



THERMO KING

Installation Manual

Heat King 450 Series

HK450 HO and HK450 MAX Diesel Heating Units

Revision C

February 2023

TK 56118-6-IM-EN

TRANE
TECHNOLOGIES

Introduction

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

Revision History

Revision A	(04/21) Released new manual format.
Revision B	(10/22) Added TKV5 and Solar Panel Information
Revision C	(02/23) Corrected battery P/N.

Customer Satisfaction Survey

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Table of Contents

Safety Precautions	4
Danger, Warning, Caution and Notice	4
Battery Installation and Cable Routing	5
Important Installation Requirements	6
Trailer / Container Requirements	6
Unit Weight	6
Front Wall Dimensions and Swing Radius	7
Mounting Bolt Specifications	8
Component Dimensions	10
Unit Dimensions	10
Remote HMI Dimensions	11
Battery Selection Guide	12
Battery Dimensions	13
Required Tools	14
Installation Kit Components	15
Installing Unit	16
Installing Remote HMI	18
Surface Mount Installation	18
Flush Mount Installation	19
Installing Fuel System	20
Under Chassis Fuel Tank	20
Installation Best Practices	20
Installing Fuel Pump and Fuel Lines	20
Optional Nose Mounted 65 Gallon Fuel Tank	22
Installation Best Practices	22
Installing Fuel Pump and Fuel Lines	22
Installing Battery	24
Service Test Procedure	26
Engine Break-in Test	26
System Check List	27

Safety Precautions

Danger, Warning, Caution and Notice

Thermo King recommends that all service be performed by a Thermo King dealer and to be aware of several general safety practices.

Safety advisories appear throughout this manual as required. Your personal safety and the proper installation of this unit depend upon the strict observance of these precautions.

⚠ DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury and unsafe practices.

NOTICE

Indicates a situation that could result in equipment or property-damage only accidents.

⚠ DANGER

Equipment Damage and Risk of Injury!

To prevent severe equipment damage, serious injury, or death, the front wall of the trailer or container must be structurally strong enough to support the weight of a Heat King 450 series unit, or when using the front wall mounted fuel tank option, the combined weight of a Heat King 450 series unit, plus the weight of the fuel, the fuel tank and brackets.

⚠ DANGER

Equipment Damage and Risk of Injury!

Failure to secure the Heat King 450 series unit properly to the trailer or container can result in severe equipment damage, serious injury, or death.

⚠ DANGER

Equipment Damage and Risk of Injury!

Consult your trailer or container manufacturer for specific details on proper fuel tank installation and recommendations. An improperly installed fuel tank could lead to serious injury or death.

NOTICE

Equipment Damage!

All unit mounting bolts must be installed, be the correct length for their application, and torqued to specifications. Missing bolts, incorrect bolt lengths and improper torque specifications can damage equipment and void the warranty.

Battery Installation and Cable Routing

⚠ WARNING

Hazard of Explosion!

An improperly installed battery could result in a fire, explosion, or injury. A Thermo King approved battery must be installed and properly secured to the battery tray.

⚠ WARNING

Hazard of Explosion!

Improperly installed battery cables could result in a fire, explosion, or injury. 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

Fire Hazard!

Do not attach fuel lines to battery cables or electrical harnesses. This has the potential to cause a fire and could cause serious injury or death.

⚠ WARNING

Hazard of Explosion!

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.

⚠ CAUTION

Hazardous Service Procedures!

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.

NOTICE

Equipment Damage!

Do not connect other manufacturer's equipment or accessories to the unit or to the TK Batteries unless approved by Thermo King. Failure to do so can result in severe damage to equipment and void the warranty.

Important Installation Requirements

Trailer / Container Requirements

⚠ DANGER

Equipment Damage and Risk of Injury!

To prevent severe equipment damage, serious injury, or death, the front wall of the trailer or container must be structurally strong enough to support the weight of a Heat King 450 series unit, or when using the front wall mounted fuel tank option, the combined weight of a Heat King 450 series unit, plus the weight of the fuel, the fuel tank and brackets.

⚠ DANGER

Equipment Damage and Risk of Injury!

Failure to secure the Heat King 450 series unit properly to the trailer or container can result in severe equipment damage, serious injury, or death.

⚠ DANGER

Equipment Damage and Risk of Injury!

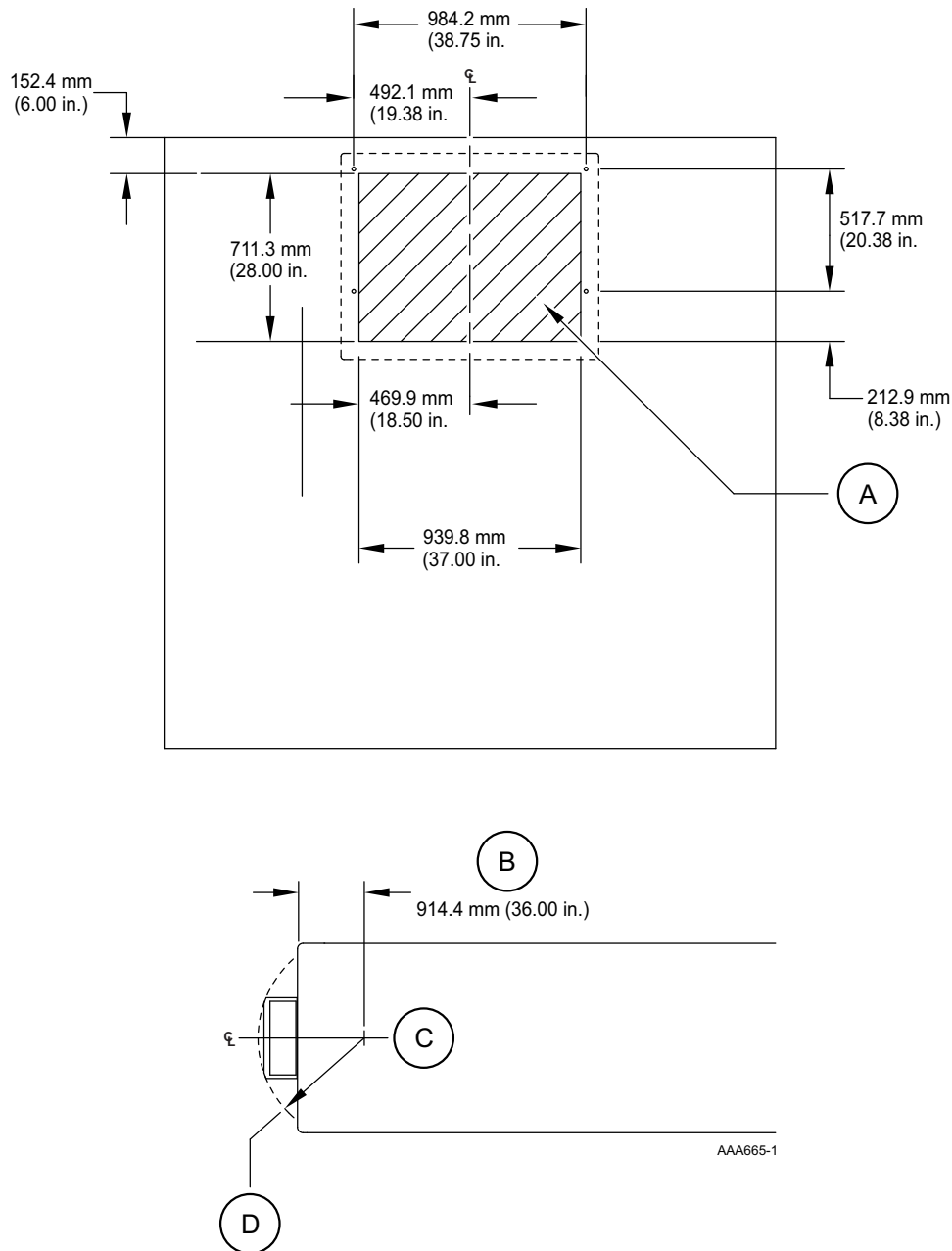
Consult your trailer or container manufacturer for specific details on proper fuel tank installation and recommendations. An improperly installed fuel tank could lead to serious injury or death.

