



Installation Manual

Truck Edition

V-520 RT SPECTRUM

Model 50

Multi-Temperature Systems

Revision 7

January 2016

TK-55455-18-IM

TRANE
TECHNOLOGIES

Installation Manual

Truck Edition V-520 RT SPECTRUM Model 50 Multi-Temperature Systems

TK 55455-18-IM (Rev. 7, 01/16)

V-520 RT Installation Manual

Release History

- Released (07/12)
- Rev. 1 (06/12) Pages 8, 10, 20 and 56: added silicone sealant update, page 39; increased compressor oil quantity.
- Rev. 2 (09/13) Page 5: changed compressor oil from 203-513 to 203-515.
- Rev. 3 (12/13) Pages 8, 13 and 14: changed text and art to clarify the minimum distance required from the cargo wall to the rear of the evaporator with or without heat option.
- Rev. 4 (04/14) Pages 24, 26 and 28: added torque of 60 in-lbs for plastic cover screws.
- Rev. 5 (08/14) Pages 9, 20, 21, 54 and 55: Added compressor ground wire.
- Rev. 6 (11/15) General update to manual including adding SPR and CPR adjustment procedures, system leak check and evacuation procedures, updated information on battery connections and how to properly secure maxi fuse holder.
- Rev. 7 (01/16) Added new in-line fuse installation procedures.

Introduction

This manual was written to assist with the installation of a **Thermo King V-520 RT SPECTRUM** unit with two **ES300** remote evaporators onto trucks designed and built for refrigerated applications. Due to its complexity, you should not attempt this installation unless you:

- Are an experienced mechanic.
- Can safely lift 34 kilos (75 lbs.)
- Are certified or trained 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 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 consulted.

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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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.

R-404A / R-134a



WARNING: Use *ONLY Polyol Ester based refrigeration compressor oil (TK P/N 203-515) in R-404A and R-134a units.*

DO NOT use Polyol Ester based oil in standard Thermo King units.

DO NOT mix Polyol Ester and standard synthetic compressor oils.

Keep Polyol Ester compressor oil in tightly sealed containers. If Polyol Ester oil becomes contaminated with moisture or standard oils, dispose of properly—DO NOT USE!



WARNING: When servicing Thermo King R-404A and R-134a units, use only those service tools certified for and dedicated to R-404A or R-134a refrigerant and Polyol Ester compressor oils. Residual non-HFC refrigerants or oils will contaminate R-404A and R-134a systems.



CAUTION

Thermo King condenser units and remote evaporators are shipped with a 35 kPa (5 psi) holding charge of Nitrogen. This holding charge may be safely vented into the atmosphere.



CAUTION: SEVERE COMPRESSOR DAMAGE will result from operating the unit before completing the installation which includes: installing the components, releasing the holding charge, connecting refrigeration lines, leak testing, evacuation, clean-up and charging of the system with the proper amount and type of refrigerant.

Safety Precautions

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

 **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.

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

 **DANGER:** Never operate the unit with the discharge valve closed as 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 eye protection such as 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 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.

Safety Precautions (continued)

Battery Installation and 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.

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

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

FROST BITE: 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

NOTE: 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

IMPORTANT INSTALLATION INFORMATION

- Read this Installation Manual to understand how all components are to be located and properly installed.
- The vehicle's cargo area must be designed and built for refrigeration applications with insulated walls, ceilings and floors. All cargo doors must close and seal tightly.
- The vehicle's exterior roof must be able to adequately support the combined weight of the rooftop mounted components. Additional supports (installer supplied) may be required. *See "Dimensions and Weight - Model 50 SPECTRUM" on page 12.*

Model 50 SPECTRUM Refrigeration, Power Pack and Condenser Modules - approximate weight 86 kg (190 lbs.)

- The vehicle's interior ceiling must be able to adequately support the weight of two (2) ES300 evaporators. Additional internal structural supports (installer supplied) may be required. *See "Dimensions and Weight - ES300 Host Evaporator" on page 13.*

ES300 HOST (Frozen Compartment) Evaporator - approximate weight 18 kg (40 lbs.)

ES300 REMOTE (Fresh Compartment) Evaporator with accumulator - approximate weight 33 kg (72 lbs.)

- Thermo King recommends securely installing steel support plates with mounting studs or threaded inserts (installer supplied) to the truck's interior roof structure to mount the V-520 RT refrigeration module, condenser module and the ES500 evaporator prior to insulating and finishing the cargo area.

ES300 HOST - Allow a minimum distance of 152 mm (6.00 in.) from the cargo area wall to the rear of the evaporator for refrigerant hose and drain hose connections.

ES300 REMOTE - Allow a minimum distance of 152 mm (6.00 in.) from the cargo area wall to the rear of the accumulator assembly for refrigerant hose and drain hose connections.

- The V-520 RT must be installed with the refrigeration module facing towards the front of the vehicle.

- Verify tools and special equipment required for the installation are available and in good operating condition before beginning the installation.
- Verify all measurements before drilling holes in vehicle.
- Verify there is no interference with OEM electrical wiring, internal supports, etc. before drilling holes in vehicle.
- Provide protection to vehicle's finish to prevent damage during the installation process.
- Install all components using the correct hardware for your particular application and tighten securely.
- All access holes through the cargo area must be sealed with a neutral/alcohol cure silicone sealant to prevent moisture from entering and air from escaping.
- Always use protective grommets when routing electrical harnesses or refrigeration hoses through sheet metal floors or walls.
- Always keep electrical harness and refrigeration hoses from rubbing or chafing against sharp metal objects or rotating components.
- The fabrication and installation (by the installer) of protective covers for any exposed refrigerant hoses, drain hoses and electrical wiring inside or outside the cargo area is recommended.
- Verify the air outlet of each ES300 evaporator is facing the correct direction for proper airflow before installing.
- ES300 evaporator drain hoses should be installed and routed correctly with no kinks or sharp bends to provide for proper drainage.

REFRIGERATION HOSES

- Always keep refrigeration system fittings 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 the correct hose fitting tool (204-1045 or 204-1128) when assembling refrigerations hoses.

Tips for a Successful Installation (continued)

- Always lubricate hose fittings with refrigerant oil when assembling to refrigeration hoses.
- Always install and lubricate o-rings with refrigerant oil when connecting refrigeration hose fittings to component connections.
- All refrigeration connections should be tightened securely using two wrenches.
- Refrigeration hoses should be installed onto components in such a way as to allow for vibration and movement. **THEY SHOULD NEVER BE STRETCHED TIGHT!**
- Refrigeration hoses should be carefully routed from the vehicle's engine compartment, up the interior wall of the cargo area.

ELECTRICAL

- Anti-corrosion gel (203-377) or equivalent should be applied to all electrical connections.
- All electrical harnesses should be neatly routed and secured with band wraps or clamps.
- Evaporator heater resistance wires must be installed as far as possible into the drain hoses. **NEVER CUT HEATER RESISTANCE WIRES!**
- Electrical power to the In-Cab controller (**BAT, ACC**) must be spliced into the supplied 10 amp fuse and connected to the ON position of the vehicle's ignition switch.
- The unit's power wire (**2**) must be spliced into the supplied 60 amp fuse and connected securely to the vehicle's positive (+) battery connection.
- If the vehicle is equipped with a battery disconnect switch, always attach the 2 wire after the switch. This allows power to the unit to be turned off by the battery disconnect switch.
- The unit's ground harness must be connected securely to the vehicle's negative (-) battery connection.
- A separate ground wire must be installed from the engine driven compressor to chassis ground. The location used on the vehicle chassis should be clean and free of paint to make a proper ground path. "Battery Installation and Cable Routing" on page 7 for details.

- The In-Cab controller must only be mounted inside the vehicle. It should be accessible and visible from the driver's position while not interfering with the driver's mobility, visibility or access to the vehicle controls and instruments.

ELECTRIC STANDBY MODELS

NOTE: Thermo King recommends a 20 amp fused power source for electric standby operation.

- Verify the receptacle box is wired for the correct voltage for your application.
- The standby receptacle box should be installed securely to the exterior of the vehicle. It should be easily accessible while not interfering with the driver's visibility or operation of the vehicle.

SYSTEM EVACUATION AND CHARGING

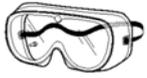
- The Liquid Injection Solenoid Valve, Liquid Line Solenoid Valves and the Defrost Solenoid Valve must both be in the OPEN position during evacuation procedures. The valves are normally in the closed position and must be held open manually using special magnets (204-1074) designed for this purpose. **DO NOT** put a magnet onto the Condenser Blocking Solenoid Valve as this is a normally open valve and a magnet will close it.
- Thermo King Evacuation Station P/N 204-725 and Evacuation Station Operation and Field Application Instructions (TK-40612) is required.
- Never evacuate a system without a micron gauge.
- The oil in the evacuation station vacuum pump should be changed after each use.
- Verify the refrigeration system is charged with the correct type and amount of refrigerant for your application.
- Verify the refrigeration system has been checked for leaks by using an electronic leak detector.
- Verify the SPR and CPR adjustment procedures were followed and the unit operates at its maximum capacity.

Required Tools

1. Protective Eye Wear
2. Drill
3. Drill Bits
4. Tape Measure
5. Hand Saw
6. File
7. Mechanics Tools
8. Torque Wrench
9. Wire Crimper
10. Hose Cutting Tool (204-677)
11. Hose Fitting Tools (204-1045 and 204-1128)
12. Voltmeter
13. Neutral/Alcohol Cure Silicone Sealant (203-436) or equivalent
14. Manifold Gauge Set
15. Evacuation Station
16. Reclaiming Station
17. Electronic Leak Detector
18. Refrigerant and Scale
19. Overhead Crane or Hoist with locking lifting hooks
20. Work Platform (Recommended)
21. Solenoid Valve Magnet (204-1074)

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

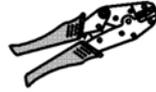
Required Tools



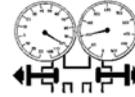
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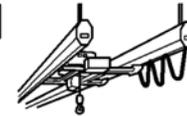
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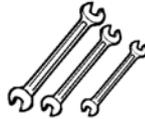
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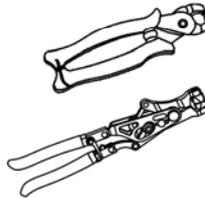
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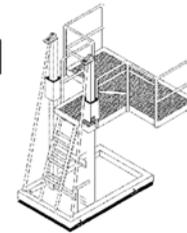
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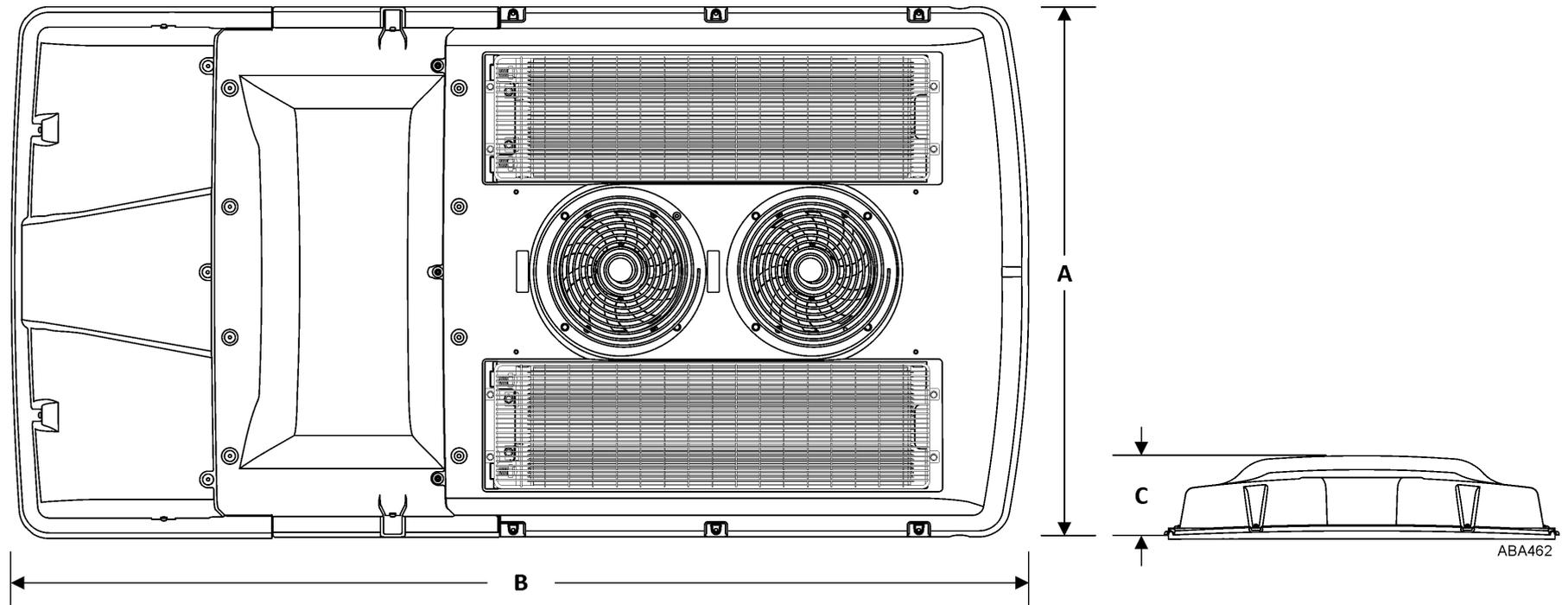


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Dimensions and Weight - Model 50 SPECTRUM



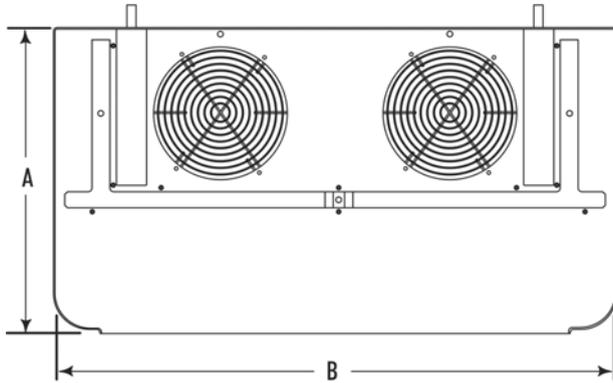
Approximate Weight:

Complete Model 50 SPECTRUM - (Refrigeration, Power Pack and Condenser Modules) = 86 kg (190 lbs.)

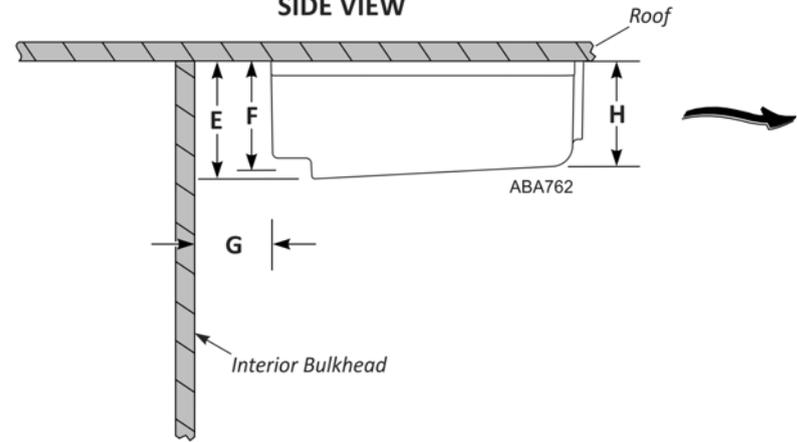
Dimensions	
A.	1137 mm (44.75in.)
B.	2159 mm (85.00 in)
C.	229 mm (9.00 in.)

Dimensions and Weight - ES300 Host Evaporator

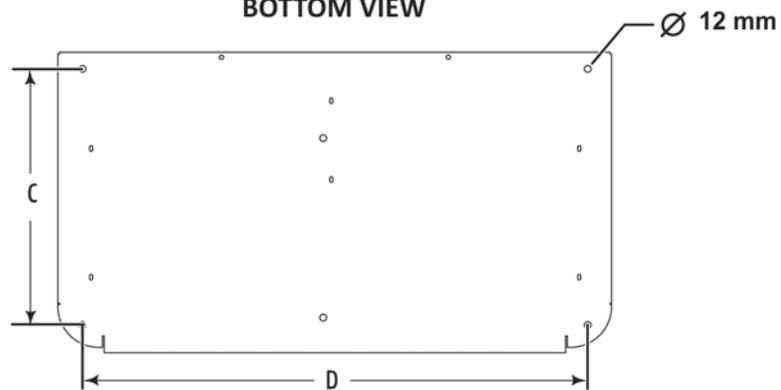
TOP VIEW



SIDE VIEW



BOTTOM VIEW

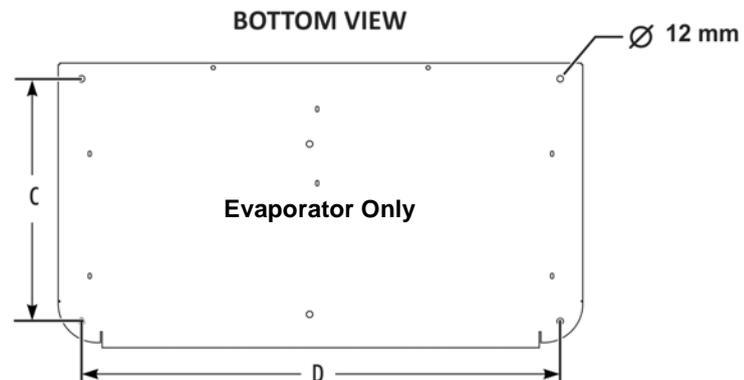
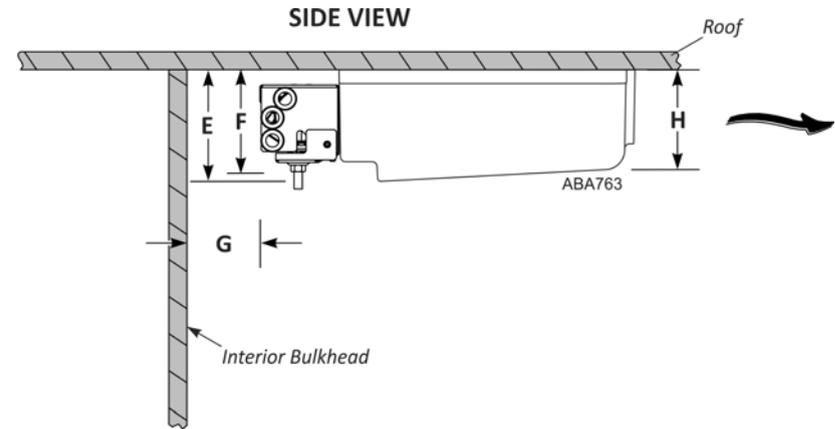
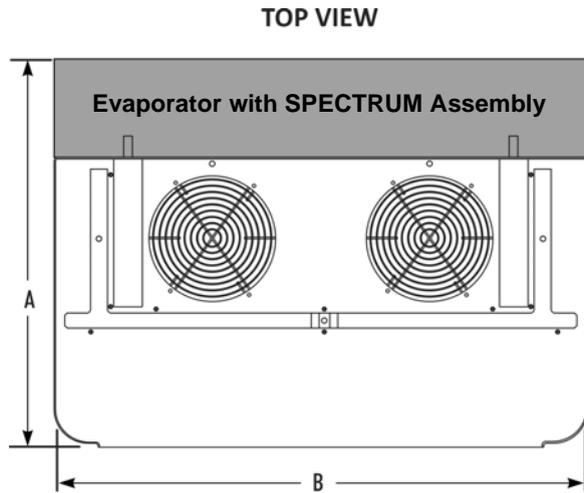


Approximate Weight:

ES300 Host Evaporator = 18 kg (40 lbs.)

Dimensions			
A.	524 mm (20.7 in.)	E.	183 mm (7.2 in.)
B.	976.8 mm (38.5 in.)	F.	152 mm (6.0 in.)
C.	455 mm (18.0 in.)	G.	152 mm (6.0 in.)
D.	892 mm (35.0 in.)	H.	147 mm (5.8 in.)

