THERMO KING

Operator's Manual

Precedent™
Single Temperature Units
C-600, S-600 and S-700

Revision B

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TK 56218-2-OP-EN

TRANE TECHNOLOGIES

Introduction

This manual is published for informational purposes only and the information furnished herein should not be considered as all-inclusive or meant to cover all contingencies. If more information is required, consult your Thermo King Service Directory for the location and telephone number of the local dealer.

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.

There is nothing complicated about operating and maintaining your Thermo King unit, but a few minutes studying this manual will be time well spent.

Performing pre-trip checks and enroute inspections on a regular basis will minimize operating problems. A regular maintenance program will also help to keep your unit in top operating condition. If factory recommended procedures are followed, you will find that you have purchased the most efficient and dependable temperature control system available.

All service requirements, major and minor, should be handled by a Thermo King dealer for four very important reasons:

- They are equipped with the factory recommended tools to perform all service functions.
- They have factory trained and certified technicians.
- They have genuine Thermo King replacement parts.
- The warranty on your new unit is valid only when the repair and replacement of component parts is performed by an authorized Thermo King dealer.

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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 operation of this unit depend upon the strict observance of these precautions. The four types of advisories are defined as follows:

⚠ DANGER

Hazard!

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

⚠ WARNING

Hazard!

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

⚠ CAUTION

Hazard!

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

NOTICE

Hazard!

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

General Safety Practices

⚠ DANGER

Risk of Injury!

Keep hands and loose clothing clear of fans and belts at all times when the unit is operating with the doors open.

⚠ WARNING

Risk of Injury!

Do not apply heat to a closed cooling system. Before applying heat to a cooling system, drain it. Then flush it with water and drain the water. Antifreeze contains water and ethylene glycol. The ethylene glycol is flammable and can ignite if the antifreeze is heated enough to boil off the water.

⚠ CAUTION

Sharp Edges!

Exposed coil fins can cause lacerations. Service work on the evaporator or condenser coils should only be accomplished by a certified Thermo King technician.

Automatic Start/Stop Operation

⚠ CAUTION

Risk of Injury!

The unit can start and run automatically any time the unit is turned on. Turn the unit On/Off switch Off before doing inspections or working on any part of the unit. Please note that only Qualified and Certified personnel should attempt to service your Thermo King unit.

Electrical Hazard

⚠ DANGER

Hazardous Voltage!

Dangerous three phase AC electric power is present whenever the unit is operating in either Diesel Mode or Electric Mode and whenever the unit is connected to a source of external standby power. Voltages of this magnitude can be lethal. Exercise extreme caution when working on the unit. If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other local, state, or country-specific requirements for arc flash protection PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASHING CLOTHING. ELECTRICAL METERS AND EQUIPMENT MUST BE PROPERLY RATED FOR INTENDED VOLTAGE.

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

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!

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.

Refrigerant

Although fluorocarbon refrigerants are classified as safe, use caution when working with refrigerants or in areas where they are being used.

⚠ DANGER

Hazardous Gases - Personal Protective Equipment (PPE) Required!

Refrigerant in the presence of an open flame, spark, or electrical short produces toxic gases that are severe respiratory irritants which can cause serious injury or possible death. When working with or around hazardous chemicals, ALWAYS refer to appropriate Material Data Safety Sheets (MSDS) and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection, and handling instructions.

⚠ DANGER

Refrigerant Vapor Hazard!

Do not inhale refrigerant. Use caution when working with refrigerant or a refrigeration system in any confined area with a limited air supply. Refrigerant displaces air and can cause oxygen depletion, resulting in suffocation and possible death. When working with or around hazardous chemicals, ALWAYS refer to appropriate Material Data Safety Sheets (MSDS) and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection, and handling instructions.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Refrigerant in a liquid state evaporates rapidly when exposed to the atmosphere, freezing anything it contacts. Wear butyl lined gloves and other clothing and eye wear when handling refrigerant to help prevent frostbite. When working with or around hazardous chemicals, ALWAYS refer to appropriate Material Data Safety Sheets (MSDS) and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection, and handling instructions.

Refrigerant Oil

Observe the following precautions when working with or around refrigerant oil:

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Protect your eyes from contact with refrigerant oil. The oil can cause serious eye injuries. Protect skin and clothing from prolonged or repeated contact with refrigerant oil. To prevent irritation, wash your hands and clothing thoroughly after handling the oil. Rubber gloves are recommended. When working with or around hazardous chemicals, ALWAYS refer to appropriate Material Data Safety Sheets (MSDS) and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection, and handling instructions.

First Aid

REFRIGERANT

- **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 warm water. Do not apply heat. Remove contaminated clothing and shoes. Wrap burns with dry, sterile, bulky dressing to protect from infection. Get prompt medical attention. Wash contaminated clothing before reuse.
- **Inhalation:** Move victim to fresh air and use Cardio Pulmonary Resuscitation (CPR) or mouth-to-mouth resuscitation to restore breathing, if necessary. Stay with victim until emergency personnel arrive.
- **Frost Bite:** In the event of frost bite , the objectives of First Aid are to protect the frozen area from further injury, warm the affected area rapidly, and to maintain respiration.

REFRIGERANT OIL

- **Eyes:** Immediately flush with large amounts of water for at least 15 minutes. Get prompt medical attention.
- **Skin:** Remove contaminated clothing. Wash thoroughly with soap and water. Get medical attention if irritation persists.
- **Inhalation:** Move victim to fresh air and use Cardio Pulmonary Resuscitation (CPR) or mouth-to-mouth resuscitation to restore breathing, if necessary. Stay with victim until emergency personnel arrive.
- **Ingestion:** Do not induce vomiting. Immediately contact local poison control center or physician.

ENGINE COOLANT

- **Eyes:** Immediately flush with large amounts of water for at least 15 minutes. Get prompt medical attention.
- **Skin:** Remove contaminated clothing. Wash thoroughly with soap and water. Get medical attention if irritation persists.
- **Ingestion:** Do not induce vomiting. Immediately contact local poison control center or physician.

BATTERY ACID

- **Eyes:** Immediately flush with large amounts of water for at least 15 minutes. Get prompt medical attention. Wash skin with soap and water.

- **INHALATION:** Provide fresh air. Rinse mouth and nose with water. Seek immediate medical assistance.
- **SKIN CONTACT:** Immediately remove contaminated clothing. Wash skin with large volumes of water, for at least 15 minutes. Wash skin with soap and water. Do not apply fatty compounds. Seek immediate medical assistance.
- **INGESTION:** If the injured person is fully conscious: make the person drink extensive amounts of milk. Do not induce vomiting. Take the injured person immediately to a hospital.

ELECTRICAL SHOCK

Take IMMEDIATE action after a person has received an electrical shock. Get quick medical assistance, if possible.

The source of the shock must be quickly stopped, by either shutting off the power or removing the victim. If the power cannot be shut off, the wire should be cut with an non-conductive tool, such as a wood-handle axe or thickly insulated cable cutters. Rescuers should wear insulated gloves and safety glasses, and avoid looking at wires being cut. The ensuing flash can cause burns and blindness.

If the victim must be removed from a live circuit, pull the victim away with a non-conductive material. Use wood, rope, a belt or coat to pull or push the victim away from the current. DO NOT TOUCH the victim. You will receive a shock from current flowing through the victim's body. After separating the victim from power source, immediately check for signs of a pulse and respiration. If no pulse is present, start Cardio Pulmonary Resuscitation (CPR). If a pulse is present, respiration might be restored by using mouth-to-mouth resuscitation. Call for emergency medical assistance.

ASPHYXIATION

Move victim to fresh air and use Cardio Pulmonary Resuscitation (CPR) or mouth-to-mouth resuscitation to restore breathing, if necessary. Stay with victim until emergency personnel arrive.

Safety Decals and Locations

Condenser and Evaporator Fans

Be aware of the warning nameplates near the condenser fans and evaporator fans.

Figure 1. Fan Warning Nameplate

High Voltage Components

Various components on the Precedent unit operate using 220/3/60 or 460/3/60 high voltage and are identified by warning nameplates. All high voltage wiring is identified by ORANGE conduit. Be aware of the locations of these components. Only certified, trained technicians can service them.

Figure 2. High Voltage Nameplates

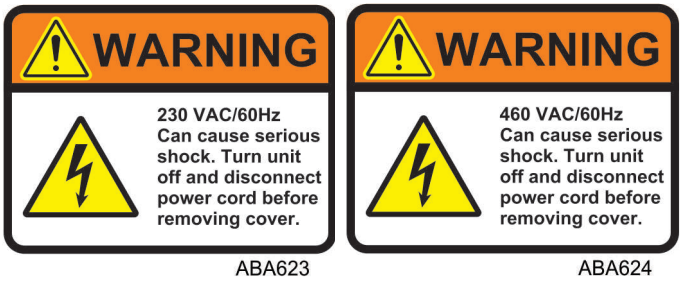
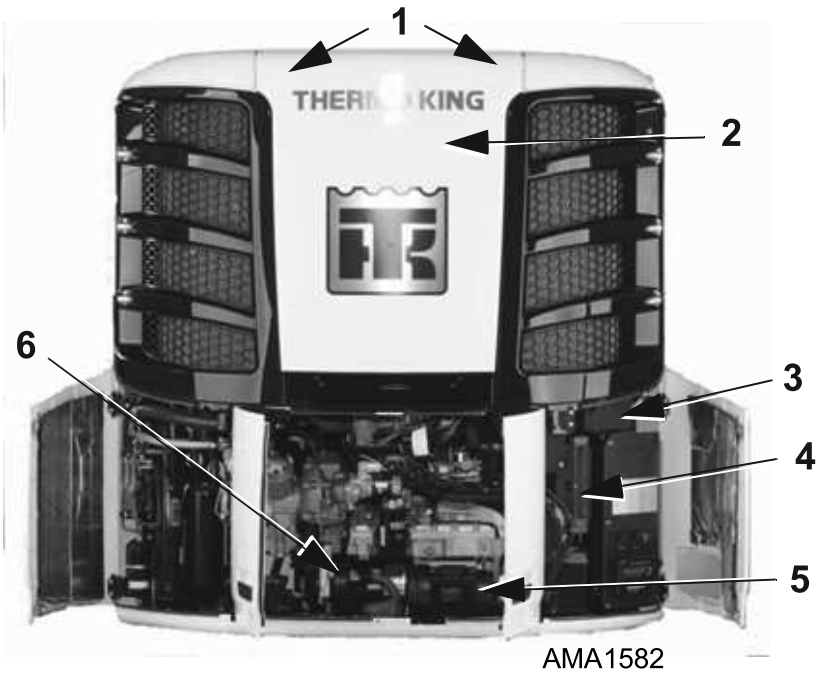
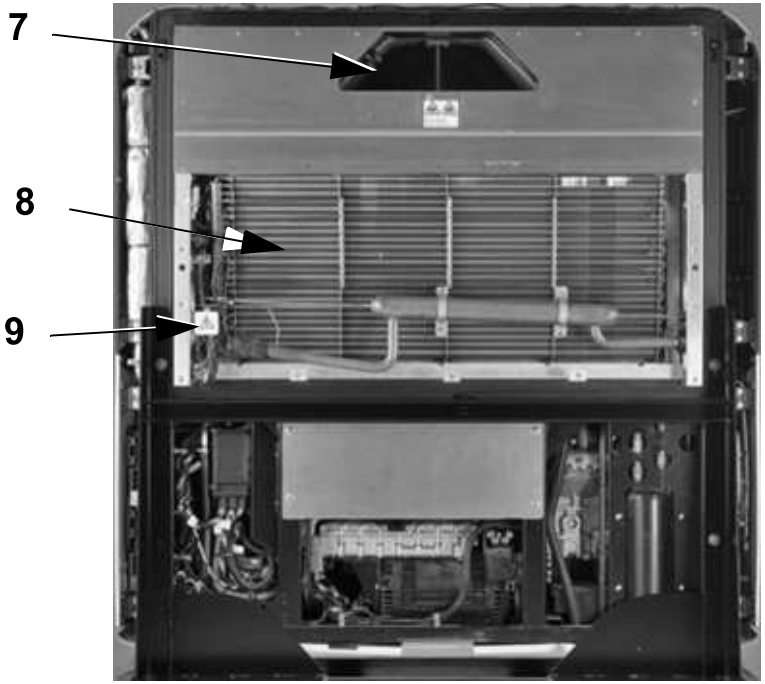


Figure 3. High Voltage Component Locations (Front)



1.	Condenser Motors	4.	High Voltage Control Box
2.	Evaporator Motor	5.	AC Generator
3.	High Voltage Distribution Box	6.	Electric Standby Motor and Power Receptacle (SmartPower Option)

Figure 4. High Voltage Component Locations (Rear)



AMA1583-1

7.	Evaporator Motor	9.	High Voltage Junction Box
8.	High Voltage Heater Strips	All ORANGE conduit contains High Voltage	

Figure 5. Ether Starting Aids Warning Nameplate (located near engine)

AMA1584

California Proposition 65 Warning Nameplate

Figure 6. P65 Warning Nameplate

RCS1032

Unit Description

Unit Overview

The Thermo King Precedent units are one piece, self-contained, diesel powered, air cooling/heating units operating under the control of the SMART REEFER™ 4 (SR-4) programmable microprocessor controller. The unit mounts on the front of the trailer with the evaporator extending through an opening in the front wall.

The units feature all-new DDE (Diesel Direct Electric) architecture, the quiet running Thermo King engine, and the Thermo King X430L/X430P reciprocating compressor.

Precedent units are available in the following models:

Standard: Cooling and heating on diesel engine operation.

SmartPower™ Option: Cooling and heating on diesel engine operations and electric standby operation.

See the following features.

Figure 7. Front View

Diesel Engine

The four cylinder engine is a water cooled, direct injection diesel engine. The engine is coupled directly to the compressor on standard units. A centrifugal clutch transfers power from the engine to the compressor on Smart Power units. Belts transmit power to the AC generator, water pump, and alternator.

Refer to the Specifications section for additional engine information.

Extended Life Coolant (ELC)

ELC (Extended Life Coolant) is standard equipment. The maintenance interval for ELC is five years or 12,000 hours. A nameplate on the coolant expansion tank identifies units with ELC. The new engine coolant, Chevron Extended Life Coolant, is RED in color instead of the previous GREEN or BLUE-GREEN colored conventional coolants.

NOTICE

System Contamination!

Do not add "GREEN" or "BLUE-GREEN" conventional coolant to cooling systems using "RED" Extended Life Coolant, except in an emergency. If conventional coolant is added to Extended Life Coolant, the coolant must be changed after 2 years instead of 5 years.

Note: *The use of 50/50 percent pre-mixed Extended Life Coolant (ELC) is recommended to assure that de-ionized water is being used. If 100 percent full strength concentrate is used, de-ionized or distilled water is recommended over tap water to insure the integrity of the cooling system is maintained.*

EMI 3000

EMI 3000 is an extended maintenance interval package. The EMI 3000 package consists of the following key components:

- EMI 3000-Hour Cyclonic Air Cleaner Assembly and Air Cleaner Element
- EMI 3000-Hour 5-Micron Fuel Filter
- EMI 3000-Hour Dual Element Oil Filter (blue with white lettering)
- API Rating CJ-4 or CK-4 Oil
- Five Year or 12,000 Hour Extended Life Coolant (ELC)

The EMI package allows standard maintenance intervals to be extended to 3,000 hours, or 2 years, whichever occurs first.

Note: *Units equipped with the EMI 3000 package do require regular inspection in accordance with Thermo King's maintenance recommendations.*

Thermo King X430 Series Reciprocating Compressor

The unit is equipped with a Thermo King X430 Series four cylinder reciprocating compressor with 30.0 cu. in. (492 cm^3) displacement.

Electronic Throttling Valve

The ETV provides enhanced control of the refrigeration system as follows:

- Allows the refrigeration system to fully utilize the power capabilities of the engine under varying conditions
- Provides an additional measure of protection against high discharge pressures
- Protects the engine from high coolant temperature shutdowns
- Provides a means of precise temperature control.

SMART REEFER 4 (SR-4) Control System

⚠ CAUTION

Risk of Injury!

Do not operate the SR-4 Controller until you are completely familiar with its function.

The SR-4 is a microprocessor control system designed for a transport refrigeration system. The SR-4 integrates the following functions:

- Changing setpoint and operating mode
- Viewing gauge, sensor, and hourmeter readings
- Initiating Defrost cycles
- Viewing and clearing alarms

The microprocessor components are located inside the control box, which is located inside the lower roadside service door. The microprocessor is connected to a Human Machine Interface (HMI) Control Panel. It is used to operate the unit. The HMI control panel is mounted on the face of the control

box. It is clearly visible through an opening in the lower roadside service door.

See Operating Instructions for more information about the SR-4 Controller.

Depending on the air temperature in the trailer, as sensed by the microprocessor Base Controller, the unit will typically operate in one of the following modes:

Diesel Operation

In diesel operation, the microprocessor will select the operating mode from the following:

- High Speed Cool
- Low Speed Cool
- Low Speed Modulated Cool
- Null (CYCLE-SENTRY operation only)
- Low Speed Modulated Heat
- Low Speed Heat
- High Speed Heat
- Defrost

Electric Operation

In electric operation, the microprocessor will select the operating mode from the following:

- Cool
- Modulated Cool
- Null (CYCLE-SENTRY operation only)
- Modulated Heat (Hot Gas only)
- Hot Gas Heat
- Full Heat (Hot Gas and Electric Heat)
- Defrost (Hot Gas and Electric Heat)

Defrost

Frost gradually builds-up on evaporator coils as a result of normal operation. The unit uses hot refrigerant to defrost the evaporator coils. Hot refrigerant gas passes through the evaporator coil and melts the frost. The water flows

through collection drain tubes onto the ground. The methods of Defrost initiation are Automatic and Manual.

Automatic Defrost: The SR-4 automatically initiates timed or demand defrost cycles. The SR-4 microprocessor can be programmed to initiate timed defrost cycles at intervals of 2, 4, 6, 8, or 12 hours. Demand defrost cycles occur if the differences between the return air temperature, discharge air temperature, and coil temperature exceed certain limits. The unit can enter defrost cycles as often as every 30 minutes if required.

Manual Defrost: In Manual Defrost Mode, the operator initiates a defrost cycle. See "Initiating a Manual Defrost Cycle".

Note: *The unit will not perform a Manual Defrost cycle unless the unit has been turned on with the ON key, the unit is running in Continuous or CYCLE-SENTRY mode (or shut down in CYCLE-SENTRY Null mode), and the coil temperature is below 45 F (7 C).*

CYCLE-SENTRY™ Start-Stop Controls

The CYCLE-SENTRY Start-Stop fuel saving system provides optimum operating economy.

⚠ WARNING

Risk of Injury!

The unit can start at any time without warning. Press the OFF key on the HMI control panel, place the unit On/Off switch in the Off position, and disconnect the battery before inspecting or servicing any part of the unit.

When CYCLE-SENTRY Mode is selected, the unit will start and stop automatically to maintain setpoint, keep the engine warm, and the battery charged. When Continuous Mode is selected, the unit starts automatically and runs continuously to maintain setpoint and provide constant airflow.

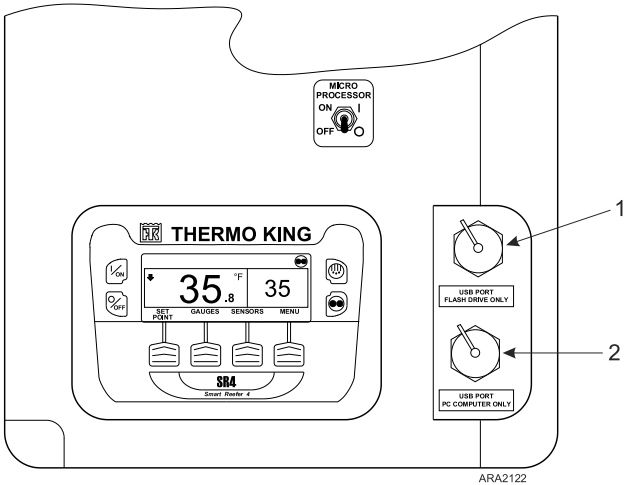
Features of the CYCLE-SENTRY system are:

- Offers either CYCLE-SENTRY or Continuous Run operation.
- Controller regulated all season temperature control.
- Maintains minimum engine temperature in low ambient conditions.
- Battery Sentry keeps batteries fully charged during unit operation.
- Variable preheat time.
- Preheat indicator buzzer.

Data Logging

There are two separate data loggers. The data is downloaded through the Flash Drive Only USB port on the front of the control box using a flash drive and ThermoServ™ software.

Figure 8. HMI Controller and USB Ports



1.	PC Only USB Port (Removed from later units)
2.	Flash Drive Only USB Port

Flash Drive Only USB Port: Standard USB drives that have been programmed with ThermoServ can be used in the Flash Drive Only USB Port. Use of a USB drive eliminates the need for an on-site computer and does not require cables.

PC Only USB Port: The PC Only USB Port is used to connect the controller to a PC with a standard USB cable. On later units, this port was removed from the front of the control panel.

ServiceWatch™: ServiceWatch is standard equipment. It records operating events, alarm codes, and compartment temperatures as they occur and at preset intervals. This information is typically used to analyze unit performance. Use a USB port to download the ServiceWatch data.

CargoWatch™: CargoWatch data logging requires the installation of optional sensors. Up to six temperature sensor/probes and four door

switches can be installed. CargoWatch also logs the setpoint. Use a USB Port to download the CargoWatch data. If optional temperature sensors are installed, the readings are displayed as Datalogger Sensor (1-6) Temperature in the sensor readings. See “Using the Sensors Key” in the Operating Instructions Chapter.

OptiSet Plus™

OptiSet Plus is a group of programmable functions that control how the unit will operate with specific setpoints or named products. This assures that when a particular setpoint or named product is selected, the unit will always operate the same way. This allows an entire fleet to be configured to match customers’ needs. Contact your Thermo King dealer for information about programming OptiSet Plus.

FreshSet™

FreshSet is included in OptiSet Plus. FreshSet is a demand base temperature control for fresh products. FreshSet modifies and adjusts unit airflow operation to control temperature and to maximize protection of cargo, while keeping operating costs to a minimum. Contact your Thermo King dealer for information about programming FreshSet.

Defrost

Frost gradually builds-up on evaporator coils as a result of normal operation. The unit uses hot refrigerant to defrost the evaporator coil. Hot refrigerant gas passes through the evaporator coil and melts the frost. The water flows through collection drain tubes onto the ground. The methods of defrost initiation are Automatic and Manual.

Automatic Defrost: The SR-4 automatically initiates timed or demand defrost cycles. The SR-4 microprocessor can be programmed to initiate timed defrost cycles at intervals of 2, 4, 6, 8, or 12 hours. Demand defrost cycles occur if the differences between the return air temperature, discharge air temperature, and coil temperature exceed certain limits. The unit can enter defrost cycles as often as every 30 minutes if required.

Opening the Front Doors

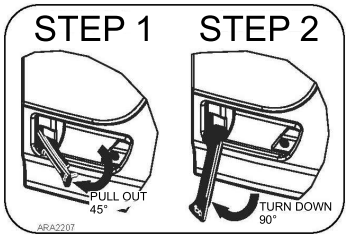
To open the doors and access the engine compartment, pull the right door latch handle out at a 45 degree angle and turn it down (clockwise) 90 degrees

(Figure 9, p. 28). To close the door, push the door closed while holding the door latch handle open and then turn it up (counterclockwise) 90 degrees.

Figure 9. Door Latch Location

1.	Door Latch

Figure 10. Door Latch Nameplate



Engine Compartment Components

The following maintenance items can be checked visually.

⚠ WARNING

Risk of Injury!

The unit can start at any time without warning. Press the OFF key on the HMI control panel, place the unit On/Off switch in the Off position, and disconnect the battery before inspecting or servicing any part of the unit.

⚠ CAUTION

Service Procedures!

Turn the unit off before attempting to check the engine oil.

Engine Oil Dipstick: Use the engine oil dipstick to check the engine oil level.

Unit Protection Devices

Coolant Level Switch: The coolant level switch closes if the coolant level drops below an acceptable level. If it stays closed for a specified time, the microprocessor records Alarm Code 37.

Engine Coolant Temperature Sensor: The microprocessor uses the engine coolant temperature sensor to monitor the engine coolant temperature. If the engine coolant temperature rises above an acceptable level, the microprocessor records Alarm Code 41 and possibly 18. The microprocessor might also shut the unit down.

