Installation Manual

NAD Truck Edition
V-200 and V-300 Series

TK 51856-1-IM (Rev. 7, 02/12)
## Release History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Changes</th>
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<tr>
<td>Released</td>
<td>04/03</td>
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<td>Rev. 0</td>
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<td>Page 38: changed electrical hose to electrical harness.</td>
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<tr>
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<tr>
<td>Rev. 7</td>
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<td>Pages 48-49; added new remote receptacle, removed MTC from manual</td>
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Introduction

This installation manual was written to help assist with the installation of Thermo King V-200 and V-300 Series refrigeration units with remote evaporators onto either a truck or a van designed and built for refrigerated applications. Due to its complexity, do not attempt this installation unless you:

- Are an experienced mechanic.
- Can safely lift 34 kg (75 lb).
- Are certified or approved in the repair and maintenance of transport refrigeration systems.
- Have a basic understanding of electricity and electrical wiring.
- Have the necessary tools and equipment to complete the installation.
- Have a truck body designed and built to meet the requirements of this installation.

This manual is published for informational purposes only. Thermo King makes no representations or warranties, express or implied, with respect to the information, recommendations and descriptions contained herein. Information provided should not be regarded as all-inclusive or covering all contingencies. If further information is required, Thermo King Corporation Service Department should be contacted.

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

Manufacturer shall have no liability to any person or entity for any personal injury, property damage or any other direct, indirect, special, or consequential damages whatsoever, arising out of the use of this manual or any information, recommendations or descriptions contained herein.
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Safety Precautions

Caution

Thermo King V-200 and V-300 Condensing units are shipped with a 35-69 kPa (5-10 psi) holding charge of nitrogen. This holding charge may be safely vented into the atmosphere.

*IMPORTANT: Do not release the holding charge until necessary to prevent moisture from entering the system.*

ES Series Remote Evaporators are shipped with a 35-69 kPa (5-10 psi) holding charge of nitrogen. This holding charge may be safely vented into the atmosphere.

SEVERE COMPRESSOR DAMAGE will result from operating the engine/motor before completing the system installation which includes: installing the components, releasing the condensing unit holding charge, releasing the remote unit holding charge, connecting the refrigeration lines, leak testing the system, evacuation and clean-up, and charging the system.

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.
Safety Precautions

The ⚠️ symbol appears next to a point that is particularly important:

⚠️ CAUTION: Addresses a circumstance that, if encountered, may cause damage to equipment or minor injury.

⚠️ DANGER: Addresses a circumstance that, if encountered, will lead to death or serious injury.

⚠️ WARNING: Addresses a circumstance that, if encountered, might lead to death or serious injury.

⚠️ DANGER: Never operate the unit with the discharge valve closed because it could cause the compressor to explode, causing death or serious injury.

⚠️ DANGER: Never apply heat to a sealed refrigeration system or container because it could explode, causing death or serious injury.

⚠️ DANGER: Fluorocarbon refrigerants, in the presence of an open flame or electrical short, produce toxic gases that are severe respiratory irritants capable of causing death.

⚠️ DANGER: Be careful when working with a refrigerant or refrigeration system in any enclosed or confined area with a limited air supply (i.e., a trailer, container or the hold of a ship). Refrigerant tends to displace air and can cause oxygen depletion which may result in death by suffocation.

⚠️ WARNING: Always wear goggles or safety glasses. Refrigerant liquid, refrigeration oil, and battery acid can permanently damage the eyes (see First Aid under Refrigeration Oil).

⚠️ WARNING: Keep your hands away from fans and belts when the unit is running. This should also be considered when opening and closing the compressor service valves.

⚠️ WARNING: Make sure gauge manifold hoses are in good condition. Never let them come in contact with a belt, fan motor pulley, or any hot surface.

⚠️ WARNING: Make sure all mounting bolts are tight and are of correct length for their particular application.

⚠️ WARNING: Never drill holes in the unit unless absolutely necessary. Holes drilled into the unit may weaken structural components. Holes drilled into electrical wiring can cause fire or explosion.

⚠️ WARNING: When using ladders to install or service refrigeration systems, always observe the ladder manufacturer’s safety labels and warnings. A work platform is the recommended method for installations.

⚠️ WARNING: Exposed coil fins are very sharp and can cause painful lacerations.
Safety Precautions

Battery Cable Routing

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

**WARNING**: Do not attach fuel lines or any additional wiring harnesses to the battery cables as this could cause an electrical fire!

**CAUTION**: Do not connect other manufacturer’s equipment or accessories to the Thermo King unit. This could result in severe damage to equipment and void the warranty!

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

**CAUTION**: Always wear protective clothing, gloves and eye wear when handling and installing batteries. Battery acid can cause serious burns when exposed to eyes or skin. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters your eye, immediately flood it with running cold water for at least twenty minutes and get medical attention immediately.