Dimensions and Weight - ES300 Remote Evaporator

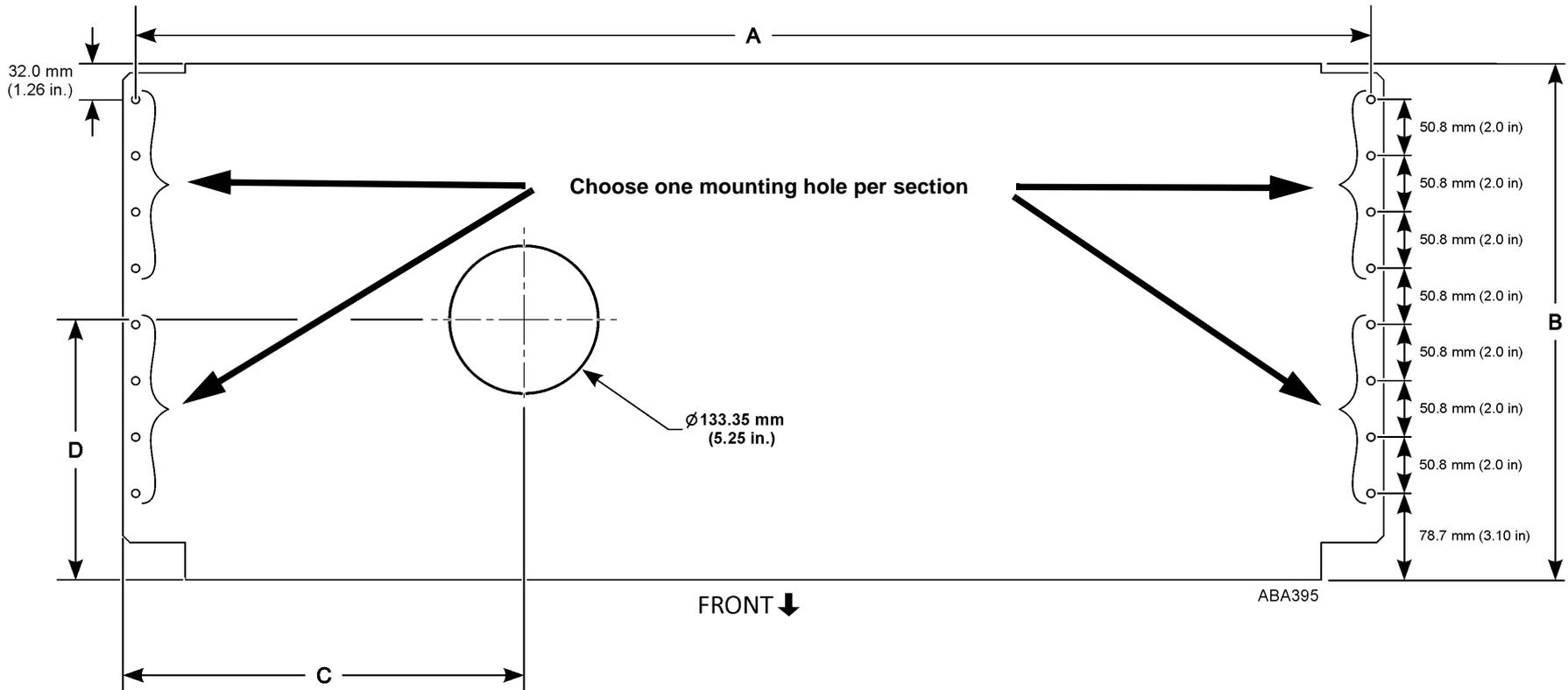


Approximate Weight:

ES300 Remote Evaporator with SPECTRUM Assembly = 33 kg (72 lbs.)

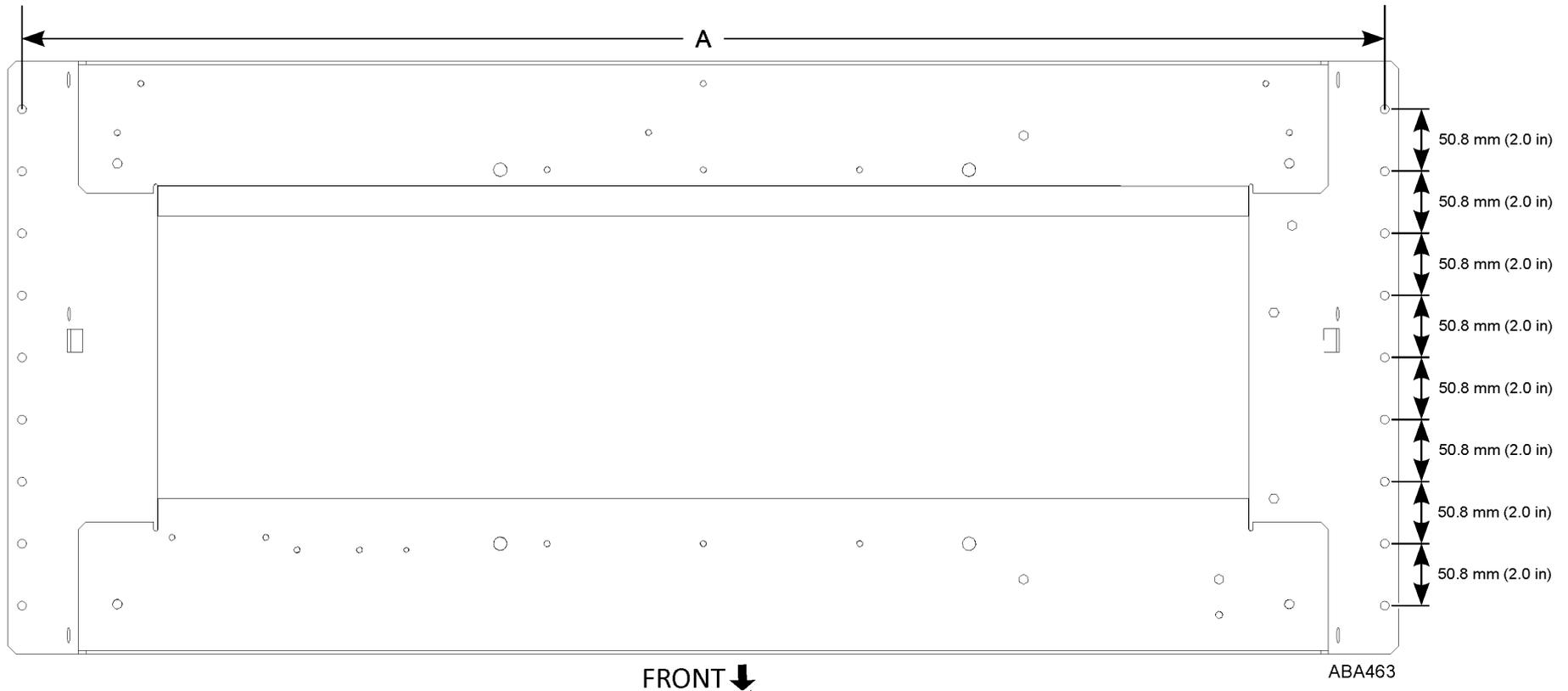
Dimensions			
A.	662.9 mm (26.1 in.)	E.	183 mm (7.2 in.)
B.	976.8 mm (38.5 in.)	F.	152 mm (6.0 in.)
C.	455 mm (18.0 in.)	G.	152 mm (6.0 in.)
D.	892 mm (35.0 in.)	H.	147 mm (5.8 in.)

Dimensions - Refrigeration Module Mounting Holes



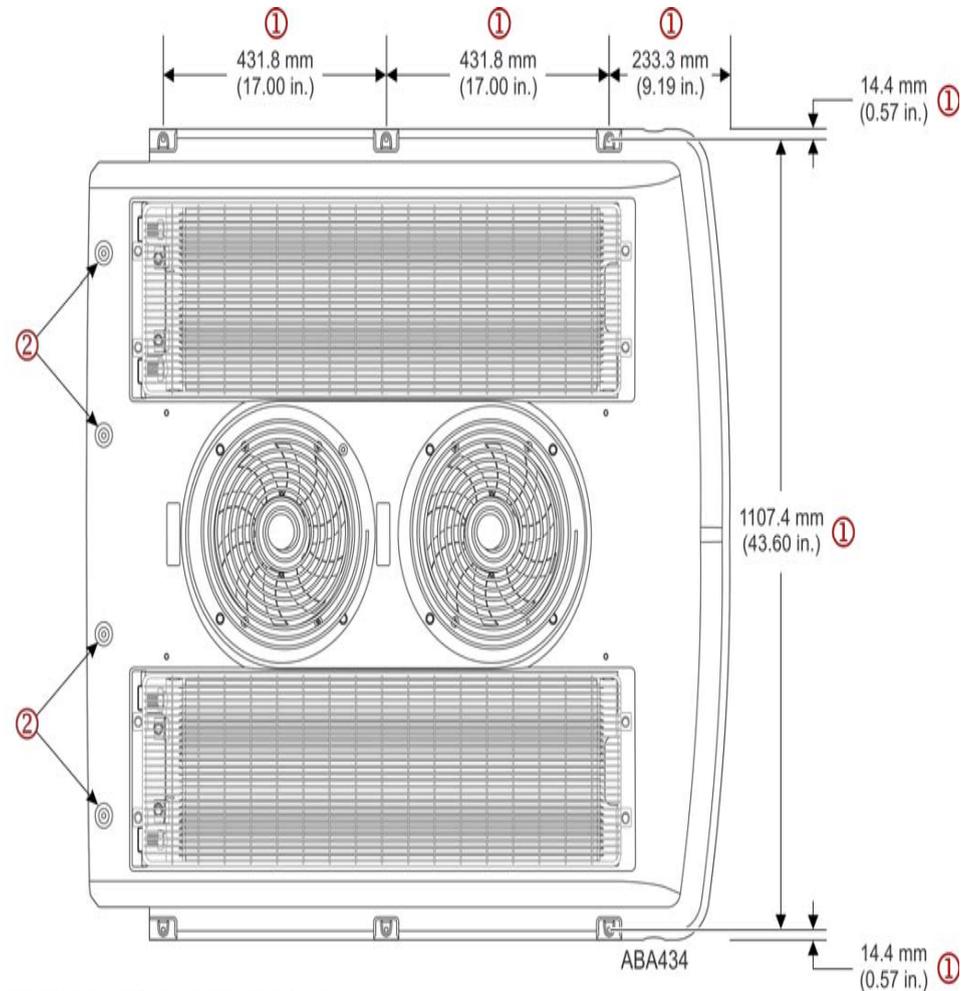
Dimensions	
A.	1107.4 mm (43.60 in.)
B.	466.3 mm (18.36 in.)
C.	393.7 mm (14.50 in.)
D.	235.0 mm (9.25 in.)

Dimensions - Power Pack Module Mounting Holes



Dimensions	
A.	1107.4 mm (43.60 in.)
B.	466.3 mm (18.36 in.)
C.	393.7 mm (14.50 in.)
D.	235.0 mm (9.25 in.)

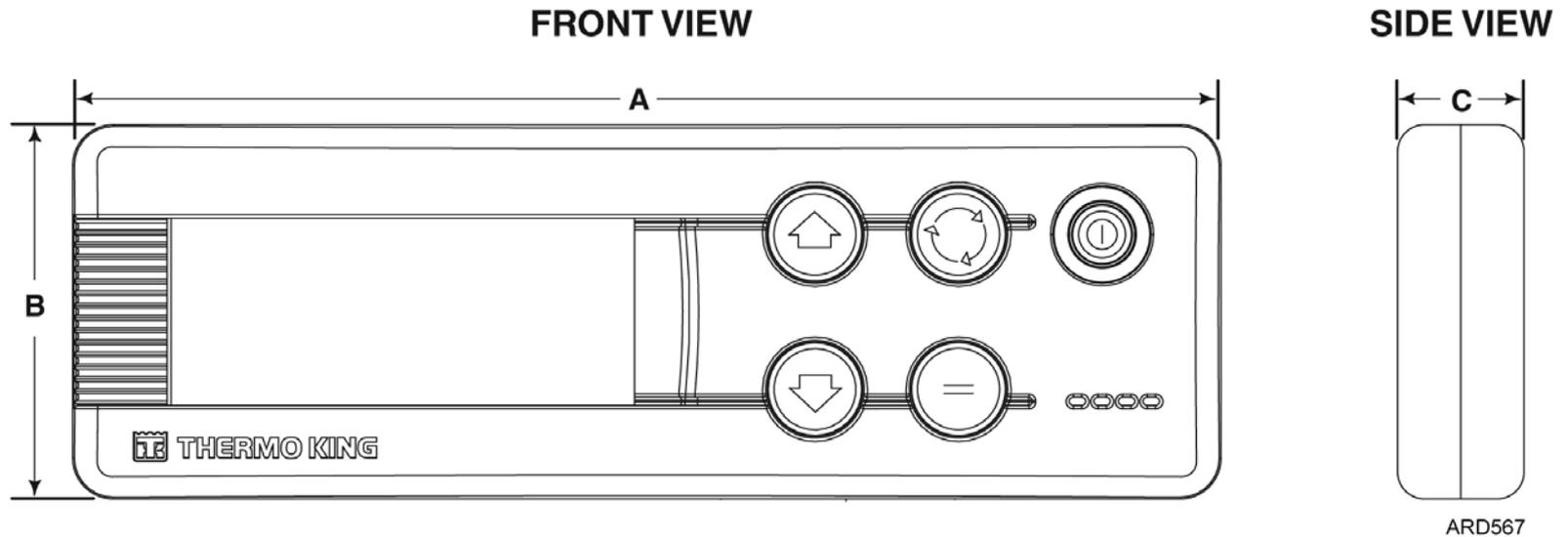
Dimensions - Condenser Module Mounting Holes



Note(s):

- ① - Locations of mounting holes in relation to the SLR chassis.
- ② - Make sure condenser to evaporator mounting holes are centered prior to marking condenser mounting holes.
- ③ - Use condenser chassis to locate mounting holes.

Dimensions - HMI



A.	140 mm (5.50 in.)
B.	46 mm (1.80 in.)
C.	12 mm (.50 in.)

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Installation - Vehicle Powered Compressor

Installation

NOTE: Always confirm compressor installation kit is correct for your vehicle before preceding with the installation.

Add only 4 oz. of oil (supplied) to the road compressor and rotate clutch end to circulate the oil throughout the compressor.

- Do not add more than 4 oz. of oil to the compressor at this time.
- Additional oil will need to be added later to the system.
See “TOTAL AMOUNT OF OIL REQUIRED” on page 43.

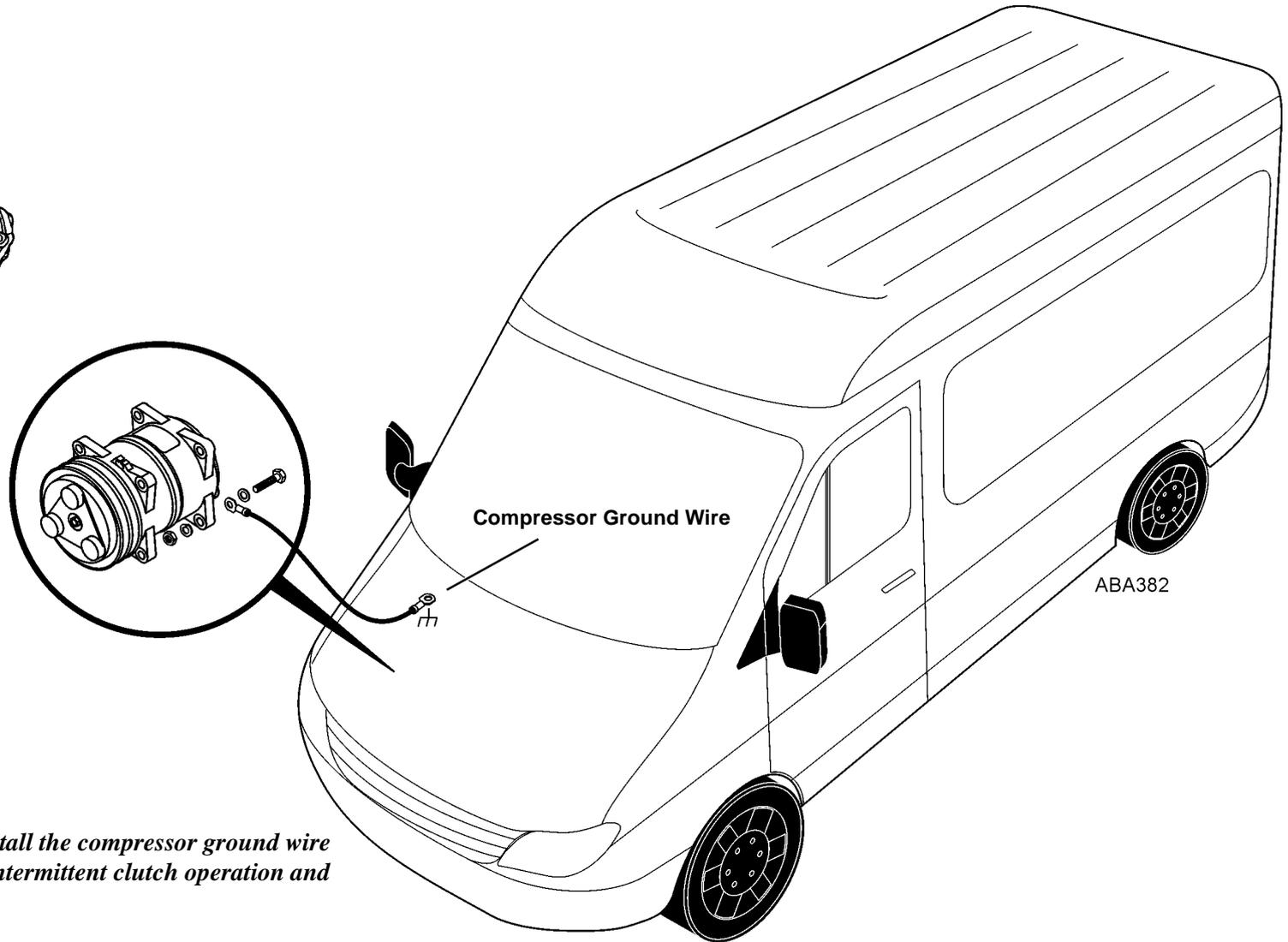
Install compressor on the vehicle by following the instructions included in the compressor kit.

Compressor Ground Wire

Install the chassis ground wire to the compressor frame using the supplied hardware. Ensure the mounting location on the chassis is free of any paint. Use anti-corrosion gel (203-377) or equivalent on ground wire connection to compressor and vehicle chassis.

IMPORTANT: Failure to install the compressor ground wire to the chassis may result in intermittent clutch operation and premature clutch failure!

Installation - Vehicle Powered Compressor



IMPORTANT: Failure to install the compressor ground wire to the chassis may result in intermittent clutch operation and premature clutch failure!

Installation - (2) ES300 Evaporators

Support Plates

Thermo King recommends securely installing steel support plates with mounting studs (installer supplied) directly to the truck's interior roof structure to safely support the weight of the ES300 evaporators prior to insulating and finishing the cargo area. The support plates should be correctly located to position the evaporator the required distance from the compartment front bulkhead wall to allow refrigerant and drain hose connections. *See "Tips for a Successful Installation" on page 8, "Dimensions and Weight - ES300 Host Evaporator" on page 13 and "Dimensions and Weight - ES300 Remote Evaporator" on page 14.*

Preferred Installation Method

(with pre-installed support plates)

IMPORTANT: *Be sure to install the correct evaporator in each compartment. The HOST evaporator has drain pan heater wires while the REMOTE evaporator does not.*

1. Remove the plastic cover from each evaporator.
2. Position the **HOST** evaporator onto (installer supplied) ceiling mounting studs in the **Frozen Compartment**.
 - Install washers and locking nuts and tighten hardware securely.
3. Position accumulator assembly at the rear of **REMOTE** evaporator:
 - Connect the supplied 7/8" tube assembly with o-rings to the mating fitting inside the evaporator.
 - Secure the accumulator to the rear of the evaporator with supplied hardware and tighten securely.
4. Position the **REMOTE** evaporator onto (installer supplied) ceiling mounting studs in the **Fresh Compartment**.
 - Install washers and locking nuts and tighten hardware securely.

