THERMO KING

Diagnostic Manual

SR–3 Control System
Large Truck Multi-Temperature Units

T-800/800R Spectrum, T-1000/1000R Spectrum, T-1200R Spectrum, UT-1200 Spectrum, UT-R Spectrum
T–1080S Spectrum, T-1090 Spectrum, T-1280R Spectrum

Revision F

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Introduction

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Recover Refrigerant

Note: *In the USA, EPA Section 608 Certification is required to work on refrigeration systems. In the EU, local F-gas Regulations must be observed when working on refrigeration systems.*

At Thermo King®, we recognize the need to preserve the environment and limit the potential harm to the ozone layer that can result from allowing refrigerant to escape into the atmosphere.

We strictly adhere to a policy that promotes the recovery and limits the loss of refrigerant into the atmosphere.

When working on transport temperature control systems, a recovery process that prevents or minimizes refrigerant loss to the atmosphere is required by law. In addition, service personnel must be aware of the applicable European Union, National, Federal, State, and/or Local regulations governing the use of refrigerants and certification of technicians. For additional information on regulations and technician programs, contact your local THERMO KING dealer.

Service Tools - Use the proper service tools. Gauge manifold sets should include appropriate shutoff valves or disconnects near the end of each service line.

Recovery Equipment - Recovery equipment must be used. Proper recovering, storing and recycling of refrigerants is an important part of all service work.

Service Procedures - Recommended procedures must be used to minimize refrigerant loss.

Components may be isolated by closing service valves and performing system pump-downs.

Components unable to be isolated for service must be repaired only after refrigerant is properly recovered.

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Revision History

Revision A	(Jan 2018) New manual format, added new Customer Satisfaction Survey, update software revision (F035/75C3) information throughout manual, add T-1280R Spectrum information, general updates throughout manual. Section 5: add Alarm Codes 38, 158, 159. Section 9: new section for Specifications.
Revision B	(Sep 2018) Add Tier 4/Jumper Relay information and general updates throughout manual.
Revision C	(Sep 2019) Update software revision (F040/75C4) information throughout manual, remove SR-2 information (moved to TK 56706), remove Specifications section, add T-1090 Spectrum information, replace Info Central with Asset Library throughout manual, general updates throughout manual. Section 4: add new flashload process for T-90 units. Section 5: add alarm codes 43, 44, 165. Section 6: add F11A, update A46B, G03A.
Revision D	(Sep 2021) Update to Step 3 of F11A.
Revision E	(Jun 2024) Update software version (F047) information throughout manual, add new SR-3.1 base controller (and corresponding supporting software version F100) information throughout manual, general updates throughout manual.
Revision F	(Jun 2024) Republish.

How To Use This Manual

Because not everyone is familiar with microprocessor based control systems, please take a few minutes to read this page. It explains the content and structure of this manual. This will make it easier for you to find the information you need.

Section 1 - Safety Information

This section contains the safety information for the SR-3 control system. Read this material carefully before working on the unit.

Section 2 - Hardware Description

This section describes the SR-3 control system hardware. It identifies and locates controllers, relays, LEDs, fuses, and other components and provides connector maps for all connectors.

Section 3 - Software Description

This section discusses the operation of the SR-3 control system software and programmable features. Each menu and feature is discussed individually to illustrate how they are used.

Section 4 - Operation

This section explains how to operate the SR-3 control system using both the Truck Standard Display (TSD) HMI Control Panel and Truck Premium Display (TPD) HMI Control Panel. This information is referenced by material in Section 5 Diagnostics.

Section 5 - Diagnostics

This section explains how to diagnose units equipped with the SR-3 control system. It includes both Alarm Code Diagnostics and Other Symptom Diagnostics. This section will reference material in Section 4 Operation and Section 6 Service Procedures.

Section 6 - Service Procedures

This section includes Service Procedures to assist the technician when servicing units equipped with the SR-3 control system. These procedures are referenced by the diagnostic routines in Section 5 Diagnostics.

Section 7 - Service Information

This section offers service information on the basic component parts of the SR-3 control system. It includes hardware and software history as well as interchangeability information.

Section 8 - Refrigeration Operation and Service Procedures

This section includes refrigeration Operation and Service Procedures to assist the technician when servicing units equipped with the SR-3 control system.

Section 9 - Diagrams

This section provides a diagram index of the schematic and wiring diagrams associated with this manual and where to locate them.

Control System Notes

The following procedures must be followed when working on units equipped with microprocessor based control systems.

- Never use testers consisting of a battery and a light bulb to test circuits on any microprocessor based equipment.
- The unit must be turned off before connecting or disconnecting the battery.
- Any time a graded sensor is replaced, it must be calibrated in accordance with Service Procedure A15A.
- Any time the Base Controller is replaced, the following Service Procedures must be used:
  - A02A Recording Existing Programmable Feature Settings
  - A03A Replacement of the Base Controller
  - A04A Programmable Feature Setup
- Any time welding is to be done on the unit or vehicle, Service Procedure "A26A - Welding on Units Equipped with Microprocessors," p. 338 must be followed.

Hardware and Software

This manual covers the following hardware versions and software revisions:

- SR-3 Base Controller with software F047 (Blue Colored Controller) and earlier, F100 (Green Colored Controller) and later
- Truck Standard Display (TSD) HMI Control Panel with software 2204 and earlier
- Truck Premium Display (TPD) HMI Control Panel (8 MB Memory) with software 75C7 and earlier

Compatibility:

- SR-3 Base Controller software F047 should only be used with Truck Standard Display (TSD) HMI Control Panel Revision 2204 or later. Do not use SR-3 Base Controller software F047 with earlier versions of TSD HMI Control Panel software.
- SR-3 Base Controller software F047 should only be used with Truck Premium Display (TPD) HMI Control Panel Revision 75C7 or later. Do not use SR-3 Base Controller software F047 with earlier versions of TPD HMI Control Panel software.
- WinTrac® Software Requirements: SR-3 Truck applications require WinTrac 6.11 or later.
- OptiSet™ Plus Software Requirements: SR-3 Truck applications require OptiSet Plus 9.5 or later.

Availability:

Base Controller and HMI Control Panel software revisions are available through the Dealer Portal/iService. Go to: https://portal.mythermoking.com

When Base Controller and/or HMI Control Panel flash load files are downloaded, the flash load files are downloaded as a *.ZIP file. When flashload files for these applications are unzipped, there will be three flashload files.

- The traditional *.mXX and *.cXX files will be unzipped. These two files are for use when flashloading an SR-3 unit in the traditional manner by using a Data Cable to connect the unit to a computer equipped with WinTrac™.

  Note: *Both the *.mXX and *.cXX files must be present in order to perform a flash load using a Data Cable, even though only one of them is shown by WinTrac.*

Installation:

For EMEA: Click here. Choose the appropriate software download file and select Extract All prior to flashloading.

For North America: Click here. Choose the appropriate software download file and select Extract All prior to flashloading.

When Base Controller and/or HMI Control Panel flashload files are downloaded from the Thermo King iService website, the flashload files are downloaded as a *.ZIP file. When flashload files for these SR-3 applications are unzipped, there will be three flashload files.

- The traditional *.mXX and *.cXX files will be unzipped. These two files are for use when flashloading an SR-3 unit in the traditional manner by using a data cable to connect the SR-3 unit to a computer loaded with WinTrac software.

  Note: *Both the *.mXX and *.cXX files must be present in order to perform a flashload using a data cable, even though only one of them is shown by WinTrac.*

Flashloading:

For additional information on flashloading software using a computer, WinTrac, and a data cable, refer to Service Procedure "A46A," p. 341 and "A46B," p. 341.

SR-3 truck units can also flashload HMI Control Panel and Base Controller software using a WinTrac configured USB Flash Drive. Refer to USB Flash Drive in Section 4 for details.

WinTrac Requirements:

SR-3 truck applications require WinTrac 6.11 or later in order to access all available configurable features.

Note: *WinTrac 5.7.1 can still be used to diagnose CargoWatch and ServiceWatch downloads from units with F047/F100 and 7xC8 installed.*

Customer Satisfaction Survey

Let your voice be heard!

Your feedback will help improve our manuals. The survey is accessible through any internet-connected device with a web browser.

Scan the Quick Response (QR) code or click Technical Publications TK Americas Feedback to complete the survey.

Scan the Quick Response (QR) code or click Technical Publications EMEA Feedback to complete the survey.

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THERMO KING

Section 1 - Safety Information

Danger, Warning, Caution, and Notice

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

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.

Personal Protective Equipment (PPE)

⚠ Warning

Personal Protective Equipment (PPE)!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on tags, stickers, labels, as well as the instructions below:

- **Before inspecting or servicing this unit, technicians MUST put on all PPE required for the work being undertaken (e.g., cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE, and arc flash clothing). ALWAYS refer to the applicable Material Data Safety Sheets (MSDS) and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the applicable 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.**
- **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.**

General Practices

⚠ Danger

Hazard of Explosion!

Never apply heat to a sealed refrigeration system or container. Heat increases internal pressure, which might cause an explosion resulting in death or serious injury.

⚠ 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 the applicable 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

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.

⚠ 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 the applicable 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

Confined Space Hazards!

Avoid engine operation in confined spaces and areas or circumstances where fumes from the engine could become trapped and cause serious injury or death.

⚠ Warning

Hazard of Explosion!

Never close the compressor discharge service valve when the unit is operating. Never operate the unit with the discharge valve closed (front seated). This condition increases internal pressure, which can cause an explosion.

⚠ Warning

Proper Equipment Condition!

Gauge manifold hoses must be in good condition before using them. Never let them come in contact with moving belts, fans, pulleys or hot surfaces. Defective gauge equipment can damage components or cause serious injury.

⚠ Warning

Personal Protective Equipment (PPE) Required!

Always wear goggles or safety glasses and proper PPE when working on a unit. Refrigerant liquid, oil, and battery acid can permanently damage your eyes. When working with or around hazardous chemicals, ALWAYS refer to the applicable 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

Equipment Damage and Risk of Injury!

Never drill holes into the unit unless instructed by Thermo King. Holes drilled into high voltage cables could cause an electrical fire, severe personal injury, or even death.

⚠ Warning

Risk of Injury!

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

⚠ 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.

Notice

Equipment Damage!

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

Auto Start/Stop

⚠ Caution

Risk of Injury!

The unit can start and run automatically any time the unit is turned on. Units start automatically in both Cycle Sentry mode and Continuous mode. Turn the unit On/Off switch Off and disconnect the battery before doing inspections or working on any part of the unit.

⚠ Caution

Risk of Injury!

Thermo King units may have options that allow for remote starting from a fully off state. Turn the unit On/Off switch Off and disconnect the battery before doing inspections or working on any part of the unit.

⚠ Caution

Risk of Injury!

Some electronic components are connected directly to un-switched battery power. All connections and circuits labeled with a "2" prefix are directly connected to battery power. Always disconnect the unit starting battery before servicing the unit.

Electrical Hazards

High Voltage

Important: *Many modern Thermo King units utilize dangerous AC voltage supplied from the diesel engine driven generator to operate the condenser fans and evaporator blower when the unit is operating in Diesel Mode.*

Important: *Do not move the vehicle if the power cable or the electric standby icon is illuminated.*

⚠ Danger

Hazardous Voltage!

Lethal amounts of voltage are present in some electrical circuits. Use extreme care when working on the refrigeration 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.

⚠ Warning

Hazardous Voltage!

Treat all wires and connections as if they were high voltage until a meter and wiring diagram indicate otherwise. Only use tools with insulated handles. Never hold uninsulated metal tools near exposed, energized conductors. 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.

⚠ Warning

Hazardous Voltage!

Never work alone on high voltage circuits in the refrigeration unit. Another person should be nearby to shut off the unit and provide aid in the event of an accident. 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.

⚠ Warning

Personal Protective Equipment (PPE) Required!

In the event of an electrical accident, all required PPE should be near the work area in accordance with OSHA, NFPE 70E, or other local, state, or country-specific requirements for a Category 3 risk.

⚠ Warning

Risk of Injury!

Do not make rapid moves when working on high voltage circuits in the refrigeration unit. Do not grab for falling tools because you might accidentally touch a high voltage source.

⚠ Warning

Hazardous Voltage w/Capacitors!

Be careful when working with electrical circuits that contain capacitors. Some capacitors hold a significant electrical charge that might cause burns or shocks if accidentally discharged. Capacitors must be discharged before working on electrical circuits. 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.

Low Voltage

⚠ Warning

Live Electrical Components!

Control circuits used in refrigeration units are low voltage (12 to 48 Vdc). However, the large amount of amperage available can cause severe burns if accidentally shorted to ground with metal objects, such as tools. Do not wear jewelry, watches, or rings because they increase the risk of shorting out electrical circuits and damaging equipment or causing severe burns. 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.

Other Electrical Considerations

Controller Service

Precautions must be taken to prevent electrostatic discharge when servicing the Controller and related components. A potential difference less than that required to create a small spark between a finger and a doorknob can cause severe damage to solid state components.

Notice

Equipment Damage!

When working with electrical circuits that contain microprocessors, always wear an ESD wrist strap and connect the opposite end to the chassis ground or CH terminal. This precaution will prevent electrostatic discharge from damaging circuits.

Battery

Always disconnect the negative battery terminal (-) first when removing a battery. Connect the positive terminal (+) first when installing a battery. This is important because the frame is grounded to the negative battery terminal. If the negative terminal is still connected, a complete circuit exists from the positive terminal of the battery to the frame. Metal objects contacting the positive side and the frame simultaneously will cause sparks or arcing. If there are sufficient hydrogen gases emitted from the battery, an explosion might occur, causing equipment damage, serious injury, even death.

Always cover battery terminals to prevent them from making contact with metal components.

Refrigerant Hazards

⚠ Danger

Hazardous Pressures!

Always store refrigerant in proper containers, out of direct sunlight and away from intense heat. Heat increases pressure inside storage containers, which can cause them to burst and could result in severe personal injury.

⚠ Danger

Combustible Hazard!

Do not use oxygen (O_2) or compressed air for leak testing. Oxygen mixed with refrigerant is combustible.

⚠ Warning

Hazardous Gases!

Do not use a Halide torch. When a flame comes in contact with refrigerant, toxic gases are produced. These gases can cause suffocation, even death.

⚠ 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 the applicable 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.

Notice

Equipment Damage!

When being transferred, refrigerant must be in liquid state to avoid possible equipment damage.

Refrigerant Oil Hazards

⚠ 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 the applicable 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.

Notice

Equipment Damage!

Use the correct oil in Thermo King systems to avoid damaging equipment and nullifying its warranty.

Notice

Equipment Damage!

Do not mix refrigerant oils. Mixing incompatible oils will damage the system.

Notice

Equipment Damage!

Use dedicated refrigeration equipment to prevent contaminating refrigeration systems with the wrong type of oil or refrigerant.

Notice

System Contamination!

Do not expose the refrigerant oil to the air any longer than necessary. Store refrigerant oil in an approved sealed container to avoid moisture contamination. The oil will absorb moisture, which results in much longer evacuation times and possible system contamination.

Notice

Material Damage!

Wipe up spills immediately. Refrigerant oil can damage paints and rubber materials.

Units Equipped With Telematics

⚠ Warning

Risk of Injury!

Thermo King units equipped with optional 2 way communications can be turned on and off from remote locations at any time via satellite or cellular phone. Once turned on, the units can start and run automatically at any time.

⚠ Caution

Risk of Injury!

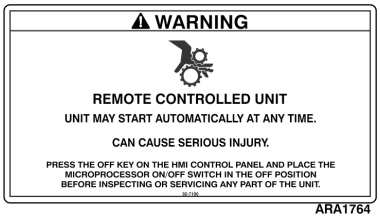
Thermo King units may have options that allow for remote starting from a fully off state. Turn the unit On/Off switch Off and disconnect the battery before doing inspections or working on any part of the unit.

Some Thermo King units may be equipped with Telematics options. These options may feature 2 way communications that include the ability to start and stop the unit from a remote location via satellite or cellular phone.

Remote Control Warning Nameplate

Units equipped with 2 way communications will feature a Warning Nameplate located next to the unit's lower door release.

Figure 1. Remote Control Warning Nameplate



ARA1764

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.
- **Skin:** 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.
- **Inhalation:** Provide fresh air. Rinse mouth and nose with water. 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.

THERMO KING

Section 2 - Hardware Description

General Description

⚠ 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.

The SR-3 control system is a self-contained temperature control unit designed for truck and trailer applications. Model 30 units are powered by a diesel engine and Model 50 units are powered by either a diesel engine or an electric motor powered from an external electric standby power source.

Tier 4 Engine

Thermo King T-1080S SPECTRUM, T-1090 SPECTRUM, and T-1280R SPECTRUM multi-temperature truck units are equipped with Tier 4 engines effective April 2013. Tier 4 engines meet all EPA 2013 Not to Exceed (NTE) Emissions Standards for less than 25 HP (19 kW) diesel engines. Tier 4 engines can be identified by checking the engine serial plate for model number.

The unit software has been modified to prevent disabling the Tier 4 Emission Controls. Units built with Tier 4 engines must be equipped with the software revisions as shown below. If these conditions are not met, the unit will not operate properly.

- Base Controller Software Revision F010 or later.
- Premium HMI Control Panel with Software Revision 75B0 or later or Truck Standard Display with Software Revision 2204 or later.

All units with Tier 4 engines are equipped with an Electronic Throttling Valve (ETV). The ETV control algorithms have been engineered to ensure that EPA 2013 (NTE) Emissions Standards are met under all unit operating conditions.

Important: *Operation of this unit requires the use of the correct Base Controller Software. Operating the unit without the correct Base Controller software may be a violation of federal law subject to civil penalty.*

Notes:

1. *"Alarm Code 163 Emission Control Failure," p. 306 has been added. This alarm will be set as a Check Alarm if conditions occur that could impact emissions.*
2. *Engine speeds on units with scroll compressors are different from previous units. Refer to the appropriate Maintenance Manual for details and engine speed settings.*

Control System

The SR-3 Control System consists of the following main components:

- Base Controller On/Off Switch
- Human Machine Interface (HMI) Control Panel
- SR-3/SR–3.1 Base Controller
- Unit Sensors and Transducers
- Refrigeration Control Components
- Engine Control Components – Tier 4 Engine Relay or Jumper Relay
- Communication Ports
- Multi-Temperature Expansion Module

Control System Overview

Figure 2. SR-3 Control System Overview

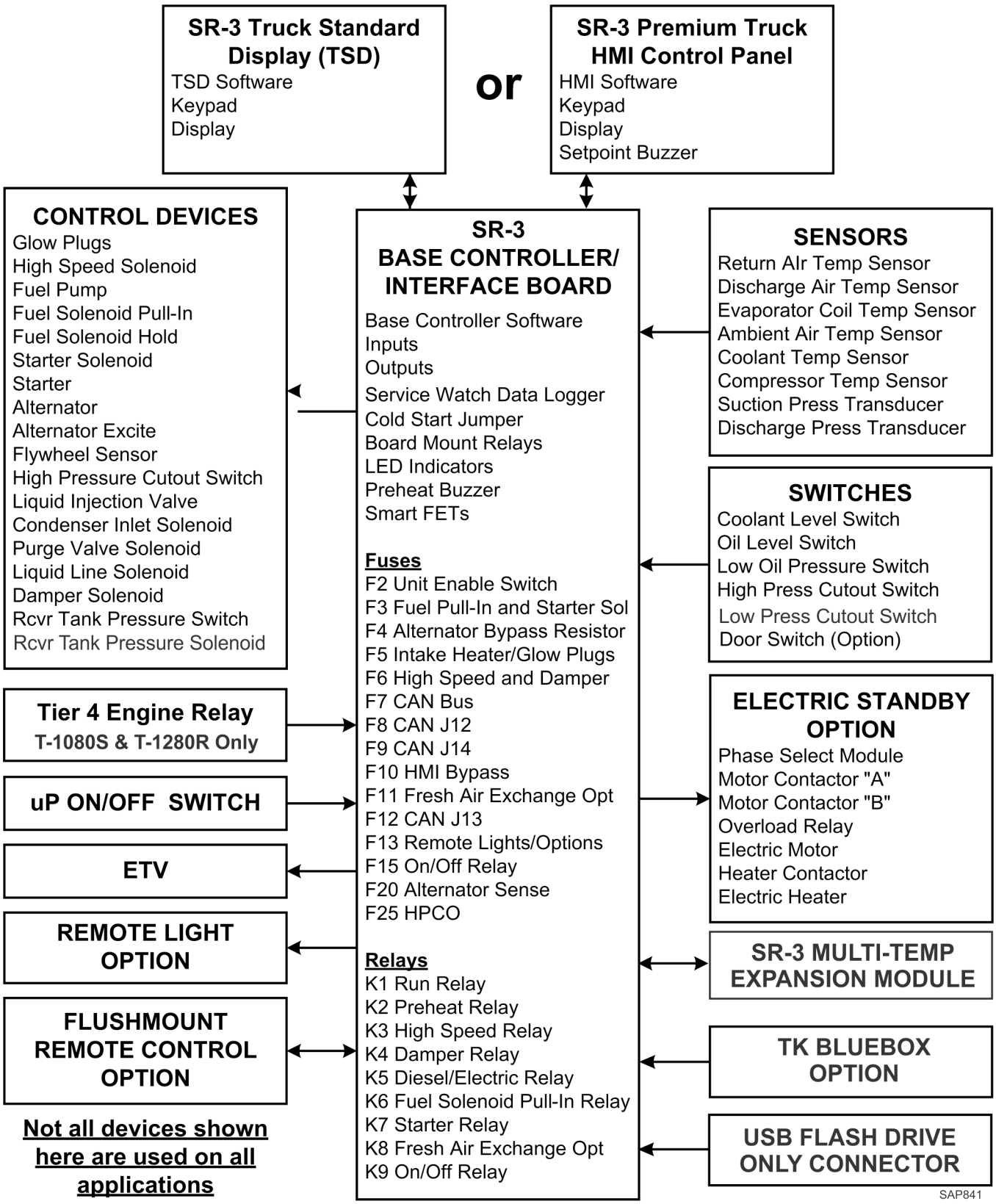
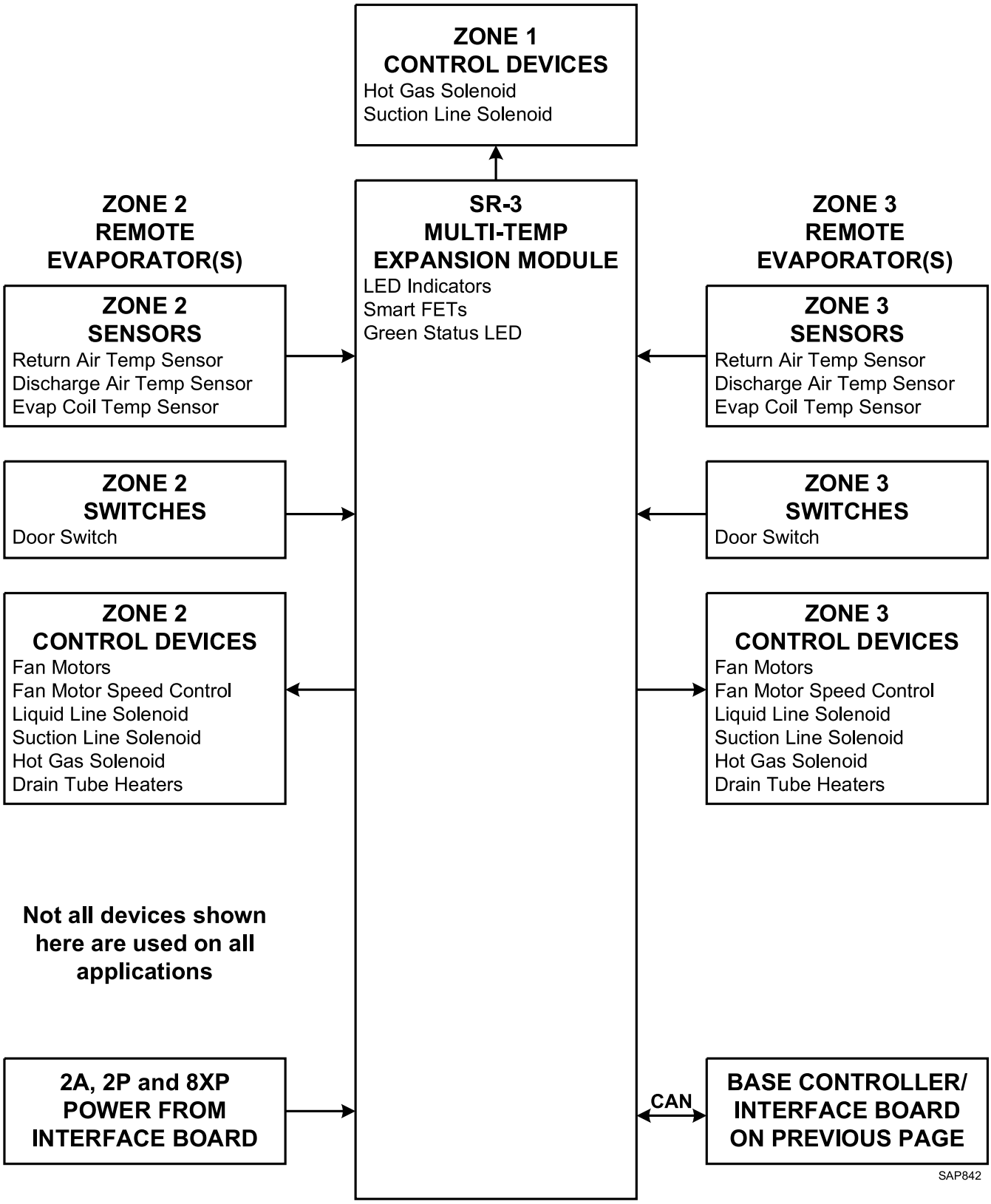


Figure 3. SR-3 Control System Overview



Control Components

The heart of the control system is the Base Controller and Interface Board. The Base Controller and Interface Board control most host unit functions.

The Base Controller and Interface Board are an integrated one-piece Base Controller/Interface Board assembly. System conditions are displayed and operator instructions are sent using the HMI Control Panel. The HMI Control Panel communicates with the Base Controller via a Controller Area Network (CAN) bus.

It is critical that the correct software be used. Multi-temperature applications with SR-3 Base Controllers must use Base Controller Software Revision F010 or later. Multi-temperature applications with SR-3.1 Base Controllers must use Base Controller Software Revision F100 or later. Refer to "Section 7," p. 361 of this manual for additional hardware and software details and requirements.

For multi-temperature applications, an Expansion Module (EM) is connected to the Base Controller/Interface Board via a Controller Area Network (CAN) communication connection. The EM provides the inputs and outputs necessary to receive information from and control the remote zone evaporators. The Expansion Module supports inputs and outputs and contains its own microprocessor and software. The EM will only execute system control instructions from the Base Controller and must be connected to the Base Controller/Interface Board. It is not capable of stand-alone operation. EM software is updated each time communications are established between the Base Controller and the Expansion Module.

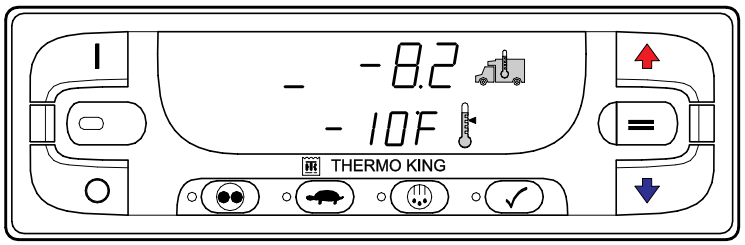
Truck Unit Controls

The Truck Standard Display HMI is supplied as standard equipment on T-80 Spectrum Series SR-3 truck applications and as an option on T-90 Spectrum SR-3 truck applications. It is used to operate the unit and display some unit information. It cannot access SR-3 truck control system menus. The Truck Standard Display communicates with the Base Controller via the Controller Area Network (CAN) bus. It is connected to the Base Controller via CAN Connector J14.

The Truck Standard Display HMI is typically located in the vehicle driver's compartment. It may be located in the truck dashboard or under the dashboard.

Refer to Section 4 for operation and additional details.

Figure 4. Truck Standard Display (TSD) HMI



SAP779

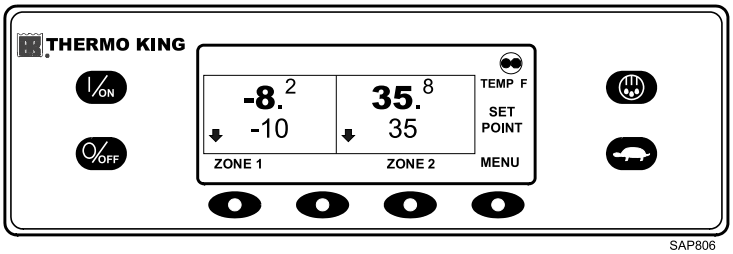
The Truck Premium Display HMI is available as an option on T-80 Spectrum Series SR-3 truck applications and as standard equipment on T-90 Spectrum SR-3 truck applications. It is used to operate the unit and display some unit information. It cannot access SR-3 truck control system menus. The Truck Standard Display communicates with the Base Controller via the Controller Area Network (CAN) bus. It is connected to the Base Controller via CAN Connector J14.

The Truck Premium Display HMI is typically located in the vehicle driver's compartment. It may be installed in the truck instrument panel or under the instrument panel.

The Truck Premium Display HMI is also available as a Mechanics HMI Control Panel. This includes a Truck Premium Display in a special protective cover, the necessary connection cables, and a storage box. The Mechanics HMI Control Panel is required to display all unit information and to access the Maintenance Menu and Guarded Access Menu on units equipped with the Truck Standard Display.

Refer to Section 4 for operation and additional details.

Figure 5. Truck Premium Display (TPD) HMI



Microprocessor On/Off Switch

⚠ 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 Service Switch (On/Off switch) in the Off position, and disconnect the battery before inspecting or servicing any part of the unit.

The Microprocessor On/Off switch is located on the outside of the control box side of the unit. The Microprocessor On/Off switch applies 12 volts DC control power to the Base Controller at connector J4. Main power to the controls is supplied by 15 amp fuse F2.

Important: *Verify the Microprocessor On/Off Switch is turned on before turning on the HMI Control Panel.*

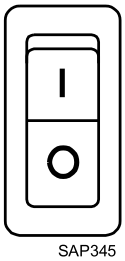
- If the Truck Standard Display HMI is turned on and the Microprocessor On/Off Switch is turned off, the HMI display screen will flash on and off.
- If the Truck Premium HMI is turned on and the Microprocessor On/Off Switch is turned off, the HMI display screen will briefly show LOST CONTROLLER POWER. The HMI will then power down.

Important:

1. *The Microprocessor On/Off switch disconnects power to the controller and most controller outputs. It does not disconnect HMI supply power. The HMI is directly connected to the unit starting battery.*
2. *Always turn the unit Microprocessor On/Off switch off before inspecting or working on any part of the unit.*
3. *To completely remove power from the unit, disconnect the unit battery.*

Figure 6. Microprocessor On/Off Switch





Over-Current Protection

Over-current protection is provided by a 60 amp fuse (F21) located in the positive battery cable. A 15 amp main power fuse (F2) is located in the "2A/2AB" circuit.

Outputs are either fuse protected or Smart FET (Field Effect Transistor) protected. All fuses are located on the Base Controller/Interface Board. Smart FETs halt current flow if an over-current condition exists. The Smart FET will reset when voltage is removed from the circuit and resume operation when the circuit is turned back on.

Real Time Clock

The real time clock is located in the HMI Control Panel. The time is supplied to the Base Controller each time the unit is turned on.

Truck Standard Display HMI

- The Truck Standard Display is equipped with Software Revision 2204 or later. This software allows the time and date held by the TSD to be viewed and set using the TSD keypad.
- Time and date can be checked and changed by connecting a computer loaded with WinTrac™ 5.7 or later software. Power must be connected to the Truck Standard HMI Control Panel and the unit must be turned off in order to check or change the time and date. Refer to Section 4 for complete details.

Truck Premium Display HMI

- The time and date held by the Truck Premium Display can be viewed and changed using the TPD keypad. Refer to Section 4 for complete details.

Important:

1. *If the unit starting battery is disconnected for an extended period, the clock setting should be checked when the unit is returned to service.*
2. *If the HMI Control Panel is changed, the clock setting should also be checked.*

ServiceWatch™ Data Logger

The ServiceWatch Data Logger is contained within the Base Controller. The ServiceWatch Data Logger records the following items:

- Thermo King Unit Serial Number
- Truck/Trailer ID
- SR-3 Serial Number
- SR-3 Software Revision
- Temperature Sensors
- Operating Modes
- Alarms Set and Cleared
- Defrost Entry and Exit
- Door Openings
- Real Time Clock Updates

The time and date used by the ServiceWatch Data Logger is loaded from the Truck Standard Display HMI or Truck Premium Display HMI each time the unit is turned on.

ServiceWatch information is viewed by connecting a computer loaded with WinTrac 5.7 or later software.

Optional Data Acquisition System (DAS)

The legacy optional DAS Data Logger (no longer sold/offered) can be installed on SR-3 Truck units. The DAS Data Logger logs cargo temperatures from up to six independent temperature sensors and also records basic unit operating information. The DAS Data Logger can output to a printer or a computer equipped with WinTrac® software. It complies with all European temperature recording.

For complete details, refer to the DAS Diagnostic Manual (TK 50565-2-OD).

Programmable Features

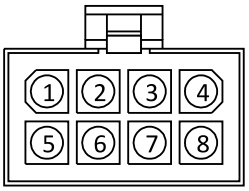
The settings of all programmable features are held in non-volatile memory in the Base Controller. The settings are supplied to the HMI Control Panel each time the unit is turned on. If the Base Controller is changed, all programmable features must be reprogrammed. If the HMI Control Panel is changed, the current programmable feature settings will be supplied to the new HMI Control Panel when the unit is turned on. Refer to Section 3 of this manual for programmable feature details.

Truck Standard Display Connector Map

Truck Standard Display Connector at the Truck Standard Display (arranged by pin number)

Pin #	Wire #	Description
1	CANL-BLUE	To J14 Pin 1 Can Connector at Base Controller
2	CANH-GREEN	To J14 Pin 2 Can Connector at Base Controller
3	SHLD	To J14 Pin 3 Can Connector at Base Controller
4	ON-RED	To J14 Pin 4 Can Connector at Base Controller
5	2A-BLACK	To J14 Pin 5 Can Connector at Base Controller
6	8XP-YELLOW	To J14 Pin 6 Can Connector at Base Controller
7	OFF-WHITE	To J14 Pin 7 Can Connector at Base Controller
8	CH-ORANGE	To J14 Pin 8 Can Connector at Base Controller

Figure 7. Truck Standard Display Connector at the Truck Standard Display (shown from pin side)



Truck Premium Display Connector Map

Note: *This connector is a molded-on connector and is not user repairable.*

Note: *For EMEA only: Since April 2016, all T-Series and UT-Series units that come with a Truck Premium Display will also come with an adapter harness as standard. Refer to Product Bulletin PB 536 and Service Bulletin SB 1070 for details.*

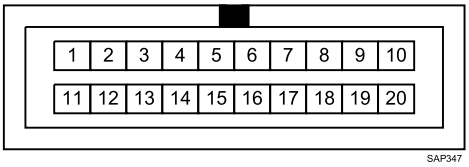
Truck Premium Display Connector at the Truck Premium Display (arranged by pin number)

Pin #	Wire #	Description
1	2A-BLUE	To J14 Pin 5 Can Connector at Base Controller
2	CH-GREEN	To J14 Pin 8 Can Connector at Base Controller
3	CANH-RED	To J14 Pin 2 Can Connector at Base Controller
4	CANL-BLK	To J14 Pin 1 Can Connector at Base Controller
5	SHIELD	To J14 Pin 3 Can Connector at Base Controller
6	DPD-PURP	To Pin 3 of 15 Pin "Sub-D" Flash Load Connector in Control Box
7	TXD-BRN	To Pin 13 of 15 Pin "Sub-D" Flash Load Connector in Control Box
8	RXD-YEL	To Pin 4 of 15 Pin "Sub-D" Flash Load Connector Pin X in Control Box
9	COM-GREY	To Pin 9 of 15 Pin "Sub-D" Flash Load Connector in Control Box
10-13		Not Used

Truck Premium Display Connector at the Truck Premium Display (arranged by pin number)

Pin #	Wire #	Description
14	8XP-WH	To J14 Pin 6 Can Connector at Base Controller
15	ON-ORAN	To J14 Pin 4 Can Connector at Base Controller
16-20		Not Used

Figure 8. Truck Premium Display Connector at the Truck Premium Display (shown from pin side)



SR-3/SR–3.1 Base Controller

⚠ 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 Service Switch (On/Off switch) in the Off position, and disconnect the battery before inspecting or servicing any part of the unit.

The heart of the integrated SR-3 control system is the Base Controller. The Base Controller is mounted on a molded plastic mounting base that is secured to the back of the control box and located on the rear panel of the control box.

Base Controller Hardware Versions

For complete details of Base Controller hardware versions and software requirements, refer to Section 7.

Base Controller Software Revisions

For complete details of Base Controller software revisions and hardware requirements, refer to Section 7.

Real Time Clock

The real time clock is located in the HMI Control Panel. The system time is supplied to the Base Controller each time the unit is turned on. If the Base Controller is changed, the clock setting will be automatically supplied to the Base Controller when the unit is turned on. If the HMI Control Panel is changed, the clock setting must be verified.

ServiceWatch Data Logger

The Base Controller contains the ServiceWatch Data Logger. The ServiceWatch Data Logger is a diagnostic data logger. This data logger records unit temperature sensors, unit setpoint, unit operating conditions, alarms and conditions that exist when an alarm is set.

When diagnosing alarm codes always download the ServiceWatch data logger using the WinTrac™ Service Tool. Review the data to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

Programmable Features

The settings of all programmable features are held in non-volatile memory in the Base Controller. The settings are supplied to the HMI Control Panel each time the unit is turned on. If the Base Controller is changed, all programmable features must be reprogrammed. If the HMI Control Panel is changed, the current programmable feature settings will be supplied to the new HMI Control Panel when the unit is turned on. Refer to Section 3 of this manual for programmable feature details.

Base Controller Operation

The Base Controller consists of an integrated microprocessor and interface board, software, memory, inputs, and outputs. The Base Controller also provides the interface between the controller inputs and outputs and the unit control components. The inputs are used to supply power and system information to the Base Controller. The Base Controller and software examine the status of the inputs and turn the outputs to the solenoids, valves and motor contactors on and off as required to control the operation of the unit. The Base Controller also provides over-current and short circuit protection for the control circuits.

The only user serviceable components on the Base Controller are the fuses and the Cold Start jumper.

The Base Controller controls the operation of the unit using control relays or Smart FETs. The relays control power to the high amperage loads such as the preheat relay, fuel solenoid pull-up coil, and starter. The Smart FETs control power to the lower amperage loads such as solenoids and valves. Each relay is individually fuse protected. The Smart FETs are self-protecting. An LED next to each relay or Smart FET is illuminated when the relay or FET is energized by the Base Controller. With relays, the LED illuminates only when the relay coil is energized and the relay contacts have transferred to the energized position.

The Base Controller can easily be identified by the color of the board. SR-3 Base Controller (2024 and earlier) is colored Blue. SR-3.1 Base Controller (2024 and later) is colored Green. Refer to "SR-3/SR–3.1 Integrated Base Controller," p. 361 for additional information.

Figure 9. SR-3 Base Controller (Blue)

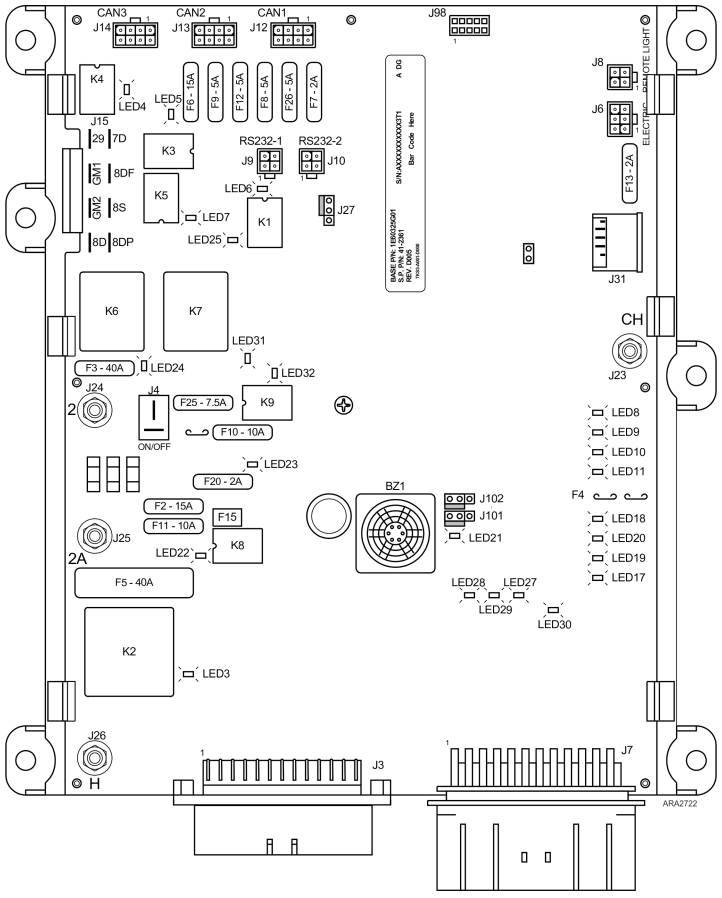
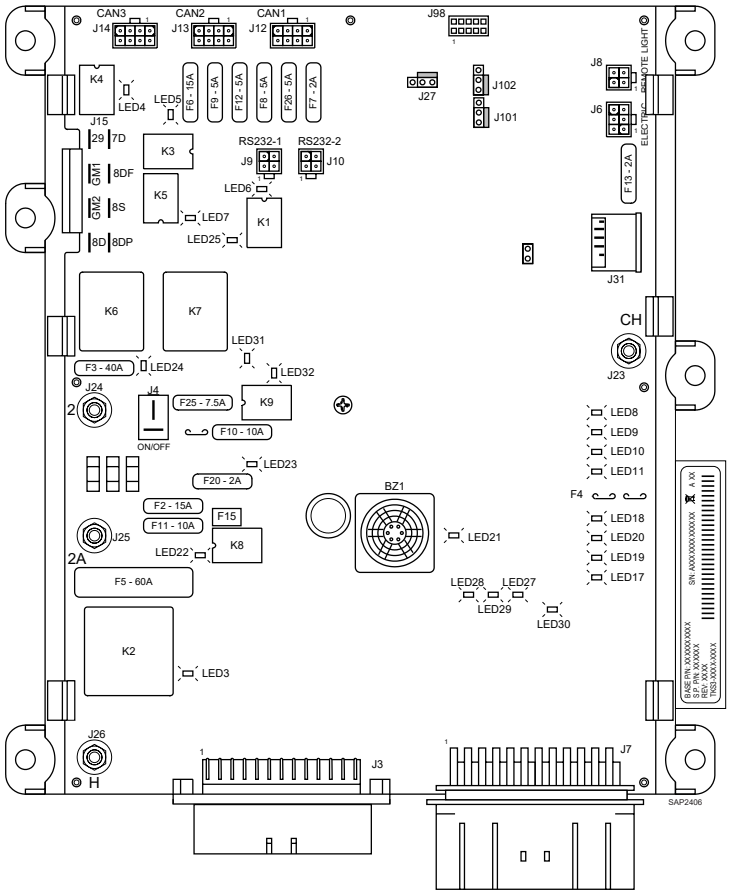


Figure 10. SR-3.1 Base Controller (Green)



Base Controller Fuse Size & Function

Fuse	Size	Function
F2	15A	Power to On/Off Switch
F3	40A	Power to Fuel Sol Pull-In/Starter Solenoid
F4	None	No fuse
F4	None or 2A	No fuse - all Bosch and TK alternators (See Note) 2A fuse - all Prestolite alternators (See Note)
F5	40A	Preheat Circuit (See Note)
F6	15A	Power to Damper and High Speed Solenoids
F7	2A	Switch On Power to CAN Bus
F8	5A	2A power to CAN Connector J12
F9	5A	2A power to CAN Connector J14
F10	10A	Power to On Relay (Right Position) Bypass HMI Control of Power (Left Position)
F11	10A	Zone 1 LLS
F12	5A	2A power to CAN Connector J13
F13	2A	Power to Remote Lights
F15	P/S	On/Off Relay (See Note)

Fuse	Size	Function
F20	2A	Power to Alternator Sense
F25	7.5A	Power to HPCO
F26	5A	Power to REB Board (Not used on T-90 Series units)

Notes:

1. *Fuse F4 must be in place for Prestolite alternators to charge. Fuse F4 must be removed for Bosch and Thermo King alternators. Service Parts Base Controllers are shipped without the F4 fuse.*
2. *The F5 preheat fuse is a "slow blow" type fuse. It is designed for use with the engine glow plugs. Always replace the fuse with the TK specified fuse. Service Parts Base Controllers are shipped without the F5 fuse.*
3. *The device identified as F15 is a polyswitch. This polyswitch provides over-current protection for the On/Off relay. The polyswitch will reset automatically and is not field repairable.*

Fuse F10

There are three in-line fuse clips that allow for two configurations of the F10 fuse. The right position is the normal position. This position has a white bar below it on the circuit board. When fuse F10 is installed in the right position, control power is routed to the K9 On/Off Relay contacts. The On/Off keys on the HMI Control Panel energize and de-energize the K9 On/Off Relay. When the K9 On/Off Relay is energized, power is supplied through the normally open K9 contacts to turn the unit on.

When fuse F10 is installed in the left position, power bypasses the K9 On/Off relay contacts and the unit will start and run without the HMI Control Panel connected. **This fuse position is for emergency bypass operation only.** Do not operate the unit with the F10 fuse installed in the left position unless absolutely necessary.

Important: *If fuse F10 is installed in the left position, the unit may start and run. If the HMI Control Panel is connected and functional, the On and Off keys will still work. The Off key will turn the unit off if fuse F10 is in the left position, but the Base Controller will remain powered up.*

Important: *If fuse F10 is installed in the left position and the unit is turned off using the Off key, the unit will shut down but the Base Controller will remain powered up. Leaving the unit turned off in this manner for an extended period may result in a dead battery.*

Fuse F15

The device identified as F15 is a poly switch. This over-current device resets automatically and is not replaceable.

Relay Functions

Important: *Do not attempt to remove the relays from the Base Controller. They are soldered in place.*

Relay	Function
K1	Run Relay
K2	Pre-Heat Relay
K3	High Speed Relay
K4	Damper Relay
K5	Diesel/Electric Relay
K6	Fuel Solenoid Pull-In Relay
K7	Starter Solenoid Relay
K8	Zone 1 Liquid Line Solenoid Relay
K9	On/Off Relay

Tier 4 Engine Relay/Jumper Relay

Note: *T-1080S Spectrum and T-1280R Spectrum units only.*

The Tier 4 Engine Relay or Jumper Relay is used only on units equipped with Tier 4 engines. Units built with Tier 4 engines must be equipped with the software revisions shown below.

- Base Controller Software Revision F010 or later.
- Premium HMI Control Panel with Software Revision 75B0 or later or Truck Standard Display with Software Revision 2204 or later.

This software is required to support the Tier 4 engine and maintain emission standards.

The Tier 4 Engine Relay or Jumper Relay is mounted in a relay socket attached to a wiring harness and is located on the cover of the electric standby high voltage control components. This cover will be present on all units equipped with Tier 4 engines.

Important: *Operation of this unit requires the correct Base Controller software. Operating the unit without the correct Base Controller software may be a violation of Federal law subject to civil penalty.*

Smart FET Outputs

A Smart FET is a self protecting output device used for the functions shown in the table. Smart FETs halt current flow if an over-current condition exists and generate an alarm. The Smart FET will resume normal operation when the alarm is cleared and current flow is within limits. Smart FETs are not field repairable. A fuse is not required.

Note: *Not all Smart FETs shown below are used on multi-temperature units.*

T-1080S Spectrum/T-1280R Spectrum/UT-1200 Spectrum

Output	Function	Output	Function
EVA, EVB, EVC, EVD	ETV Outputs	LLS	Not Used
HGB	Hot Gas Bypass Solenoid	GM1, GM2	Damper Gear Motor (See Note)
LV1	Tier 4 Relay or Jumper Relay (K10)	CIS	Condenser Inlet Solenoid
EXC	Alternator Excitation	RTPS	Receiver Tank Press Sol
WV	Not Used	PV	Purge Valve
LQI	Liquid Injection Valve (if used)		
Note: *Gear motor circuitry not present on all relay boards.*			

T-1090 Spectrum

Output	Function	Output	Function
EVA, EVB, EVC, EVD	ETV Outputs	LLS	Liquid Injection Solenoid
HGB	Hot Gas Bypass Solenoid	GM1, GM2	Damper Gear Motor (See Note)
LV1	Not Used	CIS	Condenser Inlet Solenoid
EXC	Alternator Excitation	RTPS	Receiver Tank Press Sol
WV	Not Used	PV	Purge Valve
LQI	Not Used		
Note: *Gear motor circuitry not present on all relay boards.*			

LED Functions

The LED is illuminated when the associated circuit output is energized. Not all output LEDs shown are used on multi-temperature truck applications.

LED #	Function	LED #	Function
LED 3	K2 Preheat	LED 19	Liquid Injection ValveLiquid Injection Valve (Not Used)
LED 4	K4 Damper Solenoid (Not Used)	LED 20	Water Valve (Not Used)
LED 5	K3 High Speed Solenoid	LED 21	Heartbeat (Note 1)
LED 6	K1 Run Relay	LED 22	K8 Zone 1 Liquid Line Solenoid
LED 7	K5 Diesel/Electric Relay	LED 23	K9 On/Off Relay
LED 8	Condenser Inlet Solenoid	LED 24	K6 Fuel Solenoid Pull-In
LED 9	Receiver Tank Pressure Solenoid	LED 25	K7 Starter Relay
LED 10	Hot Gas Bypass Valve (Not Used on T-1090 Spectrum)	LED 27	ETV-D (Note 2)
LED 11	Purge Valve	LED 28	ETV-B (Note 2)
LED 17	Loader Valve 1 (Not Used)	LED 29	ETV-A (Note 2)
LED 18	Alternator Excite	LED 30	ETV-C (Note 2)

Notes:

1. *The Status LED flashes once per second when the Base Controller is powered and operating normally. The Status LED flashes several times per second during a flash load. The Status LED is on without flashing during reboot and when the Base Controller is under test. The Status LED flashes twice within one second followed by one second off if a CAN communication error is present.*
2. *ETV LEDs are illuminated when the respective ETV output is energized. On applications without ETV, the LEDs may be illuminated.*

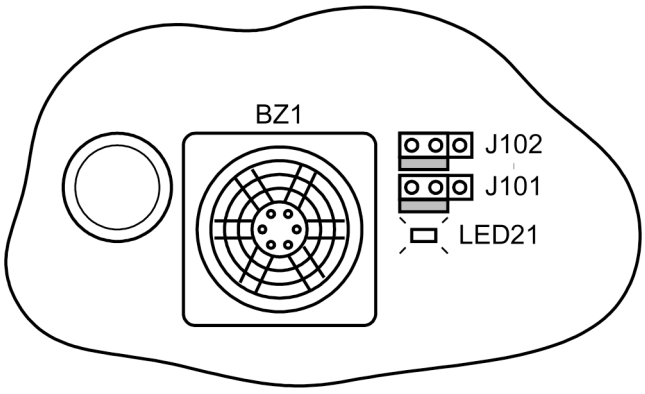
Board Jumpers

Three sets of jumper pins are located on the Base Controller. Each set consists of a jumper and three pins. A white bar next to each set of pins on the circuit board shows the usual jumper placement. For normal operation, the jumpers must be installed as shown.

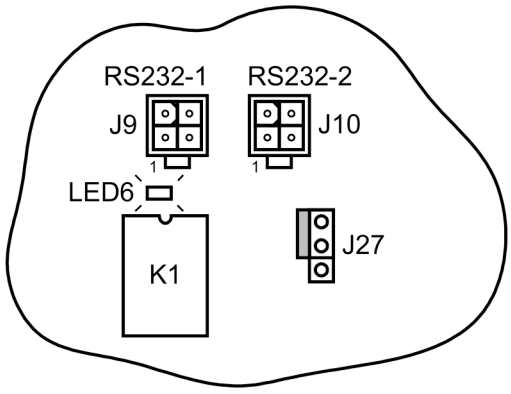
The J101 jumper is used to perform a Base Controller Cold Start. For details, refer to "Service Procedure A07A," p. 332. The J102 and J27 jumpers should not be moved.

SR–3 Base Controller (Blue)

J101 Cold Start Jumper and J102 Jumper

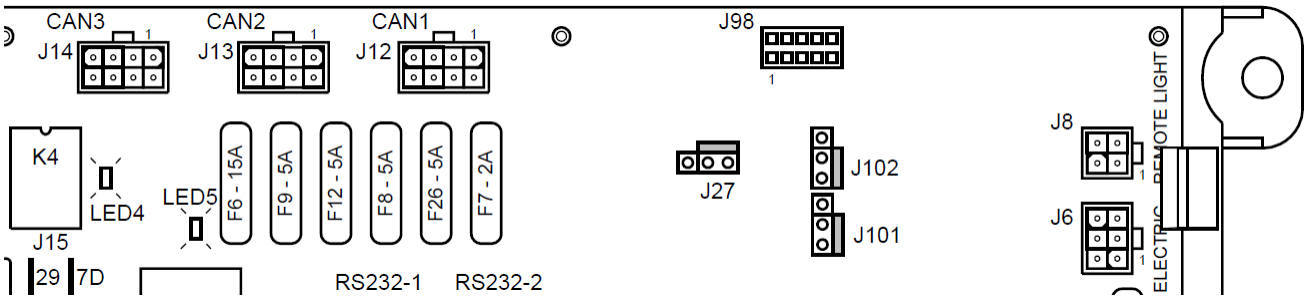


J27 CAN Bus Terminator Jumper



SR–3.1 Base Controller (Green)

J101 Cold Start Jumper, J102 Jumper, and J27 CAN Bus Terminator Jumper



Jumper Functions

J27	CAN Bus Terminator – Do Not Move
J101	Cold Start Jumper
J102	Not Used – Do Not Move

Connector Locations

Number	Connector	Circuit
1	J12	CAN connection or CAN connection to TK BlueBox if installed
2	J13	CAN Connection. 2P Power, Chassis Ground, and On Line are used for the optional Remote Control Panel, if installed. Can H and Can L are not currently used.
3	J14	CAN connection to HMI Control Panel
4	J15	Connections to unit engine and damper (and defrost gear motor – if so equipped)
5	J24	"2" circuit to F21 fuse
6	J4	Connections to Base Controller On/Off Switch
7	J25	"2A" circuit to alternator
8	J26	"H" circuit to air intake heater
9	J3	Connections to unit Sensor Harness
10	J7	Connections to unit Main Harness
11	J23	"CH" chassis ground to unit ground plate
12	J31	USB Connector (Flash Drive Only)
13	J6	Connections to optional Electric Standby
14	J8	Connections to optional Remote Status Light
15	J10	RS-232 Serial Port 2 connection to optional DAS and/or Remote Control Panel
16	J9	RS-232 Serial Port 1 connection to ServiceWatch connector
17	J98	CAN connector for REB Connection (Not used on T-90 Series units)

Figure 11. SR-3 Base Controller (Blue)

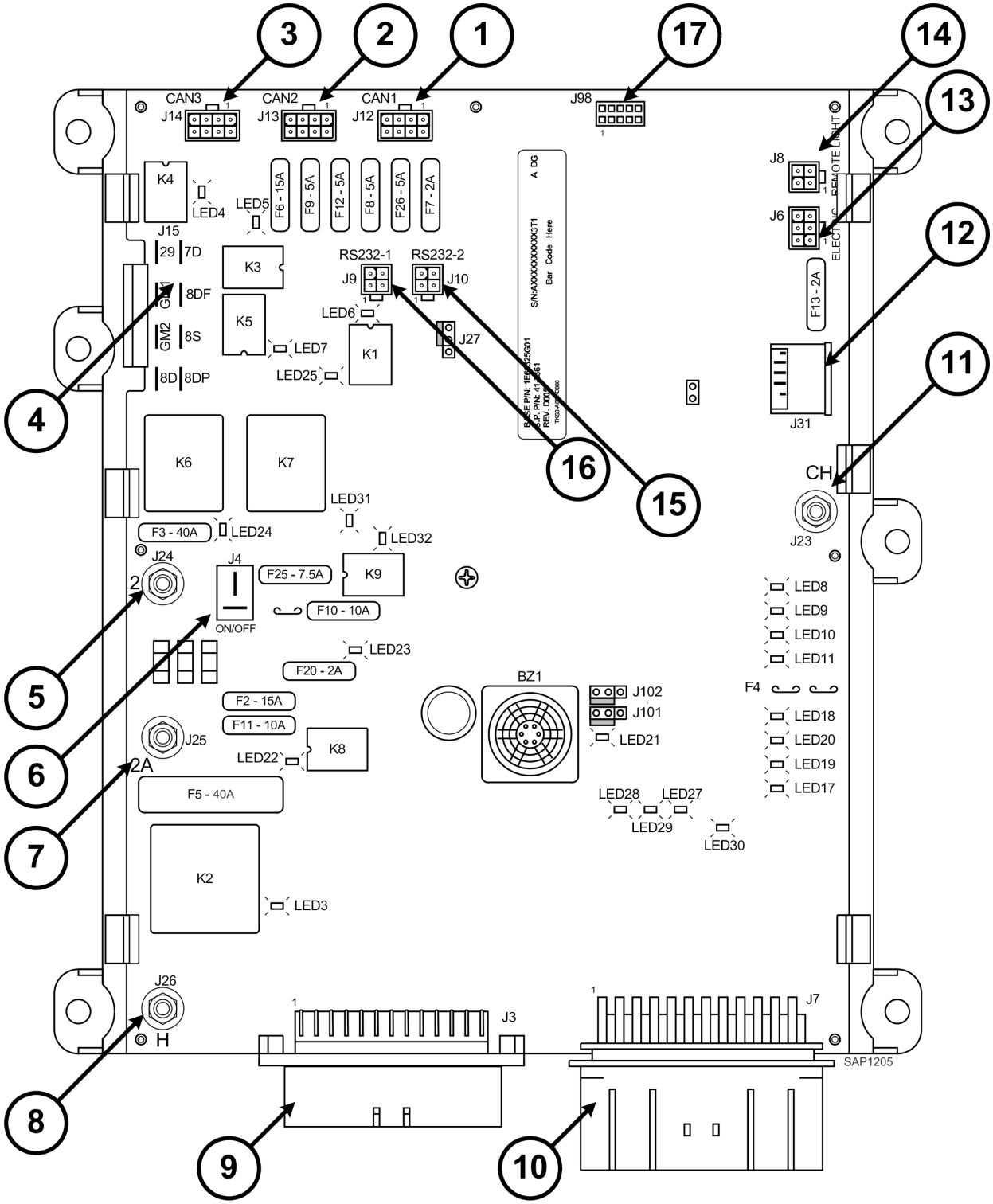
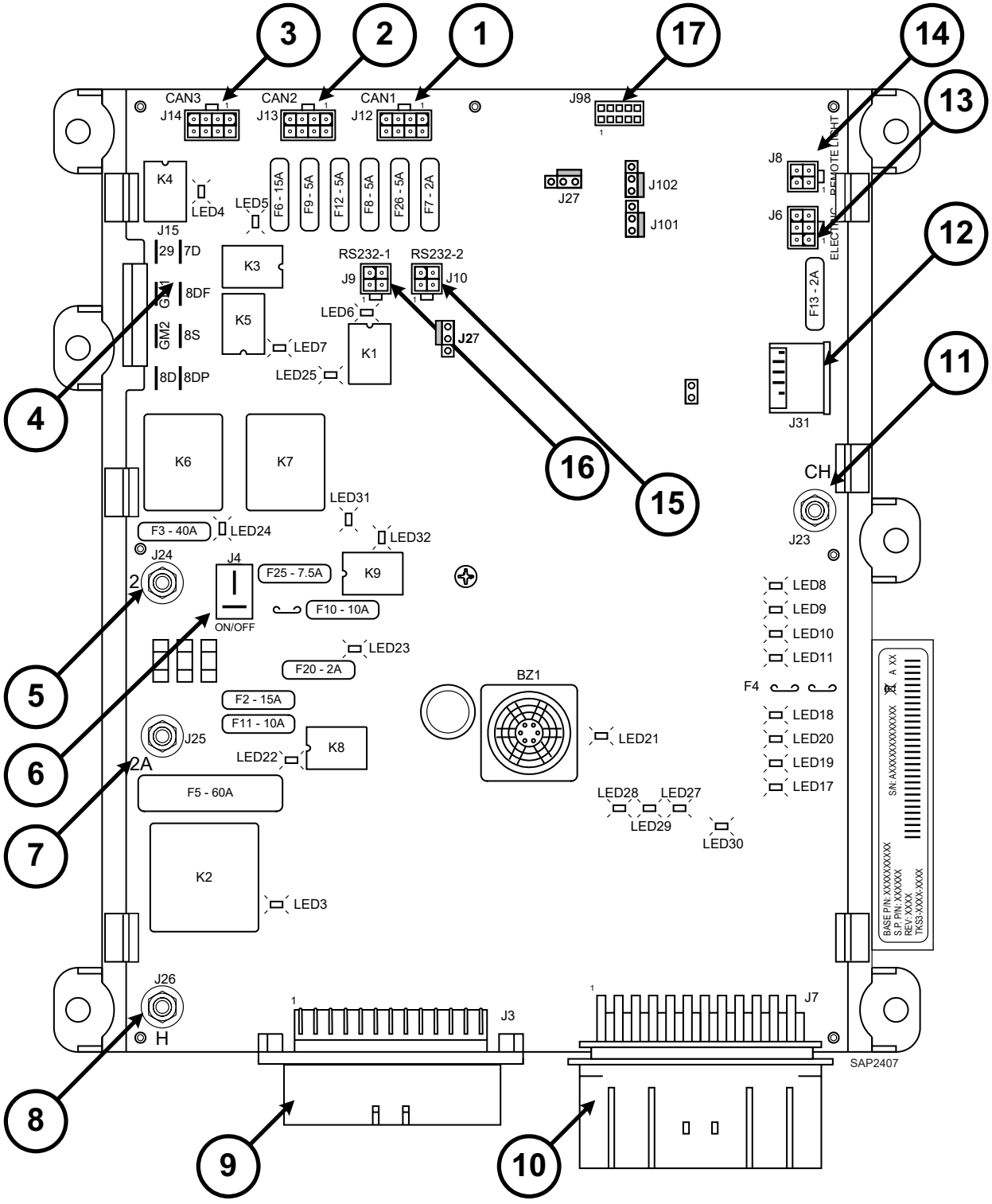


Figure 12. SR-3.1 Base Controller (Green)



Base Controller Connector Maps

Table 1. J3 - Base Controller Sensor Harness Connector - Arranged by Pin Number (T-Series Spectrum/T-80 Series Spectrum/UT-1200 Spectrum)

Pin #	Wire #	Description
1	RTP-01	Control return air temperature sensor positive (blue sensor wire)
2	RTN-01	Control return air temperature sensor negative (brown sensor wire)
3	ATP-01	Ambient temperature sensor positive (blue sensor wire)
4	ATN-01	Ambient temperature sensor negative (brown sensor wire)
9	DPI-01	Signal from discharge pressure transducer (white wire) (DPT)
10	SPI-01	Signal from suction pressure transducer (white wire) (SPT)
11	CTEMPN-01	Compressor temperature negative
13	DTN-01	Control discharge air temperature sensor negative (brown sensor wire)
14	CTN-01	Coil temperature sensor negative (brown sensor wire)
15	WTN-01	Water temperature sensor negative (brown sensor wire)
24	DTP-01	Control discharge air temperature sensor positive (blue sensor wire)
25	CTP-01	Coil temperature sensor positive (blue sensor wire)
26	WTP-01	Water temperature sensor positive (blue sensor wire)
34	CTEMP-01	Compressor temperature positive

Table 2. J3 - Base Controller Sensor Harness Connector - Arranged by Pin Number (T-1090 Spectrum)

Pin #	Wire #	Description
1	RTP-01	Control return air temperature sensor positive (blue sensor wire)
2	RTN-01	Control return air temperature sensor negative (brown sensor wire)
3	ATP-01	Ambient temperature sensor positive (blue sensor wire)
4	ATN-01	Ambient temperature sensor negative (brown sensor wire)
9	DPI-01	Signal from discharge pressure transducer (white wire) (DPT)
10	SPI-01	Signal from suction pressure transducer (white wire) (SPT)
13	DTN-01	Control discharge air temperature sensor negative (brown sensor wire)
14	CTN-01	Coil temperature sensor negative (brown sensor wire)
15	WTN-01	Water temperature sensor negative (brown sensor wire)
24	DTP-01	Control discharge air temperature sensor positive (blue sensor wire)
25	CTP-01	Coil temperature sensor positive (blue sensor wire)
26	WTP-01	Water temperature sensor positive (blue sensor wire)

Figure 13. 35 Pin Sensor Harness Connector (shown from pin side)

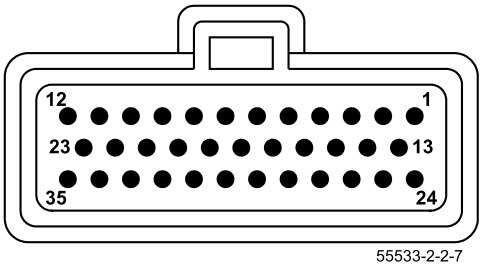


Table 3. J7 - Base Controller to Main Harness Connector (T-Series Spectrum/T-80 Series Spectrum/UT-1200 Spectrum)