Refrigerant

**WARNING**: Although fluorocarbon refrigerants are classified as safe refrigerants, certain precautions must be observed when handling them or servicing a unit in which they are used. When released to the atmosphere in the liquid state, fluorocarbon refrigerants evaporate rapidly, freezing anything they contact.

First Aid

- **FROSTBITE**: In the event of frost bite, the objectives of First Aid are to protect the frozen area from further injury, to warm the affected area rapidly and to maintain respiration.

- **EYES**: For contact with liquid, immediately flush eyes with large amounts of water and get prompt medical attention.

- **SKIN**: Flush area with large amounts of lukewarm water. Do not apply heat. Remove contaminated clothing and shoes. Wrap burns with dry, sterile, bulky dressing to protect from infection/injury. Get medical attention. Wash contaminated clothing before reuse.

- **INHALATION**: Move victim to fresh air and use CPR or mouth-to-mouth ventilation, if necessary. Stay with victim until arrival of emergency medical personnel.

Refrigeration Oil

**WARNING**: Avoid refrigeration oil contact with the eyes. Avoid prolonged or repeated contact of refrigeration oil with skin or clothing. Wash thoroughly after handling refrigeration oil to prevent irritation.

First Aid

In case of eye contact, immediately flush with plenty of water for at least 15 minutes. CALL A PHYSICIAN. Wash skin with soap and water.
Tips for a Successful Installation

• Read the Installation Manual to understand how and where components are to be located and installed.
• Verify the vehicle is designed and built for refrigeration applications including insulated walls, ceilings, floors, with doors that close and seal tightly.
• Verify the tools and special equipment required for the installation are available and in good operating condition.
• Verify all measurements before drilling any holes in the vehicle.
• Verify adequate clearance is provided for tilt cab applications before installing unit.
• Verify there is no interference with any OEM electrical wiring, internal supports, etc. before drilling any mounting holes.
• **VAN APPLICATIONS:** Verify the vehicle’s roof and the cargo area can adequately support the weight of the condenser and evaporator(s). Add additional supports (installer supplied) if required.
• **BOX TRUCK APPLICATIONS:** Verify the cargo box front wall and compartment ceiling can adequately support the weight of the condenser and evaporator. Add additional supports (installer supplied) if required.
• Provide protection to the vehicle to prevent damage during the installation.
• Install all components with correct hardware and tighten securely.
• Seal all mounting holes and access holes with silicone caulk.
• When disassembling components for installation, be sure to reassemble correctly, use proper hardware and tighten securely.
• Verify the evaporator outlet is facing the correct direction for proper airflow.
• Verify the rear of the evaporator is installed a minimum distance of 101.1mm (4.00 in.) from the wall to allow for refrigerant hose connections.
• The refrigeration system fittings of each component should be kept capped and sealed until the installation of the refrigeration hoses.
• Only cut refrigerant hoses with the correct hose cutting tool (204-677). NEVER USE A SAW!
• Always use hose fitting tool (204-1045) when assembling refrigerations hoses.
• Always lubricate hose fittings with refrigerant oil when assembling refrigeration hoses.
• Always install and lubricate O-rings when connecting refrigeration hose fittings to component connections.
• Refrigeration hose should be installed onto components in such a way as to allow for vibration and movement. They should never be stretched tight.
• All refrigerations connections should be tightened securely using two wrenches.
• **VAN APPLICATIONS:** Route electrical and refrigeration hoses from the vehicle’s compressor up through the floor into the interior of the van.
• **BOX TRUCK APPLICATIONS:** Route electrical and refrigeration hoses from the vehicle’s compressor up the exterior wall of the box and then route into the box.
• Always use protective sleeving or grommets when routing electrical harnesses or refrigeration hoses through sheet metal floors or walls.
Tips for a Successful Installation

• Always keep electrical harness and refrigeration hoses from rubbing or chafing against sharp metal objects and near or rotating components.
• Always be sure to reinstall the condenser’s filter drier in the direction indicated by the arrow.
• Always be sure to install the orifice screen correctly into the expansion valve of evaporator.
• The use of a electronic leak detector is recommended.
• Superlube or equivalent should be applied to all electrical connections.
• All electrical harnesses should be neatly routed and secured with band wraps or clamps.
• Evaporator heaters must be installed as far as possible into the drain hoses. NEVER CUT DRAIN HEATERS.
• Evaporator drain hoses should be installed and routed correctly with no kinks or sharp bends to provide for proper drainage.
• Flush compressor with oil (203-515).
• The In-Cab controller should be mounted inside the vehicle. It should be accessible and visible from the drivers position while not interfering with the driver’s mobility, visibility or access to the vehicle controls and instruments.
• Electrical power to the In-Cab controller must be connected to a fused circuit of the vehicle to provide power only when the ignition switch is in the ON position.
• Verify In-Cab controller is set to the proper voltage (12/24 Vdc) and the desired temperature scale (C or F).
• ELECTRIC STANDBY MODELS: Be sure the receptacle box is wired correctly for your application.
• Verify the main power harness is connected properly to the vehicle’s battery’s positive and negative posts.
• Verify the refrigeration system is charged with the correct type and amount of refrigerant for your application.
• The condenser fan must be installed and the harness connected before operating the system or damage to the components will result.
• The remote evaporator fan and cover must be installed and the harness connected before operating the system or damage to the components will result.
Required Tools