NOTE: *The covers for both evaporators will be installed later.*

Alternative Installation Method

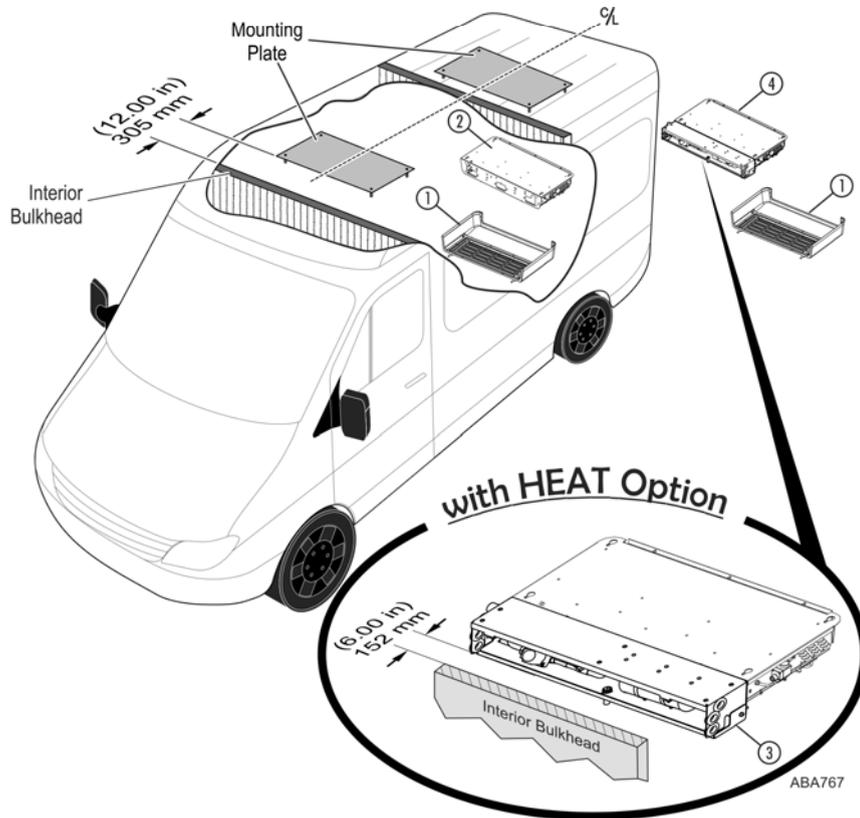
(without pre-installed support plates)

1. Locate and mark the center line (C/L) of the interior compartment ceiling.
2. **HOST evaporator** - Allow a minimum distance of 152 mm (6.00 in.) from the cargo area wall to the rear of the evaporator for refrigerant hose and drain hose connections.
REMOTE evaporator (with accumulator assembly) Allow a minimum distance of 152 mm (6.00 in.) from the cargo area wall to the rear of the accumulator assembly for refrigerant hose and drain hose connections.
3. Position each evaporator up to the ceiling and mark the location of the four mounting holes. **NOTE:** *Be sure the evaporator's air outlet is facing the correct direction for proper airflow.*
4. Drill four 5 mm (0.472 in.) mounting holes into the ceiling and loosely install the supplied 1/4" lag bolts and washers.
5. Remove the plastic cover from each evaporator.
6. Position accumulator assembly at the rear of **REMOTE** evaporator:
 - Connect the supplied 7/8" tube assembly with o-rings to the mating fitting inside the evaporator.
 - Secure the accumulator to the rear of the evaporator with supplied hardware and tighten securely.
7. Apply neutral/alcohol cure silicone sealant (installer supplied) per the sealant manufacturer's instructions to the top surface area of the evaporator.
8. Install the **HOST** evaporator onto the ceiling of **Frozen Compartment** with the 1/4" lag bolts and washers and hand tighten bolts securely.
9. Install the **REMOTE** evaporator onto the ceiling of **Fresh Compartment** with the 1/4" lag bolts and washers and hand tighten bolts securely.

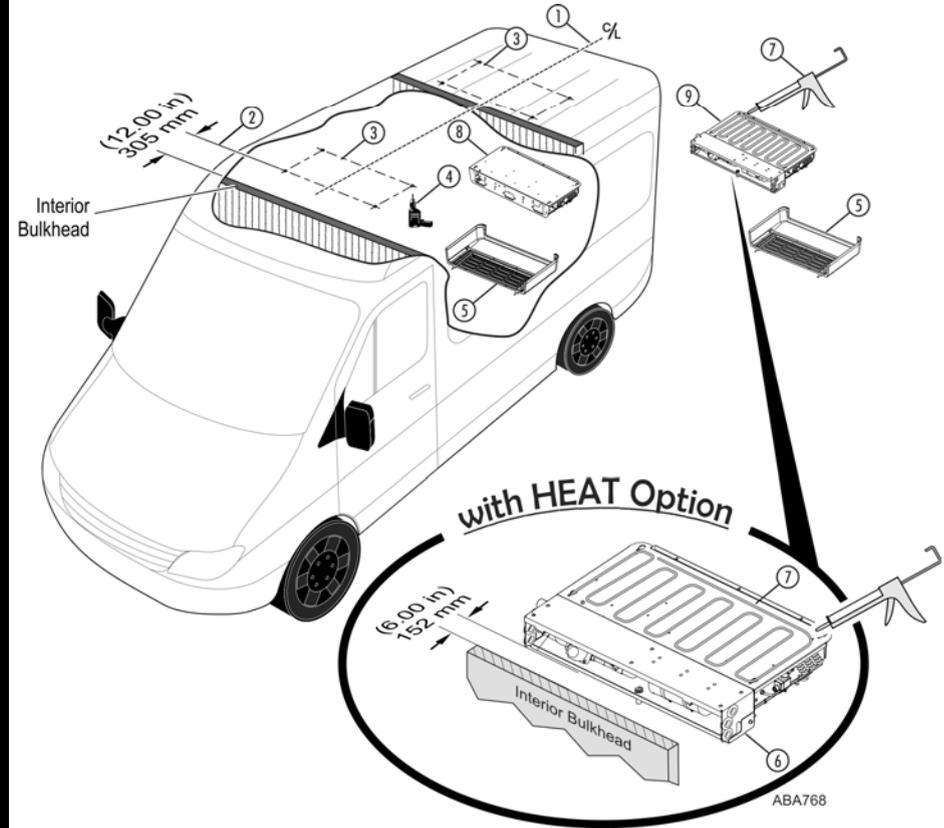
NOTE: *The evaporator covers will be installed later*

Installation - (2) ES300 Evaporators

Preferred Installation Method



Alternative Installation Method



Installation - Refrigeration Module

Support Plates

Thermo King recommends securely installing steel support plates (installer supplied) to the vehicle's inner roof support structure prior to insulating and finishing the interior ceiling. These support plates should have correct size mounting studs or thread inserts installed to safely secure the V-520 Refrigeration, Condenser and Power Pack Modules to the vehicle's roof. The support plates should be located to correctly position the refrigeration module and condenser modules in relationship to the interior bulkhead and evaporator. See "*Dimensions and Weight - Model 50 SPECTRUM*" on page 12.

Preferred Installation Method

(with pre-installed support plates and pre-cut access hole)

1. Remove the plastic cover from the refrigeration module and trim the foam gasket away from the two drain holes located in the corners.
2. Install rubber gasket (supplied) around access hole opening.
3. Apply neutral/alcohol cure silicone sealant around all mounting bolts or inserts.
4. Use an appropriate 2-point lifting device with locking hooks attached to the modules's two lifting brackets and raise into position on vehicle's roof.
5. Secure refrigeration module to the roof using the supplied 1/4" lag bolts and washers and hand tighten securely. **NOTE: Multiple mounting holes are provided every two inches along the sides of the refrigeration module for mounting options. Choose four mounting holes, ideally one in each corner to secure the refrigeration module.**

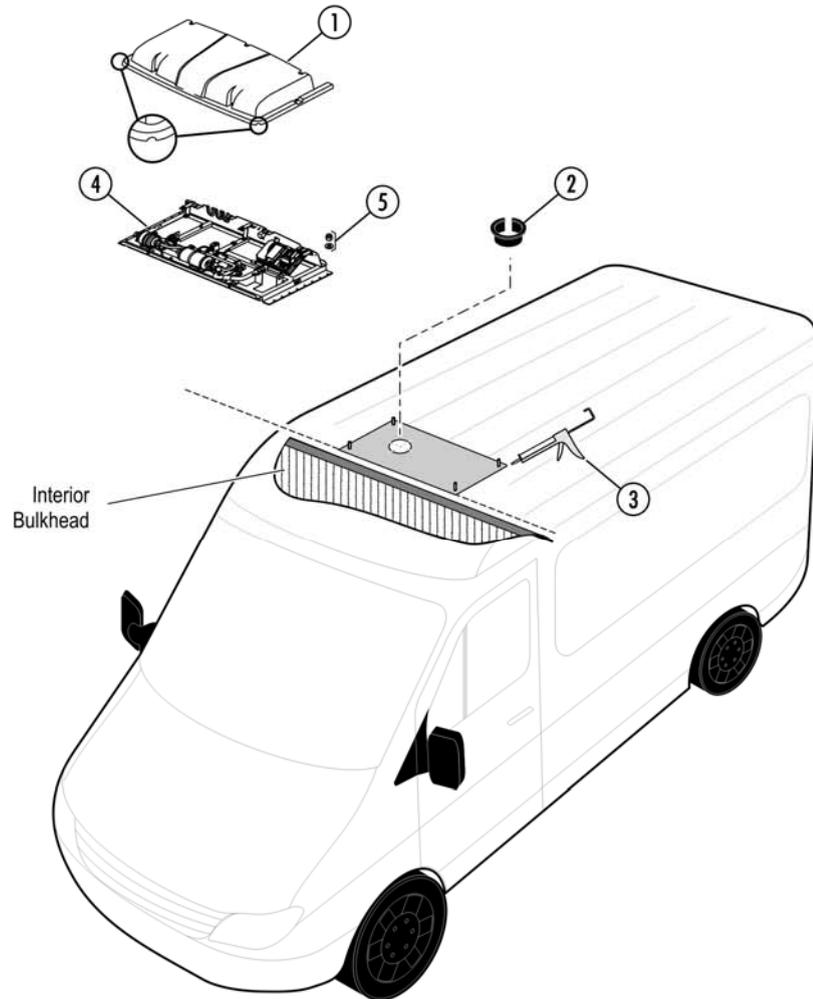
Alternative Installation Method

(without pre-installed support plates and pre-cut access hole)

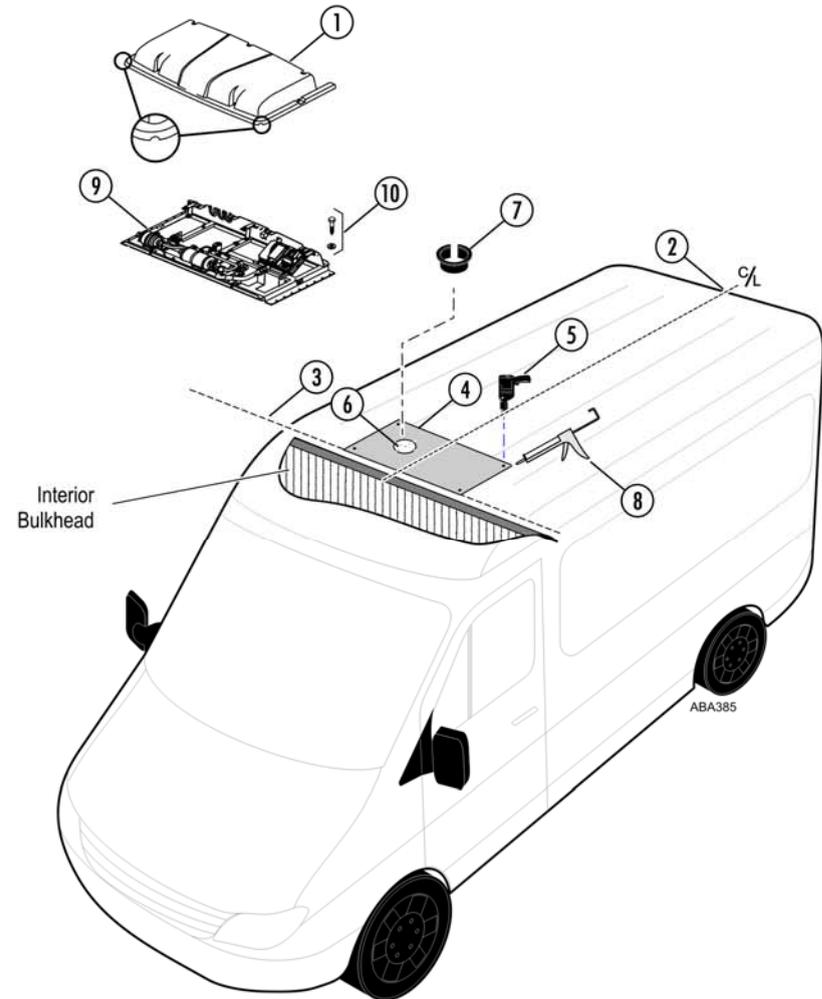
1. Remove plastic cover from refrigeration module and trim foam gasket away from the two drain holes located in the corners.
2. Locate and mark the center line (C/L) of vehicle's roof.
3. Determine location of interior bulkhead in relationship to vehicle's roof. Mark location of bulkhead on vehicle's roof.
4. Use "Dimensions - Refrigeration Module Mounting Holes" on page 15) to mark location on roof of refrigeration module's 133.35 mm (5.25 in.) access hole and mounting holes. **NOTE: Multiple mounting holes are provided every two inches along the sides of the refrigeration module for mounting options. Choose four mounting holes, ideally one in each corner to secure the refrigeration module.**
 - Confirm large access hole is positioned behind bulkhead and inside of cargo compartment. **NOTE: This is necessary so the refrigeration hoses and electrical harness will be located on the inside of cargo compartment, not in the passenger compartment.**
 - Choose mounting holes spaced farthest apart whenever possible.
 - Confirm there is no internal structural roof supports where access holes will be drilled.
5. Mark and drill four 5 mm (0.472 in.) mounting holes only into the internal ceiling supports in the roof.
6. Mark and cutout 133.35 mm (5.25 in. dia.) access opening for refrigeration tubing/electrical harnesses. **NOTE: This hole will be drilled completely through the roof and into interior compartment.**
7. Install rubber gasket (supplied) around access hole opening.
8. Apply neutral/alcohol cure silicone sealant around all mounting bolts or inserts.
9. Use an appropriate 2-point lifting device with locking hooks attached to the modules two lifting brackets and raise into position on vehicle's roof.
10. Secure refrigeration module to the roof using the supplied 1/4" lag bolts and washers and tighten to 60 in-lbs.

Installation - Refrigeration Module

Preferred Installation Method



Alternative Installation Method



Installation - Power Pack Module

Support Plates

Thermo King recommends securely installing steel support plates (installer supplied) to the vehicle's inner roof support structure prior to insulating and finishing the interior ceiling. These support plates should have correct size mounting studs or thread inserts installed to safely secure the V-520 Refrigeration, Condenser and Power Pack Modules to the vehicle's roof. The support plates should be located to correctly position the refrigeration module and condenser modules in relationship to the interior bulkhead and evaporator. See *"Dimensions and Weight - Model 50 SPECTRUM"* on page 12.

Preferred Installation Method

(with pre-installed support plates and pre-cut access hole)

NOTE: It is recommended the copper tubing be installed onto the standby compressor prior to installing the Power Pack Module onto the roof. See "Installation - Refrigeration Tubes to Compressor" on page 38.

1. Remove the plastic cover from the power pack module.
2. Apply neutral/alcohol cure silicone sealant around all mounting bolts or inserts.
3. Use an appropriate 4-point lifting device with locking hooks attached to the modules's four lifting holes and raise into position on vehicle's roof.
4. Align the power pack's three front mounting studs with the three matching mounting holes on the refrigeration module's frame.
 - Install flat washers and locking nuts and tighten securely.
5. Secure refrigeration module to the roof using the supplied 1/4" lag bolts and washers and hand tighten securely. *NOTE: Multiple mounting holes are provided every two inches along the sides of the module for mounting options. Choose four mounting holes, ideally one in each corner to secure the module.*

Alternative Installation Method

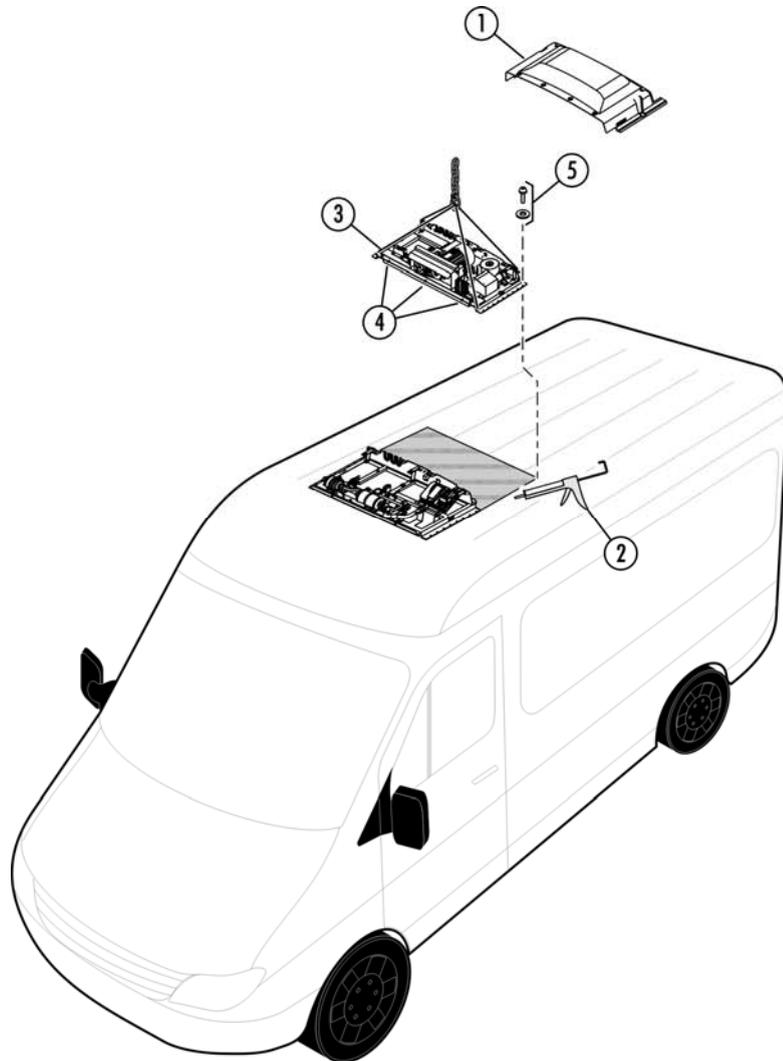
(without pre-installed support plates and pre-cut access hole)

NOTE: It is recommended the copper tubing be installed onto the standby compressor prior to installing the Power Pack Module onto the roof. See "Installation - Refrigeration Tubes to Compressor" page 40.