Fuses: Various fuses protect circuits and components.

Fuse	Size	Function
F1	5A	2A Power for REB
F2	15A	On/Off Switch Circuit
F3	40A	Fuel Solenoid/Starter Circuit
F4	None 2A	No Fuse - All Bosch and Thermo King Alternators 2A Fuse - All Prestolite Alternators
F5	60A	Preheat Circuit (See Note)
F6	15A	High Speed Solenoid Circuit
F7	2A	8X Power for CAN bus

F8	5A	2A Power for CAN bus J12
F10	15A	On/Off Relay Circuit
F12	5A	2A Power for CAN bus J13
F13	2A	Status Light Circuit
F15	2A	SR-4 Power Supply Circuit
F20	2A	Alternator Sense Circuit
F22	10A	Fresh Air Door Circuit
F25	7.5A	High Pressure Cutout Circuit

Note: *The F5 preheat fuse is a "slow blow" type fuse. It is designed for use with the Yanmar trailer engine air pre-heater. Always replace the fuse with the TK specified fuse.*

Smart FETs: Smart FETs in the base controller protect circuits and components.

High Pressure Cutout Switch: The high pressure cutout switch is located on the compressor discharge manifold. If the compressor discharge pressure becomes excessive, the switch opens the circuit to the run relay to stop the unit. The microprocessor will record Alarm Code 10.

High Pressure Relief Valve: This valve is designed to relieve excessive pressure in the refrigeration system. It is located on the receiver tank. If the high pressure relief valve opens, much of the refrigerant will be lost. Take the unit to a Thermo King dealer if this occurs.

Low Oil Level Switch: The low oil level switch closes if the oil drops below an acceptable level. If it stays closed for a specified time, the microprocessor shuts the unit down and records Alarm Code 66.

Low Oil Pressure Switch: The low oil pressure switch closes if the oil pressure drops below an acceptable level. If it stays closed for a specified time, the microprocessor shuts the unit down and records Alarm Code 19.

Preheat Buzzer: The preheat buzzer sounds when the controller energizes the preheat relay. This warns anyone near the unit that the controller is about to start the engine.

Overload Relay-Automatic Reset (SmartPower Units): An overload relay protects the standby electric motor. The overload relay opens the circuit to the electric motor if the motor overloads for any reason (e.g., low line voltage or improper power supply) while the unit is on electric standby operation. The microprocessor will record Alarm Code 90.

Manual Pretrip Inspection and Loading Procedures

The following Manual Pretrip Inspection should be completed before starting the unit and loading the trailer. While the pretrip inspection is not a substitute for regularly scheduled maintenance inspections, it is an important part of the preventive maintenance program designed to head off operating problems and breakdowns before they happen.

Fuel: The diesel fuel supply must be adequate to guarantee engine operation to the next check point.

Engine Oil: The engine oil level should be at the FULL mark with the dipstick turned (threaded) into oil pan. Never overfill.

⚠ CAUTION

Hazardous Pressures!

Do not remove expansion tank cap while coolant is hot.

NOTICE

System Contamination!

Do not add "GREEN" or "BLUE-GREEN" conventional coolant to cooling systems using "RED" Extended Life Coolant, except in an emergency. If conventional coolant is added to Extended Life Coolant, the coolant must be changed after 2 years instead of 5 years.

Coolant: The engine coolant must have antifreeze protection to -30 F (-34 C). Alarm Code 37 indicates low coolant. Add coolant in the expansion tank.

Battery: The terminals must be clean and tight.

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

Electrical: The electrical connections should be securely fastened. The wires and terminals should be free of corrosion, cracks, or moisture.

Structural: Visually inspect the unit for leaks, loose or broken parts, and other damage. The condenser and evaporator coils should be clean and free of debris. Check the defrost drain hoses and fittings to make sure they are open. Verify all the doors are latched securely.

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

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

Cargo Doors: Verify the cargo doors and weather seals are in good condition. The doors should latch securely and the weather seals should fit tightly.

Defrost Drains: Check the defrost drain hoses to make sure they are open.

Operating Instructions

SMART REEFER 4 (SR-4) Control System

Thermo King has applied the latest advances in computer technology to develop a device that controls temperature and unit function, and displays operating information quickly and accurately.

There is nothing complicated about learning to operate the SR-4 Controller, but you will find that a few minutes studying the contents of this manual will be time well spent.

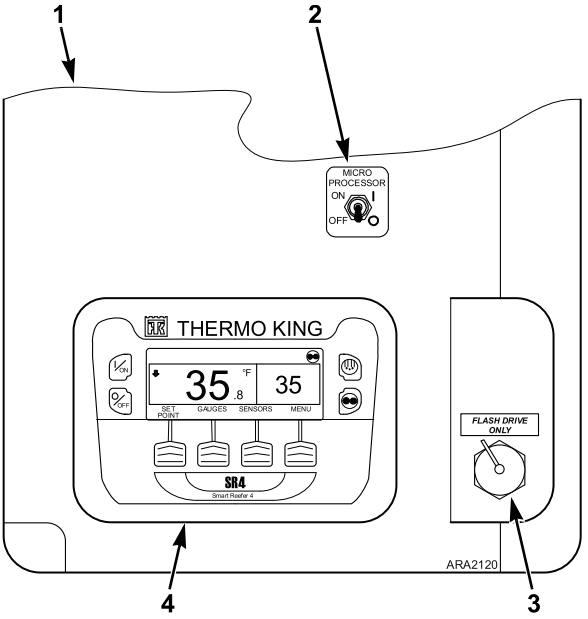
⚠ CAUTION

Risk of Injury!

Do not operate the SR-4 Controller until you are completely familiar with its function.

The microprocessor components are located inside the control box, which is located inside the lower roadside service door. The microprocessor is connected to a Human Machine Interface (HMI) Control Panel. It is used to operate the unit. The USB port is used to retrieve data from the data logging system.

Figure 11. Control Box With Service Door Open



1.	Control Box	3.	Flash Drive Only USB Port
2.	Microprocessor On/ Off Switch	4.	HMI Control Panel

Microprocessor On/Off Switch

This switch supplies or removes electrical power to the microprocessor. It is located above the HMI Control Panel. It is hidden when the lower roadside body panel surrounding the Control Box is closed.

SR-4 HMI Control Panel

⚠ WARNING

Risk of Injury!

The unit can start at any time without warning. Press the OFF key on the HMI control panel, place the unit On/Off switch in the Off position, and disconnect the battery before inspecting or servicing any part of the unit.

Use the HMI control panel to operate the unit. for more information.

The HMI control panel has a display and eight touch sensitive keys. The display is capable of showing both text and graphics. The four keys on the left and right sides of the display are “hard” (dedicated) keys. The four keys under the display are “soft” keys. The function of soft keys change depending on the operation being performed. If a soft key is active, its function will be shown in the display directly above the key.

Control Panel Display

The display is used to supply unit information to the operator. This information includes setpoint, current box temperature, operating information, unit gauge readings, system temperatures, and other information as selected by the operator.

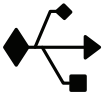
The default display is called the Standard Display (). It is described in detail later in this section.

Display Icons

Display symbols or icons are used to present additional unit information.

Down-Pointing Arrow: (At the left side of the display) Shows the unit is cooling. If the arrow were pointing upward the unit would be heating.

CYCLE SENTRY/Continuous Mode Key: The unit is running in Cycle Sentry Mode as shown by the Cycle Sentry Icon in the upper right corner of the display. If the Cycle Sentry icon is not present, the unit is running in Continuous Mode.



USB: The USB Icon in the upper left corner of the display will appear when a USB device is connected to any of the USB Ports on the Unit Control Panel or inside the unit control box.

Hard Keys

The keys on either side of the display are dedicated or hard keys. Their function always remains the same.

On Key: Used to turn the unit on. First the display will briefly show the Thermo King Logo and then the statement "Configuring System - Please Wait". When the power-up sequence is complete the display shows the Standard Display of box temperature and setpoint.

Off Key: Used to turn the unit off. First, the display will briefly show "System is Powering Down - Please Wait. Press On to Resume" and then "Off" will appear momentarily. When the power-down sequence is complete the display will be blank.

Defrost Key: Press this key to initiate a Manual Defrost cycle.

CYCLE SENTRY: Used to select Cycle Sentry Mode or Continuous Mode operation if allowed by OptiSet Plus. For more information, refer to ("Selecting Cycle Sentry or Continuous Mode," p. 60).

Soft Keys

The four soft keys under the display are multi-purpose keys. Their function changes depending on the operation being performed. If a soft key is active the key function is shown in the display directly above the key. The keys are numbered from left to right, with Key 1 on the far left and Key 4 on the far right.

Typical soft key applications:

- MENU
- NEXT
- + OR —
- SELECT
- CLEAR
- HOURMETERS
- GAUGES
- BACK
- NO
- SENSORS
- EXIT
- HELP

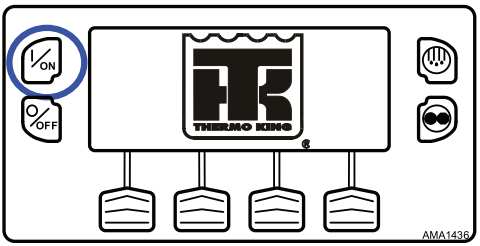
Turning Unit On

The unit is turned on by pressing the ON Key (Figure 12, p. 37) and off by pressing the OFF Key. When the On Key is pressed the display briefly shows the THERMO KING Logo as the display initializes.

Important: *The ON Key must be held down until the Thermo King Logo appears. If the ON Key is not held down long enough (approximately ½ second), the display may flicker but the unit will not start up. If this occurs, hold the ON Key down until the Thermo King logo appears.*

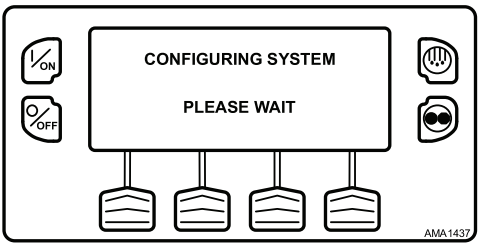
Note: *With extremely cold ambient temperatures, it may take up to 15 seconds for the display to appear on initial startup.*

Figure 12. ON Key



The startup screen (Figure 13, p. 37) appears while communications are established and the unit prepares for operation.

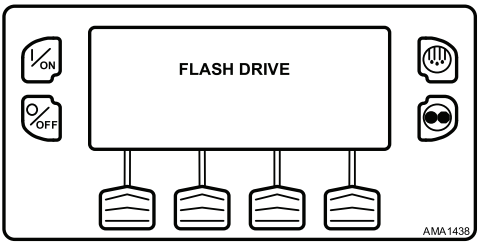
Figure 13. Startup Screen



If a Flash Drive is Connected

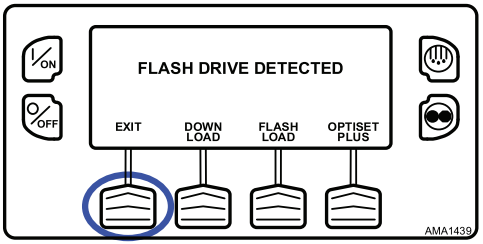
If a properly configured USB Flash Drive is inserted in the Flash Drive Only USB Port on the Control Panel when the unit is turned on, the display (Figure 14, p. 38) will briefly show FLASH DRIVE.

Figure 14. Flash Drive



The FLASH DRIVE DETECTED and the Flash Drive Menu will appear on the display (Figure 15, p. 38). The display will be shown for about 30 seconds and then the Standard Display will appear. To go to the Standard Display, immediately press the EXIT Soft Key.

Figure 15. Flash Drive Menu



Important: *The engine start is not delayed by the Flash Drive Menu shown above. The engine start prompt will appear and the engine will start. After the engine is started the display will return to the Flash Drive Menu or the Standard Display.*

If a properly configured USB Flash Drive is connected to the USB Flash Drive connector, this feature allows the operator to select the desired Flash Drive function. If enabled when the Flash Drive was configured, the following functions may be available:

- DOWNLOAD
  - Download the ServiceWatch Data Logger
  - Download the CargoWatch Data Logger
- FLASHLOAD
  - Flash load Base Controller Software
  - Flash load HMI Control Panel Software

- OPTISET PLUS
  - SEND
    - Send OptiSet Plus files
  - RETRIEVE
    - Retrieve OptiSet Plus files

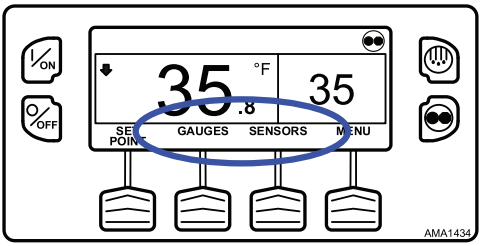
The Flash Drive is also available from the Main Menu.

The Flash Drive Menu will time out about 30 seconds after the engine starts. When the Flash Drive Menu times out, the Standard Display will appear. To go to the Standard Display, immediately press the EXIT Key.

Configurable Soft Keys

When the Standard Display is shown, the default functions of the two center soft keys are GAUGES and SENSORS (Figure 16, p. 39).

Figure 16. Soft Keys



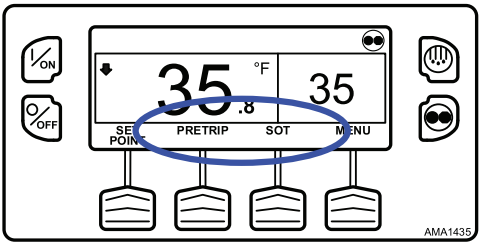
The functions of these two keys can be changed as required for customer convenience. The functions of these two soft keys on the Standard Display can be re-assigned to any of the following functions using the Guarded Access > Main Menu Configuration menu:

- Gauges
- Pretrip
- SOT (start of trip)
- Sensors
- Data Logger
- Hourmeters

The GAUGES and SENSORS functions are always available from the Maintenance Menu.

In the example shown (Figure 17, p. 40), the soft key functions from the Standard Display have been changed to PRETRIP and SOT (Start of Trip marker). The GAUGES and SENSORS functions are always available from the Maintenance Menu.

Figure 17. PRETRIP and SOT



Display Heater

The HMI Control Panel is equipped with a display heater. This heater is needed to make the display visible in very cold ambient temperatures.

The HMI has its own internal temperature sensor for the display heater. The heater is energized when the unit is turned on and the ambient temperature is below 29.4°F (-2°C). The heater turns off when the temperature sensed by the internal sensor rises above 37.4°F (3°C). The heater draws from 1.4 to 1.7 amps when energized.

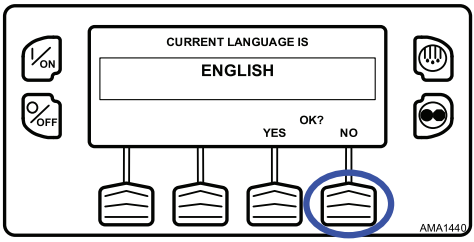
The colder the ambient temperature, the longer it will take for the heater to make the display visible on a cold startup. It may take 10-15 seconds for the display to appear with extremely cold temperatures.

If a Language is Enabled

If more than one language has been enabled from the Guarded Access Language Menu, a prompt will appear to allow the desired language to be chosen as shown below. Only languages specifically enabled from the Guarded Access Menu are available. If a different language is desired, press the NO Key (Figure 18, p. 41).

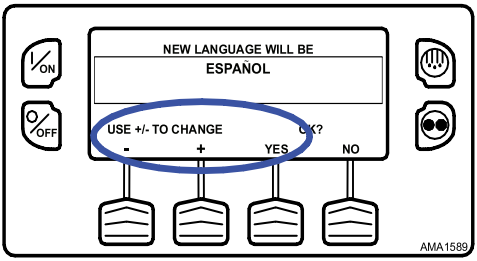
Important: *The engine start is not delayed by the language prompt shown below. The prompt will appear for 10 seconds and then the engine will start. After the engine is started the display will return to the prompt shown.*

Figure 18. NO Key



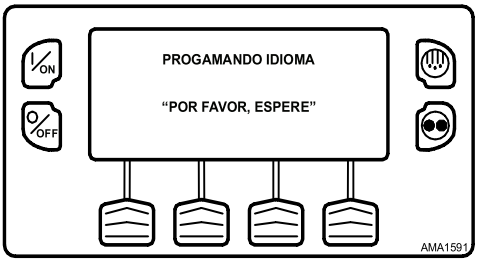
The Language Menu will appear as shown (Figure 19, p. 41). Press the + or - Keys to select the desired language. When the desired language is shown, press the YES Key to confirm the choice.

Figure 19. + or -, then YES Key



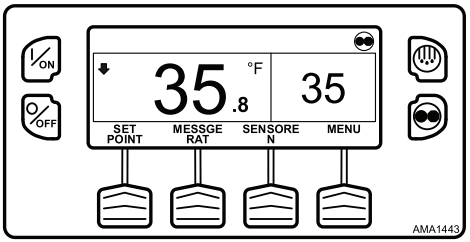
The display will briefly show PROGRAMMING LANGUAGE - PLEASE WAIT in the new language as shown (Figure 20, p. 41).

Figure 20. New Language



The new language is confirmed, and the Standard Display will appear in the new language as shown (Figure 21, p. 42). The unit is ready to run.

Figure 21. Standard Display, New Language

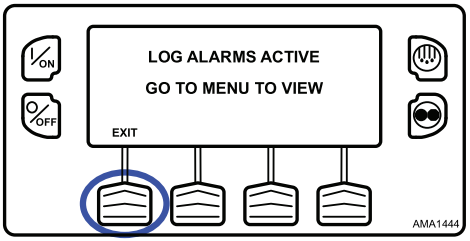


If Log Alarms are Present

Log Alarms are indicated for 30 seconds each time the unit is turned on. This level of alarm serves as a notice to take corrective action before a problem becomes severe. Maintenance items such as maintenance hourmeter time-outs are log alarms. The TemperatureWatch screen is not disabled if only log alarm(s) are active.

If log alarm(s) are present, the Log Alarm notice shown (Figure 22, p. 42) will appear on the display for 30 seconds. The remote indicator alarm light (if installed) will also be on during this period. After 30 seconds the Standard Display will appear and the remote indicator alarm light will go off. Pressing the EXIT soft key (Figure 22, p. 42) will return to the Standard Display immediately.

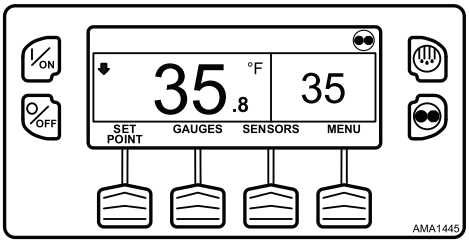
Figure 22. Log Alarms Active



Note: *The Alarm Icon does not appear on startup with log alarms present.*

When the unit is ready to run, the Standard Display appears (Figure 23, p. 43).

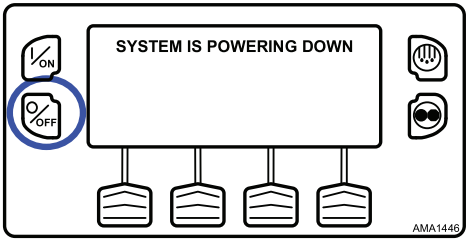
Figure 23. Standard Display



Turning The Unit Off

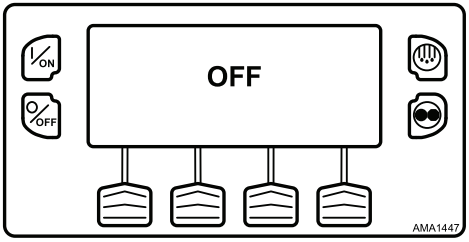
Pressing the OFF Key stops unit operation. The unit shuts down immediately and the display briefly shows the power down message (Figure 24, p. 43).

Figure 24. Power Down Message



The display briefly shows OFF (Figure 25, p. 43) and then goes blank. To start the unit again, press the ON Key.

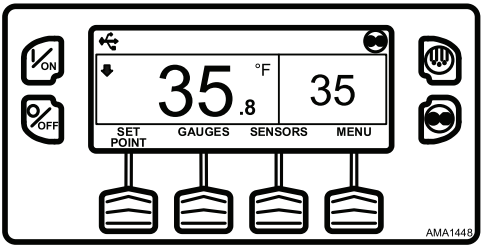
Figure 25. Display Shows OFF



The Standard Display

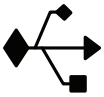
The Standard Display is the default display that appears if no other display function is selected. The Standard Display shows the box temperature and setpoint. The box temperature is measured by the controlling sensor, usually the return air sensor. The box temperature (Figure 26, p. 44) is 35.8°F (2.1°C) with a 35°F (1.7°C) setpoint.

Figure 26. Standard Display



The down-pointing arrow at the left side of the display shows the unit is cooling. If the arrow were pointing upward the unit would be heating.

The unit is running in Cycle Sentry Mode as shown by the Cycle Sentry Icon in the upper right corner of the display. If the Cycle Sentry icon is not present, the unit would be running in Continuous Mode.



The USB Icon in the upper left corner of the display will appear when a USB Flash Drive is connected to the Flash Drive Only USB Port or a computer is connected to the PC Only USB Port on the Unit Control Panel or inside the unit control box.

Pressing the left soft key allows the user to change the SETPOINT, and pressing the right soft key accesses the MAIN MENU. The other two soft keys access the GAUGES menu and the SENSORS menu.

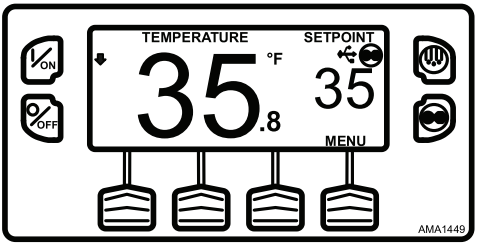
Note: *The functions of the GAUGES and SENSORS soft keys may be re-assigned to better suit customer requirements. The GAUGES and SENSORS functions are always available from the Maintenance Menu.*

The TemperatureWatch™ Display

The TemperatureWatch Display appears 2 ½ minutes after the Standard Display appears so long as there is no key activity and no Check, Prevent, or Shutdown alarms present. The TemperatureWatch Display will remain on until any key is pressed or a Check, Prevent, or Shutdown alarm occurs.

The TemperatureWatch Display shows the box temperature and setpoint. The large numbers allow unit conditions to be checked from a distance. The box temperature is that measured by the controlling sensor, usually the return air sensor. The box temperature (Figure 27, p. 45) is 35.8°F (2.1°C) with a 35°F (1.7°C) setpoint. The Cycle Sentry icon in the upper right corner of the display shows that the unit is operating in Cycle Sentry mode. If the Cycle Sentry icon is not present, the unit is running in Continuous Mode. The down-pointing arrow indicates that the unit is cooling. Pressing any soft key returns the display to the Standard Display.

Figure 27. TemperatureWatch Display



If an alarm condition (other than a Log Alarm) is present, the TemperatureWatch Display will not appear. If an alarm condition occurs while the TemperatureWatch Display is present, the display will return to the Standard Display.

If the Defrost Key or Cycle Sentry Key is pressed, the display will return to the TemperatureWatch Display immediately after the defrost cycle is initiated or the operating mode is changed.

Changing The Setpoint

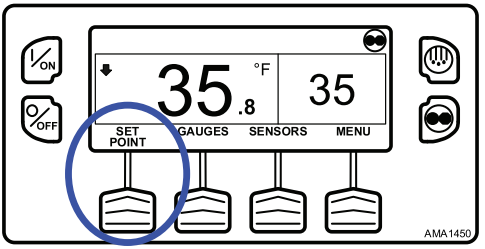
The Setpoint is changed from the Standard Display. If the TemperatureWatch display is present, press any key to return to the Standard Display.

Important: *If OptiSet Plus is in use, there are several possible options when changing the setpoint.*

Numerical Setpoints

If OptiSet Plus is not in use or if only Numerical Setpoints are enabled, the left soft key will be labeled SETPOINT (Figure 28, p. 46).

Figure 28. SETPOINT

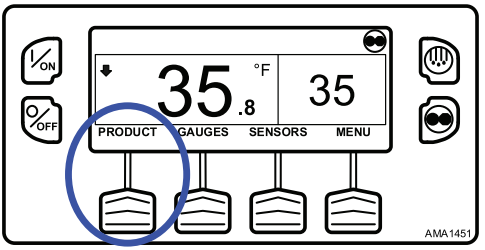


Named Products - OptiSet Plus

OptiSet Plus allows the use of Named Products such as APPLES or BANANAS in place of a numerical setpoint. If only named products are enabled, the left soft key will be labeled PRODUCT (Figure 29, p. 46).