Pin #	Wire #	Description
1	LLSI-01	Power to energize Liquid Line Solenoid Zone 1 (LLS1)
2	Sense-01	Power to the alternator sense circuit
3	CIS-01	Power to energize Condenser Inlet Solenoid (CIS)
4	RTPS-01	Power to energize Receiver Tank Pressure Solenoid (RTPS)
4	HGBS-01	Power to energize Hot Gas Bypass Solenoid
5	HG-01	Power to energize Hot Gas Solenoid (HG)
6	PV-01	Power to energize Purge Valve (PV)
7	LV1-01	Power to Tier 4 Relay Coil with 380 engines
9	LV3-01	Power to Tier 4 Relay Coil with 374 engines
10	LIQ-01	Power to energize Liquid Injection Solenoid (LIQ)
11	EVC-01	To Electronic Throttling Valve (ETV)
12	EVD-01	To Electronic Throttling Valve (ETV)
13	SPP-02	Power to suction pressure transducer (red wire) (SPT)
14	DPP-02	Power to discharge pressure transducer (red wire) (DPT)
15	CLP-01	To Coolant Level Switch (red wire) (CLS)
16	CLS-01	To Coolant Level Switch (white wire) (CLS)
17	PHPCO-01	To High Pressure Cutout Switch (HPCO)
18	HPCO-01	Signal from High Pressure Cutout Switch (HPCO)
19	LPCO-01	Signal from Low Pressure Cutout Switch (LPCO)
20	DSP-01	Power to the optional door switch (red wire) (DS)
21	DS-01	Signal from the optional door switch (white wire) (DS)
23	EVB-01	To Electronic Throttling Valve (ETV)
24	EVA-01	To Electronic Throttling Valve (ETV)
25	SPN-02	Ground from suction pressure transducer (black wire) (SPT)
26	DPN-02	Ground from discharge pressure transducer (black wire) (DPT)
28	20B-01	Signal from engine low oil pressure switch (LOPS)
29	OLS-01	Signal from engine low oil level switch (OLS)
33	EXC-01	Power to the alternator excite circuit

Table 3. J7 - Base Controller to Main Harness Connector (T-Series Spectrum/T-80 Series Spectrum/UT-1200 Spectrum) (continued)

Pin #	Wire #	Description
34	W-01	Signal from the alternator "W" circuit
35	FS1-01	Signal from flywheel sensor (FW)
36	FS2-01	Signal from flywheel sensor (FW)

Table 4. J7 - Base Controller to Main Harness Connector (T-1090 Spectrum)

Pin #	Wire #	Description
1	LLSI-01	Power to energize Liquid Line Solenoid Zone 1 (LLS1)
2	Sense-01	Power to the alternator sense circuit
3	CIS-01	Power to energize Condenser Inlet Solenoid (CIS)
4	RTPS-01	Power to energize Receiver Tank Pressure Solenoid (RTPS)
6	PV-01	Power to energize Purge Valve (PV)
11	EVC-01	To Electronic Throttling Valve (ETV)
12	EVD-01	To Electronic Throttling Valve (ETV)
13	SPP-02	Power to suction pressure transducer (red wire) (SPT)
14	DPP-02	Power to discharge pressure transducer (red wire) (DPT)
15	CLP-01	To Coolant Level Switch (red wire) (CLS)
16	CLS-01	To Coolant Level Switch (white wire) (CLS)
17	PHPCO-01	To High Pressure Cutout Switch (HPCO)
18	HPCO-01	Signal from High Pressure Cutout Switch (HPCO)
20	DSP-02	Power to the optional door switch (white wire) (DS)
21	DS-02	Signal from the optional door switch (white wire) (DS)
23	EVB-01	To Electronic Throttling Valve (ETV)
24	EVA-01	To Electronic Throttling Valve (ETV)
25	SPN-02	Ground from suction pressure transducer (black wire) (SPT)
26	DPN-02	Ground from discharge pressure transducer (black wire) (DPT)
28	20B-01	Signal from engine low oil pressure switch (LOPS)
29	OLS-01	Signal from engine low oil level switch (OLS)
33	EXC-01	Power to the alternator excite circuit
34	W-01	Signal from the alternator "W" circuit
35	FS1-01	Signal from flywheel sensor (FW)
36	FS2-01	Signal from flywheel sensor (FW)

Figure 14. J7 Base Controller Harness Connector (shown from pin side)

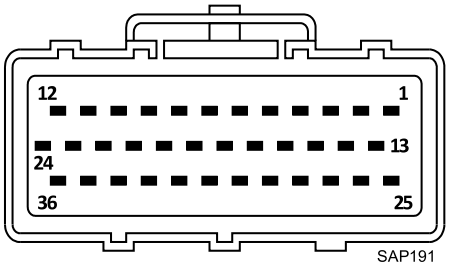


Table 5. J6 - Electric Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	7E-01	To 7EA terminal on phase select module (PSM)
2	EOL-01	Signal from overload relay (OLR)
3	8-01	To 8 terminal on phase select module (PSM)
4	CH2	To chassis ground
5	ER-01	Signal from ER terminal on phase select module (PSM)
6	26E	Ground for heater contactor coil (HC)

Table 6. J8 - Remote Light Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	ALM-01	To white wire on remote light option
2	8FC-01	To red wire on remote light option
3	ALPC-01	To black wire on remote light option
4		Not Used

Table 7. J9 - ServiceWatch Download Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	RXD-RED	Communication
2	TXD-BLK	Communication
3	COM-GRN	Communication
4	DPD-BLUE	Communication

Table 8. J10 - DAS/Remote Controller Connector - Arranged by Pin Number (T-Series Spectrum/T-80 Series Spectrum/UT-1200 Spectrum)

Pin #	Wire #	Description
1	RXD-BLK	Communication
2	TXD-RED	Communication
3		
4	REM-ON-BRN	Communication

Table 9. J10 - Remote Controller Connector - Arranged by Pin Number (T-1090 Spectrum)

Pin #	Wire #	Description
1	RXD-BLK	Communication
2	TXD-RED	Communication
3		
4	REM-ON-BRN	Communication

Table 10. J12 - Expansion Module CAN Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	CANL	To Expansion Module J2 Pin 1
2	CANH	To Expansion Module J2 Pin 2
3	SHLD	To Expansion Module J2 Pin 3
4	ON	To Expansion Module J2 Pin 4
5	2A	To Expansion Module J2 Pin 5
6	8XP	To Expansion Module J2 Pin 6
7		
8	CH	To Expansion Module J2 Pin 8

Table 11. J13 - DAS/Remote Controller CAN Connector - Arranged by Pin Number (T-Series Spectrum/T-80 Series Spectrum/UT-1200 Spectrum)

Pin #	Wire #	Description
1	CANL-BLK	Optional DAS/Remote Control Harness
2	CANH-RED1	Optional DAS/Remote Control Harness
3	SHLD2	Optional DAS/Remote Control Harness
4	ON-ORN	Optional DAS/Remote Control Harness
5	2A-BLU2	Optional DAS/Remote Control Harness
6	8XP-BLUE	Optional DAS/Remote Control Harness
7	OFF-YEL	Optional DAS/Remote Control Harness
8	CH-GRN2	Optional DAS/Remote Control Harness

Table 12. J13 - Remote Controller CAN Connector - Arranged by Pin Number (T-1090 Spectrum)

Pin #	Wire #	Description
4	ON-ORN	Remote Control Harness
5	2A-BLU2	Remote Control Harness
7	OFF-YEL	Remote Control Harness
8	CH-GRN2	Remote Control Harness

Table 13. J13 - DAS - Arranged by Pin Number (T-1090 Spectrum)

Pin #	Wire #	Description
1	CANL-02	To Optional DAS
2	CANH-02	To Optional DAS

Table 13. J13 - DAS - Arranged by Pin Number (T-1090 Spectrum) (continued)

Pin #	Wire #	Description
5	2D-1	To Optional DAS
6	8XP-03	To Optional DAS
8	CHDAS-01	To Optional DAS

Table 14. J13 - TK BlueBox - Arranged by Pin Number (T-1090 Spectrum)

Pin #	Wire #	Description
1	CANL-01	To Optional TK BlueBox
2	CANH-01	To Optional TK BlueBox
4	ON-01	To Optional TK BlueBox
5	2AAL-01	To Optional TK BlueBox
6	8XP-02	To Optional TK BlueBox
8	CHBB-01	To Optional TK BlueBox

Table 15. J14 - HMI CAN Connector from TSD HMI - Arranged by Pin Number

Pin #	Wire #	Description
1	CANL-BLUE	To HMI Control Panel Pin 1
2	CANH-GRN	To HMI Control Panel Pin 2
3	SHLD-01	To HMI Control Panel Pin 3
4	ON-RED	To HMI Control Panel Pin 4
5	2A-BLK	To HMI Control Panel Pin 5
6	8XP-YEL	To HMI Control Panel Pin 6
7	OFF-WHITE	To HMI Control Panel Pin 7
8	CH-ORN	To HMI Control Panel Pin 8

Table 16. J14 - HMI CAN Connector from TPD HMI - Arranged by Pin Number

Pin #	Wire #	Description
1	CANL-BLK	To HMI Control Panel Pin 1
2	CANH-RED	To HMI Control Panel Pin 2
3	SHLD-01	To HMI Control Panel Pin 3
4	ON-ORN	To HMI Control Panel Pin 4
5	2A-BLUE	To HMI Control Panel Pin 5
6	8XP-WHITE	To HMI Control Panel Pin 6
7		Not Used
8	CH-GRN	To HMI Control Panel Pin 8

Table 17. J4 - Power Switch Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	2AB-01	2AB Power
2	8-02	8 Power

Table 18. J15 - Engine Connector - Arranged by Pin Number (T-Series Spectrum/T-80 Series Spectrum/UT-1200 Spectrum)

Pin #	Wire #	Description
1	29-01	Power to energize damper solenoid (DS)
4	8D-01	Power to energize fuel solenoid hold coil (red wire) (FSH)
		Tier 4 Engines Only – Power to main contacts of Tier 4 Relay
5	8DP-01	Power to energize fuel solenoid pull-in coil (white wire) (FSP)
6	8S-01	Power to energize starter solenoid (SS)
7	8DF-01	Power to energize fuel pump (red wire) (FP)
8	7D-01	Power to energize high speed solenoid (HS)

Table 19. J15 - Engine Connector - Arranged by Pin Number (T-1090 Spectrum)

Pin #	Wire #	Description
1	29-01	Power to energize damper solenoid (white wire) (DS)
4	8D-01	Power to energize fuel solenoid hold coil (white wire) (FSH)
		Tier 4 Engines Only – Power to main contacts of Tier 4 Relay (white wire)
5	8DP-01	Power to energize fuel solenoid pull-in coil (white wire) (FSP)
6	8S-01	Power to energize starter solenoid (white wire) (SS)
7	8DF-01	Power to energize fuel pump (white wire) (FP)
8	7D-01	Power to energize high speed solenoid (white wire) (HS)

Figure 15. Engine Connector (shown from pin side of harness connector)

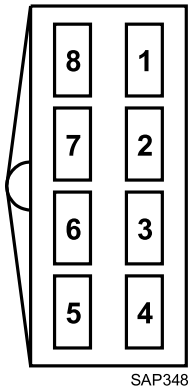
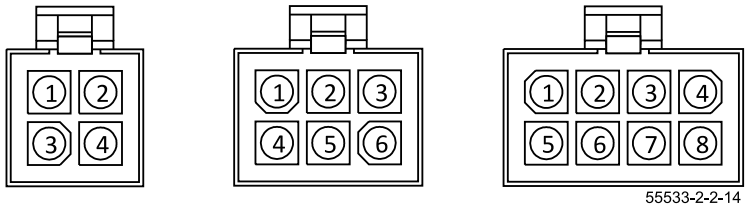


Table 20. Screw Terminal Power Connections

Terminal #	Wire #	Description
J24 (2)	2-01	From fuse F21 (battery power)
J25 (2A)	2A-01	From alternator output
J26 (H)	H	Glow plugs
J23 (CH)	CHP-01	Chassis ground

Figure 16. Mini Mate-N-Lok Harness 4/6/8 Pin Connectors (shown from pin side of harness connector)



Expansion Module

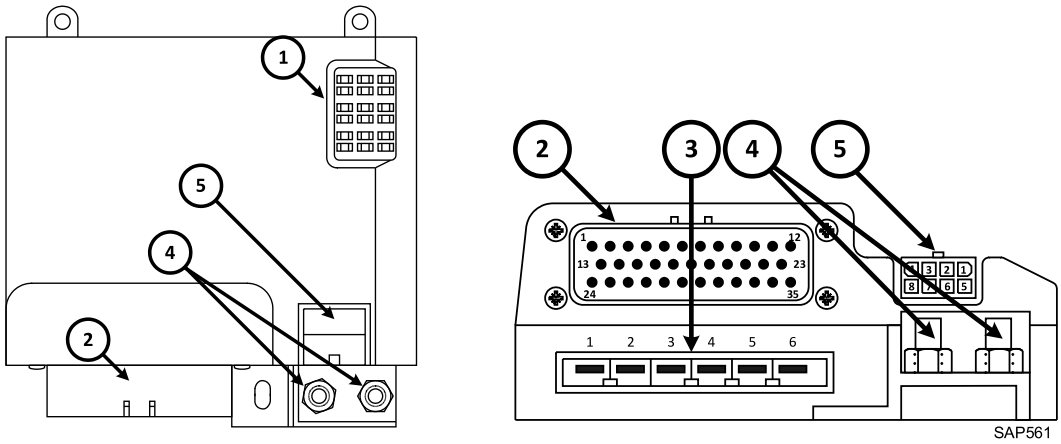
The Expansion Module (EM) is a hardware module that allows for operation of up to three temperature controlled zones. The EM provides the interface between the Base Controller and the Zone 1, Zone 2, and Zone 3 multi-temperature components such as sensors, solenoids, valves, and fan motors. It also provides over-current and short circuit protection for the associated circuits. The EM features 100% solid state outputs. All outputs are Smart FET controlled.

All engine functions and some of the host unit valves are controlled by the Base Controller. This includes the Receiver Tank Pressure Solenoid (RTPS), Purge Valve (PV), and Condenser Inlet Solenoid (CIS). In addition, the Liquid Line Solenoid (LLS1) for Zone 1 is controlled directly from the Base Controller, and the Zone 1 return air temperature sensor, Zone 1 discharge air temperature sensor, and Zone 1 evaporator coil temperature sensor are input directly to the Base Controller. All other Zone 1 devices and all remote evaporators are controlled by the Expansion Module.

Load power is supplied to the Expansion Module by the alternator via the two 2A terminal studs. EM controller power is supplied via the 8 pin J2 CAN connector at pin 6 (8XP yellow). The EM also communicates with the Base Controller via the CAN bus connection. All remote zone input and solenoid output functions (except the Zone 1 LLSV) are connected via the Expansion Module J1 35 pin connector harness. The EM J13 fan connector has six remote evaporator fan motor outputs for powering up to 12 remote fan motors. Each output is capable of operating two fans. The EM has two outputs for controlling evaporator fan speed in up to two zones. Each output will control the fan speed for all motors in a zone. Refer to the connector maps on the following pages for additional details.

There are no user replaceable components on the Expansion Module. To check Expansion Module operation, refer to Service Procedure A01D.

Figure 17. Top and End Views

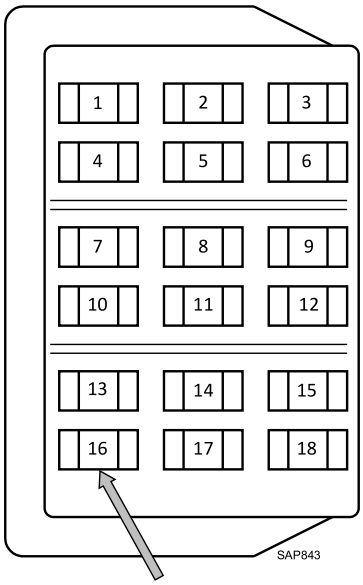


1.	Expansion Module Status LEDs
2.	J1 35 Pin Expansion Module Connector
3.	J13 6 Pin Evaporator Fan Connector
4.	2A Power Connection Studs (2 ea)
5.	J2 8 Pin CAN Connection to the Base Controller J12 CAN connector

LED Functions

Output LEDs are provided to indicate outputs that are energized. These LED indicators are located in the corner of the Expansion Module body. The LED is illuminated when the associated circuit output is energized.

Figure 18. Green Status LED (all other LEDs are red)



LED #	Function	LED #	Function
LED 1	Fan Output #1	LED 10	Zone 1 Hot Gas Solenoid Output
LED 2	Fan Output #3	LED 11	Zone 2 Hot Gas Solenoid Output
LED 3	Fan Output #5	LED 12	Zone 3 Hot Gas Solenoid Output
LED 4	Fan Output #2	LED 13	Zone 1 Suction Line Solenoid Output
LED 5	Fan Output #4	LED 14	Zone 2 Suction Line Solenoid Output
LED 6	Fan Output #6	LED 15	Zone 3 Suction Line Solenoid Output
LED 7	Zone 1 Drain Tube Heater Output	LED 16	Status – Flashes once per second when the Base Controller is powered and operating normally. Flashes several times per second when flash loading. On without flashing during reboot and when under test. Flashes twice within one second followed by one second off if a CAN communication error is present.
LED 8	Zone 2 Drain Tube Heater Output	LED 17	Zone 2 Liquid Line Solenoid Output
LED 9	Zone 3 Drain Tube Heater Output	LED 18	Zone 3 Liquid Line Solenoid Output

Connector Maps

Table 21. J1 - Expansion Module Harness Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	DH3	Zone 3 Drain Tube Heater Output
2	CH	Chassis Ground
3	DH1	Zone 1 Drain Tube Heater Output

Table 21. J1 - Expansion Module Harness Connector - Arranged by Pin Number (continued)

Pin #	Wire #	Description
4		Not Used
5	LLS2	Zone 2 Liquid Line Solenoid Output
6	LLS3	Zone 3 Liquid Line Solenoid Output
7	HGS1	Zone 1 Hot Gas Solenoid Output
8	HGS2	Zone 2 Hot Gas Solenoid Output
9	HGS3	Zone 3 Hot Gas Solenoid Output
10	SLS1	Zone 1 Suction Line Solenoid Output
11	SLS2	Zone 2 Suction Line Solenoid Output
12	SLS3	Zone 3 Suction Line Solenoid Output
13		Not Used
14		Not Used
15	DTN2	Zone 2 Discharge Air Temperature Sensor (-) Input
16	RTN2	Zone 2 Return Air Temperature Sensor (-) Input
17	CTN2	Zone 2 Evaporator Coil Temperature Sensor (-) Input
18	DTN3	Zone 3 Discharge Air Temperature Sensor (-) Input
19	RTN3	Zone 3 Return Air Temperature Sensor (-) Input
20	CTN3	Zone 3 Evaporator Coil Temperature Sensor (-) Input
21	SC1	Zone 1 Fan Speed Control Output
22	SC2	Zone 2 Fan Speed Control Output
23	SC3	Zone 3 Fan Speed Control Output
24	DH2	Zone 2 Drain Tube Heater Output
25		Not Used
26	DTP2	Zone 2 Discharge Air Temperature Sensor (+) Input
27	RTP2	Zone 2 Return Air Temperature Sensor (+) Input
28	CTP2	Zone 2 Evaporator Coil Temperature Sensor (+) Input
29	DTP3	Zone 3 Discharge Air Temperature Sensor (+) Input
30	RTP3	Zone 3 Return Air Temperature Sensor (+) Input
31	CTP3	Zone 3 Evaporator Coil Temperature Sensor (+) Input
32	DSP2	Zone 2 Door Switch Power Output
33	DS2	Zone 2 Door Switch Input
34	DSP3	Zone 3 Door Switch Power Output
35	DS3	Zone 3 Door Switch Input

Figure 19. 35 Pin Module Harness Connector (shown from pin side)

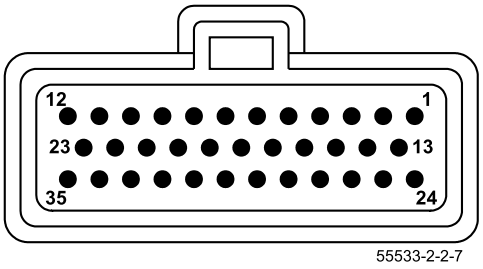


Table 22. J2 - Expansion Module CAN Harness Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	CANL-BLU	To Interface Board CAN Connector J12
2	CANH-GRE	To Interface Board CAN Connector J12
3	SHLD	To Interface Board CAN Connector J12
4	ON-RED	To Interface Board CAN Connector J12
5	2A-BLK	To Interface Board CAN Connector J12
6	8FP-YEL	To Interface Board CAN Connector J12
7		Not Used
8	CH-ORA	To Interface Board CAN Connector J12

Figure 20. Mini Mate-N-Lok Harness Connector (shown from pin side of harness connector)

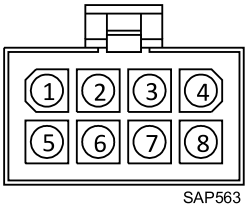
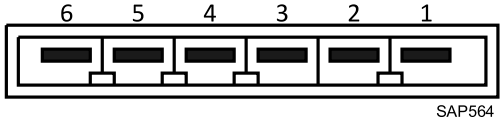


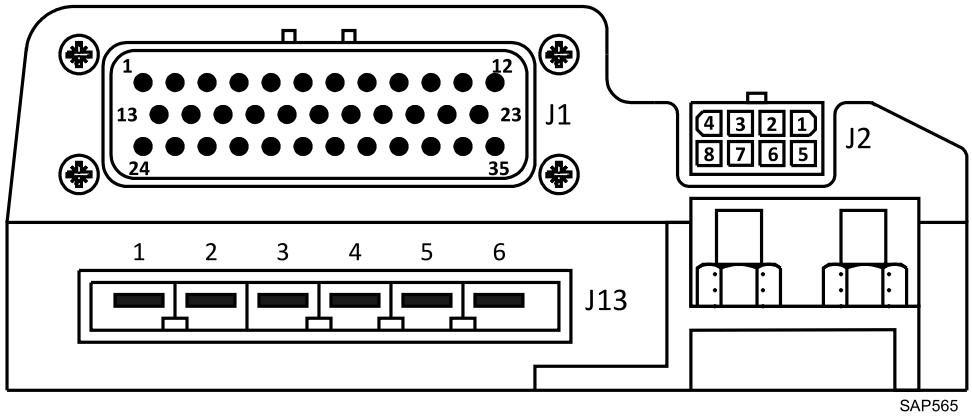
Table 23. J13 - Expansion Module Fan Harness Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	FM1A	Zone 1 Fan Motor Output #1
2	FM1B	Zone 1 Fan Motor Output #2
3	FM2A	Zone 2 Fan Motor Output #1
4	FM2B	Zone 2 Fan Motor Output #2
5	FM3A	Zone 3 Fan Motor Output #1
6	FM3B	Zone 3 Fan Motor Output #2

Figure 21. Expansion Module Fan Harness Connectors (shown from pin side of harness connector)



Connections



Unit Sensors

The sensors monitor air temperatures at various points in the system, as well as the engine oil pressure, engine oil level, engine coolant level, engine coolant temperature, engine speed, and alternator frequency. Refrigerant pressures are also monitored on ETV units. Host unit sensors and Zone 1 temperature sensors are connected to the Base Controller via the J3 Sensor Connector. Zone 2 and Zone 3 temperature sensors are connected to the Expansion Module J1 connector.

The sensors monitor air temperatures at various points in the system, as well as the engine oil pressure, engine oil level, engine coolant level, engine coolant temperature, engine speed, and alternator frequency. Refrigerant pressures are also monitored on ETV units. Sensors are connected to the Base Controller via the J3 Sensor Connector.

Air Temperature Sensors

Graded and Un-graded Air Temperature Sensors

The Return Air and Discharge Air sensors are graded sensors. Sensor grading allows maximum accuracy without the need for ice water calibration. The sensor grade (from 1L through 9H) is stamped on the sensor and must be entered into the Base Controller when a sensor is changed, in order to properly calibrate the sensor for accurate temperature readings. If the grade is not changed from the factory setting of 5H, Alarm Code 92 Sensor Grades Not Set will occur. Always update the sensor grade nameplate when graded sensors are changed.

Un-graded sensors are used to measure the evaporator coil temperature and ambient temperature, since these temperatures are not as critical as the return and discharge air temperatures.

Each zone uses return air, discharge air and evaporator coil temperature sensors. Do not replace a graded sensor with an un-graded sensor.

Figure 22. New Style Graded Sensor



Figure 23. New Style Un-graded Sensor with Yellow Shrink Tube Marker



Return Air Sensors

These sensors monitor the temperature of the air returning to the evaporator coils. These sensors are located in the return air flow. The Zone 1 sensor is connected to the Base Controller connector J3. Zone 2 and Zone 3 sensors are connected to the Expansion Module connector J1. These sensors are graded sensors and must be replaced with graded sensors. The Base Controller must be calibrated to the respective grades of the installed sensors in order to operate properly.

Discharge Air Sensors

These sensors monitor the temperature of the air leaving the evaporator coils. These sensors are located in the evaporator discharge air path. The Zone 1 sensor is connected to the Base Controller connector J3. Zone 2 and Zone 3 sensors are connected to the Expansion Module connector J1. These sensors are graded sensors and must be replaced with graded sensors. The Base Controller must be calibrated to the respective grades of the installed sensors in order to operate properly.

Evaporator Coil Temperature Sensors

These sensors monitor the temperature of the evaporator coils. These sensors are located on the evaporator coil header plate The Zone 1 sensor is connected to the Base Controller connector J3. Zone 2 and Zone 3 sensors are connected to the Expansion Module connector J1. These sensors are un-graded sensors.

Ambient Temperature Sensor

The Ambient Temperature Sensor monitors the ambient air temperature just before it enters the condenser/radiator. The sensor is located in the main unit adjacent to the condenser coil and is connected directly to the Base Controller via connector J3. This is an un-graded sensor and is connected to the Base Controller via the ATP and ATN wires.

Refrigeration Control Components

The following components are used by the Base Controller to sense conditions or control operation of the refrigeration system. The Base Controller determines the necessary requirements by considering the setpoint, the software, the programmable feature settings, and the information supplied by the sensors.

Discharge Pressure Transducer (DPT)

This transducer supplies the compressor discharge pressure to the Base Controller. The sense wire is connected to the Base Controller at J3 via the DPI wire. The DPP and DPN wires supply power to the sensor. It is installed on scroll compressor units with ETV and not used on scroll compressor units without ETV.

Suction Pressure Transducer (SPT)

This transducer supplies the compressor suction pressure to the Base Controller. The sense wire is connected to the Base Controller at J3 via the SPI wire. The SPP and SPN wires supply power to the sensor. It is installed on scroll compressor units with ETV and not used on scroll compressor units without ETV.

High Pressure Cutout Switch (HPCO)

The High Pressure Cutout Switch is located on the discharge line near the scroll compressor or on the manifold or head of reciprocating compressors. The switch is closed with normal discharge pressure and opens with excessive pressure. When the switch opens, the Run Relay is de-energized. This stops the unit to prevent damage and sends a signal to the Base Controller to generate Alarm Code 10.

Low Pressure Cutout Switch (LPCO)

The Low Pressure Cutout Switch is used only on non-ETV units with scroll compressors. The Low Pressure Cutout Switch is located on the suction line adaptor at the scroll compressor. The switch is closed with normal suction pressure and opens with low pressure. When the switch opens, a signal is sent to the Base Controller to shut the unit down to prevent damage. The Run Relay is de-energized by the Base Controller and an Alarm Code 93 is generated.

Condenser Inlet Solenoid (CIS)

This normally open solenoid valve is located in the discharge line just before it enters the condenser coil. The Base Controller energizes (closes) the Condenser Inlet Solenoid during heat mode or defrost mode operation. The Condenser Inlet Solenoid operates together with the Hot Gas Solenoid (HGS). The Condenser Inlet Solenoid is energized and LED 8 is illuminated when the Base Controller energizes the CIS Smart FET. This supplies power via the CIS wire to the Condenser Inlet Solenoid and is grounded by means of a CH wire to chassis ground. The circuit is protected by the Smart FET.

Hot Gas Bypass Solenoid (HGBS)

The Base Controller energizes (opens) the Hot Gas Bypass Solenoid during heat mode or defrost mode operation. This normally closed solenoid valve is located in a branch of the hot gas line. It opens when the controller senses low

suction pressure. The Hot Gas Solenoid is energized and LED 10 is illuminated when the Base Controller energizes the HG Smart FET. This supplies power via the HG wire to the Hot Gas Solenoid and is grounded by means of a CH wire to chassis ground. The circuit is protected by the Smart FET.

Purge Valve (PV)

This normally closed solenoid valve is located in a branch of the suction line near the accumulator tank. The Base Controller energizes (opens) the Purge Valve during heat mode operation to scavenge refrigerant from the condenser coil. The Purge Valve is energized and LED 11 is illuminated when the Base Controller energizes the PV Smart FET. This supplies power via the PV wire to the Purge Valve and is grounded by means of a CH wire to chassis ground. The circuit is protected by the Smart FET. The Purge Valve is used on units with both scroll compressors and reciprocating compressors.

Receiver Tank Pressure Solenoid (RTPS)

The Base Controller energizes (opens) the Receiver Tank Pressure Solenoid when any zone is operating in heat or defrost mode and the refrigerant discharge pressure is low. It pressurizes the receiver tank to push stored liquid refrigerant into the system. This verifies adequate refrigerant is available to heat or defrost the zone. The Receiver Tank Pressure Solenoid is always energized at the same time as the Purge Valve (the Purge Valve and Receiver Tank Pressure Solenoid are controlled by separate electronic outputs). As discharge pressure rises the RTPS may de-energize to limit the amount of refrigerant available to the system. This solenoid is a normally closed valve. The Base Controller will supply 12 volts from a Smart FET to energize (open) the valve.

Liquid Injection Solenoid (LIQ)

This normally closed solenoid valve is located in a branch of the liquid line that attaches to the compressor body. The Base Controller monitors the Compressor Temperature Sensor. When the compressor temperature is determined to be high, the Base Controller energizes (opens) the Liquid Injection Solenoid to inject liquid refrigerant into the suction line side of the compressor. When the liquid refrigerant flashes to a gas, it cools the compressor. The Liquid Injection Valve is energized and LED 19 is illuminated when the Base Controller energizes the LIQ Smart FET. This supplies power via the LIQ wire to the Liquid Injection Solenoid and is grounded by means of a CH wire to chassis ground. The circuit is protected by the Smart FET. The Liquid Injection Solenoid is used only on units with scroll compressors.

Electronic Throttling Valve (ETV)

The Electronic Throttling Valve is capable of opening and closing incrementally and is installed in the suction line between the evaporator and the compressor. It is used in place of a mechanical Suction Pressure Regulator. The ETV is standard on all Tier 4 units.

The ETV is controlled directly by the Base Controller EVA, EVB, EVC, and EVD Smart FET outputs. In truck applications, the ETV is used to control suction pressure. The Base Controller uses information from the Suction Pressure Transducer and Discharge Pressure Transducer to determine the appropriate ETV valve position. The control algorithm is designed to provide maximum cooling and heating capacity without overloading the compressor. The ETV circuitry is protected by the ETV Smart FETs.

Zone Refrigeration Control Components

The following solenoid valves are required for each zone. The valves are located in the remote evaporator(s) for each zone.

Liquid Line Solenoid (LLS)

This valve is energized (open) any time cooling, heating, or defrosting is required in its zone. The valve is de-energized when the zone is in null to stop refrigerant flow in that zone and is a normally closed valve.

The Zone 1 liquid line solenoid is controlled by an output on the Base Controller and Interface Board. The Zone 2 and Zone 3 liquid line solenoid outputs are located in the Expansion Module.

Hot Gas Solenoid (HGS)

This valve is energized (open) any time heating or defrosting is required in the zone and is a normally closed valve. All hot gas solenoid valve outputs are located in the Expansion Module.

Suction Line Solenoid (SLS)

All zones are capable of reverse cycle heating operation. Reverse cycle heating means that the evaporator coil in the zone in heat mode is used as the condenser coil during heat operation as long as at least one other zone is operating in cool mode.

The suction line solenoid is energized (closed) when its compartment is operating in heat mode as long as at least one other zone is operating in cool mode. This is a normally open valve. All suction line solenoid valve outputs are located in the Expansion Module.

Engine Control Components

The following components are used by the Base Controller to sense conditions and control operation of the diesel engine (or electric motor, if present).

Tier 4 Engine Relay/Jumper Relay

The Tier 4 Engine Relay or Jumper Relay is mounted in a relay socket attached to a wiring harness and is located on the cover of the electric standby high voltage control components. This cover will be present on all units equipped with Tier 4 engines. The Tier 4 Engine Relay or Jumper Relay is used only on units equipped with Tier 4 engines.

Coolant Temperature Sensor (WTS) (Except UT-R Units)

This sensor monitors the temperature of the coolant in the diesel engine. It is located on the diesel engine thermostat housing and is connected to the Base Controller via the J3 connector WTP-01 and WTN-01 wires.

Coolant Level Switch (CLS) (Except UT-R Units)

This switch (if installed/applicable) monitors the engine coolant level. If installed/applicable, it is located on the radiator expansion tank and is connected to the Base Controller via the J7 connector CLS-01 and CLP-01 wires. The switch is closed when the coolant level is adequate.

Oil Pressure Switch (LOPS)

The normally closed low oil pressure switch monitors the oil pressure of the diesel engine. It is located on the bypass oil filter base on the engine side of the unit frame and is connected to the Base Controller via J7 connector and the 20B wire. The switch is open when the oil pressure is adequate.

Oil Level Switch (OLS)

The normally open oil level switch monitors the oil level in the diesel engine. It is located above the oil pan on the door side of the engine. It supplies information on the oil level to the Base Controller via the J3 connector OLS wire. The switch is closed when the oil level is low.

Flywheel Sensor (FW)

This sensor monitors the RPM of the diesel engine. The flywheel sensor is located on the door side of the engine just under the starter. It supplies engine speed information to the Base Controller connector J3 via the FS1 and FS2 wires.

Glow Plugs

The glow plugs are located in the diesel engine cylinder head. The glow plugs are energized and LED 3 is illuminated when the Base Controller energizes the K2 Preheat Relay. The K2 Preheat Relay normally open contacts supply power via the H wire to the glow plugs to preheat the engine before starting. The circuit is protected by the 40 amp fuse F5.

Starter Motor (SM)

The starter motor is located on the door side of the engine. The starter motor is energized and LED 25 is illuminated when the Base Controller energizes the K7 Starter Relay and the relay contacts close. The K7 Starter Relay normally open contacts supply power via the 8S wire to the starter solenoid to crank the engine. The circuit is protected by the 40 amp fuse F3.

Fuel Solenoid (FSH, FSP)

The fuel solenoid is located at the rear of the injector pump and is used to start and stop the flow of fuel to the diesel engine during diesel mode operation. The fuel solenoid features two coils, a pull-in coil and a hold coil. The pull-in coil transfers the fuel solenoid to the open position. The hold coil maintains the fuel solenoid in the open position.

- The hold coil is energized in Diesel Mode when the Base Controller energizes the K1 Run Relay. LED 6 is illuminated when the Run Relay is energized and the contacts have transferred. The K1 Run Relay normally open contacts supply power from the 8 wire through the normally closed contacts of the Diesel/Electric relay to the 8D wire to energize the fuel solenoid hold coil. The circuit is protected by the 15 amp fuse F2.
- The pull-in coil is momentarily energized and LED 24 is momentarily illuminated in Diesel Mode when the Base Controller energizes the K6 Fuel Solenoid Pull-in Relay for two seconds. The K6 Fuel Solenoid Pull-in Relay normally open contacts supply power via the 8DP wire to the fuel solenoid pull-in coil to positively open the fuel solenoid. The circuit is protected by the 40 amp fuse F3.

Alternator Frequency

Alternator frequency is monitored by the Base Controller via the “W” wire. The alternator frequency is used for diagnostic and backup control purposes on model 30 units. It is used as the speed sensor on model 50 units when operating on electric standby.

Communication Ports

ServiceWatch Port

For T-80 units: The standard ServiceWatch Port is used to download the ServiceWatch data logger and to flashload software to the Base Controller. The ServiceWatch port is located in the control box and is connected to Base Controller connector J9. An optional remote port may be mounted on the truck body for easy access.

For T-90 units: A WinTrac configured flash drive is used to download the ServiceWatch data logger, flashload software to the Base Controller, and send/retrieve OptiSet profiles. Connecting directly to a PC requires a connection to connector J9. The ServiceWatch port is located in the control box and is connected to the Base Controller via USB port.

Truck Standard Display (TSD) HMI Flashload Port

The Truck Standard Display HMI Flashload Port is used to flashload software and send time/date information to the Truck Standard Display. The Flashload Port is located on the back of the TSD. The TSD HMI Flashload Port is a 15 pin serial port. The TSD HMI cannot be flashloaded using a USB Flash Drive.

Truck Premium Display (TPD) HMI Flashload Port

The Truck Premium Display HMI Flashload Port is used to flashload software to the Truck Premium Display. The Flashload Port is located in the control box on a pigtail cable near the end of the HMI Control Panel Cable that is connected to Base Controller connector J14.

Note: *For EMEA only: Since April 2016, there is an additional connector on the new adapter harness delivered with the TPD that plugs directly into a laptop to facilitate the flashload process. Refer to Product Bulletin PB 536 and Service Bulletin SB 1070 for details.*

DAS Port

With the optional DAS data logger, a remote communication port is mounted on the truck body for easy access. It can be used to retrieve a DAS download or flashload and configure DAS software.

Printer Port

With the optional DAS data logger, a remote Printer Port is mounted on the truck body with the DAS port for easy access. This port is used to print trip records from the DAS data logger.

Optional Electric Standby

Note: *Model 50 units only.*

The Electric Standby option allows the unit to be operated on either the diesel engine or external electric power. Electric Standby units are designed to operate on three phase power.

Model 50 Features

⚠ 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.

The following features are standard equipment on units equipped with Electric Standby:

- **Automatic Diesel/Electric Selection** - The unit can be programmed to automatically switch to electric operation when a power cord is connected and the standby power is switched on. The unit can also be programmed to automatically switch back to diesel power if the standby power is switched off or fails. The HMI Control Panel will prompt for electric or diesel switchover if the respective autoswitch feature is not enabled.

  Note: *Auto-switch from electric to diesel is not recommended when the unit is running in electric mode indoors or when below deck on a ferry.*

  Note: *The unit will automatically switch to Cycle Sentry when the unit is manually switched or auto-switched to electric mode.*

- **Automatic Overload Reset** - If the drive motor amperage becomes excessive, the overload relay will open and send a signal to the Base Controller. This signal causes the motor to stop and generates Alarm Code 90. The overload relay resets automatically after the alarm is cleared and the unit is restarted.
- **Automatic Phase Correction** - The control system features two motor contactors. One of the contactors is energized by the phase detection module to insure correct motor rotation, regardless of phase rotation on the incoming power. The motor contactors are also electrically interlocked so that only one contactor can be closed at a time.
- **Low Voltage Detection** - The phase detection modulation will not allow the unit to run if the supply voltage is too low.
- **Single Phase Protection** - The phase detection modulation will not allow the unit to run if it detects a single phase condition.

High Voltage Components

The high voltage tray contains the motor contactors, overload relay, heater contactor, and phase select module used to operate the drive motor on units equipped with Electric Standby. The contactors are controlled by 12 volt dc control signals from the Base Controller.

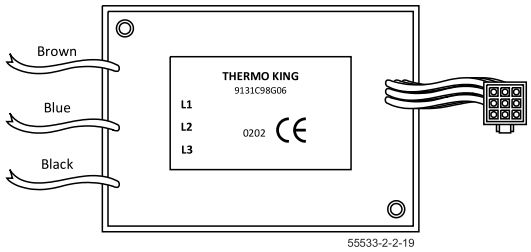
Diesel/Electric Relay K5

The Diesel/Electric Relay K5 is present on all units. If the Electric Standby option is not present or if the unit is running in Diesel Mode, control power is routed through the Diesel/Electric Relay normally closed contacts.

The Diesel/Electric Relay is energized and LED 7 is illuminated when the Base Controller requests Electric Mode operation. The K5 Diesel/Electric Relay normally open contacts supply power to the 7E circuit to enable Electric Mode operation.

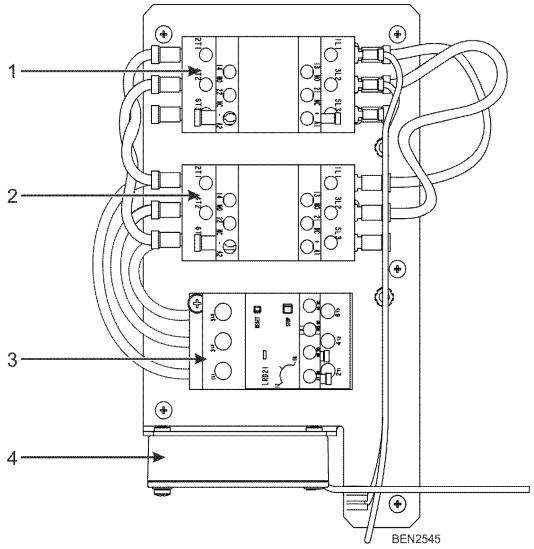
Phase Detect Module

The phase detect module is designed to monitor three phase voltages from 160 volts AC to 510 volts AC. The phase detect module detects missing phases, automatically corrects phase rotation, and provides low voltage protection. Refer to Service Procedure A48A in Section 6 for operation and diagnostics.



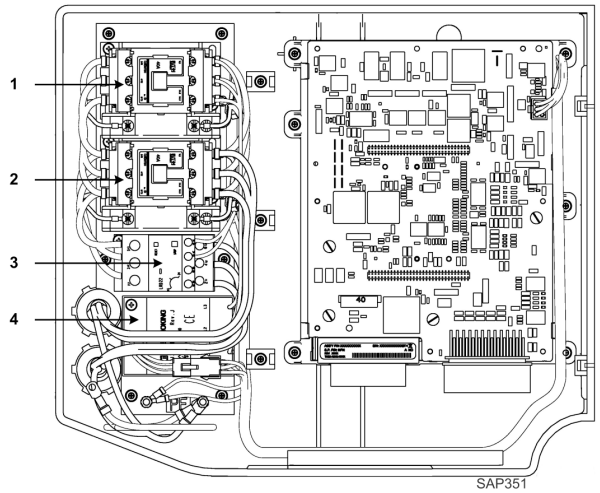
Electric Standby Components

Truck Control Box with Optional Electric Standby (shown with cover removed) (UT-R Series Single Temp & Spectrum)



1	Motor Contactor "A" (MCA)
2	Motor Contactor "B" (MCB)
3	Overload Relay (OL)
4	Phase Detect Module (PDM)

Truck Control Box with Optional Electric Standby (shown with cover removed) (T-Series Spectrum, T-80 Series Spectrum, UT-1200 Spectrum)



1	Motor Contactor "A" (MCA)
2	Motor Contactor "B" (MCB)
3	Overload Relay (OL)
4	Phase Detect Module (PDM)

TK BlueBox

The TK BlueBox communication device is available as an option. If present, it will offer real-time information and two-way communication.

A Maintenance Menu feature called Telematics Status is available that allows the user to check for possible telematics status alarms. Telematics status alarms differ from standard unit alarms; they do not appear as alarms on the HMI main screen if there is an issue with the TK BlueBox. The user is required to access the Maintenance Menu and select Telematics Status to determine if status alarms are activated.

T1	SIM Not Inserted	T6	Check GPS Antenna	T11	iBox System Issue
T2	Check SIM PIN	T7	No GPS Fix	T12	Check Backup Battery
T3	Check APN Configuration	T8	Data Delayed to TracKing™	TT99	Telematics System Issue
T4	Check GSM Antenna	T9	CAN Communication Issue		
T5	No GSM Coverage	T10	Check iBox™ Third Party		

Section 3 - Software Description

Software Operation

The software is a very complex set of instructions used by the Base Controller, HMI Control Panel, and the Expansion Module to control the refrigeration system and interface with the operator. The Base Controller, HMI Control Panel, and the Expansion Module microprocessors examine the conditions of all the inputs and compare them to the instructions contained in the software. The outputs are then energized as specified by the software instructions.

There is no way to determine from the schematic what conditions will cause the unit to operate in a particular mode. This decision is made by the software after examining all the input conditions and setpoint. However, operating mode can usually be deduced from the existing conditions. As an example, if a 35°F (2°C) setpoint is selected and the box temperature, as indicated by the return air sensor is 60°F (16°C), the unit should operate in Cool mode when turned on.

Note: *For the most accurate software information, refer to the applicable software related Service Bulletin located in e-Tech Library.*

The SR-3 system utilizes the following software:

- Base Controller software Fxxx.
- Truck Standard Display HMI Control Panel software 2204 or later.
- Truck Premium Display HMI Control Panel software 75xx/76xx/77xx/78xx.

Base Controller, Standard Truck HMI Control Panel, and Premium Truck HMI Control Panel software updates can be flashloaded using a computer equipped with Wintrac 6.10 or later. Refer to Service Procedure "A46A," p. 341 and "A46B," p. 341 in Section 6 for details.

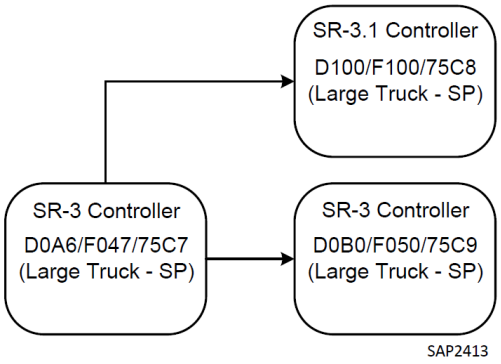
To check the Base Controller, Standard Truck HMI Control Panel, or Premium Truck HMI Control Panel software revision, refer to Section 4. For hardware version and software revision details, refer to "Section 7," p. 361.

Software Separation

Due to the difficulty in managing the increasing number of unit configurations and diverging platforms, Thermo King has decided to separate the software for Self-Powered Truck platforms. This will help to reduce the development timelines and software scopes for future truck units.

F047/75C7 software revisions support current production SR–3 Base Controllers (Blue). F100/75C8 software revisions support new production SR–3.1 Base Controllers (Green).

Figure 24. Truck Software Split (Example)



Menu Structure

Truck Standard Display

Note: *Refer to Section 4 for additional information and complete operating instructions.*

The Truck Standard Display is used to operate the unit and display some unit information. It cannot access Truck Control System menus. It supports the following features:

- Shows which zone is currently displayed
- Displays Box Temperature and Setpoint in Fahrenheit or Celsius for each zone

- Displays Engine Running and Electric Motor Running Hourmeters
- Changes Setpoint for each zone
- Indicates Alarm Condition Exists
- Displays and Clears Most Alarms
- Selects and indicates CYCLE-SENTRY or Continuous Mode Operation
- Selects and indicates High Speed Lock-Out Operation
- Initiates and indicates a Defrost Cycle for each zone
- Initiates and indicates a Pretrip Test
- Sends a Start of Trip to the ServiceWatch data logger

Truck Premium Display

Note: *Refer to Section 4 for additional information and complete operating instructions.*

The Truck Premium Display is a full function graphics capable Control Panel. It is used to operate the unit, display unit information, and provide full access to all Control System features, functions, and menus. The menu structure consists of the Standard Display, Main Menu, Maintenance Menu, and Guarded Access Menu.

Standard Display

The Standard Display shows the box temperature and setpoint for each zone. The box temperature is usually return air temperature, but can be discharge air temperature if some features are enabled. The setpoint for each zone can be changed from the Standard Display using the SETPOINT soft key. The readings of the unit gauges and temperature sensors are shown from the Main Menu. The Main Menu is accessed from the Standard Display using the MENU soft key.

Main Menu

The Main Menu is made up of informational and operational items intended for the driver or unit operator. The Main Menu is directly accessible from the Standard Display using the MENU soft key. This soft key is at the bottom right of the display.

Maintenance Menu

The Maintenance Menu is made up of informational, operational, control, and diagnostic items used to help the service technician maintain and diagnose the unit. The Maintenance Menu is indirectly accessible from the Main Menu.

Guarded Access Menu

The Guarded Access Menu is made up of programmable feature settings that configure the unit, set sensor grades, enable options, and allow the customer to tailor unit operation to their particular requirements. The Guarded Access Menu is indirectly accessible from the Maintenance Menu.

Operator Features

When used with the Truck Premium Display, the Thermo King SR-3 Truck Control System features many special operator functions. These functions are available from the Standard Display. A brief explanation of each menu is included here.

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 for each configured zone. The box temperature is usually return air temperature, but can be discharge air temperature if some features are enabled. The Standard Display soft keys provide direct operator access to the Setpoint Menu for each zone, Gauges Menu, Sensors Menu, or Main Menu.

- **Setpoint Change**

  The Setpoint Menu for each zone can be directly accessed from the Standard Display using the Setpoint soft key.

- **Gauges Menu**

  The unit Gauges Menu can be directly accessed using a soft key from the Standard Display. For a list of gauges available, refer to ("Main Menu," p. 65).

- **Sensors Menu**

The unit Sensors Menu can be directly accessed using a soft key from the Standard Display. For a list of sensors available, refer to ("Main Menu," p. 65).

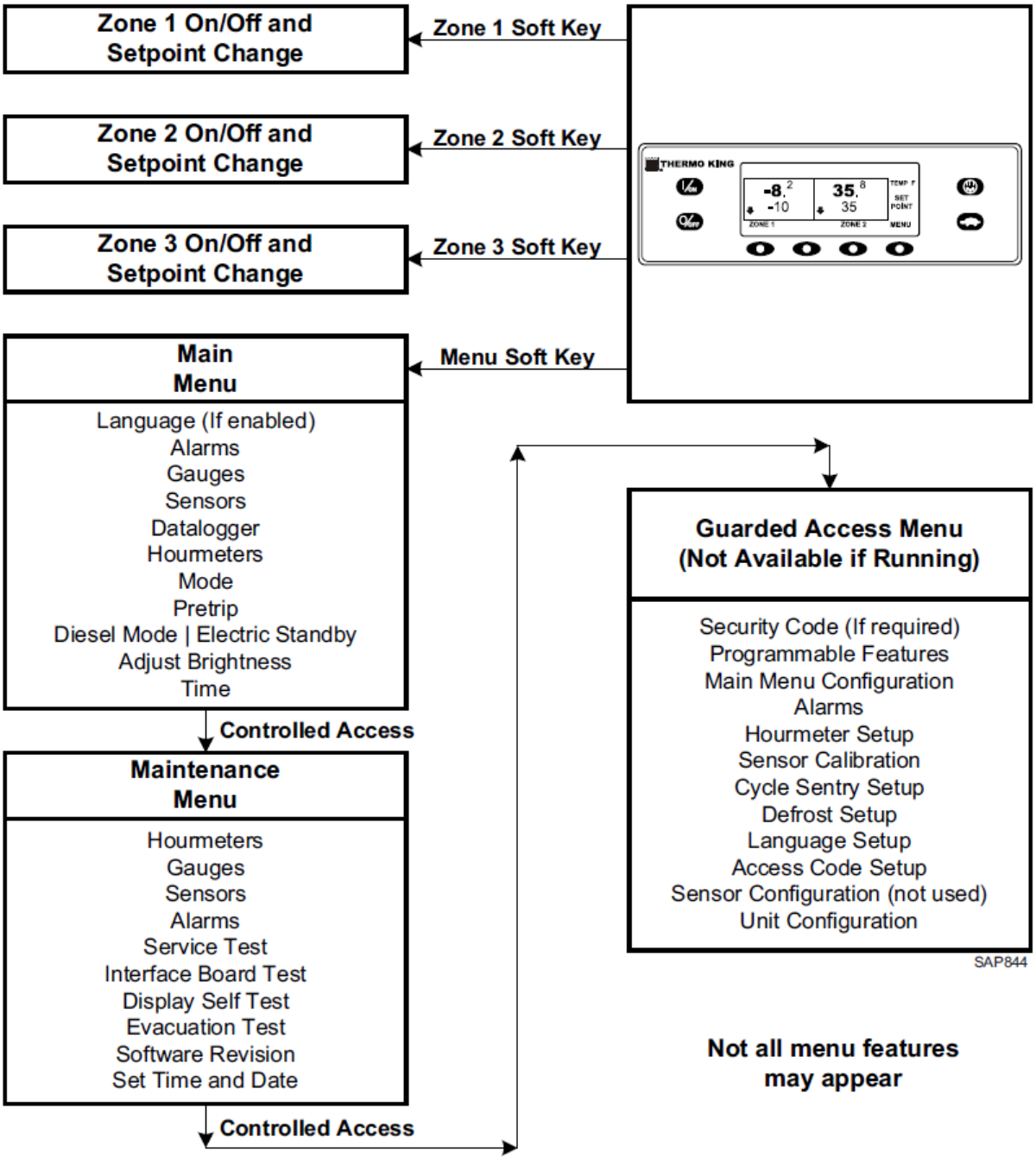
- **Main Menu**

  The unit Main Menu can be directly accessed using a soft key from the Standard Display. For a list of Main Menu functions, refer to ("Main Menu," p. 65).

Main Menu

Note: *Software revision F047/75C7 (Blue) and F100/75C8 (Green). Not all menu features may appear.*

Figure 25. Main Menu Overview



Language

Select from enabled languages

Alarms

Display all alarms
Clear most alarms

Gauges

Coolant Temperature
Coolant Level
Oil Pressure
Oil Level
Amps
Battery Voltage
Engine RPM
Fuel Level Sensor (if configured)
Discharge Pressure
Suction Pressure
ETV Position (if configured)
Compressor Temperature
I/O (Input/Output State)
- High Speed Relay
- Run Relay
- Run Relay Feedback
- Alternator Excite Output
- Alternator Frequency
- Diesel/Electric Relay
- Electric Ready Input
- Electric Overload
- Hot Gas Bypass
- Liquid Injection Solenoid
- Condenser Inlet Solenoid
- Receiver Tank Inlet Pressure Solenoid
- Purge Valve
- Liquid Line Solenoid Zone 1
- Drain Hose Heater Zone 1
- Fan Output Zone 1
- Hot Gas Solenoid Zone 1
- Suction Line Solenoid Zone 1
- Liquid Line Solenoid Zone 2
- Hot Gas Solenoid Zone 2
- Suction Line Solenoid Zone 2
- Drain Hose Heater Zone 2
- Fan Output Zone 2
- Liquid Line Solenoid Zone 3
- Hot Gas Solenoid Zone 3
- Suction Line Solenoid Zone 3
- Drain Hose Heater Zone 3
- Fan Output Zone 3

Sensors

Zone 1 Return Air Temperature
Zone 1 Discharge Air Temperature
Zone 1 Temperature Differential
Zone 1 Evaporator Coil Temperature
Zone 2 Return Air Temperature
Zone 2 Discharge Air Temperature
Zone 2 Temperature Differential
Zone 2 Evaporator Coil Temperature
Zone 3 Return Air Temperature
Zone 3 Discharge Air Temperature
Zone 3 Temperature Differential
Zone 3 Evaporator Coil Temperature
Ambient Air Temperature
Board Temperature Sensor

Datalogger (CargoWatch)

Start Trip
Print/View
  Delivery Ticket
  Trip Ticket

Hourmeters - View Enabled Hourmeters Only

Total Hours
Total Run Time Hours
Engine Hours
Electric Run Hours
Zone 1 Run Time Hours
Zone 2 Run Time Hours
Zone 3 Run Time Hours
Total Run Time Reminder #1 Hours
Total Run Time Reminder #2 Hours
Controller Power On Hours
Pretrip Reminder Hours
Engine Run Time Reminder #1 Hours
Engine Run Time Reminder #2 Hours
Electric Run Time Reminder #1 Hours
Electric Run Time Reminder #2 Hours

Mode

Turn On | Off Cycle Sentry
Fahrenheit | Celsius
Single Zone Control
Keypad Lockout
Start Sleep Mode
  Program a Wakeup Time
    Enter Day to Wake Up
    Enter Hour to Wake Up
    Enter Minutes to Wake Up
    Run Pretrip on Wake Up

Pretrip

Full Pretrip if Not Running
Running Pretrip if Running

Adjust Brightness

Off - Low - Medium - High

Time (View Only)

Hour/Minute/Day/Date/Month/Year

Others

Diesel Mode | Electric Standby (Model 50 Only)

Main Menu Features

The Main menu allows the operator to check other unit conditions, change operating modes, and perform other operator functions. The Main Menu is accessed from the Standard Display by means of the Menu soft key. The sub-menus shown below may be available. For additional details, refer to Section 4.

Language

If more than one language is enabled, this menu item allows the operator to select a language from a list of up to 11 languages at one time. All subsequent displays are shown in the selected language. Four different language packages

with a total of 24 languages are available. English is the default language and is provided in each of the packages. For additional details, refer to Section 4.

Alarms

The Alarms display allows the operator to display any existing alarms. The operator can also clear most alarms from this menu.

A list of Alarm Codes including diagnostic procedures for each code is presented in Section 5.

Note: *Some alarms are clearable in Guarded Access only. Alarms with this feature will not provide a soft key "Clear" function. Refer to Section 4 for additional details.*

Gauges

The Gauges menu allows the operator to display operating information such as coolant level and temperature, engine RPM, battery amps, battery volts, and suction and discharge pressure. The I/O selection under Gauges indicates the named outputs as either On or Off.

Note: *This menu contains the same information as the Maintenance Menu - Gauges menu.*

Sensors

The Sensors menu allows the operator to display the reading of all unit temperature sensors as well as the calculated temperature differential.

Note: *This menu contains the same information as the Maintenance Menu - Sensors menu.*

Data Logger

This menu allows the operator to set Start of Trip (SOT) marker to the ServiceWatch and optional DAS data loggers or print a trip report from the DAS data logger.

ServiceWatch Data Logger

The ServiceWatch Data Logger is contained within the Base Controller. The ServiceWatch Data Logger records the following items:

- Thermo King Unit Serial Number
- Truck Number
- Base Controller Serial Number
- Software Revision
- Temperature Sensors
- Operating Modes
- Alarms Set and Cleared
- Defrost Entry and Exit
- Door Openings
- Real Time Clock Updates

The time and date used by the ServiceWatch Data Logger is loaded from the HMI Control Panel each time the unit is turned on. ServiceWatch information is viewed by connecting a computer loaded with WinTrac 5.2 or later software. For details, refer to "Service Procedure A50A," p. 345.

Data Acquisition System (DAS) Data Logger

The optional DAS Data Logger (no longer sold/offered) can be installed on SR-3 Multi-Temperature Truck Units. It is mounted inside the unit control box. The DAS Data Logger logs cargo temperatures from up to six independent temperature sensors and also records basic unit operating information. The DAS Data Logger can output to a printer or a computer equipped with Wintrac software. It complies with all European temperature recording. For complete details, refer to the DAS Diagnostic Manual (TK 50565-2-OD).

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 cannot be viewed from the Main Menu. For additional details, refer to Section 4.

Notes:

1. *All active hourmeters are available for viewing in the Maintenance Menu.*
2. *Active hourmeters with the view feature set to Disable will still record hours.*

Mode

The Mode Menu allows the operator to change the unit operating modes if allowed. Not all modes may appear depending on the settings selected from the Guarded Access Menu. For additional details, refer to Section 4.

- Turn Off Cycle Sentry Mode/Turn On Cycle Sentry Mode (If Cycle Sentry Mode is turned Off, the unit runs in Continuous Mode).
- Allow Keypad Lockout to be selected (if enabled).
- Select temperature displays in either degrees Fahrenheit or degrees Celsius (if enabled).
- Allow Single Zone Control or Multi Zone Control to be selected (if enabled).
- Start Sleep Mode (if enabled).

Pretrip Test

A Pretrip Test is used to confirm unit operation. This menu allows a Pretrip Test to be initiated by the operator. If the test is started with the engine or electric motor off, a full test including the non-running amp checks and the running performance tests are performed. If the test is started with the engine or electric motor running, only the running tests are performed. Test results are reported as PASS, CHECK, or FAIL. For additional details, refer to Section 4.

Electric Standby (Model 50 units only)

If the Electric Standby option is present and the Diesel to Electric Auto-Switch feature is set to NO, this feature allows the operator to manually select electric mode operation. This feature does not appear if the unit does not have the optional Electric Standby or if the Diesel to Electric Auto-Switch feature is set YES. For additional details, refer to Section 4.

Diesel Mode (Model 50 units only)

If a unit equipped with electric standby 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 unit does not have optional Electric Standby or if the Electric to Diesel Auto-Switch feature is set YES. For additional details, refer to Section 4.

Note: *Auto-Switch from electric to diesel is not recommended when the unit is running in electric mode indoors or when below deck on a ferry.*

Adjust Brightness

This menu allows the operator to adjust the HMI Control Panel display backlight intensity as required by local conditions. If desired, the backlight can also be turned off. For additional details, refer to Section 4.

Time

This menu allows the operator to view the unit time and date. The time and date cannot be changed from this menu. The time and date is loaded from the HMI Control Panel to the Base Controller each time the unit is turned on. For additional details, refer to Section 4.

Maintenance Menu

Note: *Software revision F047/75C7 (SR-3) and F100/75C8 (SR-3.1). Not all menu features may appear.*

Hourmeters - View and Reset Time

Total Hours
Total Run Time Hours
Engine Hours
Electric Run Hours
Zone 1 Run Time Hours
Zone 2 Run Time Hours
Zone 3 Run Time Hours
Total Run Time Reminder #1 Hours
Total Run Time Reminder #2 Hours
Controller Power On Hours
Pretrip Reminder Hours
Engine Run Time Reminder #1 Hours
Engine Run Time Reminder #2 Hours
Electric Run Time Reminder #1 Hours
Electric Run Time Reminder #2 Hours

Gauges

Coolant Temperature
Coolant Level
Oil Pressure
Oil Level
Amps
Battery Voltage
Engine RPM
Fuel Level Sensor (if configured)
Discharge Pressure
Suction Pressure
ETV Position
I/O (Input/Output State)
- High Speed Relay
- Run Relay
- Run Relay Feedback
- Alternator Excite Output
- Alternator Frequency
- Diesel/Electric Relay
- Electric Ready Input
- Electric Overload
- Hot Gas Bypass
- Liquid Injection Solenoid
- Condenser Inlet Solenoid
- Receiver Tank Inlet Pressure Solenoid
- Purge Valve
- Liquid Line Solenoid Zone 1
- Drain Hose Heater Zone 1
- Fan Output Zone 1
- Hot Gas Solenoid Zone 1
- Suction Line Solenoid Zone 1
- Liquid Line Solenoid Zone 2
- Hot Gas Solenoid Zone 2
- Suction Line Solenoid Zone 2
- Drain Hose Heater Zone 2
- Fan Output Zone 2
- Liquid Line Solenoid Zone 3
- Hot Gas Solenoid Zone 3
- Suction Line Solenoid Zone 3
- Drain Hose Heater Zone 3
- Fan Output Zone 3

Sensors

Zone 1 Return Air Temperature
Zone 1 Discharge Air Temperature
Zone 1 Temperature Differential
Zone 1 Evaporator Coil Temperature
Zone 2 Return Air Temperature
Zone 2 Discharge Air Temperature
Zone 2 Temperature Differential
Zone 2 Evaporator Coil Temperature
Zone 3 Return Air Temperature
Zone 3 Discharge Air Temperature
Zone 3 Temperature Differential
Zone 3 Evaporator Coil Temperature
Ambient Air Temperature
Board Temperature Sensor

Telematics Status

Display Status

Note: *Refer to TK BlueBox Diagnostic Manual (TK 56391) Section 4.*

Alarms

Display all alarms
Clear most alarms

Service Test

Test with Unit Running?
Zone 1
- Zone 1 Null
- Zone 1 Low Speed Cool
- Zone 1 High Speed Cool
- Zone 1 Low Speed Heat
- Zone 1 High Speed Heat
- Zone 1 Defrost

Zone 2
- Zone 2 Null
- Zone 2 Low Speed Cool
- Zone 2 High Speed Cool
- Zone 2 Low Speed Heat
- Zone 2 High Speed Heat
- Zone 2 Defrost

Zone 3 (if installed)
- Zone 3 Null
- Zone 3 Low Speed Cool
- Zone 3 High Speed Cool
- Zone 3 Low Speed Heat
- Zone 3 High Speed Heat
- Zone 3 Defrost

Interface Board Test

Preheat Relay
Buzzer
Run Relay
Condenser Inlet Solenoid
Damper Output
Indicator Light
Alarm Light
Diesel/Electric Relay
High Speed Relay
Receiver Tank Solenoid
Alternator Excite Relay
Purge Valve
Zone 1 Liquid Line Solenoid
Zone 1 Hot Gas Solenoid
Zone 1 Suction Line Solenoid
Fan Motor 2 Relay (not if configured DE)
Zone 2 Damper Output (if configured DE)
Drain Hose Heater Zone 2
Zone 2 Hot Gas Solenoid
Zone 2 Suction Line Solenoid
Zone 2 Liquid Line Solenoid
Fan Motor 3 Relay
Drain Hose Heater Zone 3
Zone 3 Hot Gas Solenoid
Zone 3 Suction Line Solenoid
Zone 3 Liquid Line Solenoid
Hot Gas Bypass Valve

Display Self Test

LCD Test
Keypad Test
Backlight Test
Brightness Test
Buzzer Test
Heater Output
Serial E2
Datalog Flash
RTC Update

Evacuation Test

Connect Battery Charger

Software Revision

Display (HMI) Software Rev
Controller Software Rev
Supervisor Software Rev

Set Time and Date

Hour/Minute/Date/Month/Year

Maintenance Menu Features

When used with the optional Premium HMI Control Panel, the Thermo King control system features many special technician functions. These functions are available from the Maintenance Menu. A brief explanation of each menu is included here.

Note: *For complete details, refer to Section 4.*

Accessing the Maintenance Menu

The Maintenance Menu is accessible from the Main Menu. From the Standard Display press the MENU key. From the first Main Menu display (either Alarms or Language) press and hold both the EXIT key and the key with no label above it for five seconds. After five seconds, the HMI will display the Maintenance Menu.