Unit Weight

UNIT WEIGHT*		
Heat King 450 series unit with EON battery installed.	HK450 HO 220 kg (484 lbs.)	HK450 MAX 231 kg (510 lbs)
<i>*Does not include the weight of the fuel, the fuel tank and brackets.</i>		

Front Wall Dimensions and Swing Radius

Figure 1. Front Wall Dimensions and Swing Radius Shown



- A. Trailer opening must be square.
Diagonal dimension must be +/- .12 in.
- B. King Pin Setting
- C. Swing Radius
- D. 407.2 mm (55.40) Radius for Standard HK installation
464.3 mm (57.65) Radius for Zero Cube HK installation



Mounting Bolt Specifications

NOTICE

Equipment Damage!

All unit mounting bolts must be installed, be the correct length for their application, and torqued to specifications. Missing bolts, incorrect bolt lengths and improper torque specifications can damage equipment and void the warranty.

⚠ DANGER

Equipment Damage and Risk of Injury!!

The use of mounting bolts other than those specified could result in severe damage to equipment, void the warranty, or cause personal injury or death.

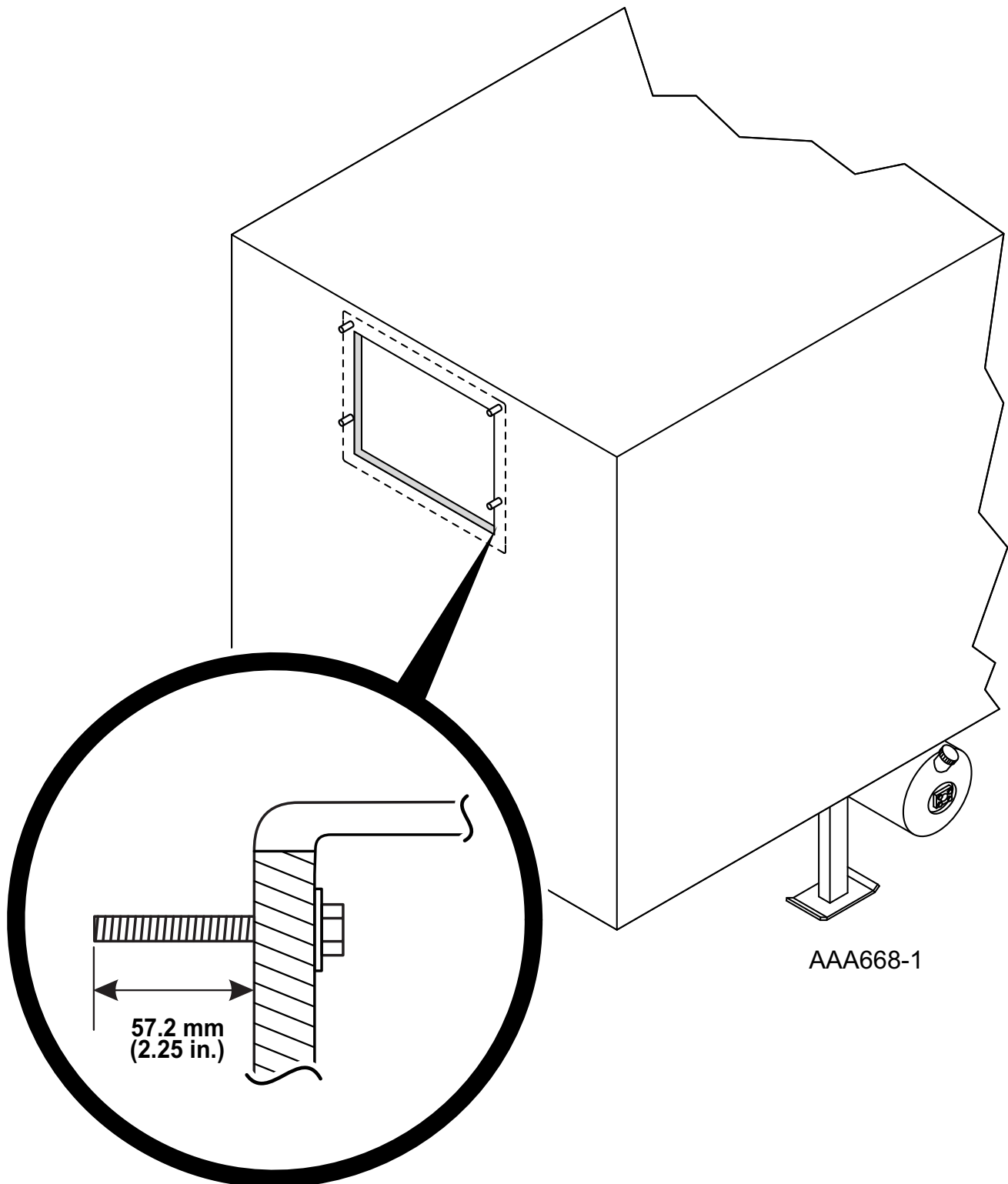
Note: Mounting hardware to be supplied by installer.

- Metric M12 x 1.75 pitch class 8.8 (or 1/2 in.-13 UNC - 2B Rolled thread grade 5), medium carbon steel bolts and locking nuts
- All hardware must be zinc plated with dichromate finish.

Note: The location of the unit mounting bolts in the trailer front wall is critical to proper unit installation.

- A gasket sealing surface of 76.2 mm (3.00 in.) wide all around the trailer/container wall opening must be free from rivets or bolt heads and flat within 6.5 mm (.25 in.)
- All mounting bolts must be square with the front wall and securely fastened to the trailer/container wall in such a manner to allow the mounting nuts be torqued to 82 N•m (60 ft. lbs.) from outside the trailer/container.
- Mounting bolts are to extend 57.2 mm (2.25 in.) beyond the front wall (**See Fig. 2**).
- Surface of all mounting bolts are to be flat within 2.5 mm (0.10 in.).