- A single setpoint temperature may be allowed for the specific named product.
- A numerical setpoint range may be allowed for the specific named product.

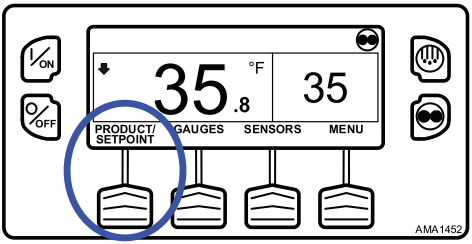
Figure 29. Left Soft Key Labeled "PRODUCT"



Both Numerical Setpoints and Named Products

OptiSet Plus can allow the use of both Numerical Setpoints and Named Products. If both numerical setpoints and named products are enabled, the left soft key will be labeled PRODUCT/SETPOINT (Figure 30, p. 47).

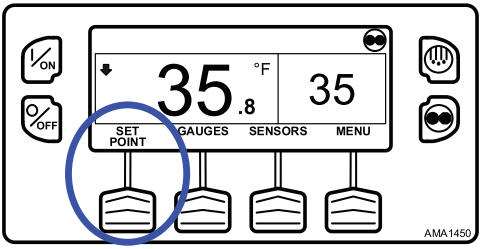
Figure 30. Left Soft Key Labeled "PRODUCT/SETPOINT"



Changing the Setpoint - Numerical Setpoint

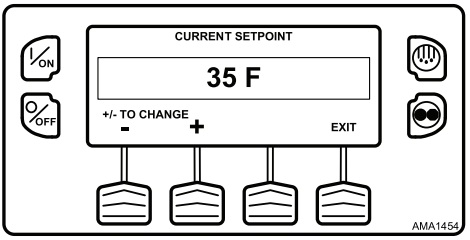
If the TemperatureWatch display is shown, press any soft key to return to the Standard Display. From the Standard Display, press the SETPOINT Key (Figure 31, p. 47).

Figure 31. Setpoint Key



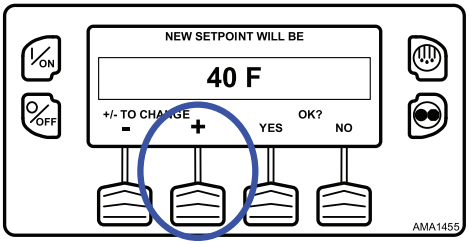
The setpoint display appears (Figure 32, p. 47).

Figure 32. Setpoint Display



The "-" and "+" Keys are used to increase or decrease the setpoint until the desired setpoint is shown. The setpoint has been changed to 40 F using the "+" Key (Figure 33, p. 48).

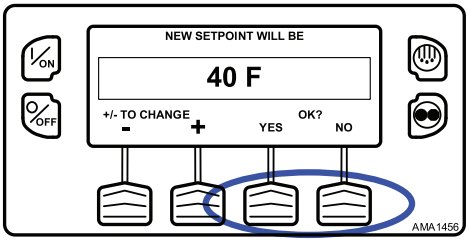
Figure 33. Setpoint Changed Using “+” Key



The YES and NO Keys (Figure 34, p. 48) confirm the setpoint change. When the desired setpoint has been selected using the “+” and/or “-” Keys, press the YES Key to confirm and load the new setpoint. If the setpoint is changed using the “+” or “-” Keys, the change must be confirmed or rejected by pressing the YES or NO Key within 10 seconds of changing the setpoint. A warning beep will sound for five seconds as a reminder.

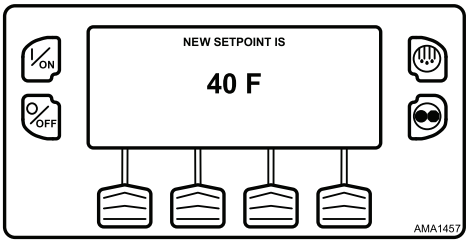
Failure to confirm the new setpoint by pressing Yes or No within 10 seconds of changing the setpoint will result in no setpoint change. In addition, Alarm Code 127 Setpoint Not Entered is set, to indicate that a setpoint change was initiated but not completed.

Figure 34. Yes and No Keys



After the YES Key has been pressed, the display briefly shows PROGRAMMING NEW SETPOINT - PLEASE WAIT. The display then confirms the new setpoint for several seconds (Figure 35, p. 49).

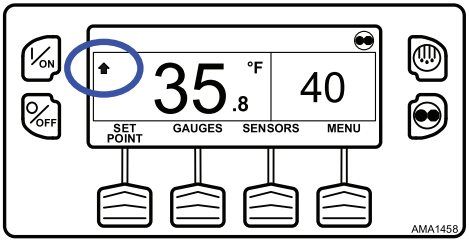
Figure 35. New Setpoint



If the NO Key is pressed the display will briefly show SETPOINT NOT CHANGED and return to the Standard Display. The Standard Display will show the old setpoint.

The display then returns to the Standard Display showing the new setpoint. Notice that the arrow now points up to indicate that the unit is heating (Figure 36, p. 49).

Figure 36. Up Arrow



Important: *If the setpoint is changed using the "+" or "-" Keys, the change must be confirmed or rejected by pressing the YES or NO Key within 10 seconds of changing the setpoint.*

- If the YES Key is pressed, the setpoint change made with the "+" or "-" Key is accepted, the setpoint changes, and the display returns to the Standard Display.
- If the NO Key is pressed the setpoint change made with the "+" or "-" Key is not accepted, the setpoint is not changed, and the display returns to the Standard Display.
- If the YES or NO Key is not pressed within 10 seconds of making a change with the "+" or "-" Key, the setpoint is not changed and the display returns to the Standard Display. The display briefly shows

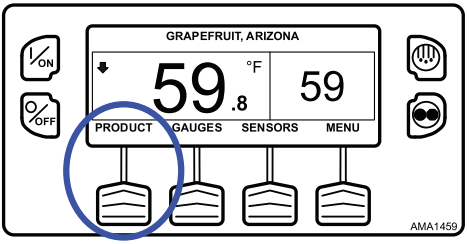
[SETPOINT NOT CHANGED] and Alarm Code 127 Setpoint Not Entered is set, to indicate that a setpoint change was initiated but not completed.

See **Changing the Setpoint - Numerical Setpoint** () for an overview of the procedure.

Changing the Setpoint - Named Product

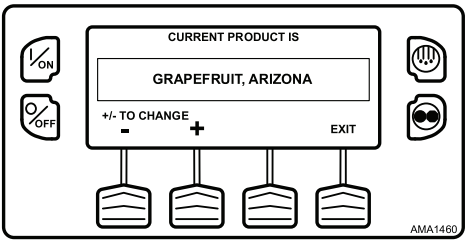
If the TemperatureWatch display is shown, press any soft key to return to the Standard Display. From the Standard Display, press the PRODUCT Key. Note that PRODUCT is displayed in place of SETPOINT (Figure 37, p. 50).

Figure 37. Product Displayed



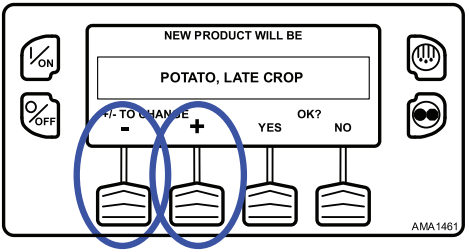
The display briefly shows PRODUCT and then the setpoint display appears (Figure 38, p. 50).

Figure 38. Setpoint Display



The “-” and “+” Keys are used to change the Named Product until the desired product is shown. The product has been changed to Potato, Late Crop (Figure 39, p. 51).

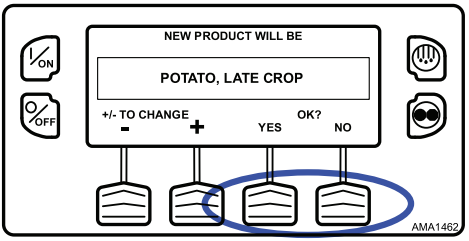
Figure 39. Named Product



The YES and NO Keys confirm the product change (Figure 40, p. 51). When the desired product has been selected using the "+" and/or "-" Keys, press the YES Key to confirm and load the new product. If the product is changed using the "+" or "-" Keys, the change must be confirmed or rejected by pressing the YES or NO Key within 10 seconds of changing the product. A warning beep will sound for five seconds as a reminder.

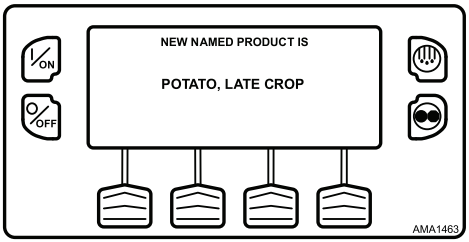
Failure to confirm the new product by pressing Yes or No within 10 seconds of changing the product will result in no product change. In addition, Alarm Code 127 Setpoint Not Entered is set, to indicate that the product change was initiated but not completed.

Figure 40. Yes and No Keys



After the YES Key has been pressed, the display briefly shows PROGRAMMING NAMED PRODUCT - PLEASE WAIT. The display then confirms the new setpoint for several seconds (Figure 41, p. 52).

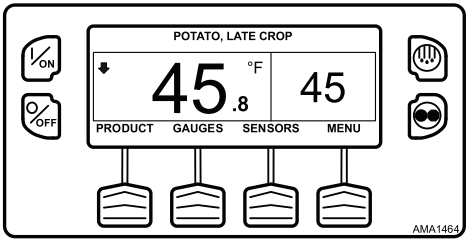
Figure 41. New Named Product



If the NO Key is pressed the display will briefly show SETPOINT NOT CHANGED and return to the Standard Display. The Standard Display will show the old setpoint.

The display then returns to the Standard Display showing the new named product. Notice that the arrow points down, to indicate that the unit is cooling (Figure 42, p. 52).

Figure 42. Standard Display



Important: *If the named product is changed using the "+" or "-" Keys, the change must be confirmed or rejected by pressing the YES or NO Key within 10 seconds of changing the named product.*

- If the YES Key is pressed, the product change made with the "+" or "-" Key is accepted, the product changes, and the display returns to the Standard Display.
- If the NO Key is pressed the product change made with the "+" or "-" Key is not accepted, the product is not changed, and the display returns to the Standard Display.
- If the YES or NO Key is not pressed within 10 seconds of making a change with the "+" or "-" Key, the product is not changed and the display returns to the Standard Display. The display briefly shows

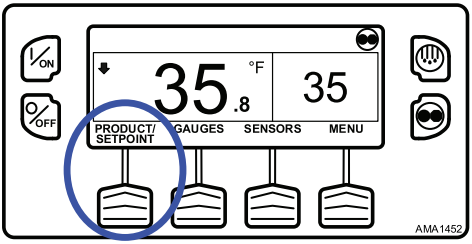
[SETPOINT NOT CHANGED] and Alarm Code 127 Setpoint Not Entered is set, to indicate that the product change was initiated but not completed.

See **Changing the Setpoint - Named Product** () for an overview of the procedure.

Changing the Setpoint - Both Numerical Setpoint and Named Product Available

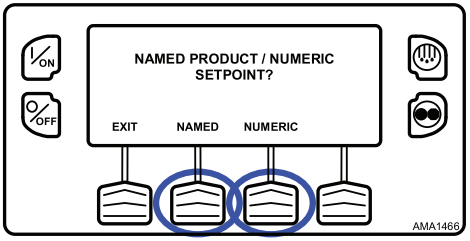
If the TemperatureWatch display is shown, press any soft key to return to the Standard Display. From the Standard Display, press the SETPOINT Key. Note that both PRODUCT and SETPOINT are displayed as shown (Figure 43, p. 53).

Figure 43. PRODUCT and SETPOINT are Displayed



The NAMED PRODUCT / NUMERIC SETPOINT prompt will appear (Figure 44, p. 53).

Figure 44. NAMED PRODUCT / NUMERIC SETPOINT Prompt



- Press the NUMERIC Soft Key to proceed with Changing the Setpoint - Numeric Setpoint change as previously shown.
- Press the NAMED Soft Key to proceed with Changing the Setpoint - Named Product change as previously shown.
- Press the EXIT Soft Key to return to the Standard Display.

Starting the Diesel Engine

Diesel engine preheats and starts are automatic in both Continuous Mode and Cycle Sentry Mode. The engine will preheat and start as required when the unit is turned on. The engine preheat and start will be delayed in Cycle Sentry mode if there is no current need for the engine to run. If any keys are being pressed on the HMI Control Panel, the engine will not preheat and start until 10 seconds after the last key is pressed.

Note: *If the unit is equipped with optional Electric Standby there may be some additional prompts before the engine will start. Refer to "Starting the Electric Motor "for details.*

⚠ CAUTION

Risk of Injury!

The engine may start automatically any time the unit is turned on.

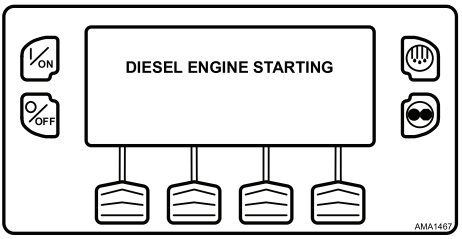
NOTICE

Equipment Damage!

Never use starting fluid. Damage to the engine can occur.

When the engine is preparing to start, the HMI Control Panel will display the engine start screen as shown (Figure 45, p. 54). The preheat buzzer sounds during the engine preheat and crank sequence.

Figure 45. Engine Start Screen



After the engine is started, the display returns to the Standard Display of temperature and setpoint.

Starting the Electric Motor

⚠ CAUTION

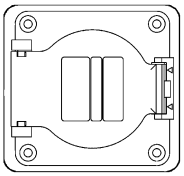
Risk of Injury!

The motor may start automatically any time the unit is turned on.

Note: *Units equipped with the SmartPower option only.*

Electric Power Receptacle: The electric power receptacle is used to connect the unit to an appropriate electric power source for electric standby operation (Figure 46, p. 55). The electric power receptacle is located next to the HMI Control Panel. Verify the unit and the power supply are turned off before connecting or disconnecting a power cord.

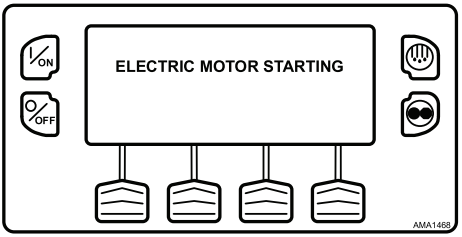
Figure 46. Electric Power Receptacle



Electric motor starting is automatic in both Continuous Mode and Cycle Sentry Mode. The motor will start as required when the unit is turned on. If any keys are being pressed on the HMI Control Panel prior to the motor start, the motor start will be delayed until 10 seconds after the last key is pressed.

When the motor is preparing to start, the HMI Control Panel will display the motor start screen (Figure 47, p. 55). The preheat buzzer sounds for 20 seconds before the electric motor starts.

Figure 47. Motor Start Screen



After the motor is started the display returns to the Standard Display of temperature and setpoint.

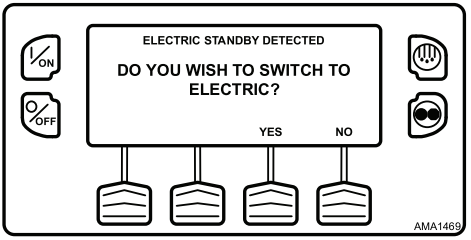
Switching from Diesel to Electric

Note: *Units equipped with the SmartPower option only.*

If the Diesel to Electric Auto-Switch Enabled feature in Guarded Access is set YES, the unit will automatically switch to Electric Mode operation when standby power is connected and available.

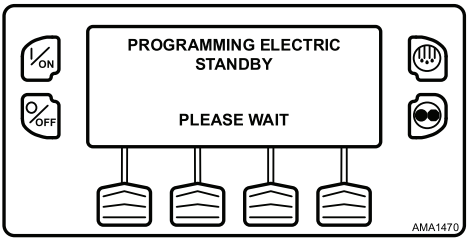
If the Diesel to Electric Auto-Switch Enabled feature in Guarded Access is set NO, the prompt screen (Figure 48, p. 56) will appear when standby power is connected and available.

Figure 48. Standby Power Connected



If NO is selected, the unit will continue to operate in Diesel Mode. If YES is selected, the display will briefly show the screen (Figure 49, p. 56).

Figure 49. YES Selected



Electric Mode operation will briefly be confirmed. If unit operation is required the electric motor will start as shown previously under STARTING THE ELECTRIC MOTOR.

If the Diesel to Electric Auto-Switch Enabled feature in Guarded Access is set NO, the unit can also be switched from Diesel mode to Electric mode

operation using the Electric Standby Selection from the Main Menu as shown later in this section.

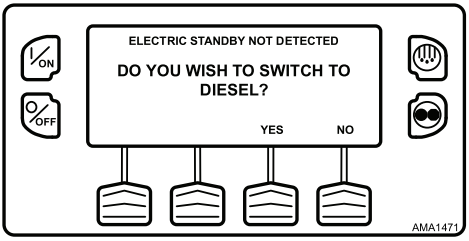
Switching from Electric to Diesel

Note: *Units equipped with the SmartPower option only.*

If the Electric to Diesel Auto-Switch Enabled feature in Guarded Access is set YES, the unit will automatically switch to Diesel Mode operation when standby power is turned off or is no longer available.

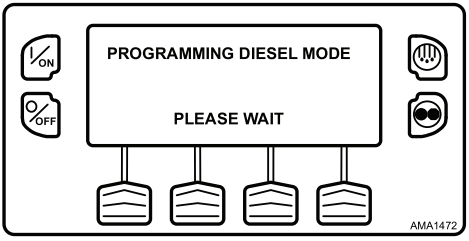
If the Electric to Diesel Auto-Switch Enabled feature in Guarded Access is set NO and standby power is disconnected or fails, the unit will not automatically switch to Diesel mode. This is primarily designed to prevent unauthorized diesel engine starts when the truck is indoors or on a ferry where engine operation is strictly prohibited. If the Electric to Diesel Auto-Switch Enabled feature in Guarded Access is set NO, the prompt screen (Figure 50, p. 57) will appear when standby power is turned off or is no longer available.

Figure 50. Standby Power is Off



If YES is selected, the display will briefly show the screen (Figure 51, p. 57).

Figure 51. Yes Selected



Diesel Mode operation will briefly be confirmed. If unit operation is required, the diesel engine will start as shown previously under “Starting the Diesel Engine”.

If the Electric to Diesel Auto-Switch Enabled feature in Guarded Access is set NO, the unit can also be switched from Diesel mode to Electric mode operation using the Diesel Selection from the Main Menu as shown later in this section.

Initiating a Manual Defrost Cycle

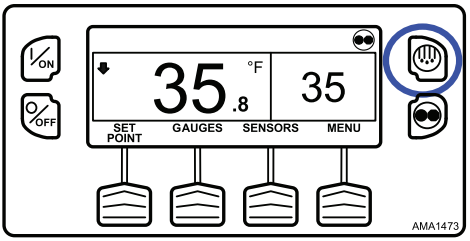
Defrost cycles are usually initiated automatically based on time or demand. Manual defrost is also available.

Manual defrost is available if the unit is running and the evaporator coil temperature is less than or equal to 45 F (7 C).

Note: *If the Rail Alternate feature is set YES, defrost is allowed with an evaporator coil temperature less than or equal to 55 F (13 C).*

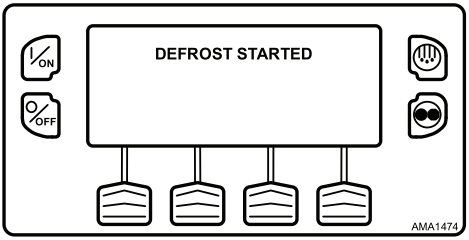
Other features such as door switch settings may not allow manual defrost under some conditions. To initiate a manual defrost cycle, press the Defrost Key (Figure 52, p. 58).

Figure 52. Press Defrost Key



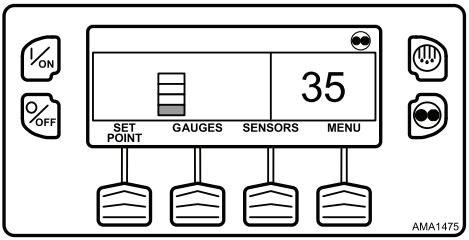
The display briefly shows [DEFROST], [PROGRAMMING DEFROST - PLEASE WAIT] and then [DEFROST STARTED] (Figure 53, p. 59).

Figure 53. Defrost Started



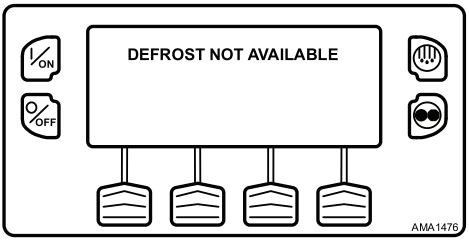
The display then shows the Defrost display. The bar indicator shows approximately how much time remains to complete the defrost cycle. The bar indicator shows that the defrost cycle is about 25% complete (Figure 54, p. 59).

Figure 54. Bar Indicator



If conditions do not allow a defrost cycle, the display shown (Figure 55, p. 59) will briefly appear. The display will then return to the Standard Display.

Figure 55. Defrost Not Available



See **Initiating a Manual Defrost Cycle** () for an overview of the procedure.

Terminating a Defrost Cycle

The defrost cycle terminates automatically when the coil temperature is greater than or equal to 58°F (14°C) or the defrost timer expires. Defrost can also be terminated by turning the unit off and back on.

Note: *If Rail Alternate is set YES, the defrost cycle terminates at 70°F (21°C) or if the defrost timer expires.*

Selecting Cycle Sentry or Continuous Mode

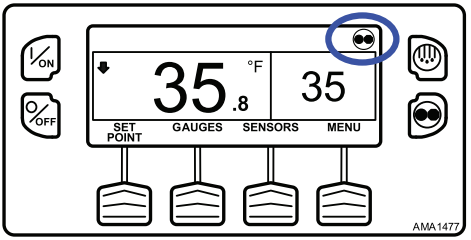
When Cycle Sentry Mode is selected, the unit will start and stop automatically to maintain setpoint, keep the engine warm, and the battery charged. When Continuous Mode is selected, the unit starts automatically and runs continuously to maintain setpoint and provide constant airflow.

Important: *Cycle Sentry or Continuous Mode may not be selectable if OptiSet Plus is in use.*

See **Selecting Cycle Sentry or Continuous Mode** () for an overview of the procedure.

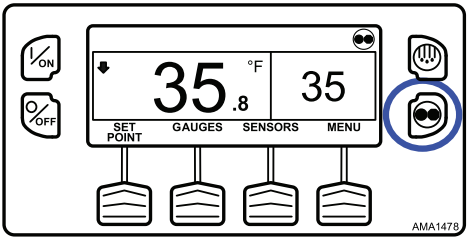
If the unit is operating in Cycle Sentry Mode, the Cycle Sentry Icon will be present in the upper right corner of the display as shown below. If the Cycle Sentry Icon (Figure 56, p. 60) is not present the unit is operating in Continuous Mode.

Figure 56. Cycle Sentry Icon



If allowed by OptiSet Plus, Cycle Sentry Mode or Continuous Mode is selected by pressing the Cycle Sentry/Continuous Key as shown (Figure 57, p. 61).

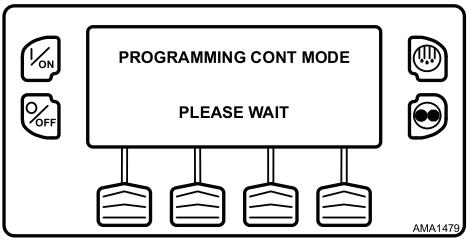
Figure 57. Cycle Sentry/Continuous Key



Note: *Cycle Sentry Mode or Continuous Mode can also be selected using the Main Menu > Mode Submenu.*

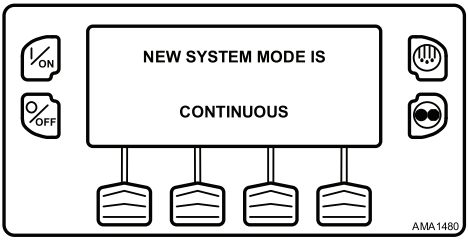
If the unit is in Cycle Sentry Mode, pressing the Cycle Sentry/Continuous Key changes the mode from Cycle Sentry Mode to Continuous Mode. The display confirms the change (Figure 58, p. 61).