1. Drill
2. Drill Bits (1/8 and 31/64)
3. Hole Saws (3.00 in.)
4. Protective Eye Wear
5. Adhesive Tape
6. Measuring Tape
7. Installation Templates
8. Pencil
9. Sockets and Extensions
10. Open End Wrenches (9/16-13/16-7/8-3/4)
11. Adjustable Wrench (12.00 in.)
12. Silicone Caulk
13. Protective Gloves
14. File
15. Tie Bands
16. Terminal Connectors
17. Electrical Extension Cord
18. Voltmeter
19. Screwdrivers
20. Hose Cutting Tool (204-677)
21. Wire Strippers
22. Wire Cutters
23. Hand Saw
24. Electrical Terminal Crimpers
25. Hose Fitting Tool (204-1045)
26. Manifold Set
27. Evacuation Station
28. Electronic Leak Detector
29. Nitrogen
30. Refrigerant and Scale
31. Table Mounted Vise
32. Overhead Crane or Hoist
33. Refrigerant Oil (203-515)
34. Reclaiming Station
35. Solenoid Valve Magnets (204-1074)
36. Work Platform (Recommended)
37. Torque Wrench

IMPORTANT: Equipment such as scales, gauges, and torque wrenches should be in good working condition and routinely calibrated to assure accurate readings.
Required Tools
Unpacking and Inspecting Components

**Unpacking the Components**
1. Carefully open the packaging and remove the components.
2. Locate the unit documentation.
3. Verify the packaging contains all the accessories indicated on the list attached with the documentation.

**Inspecting the Components**
1. Inspect the Condenser and Remote Evaporator for the following:
   - Any shipping damage or imperfections.
   - Confirm the voltage of all the electrical components is correct (12/24V)
2. Remove the cover from the Condenser and inspect for the following:
   - The condenser is charged with helium gas.
   - Defrost is set to 4 hours.
3. Remove the cover from the Remote Evaporator and inspect for the following:
   - The evaporator is charged with helium gas.
   - Locate the capsule that contains the expansion valve orifice screen.

**IMPORTANT:** After unpacking and inspecting all components, please fill out the Green Tag and return to Thermo King Corporation.
Unpacking and Inspecting Components
Installation Sequence

Single Compartment Units

The operations indicated in this manual should be carried out by a mechanic in the exact sequence in which they are presented in the manual.

In order to speed up the installation, two mechanics can work together. In this case, the installation can be completed in less than eight hours (one working day). In order to achieve this objective, each mechanic should have his/her own separate tool kit.

The diagram on the following page shows the way in which the different tasks should be divided between the two mechanics.

Each mechanic should work on different parts of the vehicle at all times, and on unrelated tasks, which will avoid interference between them.
# Installation Sequence

## Single Compartment Units

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<tr>
<th>TASK</th>
<th>t (minutes)</th>
<th>1 HOUR</th>
<th>2 HOUR</th>
<th>3 HOUR</th>
<th>4 HOUR</th>
<th>5 HOUR</th>
<th>6 HOUR</th>
<th>7 HOUR</th>
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*MECHANIC A*

*MECHANIC B*
Installation of the Engine Driven Compressor

CAUTION: Always disconnect the vehicle’s negative (-) battery cable to prevent damage to equipment or personal injury during the installation of this product.

IMPORTANT: DO NOT remove the caps on the Suction and Discharge fittings on the compressor. These refrigeration hose connections will be made in a later step.

IMPORTANT: Always confirm installation kit is correct for your vehicle before preceding.

Flush compressor with oil (203-515).

Install the engine driven compressor onto your vehicle per the instructions included in your particular compressor installation kit.
Installation of the Engine Driven Compressor
Installation of the Roof Mounted Condenser Unit

**IMPORTANT:** Verify the roof of the vehicle can support the weight of the condenser unit. Additional supports (installer supplied) may be required.

**IMPORTANT:** Before drilling any mounting holes, verify there is no interference with any of the vehicle’s OEM electrical wiring, etc.

1. Remove the plastic cover and fan assembly from the condenser unit.
2. Locate and mark the centerline (C/L) of the vehicle’s roof.
3. Position the condenser template (roof mount version) onto the roof and mark the mounting holes and access holes.
4. Drill 12 mm (.472 in.) mounting holes and a 70 mm (2.75 in.) refrigerant hose access hole.
5. Apply caulking around all mounting holes.
6. Position the large rubber mounts over each mounting hole and place the condenser onto the roof.
7. Install condenser mounting hardware and tighten securely.
8. Reinstall fan assembly only.
Installation of the Roof Mounted Condenser Unit

T = 20 min.
Installation of the Nose Mounted Condenser Unit

**IMPORTANT:** Verify the front wall of the vehicle can support the weight of the condenser. Additional supports (installer supplied) may be required.