Hourmeters

This menu allows the technician to view all the active unit hourmeters, even if the Main Menu view has been disabled. The Maintenance Menu Hourmeter Display also allows the technician to reset the time on hourmeters with a programmed time limit.

Gauges

The Gauges Menu allows the technician to display operating information such as coolant level and temperature, engine RPM, battery amps, battery volts, suction and discharge pressure. The I/O selection under Gauges indicates the named outputs as either On or Off. Some Gauges can also be viewed from the Service Test Mode and Interface Board Test Mode displays.

Note: *This menu contains the same information as the Standard Display Soft Key Menu and Main Menu > Gauges Menu.*

Sensors

The Sensors Menu allows the technician to display the reading of all unit temperature sensors as well as the calculated temperature differential.

Note: *This menu contains the same information as the Standard Display Soft Key Menu and Main Menu > Sensors Menu.*

Alarms

The Alarms display allows the technician to display any existing alarms. The technician can also clear most alarms from this menu.

A complete list of Alarm Codes including diagnostic procedures for each code is presented in Section 5.

Note: *Some alarms are clearable in Guarded Access only. These alarms will not provide a Clear Soft Key if displayed from the Main Menu or Maintenance Menu. Refer to Section 4 for additional details.*

Service Test Mode

The Service Test Mode Menu allows the unit to be forced to a known set of operating conditions in diesel or electric mode, regardless of setpoint or temperature sensor inputs. Service personnel can use this mode to troubleshoot the system under defined operating conditions. Service Test Mode can be used with the unit running or non-running. Any Shutdown Alarms that are present must be cleared before Service Test Mode is available. Refer to Section 4 for complete details.

Interface Board Test

Interface Board Test Mode allows individual relays or outputs to be energized. This permits service personnel to troubleshoot individual circuits under known conditions. Interface Board Test Mode can only be used with the unit in a non-running condition. If Interface Board Test Mode is entered with the diesel engine or electric motor running, the engine or motor will be shut down. Any Shutdown Alarms that are present must be cleared before Interface Board Test Mode is available. Refer to Section 4 for complete details.

Display Self Test

This menu allows the technician to perform a series of built in tests on the HMI Control Panel.

Evacuation Test

The Evacuation Test allows a full system evacuation to be performed. All normally closed valves are opened to allow the entire system to be completely evacuated before charging with refrigerant. If present, the ETV will be fully opened. If the battery voltage falls below acceptable limits, the operator is prompted to connect a battery charger to maintain sufficient battery voltage to hold all necessary valves open during the procedure. If the voltage from the battery charger rises above acceptable limits, the controller will be turned off to prevent damage to the electronics and/or system components.

Software Revision

The Software Revision Menu shows the software revision of the HMI Control Panel and the Base Controller.

Set Time and Date

The Set Time and Date Menu allows the system time and date to be checked and changed as required. The time and date is loaded from the HMI Control Panel to the Base Controller each time the unit is turned on.

Telematics Status

The Telematics Status Menu allows the technician to view any existing status messages from the TK BlueBox. Up to three messages will be displayed in order of severity. The messages will self-clear after the TK BlueBox detects the problem has been corrected. Refer to Section 4 for details.

Guarded Access Menu

Note: *Software revision F047/75C7 (SR-3) and F100/75C8 (SR-3.1). Not all menu features may appear.*

Security Code (if enabled)

Enter Access Code

Programmable Features

Temperature Units (F)
Pressure Units (PSIG)
Restart Unit After Shutdown (Enabled)
Setpoint High Limit Zone 1 (80°F/27°C)
Setpoint Low Limit Zone 1 (-20°F/-29°C)
Setpoint High Limit Zone 2 (80°F/27°C)
Setpoint Low Limit Zone 2 (-20°F/-29°C)
Setpoint High Limit Zone 3 (80°F/27°C)
Setpoint Low Limit Zone 3 (-20°F/-29°C)
Running Fans in Null (Disabled)
Fresh Frozen Range (15°F or 24°F/-9°C or -4°C)
High Speed Lockout Key (Enabled)
High Speed Inhibit Timeout HRS:MIN (Off)
Sleep Mode After Pretrip (Disabled)
Discharge Pressure Setpoint (420 PSI)
Limited Alarm Restart (Disabled)
Remote Device (Disabled)
COM 1 Default Baud Rate (1200)
COM 2 Default Baud Rate (9600)
COM 3 Default Baud Rate (9600)
Demand Defrost on Temp Rises (Disabled)
Extended ServiceWatch Logging (Disabled)
Zone Priority (Disabled)
ServiceWatch Logging Interval (1 Minute)
Null Restart Temperature
    Fresh (2.8°F to 15.2°F/1.5°C to 8.5°C)
    Frozen (3.6°F to 15.2°F/2°C to 8.5°C)
Limited Alarm Restart II (Disabled)

Main Menu Configuration

Add Keypad Lockout to Mode Menu (Disabled)
Add Sleep to Mode Menu (Disabled)
Show SZC on Mode Menu (Disabled)
Add Temperature Units to Mode Menu (Disabled)
Keypad Lock PIN (No Code)
Easy Cargo Sensor Access (Disabled)

Alarms

Display all alarms
Clear all alarms except Alarm Code 64

Hourmeter Setup

Program Hourmeter
- Total Run Time Reminder #1 Hours (Off)
- Total Run Time Reminder #2 Hours (Off)
- Controller Power On Hours (Off)
- Pretrip Reminder Hours (Off)
- Engine Run Time Reminder #1 Hours (Off)
- Engine Run Time Reminder #2 Hours (Off)
- Electric Run Time Reminder #1 Hours (Off)
- Electric Run Time Reminder #2 Hours (Off)

Viewable Hourmeter Setup
- Total Hours (Disabled)
- Total Run Time Hours (Enabled if Model 50)
- Engine Hours (Enabled)
- Electric Run Hours (Enabled if Model 50)
- Zone 1 Run Time Hours (Disabled)
- Zone 2 Run Time Hours (Disabled)
- Zone 3 Run Time Hours (Disabled)
- Total Run Time Reminder #1 Hours (Disabled)
- Total Run Time Reminder #2 Hours (Disabled)
- Controller Power On Hours (Disabled)
- Pretrip Reminder Hours (Disabled)
- Engine Run Time Reminder #1 Hours (Disabled)
- Engine Run Time Reminder #2 Hours (Disabled)
- Electric Run Time Reminder #1 Hours (Disabled)
- Electric Run Time Reminder #2 Hours (Disabled)

Program Service Due Date
- Engine Run Time Service Due Date (Disabled)

Sensor Calibration

Zone 1 Return Air Sensor Grade (5H)
Zone 1 Discharge Air Sensor Grade (5H)
Zone 2 Return Air Sensor Grade (5H)
Zone 2 Discharge Air Sensor Grade (5H)
Zone 3 Return Air Sensor Grade (5H)
Zone 3 Discharge Air Sensor Grade (5H)

Cycle Sentry Setup

Cycle Sentry Amps Level (5)
Battery Sentry Voltage Level (12.2)

Defrost Setup

Defrost Interval In Range w/ Fresh Setpoint (6)
Defrost Interval Not In Range w/ Fresh Setpoint (4)
Defrost Interval In Range w/ Frozen Setpoint (6)
Defrost Interval Not In Range w/ Frozen Setpoint (4)
Maximum Defrost Duration (45)
High Speed Defrost (Disabled)

Language Setup

HMI Rev 75xx	HMI Rev 76xx	HMI Rev 77xx
English	English	English
Spanish	Danish	Japanese
French	Russian	Chinese
German	Norwegian	
Italian	Swedish	HMI Rev 68xx
Dutch	Finnish	Mix and Match Languages
Portuguese	Polish	
Greek	Hungarian	
Turkish	Romanian	
Hebrew	Bulgarian	
Arabic	Czech	

Access Code Setup

Enter Access Code

Unit Configuration

Unit Type (Truck - Trailer)
Sensor Data (Disabled)
Engine Type (270, 370, 376; Tier 4 374, 380)
Compressor Type (Scroll, Recip)
ETV Configured (No)
How Many Zones in This Unit? (2 or 3)
Zone 1 Evap Fans Configuration (3 Fans)
Zone 2 Evap Fans Configuration (3 Fans)
Zone 3 Evap Fans Configuration (3 Fans)
Electric Standby Equipped? (Yes)
Diesel to Electric Autoswitch Enabled? (No)
Electric to Diesel Autoswitch Enabled? (No)
Unit Model (T-800 MT, T-800R MT, T-1000 MT, T-1000R MT, T-1200 MT, T-1200R MT, UT-SPECTRUM, UT-1200 Spectrum; Tier 4 Units: T-1080S Spectrum, T-1280R Spectrum, T-1090 Spectrum)
Fuel Sensor Type (None)
Rear Remote Control (None)
    Rear Remote Control Action (Stand By)
Pretrip/Sleep Switch Options (Disabled)
3rd Party Device Control (None)
TK Telematics Fuel Level Sensor Type (No Sensor)
TK Telematics Door Switch Enabled? (Disabled)
Cargo Link (Enabled)
Low Fuel Shutdown (Disabled)

Guarded Access Menu Features

Note: *The Guarded Access Menu allows the programmable unit features to be configured to user requirements.*

The features presented in this section contain the following information:

- Control Rev: The controller software release in which the feature was first implemented.
- HMI Rev: The HMI software release in which the feature was first implemented.
- Choices: The selections that are available for the feature.
- Factory Set: Default setting from factory.
- Exceptions: Special considerations for use of the feature.
- Description: A brief description of the feature and its use.

For complete details, refer to "Using the Guarded Access Menu," p. 199.

Security Code Protection

A security code can be set to restrict access to the Guarded Access Menu. If a security code is set, the technician will be prompted to enter the correct code when accessing the Guarded Access Menu. The security code is defaulted to No Code.

Accessing the Guarded Access Menu

From the Standard Display press the MENU key. The controller will display the Main Menu. From the first Main Menu display (either Language or Alarms) press and hold both the EXIT key and the key with no label above it for five seconds.

After five seconds, the controller will display the Maintenance Menu. Press the NEXT key until the Set Time and Date Menu appears. From the Set Time and Date Menu, press and hold both the EXIT key and the key with no label above it for five seconds.

The controller may display a Security Code challenge. If a Security Code has been set, the operator is prompted to enter the correct code using the "+" and "-" keys. When the correct code is set, press the YES key to enter the Guarded Access Menu. If the correct Security Code is not entered, access to the Guarded Access Menu will be denied.

If no Security Code has been set, the controller will enter the Guarded Access Menu directly.

Bypassing the Security Code

If a Security Code is set and the Guarded Access Menu must be accessed, the Security Code can be bypassed by entering "4444".

Leaving the Guarded Access Menu

When leaving the Guarded Access Menu, the Base Controller will automatically turn off and restart to configure the changes that may have been made. This power cycle is termed a controller "warm restart".

Programmable Features Menu

The Programmable Features Menu allows overall unit operation to be configured to specific end user requirements. These features are set to factory defaults when shipped, but can easily be changed to suit the end user's needs.

Temperature Units

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	FAHRENHEIT or CELSIUS
Factory Set	FAHRENHEIT or CELSIUS – depending on region
Exceptions	
Description	The controller can be set to display temperatures in either degrees FAHRENHEIT or degrees CELSIUS.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	FAHRENHEIT or CELSIUS
Factory Set	FAHRENHEIT or CELSIUS – depending on region
Exceptions	
Description	The controller can be set to display temperatures in either degrees FAHRENHEIT or degrees CELSIUS.

Pressure Units

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	PSIG, KPa, or BARS
Factory Set	PSIG
Exceptions	
Description	The controller can be set to display system refrigerant pressures in PSIG, kPa, or BARS.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	PSIG, KPa, or BARS
Factory Set	PSIG
Exceptions	
Description	The controller can be set to display system refrigerant pressures in PSIG, kPa, or BARS.

Restart Unit After Shutdown

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED, DISABLED, or CONTINUOUS
Factory Set	ENABLED
Exceptions	
Description	If this feature is set ENABLED, all restarts after shutdown alarms are enabled. If a shutdown alarm occurs, the unit will restart after a set time to provide load protection. Depending on the cause of the shutdown alarm, unit performance may be reduced in an attempt to allow continued operation. If this feature is set DISABLED, it will cause the unit to remain shut down after any shutdown alarm occurs. If this feature is set CONTINUOUS, it will allow alarm codes 10, 18, 63, and 82 to have continuous restarts.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED, DISABLED, or CONTINUOUS
Factory Set	ENABLED
Exceptions	
Description	If this feature is set ENABLED, all restarts after shutdown alarms are enabled. If a shutdown alarm occurs, the unit will restart after a set time to provide load protection. Depending on the cause of the shutdown alarm, unit performance may be reduced in an attempt to allow continued operation. If this feature is set DISABLED, it will cause the unit to remain shut down after any shutdown alarm occurs. If this feature is set CONTINUOUS, it will allow alarm codes 10, 18, 63, and 82 to have continuous restarts.

Setpoint High Limit (for the indicated Zone)

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	Maximum is 90°F (32°C), Minimum is Setpoint Low Limit
Factory Set	80°F (27°C)
Exceptions	
Description	Setpoint High Limit allows the upper setpoint limit to be set to a maximum of 90°F (32°C) in one degree increments. The minimum setting is determined by the setting of Setpoint Low Limit. If the driver attempts to select a setpoint higher than the Setpoint High Limit, the display will show Setpoint Limit, indicating that the selected Setpoint High Limit has been reached. Setting Setpoint High Limit and the Setpoint Low Limit to the same temperature results in a single setpoint temperature available. This setting is zone specific.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	Maximum is 90°F (32°C), Minimum is Setpoint Low Limit
Factory Set	80°F (27°C)

Exceptions	
Description	Setpoint High Limit allows the upper setpoint limit to be set to a maximum of 90°F (32°C) in one degree increments. The minimum setting is determined by the setting of Setpoint Low Limit. If the driver attempts to select a setpoint higher than the Setpoint High Limit, the display will show Setpoint Limit, indicating that the selected Setpoint High Limit has been reached. Setting Setpoint High Limit and the Setpoint Low Limit to the same temperature results in a single setpoint temperature available. This setting is zone specific.

Setpoint Low Limit (for the indicated Zone)

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	Minimum is -25°F (-32°C), Maximum is Setpoint High Limit
Factory Set	-20°F (-29°C)
Exceptions	
Description	The Setpoint Low Limit allows the lower setpoint limit to be set to a minimum of -25°F (-32°C) in one degree increments. The maximum setting available is determined by the setting of Setpoint High Limit. If the driver attempts to select a setpoint lower than the Setpoint Low Limit, the display will show Setpoint Limit, indicating that the selected Setpoint Low Limit has been reached. Setting the Setpoint High Limit and the Setpoint Low Limit to the same temperature results in a single setpoint temperature available. This setting is zone specific.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	Minimum is -25°F (-32°C), Maximum is Setpoint High Limit
Factory Set	-20°F (-29°C)
Exceptions	
Description	The Setpoint Low Limit allows the lower setpoint limit to be set to a minimum of -25°F (-32°C) in one degree increments. The maximum setting available is determined by the setting of Setpoint High Limit. If the driver attempts to select a setpoint lower than the Setpoint Low Limit, the display will show Setpoint Limit, indicating that the selected Setpoint Low Limit has been reached. Setting the Setpoint High Limit and the Setpoint Low Limit to the same temperature results in a single setpoint temperature available. This setting is zone specific.

Running Fans in Null

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	This feature allows the fans in a zone to run when the zone is in running null. This maintains airflow in the zone and is normally used with fresh loads. If this feature is Set OFF, the zone fans will not run when the zone is in running null.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED

Exceptions	
Description	This feature allows the fans in a zone to run when the zone is in running null. This maintains airflow in the zone and is normally used with fresh loads. If this feature is Set OFF, the zone fans will not run when the zone is in running null.

Fresh Frozen Range

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	24°F (-4°C) or 15°F (-9°C)
Factory Set	15°F (-9°C)
Exceptions	
Description	One set of general control specifications is used when operating in the Fresh range, and another set of general operating specifications is used when operating in the Frozen range. This feature allows the line between Fresh and Frozen ranges to be selected as either 15°F (-9°C) or 24°F (-4°C). All setpoints less than or equal to this value will be treated as frozen ranges. All setpoints greater than this value will be treated as Fresh ranges. The Frozen setpoint range is from the limit of the Setpoint Limit Low setting to the Fresh Frozen range setting. The Fresh setpoint range is from the limit of the Fresh Frozen range +1 degree to the setpoint high limit setting.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	24°F (-4°C) or 15°F (-9°C)
Factory Set	15°F (-9°C)
Exceptions	
Description	One set of general control specifications is used when operating in the Fresh range, and another set of general operating specifications is used when operating in the Frozen range. This feature allows the line between Fresh and Frozen ranges to be selected as either 15°F (-9°C) or 24°F (-4°C). All setpoints less than or equal to this value will be treated as frozen ranges. All setpoints greater than this value will be treated as Fresh ranges. The Frozen setpoint range is from the limit of the Setpoint Limit Low setting to the Fresh Frozen range setting. The Fresh setpoint range is from the limit of the Fresh Frozen range +1 degree to the setpoint high limit setting.

Door Open

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	This screen is no longer available starting with 75C2.
Description	This feature allows the optional Door Switch to be enabled or disabled. If the Door Open feature is set ENABLED, the door switch will operate as selected with the Door Action feature. If the Door Open feature is set DISABLED, the door switch has no function. The default setting is ENABLED.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	This feature allows the optional Door Switch to be enabled or disabled. If the Door Open feature is set ENABLED, the door switch will operate as selected with the Door Action feature. If the Door Open feature is set DISABLED, the door switch has no function. The default setting is ENABLED.

Door Open Forces

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	LOG ONLY, UNIT NULL, ZONE NULL, ZONE RUNNING NULL, HI SPD LOCKOUT
Factory Set	LOG ONLY
Exceptions	
Description	This feature allows the Door Open action to be set. If this feature is set UNIT NULL, the Base Controller switches the unit to Null mode and logs the door opening four seconds after the door is opened. The unit will operate in normal required control when door is closed. If the unit is in defrost when the door is opened, the defrost cycle will be completed before the unit shuts down. If this feature is set TIMED OFF (previous to 7590), the unit will restart and run if the time set by Door Open Timeout is exceeded. An Alarm Code 108 Door Open Timeout will generate as a Check Alarm. If this feature is set LOG ONLY, the door opening will be logged after four seconds but the unit will continue to run. If this feature is set to ZONE NULL, the Base Controller forces the zone in Null and logs the door opening four seconds after the door is opened. If the zone is in defrost when the door is opened, the defrost cycle will be completed before the zone shuts down. If this feature is set to ZONE RUNNING NULL, the Base Controller forces the zone in Null but active the fans every 3 minutes (3 minutes ON, 3 minutes Off) and logs the door opening four seconds after the door is opened. If the zone is in defrost when the door is opened, the defrost cycle will be completed before the zone shuts down. If this feature is set HIGH SPEED LOCKOUT, the door opening will be logged after four seconds but the unit will continue to run forced to Low Speed. The unit will be allowed to run high speed again four seconds after door is closed. Door openings are logged in both the DAS (if equipped) and ServiceWatch data loggers. The door switch must be open or closed for four seconds before the event is logged to prevent false readings.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	LOG ONLY, UNIT NULL, ZONE NULL, ZONE RUNNING NULL, HI SPD LOCKOUT
Factory Set	LOG ONLY
Exceptions	
Description	This feature allows the Door Open action to be set. If this feature is set UNIT NULL, the Base Controller switches the unit to Null mode and logs the door opening four seconds after the door is opened. The unit will operate in normal required control when door is closed. If the unit is in defrost when the door is opened, the defrost cycle will be completed before the unit shuts down. If this feature is set TIMED OFF (previous to 7590), the unit will restart and run if the time set by Door Open Timeout is exceeded. An Alarm Code 108 Door Open Timeout will generate as a Check Alarm. If this feature is set LOG ONLY, the door opening will be logged after four seconds but the unit will continue to run. If this feature is set to ZONE NULL, the Base Controller forces the zone in Null and logs the door opening four seconds after the door is opened. If the zone is in defrost when the door is opened, the defrost cycle will be completed before the zone shuts down. If this feature is set to ZONE RUNNING NULL, the Base Controller forces the zone in Null but active the fans every 3 minutes (3 minutes ON, 3 minutes Off) and logs the door opening four seconds after the door is opened. If the zone is in defrost when the door is opened, the defrost cycle will be completed before the zone shuts down. If this feature is set HIGH SPEED LOCKOUT, the door opening will be logged after four seconds but the unit will continue to run forced to Low Speed. The unit will be allowed to run high speed again four seconds after door is closed. Door openings are logged in both the DAS (if equipped) and ServiceWatch data loggers. The door switch must be open or closed for four seconds before the event is logged to prevent false readings.

Door Open Timeout

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	1:00 to 4:00 (Hours) in 10 Min Increments or OFF
Factory Set	1:00

Exceptions	The optional door switch must be installed. Only appears if the DOOR OPEN FORCES feature is not set to LOG ONLY.
Description	This feature allows the unit to restart if the door open time exceeds the set limit. An Alarm Code 108 will generate as a Check Alarm. Timer starts when the door is open for 4 seconds. Door Open Timeout can be set to OFF or for a time limit from 1 to 4 hours, in 10-minute increments. If set to OFF, the unit will remain off until the door is closed. If a time period is selected, the unit will restart and resume normal operation after the time period elapses even if the door is still open. The timer resets if the door is closed, if the unit enters Pretrip, Sleep Mode, Test Mode, Interface Board Test Mode, or Evacuation mode, if shutdown alarm is set, or if the unit is switched Off.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1:00 to 4:00 (Hours) in 10 Min Increments or OFF
Factory Set	1:00
Exceptions	The optional door switch must be installed. Only appears if the DOOR OPEN FORCES feature is not set to LOG ONLY.
Description	This feature allows the unit to restart if the door open time exceeds the set limit. An Alarm Code 108 will generate as a Check Alarm. Timer starts when the door is open for 4 seconds. Door Open Timeout can be set to OFF or for a time limit from 1 to 4 hours, in 10-minute increments. If set to OFF, the unit will remain off until the door is closed. If a time period is selected, the unit will restart and resume normal operation after the time period elapses even if the door is still open. The timer resets if the door is closed, if the unit enters Pretrip, Sleep Mode, Test Mode, Interface Board Test Mode, or Evacuation mode, if shutdown alarm is set, or if the unit is switched Off.

Door Open Timeout Alarm

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	ENABLED
Exceptions	The optional door switch must be installed. Only appears if the DOOR OPEN TIMEOUT feature is set to any value except OFF.
Description	This feature determines if Alarm Code 108 Door Open Timeout is set when the Door Open Timer is exceeded. If Door Timeout Alarm is set ENABLED, Alarm Code 108 Door Open Timeout will be set when the Door Open Timer is exceeded. If Door Timeout Alarm is set DISABLED, Alarm Code 108 Door Open Timeout will not be set when the Door Open Timer is exceeded.

High Speed Lock-Out Key

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	ENABLED
Exceptions	Diesel mode only.
Description	This feature is typically used in noise sensitive areas to reduce unit engine noise. When the High Speed Lock-Out feature is enabled and High Speed Lock-Out is turned on, the unit will run only in low speed regardless of unit requirements. The unit will run in low speed until High Speed Lock-Out is turned off or the High Speed Inhibit Timer times out. If High Speed Lock-Out is enabled, the feature is turned on and off with a key press from the HMI Control Panel.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	ENABLED

Exceptions	Diesel mode only.
Description	This feature is typically used in noise sensitive areas to reduce unit engine noise. When the High Speed Lock-Out feature is enabled and High Speed Lock-Out is turned on, the unit will run only in low speed regardless of unit requirements. The unit will run in low speed until High Speed Lock-Out is turned off or the High Speed Inhibit Timer times out. If High Speed Lock-Out is enabled, the feature is turned on and off with a key press from the HMI Control Panel.

High Speed Inhibit Timeout

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	OFF, 15, 30, 60, 90, or 120 minutes
Factory Set	OFF
Exceptions	Diesel mode only. This feature only appears if High Speed Lock-Out Mode is enabled.
Description	High Speed Lock-Out Mode features a High Speed Inhibit Timer that can be set OFF or for intervals of 15, 30, 60, 90, or 120 minutes. When High Speed Lock-Out Mode is selected, the High Speed Inhibit Timer is used to allow the unit to return to high speed operation after the set time interval has expired. This prevents the unit from running in low speed indefinitely. When High Speed Lock-Out Mode is turned on, this timer is started. If a time is selected and the High Speed Inhibit Timer expires, High Speed Lock-Out Mode is disabled and normal unit operation resumes. If OFF is selected, the High Speed Inhibit Timer is not used and the unit will remain in low speed until High Speed Lock-Out is turned off.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	OFF, 15, 30, 60, 90, or 120 minutes
Factory Set	OFF
Exceptions	Diesel mode only. This feature only appears if High Speed Lock-Out Mode is enabled.
Description	High Speed Lock-Out Mode features a High Speed Inhibit Timer that can be set OFF or for intervals of 15, 30, 60, 90, or 120 minutes. When High Speed Lock-Out Mode is selected, the High Speed Inhibit Timer is used to allow the unit to return to high speed operation after the set time interval has expired. This prevents the unit from running in low speed indefinitely. When High Speed Lock-Out Mode is turned on, this timer is started. If a time is selected and the High Speed Inhibit Timer expires, High Speed Lock-Out Mode is disabled and normal unit operation resumes. If OFF is selected, the High Speed Inhibit Timer is not used and the unit will remain in low speed until High Speed Lock-Out is turned off.

Sleep Mode After Pretrip

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	If the feature is set ENABLED, the unit will enter Sleep Mode after a Pretrip Test. If the feature is set DISABLED, the unit will not enter Sleep Mode after a Pretrip Test.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	If the feature is set ENABLED, the unit will enter Sleep Mode after a Pretrip Test. If the feature is set DISABLED, the unit will not enter Sleep Mode after a Pretrip Test.

Discharge Pressure Setpoint

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	380 to 440 PSIG
Factory Set	420 PSIG
Exceptions	
Description	This feature allows the head pressure setpoint to be adjusted. This pressure determines when the base controller will enter a temporary operating mode to prevent unit shutdown. Do not change this setting unless instructed to do so.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	380 to 440 PSIG
Factory Set	420 PSIG
Exceptions	
Description	This feature allows the head pressure setpoint to be adjusted. This pressure determines when the base controller will enter a temporary operating mode to prevent unit shutdown. Do not change this setting unless instructed to do so.

Water Temperature Setpoint

Control Rev	F040 and later
HMI Rev	75C4 and later
Choices	180°F to 210°F (82°C to 99°C)
Factory Set	210°F (99°C)
Exceptions	Menu option available only if ETV is configured YES and unit model is not T-1090 Spectrum.
Description	This feature allows the water temperature setpoint to be adjusted. This temperature determines when the base controller will enter a temporary operating mode to prevent unit shutdown. Do not change this setting unless instructed to do so.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	180°F to 210°F (82°C to 99°C)
Factory Set	210°F (99°C)
Exceptions	
Description	This feature allows the water temperature setpoint to be adjusted. This temperature determines when the base controller will enter a temporary operating mode to prevent unit shutdown. Do not change this setting unless instructed to do so.

Limited Alarm Restart

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED

Exceptions	
Description	This feature modifies the ability to repeatedly clear certain alarms from the Main Menu or Operators Menu. If these alarms occur repeatedly, they may indicate a need for service to prevent unit or product damage. These alarms are as follows: • Alarm Code 23 Cooling Cycle Fault • Alarm Code 24 Heating Cycle Fault • Alarm Code 32 Refrigeration Capacity Low • Alarm Code 82 High Compressor Discharge Temp • Alarm Code 93 Low Compressor Suction Pressure Setting this feature to ENABLED will allow the above alarms to be cleared conventionally two times in a continuous 12 hour period. If any of these alarms are cleared more than two times in 12 hours, all subsequent occurrences can only be cleared from the Guarded Access Menu. This helps ensure that the alarms receive the attention of service personnel. The 12 hour timer is reset when any of the above alarms is cleared from the Guarded Access Menu. The 12 hour timer is not reset with a unit or controller power-down. Setting this feature to DISABLED will allow the above alarms to be cleared conventionally an unlimited number of times.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	This feature modifies the ability to repeatedly clear certain alarms from the Main Menu or Operators Menu. If these alarms occur repeatedly, they may indicate a need for service to prevent unit or product damage. These alarms are as follows: • Alarm Code 23 Cooling Cycle Fault • Alarm Code 24 Heating Cycle Fault • Alarm Code 32 Refrigeration Capacity Low • Alarm Code 82 High Compressor Discharge Temp • Alarm Code 93 Low Compressor Suction Pressure Setting this feature to ENABLED will allow the above alarms to be cleared conventionally two times in a continuous 12 hour period. If any of these alarms are cleared more than two times in 12 hours, all subsequent occurrences can only be cleared from the Guarded Access Menu. This helps ensure that the alarms receive the attention of service personnel. The 12 hour timer is reset when any of the above alarms is cleared from the Guarded Access Menu. The 12 hour timer is not reset with a unit or controller power-down. Setting this feature to DISABLED will allow the above alarms to be cleared conventionally an unlimited number of times.

Remote Device

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	Requires optional device - see below.
Description	Setting this feature to ENABLED allows an external device, such as TracKing™, to start and stop a properly equipped unit. Setting this feature to DISABLED prevents this control. ***Important:*** *The Remote Device feature should be set DISABLED before working on the unit if the unit is equipped with a device that allows it to be started and stopped from a remote location.*

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED

Exceptions	Requires optional device - see below.
Description	Setting this feature to ENABLED allows an external device, such as TracKing™, to start and stop a properly equipped unit. Setting this feature to DISABLED prevents this control. ***Important:*** *The Remote Device feature should be set DISABLED before working on the unit if the unit is equipped with a device that allows it to be started and stopped from a remote location.*

HMI Control Panel COM 1 Default Baud Rate

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 BPS
Factory Set	1200
Exceptions	
Description	This feature allows the default baud rate to be selected for the HMI Control Panel COM Port 1. COM Port 1 is used by WinTrac. The setting of this feature should not be changed.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 BPS
Factory Set	1200
Exceptions	
Description	This feature allows the default baud rate to be selected for the HMI Control Panel COM Port 1. COM Port 1 is used by WinTrac. The setting of this feature should not be changed.

HMI Control Panel COM 2 Default Baud Rate

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 BPS
Factory Set	9600
Exceptions	
Description	This feature allows the default baud rate to be selected for the HMI Control Panel COM Port 2. The printer baud rate must be set to match the baud rate setting of the Com 2 Port.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 BPS
Factory Set	9600
Exceptions	
Description	This feature allows the default baud rate to be selected for the HMI Control Panel COM Port 2. The printer baud rate must be set to match the baud rate setting of the Com 2 Port.

HMI Control Panel COM 3 Default Baud Rate

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 BPS

Factory Set	9600
Exceptions	
Description	This feature allows the default baud rate to be selected for the HMI Control Panel COM Port 3. COM port 3 is currently used by third party or other Telematics devices. The setting of this feature should not be changed.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 BPS
Factory Set	9600
Exceptions	
Description	This feature allows the default baud rate to be selected for the HMI Control Panel COM Port 3. COM port 3 is currently used by third party or other Telematics devices. The setting of this feature should not be changed.

Demand Defrost on Temperature Rise Limit

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	Disabled, 5°F (2.8°C)/Minute to 12°F (6.7°C)/Minute
Factory Set	Disabled
Exceptions	
Description	This feature will force a demand defrost in a zone if the temperature rises rapidly. This rapid temperature rise is typically caused when a zone access door is opened. The programmable temperature rise settings are from 5°F (2.8°C) per minute to 12°F (6.7°C) per minute in one degree increments. If the temperature rises more than the programmed rise, a demand defrost is forced in that zone.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	Disabled, 5°F (2.8°C)/Minute to 12°F (6.7°C)/Minute
Factory Set	Disabled
Exceptions	
Description	This feature will force a demand defrost in a zone if the temperature rises rapidly. This rapid temperature rise is typically caused when a zone access door is opened. The programmable temperature rise settings are from 5°F (2.8°C) per minute to 12°F (6.7°C) per minute in one degree increments. If the temperature rises more than the programmed rise, a demand defrost is forced in that zone.

Extended ServiceWatch™ Logging

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	Enabling this feature forces the ServiceWatch data logger to record a timed log every time a zone operating mode changes. Enabling this feature allows for the logging of additional unit operating data. However, due to the additional logging, the data logger memory will be filled faster. If the memory is filled, subsequent logs will be written over the oldest data in the memory. If old data is written over by new data, the old data information is permanently lost.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	Enabling this feature forces the ServiceWatch data logger to record a timed log every time a zone operating mode changes. Enabling this feature allows for the logging of additional unit operating data. However, due to the additional logging, the data logger memory will be filled faster. If the memory is filled, subsequent logs will be written over the oldest data in the memory. If old data is written over by new data, the old data information is permanently lost.

Zone Priority

Control Rev	F010 and later
HMI Rev	75B0 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	If Zone Priority is DISABLED, all zone temperature control regions have equal priority. If Zone Priority is ENABLED: • Priority shall be given to the zone in Cool that has the greatest difference between the return air temperature and the temperature setpoint. – Fresh zone(s) not given priority shall operate in Running Null. – Frozen zone(s) not given priority shall operate in Null. – Priority shall be determined every 15 minutes.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	If Zone Priority is DISABLED, all zone temperature control regions have equal priority. If Zone Priority is ENABLED: • Priority shall be given to the zone in Cool that has the greatest difference between the return air temperature and the temperature setpoint. – Fresh zone(s) not given priority shall operate in Running Null. – Frozen zone(s) not given priority shall operate in Null. – Priority shall be determined every 15 minutes.

ServiceWatch™ Logging Intervals

Control Rev	F010 and later
HMI Rev	75B0 and later
Choices	1 Minute, 2 Minutes, 5 Minutes, 10 Minutes, 15 Minutes, 30 Minutes, 60 Minutes, 90 Minutes, 120 Minutes
Factory Set	15 Minutes
Exceptions	
Description	This feature allows the user to select the logging interval for the ServiceWatch Data Logger.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1 Minute, 2 Minutes, 5 Minutes, 10 Minutes, 15 Minutes, 30 Minutes, 60 Minutes, 90 Minutes, 120 Minutes
Factory Set	15 Minutes
Exceptions	
Description	This feature allows the user to select the logging interval for the ServiceWatch Data Logger.

Null Restart Temperature

Control Rev	F040 and later
HMI Rev	75C4 and later
Choices	2.8°F to 15.2°F (1.5°C to 8.5°C) in increments of 0.2°F (0.1°C) for Fresh range 3.6°F to 15.2°F (2°C to 8.5°C) in increments of 0.2°F (0.1°C) for Frozen range
Factory Set	5°F (2.8°C)
Exceptions	A Fresh or Frozen Null Restart Temperature value is determined by the setpoint in each zone.
Description	This feature allows the temperature range between Null shutdown and Cycle Sentry restart to be set as desired.

Limited Alarm Restart II

Control Rev	F020 and later
HMI Rev	75C0 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	If Restart Unit After Shutdown is ENABLED, this feature can be switched to either ENABLED or DISABLED. If Restart Unit After Shutdown is DISABLED or CONTINUOUS, the menu screen is hidden by the HMI and the setting is automatically switched to DISABLED. If this feature is ENABLED and Alarm Code 18 is set the third time in a continuous 12 hour period after Alarm Code 18 was cleared twice manually via the HMI, the unit will permanently shut down and will not be allowed to restart unless Alarm Code 18 is cleared via Guarded Access. During this permanent shut down event, Alarm Code 18 cannot be cleared outside of Guarded Access. ***Note:*** *Applicable only when Alarm Code 6 is not set/active.*

Control Rev	C052 and later
HMI Rev	68C0 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	If Restart Unit After Shutdown is ENABLED, this feature can be switched to either ENABLED or DISABLED. If Restart Unit After Shutdown is DISABLED or CONTINUOUS, the menu screen is hidden by the HMI and the setting is automatically switched to DISABLED. If this feature is ENABLED and Alarm Code 18 is set the third time in a continuous 12 hour period after Alarm Code 18 was cleared twice manually via the HMI, the unit will permanently shut down and will not be allowed to restart unless Alarm Code 18 is cleared via Guarded Access. During this permanent shut down event, Alarm Code 18 cannot be cleared outside of Guarded Access.

Main Menu Configuration Menu

The Main Menu Configuration Menu determines if the Keypad Lock-Out and Sleep Mode menus are visible in the Main Menu > Mode Menu. These features are set to factory defaults when shipped, but can easily be changed to suit the end user's needs.

Add Keypad Lockout to Mode Menu

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	This feature allows the operator to lock the keypad to prevent tampering. Pressing any soft key for five seconds will unlock the keypad. Setting this feature to Enabled adds the Keypad Lockout feature to the Mode Menu. Setting this feature to Disabled turns the Keypad LockOut feature off and removes the feature from the Mode Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	This feature allows the operator to lock the keypad to prevent tampering. Pressing any soft key for five seconds will unlock the keypad. Setting this feature to Enabled adds the Keypad Lockout feature to the Mode Menu. Setting this feature to Disabled turns the Keypad LockOut feature off and removes the feature from the Mode Menu.

Add Sleep to Mode Menu

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	This feature allows the operator to place the unit in Sleep Mode from the Mode Menu. Setting this feature to Enabled adds the Sleep Mode feature to the Mode Menu. Setting this feature to Disabled removes the Sleep Mode feature from the Mode Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	This feature allows the operator to place the unit in Sleep Mode from the Mode Menu. Setting this feature to Enabled adds the Sleep Mode feature to the Mode Menu. Setting this feature to Disabled removes the Sleep Mode feature from the Mode Menu.

Show Single Zone Control on Mode Menu

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED

Exceptions	
Description	Single Zone Control allows a Multi-Temp unit to be placed in Single Temperature operation. Typically, the dividing wall(s) should be repositioned and the entire truck is operated in the same manner as a single temperature unit. All evaporators will be operated in the same mode, (except for defrost) when this mode is active. The unit will control the entire truck to a single temperature when this mode is active. Setting this feature Enabled places Single Zone Control in the Mode Menu. Setting this feature Disabled turns the Single Zone Control feature off and removes the feature from the Mode Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	Single Zone Control allows a Multi-Temp unit to be placed in Single Temperature operation. Typically, the dividing wall(s) should be repositioned and the entire truck is operated in the same manner as a single temperature unit. All evaporators will be operated in the same mode, (except for defrost) when this mode is active. The unit will control the entire truck to a single temperature when this mode is active. Setting this feature Enabled places Single Zone Control in the Mode Menu. Setting this feature Disabled turns the Single Zone Control feature off and removes the feature from the Mode Menu.

Add Temperature Units to Mode Menu

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	When Enabled, Add Temp Units to Mode Menu allows the operator to choose to display temperatures in either degrees Fahrenheit or degrees Celsius. Setting this feature Enabled adds the Select Temperature Units feature to the Mode Menu. Setting this feature Disabled removes the Select Temperature Units feature from the Mode Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	When Enabled, Add Temp Units to Mode Menu allows the operator to choose to display temperatures in either degrees Fahrenheit or degrees Celsius. Setting this feature Enabled adds the Select Temperature Units feature to the Mode Menu. Setting this feature Disabled removes the Select Temperature Units feature from the Mode Menu.

Keypad Lock PIN

Control Rev	F020 and later
HMI Rev	75C0 and later
Choices	NO CODE or any value from 1 to 99999
Factory Set	NO CODE
Exceptions	
Description	If this feature is set NO CODE, a code is not required to unlock the keypad if it has been locked. If a code from 1 to 99999 has been selected, this code must be entered in order to unlock the HMI keypad. The code should be recorded for future use.

Alarm Display Menu

The Alarm Menu allows the technician to display and clear any existing alarms except alarms that auto-clear only. Refer to Section 4 for operating details. If an alarm condition still exists when the alarm is cleared, the alarm will be set again as soon as the alarm condition is detected.

A list of alarm codes including diagnostic procedures for each alarm code is presented in Section 5 of this manual.

Hourmeter Setup Menu

The Hourmeter Setup Menu allows the unit hourmeters to be configured to customer requirements. There are three sub-menus under the Hourmeter Setup Menu:

- Program Hourmeter
- Viewable Hourmeter Setup
- Program Service Due Date

Program Hourmeter Sub-Menu

The hourmeters listed below allow a time limit to be established for each programmable Hourmeter. These time limits are defined by the customer and are typically used as maintenance reminders. When a hourmeter time is exceeded, a stored alarm is set as a maintenance reminder. The hourmeter is cleared by means of a CLEAR soft key when viewing the hourmeters from the Guarded Access Menu. The hour meter elapsed time should be reset to 0. Hourmeters cannot be cleared from the Main Menu.

With the exception of Controller Power On Hours and Pretrip Reminder Hours, there are two hourmeters for each feature to allow two different maintenance intervals to be set.

The Program Hourmeter Sub-menu is used to set and clear the adjustable time limits for each Hourmeter, as required by a customer's maintenance program. The default time limit for all hourmeters is 100 hours. The hourmeters appear in the order shown.

Total Run Time Reminder # 1 Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 132 will be set as a stored alarm.
Description	Total Run Time Reminder #1 Hours is one of two hourmeters that track the total amount of time the unit has run in both diesel and electric mode. If a time limit is set and exceeded, Alarm Code 132 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 132 will be set as a stored alarm.
Description	Total Run Time Reminder #1 Hours is one of two hourmeters that track the total amount of time the unit has run in both diesel and electric mode. If a time limit is set and exceeded, Alarm Code 132 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Total Run Time Reminder # 2 Hours

Control Rev	F000 and later
HMI Rev	7595 and later

Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 133 will be set as a stored alarm.
Description	Total Run Time Reminder #2 Hours is one of two hourmeters that track the total amount of time the unit has run in both diesel and electric mode. If a time limit is set and exceeded, Alarm Code 133 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 133 will be set as a stored alarm.
Description	Total Run Time Reminder #2 Hours is one of two hourmeters that track the total amount of time the unit has run in both diesel and electric mode. If a time limit is set and exceeded, Alarm Code 133 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Controller Power On Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 134 will be set as a stored alarm.
Description	Controller Power On Hours is the total amount of time the controller has been turned on. If a time limit is set and exceeded, Alarm Code 134 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 134 will be set as a stored alarm.
Description	Controller Power On Hours is the total amount of time the controller has been turned on. If a time limit is set and exceeded, Alarm Code 134 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Pretrip Reminder Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF

Exceptions	If a time limit is set and exceeded, Alarm Code 64 will be set as a stored alarm. The hourmeter is cleared when a Pretrip is activated.
Description	Pretrip Reminder Hours is the total amount of time since the last Pretrip Test was performed. If a time limit is set and exceeded, Alarm Code 64 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 64 will be set as a stored alarm. The hourmeter is cleared when a Pretrip is activated.
Description	Pretrip Reminder Hours is the total amount of time since the last Pretrip Test was performed. If a time limit is set and exceeded, Alarm Code 64 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Engine Run Time Reminder # 1 Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 128 will be set as a stored alarm.
Description	Engine Run Time Reminder #1 Hours is one of two hourmeters that track the total amount of time the unit has run in diesel mode. If a time limit is set and exceeded, Alarm Code 128 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 128 will be set as a stored alarm.
Description	Engine Run Time Reminder #1 Hours is one of two hourmeters that track the total amount of time the unit has run in diesel mode. If a time limit is set and exceeded, Alarm Code 128 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Engine Run Time Reminder # 2 Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 129 will be set as a stored alarm.
Description	Engine Run Time Reminder #2 Hours is one of two hourmeters that track the total amount of time the unit has run in diesel mode. If a time limit is set and exceeded, Alarm Code 129 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 129 will be set as a stored alarm.
Description	Engine Run Time Reminder #2 Hours is one of two hourmeters that track the total amount of time the unit has run in diesel mode. If a time limit is set and exceeded, Alarm Code 129 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Electric Run Time Reminder # 1 Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 130 will be set as a stored alarm. Only appears if the unit is configured as being equipped with optional electric standby.
Description	Electric Run Time Reminder #1 Hours is one of two hourmeters that track the total amount of time the unit has run in electric mode. If a time limit is set and exceeded, Alarm Code 130 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 130 will be set as a stored alarm. Only appears if the unit is configured as being equipped with optional electric standby.
Description	Electric Run Time Reminder #1 Hours is one of two hourmeters that track the total amount of time the unit has run in electric mode. If a time limit is set and exceeded, Alarm Code 130 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Electric Run Time Reminder # 2 Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 131 will be set as a stored alarm. Only appears if the unit is configured as being equipped with optional electric standby.
Description	Electric Run Time Reminder #2 Hours is one of two hourmeters that track the total amount of time the unit has run in electric mode. If a time limit is set and exceeded, Alarm Code 131 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	OFF, 1 to 99,999

Factory Set	OFF
Exceptions	If a time limit is set and exceeded, Alarm Code 131 will be set as a stored alarm. Only appears if the unit is configured as being equipped with optional electric standby.
Description	Electric Run Time Reminder #2 Hours is one of two hourmeters that track the total amount of time the unit has run in electric mode. If a time limit is set and exceeded, Alarm Code 131 will be set as a stored alarm. This feature sets the meter limits for this programmable hourmeter. The default setting is OFF. Time limits start at 100 hours and can be decreased to 1 and then OFF or increased to a maximum of 99,999 hours.

Viewable Hourmeter Setup Sub-Menu

The hourmeters can be programmed to be visible or hidden from the Main Menu. The hourmeters continue to accumulate time even if the hourmeter view is hidden.

If an hourmeter view is set Enabled, that hourmeter will appear in the Hourmeter menu in both the Main Menu and Maintenance Menu. If the hourmeter view is set Disabled, the hourmeter is only viewable from the Maintenance Menu.

For Model 30 units, the default setting for the Engine Hours hourmeter is Enabled. The default setting for all other hourmeters is Disabled.

For Model 50 units, the default setting for the Total Unit Run Hours, Engine Hours, and Electric Run Hours hourmeters is Enabled. The default setting for all other hourmeters is Disabled.

The hourmeters appear in the order shown.

Total Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Total Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Total Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Total Run Time Hours (If Model 50)

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	ENABLED if Model 50
Exceptions	Only appears if the unit is configured as being equipped with optional electric standby.
Description	The setting of this feature determines if the Total Run Time Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	ENABLED if Model 50
Exceptions	Only appears if the unit is configured as being equipped with optional electric standby.
Description	The setting of this feature determines if the Total Run Time Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Total Engine Run Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	ENABLED
Exceptions	
Description	The setting of this feature determines if the Engine Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	ENABLED
Exceptions	
Description	The setting of this feature determines if the Engine Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Electric Run Hours (If Model 50)

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	ENABLED if Model 50
Exceptions	Only appears if the unit is configured as being equipped with optional electric standby.
Description	The setting of this feature determines if the Electric Run Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	ENABLED if Model 50
Exceptions	Only appears if the unit is configured as being equipped with optional electric standby.
Description	The setting of this feature determines if the Electric Run Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Zone 1 Run Time Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Zone 1 Run Time Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Zone 1 Run Time Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Zone 2 Run Time Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Zone 2 Run Time Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Zone 2 Run Time Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Zone 3 Run Time Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	Only appears if the unit is configured as being equipped with three zones.
Description	The setting of this feature determines if the Zone 3 Run Time Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	Only appears if the unit is configured as being equipped with three zones.
Description	The setting of this feature determines if the Zone 3 Run Time Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Total Run Time Reminder #1 Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Total Run Time Reminder #1 Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Total Run Time Reminder #1 Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Total Run Time Reminder #2 Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Total Run Time Reminder #2 Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Total Run Time Reminder #2 Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Controller On Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Controller Power On Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Controller Power On Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Pretrip Reminder Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Pretrip Reminder Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Pretrip Reminder Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Engine Run Time Reminder #1 Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Engine Run Time Reminder #1 Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Engine Run Time Reminder #1 Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Engine Run Time Reminder #2 Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Engine Run Time Reminder #2 Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	The setting of this feature determines if the Engine Run Time Reminder #2 Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Electric Run Time Reminder #1 Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	Only appears if the unit is configured as being equipped with optional electric standby.
Description	The setting of this feature determines if the Electric Run Time Reminder #1 Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	Only appears if the unit is configured as being equipped with optional electric standby.
Description	The setting of this feature determines if the Electric Run Time Reminder #1 Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Electric Run Time Reminder #2 Hours

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	Only appears if the unit is configured as being equipped with optional electric standby.
Description	The setting of this feature determines if the Electric Run Time Reminder #2 Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	Only appears if the unit is configured as being equipped with optional electric standby.
Description	The setting of this feature determines if the Electric Run Time Reminder #2 Hours hourmeter can be viewed from the Main Menu. If the hourmeter is Enabled, it can be viewed from the Main Menu. If it is Disabled, it cannot be viewed from the Main Menu but is visible from the Maintenance Menu.

Programmable Service Due Date

This feature allows a Service Due Date to be programmed. When the selected Service Due Date is reached, Alarm Code 128 Service Due is set.

Service Due Date

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	If this feature is set Enabled, prompts appear to set a Service Due Date (Date / Month / Year). When this date is reached, Alarm Code 128 Service Due is set as a stored alarm. Alarm Code 128 Service Due can only be cleared from the Guarded Access Menu. When Alarm Code 128 Service Due is cleared, the Service Due Date feature is reset to Disabled. The feature can again be set Enabled and a new Service Due Date selected.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	If this feature is set Enabled, prompts appear to set a Service Due Date (Date / Month / Year). When this date is reached, Alarm Code 128 Service Due is set as a stored alarm. Alarm Code 128 Service Due can only be cleared from the Guarded Access Menu. When Alarm Code 128 Service Due is cleared, the Service Due Date feature is reset to Disabled. The feature can again be set Enabled and a new Service Due Date selected.

Sensor Calibration Menu

The Sensor Calibration Menu allows the operator to select the correct grade for all graded sensors. Sensor grades range from 1L through 9H. The sensors appear in the order shown.

Zone 1 Return Air Sensor Grade

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	1L thru 9H
Factory Set	5H
Exceptions	
Description	This feature is used to set the sensor grade for the Zone 1 Return Air Sensor. The default setting for a new base controller or after a ServiceWatch base controller cold start is 5H. This serves as a warning that the sensor grade is not set. The default grade of 5H is not a valid grade and will not be printed on any sensor. If a sensor grade for a return air or discharge air sensor is set to grade 5H, the alarm code for that sensor and Alarm Code 92 Sensor Grade Not Set will be set. To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent nuisance alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is by physically checking the sensor grade printed on each graded sensor.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1L thru 9H
Factory Set	5H
Exceptions	
Description	This feature is used to set the sensor grade for the Zone 1 Return Air Sensor. The default setting for a new base controller or after a ServiceWatch base controller cold start is 5H. This serves as a warning that the sensor grade is not set. The default grade of 5H is not a valid grade and will not be printed on any sensor. If a sensor grade for a return air or discharge air sensor is set to grade 5H, the alarm code for that sensor and Alarm Code 92 Sensor Grade Not Set will be set. To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent nuisance alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is by physically checking the sensor grade printed on each graded sensor.

Zone 1 Discharge Air Sensor Grade

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	1L thru 9H
Factory Set	5H
Exceptions	
Description	This feature is used to set the sensor grade for the Zone 1 Discharge Air Sensor. The default setting for a new base controller or after a ServiceWatch base controller cold start is 5H. This serves as a warning that the sensor grade is not set. The default grade of 5H is not a valid grade and will not be printed on any sensor. If a sensor grade for a return air or discharge air sensor is set to grade 5H, the alarm code for that sensor and Alarm Code 92 Sensor Grade Not Set will be set. To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent nuisance alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is by physically checking the sensor grade printed on each graded sensor.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1L thru 9H
Factory Set	5H

Exceptions	
Description	This feature is used to set the sensor grade for the Zone 1 Discharge Air Sensor. The default setting for a new base controller or after a ServiceWatch base controller cold start is 5H. This serves as a warning that the sensor grade is not set. The default grade of 5H is not a valid grade and will not be printed on any sensor. If a sensor grade for a return air or discharge air sensor is set to grade 5H, the alarm code for that sensor and Alarm Code 92 Sensor Grade Not Set will be set. To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent nuisance alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is by physically checking the sensor grade printed on each graded sensor.

Zone 2 Return Air Sensor Grade

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	1L thru 9H
Factory Set	5H
Exceptions	
Description	This feature is used to set the sensor grade for the Zone 2 Return Air Sensor. The default setting for a new base controller or after a ServiceWatch base controller cold start is 5H. This serves as a warning that the sensor grade is not set. The default grade of 5H is not a valid grade and will not be printed on any sensor. If a sensor grade for a return air or discharge air sensor is set to grade 5H, the alarm code for that sensor and Alarm Code 92 Sensor Grade Not Set will be set. To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent nuisance alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is by physically checking the sensor grade printed on each graded sensor.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1L thru 9H
Factory Set	5H
Exceptions	
Description	This feature is used to set the sensor grade for the Zone 2 Return Air Sensor. The default setting for a new base controller or after a ServiceWatch base controller cold start is 5H. This serves as a warning that the sensor grade is not set. The default grade of 5H is not a valid grade and will not be printed on any sensor. If a sensor grade for a return air or discharge air sensor is set to grade 5H, the alarm code for that sensor and Alarm Code 92 Sensor Grade Not Set will be set. To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent nuisance alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is by physically checking the sensor grade printed on each graded sensor.

Zone 2 Discharge Air Sensor Grade

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	1L thru 9H
Factory Set	5H
Exceptions	
Description	This feature is used to set the sensor grade for the Zone 2 Discharge Air Sensor. The default setting for a new base controller or after a ServiceWatch base controller cold start is 5H. This serves as a warning that the sensor grade is not set. The default grade of 5H is not a valid grade and will not be printed on any sensor. If a sensor grade for a return air or discharge air sensor is set to grade 5H, the alarm code for that sensor and Alarm Code 92 Sensor Grade Not Set will be set. To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent nuisance alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is by physically checking the sensor grade printed on each graded sensor.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1L thru 9H
Factory Set	5H
Exceptions	
Description	This feature is used to set the sensor grade for the Zone 2 Discharge Air Sensor. The default setting for a new base controller or after a ServiceWatch base controller cold start is 5H. This serves as a warning that the sensor grade is not set. The default grade of 5H is not a valid grade and will not be printed on any sensor. If a sensor grade for a return air or discharge air sensor is set to grade 5H, the alarm code for that sensor and Alarm Code 92 Sensor Grade Not Set will be set. To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent nuisance alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is by physically checking the sensor grade printed on each graded sensor.

Zone 3 Return Air Sensor Grade

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	1L thru 9H
Factory Set	5H
Exceptions	Only appears if the unit is configured as being equipped with three zones.
Description	This feature is used to set the sensor grade for the Zone 3 Return Air Sensor. The default setting for a new base controller or after a ServiceWatch base controller cold start is 5H. This serves as a warning that the sensor grade is not set. The default grade of 5H is not a valid grade and will not be printed on any sensor. If a sensor grade for a return air or discharge air sensor is set to grade 5H, the alarm code for that sensor and Alarm Code 92 Sensor Grade Not Set will be set. To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent nuisance alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is by physically checking the sensor grade printed on each graded sensor.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1L thru 9H
Factory Set	5H
Exceptions	Only appears if the unit is configured as being equipped with three zones.
Description	This feature is used to set the sensor grade for the Zone 3 Return Air Sensor. The default setting for a new base controller or after a ServiceWatch base controller cold start is 5H. This serves as a warning that the sensor grade is not set. The default grade of 5H is not a valid grade and will not be printed on any sensor. If a sensor grade for a return air or discharge air sensor is set to grade 5H, the alarm code for that sensor and Alarm Code 92 Sensor Grade Not Set will be set. To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent nuisance alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is by physically checking the sensor grade printed on each graded sensor.

Zone 3 Discharge Air Sensor Grade

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	1L thru 9H
Factory Set	5H

Exceptions	Only appears if the unit is configured as being equipped with three zones.
Description	This feature is used to set the sensor grade for the Zone 3 Discharge Air Sensor. The default setting for a new base controller or after a ServiceWatch base controller cold start is 5H. This serves as a warning that the sensor grade is not set. The default grade of 5H is not a valid grade and will not be printed on any sensor. If a sensor grade for a return air or discharge air sensor is set to grade 5H, the alarm code for that sensor and Alarm Code 92 Sensor Grade Not Set will be set. To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent nuisance alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is by physically checking the sensor grade printed on each graded sensor.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1L thru 9H
Factory Set	5H
Exceptions	Only appears if the unit is configured as being equipped with three zones.
Description	This feature is used to set the sensor grade for the Zone 3 Discharge Air Sensor. The default setting for a new base controller or after a ServiceWatch base controller cold start is 5H. This serves as a warning that the sensor grade is not set. The default grade of 5H is not a valid grade and will not be printed on any sensor. If a sensor grade for a return air or discharge air sensor is set to grade 5H, the alarm code for that sensor and Alarm Code 92 Sensor Grade Not Set will be set. To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent nuisance alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is by physically checking the sensor grade printed on each graded sensor.

Cycle Sentry Setup Menu

The Cycle Sentry Menu allows the unit defaults for Cycle Sentry Null and Sleep Null unit shut down on battery charge current and unit restart on battery voltage to be modified as desired by the customer.

Cycle Sentry Amps

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	2A to 8A in 1A increments
Factory Set	5A
Exceptions	If an EON battery is installed, this feature should be set for 2A.
Description	When operating in Cycle Sentry or Sleep Mode, the unit will automatically run to charge the battery until the charging current falls below this set limit. This occurs even if cooling, heating, or defrosting is not required.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	2A to 8A in 1A increments
Factory Set	5A
Exceptions	If an EON battery is installed, this feature should be set for 2A.
Description	When operating in Cycle Sentry or Sleep Mode, the unit will automatically run to charge the battery until the charging current falls below this set limit. This occurs even if cooling, heating, or defrosting is not required.

Cycle Sentry Battery Voltage

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	11.8V to 12.6V in 0.1V increments

Factory Set	12.2V
Exceptions	If an EON battery is installed, this feature should be set for 12.6V.
Description	When operating in Cycle Sentry or Sleep Mode, the controller will monitor battery voltage and restart the unit to charge the battery, if the battery voltage falls below this set limit. This occurs even if cooling, heating, or defrosting is not required.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	11.8V to 12.6V in 0.1V increments
Factory Set	12.2V
Exceptions	If an EON battery is installed, this feature should be set for 12.6V.
Description	When operating in Cycle Sentry or Sleep Mode, the controller will monitor battery voltage and restart the unit to charge the battery, if the battery voltage falls below this set limit. This occurs even if cooling, heating, or defrosting is not required.

Defrost Setup Menu

The Defrost Setup Menu allows the defrost operation to be configured for maximum performance.

- The evaporator coil temperature must be 45°F (7°C)7°C (45°F) or less to allow defrost. Defrost cycles will terminate when the coil temperature reaches 52°F (11°C)11°C (52°F).

Defrost Interval In Range with Fresh Setpoint

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	2, 4, 6, 8 or 12 Hours
Factory Set	6 Hours
Exceptions	
Description	This feature selects the timed interval between defrost cycles with Fresh range setpoints when the temperature is in range.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	2, 4, 6, 8 or 12 Hours
Factory Set	6 Hours
Exceptions	
Description	This feature selects the timed interval between defrost cycles with Fresh range setpoints when the temperature is in range.

Defrost Interval Not In Range with Fresh Setpoint

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	2, 4, 6, 8 or 12 Hours
Factory Set	4 Hours
Exceptions	
Description	This feature selects the timed interval between defrost cycles with Fresh range setpoints when the temperature is not in range.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	2, 4, 6, 8 or 12 Hours
Factory Set	4 Hours
Exceptions	
Description	This feature selects the timed interval between defrost cycles with Fresh range setpoints when the temperature is not in range.

Defrost Interval In Range with Frozen Setpoint

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	2, 4, 6, 8 or 12 Hours
Factory Set	6 Hours
Exceptions	
Description	This feature selects the timed interval between defrost cycles with Frozen range setpoints when the temperature is in range.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	2, 4, 6, 8 or 12 Hours
Factory Set	6 Hours
Exceptions	
Description	This feature selects the timed interval between defrost cycles with Frozen range setpoints when the temperature is in range.

Defrost Interval Not In Range with Frozen Setpoint

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	2, 4, 6, 8 or 12 Hours
Factory Set	4 Hours
Exceptions	
Description	This feature selects the timed interval between defrost cycles with Frozen range setpoints when the temperature is not in range.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	2, 4, 6, 8 or 12 Hours
Factory Set	4 Hours
Exceptions	
Description	This feature selects the timed interval between defrost cycles with Frozen range setpoints when the temperature is not in range.

Maximum Defrost Duration

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	30 or 45 Minutes
Factory Set	45 Minutes
Exceptions	
Description	This feature selects the maximum time the unit can remain in a defrost cycle. A defrost cycle normally terminates when the evaporator coil temperature reaches 52°F (11°C). If the evaporator temperature does not reach this temperature, the defrost cycle will terminate after the elapsed time selected here.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	30 or 45 Minutes
Factory Set	45 Minutes
Exceptions	
Description	This feature selects the maximum time the unit can remain in a defrost cycle. A defrost cycle normally terminates when the evaporator coil temperature reaches 52°F (11°C). If the evaporator temperature does not reach this temperature, the defrost cycle will terminate after the elapsed time selected here.

High Speed Defrost

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	This feature determines if High Speed Defrost is available. This feature is set as required by ambient temperature and customer requirements.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	This feature determines if High Speed Defrost is available. This feature is set as required by ambient temperature and customer requirements.

Language Setup Menu

This menu allows the display language or languages to be enabled as required. When a language is selected all subsequent displays are in that language.

The languages available are dependent on the software revision in the HMI control panel. Only one of the seven software revisions can be installed, and only the languages in that revision are available. English is included in all HMI software versions.

HMI control panel software revisions support the languages shown in the table.

Table 24. Software Revision Language Support Table

Revision 75xx	Revision 76xx	Revision 77xx
English	English	English
Spanish	Russian	Japanese
French	Polish	Chinese
German	Hungarian	
Italian	Romanian	
Dutch	Bulgarian	
Portuguese	Czech	
Greek	Danish	
Turkish	Swedish	
Hebrew	Norwegian	
Arabic	Finnish	

HMI control panel software revisions support the languages shown in the table.

Table 25. Software Revision Language Support Table

Revision 65xx	Revision 66xx	Revision 67xx
English	English	English
Spanish	Russian	Japanese
French	Polish	Chinese
German	Hungarian	
Italian	Romanian	
Dutch	Bulgarian	
Portuguese	Czech	
Greek	Danish	
Turkish	Swedish	
Hebrew	Norwegian	
Arabic	Finnish	

Revision 6830 or later

- HMI Control Panel Revision 6830 or later allows a combination of up to five languages from the 21 languages available in Revision 65xx and Revision 66xx to be selected. This allows several languages from Revision 65xx and Revision 66xx to be loaded. HMI Control Panel Revision 6830 requires Base Controller Software Revision C031 or later and WinTrac 5.2 or later.
- When flash loading HMI Control Panel Revision 6830 or later software, one of three language options is selected:
  - English only
  - English and Spanish only
  - Select up to five languages from the provided list

Note: *Refer to "Service Procedure A46B," p. 341 for details.*

There is an Enable Language screen for each language included in the installed HMI software version. English is included in all language sets and is factory set as Enabled. Only enabled languages will appear in the Main Menu Language selections. All languages other than English are factory set as Disabled. If only one language is enabled, the Language selection screen does not appear in the Main Menu.

Enable Language

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	Refer to (Table 24, p. 110)
Factory Set	English only
Exceptions	
Description	This feature allows any or all of the included languages to be enabled. Only enabled languages will appear in the operators Language Menu. All languages other than English are factory set as Disabled. If only one language is enabled, the Language Selection Menu will not appear in the Main Menu.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	Refer to (Table 25, p. 110)
Factory Set	English only
Exceptions	
Description	This feature allows any or all of the included languages to be enabled. Only enabled languages will appear in the operators Language Menu. All languages other than English are factory set as Disabled. If only one language is enabled, the Language Selection Menu will not appear in the Main Menu.

Access Code Setup Menu

This menu allows an Access code to be required for entry to the Guarded Access Menu. If a code is selected, an access code challenge will appear when entering the Guarded Access Menu. If the correct code is not entered, access is denied.

Note: *A technician can bypass an unknown Access Code by entering "4444" and pressing the Enter key.*

Enter Access Code

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	1-9999
Factory Set	NO CODE
Exceptions	
Description	This feature allows an Access Code to be set. The + and – keys are used to enter the desired Access Code. The code should be recorded for future use. Setting the value to 1 will disable the Access Code feature.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1-9999
Factory Set	NO CODE
Exceptions	
Description	This feature allows an Access Code to be set. The + and – keys are used to enter the desired Access Code. The code should be recorded for future use. Setting the value to 1 will disable the Access Code feature.

Sensor Configuration Menu - CargoWatch Data Logger

This menu is present but is not currently used on SR-3 Truck multi-temperature applications.

Hardware Configuration Setup Menu

The Hardware Configuration Setup Menu is used to specify the actual unit configuration. These features are set at the factory as required for each unit. Unit Type selection will affect available features and menu selections. Verify the selection is proper for the unit.

Alarm Code 111 Unit Not Configured Correctly

If the Base Controller detects a mismatch between unit connections and configuration selections, Alarm Code 111 will be set.

Unit Type

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	TRUCK or TRAILER
Factory Set	To match unit as built. A Base Controller cold start will default this feature to TRAILER.
Exceptions	If this feature is changed, it is necessary to exit the Guarded Access Menu after making the change. This will reset the unit to the new setting. Failure to do so will result in the wrong selections to be present in other Guarded Access Menu settings. For example, if the feature was set to TRAILER and changed to TRUCK, the reset changes the TRAILER default settings to the TRUCK default settings.
Description	This feature allows the Unit Type to be selected.