Figure 58. Continuous Mode



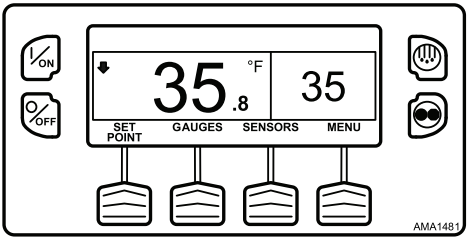
The new mode is confirmed for three seconds (Figure 59, p. 61).

Figure 59. New Mode Confirmed



The display then returns to the Standard Display. In the example shown (Figure 60, p. 62), the absence of the Cycle Sentry Icon indicates that the unit is running in Continuous Mode.

Figure 60. Cycle Sentry Icon Not Shown = Continuous Mode



Pressing the Cycle Sentry/Continuous Key again allows the operator to change back to Cycle Sentry Mode operation.

Important: *If the unit is in Cycle Sentry Null and the mode is switched to Continuous Mode, the unit will start automatically.*

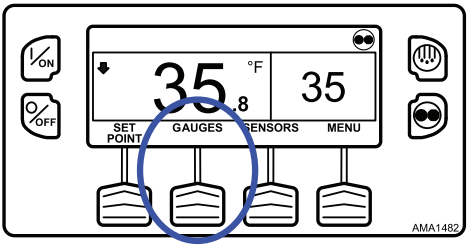
Important: *Cycle Sentry or Continuous Mode may not be selectable if OptiSet Plus is in use.*

Using the Gauges Key

The GAUGES Key allows the operator to view the unit gauges. If the function of this key has been reassigned, the GAUGES Menu is also available in the Maintenance Menu.

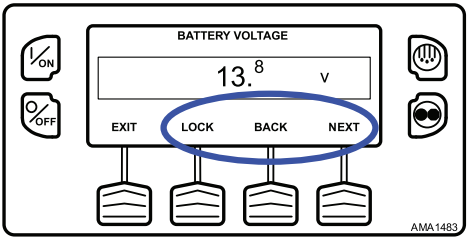
To access the GAUGES Menu, press the GAUGES Key (Figure 61, p. 62).

Figure 61. Gauges Key



The first gauge display will appear. Press the NEXT and BACK Keys to scroll through the gauges. Pressing the LOCK Key will lock the current gauge on the display (Figure 62, p. 63).

Figure 62. Gauge Display Locked



The gauges and I/O conditions available are shown on the next page. Not all gauges or I/O conditions may appear depending on unit configuration and software revision.

To return to the Standard Display press the EXIT Key.

Gauges Available

Coolant Temperature: Displays the temperature of the engine coolant.

Coolant Level: Displays the coolant level in the overflow tank.

Engine Oil Pressure: Displays the engine oil pressure as OK or LOW.

Engine Oil Level Switch: Displays the engine oil level as OK or LOW.

Amps: Displays the current flow in amps flowing to or from the unit battery.

Battery Voltage: Displays the voltage of the unit battery.

Accessory Battery Voltage: Displays the voltage at the alternator.

Engine RPM: Displays the engine speed in RPMs.

Fuel Level Sensor: Displays the fuel level if a fuel level sensor is installed.

Discharge Pressure: Displays the unit discharge pressure.

Suction Pressure: Displays the unit suction pressure.

ETV Position: Displays the current position of the ETV valve.

Fresh Air Exchange: Displays the current position of the optional Fresh Air Exchange Door.

I/O (Input/Output State): Displays the current state of the input/output devices listed here:

• High Speed Relay/Electric Heat	• Spare Analog Input 2
• Run Relay	• Spare Output 1

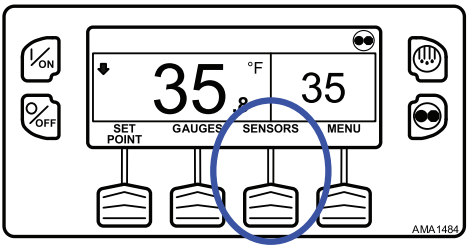
• Run Relay Feedback	• Spare Output 2
• Alternator Excite Output	• Spare Output 3
• Defrost Damper	• Spare Output 4
• Heat Output	• Spare Output 5
• Motor RPM	• Fresh Air Exchange Output
• Spare Digital Input 1	• Fresh Air Exchange Feedback
• Spare Digital Input 2	• Diesel/Electric Relay (SmartPower™ units only)
• Spare Digital Input 3	• Electric Ready Input (SmartPower™ units only)
• Spare Digital Input 4	• Electric overload (SmartPower™ units only)
• Spare Analog Input 1	• Hot Gas Bypass

Using the Sensors Key

The SENSORS Key allows the operator to view the unit gauges. If the function of this key has been reassigned, the SENSORS Menu is also available in the Maintenance Menu.

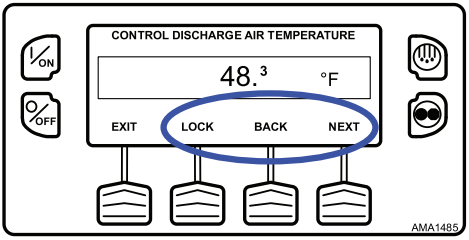
To access the SENSORS Menu, press the SENSORS Key:

Figure 63. Sensors Key



The first sensor display will appear. Press the NEXT and BACK Keys to scroll through the sensors. Pressing the LOCK Key will lock the current sensor on the display (Figure 64, p. 65).

Figure 64. Next, Back, Lock Keys



The sensors available are shown below.

To return to the Standard Display, press the EXIT Key.

Sensors Available

Control Return Air Temperature: Displays the temperature of the control return air sensor.

Display Return Air Temperature: Displays the temperature of the display return air sensor.

Control Discharge Air Temperature: Displays the temperature of the control discharge air sensor.

Display Discharge Air Temperature: Displays the temperature of the display discharge air sensor.

Temperature Differential: Displays the calculated difference between the control return air sensor and the control discharge air sensor.

Evaporator Coil Temperature: Displays the temperature of the evaporator coil sensor.

Ambient Air Temperature: Displays the temperature of the ambient air sensor.

*** Spare 1 Temperature:** Displays the temperature of the spare 1 temperature sensor.

*** Log Sensor 1:** Displays the temperature of the CargoWatch Data Logger temperature sensor 1.

*** Log Sensor 2:** Displays the temperature of the CargoWatch Data Logger temperature sensor 2.

*** Log Sensor 3:** Displays the temperature of the CargoWatch Data Logger temperature sensor 3.

*** Log Sensor 4:** Displays the temperature of the CargoWatch Data Logger temperature sensor 4.

*** Log Sensor 5:** Displays the temperature of the CargoWatch Data Logger temperature sensor 5.

*** Log Sensor 6:** Displays the temperature of the CargoWatch Data Logger temperature sensor 6.

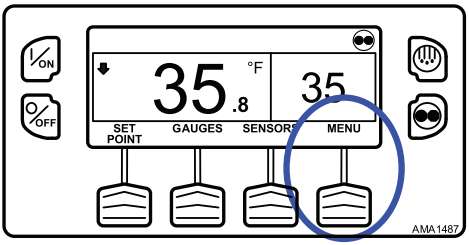
Board Temperature Sensor: Displays the internal temperature of the HMI Control Panel pc board.

* If sensors have been added.

Using the Main Menu

The Main Menu contains several additional submenus that allow the operator to view information and modify unit operation. To access the Main Menu press the MENU Key (Figure 65, p. 66).

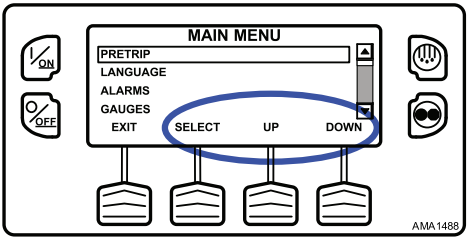
Figure 65. Menu Key



The first Main Menu choice will appear. Press and hold the UP or DOWN Keys to scroll through the menu choices. When the desired selection is shown on the display, press the SELECT Key to access it. The Pretrip submenu is displayed (Figure 66, p. 67).

To return to the Standard Display press the EXIT Key.

Figure 66. Pretrip Submenu



Main Menu Choices

Each of these Main Menu choices will be explained later in this section:

Pretrip: A Pretrip Test verifies unit operation.

Flash Drive: If a properly configured USB Flash Drive is currently connected to the USB Port on the unit Control Panel, the Flash Drive Menu will appear as a Main Menu selection.

Languages: If more than one language is enabled from the Guarded Access > Language Menu, this menu item will appear.

Alarms: The Alarm Menu allows the operator to view any active alarms, and allows most alarms to be cleared.

Gauges: The Gauges Menu allows the operator to view the unit gauges and I/O conditions.

Sensors: The Sensors Menu allows the operator to view the unit and CargoWatch Data Logger temperature sensors.

Data Logger (CargoWatch): The CargoWatch Data Logger is physically located in the HMI Control Panel. It can support up to 6 optional temperature sensors.

Hourmeters: The Hourmeters Menu allows the operator to view the unit hourmeters that have the view feature enabled in the Guarded Access menu.

Mode: The Mode Menu allows the operator to change the unit operating modes that have been enabled in Guarded Access.

Keypad Lockout: If enabled in Guarded Access > Main Menu Configuration, the keypad can be locked to prevent unauthorized use.

Start Sleep Mode: If this feature enabled in Guarded Access > Main Menu Configuration, the operator can select and set Sleep Mode from the Mode Menu.

SmartPower™ Electric Standby Option: The Diesel/Electric Standby selection from the Main Menu allows the operator to manually select diesel or electric mode operation on units equipped with the electric standby SmartPower option.

Adjust Brightness: The brightness of the HMI Control Panel display can be adjusted to allow for changing ambient light conditions.

Time: The Time and Date held by the HMI Control Panel can be checked. Time and Date cannot be changed from the Main Menu.

Clear All ECU Faults: Pressing this key will clear all existing Engine Control Unit (ECU) Fault Codes on applicable units with an ECU.

Pretrip

Pretrip Test verifies unit operation. This display allows a Pretrip Test to be selected and initiated by the operator. If the Pretrip Test is entered with the unit not running, a Full Pretrip Test with device amp checks will be performed. If the Pretrip Test is entered with the unit running in either diesel or electric mode, a Running Pretrip Test is performed. Test results are reported as PASS, CHECK, or FAIL when the Pretrip Test is completed.

Pretrip Test Conditions

- Current unit settings are saved and restored at the end of the Pretrip Test or if the unit is turned off and back on.
- Pretrip Test can be run in either Diesel or Electric Mode.
- The unit will auto switch from Diesel Mode to Electric Mode or from Electric Mode to Diesel Mode during a Pretrip Test if these features are enabled and the auto switch conditions occur.

Conditions Where Pretrip Tests Are Not Allowed

- If any shutdown alarms are present. Pretrip tests are allowed with some Check and Log alarms.
- If the unit is in Sleep Mode.
- If the unit is in Service Test Mode, Output Test Mode, or Evacuation Mode.

Pretrip Test Considerations

When performing a Pretrip Test, the following issues should be considered:

- If running a Pretrip Test on a trailer loaded with dry cargo, verify that proper airflow can occur around the load. If the load restricts airflow, false test results may occur. Also, these units have high refrigeration

capacity which results in rapid temperature changes. Sensitive dry cargo may be damaged as a result.

- If running a Pretrip Test on a trailer that has just been washed down, the extremely high humidity inside the trailer may result in false test results.
- If running a Pretrip Test on a trailer loaded with sensitive cargo, monitor the load temperature during the test as normal temperature control is suspended during pre-trip operation.
- Always perform Pretrip Tests with the trailer cargo doors closed to prevent false test failures.

Pretrip Test Sequence

Pretrip tests proceed in the order shown below. A Full Pretrip Test is started with the engine or electric motor not running and includes all tests. A Running Pretrip Test is started with the engine or electric motor running and does not include the Amp Checks or Engine Start Check.

- **Amp Checks:** Each electrical control component is energized and the current drawn is confirmed as within specification.
- **Engine Start:** The engine will start automatically.
- **Defrost:** If the coil temperature is below 45 F (7 C), a defrost cycle is initiated.
- **RPM Check:** The engine RPM in high and low speed is checked during the Cool Check.
- **Cool Check:** The ability of the unit to cool in low speed is checked.
- **Heat Check:** The ability of the unit to heat in low speed is checked.
- **Report Test Results:** The test results are reported as PASS, CHECK, or FAIL when the Pretrip Test is completed. If test results are CHECK or FAIL alarm codes will exist to direct the technician to the source of the problem.

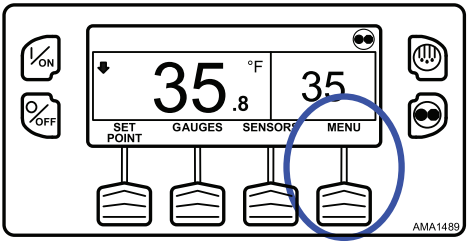
Performing a Pretrip Test

If a Pretrip Test is initiated with the engine or electric motor not running, a Full Pretrip Test will be performed. If a Pretrip Test is initiated with the engine or electric motor running, a Running Pretrip Test is performed.

- Before initiating a Pretrip Test, clear all alarm codes.
- To stop a Pretrip Test at any time, turn the unit off.

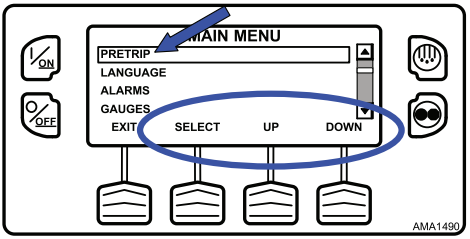
Pretrip Tests are initiated using the Pretrip Menu. From the Standard Display, press the MENU Key (Figure 67, p. 70).

Figure 67. Menu Key



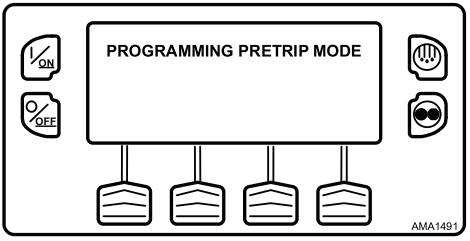
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Pretrip Menu. When the Pretrip Menu is shown, press the SELECT Key to start a Pretrip Test (Figure 68, p. 70).

Figure 68. Select Key



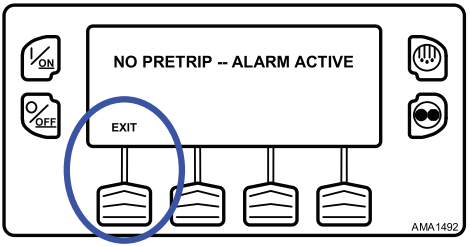
The display will briefly show PROGRAMMING PRETRIP MODE (Figure 69, p. 70). If the unit is not running, a Full Pretrip Test will be initiated. If the unit is running in either diesel or electric mode, a Running Pretrip Test will be performed.

Figure 69. Programming Trip Mode



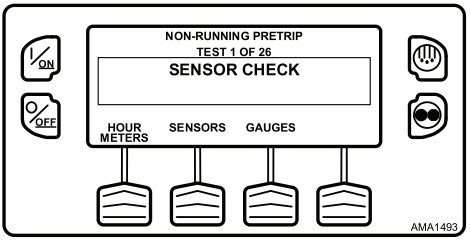
If all alarms were not cleared, a prompt appears (Figure 70, p. 71). Exit the Pretrip Test, clear all alarms, and repeat the Pretrip Test.

Figure 70. Alarms Not Cleared



If all alarms were cleared, the Pretrip Test display appears (Figure 71, p. 71).

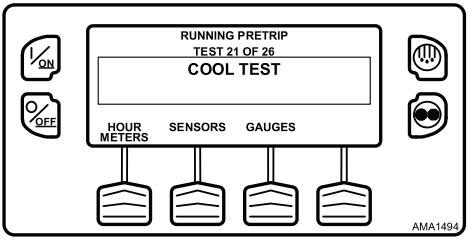
Figure 71. Pretrip Test



- The top line of the display indicates the unit is performing the non-running portion of the Pretrip Test.
- The second line measures test progress. The number of tests completed of the total number of tests to be performed is shown. In the example above the unit is performing Test 1 of 26, Sensor Check.
- The soft keys may be used during the Pretrip Test to select the Hourmeter, Gauge or Sensor menus.
- To stop a Pretrip Test at any time turn the unit off. This will generate Alarm Code 28 Pretrip Abort. Other alarm codes may also be generated. This is normal when the Pretrip Test is halted before completion.

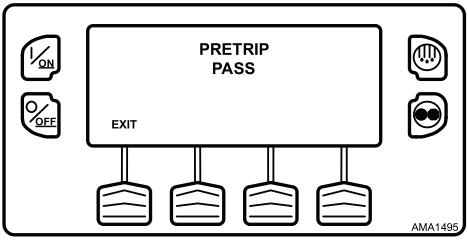
When the non-running tests are complete, the unit will start automatically and continue with the Running Pretrip Test. In the example shown (Figure 72, p. 72), the unit is in the Running Pretrip and is performing Test 21 of 26, Cool Test.

Figure 72. Cool Test



When all tests are complete, the results are reported as PASS, CHECK or FAIL (Figure 73, p. 72). If the results are CHECK or FAIL, the accompanying alarm codes will direct the technician to the cause of the problem.

Figure 73. Pretrip Pass



If the Pretrip Test results are CHECK or FAIL, the problem should be diagnosed and corrected by a Thermo King service technician before the unit is released for service.

To return to the Main Menu, press the EXIT Key. To return to the Standard display press the EXIT Key again.

See **Performing a Pretrip Test** () for an overview of the procedure.

Flash Drive

If a properly configured USB Flash Drive is currently connected to the USB Port on the unit Control Panel, the Flash Drive Menu will appear as a Main Menu selection. If a properly configured USB Flash Drive is connected to the USB Flash Drive connector, this feature allows the operator to select the desired Flash Drive function. If enabled when the Flash Drive was configured, the following functions may be available:

Download

- Download the ServiceWatch Data Logger
- Download the CargoWatch Data Logger

Flashload

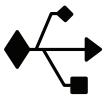
- Flash load Base Controller Software
- Flash load HMI Control Panel Software

OptiSet Plus

- SEND
  - Send OptiSet Plus files
- RETRIEVE
  - Retrieve OptiSet Plus files

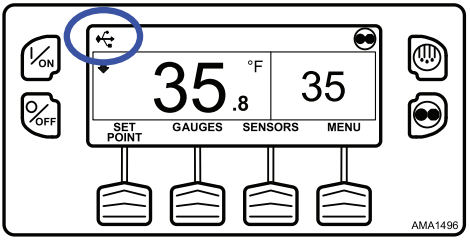
Note: *If a USB Flash Drive is not connected to the unit, this feature will not appear in the Main Menu.*

Flash Drive Icon



- The USB Icon (Figure 74, p. 74) will appear in the upper left corner of the display as shown below when a USB Flash Drive is inserted in the USB Flash Drive USB Port on the Unit Control Panel.
- The USB Icon will also appear if a computer is connected to the USB PC USB Port on the Unit Control Panel or inside the control box.

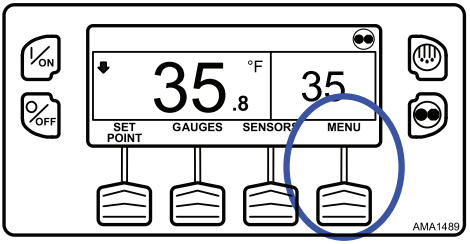
Figure 74. Flash Drive Icon



Selecting the Flash Drive Menu from the Main Menu (If Already Connected)

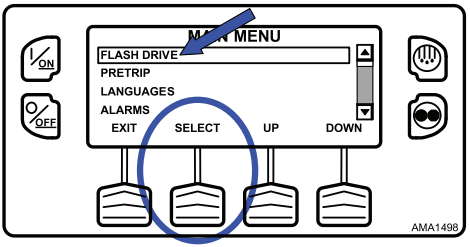
To select the Flash Drive Menu, press the MENU Key (Figure 75, p. 74). The Main Menu will appear.

Figure 75. Menu Key



If a properly configured USB Flash Drive is connected to the Flash Drive Only USB Port on the Control Panel, the Flash Drive Menu will appear as a Main Menu selection. Press the UP or DOWN Key as required to choose the Flash Drive Menu. When the Flash Drive Menu is shown, press the SELECT Key to select the Flash Drive Menu (Figure 76, p. 74).

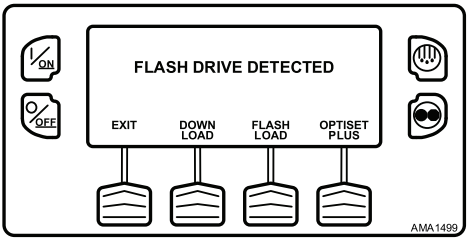
Figure 76. Flash Drive Menu



Flash Drive (If Connected While the Unit is Turned On)

If a properly configured USB Flash Drive is connected to the USB Port on the unit Control Panel while the unit is turned on, a Flash Drive indication will appear for several seconds and the Flash Drive Menu will be shown (Figure 77, p. 75).

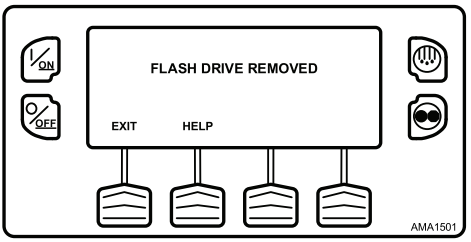
Figure 77. Flash Drive



Removing the Flash Drive

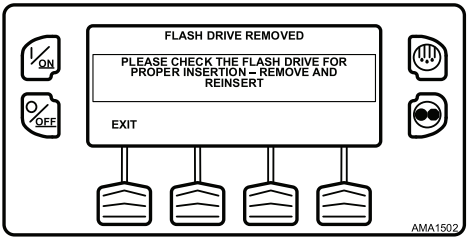
If the Flash Drive is disconnected, the display shown (Figure 78, p. 75) will appear for 30 seconds and the display will return to the Standard Display. To return to the Standard Display, immediately press the EXIT Soft Key.

Figure 78. Flash Drive Removed



If the HELP Soft Key is pressed, the display shown (Figure 79, p. 76) will appear.

Figure 79. Help Soft Key Pressed



Languages

If more than one language is enabled from the Guarded Access > Language Menu, this menu item will appear. If only one language is enabled, this menu will not appear. The Language Menu allows the operator to select a language from a list of up to four enabled languages. All subsequent displays are shown in the selected language. English is the default language. Refer to the Language Setup Menu in Section 3 of the SR-4 Trailer S/T Diagnostic Manual (TK 55533-2) for details.

If Languages are not enabled from the Guarded Access Menu, this feature will not appear in the Main Menu.

Important: *Exercise care when changing languages. Once changed, all HMI Control Panel displays will be in the new language.*

Available Languages

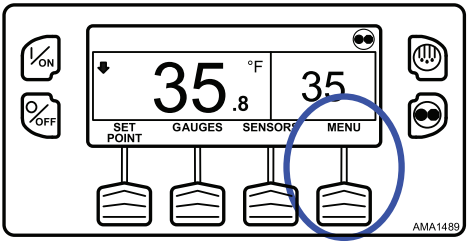
The following languages are available:

English French Spanish Portuguese

Selecting an Alternate Language

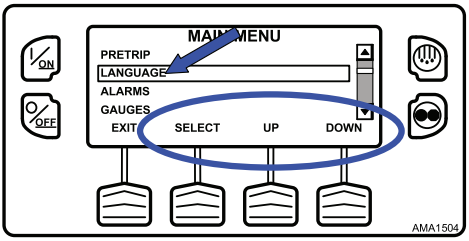
To select an alternate language, press the MENU Key (Figure 80, p. 77).

Figure 80. Menu Key



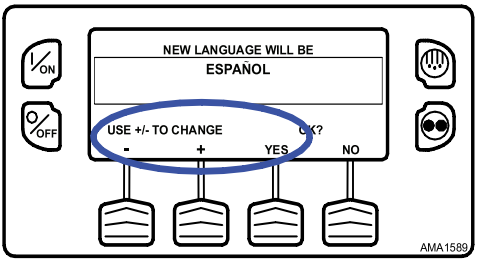
The Main Menu will appear. If more than one language is enabled, the Language Menu will appear as a Main Menu selection (Figure 81, p. 77). Press the UP or DOWN Key as required to choose the Language Menu. When the Language Menu is shown press the SELECT Key to select the Language Menu.