**IMPORTANT:** Verify adequate clearance is provided for tilt cab applications before installing the condenser.

**IMPORTANT:** Before drilling any mounting holes, verify there is no interference with any of the vehicle’s OEM electrical wiring, etc.

1. Remove the plastic cover and fan assembly from the condenser unit.
2. Mark and trim the plastic fan assembly as shown.
3. Locate and mark the centerline (C/L) of the vehicle’s front wall.
4. Position the condenser template (nose mount version) onto the front wall and mark the mounting holes and access holes.
5. Drill 12 mm (.472 in.) mounting holes and a 70 mm (2.75 in.) refrigerant hose access hole.
6. Apply caulking around all mounting holes.
7. Install condenser with mounting hardware and tighten securely.

**IMPORTANT:** **DO NOT** install the large rubber washers. The front mount installation **DOES NOT** use them.
8. Reinstall the modified fan assembly onto the condenser.
Installation of the Nose Mounted Condenser Unit

T = 20 min.
Installation of the Evaporator

**ES-200 / ES-200 MAX and ES-300 / ES-300 MAX Applications**

**IMPORTANT:** Verify the ceiling of the vehicle can support the weight of the remote evaporator. Additional supports (installer supplied) may be required.

**IMPORTANT:** Before drilling any mounting holes, verify there is no interference with any of the vehicle’s OEM electrical wiring, etc.

1. Locate and mark the centerline (C/L) of the compartment ceiling.
2. Mark a line a minimum of 152 mm (6.00 in.) from the compartment rear wall.

*NOTE:* This distance is required to allow access for refrigerant hose connections.

3. Position the template onto the ceiling (aligned with centerline and rear wall measurements) and mark the mounting locations.
4. Drill 12 mm (.472 in.) mounting holes in the ceiling.
5. Remove the cover from the evaporator.
6. Install the evaporator with appropriate hardware and tighten securely.

*NOTE:* The cover will be reinstalled later.
Installation of the Evaporator

T = 20 min.
Fabricating Refrigeration Hoses

TK 2000 Assembly System

The TK 2000 System is designed for assembly with Multi-refrigeration hose only.

The benefits are virtually endless:

• No Guess work
• No Leaking Crimps
• No Power Supply Needed
• As easy to use as a pair of Pliers
• Easy to use in confined areas

Assembly Materials Checklist

• Hose Fitting Tool (204-1045)
• Hose Cutting Tool (204-677)
• TK 2000 Multi-Refrigerant Hose
• Nipple Assembly*
• Appropriately Sized Clips and Cage

NOTE: The two black O-rings on the nipple assembly are of a specific rubber compound and size. They should not be removed or replaced.

1. Hose
2. Cage
3. Clips
4. O-rings
Fabricating Refrigeration Hoses

Cut the Hose

1. Cut the hose to proper length with an appropriate cutting tool. Hand-held hose cutter (204-677) has been specially designed for cutting all non-wire reinforced hose, such as TK 2000 Multi-refrigerant hose. Be sure the cut is made square to the hose length.

Slip on Two Clamps

2. Install two proper-size clips onto the cut end of the hose. Orientation of the clips does not affect the performance of the connection. However for ease of assembly, both clips should have the same orientation.

CAUTION: Failure to slide the clips over the hose at this time will require the clips to be stretched over the hose or fitting later. This may permanently damage the clip.
Fabricating Refrigeration Hoses

Oil the Nipple

3. Lubricate the nipple with a generous amount of the refrigeration or A/C system’s compressor lubricating oil. This MUST be done to lower the force of nipple insertion.

4. Insert the nipple into the hose. To ensure that the nipple is fully inserted, check the gap between the cut end of the hose and the shoulder on the nipple. Care should be taken to avoid kinking or other damage to the hose during nipple insertion.

NOTE: Be sure to wipe excess oil from the nipple and hose.
Fabricating Refrigeration Hoses

Snap on the Cage.
5. Snap the cage into the groove on the nipple. The arms should extend over the hose length. When the cage has been carefully installed in the cage groove, the cage will be able to rotate in the groove. This step must be performed to ensure:
   • The clips will be located over the O-ring on the nipple.
   • The connection will be compatible with the connection’s pressure rating.

Slide the Clips
6. Slide the clips over the cage arms and into the channels on each arm.

Close the Clips
7. Use the fitting pliers (204-1045) to close the clips. The pliers should be positioned squarely on the clip connection points and should remain square during the closing of the clip.

NOTE: For easiest assembly, the clasp should be closed between the cage arms.
Fabricating Refrigeration Hoses

Nose of the pliers should be firmly seated under the assembly bump and lock latch.