Unit Type

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	TRUCK or TRAILER
Factory Set	To match unit as built. A Base Controller cold start will default this feature to TRAILER.
Exceptions	If this feature is changed, it is necessary to exit the Guarded Access Menu after making the change. This will reset the unit to the new setting. Failure to do so will result in the wrong selections to be present in other Guarded Access Menu settings. For example, if the feature was set to TRAILER and changed to TRUCK, the reset changes the TRAILER default settings to the TRUCK default settings.
Description	This feature allows the Unit Type to be selected.

Sensor Data

Control Rev	F020 and later
HMI Rev	75C0 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	Only used for truck units equipped with Trailer HMI and CargoWatch sensors.
Description	When this feature is set to ENABLED, the HMI displays CargoWatch sensors and enables the printing option for Truck.

Engine Type

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	270, 370, 376, Tier 4 Engines 374, 380
Factory Set	To match unit as built
Exceptions	
Description	This feature allows the engine type to be selected.

Engine Type

Control Rev	F000 and later Units with Tier 4 engines require F010 and later
HMI Rev	7595 and later Units with Tier 4 engines require 75B0 and later
Choices	270, 370, 376, Tier 4 Engines 374, 380
Factory Set	To match unit as built
Exceptions	
Description	This feature allows the engine type to be selected.

Compressor Type

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	Scroll or Recip
Factory Set	To match unit as built
Exceptions	
Description	This feature allows the compressor type to be selected.

Compressor Type

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	Scroll or Recip
Factory Set	To match unit as built
Exceptions	
Description	This feature allows the compressor type to be selected.

ETV Configured

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	YES or NO
Factory Set	To match unit as built.
Exceptions	If Unit Model is set for a unit with a Tier 4 engine, this feature is forced to YES and cannot be changed.
Description	This feature allows the unit to be configured with an Electronic Throttling Valve (ETV). If the unit was built with an ETV, this feature must be set to YES. All other units set to NO.

ETV Configured

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	YES or NO
Factory Set	To match unit as built.

Exceptions	If Unit Model is set for a unit with a Tier 4 engine, this feature is forced to YES and cannot be changed.
Description	This feature allows the unit to be configured with an Electronic Throttling Valve (ETV). If the unit was built with an ETV, this feature must be set to YES. All other units set to NO.

How Many Zones in This Unit?

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	1, 2, or 3
Factory Set	2
Exceptions	
Description	This feature specifies if the unit is equipped with two or three zones. If the unit is equipped with two zones, this feature should be set to 2. If the unit is equipped with three zones, this feature should be set to 3.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	1, 2, or 3
Factory Set	2
Exceptions	
Description	This feature specifies if the unit is equipped with two or three zones. If the unit is equipped with two zones, this feature should be set to 2. If the unit is equipped with three zones, this feature should be set to 3.

Zone 1 Evap Fans Configuration

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	2 or 3 fans
Factory Set	3
Exceptions	
Description	This feature is set to match the number of fans in the remote evaporator(s) used in Zone 1.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	2 or 3 fans
Factory Set	3
Exceptions	
Description	This feature is set to match the number of fans in the remote evaporator(s) used in Zone 1.

Zone 2 Evap Fans Configuration

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	2, 3, or 4 fans
Factory Set	3

Exceptions	This screen only appears if the unit is configured for two or more zones.
Description	This feature is set to match the number of fans in the remote evaporator(s) used in Zone 2.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	2, 3, or 4 fans
Factory Set	3
Exceptions	This screen only appears if the unit is configured for two or more zones.
Description	This feature is set to match the number of fans in the remote evaporator(s) used in Zone 2.

Zone 3 Evap Fans Configuration

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	2, 3, or 4 fans
Factory Set	3
Exceptions	This screen only appears if the unit is configured for two or more zones.
Description	This feature is set to match the number of fans in the remote evaporator(s) used in Zone 3.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	2, 3, or 4 fans
Factory Set	3
Exceptions	This screen only appears if the unit is configured for two or more zones.
Description	This feature is set to match the number of fans in the remote evaporator(s) used in Zone 3.

Electric Standby Equipped?

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	YES or NO
Factory Set	To match unit as built.
Exceptions	This setting will automatically be forced from NO to YES if the unit detects that electric supply power is connected to the unit.
Description	This feature specifies if the unit is equipped with optional electric standby. If the unit is equipped with electric standby, this feature should be set to YES. If the unit is not equipped with electric standby, this feature should be set to NO.

Electric Standby Equipped?

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	YES or NO
Factory Set	To match unit as built.
Exceptions	This setting will automatically be forced from NO to YES if the unit detects that electric supply power is connected to the unit.
Description	This feature specifies if the unit is equipped with optional electric standby. If the unit is equipped with electric standby, this feature should be set to YES. If the unit is not equipped with electric standby, this feature should be set to NO.

Diesel to Electric Auto Switch Enabled?

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	YES or NO
Factory Set	YES
Exceptions	Screen appears only if Electric Standby Equipped feature is set to YES. ***Important:*** *This feature should only be set to YES on units equipped with the Standard Truck HMI Control Panel.*
Description	Units Equipped with the Standard Truck HMI Control Panel: This feature should only be set to YES on units equipped with the Standard Truck HMI Control Panel. If this feature and the Electric to Diesel Auto Switch Enabled feature are both set to NO on units equipped with the Standard Truck HMI Control Panel, the unit will behave as if Electric Standby is not installed on the unit. Units Equipped with the Premium Truck HMI Control Panel: On units equipped with the Premium Truck HMI Control Panel, this feature allows the Auto Switch from Diesel Mode to Electric Mode to be enabled or disabled. If this feature is set to YES, the unit will switch automatically to electric mode when standby power is connected. If the feature is set to NO, the operator must manually switch the unit to electric mode using the Premium Truck HMI Control Panel. Refer to Premium Truck HMI Operation in Section 4 for details.

Diesel to Electric Auto Switch Enabled?

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	YES or NO
Factory Set	YES
Exceptions	Screen appears only if Electric Standby Equipped feature is set to YES. ***Important:*** *This feature should only be set to YES on units equipped with the Standard Truck HMI Control Panel.*
Description	Units Equipped with the Standard Truck HMI Control Panel: This feature should only be set to YES on units equipped with the Standard Truck HMI Control Panel. If this feature and the Electric to Diesel Auto Switch Enabled feature are both set to NO on units equipped with the Standard Truck HMI Control Panel, the unit will behave as if Electric Standby is not installed on the unit. Units Equipped with the Premium Truck HMI Control Panel: On units equipped with the Premium Truck HMI Control Panel, this feature allows the Auto Switch from Diesel Mode to Electric Mode to be enabled or disabled. If this feature is set to YES, the unit will switch automatically to electric mode when standby power is connected. If the feature is set to NO, the operator must manually switch the unit to electric mode using the Premium Truck HMI Control Panel. Refer to Premium Truck HMI Operation in Section 4 for details.

Electric to Diesel Auto Switch Enabled?

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	YES or NO
Factory Set	NO
Exceptions	Screen appears only if Electric Standby Equipped feature is set to YES.
Description	Units Equipped with the Standard Truck HMI Control Panel: If this feature is set to YES, the unit will switch automatically to diesel mode when standby power is disconnected or lost. If the feature is set to NO, the operator must manually switch the unit to electric mode using the Standard Truck HMI Control Panel. Refer to Standard Truck HMI Operation in Section 4 for details. If this feature and the Diesel to Electric Auto Switch Enabled feature are both set to NO on units equipped with the Standard Truck HMI Control Panel, the unit will behave as if Electric Standby is not installed. Units Equipped with the Premium Truck HMI Control Panel: On units equipped with the Premium Truck HMI Control Panel, this feature allows the Auto Switch from Electric Mode to Diesel Mode to be enabled or disabled. If this feature is set to YES, the unit will switch automatically to diesel mode when standby power is disconnected or lost. If the feature is set to NO, the operator must manually switch the unit to diesel mode using the Premium Truck HMI Control Panel. Refer to Premium Truck HMI Operation in Section 4 for details.

Electric to Diesel Auto Switch Enabled?

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	YES or NO
Factory Set	NO
Exceptions	Screen appears only if Electric Standby Equipped feature is set to YES.
Description	Units Equipped with the Standard Truck HMI Control Panel: If this feature is set to YES, the unit will switch automatically to diesel mode when standby power is disconnected or lost. If the feature is set to NO, the operator must manually switch the unit to electric mode using the Standard Truck HMI Control Panel. Refer to Standard Truck HMI Operation in Section 4 for details. If this feature and the Diesel to Electric Auto Switch Enabled feature are both set to NO on units equipped with the Standard Truck HMI Control Panel, the unit will behave as if Electric Standby is not installed. Units Equipped with the Premium Truck HMI Control Panel: On units equipped with the Premium Truck HMI Control Panel, this feature allows the Auto Switch from Electric Mode to Diesel Mode to be enabled or disabled. If this feature is set to YES, the unit will switch automatically to diesel mode when standby power is disconnected or lost. If the feature is set to NO, the operator must manually switch the unit to diesel mode using the Premium Truck HMI Control Panel. Refer to Premium Truck HMI Operation in Section 4 for details.

Unit Model

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	T-800 Spectrum, UT-1200 Spectrum Units with Tier 4 Engines: T-1080S Spectrum, T-1280R Spectrum, T-1090 Spectrum
Factory Set	To match unit as built.
Exceptions	
Description	This feature allows the Unit Model to be selected. Available units will change based on Compressor Type selected.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	T-800R Spectrum, T-1000 Spectrum, T-1000R Spectrum, T-1200R Spectrum
Factory Set	To match unit as built.
Exceptions	
Description	This feature allows the Unit Model to be selected. Available units will change based on Compressor Type selected.

Fuel Sensor Type

Control Rev	F010 and later
HMI Rev	75B0 and later
Choices	NONE, SOLID STATE, FLOAT, or SWITCH
Factory Set	NONE
Exceptions	This feature is for trucks equipped with a separate fuel tank for the refrigeration unit. It is not for use with applications that obtain fuel from the truck fuel tank.
Description	This feature is used to select the type of fuel level sensor installed. If no fuel level sensor is installed, this feature should be set to NONE.

Rear Remote Control Panel

Control Rev	C031 and later
HMI Rev	6550 and later

Choices	NONE, COM 2
Factory Set	NONE
Exceptions	
Description	This feature specifies if the unit is equipped with the optional flush mount rear remote control. If the unit is equipped with the flush mount rear remote control, this feature should be set to COM 2. If the unit is not equipped with a flush mount rear remote control, this feature should be set to NONE.

Rear Remote Control Panel

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	NONE, COM 2
Factory Set	NONE
Exceptions	
Description	This feature specifies if the unit is equipped with the optional flush mount rear remote control. If the unit is equipped with the flush mount rear remote control, this feature should be set to COM 2. If the unit is not equipped with a flush mount rear remote control, this feature should be set to NONE.

Rear Remote Control Panel Action

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	STAND BY, RUN ALL ZONES, RUN LAST CONFIG
Factory Set	STAND BY
Exceptions	Only appears if Rear Remote Control is set for COM 2.
Description	If the Action is set to STAND BY, the unit will power up when the Remote Control ON key is pressed. The setpoints can be changed from the Remote Control Panel but the unit will not start and run. STAND BY will display on the primary HMI Control Panel screen. The unit must be started from the primary HMI Control Panel on the unit. Pressing the Remote Control Panel OFF key will power down the control system. If the Action is set to RUN ALL ZONES, the unit will automatically start and run all configured zones when the remote control ON key is pressed. The feature will automatically turn zones that are turned OFF to ON. Pressing a zone OFF key will turn that zone off. Pressing the remote control OFF key will power down the control system. If the Action is set to RUN LAST CONFIG, the unit will automatically start and run the unit in the last operating condition when the remote control ON key is pressed. The feature will not turn zones that were previously turned OFF to ON. Pressing a zone ON or OFF key will turn that zone on or off. Pressing the remote control OFF key will power down the control system.

Rear Remote Control Panel Action

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	STAND BY, RUN ALL ZONES, RUN LAST CONFIG
Factory Set	STAND BY
Exceptions	Only appears if Rear Remote Control is set for COM 2.
Description	If the Action is set to STAND BY, the unit will power up when the Remote Control ON key is pressed. The setpoints can be changed from the Remote Control Panel but the unit will not start and run. STAND BY will display on the primary HMI Control Panel screen. The unit must be started from the primary HMI Control Panel on the unit. Pressing the Remote Control Panel OFF key will power down the control system. If the Action is set to RUN ALL ZONES, the unit will automatically start and run all configured zones when the remote control ON key is pressed. The feature will automatically turn zones that are turned OFF to ON. Pressing a zone OFF key will turn that zone off. Pressing the remote control OFF key will power down the control system. If the Action is set to RUN LAST CONFIG, the unit will automatically start and run the unit in the last operating condition when the remote control ON key is pressed. The feature will not turn zones that were previously turned OFF to ON. Pressing a zone ON or OFF key will turn that zone on or off. Pressing the remote control OFF key will power down the control system.

Pretrip/Sleep Switch Options

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	DISABLE, PRETRIP, SLEEP
Factory Set	DISABLE
Exceptions	
Description	This feature is used to allow an optional Sleep or Pretrip switch to be connected to the base controller. A momentary contact switch is connected from chassis ground to the Controller Sensor Connecter J7 pin 30. This feature determines the action resulting when this input is temporarily connected to chassis ground. DISABLE results in no action. If a switch is not connected, this feature should be set to DISABLE. PRETRIP will start a Pretrip Test in the same manner as starting the test from the Main/Mode menu. SLEEP will place the unit in Sleep Mode in the same manner as entering Sleep Mode from the Main/Pretrip menu.

Pretrip/Sleep Switch Options

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	DISABLE, PRETRIP, SLEEP
Factory Set	DISABLE
Exceptions	
Description	This feature is used to allow an optional Sleep or Pretrip switch to be connected to the base controller. A momentary contact switch is connected from chassis ground to the Controller Sensor Connecter J7 pin 30. This feature determines the action resulting when this input is temporarily connected to chassis ground. DISABLE results in no action. If a switch is not connected, this feature should be set to DISABLE. PRETRIP will start a Pretrip Test in the same manner as starting the test from the Main/Mode menu. SLEEP will place the unit in Sleep Mode in the same manner as entering Sleep Mode from the Main/Pretrip menu.

3rd Party Device Control

Control Rev	F000 and later
HMI Rev	7595 and later
Choices	NONE, COM 1, COM 2
Factory Set	NONE
Exceptions	
Description	This feature selects the communications port on the Base Controller/Interface Board that will be used by a third party control device such as satellite communications. If the unit is not equipped with a third party device, this feature should be set to NONE. If the unit is equipped with TK BlueBox, this feature should be set to NONE.

Control Rev	C031 and later
HMI Rev	6550 and later
Choices	NONE, COM 1, COM 2
Factory Set	NONE
Exceptions	
Description	This feature selects the communications port on the Base Controller/Interface Board that will be used by a third party control device such as satellite communications. If the unit is not equipped with a third party device, this feature should be set to NONE.

Low Fuel Shutdown

Control Rev	F010 and later
HMI Rev	75B0 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	A float or solid state fuel level sensor must be installed and enabled from the Guarded Access / Unit Configuration / Fuel Sensor Type menu. This feature is not available if the Rail Option feature is enabled.
Description	Low Fuel Shutdown allows the low fuel shutdown feature to be enabled or disabled. If Low Fuel Shutdown is set TO ENABLED, Alarm Code 44 Check Fuel System will be set as a Shutdown Alarm if the fuel level falls below 5% of tank capacity. When the fuel tank is filled to more than 15% of tank capacity, Alarm Code 44 is automatically cleared. ***Important:*** *If Alarm Code 44 is manually cleared, it is reset as a Check Alarm. The unit can now be restarted but will continue to run until the fuel supply is exhausted.* If Low Fuel Shutdown is set DISABLED, Alarm Code 44 will not be set and the unit will run until the fuel supply is exhausted.

Control Rev	C052 and later
HMI Rev	65B0 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	A float or solid state fuel level sensor must be installed and enabled from the Guarded Access / Unit Configuration / Fuel Sensor Type menu. This feature is not available if the Rail Option feature is enabled.
Description	Low Fuel Shutdown allows the low fuel shutdown feature to be enabled or disabled. If Low Fuel Shutdown is set TO ENABLED, Alarm Code 44 Check Fuel System will be set as a Shutdown Alarm if the fuel level falls below 5% of tank capacity. When the fuel tank is filled to more than 15% of tank capacity, Alarm Code 44 is automatically cleared. ***Important:*** *If Alarm Code 44 is manually cleared, it is reset as a Check Alarm. The unit can now be restarted but will continue to run until the fuel supply is exhausted.* If Low Fuel Shutdown is set DISABLED, Alarm Code 44 will not be set and the unit will run until the fuel supply is exhausted.

TK Telematics Type Configuration

Note: *Prior to D0A0/F040/75C4, this feature was named REB Type Configured.*

Control Rev	F040 and later
HMI Rev	75C4 and later
Choices	NONE, IBOX, IBOX+CELL, IBOX+WPAN, WIFI+WPAN, IBOX+WIFI+WPAN, IBOX+CELL+WPAN, IBOX+CELL+WIFI+WPAN
Factory Set	NONE
Exceptions	
Description	The Telematics Type Configured feature should be set to match the options installed on the unit.

TK Telematics Fuel Level Sensor Type

Note: *Prior to D0A0/F040/75C4, this feature was named REB Fuel Level Sensor Type.*

Control Rev	F040 and later
HMI Rev	75C4 and later
Choices	NO SENSOR, SOLID STATE, FLOAT, SWITCH
Factory Set	NO SENSOR
Exceptions	
Description	If a dedicated Telematics Fuel Sensor is installed, this feature should be set to match the sensor type. If no dedicated Telematics Fuel Sensor is installed, this feature should be set NO SENSOR.

TK Telematics Door Switch Enabled?

Note: *Prior to D0A0/F040/75C4, this feature was named REB Door Switch Enabled.*

Control Rev	F040 and later
HMI Rev	75C4 and later
Choices	ENABLE or DISABLE
Factory Set	DISABLE
Exceptions	
Description	If a dedicated Telematics Door Switch is installed, this feature should be set ENABLE. If no dedicated Telematics Door Switch is installed, this feature should be set DISABLE.

CargoLink

Control Rev	F020 and later
HMI Rev	75B0 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	When ENABLED, this feature will allow the HMI to read the sensor data from the COM ports.

S4.2 Configuration

Control Rev	F045 and later
HMI Rev	75C5 and later
Choices	NONE, ZONE 1, ZONE 2, ZONE 3, ZONES 1 and 2, ZONES 2 and 3, ZONES 1 and 3, ALL ZONES
Factory Set	NONE
Exceptions	Applicable for the following unit models only: T-800/800R Spectrum, T-1000/1000R Spectrum, T-1200R Spectrum, UT-R Spectrum, UT-1200 Spectrum.
Description	When a zone is configured for S4.2, the required min-max amperage draw for drain hose heater wiring is adjusted during non-running pretrip to prevent Alarm Code 143 and the fan speed control is maintained to 100% during frozen range operation.

Whisper Pro Installed

Control Rev	F045 and later
HMI Rev	75C6 and later
Choices	YES or NO
Factory Set	NO
Exceptions	Applicable only when unit model is configured as T-1200R Spectrum (EMEA unit model).
Description	This feature determines if the T-1200R Spectrum unit model is configured as Whisper Pro. When configured as Whisper Pro, the unit will be forced to low engine speed operation when operating in PIEK zones (PIEK zones are determined by Telematics via Geofence mapping).

Section 4 - Operation

Truck Standard Display HMI Control Panel

The Truck Standard Display (TSD) HMI Control Panel is used to operate the unit and display some unit information. The Truck Standard Display communicates with the Base Controller via the Controller Area Network (CAN) bus. It is connected to the Base Controller via CAN Connector J14. The TSD is typically located in the vehicle driver's compartment. It may be located in the truck dashboard using a DIN mounting ring or under the dashboard using an under dash mounting kit.

Figure 26. Truck Standard Display HMI Control Panel



SAP357

Features

- Displays Box Temperature and Setpoint in Fahrenheit or Celsius
- Displays Engine Running Hourmeter and Motor Running Hourmeter
- Indicates the current zone on Multi-Temperature applications
- Changes Unit or Zone Setpoints
- Selects and indicates Cycle Sentry or Continuous Mode Operation
- Selects and indicates High Speed Lock-Out Operation
- Initiates and indicates a Unit or Zone Defrost Cycle
- Indicates an alarm condition exists, displays and clears alarms
- Initiates and indicates a Pretrip Test
- Sends a Start of Trip Marker to the ServiceWatch Data Logger
- Changes display brightness
- Shows Truck Standard Display serial number and software revision
- Displays and changes Date and Time

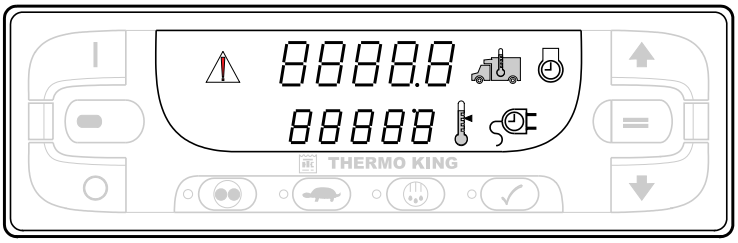
Display

The Truck Standard Display consists of a display and nine touch-sensitive keys. The display presents information to the operator and includes setpoint and box temperature, hourmeter readings, alarms, and several icons.

The display is capable of showing numbers and illuminating several icons. It does not display text, making it suitable for use with any language.

The upper row of numbers can display the box temperature, engine run time hourmeter, current zone, or alarm code(s). The lower row of numbers can display the setpoint, electric run time hourmeter, or total number of alarms.

Figure 27. Control Panel Display



Display Icons

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



When this icon is present in the upper display, it is showing the actual box temperature inside the truck box.



When this icon is present in the lower display, it is showing the current setpoint.



When this icon is present in the upper display, it is showing the diesel engine run time.



When this icon is present in the the lower display, it is showing the electric motor run time (if the unit is equipped with optional Electric Standby).

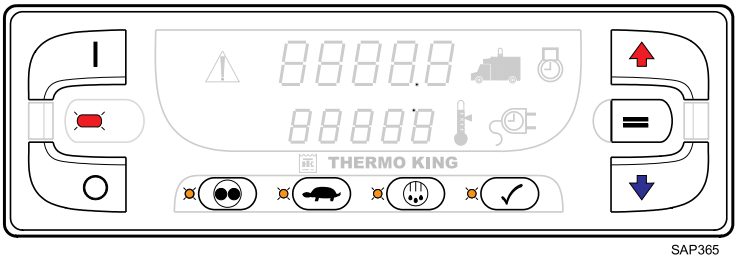


When this Alarm Icon is present, one or more alarm conditions have occurred. If the display is not flashing, any alarms are Check Alarms. If the display is flashing on and off, a Shutdown Alarm has occurred and the unit has been shut down. Immediate action must be taken.

Keys and LED Indicators

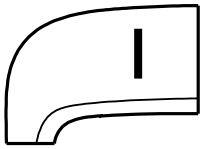
There are nine touch sensitive keys. Some of these keys have more than one function.

Figure 28. Keys and LED Indicators



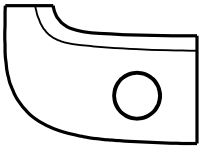
There are amber LED indicators located next to each of the four function keys below the display. The LED will glow amber when that function is active. A red LED indicator is located between the ON Key and OFF Key at the left side of the display. This indicator will glow if Alarm Code 91 Check Electric Ready Input occurs. It will also illuminate if a 15 pin Thermo King Data Cable is connected to the serial port on the back of the Base Controller.

ON



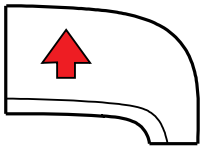
Primary Use – Pressing the ON Key will turn the unit on.
Secondary Use – When the unit is on, pressing this key and the PRETRIP Key at the same time will display any alarm codes that are present.
Secondary Use – When the unit is on, pressing and holding this key allows the UP ARROW Key and DOWN ARROW Key to increase or decrease the display brightness.
Secondary Use – When the unit is on and a different display is shown, pressing this key will return to the Standard Display of box temperature and setpoint.
Multi-Temp Use – When Manual Zone Selection is active the selected zone can be turned on and off by simultaneously pressing the ON Key and ENTER Key.

OFF



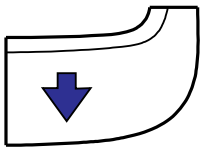
Primary Use – Pressing the OFF Key will turn the unit off.

UP ARROW



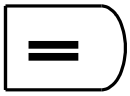
Primary Use – When the unit is turned on and the Standard Display is shown, pressing the UP ARROW Key will increase the setpoint.
Secondary Use – When alarms are being displayed, pressing this key will scroll through the alarms (if more than one alarm is present).
Secondary Use – While holding ON Key down with the unit turned on, pressing this key will increase the display brightness (Low, Medium, High).

DOWN ARROW



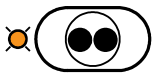
Primary Use – When the unit is turned on and the Standard Display is shown, pressing the DOWN ARROW Key will decrease the setpoint.
Secondary Use – While holding ON Key down with the unit turned on, pressing this key will decrease the display brightness (High, Medium, Low).

ENTER



Primary Use – If the setpoint has been changed using the UP ARROW Key and/or DOWN ARROW Key, pressing the ENTER Key enters the setpoint into the base controller's memory.
Secondary Use – When alarms are being displayed, pressing this key will clear the alarm shown on the display.
Secondary Use – When the unit is turned on, press and hold this key for five seconds to send a Start of Trip (SOT) to the data logger.
Multi-Temp Use – Pressing this key will enable Manual Zone Selection mode and scroll through the installed zones, one zone at a time. When a zone is manually selected the zone can be turned on or off, the setpoint can be changed and a manual defrost cycle can be initiated if zone conditions permit.

CYCLE-SENTRY/CONTINUOUS



Primary Use – If the unit is turned on and is in Continuous Mode, pressing the CYCLE SENTRY/CONTINUOUS Key will switch operation to CYCLE SENTRY Mode and the amber LED indictor will glow. If the unit is running in CYCLE SENTRY Mode, pressing this key will switch operation to Continuous Mode and the amber LED will turn off.

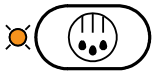
HIGH SPEED LOCK-OUT



Primary Use – If the unit is turned on, pressing the HIGH SPEED LOCKOUT Key will activate High Speed Lock-Out. The unit will switch to low speed operation and the amber LED indictor will glow. No further high speed operation is allowed until this feature is turned off. If the High Speed Lockout Timer is enabled, the unit will automatically return to high speed after a programmed time limit. This feature is typically used in noise sensitive areas to reduce unit noise.

Note: *The HIGH SPEED LOCK-OUT Key is only used when the unit is operating in Diesel Mode. The HIGH SPEED LOCK-OUT Key does not have any effect in Electric Mode operation.*

DEFROST



Primary Use – If the unit is turned on, pressing the DEFROST Key will initiate a manual defrost cycle if conditions allow. If the evaporator coil temperature less than 45°F (7°C) the unit will enter a defrost cycle. The amber LED will flash while the defrost cycle is initialized and will glow during the defrost cycle. The defrost cycle will terminate automatically and the amber LED will turn off when the evaporator coil temperature is greater than 52°F (11°C). To manually terminate a defrost cycle turn the unit off and back on.
Multi-Temp Use – A zone must be selected before initiating a manual defrost cycle.

PRETRIP TEST



Primary Use – Pressing and holding the PRETRIP TEST Key for five seconds will initiate either a Full Pretrip Test or Engine Running Pretrip Test so long as no alarm conditions exist. If the Alarm Icon is glowing, record and clear the alarms before starting the Pretrip Test.
Press and hold the PRETRIP TEST Key for five seconds. The amber LED may flash while the Pretrip Test is initialized and will glow steady while the Pretrip Test is running. When the Pretrip Test is complete the amber LED will turn off.

- If there are no alarm codes set when the Pretrip Test is complete, the unit passed.
- If there are alarm codes set when the Pretrip Test is complete, the unit failed. Check and correct the alarm conditions and repeat the test.
- If a shutdown alarm occurred, Alarm Code 28 Pretrip Abort will be set and the unit will be shut down. Check and correct the alarm conditions and repeat the test.

Secondary Use – When the unit is turned off press and hold this key for five seconds to show the HMI Control Panel Serial Number (in the upper display) and the HMI Control Panel Software Revision (in the lower display).
Secondary Use – When the unit is turned off this key is used to display the Clock/Calendar.

Turning the Unit On and Off

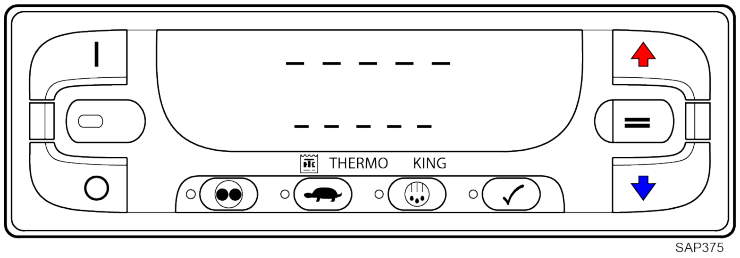
Important: *Verify the Base Controller ON/OFF Switch is turned on before turning on the HMI Control Panel. The Base Controller ON/OFF switch is located on the outside of the control box side of the unit.*

If the HMI Control Panel is turned on and the Base Controller ON/OFF Switch is turned off, the HMI display screen will flash ON and OFF.

The unit is turned on by pressing the ON Key and off by pressing the OFF Key. When the ON Key is pressed, the display briefly shows dashes as the display initializes.

Important: *If the display flashes on and off continuously when the ON Key is pressed, check to verify the Base Controller ON/OFF switch is in the ON position.*

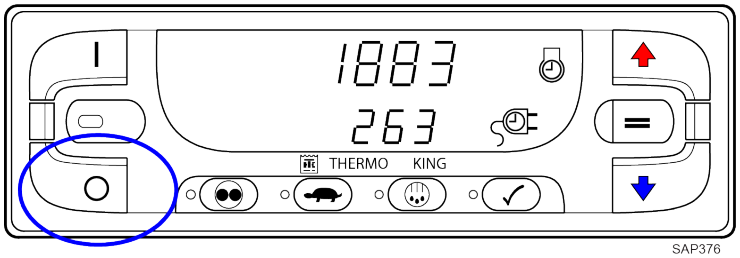
Figure 29. Keys and LED Indicators



SAP375

The unit running time hourmeters are shown for 30 seconds. The diesel engine run time hours and Diesel Icon are shown in the upper display. If the optional Electric Standby Feature is installed, the electric motor run time hours and Electric Icon appear in the lower display as shown below. A Full Pretrip Test is initiated from this display by pressing and holding the Pretrip Key as shown later in this section.

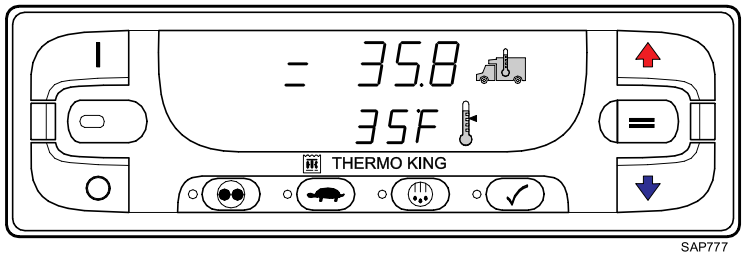
Figure 30. Electric Motor Run Time Hours and Electric Icon



SAP376

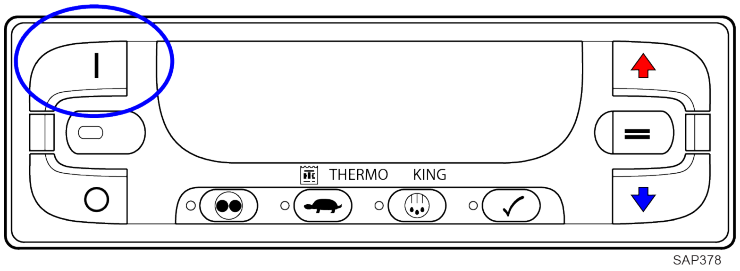
When the unit is ready to run, the Standard Display of box temperature and setpoint appears. The box temperature and Box Temp Icon are shown in the upper display. The setpoint and Setpoint Icon are shown in the lower display. On multi-temperature applications, the Zone indicators are shown to the left of the box temperature. In the example below, Zone 2 is being shown on the display. The Zone 2 box temperature shown here is 35.8°F (2.1°C) with a 35°F (1.7°C) setpoint.

Figure 31. Zone 2



Pressing the OFF Key stops unit operation. The unit shuts down immediately and the display goes blank. To start the unit again, press the ON Key.

Figure 32. ON Key

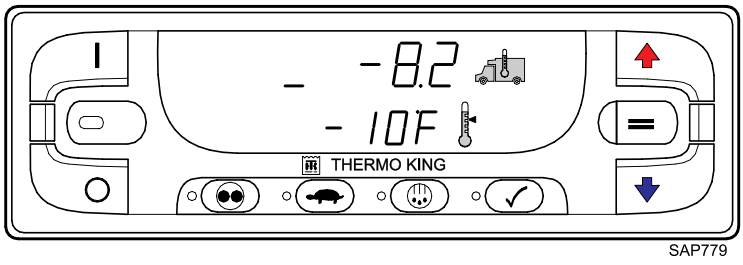


Multi-Temperature Standard Display

The Standard Display is the default display that appears if no other display function is selected. The Standard Display shows the current zone box and the temperature and setpoint of that zone.

The box temperature is that measured by the return air sensor. The box temperature and Box Temperature Icon are shown in the upper display. The setpoint and Setpoint Icon are shown in the lower display. The box temperature here is -8.2°F (-22.3°C) with a -10°F (-23.3°C) setpoint. If another display is shown, pressing the ON Key will return the display to the Standard Display.

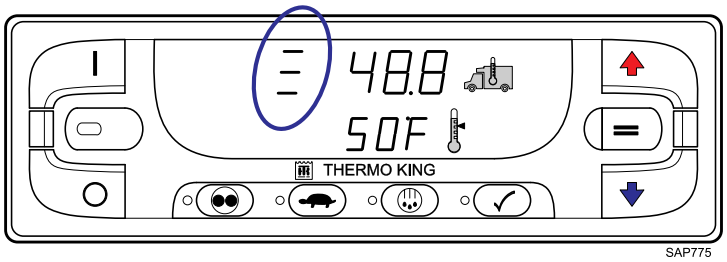
Figure 33. Truck Standard Display (TSD) HMI



Zone Indicators

Horizontal bars to the left of the box temperature are used to indicate the zone currently shown on the display. In the example (Figure 34, p. 127) Zone 3 is being shown on the display.

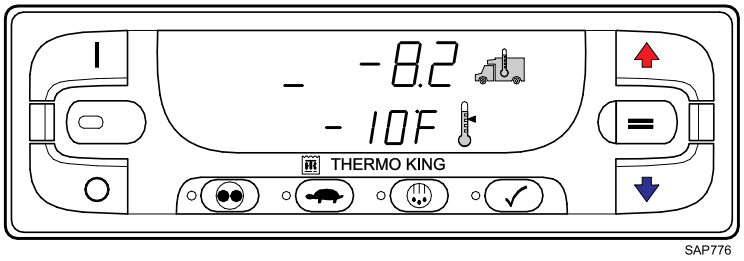
Figure 34. Zone Indicators



—	When one horizontal bar is present at the left side of the box temperature, Zone 1 is being shown on the display. The display will automatically scroll through all configured zones, showing each zone for 10 seconds.
— —	When two horizontal bars are present at the left side of the box temperature, Zone 2 is being shown on the display. The display will automatically scroll through all configured zones, showing each zone for 10 seconds.
— — —	When three horizontal bars are present at the left side of the box temperature, Zone 3 is being shown on the display. The display will automatically scroll through all configured zones, showing each zone for 10 seconds. Zone 3 only appears on units configured with three zones.

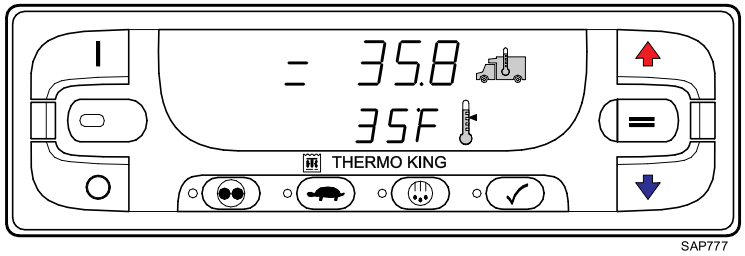
In the example (Figure 35, p. 127), Zone 1 is being shown on the display. The box temperature in Zone 1 is -8.2°F (-22.3° C) and the setpoint is -10°F (-23.3°C).

Figure 35. Zone 1



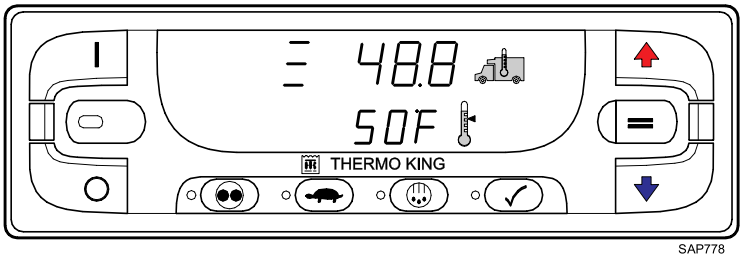
In the example (Figure 36, p. 127), Zone 2 is being shown on the display. The box temperature in Zone 2 is 35.8°F (2.1°C) and the setpoint is 35°F (1.7°C).

Figure 36. Zone 2



In the example (Figure 37, p. 128), Zone 3 is being shown on the display. The box temperature in Zone 3 is 48.8°F (9.3°C) and the setpoint is 50°F (10°C). Zone 3 only appears on units configured with three zones.

Figure 37. Zone 3



Automatic Zone Scrolling

When the Standard Display is shown, the operating conditions for each zone will automatically be shown for 10 seconds. At the end of that time, the next zone will appear on the display.

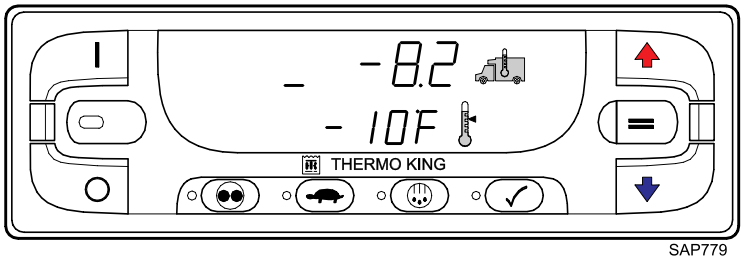
- If a zone is currently turned on, the box temperature and setpoint for that zone will be shown.

  Important: *On Multi-Temperature units, Zone 1 can be turned off while the unit is running. The unit will continue to run with Zone 1 turned off.*

- If a zone is turned off, dashes will be shown instead of the box temperature and setpoint for that zone.
- If a zone is in defrost, the LED indicator next to the Defrost Key will be illuminated when that zone is shown on the display.
- Unit operating conditions are shown by the LED indicators next to the Cycle Sentry Key, High Speed Lock-out Key, and Pretrip Test Key.

In the example (Figure 38, p. 128), Zone 1 is being shown as indicated by the single horizontal bar to the left of the box temperature. The box temperature of -8.2°F (-22.3°C) and setpoint of -10°F (-23.3°C) indicate that Zone 1 is turned on. Since the Cycle Sentry LED is turned off, the unit operating in Continuous Mode. The illuminated LED next to the High Speed Lock-out Key indicates that high speed operation is locked out. The absence of the Alarm Icon indicated that no alarm conditions exist.

Figure 38. Multi-Temperature Standard Display

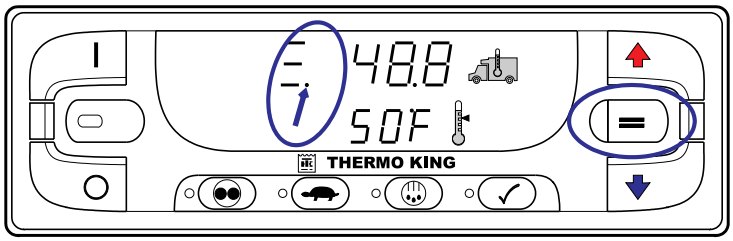


Manual Zone Selection Mode

Manual Zone Selection mode allows the operator to select a desired zone when the Standard Display is being shown. Once a zone is selected, the zone can be turned on or off, the zone setpoint can be changed, or a manual defrost cycle can be initiated.

To manually select a zone when the Standard Display is being shown, press the Enter Key once. A decimal point will be illuminated to the right of the Zone 1 horizontal bar as shown (Figure 39, p. 129). This indicates that Manual Zone Selection MODE is active. The unit will remain in Manual Zone Selection MODE for 30 seconds after the last key press.

Figure 39. Manual Zone Selection Mode



SAP783

When Manual Zone Selection MODE is active, pressing the Enter Key manually scrolls through the zones. When the desired zone is shown on the display, operation of that zone can be changed as required.

- The selected zone can be turned on or off.
- The selected zone setpoint can be changed.
- A manual defrost cycle can be initiated in the selected zone if zone conditions permit.

Turning Zones On and Off

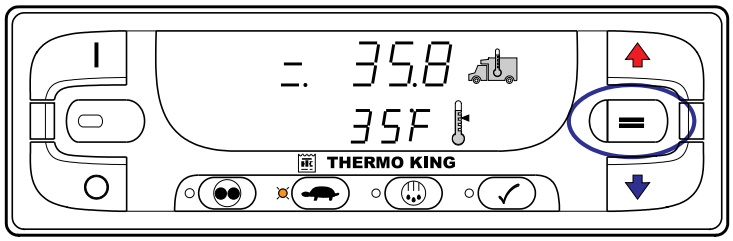
Each configured zone can be individually turned on or off. The On and Off state for each zone is maintained even if the unit is turned off and back on. For example, if Zone 2 is turned off and the unit is then turned off and back on, Zone 2 will still be off.

Important:

1. *At least one zone must be turned on. If all configured zones but one are turned off, the controller will not allow the last zone to be turned off.*
2. *Unlike trailer applications, Zone 1 can be turned off without affecting unit operation, so long as at least one other zone is turned on.*

From the Standard Display, press the Enter Key to put the unit in Manual Zone Selection mode. Press the Enter Key again as required to select the desired zone. In the example shown (Figure 40, p. 129), Zone 2 has been selected.

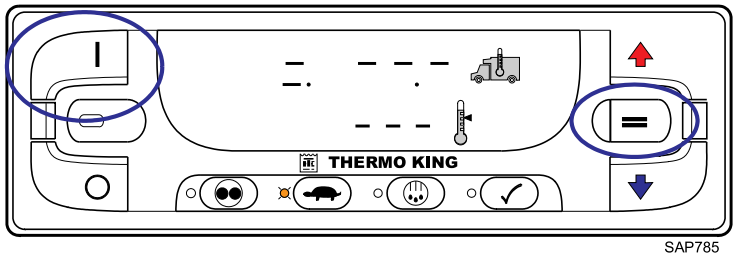
Figure 40. Zone 2



SAP784

When the desired zone is selected, simultaneously press the ON Key and ENTER Key to turn the zone off. The box temperature and setpoint show all dashes to indicate the zone is turned off as shown (Figure 41, p. 129).

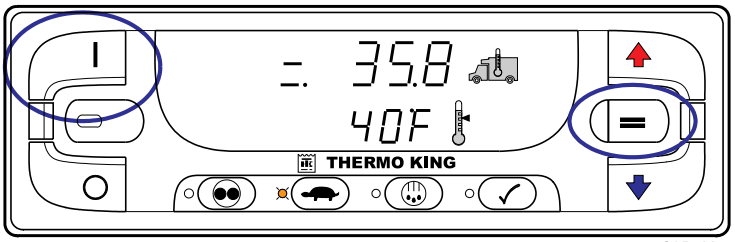
Figure 41. Zone Off



SAP785

Simultaneously pressing the ON Key and ENTER Key again will turn the selected zone back on as shown (Figure 42, p. 130).

Figure 42. Zone On

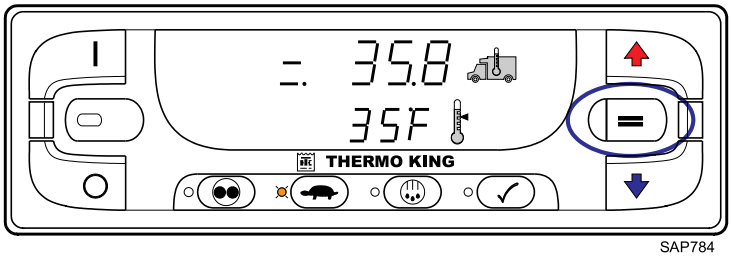


SAP786

Changing Zone Setpoint

From the Standard Display, press the Enter Key to put the unit in Manual Zone Selection mode. Press the Enter Key again as required to select the desired zone. In the example shown (Figure 43, p. 130), Zone 2 has been selected.

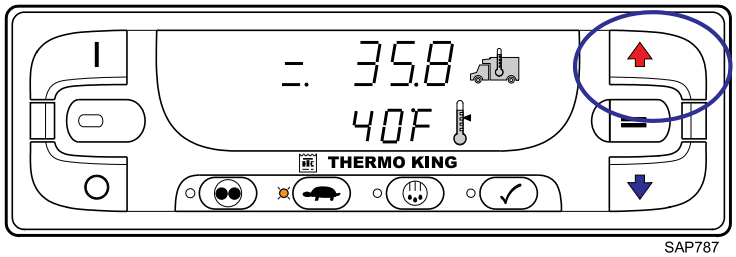
Figure 43. Zone 2



SAP784

When the desired zone is selected, press the UP ARROW Key and/or DOWN ARROW Key until the desired setpoint is shown. In the example (Figure 44, p. 130), the setpoint has been increased to 40°F (4.4°C) using the UP ARROW Key.

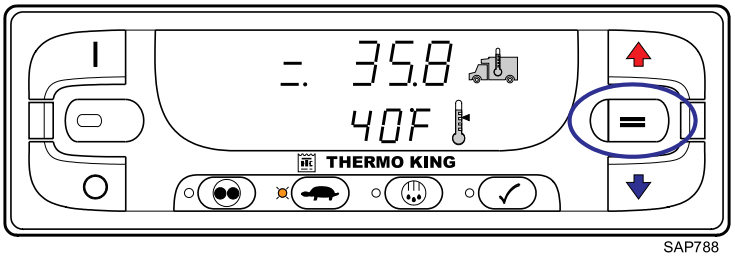
Figure 44. Setpoint Change



SAP787

When the desired setpoint has been selected using the UP ARROW Key and DOWN ARROW Key, the ENTER Key must be pressed to confirm and load the new setpoint (Figure 45, p. 130).

Figure 45. Enter Key



SAP788

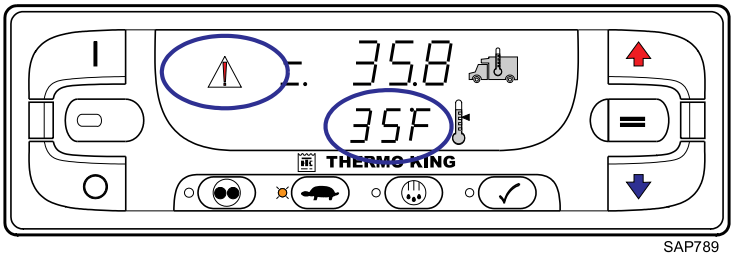
The new setpoint of 40°F (4.4°C) will remain on the display after the ENTER Key has been pressed.

- If the setpoint is changed using the UP ARROW Key and DOWN ARROW Key, the setpoint display will begin to flash 10 seconds after the last press of the Up Arrow or Down Arrow key as a reminder to press the ENTER Key.

- The setpoint display will flash for 10 additional seconds. If at the end of this time the ENTER Key still has not been pressed to complete the setpoint change, the setpoint will return to the old setpoint and Alarm Code 127 Setpoint Not Entered will be set. The Alarm Icon will appear in the display.

Failure to confirm the new setpoint by pressing the ENTER Key within 20 seconds of changing the setpoint will result in no setpoint change. In addition, Alarm Code 127 Setpoint Not Entered is set, to indicate that the setpoint change was started but was not completed (Figure 46, p. 131).

Figure 46. Setpoint Change Not Completed



SAP789

The setpoint has returned to the old setpoint of 35°F (1.6°C) and the Alarm Icon has lighted indicating that Alarm Code 127 Setpoint Not Entered is set.

Important: *If the setpoint is changed using the UP ARROW Key or DOWN ARROW Key, the change must be confirmed by pressing the ENTER Key within 20 seconds of changing the setpoint.*

- If the ENTER Key is pressed, the setpoint change made with the UP ARROW Key and/or DOWN ARROW Key is accepted, the setpoint is changed, and the display returns to the Standard Display showing the new setpoint.
- If the ENTER Key is not pressed within 20 seconds of making a change with the UP ARROW Key and/or DOWN ARROW Key, the setpoint is not changed and the display returns to the Setpoint Display showing the old setpoint. Alarm Code 127 Setpoint Not Entered is set and the Alarm Icon will appear on the display, to indicate that the setpoint change was started but not completed.

Starting the Diesel Engine

⚠ Caution

Risk of Injury!

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

Notice

Equipment Damage!

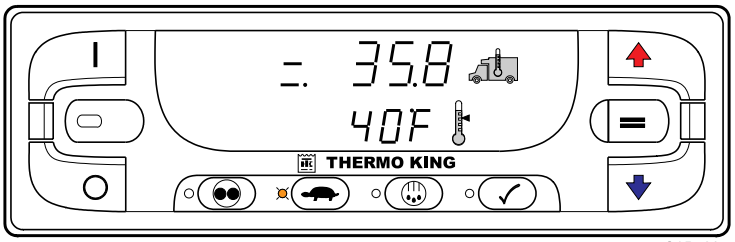
Never use starting fluid. Damage to the engine can occur.

Verify the Base Controller On/Off switch is in the ON position. 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 pre-heat and start sequence will be delayed in Cycle Sentry mode if there is no current need for the engine to run.

When the engine is preparing to start, the Truck Standard Display HMI Control Panel will continue to display the Standard Display as shown (Figure 47, p. 132). The preheat buzzer at the unit (located on the unit Interface Board) sounds during the engine pre-heat and crank sequence.

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.*

Figure 47. Standard Display



SAP790

Starting the Electric Motor

Note: *Units equipped with the Electric Standby option only.*

⚠ Caution

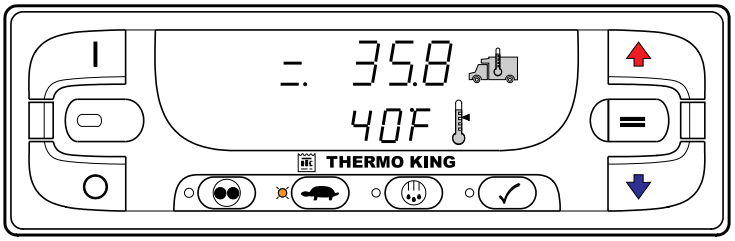
Risk of Injury!

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

Verify the Base Controller On/Off switch is in the ON position. 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 in Standby Mode and standby power is connected.

When the motor is preparing to start, the Truck Standard Display HMI Control Panel will continue to show the Standard Display as shown (Figure 48, p. 132). The preheat buzzer at the unit (located on the unit Interface Board) sounds for 20 seconds before the electric motor starts.

Figure 48. Standard Display



SAP790

Switching from Diesel to Electric

Important: *Applies to units with the Electric Standby Option only. The operation of this feature can be changed using the Guarded Access Menu. Refer to Guarded Access / Unit Configuration Menu / Diesel to Electric Auto Switch Enabled feature in Section 3. The Diesel to Electric Auto Switch Enabled feature should be set YES on units equipped with the Truck Standard Display HMI Control Panel.*

Diesel to Electric Auto Switch Enabled set YES (Default)

If this feature is set YES, the unit will switch automatically from Diesel Mode to Electric Mode when standby power is connected and present.

Diesel to Electric Auto Switch Enabled set NO

The Diesel to Electric Auto Switch Enabled feature should not be set NO on units equipped with the Truck Standard Display HMI Control Panel.

Switching from Electric to Diesel

Important: *Applies to units with the Electric Standby Option only. The operation of this feature can be changed using the Guarded Access Menu. Refer to Guarded Access / Unit Configuration Menu / Electric to Diesel Auto Switch Enabled feature in Section 3.*

Electric to Diesel Auto Switch Enabled feature set YES

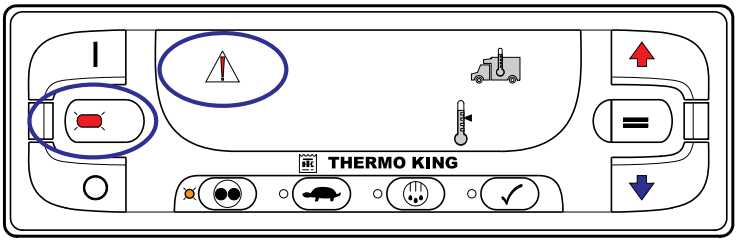
If this feature is set YES, the unit will switch automatically from Electric Mode to Diesel Mode when standby power is removed or fails.

Electric to Diesel Auto Switch Enabled feature set NO (Default)

If the unit is operating in Electric Mode 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 unit is operating in Electric Mode and standby power is disconnected or fails, Alarm Code 91 Check Electric Ready Input will be set. The red LED between the ON key and OFF Key will glow, the Alarm Icon will glow, and the box temperature and setpoint displays will disappear as shown (Figure 49, p. 133).

Figure 49. Alarm Icon



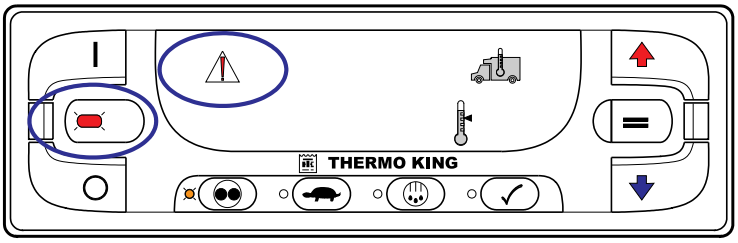
Important:

1. *If the unit is running in Electric Mode and electric standby power is lost and then restored, Alarm Code 91 Check Electric Ready Input will be automatically cleared and the unit will restart in Electric Mode.*
2. *When the display shown (Figure 49, p. 133) is present, do not press the Truck Standard Display HMI Control Panel OFF Key to turn the unit off. Press the HMI Control Panel ON Key twice to clear Alarm Code 91 Check Electric Ready Input and turn the unit back on in Diesel Mode.*

Preferred Method for Manually Switching from Electric Mode to Diesel Mode

1. Press the HMI Control Panel OFF Key to turn the unit off.
2. Turn off the standby power and disconnect the cord.
3. Press the HMI Control Panel ON Key to turn the unit on. The Hourmeters display will briefly appear and then the screen will appear as shown.

Figure 50. Display



4. Press the HMI Control Panel ON Key again to clear Alarm Code 91 Check Electric Ready Input and turn the unit back on in Diesel Mode.

Important: *When the display shown (Figure 50, p. 133) is present, do not press the HMI Control Panel OFF Key to turn the unit off. Press the HMI Control Panel ON Key twice to clear Alarm Code 91 Check Electric Ready Input and turn the unit back on in Diesel Mode.*

If the HMI Control Panel OFF Key is pressed when the display shown (Figure 50, p. 133) is present, the unit will turn off and the display will be blank. To restart the unit in Diesel Mode, proceed as follows:

- Press the HMI Control Panel ON Key. The Hourmeters display and a blinking Alarm Icon will appear.
- When the Hourmeters display and a blinking Alarm Icon is shown, press the HMI Control Panel ON Key again. The display will go blank but the blinking Alarm Icon will remain on and blinking.

- When the display goes blank and the blinking Alarm Icon is shown, press the HMI Control Panel ON Key again. The box temperature and setpoint will appear, the blinking Alarm Icon will disappear and the unit will start in Diesel Mode.

Selecting CYCLE-SENTRY or Continuous Mode

⚠ Caution

Risk of Injury!

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

⚠ Caution

Risk of Injury!

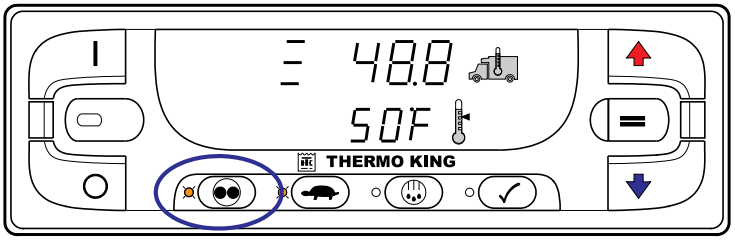
If the unit is in CYCLE-SENTRY null and the mode is switched to Continuous Mode, the unit will start automatically.

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 to provide constant airflow.

CYCLE-SENTRY Mode or Continuous Mode is selected by pressing the CYCLE-SENTRY/CONTINUOUS Key when the unit is turned on. If the unit is running in Continuous Mode, pressing this key will switch operation to CYCLE-SENTRY Mode and the amber LED indictor will glow. If the unit is running in CYCLE-SENTRY Mode, pressing this key will switch operation to Continuous Mode and the amber LED will turn off.

The unit shown (Figure 51, p. 134) is running in CYCLE-SENTRY Mode.

Figure 51. CYCLE-SENTRY/Continuous Key



SAP791

Selecting High Speed Lock-Out Feature

If the High Speed Lock-Out feature is enabled and turned on, the unit will run only in low speed until the High Speed Lock-Out feature is turned off or the High Speed Lock-Out Timer is exceeded. This feature is typically used in noise sensitive areas to reduce unit engine noise.

High Speed Lock-Out is turned on or off by pressing the HIGH SPEED LOCK-OUT Key when the unit is turned on. Pressing this key will turn High Speed Lock-Out on; pressing it again will turn High Speed Lock-Out off. If High Speed Lock-Out is turned on, unit will switch to low speed operation and the amber LED indictor will glow. No further high speed operation is allowed until this feature is turned off or the High Speed Lock-Out Timer is exceeded.

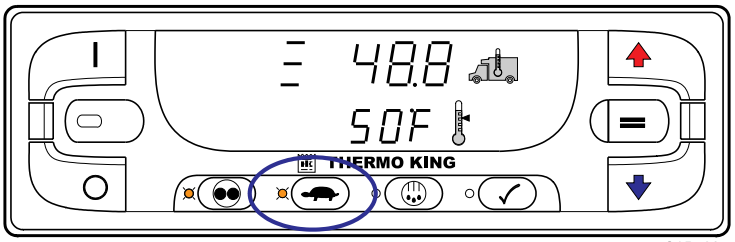
High Speed Lock-Out Timer

If High Speed Lock-Out Mode is selected, the High Speed Inhibit Timeout feature may be enabled to return the unit to normal operation after a set time period has expired. This prevents unintended extended operation with high speed operation locked out. The time period may be set from 15 minutes to 2 hours. If a time period is set and exceeded, the unit will return to normal operation with high speed operation allowed and the amber LED indicator will turn off. If necessary to return to High Speed Lock-Out Mode, press the HIGH SPEED LOCK-OUT Key again.

The unit shown (Figure 52, p. 135) has High Speed Lock-Out turned on.

Note: *The HIGH SPEED LOCK-OUT Key is only used when the unit is operating in Diesel Mode. The HIGH SPEED LOCK-OUT Key does not have any effect in Electric Mode operation.*

Figure 52. High Speed Lock-Out On



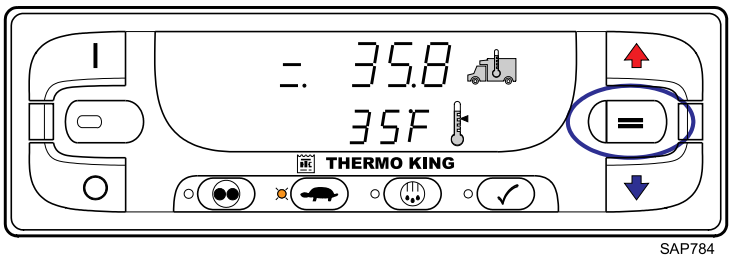
SAP792

Initiating a Zone Manual Defrost Cycle

Defrost cycles are usually initiated automatically based on time or demand. Manual defrost may also be available. Defrost is only available if the unit is running and the evaporator coil temperature is less than 45°F (7°C). Other features such as door switch settings may not allow manual defrost under some conditions.

From the Standard Display, press the Enter Key to put the unit in Manual Zone Selection mode. Press the Enter Key again as required to select the desired zone. In the example shown (Figure 53, p. 135), Zone 2 has been selected.

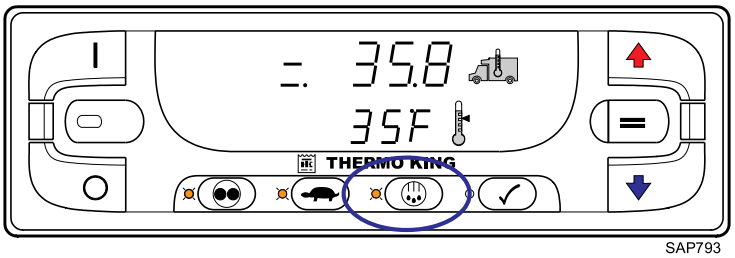
Figure 53. Zone 2



SAP784

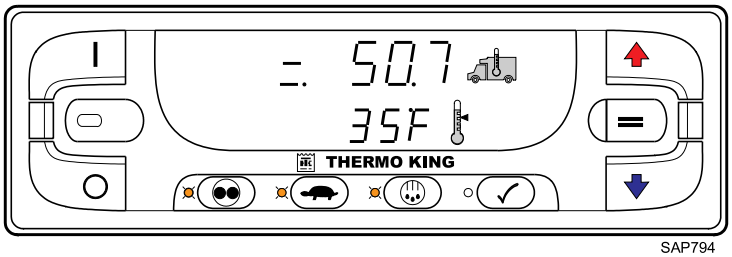
To initiate a manual defrost cycle in the selected zone, press the DEFROST Key as shown (Figure 54, p. 135). If zone conditions allow, the zone will enter a defrost cycle and the amber LED next to the DEFROST Key will glow.

Figure 54. Defrost Key



SAP793

Important: *During the defrost cycle, the box temperature of the zone in defrost will rise toward 50°F (10°C). This is normal and is caused by the defrost cycle warming the evaporator coil. Since the evaporator fans are turned off during the defrost cycle, this warm air is not circulated in the truck box.*



SAP794

Terminating a Defrost Cycle

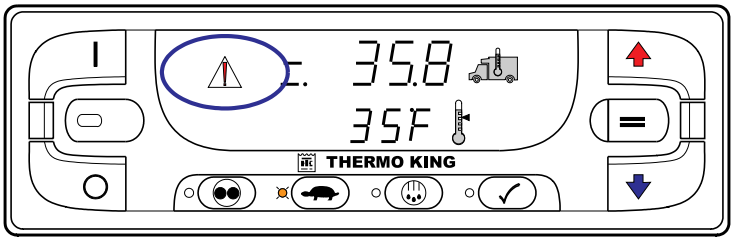
The defrost cycle terminates automatically when the evaporator coil temperature is greater than or equal to 52°F (11°C) or the defrost timer expires. When the defrost cycle is completed the amber LED next to the DEFROST Key will turn off. Defrost can also be terminated by turning the unit off and back on.

Alarms

Alarm Code Notification

If an alarm condition occurs, the Alarm Icon will appear on the display. If the alarm is a Check Alarm, the Alarm Icon will turn on but the unit will continue to run. If the alarm is a Shutdown Alarm, the Alarm Icon and the display will flash on and off and the unit will shut down. If the alarm is zone specific, the zone indicator will be present to show which zone has the alarm condition.

Figure 55. Alarm Icon

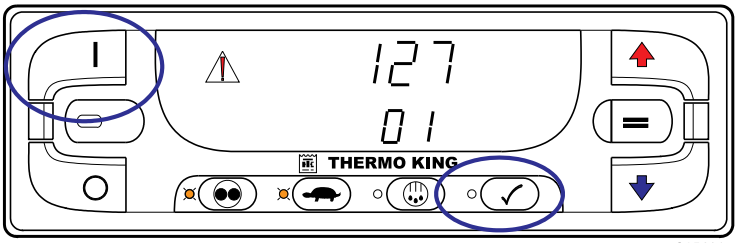


SAP795

Displaying Alarm Codes

Alarms are displayed by simultaneously pressing and holding the ON Key and PRETRIP TEST Key. The upper display shown (Figure 56, p. 136) indicates that Alarm Code 127 Setpoint Not Entered has been set. The lower display indicates that only one alarm code exists. If more than one alarm code has been set, they are displayed with the most recent alarm shown first. Use the UP ARROW Key to scroll through the alarms.

Figure 56. ON and PRETRIP TEST Keys



SAP391

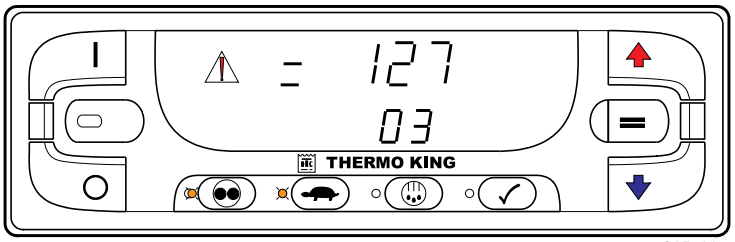
Unit Alarm Codes

Unit alarms affect the operation of the entire unit. The Alarm Display shown above indicates that Alarm Code 127 exists and that there is only one alarm condition present.

Zone Specific Alarm Codes

If an alarm condition is specific to a zone, the zone indicator will be present to identify the zone experiencing the alarm condition. The Alarm Display shown (Figure 57, p. 137) indicates that Alarm Code 127 Setpoint Not Entered exists in Zone 2. It also shows that a total of three alarm conditions exist.