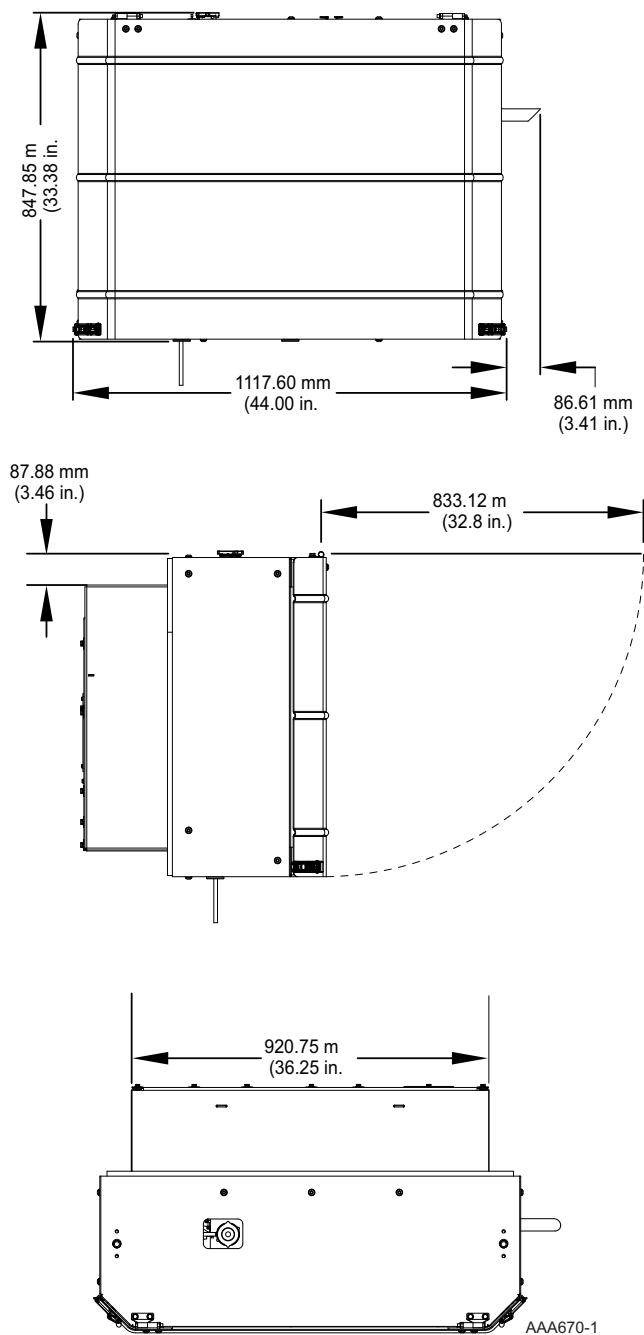
Figure 2. Mounting Bolt Specifications Shown



Component Dimensions

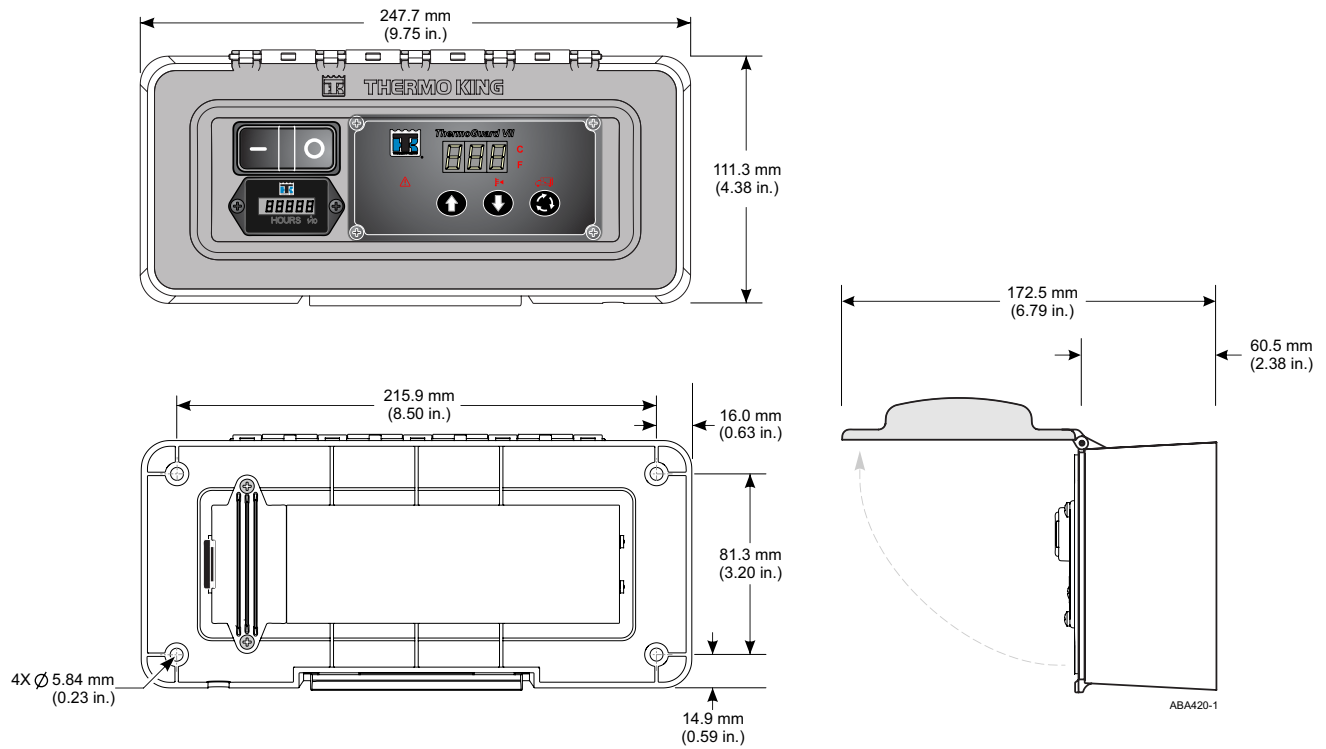
Unit Dimensions

Figure 3. HK Unit Dimensions Shown



Remote HMI Dimensions

Figure 4. Remote HMI Dimensions Shown



Battery Selection Guide

NOTICE

Equipment Damage!

Do not connect other manufacturer's equipment or accessories to the unit or to the TK Batteries unless approved by Thermo King. Failure to do so can result in severe damage to equipment and void the warranty.

Important: The specified battery, electrical wiring and electronic controls were designed to operate and maintain only the Thermo King Heat King unit and factory authorized Thermo King options. 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!

Heat King units:

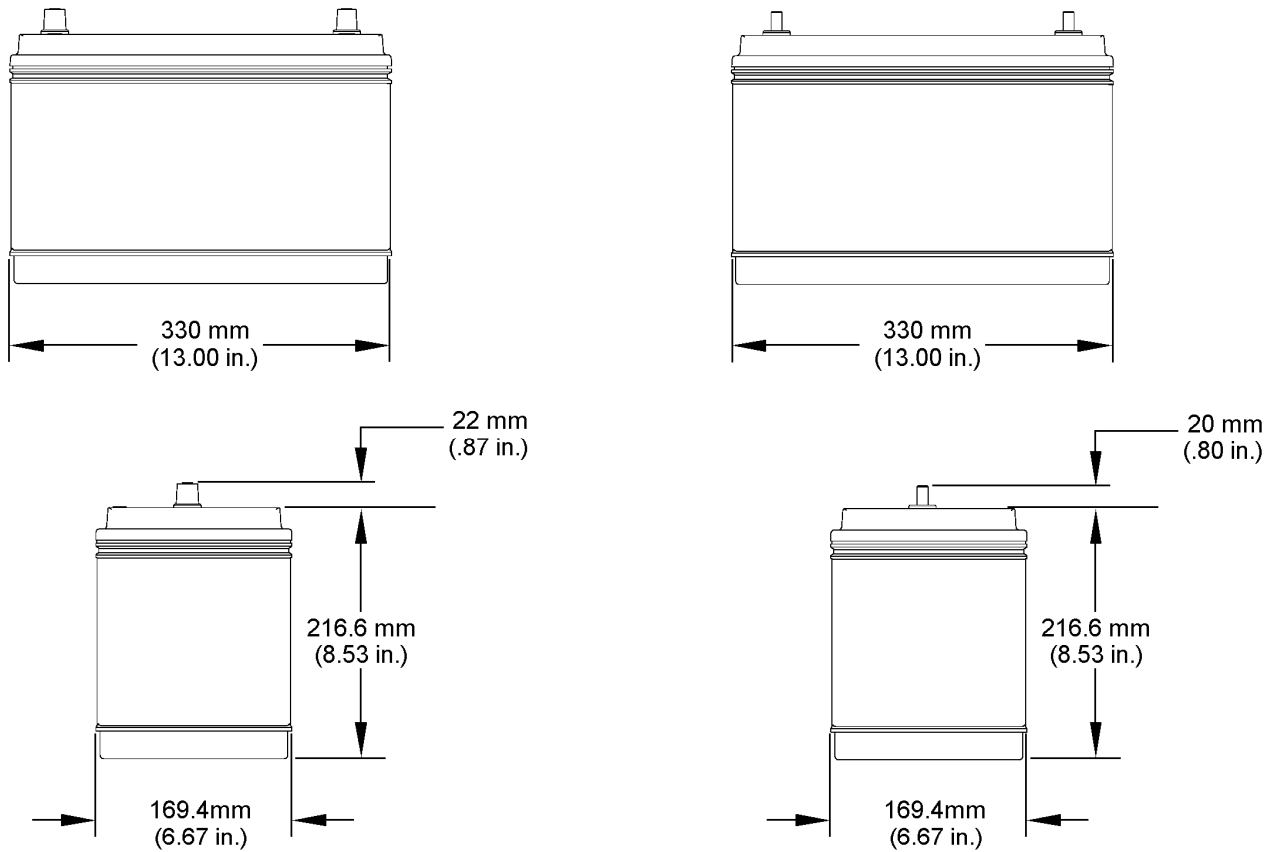
- are designed for one 12 volt, Group 31 battery supplied by the installer.
- must use a battery suitable for deep cycling, heavy duty and rated with a minimum of 95 amp/hr.