If the pliers are not kept square during closing the clip, the clasp may have an offset. Use the piers to correct the clasp alignment.
CAUTION: TK 2000 Speedy Clip System components should not be reused. Failure to follow these instructions and/or the use of TK 2000 Speedy Clip System hose with fittings supplied by other manufactures could result in sudden or unintended escape of refrigerant gases. Personal injury and/or violations of EPA regulations may occur as a consequence.

NOTE: Thermo King recommends adherence to all guidelines, including EPA guidelines concerning the service of refrigerant systems.
Installation of Hoses to the Vehicle’s Compressor

**IMPORTANT:** Refrigerant hoses should not be stretched tight. Always allow excess hose at compressor for engine movement.

**IMPORTANT:** Secure all refrigerant hoses adequately to the truck frame with tie bands and clamps. Keep refrigeration hoses from rubbing or chafing against sharp metal objects and near hot or rotating truck components.

**IMPORTANT:** Grommets or protective sleeving should always be used when routing refrigerant hoses through sheet metal floors.

1. Fabricate suction and discharge refrigeration hoses.
2. Lubricate the compressor refrigeration fittings with refrigerant oil. Pour the remaining refrigerant oil into the suction hose.
3. Place an O-ring on each compressor fitting.
4. Provide an oil trap and connect the SUCTION hose to the compressor fitting marked S.
5. Connect the DISCHARGE hose to the fitting marked D.
6. Connect the CLU wire to the compressor harness connector. Secure the harness to the compressor to avoid damages to the wire caused by the vibrations.
Installation of Hoses to the Vehicle’s Compressor
Installation of the Jet Cool System

MAX Units Only

1. Remove the Schrader valve from the suction service port. Mount the double nut, tee and orifice on the suction service port.

2. Route and mount the liquid injection hose from the injection solenoid valve down to the liquid orifice located on the compressor.

3. Mount the liquid injection switch onto the compressor discharge fitting and connect to the condenser electrical harness.
Installation of the Jet Cool System
Installation of Hoses to the Condenser Unit

*NOTE: It is important to minimize the amount of time refrigeration systems and components are uncapped and open to ambient conditions. Always keep systems and components capped until ready to install.*

1. Remove the filter-drier from the condenser.
2. Remove the rubber plugs or plastic caps from all the tubes.
   *NOTE: Do not remove the metal plugs on a 10 Model unit.*
3. Lubricate all refrigeration fittings with refrigerant oil.
4. Place an O-ring in the seat of all the refrigeration fittings.
5. Check that the O-ring is properly positioned and connect each hose using two wrenches. Fit the discharge fitting first. Use an open wrench to install the oil return fitting to the separator.
6. Connect the filter-drier to the liquid line in the direction indicated by the arrow.
Installation of Hoses to the Condenser Unit

Without Electric Standby

With Electric Standby

T = 12 min. R-134a
T = 14 min. R-404a
Installation of Hoses to the Evaporator

ES-200 / ES-200 MAX Evaporators

1. Remove the rubber plugs or plastic caps from all the tubes.

   *NOTE: Do not remove the metal plugs on a 10 Model unit.*

2. Install the orifice screen into the expansion valve.

3. Lubricate all refrigeration fittings with refrigerant oil.

4. Place an O-ring on each refrigeration fitting (except on the expansion valve).

5. Connect each hose using two wrenches.

   *NOTE: The O-ring should be properly positioned before the fitting is screwed on.*
Installation of Hoses to the Evaporator

T = 22 min.
Installation of Hoses to the Evaporator

ES-300 / ES-300 MAX Evaporators

1. Remove the rubber plugs or plastic caps from all the tubes.

   *NOTE: Do not remove the metal plugs on a 10 Model unit.*

2. Install the orifice screen into the expansion valve.

3. Lubricate all refrigeration fittings with refrigerant oil.

4. Place an O-ring on each refrigeration fitting *(except on the expansion valve)*.

5. Connect each hose using two fixed wrenches.

   *NOTE: The O-ring should be properly positioned before the fitting is screwed on.*
Installation of Hoses to the Evaporator
System Leak Check and Evacuation

**IMPORTANT: Thermo King Evacuation Station P/N 204-725 and Evacuation Station Operation and Field Application Instructions (TK-40612) is required.**

**NOTE: The oil in the evacuation station vacuum pump should be changed after each use.**

1. Heat the box up to 20°C / 70°F using a ventilated radiator.
2. Connect the gauge manifold to the suction and discharge intakes of the vehicle compressor.
3. Connect the central line of the gauge manifold to the vacuum pump. Always use recommended vacuum equipment. Before each use, check that there are no leaks in the vacuum equipment either in the pump itself or in the hoses.
4. Open the gauge manifold and vacuum pump valves. Open all the solenoid valves in the circuit.