Figure 81. Main Menu



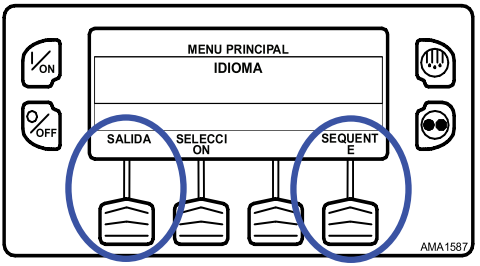
The Language Menu will appear as shown (Figure 82, p. 77). Press the + or - Keys to select the desired language. Only languages enabled from the Guarded Access Menu are available. When the desired language is shown (example is Español [Spanish]) press the YES Key to confirm the choice.

Figure 82. Language Menu



The display will briefly show PROGRAMMING LANGUAGE - PLEASE WAIT in the new language. The display will then return to the Language Menu, but will show the new language. Español (Spanish) is shown (Figure 83, p. 78).

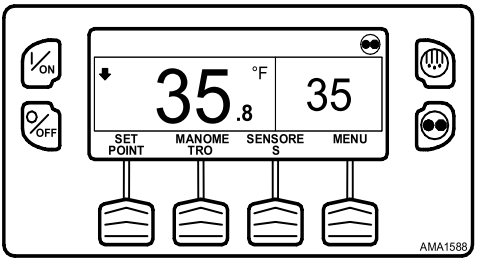
Figure 83. New Language (Example: Spanish)



Repeat the process to select a different language. To select a different Main Menu item, press the NEXT (SIGUIENTE) Key. To return to the Standard Display, press the EXIT (SALIDA) Key.

All displays will now be in the new language. Español (Spanish) is shown (Figure 84, p. 78).

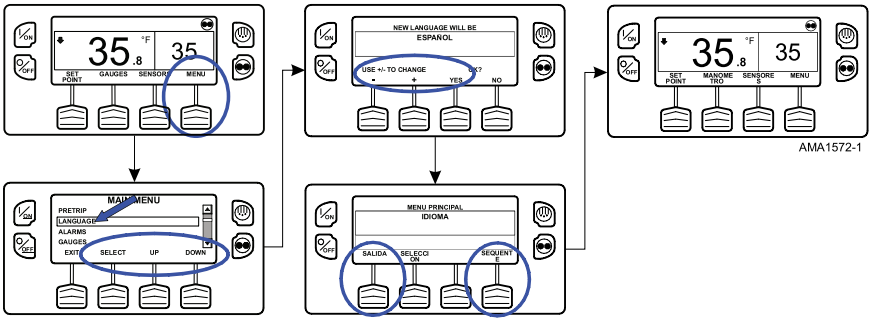
Figure 84. New Language (Example: Spanish)



To return to the Main Menu press the EXIT Key. To return to the Standard display press the EXIT Key again.

See **Languages** (Figure 85, p. 79) for an overview of the selection procedure.

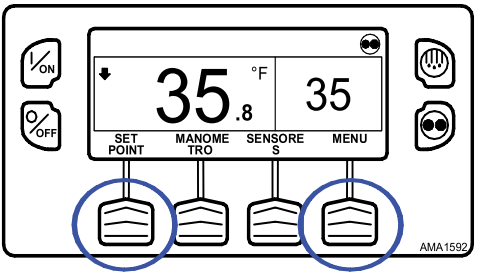
Figure 85. Languages



Language Menu Quick Access

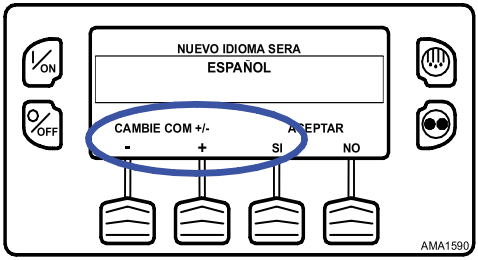
Should it be necessary at any time to change to English or any other installed language, return to the Standard Display and then press and hold the first and last soft keys for five seconds as shown below. The Standard Display shown (Figure 86, p. 79) is Español (Spanish).

Figure 86. Standard Display in Español



After five seconds, the Language Menu will appear in the current language as shown below. Press the + or - Keys to select the desired language. When the desired language is shown, press the SI (YES) Key to confirm the choice (Figure 87, p. 80).

Figure 87. Select Desired Language



Note: *All languages in the installed software can be selected using this method.*

Alarms

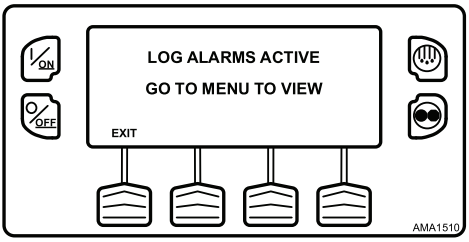
The Alarm Menu allows the operator to view any active alarms, and allows most alarms to be cleared.

Log Alarm

Log Alarms are indicated for 30 seconds each time the unit is turned on. This level of alarm serves as a notice to take corrective action before a problem becomes severe. Maintenance items such as maintenance hourmeter time-outs are Log Alarms. The TemperatureWatch™ screen is not disabled if only Log Alarm(s) are active.

When the unit is turned on, the display will show the Thermo King Logo and then the “Configuring System” message. If Log Alarm(s) are present, the Log Alarm notice will appear on the display for 30 seconds. The remote indicator alarm light (if installed) will also be on during this period. After 30 seconds, the Standard Display will appear and the remote indicator alarm light will go off.

Figure 88. Log Alarms Exist

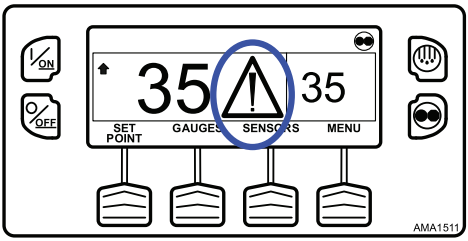


Check Alarm

Check Alarms are indicated by a steady alarm indication at the top of the display and the message “Service Required within 24 Hours”. The Alarm Icon will appear. This level of alarm serves as a notice to take corrective action before a problem becomes severe. The unit will run with Check Alarms but some features and functions may be inhibited. The TemperatureWatch screen is disabled if a Check Alarm is active.

If a Check Alarm condition occurs while the unit is running, the alarm icon will appear in the display as shown (Figure 89, p. 81).

Figure 89. Alarm Icon



Prevent Alarm

Prevent Alarms are indicated by a steady alarm indication at the top of the display and the message “Service Required within 24 Hours”. The Alarm Icon will appear. The unit will be temporarily shut down if a Prevent Alarm is active. The unit will remain shut down for a timed restart interval or until the fault conditions are corrected and then restart. If the unit is in a temporary shutdown, Alarm Code 84 Restart Null will be present along with the associated Prevent Alarm. In most cases, the unit will restart with reduced performance to determine if continued operation is possible. If the alarm does not reoccur with reduced performance, the unit will return to full performance. If the unit is operating with reduced performance, Alarm Code 85 Forced Unit Operation will also be present under some conditions. In general, if the alarm condition reoccurs a defined number of times, the alarm is set as a Shutdown Alarm and no further restarts are possible. The Temperature Watch screen is disabled if a prevent alarm is active.

Note: *If the Restart After Shutdown feature in the Guarded Access Menu is set for CONTINUOUS, an unlimited number of restart attempts are allowed.*

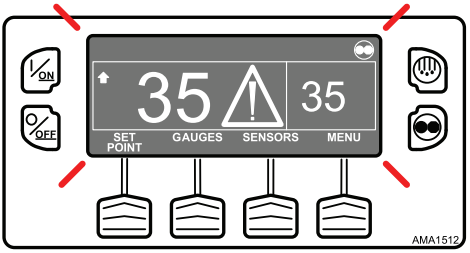
Shutdown Alarm

If a Shutdown Alarm occurs while the unit is running, it will be indicated by all of the following (Figure 90, p. 82):

- The Alarm Icon will appear.
- The display, backlight and optional remote alarm light will flash on and off.
- The display will switch from normal to inverted and back (light areas become dark and dark areas become light.)

Shutdown Alarms will force the unit into shutdown. The unit will remain in shutdown until the Shutdown Alarm is manually cleared. Exceptions are some engine and electric Shutdown Alarms that become Log Alarms when switched to the alternate operating mode (diesel to electric or electric to diesel). The TemperatureWatch screen is disabled if a unit level Shutdown Alarm is active.

Figure 90. Reverse/Normal Video



Pretrip Alarm

If an alarm occurs during a Pretrip Test, the alarm code will be displayed as Pretrip Alarm XX, where XX is the alarm code.

Alarm Codes When Switching Between Diesel and Electric

If a shutdown alarm occurs that affects only diesel mode operation and the unit is switched to electric, the diesel mode shutdown alarm becomes an electric mode log alarm. This allows the unit to run in electric mode without clearing the shutdown alarm that is preventing diesel mode operation. If the unit is switched back to diesel mode, the alarm again become a diesel mode shutdown alarm and prevents unit operation.

In the same manner, if a shutdown alarm occurs that affects only electric mode operation and the unit is switched to diesel, the electric mode shutdown alarm becomes a diesel mode log alarm to allow diesel mode

operation. If the unit is switched back to electric mode, the alarm reverts to an electric mode shutdown alarm and prevents unit operation. If the unit is configured for electric to diesel Auto-Switch, it automatically starts and runs in diesel mode if an electric shutdown occurs.

Clearing Alarm Codes

Most alarm codes can be cleared conventionally from the Alarm Menu using the CLEAR Key.

The following control and display sensor alarm codes can only be cleared from the Maintenance Menu or Guarded Access Menu:

- Alarm Code 03 Check Control Return Air Sensor
- Alarm Code 04 Check Control Discharge Air Sensor
- Alarm Code 203 Check Display Return Air Sensor
- Alarm Code 204 Check Display Discharge Air Sensor
- Alarm Code 74 Controller Reset to Defaults.

The following alarm codes clear automatically:

- Alarm Code 64 Pretrip Reminder - Clears when a Pretrip Test is performed.
- Alarm Code 84 Restart Null - Clears when the unit is no longer in a restart null due to a Prevent Alarm.
- Alarm Code 85 Forced Unit Operation - Clears when the unit is no longer running in a forced mode due to a Prevent Alarm.
- Alarm Code 91 Check Electric Ready Input - Clears automatically when electric power is restored.
- Alarm Code 92 Sensor Grades Not Set - Clears when the sensor grade is changed from 5H.

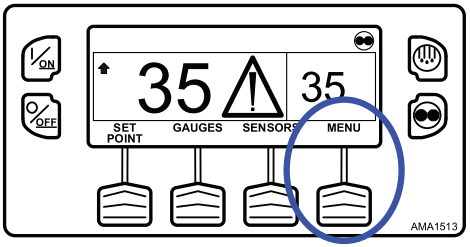
If the Limited Alarm Restarts feature is enabled, the following additional alarm codes may only be cleared from the Guarded Access Menu. If this is the case, the CLEAR soft key will not appear if the alarms are displayed from the Main Menu or the Maintenance Menu.

- Alarm Code 10 High Discharge Pressure
- Alarm Code 23 Cooling Cycle Fault
- Alarm Code 24 Heating Cycle Fault
- Alarm Code 32 Refrigeration Capacity Low

Displaying and Clearing Alarm Codes

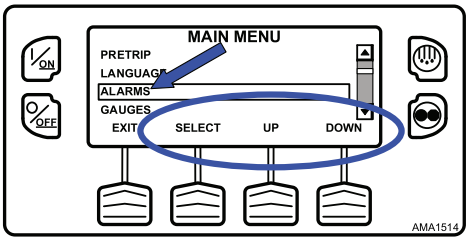
Alarms are displayed and cleared using the Alarm Menu. From the Standard Display, press the MENU Key (Figure 91, p. 84).

Figure 91. Menu Key



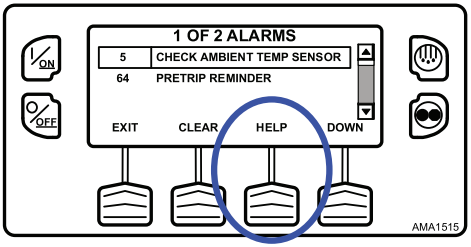
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Alarms Menu (Figure 92, p. 84). When the Alarms Menu is shown, press the SELECT Key to select the Alarms Menu.

Figure 92. Up/Down, Select Keys



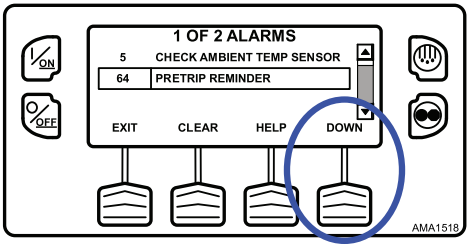
The number of alarms (if more than one) and a list of the alarms with the most recent alarm first will be shown. In the example shown (Figure 93, p. 85), there are two alarms. The most recent is Alarm Code 5 Check Ambient Temp Sensor.

Figure 93. Alarms Menu



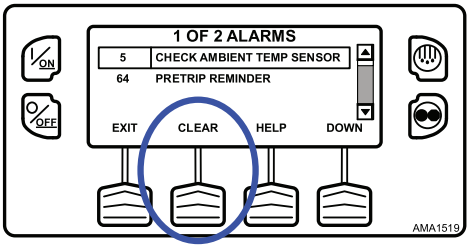
If necessary to view all alarms, scroll down using the DOWN Key (Figure 94, p. 85).

Figure 94. Down Key



If the alarm situation has been resolved, press the CLEAR Key to clear the alarm (Figure 95, p. 85).

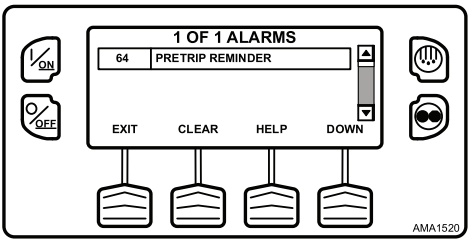
Figure 95. Clear Key



The display will briefly show CLEARING ALARM 5 – PLEASE WAIT and the Alarm Menu will reappear (Figure 96, p. 86).

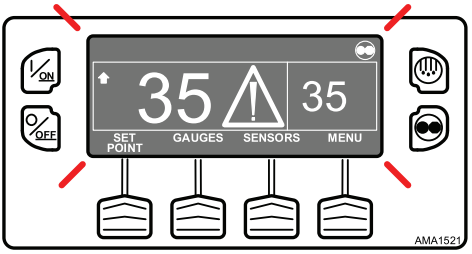
Alarm Code 64 Pretrip Reminder cannot be cleared using the CLEAR Key. This alarm will clear automatically when a Pretrip Test is run.

Figure 96. Pretrip Reminder



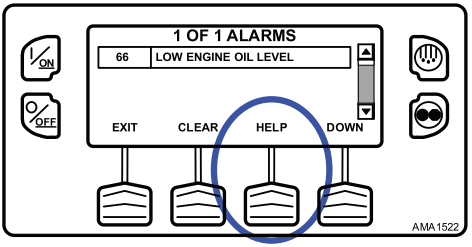
If a serious condition occurs, the unit will be shut down to prevent damage to the unit or the load. If this occurs, the Alarm Icon will appear, the display and backlight will flash on and off (Figure 97, p. 86).

Figure 97. Unit Shutdown



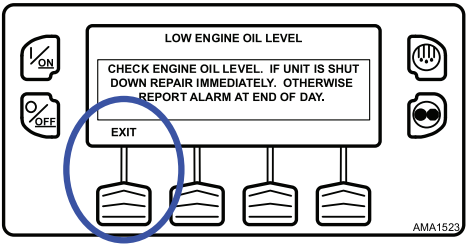
The Alarm Menu display will display the Shutdown Alarm Code. For additional information regarding the alarm shown on the display, press the HELP Key (Figure 98, p. 86).

Figure 98. Help Key



A help message will appear. Press the EXIT Key to return to the Alarms Menu (Figure 99, p. 87). Check the oil level and add oil as required, clear the alarm and restart the engine.

Figure 99. Exit Key



To return to the Main Menu press the EXIT Key. To return to the Standard display press the EXIT Key again.

Important Alarm Notes

- If an alarm will not clear, it may still exist. If the alarm is not corrected, it will not clear or may be immediately set again.
- If an alarm cannot be cleared from the Main menu, the Clear Key will not appear. These alarms must be cleared from the Maintenance or Guarded Access Menus.

See **Displaying and Clearing Alarm Codes** () for an overview or the procedure.

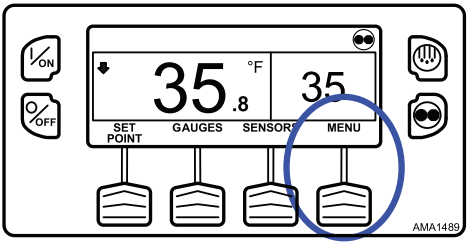
Gauges

The Gauges Menu allows the operator to view the unit gauges and I/O conditions. The unit gauges can always be viewed from the Main Menu. This is necessary if the GAUGES Soft Key on the Standard Display has been reassigned to a different function.

Displaying Gauges

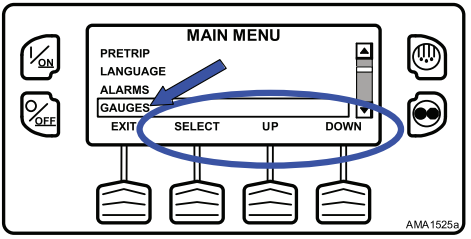
Gauges are displayed using the Gauges Menu. From the Standard Display, press the MENU Key (Figure 100, p. 88).

Figure 100. Menu Key



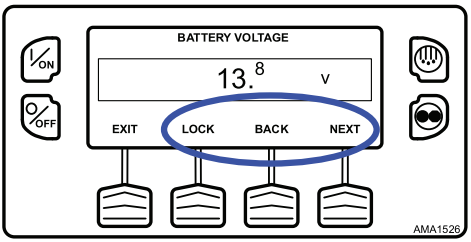
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Gauges Menu. When the Gauges Menu is selected, press the SELECT Key to choose the Gauges Menu (Figure 101, p. 88).

Figure 101. Up, Down, Select Keys



The first gauge display will appear. Press the NEXT and BACK Keys to scroll through the gauges and I/O conditions. Pressing the LOCK Key will lock the current gauge on the display (Figure 102, p. 89).

Figure 102. Next, Back, Lock Keys



The gauges and I/O conditions available are described in “Using the Gauges Key”. Not all gauges or I/O conditions may appear depending on unit configuration and software revision.

To return to the Main Menu, press the EXIT Key. To return to the Standard Display, press the EXIT Key again.

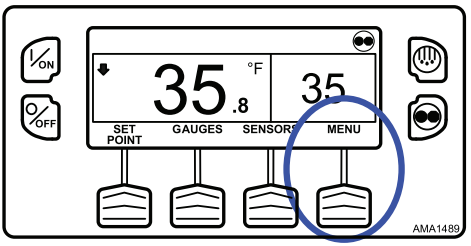
Sensors

The Sensors Menu allows the operator to view the unit and CargoWatch Data Logger temperature sensors. The sensors can always be viewed from the Main Menu. This is necessary if the SENSORS Soft Key on the Standard Display has been reassigned to a different function.

Displaying Sensors

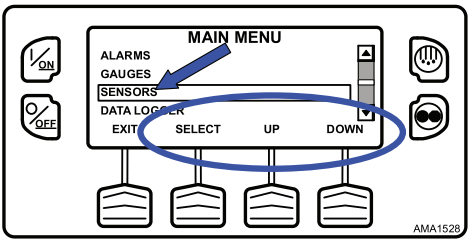
Sensors are displayed using the Sensors Menu. From the Standard Display, press the MENU Key (Figure 103, p. 89).

Figure 103. Menu Key



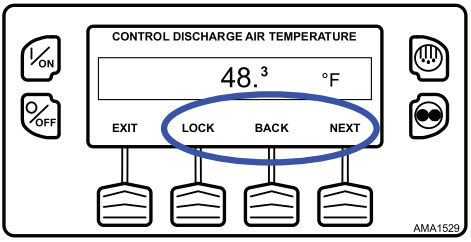
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Sensors Menu. When the Sensors Menu is selected, press the SELECT Key to choose the Sensors Menu (Figure 104, p. 90).

Figure 104. Up, Down, Select Keys



The first sensors display will appear. Press the NEXT and BACK Keys to scroll through the sensors and I/O conditions. Pressing the LOCK Key will lock the current sensor on the display (Figure 105, p. 90).

Figure 105. Next, Back, Lock Keys



The sensors available are described in "Using the Sensors Key," p. 64.

To return to the Main Menu, press the EXIT Key. To return to the Standard Display, press the EXIT Key again.

Data Logger (CargoWatch)

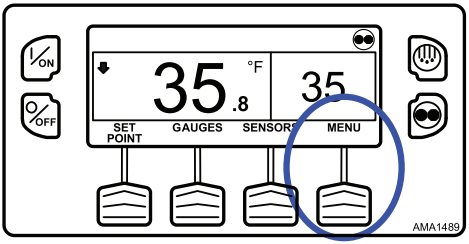
The CargoWatch Data Logger is physically located in the HMI Control Panel. It can support up to 6 optional temperature sensors.

When shipped from the factory, CargoWatch sensors 1 and 2 are turned on to be logged and CargoWatch sensors 3 through 6 are turned off. Also, digital input 1 is turned on to be logged and digital inputs 2 through 4 are turned off. Sensors and digital inputs can be turned on, off and configured using the CargoWatch menu in Guarded Access or with WinTrac. The CargoWatch Data Logger can also be configured using the USB Flash Drive OptiSet Plus Feature.

A Start of Trip can be sent to the unit ServiceWatch and CargoWatch Data Loggers. In addition, the CargoWatch Data Logger contents can be printed with a hand-held printer.

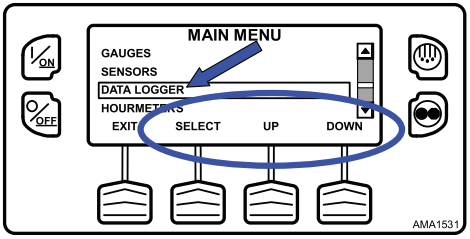
The ServiceWatch and CargoWatch Data Logger are accessed using the Data Logger Menu. From the Standard Display, press the MENU Key (Figure 106, p. 91).

Figure 106. Standard Screen, Menu Key



The Main Menu will appear. Press the UP or DOWN Key as required to choose the Data Logger Menu. When the Data Logger Menu is selected, press the SELECT Key to choose the Data Logger Menu (Figure 107, p. 91).

Figure 107. Up, Down, Select Keys

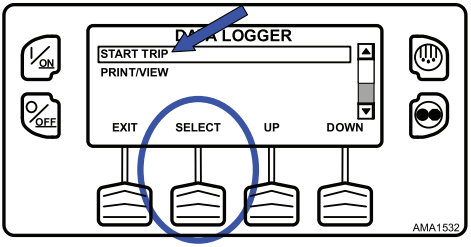


The Data Logger Menu will appear.

Sending Start of Trip Marker to CargoWatch and ServiceWatch Data Loggers

To send a Start of Trip marker to the CargoWatch and ServiceWatch Data Loggers, press the SELECT Key. The display will briefly show START OF TRIP COMPLETE to confirm that a Start of Trip marker was set in the CargoWatch Data Logger (Figure 108, p. 92).

Figure 108. Select Key, Start of Trip Complete

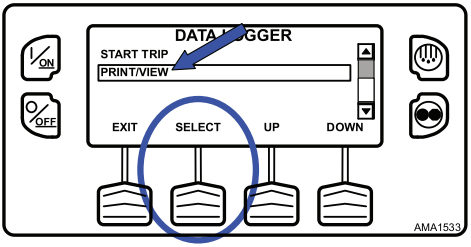


Note: *The start of trip marker is sent to both the CargoWatch and ServiceWatch data loggers.*

Printing CargoWatch Data Logger Reports

Press the DOWN Key to select the PRINT / VIEW feature and press the SELECT Key to choose Print/View (Figure 109, p. 92).