Note: See following table for Thermo King approved batteries. Refer to Service Bulletin T&T 446 for more information regarding Battery Selection and Maintenance.

BATTERY APPLICATION TABLE		
750 CCA Wet Cell Thermo King ReliaMax 750S P/N 2030731 Threaded Stud P/N 2030730 SAE Post	925 CCA Wet Cell Thermo King ReliaMax 925N P/N 2030733 Threaded Stud P/N 2030732 SAE Post	1150 CCA Dry Cell (AGM) Thermo King EON P/N 2030550 Threaded Stud P/N 2030551 SAE Post
• Wet Cell Technology • Better suited for warmer climates • Less cranking power at low ambient temperatures • 18-24 month expected life *see note below • Choose for southern climates	• Wet Cell Technology • Better suited for colder climates • High cranking power at low ambient temperatures • 18-24 month expected life *see note below • Choose for northern climates	• Dry Cell Technology • Better suited for all applications • High cranking power at low ambient temperatures • Suited for extreme temperatures • Best for high cycling applications (Cycle-Sentry use) • 5-7 year expected life
NOTE: Wet cell battery life and maintenance requirements are determined by the operating environment and the charge/discharge rate (cycles) while the battery is in service. Higher ambient temperatures and frequent discharges will shorten a wet cell battery's overall life expectancy and increase maintenance requirements.		

Battery Dimensions

Figure 5. Group 31 Battery Dimensions Shown



AAA403

Required Tools

1. Safety Glasses
2. Drill
3. Drill Bits
4. Tape Measure
5. Mechanics Tools
6. Lifting Device
7. Two Forged Eyebolts (1/2–13 UNC)
8. Work Platform (Recommended)
9. Torque Wrench

Note: *Equipment such as torque wrenches should be in good working condition and routinely calibrated to assure accurate readings.*

Installation Kit Components

HARDWARE KIT	FUEL LINE KIT	FUEL PUMP KIT	Battery Box Kit
Clamps	1/4" OD x 40 ft. Fuel Hose	Fuel Pump	Battery Box Bracket
Band wraps	3/8" OD x 40 ft. Fuel Hose	3/8 Hose Fittings	3/8 Lock Washers
1/4-20 SS Screws	1/4" Eyelet Fitting	Fuel Pump Bracket	3/8 Flat Washers
1/4-20 Lag Bolts	3/8" Eyelet Fittings	Nameplate	3/8-16 Nuts
5/16 Lag Bolts	1/4" Sleeve Fittings	Harness	3/8-16 Screws
1/4-20 SS Nuts	3/8" Sleeve Fittings		
1/2-13 Lock Nuts	1/4" Nut Fittings		
1/2 SAE Washers	3/8" Nut Fittings		
1/4-SS Washers	1/4" Connector		
1/4-20 SS Lock Nuts	Fuel Line Connector		
1.25 OD Washers	4" Long Hose		
#10 Screws			
1/4-20 Screws			

Installing Unit

⚠ WARNING

Equipment Damage and Risk of Injury!

Do not use a forklift to install the unit. This could result in severe damage to equipment, void the warranty, or cause personal injury or death.

⚠ WARNING

Risk of Injury!

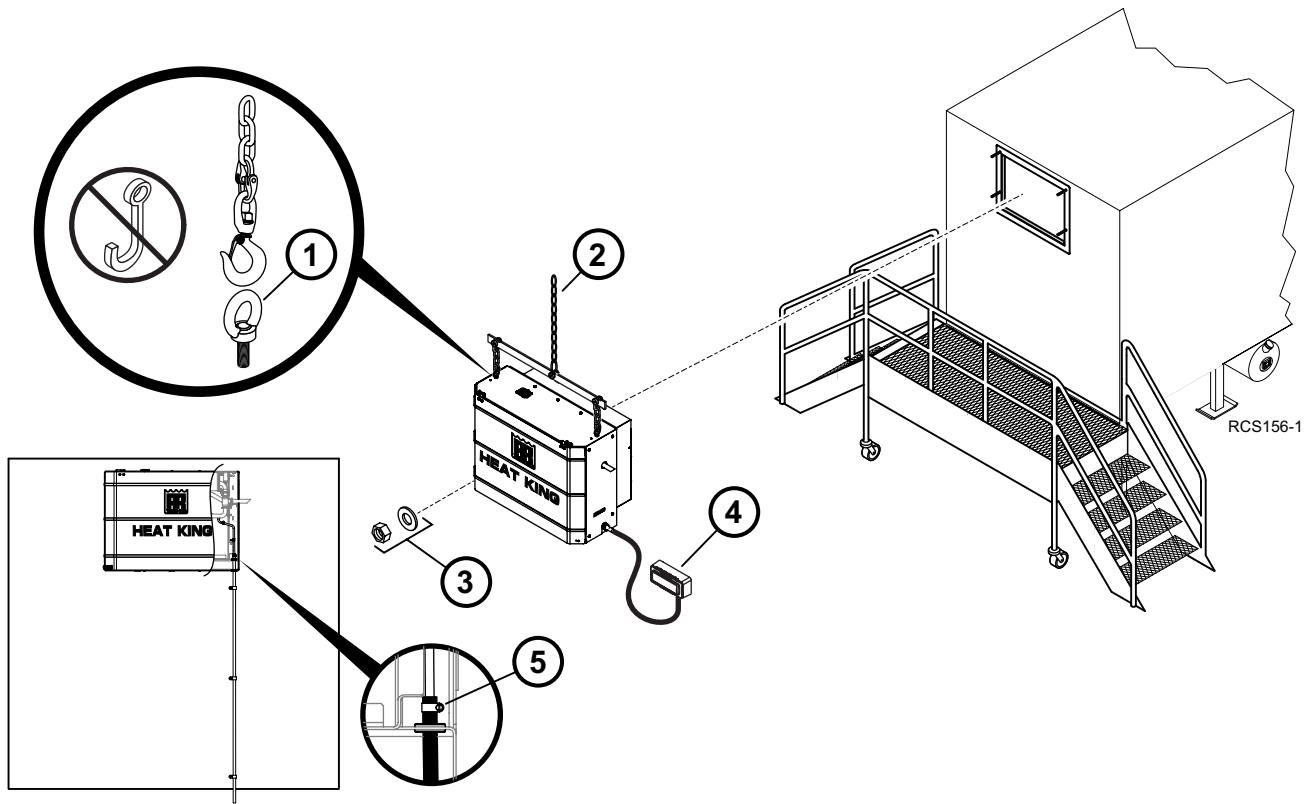
Use only locking hooks to safely lift the unit. Failure to use locking hooks could result in severe damage to the equipment, void the warranty, or cause personal injury or death.