**IMPORTANT: The solenoid valves must be in the OPEN position during evacuation procedures.**

5. Start the vacuum pump and maintain suction until it reaches 500 microns.
6. Once it reaches 500 microns, leave suction running for **one hour**.
7. Close the vacuum pump valve, switch off the pump, checking that the gauge reading for the vacuum pump does not exceed **2000 microns** in the following five minutes. If vacuum level exceeds 2000 microns after five minutes, a leak is present or additional evacuation time is required.
8. Start the vacuum pump again and open the vacuum valve. Leave the pump running until it reaches **500 microns** of pressure again.
9. Once it reaches 500 microns, close the vacuum pump valve and switch off the pump.

The unit is ready to be filled with refrigerant.
System Leak Check and Evacuation

T = 10 min.
Electrical Connections to the Evaporator

ES-200 / ES-200 MAX / ES-300 / ES-300 MAX Evaporators

1. Pass the electrical hose and the return temperature sensor through as far as the evaporator.

2. Connect the low pressure cutout, the defrost temperature thermostat and the temperature sensor.

3. Connect the harnesses for the fans.

4. **ES-200 MAX / ES-300 MAX ONLY:** Connect the defrost resistors to the power cables.

5. Install the evaporator cover and secure using screws.
Electrical Connections to the Evaporator
Installation of the Drain Hoses

ES-200 / ES-200 MAX / ES-300 / ES-300 MAX

1. Cut the drain hose into three sections of suitable length.
2. Join the three sections of hose using the Y connector.
3. **ES-200 MAX / ES-300 MAX ONLY**: Insert the defrost heater wire through each drainage hose, along its entire length.
4. Allow the drain hoses a sufficient slant to ensure that the water drains away and connect the hoses to the drain tubes. Secure the connections with tie bands.
5. Route the hoses through the compartment wall drain hole and seal with caulking.
Installation of the Drain Hoses
Installation of the In-Cab Controller

1. Install the in-cab control mounting bracket. Find a location that is accessible and visible from the driver's position and that does not hinder the driver's mobility, visibility or access to the vehicle instruments and levers.

2. Route the control and temperature sensor wires up to the cab.

3. Open the rear cover of the controller. Select the operating voltage 12/24 Vdc, temperature scale C/F and the set point range.

4. Locate the vehicle ignition key fuse and connect it to the wire coming from pin 3 of the main in-cab controller.

5. Connect the control and temperature sensor cables to the in-cab controller.

6. Reinstall the controller cover without crimping the wires.

7. Install the controller to the bracket.
Installation of the Electric Standby Power Supply (OPTION)

Units with Electric Standby Option

⚠️ **DANGER:** Electrical cord must not be connected to an electrical power source during installation.

The standby receptacle and power cable should be installed securely to the exterior of the vehicle.

The location chosen should be easily accessible while not interfering with the driver’s visibility or operation of the vehicle.
Installation of the Electric Standby Power Supply (OPTION)

T = 10 min.
Electrical Connections to the Battery

1. Route the electrical wires (CH, 2 and 2) to the battery.
2. Cut the wires to the required length using the recommended tools.
   
   **NOTE: Do not roll up the excess electrical wire.**

3. Strip the wires and attach connectors using recommended tools.
4. Connect the CH wire to the negative (-) pole of the battery.
5. Connect the 2 and 2 wires to the positive (+) pole of the battery.
Electrical Connections to the Battery
**System Charging**

**IMPORTANT:** The V-200 condenser fan assembly and ES remote evaporator cover with fans must be installed prior to operating the system during the charging procedures. Operating the unit without the fans operating will cause serious damage to the system and its components.

1. Connect a gauge manifold set to the suction and discharge service ports on the engine driven compressor.
2. Connect the refrigerant bottle to the gauge manifold and place it on a scale.
3. Connect the refrigerant bottle valve and **drain the gauge fitting line**.
4. Keep the low pressure side valve of the gauge manifold closed. Open the high pressure side valve.
5. **V-200 Series Units:**
   Add refrigerant until reaching approximately 1.40 kg/3.00 lb. for R-404A or 1.8 kg/2.75 lb. for R-134a. The refrigerant charge must be made in liquid phase for R-404A.
6. **V-300 Series Units:**
   Add refrigerant until reaching approximately 1.80 kg/4.00 lb. for R-404A or 1.75 kg/3.85 lb. for R-134a. The refrigerant charge must be made in liquid phase for R-404A.
7. Close the refrigerant bottle valve and the high side valve of the gauge manifold.
8. Start the vehicle engine, run at approximately 1000 rpm and turn the unit ON.
9. Set the unit thermostat at 0C/32F (see operators manual).
10. Run the unit until it reaches a temperature close to that indicated, and a high circuit pressure of **180 psig for R-134a** or **275 psig for R-404A**. Partially block off the air intake to the condenser if necessary.
11. Open the low side valve of the gauge manifold and the refrigerant bottle valve, and add refrigerant slowly until no bubbles can be seen through the liquid sight glass.
12. Close the refrigerant bottle and gauge manifold valves.
13. Leave the unit running for 15 minutes.
14. **UNITS WITHOUT ELECTRIC STANDBY:** Turn unit OFF, turn the vehicle OFF and remove the gauge manifold.
15. **UNITS WITH ELECTRIC STANDBY:** Turn unit OFF and turn the vehicle OFF.
16. Connect the unit to electrical standby source. Run the unit on electric standby operation for 15 minutes.
17. Turn the unit OFF and remove the electrical standby plug.
18. Start the vehicle, turn on the unit and allow it to run on vehicle power for 15 minutes.
19. Check that there are no bubbles in the sight glass. If bubbles are seen, repeat steps 10 and 11.
20. Turn off the unit, stop the vehicle and remove the gauge manifold.