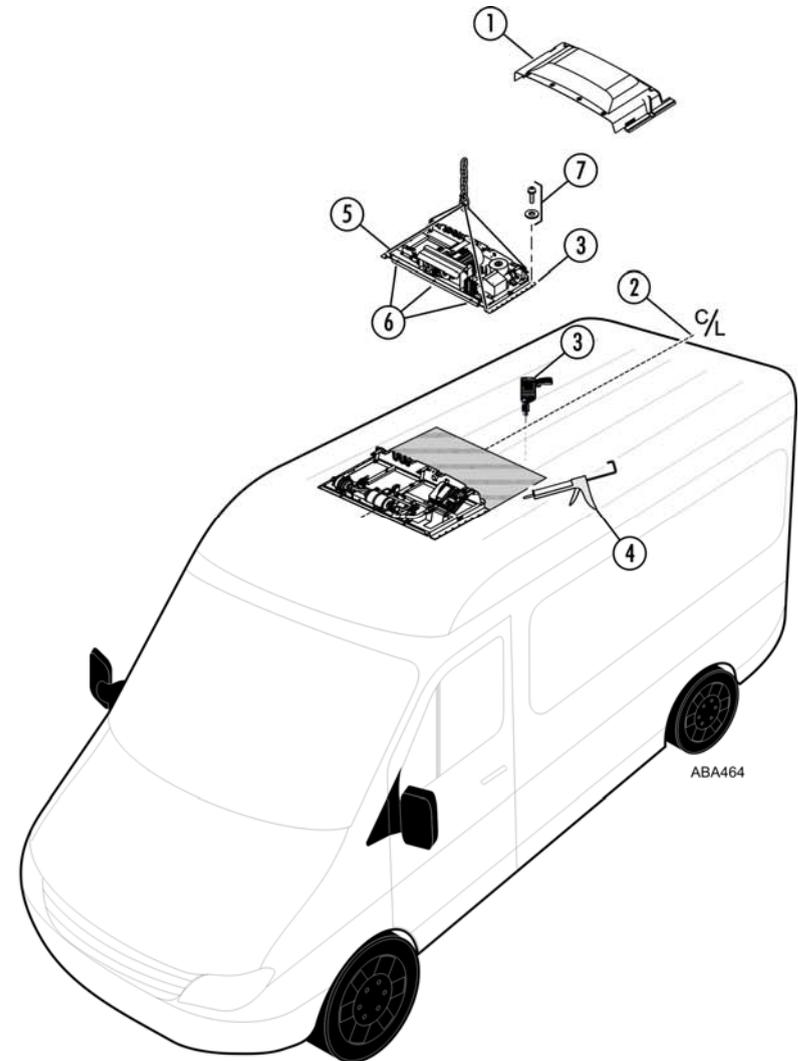
1. Remove plastic cover from power pack module.
2. Locate and mark the center line (C/L) of vehicle's roof.
3. Choose mounting holes spaced farthest apart whenever possible.
NOTE: Multiple mounting holes are provided every two inches along the sides of the module for mounting options. Choose four mounting holes, ideally one in each corner to secure the module
 - Confirm there is no internal structural roof supports where access holes will be drilled.
 - Mark and drill four 5 mm (0.472 in.) mounting holes only into the internal ceiling supports in the roof.
4. Apply neutral/alcohol cure silicone sealant around all mounting bolts or inserts.
5. Use an appropriate 4-point lifting device with locking hooks attached to the modules's four lifting holes and raise into position on vehicle's roof.
6. Align the power pack's three front mounting studs with the three matching mounting holes on the refrigeration module's frame.
 - Install flat washers and locking nuts and tighten securely.
7. Secure refrigeration module to the roof using the supplied 1/4" lag bolts and washers and tighten to 60 in-lbs.

Installation - Power Pack Module

Preferred Installation Method



Alternative Installation Method



ABA464

Installation - Condenser Module

Support Plates

Thermo King recommends securely installing steel support plates (installer supplied) to the vehicle's inner roof support structure prior to insulating and finishing the interior ceiling. These support plates should have correct size mounting studs or thread inserts installed to safely secure the V-520 Refrigeration, Condenser and Power Pack Modules to the vehicle's roof. The support plates should be located to correctly position the refrigeration module and condenser modules in relationship to the interior bulkhead and evaporator. See *"Dimensions and Weight - Model 50 SPECTRUM"* on page 12.

Preferred Installation Method

(with pre-installed support plates)

1. Trim the foam gasket away from the two drain holes located in the corners of the condenser module prior to installing on roof.
2. Apply neutral/alcohol cure silicone sealant around each mounting location on the vehicle's roof.
3. Install four 1/4-20 lifting eyebolts (installer supplied) into the four threaded inserts located on the top of the condenser module.
 - Use an appropriate 4-point lifting device with locking lifting hooks attached to the lifting eyebolts to raise the condenser module into position on the vehicle's roof.
4. Align the four top front mounting holes of the condenser module's cover with the matching four rear mounting brackets with speed nuts on the power pack's frame.
 - Install four 6 mm screws, lock washers and flat washers and tighten securely.
5. Secure condenser module to the roof using the supplied 1/4" lag bolts and washers and tighten to 36 in-lbs. **DO NOT OVER TIGHTEN BOLTS!**

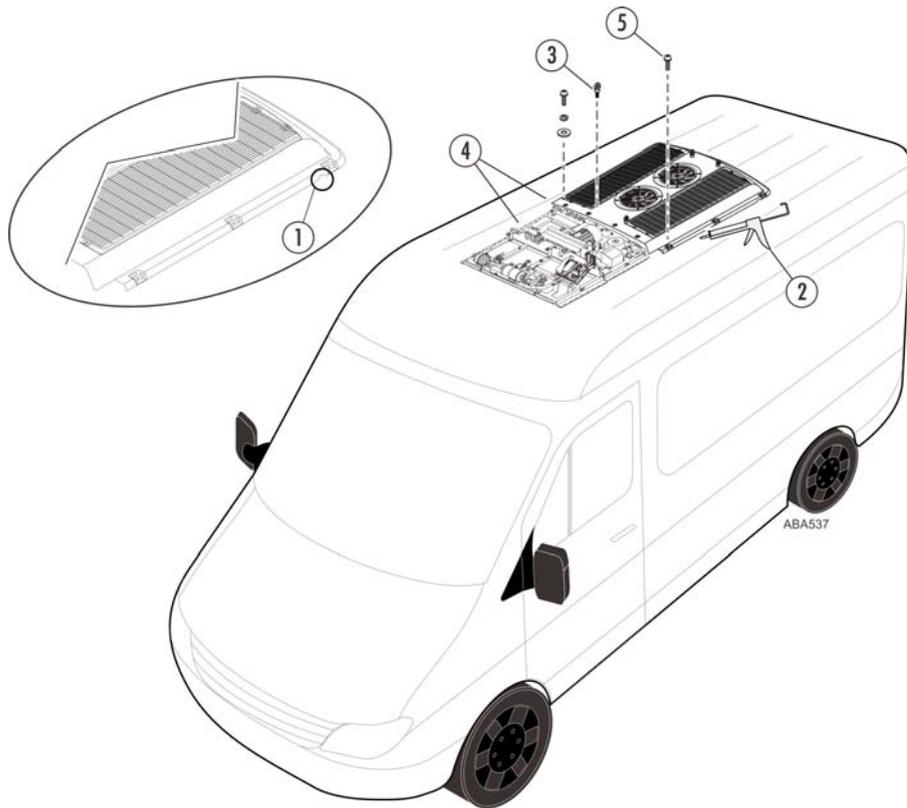
Alternative Installation Method

(without pre-installed support plates)

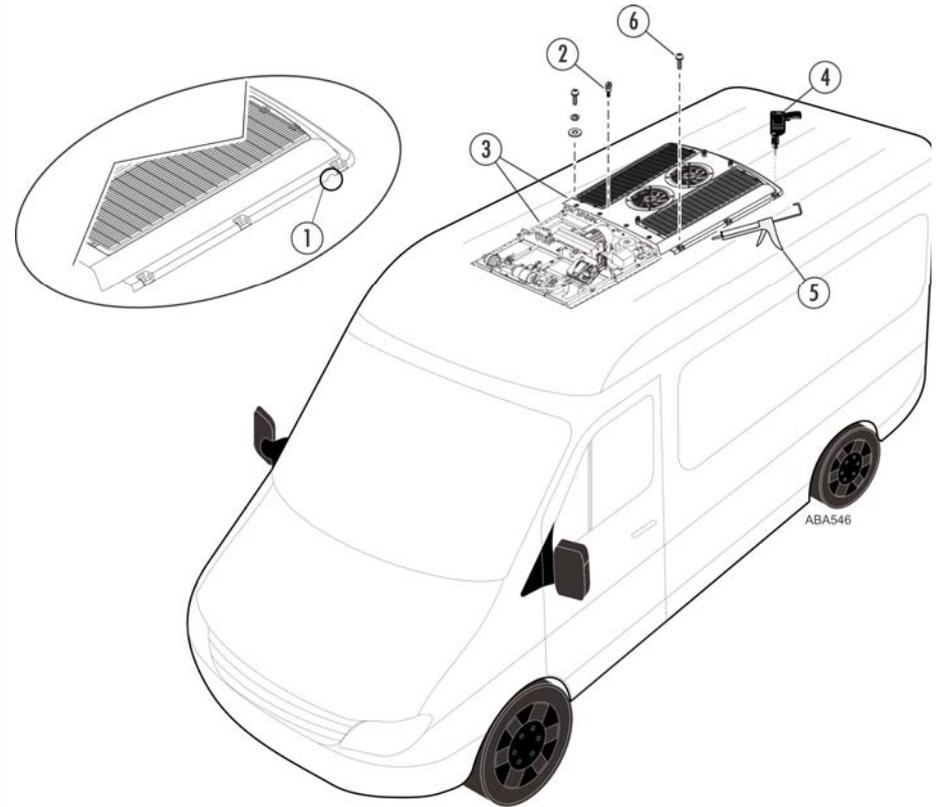
1. Trim the foam gasket away from the two drain holes located in the corners of the condenser module prior to installing on roof.
2. Install four 1/4-20 lifting eyebolts (installer supplied) into the four threaded inserts located on the top of the condenser module.
 - Use an appropriate 4-point lifting device with locking lifting hooks attached to the four lifting eyebolts to raise the condenser module into position on the vehicle's roof.
3. Align the four top front mounting holes of the condenser module's cover with the matching four rear mounting brackets with speed nuts on the power pack's frame.
 - Install four 6 mm screws, lock washers and flat washers and tighten securely.
4. Use the condenser modules's six mounting holes as a template and drill 5mm (0.472 in.) mounting holes into the internal supports of the roof.
5. Apply neutral/alcohol cure silicone sealant around each mounting location on the vehicle's roof.
6. Secure condenser module to the roof using the supplied 1/4" lag bolts and washers and tighten to 36 in-lbs. **DO NOT OVER TIGHTEN BOLTS!**

Installation - Condenser Module

Preferred Installation Method



Alternative Installation Method



Fabricating Refrigeration Hoses

TK 2000 Assembly System

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

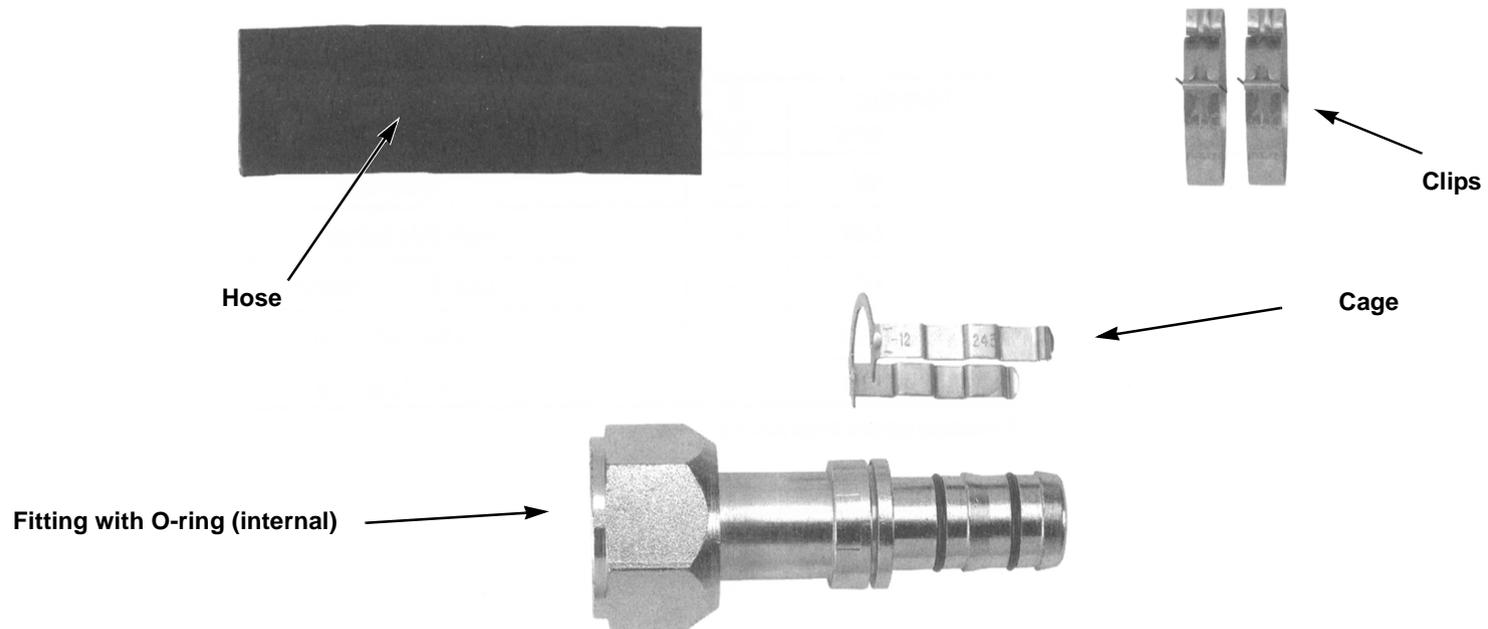
The benefits are virtually endless:

- 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 Tools (204-1045 and 204-1128)
- Hose Cutting Tools (204-677)
- TK 2000 Multi-Refrigerant Hose
- Nipple Assembly
- Appropriately Sized Clips and Cage

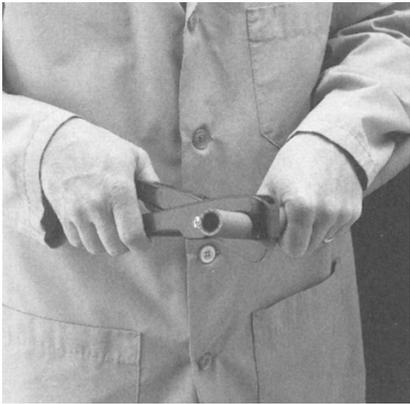
NOTE: The two black O-rings on the nipple assembly are of a specific rubber compound and size. They should not be removed or replaced.



Fabricating Refrigeration Hoses

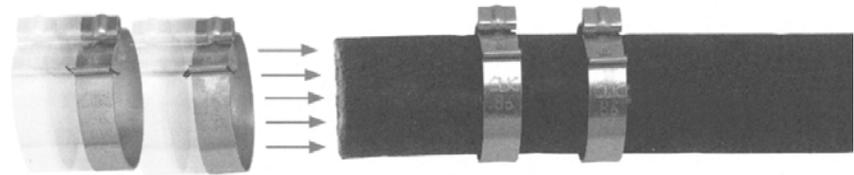
Cut the Hose

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

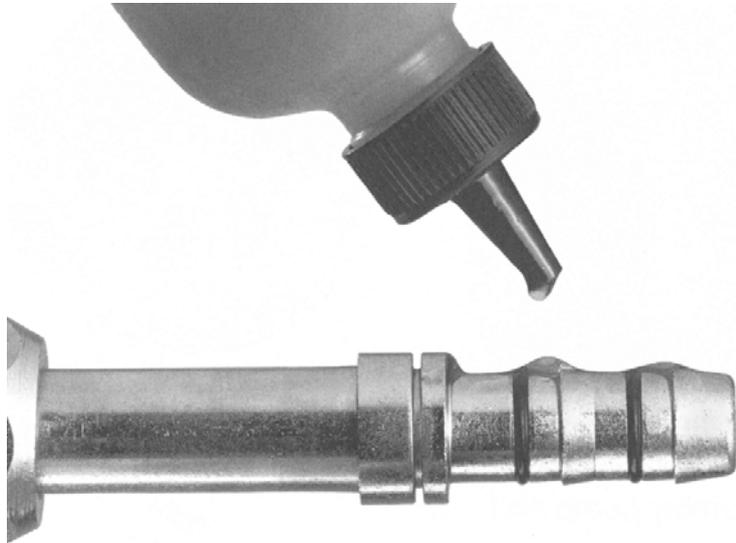
Fabricating Refrigeration Hoses

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.

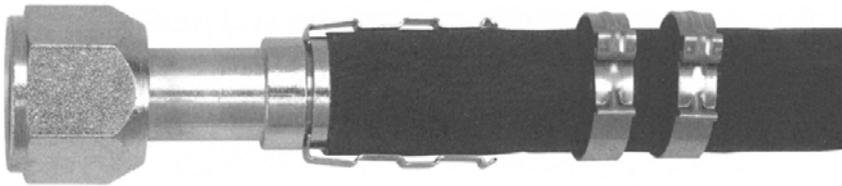
NOTE: *Be sure to wipe excess oil from the nipple and hose.*



Fabricating Refrigeration Hoses

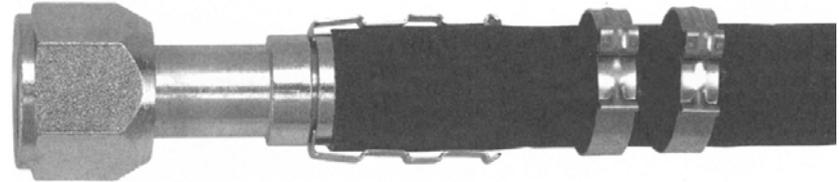
Snap on the Cage

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.



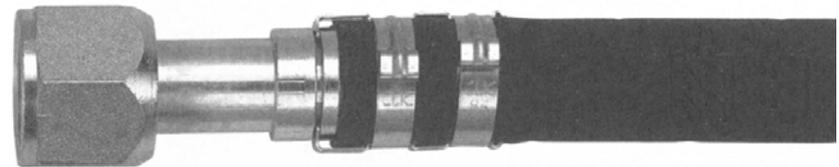
Slide the Clips

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



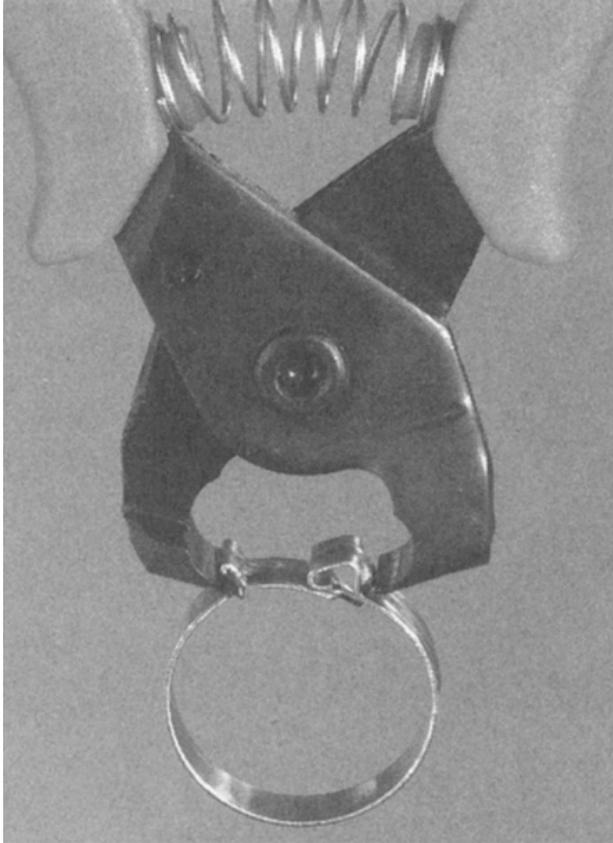
Close the Clips

7. Use the fitting tool (204-1045 or 204-1128) 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.



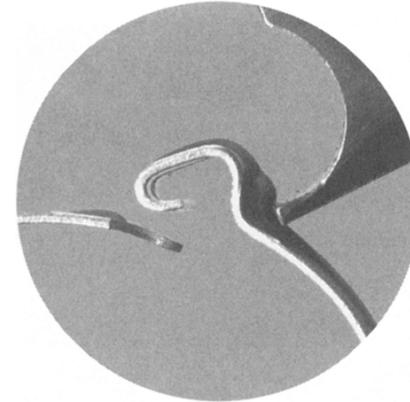
NOTE: For easiest assembly, the clasp should be closed between the cage arms.