To avoid unnecessary damage to your unit, place the crated unit near the trailer/container prior to its removal. Carefully remove top boards of the crate, the installation kit boxes, and any other loose components from rear of unit.

1. Attach two forged lifting eyebolts (1/2-13 UNC) into the thread holes located on top of unit (Detail I).
 - a. Attach lifting device to eyebolts and slightly raise unit and remove hardware holding unit to crate.
- Note:** For Zero-Cube installations, refer to Zero-Cube installation instructions (TK 56142) available at Thermo King iService or Thermoking.com.
2. Lift the unit and position it in the trailer/container opening.
 - a. With the unit access door open, align the four unit mounting holes with the trailer/container mounting bolts.
3. Attach supplied 1-1/4" washers and locking nuts.
 - a. Torque mounting hardware to 82 N•m (60 ft. lbs.).
4. See "Installing Remote HMI" on page 18.
5. **HK450 MAX UNITS ONLY** – From inside the unit, place the supplied hose clamp over the end of the copper exhaust drain tube and slide it up the tube a few inches.
 - a. From under the unit, insert the drain hose up through the two grommets located in the frame and over the copper exhaust drain tube. Slide the hose clamp down onto the drain hose and tighten clamp securely.
 - b. Route the drain hose straight down past the bottom of the trailer and secure with supplied clamps and screws. Be sure not to pinch the drain hose closed when routing and installing clamps.

Note: When installing an optional exhaust extension kit 701181 or 701182, follow the instructions that are included with the kit.

Figure 6. Standard HK Unit Installation Shown



Installing Remote HMI

Surface Mount Installation

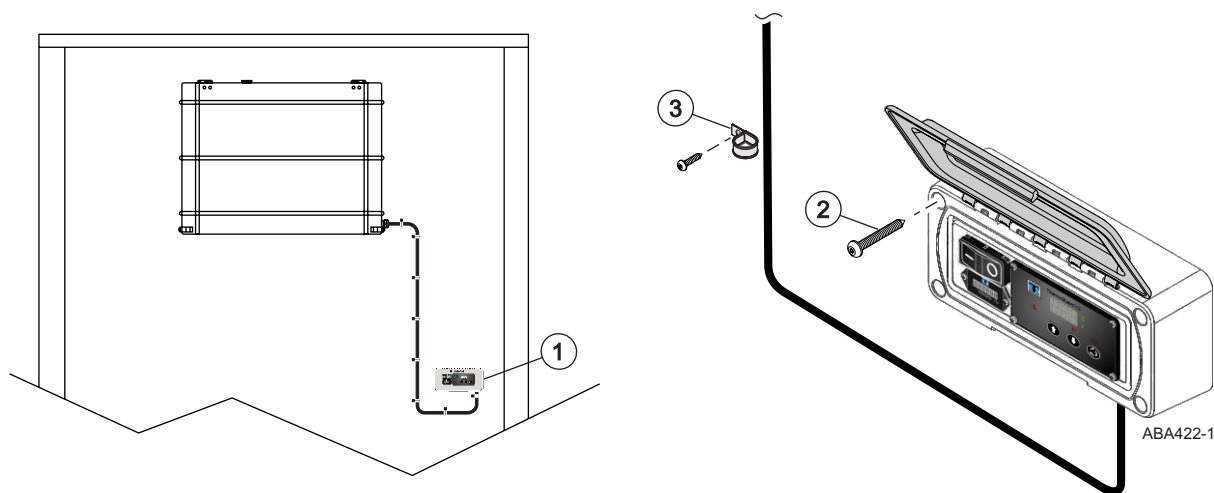
Note: The installation views shown are for reference only. The actual locations chosen for installing the remote HMI may vary per your specific application and should not interfere with the operation of the trailer or container.

1. Position the HMI onto the surface of the front wall while providing a drip loop as shown.
2. Open the front cover to access the four mounting holes.
- a. Secure to the trailer wall with the supplied T-25 Torx head self tapping screws.

Important: Do not overtighten the screws or the plastic enclosure will be damaged.

3. Secure the harness to the trailer wall with the supplied clamps and self tapping screws.

Figure 7. Surface Mount Installation Shown



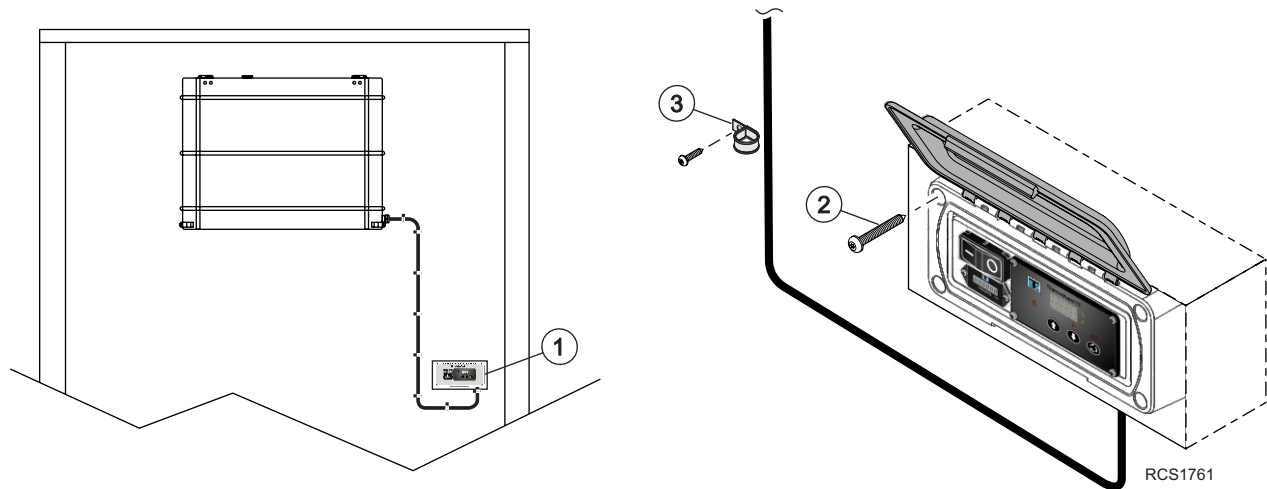
Flush Mount Installation

Note: NOTE: Installer to provide a recessed pocket in the trailer wall to accommodate the remote HMI. This recessed pocket must be deep enough to help protect the HMI from damage and allow for water drainage.

1. Position the HMI into the recessed pocket while providing a drip loop as shown.
2. Open the front cover to access the four mounting holes.
 - a. Secure to the recessed pocket with the supplied T-25 Torx head self tapping screws.
3. Secure the harness to the trailer wall with the supplied clamps and self tapping screws.

Note: Do not overtighten the screws or the plastic enclosure will be damaged.

Figure 8. Flush Mount Installation Shown



Installing Fuel System

Under Chassis Fuel Tank

Installation Best Practices

DANGER

Fire Hazard!