**NOTE:** The above conditions **MUST** be established each time the refrigerant level is checked or if refrigerant needs to be added for any reason.
Checking the Installation

- All mounting holes and access holes should be sealed with silicone or foam.
- Check with a sheet of paper that the fans blow in the right direction.
- The drain hoses should be slanted on all evaporators.
- The orifice screen should be installed in the expansion valve on all evaporators.
- The temperature sensor should be connected on all evaporators.
- The in-cab control box should be installed in an area that is accessible and visible from the driver's position.
- The electrical contact draw should be verified.
- Hoses should not be taut (they should be able to absorb vibrations and be shortened in case of leaks).
- Hoses should not be allowed to rub against moving parts, sharp parts, or parts that can reach high temperatures.
- The oil return hose should be installed.
- The liquid injection hose should be installed (R-404A units only).
- The vehicle compressor should be primed with oil.
- The unit should be connected to the battery.
- The vehicle compressor drive kit test should have been carried out.
- The leak test should have been carried out.
- The unit should be charged with correct type and amount of refrigerant.
Installing the Heater (OPTION)

Installing the Heater Assembly

CAUTION: Before servicing the unit, disconnect the vehicle’s negative (-) battery cable and standby AC electrical power source (if applicable) to prevent personal injury.

IMPORTANT: Verify the roof of the vehicle can support the combined weight of the evaporator and the heater assembly. Additional supports may be required.

1. Remove the plastic cover from the evaporator.
2. Remove the mounting hardware securing the fan guard and fan assembly. Reinstall only the fan assembly with the mounting hardware. The fan guard will not be reused.
3. Locate the temperature sensor inside the evaporator. Disconnect it from the evaporator harness and remove the temperature sensor, clamp and mounting hardware from the evaporator. These parts will be reinstalled onto the heater in step #4.
4. Reinstall the temperature sensor to the OUTSIDE of the heater housing, over the oval hole, using the clamp and mounting hardware removed in step #3. Reconnect the temperature sensor to the mating connector at the evaporator harness. Secure excess harness with tie bands.
5. Reinstall the plastic cover onto the evaporator replacing the three mounting bolts in the recessed mounting locations with three M5 mounting studs. Do not install the two rear mounting bolts at this time.  

NOTE: The M5 mounting studs are to be installed in the covers three recessed mounting locations only.

6. Position the heater onto the three studs, secure with M5 flat washers, lock washers and nuts. Reinstall the two rear mounting bolts and the two large M5 flat washers supplied in the kit. Tighten hardware securely.
7. Locate and drill appropriate size holes in the truck box for the heater hoses.
Installing the Heater (OPTION)
Installing the Heater (OPTION)

Installing the Water Pump and Coolant Lines

CAUTION: Before servicing the unit, disconnect the vehicle’s negative (-) battery cable and standby AC electrical power source (if applicable) to prevent personal injury.

IMPORTANT: NEVER add Red Extended Life Coolants to cooling systems using Green or Blue-Green coolants. NEVER add Green or Blue-Green coolants to cooling systems using Red Extended Life Coolants.

NOTE: The water pump should be installed in the vehicle’s engine compartment where it can be accessible to the engine coolant lines. Silicon hose for coolant lines are to be supplied by the installer.

Assemble the water pump and solenoid assembly inside the engine compartment per the installation sheet supplied with pump kit.

1. Install the water pump securely to the vehicle noting the locations of the INLET and OUTLET connections.

2. Install a tee in line with the vehicle’s water pump outlet hose. This should be the hose that runs from the OUTLET of the vehicle’s engine water pump before the thermostat. Run a hose from this tee to the water pump INLET fitting.

3. Route the coolant hose from OUTLET of the water pump to the INLET of the heater assembly.

4. Install a tee in line with the vehicle’s heater coolant return hose. This should be the hose that runs to the vehicle water pump inlet. From the tee connect a coolant hose and route it to the OUTLET water tube from the heater assembly.

5. All coolant hoses should be properly routed and adequately secured every 305 mm (12.00 in.) with clamps.

6. Caulk coolant hose access holes with silicone.

7. Pressure test the cooling system to ensure that there are no leaks in the evaporator section and top off the coolant level with the correct type of antifreeze.