Fabricating Refrigeration Hoses

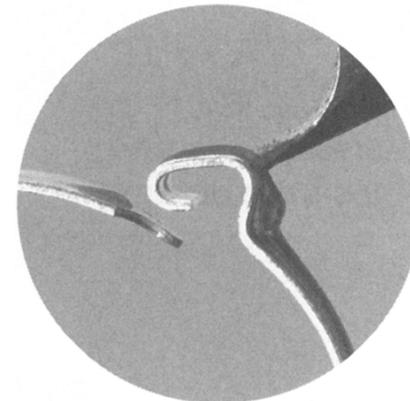


Nose of the pliers should be firmly seated under the assembly bump and lock latch.

If the pliers are not kept square during closing the clip, the clasp may have an offset. Use the pliers to correct the clasp alignment.



Correct



Incorrect

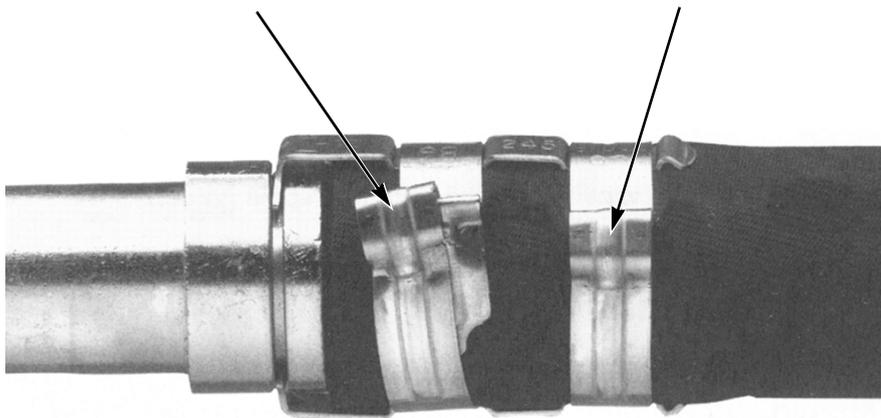
Fabricating Refrigeration Hoses

⚠ 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.

Improperly Installed Clip

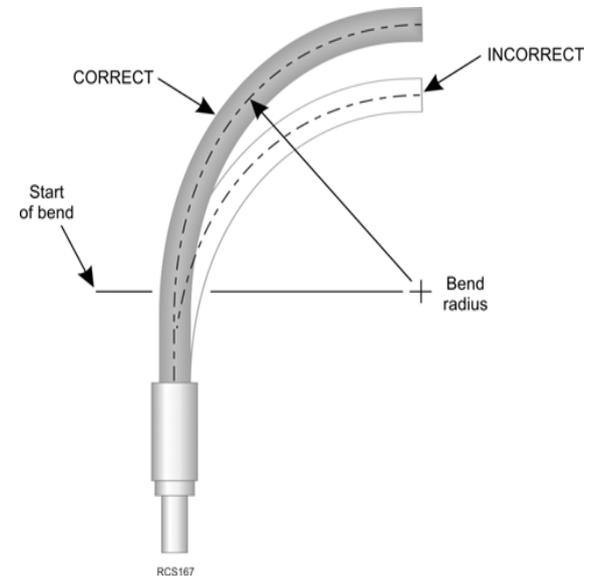
Properly Installed Clip



Minimum Bend Radii

All hoses must be routed as to maintain the minimum bend radii given in the table below.

Hose Size	Minimum Bend Radius
#6	2.00 in.
#8	2.50 in.
#10	3.00 in.
#12	4.00 in.
#16	7.00 in.



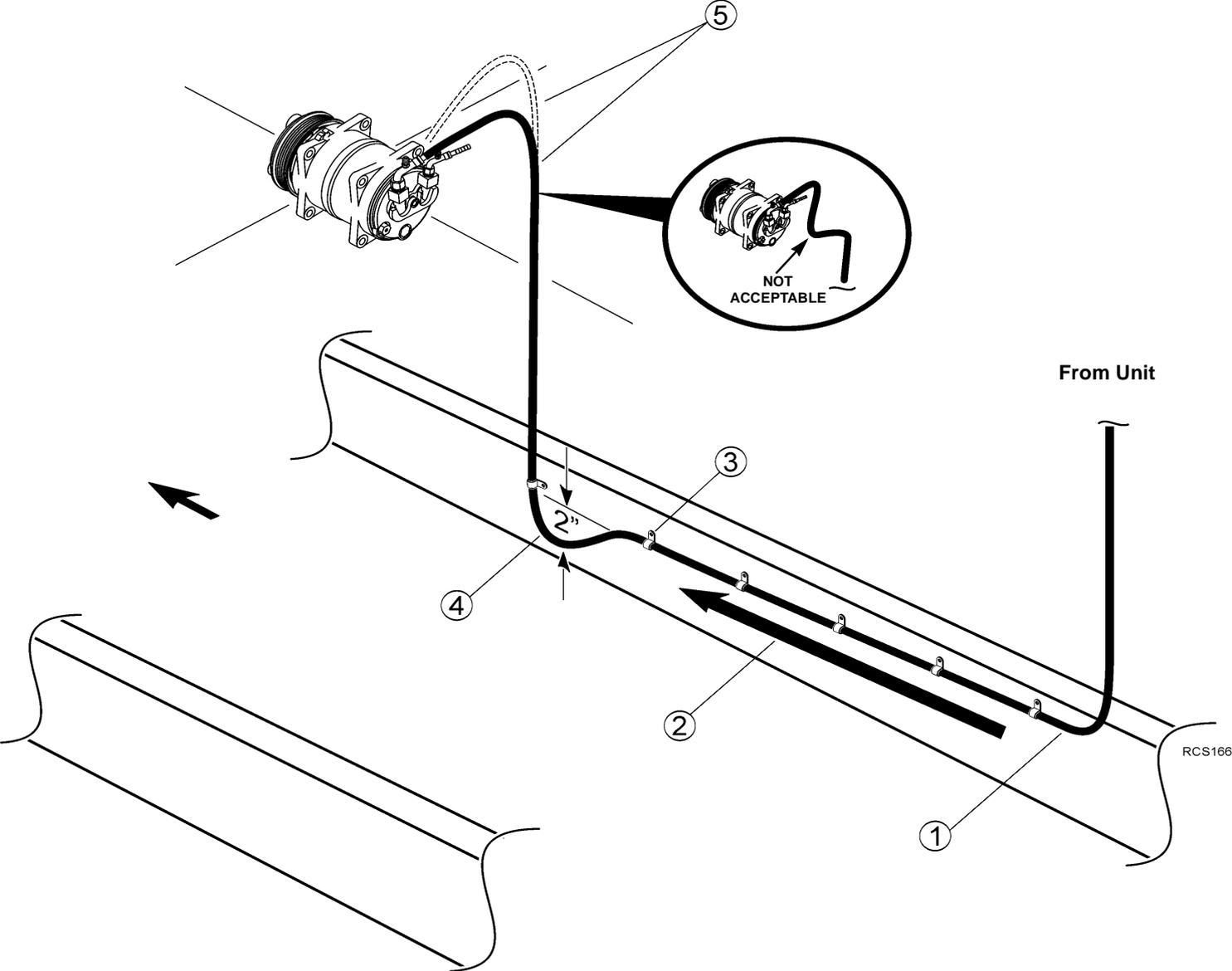
RCS167

Important - Suction Line Routing and P-Trap Formation

Best Practices That Must Be Followed (Refer to the illustration on following page)

1. All hose bends must maintain at least minimum bend radii with no kinks. *See “Minimum Bend Radii” on page 35.*
2. Suction line should have a slight (if possible) downhill angle from the unit towards the compressor. Horizontal angle is acceptable - uphill angle is not.
3. Hoses should be secured adequately to prevent rubbing or chafing against hot, sharp or moving components.
4. P-Trap to be formed immediately before vertical run upwards to compressor while maintaining minimum bend radius with no kinks. It should be a minimum of 2” below the lowest point of the horizontal run hose as shown.
5. After vertical run, the suction line must be horizontal or downwards to the compressor and cannot have any sag or droop.

Important - Suction Line Routing and P-Trap Formation



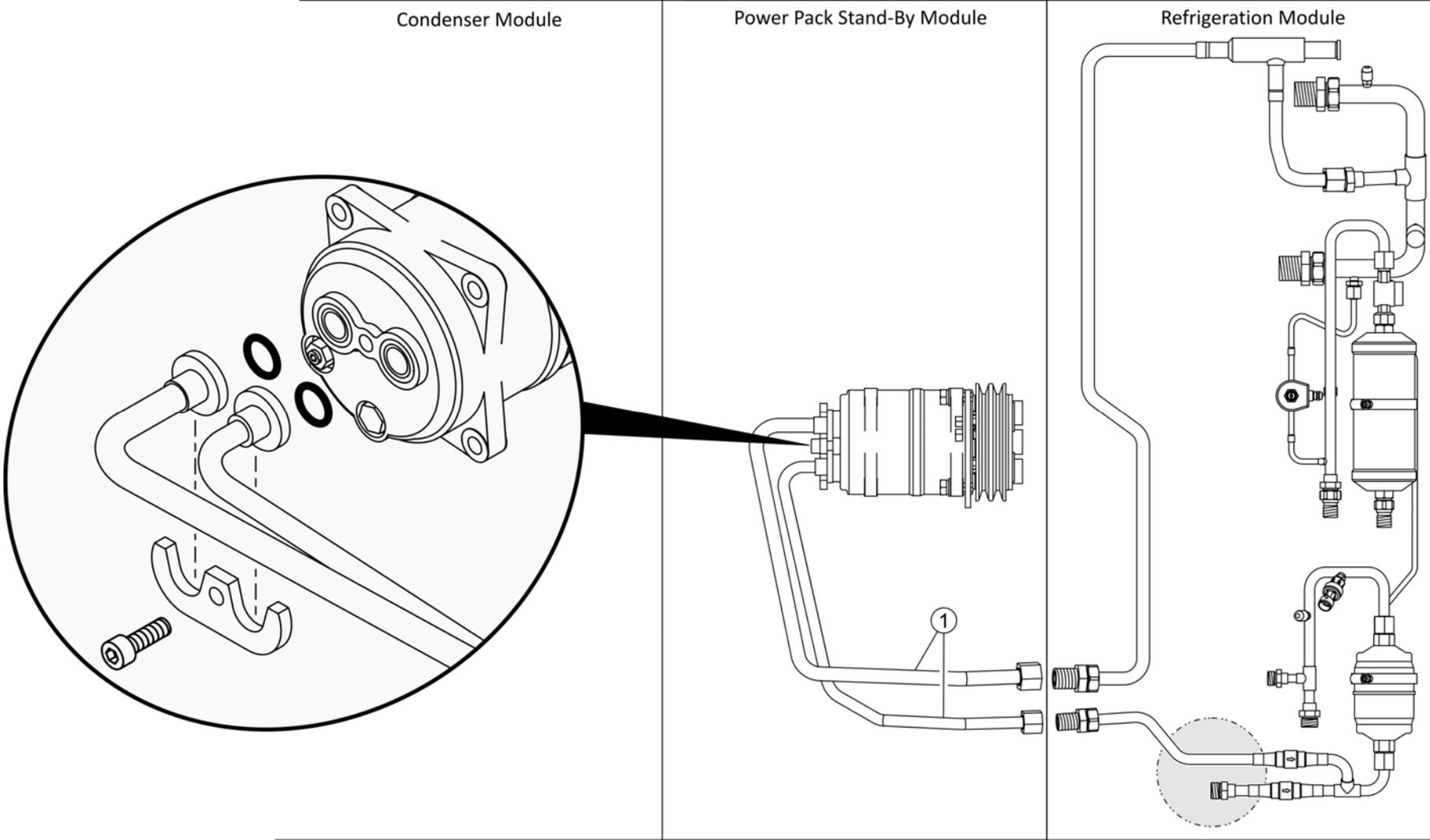
Installation - Refrigeration Tubes to Compressor

Power Pack Module Compressor Connections

NOTE: The compressor contains oil. Tip the compressor forward to prevent oil from spilling and place rags under the fittings before removing the protective caps to catch any oil. Replace any oil that is spilled.

1. Locate the supplied suction and discharge copper tubes:
 - Remove the protective caps from the rear of the standby compressor and from the ORS fittings on the refrigeration module
 - Install O-rings onto the ORS fittings on the refrigeration module and attach the copper tubes onto the fittings and tighten securely.
 - Install O-rings onto the suction and discharge copper tube fittings and attach the tubes to the rear of the compressor. Secure the tubes to the compressor with the supplied manifold hold down bracket and retaining screw and tighten securely.
 - Secure the tubes to the Power Pack module with the supplied clamps, screws and flat washers.

Installation - Refrigeration Tubes to Compressor



ABA471

Installation - Refrigeration Hoses

IMPORTANT: All hose bends must maintain at least minimum bend radii with no kinks. See “Minimum Bend Radii” on page 35.

Condenser Module Connections

1. Liquid Line

- Fabricate #6 hose from liquid line fitting on condenser module to drier in refrigeration module.
- Install female 90°, male 90° ORS fittings with O-rings and tighten securely.

2. Discharge Line

- Fabricate #8 hose from discharge fitting on condenser module to oil separator fitting in refrigeration module.
- Install female 90°, male 90° ORS fitting with O-rings and tighten securely.

Evaporator Connections

3. Suction Line - REMOTE (Fresh Compartment)

- Fabricate #16 hose from manifold fitting A to the large suction fitting of the accumulator assembly on **REMOTE** evaporator.

IMPORTANT: The suction line for the **REMOTE** evaporator must be attached only to manifold fitting A or severe damage to the compressor will result!

- Install 90° ORS fittings with O-rings and tighten securely.

4. Suction Line - HOST (Frozen Compartment)

- Fabricate #12 hose from the suction fitting on the **HOST** evaporator to the small suction fitting of accumulator assembly on **REMOTE** evaporator.
- Install #12 hose to the small fitting on the accumulator with supplied straight ORS reducing fitting and O-ring and tighten securely.
- Route hose through rear access hole of **REMOTE** evaporator, install O-ring and attach 90° ORS fitting onto suction line fitting and tighten securely.

5. Liquid Line - HOST (Frozen Compartment)

- Fabricate #6 hose from liquid injection fitting on the condenser module to liquid fitting on **HOST** unit.
- Install the supplied tee splice ORS fitting and a 90° ORS fitting.
- Route hose through rear access hole of **HOST** evaporator, install O-ring and attach 90° ORS fitting onto liquid line fitting and tighten securely.

6. Liquid Line - REMOTE (Fresh Compartment)

- Fabricate #6 hose from the liquid line tee fitting on the **HOST** evaporator to the liquid line fitting on the **REMOTE** evaporator.
- Install O-ring and attach ORS fitting onto tee splice fitting on the **HOST** evaporator and tighten securely.
- Route hose through rear access hole of **REMOTE** evaporator, install O-ring and attach 90° ORS fitting onto liquid line fitting and tighten securely.

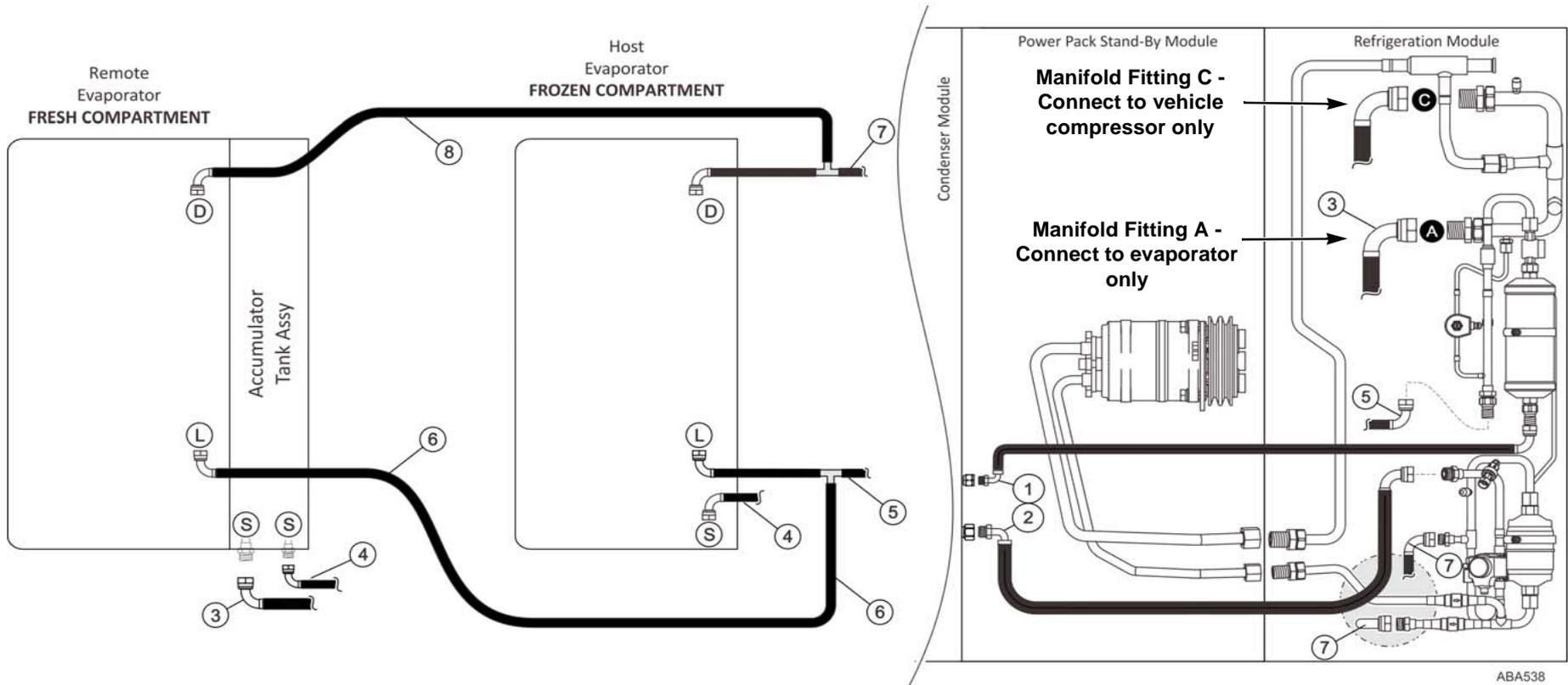
7. Defrost Line - HOST Frozen Compartment

- Fabricate #6 hose from oil separator tee fitting on the refrigeration module to the **HOST** evaporator.
- Install the supplied tee splice fitting and 90° ORS fitting.
- Route hose through rear access hole of **HOST** evaporator, install O-ring and attach ORS fitting onto defrost fitting and tighten securely.

8. Defrost Line - REMOTE Fresh Compartment

- Fabricate #6 hose from tee splice fitting on the **HOST** evaporator to defrost fitting on **REMOTE** evaporator.
- Route hose through rear access hole of **REMOTE** evaporator, install O-ring and attach ORS fitting onto defrost line fitting and tighten securely.

Installation - Refrigeration Hoses



Installation - Refrigeration Hoses to Vehicle's Compressor

IMPORTANT: All hose bends must maintain at least minimum bend radii with no kinks. See “Minimum Bend Radii” on page 35.

Connections at Refrigeration Module

1. Discharge Line

- Install 90° ORS fitting onto #8 hose.
- Install O-ring and attach ORS fitting onto oil separator fitting.
- Route hose down to vehicle's compressor.
- See “Connections at compressor” on page 42.

2. Suction Line

- Install 90° ORS fitting onto #16 hose.
- Install O-ring and attach ORS fitting onto manifold fitting **C** and tighten securely.

IMPORTANT: The suction line for the compressor must be attached only to manifold fitting C or severe damage to the compressor will result!