Figure 57. Zone Specific Alarm Display



SAP796

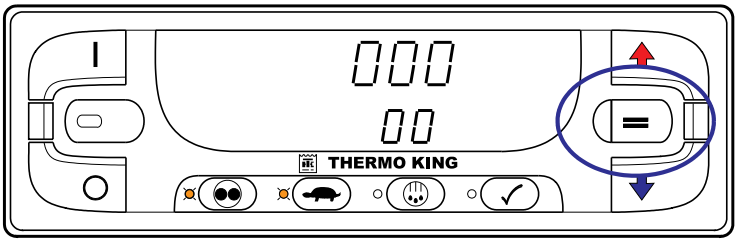
Multiple Alarm Codes

If more than one alarm code has been set, they are displayed with the most recent alarm shown first. Use the UP ARROW Key to scroll through the alarms.

Clearing Alarm Codes

After the alarm situation is resolved, press the ENTER Key to clear the alarm code currently being shown. When all alarms have been cleared, the display will show all zeros to indicate that no alarm codes exist.

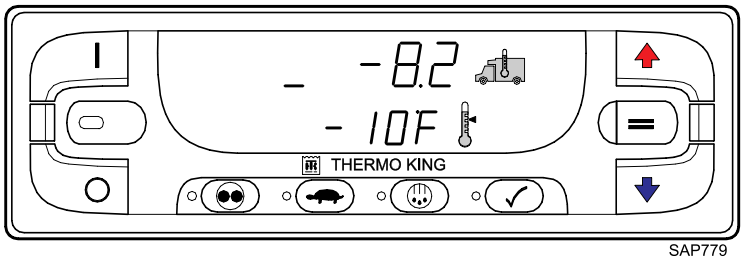
Figure 58. ENTER Key



SAP392

The display will return to the Standard Display about 30 seconds after all alarms have been cleared.

Figure 59. Standard Display



SAP779

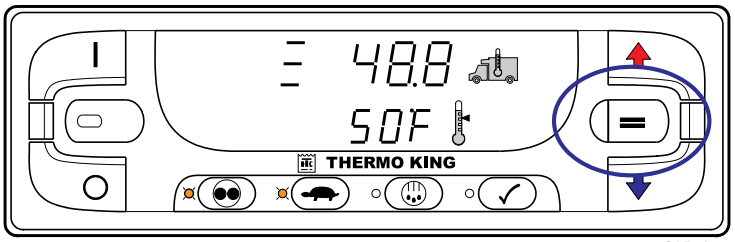
Important Alarm Notes

- All alarms must be viewed before any of the alarms can be cleared.
- 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.
- Some alarms cannot be cleared using the HMI Control Panel. These alarms must be cleared by maintenance personnel from the Maintenance or Guarded Access Menus.
- Alarm Code 91 Check Electric Ready Input is cleared by turning the unit off and back on. Refer to Switching From Electric To Diesel in this section.

Sending a Servicewatch Data Logger Start of Trip

When the unit is turned on, press and hold the ENTER Key for five seconds to send a Start of Trip (SOT) marker to the unit ServiceWatch Data Logger and the optional DAS Data Logger (if equipped).

Figure 60. ENTER Key



Pretrip Test

A Pretrip Test verifies unit operation. The PRETRIP Key allows either a Full Pretrip Test or an Engine Running Pretrip Test to be initiated by the operator.

Pretrip Test Conditions

- The current unit settings are saved and restored at the end of the Pretrip Test or if the unit is turned off and back on.
- The 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

- Pretrip Tests are not allowed if any Shutdown Alarms are present.
- Pretrip tests are allowed with some Check and Log Alarms present.

Pretrip Test Sequence

Pretrip tests proceed in the order shown below. A Full Pretrip Test is started with the engine or motor not running and includes all tests. A Running Pretrip Test is started with the engine or 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 in a zone is below 45°F (7°C), a defrost cycle is initiated for that zone.
- RPM Check - The engine RPM in high and low speed is checked.
- Zone 1, 2, or 3 Cool Check - The ability of the zone to cool in low speed is checked.
- Zone 1, 2, or 3 Heat Check - The ability of the zone to heat in low speed is checked.
- Zone 1, 2, or 3 Return to Cool Check - The ability of the zone to return to cool mode 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.

Pretrip Test Considerations

Important: *Always perform Pretrip with the dividing wall(s) in place. Running a Pretrip with the dividing wall(s) removed may result in false test results.*

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

- Whenever possible, run the Pretrip Test with an empty truck box.
- If running a Pretrip Test on a truck loaded with dry cargo, verify that proper airflow can occur around the load. If the load restricts airflow, false test results may occur. Units have high refrigeration capacity which results in rapid temperature change. Sensitive dry cargo may be damaged as a result.
- If running a Pretrip Test on a truck that has just been washed down, the extremely high humidity inside the truck box may result in false test results.
- If running a Pretrip Test on a truck 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 cargo doors closed to prevent false test results.

Performing a Pretrip Test

Starting a Full Pretrip Test

The Full Pretrip Test must be started with the unit not running. Turn the unit on and clear all alarm codes. Turn the unit off.

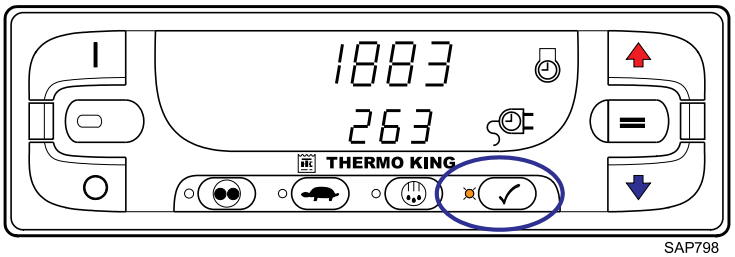
Turn the unit on and wait for the unit running time hourmeters to be shown on the display. When the unit running time hourmeters are shown, press and hold the PRETRIP Key for five seconds (Figure 61, p. 139).

- A flashing Pretrip LED indicates that the Pretrip Test is being initialized. When the Pretrip Test starts, the Pretrip LED will glow steady amber. The display will show the Standard Display.
- The Amps Check Test will be performed and then the unit will start automatically. The balance of the tests will be completed.
- The Pretrip Test will take about 20 - 30 minutes, depending on conditions.

  Important: *The box temperature will vary during the Pretrip Test. This is normal operation.*
- When the Pretrip Test is complete or if a Shutdown Alarm occurs, the amber Pretrip LED will turn off.

To stop a Pretrip Test at any time, press the POWER OFF Key to 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.

Figure 61. PRETRIP Key



SAP798

Starting an Engine Running Pretrip Test

The Engine Running Pretrip Test must be started with the unit running. Turn the unit on and clear all alarm codes. Allow the unit to start.

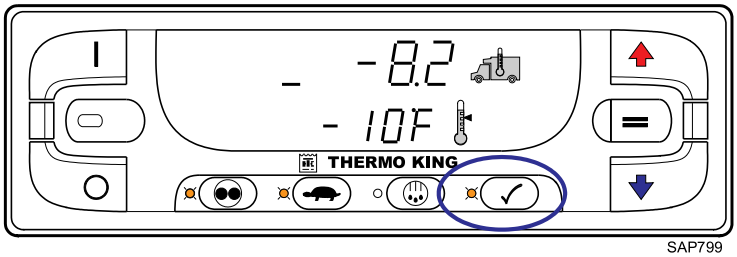
With the unit running, press and hold the PRETRIP Key for five seconds (Figure 62, p. 139).

- A flashing Pretrip LED indicates that the Pretrip Test is being initialized. When the Pretrip Test starts, the Pretrip LED will glow steady amber to indicate the test is in progress. The display will show the Standard Display.
- The Pretrip Test will take about 20 - 25 minutes, depending on conditions.

  Important: *The box temperature will vary during the Pretrip Test. This is normal operation.*
- When the Pretrip Test is complete or if a Shutdown Alarm occurs, the amber Pretrip LED will turn off.

To stop a Pretrip Test at any time, press the POWER OFF Key to 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.

Figure 62. PRETRIP Key



SAP799

Pretrip Test Results

Pass Pretrip Test

- If the unit passes the Pretrip Test, the amber Pretrip Test LED will turn off at the completion of the test and the unit will continue to run as required. This signifies that the unit passed the Pretrip Test.

Fail Pretrip Test with Check Alarms

- If the unit fails the Pretrip Test with Check alarms, the Alarm Icon will appear when the alarm condition occurs. The Pretrip Test will continue to run unless a Shutdown Alarm occurs.
- The amber Pretrip Test LED will turn off at the completion of the test, but the Alarm Icon will remain lit. This indicates that one or more Check Alarm conditions occurred during the Pretrip Test. More than one alarm may be present.
- View and record the alarm(s), correct as necessary, clear the alarm(s) and repeat the Pretrip Test.

Fail Pretrip Test with Shutdown Alarms

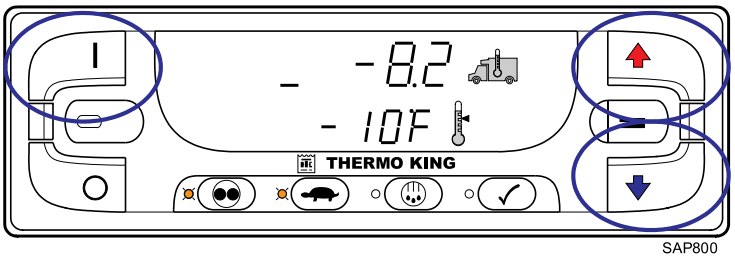
- If the unit fails the Pretrip Test with a Shutdown alarm, the Alarm Icon will appear when the alarm condition occurs, the unit will immediately shut down and the amber Pretrip Test LED will turn off.
- The Pretrip Test will be aborted.
- Alarm Code 28 Pretrip Abort will be set along with the Shutdown Alarm that was detected. This signifies that a Shutdown Alarm occurred during the Pretrip Test and that the test was aborted. Other alarms may also be present.
- View and record the alarm(s), correct as necessary, clear the alarm(s) and repeat the Pretrip Test.

Display 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, and LOW.

To change the display brightness, press and hold the ON key and press the UP ARROW Key to increase display brightness and the DOWN ARROW Key to decrease display brightness.

Figure 63. ON Key, UP/DOWN Arrow Keys



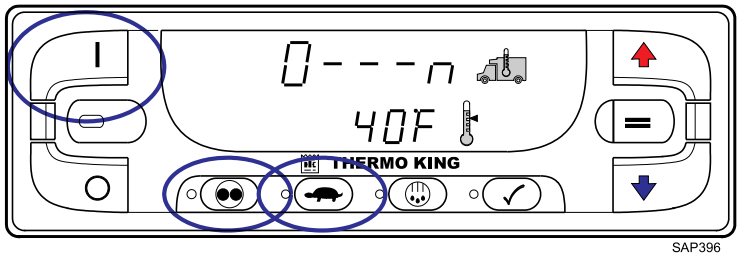
SAP800

Keypad Lockout

The Keypad Lockout feature allows the operator to lock the keypad to prevent tampering. If the Keypad Lockout feature is turned on, all keys except the ON Key and OFF Key are prevented from functioning. The unit can still be turned On and Off, but doing so does not clear Keypad Lockout.

To turn Keypad Lockout on, simultaneously press and hold the ON Key, CYCLE SENTRY Key, and HIGH SPEED LOCK-OUT Key for five seconds. The display shown (Figure 64, p. 141) will appear, with [0 - - - n] replacing the box temperature. When the three keys are released, the display will return to the Standard Display of box temperature and setpoint.

Figure 64. ON Key, CYCLE SENTRY Key, and HIGH SPEED LOCK-OUT Key



When Keypad Lockout is turned on, only the ON and OFF Keys are functional. All other keys are locked out. Pressing any key other than the ON Key and OFF Key will cause the box temperature to display [0 - - - n]. When the key is released, the display will return to the Standard Display of box temperature and setpoint.

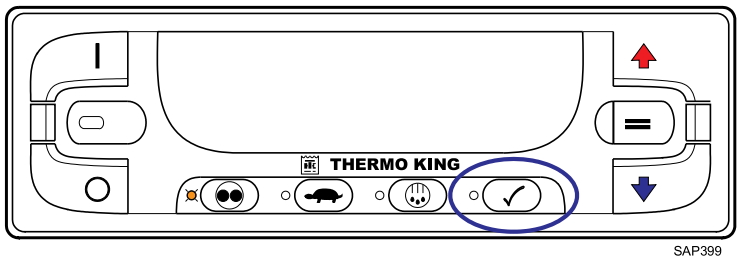
To turn Keypad Lockout off, simultaneously press and hold the ON Key, CYCLE SENTRY Key, and HIGH SPEED LOCK-OUT Key for five seconds. The display shown (Figure 64, p. 141) will appear, with [0 - - - n] replacing the box temperature. When the three keys are released, the display will return to the Standard Display of box temperature and setpoint. All keys will function normally.

Note: *With the Truck Standard Display, the Keypad Lockout feature is present even if the Guarded Access / Main Menu Configuration / Add Keypad Lockout to Mode Menu feature is disabled.*

Checking Truck HMI Control Panel Software Revision and Serial Number

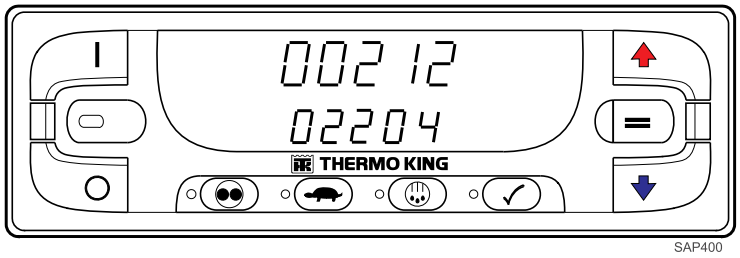
The HMI Control Panel serial number and software revision can be displayed if necessary. To display the serial number and software revision, press and hold the PRETRIP key for five seconds when the unit is turned off.

Figure 65. PRETRIP Key



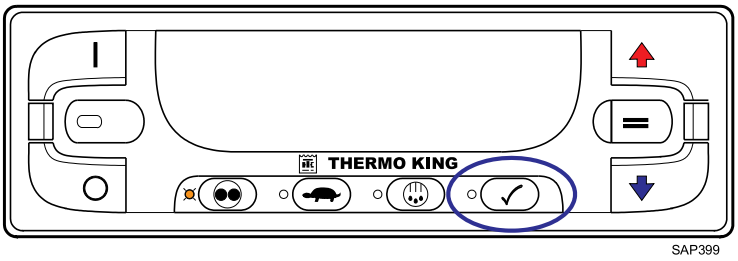
The serial number is shown at the top of the display and the software revision is shown at the bottom of the display. The HMI Control Panel Serial Number shown (Figure 66, p. 141) is 00212. The software revision shown is Revision 2204.

Figure 66. Software Revision and Serial Number



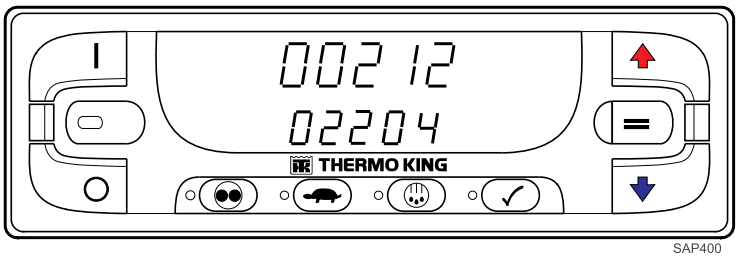
Displaying Date and Time

The Date and Time can be viewed and changed using the HMI Control Panel equipped with Software Revision 2204 and later. To display the Date and Time, press and hold the PRETRIP key for five seconds when the unit is turned off.



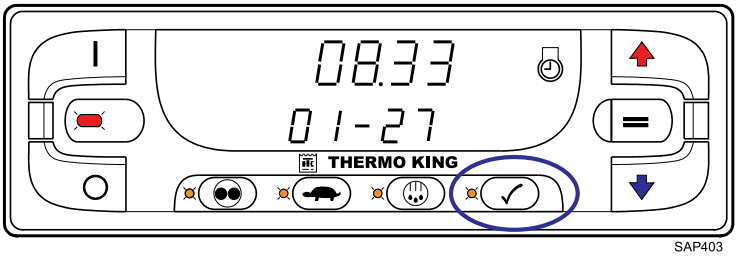
SAP399

The HMI Control Panel serial number will be shown at the top of the display and the installed software revision will be shown at the bottom of the display.



SAP400

Press the PRETRIP key again to display the current date and time as held by the HMI Control Panel. The time shown is 8:33 AM and the date is January 27th.



SAP403

Time Display

The time displayed by the HMI Control Panel is always shown by means of a 24 hour clock. This time is sometimes referred to as military time or 24 hour time. Refer to the table (Table 26, p. 142) to convert 24 hour time to 12 hour time.

Table 26. Time Conversion

Morning		Afternoon - Evening	
12 Hour	**24 Hour**	**12 Hour**	**24 Hour**
Midnight	0000	Noon	1200
1 AM	0100	1 PM	1300
2 AM	0200	2 PM	1400
3 AM	0300	3 PM	1500
4 AM	0400	4 PM	1600
5 AM	0500	5 PM	1700
6 AM	0600	6 PM	1800
7 AM	0700	7 PM	1900
8 AM	0800	8 PM	2000
9 AM	0900	9 PM	2100
10 AM	1000	10 PM	2200

Table 26. Time Conversion (continued)

Morning		Afternoon - Evening	
12 Hour	**24 Hour**	**12 Hour**	**24 Hour**
11 AM	1100	11 PM	2300
12 AM	1200	12 PM	2400

Date Display

Dates can be displayed in one of two ways.

- If the US/EU Clock Set Feature is set for US, time is displayed as Month - Day (December 10, 2012).
- If the US/EU Clock Set Feature is set for EU, time is displayed as Day - Month (10 December, 2012).

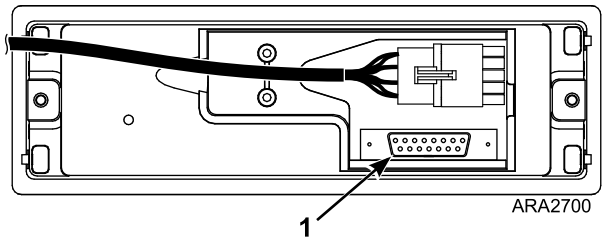
Checking or Setting Date and Time Using WinTrac™

With all SR-3 control systems, the system Date and Time is maintained by the HMI Control Panel. Prior to Software Revision 2204, the Date and Time held by the HMI Control Panel cannot be viewed using the Truck Standard Display.

Date and Time can be checked and changed using WinTrac 5.2 or later. Power must be connected to the Truck Standard Display and the unit must be turned off in order to check or change the Date and Time.

1. Remove the Truck Standard Display as necessary to gain access to the back of the device.
2. Turn the unit on to verify that power is available to the Truck Standard Display. Turn the unit back off.
3. Remove the back cover from the Truck Standard Display.
4. Connect a Thermo King 9 to 15 pin serial cable from a computer to the 15 pin connector on the back of the Truck Standard Display as shown below.

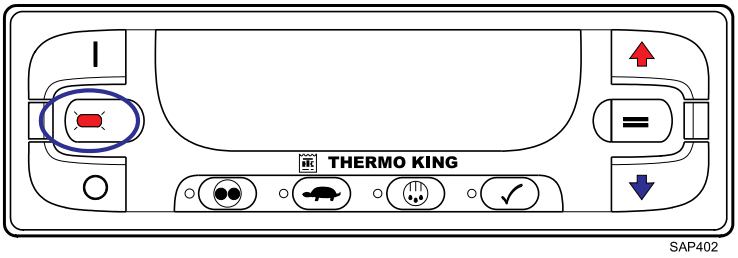
Figure 67. 15 Pin D Connector



1.	15 Pin "D" Connector

5. When the cable is connected, verify the red LED indicator located between the Truck Standard Display POWER ON Key and POWER OFF Key is illuminated as shown (). If the red LED indicator is not illuminated, the Date and Time cannot be changed. If the red LED indicator is not illuminated, verify the unit is turned off.

Figure 68. Red LED Indicator

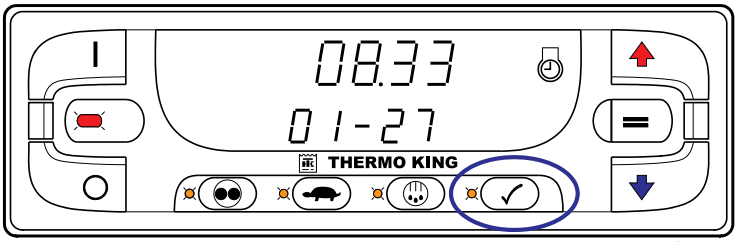


6. Open WinTrac 5.2 or later. Earlier versions of WinTrac will not work.
7. Select Seek Device.
8. Use WinTrac to set the Date and Time. Refer to the WinTrac Help File for additional information.

9. When the Date and Time is set and checked, disconnected the cable, replace the back cover, and reinstall the Truck Standard Display as required.
10. Turn the unit on and perform a ServiceWatch Data Logger download using WinTrac to verify the Date and Time are correct.

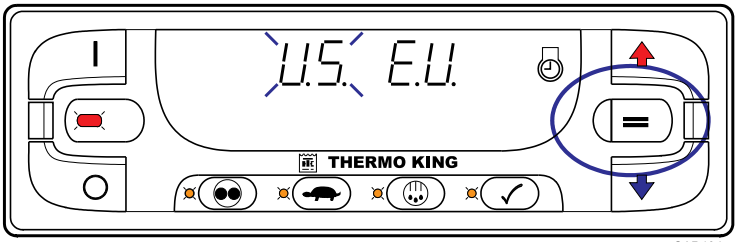
Setting Date and Time

The Date and Time can be changed using the HMI Control Panel with Software Revision 2204 and later. Display the current Date and Time as shown on the previous pages.



SAP403

When the current Date and Time is shown on the display, press and hold the Enter key to display US - EU.



SAP404

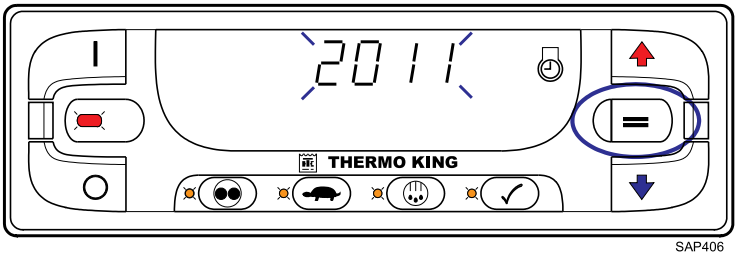
Using the Up Arrow Key and/or Down Arrow Key, select the flashing display to either “US” or “EU” as desired.

- If the US/EU Clock Set Feature is set for “US”, time is displayed as Month - Day (December 10, 2012).
- If the US/EU Clock Set Feature is set for “EU”, time is displayed as Day - Month (10 December, 2012).



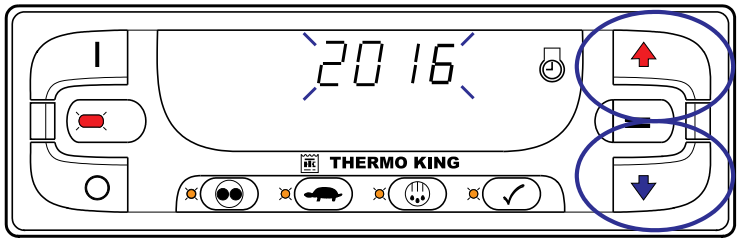
SAP405

Press the Enter key to display the year. The year will flash indicating it can be changed.



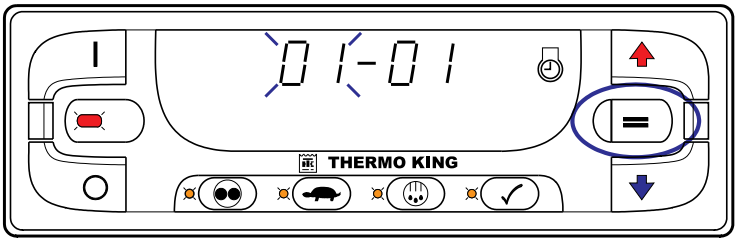
SAP406

Using the Up Arrow Key and/or Down Arrow Key, select the current year.



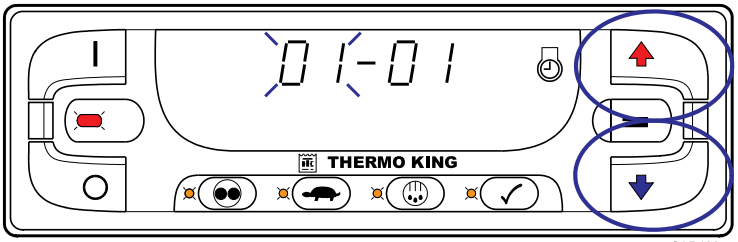
SAP407

Press the Enter key to display the Month - Day. The Month will flash indicating it can be changed.



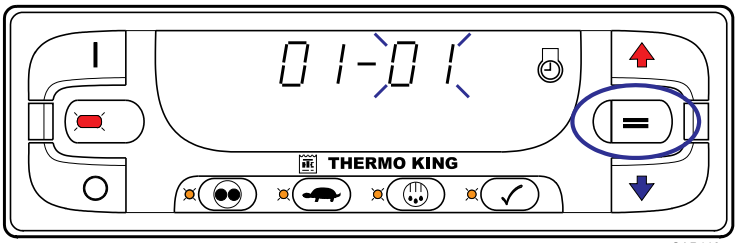
SAP408

Using the Up Arrow Key and/or Down Arrow Key, select the current month.



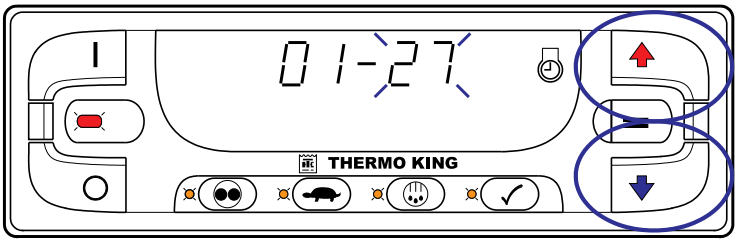
SAP409

Press the Enter key to display the Month - Day. The Day will flash indicating it can be changed.



SAP410

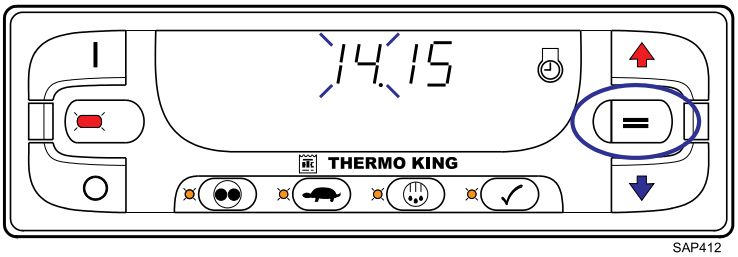
Using the Up Arrow Key and/or Down Arrow Key, select the current day.



SAP411

Press the Enter key to display the Time. The Hour setting will flash indicating it can be changed. The hours shown in 24 Hour clock format are “14”, which is the same as 2 PM.

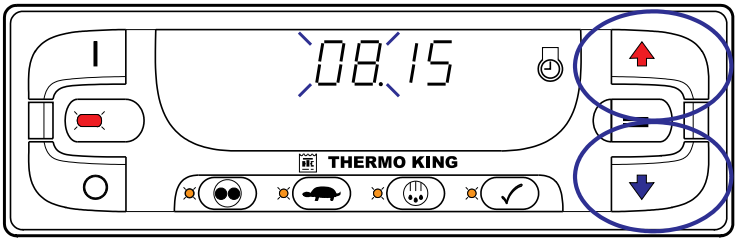
Note: *Hours are displayed on a 24 Hour Clock as shown under Checking Date and Time.*



SAP412

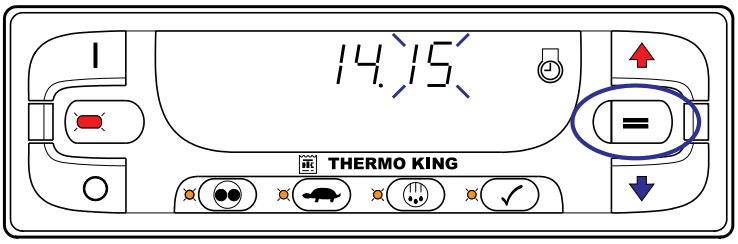
Using the Up Arrow Key and/or Down Arrow Key, select the desired Hour. The hours shown is now 8 AM.

Note: *Hours are displayed on a 24 Hour Clock as shown under Checking Date and Time.*



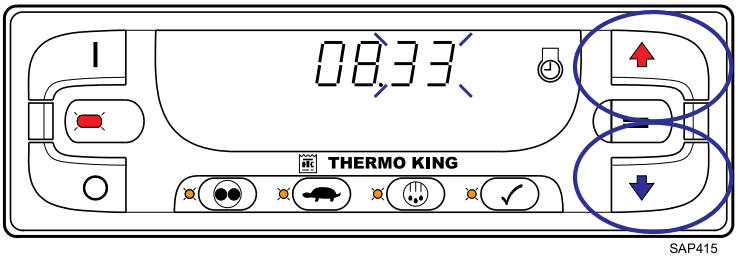
SAP413

Press the Enter key to display Minutes. The Minute setting will flash indicating it can be changed. The minutes shown are 15 minutes past the hour.



SAP414

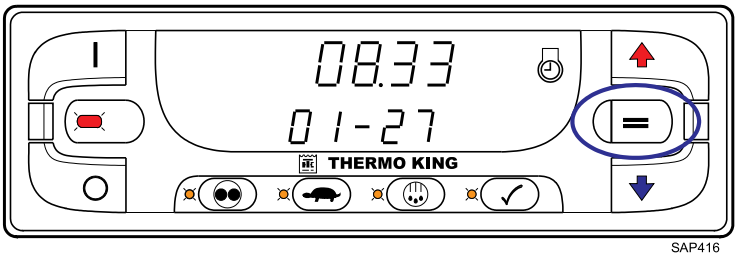
Using the Up Arrow Key and/or Down Arrow Key, select the desired Minutes. The minutes shown are now 33 minutes past the hour.



SAP415

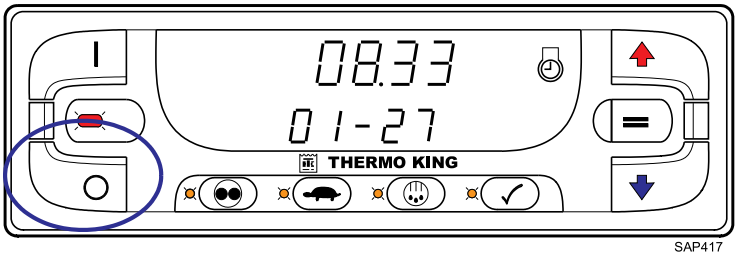
Press the Enter Key to load the Date and Time. The time shown is 8:33 AM and date is January 27th.

Important: *The Enter Key must be pressed to complete the Date and Time change.*



SAP416

To leave the Date and Time Display press the Off Key. The displays will also time out after one minute.



SAP417

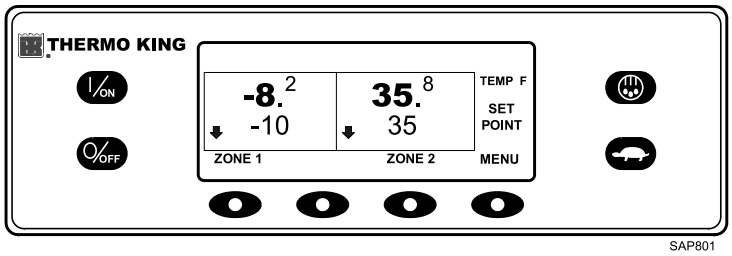
Verify the Date and Time is correct displaying the current date and time as shown under Displaying Date and Time. Date and time can also be checked using WinTrac 5.3 or later.

Truck Premium Display HMI Control Panel

The Truck Premium Display is used to operate the unit, display unit information, and access all Maintenance and Guarded Access Menus. The Truck Premium Display communicates with the Base Controller via the Controller Area Network (CAN) bus. It is connected to the Base Controller via CAN Connector J14 on the interface board. The Truck Premium Display is typically located in the vehicle driver's compartment. It may be installed in the truck instrument panel using a DIN mounting ring or under the instrument panel using an under dash mounting kit.

The Truck Premium Display is also available as a Mechanics HMI Control Panel. The Mechanics HMI Control Panel consists of a Truck Premium Display mounted in a shockproof housing and is supplied with the necessary connection cables and a plastic carrying case. The Mechanics HMI Control Panel is required to display all unit information and to access the Maintenance Menu and Guarded Access Menu on units equipped with the Truck Standard Display. Refer to Section 7 for additional details.

Figure 69. Truck Premium HMI Control Panel



The HMI control panel consists of a display and 8 touch-sensitive keys.

The display is capable of showing both text and graphics.

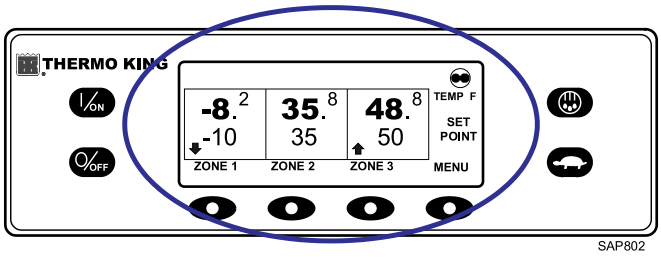
The keys on the left and right sides of the display are dedicated single function "hard" keys.

The four keys under the display are "soft" keys. The functions of these soft keys change depending on the operation being performed. If a soft key is active the current key function is shown in the display directly above the key.

Display

The display presents information to the operator. This information includes setpoint and temperature for each zone, unit or zone operating information, gauge readings, temperatures, and other information as selected by the operator.

Figure 70. Display



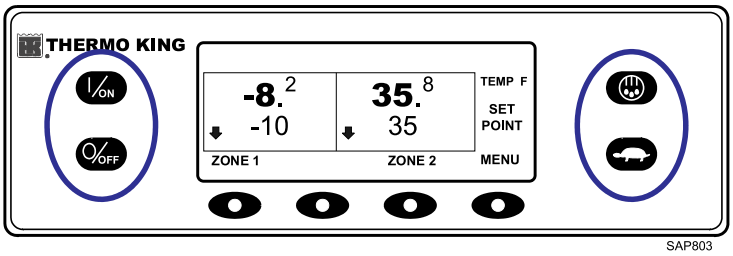
The Standard Display of box temperature and setpoint for three zones is shown (Figure 70, p. 148). The Cycle Sentry Icon in the upper right of the display shows the unit is running in Cycle Sentry Mode. Zone 1 has a setpoint of -10°F, and a return air temperature of -8.2°F. The downward pointing arrow shows this zone is cooling. Zone 2 has a setpoint of 35°F, and a return air temperature of 35.8°F. The absence of an arrow indicates that this zone is in null. Zone 3 has a setpoint of 50°F, and a return air temperature of 48.8°F. The upward pointing arrow shows this zone is heating.

Note: *The zone temperature shown is always return air temperature.*

The four keys under the display are termed "soft" keys. The functions of these keys change depending on the operation being performed. The function of each soft key is shown by labels in the display located directly above each soft key. The soft key under each zone is used to turn that zone on and off and allows the Setpoint for that zone to be changed. Pressing the soft key under MENU accesses the MAIN MENU.

Hard Keys

Figure 71. Hard Keys



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



This key is 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. For more information see "Turning the Unit On and Off" later in this section.



This key is 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. For more information see "Turning the Unit On and Off" later in this section.



This key is used to initiate a manual defrost cycle. For more information see "Initiating a Manual Defrost Cycle" later in this section.

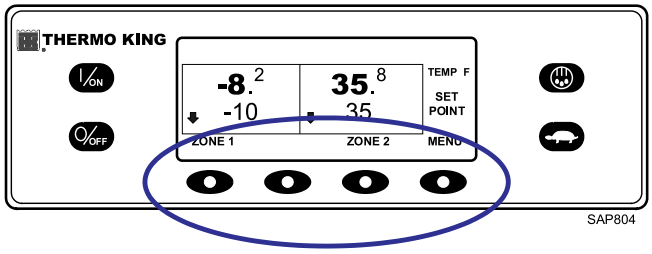


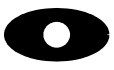
This key is used to lock out high speed operation in noise sensitive areas. For more information see "Selecting High Speed Lockout" later in this section.

Note: *The Thermo King Premium Truck HMI Control Panel features a High Speed Lock-Out key as shown here. The Thermo King Truck HMI Control Panel features a Cycle Sentry key in this position. When using the Thermo King Premium Truck HMI Control Panel, Cycle Sentry Mode or Continuous Mode is selected from the Main Menu – Mode Submenu as shown later in this section.*

Soft Keys

Figure 72. 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 functions:

ZONE ON/OFF and SETPOINT CHANGE			
MENU	+ or -	HOURMETERS	EXIT
NEXT	SELECT	GAUGES	HELP
YES/NO	CLEAR	BACK	SENSORS

Turning the Unit On and Off

Important: *Verify the Base Controller On/Off Switch is turned on before turning on the HMI Control Panel. The Base Controller On/Off switch is located on the outside of the control box side of the unit.*

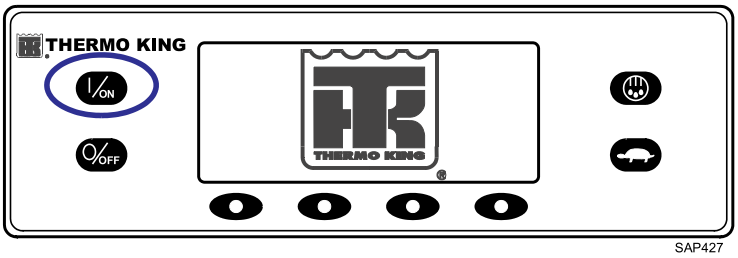
If the HMI Control Panel is turned on and the Base Controller On/Off Switch is turned off, the HMI display screen will briefly show LOST CONTROLLER POWER. The HMI will then power down.

The unit is turned on by pressing the ON key 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 as shown (Figure 73, p. 150). 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.*

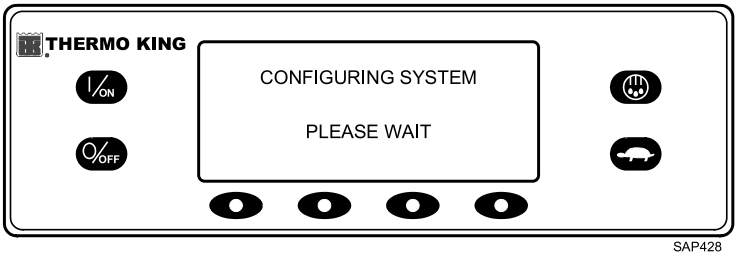
Note: *With extremely cold ambient temperatures, it may take up to 15 seconds for the display to appear on initial startup.*

Figure 73. ON Key



The startup screen shown (Figure 74, p. 150) appears while communications are established and the unit prepares for operation.

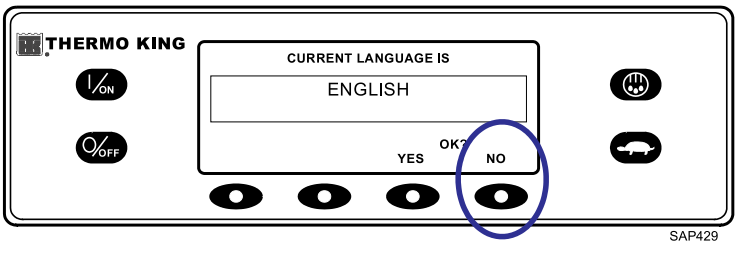
Figure 74. Startup Screen



If More Than One Language is Enabled

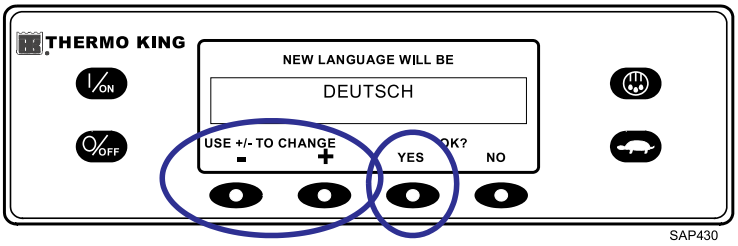
If more than one language has been enabled, a prompt will appear to allow the desired language to be chosen as shown (Figure 75, p. 150). Only languages enabled from the Guarded Access Menu are available. If a different language is desired, press the NO key.

Figure 75. NO key



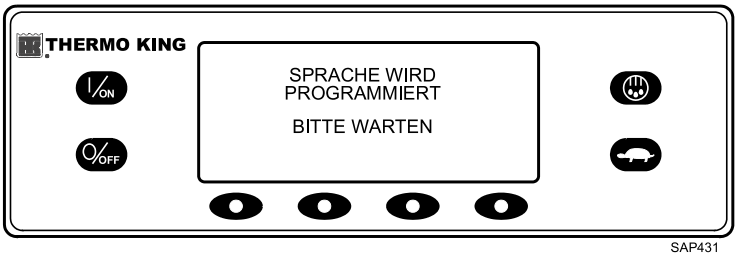
The Language menu will appear as shown (Figure 76, p. 151). Press the + or - keys to select the desired language. When the desired language is shown, press the YES key to confirm the choice.

Figure 76. YES Key



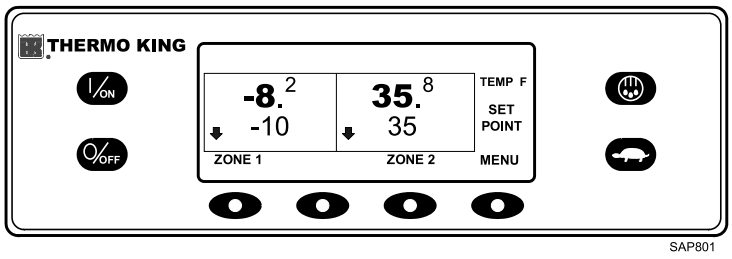
The display will briefly show PROGRAMMING LANGUAGE - PLEASE WAIT in the new language as shown (Figure 77, p. 151).

Figure 77. Programming Language



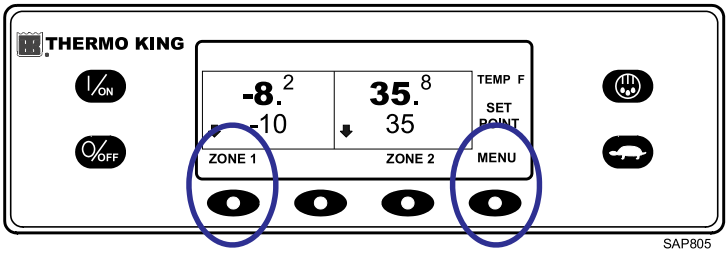
The new language is confirmed, and the Standard Display will appear in the new language as shown (Figure 78, p. 151). The unit is ready to run.

Figure 78. Truck Premium HMI Control Panel



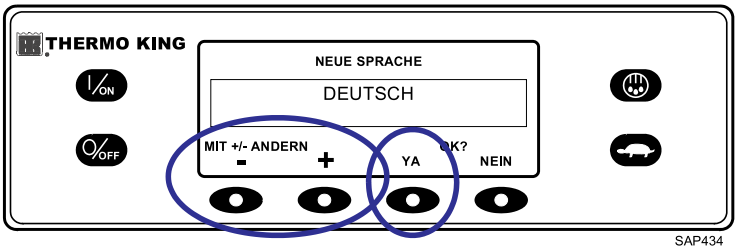
Should it be necessary to change to another language at any time, return to the Standard Display and then press and hold the first and last soft keys for five seconds as shown (Figure 79, p. 151). The Standard Display below is shown in Deutsch (German).

Figure 79. First and Last Soft Keys



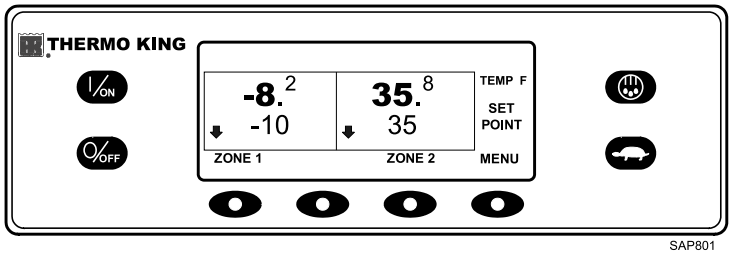
The Language menu will appear in the current language as shown (Figure 80, p. 152). Press the + or - keys to select the desired language. When the desired language is shown, press the YES key to confirm the choice. All languages in the installed software can be selected using this method.

Figure 80. Language Menu



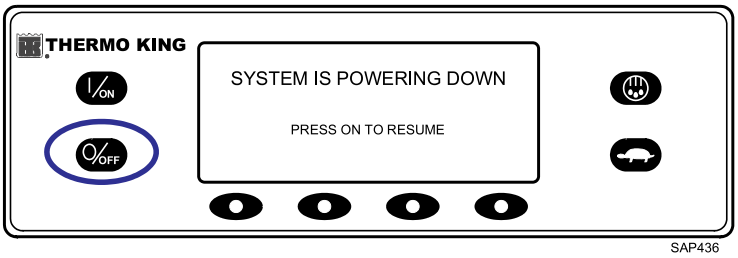
When the unit is ready to run, the Standard Display appears.

Figure 81. Standard Display



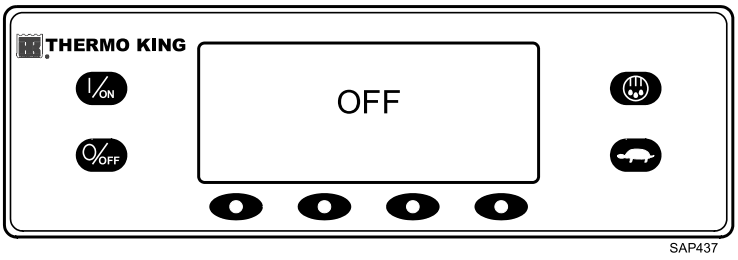
Pressing the OFF key stops unit operation. The unit shuts down immediately and the display briefly shows the power down message.

Figure 82. Power Down Message

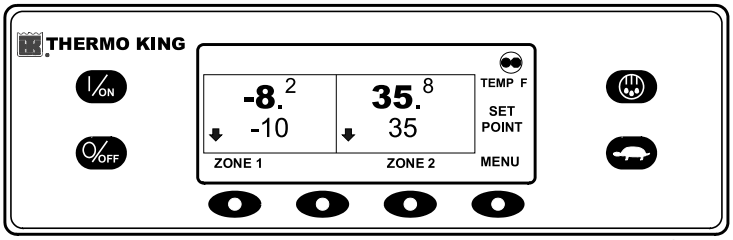


The display briefly shows OFF and then goes blank. To start the unit again, press the ON key.

Figure 83. Off Display



Two Zone Standard Display

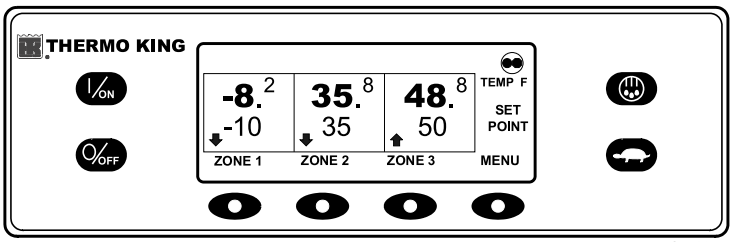


SAP806

The Standard Display is the default display that appears if no other display function is selected. A Two Zone Standard display is shown here. The Two Zone Standard Display above shows the return air temperature and setpoint for two zones.

- The Cycle Sentry Icon in the upper right of the display shows that the unit is operating in Cycle Sentry mode.
- The return air temperature for Zone 1 is -8.2°F with a -10°F setpoint. The down-pointing arrow indicates that Zone 1 is cooling.
- The return air temperature for Zone 2 is 35.8°F with a 35°F setpoint. The down-pointing arrow indicates that Zone 2 is also cooling.
- The soft key under each zone is used to turn that zone on and off and allows the Setpoint for that zone to be changed.
- The soft key labeled MENU allows the Main Menu to be selected.

Three Zone Standard Display

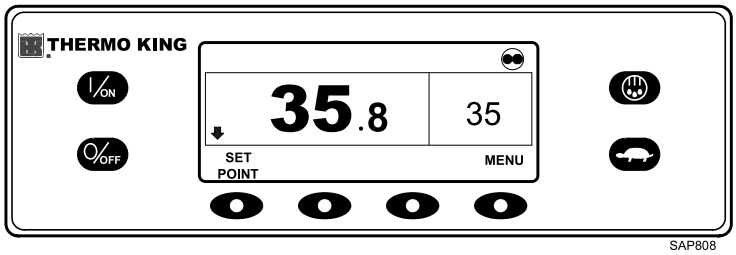


SAP807

The Three Zone Standard Display adds the third zone for units equipped with three zones. The Three Zone Standard Display functions the same way as the Two Zone Standard Display.

- The Cycle Sentry Icon in the upper right of the display shows that the unit is operating in Cycle Sentry mode.
- The return air temperature for Zone 1 is -8.2°F with a -10°F setpoint. The down-pointing arrow indicates that Zone 1 is cooling.
- The return air temperature for Zone 2 is 35.8°F with a 35°F setpoint. The down-pointing arrow indicates that Zone 2 is also cooling.
- The return air temperature for Zone 3 is 48.8°F with a 50°F setpoint. The up-pointing arrow indicates that Zone 3 is heating.
- The soft key under each zone is used to turn that zone on and off and allows the Setpoint for that zone to be changed.
- The soft key labeled MENU allows the Main Menu to be selected.

Single Zone Control Standard Display



SAP808

This feature, if enabled in Guarded Access, allows Single Zone Control operation to be selected by choosing the Main Menu and then selecting Single Zone Control from within the Mode submenu. The Single Zone Control Standard Display functions the same way as the other Standard Displays.

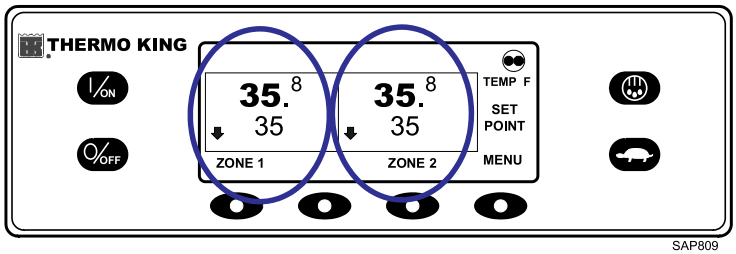
- When this feature is selected, all zones will be forced on and will control to the same selected setpoint.
- The Cycle Sentry Icon in the upper right of the display shows that the unit is operating in Cycle Sentry mode.
- The box temperature in all zones is 35.8°F and all zones are controlling to a 35°F setpoint.
- The down-pointing arrow indicates that all zones are cooling.
- The soft key labeled Setpoint allows the setpoint for all zones to be changed.
- The soft key labeled Menu allows the Main Menu to be selected.

Single Zone Control Mode Operation

The following differences exist when operating the unit in Single Zone Control Mode.

- Single Zone Control Mode will appear in the Main Menu/Mode Menu only if the Single Zone Control feature has been enabled in the Guarded Access/Main Menu Configuration menu.
- If Single Zone Control operation is selected, all zones will be forced on and will control to the same setpoint.
- Unit control is based on the temperature sensors of Zone 1.
- Dividing wall(s) should be repositioned to create one large compartment.
- With the exception of defrost, the operating mode of each zone evaporator(s) will be same when in this mode. Unit control is based on the temperature sensors of Zone 1.
- If Single Zone Control operation is selected, the Single Zone Standard Display provides one soft key labeled Set Point. This allows the setpoint for all zones to be changed simultaneously.
- If Single Zone Control operation is selected, the individual zones cannot be turned off. The unit and all zones are turned On and Off simultaneously using the On and Off hard keys at the left side of the display.

Unit Single Temperature Operation



SAP809

If Single Zone Control Mode is not enabled, the unit can still be run at a single temperature.

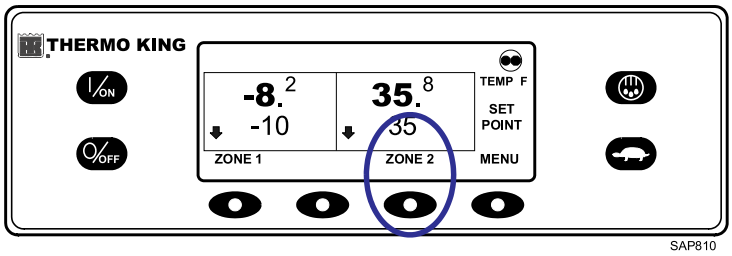
- Dividing wall(s) should be repositioned to create one large compartment.
- Turn all zones on.
- Set all zones to the same setpoint.

Note: *Each evaporator is controlled by its own sensors which could result in conflicting running modes (i.e., Cool/Heat).*

Changing the Setpoint

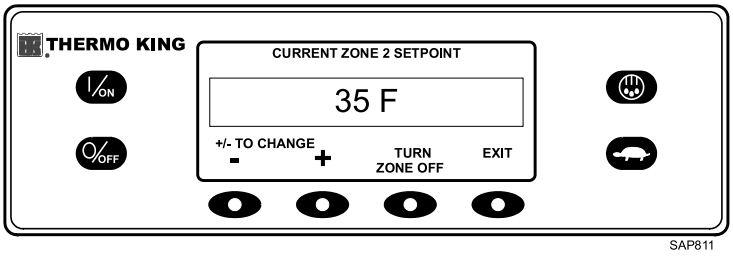
From the Standard Display, press the ZONE soft key for the desired zone. ZONE 2 is shown (Figure 84, p. 155).

Figure 84. Zone Key



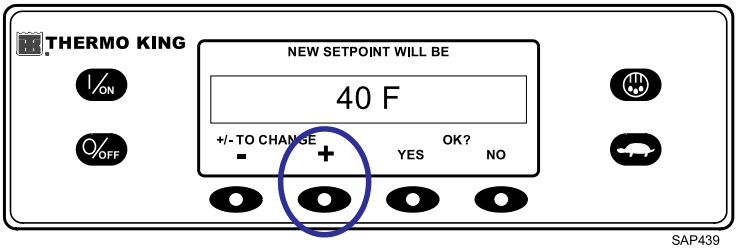
The setpoint display appears as shown (Figure 85, p. 155).

Figure 85. Setpoint Display



The - and + soft keys are used to increase or decrease the setpoint until the desire setpoint is shown. The setpoint has been changed to 40°F using the + key (Figure 86, p. 155).

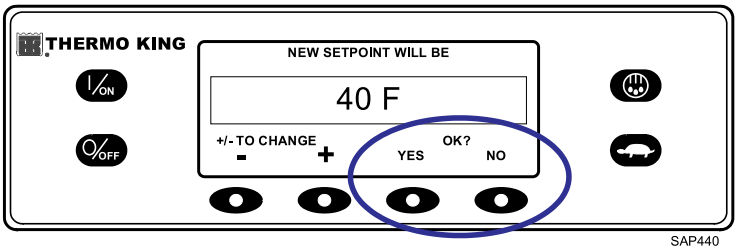
Figure 86. Increase Setpoint



The YES and NO soft keys confirm the setpoint change. When the desired setpoint has been selected using the + and/or - keys, press the YES soft 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 soft key within 10 seconds of changing the setpoint.

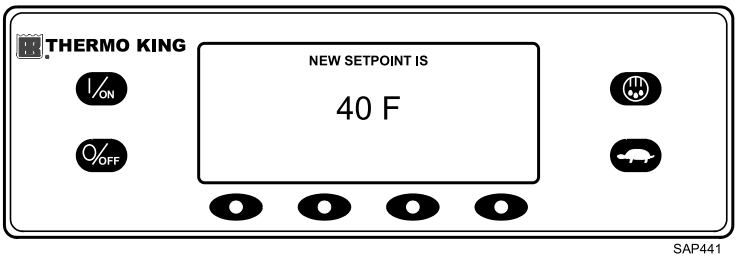
Failure to confirm the new setpoint by pressing YES or NO within 10 seconds of changing the setpoint will result in no setpoint change. In addition, Alarm Code 127 Setpoint Not Entered is set, to indicate that the setpoint change was not completed.

Figure 87. YES/NO Soft Keys



After the YES soft key has been pressed, the display briefly shows PROGRAMMING NEW SETPOINT - PLEASE WAIT. The display then confirms the new setpoint for several seconds.

Figure 88. New Setpoint

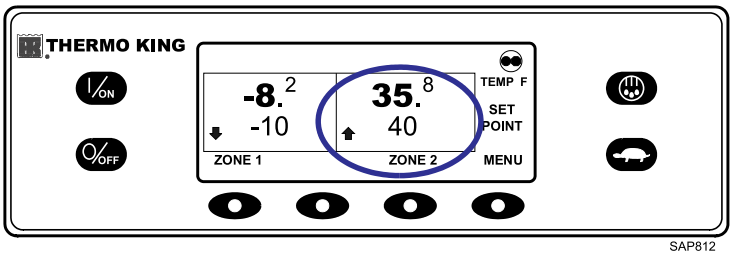


If the NO soft key is pressed, the display will briefly show SETPOINT NOT CHANGED and return to the Standard Display. The Standard Display will show the old setpoint. The display then returns to the Standard Display showing the new setpoint. The arrow now points up to indicate that the unit is heating (Figure 89, p. 156). The Zone 2 arrow now points up, to indicate that Zone 2 is heating.

Important: *If the setpoint is changed using the + or - keys, the change must be confirmed or rejected by pressing the YES or NO soft 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 either 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 Setpoint Display. The display briefly shows [SETPOINT NOT CHANGED] and Alarm Code 127 Setpoint Not Entered is set, to indicate that a setpoint change was started but not completed.

Figure 89. Standard Display, New Setpoint



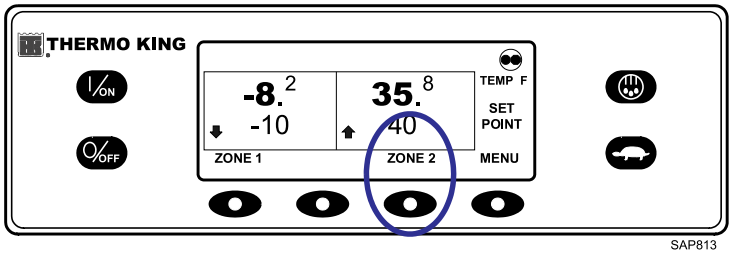
Turning Zones On and Off

The state of each zone is retained when the unit is turned off and on. For example, on a three zone unit if zones 1 and 2 are turned off and Zone 3 is turned on and the unit is turned off, the zone states remain as they were. When the unit is turned back on Zones 1 and 2 will still be off and Zone 3 will still be on. To turn a zone on or off, press the soft key under the desired zone. Zone 2 is selected as shown (Figure 90, p. 157).

Important:

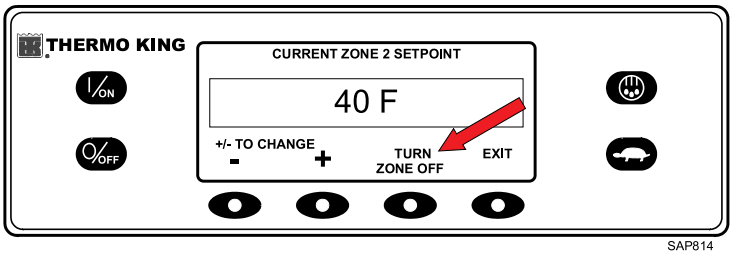
1. *At least one zone must be turned on. If all configured zones but one are turned off, the controller will not allow the last zone to be turned off.*
2. *Unlike trailer applications, Zone 1 can be turned off without affecting unit operation, so long as at least one other zone is turned on.*

Figure 90. Zone 2



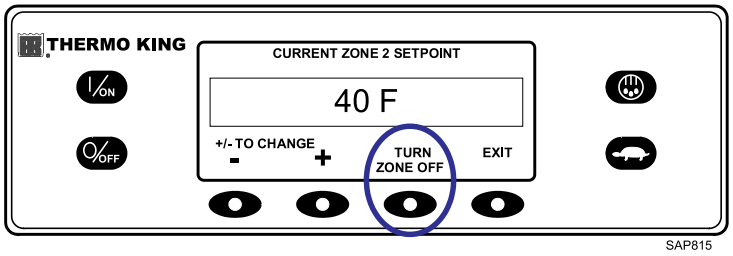
The Zone 2 setpoint display appears as shown (Figure 91, p. 157). If the zone is turned on, the third soft key will be labeled TURN ZONE OFF. If the zone is turned off, the third soft key will be labeled TURN ZONE ON. In this case, TURN ZONE OFF is shown since the zone is currently turned on.

Figure 91. Zone 2 Setpoint



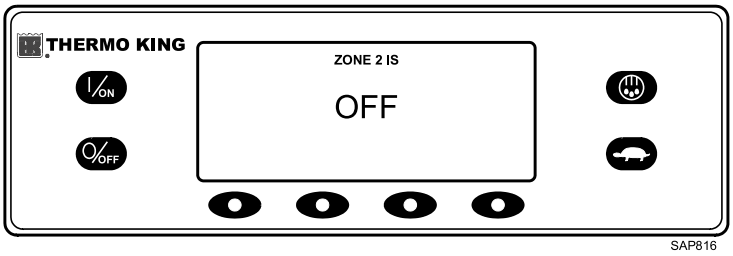
Press the TURN ZONE OFF soft key to turn the zone off.

Figure 92. Turn Zone Off



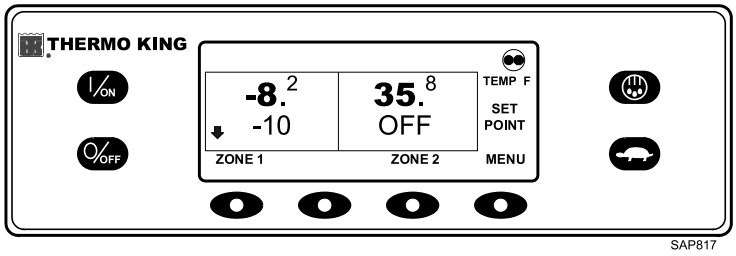
The display briefly shows PROGRAMMING ZONE ON/OFF – PLEASE WAIT. The display then confirms the new Zone 2 setting for several seconds.

Figure 93. New Zone Setting



The display then returns to the Standard Display showing Zone 2 is off. The setpoint for Zone 2 has been replaced with OFF as shown (Figure 94, p. 158) to indicate that the zone is now off.

Figure 94. Zone 2 Off



Starting the Diesel Engine

⚠ Caution

Risk of Injury!

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

Notice

Equipment Damage!

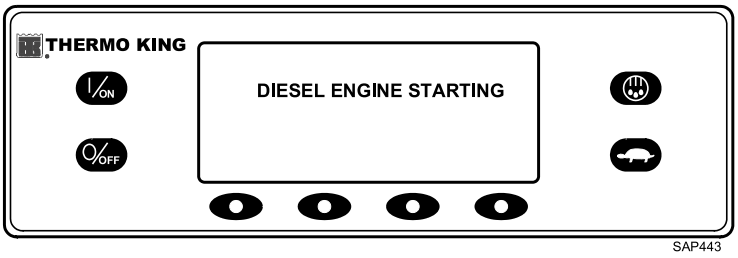
Never use starting fluid. Damage to the engine can occur.

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.

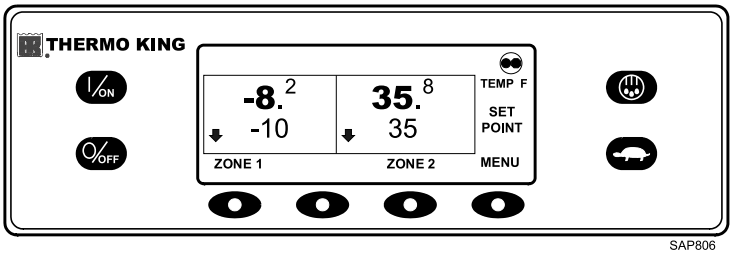
Note: *If the unit is equipped with optional Electric Standby, there may be some additional prompts before the engine will start. Refer to Starting the Electric Motor for details.*

When the engine is preparing to start, the HMI Control Panel will display the engine start screen (Figure 95, p. 158). The preheat buzzer sounds during the engine preheat and crank sequence.

Figure 95. Engine Start Screen



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



Starting the Electric Motor

Note: *Units equipped with the Electric Standby option only.*

⚠ Caution

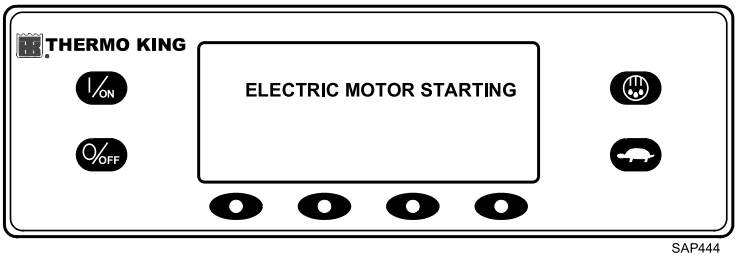
Risk of Injury!

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

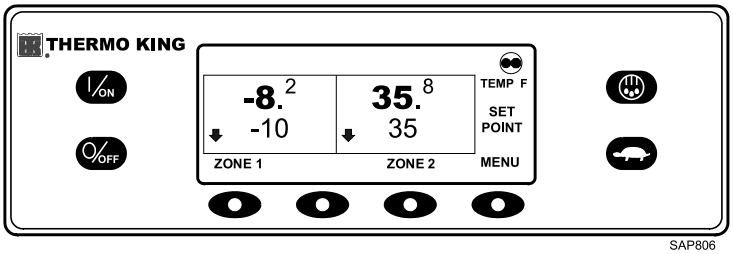
Electric motor starting is automatic in both Continuous Mode and CYCLE-SENTRY Mode. The motor will start as required when the unit is turned on. If any keys are being pressed on the HMI Control Panel prior to the motor start, the motor start will be delayed until 10 seconds after the last key is pressed.