IMPORTANT: Any air in the coolant system must be bled after completing the installation using the fitting (see arrow) located on the outlet tube of the heater coil.
Installing the Heater (OPTION)
Installing the Heater (OPTION)

Installing the Electrical Components for Hot Water Heat Only

⚠️ **CAUTION:** Before servicing the unit, disconnect the vehicle’s negative (-) battery cable and standby AC electrical power source (if applicable) to prevent personal injury.

Remove the outer white and grey plastic cover/fan assembly from the condenser unit.

1. Remove the nut and washer from the stud fastening the contactor bracket to the condenser frame.

2. Remove motor contactor from the contactor bracket. **DO NOT** disconnect the wiring.

3. Move the contactor bracket away from the frame by rotating it on its hinge. Install the heater relay bracket to the contactor bracket with two rivets. The head of the rivets must be installed from the inside of the contactor bracket. Reinstall the motor contactor with the wires folded neatly to the inside of the relay bracket.

4. Remove the heater relay from the socket. Attach the relay socket to the heater relay bracket using the hole closest to the circuit board and secure with nut, screw and washers. Reinstall the heater relay into the socket. Reinstall the nut and washer (removed in step #1) onto the stud securing the contactor bracket to the condenser frame and tighten securely.

5. Unplug and discard the white 8-pin connector (with single jumper wire) on the main harness and replace it with the white 8-pin connector from the heater harness.

6. Attach the heater harness ground wire (CH) to the ground screw located on the condenser frame.

7. Locate the 3-pin connector with jumper (Labeled S1) on the circuit board. **Note:** The S1 connector is easily located using the orange dial on the circuit board as reference.

**IMPORTANT:** There are two 3-pin connectors with jumpers located on the circuit board labeled S1 and S2. **DO NOT** connect the harness to the S2 connector or serious damage to the circuit board will result!

Unplug and discard the jumper and replace it with the harness with the 3-pin connector.

**Note:** The pin connections of S1 on the circuit board are marked #1, #2, and #3. Be sure the empty socket (#1) of the 3-pin connector connects to the #1 pin of S1 on the circuit board.

8. Route and secure the water pump harness along side of the main condenser harness to the motor/compressor side of the condenser assembly. Route the water pump harness out the bottom of the condenser frame to the vehicle’s engine compartment. In the vehicle’s engine compartment, connect the water pump harness 2-pin connectors (CH-02, 26A-03, CH-03, 26A-04) to the mating water pump and water valve electrical connectors.


10. Caulk all harness access holes with silicone.

11. Reinstall the outer white and grey plastic cover/fan assembly onto the condenser unit, reconnect the vehicle’s negative (-) battery cable, and test the operation of the heater.
Installing the Heater (OPTION)
Installing the Heater (OPTION)

Installing the Electrical Components for Hot Water Heat with Electric Heater Elements

**CAUTION: Before servicing the unit, disconnect the vehicle’s negative (-) battery cable and standby AC electrical power source to prevent personal injury.**

Remove the outer white and grey plastic cover/fan assembly from the condenser unit.

Follow steps #1-8 on page 58 with the following exceptions:

**Step #6**
- *Electric Heater* units have two ground wires (CH-01, CH-04). Attach both wires to the ground stud.

**Step #8**
- *Electric Heater* units water pump harness wires are marked CH-02, 26A-03, and CH-03, 26A-04. Connect these 2-pin connectors to the mating water pump electrical connectors.

1. Connect wire (L1-01) to the fuse connector.
2. Connect wire (H2-01) across from wire H2 on the transformers terminal strip connector.
3. Locate the two capacitors. Disconnect the jumper strips and remove the front capacitor only. Locate the grommet (under the front capacitor) and drill an appropriate size hole through the vehicle’s roof. Route the heater harness and 9 wires through the grommeted hole in the frame and the vehicle’s roof. Caulk the harness access hole with silicone sealer and reinstall the capacitor.
4. Insert the wires into the electrical connector body as shown noting **correct wire locations** and assemble the connector tightly. Connect the harness plug securely to the mating connector on the heater.
5. Secure all harnesses adequately with tie bands.
6. Reinstall the outer white and grey plastic cover/fan assembly onto the condenser unit. Reconnect the vehicle’s negative (-) battery cable and standby AC electrical power source and test the operation of heater.

CAUTION: Before servicing the unit, disconnect the vehicle’s negative (-) battery cable and standby AC electrical power source to prevent personal injury.
Installing the Heater (OPTION)
Providing equipment and services to manage controlled-temperature environments for food and other temperature-sensitive products, our Climate Control Technologies sector encompasses both transport and stationary refrigeration solutions. Our product brands include Thermo King®, a world leader in transport temperature control systems, and Hussmann®, a manufacturer of refrigeration and food merchandising equipment.


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