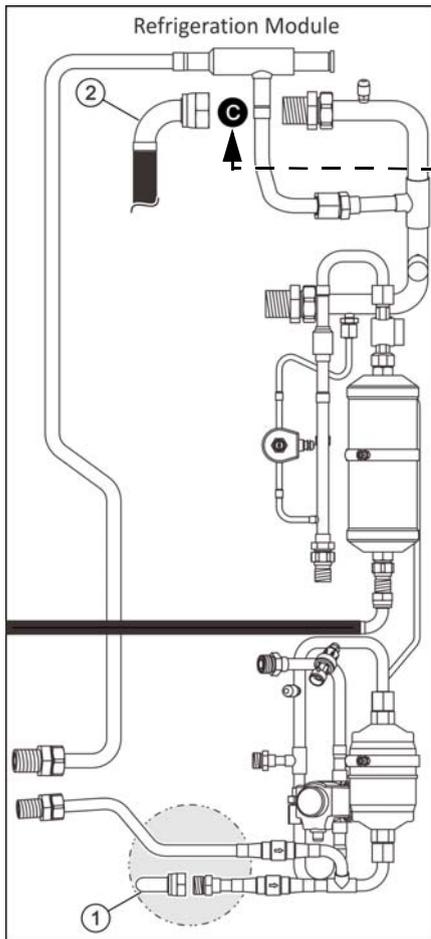
- Route hose down through the access hole to compressor.
- See “Connections at compressor” on page 42.

Connections at compressor

The refrigeration hoses must be routed from the cargo box, along the vehicle's chassis to the engine compartment and compressor while maintaining the minimum bend radii. See “Minimum Bend Radii” on page 35. The hoses should be secured adequately to prevent rubbing or chafing against hot, sharp or moving components.

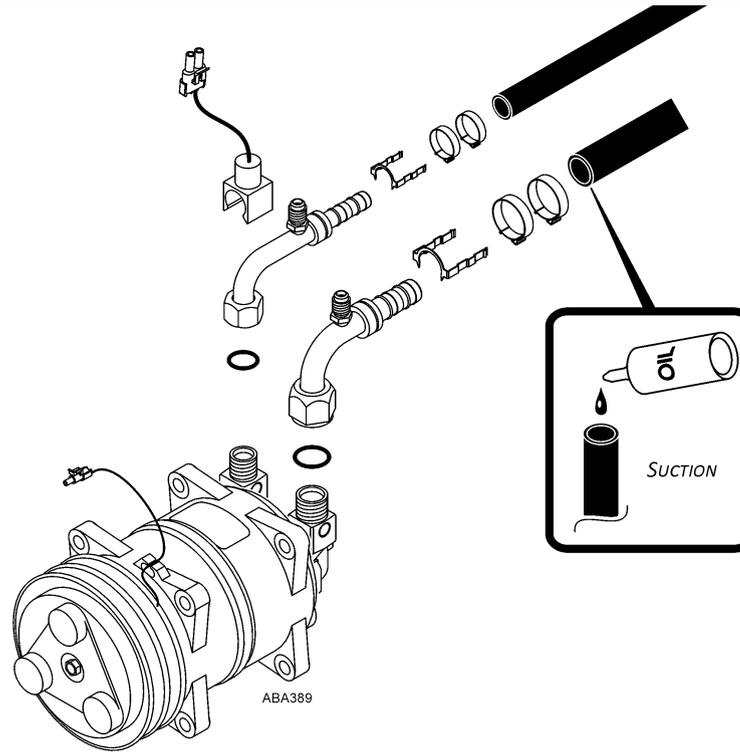
1. Install a 90° ORS fitting onto the #16 suction hose and 90° ORS fitting onto the discharge hose.
 - Place an O-ring on each fitting.
 - Lubricate the compressor refrigeration fittings and O-rings with refrigerant oil.
2. Locate your model unit on the chart and add the proper amount of compressor oil directly into the suction hose.
3. Provide an oil trap and connect the **SUCTION** hose fitting onto the compressor fitting marked **S**.
4. Connect the **DISCHARGE** hose fitting onto the compressor fitting marked **D**.
5. Use two wrenches and tighten refrigeration hose fittings.
6. Mount the liquid injection switch onto the compressor discharge fitting.

Installation - Refrigeration Hoses to Vehicle's Compressor



Manifold Fitting C
Connect to Vehicle's
Compressor Only

ABA539



TOTAL AMOUNT OF OIL REQUIRED

MODEL 50 SPECTRUM = 32 ounces total

Add 4 oz. to the road compressor, see pages 20-21.

Add 23 oz. into the suction hose, see pages 40-41.

NOTE: 5 oz. is already factory installed in system.

NOTE: All oil quantities assume swash plate style road compressors only.

System Leak Check and Evacuation

Solenoid Valve Positions

IMPORTANT: The Liquid Injection Solenoid Valve, Liquid Solenoid Valves and the Defrost Solenoid Valve must be in the OPEN position during evacuation procedures. The valves are normally in the closed position and must be held open manually using special magnets (204-1074) designed for this purpose. DO NOT put a magnet onto the Condenser Blocking Solenoid Valve as this is a normally open valve and a magnet will close it.

Refrigeration System Evacuation Procedure

1. Connect the Evacuation Station
 - **3 Point Evacuation for Model 10 and Model 30 Single Compressor Applications** - Connect the three evacuation lines from the Evacuation Station to the Discharge Service Valve, Suction Service Valve and the Service Valve located on the refrigerant line from the Oil Separator.
 - **4 point Evacuation for Model 20 and Model 50 Standby Compressor Applications** - Connect the three evacuation lines from the Evacuation Station to the Discharge Service Valve, Suction Service Valve and the Service Line (Yellow) of a gauge set.

Connect the Gauge Set Discharge Line (Red) to the Service Valve located on the refrigerant line from the Oil Separator. Connect the Gauge Set Suction Line (Blue) to the Service Valve previously installed on the standby compressor discharge line from the Standby Compressor to the Oil Separator.
2. Remove the retaining nut and coil from the normally closed Liquid Injection Solenoid located near the drier in the Condenser Section. Install a valve magnet on the valve stem. When the magnet is installed, a click should be heard as the valve opens.

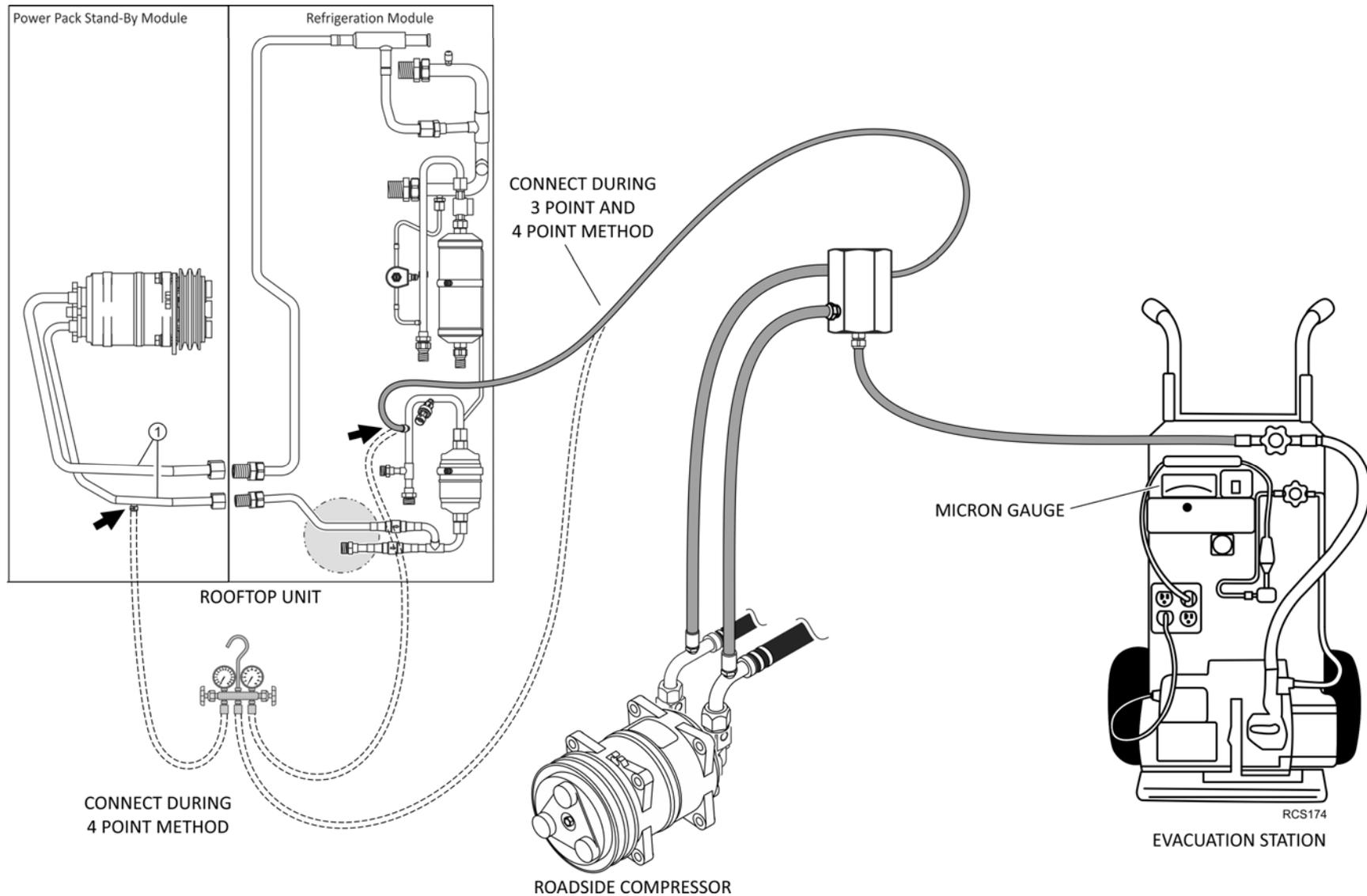
IMPORTANT: Do not install a valve magnet on the Condenser Block Off Solenoid (if present). The condenser block off Solenoid is a normally open solenoid - installing a valve magnet will close the solenoid.

3. Remove the coil from the normally closed Defrost Solenoid located in the Evaporator section. When the magnet is installed, a click should be heard as the valve opens.
4. Open the gauge manifold and vacuum pump valves. Start the vacuum pump and pump the system down to 500 microns. Continue to pump for 1 hr. after reaching 500 microns.

IMPORTANT: If the system will not pump down to 500 microns, there is likely a leak in the system or the Evacuation Station Hoses.

5. Close the vacuum pump valve and turn the pump off. Monitor the system pressure for 15 minutes.
6. If the system pressure remains below 2000 microns for 5 minutes, start the vacuum pump, open the vacuum pump valve and pump the system down to 500 microns. Close the vacuum pump valve and turn the pump off. Proceed to Step 9.
7. If pressure rise above 2000 microns in 5 minutes, additional pumping may be required or a leak may exist. A rapid rise in system pressure may indicate the presence of a leak. A slow rise in a system pressure may indicate a need for additional pumping time due to moisture in a system. Check for leaks as required. Repeat Steps 5 and 6 until the system pressure remains below 2000 microns for 5 minutes. Proceed to Step 9.
8. Remove the valve magnets from the normally closed Liquid Injection Solenoid, Liquid Line Solenoid Valves and Defrost Solenoid and reinstall the valve coil and retaining nut on the valve stems.
9. The system is ready to be charged with refrigerant.

System Leak Check and Evacuation

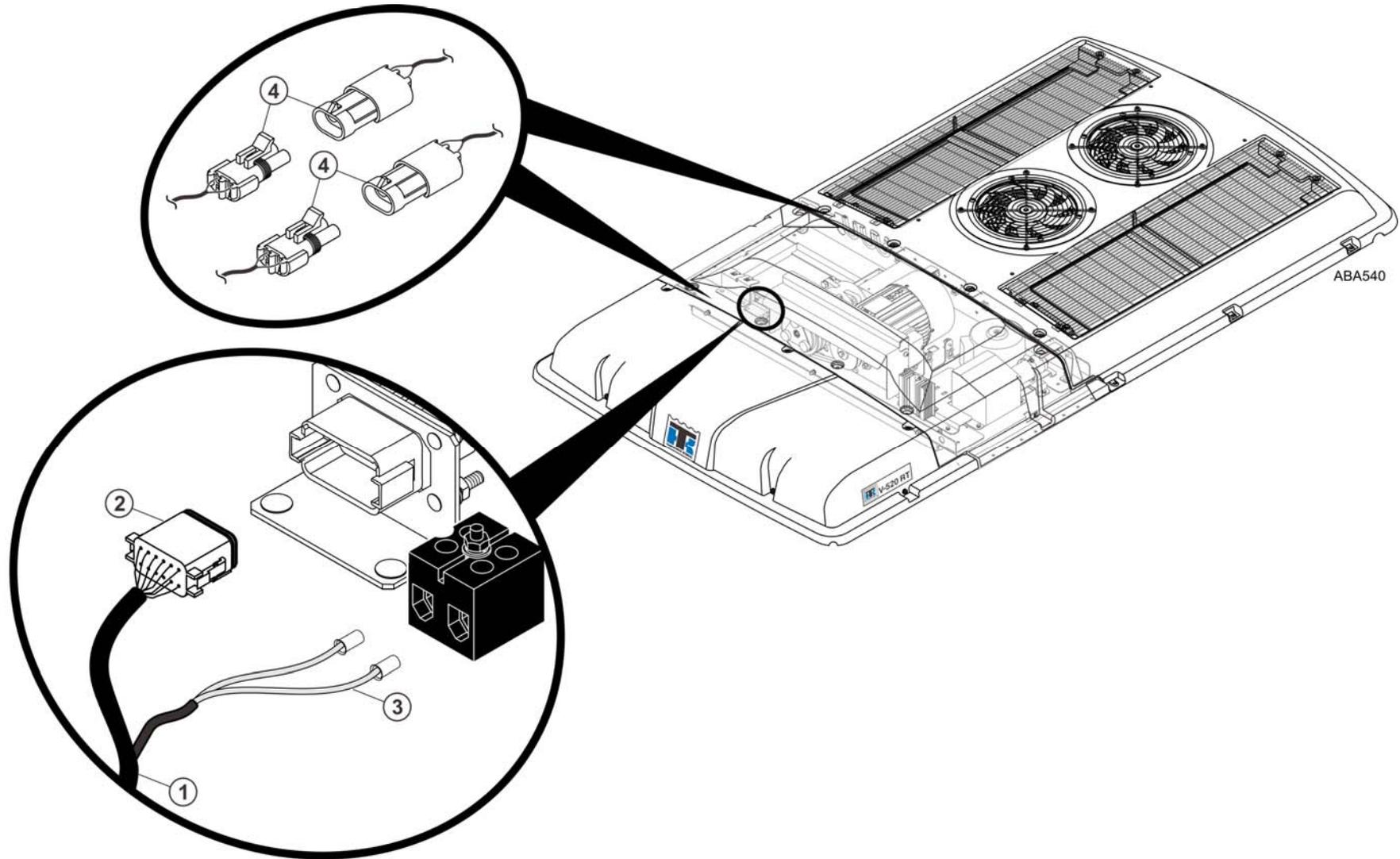


Installation - Electrical Connections

Rooftop Connections

1. Route the power harness from the Refrigeration Module to the Power Pack Module.
2. Connect the 12-pin connector to the mating connector on the Power Pack Module.
3. Insert the two electrical barrel connectors (**2R-01**) and (**CH10**) into the mating terminal connector block on the Power Pack and tighten securely.
4. Connect the Condenser Fan Motor connectors (**CF1-01, CFI**) and (**CF2, CHK**) to the mating connectors in both the Power Pack Module and at the Condenser Module.

Installation - Electrical Connections



Electrical Connections - Evaporator(s)

Installation

Route the **Evaporator Harness** from the V-520 condenser into the cargo box and make the following connections:

Host Evaporator

1. Defrost Termination Switch (**12, CHB**) to mating connector.
2. Hot Gas Defrost Solenoid (**26, CHM**) to mating connector.
3. Liquid Solenoid (**B3-01, CHZ**) to mating connector.
4. Temperature Sensor (**PNK, BLK**) to mating connector.
5. Drain Heaters (**27, CHF**) and (**27A, CHG**) to each mating connector. See “Installation - Evaporator Drain Hoses” on page 52 regarding the drain hoses and the correct placement of the drain pan heater wires.
6. Fan Motor 1 (**EFI, CHC**) to the mating connector.
7. Fan Motor 2 (**EF2, CHD**) to the mating connector.

OPTION - Door Switch (**DSW1, CHH**) to door switch connector.

NOTE: Make sure all harness are neatly routed and secured to prevent rubbing or chafing against sharp edges inside the evaporator assembly.

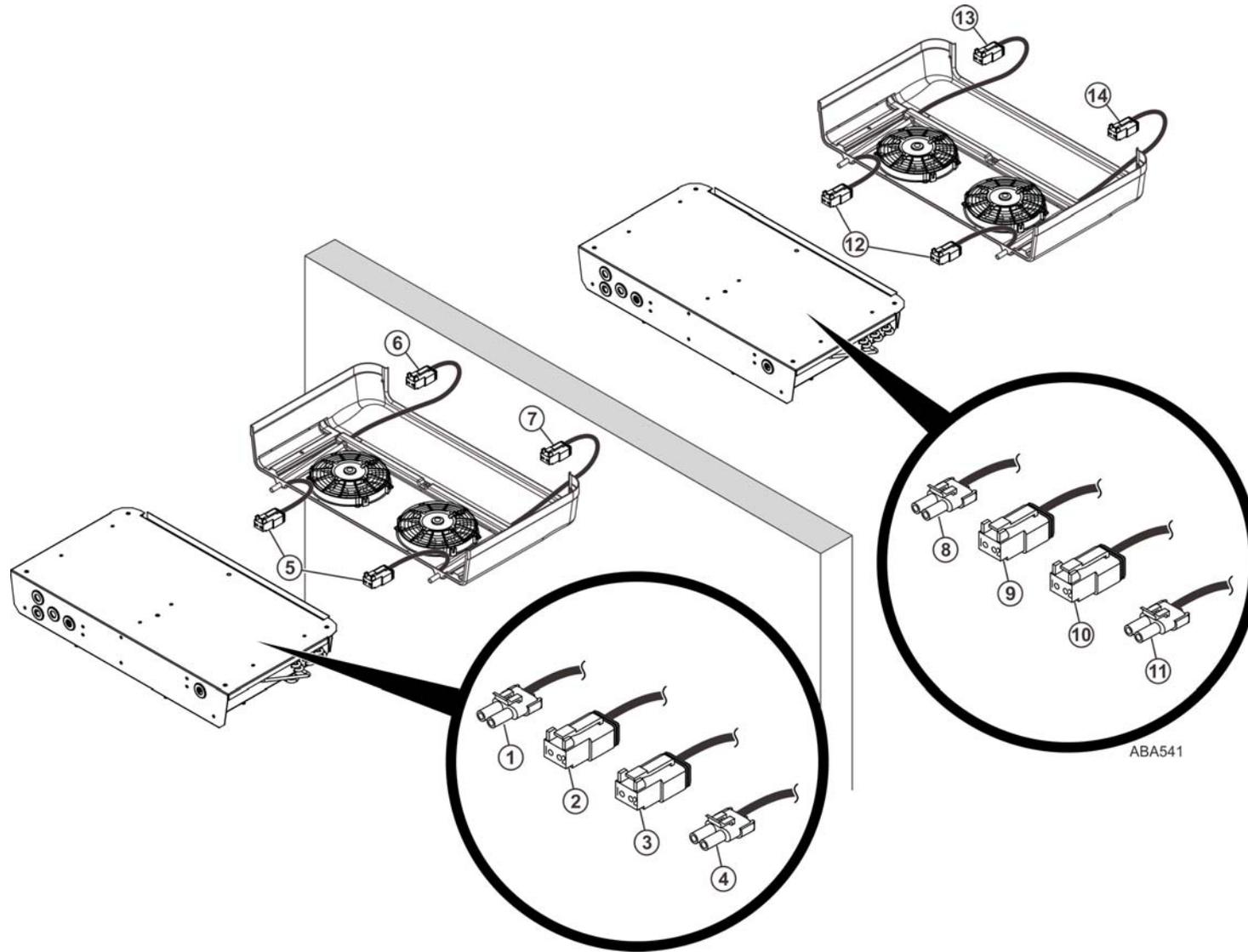
Remote Evaporator

8. Defrost Termination Switch (**12A, CHB2**) to mating connector.
9. Hot Gas Defrost Solenoid (**28, CHS**) to mating connector.
10. Liquid Solenoid (**33, CHY**) to mating connector.
11. Temperature Sensor (**G, B**) to mating connector.
12. Drain Heaters (**27B, CHF2**) and (**27C, CHG2**) to each mating connector. See “Installation - Evaporator Drain Hoses” on page 52 regarding the drain hoses and the correct placement of the drain pan heater wires.
13. Fan Motor 3 (**EF3, CHE**) to the mating connector.
14. Fan Motor 4 (**EF4, CHR**) to the mating connector.