When the motor is preparing to start, the HMI Control Panel will display the motor start screen (Figure 96, p. 159). The preheat buzzer sounds for 20 seconds before the electric motor starts.

Figure 96. Motor Start Screen



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



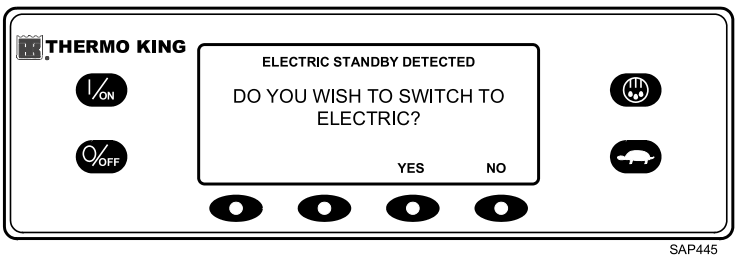
Switching from Diesel to Electric

Note: *Units equipped with the Electric Standby option only.*

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

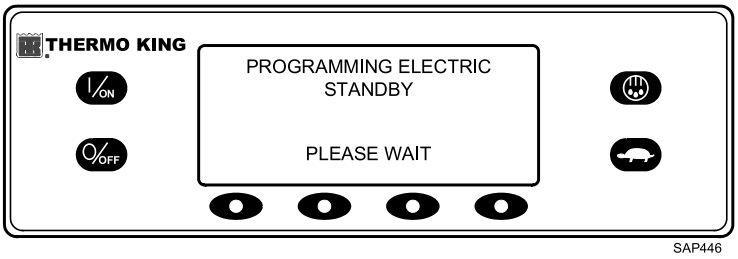
If the Diesel to Electric Autoswitch Enabled feature in Guarded Access is set NO, the prompt screen shown (Figure 97, p. 159) will appear when standby power is connected and available.

Figure 97. Prompt Screen



If YES is selected, the display will briefly show the screen below (Figure 98, p. 160).

Figure 98. Programming Screen



Electric Mode operation will briefly be confirmed. If unit operation is required, the electric motor will start as shown in Starting The Electric Motor.

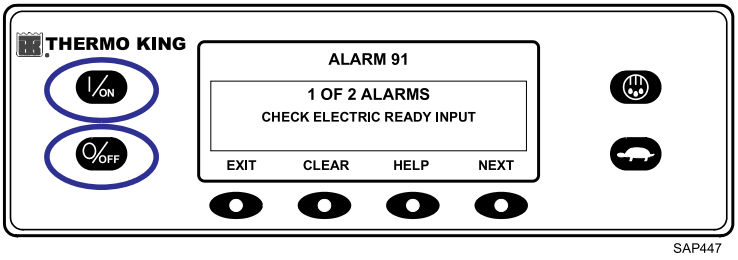
Switching from Electric to Diesel

Note: *Units equipped with the Electric Standby option only.*

If the Electric to Diesel Autoswitch 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 Autoswitch Enabled feature in Guarded Access is set NO, the prompt screen (Figure 99, p. 160) will appear when standby power is turned off or is no longer available. Alarm Code 91 Check Electric Ready Input and Alarm Code 84 Restart Null will both be set.

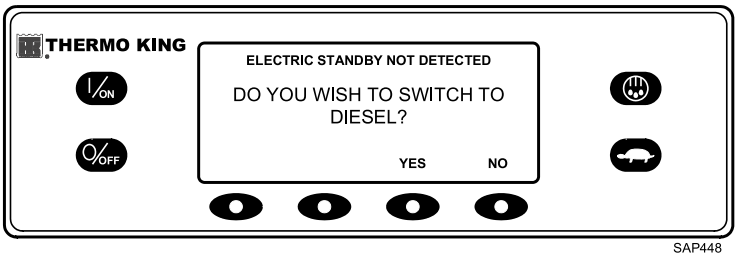
Figure 99. Prompt Screen



Turn the unit off and back on using the OFF and ON Keys. This will clear Alarm Code 91 Check Electric Ready Input and Alarm Code 84 Restart Null.

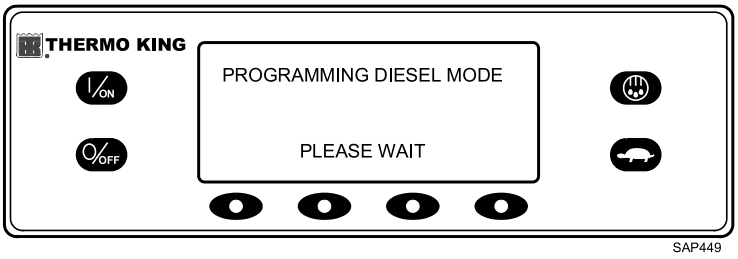
Note: *The CLEAR Soft Key will not clear these two alarms. The prompt screen shown (Figure 100, p. 160) will appear.*

Figure 100. Prompt Screen



If YES is selected, the display will briefly show the programming screen (Figure 101, p. 161). Diesel Mode operation will briefly be confirmed.

Figure 101. Programming Screen



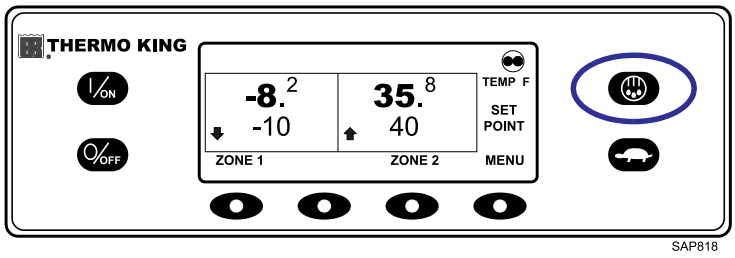
If unit operation is required, the diesel engine will start as shown previously in Starting The Diesel Engine.

Initiating a Manual Defrost Cycle

Defrost cycles are usually initiated automatically based on time or demand. Manual defrost is only available if the zone is running and the zone evaporator coil temperature is less than or equal to 45°F (7°C). Other features such as door switch settings may not allow manual defrost under some conditions.

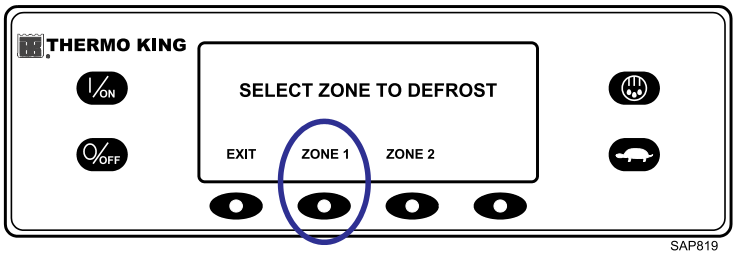
To initiate a manual defrost cycle, press the Defrost Key as shown (Figure 102, p. 161).

Figure 102. Defrost Key



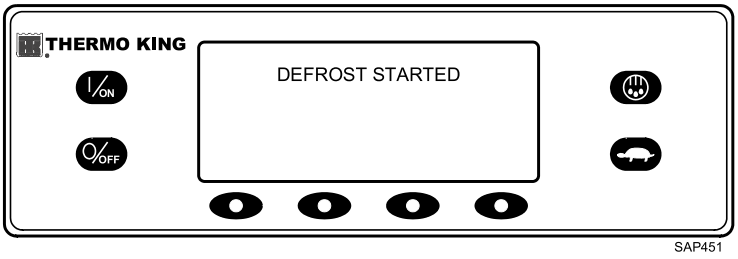
The display will briefly show [DEFROST]. The Zone Select display will appear. Zone 1 has been selected (Figure 103, p. 161).

Figure 103. Select Zone



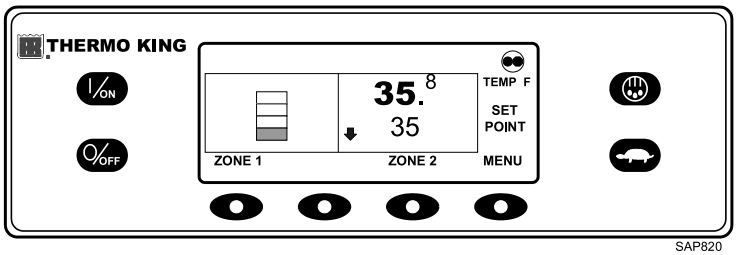
The display briefly shows [DEFROST], [PROGRAMMING DEFROST - PLEASE WAIT] and then [DEFROST STARTED].

Figure 104. Defrost Started



The display then shows the Defrost display. The bar indicator shows approximately the percentage of time remaining to complete the defrost cycle. The bar indicator (Figure 105, p. 162) shows that the Zone 1 defrost cycle is approximately 25% complete.

Figure 105. Defrost Display



Terminating a Defrost Cycle

The defrost cycle terminates automatically when the coil temperature is greater than or equal to 52°F (11°C) or the defrost timer expires. Defrost can also be terminated by turning the unit off and back on.

Selecting High Speed Lockout Mode (If Enabled)

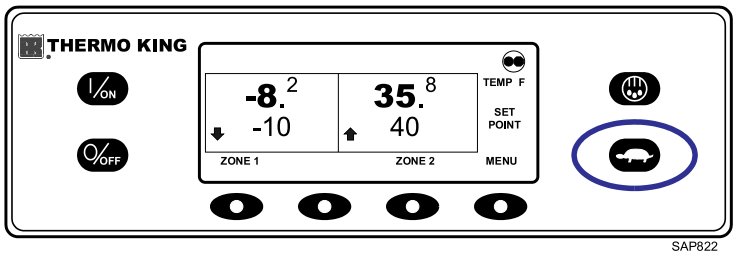
High speed operation can be locked out in noise sensitive areas if required.

Note: *High Speed Lockout Enable must be set to [Enabled] in the Guarded Access/Programmable Features Menu or this feature will not be available.*

Important: *HIGH SPEED LOCKOUT TIMEOUT: If High Speed Lockout Mode is selected, the High Speed Inhibit Timeout feature may be set to return the unit to normal operation after a set time period has expired. This prevents extended operation with high speed operation locked out. The time period may be from 15 minutes to 2 hours. If the time period is set and is exceeded, the unit will return to normal operation, with high speed operation allowed. If this occurs, the message HIGH SPEED LOCKOUT ACTIVE at the top of the display will disappear. If necessary to return to High Speed Lockout Mode, press the High Speed Lockout Key again.*

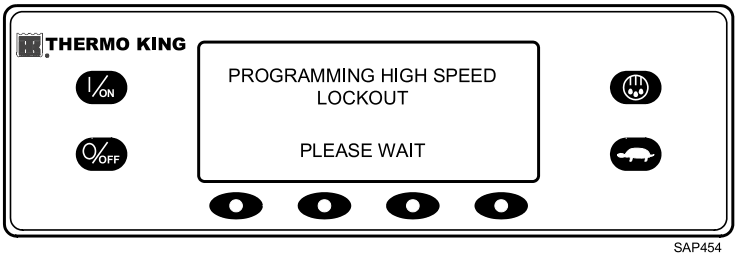
The High Speed Lockout Key is a toggle. If high speed is currently allowed, pressing the High Speed Lockout Key will disable high speed operation. Pressing the High Speed Lockout Key again will allow high speed operation. To change the setting, press the High Speed Lockout key as shown (Figure 106, p. 162).

Figure 106. High Speed Lockout Key



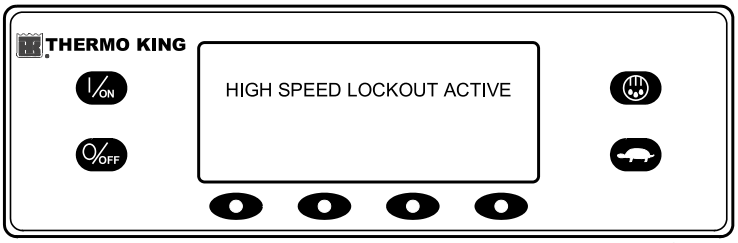
The display will briefly show [PROGRAMMING HIGH SPEED LOCKOUT - PLEASE WAIT].

Figure 107. Programming Screen



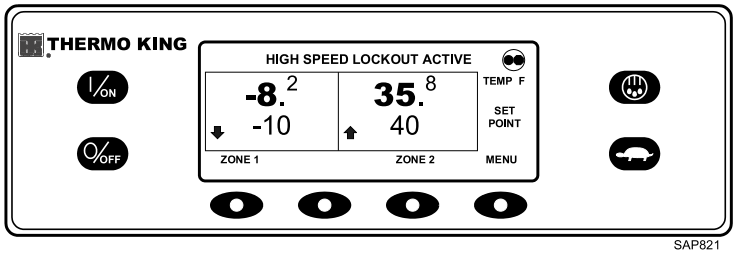
The change is confirmed by briefly displaying [HIGH SPEED LOCKOUT ACTIVE] or [HIGH SPEED LOCKOUT INACTIVE].

Figure 108. High Speed Lockout Display



The display will then return to the Standard Display. If High Speed Lockout is turned on, the message HIGH SPEED LOCKOUT ACTIVE will be shown at the top of the display.

Figure 109. High Speed Lockout Active

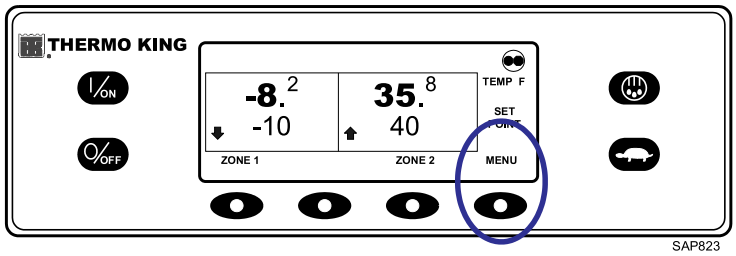


Pressing the High Speed Lockout key again will turn the feature off.

Using The Main Menu

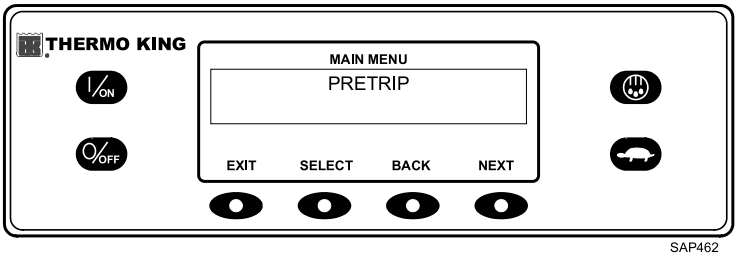
The Main Menu contains several additional submenus that allow the operator to view information and modify unit operation. To access the Main Menu press the MENU key.

Figure 110. Menu Key



The first Main Menu choice will appear. Press the NEXT and BACK 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 shown (Figure 111, p. 163). To return to the Standard Display press the EXIT key.

Figure 111. Pretrip Submenu



Main Menu Choices

Language Menu: If more than one language is enabled, this will be the first menu item to 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 11 languages at one time. All subsequent displays are shown in the selected language. Three different language packages with a total of 23 languages are available. English is the default language and is provided in each of the packages.

Alarms Menu: Allows the operator to view all alarms, and allows most alarms to be cleared. If only one language is enabled, this will be the first menu item to appear.

Gauges Menu: Allows the operator to view the unit gauges and the state of the Inputs and Outputs on both the Interface Board and the Expansion Module.

Sensors Menu: Allows the operator to view the unit temperature sensors. If a DAS Data Logger is installed, the data logger sensors may also be viewed.

Data Logger: Allows the operator to set a Start of Trip marker to the ServiceWatch data logger. Also allows a Start of Trip and Print requests to be sent to the Optional DAS Data Logger (if installed). A Print request can also be sent to the optional DAS Data Logger (if installed) to print the most recent trip record.

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.

Mode Menu: Allows the operator to change the unit operating modes if allowed. Not all modes may appear depending on the settings selected from the Guarded Access menu and the HMI Control Panel software version.

- Turn Off CYCLE-SENTRY Mode/Turn On CYCLE-SENTRY Mode (If CYCLE-SENTRY is Off unit runs in Continuous).
- Allows Temperature Units to be selected as Fahrenheit or Celsius.
- Allows Single Zone Control or Multi Zone Control to be selected.
- Allow Keypad Lock-Out to be selected.
- Allows Sleep Mode to be entered.

Pretrip Menu: Allows the operator to start a Pretrip Test. If an alarm is active, the Pretrip Test is not allowed and the operator is prompted to clear the alarm(s).

Electric Standby Menu: If the Electric Standby option is present and the Diesel to Electric Auto-switch feature is set NO, this feature allows the operator to manually select electric mode operation. This feature does not appear if the unit does not feature optional Electric Standby or if the Diesel to Electric Auto-switch feature is set YES.

Diesel Mode Menu: If a unit equipped with electric standby 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 unit does not feature optional Electric Standby or if the Electric to Diesel Auto-switch feature is set YES.

Adjust Brightness Menu: Allows the operator to adjust the HMI Control Panel display backlight intensity as required by local conditions.

Time Menu: Allows the operator to view the unit time and date. The time and date cannot be changed from this menu.

Languages Menu

If the Language feature is enabled, an alternate language can be selected from the Language Menu. After a new language is chosen, all subsequent displays will appear in that language. If the language feature is not enabled, this menu does not appear. The default language is English. Only languages that have been enabled in Guarded Access will appear. Exercise care when changing languages, once changed, all HMI Control Panel displays will be in the new language. If the user is not familiar with the new language, problems may be experienced returning to the default language.

The languages available are dependent on the HMI control panel software revision. Other than the languages supported, software revisions 75xx, 76xx, and 77xx are functionally identical.

- Languages currently supported by software revision 75xx are English, Spanish, French, German, Italian, Dutch, Portuguese, Greek, Turkish, Hebrew, and Arabic.
- Languages currently supported by software revision 76xx are English, Danish, Russian, Norwegian, Swedish, Finnish, Polish, Hungarian, Romanian, Bulgarian, and Czech.

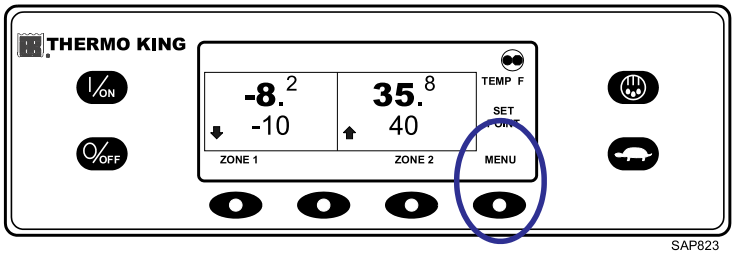
- Languages currently supported by software revision 77xx are English, Japanese, and Chinese.

Mix and Match Language Feature: Software revision 68xx allows any five languages from both the 65/75xx and 66/76xx to be enabled. Japanese and Chinese are not available for use with this feature.

Note: *WinTrac 4.8.1 or later is required to use the Mix and Match Language Feature.*

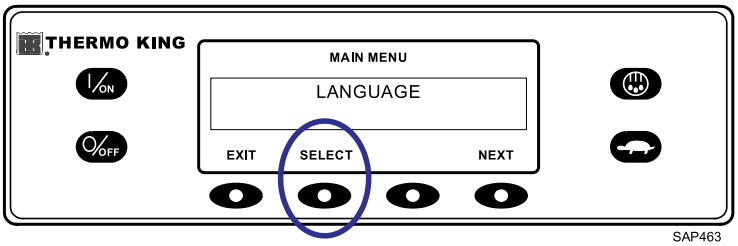
To select an alternate language, press the MENU key.

Figure 112. Menu Key



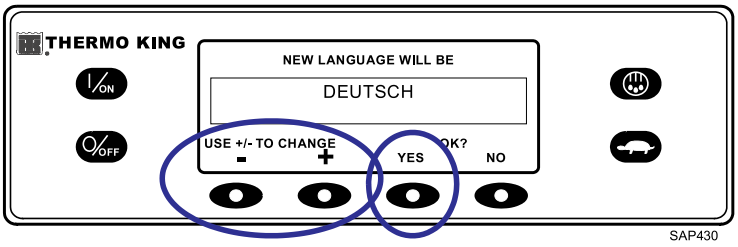
If enabled, the Language Menu is the first menu item to appear as shown (Figure 113, p. 165). Press the SELECT key to choose the Language menu.

Figure 113. Select Key



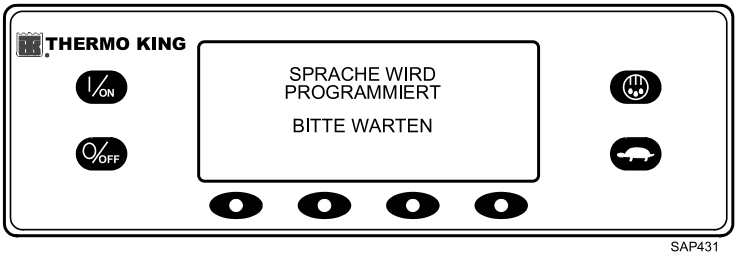
The Language menu will appear as shown (Figure 114, p. 165). Press the + or - keys to select the desired language. When the desired language is shown, press the YES key to confirm the choice.

Figure 114. + or - Keys, Yes Key



The display will briefly show PROGRAMMING LANGUAGE - PLEASE WAIT in the new language as shown (Figure 115, p. 165).

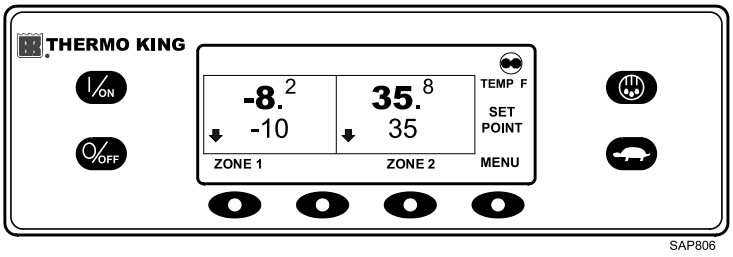
Figure 115. New Language



The new language is confirmed, and then the Standard Display will appear in the new language as shown (Figure 116, p. 166).

Note: *The Standard Display in Deutsch (German) is the same as in English. The unit is ready to run.*

Figure 116. Standard Display

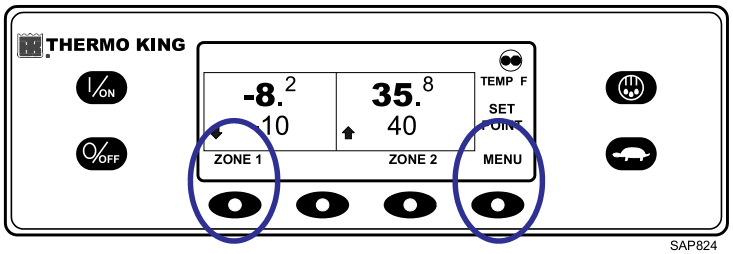


Repeat the process to select a different language. To select a different Main Menu item, press the NEXT key. To return to the Standard Display press the EXIT key.

Important: *If necessary, English and all other languages in the installed HMI Control Panel software revision may be accessed from the Standard Display.*

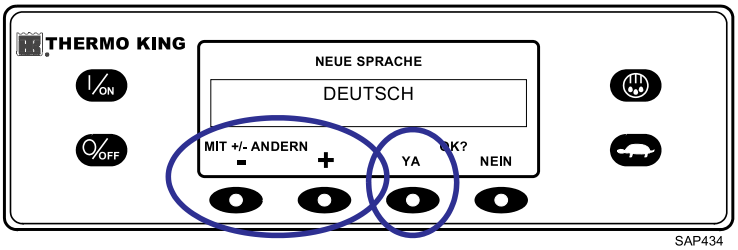
Should it be necessary to change to another language at any time, return to the Standard Display and press and hold the first and last soft keys for five seconds as shown (Figure 117, p. 166).

Figure 117. Standard Display



After five seconds, the Language Menu will appear in the current language as shown (Figure 118, p. 166). Press the + or - keys to select the desired language. When the desired language is shown, press the YES key to confirm the choice. All languages in the installed HMI Control Panel software (75xx, 76xx, or 77xx) can be selected using this method.

Figure 118. Language Menu



Alarms Menu

Alarm Types

Log Alarms

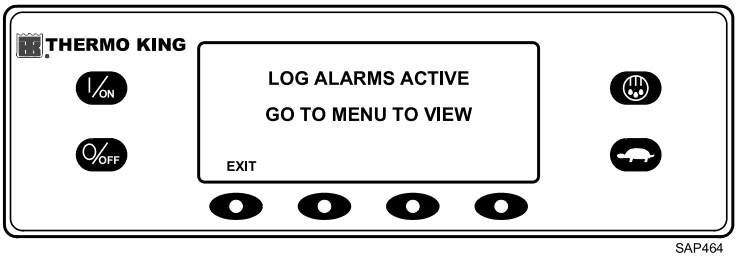
Log Alarms are indicated for 60 seconds each time the unit is turned on. This level of alarm serves as a notice to take corrective action before the condition impacts unit performance. Maintenance items such as maintenance hourmeter time-outs are Log Alarms.

When the unit is turned on, the display will show the Thermo King Logo and the "Configuring System" message. If Log Alarm(s) are present, the Log Alarm notice will appear on the display for 60 seconds as shown (Figure 119, p. 167). The

amber K symbol of the remote indicator alarm light (if installed) will also be on during this period. The Standard Display will appear and the remote indicator alarm light will go to the white T symbol after 60 seconds.

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

Figure 119. Log Alarm Notice



Note: *If required, an engine start may occur while the Log Alarm Notice is shown (Figure 119, p. 167). This is normal operation.*

Check Alarms

Check Alarms are indicated by an Alarm Icon in the display. If the alarm is specific to a zone, a smaller Alarm Icon will appear in the affected zone as previously shown. The remote indicator alarm light (if installed) will be on. 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.

Unit Level Prevent Alarms

Prevent Alarms are also indicated by a steady Alarm Icon in the display. The remote indicator alarm light (if installed) will be on. The unit will attempt to resolve the situation as shown below.

- 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.
- If the unit is in a temporary shutdown, Alarm Code 84 Restart Null will be present along with the associated Prevent Alarm.
- The unit will restart and run (in most cases with forced reduced performance) to determine if continued operation is possible. The unit will run in this manner for a timed interval. If the unit is running with forced reduced performance, Alarm Code 85 Forced Unit Operation will also be present under some conditions.
- If the alarm does not reoccur during the timed running interval with reduced performance, the unit will return to full performance to determine if continued operation is possible. The unit will run in this manner for a timed interval. If the unit is successfully able to return to full performance for the timed interval without the alarm re-occurring, the alarm is auto cleared and the unit will run normally.
- All Prevent Alarm events and conditions are logged by the ServiceWatch Data Logger.
- 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.

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

Zone Level Prevent Alarms

A Zone Level Prevent Alarm will force the affected zone into a temporary shutdown, but allow the unit to continue to run as required by the host unit or other zones.

- A small Alarm Icon will appear next to the affected zone.
- If a Zone Prevent Alarm occurs in all zones then the unit will be forced into a unit level Prevent shut down.

Unit Level Shutdown Alarms

A Unit Level Shutdown Alarm will be set if continued operation could cause damage to the unit or the load. Shutdown Alarms are 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).
- The remote indicator alarm light (if installed) will be on.

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).

Zone Level Shutdown Alarms

A Zone Level Shutdown Alarm will force the affected zone to shut down, but allow the unit to continue to run as required by the host unit or other zones.

- A small alarm icon will appear next to the affected zone and blink with a period of ½ second on - ½ second off.
- If zone specific shutdown alarms occur in all zones, the unit will shut down and Alarm Code 114 Multiple Alarms – Can Not Run will be set.
- If installed, the optional remote indicator light will indicate an alarm condition exists.

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.

Alarm Codes When Switching Between Diesel and Electric

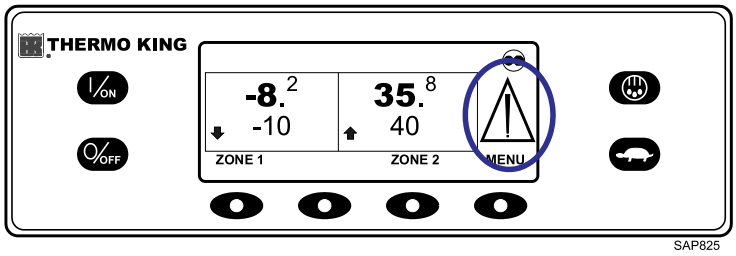
If a shutdown alarm occurs that affects only diesel mode operation and the unit is switched to electric, the diesel mode shutdown alarm becomes an electric mode log alarm. This allows the unit to run in electric mode without clearing the shutdown alarm that is preventing diesel mode operation. If the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

Alarm Code Notification

If a unit alarm condition occurs the large Alarm Icon will appear on the Standard Display as shown (Figure 120, p. 168).

Figure 120. Standard Display

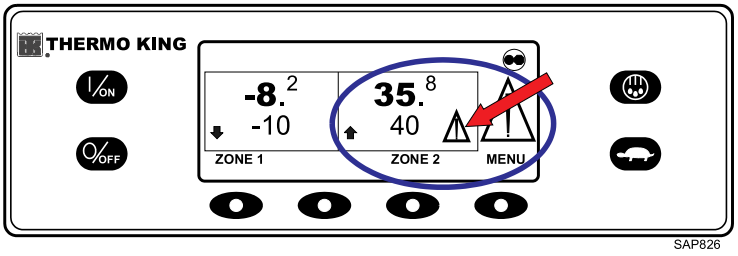


If a zone specific alarm occurs, a small Zone Alarm Icon will appear within the affected zone as well. Both Alarm Icons will be present. The small Zone Alarm Icon indicates that an alarm exists specific to Zone 2 (Figure 121, p. 169).

Notes:

1. *Zone specific alarm codes use the standard Thermo King Alarm Code numbers. If an alarm is specific to a zone, both the alarm code number and affected zone number are displayed.*
2. *If the large alarm icon only appears, the active alarm(s) are unit level alarm(s). If a zone alarm icon and the large alarm icon are displayed, there is a zone level alarm or a combination of zone level and unit level alarms present.*

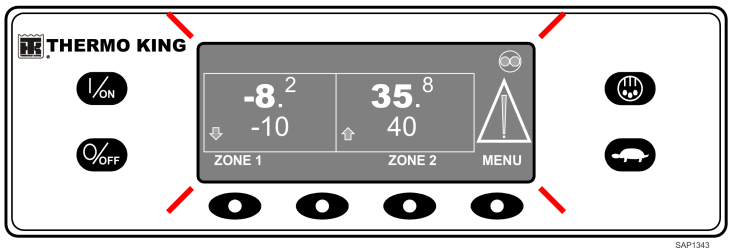
Figure 121. Zone Alarm Icon



If a Shutdown Alarm occurs it will be indicated by all of 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 to normal (light areas become dark and dark areas become light).

Figure 122. Shutdown Alarm



Clearing Alarm Codes

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

The following alarm codes can only be cleared from the Guarded Access Menu using the Truck Premium Display or Service Tool. The CLEAR soft key will not appear if the alarms are displayed from the Main Menu or the Maintenance Menu.

- Alarm Code 03 Check (Control) Return Air Sensor for all zones.
- Alarm Code 04 Check (Control) Discharge Air Sensor for all zones.
- 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 the unit starts running or the unit is switched to Diesel Mode.
- Alarm Code 92 Sensor Grades Not Set – Clears when all installed graded sensor grades are changed from 5H.
- Alarm Code 163 Emission Control Failure – Clears when no conditions necessary to set the alarm remain set.

If the Limited Alarm Restart feature is enabled, the following additional alarm codes may only be cleared from the Guarded Access Menu using the Truck Premium Display or Service Tool. 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. Refer to the Limited Alarm Restarts feature in Section 3 for details.

Note: *Truck units with the Truck Standard Display cannot access the Guarded Access Menu. A Truck Premium Display is required.*

- Alarm Code 23 Cooling Cycle Fault.
- Alarm Code 24 Heating Cycle Fault.

- Alarm Code 32 Refrigeration Capacity Low.
- Alarm Code 82 High Compressor Temperature Shutdown
- Alarm Code 93 Low Compressor Suction Pressure

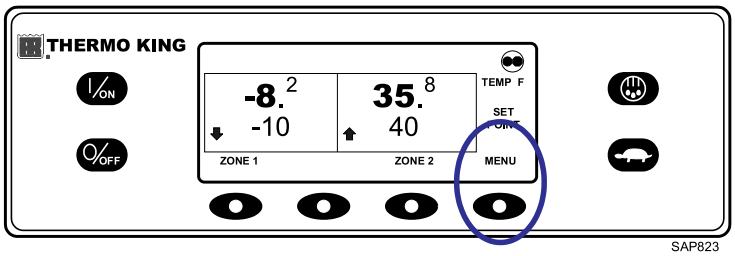
Depending on the Limited Alarm Restart II feature setting, the following alarm codes may only be cleared from the Guarded Access Menu. If this is the case, the CLEAR soft key will not appear if the alarm is displayed from the Main Menu or the Maintenance Menu. Refer to the Limited Alarm Restart II feature in Section 3 for details.

- Alarm Code 18 High Engine Coolant Temperature (Limited Alarm Restart II feature enabled).
- Alarm Code 235 High Engine Coolant Temperature Check (Limited Alarm Restart II feature disabled).

Displaying and Clearing Alarm Codes

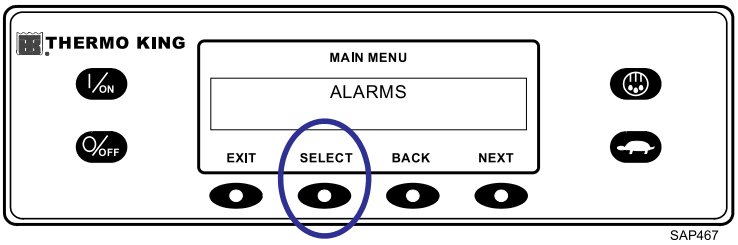
Alarms are displayed and cleared using the Alarm Menu. From the Standard Display, press the MENU key.

Figure 123. Menu Key



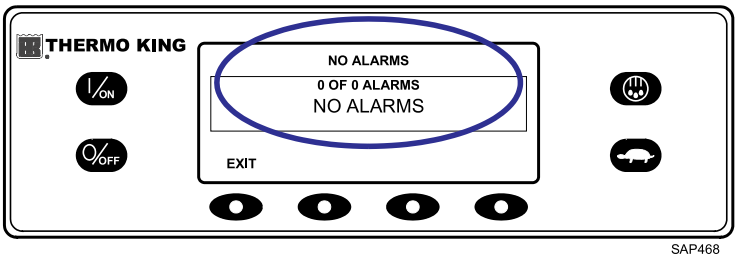
The Language Menu or Alarms Menu will appear. If the Language Menu appears, press the NEXT key to show the Alarm Menu. When the Alarm Menu is shown, press the SELECT key.

Figure 124. Select Key



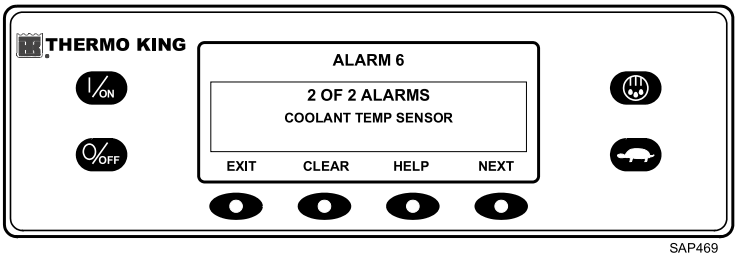
The Alarm Display will appear. If no alarms are present, NO ALARMS will be shown.

Figure 125. No Alarms



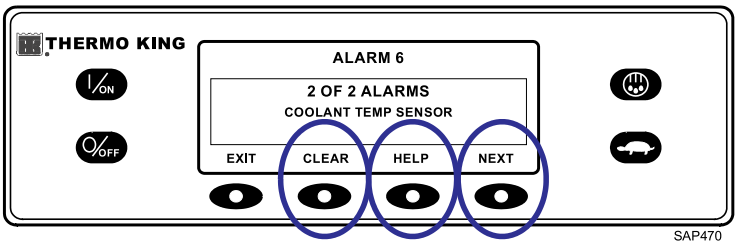
If alarms are present, the quantity of alarms (if more than one) and the most recent alarm code number will be shown. In the example shown (Figure 126, p. 171), there are two alarms present. The most recent is Alarm Code 6. It indicates a problem with the coolant temperature sensor.

Figure 126. Alarm Code 6



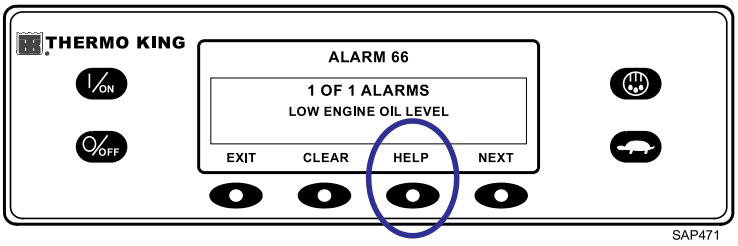
After the alarm situation is resolved, press the CLEAR key to clear the alarm. For additional information regarding the alarm shown on the display, press the HELP key. To display the next alarm, press the NEXT key.

Figure 127. Next Key



If a serious condition occurs, the unit will be shut down to prevent damage to the unit or the load. If this occurs, the display will show that the unit is shut down and display the alarm code that caused the shutdown. In the example shown (Figure 128, p. 171), the unit is shut down due to low engine oil level. For additional information regarding the alarm shown on the display, press the HELP key.

Figure 128. Help Key



A help message will appear. For the alarm shown (Figure 128, p. 171), the message "CHECK OIL LEVEL. IF UNIT IS SHUT DOWN, REPAIR IMMEDIATELY. OTHERWISE, REPORT ALARM AT END OF THE DAY" will be shown on the display. Check the oil level and add oil as required, clear the alarm and restart the engine.

To select a different Main Menu item, press the NEXT key. To return to the Standard Display, press the EXIT key.

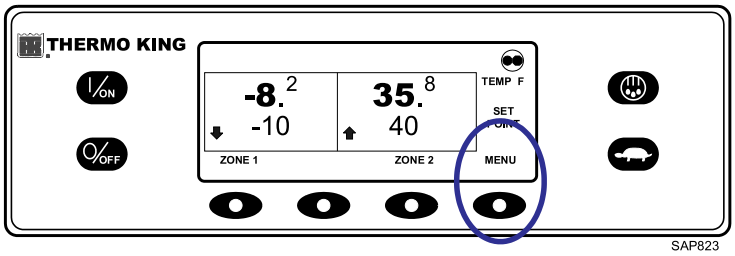
Important Alarm Notes

- 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.
- All alarms must be viewed before any of the alarms can be cleared.

Gauges Menu

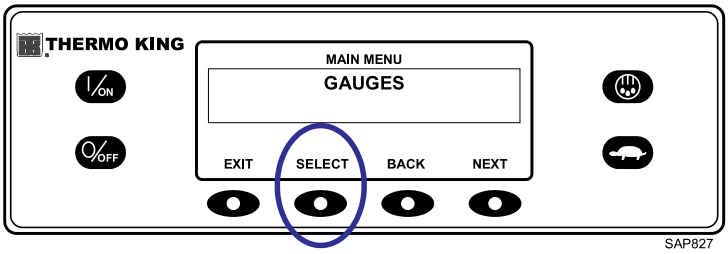
Unit Gauges and I/O (Input/Output) State are viewed using the Gauges menu. From the Standard Display, press the MENU soft key.

Figure 129. Menu Key



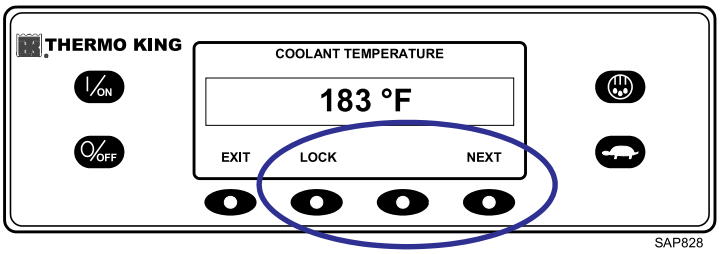
The Language Menu or Alarm Menu will appear. Press the NEXT soft key as required to display the Gauges menu. When the Gauges menu is shown press the SELECT soft key.

Figure 130. Gauges Menu



The first Gauge menu display will appear. Press the NEXT and BACK soft keys to scroll through the gauges. Pressing the LOCK soft key will lock the current gauge on the display for 15 minutes. Pressing the NEXT or BACK soft keys will unlock the display and scroll to the next gauge. To return to the Main Menu press the EXIT soft key. To return to the Standard Display press the EXIT soft key again.

Figure 131. Gauge Menu Display



Gauges Available

Note: *Not all gauges may appear, dependent upon software revision, unit type, and configuration. On early versions of software the Oil Pressure and Oil Level appear in the I/O Menu and the order may be different.*

Coolant Temperature: Displays the temperature of the engine coolant.

Coolant Level: Displays the coolant level in the expansion tank as OK or LOW.

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

Oil Level: 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.

Engine RPM: Displays the engine speed in RPMs.

Discharge Pressure: Displays the unit discharge pressure.

Suction Pressure: Displays the unit suction pressure.

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

Compressor Temperature: Displays the unit compressor temperature sensor. Scroll compressor only.

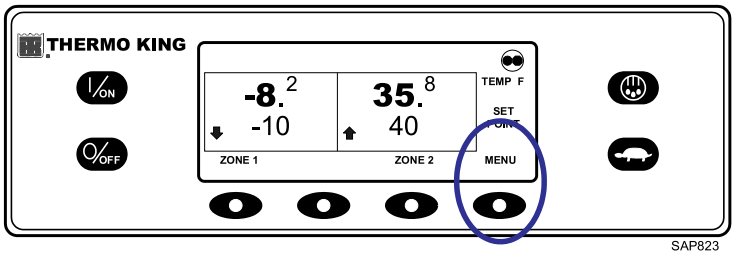
I/O (Input/Output State): Displays the current state of the input/output devices (ON or OFF) listed here:

High Speed Relay	Condenser Inlet Solenoid	Suction Line Solenoid Zone 2
Run Relay	Receiver Tank Inlet Press Sol	Drain Hose Heater Zone 2
Run Relay Feedback	Purge Valve	Fan Output Zone 2
Alternator Excite Output	Liquid Line Solenoid Zone 1	Liquid Line Solenoid Zone 3
Alternator Frequency	Drain Hose Heater Zone 1	Hot Gas Solenoid Zone 3
Diesel/Electric Relay	Fan Output Zone 1	Suction Line Solenoid Zone 3
Electric Ready Input	Hot Gas Solenoid Zone 1	Drain Hose Heater Zone 3
Electric Overload	Suction Line Solenoid Zone 1	Fan Output Zone 3
Hot Gas Bypass	Liquid Line Solenoid Zone 2	
Liquid Injection Solenoid	Hot Gas Solenoid Zone 2	

Sensors Menu

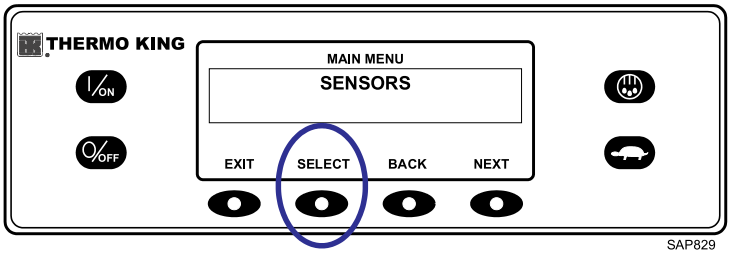
Unit temperature sensors are viewed using the Sensors menu. From the Standard Display, press the MENU soft key.

Figure 132. Menu Key



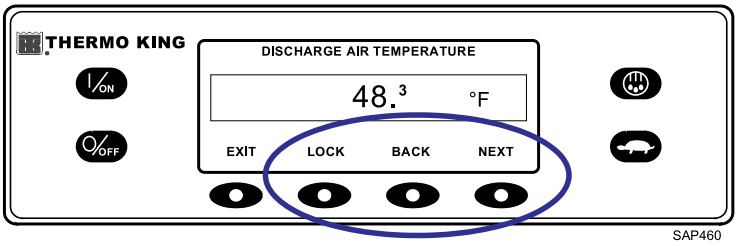
The Language Menu or Alarm Menu will appear. Press the NEXT soft key as required to display the Sensors menu. When the Sensors menu is shown press the SELECT soft key.

Figure 133. Sensors Menu



The Sensors menu display will appear. Press the NEXT and BACK soft keys to scroll through the sensors. Pressing the LOCK soft key will lock the current sensor on the display for 15 minutes. Pressing the NEXT or BACK soft keys will unlock the display and scroll to the next sensor. To return to the Main Menu press the EXIT soft key. To return to the Standard Display press the EXIT soft key again.

Figure 134. Next, Back, Lock Keys



Sensors Available

Note: *Not all sensors may appear, depending on number of zones, unit configuration, and software revision. If the sensor is not connected or is open, the display will show dashes (- - -) when that sensor is selected.*

Zone 1 Return Air Temperature: Displays the temperature of the Zone 1 Return Air Sensor.

Zone 1 Discharge Air Temperature: Displays the temperature of the Zone 1 Discharge Air Sensor.

Zone 1 Temperature Differential: Displays the Zone 1 Temperature Differential.

Zone 1 Evaporator Coil Temperature: Displays the temperature of the Zone 1 Evaporator Coil Sensor.

Zone 2 Return Air Temperature: Displays the temperature of the Zone 2 Return Air Sensor.

Zone 2 Discharge Air Temperature: Displays the temperature of the Zone 2 Discharge Air Sensor.

Zone 2 Temperature Differential: Displays the Zone 2 Temperature Differential.

Zone 2 Evaporator Coil Temperature: Displays the temperature of the Zone 2 Evaporator Coil Sensor.

Zone 3 Return Air Temperature: Displays the temperature of the Zone 3 Return Air Sensor.

Zone 3 Discharge Air Temperature: Displays the temperature of the Zone 3 Discharge Air Sensor.

Zone 3 Temperature Differential: Displays the Zone 3 Temperature Differential.

Zone 3 Evaporator Coil Temperature: Displays the temperature of the Zone 3 Evaporator Coil Sensor.

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

Board Temperature Sensor: Displays the temperature of the HMI control panel pc board.

Datalogger Menu

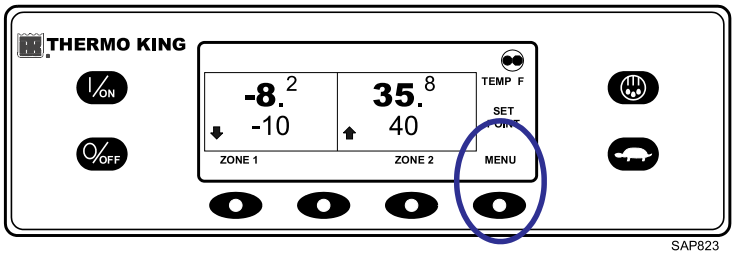
The unit can be equipped with an optional DAS Data Logger if desired.

A Start of Trip marker can be sent to the unit ServiceWatch Data Logger and the optional DAS Data Logger (if equipped).

If equipped with the optional DAS Data Logger, the most recent DAS trip record can be printed. The most recent trip is defined as the trip following the last Start of Trip marker sent to the data logger.

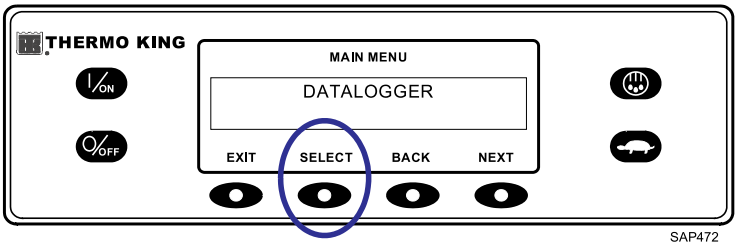
The ServiceWatch Data Logger and DAS Data Logger (if equipped) are accessed using the Data Logger Menu. From the Standard Display, press the MENU key.

Figure 135. Menu Key



The Language Menu or Alarm Menu will appear. Press the NEXT key as required to display the Data Logger Menu. When the Data Logger Menu is shown, press the SELECT key.

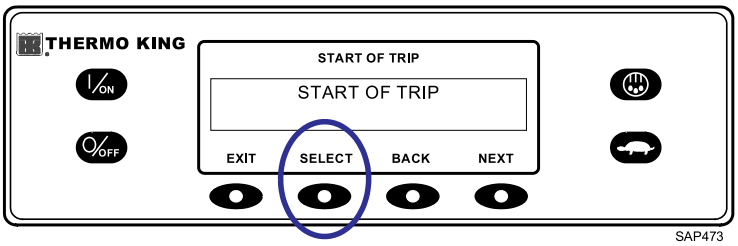
Figure 136. Select Key



The first feature that appears is the Start of Trip. To send a Start of Trip to the ServiceWatch Data Logger and DAS Data Logger (if equipped), press the SELECT key to select the feature, and press it again to send the Start of Trip. The display will briefly show START OF TRIP COMPLETE to confirm that a Start of Trip marker was set in the data logger(s).

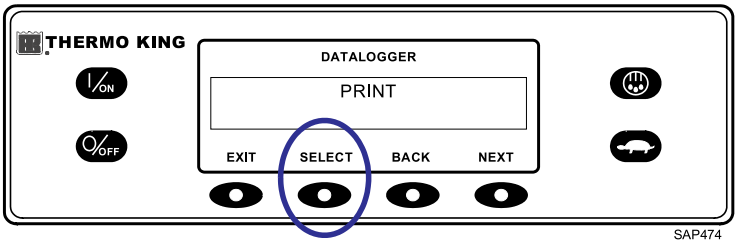
Note: *The start of trip marker is sent to both the ServiceWatch Data Logger and DAS Data Logger (if equipped).*

Figure 137. Start of Trip



Press the NEXT key to select the PRINT feature. The PRINT screen will appear. Press the SELECT key to print the most recent trip record to the optional remote printer. Pressing the EXIT key returns the display to the Main Menu.

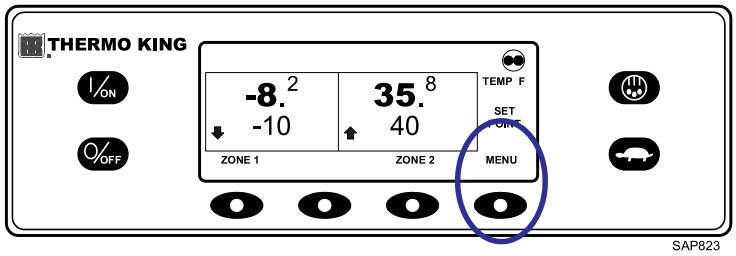
Figure 138. Select Key



Hourmeters Menu

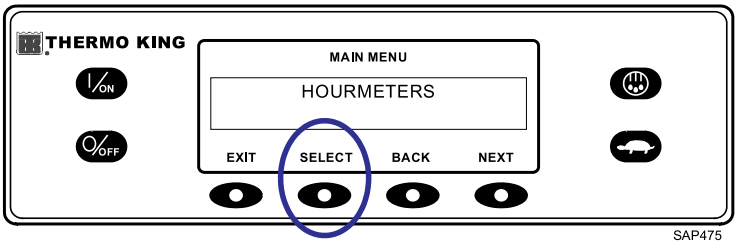
Hourmeters are displayed using the Hourmeter Menu. Only hourmeters enabled in the Guarded Access Menu will be shown. From the Standard Display, press the MENU key.

Figure 139. Menu Key



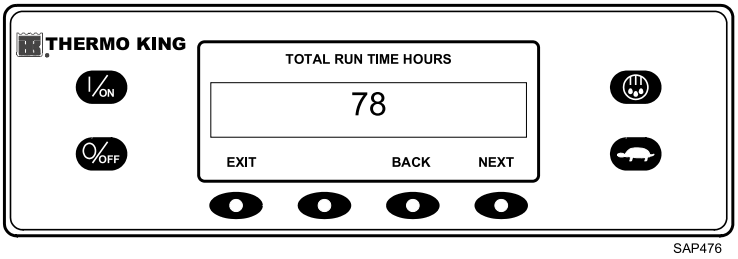
The Language Menu or Alarm Menu will appear. Press the NEXT key as required to display the Hourmeter Menu. When the Hourmeter Menu is shown, press the SELECT key. The Hourmeter Display will appear.

Figure 140. Hourmeter Display



Press the NEXT or PREVIOUS key to scroll through the enabled hourmeters.

Figure 141. Hourmeters



Hourmeter Names and Definitions

Hourmeter names and definitions are shown 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.

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.*

- **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.
- **Zone 1 Run Time Hours:** Total number of hours Zone 1 has run in both diesel and electric mode.
- **Zone 2 Run Time Hours:** Total number of hours Zone 2 has run in both diesel and electric mode.
- **Zone 3 Run Time Hours:** Total number of hours Zone 3 has run in both diesel and 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 - The 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.
- **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.

Mode Menu

Various operating modes can be selected using the Mode Menu. Not all modes may be available, depending on settings of other programmable features. The following modes may be available.

- **Turn CYCLE-SENTRY On or Off**

  CYCLE-SENTRY Mode can be turned On or Off. If CYCLE-SENTRY Mode is turned Off, the unit will run in Continuous Mode.

- **Select Temperature Display Units**

  If enabled in Guarded Access, temperature display units can be selected by the driver to be either Fahrenheit or Celsius degrees.

- **Single Zone Control - Multi Zone Control**

  If enabled in Guarded Access, Single Zone Control allows single temperature operation. If Single Zone Control operation is selected, all zones will be forced on and will control to the same setpoint. All bulkheads should be taken down to create one large compartment. Multi Zone Control allows separate control for each configured zone. For additional details, refer to Operating the Unit in Single Zone Mode earlier in this section.

- **Keypad Lockout**

  If enabled in Guarded Access, the keypad can be locked to prevent unauthorized use. If the keypad is locked, only the ON and OFF keys 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.

- **Start Sleep Mode**

  If enabled in Guarded Access, Sleep Mode is used to keep the engine warm and the battery charged when the unit is not in use. When the unit is in Sleep Mode, the display will show "SLEEP" and the current time. When Sleep Mode is entered, the unit will start and run to confirm proper battery charge level and engine temperature.

  Important: *While in Sleep Mode, the unit will not monitor or maintain setpoint and load temperature. Fuel level should be monitored as the unit may run periodically, particularly in cold weather.*

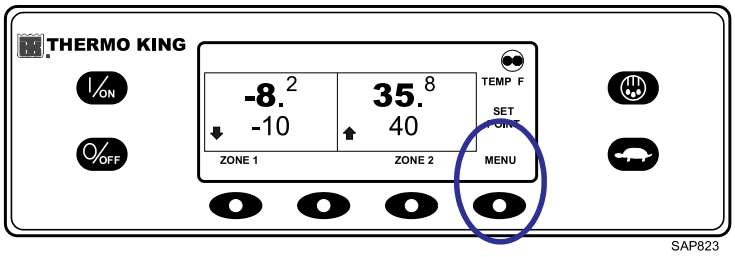
  The following features are available in Sleep Mode:

  – **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 of the week 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.

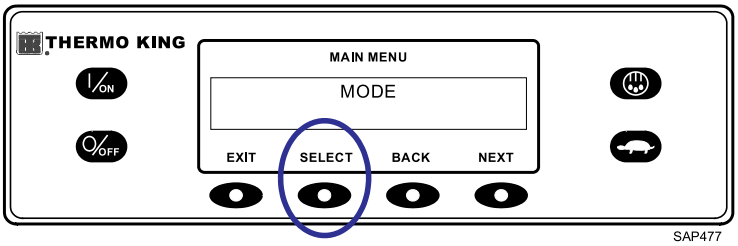
Mode changes are made using the Mode Menu. From the Standard Display, press the MENU key.

Figure 142. Menu Key



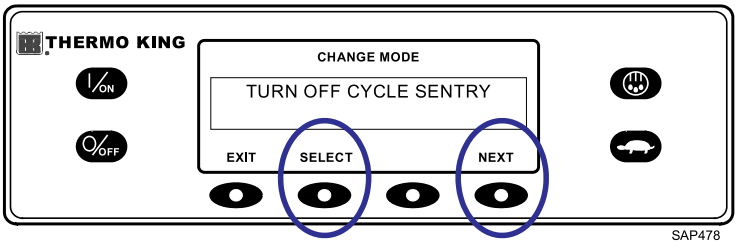
The Language Menu or Alarm Menu will appear. Press the NEXT key as required to show the Mode Menu. When the Mode Menu is shown, press the SELECT key.

Figure 143. Select Key



The first mode change screen will appear. To choose that function, press the SELECT key. To Scroll through the Mode Menu, press the NEXT key.

Figure 144. Select and Next Keys



Selecting CYCLE-SENTRY or Continuous Mode

⚠ Caution

Risk of Injury!

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

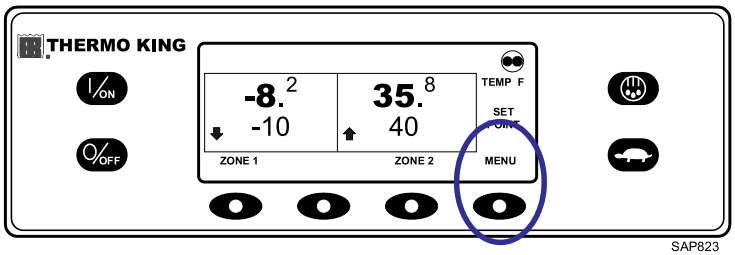
⚠ Caution

Risk of Injury!

If the unit is in CYCLE-SENTRY null and the mode is switched to Continuous Mode, the unit will start automatically.

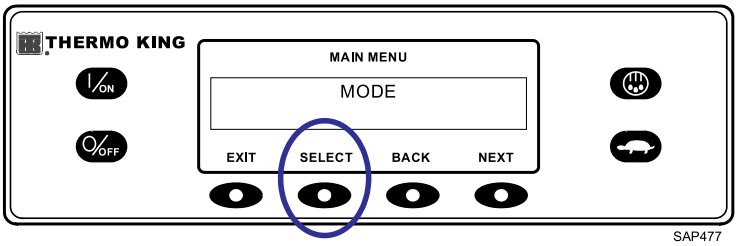
When CYCLE-SENTRY mode is selected, the unit will start and stop automatically to maintain setpoint, keep the engine warm, and the battery charged. When Continuous Mode is selected, the unit will start automatically and run continuously to maintain setpoint and provide constant airflow. From the Standard Display, press the MENU key.

Figure 145. Menu Key



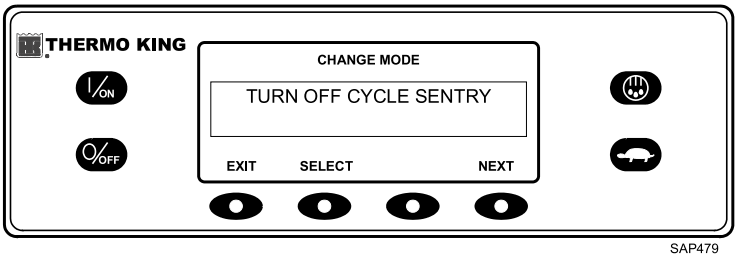
The Language Menu or Alarm Menu will appear. Press the NEXT key as required to display the Mode Menu. When the Mode Menu is shown press the SELECT key.

Figure 146. Select Key



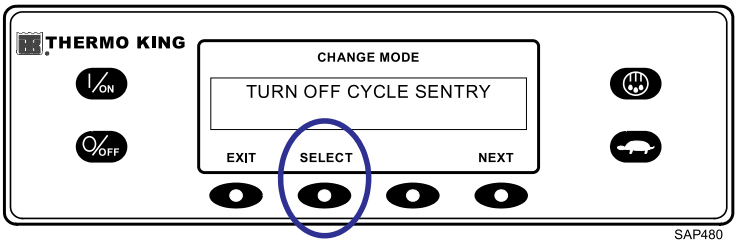
The Turn Off/Turn On CYCLE-SENTRY screen will appear. In the display shown (Figure 147, p. 179), the unit is operating in CYCLE-SENTRY mode. Turning CYCLE-SENTRY mode off will result in the unit running in Continuous mode.

Figure 147. Turn Off/Turn On CYCLE-SENTRY Screen



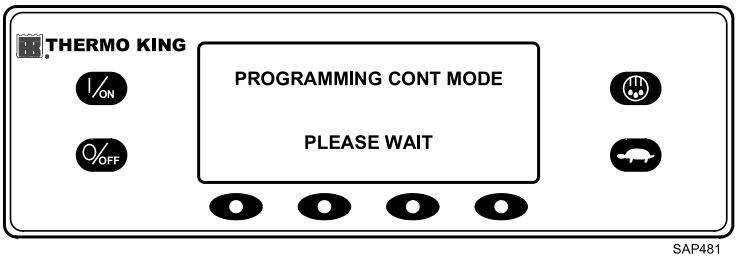
Pressing the Select key will change the mode from CYCLE-SENTRY to Continuous.

Figure 148. Select Key



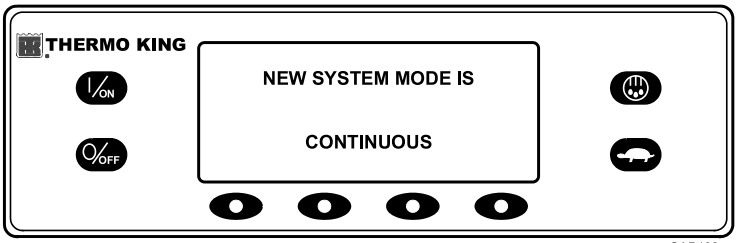
The display will confirm the change as shown (Figure 149, p. 179).

Figure 149. Programming Screen



The new mode is then confirmed for 10 seconds.

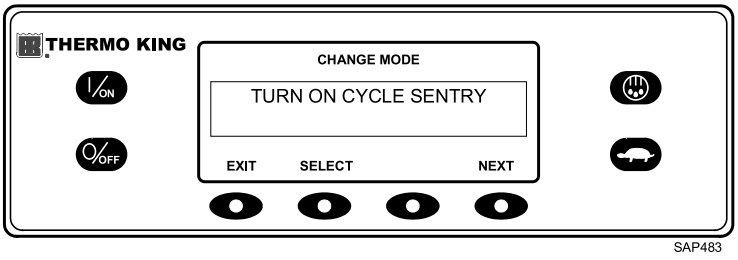
Figure 150. Mode Confirmed



The display then returns to the Mode Menu. In the example shown (Figure 151, p. 180), the unit is currently running in Continuous Mode. Pressing the Select 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.*

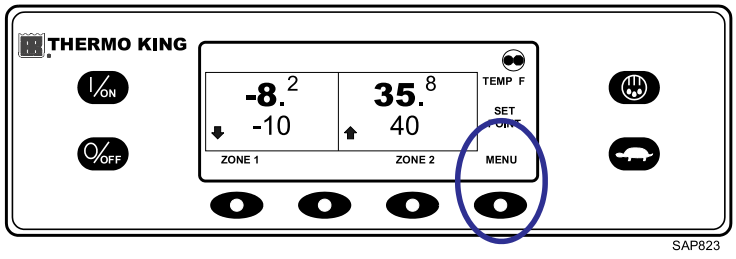
Figure 151. Mode Menu



Selecting Temperature Display Units

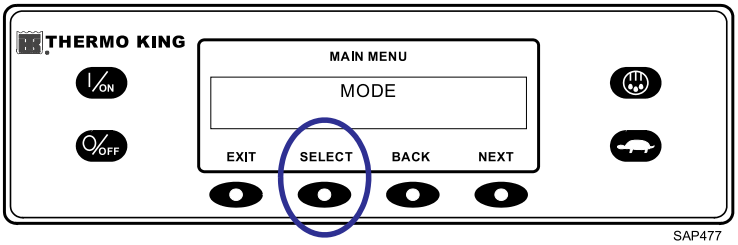
This feature, if enabled in Guarded Access, allows the operator to set temperature units to be display in either Fahrenheit or Celsius. From the Standard Display, press the MENU key.

Figure 152. Menu Key



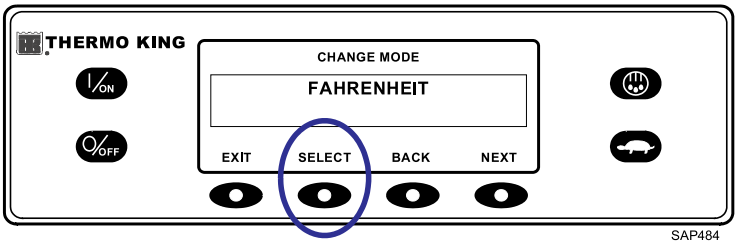
The Language Menu or Alarm Menu will appear. Press the NEXT key as required to display the Mode Menu. When the Mode Menu is shown, press the SELECT key.

Figure 153. Select Key



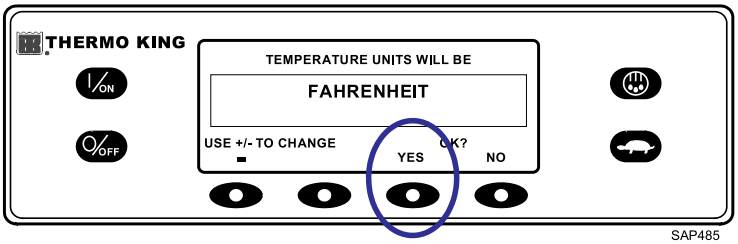
The TURN OFF/TURN ON Cycle Sentry screen will appear. Press the NEXT key as required to display the Temperature Display Screen. This feature must be enabled or it will not appear in the Mode Menu.

Figure 154. Select Key



The Temperature Display screen will appear. Use the + and - soft keys to chose either FAHREHEIT or CELSIUS. When the desired temperature units are shown, press the YES soft key to select.