Figure 109. Select Key, Print/View



The Print Data Menu will appear. The first Print Data Menu allows the operator to print a Delivery Ticket using a hand held printer. Pressing the SELECT Key will print the ticket (Figure 110, p. 93). The Delivery Ticket is a short ticket that shows delivery specific details including the current temperature. A Sample Delivery Ticket is shown (Figure 111, p. 93).

Figure 110. Select Key, Print Delivery Ticket

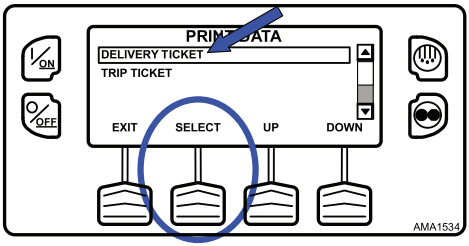
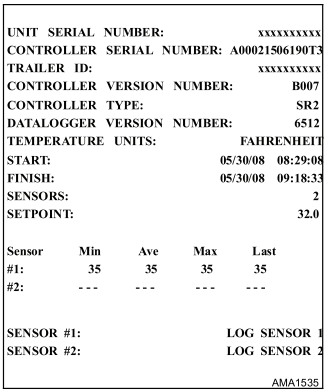


Figure 111. Sample Delivery Ticket



```
UNIT SERIAL NUMBER:                          xxxxxxxxxx
CONTROLLER SERIAL NUMBER: A00021506190T3
TRAILER ID:                                  xxxxxxxxxx
CONTROLLER VERSION NUMBER:                        B007
CONTROLLER TYPE:                                   SR2
DATALOGGER VERSION NUMBER:                        6512
TEMPERATURE UNITS:                          FAHRENHEIT
START:                                05/30/08 08:29:08
FINISH:                               05/30/08 09:18:33
SENSORS:                                             2
SETPOINT:                                         32.0

Sensor      Min      Ave      Max      Last
#1:          35       35       35       35
#2:         ---      ---      ---      ---

SENSOR #1:                              LOG SENSOR 1
SENSOR #2:                              LOG SENSOR 2

                                                AMA1535
```

Pressing the DOWN Key allows the operator to print a Trip Ticket using a hand held printer. Press the SELECT Key to print the ticket (Figure 112, p. 93). The Trip Ticket is a long ticket that shows details for the current trip including a temperature history. The Trip Ticket is also called a Journey Ticket. A sample Trip Ticket is shown (Figure 113, p. 94).

Figure 112. Select Key, Print Trip Ticket

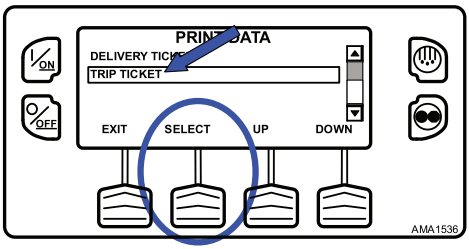
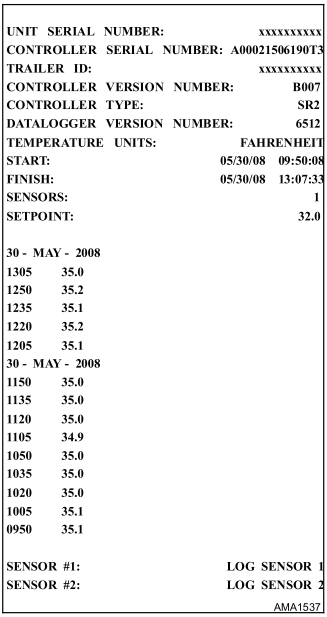


Figure 113. Sample Trip Ticket



```
UNIT SERIAL NUMBER:                    xxxxxxxxxx
CONTROLLER SERIAL NUMBER: A00021506190T3
TRAILER ID:                            xxxxxxxxxx
CONTROLLER VERSION NUMBER:                  B007
CONTROLLER TYPE:                             SR2
DATALOGGER VERSION NUMBER:                  6512
TEMPERATURE UNITS:                    FAHRENHEIT
START:                          05/30/08  09:50:08
FINISH:                         05/30/08  13:07:33
SENSORS:                                        1
SETPOINT:                                    32.0

30 - MAY - 2008
1305      35.0
1250      35.2
1235      35.1
1220      35.2
1205      35.1
30 - MAY - 2008
1150      35.0
1135      35.0
1120      35.0
1105      34.9
1050      35.0
1035      35.0
1020      35.0
1005      35.1
0950      35.1

SENSOR #1:                        LOG SENSOR 1
SENSOR #2:                        LOG SENSOR 2
                                          AMA1537
```

To return to the Main Menu press the EXIT Key. To return to the Standard display press the EXIT Key again.

Hourmeters

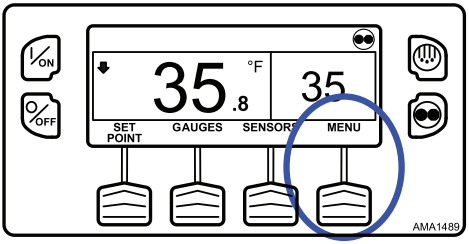
The Hourmeters Menu allows the operator to view the unit hourmeters that have the view feature enabled in the Guarded Access Menu. If the view feature for a particular hourmeter is not enabled, that hourmeter will continue to accumulate time but cannot be viewed from the Main Menu. However, all hourmeters can be viewed from the Maintenance Menu, even if they are not enabled. The hourmeters shown below are implemented.

Viewing Hourmeters

Only Hourmeters that have been enabled in Guarded Access are shown from the Main Menu. The Hourmeters can be viewed only.

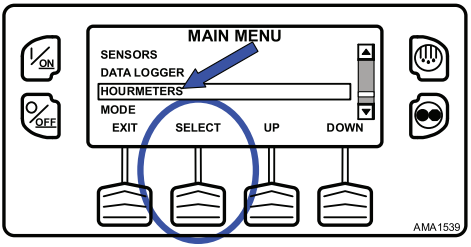
Hourmeters are displayed using the Hourmeter Display. From the Standard Display, press the MENU Key (Figure 114, p. 95).

Figure 114. Menu Key



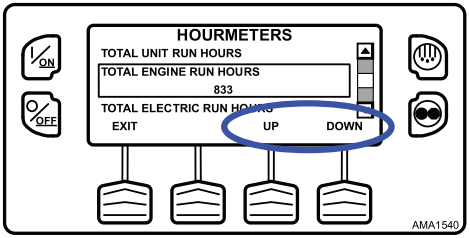
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Hourmeter Menu. When the Hourmeter Menu is selected, press the SELECT Key to choose the Hourmeter Menu (Figure 115, p. 95).

Figure 115. Select Key



Press the NEXT or PREVIOUS Key to scroll through the hourmeters (Figure 116, p. 95).

Figure 116. Up/Down Keys



Hourmeter names and definitions are shown below in the order they appear. Only hourmeters enabled in the Guarded Access Menu will be shown. To return to the Standard Display, press the EXIT Key.

When shipped from the factory, only these hourmeters are enabled for viewing from the Main Menu:

- Total Unit Run Hours
- Total Engine Run Hours
- Total Electric Run Hours

To return to the Main Menu, press the EXIT Key. To return to the Standard Display, press the EXIT Key again.

Hourmeter Names and Definitions

Only configured hourmeters that have been enabled in the Viewable Hourmeter Setup Menu will be shown:

Hourmeter Name	Definition
Total Hours	Total number of hours the unit has been turned on (protection hours).
Total Run Time Hours	Total number of hours the unit has run in both diesel and electric mode.
Engine Hours	Total number of hours the unit has run in diesel mode.
Electric Run Hours	Total number of hours the unit has run in electric mode.
Total Run Reminder 1	User Programmable - The number of hours before a Total Unit Run Time Maintenance Reminder 1 occurs.
Total Run Reminder 2	User Programmable - The number of hours before a Total Unit Run Time Maintenance Reminder 2 occurs.
Controller Power On	Total hours the controller and HMI Control Panel have been turned on.
Pretrip Reminder	User Programmable - number of hours before a Pretrip Reminder occurs.
Engine Reminder 1	User Programmable - The number of hours before an Engine Run Time Maintenance Reminder 1 occurs.
Engine Reminder 2	User Programmable - The number of hours before an Engine Run Time Maintenance Reminder 2 occurs.

Hourmeter Name	Definition
Electric Reminder 1	User Programmable - The number of hours before an Electric Run Time Maintenance Reminder 1 occurs.
Electric Reminder 2	User Programmable - The number of hours before an Electric Run Time Maintenance Reminder 2 occurs.

Important: *If a programmable hourmeter is not enabled or the view for that hourmeter is not turned on it will not appear in the display sequence.*

Mode

The Mode Menu allows the operator to change the unit operating modes that have been enabled in Guarded Access. Only Operating Modes that have been enabled from the Guarded Access > Main Menu Configuration Menu will be shown.

- Turns Off Cycle Sentry Mode/Turns On Cycle Sentry Mode (If Cycle Sentry is turned Off unit runs in Continuous). Note that selecting Cycle Sentry Mode or Continuous Mode can also be accomplished using the Cycle Sentry Key to the right of the display.
- Allows temperature to be displayed in either Fahrenheit or Celsius degrees (if enabled from the Guarded Access > Main Menu Configuration Menu).
- Allows the optional Fresh Air Exchange door to be opened or closed (if enabled from the Guarded Access > Hardware Configuration Menu).
- Allows Keypad Lockout to be selected (if enabled from the Guarded Access > Main Menu Configuration Menu).
- Allows Sleep Mode to be set up and started (if enabled from the Guarded Access > Main Menu Configuration Menu).

When shipped from the factory, only the Cycle Sentry/Continuous Mode is enabled.

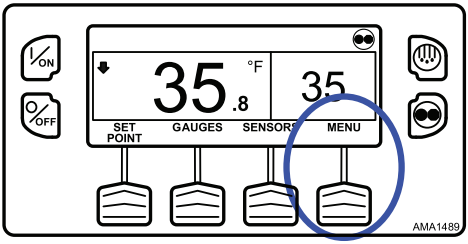
If OptiSet Plus is in use, some modes may not be available.

To return to the Main Menu press the EXIT Key. To return to the Standard display press the EXIT Key again.

Using the Change Mode Menu

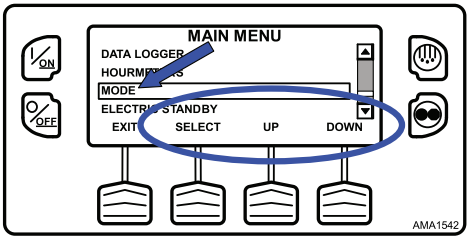
Mode changes are made using the Mode Menu. From the Standard Display, press the MENU Key (Figure 117, p. 98).

Figure 117. Menu Key



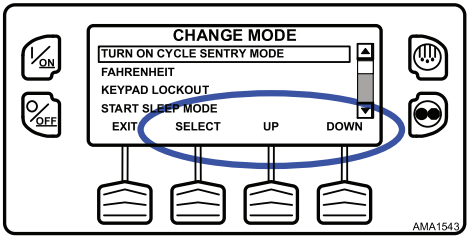
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Mode Menu. When the Mode Menu is selected, press the SELECT Key to choose the Mode Menu (Figure 118, p. 98).

Figure 118. Up, Down, Select Keys



The first enabled Change Mode Menu selection will appear. To choose that function, press the SELECT Soft Key. To Scroll through the enabled features in the Change Mode Menu, press the UP and DOWN Soft Keys (Figure 119, p. 98).

Figure 119. Select, Up, Down Keys



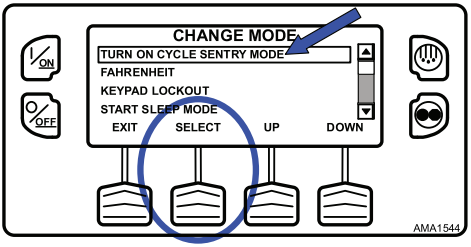
Possible mode selections are shown later in this section.

- Only those modes that have been enabled will appear. Only the Cycle Sentry Menu is enabled on factory units.
- Not all modes may be available, depending on OptiSet Plus usage and the settings of other programmable features.
- To return to the Standard Display press the EXIT Key.
- The modes shown below may be available.

Turn Cycle Sentry On or Off

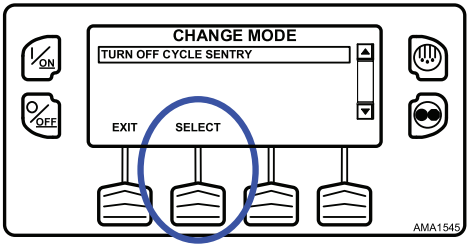
Cycle Sentry Mode can be turned On or Off if Cycle Sentry Mode is allowed by OptiSet Plus. If Cycle Sentry is turned off, the unit runs in Continuous mode, unless Continuous Mode is not allowed by OptiSet Plus. Either Cycle Sentry or Continuous operation can be disabled via OptiSet Plus. From the Main Menu > Change Mode menu choose Turn On/Off Cycle Sentry Mode and press the SELECT Soft Key (Figure 120, p. 99).

Figure 120. Select Key



If the unit is running in Cycle Sentry Mode, press the SELECT Soft Key (Figure 121, p. 99) to turn off Cycle Sentry Mode as shown.

Figure 121. Select Key



Confirmation screens will appear briefly, the unit will switch to Continuous Mode operation and the Cycle Sentry Icon will disappear.

To turn Cycle Sentry back on, press the SELECT Key again.

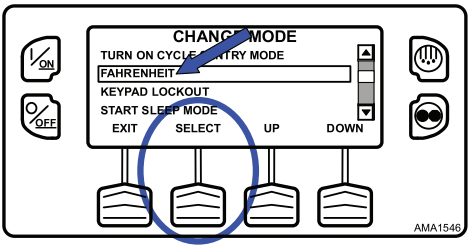
To leave this menu without changing the setting, press the EXIT Soft Key. To return to the Standard Display, press the EXIT Soft Key again.

Note: *Cycle Sentry Mode can also be turned on and off using the Cycle Sentry Key on the HMI Control Panel.*

Select Temperature Units

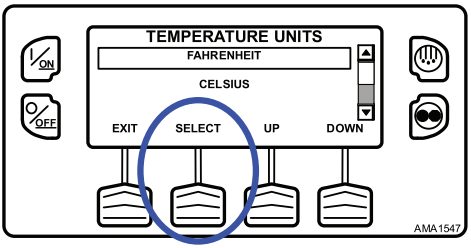
If this feature enabled in Guarded Access > Main Menu Configuration, the operator can select temperature units to be displayed as either degrees Fahrenheit or degrees Celsius. From the Main Menu > Change Mode menu choose Fahrenheit or Celsius and press the SELECT Soft Key (Figure 122, p. 100).

Figure 122. Fahrenheit or Celsius, Select Key



Choose the desired Temperature Units using the UP and DOWN Soft Keys and press the SELECT Soft Key to select the choice (Figure 123, p. 100).

Figure 123. Up, Down, Select Keys



Temperatures will be displayed in the selected units.

- To leave this menu without changing the setting, press the EXIT Soft Key. To return to the Standard Display, press the EXIT Soft Key again.

Fresh Air Exchange Open or Closed

If installed and enabled in Guarded Access > Main Menu Configuration, the Fresh Air Exchange option allows fresh outside air to be drawn into the trailer and the interior air to be exhausted by opening the Fresh Air Exchange door. This feature is beneficial when hauling loads that release gas as they ripen, such as potatoes. The Fresh Air Exchange feature is only available with setpoints above 32°F (0°C). The feature is disabled with setpoints of 32°F (0°C) and below. This feature may not be available if OptiSet Plus is in use.

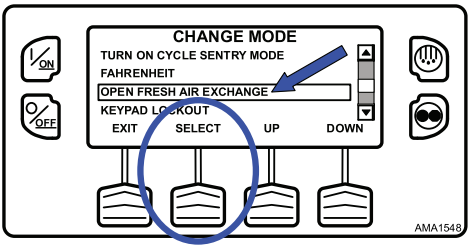
Important: *The Fresh Air Exchange feature should be used exactly as specified by the customer.*

The Fresh Air Exchange door will only be open when the unit engine is running. The door will close when the engine shuts down to preserve unit battery life.

The setting of the Fresh Air Exchange door will survive power off/power on cycles, if the door is set to “Open” by the operator, it will continue to open any time the engine is running until it is set to “Close” by the operator.

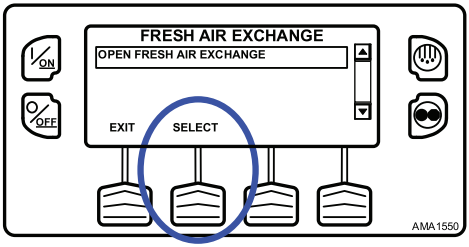
From the Change Mode menu choose Open Fresh Air Exchange and press the SELECT Soft Key (Figure 124, p. 101).

Figure 124. Select Key



To open the Fresh Air Exchange door press the SELECT Key as shown below.

Figure 125. Select Key



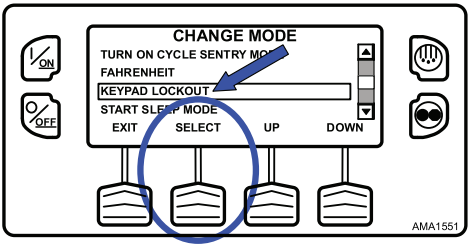
The Fresh Air Exchange door will open. To close the Fresh Air Exchange door press the SELECT Key again.

To leave this menu without changing the setting, press the EXIT Soft Key. To return to the Standard Display, press the EXIT Soft Key again.

Keypad Lockout

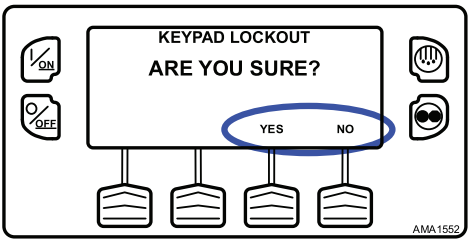
If enabled in Guarded Access > Main Menu Configuration, the keypad can be locked to prevent unauthorized use. If the keypad is locked, only the On Key and Off Key function. The keypad will remain locked even if the unit is turned off and back on. If Keypad Lockout is active, press and hold any soft key for five seconds to deactivate the feature. To turn the feature on, from the Change Mode menu choose Keypad Lockout and press the SELECT Soft Key (Figure 126, p. 102).

Figure 126. Select Key



A Confirmation Request will appear. To activate Keypad Lockout press the YES Soft Key. To leave this menu without turning the Keypad Lockout feature on, press the NO Soft Key (Figure 127, p. 103).

Figure 127. Yes, No Soft Keys



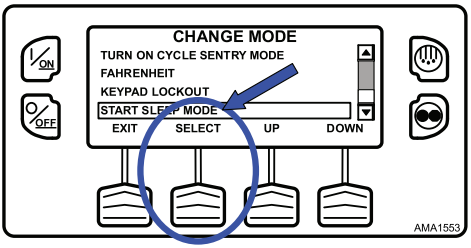
If the YES Soft Key was pressed, Keypad Lockout is active. Repeat the process to turn the Keypad Lockout feature off.

- If the keypad is locked, only the On Key and Off Key function. The keypad will remain locked even if the unit is turned off and back on.
- If Keypad Lockout is active, press and hold any soft key for five seconds to deactivate the feature.
- To return to the Standard Display, press the EXIT Soft Key again.

Start Sleep Mode

If this feature enabled in Guarded Access > Main Menu Configuration, the operator can select and set Sleep Mode from the Mode Menu. Sleep Mode is used to keep the engine warm and the battery charged when the unit is not in use. When the unit is Sleep Mode the display will show “SLEEP” and the current time. To turn the feature on, from the Change Mode menu choose Start Sleep Mode and press the SELECT Soft Key (Figure 128, p. 103).

Figure 128. Select Soft Key



The following features are available in Sleep Mode. Follow the display prompts to select and set the features.

- **Program Wakeup Time:** This feature allows a wakeup time to be specified. When the selected time is reached, the unit will start and

resume normal operation. If a Wakeup Time is selected, the following features are available:

– Day to Wake Up: This feature allows the day the unit is to wake up to be specified.

– Hour to Wake Up: This feature allows the hour the unit is to wake up to be specified.

– Minute to Wake Up: This feature allows the minute the unit is to wake up to be specified.

– Run Pretrip on Wakeup: This feature allows a Pretrip Test to be automatically run when the unit wakes up.

SmartPower™ Electric Standby Option

The Diesel/Electric Standby selection from the Main Menu allows the operator to manually select diesel or electric mode operation on units equipped with the electric standby SmartPower option. The unit can also be programmed to automatically switch to Electric Mode operation when standby power is available and to automatically switch to Diesel Mode operation if standby power fails or is removed. If the unit is programmed to automatically switch from diesel to electric and/or electric to diesel, the associated screens do not appear.

- If the unit is currently operating in Diesel Mode, the ELECTRIC STANDBY selection will appear in the Main Menu.
- If the unit is currently operating in Electric Mode, the DIESEL MODE selection will appear in the Main Menu.

Electric Mode Operation

If a unit equipped with the electric standby SmartPower option is running in Diesel Mode, the Diesel to Electric Auto-Switch feature is set NO and the unit is connected to a source of standby power, this feature allows the operator to manually select electric mode operation. This feature does not appear if the electric standby SmartPower option is not installed or if the Diesel to Electric Auto-Switch feature is set YES.

Diesel Mode Operation

If a unit equipped with the electric standby SmartPower option is running in Electric Mode and the Electric to Diesel Auto-Switch feature is set NO, this feature allows the operator to manually select diesel mode operation. This feature does not appear if the electric standby SmartPower option is not installed or if the Electric to Diesel Auto-Switch feature is set YES.

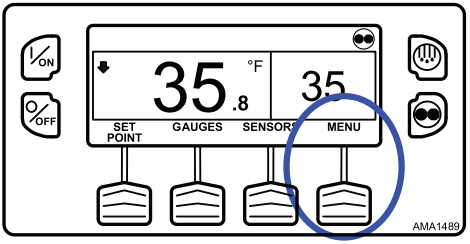
Switching from Diesel to Electric

If the unit is running in Diesel Mode and the Diesel to Electric Auto-Switch Enabled feature in Guarded Access is set YES, the unit will automatically switch to Electric Mode operation when standby power is connected and available. The screens shown will not appear.

If the unit is running in Diesel Mode and the Diesel to Electric Auto-Switch Enabled feature in Guarded Access is set NO, the unit can be switched to Electric Mode using the Electric Standby selection from the Main Menu.

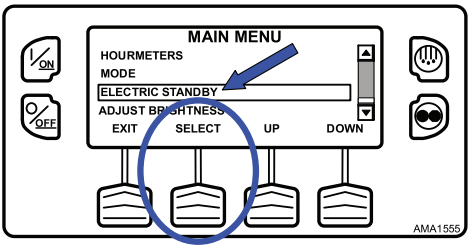
From the Standard Display, press the MENU Key (Figure 129, p. 105).

Figure 129. Menu Key



From the Main Menu choose Electric Standby and press the SELECT Soft Key (Figure 130, p. 105).

Figure 130. Select Key



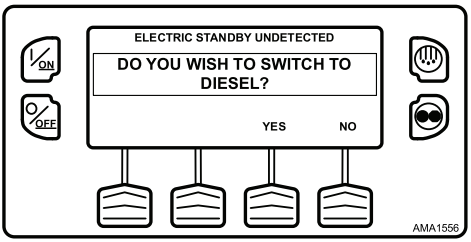
If the unit has standby power available and is turned on, the electric standby run screen will appear. The new mode is confirmed for 10 seconds. The unit will start and run in Electric Mode.

Any engine related Shutdown Alarms become Log Alarms when the unit is switched to Electric Mode operation. If the unit is switched back to Diesel Mode, these alarms again become Shutdown Alarms.

Electric Standby Power Fails or is Disconnected

If the electric standby power source fails or is disconnected and manual switching to Diesel Mode is selected, the unit will prompt for a switch to Diesel Mode (Figure 131, p. 106).

Figure 131. Diesel Mode Prompt



- Pressing the YES Soft Key will switch unit operation back to Diesel Mode.
- Pressing the NO Soft Key will allow the unit to remain in Electric Mode even though standby power is not available.

The unit will not run and Alarm Code 91 Check Electric Ready Input will be set as a Prevent Alarm.