OPTION - Door Switch (**DSW2, CHH2**) to door switch connector.

NOTE: Make sure all harness are neatly routed and secured to prevent rubbing or chafing against sharp edges inside the evaporator assembly.

Electrical Connections - Evaporator(s)



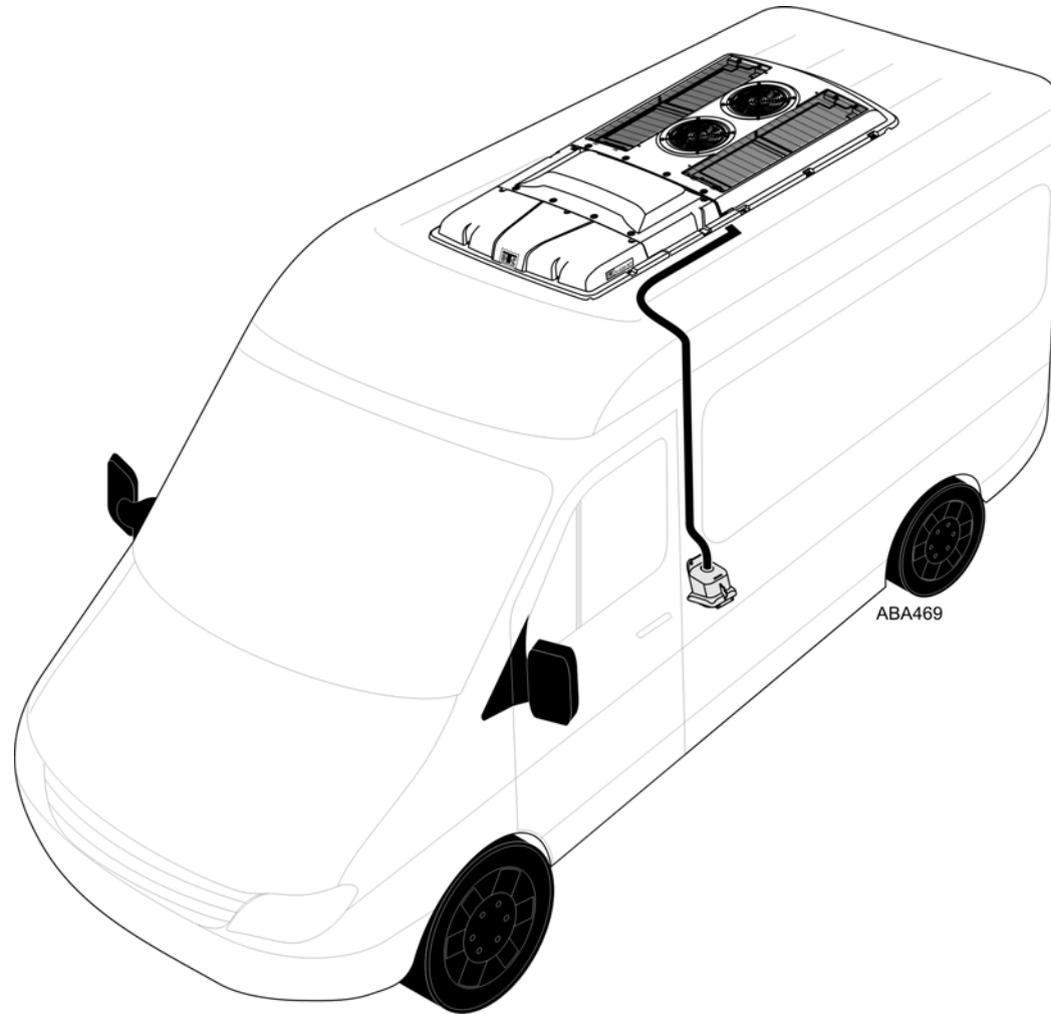
Installation - Standby Power Receptacle

Procedures

NOTE: Thermo King recommends a 20 amp fused power source for electric standby operation.

- Verify the receptacle box is wired for the correct voltage for your application.
- The standby receptacle box should be installed securely to the exterior of the vehicle. It should be easily accessible while not interfering with the driver's visibility or operation of the vehicle.
- Do not disassemble receptacle box.

Installation - Standby Power Receptacle



Installation - Evaporator Drain Hoses

REMOTE Evaporator

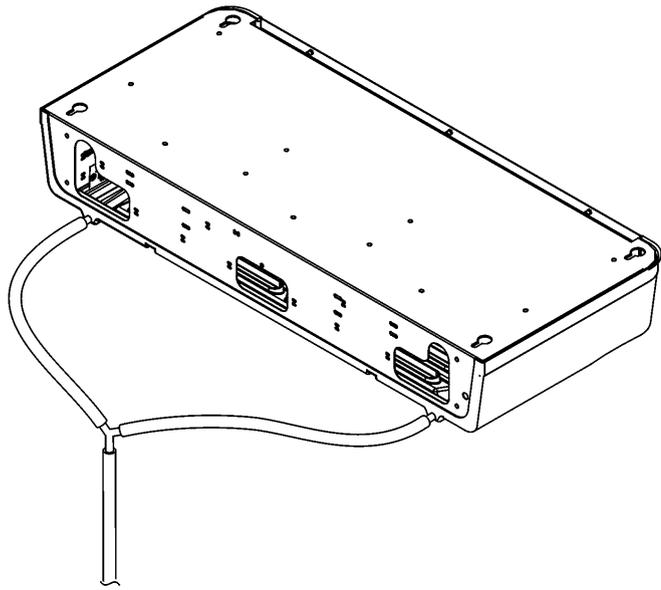
1. Cut the drain hose into two sections of suitable length and attach each drain hose onto the evaporator drain tubes.
2. Allow the drain hoses a sufficient slope to ensure that the water drains away from the evaporator.
3. Secure the connections with tie bands.
4. Route both hoses directly out through the compartment wall and join to a third single drain hose using the **Y connector**.
5. Route the single drain down the outside of the cargo area and secure with clamps.
6. Seal drain hose holes in the cargo area with neutral/alcohol cure silicone sealant.

HOST Evaporator

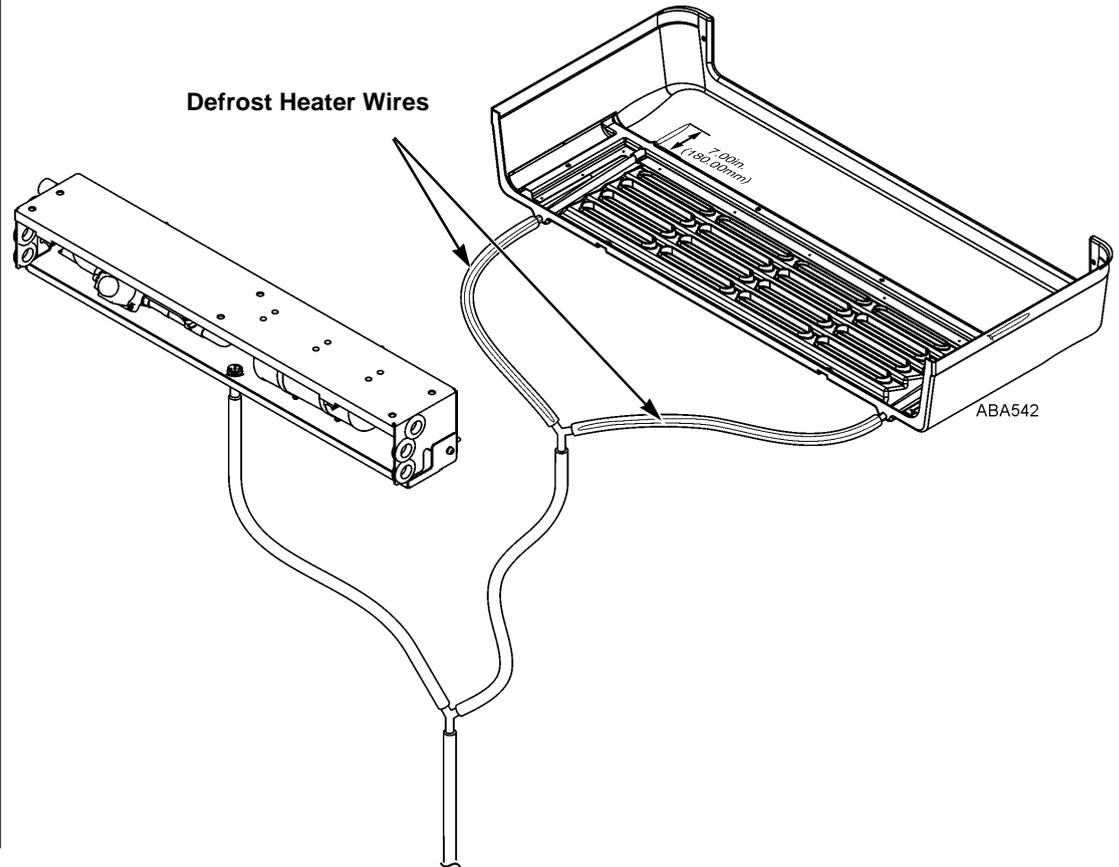
1. Cut the drain hose into two sections of suitable length and attach onto the drain tubes.
2. Allow the drain hoses a sufficient slope to ensure that the water drains away from the evaporator.
3. Allow approximately 7.00 in. (180 mm) of defrost wire to extend from each defrost tube into the pan.
4. Insert the defrost heater wires through each drain hose and along its entire length.
 - **Do not** use band wraps (wire ties) to hold the defrost heater wires.
 - **Do not** cover or wrap the defrost heater wires.
 - **Do not** cut the defrost heater wires.
 - **Do not** install more than 4 defrost heater wires into the drain tube.
5. Connect Drain Heater 1 (**27,CHF**) and Drain Heater 2 (**27A, CHG**) to mating connectors.
6. Install the cover onto the evaporator.
7. Use another Y connector to join the drain hose from the accumulator with the drain hose from the host evaporator as shown.
8. Route the single drain hose down the outside of the cargo area and secure with clamps.
9. Secure all hose connections with tie bands.
10. Seal drain hose holes in the cargo area with neutral/alcohol cure silicone sealant.

Installation - Drain Hoses

REMOTE Evaporator



HOST Evaporator



Installation - HMI

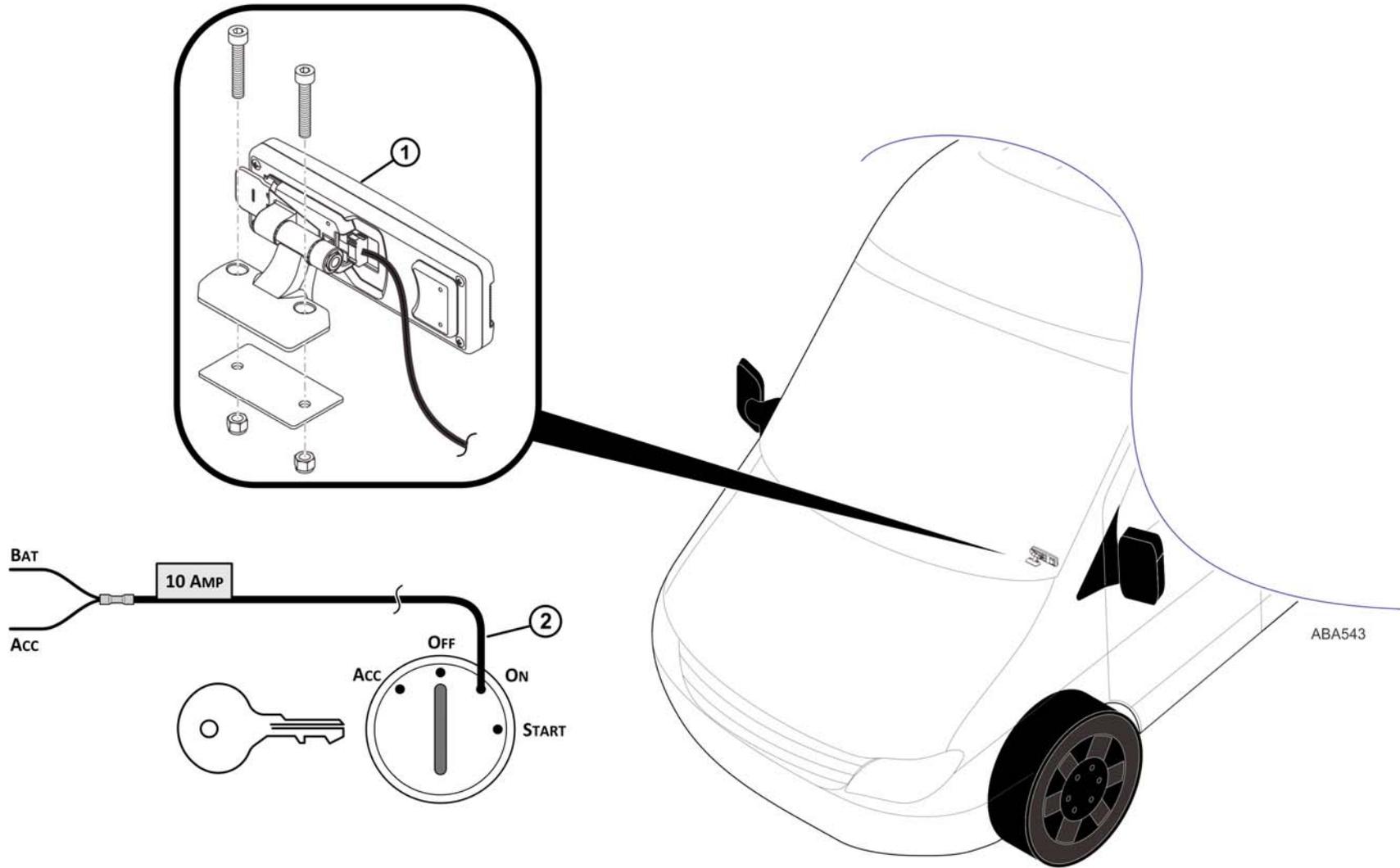
Procedures

1. From the cargo area, route the multi-conductor **Controller Harness** with wire colors **Blue (CH0)**, **Black (TXD)**, **White (RXD)**, **Brown (9V)**, and **Drain Wire (SHIELD)** and the **Vehicle Ignition Switch wires (ACC, BAT)** to the interior of the cab.
 - Attach the 5-pin connector (BLUE, BLACK, WHITE, BROWN, SHIELD) firmly to the rear of the controller.
 - Install the controller to the bracket.

NOTE: Install the in-cab controller in 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. Splice the **ACC** and **BAT** with the supplied 10 amp in-line fuse using the crimp connector in the kit and attach the in-line fuse (with ACC and Bat wires) to the ON side of the vehicle ignition switch.
3. Neatly route and secure all harnesses.

Installation - HMI



Installation - Electrical Connections to Compressor

Compressor Harness

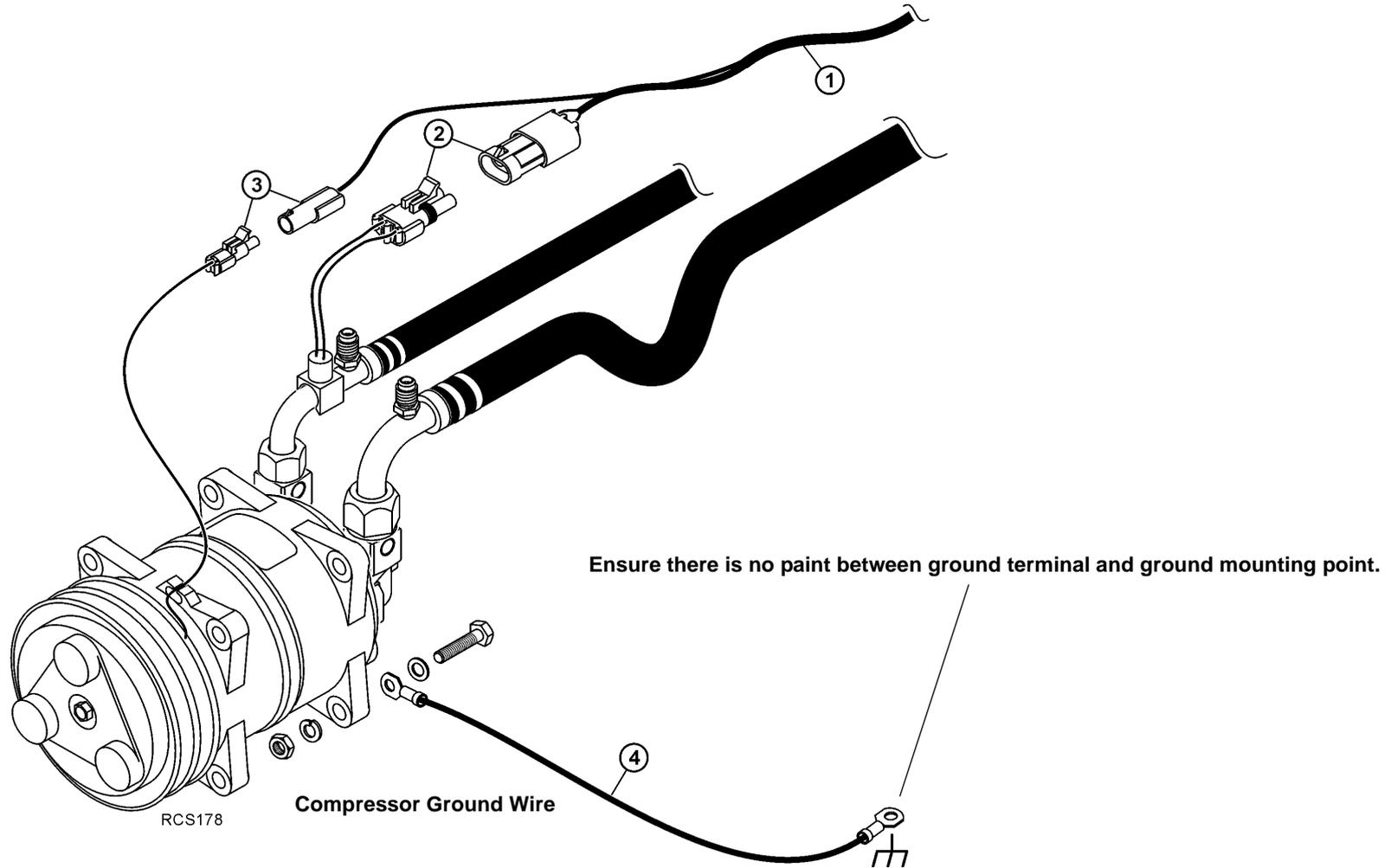
1. Route compressor harness with connectors (**LIS, CLU**) and (**CLU1**) to engine compartment.
2. Connect Liquid Injection (**LIS, CLU**) connector to mating connector on liquid injection switch.
3. Connect Clutch Harness (**CLU1**) to mating connector on clutch.

Compressor Ground Wire

4. Install chassis ground wire from the engine driven compressor to chassis ground using supplied hardware. Use anti-corrosion gel (203-377) or equivalent on ground wire connection to compressor and vehicle chassis. The location used on the vehicle chassis should be clean and free of paint to make a proper ground path.