Figure 155. Temperature Display Screen

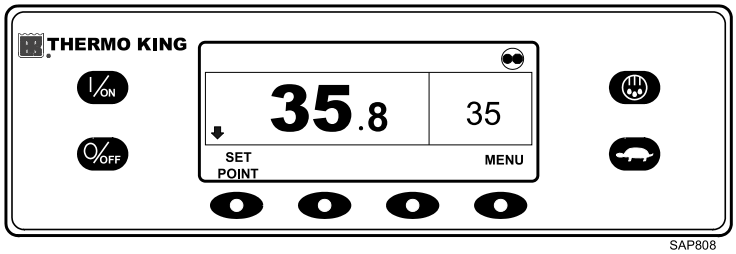


After the YES soft key has been pressed, the display will briefly show PROGRAMMING TEMPERATURE UNITS – PLEASE WAIT. The display confirms the new setting for two seconds and then returns to the Standard Display.

Single Zone Control

This feature, if enabled in Guarded Access, allows Single Zone Control operation to be selected by choosing the Main Menu and then selecting Single Zone Control from within the Mode submenu. The Single Zone Control Standard Display shown below functions the same way as the other Standard Displays.

- When this feature is selected, all zones will be forced on and will control to the same selected setpoint.
- The Cycle Sentry Icon in the upper right of the display shows that the unit is operating in Cycle Sentry mode.
- The box temperature in all zones is 35.8°F and all zones are controlling to a 35°F setpoint.
- The down-pointing arrow indicates that all zones are cooling.
- The soft key labeled Setpoint allows the setpoint for all zones to be changed.
- The soft key labeled Menu allows the Main Menu to be selected.



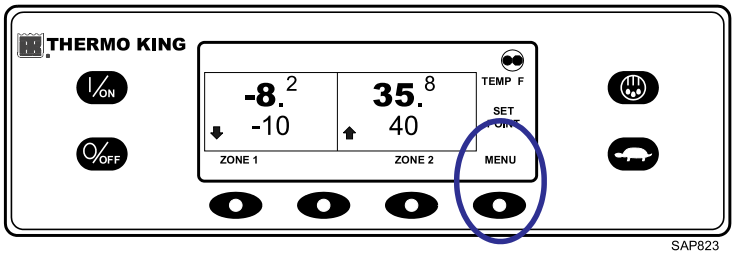
The following differences exist when operating the unit in Single Zone Control Mode.

- Single Zone Control Mode will appear in the Main Menu/Mode Menu only if the Single Zone Control feature has been enabled in the Guarded Access/Main Menu Configuration menu.
- If Single Zone Control operation is selected, all zones will be forced on and will control to the same setpoint.
- Unit control is based on the temperature sensors of Zone 1.
- Dividing wall(s) should be repositioned to create one large compartment.

- With the exception of defrost, the operating mode of each zone evaporator(s) will be same when in this mode. Unit control is based on the temperature sensors of Zone 1.
- If Single Zone Control operation is selected, the Single Zone Standard Display provides one soft key labeled Set Point. This allows the setpoint for all zones to be changed simultaneously.
- If Single Zone Control operation is selected, the individual zones cannot be turned off. The unit and all zones are turned On and Off simultaneously using the On and Off hard keys at the left side of the display.

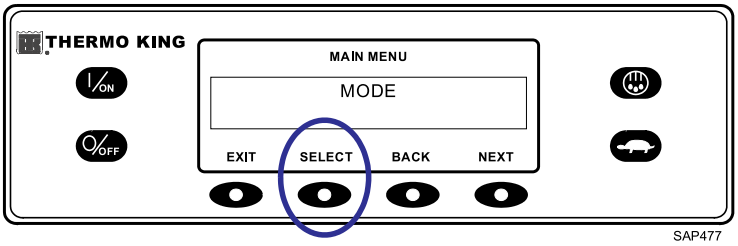
Single Zone Control is turned on by choosing the Main Menu and then selecting Single Zone Control from within the Mode submenu. From the Standard Display, press the MENU key.

Figure 156. Menu Key



The Language Menu or Alarm Menu will appear. Press the NEXT key as required to display the Mode Menu. When the Mode Menu is shown press the SELECT key.

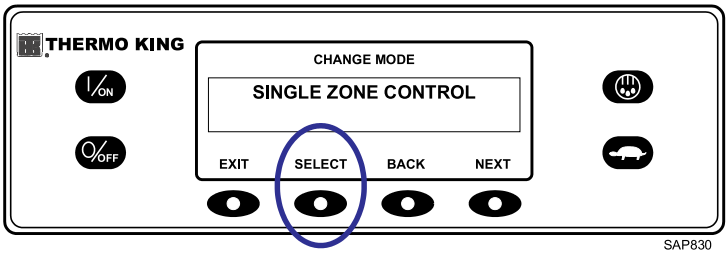
Figure 157. Select Key



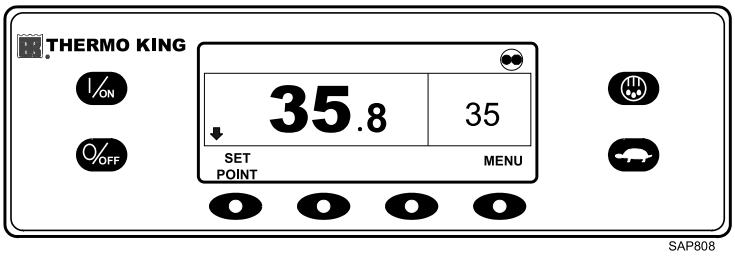
The TURN OFF/TURN ON CYCLE SENTRY screen will appear. Press the NEXT key as required to display the Single Zone Display.

Note: *This feature must be enabled or it will not appear in the Mode Menu.*

Figure 158. Single Zone Control

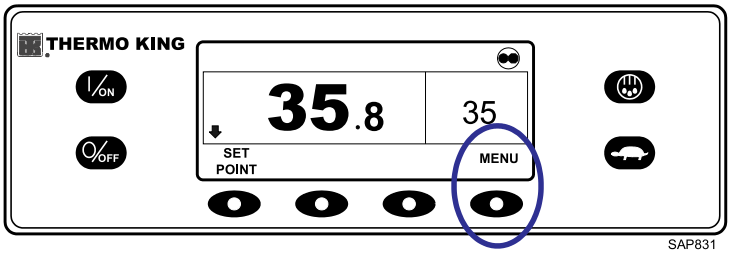


After the SELECT soft key has been pressed, the display will briefly show PROGRAMMING SINGLE ZONE CONTROL – PLEASE WAIT. The display confirms the new setting for two seconds and then shows the Single Zone Standard Display.



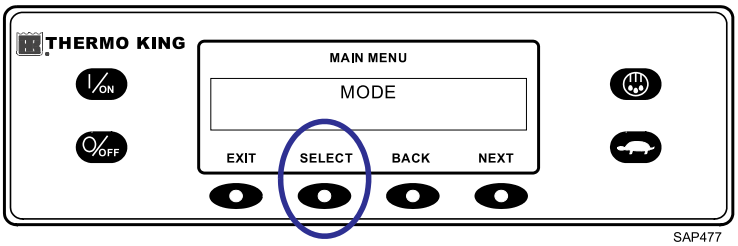
Choose the desired setpoint and remove the bulkheads to form one large compartment. To return to multi-zone operation from the Single Temperature Standard Display, press the Menu soft key.

Figure 159. Menu Key



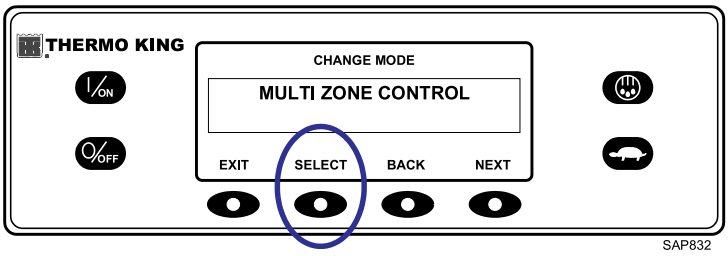
The Language Menu or Alarm Menu will appear. Press the NEXT key as required to display the Mode Menu. When the Mode Menu is shown press the SELECT key.

Figure 160. Select Key



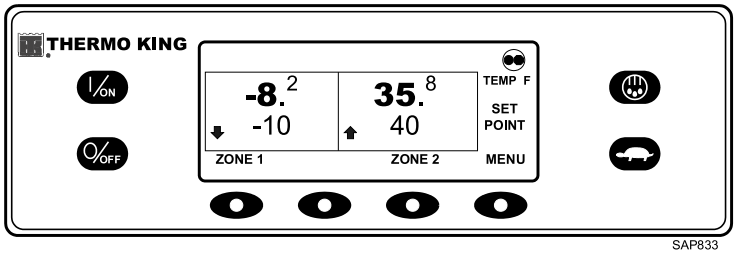
The TURN OFF/TURN ON CYCLE SENTRY screen will appear. Press the NEXT key as required to display the Multi Zone Display.

Figure 161. Multi Zone Control



After the SELECT soft key has been pressed, the display will briefly show PROGRAMMING MULTI ZONE CONTROL – PLEASE WAIT. The display confirms the new setting for two seconds and then shows the Multi Zone Standard Display.

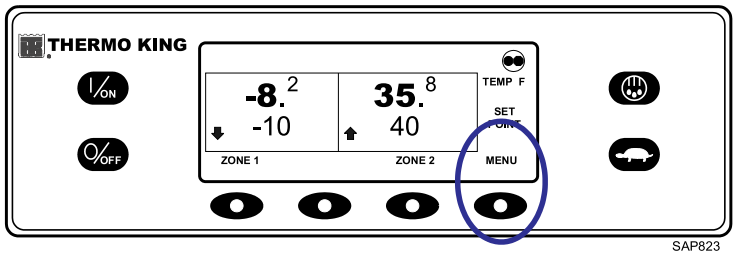
Figure 162. Multi Zone Standard Display.



Keypad Lockout

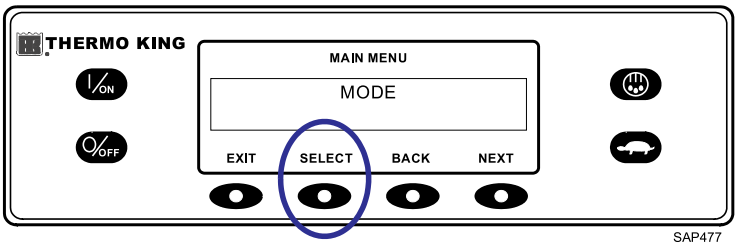
This feature, if enabled in Guarded Access, allows the keypad to be locked to prevent unauthorized use or tampering. If the keypad is locked, only the ON and OFF keys are functional. Access to all other keys is denied. Keypad Lockout is turned on by choosing the Main Menu and then selecting Keypad Lockout from within the Mode submenu. From the Standard Display, press the MENU key.

Figure 163. Menu Key



The Language Menu or Alarm Menu will appear. Press the NEXT key as required to display the Mode Menu. When the Mode Menu is shown press the SELECT key.

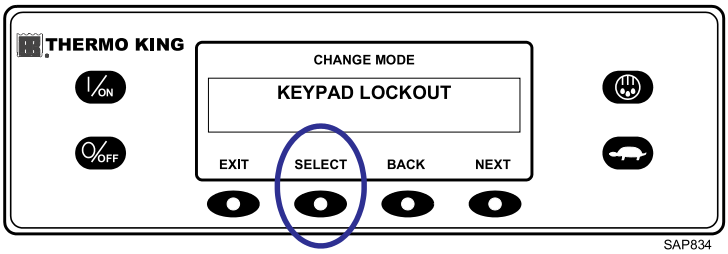
Figure 164. Select Key



The TURN OFF/TURN ON CYCLE SENTRY screen will appear. Press the NEXT key as required to display the Keypad Lockout Screen.

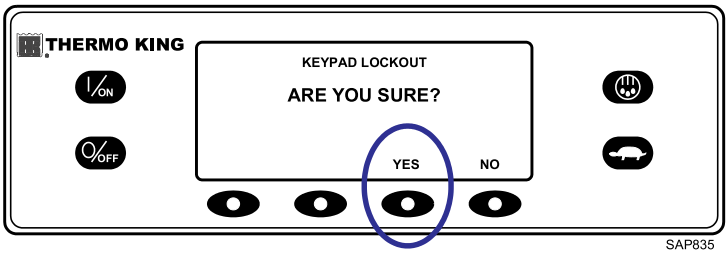
Note: *This feature must be enabled or it will not appear in the Mode Menu.*

Figure 165. Keypad Lockout



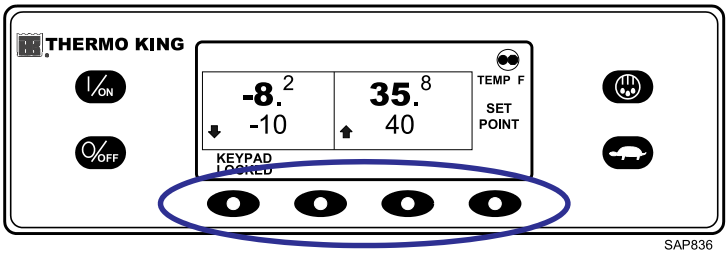
The Keypad Lockout Confirmation screen will appear. To enter Keypad Lockout Mode press the YES soft key to confirm the choice.

Figure 166. Confirmation Screen



After the YES soft key has been pressed, the display will briefly show KEYPAD LOCKED. The display confirms the setting for two seconds and then returns to the Locked Standard Display.

Figure 167. Locked Standard Display



To exit Keypad Lockout Mode press and hold any of the soft keys for five seconds. Keypad Lockout Mode will be turned off and the Standard Display will appear.

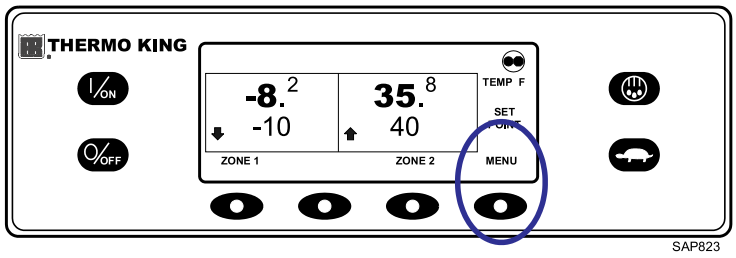
Selecting Sleep Mode

Normal CYCLE-SENTRY mode starts and stops the unit as required to maintain the desired setpoint temperature, maintain the unit battery in a charged condition, and keep the engine warm in cold ambient conditions. Sleep Mode does not consider setpoint or maintain cargo temperatures - it only keeps the engine warm and the unit battery charged. This is useful in extremely cold weather or when the unit is to be out of service for an extended time. Sleep Mode operates in both Diesel and Electric. In Diesel, the unit will start and stop as required to maintain engine temperature and battery charge. In Electric, the unit starts and stops as necessary to maintain battery charge only.

When Sleep Mode is entered, the operator can program an automatic Wake-up Time up to a week away. Using this feature, the unit will automatically restart and run normally at the determined time. If a Wake-up Time is programmed, the operator can also program an automatic Pretrip Test when the unit restarts.

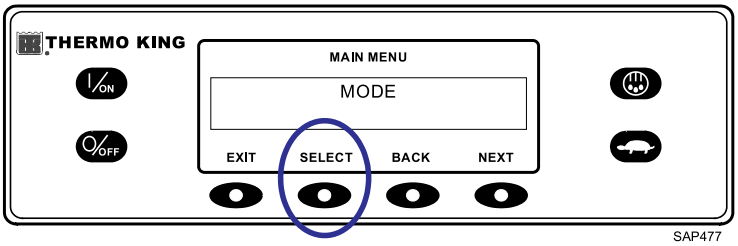
Sleep Mode is turned On and Off using the Mode Menu. From the Standard Display, press the MENU key.

Figure 168. Menu Key



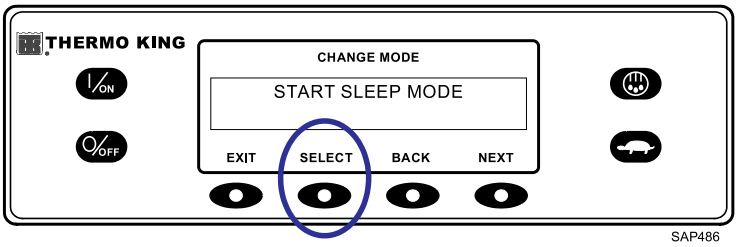
The Language Menu or Alarm Menu will appear. Press the NEXT key as required to show the Mode Menu. When the Mode Menu is shown, press the SELECT key.

Figure 169. Select Key



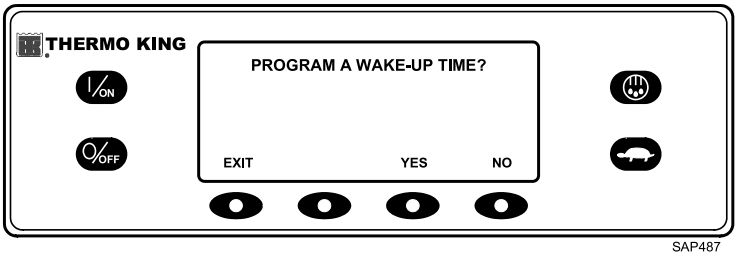
Press the Next key as required to display the Sleep Mode prompt. Press the Select key to choose the Sleep Mode menu.

Figure 170. Select Key



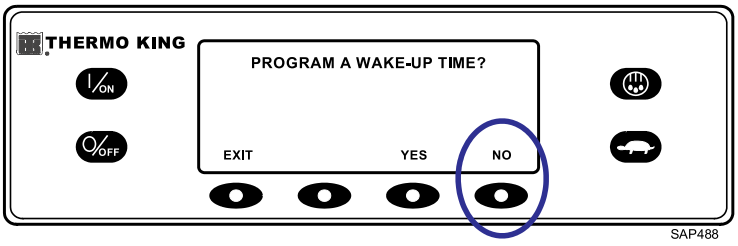
The screen shown (Figure 171, p. 186) will appear.

Figure 171. Start of Sleep Mode Menu



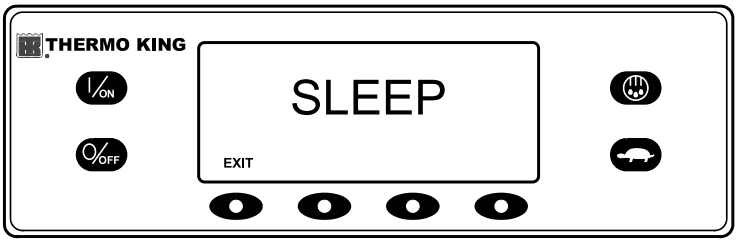
The operator can now choose a Sleep Mode Wake-up Time or simply enter Sleep Mode immediately. If NO is pressed, the unit will immediately enter Sleep Mode.

Figure 172. Select No to Enter Sleep Mode



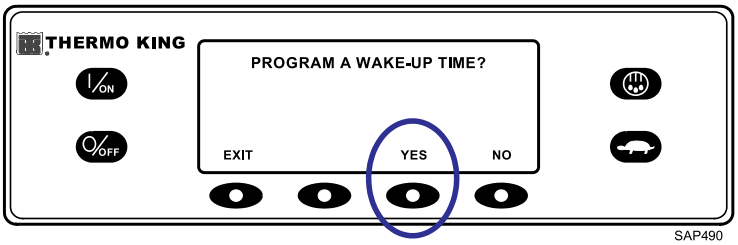
The display will show SLEEP and the unit will start and stop as required to keep the engine warm and/or the battery charged. To exit Sleep Mode, press the EXIT key or turn the unit off and back on. The unit will resume normal operation and control to setpoint.

Figure 173. Sleep Mode Display



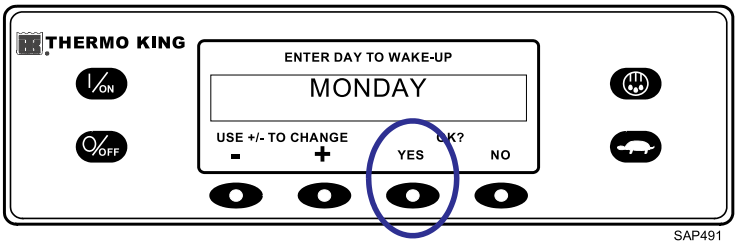
To enter a Wake-up Time, verify the unit clock is set properly. Press the YES key at the Sleep Mode Menu.

Figure 174. Yes Key



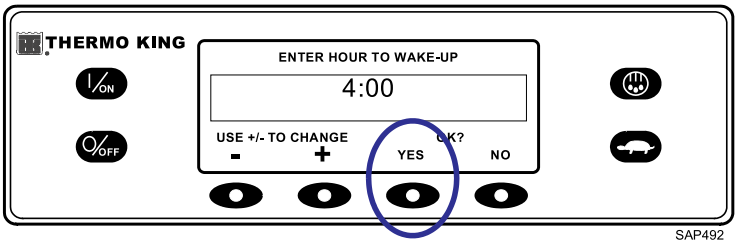
The display will prompt the operator for the DAY the unit is to restart in normal operation. In the example shown (Figure 175, p. 187), Monday has been chosen. Press the YES key to confirm the DAY.

Figure 175. Confirm Day



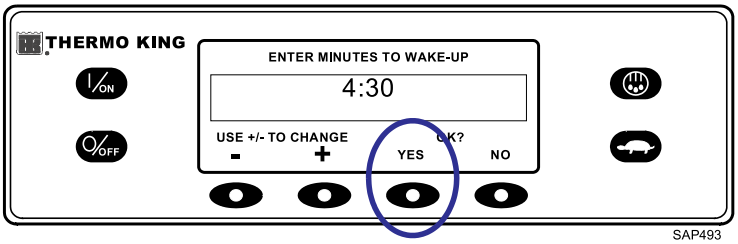
The display will now prompt the operator for the HOUR the unit is to restart in normal operation. In the example shown (Figure 176, p. 187), 4:00 am has been chosen. Press the YES key to confirm the HOUR (24 hour "military time" is used).

Figure 176. Confirm Hour



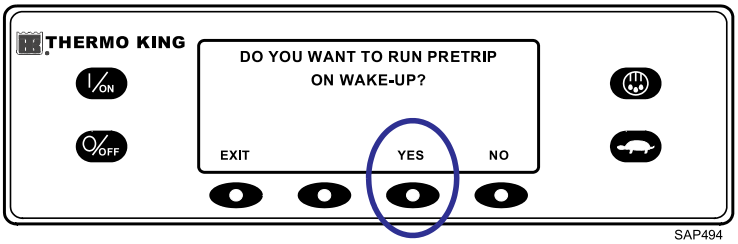
The display will now prompt the operator for the MINUTE the unit is to restart in normal operation. In the example shown (Figure 177, p. 188), 4:30 am has been chosen. Press the YES key to confirm the MINUTE.

Figure 177. Confirm Minute



The display will now prompt for a Pretrip Test on Wake-up. Press the YES key to perform a Pretrip Test on Wake-up. If the No key is pressed, the unit will resume normal operation on Wake-up.

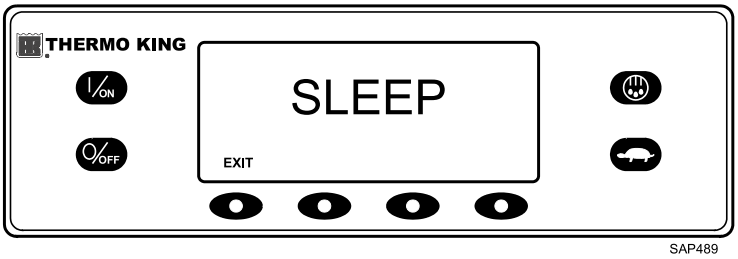
Figure 178. Press Yes Key for Pretrip Test



The display will show SLEEP and the unit will start and stop as required to keep the engine warm and/or the battery charged.

Note: *The unit may start when sleep is enabled to bring battery charge level and engine temperature up to minimum level. It will shut down and then maintain minimum levels.*

Figure 179. Sleep Mode



The unit will restart at the programmed time (in this example 4:30 am) and perform a Pretrip Test (if selected). After the Pretrip Test is complete, the test results will be displayed and the unit will resume normal operation and control to setpoint.

To exit Sleep Mode before the selected Wake-up time, press the EXIT key or turn the unit off and back on. The unit will resume normal operation and control to setpoint.

Pretrip Test

A Pretrip Test verifies unit operation. The PRETRIP Key allows either a Full Pretrip Test or an Engine Running Pretrip Test to be initiated by the operator.

Pretrip Test Conditions

- The current unit settings are saved and restored at the end of the Pretrip Test or if the unit is turned off and back on.
- The 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

- Pretrip Tests are not allowed if any Shutdown Alarms are present.
- Pretrip tests are allowed with some Check and Log Alarms present.

Pretrip Test Sequence

Pretrip tests proceed in the order shown below. A Full Pretrip Test is started with the engine or motor not running and includes all tests. A Running Pretrip Test is started with the engine or 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 in a zone is below 45°F (7°C), a defrost cycle is initiated for that zone.
- RPM Check - The engine RPM in high and low speed is checked.
- Zone 1, 2, or 3 Cool Check - The ability of the zone to cool in low speed is checked.
- Zone 1, 2, or 3 Heat Check - The ability of the zone to heat in low speed is checked.
- Zone 1, 2, or 3 Return to Cool Check - The ability of the zone to return to cool mode 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.

Pretrip Test Considerations

Important: *Always perform Pretrip with the dividing wall(s) in place. Running a Pretrip with the dividing wall(s) removed may result in false test results.*

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

- Whenever possible, run the Pretrip Test with an empty truck box.
- If running a Pretrip Test on a truck loaded with dry cargo, verify that proper airflow can occur around the load. If the load restricts airflow, false test results may occur. Units have high refrigeration capacity which results in rapid temperature change. Sensitive dry cargo may be damaged as a result.
- If running a Pretrip Test on a truck that has just been washed down, the extremely high humidity inside the truck box may result in false test results.
- If running a Pretrip Test on a truck 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 cargo doors closed to prevent false test results.

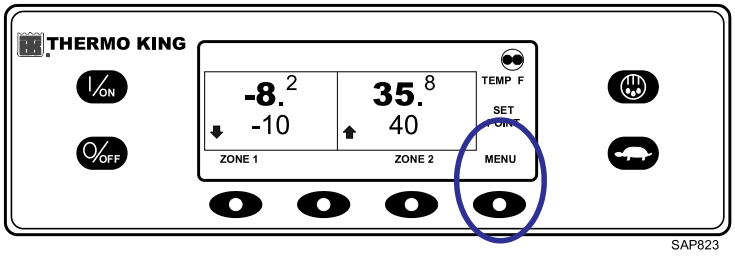
Performing a Pretrip Test

If a Pretrip Test is initiated with the engine shut down, 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. Alarm Code 28 Pretrip Abort will be set. Other alarms may also be set depending upon test in progress when the test was terminated.

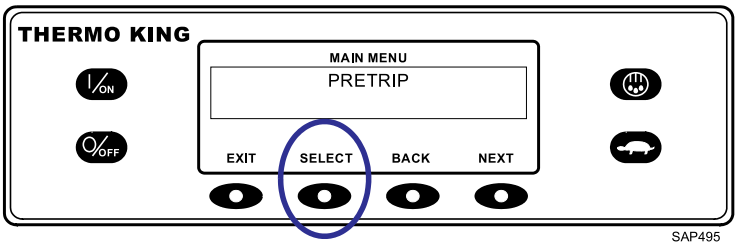
Pretrip Tests are initiated using the Pretrip Menu. From the Standard Display, press the MENU key.

Figure 180. Menu Key



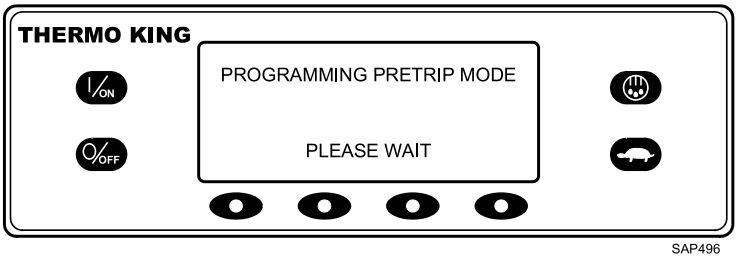
The Language Menu or Alarm Menu will appear. Press the NEXT key as required to display the Pretrip Menu. When the Pretrip Menu is shown, press the SELECT key.

Figure 181. Select Key



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 will be performed.

Figure 182. Running Pretrip



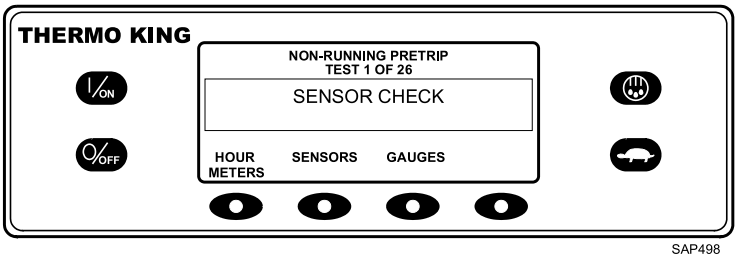
If all alarms were not cleared, a prompt appears as shown (Figure 183, p. 190). Exit the Pretrip Test, clear all alarms, and restart the Pretrip Test.

Figure 183. No Pretrip Prompt



If no alarms are present, the Pretrip Test display appears.

Figure 184. Pretrip Test Display

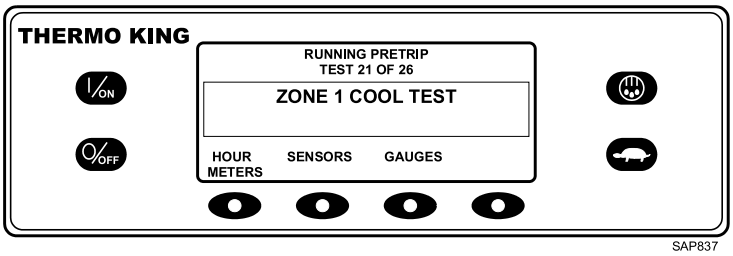


- The top line of the display indicates the unit is performing the non-running portion of the Pretrip Test.
- The second line measures test progress. The number of tests completed of the total number of tests to be performed is shown. In the example (Figure 184, p. 190), the unit is performing Test 1 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.

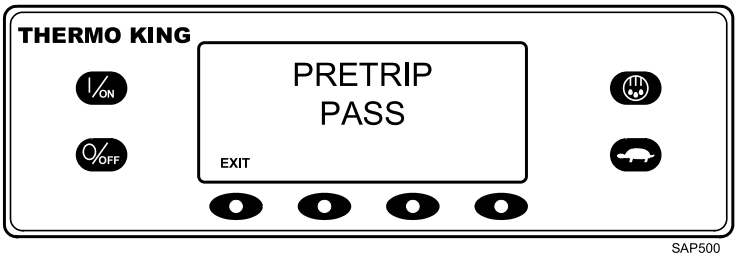
When the non-running tests are complete, the unit will start automatically and continue with the Running Pretrip Test. In the example shown (Figure 185, p. 191), the unit is in the Running Pretrip and is performing Test 21 of 26, Cool Test.

Figure 185. Performing Cool Test



When all tests are complete, the results are reported as PASS, CHECK, or FAIL. If the results are CHECK or FAIL, the accompanying alarm codes will direct the technician to the cause of the problem. If the Pretrip Test results are CHECK or FAIL, the problem should be diagnosed and corrected before the unit is released for service.

Figure 186. Pass, Check, or Fail



Diesel/Electric Menu

The Diesel Mode/Electric Standby menu allows the operator to manually select diesel or electric mode operation. The unit can also be programmed to automatically select electric mode operation when standby power is available and to automatically select diesel mode operation if standby power fails or is removed. Refer to "Switching from Diesel to Electric," p. 159 and "Switching from Electric to Diesel," p. 160 for details.

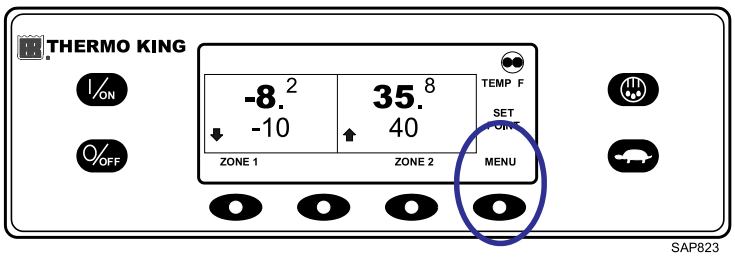
Note: *If the unit is programmed to switch automatically from diesel to electric and electric to diesel the normal screens do not appear.*

Adjust Brightness Menu

The brightness of the HMI Controller 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.

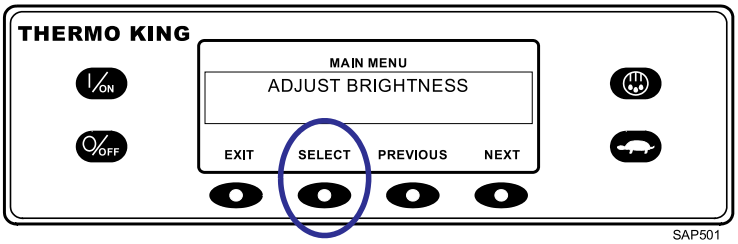
Display brightness is adjusted using the Adjust Brightness Menu. From the Standard Display, press the MENU key.

Figure 187. Menu Key



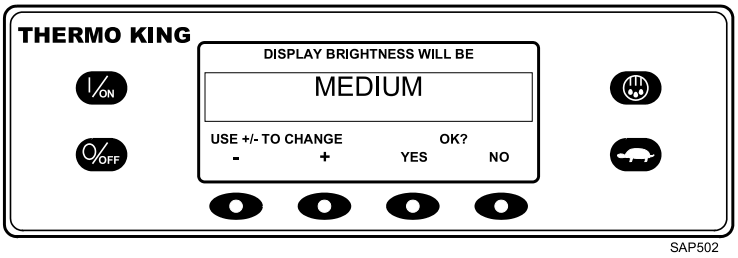
The Language Menu or Alarm Menu will appear. Press the NEXT key as required to display the Adjust Brightness Menu. When the Adjust Brightness Menu is shown, press the SELECT key.

Figure 188. Select Key



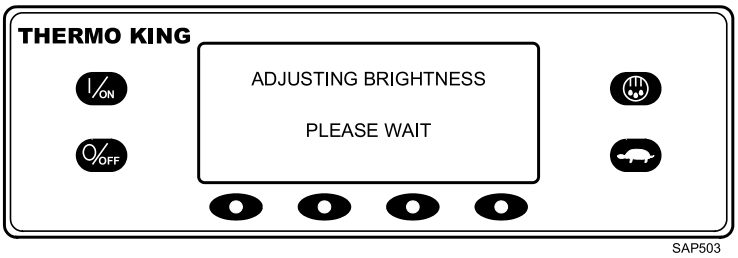
The Display Brightness menu will appear as shown (Figure 189, p. 192). Press the + or - keys to select the desired display brightness. When the desired brightness is shown, press the YES key to confirm the choice.

Figure 189. + and - Keys



The display will briefly show ADJUSTING BRIGHTNESS - PLEASE WAIT. The display brightness is changed to the new setting. To return to the Main Menu press the EXIT soft key. To return to the Standard Display press the EXIT soft key again.

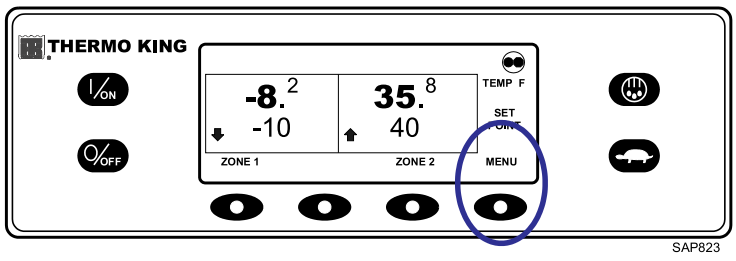
Figure 190. Adjusting Brightness



Time Menu

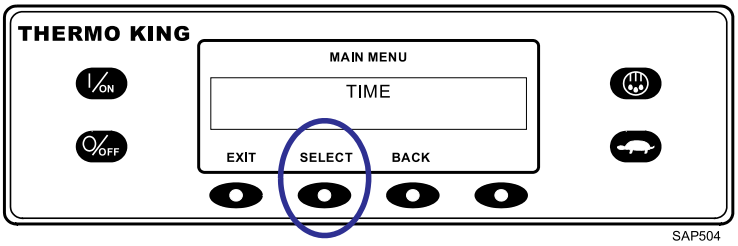
The system time and date is viewed using the Main Menu. Time and Date cannot be changed from the Main Menu. From the Standard Display, press the MENU key.

Figure 191. Menu Key



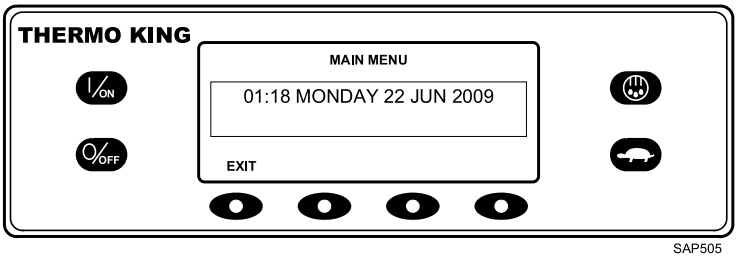
The Language Menu or Alarm Menu will appear. Press the NEXT key as required to display the Time Menu. When the Time Menu is shown, press the SELECT key.

Figure 192. Select Key



The current time and date will appear. To return to the Main Menu press the EXIT soft key. To return to the Standard Display press the EXIT soft key again.

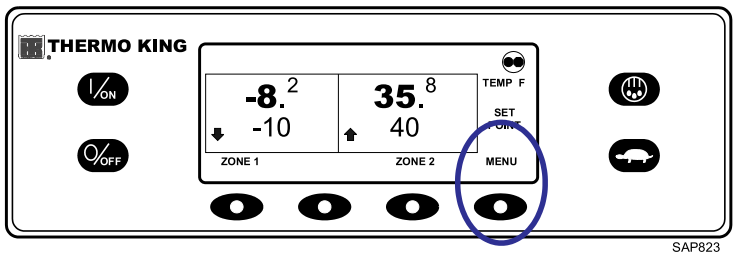
Figure 193. Current Time and Date



Using The Maintenance Menu

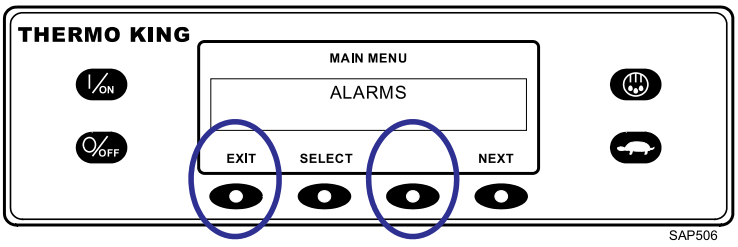
The Maintenance Menu contains features that allow the technician to view additional information, perform unit diagnostics using Service Test Mode and Interface Board Test Mode, and evacuate and charge the unit with refrigerant using Evacuation Mode. Software revisions can be checked, and the time and date can be set. To access the Maintenance Menu press the MENU key.

Figure 194. Menu Key



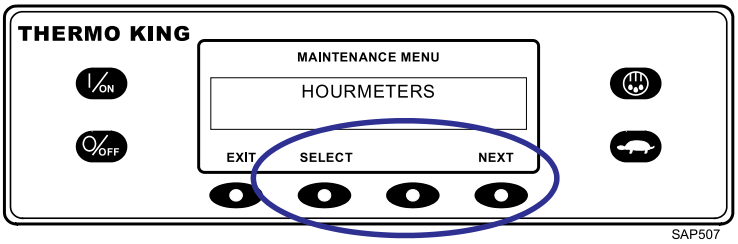
The Maintenance Menu is accessed from the first Main Menu screen that appears, either the Language Display or the Alarms Display. Press and hold both the unlabeled soft key and the Exit key for five seconds.

Figure 195. Alarms Display



The first Maintenance Menu feature will appear. Press the NEXT and BACK keys to scroll through the Maintenance Menu choices. When the desired choice is shown on the display, press the SELECT key to access it.

Figure 196. Maintenance Menu



To return to the Standard Display press the EXIT key. The HMI control panel will also return to the Standard Display 30 seconds after the last key is pressed.

The Maintenance Menu choices are shown on the following pages.

Maintenance Menu Choices

Hourmeters

This menu allows the technician to view all the active unit hourmeters, even if the Main Menu view has been turned off. The Maintenance Menu Hourmeter Display also allows the technician to reset the time on hourmeters with a programmed time limit. Refer to "Hourmeters Menu," p. 175 for detailed information.

Gauges

The Gauges Menu allows the technician to view the unit gauges. Refer to "Gauges Menu," p. 171 for detailed information.

Sensors

The Sensors Menu allows the technician to view the unit temperature sensors. Refer to "Sensors Menu," p. 173 for detailed information.

Alarms

The Alarms Menu allows the technician to view any active alarms, and also allows most alarms to be cleared. Refer to "Alarms Menu," p. 166 for detailed information.

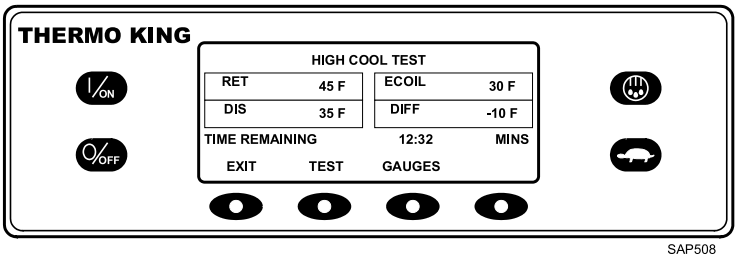
Service Test Mode

The Service Test Mode Menu allows the technician to force the unit to a known operating mode for diagnostic purposes. The unit can be either running or not running. If the unit is not running and a running test is selected, the unit will start and run. If the unit is running when a running test is selected, the unit will shut down and restart in the selected mode. A different test may then be selected without a shut down/restart sequence. If the unit is running when a non running test is selected, the unit will shut down and activate the test.

Important: *Service Test Mode is not allowed if any Shutdown Alarms exist or if the unit is in a Prevent Mode Shutdown Null (Alarm Code 84). Clear all alarms before attempting to use Service Test Mode.*

Choose Service Test by pressing the SELECT key when SERVICE TEST is shown in the Maintenance Menu. Select Running or Non Running tests. The SERVICE TEST MODE screen appears as shown (Figure 197, p. 194).

Figure 197. Service Test Display



The test shown is the High Speed Cool Test. Return, Discharge, and Evaporator Coil temperatures are shown. The Temperature Differential is also calculated and displayed.

- A test will remain active for 15 minutes. A countdown counter shows the time remaining for the test. If the test times out, it will terminate and the unit will be shut down (if running) and Alarm Code 54 Test Mode Timeout will be set.
- The GAUGES key is used to scroll through the gauges.
- The TEST key allows the various tests to be selected.
- The EXIT key returns to the Maintenance Menu.

Not all tests are available on all units. Only tests used by the specific unit configuration will appear.

Table 27. Service Test Modes

Zone 1 Null	Zone 2 Null	Zone 3 Null
Zone 1 Low Speed Cool	Zone 2 Low Speed Cool	Zone 3 Low Speed Cool
Zone 1 High Speed Cool	Zone 2 High Speed Cool	Zone 3 High Speed Cool
Zone 1 Low Speed Heat	Zone 2 Low Speed Heat	Zone 3 Low Speed Heat
Zone 1 High Speed Heat	Zone 2 High Speed Heat	Zone 3 High Speed Heat
Zone 1 Defrost	Zone 2 Defrost	Zone 3 Defrost

Table 28. Devices Energized - Scroll Compressor

Service Test Mode Test	Run Relay Note 1	High Speed	Cond Inlet Sol	Hot Gas Sol	Purge Valve	ETV	Evap Fans
Null							
High Speed Cool	ON	ON				Enabled	ON
Low Speed Cool	ON					Enabled	ON
Low Speed Heat	ON		ON	ON	ON	Enabled	ON
High Speed Heat	ON	ON	ON	ON	ON	Enabled	ON
Defrost	ON	Note 2	ON	ON	ON	Enabled	OFF

Notes:

1. *Diesel/Electric Relay will also be energized if in Electric Mode.*
2. *If High Speed Defrost is enabled, the High Speed Solenoid will be energized in defrost.*

Table 29. Devices Energized - Reciprocating Compressor

Service Test Mode Test	Run Relay Note 1	High Speed	Cond Inlet Sol	Hot Gas Sol	ETV	Evap Fans
Null						
High Speed Cool	ON	ON			Enabled	ON
Low Speed Cool	ON				Enabled	ON
Low Speed Heat	ON		ON	ON	Enabled	ON
High Speed Heat	ON	ON	ON	ON	Enabled	ON
Defrost	ON	Note 2	ON	ON	Enabled	OFF

Notes:

1. *Diesel/Electric Relay will also be energized if in Electric Mode.*
2. *If High Speed Defrost is enabled, the High Speed Solenoid will be energized in defrost.*

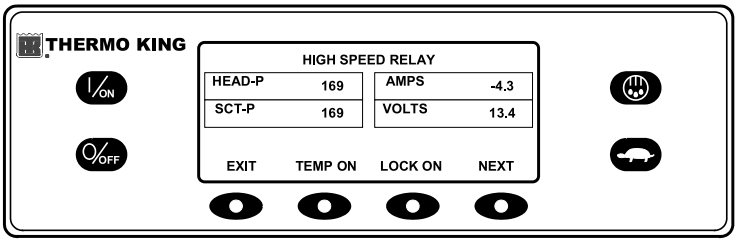
Interface Board Test

The Interface Board Test Menu allows the technician to energize and de-energize individual control devices for diagnostic purposes. The unit cannot be running to use this test. If the test is entered with the unit running, the unit will shut down.

Important: *Interface Board Test Mode is not allowed if any Shutdown Alarms exist or if the unit is in a Prevent Mode Shutdown Null (Alarm Code 84). Clear all alarms before using Interface Board Test Mode.*

Choose Interface Board Test by pressing the SELECT key when INTERFACE BOARD TEST is shown in the Maintenance Menu. The Interface Board Test screen appears as shown (Figure 198, p. 196).

Figure 198. Interface Board Test



The test shown is the High Speed Relay Test. Discharge Pressure, Suction Pressure, Amps, and Volts are shown.

- The TEMP ON key is used to momentarily energize the device.
- The LOCK ON key energizes the device for 15 minutes. A countdown counter shows the time remaining for the test. If the test times out, Alarm Code 54 Test Mode Timeout is set. Not all devices can be locked on.
- The UNLOCK key unlocks the display and returns to the Interface Board Test.
- The EXIT key returns to the Maintenance Menu.

Not all tests are available on all units. Only tests used by the specific unit will appear.

Table 30. Interface Board Test Modes and Current Draw

Interface Board Test	Approximate Device Current Draw	Comments
Preheat Relay	17 Amps	Temporary On only
Buzzer	Negligible	Temporary On only
Run Relay	2.0 Amps	
Condenser Inlet Solenoid	1.3 - 1.6 Amps	
Indicator Light	0.1 Amps	
Alarm Light	0.1 Amps	
Diesel/Electric Relay	1.1 Amps	Not available if ER is high
High Speed Relay	4.6 Amps	
Receiver Tank Solenoid	0.7 Amps	
Hot Gas Bypass Valve	1.5 Amps	
Alternator Excite Output	0.5 - 2.0 Amps	Depends on alternator type
Purge Valve	0.7 Amps	Scroll Only
Liquid Injection Valve	1.3 Amps	Scroll Only
Zone 1 Liquid Line Solenoid and Fuel Pump	2.3 Amps	4.6 Amps if Parallel Evaps
Fan Motor Zone 1 Output	8.0 Amps (Per Motor)	

Table 30. Interface Board Test Modes and Current Draw (continued)

Interface Board Test	Approximate Device Current Draw	Comments
Drain Hose Heater Zone 1	2.0 Amps (Each)	
Zone 1 Hot Gas Solenoid	1.5 Amps	3.0 Amps if Parallel Evaps
Zone 1 Suction Line Solenoid	1.5 - 1.7 Amps	3.0 - 3.4 Amps if Parallel Evaps
Fan Motor Zone 2 Output	8.0 Amps (Per Motor)	
Drain Hose Heater Zone 2	2.0 Amps (Each)	
Zone 2 Hot Gas Solenoid	1.5 Amps	3.0 Amps if Parallel Evaps
Zone 2 Suction Line Solenoid	1.5 - 1.7 Amps	3.0 - 3.4 Amps if Parallel Evaps
Zone 2 Liquid Line Solenoid	2.3 Amps	Current doubles if Parallel Evaps
Fan Motor Zone 3 Output	8.0 Amps (Per Motor)	
Drain Hose Heater Zone 3	2.0 Amps (Each)	
Zone 3 Hot Gas Solenoid	1.5 Amps	3.0 Amps if Parallel Evaps
Zone 3 Suction Line Solenoid	1.5 - 1.7 Amps	3.0 - 3.4 Amps if Parallel Evaps
Zone 3 Liquid Line Solenoid	2.3 Amps	Current doubles if Parallel Evaps

Note: *Device current will vary dependant on battery voltage and battery condition.*

Display Self Test

The Display Self Test Menu allows the technician to perform a number of self tests on the unit HMI control panel. The tests available are shown below.

Choose Display Self Test by pressing the SELECT key when DISPLAY SELF TEST is shown in the Maintenance Menu. The Display Self Test screen appears. Select a test from the list below.

- LCD Test - This test allows the technician to select a normal or inverted display. If inverted is chosen, the display is reversed – segments that were turned on are now turned off and segments that were turned off are now turned on. The technician visually verifies that all display segments are functioning properly.
- Keypad Test - This test prompts the technician to press the four soft keys, the Defrost Key, and the Cycle Sentry Key. Each time the requested key is pressed, the next prompt is displayed allowing the technician to verify proper operation of these keys.
- Backlight Test - This test allows the technician to turn the backlight on and off to confirm operation.
- Brightness Test - This test allows the technician to select Low, Medium, or High backlight intensity.
- Buzzer Test - This test allows the technician to turn the HMI buzzer on and off to verify operation.
- Heater Output - This test allows the technician to turn the HMI display heater on and off.
- Serial E2 - This test allows the technician to perform an internal HMI memory test. The test takes less than one second and the results are reported as PASS or FAIL.
- Data Log Flash - This test is not used on truck applications.
- RTC Update - This test allows the technician to perform an internal HMI real time clock test. The test takes less than three seconds and the results are reported as PASS or FAIL.

Evacuation Test

This menu allows the technician to open all normally closed refrigeration system valves to evacuate and charge the unit with refrigerant.

Important: *Evacuation mode has no time-out. The unit will remain in Evacuation Mode indefinitely unless the battery voltage becomes excessive.*

All selectable unit features will be disabled when in Evacuation Mode. Auto-switch from diesel to electric or from electric to diesel is allowed, but the unit will not start.

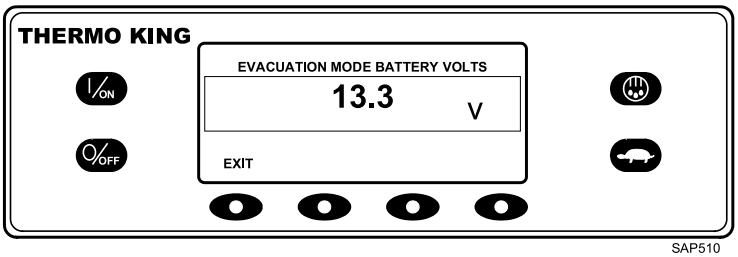
Evacuation mode is not allowed if:

- Any Shutdown Alarms are present.
- The unit is in restart null.
- The unit is in a start sequence.

When in evacuation mode:

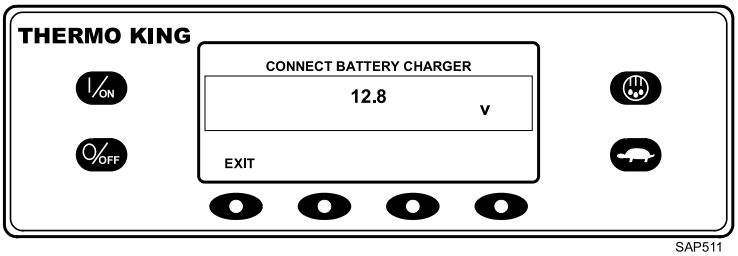
- If the unit is running, it will shut down automatically when entering Evacuation Mode.
- Alarm Code 86 Check Discharge Pressure Sensor is disabled.
- Alarm Code 87 Check Suction Pressure Sensor is disabled.
- Door switch operation is disabled.

Choose Evacuation Test by pressing the SELECT key when EVACUATION TEST is shown by the Maintenance Menu. The Evacuation Test display shown will appear and remain on the display so long as the battery voltage does not fall below 13.0 Vdc. All normally closed refrigerant valves are energized to the open position to allow the evacuation process to effectively remove air and moisture from the refrigeration system.



SAP510

If the battery voltage falls below 13.0 Vdc, the technician is prompted to install a battery charger to guarantee sufficient voltage to keep all valves open during the evacuation process.



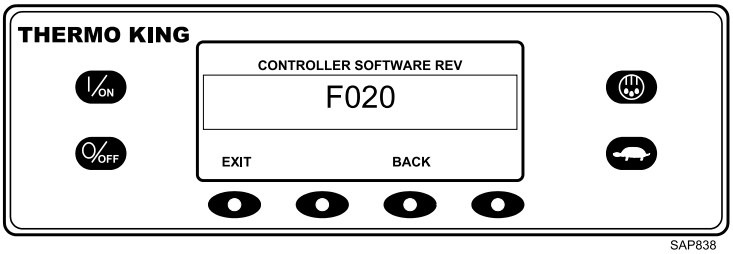
SAP511

If the voltage from the battery charger rises above 16 Vdc, the controller will be turned off to prevent damage to the electronics and/or system components. To exit Evacuation Mode, press the EXIT soft key or turn the unit off.

Software Revision

This menu allows the technician to view the software revision for the HMI Control Panel and the Base Controller.

Choose Software Revision by pressing the SELECT key when SOFTWARE REVISION is shown in the Maintenance Menu. The Software Revision display appears as shown in the example.



SAP838

The NEXT and BACK soft keys allow the technician to scroll through the software revisions. Software revisions appear in the order shown below:

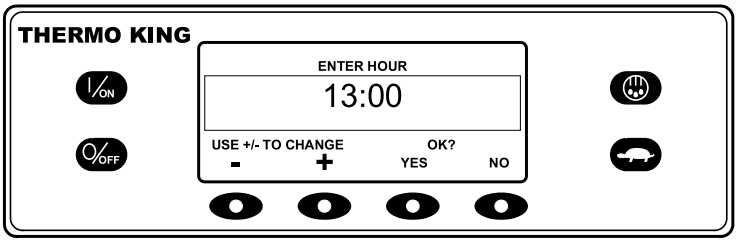
- HMI Control Panel Display Software Revision
- Base Controller Software Revision

The WinTrac™ Service Tool is used to flash software updates to the HMI Control Panel and Base Controller.

Set Time and Date

This menu allows the technician to view and change the HMI control panel clock/calendar.

Choose Set Time and Date by pressing the SELECT key when SET TIME AND DATE is shown in the Maintenance Menu. The Set Time and Date display appears as shown.



SAP513

The - and + soft keys are used to change the hour as required. Pressing YES changes the hour to the selected time and shows the next Time/Date screen. The screens appear in the order shown below.

- Hour, Minute, Date (Day), Month, Year

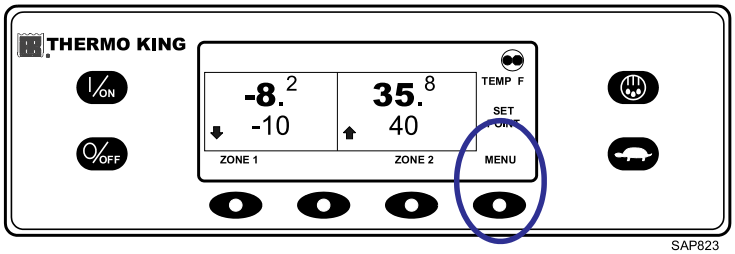
Using the Guarded Access Menu

The Guarded Access Menu contains menus that allow the technician to check and change the unit's programmable features. These features are detailed in Section 3. In Section 6, Service Procedure A02A explains how to display and record the Guarded Access programmable feature settings. "Service Procedure A04A," p. 329 explains how to set the Guarded Access programmable features.

Note: *A warm restart is performed when the Guarded Access Menu is exited. The unit is reconfigured so that any changes that were made from the Guarded Access Menu take effect.*

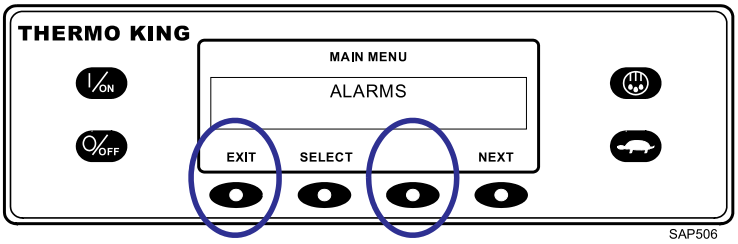
The Guarded Access Menu is entered from the last screen of the Maintenance Menu. The unit must not be running in order to enter the Guarded Access Menu. If the unit is running, enter Interface Board Test from the Maintenance Menu to shut the unit down. Press the EXIT key to return to the Maintenance Menu and continue scrolling to the end of the Maintenance Menu.

To access the Guarded Access menu from the Standard Display press the MENU key.



SAP823

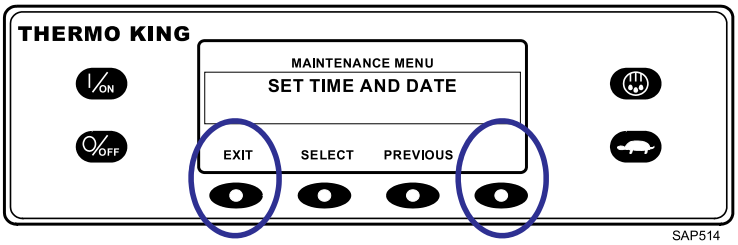
The Maintenance Menu is accessed from the first Main Menu screen that appears, either the Language Display or the Alarms Display. Press and hold both the unlabeled soft key and the Exit key for five seconds.



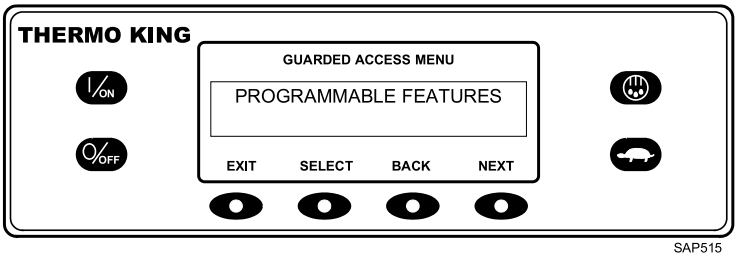
SAP506

The first Maintenance Menu feature will appear. Press the NEXT key to scroll to the Set Time and Date selection at the end of the Maintenance Menu choices. Press and hold both the unlabeled soft key and the Exit key for five seconds.

Important: *If a Security Code has been set, the correct code must be entered here to gain access to the Guarded Access Menu. If access is required by a technician and the code is not known, enter 4444.*



If an Access Code is not enabled or when the correct security code is entered (4444 always works), the first Guarded Access Menu feature will appear. Press the NEXT and BACK keys to scroll through the Guarded Access Menu choices. When the desired choice is shown on the display, press the SELECT key to access it. To return to the Standard Display press the EXIT key.



Flash Load with USB Flash Drive

Note: *To flash load using a computer and the WinTrac Service Tool, refer to ("A46B - Flash Loading HMI Control Panel Software," p. 341).*

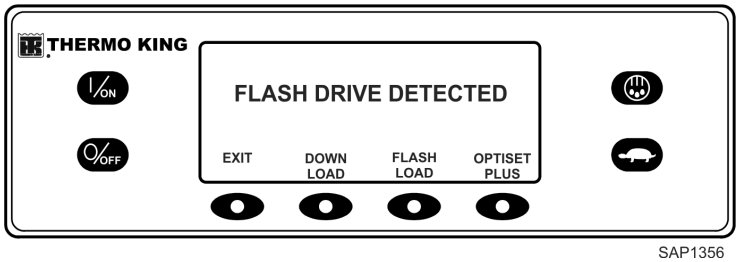
Thermo King T-90 units provide a Universal Serial Bus (USB) Communication Port located in the control box or mounted externally to the front of the truck box. If a properly configured USB flash drive is connected to the USB port, the Flash Drive Detected screen will appear. With a flash drive connected to the USB port, the operator can also access the desired flash drive function by selecting the Menu key.

Important: *The flash drive must be properly configured using the WinTrac Service Tool.*

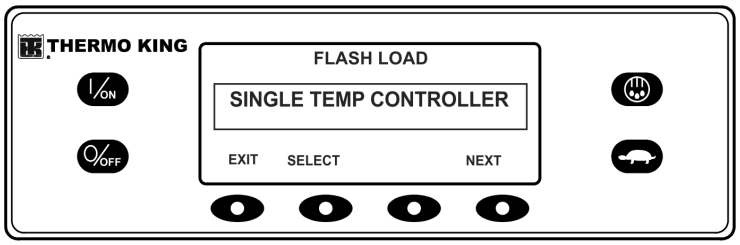
Controller Flash Load

Turn on the HMI and wait for the home screen to appear. Insert a properly configured flash drive into the USB communication port.

The Flash Drive Detected screen will appear. Press "Flash Load".

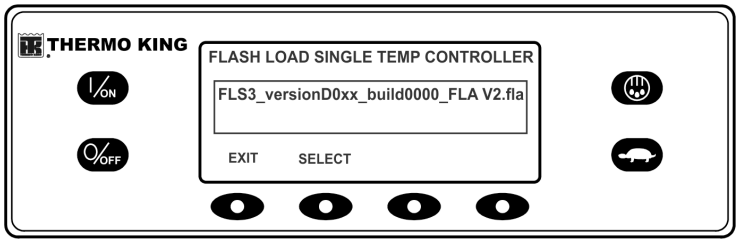


Select Controller.



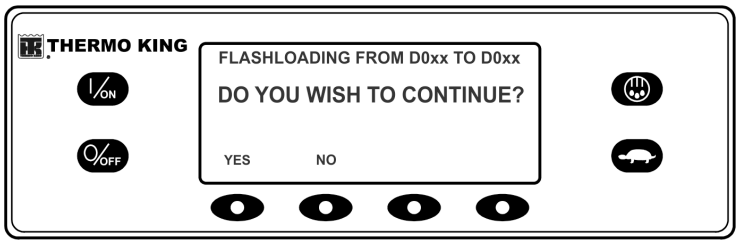
SAP1357

The saved file name from the flash drive will appear. Select the correct file name to be loaded.



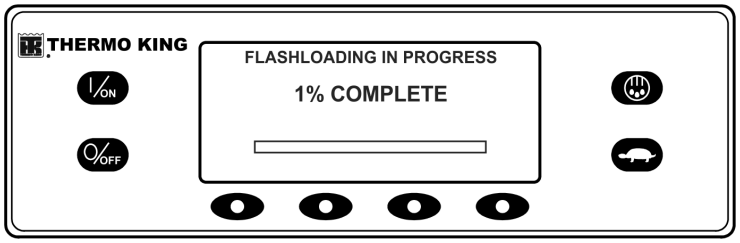
SAP1358

Select “Yes” to confirm flash load.



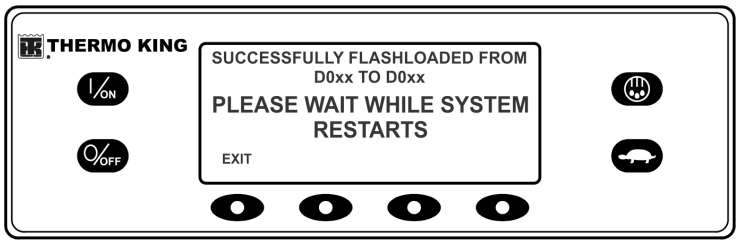
SAP1359

Flashloading in Progress will appear.



SAP1360

When flashloading is successful, the system will restart.

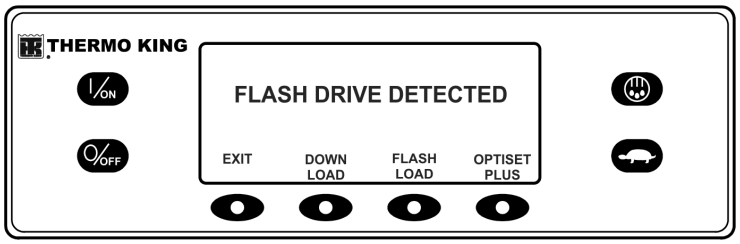


SAP1361

HMI Flash Load

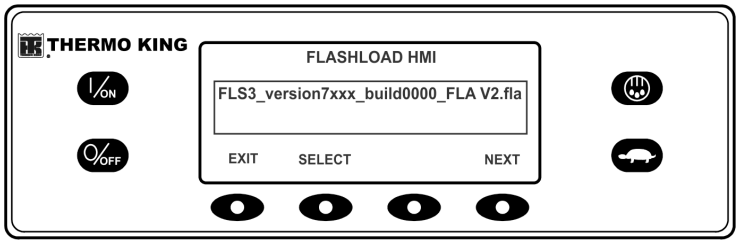
Turn on the HMI and wait for the home screen to appear. Insert a properly configured flash drive into the USB communication port.

The Flash Drive Detected screen will appear. Press “Flash Load”.