Leaking fuel lines could cause a fire resulting in death or serious injury. All fuel line fittings must be tight and leak free.

DANGER

Fire Hazard!

Do not route fuel lines with battery cables or electrical wires, as this could cause a fire.

- All fuel lines should be routed in a protective housing with no kinks and sharp bends.
- Rubber grommets must be used when routing fuel lines through holes in metal.
- Secure all fuel lines with provided clamps.
- Remove plastic cap from the fuel vent and point the outlet towards the rear of the trailer.

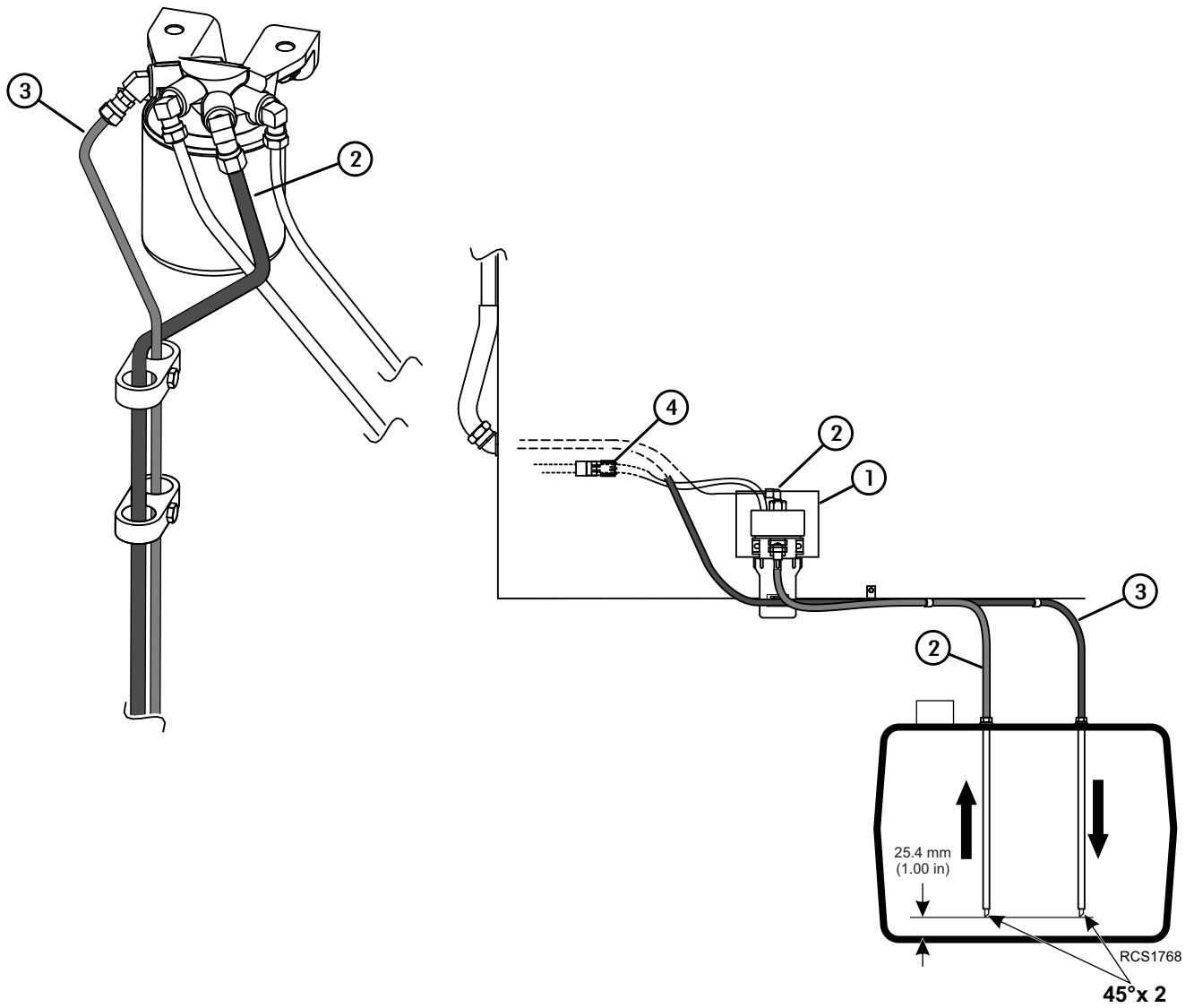
Important: The factory installed fuel tank air vent must be in place and functional for the Thermo King unit's fuel system to operate correctly and for the fuel tank to remain in compliance with Federal Motor Carrier Safety Administration specifications (title 49, paragraph 393.67). A plugged or restricted fuel tank air vent can result in premature damage to the fuel pump and could also cause severe damage to the fuel tank. NEVER remove or install any other component in place of the fuel tank air vent.

Installing Fuel Pump and Fuel Lines

1. Install fuel pump and bracket as low as possible and near fuel tank to provide rapid pump priming.
2. Route a fuel **supply** line from:
 - a. **Inlet** fitting on fuel filter to the **outlet** fitting on top of fuel pump and tighten all fuel lines securely.
 - b. Route another fuel **supply** line from **inlet** fitting on bottom of fuel pump to the **outlet** fitting on fuel tank.
 - c. Cut fuel supply line at 45 degree angle and install sleeve and nut provided in installation kit.
 - d. Insert fuel supply line into fuel tank **outlet** fitting until it bottoms out, then pull line up 25.4 mm (1.00 in.) and tighten nut securely.
3. Route a fuel **return** line from:
 - a. **Return** fitting from the fuel filter to the fuel tank **inlet** fitting.
 - b. Cut fuel line at 45 degree angle and install sleeve and nut provided in installation kit.
 - c. Insert fuel line into fuel tank **inlet** fitting until it bottoms out, then pull line up 25.4 mm (1.00 in.) and tighten nut securely.
4. Route the electrical harness from the unit to the fuel pump and attach to the fuel pump connector. The connector must be installed out of road spray area.

Note: It is important not to allow the unit to run out of fuel during the engine break-in period. Add a sufficient amount of fuel (approximately 20 gallons) to allow the unit to run for 8 to 12 hours during engine break-in and pre-delivery procedures.

Figure 9. Fuel System Components



Optional Nose Mounted 65 Gallon Fuel Tank

Installation Best Practices

⚠ DANGER

Fire Hazard!

Leaking fuel lines could cause a fire resulting in death or serious injury. All fuel line fittings must be tight and leak free.

⚠ DANGER

Fire Hazard!

Do not route fuel lines with battery cables or electrical wires, as this could cause a fire.

- All fuel lines should be routed in a protective housing with no kinks and sharp bends.
- Rubber grommets must be used when routing fuel lines through holes in metal.
- Secure all fuel lines with provided clamps.
- Remove plastic cap from the fuel vent and point the outlet towards the rear of the trailer.