IMPORTANT: Failure to install the compressor ground wire to the chassis may result in intermittent clutch operation and premature clutch failure!

Installation - Electrical Connections to Compressor



IMPORTANT: Failure to install the compressor ground wire to the chassis may result in intermittent clutch operation and premature clutch failure!

Installation - Electrical Connections to Battery

In-Line Fuse Installation

IMPORTANT: *The in-line fuse must be located in an accessible location as close to the battery as possible while keeping it from directly touching or laying on the battery.*

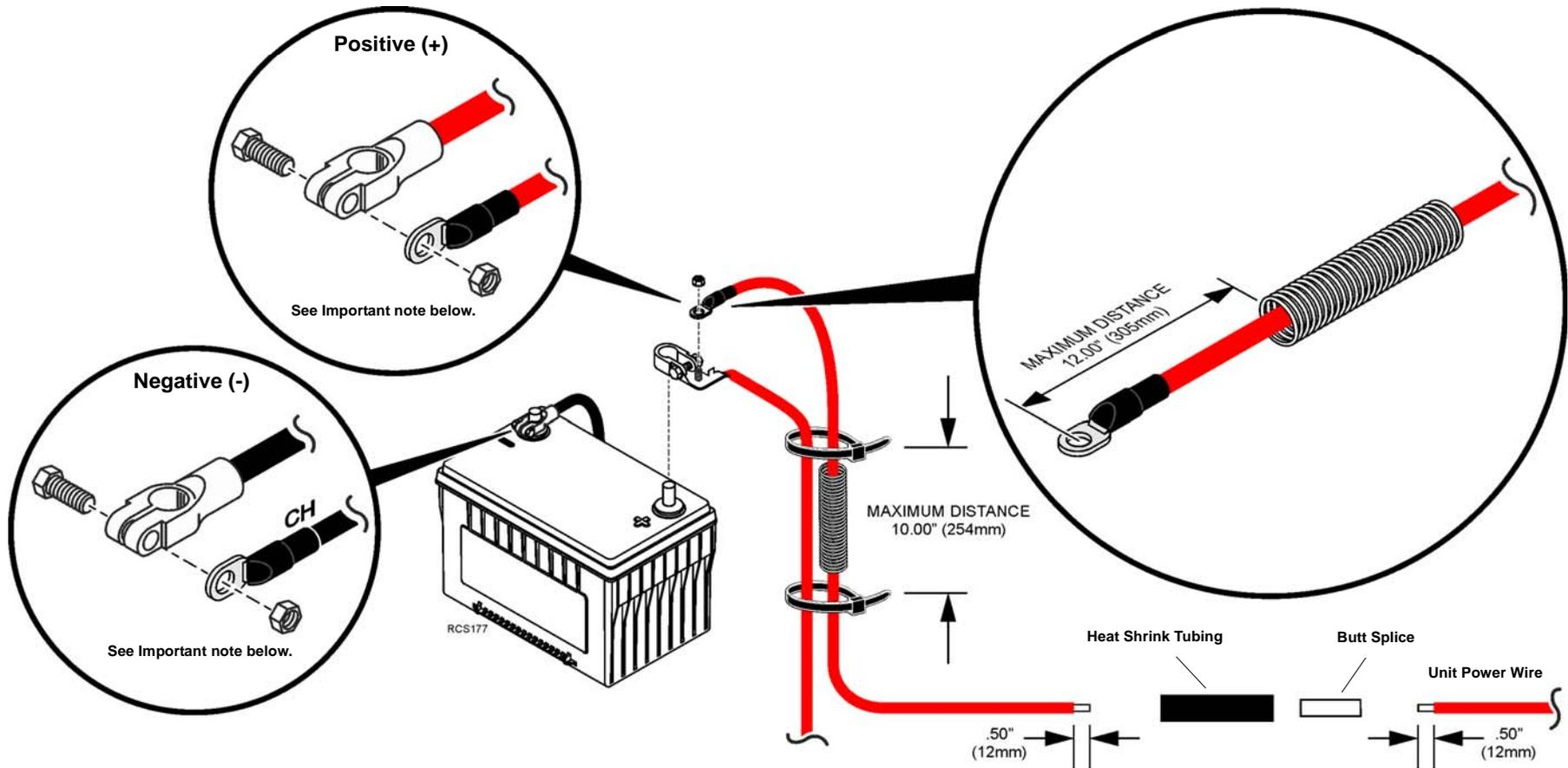
1. Cut one in-line fuse wire to a maximum length of 12.00 in. (305 mm) and strip 0.50 in. (12 mm) from the end.
2. Slide the heat shrink tubing onto the wire and position it away from the connection.
3. Securely crimp and solder the correct size ring terminal onto the wire.
4. Position the heat shrink tubing over the body of the terminal and the wire and then apply heat.
5. Cut the other end of the in-line fuse wire and the unit's power (2) wire to appropriate lengths and strip 0.50 in. (12 mm) from the ends of each wire.
6. Slide the heat shrink tubing onto one wire and position it away from the connection.
7. Using the supplied butt splice connector, securely crimp and solder the two wires together.
8. Position the heat shrink tubing over the entire connection and then apply heat.
9. Attach the ring terminal onto the positive (+) battery lug and tighten securely.
10. Route and secure the in-line fuse to the vehicle or alongside the positive battery cable with the supplied cable ties.
 - The in-line fuse should be positioned **vertically** to help promote water drainage.
 - Fuses mounted **horizontally** must have the slit in the sleeving pointing downwards.

Cable ties should be positioned within 5.00 in. (127 mm) on each side of fuse as shown and no further than 10.00 in. (254 mm) apart.

Ground Wire

11. Securely crimp and solder the correct size ring terminal onto the **CH** wire.
12. Position the heat shrink tubing over the body of the ring terminal and the wire and then apply heat.
13. Attach the negative (**CH**) wire to **negative (-)** post of battery securely.

Installation - Electrical Connections to Battery



IMPORTANT: The ring terminals used must be sized to match the battery power stud or lug bolt. Oversized ring terminals can contribute to high resistance resulting in the fuse overheating and failure.

System Charging

Procedures

NOTE: Ensure proper leak check and evacuation procedure was performed.

1. If gauge set is still connected from the evacuation, ensure gauge set is free of non-condensables and connect the refrigerant bottle to the gauge manifold.
2. If gauge set is not connected to unit, connect the refrigerant bottle and purge the gauge fitting lines and connect the gauge manifold set to the suction and discharge service ports on the engine driven compressor.
3. Place refrigerant bottle on scale and zero scale.
4. Keep the low pressure side valve of the gauge manifold closed. Open the high pressure side valve.
5. Add the proper amount of refrigerant for your model.

AMOUNT OF REFRIGERANT	
Model 50	5.00 lbs.

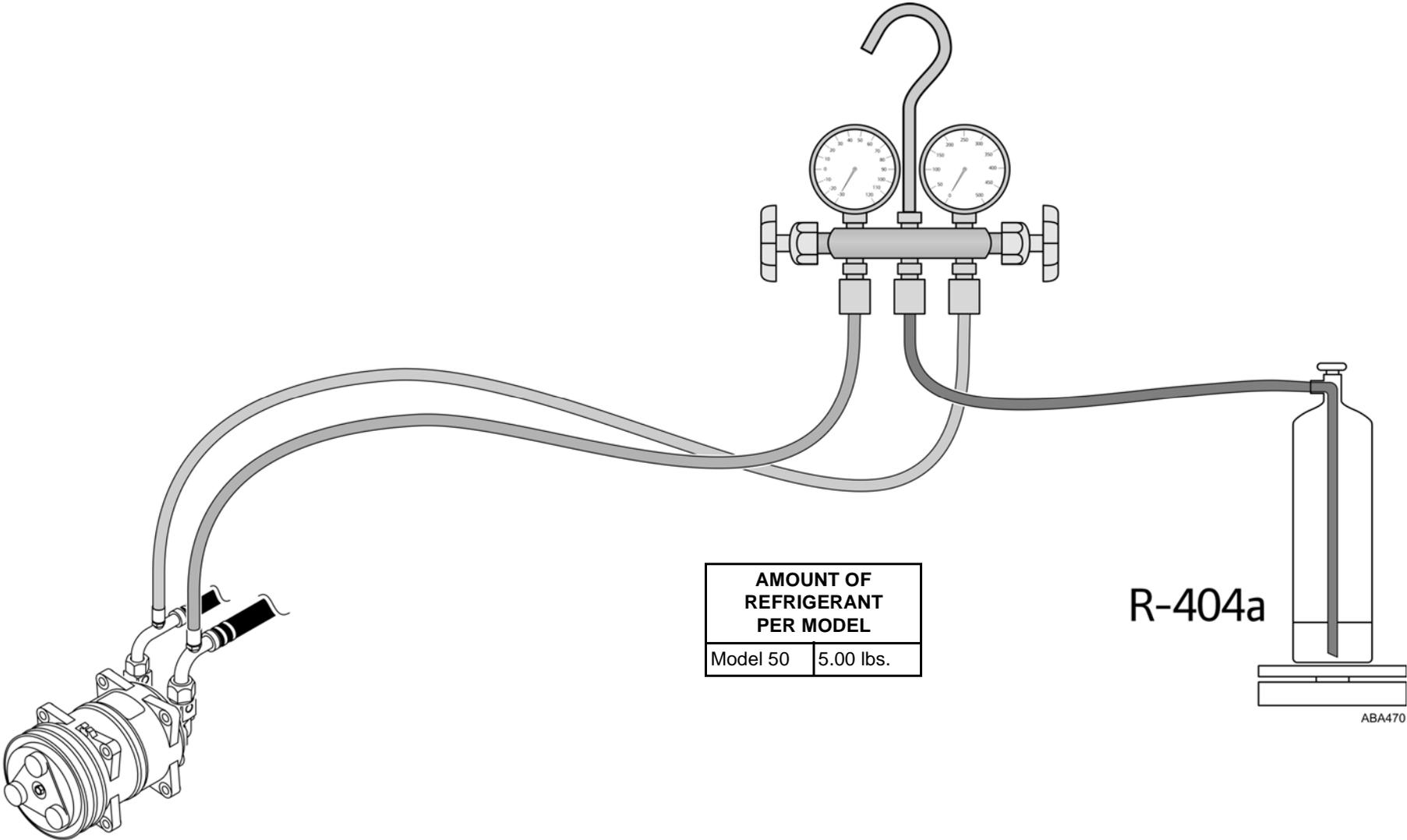
NOTE: The refrigerant charge must be made in liquid phase for R-404A.

6. Close the refrigerant bottle valve and the high side valve of the gauge manifold.
7. Start the vehicle's engine, run at approximately 1000 rpm and turn the unit ON.
8. Set the unit thermostat at 0C/32F (see operating manual).

9. Run the unit until it reaches a temperature close to that indicated, and a high circuit pressure of 19 bar (**275 psig for R-404A**). Partially block off the air intake to the condenser if necessary.
10. 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.
11. Close the refrigerant bottle and gauge manifold valves.
12. Leave the unit running for 15 minutes.
13. Check that there are no bubbles in the sight glass. If bubbles are seen, repeat steps 10 and 11.
14. Turn the unit OFF, stop the vehicle's engine 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.

System Charging



ABA470

SPR and CPR Adjustment Procedures

IMPORTANT: The following applicable procedures must be performed on all new unit installations. Failure to do so may not allow the unit to operate at its maximum capacity.

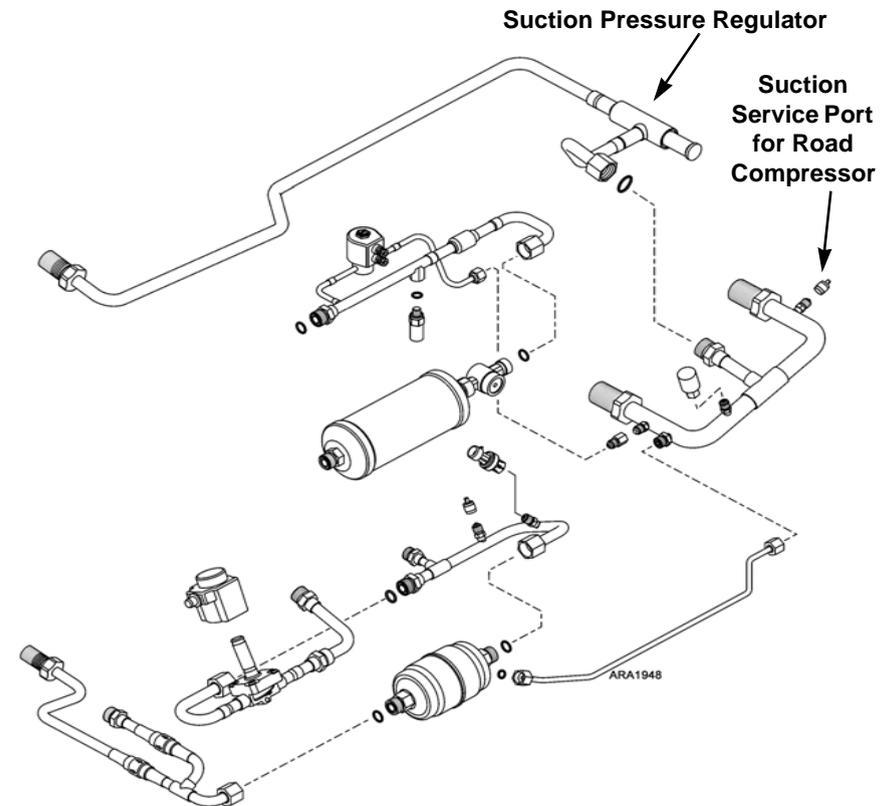
NOTE: The following procedures are for initial settings. Sometimes conditions such as high or low ambient temperatures may require that the settings be fine-tuned for optimum performance.

Suction Pressure Regulator Valve (Model 20 and 50 Only)

Model 20 and 50 units are equipped with a suction pressure regulator (SPR) valve. The valve is used to limit the load on the standby compressor. This also affects the current draw of the electric motor. Monitor the current drawn of the electric motor when making this adjustment and keep it at least 1.5 amps below the overload relay setting. Refer to the Maintenance Manual for overload relay settings.

1. Install a gauge manifold set on the electric standby compressor. Attach an additional compound gauge to the suction service port on the copper tube directly before SPR valve (shown in illustration to monitor suction pressure at the inlet to the suction pressure regulator).
2. Connect the unit power receptacle to an appropriate electric power source.
3. Place a jumper wire between the 12 and CHB wires at the defrost termination switch to ensure the unit will run in Defrost.
4. Start the unit and run it in Defrost on the electric standby compressor until the pressure on the additional compound gauge attached to the suction service port stabilizes at a pressure above 45 psig (310 kPa).
5. Check the suction pressure on the gauge attached to the suction service port at the standby compressor. It should be 39.0 ± 4 psig (269 ± 28 kPa) for 230V 3 phase electric motor, and 24.0 ± 4 psig (165.5 ± 28 kPa) for 230V 1 phase electric motor. If the setting is incorrect, remove the protective cap and adjust the suction pressure regulator valve to the correct setting.

6. Remove the gauge manifold set, the additional compound gauge, and the jumper wire when finished with the procedure.



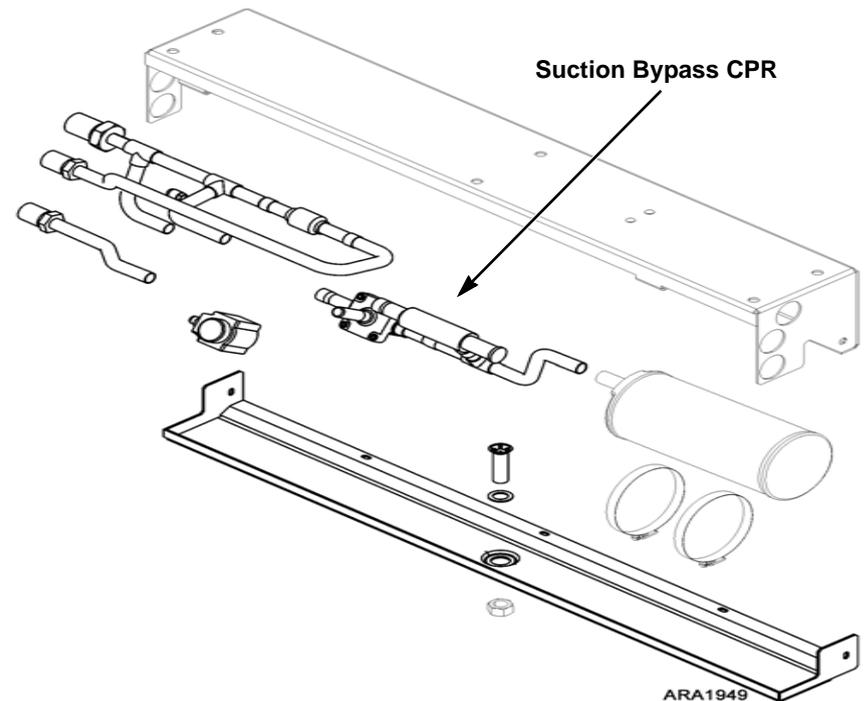
Typical V-520 RT Refrigeration Module Components

SPR and CPR Adjustment Procedures (continued)

Suction Bypass CPR Valve (SPECTRUM Units Only)

The suction bypass CPR valve is located in the advanced control system module, which is mounted on the back of the evaporator. The advanced control system balances the suction pressure between the fresh and frozen evaporators to allow both evaporators to have equal capacity to control the two zones. This system gives priority to the frozen section. It also keeps refrigerant from migrating into the frozen evaporator when it is not running.

1. Install a gauge manifold set on the engine driven compressor.
2. Shut off the fresh compartment by raising its setpoint to the highest setting.
3. Start the unit on the engine driven compressor at 1800 to 2000 RPM.
4. Bring the frozen compartment to 5 to 7 F (3 to 4 C) above desired setpoint. Record the suction pressure and then shut the unit off.
5. Remove the suction bypass solenoid coil and install a magnet (P/N 204-1074) to close valve.
6. Raise the frozen compartment setpoint to the highest level on the HMI and lower the fresh compartment setpoint to 35 F (2 C) and start the unit.
7. With the unit running, set the suction pressure to the recorded value from step 4 by adjusting the suction bypass CPR valve. Once the suction pressure has been set, turn the unit off.
8. Remove magnet and reinstall the coil on the suction bypass solenoid.
9. Remove the gauge manifold set.
10. Start the unit with both compartments set to desired setpoints and let the unit pull down.
11. It is normal for the frozen compartment to pull down faster than the fresh compartment on first start up.



Typical V-520 RT SPECTRUM Advanced Control System Module Components

Installation Check List

- Components are installed with recommended hardware and tightened securely.
- All mounting holes and access holes are sealed with neutral/alcohol cure silicone sealant.
- All covers, guards or screens are installed securely on unit.
- Evaporator drain hoses are angled downward for proper drainage.
- Drain hose heaters (if applicable) are installed correctly.
- The orifice screen is installed in the expansion valve at the evaporator.
- In-cab controller installed and is accessible and visible from the driver's position.
- Refrigerant hoses are not taut - they are able to absorb vibrations.
- Refrigerant hoses are not rubbing against moving components, sharp objects, or items that can reach high temperatures.
- Compressor was filled with the proper amount and type of oil.
- All electrical connectors are properly locked in place.
- Standby Power Receptacle mounted securely to vehicle.
- All electrical harnesses and wiring is routed and secured adequately.
- Correct size and amperages fuse was installed in the main power harness to the battery.
- Maxi Fuse holder was secured properly with bolt and nut to vehicle.
- All battery connections are clean and tight.
- Vehicle compressor drive kit test was carried out.
- Complete refrigeration system was checked for leaks.
- Unit is charged with correct type and amount of refrigerant.
- SPR and CPR adjustment procedures were carried out and unit operates at its maximum capacity.
- Unit operates correctly.
- P-Trap installed correctly.
- Compressor ground strap installed.

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