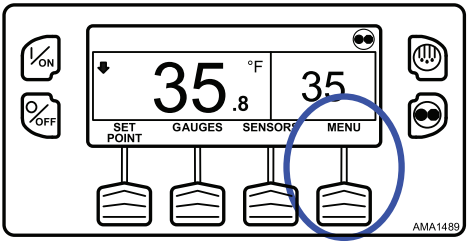
Switching from Electric to Diesel

If the unit is running in Electric Mode and the Electric to Diesel Auto-Switch Enabled feature in Guarded Access is set YES, the unit will automatically switch to Diesel Mode operation when standby power is no longer available. The screens shown will not appear.

If the Diesel to Electric Auto-Switch Enabled feature in Guarded Access is set NO and standby power is disconnected or fails, the unit will not automatically switch to Diesel mode. This is primarily designed to prevent unauthorized diesel engine starts when the truck is indoors or on a ferry where engine operation is strictly prohibited.

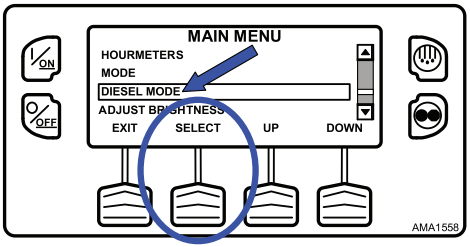
From the Standard Display, press the MENU Key (Figure 132, p. 107).

Figure 132. Menu Key



From the Main Menu choose Diesel Mode and press the SELECT Soft Key (Figure 133, p. 107).

Figure 133. Select Key



The new mode is confirmed for 10 seconds. The unit will start and run in Diesel Mode.

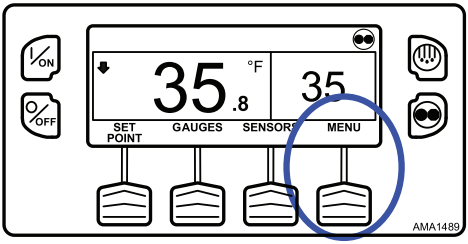
Any electric standby related Shutdown Alarms become Log Alarms when the unit is switched to Diesel Mode operation. If the unit is switched back to Electric Mode, these alarms again become Shutdown Alarms.

Adjust Brightness

The brightness of the HMI Control Panel display can be adjusted to allow for changing ambient light conditions. The choices available to the operator are HIGH, MEDIUM, LOW, and OFF. OFF actually results in a very dim screen suitable for low light conditions.

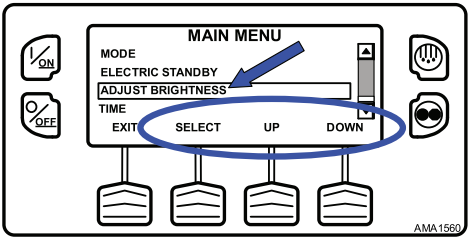
Display brightness is adjusted using the Adjust Brightness Menu. From the Standard Display, press the MENU Key (Figure 134, p. 108).

Figure 134. Menu Key



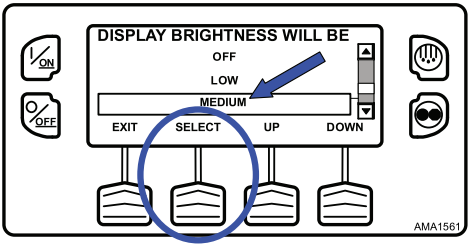
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Adjust Brightness Menu. When the Adjust Brightness is selected, press the SELECT Key to choose the Adjust Brightness (Figure 135, p. 108).

Figure 135. Select Key



The Display Brightness menu will appear as shown. Press the UP or DOWN Soft Keys to select the desired display brightness. When the desired brightness is shown, press the SELECT Soft Key to confirm the choice (Figure 136, p. 108).

Figure 136. Select Key

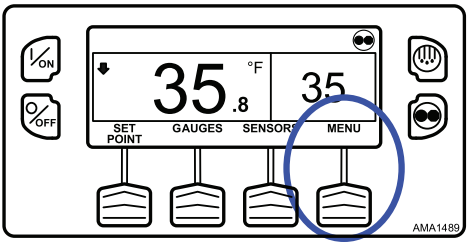


To return to the Main Menu press the EXIT Key. To return to the Standard Display, press the EXIT Key again.

Time

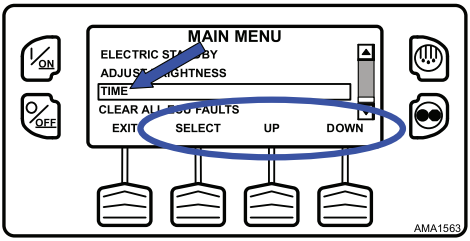
The Time and Date held by the HMI Control Panel can be checked. Time and Date cannot be changed from the Main Menu. The time and date is accessed using the Main Menu. From the Standard Display, press the MENU Key (Figure 137, p. 109).

Figure 137. Menu Key



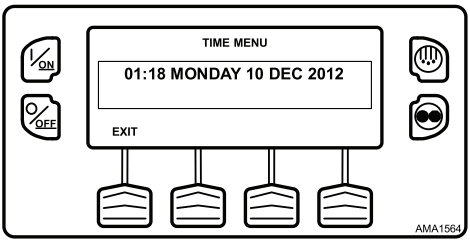
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Time Menu. When the Time Menu is selected, press the SELECT Key to choose the Time Menu (Figure 138, p. 109).

Figure 138. Select Key



The date and time held in the HMI Control Panel will be shown on the display (Figure 139, p. 110). Time and Date cannot be changed from the Main Menu.

Figure 139. Date and Time



To return to the Main Menu press the EXIT Key. To return to the Standard Display, press the EXIT Key again.

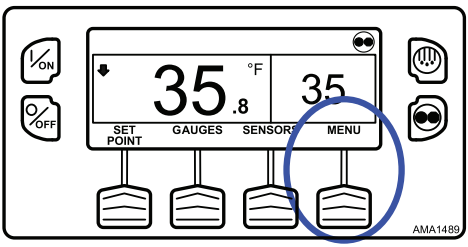
Clear All ECU Faults

Pressing this key will clear all existing Engine Control Unit (ECU) Fault Codes. This may allow continued unit operation should an ECU fault code result in engine shutdown.

- Any Thermo King Alarm Codes associated with the Engine Control Unit (ECU) Fault Codes will also be cleared.
- The Thermo King Alarm Codes and ECU Fault Codes that were cleared can be viewed in the ServiceWatch and ECU Data Loggers.

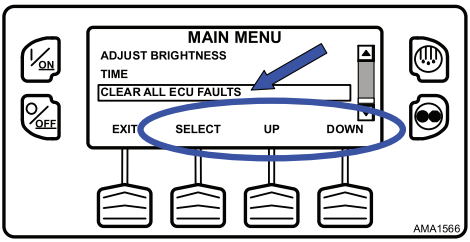
Engine Control Unit (ECU) Fault Codes are cleared using the Clear All ECU Faults Menu. From the Standard Display, press the MENU Key (Figure 140, p. 110).

Figure 140. Menu Key



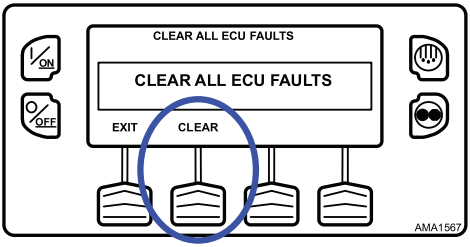
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Clear All ECU Faults Menu. When the Clear All ECU Faults Menu is selected, press the SELECT Key to choose the Clear All ECU Faults Menu (Figure 141, p. 111).

Figure 141. Select Key



The Clear All ECU Faults Prompt will appear. To clear all ECU Faults and associated Thermo King Faults, press the CLEAR Soft Key (Figure 142, p. 111).

Figure 142. Clear Key



All ECU Faults and associated Thermo King Faults will be cleared.

To return to the Main Menu press the EXIT Key. To return to the Standard Display, press the EXIT Key again.

Alarm Codes

Introduction

An alarm code is generated when the microprocessor senses an abnormal condition. Alarms direct an operator or service technician to the source of a problem.

Multiple alarms can be present at one time. All generated alarms will be stored in memory until cleared by the operator. Document all alarm occurrences and report them to the service technician.

See "Alarms Menu" in the Operator's Instructions Chapter for information about viewing and clearing alarms.

Important: *Always record any Alarm Codes that occur in the order that they occur – as well as any other pertinent information. This information is extremely valuable to service personnel.*

Notes:

1. *Some alarms (3, 4, 74, 203, and 204) cannot be cleared in the Alarms Menu, they must be cleared in the Maintenance Menu or the Guarded Access Menu. Contact your supervisor or a Thermo King dealer about clearing those alarms.*
2. *In some cases alarms cannot be cleared, or cannot be cleared after they have occurred a specified number of times. If such is the case, these alarms must be cleared by a service technician.*

Alarm Types

There are four types of alarms.

Log Alarms

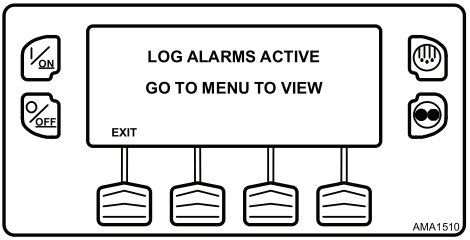
Log Alarms are indicated for 30 seconds each time the unit is turned on. This level of alarm serves as a notice to take corrective action before a problem becomes severe. Maintenance items such as maintenance hourmeter time-outs are Log Alarms. The TemperatureWatch™ screen is not disabled if only Log Alarm(s) are active.

When the unit is turned on, the display will show the Thermo King Logo and then the "Configuring System" message. If Log Alarm(s) are present, the Log Alarm notice will appear on the display for 30 seconds. The remote indicator alarm light (if installed) will also be on during this period. After 30

seconds, the Standard Display will appear and the remote indicator alarm light will go off.

Note: *The Alarm Icon does not appear on startup with Log Alarms present.*

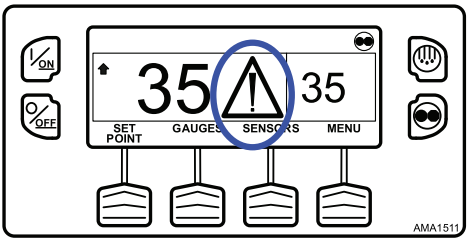
Figure 143. Log Alarms Screen



Check Alarms

Check Alarms are indicated by a steady alarm indication at the top of the display and the message “Service Required within 24 Hours”. The Alarm Icon will appear. This level of alarm serves as a notice to take corrective action before a problem becomes severe. The unit will run with Check Alarms but some features and functions may be inhibited. The TemperatureWatch screen is disabled if a Check Alarm is active.

Figure 144. Alarm Display



Prevent Alarms

Prevent Alarms are indicated by a steady alarm indication at the top of the display and the message “Service Required within 24 Hours”. The Alarm Icon will appear. The unit will be temporarily shut down if a Prevent Alarm is active. The unit will remain shut down for a timed restart interval or until the fault conditions are corrected and then restart. If the unit is in a temporary shutdown, Alarm Code 84 Restart Null will be present along with the associated Prevent Alarm. In most cases, the unit will restart with reduced

performance to determine if continued operation is possible. If the alarm does not reoccur with reduced performance, the unit will return to full performance. If the unit is operating with reduced performance, Alarm Code 85 Forced Unit Operation will also be present under some conditions. In general, if the alarm condition reoccurs a defined number of times, the alarm is set as a Shutdown Alarm and no further restarts are possible. The TemperatureWatch screen is disabled if a prevent alarm is active.

Note: *If the Restart After Shutdown feature in the Guarded Access Menu is set for CONTINUOUS, an unlimited number of restart attempts are allowed.*

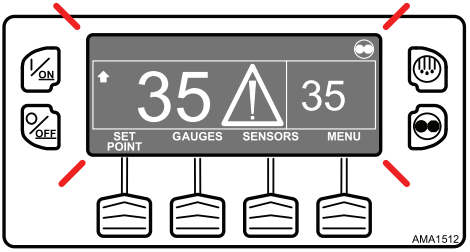
Shutdown Alarms

Depending on software revisions, Shutdown Alarms may be indicated by the following:

- The Alarm Icon will appear.
- The display and backlight will flash on and off.
- The display will switch from normal to inverted and back (light areas become dark and dark areas become light).

Shutdown Alarms will force the unit into shutdown. The unit will remain in shutdown until the Shutdown Alarm is manually cleared. Exceptions are some engine and electric Shutdown Alarms that become Log Alarms when switched to the alternate operating mode (diesel to electric or electric to diesel). The TemperatureWatch screen is disabled if a unit level Shutdown Alarm is active.

Figure 145. Shutdown Alarm Display



Pretrip Alarm Codes

If an alarm occurs during a Pretrip Test the alarm code will be displayed as Pretrip Alarm XX, where XX is the alarm code.

Clearing Alarm Codes

Most alarm codes can be cleared conventionally from the Alarm Menu using the CLEAR soft key. See the Operating Instructions chapter for procedures. The operator should contact a supervisor or a Thermo King dealer about clearing alarms using the Guarded Access Menu. Refer to (Table 1, p. 115) for alarm corrective action.

Note: *Document all alarm faults and report them to the service technician.*

There are three levels of corrective action that can be taken when an alarm condition occurs.

OK to Run: An alarm condition exists but does not affect unit operation. Corrective action can occur at a later date.

Check As Specified: An alarm condition exists that could affect unit operation. Follow diections in the Corrective Action column on the following chart.

Take Immediate Action: An alarm condition exists that will damage the unit or load. Take immediate action to correct the problem.

Note: *The corrective actions listed in the Operating Instructions chapter and in Table 1, p. 115 are suggestions only. Always consult your company for final decisions.*

Note: *Table 1, p. 115 shows all possible alarm codes for all possible applications. Not all codes will be applicable to each individual unit. Not all alarm codes are available with all microprocessor controllers or all revisions of software.*

Table 1. Table of Alarm Codes

COLOR CODE DEFINITIONS:	OK TO RUN	CHECK AS SPECIFIED	TAKE IMMEDIATE ACTION

Num		Description	Operator Action
00		No Alarms Exist	No action required.
02		Check Evaporator Coil Sensor	Manually monitor load temperature. Report alarm at end of day.
03		Check (Control) Return Air Sensor	Manually monitor load temperature. Report alarm at end of day.
04		Check (Control) Discharge Air Sensor	Manually monitor load temperature. Report alarm at end of day.
05		Check Ambient Temp Sensor	Report alarm at end of day.

Table 1. Table of Alarm Codes (continued)

COLOR CODE DEFINITIONS:	OK TO RUN	CHECK AS SPECIFIED	TAKE IMMEDIATE ACTION

Num		Description	Operator Action
06		Check Coolant Temp Sensor	Report alarm at end of day.
07		Check Engine RPM Sensor	Report alarm at end of day.
(09)		High Evaporator Temperature	Manually monitor load temperature. Report alarm at end of day.
(10)		High Discharge Pressure	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
11		Unit Controlling on Alternate Sensor	Manually monitor load temperature. Report alarm at end of day.
12		Sensor or Digital Input Shutdown	The unit is no longer able to operate and has been shut down. Repair immediately.
13		Sensor Calibration Check	Manually monitor load temperature. Report alarm at end of day.
(17)		Engine Failed to Crank	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
(18)		High Engine Coolant Temperature	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
(19)		Low Engine Oil Pressure	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
(20)		Engine Failed to Start	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
(21)		Cooling Cycle Check	Manually monitor load temperature. Report alarm at end of day.
(22)		Heating Cycle Check	Manually monitor load temperature. Report alarm at end of day.
(23)		Cooling Cycle Fault	The unit is no longer able to operate and has been shut down. Repair immediately.

Table 1. Table of Alarm Codes (continued)

COLOR CODE DEFINITIONS:	OK TO RUN	CHECK AS SPECIFIED	TAKE IMMEDIATE ACTION

Num		Description	Operator Action
(24)		Heating Cycle Fault	The unit is no longer able to operate and has been shut down. Repair immediately.
25		Alternator/Battery Charger Check	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
(26)		Check Refrigeration Capacity	Manually monitor load temperature. Report alarm at end of day.
28		Pretrip Abort	Report alarm at end of day.
31		Check Oil Pressure Switch	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
32		Refrigeration Capacity Low	The unit is no longer able to operate and has been shut down. Repair immediately.
33		Check Engine RPM	Report alarm at end of day.
35		Check Run Relay Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
(36)		Electric Motor Failed to Run	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
37		Check Engine Coolant Level	Check engine coolant level. Do not remove the cap if the engine is hot. Report alarm at end of day.
38		Electric Phase Reversed	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
39		Check Water Valve Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
40		Check High Speed Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of day.

Table 1. Table of Alarm Codes (continued)

COLOR CODE DEFINITIONS:	OK TO RUN	CHECK AS SPECIFIED	TAKE IMMEDIATE ACTION

Num		Description	Operator Action
41		Check Engine Coolant Temperature	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
42		Unit Forced to Low Speed	Report alarm at end of day.
43		Unit Forced to Low Speed Modulation	Report alarm at end of day.
44		Check Fuel System	Add fuel as necessary, otherwise report alarm at end of day.
45		Check Hot Gas or Hot Gas Bypass Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
46		Check Air Flow	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
48		Check Belts or Clutch	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
50		Reset Clock	Report alarm at end of day.
52		Check Heat Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
54		Test Mode Timeout	Service Test or Output Test timed out after 15 minutes. Report alarm at end of day.
56		Check Host Evap Fan Low Speed	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
57		Check Host Evap Fan High Speed	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
61		Low Battery Voltage	If unit is shut down repair immediately. Otherwise, report alarm at end of day.

Table 1. Table of Alarm Codes (continued)

COLOR CODE DEFINITIONS:	OK TO RUN	CHECK AS SPECIFIED	TAKE IMMEDIATE ACTION

Num	Description	Operator Action
62	Ammeter Out of Calibration	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
(63)	Engine Stopped	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
64	Pretrip Reminder	Report alarm at end of day.
65	Abnormal Temperature Differential	Report alarm at end of day.
66	Low Engine Oil Level	Check engine oil level. If unit is shut down repair immediately. Otherwise, report alarm at end of day.
67	Check Liquid Line Solenoid Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
68	Internal Controller Fault Code	Report alarm at end of day.
70	Hourmeter Failure	Report alarm at end of day.
74	Controller Reset to Defaults	Report alarm at end of day.
79	Internal Data Logger Overflow	Report alarm at end of day.
84	Restart Null	Report alarm at end of day.
85	Forced Unit Operation	Report alarm at end of day.
86	Check Discharge Pressure Sensor	Report alarm at end of day.
87	Check Suction Pressure Sensor	Report alarm at end of day.
89	Check Electronic Throttling Valve Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
90	Electric Overload	If unit is shut down repair immediately. Otherwise, report alarm at end of day.

Table 1. Table of Alarm Codes (continued)

COLOR CODE DEFINITIONS:	OK TO RUN	CHECK AS SPECIFIED	TAKE IMMEDIATE ACTION

Num		Description	Operator Action
91		Check Electric Ready Input	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
92		Sensor Grades Not Set	Report alarm at end of day.
96		Low Fuel Level	Check engine fuel level and add fuel as required.
98		Check Fuel Level Sensor	Report alarm at end of day.
108		Door Open Time-out	Close doors. Report alarm at end of day.
111		Unit Not Configured Correctly	Report alarm at end of day.
113		Check Electric Heat Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
114		Multiple Alarms - Can Not Run	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
117		Auto Switch from Diesel to Electric	Report alarm at end of day.
118		Auto Switch from Electric to Diesel	Report alarm at end of day.
120		Check Alternator Excite Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
121		Check PWM/Liquid Injection Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
122		Check Diesel/Electric Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
127		Setpoint Not Entered	Be sure setpoint is adjusted to required temperature.
128		Engine Run Time Maintenance Reminder #1	Report alarm at end of day.

Table 1. Table of Alarm Codes (continued)

COLOR CODE DEFINITIONS:	OK TO RUN	CHECK AS SPECIFIED	TAKE IMMEDIATE ACTION

Num		Description	Operator Action
129		Engine Run Time Maintenance Reminder #2	Report alarm at end of day.
130		Electric Run Time Maintenance Reminder #1	Report alarm at end of day.
131		Electric Run Time Maintenance Reminder #2	Report alarm at end of day.
132		Total Unit Run Time Maintenance Reminder #1	Report alarm at end of day.
133		Total Unit Run Time Maintenance Reminder #2	Report alarm at end of day.
134		Controller Power On Hours	Report alarm at end of day.
141		Auto-Switch Diesel to Electric Disabled	Report alarm at end of day.
143		Check Remote Zone Drain Hose Heater Output	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
144		Lost Expansion Module CAN Communication	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
145		Loss of Controller "On" 8XP Feedback Signal	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
146		Software Version Mismatch	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
148		Auto-Switch Electric to Diesel Disabled	Report alarm at end of day.
150		Out of Range Low (HMI)	Manually monitor load temperature. Report alarm at end of day.
151		Out of Range High (HMI)	Manually monitor load temperature. Report alarm at end of day.
157		OptiSet File Mismatch	Report alarm at end of day.
158		Primary Software Failed to Load	Report alarm at end of day.

Table 1. Table of Alarm Codes (continued)

COLOR CODE DEFINITIONS:	OK TO RUN	CHECK AS SPECIFIED	TAKE IMMEDIATE ACTION

Num		Description	Operator Action
159		Check Battery Condition	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
160		Lost Radio Expansion Board (REB) CAN Communication	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
203		Check Display Return Air Sensor	Manually monitor load temperature. Report alarm at end of day.
204		Check Display Discharge Air Sensor	Manually monitor load temperature. Report alarm at end of day.
233		REB Transitioning From Conservative to Full Null	Report alarm at end of day.
234		Check Relative Humidity Sensor	Report alarm at end of day.
251		REB Mis-configured	Report alarm at end of day.
252		Check Auto Fresh Air Exchange	Report alarm at end of day.
508		Speed Request Communications Error	Report alarm at end of day.
509		Engine Control Unit (ECU) Failed to Enable	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
510		Engine Control Unit (ECU) Run Signal Failed	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
511		Engine Wait to Start Time Delay Expired	Report alarm at end of day.
517		Water in Fuel	Report alarm at end of day.
518		Generator Ground Fault	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
519		Check Battery Charger Input Power	If unit is shut down repair immediately. Otherwise, report alarm at end of day.

Table 1. Table of Alarm Codes (continued)

COLOR CODE DEFINITIONS:	OK TO RUN	CHECK AS SPECIFIED	TAKE IMMEDIATE ACTION

Num		Description	Operator Action
520		Check Battery Charger Output Power	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
521		Battery Charger External / Environmental Faults	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
522		Battery Temperature Sensor Alarm	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
523		Battery Charger Indicated Conditions	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
524		Generator Operational Limit, V out to Frequency Ratio	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
525		Generator Frequency Range Fault	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
526		Generator Operational Limit Output Current	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
528		Controller Not Receiving Messages From Battery Charger	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
529		Check Fuel Pump Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
538		Engine J1939 CAN Datalink Degraded (Electronic Engine Only)	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
539		Engine J1939 CAN Datalink Failed (Electronic Engine Only)	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
599		Engine Service Tool Connected	Maintenance information only. Report alarm at end of the day.

Table 1. Table of Alarm Codes (continued)

COLOR CODE DEFINITIONS:	OK TO RUN	CHECK AS SPECIFIED	TAKE IMMEDIATE ACTION

Num		Description	Operator Action
600		Check Crankshaft Speed Sensor	Report alarm at end of day.
601		Check Camshaft Speed Sensor	Report alarm at end of day.
602		Check Intake Throttle Position Sensor	Report alarm at end of day.
603		Check Exhaust Pressure Sensor	Report alarm at end of day.
604		Check Coolant Temperature Sensor	Report alarm at end of day.
605		Check Fresh Air Temperature Sensor	Report alarm at end of day.
607		Check Fuel Temperature Sensor	Report alarm at end of day.
608		Check Rail Pressure Sensor	Report alarm at end of day.
609		Check Intake Pressure Sensor	Report alarm at end of day.
610		Check Atmospheric Pressure Sensor	Report alarm at end of day.
611		Check Glow Plug Circuit	Report alarm at end of day.
612		Check Intake Throttle Circuit	Report alarm at end of day.
613		Check Injector(s)	Report alarm at end of day.
614		Check High Pressure Fuel Pump	Report alarm at end of day.
615		Rail Pressure Fault	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
616		Engine Overspeed	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
617		Internal ECU Fault	If unit is shut down repair immediately. Otherwise, report alarm at end of day.
618		Check EGR	Report alarm at end of day.
619		ECU Main Relay Fault	Report alarm at end of day.