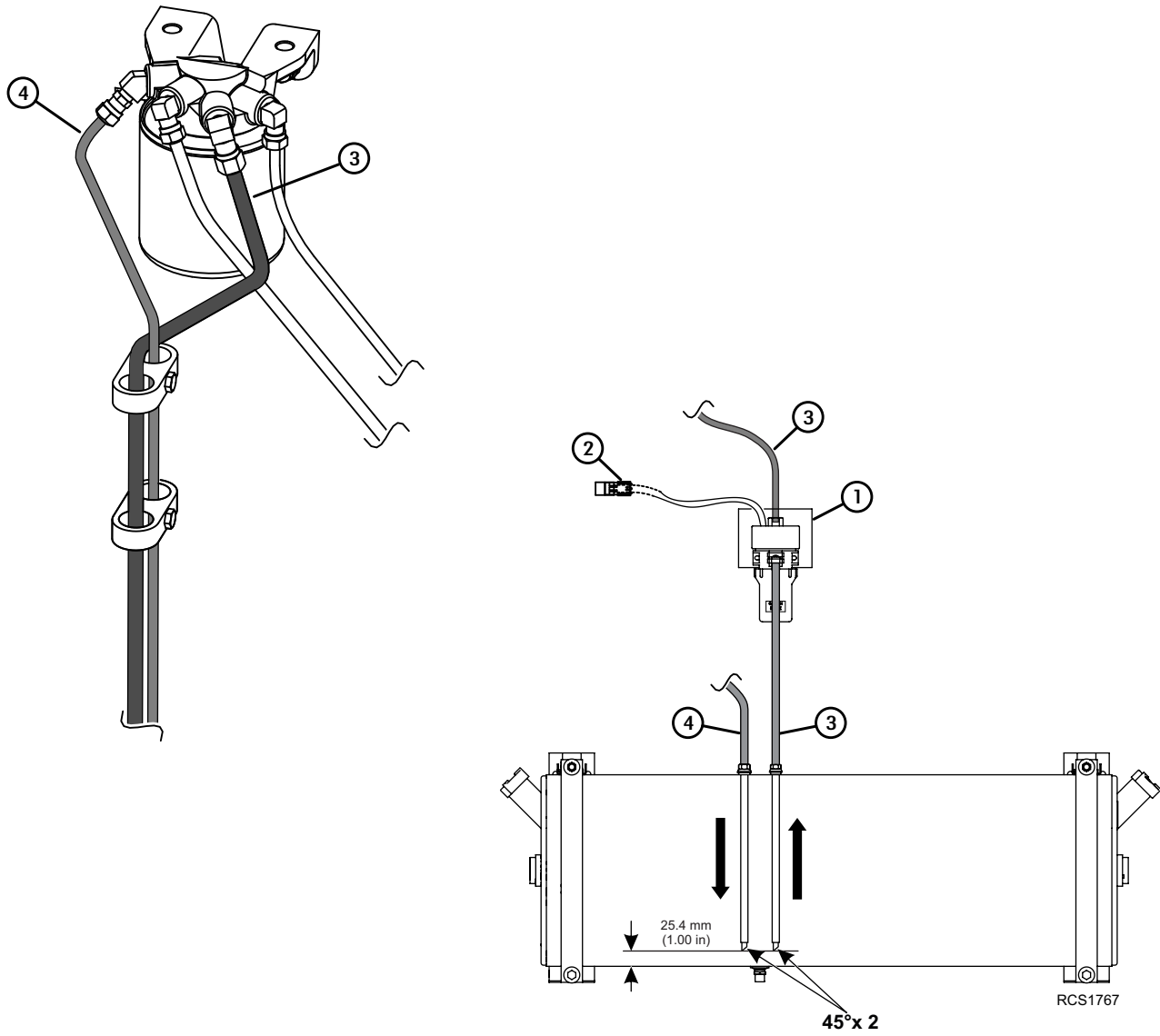
Important: The factory installed fuel tank air vent must be in place and functional for the Thermo King unit's fuel system to operate correctly and for the fuel tank to remain in compliance with Federal Motor Carrier Safety Administration specifications (title 49, paragraph 393.67). A plugged or restricted fuel tank air vent can result in premature damage to the fuel pump and could also cause severe damage to the fuel tank. NEVER remove or install any other component in place of the fuel tank air vent.

Installing Fuel Pump and Fuel Lines

1. The fuel pump is to be mounted inside the unit directly behind the air cleaner with provided hardware.
 - a. Remove the two 1/4-20 screws, flat washers and locking nuts that are provided on the frame directly behind the air cleaner.
 - b. Install the fuel pump using this hardware. Tighten hardware securely.
2. Route and attach the fuel pump harness to the fuel pump.
3. Route a fuel **supply** line from:
 - a. **Inlet** fitting on fuel filter to the **outlet** fitting on top of fuel pump and tighten all fuel lines securely.
 - b. Route another fuel **supply** line from **inlet** fitting on bottom of fuel pump to the **outlet** fitting on fuel tank.
 - c. Cut fuel supply line at 45 degree angle and install sleeve and nut provided in installation kit.
 - d. Insert fuel supply line into fuel tank **outlet** fitting until it bottoms out, then pull line up 25.4 mm (1.00 in.) and tighten nut securely.
4. Route a fuel **return** line from:
 - a. **Return** fitting from the fuel filter to the fuel tank **inlet** fitting.
 - b. Cut fuel line at 45 degree angle and install sleeve and nut provided in installation kit.
 - c. Insert fuel line into fuel tank **inlet** fitting until it bottoms out, then pull line up 25.4 mm (1.00 in.) and tighten nut securely.

Note: It is important not to allow the unit to run out of fuel during the engine break-in period. Add a sufficient amount of fuel (approximately 20 gallons) to allow the unit to run for 8 to 12 hours during engine break-in and pre-delivery procedures.

Figure 10. Fuel System Components



Installing Battery

⚠ WARNING

Personal Protective Equipment (PPE) Required!

A battery can be dangerous. A battery contains a flammable gas that can ignite or explode. A battery stores enough electricity to burn you if it discharges quickly. A battery contains battery acid that can burn you. Always wear goggles or safety glasses and personal protective equipment when working with a battery. If you get battery acid on you, immediately flush it with water and get medical attention.

⚠ WARNING

Hazard of Explosion!

Improperly installed battery cables could result in a fire, explosion, or injury. 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

Fire Hazard!

Do not attach fuel lines to battery cables or electrical harnesses. This has the potential to cause a fire and could cause serious injury or death.

⚠ WARNING

Hazard of Explosion!

An improperly installed battery could result in a fire, explosion, or injury. A Thermo King approved battery must be installed and properly secured to the battery tray.

⚠ CAUTION

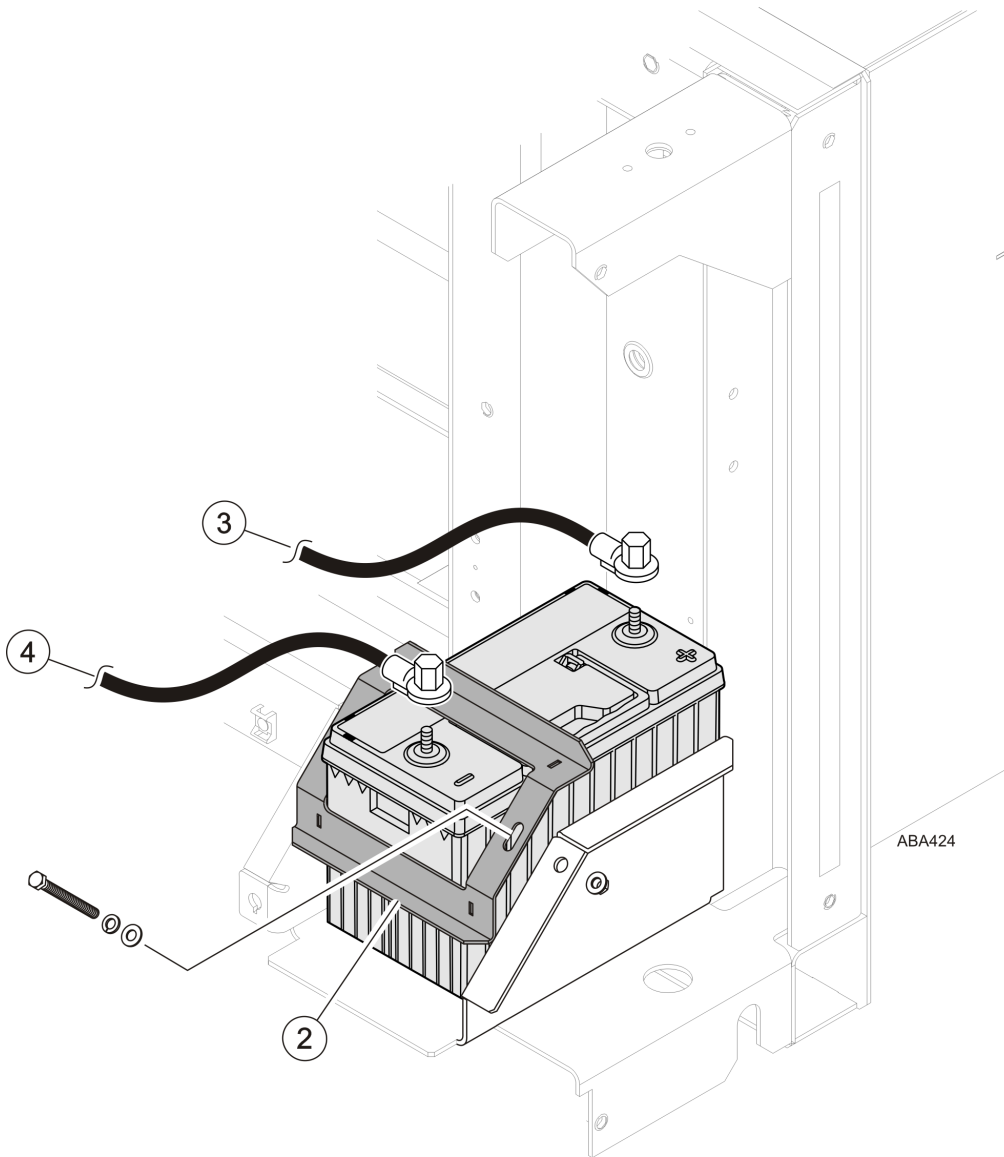
Hazardous Service Procedures!

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.

1. Open unit door to access battery tray.
2. Install battery into tray and secure with hold down bracket, bolts, lock washers and flat washers.
 - a. Hand tighten both bolts and then torque to 6.8 N•m (60 in-lb).

Important: DO NOT over tighten hardware as this may crack or distort the battery!
3. Install **positive (+)** battery cable on the positive battery post first to minimize accidental electrical shorting.
4. Install **negative (-)** battery cable on negative battery post second to minimize accidental electrical shorting.
5. Close and secure unit door.

Figure 11. Battery Installation Shown



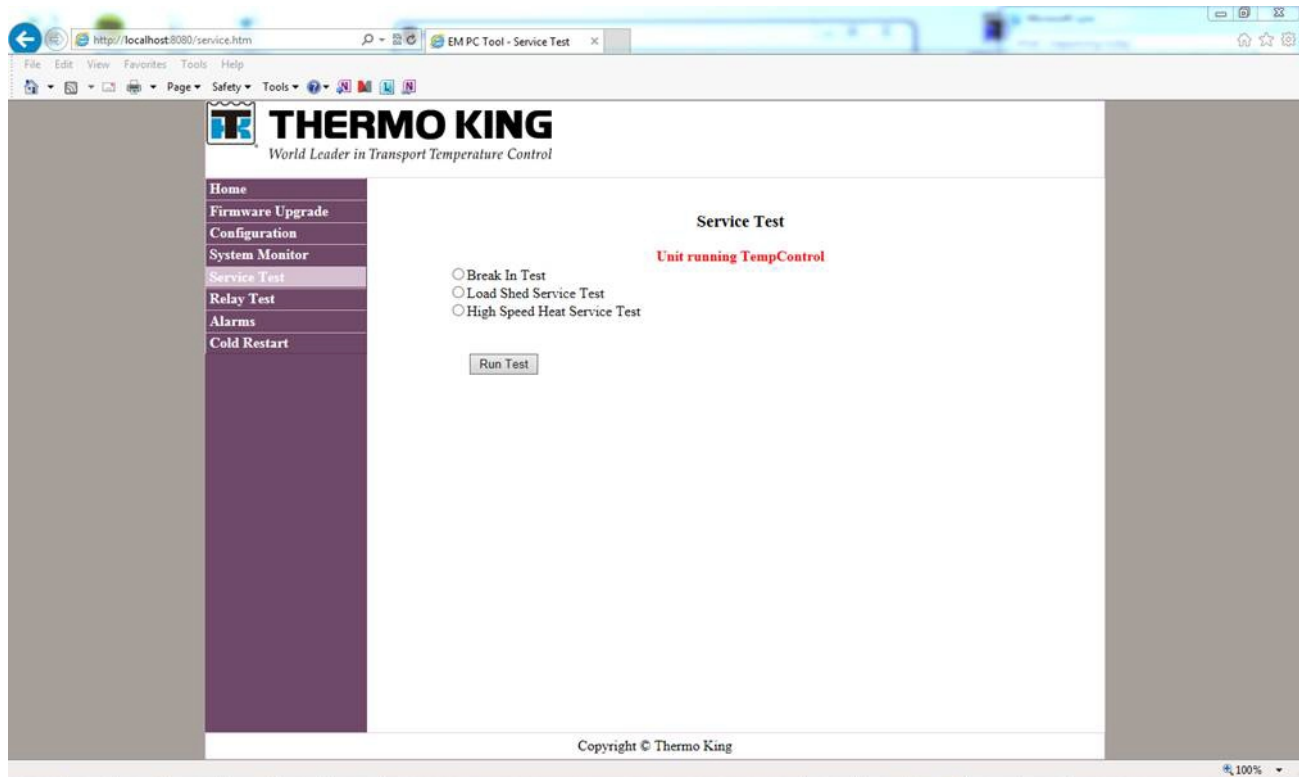
Service Test Procedure

Engine Break-in Test

The following procedure is used to run the unit for 10 hours to break-in the diesel engine.

1. Ensure software revision is **EB04** or higher.
2. Open PC Monitor - In the menu on the left is a page called "Service Test" - this page is new, the only test is the break-in Test.
3. Select - Service Test page.
4. Select - Break-in Test by clicking in the dot in front of it.
5. Select - Run Test by clicking in the radio button.
 - A countdown timer for the 10 hour break-in test will appear and start counting down.
 - The PC may be disconnected and the test will continue until the timer runs out.
 - When the test is completed (timer goes to 0) the unit will go back into temp control mode.
 - The test can be stopped prematurely using PC Monitor. The test can be restarted with PC Monitor, and will run for the remaining amount of time.
 - The test can also be stopped by turning the unit off. Turning the unit off will not affect the hours counter. The counter will stop and restart when the operator goes back in to engine break-in test mode.
 - The software only allows the test to be run once. The test cannot be run with a replacement engine.

Figure 12. Service Test Shown



RCS1766

System Check List

☐	All unit mounting hardware torqued to specifications.	☐	Battery secured correctly and all connections clean and tight.
☐	No air gaps between unit and trailer wall.	☐	Remote HMI mounted securely.
☐	Drain hose properly routed and secured.	☐	Run Pre-Trip Inspection (refer to Operator's Manual).
☐	Fuel tank properly installed.	☐	Run unit under load for eight hours to properly break-in engine
☐	Fuel lines properly routed and fuel fittings tightened securely.	☐	Release to customer
☐	Bulkhead properly designed and installed.	☐	

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