Table 1. Table of Alarm Codes (continued)

COLOR CODE DEFINITIONS:	OK TO RUN	CHECK AS SPECIFIED	TAKE IMMEDIATE ACTION

Num		Description	Operator Action
623		TRU CAN Message Timeout	Report alarm at end of day.
624		Check EGR Temperature Sensor	Report alarm at end of day.
625		Check Intake Air Temperature Sensor	Report alarm at end of day.
626		Check Exhaust Temperature Sensor	Report alarm at end of day.
699		Unknown ECU Fault	If unit is shut down repair immediately. Otherwise, report alarm at end of day.

Loading and Inspection Procedures

This chapter describes pre-loading inspections, loading procedures, post-loading procedures, post-loading inspections, and enroute inspections. Thermo King refrigeration units are designed to maintain the required product load temperature during transit. Follow these recommended loading and enroute procedures to help minimize temperature related problems.

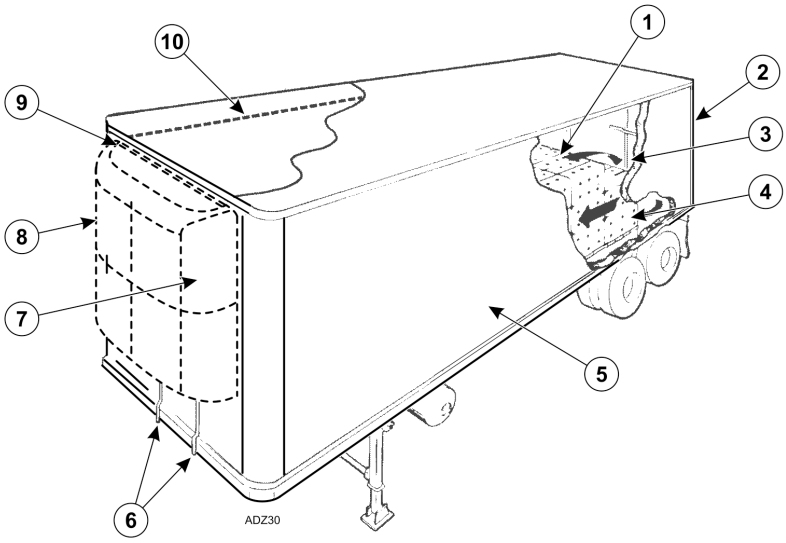
Note: *When in doubt as to the correct refrigeration requirements and/or loading procedures, call your company office for instructions.*

Pre-Loading Inspection

1. Pre-cool products before loading. Note any variances on the manifest.
2. Inspect door seals and vent doors for condition and a tight seal with no air leakage.
3. Inspect the trailer inside and out. Look for:
   - Damaged or loose trailer skin and insulation
   - Damaged walls, air ducts, floor channels, or “T” flooring
   - Clogged defrost drain tubes
   - Blocked return air bulkhead
4. Verify that the setpoint temperature is correct for your cargo. Pre-cool the trailer as required.
5. Supervise product loading to ensure sufficient air space around and through the load. Airflow around cargo must not be restricted.

   Note: *If the warehouse is not refrigerated, operate the unit with the doors closed until cargo is ready to be loaded. Then turn off the unit, open the cargo doors and load cargo. When cargo is loaded, close trailer doors and restart the unit. The unit can be operated with the cargo box doors open if the truck is backed into a refrigerated warehouse and the dock door seals fit tightly around the trailer.*

Figure 146. Loading Considerations



1.	Correct load height (trailers without chutes)	6.	Clear defrost drains
2.	Tight doors and seals	7.	Good outside air circulation
3.	Good air circulation around load	8.	Unit inspection
4.	Proper cargo temperature (**prior** to loading)	9.	Tight seals
5.	Interior/exterior walls and insulation in good condition	10.	Maximum load height followed

Post-Loading Inspection

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

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

Note: *The unit can be operated with the cargo box doors open if the truck is backed into a refrigerated warehouse and the dock door seals fit tightly around the trailer.*

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

   Important: *Cargo must be pre-cooled to proper temperature before loading. The unit is designed to maintain temperature, not cool an above-temperature load.*

4. Close or supervise the closing of the cargo box doors. Verify they are securely locked.
5. Verify the setpoint is at the temperature listed on the manifest.
6. If the unit was stopped, restart using the correct starting procedure. See the Operating Instruction chapter in this manual.
7. Start a manual defrost cycle 30 minutes after loading. See the Manual Defrost procedure in the manual.

Enroute Inspections

Complete the following enroute inspection every four hours. This will help minimize temperature related problems.

Inspection Procedure

1. Verify setpoint is correct.
2. Check the return air temperature reading. It should be within the desired temperature range.
3. Initiate a manual defrost cycle after each enroute inspection.

Inspection Troubleshooting

1. If a temperature reading is not within the desired temperature range, refer to the troubleshooting table (Table 2, p. 129). Correct problem as required.
2. Repeat the Enroute Inspection every 30 minutes until the compartment temperature is within the desired temperature range. Stop the unit if the compartment temperature is not within the desired temperature range on two consecutive 30 minute inspections, especially if the compartment temperature appears to be moving away from the setpoint.
3. Immediately contact the nearest Thermo King Service Center or your company office.

4. Take all necessary steps to protect and maintain proper load temperature.

NOTICE

Cargo Loss!

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

Table 2. Inspection Troubleshooting

Problem: A return air temperature reading is not within desired temperature range of the setpoint.	
Cause	**Remedy**
The unit has not had time to cool down to correct temperature.	Refer to the load log history. Look for above temperature load records, properly pre-cooled cargo compartment, length of time on road, etc. Correct as required. Continue monitoring return air temperature until the reading is within the desired temperature range of the setpoint.
The unit may have a low refrigerant charge.	Check the receiver tank sight glass for refrigerant level. If fluid is not showing in the receiver tank sight glass, the refrigerant charge may be low. A competent refrigeration technician is required to add refrigerant or repair the system. Contact the nearest Thermo King dealer, authorized Service Center, or call the Thermo King Cold Line for referral. Consult the Table of Contents for Cold Line information.
The unit is in defrost or has just completed a defrost cycle.	Monitor the return air temperature after the defrost cycle is completed to see if the temperature returns to the desired temperature range of the setpoint.
The evaporator is plugged with frost.	Initiate a manual defrost cycle. The defrost cycle will automatically terminate when complete. Continue monitoring the return air temperature until the reading is within the desired temperature range of the setpoint.
Improper air circulation in the cargo compartment.	Inspect the unit and cargo compartment to determine if the evaporator fan (3) are working properly circulation the air. Poor air circulation may be due to improper loading of the cargo, shifting of the load, or depending on unit, fan belt slippage or faulty electrical fans. Correct as required. Continue monitoring return air temperature until problem is corrected.

Table 2. Inspection Troubleshooting (continued)

Problem: A return air temperature reading is not within desired temperature range of the setpoint.	
Cause	**Remedy**
The unit did not start automatically.	Determine the cause for not starting. Correct as required. Continue monitoring return air temperature until reading is within desired temperature range of the setpoint.
Multi-Temp Units Only– The unit is being used to cool/ heat a single temperature load and does not have the capacity to cool the entire trailer.	A multi-temperature unit may not have the cooling or heating capacity to maintain a specific temperature range throughout an entire trailer.

Jump Starting

If unit battery is discharged or run down, unit may be jump started using jumper cables and another battery or vehicle. Consider the following precautions and be careful when jump starting a unit.

⚠ 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.

⚠ CAUTION

Hazard of Explosion!

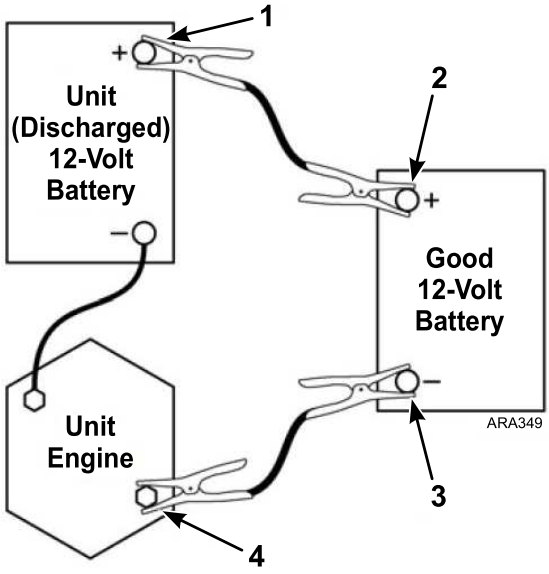
Unhook the semi tractor from the trailer before using the tractor to jump start the unit on the trailer. The negative ground circuit is complete when the tractor is hooked to the trailer. This can cause dangerous sparks when the positive connection is made at the battery.

Important: *Make sure to use a 12 volt battery to jump start unit. If you are using a vehicle, make sure it has a 12 volt battery with a negative ground system. Do not use a "hot shot" booster device or a 24 volt source.*

Read and understand the following procedure completely before connecting and jumper cables. Use good jumper cables made with #2 gauge (or larger) cables.

1. Verify unit is turned off. If you are using a vehicle, verify its ignition is also turned off.
2. Open front doors on unit. Battery is located on the right of engine.
3. Check discharged battery to verify it is not damaged or frozen. Do not jump start a damaged or frozen battery. Check vent caps to verify they are tight.
4. Identify positive (+) and negative (–) battery terminals.
5. Remove red cover from positive (+) battery terminal on the unit's battery.

Figure 147. Sequence for Connecting Jumper Cables



1.	Positive (+) Terminal on Unit Battery
2.	Positive (+) Terminal on Good Battery
3.	Negative (−)Terminal on Good Battery
4.	Starter Mounting Bolt on Unit Engine

6. Connect the red positive (+) jumper cable to the positive (+) battery terminal on the unit's battery. Do not let the other end of the jumper cable touch anything that conducts electricity.

⚠ WARNING

Hazard of Explosion!

Allowing the positive (+) jumper cable to short to ground can produce dangerous sparks.

7. Connect the other end of the red positive (+) jumper cable to the positive (+) battery terminal on the good battery.

8. Connect the black negative (–) jumper cable to the negative (–) battery terminal on a good battery. Do not let the other end of the jumper cable touch anything that conducts electricity.
9. Connect the black negative (–) jumper cable to the lower starter mounting bolt on the unit's engine.
10. If you are using a vehicle to jump start the unit, start the vehicle and let it run for a few minutes. This will help charge the discharged battery.

⚠ DANGER

Risk of Injury!

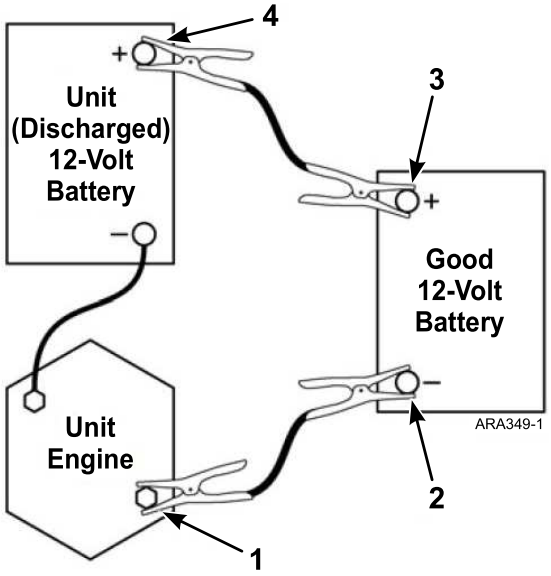
Keep your hands, clothing, and tools clear of fans and/or belts when working on a unit that is running or when opening or closing compressor service valves. Loose clothing might entangle moving pulleys or belts, causing serious injury or possible death.

11. Turn the unit on and let it start automatically or start it manually. If the unit will not crank or start, contact a qualified technician.

    Note: *Some units with microprocessors will show an alarm code and will not try to start the unit until battery voltage is above 10 volts.*

12. After the unit starts, remove the jumper cables in reverse order: black negative (–) from the unit starter mounting bolt, black negative (–) from the good battery, red positive (+) from the good battery, and red positive (+) from the unit battery (that was discharged).

Figure 148. Sequence for Disconnecting Jumper Cables



1.	Starter Mounting Bolt on Unit Engine
2.	Negative (−)Terminal on Good Battery
3.	Positive (+) Terminal on Good Battery
4.	Positive (+) Terminal on Unit Battery

Specifications

Engine

Note: *New diesel engine models started being installed in units beginning the 4th quarter of 2020. Some engine components along with maintenance and inspection procedures are different between engine models. Refer to the information located on top of the engine to determine which model engine is in your unit, or contact your Thermo King Dealer for assistance.*

Model/Engine	C-600: TK486V25 changed to TK486V25L1 4th quarter 2020. S-600: TK488CR changed to TK488CR1 2nd quarter 2021. S-700: TK488CRH changed to TK488CRH1 2nd quarter 2021.
Fuel Type	No. 2 diesel fuel under normal conditions No. 1 diesel fuel is acceptable cold weather fuel ***Note:*** *The sulfur content must be less than or equal to 15 ppm, the fuel must be free of zinc, and comply with the latest release of ASTM D975, EN 590, or JIS K2204.*
Oil Capacity	12 quarts (11.4 liters) crankcase and oil filter. Fill to full mark on dipstick
Oil Type	C-600: Requires API Classification CI-4 or better. ***Important:*** *This oil type must be used to meet Federal Regulations based on EPA 40 CFR Part 89.* S-600 and S-700 (only): Requires API Classification CJ-4 or better. ***Important:*** *This oil type must be used together with ULSD fuel to prevent damage to the DOC.*
Recommended oil viscosity based on ambient temperature	14 to 122 F (-10 C to 50 C): SAE 15–W-40 (Synthetic) 5 to 104 F (-15 to 40 C): SAE 15W-40 5 to 104 F (-15 to 40 C): SAE 10W-30 (Synthetic or Synthetic Blend) -13 to 104 F (-25 to 40 C): SAE 10W-40 -13 to 86 F (-2 to 30 C): SAE 10W-30 -22 to 122 F (-30 to 50 C): SAE 5W-40 (Synthetic) Below -22 F (-30 C): SAE 0W-30 (Synthetic)
Engine Coolant Type	Chevron/Delo XLC - a nitrite-free Extended Life Coolant (ELC) Use a 50/50 concentration

NOTICE

System Contamination!

Do not add other types of coolant to cooling systems using Chevron/Delo XLC except in an emergency. If another type of coolant is added, the coolant must be changed to Chevron/Delo XLC when available.

Coolant System Capacity	7.5 quarts (7.1 liters)
Radiator Cap Pressure	15 psig (103 kPa)
Engine Coolant Thermostat	160 F (71 C)

Refrigeration System

Contact your Thermo King dealer for refrigeration system service or maintenance.

Electrical Control System

Low Voltage	12.5 Vdc
High Voltage	200-210 Vac from AC generator at engine low speed. 345 Vac from AC generator at engine high speed. **⚠ DANGER** **Hazardous Voltage!** All inspection or service procedures of the high voltage systems should only be done by an authorized Thermo King dealer.
Battery	One, Group C31, 12 volt battery. The battery must be suitable for deep cycling, heavy duty and rated with a minimum of 95 amp/hr. Thermo King ReliaMax 925N (925 CCA) wet cell battery is recommended for both warm and cold climates. Thermo King EON (1150 CCA) AGM battery is recommended for extreme climates and for Rail Ready (RR), Domestic Refrigerated Container (DRC), and Trailer on Flat Car (TOFC) applications. ***Note:*** *If the unit is not going to be used for an extended period of time, turn the Microprocesor On/Off Power Switch to the OFF position to maximize battery life.*
Fuses	Refer to Fuses ("Unit Protection Devices," p. 29).
Battery Charging	12 volt, 37 amp, brush type, Thermo King Alternator.

Electrical Standby (SmartPower Unit Only)

Note: *A transformer is used to convert 460 Vac to 230 Vac for the condenser and evaporator fan motors in units configured to use electric standby input voltage of 460 Vac.*

Electric Motor and Overload Relay

Voltage/ Phase/ Frequency	Horse-power	Kilowatts	RPM	Full Load (amps)	Overload Relay Setting (amps)
230/3/60	12.0	9.0	1760	31.2	34
460/3/60	12.0	9.0	1760	15.6	20
460/3/60	19.0	14.2	3500	21.7	32

Standby Power Cord Requirements (SmartPower Units Only)

Supply Circuit Breaker	12 HP Motor 230/3/60 – 70 amps 12 HP Motor 460/3/60 – 40 amps 19 HP Motor 460/3/60 – 60 amps
Extension Cord Size	12 HP Motor 230/3/60 (all 4 conductor, 2000 Vac, Type W Power Cable) – 8 AWG Power Cable, 25 to 50 foot length 12 HP Motor 230/3/60 – 6 AWG Power Cable, 75 foot length 12 HP Motor 460/3/60 – 10 AWG Power Cable, up to 75 foot length 19 HP Motor 460/3/60 – 8 AWG Power Cable, up to 75 foot length

Maintenance Inspection Schedule

Pretrip	Every 1,500 Hours	Every 3,000 Hours*	Annual/ 4,500 Hours	As Needed	Inspect/Check/Service These Items
					Microprocessor:
•					Run Pretrip Test. (see "Performing a Pretrip Test").
					Engine:
•					Check fuel supply.
•					Check engine oil level.
•	•	•	•		Inspect belts for condition and proper tension.
•	•	•	•		Check engine oil pressure hot, on high speed (should display "OK").
•	•	•	•		Listen for unusual noises, vibrations, etc.
•	•	•	•		Check engine coolant level and antifreeze protection (-30 F [-40 C]).
	•	•	•		Drain water from fuel tank and check vent.
	•	•	•		**TK486V25 and TK486V25L1 Engines Only:** Inspect/clean electric fuel pump filter.
	•	•	•		**TK488CR and TK488CRH Engines Only:** Inspect/clean electric fuel pump prefilter screen.
	•	•	•		**TK488CR1 and TK488CRH1 Engines Only:** Inspect/clean the fuel strainer / pressure regulator assembly prefilter screen.
	•	•	•		**TK486V25 and TK486V25L1 Engines Only:** Check and adjust engine speeds (high and low speed).

Pretrip	Every 1,500 Hours	Every 3,000 Hours*	Annual/ 4,500 Hours	As Needed	Inspect/Check/Service These Items
	•	•	•		Check condition of drive coupling bushings.
			•		Check engine mounts for wear.
		•			Replace EMI 3000 air cleaner element (see "EMI 3000 Air Cleaner") at 3,000 hours or two years (whichever occurs first). See Note.
		•			Replace EMI 3000 fuel filter/water separator. See Note.
		•			**TK488CR and TK488CRH Engines Only:** Replace EMI 3000 fuel filter/water separator. See Note. **TK488CR1 and TK488CRH1 Engines Only:** Replace the primary and secondary fuel filters. See Note.
				•	**TK488CR1 and TK488CRH1 Engines Only:** Drain water separator as needed. Alarm Code 517 indicates water level high and separator needs draining.
		•			Change engine oil and oil filter (hot). Requires oil with API Classification CJ-4 or CK-4 (ACEA Rating E6 for Europe). See Note.
		•			**TK 486V25, TK488CR and TK488CRH Engines Only:** Adjust engine valve clearance.
				•	**TK486V25L1, TK488CR1 and TK488CRH1 Engines Only:** Adjust engine valve clearance.
		•			**TK488CR and TK488CRH Engines Only:** Inspect/clean EGR system. Cleaning the valve and piping is recommended. Cleaning the cooler is required for emissions compliance.

Pretrip	Every 1,500 Hours	Every 3,000 Hours*	Annual/ 4,500 Hours	As Needed	Inspect/Check/Service These Items
				•	**TK488CR1 and TK488CRH1 Engines Only:** Inspect/clean EGR system. Clean as necessary schedule. No scheduled EGR system maintenance required. If an EGR valve alarm code (618 / P148A) occurs on an engine with less than 5,000 total engine hours, clean the EGR valve and cooler as necessary to eliminate the Alarm Code.
		•			**TK486V25 and TK486V25L1 Engines Only:** Test fuel injection nozzles at least every 3,000 hours. Based on EPA 40 CFR Part 89.
			—		Change ELC (red) engine coolant every 5 years or 12,000 hours. Units equipped with ELC have an ELC nameplate on the expansion tank (see "Engine Cooling System").
			—		**TK486V25 and TK486V25L1 Engines Only:** Replace fuel return lines between fuel injection nozzles every 10,000 hours.
Note: *Units equipped with Severe Duty Filtration Package - Replace air cleaner element, replace fuel filter/water separator, and change engine oil and oil filter every 4,000 hours.*					
					Electrical:
	•	•	•		Inspect battery terminals and electrolyte level.
	•	•	•		Inspect wire harness for damaged wires or connections.
	•	•	•		Inspect AC generator and alternator wire connections for tightness.
			•		Inspect electric motors.
			•		Inspect and, if required, re-torque all electrical connections on the contactors in the Fan Control Box to 15 in-lb (1.7 N•m).

Pretrip	Every 1,500 Hours	Every 3,000 Hours*	Annual/ 4,500 Hours	As Needed	Inspect/Check/Service These Items
			•		Inspect and, if required, re-torque all electrical connections on the contactors in the High Voltage Box in SmartPower units. Torque the connections on the Compressor Motor Contactor, Phase Contactors, and Overload Relay to 22 in-lb (2.5 N•m). Torque the connections on all other contactors to 15 in-lb (1.7 N•m).
					Refrigeration:
•	•	•	•		Check refrigerant level.
	•	•	•		Check for proper suction pressure.
	•	•	•		Check compressor oil level and condition.
			•		Check compressor efficiency and pump down refrigeration system.
			•		Empty oil collection container mounted on compressor.
			—		Replace dehydrator and check discharge and suction pressure every two (2) years.
					Structural:
•	•	•	•		Visually inspect unit for fluid leaks.
•	•	•	•		Visually inspect unit for damaged, loose, or broken parts (includes air ducts and bulkheads).
	•	•	•		Visually inspect the top of the unit for debris, soot build up, branches, and bird nesting material – remove debris.
	•	•	•		Inspect idlers for bearing wear (noise).

Pretrip	Every 1,500 Hours	Every 3,000 Hours*	Annual/ 4,500 Hours	As Needed	Inspect/Check/Service These Items
	•	•	•		Clean entire unit including condenser and evaporator coils and defrost drains.
	•	•	•		Check all unit and fuel tank mounting bolts, brackets, lines, hoses, etc.

Serial Number Locations

Figure 149. Unit Serial Number Locations

1.	On Evaporator Housing
2.	On Frame In Engine Compartment

Figure 150. Laminated Serial Number Plate (Located Where Shown Above)

1.	Unit Serial Number
2.	Unit Model
3.	Bill of Material Number

Emergency Cold Line

If you can't get your unit operating and need assistance, you can locate a Thermo King Dealer anywhere in the United States by going to thermoking.com or by using the Thermo King North American Service Directory (available from any Thermo King dealer). If you are unable to reach a dealer, then call the Toll Free Emergency Cold Line Number (888) 887-2202. The answering service will assist you in reaching a dealer to get the help you need. The Cold Line is answered 24 hours a day by personnel who will do their best to get you quick service at an authorized Thermo King Dealer

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Warranty

Please contact your nearest Thermo King dealer for terms of the Thermo King North American Trailer Unit Limited Warranty.

EPA and ARB Supplemental Emissions Warranty Statement

Your Thermo King unit is covered by the diesel engine manufacturer's EPA and ARB Supplemental Emissions Warranty. Complete details of this emission warranty can be found at www.thermo.com/manuals reference TK 56690-9-WA.

CALIFORNIA Proposition 65 Warning

⚠WARNING:
Cancer and Reproductive Harm
www.P65Warnings.ca.gov

RCS1032

Thermo King – by Trane Technologies (NYSE: TT), a global climate innovator – is a worldwide leader in sustainable transport temperature control solutions. Thermo King has been providing transport temperature control solutions for a variety of applications, including trailers, truck bodies, buses, air, shipboard containers and railway cars since 1938. For more information, visit www.thermoking.com or www.tranetechnologies.com.

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