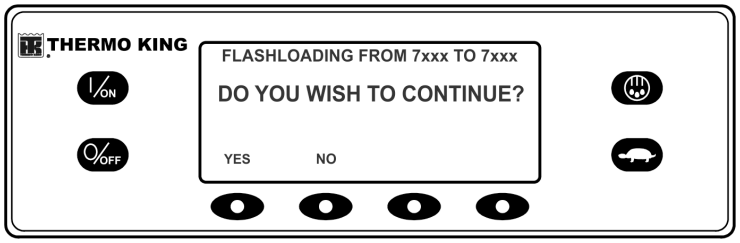
SAP1356

Select HMI. The saved file name from the flash drive will appear. Select the correct file name to be loaded.



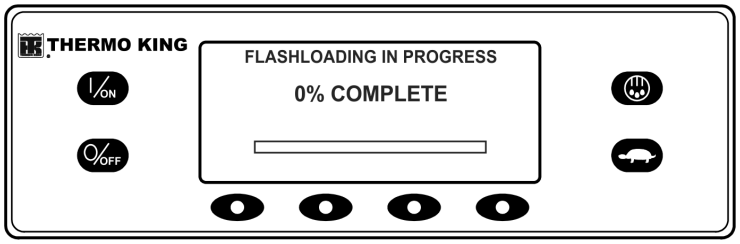
SAP1363

Select “Yes” to confirm flash load.



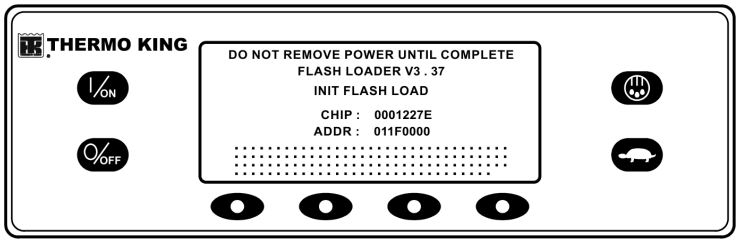
SAP1364

Flashloading in Progress will appear.



SAP1365

The Flash Loader screen will appear, this may take 20 to 40 minutes.



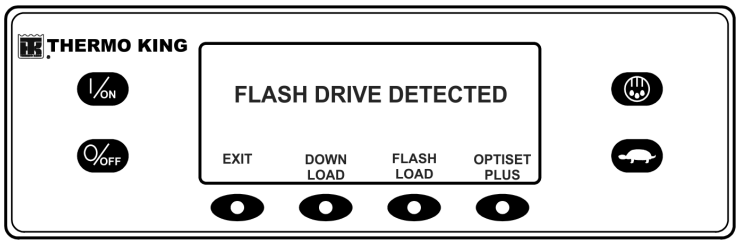
SAP1366

When flashloading is successful, the system will restart.

Downloading a CargoWatch™ or ServiceWatch™ File

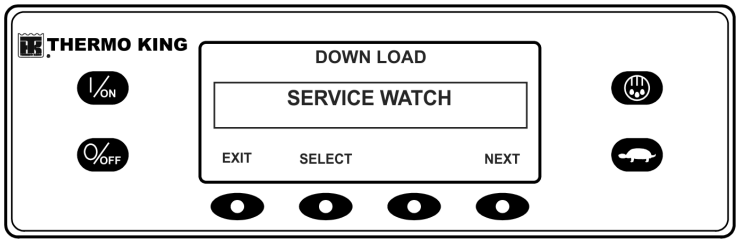
Turn on the HMI and wait for the home screen to appear. Insert a properly configured flash drive into the USB communication port.

The Flash Drive Detected screen will appear. Press “Down Load”.



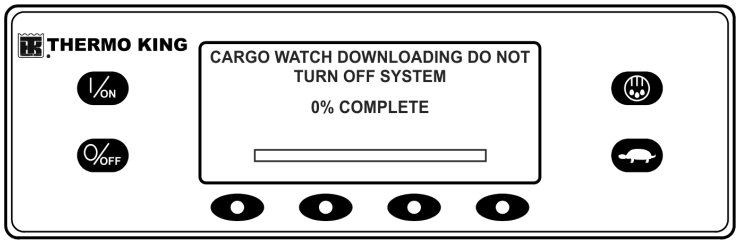
SAP1356

Select CargoWatch or ServiceWatch.



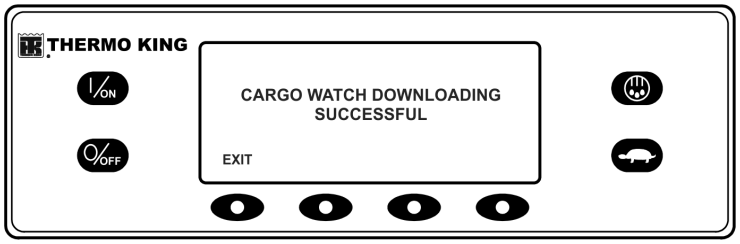
SAP1367

CargoWatch or ServiceWatch Downloading screen will appear.



SAP1368

Downloading successful.



SAP1369

Section 5 - Diagnostics

SR-3 Diagnostics

This section is devoted to diagnostic routines designed to help the technician quickly identify the cause of a problem and repair it using the correct tools, information, and procedures. It is important that the required procedures be followed exactly. Failure to do so may result in an incomplete repair.

The following hints will prove helpful:

- Use the Premium HMI Control Panel to record and review current unit operating information including operating mode, setpoint, temperature sensor readings including temperature differential, gauge readings, and I/O conditions.
- Download the ServiceWatch™ Data Logger using the WinTrac™ Service Tool. Review the data to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is set and cleared. This data can be very helpful in determining the cause of the alarm.
- Operators should record all alarm codes in sequence for reference. Alarm codes are displayed in order of occurrence, with the most recent alarm code displayed last.
- Every effort should be made to perform a Pretrip Test on a suspect unit. In almost all cases, the Pretrip Test will result in one or more alarm codes that will lead you directly to the problem.
- Clear all alarm codes before starting a Pretrip Test.
- If multiple alarm codes are present, diagnose and repair alarm codes caused by faulty components or control circuits first and repeat the full Pretrip Test. Diagnosing and repairing component or control circuit based alarms will often correct unit operation alarms such as reduced refrigeration capacity.
- Use Interface Board Test and Service Test Mode as appropriate to verify unit operation.
- Verify all connectors at the Base Controller, HMI Control Panel, and Expansion Module (if multi-temp unit) are properly seated.
- Verify all outboard harness connectors are properly seated.
- Verify all programmable features are set to the customer's specifications before releasing the unit for service.

Each alarm code presented in this section will have information that will assist the technician in the diagnostic procedure. Not all alarm codes will have all of the sub-topics listed below.

- Alarm Types: This topic will list the specific alarm type for the alarm code.
- Associated Alarm Codes: This topic will list any associated alarm codes that may appear and may be related to the alarm code or even another alarm code. For example, an Alarm Code 18 for engine overheat will often times have an Alarm Code 42 set at the same time indicating that the unit was forced to low speed. Another example would be that a unit shut down on an Alarm Code 10 for high discharge pressure. When the unit shut down it would also have set an Alarm Code 84 indicating that the unit will restart in a set period of time.

  Note: *Not all associated alarm codes may be listed.*
- Component Description and Location: This topic will briefly describe the related component(s) and location(s).
- Circuit Description: This topic will briefly describe the circuit(s) involved.
- Considerations: This topic will give additional information that the technician may find useful.
- How Alarm is Set: This topic briefly describes how the alarm is set.
- How Alarm is Cleared: This topic briefly describes how the alarm is cleared.
- Diagnostic Procedure: This topic will list the specific diagnostic procedures to be followed by the technician.

Electrostatic Discharge

The following electrostatic precautions must be taken:

- Keep all Base Controllers, HMI Control Panels, and Expansion Modules (if multi-temp unit) in anti-static bags at all times.
- When working with electrical circuits that contain microprocessors, always wear an ESD wrist strap and connect the opposite end to the chassis ground or CH terminal. This precaution will prevent electrostatic discharge from damaging circuits.

Physical Protection

Protect any defective Base Controller, HMI Control Panel, or Expansion Module (if multi-temp unit) from physical damage by placing them in the shipping carton supplied with the replacement. They will be returned to Thermo King for failure analysis and possible remanufacture.

Corrective Actions As A Result Of Alarm Codes

Every effort should be made to perform a Pretrip Test on a unit suspected of having a defect. In almost all cases, the Pretrip Test will result in one or more alarm codes that will lead you directly to the problem.

Download the ServiceWatch Data Logger using the WinTrac Service Tool. Review the data to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is set and cleared. This data can be very helpful in determining the cause of the alarm.

00 NO ALARMS EXIST

No action required.

02 EVAPORATOR COIL SENSOR (ZONE)

Alarm Type

Check (Shutdown during a Pretrip Test)

Associated Alarm Codes

13 Sensor Calibration Check

111 Unit Not Configured Correctly

Component Description and Location

This sensor is an un-graded sensor and does not require calibration. The sensor is located on the evaporator coil suction header plate.

Circuit Description

This sensor circuit is a two wire circuit and is polarity sensitive. The Zone 1 sensor is connected to the Base Controller. Zone 2 and Zone 3 sensors are connected to the Expansion Module. The CTP (+) wire connects to the blue sensor wire. The CTN (-) wire connects to the brown sensor wire. The Zone 1 sensor wires are routed in the Sensor Harness and the MT Harness. The Zone 2 and Zone 3 sensor wires are located in the MT Harness. Refer to the Schematic and Wiring Diagram for connectors and pin numbers for each zone sensor.

Considerations

1. Sensors should be positioned to minimize the potential for moisture entry where the wires enter the sensor shell. Mount sensors with the barrel up and the wires down wherever possible.
2. Sensor alarms are classified as either Soft Failures or Hard Failures.

   A Soft Failure is defined as erratic operation or sensor drift that exceeds acceptable tolerances. If this occurs, the alarm code for the suspect sensor will be set along with Alarm Code 13. This indicates a potential problem that may not be immediately apparent, and also shows that a hard failure as defined below did not occur. Alarm Code 13 is always set if a soft failure occurs.

   Note: *Alarm Code 13 can be cleared by the driver, while sensor Alarm Codes 03, 04 can only be cleared from the Guarded Access Menu. If the unit has only Alarm Code 03, 04 set when inspected, that alarm code may have been originally set with Alarm Code 13. Checking the ServiceWatch data logger download will indicate the conditions that existed when the failure occurred.*

   A Hard Failure is defined by an out of range sensor reading, typically caused by an open or shorted sensor, connector, or harness conductor. The sensor display will show dashes if a hard failure occurs. If this occurs, only the alarm code for that sensor will be set (such as Alarm Code 03 if the control return air sensor failed). Alarm Code 13 will not be set if a hard failure occurs.

   Note: *The controller may not be currently showing dashes for the sensor reading, but the alarm will be present when the unit is inspected. If a sensor alarm code is set, a failure did occur at some point. Checking the ServiceWatch data logger download will indicate when the hard failure occurred.*
3. The sensors located in remote evaporators have two harness connections. One connection point is located on the back of the condenser unit. The second connection is located in the remote evaporator. If a remote zone Alarm Code is present, inspect both connectors for contamination and proper connection (e.g., pushed or damaged pins).

How Alarm is Set

1. If the sensor reading is 200°F (93°C) or over for 10 seconds, Alarm Code 02 is set as a Check Alarm. The sensor reading will display dashes [- - -] and may return to normal. This condition is termed a hard sensor failure.
2. If the sensor reading is -50°F (-46°C) or under for 10 seconds, Alarm Code 02 is set as a Check Alarm. The sensor reading will display dashes [- - -] and may return to normal. The -50°F (-46°C) check is ignored when the zone is in a Low Evaporator Coil Temperature Demand Defrost. This condition is termed a hard sensor failure.
3. If the differential between the coil and other sensors is too large when Alarm Code 02 is cleared, Alarm Code 02 and Alarm Code 13 are set as Check Alarms. This condition is termed a soft sensor failure.
4. If the sensor reading is erratic over time but does not go above 200°F (93°C) or below -50°F (-46°C), Alarm Code 02 and Alarm Code 13 are set as Check Alarms. This condition is termed a soft sensor failure.

5. If a valid sensor reading is detected in a zone that has not been configured, Alarm Code 02 is set as a Check Alarm and Alarm Code 111 is set as a Log Alarm.

How Alarm is Cleared

This alarm can be cleared manually. When the alarm is cleared, the return air sensors, discharge air sensors, and evaporator coil sensor must all read within 30°F (17°C) of each other. If they do not, it is assumed that the sensor reading is not accurate. The alarm code is not cleared and Alarm Code 13 will also be set. Also, if the sensor is over or under range when the alarm clear is attempted, the alarm will not be cleared.

If the alarm is set by #5 above, Alarm Codes 02 and 111 will clear automatically if the unit configuration is changed or if the sensor is no longer exhibiting a valid reading.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

- **Alarm Code 02 (Sensor was out of range):**

  Note: *This is a hard failure.*

  1. Display the sensor reading using the Sensor Menu. If the display shows [- - - -], the sensor is defective and should be replaced. If the condition still exists, check the sensor circuit for an open wire or short to ground (Refer to Service Procedure D01A). Check the Base Controller in accordance with Service Procedure A01A.
  2. If the display is normal proceed as shown below.

- **Alarm Code 02 and Alarm Code 13 (Sensor was reading erratically):**

  Note: *This is a soft failure.*

  1. Review the ServiceWatch data logger and check the sensor reading at the time the alarm was set. Also review the history to see if previous alarm codes exist that would indicate an intermittent problem. If the sensor appears to have read incorrectly, it should be replaced.
  2. If the problem reoccurs, check the sensor connector/sensor circuit in accordance with Service Procedure D01A.

- **Alarm Code 02 and Alarm Code 111 (Configuration Error):**

  1. Check unit configuration to confirm proper setting.
  2. Check the sensor connector/sensor circuit in accordance with Service Procedure D01A.

- **If all or many of the Sensor Codes (02, 03, 04, 05, 06, 11, 12, and 13) are set:**

  1. Verify the 35 pin Base Controller sensor connector J3 is securely attached.
  2. Verify the 35 pin Expansion Module connector is securely attached.
  3. Verify the CAN connector on the Expansion Module is securely connected (Zone 2 and Zone 3 specific alarms).
  4. Check the Base Controller in accordance with Service Procedure A01A.

03 RETURN CONTROL AIR SENSOR (ZONE)

Alarm Type

Check (Shutdown during a Pretrip Test)

Associated Alarm Codes

11 Unit or Zone Controlling on Alternate Sensor

12 Sensor Shutdown

13 Sensor Calibration Check

92 Sensor Grades Not Set

111 Unit Not Configured Correctly

Component Description and Location

The sensor is located in the return air stream. It is a graded sensor. The sensor grade must be set correctly to the actual grade of the sensor installed using the Guarded Access > Sensor Calibration Menu. If the sensor grade is not set, Alarm Code 92 may be set. Refer to Service Procedure A15A.

Circuit Description

This sensor circuit is a two wire circuit and is polarity sensitive. The RTP (+) wire connects to the blue sensor wire. The RTN (-) wire connects to the brown sensor wire. The Zone 1 sensor is connected to the Base Controller. Zone 2 and Zone 3 sensors are connected to the Expansion Module. The Zone 1 sensor wires are routed in the Sensor Harness and the MT Harness. The Zone 2 and Zone 3 sensor wires are located in the MT Harness. Refer to the Schematic and Wiring Diagram for connectors and pin numbers for each zone sensor.

Considerations

1. If a problem occurs with the return air sensor, the unit will switch to Discharge Air Control. Alarm Code 03 and Alarm Code 11 will be set.
2. Sensor codes must be cleared from the Guarded Access Menu before Alarm Code 11 can be cleared.
3. Sensor grades must be correctly set to the actual grade of the sensor installed. Failure to do so may result in nuisance sensor alarm codes.
4. Sensors should be positioned to minimize the potential for moisture entry where the wires enter the sensor shell. Mount sensors with the barrel up and the wires down wherever possible.
5. Sensor alarms are classified as either Soft Failures or Hard Failures.

   A Soft Failure is defined as erratic operation or sensor drift that exceeds acceptable tolerances. If this occurs, the alarm code for the suspect sensor will be set along with Alarm Code 13. This indicates a potential problem that may not be immediately apparent, and also shows that a hard failure as defined below did not occur. Alarm Code 13 is always set if a soft failure occurs.

   Note: *Alarm Code 13 can be cleared by the driver, while sensor Alarm Codes 03, 04 can only be cleared from the Guarded Access Menu. If the unit has only Alarm Code 03, 04 set when inspected, that alarm code may have been originally set with Alarm Code 13. Checking the ServiceWatch data logger download will indicate the conditions that existed when the failure occurred.*

   A Hard Failure is defined by an out of range sensor reading, typically caused by an open or shorted sensor, connector, or harness conductor. The sensor display will show dashes if a hard failure occurs. If this occurs, only the alarm code for that sensor will be set (such as Alarm Code 03 if the control return air sensor failed). Alarm Code 13 will not be set if a hard failure occurs.

   Note: *The controller may not be currently showing dashes for the sensor reading, but the alarm will be present when the unit is inspected. If a sensor alarm code is set, a failure did occur at some point. Checking the ServiceWatch data logger download will indicate when the hard failure occurred.*
6. The sensors located in remote evaporators have two harness connections. One connection point is located on the back of the condenser unit. The second connection is located in the remote evaporator. If a remote zone Alarm Code is present, inspect both connectors for contamination and proper connection (e.g., pushed or damaged pins).

How Alarm is Set

1. If the sensor reading is over 200°F (93°C) for 10 seconds, Alarm Code 03 is set as a Check Alarm. The sensor reading will display dashes [- - -] and may return to normal. This condition is termed a hard sensor failure.
2. If the sensor reading is under -50°F (-46°C) for 10 seconds, Alarm Code 03 is set as a Check Alarm. The sensor reading will display dashes [- - -] and may return to normal. This condition is termed a hard sensor failure.

3. If the differential between the return air temperature and other temperature sensors is too large when Alarm Code 03 is cleared, Alarm Code 03 and Alarm Code 13 are set as Check Alarms. This condition is termed a soft sensor failure.
4. If the sensor reading is erratic over time but does not go above 200°F (93°C) or below -50°F (-46°C), Alarm Code 03 and Alarm Code 13 are set as Check Alarms. This condition is termed a soft sensor failure.
5. If the sensor grade for this sensor is set to 5H, Alarm Code 03 and Alarm Code 92 are set as Check Alarms.
6. If a valid sensor reading is detected in a zone that has not been configured, Alarm Code 03 is set as Check Alarm and Alarm Code 111 is set as a Log Alarm.

How Alarm is Cleared

Note: *This alarm can only be cleared manually from the Guarded Access menu.*

When the alarm is cleared, the return air sensors, discharge air sensors, and evaporator coil sensor must all read within 30°F (17°C) of each other. If they do not, it is assumed that the sensor reading is not accurate. The alarm code is not cleared and Alarm Code 13 will also be set. Also, if the sensor is over or under range when the alarm clear is attempted, the alarm will not be cleared.

If the alarm is set by #5 above, Alarm Code 92 will clear automatically if the sensor grade is changed from 5H. If the sensor grade remains 5H, Alarm Code 92 can not be cleared.

If the alarm is set by #6 above, Alarm Codes 02 and 111 will clear automatically if the unit configuration is changed or if the sensor is no longer exhibiting a valid reading.

Programmable Features

This is a graded sensor. The sensor grade must be correctly set in the Guarded Access Menu.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

- **Alarm Code 03 (Sensor was out of range):**

  Note: *This is a hard failure.*

  1. Display the sensor reading using the Sensor Menu. If the display shows [- - - -], the sensor is defective and should be replaced. If the condition still exists, check the sensor circuit for an open wire or short to ground (Refer to Service Procedure D01A). Check the Base Controller in accordance with Service Procedure A01A.
  2. If the display is normal, proceed as shown below.

- **Alarm Code 03 and Alarm Code 13 (Sensor drifted or was reading erratically):**

  Note: *This is a soft failure.*

  1. Review the ServiceWatch data logger and check the sensor reading at the time the alarm was set. Also, review the history to see if previous alarm codes exist that would indicate an intermittent problem. If the sensor appears to have read incorrectly, it should be replaced.
  2. Verify the sensor grades are set to the actual sensor grade.
  3. Check for an airflow obstruction and correct sensor mounting.
  4. If the problem reoccurs, check the sensor connector/sensor circuit in accordance with Service Procedure D01A.

- **Alarm Code 03 and Alarm Code 92 (Sensor grade set to 5H):**
  1. Verify and set the sensor grade.

- **Alarm Code 03 and Alarm Code 111 (Configuration Error):**
  1. Check unit configuration to confirm the proper setting.
  2. Check the sensor connector/sensor circuit in accordance with Service Procedure D01A.

- **If all or many of the Sensor Codes (02, 03, 04, 05, 06, 11, 12) are set:**
  1. Verify the 35 pin Base Controller sensor connector J3 is securely connected.
  2. Verify the 35 pin Expansion Module connector is securely attached.
  3. Verify the CAN connector on the Expansion Module is securely connected (Zone 2 and Zone 3 specific alarms).
  4. Check the Base Controller in accordance with Service Procedure A01A.

04 DISCHARGE AIR CONTROL SENSOR (ZONE)

Alarm Type

Check (Shutdown during a Pretrip Test)

Associated Alarm Codes

11 Unit or Zone Controlling on Alternate Sensor

12 Sensor Shutdown

13 Sensor Calibration Check

92 Sensor Grades Not Set

111 Unit Not Configured Correctly

Component Description and Location

The sensor is located in the air stream. It is a graded sensor. The sensor grade must be set correctly to the actual grade of the sensor installed using the Guarded Access > Sensor Calibration Menu. If the sensor grade is not set, Alarm Code 92 may be set. Refer to Service Procedure A15A.

Circuit Description

This sensor circuit is a two wire circuit and is polarity sensitive. The DTP (+) wire connects to the blue sensor wire. The DTN (-) wire connects to the brown sensor wire. The Zone 1 sensor is connected to the Base Controller. Zone 2 and Zone 3 sensors are connected to the Expansion Module. The Zone 1 sensor wires are routed in the Sensor Harness and the MT Harness. The Zone 2 and Zone 3 sensor wires are located in the MT Harness. Refer to Schematic and Wiring Diagram for connectors and pin numbers for each zone sensor.

Considerations

1. If the unit is controlling on discharge air temperature and a problem occurs with the discharge air sensor, the unit will switch to Return Air Control and Alarm Code 11 will be set. The appropriate sensor alarm codes will also be set.
2. Sensor codes must be cleared from the Guarded Access Menu before Alarm Code 11 can be cleared.
3. Sensor grades must be correctly set to the actual grade of the sensor installed. Failure to do so may result in nuisance sensor alarm codes.
4. Sensors should be positioned to minimize the potential for moisture entry where the wires enter the sensor shell. Mount sensors with the barrel up and the wires down wherever possible.
5. Sensor alarms are classified as either Soft Failures or Hard Failures.

   A Soft Failure is defined as erratic operation or sensor drift that exceeds acceptable tolerances. If this occurs, the alarm code for the suspect sensor will be set along with Alarm Code 13. This indicates a potential problem that may not be immediately apparent, and also shows that a hard failure as defined below did not occur. Alarm Code 13 is always set if a soft failure occurs.

   Note: *Alarm Code 13 can be cleared by the driver, while sensor Alarm Codes 03, 04 can only be cleared from the Guarded Access Menu. If the unit has only Alarm Code 03, 04 set when inspected, that alarm code may have been originally set with Alarm Code 13. Checking the ServiceWatch data logger download will indicate the conditions that existed when the failure occurred.*

   A Hard Failure is defined by an out of range sensor reading, typically caused by an open or shorted sensor, connector, or harness conductor. The sensor display will show dashes if a hard failure occurs. If this occurs, only the alarm code for that sensor will be set (such as Alarm Code 03 if the control return air sensor failed). Alarm Code 13 will not be set if a hard failure occurs.

   Note: *The controller may not be currently showing dashes for the sensor reading, but the alarm will be present when the unit is inspected. If a sensor alarm code is set, a failure did occur at some point. Checking the ServiceWatch data logger download will indicate when the hard failure occurred.*
6. The sensors located in remote evaporators have two harness connections. One connection point is located on the back of the condenser unit. The second connection is located in the remote evaporator. If a remote zone Alarm Code is present, inspect both connectors for contamination and proper connection (e.g., pushed or damaged pins).

How Alarm is Set

1. If the sensor reading is over 200°F (93°C) for 10 seconds, Alarm Code 04 is set as a Check Alarm. The sensor reading will display dashes [- - -] and may return to normal. This condition is termed a hard sensor failure.
2. If the sensor reading is under -50°F (-46°C) for 10 seconds, Alarm Code 04 is set as a Check Alarm. The sensor reading will display dashes [- - -] and may return to normal. This condition is termed a hard sensor failure.
3. If the differential between the discharge and other sensors is too large when Alarm Code 04 is cleared, Alarm Code 04 and Alarm Code 13 are set as Check Alarms. This condition is termed a soft sensor failure.

4. If the sensor reading is erratic over time but does not go above 200°F (93°C) or below -50°F (-46°C), Alarm Code 04 and Alarm Code 13 are set as Check Alarms. This condition is termed a soft sensor failure.
5. If the sensor grade for this sensor is set to 5H, both Alarm Code 04 and Alarm Code 92 are set as Check Alarms.
6. If a valid sensor reading is detected in a zone that has not been configured, Alarm Code 04 is set as a Check Alarm and Alarm Code 111 is set as a Log Alarm.

How Alarm is Cleared

Note: *This alarm can only be cleared manually from the Guarded Access menu.*

When the alarm is cleared, the return air sensors, discharge air sensors, and evaporator coil sensor must all read within 30°F (17°C) of each other. If they do not, it is assumed that the sensor reading is not accurate. The alarm code is not cleared and Alarm Code 13 will also be set. Also, if the sensor is over or under range when the alarm clear is attempted, the alarm will not be cleared.

If the alarm is set by condition #5 above, Alarm Code 92 will clear automatically if the sensor grade is changed from 5H. If the sensor grade remains 5H, Alarm Code 92 can not be cleared.

If the alarm is set by #6 above, Alarm Codes 04 and 111 will clear automatically if the unit configuration is changed or if the sensor is no longer exhibiting a valid reading.

Programmable Features

This is a graded sensor. The sensor grade must be correctly set in the Guarded Access Menu.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

- **Alarm Code 04 (Sensor was out of range):**

  Note: *This is a hard failure.*

  1. Display the sensor reading using the Sensor Menu. If the display shows [- - - -], the sensor is defective and should be replaced. If the condition still exists, check the sensor circuit for an open wire or short to ground (Refer to Service Procedure D01A). Check the Base Controller in accordance with Service Procedure A01A.
  2. If the display is normal, proceed as shown below.

- **Alarm Code 04 and Alarm Code 13 (Sensor drifted or was reading erratically):**

  Note: *This is a soft failure.*

  1. Review the ServiceWatch data logger and check the sensor reading at the time the alarm was set. Also, review the history to see if previous alarm codes exist that would indicate an intermittent problem. If the sensor appears to have read incorrectly, it should be replaced.
  2. Verify the sensor grades are set to the actual sensor grade.
  3. Check for an airflow obstruction and correct sensor mounting.
  4. If the problem reoccurs, check the sensor connector/sensor circuit in accordance with Service Procedure D01A.

- **Alarm Code 04 and Alarm Code 92 (Sensor grade set to 5H):**

  1. Verify and set the sensor grade.

- **Alarm Code 04 and Alarm Code 111 (Configuration Error):**

  1. Check unit configuration to confirm the proper setting.
  2. Check the sensor connector/sensor circuit in accordance with Service Procedure D01A.

- **If all or many of the Sensor Codes (02, 03, 04, 05, 06, 11, 12) are set:**

  1. Verify the 35 pin Base Controller sensor connector J3 is securely connected.
  2. Verify the 35 pin Expansion Module connector is securely attached.
  3. Verify the CAN connector on the Expansion Module is securely connected (Zone 2 and Zone 3 specific alarms).
  4. Check the Base Controller in accordance with Service Procedure A01A.

05 AMBIENT TEMPERATURE SENSOR

Alarm Type

Check (Shutdown during a Pretrip Test)

Associated Alarm Codes

13 Sensor Calibration Check

Component Description and Location

This sensor is an un-graded sensor and does not require calibration. The sensor is located in the condenser air stream behind the condenser grill.

Circuit Description

This sensor circuit is a two wire circuit and is polarity sensitive. The ATP (+) wire connects to the blue sensor wire. The ATN (-) wire connects to the brown sensor wire. The wires are routed in the Sensor Harness and the sensor is hardwired to the harness. Refer to the Schematic Diagram and Wiring Diagram for connectors and pin numbers for the ambient temperature sensor.

Considerations

1. Sensors should be positioned to minimize the potential for moisture entry where the wires enter the sensor shell. Mount sensors with the barrel up and the wires down wherever possible.
2. Sensor alarms are classified as either Soft Failures or Hard Failures.

   A Soft Failure is defined as erratic operation or sensor drift that exceeds acceptable tolerances. If this occurs, the alarm code for the suspect sensor will be set along with Alarm Code 13. This indicates a potential problem that may not be immediately apparent, and also shows that a hard failure as defined below did not occur. Alarm Code 13 is always set if a soft failure occurs.

   Note: *Alarm Code 13 can be cleared by the driver, while sensor Alarm Codes 03, 04 can only be cleared from the Guarded Access Menu. If the unit has only Alarm Code 03, 04 set when inspected, that alarm code may have been originally set with Alarm Code 13. Checking the ServiceWatch data logger download will indicate the conditions that existed when the failure occurred.*

   A Hard Failure is defined by an out of range sensor reading, typically caused by an open or shorted sensor, connector, or harness conductor. The sensor display will show dashes if a hard failure occurs. If this occurs, only the alarm code for that sensor will be set (such as Alarm Code 03 if the control return air sensor failed). Alarm Code 13 will not be set if a hard failure occurs.

   Note: *The controller may not be currently showing dashes for the sensor reading, but the alarm will be present when the unit is inspected. If a sensor alarm code is set, a failure did occur at some point. Checking the ServiceWatch data logger download will indicate when the hard failure occurred.*

How Alarm is Set

1. If the sensor reading is over 200°F (93°C) for 10 seconds, Alarm Code 05 is set as a Check Alarm. The sensor reading will display dashes [- - -] and may return to normal. This condition is termed a hard sensor failure.
2. If the sensor reading is under -50°F (-46°C) for 10 seconds, Alarm Code 05 is set as a Check Alarm. The sensor reading will display dashes [- - -] and may return to normal. This condition is termed a hard sensor failure.
3. If the sensor reading is erratic over time but does not go above 200°F (93°C) or below -50°F (-46°C), Alarm Code 05 and Alarm Code 13 are set as Check Alarms. This condition is termed a soft sensor failure.

How Alarm is Cleared

This alarm is cleared manually. If the sensor is over or under range when the alarm clear is attempted, the alarm will not be cleared.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

- **Alarm Code 05 (Sensor was out of range) Only:**

  Note: *This is a hard failure.*

1. Display the sensor reading using the Sensor Menu. If the display shows [- - - -], the sensor is defective and should be replaced. If the condition still exists, check the sensor circuit for an open wire or short to ground (Refer to Service Procedure D01A). Check the Base Controller in accordance with Service Procedure A01A.
2. If the display is normal, proceed as shown below.

- **Alarm Code 05 and Alarm Code 13 (Sensor drifted or was reading erratically):**

  Note: *This is a soft failure.*

  1. Review the ServiceWatch data logger and check the sensor reading at the time the alarm was set. Also, review the history to see if previous alarm codes exist that would indicate an intermittent problem. If the sensor appears to have read incorrectly, it should be replaced.
  2. Check for an airflow obstruction and correct sensor mounting.
  3. If the problem reoccurs, check the sensor connector/sensor circuit in accordance with Service Procedure D01A.
- **If all or many of the Sensor Codes (02, 03, 04, 05, 06, 11, 12) are set:**
  1. Verify the 35 pin Base Controller sensor connector J3 is securely connected.
  2. Check the Base Controller in accordance with Service Procedure A01A.

06 ENGINE COOLANT TEMPERATURE SENSOR

Alarm Type

Log, Check, or Shutdown (Shutdown during a Pretrip Test or if Alarm Code 37 is set)

Becomes a Log Alarm if the unit is switched to electric operation

Associated Alarm Codes

37 Check Engine Coolant Level

Component Description and Location

This sensor is an un-graded sensor and does not require calibration. The sensor is located in the engine thermostat housing.

Circuit Description

This sensor circuit is a two wire circuit and is polarity sensitive. The WTP (+) wire connects to the blue sensor wire. The WTN (-) wire connects to the brown sensor wire. The wires are routed in the Sensor Harness. The sensor is connected to the harness with a Deutsch connector. Refer to the Schematic Diagram and Wiring Diagram for connectors and pin numbers for the coolant temperature sensor.

Considerations

Connectors should be positioned to minimize the potential for moisture entry where the wires enter the connector shell.

How Alarm is Set

1. If the sensor reading is 250°F (121°C) or over for 10 seconds, Alarm Code 06 is set as a Check Alarm. The sensor reading will display dashes [- - -] and may return to normal.
2. If the sensor reading is -50°F (-46°C) or under for 10 seconds, Alarm Code 06 is set as a Check Alarm. The sensor reading will display dashes [- - -] and may return to normal.

How Alarm is Cleared

This alarm is cleared manually. If the sensor is over or under range when the alarm clear is attempted, the alarm will not be cleared.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

- **Alarm Code 06 (Sensor was out of range) Only:**

  Note: *This is a hard failure.*

  1. Display the sensor reading using the Sensor Menu. If the display shows [- - - -], the sensor is defective and should be replaced. If the condition still exists, check the sensor circuit for an open wire or short to ground. Refer to Service Procedure D01A. Check the Base Controller in accordance with Service Procedure A01A.
  2. Verify coolant level is correct and cooling system is correctly bled of air, especially if Alarm Code 37 is present.

- **If all or many of the Sensor Codes (02, 03, 04, 05, 06, 11, 12) are set:**

  1. Verify that the 35 pin Base Controller sensor connector J3 is securely connected.
  2. Check the Base Controller in accordance with Service Procedure A01A.

07 ENGINE RPM SENSOR

Alarm Type

Check

Associated Alarm Codes

17 Engine Failed to Crank

48 Check Belts or Clutch

163 Emissions Control Failure

Component Description and Location

The flywheel sensor is a proximity sensor that generates a pulse as each flywheel tooth passes the sensor. The Base Controller counts these pulses and performs the arithmetic necessary to convert the pulses into engine rpm. It is located on the flywheel housing above the starter.

Circuit Description

The flywheel sensor circuit is a two wire circuit and is not polarity sensitive. The FS1-01 wire connects the Base Controller 36 pin connector J7 pin 35 to one side of the flywheel sensor. The FS2-01 wire connects the Base Controller 36 pin connector J7 pin 36 to the other side of the flywheel sensor. The sensor wires are routed in the Main Harness.

How Alarm is Set

1. If the alternator frequency is greater than 100 Hz and oil pressure input is high but the RPM sensor indicates less than 800 RPM, Alarm Code 07 is set as a Check Alarm.
2. If the alternator frequency is greater than 100 Hz and oil pressure input is high but the RPM sensor indicates less than 300 RPM for 4 seconds, Alarm Code 07 is set as a Check Alarm.
3. If the RPM is less than 40 during an engine start attempt, Alarm Code 07 is set as a Check Alarm.

Note: *Units Equipped with Tier 4 Engines Only. If this alarm code is set, Alarm Code 163 will also be set.*

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Disconnect the sensor wires at the flywheel sensor. Check the AC voltage at the sensor with the engine running. If a small AC voltage (greater than 1.0 Vac) is not present, check the sensor adjustment. Turn the unit off and loosen the lock nut and turn the sensor in until it contacts the flywheel. Back the sensor out ½ turn and tighten the lock nut. Start the unit and recheck the sensor voltage. If more than 1.0 Vac is still not present, the sensor is defective and must be replaced.
2. Disconnect the FS1-01 and FS2-01 connections and check the flywheel sensor continuity. The resistance between the flywheel sensor terminals should be approximately 250 to 300 ohms. Also check from each flywheel sensor terminal to ground. If either terminal is shorted to ground, the flywheel sensor is defective.
3. If AC voltage is present, disconnect the flywheel harness at the Base Controller and disconnect the flywheel sensor. Using a Fluke meter set for ohms, check for shorts to chassis ground on the FS1-01 and FS2-01 wires. If a short exists, examine the wiring harness for chaffed areas and repair, as required.
4. If no shorts to chassis ground exist, connect the FS1-01 wire to the FS2-01 wire at the sensor. Check continuity from FS1-01 to FS2-01 at the 36 pin Base Controller connector. The circuit should measure less than one ohm. If the circuit is open, check the harness using the wiring diagram for the unit.

09 HIGH EVAPORATOR TEMPERATURE

Alarm Type

Shutdown

Associated Alarm Codes

02 Evaporator Coil Sensor

04 Discharge Air Control Sensor

Component Description and Location

This sensor is an un-graded sensor and does not require calibration. The sensor is located on the evaporator coil suction header plate.

How Alarm is Set

If the unit is running and the evaporator coil temperature was greater than or equal to 155°F (68°C) or the discharge air temperature was greater than or equal to 135°F (57°C), Alarm Code 09 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check refrigeration system operation, especially in heat and defrost.
   a. This alarm may be set if the hot gas solenoid is stuck in the open position.
   b. This alarm can be set if a remote evaporator motor(s) failed or is inoperable due to a faulty connection or Expansion Module output failure.
2. Check the evaporator fan for proper operation.
3. If both the coil temperature sensor and the discharge temperature sensor are failed, the defrost cycle is terminated on time. If this occurs, the unit may remain in defrost long enough to cause excessive evaporator coil temperature.
4. Check evaporator coil sensor operation, as shown in Alarm Code 02. If the evaporator coil sensor reads high due to a defective sensor, Alarm Code 09 may be set as a result.
5. The sensors located in remote evaporators have two harness connections. One connection point is located on the back of the condenser unit. The second connection is located in the remote evaporator. If a remote zone alarm code is present, inspect both connectors for contamination and proper connection (e.g., pushed or damaged pins).

10 HIGH DISCHARGE PRESSURE

Alarm Type

Prevent or Shutdown

Associated Alarm Codes

"84 Restart Null," p. 263

"86 Forced Unit Operation," p. 265

Component Description and Location

The High Pressure Cutout Switch (HPCO) is located on the compressor discharge manifold of reciprocating compressors or in the discharge line of scroll compressors.

Circuit Description

The high pressure cutout circuit is a two wire circuit. The PHPC-01 wire connects the Base Controller 36 pin connector J7 pin 17 to one side of the high pressure cutout switch. The HPCO-01 wire connects the Base Controller 36 pin connector J7 pin 18 to the other side of the high pressure cutout switch. The switch is not polarity sensitive. The switch wires are routed in the Main Harness. The HPCO switch is connected to the Main Harness with a Deutsch connector.

Considerations

If the HPCO switch is open, it will always shut the unit down. The switch contacts break power to the Run Relay and the fuel solenoid.

How Alarm is Set

1. If the HPCO switch opens, Alarm Code 10 is set as a Prevent Alarm. Two restart attempts will be made to allow continued operation at temporarily reduced performance. If, at the end of the two attempts full performance is not possible, the alarm is set as a Shutdown Alarm. The temporary shutdown period is 15 minutes. Alarm Code 84 is set along with Alarm Code 10 to indicate the unit is in a temporary shutdown mode.

   If continuous restarts are enabled, a Shutdown Alarm is not set after two attempts. The temporary shutdown period is 60 minutes if continuous restarts are enabled. Alarm Code 84 is set along with Alarm Code 10 to indicate the unit is in a temporary shutdown mode.

   If restarts are disabled, the alarm will be set as a shutdown on the first occurrence.

2. If the discharge pressure transducer exceeds a pre-set value (greater than 470 PSIG and less than 500 PSIG for five seconds) and the discharge pressure transducer is not failed, Alarm Code 10 is set as a Prevent Alarm. Two restart attempts will be made to allow continued operation at temporarily reduced performance. If, at the end of the two attempts full performance is not possible, the alarm is set as a Shutdown Alarm. The temporary shutdown period is 15 minutes. Alarm Code 84 is set along with Alarm Code 10 to indicate the unit is in a temporary shutdown mode.

   If continuous restarts are enabled, a Shutdown Alarm is not set after two attempts. The temporary shutdown period is 60 minutes if continuous restarts are enabled. Alarm Code 84 is set along with Alarm Code 10 to indicate the unit is in a temporary shutdown mode.

   If restarts are disabled, the alarm will be set as a shutdown on the first occurrence.

How Alarm is Cleared

1. The alarm can be cleared manually or may be reset if the condition no longer exists.
2. The alarm will clear automatically at the conclusion of a successful prevent routine.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the refrigeration system for high discharge pressure and correct as required.
2. Check the HPCO for proper operation with unit not running. Verify discharge pressure with gauge manifold. If discharge pressure is less than switch opening pressure (refer to Specifications), resistance across the switch contacts should read less than one ohm.
3. If HPCO checks good in Step 2, reconnect unit harness and check resistance at J7 pin 17 and 18. Resistance should read less than one ohm. A resistance of greater than one ohm indicates an open or high resistance.
4. Check the Base Controller High Pressure Cutout fuse F25.
5. Check the discharge pressure transducer for correct and accurate readings.

6. Check the refrigeration system valves for correct operation. A fault that prevents refrigerant flow from the system high side to the system low side may create high discharge pressure.
7. Review the ServiceWatch download in technician level view. The associated alarm data will show the status of the HPCO switch and the discharge pressure at the time the alarm was set. If this data indicates that the HPCO switch opened but the discharge pressure remained within acceptable limits, the actual problem is a defective HPCO switch or circuit, not high discharge pressure.

11 UNIT OR ZONE CONTROLLING ON ALTERNATE SENSOR

Alarm Type

Zone Specific Check

Associated Alarm Codes

03 Return Control Air Sensor

04 Discharge Air Control Sensor

12 Sensor Shutdown

Component Description and Location

Refer to Associated Alarm Codes.

Circuit Description

Refer to Associated Alarm Codes.

How Alarm is Set

The primary control sensor (either return or discharge depending on unit settings) has failed and the unit is controlling on the alternate sensor. If the unit is operating with return air sensor control and the return air sensor fails, the unit will control using the discharge air sensor. If the unit is operating with discharge air sensor control and the discharge air sensor fails, the unit will control using the return air sensor.

How Alarm is Cleared

This alarm is cleared manually. The associated sensor Alarm Code must be cleared before Alarm Code 11 can be cleared.

If Alarm Code 12 is set, Alarm Code 11 will be auto cleared.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

Determine which sensor alarm codes are present and proceed as shown for that alarm code.

12 SENSOR SHUTDOWN (ZONE)

Alarm Type

Check or Shutdown

Associated Alarm Codes

03 Return Control Air Sensor

04 Discharge Air Control Sensor

13 Sensor Calibration Check

Component Description and Location

Refer to Associated Alarm Codes.

Circuit Description

Refer to Associated Alarm Codes.

How Alarm is Set

Both return and discharge sensors in a zone have failed.

Zone with Fresh Range Setpoint:

1. With a fresh range setpoint and with only one zone running, the alarm is set as a unit Shutdown Alarm.
2. If more than one zone is running, a zone Shutdown Alarm will be set for the affected zone but the unit can continue to run as required by unit or other zone demands. The affected zone will be forced to zone null.
3. If the affected zone setpoint is changed to a frozen range setpoint, the zone will remain in zone shutdown.

Zone with Frozen Range Setpoint:

1. With a frozen range setpoint, the alarm is set as a zone Check Alarm and the zone will be forced into low speed cool.
2. If the affected zone setpoint is changed to a fresh range setpoint, the zone Check Alarm will become a zone Shutdown Alarm and the affected zone will be forced to zone null.

How Alarm is Cleared

This alarm is cleared automatically when the associated sensor Alarm Codes 03 and 04 are cleared.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

Determine which sensor alarm codes are present and proceed as shown for that alarm code.

13 SENSOR CALIBRATION CHECK

Alarm Type

Zone Specific Check

Associated Alarm Codes

02 Evaporator Coil Sensor

03 Return Control Air Sensor

04 Discharge Air Control Sensor

05 Ambient Temperature Sensor

65 Abnormal Temperature Differential

Component Description and Location

Refer to Associated Alarm Codes.

Circuit Description

Refer to Associated Alarm Codes.

Considerations

Sensor alarms are classified as either Soft Failures or Hard Failures.

A Soft Failure is defined as erratic operation or sensor drift that exceeds acceptable tolerances. If this occurs, the alarm code for the suspect sensor will be set along with Alarm Code 13. This indicates a potential problem that may not be immediately apparent, and also shows that a hard failure as defined below did not occur. Alarm Code 13 is always set if a soft failure occurs.

Note: *Alarm Code 13 can be cleared by the driver, while sensor Alarm Codes 03, 04 can only be cleared from the Guarded Access Menu. If the unit has only Alarm Code 03, 04 set when inspected, that alarm code may have been originally set with Alarm Code 13. Checking the ServiceWatch data logger download will indicate the conditions that existed when the failure occurred.*

A Hard Failure is defined by an out of range sensor reading, typically caused by an open or shorted sensor, connector, or harness conductor. The sensor display will show dashes if a hard failure occurs. If this occurs, only the alarm code for that sensor will be set (such as Alarm Code 03 if the control return air sensor failed). Alarm Code 13 will not be set if a hard failure occurs.

Note: *The controller may not be currently showing dashes for the sensor reading, but the alarm will be present when the unit is inspected. If a sensor alarm code is set, a failure did occur at some point. Checking the ServiceWatch data logger download will indicate when the hard failure occurred.*

How Alarm is Set

1. Evaporator Coil Sensor Check: If the evaporator coil, return, and discharge sensors do not read within a specified number of degrees of each other 20 minutes after a defrost cycle terminates, Alarm Code 13 is set as a Check Alarm. Alarm Code 02 will also be set.
2. Return and Discharge Sensor Check: If sensors drift apart, Alarm Code 65 is set. If the return and discharge sensors are reading erratically over a specified time. Alarm Code 13 will be set as a Check Alarm along with the alarm code for the erratic sensor (Alarm Code 03 or Alarm Code 04). If the erratic sensor cannot be determined and the temperature differential is greater than the allowable limits, Alarm Code 13 and Alarm Code 65 will be set.
3. Return, Discharge, Evaporator Coil, and Ambient Sensor Check: If one or more of the return, discharge, evaporator coil or ambient sensors are reading erratically over a specified time, Alarm Code 13 will be set along with the alarm code for the erratic sensor (02, 03, 04, or 05).

How Alarm is Cleared

This alarm is cleared manually. The associated sensor code must be cleared from the Guarded Access menu.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

Determine which sensor alarm codes (02, 03, 04, or 05) are present along with Alarm Code 13. Proceed as shown for that alarm code.

15 CHECK GLOW PLUGS

Alarm Type

Log, Check, or Shutdown

Associated Alarm Codes

62 Ammeter Out of Calibration

Component Description and Location

The glow plugs are located on the engine intake manifold.

Circuit Description

Power to the glow plugs is supplied by the H circuit. The associated Base Controller fuse is fuse F5. Glow plug current is monitored by the Base Controller shunt.

How Alarm is Set

1. If the current draw is out of specification during an engine start, Alarm Code 15 is set as a Log Alarm if the current is below the minimum and the battery voltage is within specifications. The alarm is set as a Check Alarm if the current exceeds the maximum specification. Minimum preheat current for the truck unit glow plugs is 10 amps. Maximum preheat starting current for the truck unit glow plugs is 23 amps.
2. If the current draw is out of specification during a Pretrip Test, Alarm Code 15 is set as a Shutdown Alarm. Minimum preheat current on the truck unit glow plugs is 10 amps. Maximum preheat current for the truck unit glow plugs is 23 amps.
3. If during a Pretrip Test the current does not return to less than 0.5 amps when de-energized, Alarm Code 15 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the operation of the preheat circuit using Interface Board Test Mode. LED 3 should illuminate. Current draw should be approximately 14 amps.
2. If the current draw is zero, check for a blown fuse F5, defective K2 Preheat Relay, or an open “H” circuit.
3. If the current draw is low, check for low battery voltage or high circuit resistance.
4. If the current draw is in excess of 23 amps, check for a shorted glow plug or shorted “H” circuit.
5. Check for battery voltage at the glow plugs when the preheat circuit is energized. The voltage should be above 11.2 volts. If the voltage is low, check the entire preheat circuit for excessive resistance due to burned preheat relay contacts or loose or corroded connections. Verify all connections are secure.
6. Verify the current values above with an external ammeter. If the values do not match, the shunt may be defective. Check the Base Controller in accordance with Service Procedure A01A.

17 ENGINE FAILED TO CRANK

Alarm Type

Log, Check, Prevent, or Shutdown in Diesel Mode; Log in Electric Mode

Associated Alarm Codes

20 Engine Failed to Start

63 Engine Stopped

84 Restart Null

How Alarm is Set

1. If the engine fails to reach 40 RPM or rises above and then falls below 40 RPM during the engine crank sequence, this alarm is set as a Prevent Alarm. Two attempts are made to crank, and Alarm Code 17 is set as a Shutdown Alarm.
2. An Alarm Code 17 that follows an Alarm Code 20/84 will be set as a Shutdown Alarm.
3. If Alarm Code 17 follows an Alarm Code 63 that has been cleared, only one crank attempt will be made.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the battery cables for clean and tight connections. Check the condition of the battery with a load tester (SB only) rated for the CCA of the battery.
2. Check available voltage on the 8S wire at the starter solenoid while the unit is going through a start sequence. A forced engine start can be attempted by switching to “continuous” run mode. If voltage is present during start attempt, either the starter is defective, the engine/compressor is locked, or a poor ground exists between the bell housing and the starter face (check for possible corrosion).
3. If no or low voltage is present on 8S during start attempt, verify LED 25 is illuminated during a start attempt.
4. If LED 25 is not illuminated, check F3 fuse.
5. Check 8S circuit from the controller to the starter for broken wire, loose crimps, or a pushed pin.
6. With the battery disconnected, attempt to turn the engine over with a breaker bar.
7. If a Model 50 Electric Standby unit, check for a failed clutch or seized electric motor.
8. Verify Servicewatch download RPM is reading accurately.

18 HIGH ENGINE COOLANT TEMPERATURE

Alarm Type

Prevent or Shutdown in Diesel Mode

Log in Electric Mode

Associated Alarm Codes

06 Engine Coolant Temperature Sensor

41 Check Engine Coolant Temperature

42 Unit Forced to Low Speed

84 Restart Null

235 High Engine Coolant Temperature Check

Considerations

1. This alarm becomes a Log Alarm if the unit is switched to Electric Mode. Alarm Code 18 alarm conditions will be monitored while the unit is operating in Electric Mode, and will auto-clear when the engine coolant temperature is reduced to a safe value.
2. If Limited Alarm Restart II is ENABLED and Alarm Code 18 is set the third time in a continuous 12 hour period after Alarm Code 18 was cleared twice manually via the HMI, the unit will permanently shut down and will not be allowed to restart unless Alarm Code 18 is cleared via Guarded Access. During this permanent shutdown event, Alarm Code 18 cannot be cleared outside of Guarded Access.

How Alarm is Set

1. If the coolant temperature is greater than 225°F (107°C) for 30 seconds as determined by the coolant temperature sensor and the coolant level sensor is not indicating low coolant level, Alarm Code 18 is set as a Prevent Alarm. Two attempts will be made to allow continued operation at temporarily reduced performance. If, at the end of the two attempts full performance is not possible, the alarm is set as a Shutdown Alarm. The temporary shutdown period is 15 minutes. Alarm Code 84 is set along with Alarm Code 18 to indicate the unit is in a temporary shutdown mode.

   If continuous restarts are enabled, a Shutdown Alarm is not set after two attempts. The temporary shutdown period is 60 minutes if continuous restarts are enabled. Alarm Code 84 is set along with Alarm Code 18 to indicate the unit is in a temporary shutdown mode. If restarts are disabled, the alarm will be set as a shutdown on the first occurrence.
2. If the coolant temperature is greater than 225°F (107°C) for 30 seconds as determined by the coolant temperature sensor and the coolant level sensor is indicating low coolant level, Alarm Code 18 is set as a Shutdown Alarm.

How Alarm is Cleared

1. The alarm can be cleared manually if the condition no longer exists. If condition still exists, it will reset.
2. The alarm will clear automatically at the conclusion of a successful prevent routine.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the engine water temperature using the Gauge Menu. If the temperature is above 225°F (107°C), check the engine cooling system to determine the cause of overheating.
2. Check for Alarm Code 37 as a related alarm.

⚠ Caution

Hazardous Pressures!

Do not remove expansion tank cap while coolant is hot.

3. Check the engine coolant level. Bleed air from the cooling system if necessary.
4. Check the water pump drive belt.
5. Check the radiator for airflow and coolant flow restrictions.
6. Check the Water Temperature Sensor in accordance with Alarm Code 06.

19 LOW ENGINE OIL PRESSURE

Alarm Type

Shutdown in Diesel Mode

Log in Electric Mode

Associated Alarm Codes

31 Check Oil Pressure Switch

66 Low Engine Oil Level

Component Description and Location

The oil pressure switch is located at the side of the oil filter housing.

Circuit Description

The low oil pressure switch circuit is a two wire circuit. The 20B wire connects the Base Controller 36 pin connector J7 pin 28 to the low oil pressure switch. The CHO wire goes from the switch to the ground plate main stud. The switch is not polarity sensitive and is closed on low oil pressure. This applies chassis ground to the Base Controller. The switch wire is routed in the Main Harness.

Considerations

This alarm becomes a Log Alarm if the unit is switched to Electric Mode. It will again become a Shutdown Alarm if the unit is switched to Diesel Mode.

How Alarm is Set

If running in diesel mode and the oil pressure is low for 30 seconds, Alarm Code 19 is set as a Shutdown Alarm. If the low oil level switch is indicating low oil level when this occurs, Alarm Code 66 Low Engine Oil Level will also be set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check for Alarm Code 31 as a related alarm.
2. Check engine oil level.
3. Display the oil pressure when the unit is running, using the Gauge Menu. The oil pressure should be [OK]. If not, the switch may be stuck closed or the switch circuit may be shorted. If shorted, Alarm Code 31 would be active.
4. Verify the oil pressure switch is open with good oil pressure and closed with low oil pressure. The oil pressure switch should be closed when the engine is not running and open when the engine is running. Confirm using an ohmmeter.
5. Check the voltage of the 20B-01 wire at the 36 pin Base Controller connector J7 pin 28. Battery volts should be present when the engine is running.
6. Check the 20B wire in the Main Harness with an ohmmeter for continuity in accordance with Service Procedure H04A.
7. Connect an external oil pressure gauge and confirm that adequate oil pressure (20 psig or above) is present when the unit is running.

20 ENGINE FAILED TO START

Alarm Type

Log, Check, Prevent, or Shutdown in Diesel Mode

Log in Electric Mode

Associated Alarm Codes

15 Check Air Intake Heater

17 Engine Failed to Crank

63 Engine Stopped Reason Unknown

84 Restart Null

Considerations

This alarm becomes a Log Alarm if the unit is switched to Electric Mode.

How Alarm is Set

1. If the engine failed to start after the starter motor was allowed to crank for the maximum allowed time, Alarm Code 20 is set as a Prevent Alarm. Two start attempts are normally made.
2. If the engine coolant sensor temperature is greater than 10°F (-12°C), the crank timer on the first start attempt is 15 seconds. The crank timer on the second start is 15 seconds.
3. If the engine coolant temperature is less than 10°F (-12°C), the crank timer on the first start attempt is six seconds. The crank timer on the second start is 30 seconds.

Notes:

1. *If Alarm Code 20 follows an Alarm Code 17/84, Alarm Code 20 will be set as a Shutdown Alarm.*
2. *If Alarm Code 20 follows an Alarm Code 63 alarm clear, only one crank attempt will be made.*

How Alarm is Cleared

1. The alarm can be cleared manually if the condition no longer exists. If condition still exists, it will reset.
2. The alarm will clear automatically at the conclusion of a successful prevent routine.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the unit fuel level.
2. Check fuel solenoid for proper operation, fuel pump, and fuel system electrically, mechanically and for fuel flow restrictions or blockages.
3. Check for cause of slow start or no start of the engine.
4. In cold ambient temperatures, check for fuel gelling.
5. Check for restricted air cleaner or air intake system.
6. Verify the intake air heater is operating properly, using Interface Board Test Mode.
7. If a Model 50 electric standby unit, check for a failed clutch or seized electric motor.
8. Verify Servicewatch download RPM is reading accurately.

21 COOLING CYCLE CHECK (ZONE)

Alarm Type

Prevent

Associated Alarm Codes

23 Cooling Cycle Fault

84 Restart Null

85 Forced Unit Operation

Considerations

1. The zone may be heating when it should be cooling.
2. This is a Prevent Alarm. A second occurrence of this alarm will be set as Alarm Code 23 Cooling Cycle Fault Shutdown Alarm.
3. If restarts are disabled, Alarm Code 23 will be set as a Shutdown Alarm on the first occurrence of the alarm.

How Alarm is Set

If the unit or zone is exhibiting a heating temperature differential (ΔT) while operating in cool mode, Alarm Code 21 is set as a Prevent Alarm.

How Alarm is Cleared

The alarm is cleared automatically or manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check temperature differential by displaying the temperature differential, or by checking the difference between the return and discharge air temperature sensors.
2. Check refrigerant level.
3. Attach gauges and evaluate unit refrigeration system performance.
4. Verify that sensor grades are set correctly.
5. Check for proper air flow. Short cycling, caused by a blocked air flow path, may generate this code.
6. Check the zone hot gas valve. A defective valve that does not return to the cooling position may cause this alarm.

22 HEATING CYCLE CHECK (ZONE)

Alarm Type

Zone Specific Check or Prevent

Associated Alarm Codes

24 Heating Cycle Fault

84 Restart Null

85 Forced Unit Operation

Considerations

1. The zone may be cooling when it should be heating.
2. This is a Prevent Alarm. A second occurrence of this alarm will be set as Alarm Code 24 Heating Cycle Fault Shutdown Alarm if the zone is operating in the fresh setpoint range.
3. The alarm is set as a Check Alarm if the unit is operating in the frozen setpoint range. Heat operation is locked out if an Alarm Code 24 is set in a unit that is operating in the frozen setpoint range.
4. If restarts are disabled, Alarm Code 24 will be set as a Shutdown Alarm on the first occurrence of the alarm.

How Alarm is Set

If the unit or zone is exhibiting a cooling temperature differential (ΔT) while operating in heat mode, Alarm Code 22 is set as a Prevent Alarm.

How Alarm is Cleared

The alarm is cleared automatically or manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the Wintrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check temperature differential by displaying the temperature differential, or by checking the difference between the return and discharge air temperature sensors.
2. Check refrigerant level.
3. Attach gauges and evaluate unit refrigeration system performance.
4. Verify that sensor grades are set correctly.
5. Check for proper air flow. Short cycling, caused by a blocked air flow path, may generate this code.
6. Check zone hot gas valve. A defective valve that does not shift to the heating position may cause this alarm.

23 COOLING CYCLE FAULT (ZONE)

Alarm Type

Zone Specific Shutdown

Associated Alarm Codes

21 Cooling Cycle Check

Considerations

1. The zone may be heating when it should be cooling.
2. This is a Shutdown Alarm. It is typically preceded by Alarm Code 21 Cooling Cycle Check.
3. If restarts are disabled, Alarm Code 23 will be set as a Shutdown Alarm on the first occurrence of the alarm.

How Alarm is Set

If the unit or zone was operating with a heating temperature differential (ΔT) while operating in cool mode and Alarm Code 21 has previously been set, Alarm Code 23 is set as a Shutdown Alarm. If the unit is in a Pretrip Test or Restarts are set DISABLED, Alarm Code 23 can be set without Alarm Code 21 having occurred.

How Alarm is Cleared

This alarm is cleared manually. If the Limited Alarm Restarts feature is active, Alarm Code 23 will be promoted to Guarded Access clear.

If restarts are disabled, Alarm Code 23 will be set as a Shutdown Alarm on the first occurrence of the alarm.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check temperature differential by displaying the temperature differential, or by checking the difference between the return and discharge air temperature sensors.
2. Check refrigerant level.
3. Attach gauges and evaluate unit refrigeration system performance.
4. Verify that sensor grades are set correctly.
5. Check for proper air flow. Short cycling, caused by a blocked air flow path, may generate this code.
6. Check zone hot gas valve for proper operation. A defective valve that does not return to the cooling position may cause this alarm.

24 HEATING CYCLE FAULT (ZONE)

Alarm Type

Shutdown

Associated Alarm Codes

22 Heating Cycle Check

Considerations

1. The zone may be cooling when it should be heating.
2. This is a Shutdown Alarm. It is typically preceded by Alarm Code 22 Heating Cycle Check.
3. If restarts are disabled, Alarm Code 24 will be set as a Shutdown Alarm on the first occurrence of the alarm.
4. This alarm cannot be set in a unit operating in the frozen setpoint range. The alarm is set as a Check Alarm if the unit is operating in the frozen setpoint range. Heat operation is locked out if an Alarm Code 24 is set in a unit that is operating in the frozen setpoint range.

How Alarm is Set

If the unit or zone was operating with a cooling temperature differential (ΔT) while operating in heat mode and Alarm Code 22 has previously been set, Alarm Code 24 is set as a Shutdown Alarm. If the unit is in a Pretrip Test or Restarts are set DISABLED, Alarm Code 24 can be set without Alarm Code 22 having occurred.

How Alarm is Cleared

This alarm is cleared manually. If the Limited Alarm Restarts feature is active, Alarm Code 24 will be promoted to Guarded Access clear.

If restarts are disabled, Alarm Code 24 will be set as a Shutdown Alarm on the first occurrence of the alarm.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check temperature differential by displaying the temperature differential, or by checking the difference between the return and discharge air temperature sensors.
2. Check refrigerant level.
3. Attach gauges and evaluate unit refrigeration system performance.
4. Verify that sensor grades are set correctly.
5. Check for proper air flow. Short cycling, caused by a blocked air flow path, may generate this code.
6. Check zone hot gas valve. A defective valve that does not shift to the heating position may cause this alarm.

25 ALTERNATOR CHECK

Alarm Type

Log, Check, or Shutdown

Associated Alarm Codes

N/A

Considerations

The alternator excite voltage is controlled by the Alternator Excite Output. The Alternator Excite Output will supply alternator excite voltage after the engine starts.

How Alarm is Set

1. If the engine is running, oil pressure is good, charge amps are less than -1.0 amps, and battery volts are less than 13.2 volts for two and a half minutes, the alarm is set as a Check Alarm in normal operation and during a Pretrip Test, and as a Shutdown Alarm in Sleep Mode.
2. If the engine is running, oil pressure is good, and battery volts are greater than 16.0 volts, the alarm is set as a Check Alarm. If the voltage stays above 15.8 volts for two and a half minutes, the alarm is set as a Shutdown Alarm.
3. If the unit is running in electric, the alternator frequency is >100HZ, charge amps are less than -1.0 amps, and battery volts are less than 13.2 volts for two and a half minutes, the alarm is set as a Check Alarm in normal operation and during a Pretrip Test, and as a Shutdown Alarm in Sleep Mode.

How Alarm is Cleared

This alarm is cleared manually. The alarm will also auto clear after setting for high voltage (over 16 Vdc) and then remaining between 13.5 volts and 15.8 volts for one minute.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check and adjust the alternator drive belt.
2. Start the engine or electric motor and check the battery voltage and amperage, using the Gauge Display in the Maintenance Menu. The voltage should be greater than 13.2 volts but less than 16 volts. Current flow should be greater than -1.0 amps.
3. Check the alternator connections.
4. Check the excitation voltage at the alternator. Excitation voltage should be equal to the battery voltage.
5. Check the operation of the Alternator Excite Output using Interface Board Test Mode. Verify the Alternator Excite LED 18 illuminates. The Alternator Excite Output will supply alternator excite voltage as soon as the engine starts.
6. Check the sense voltage at the alternator. Sense voltage should be equal to the battery voltage.
7. Check Fuse F20 on the Base Controller.
8. If the unit is equipped with a Prestolite alternator, verify that fuse F4 is in place on the Base Controller and is not open. Units equipped with a Bosch or a Thermo King alternator should not have fuse F4 installed on the Base Controller.
9. Check for good ground and bare metal connection with ground wire.

26 CHECK REFRIGERATION CAPACITY (ZONE)

Alarm Type

Zone Specific Check

Associated Alarm Codes

32 Refrigeration Capacity Low

85 Forced Unit Operation

Considerations

1. If all configured zones have an Alarm Code 26 set, a unit level Alarm Code 32 will be set.
2. If the unit is running in reduced capacity mode because of a Prevent Alarm and Alarm Code 26 is set, Alarm Code 85 is also set. Alarm Code 85 indicates the unit was forced into a reduced capacity mode.

How Alarm is Set

If the unit heating or cooling capacity is reduced far enough below normal levels to indicate a refrigeration problem, Alarm Code 26 is set as a Check Alarm. The capacity loss is not significant enough to force the unit into shutdown mode.

How Alarm is Cleared

This alarm is cleared manually or automatically.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check zone temperature differential by displaying the temperature differential, or by checking the difference between the zone return and discharge air temperature sensors.
2. Check refrigerant level.
3. Attach gauges and evaluate unit refrigeration system performance.
4. Verify that sensor grades are set correctly.
5. Check for proper air flow. Short cycling, caused by a blocked air flow path, may generate this code.
6. Check the superheat for the affected zone evaporator(s).

28 PRETRIP OR SELF CHECK ABORT

Alarm Type

Shutdown

Associated Alarm Codes

The active associated alarm codes.

How Alarm is Set

If a Shutdown Alarm occurs during a Pretrip test, Alarm Code 28 is set and the unit is shut down. The alarm condition that caused the shutdown is also set. Alarm Code 28 is also set if the unit is turned off while a Pretrip Test is in progress or if the Pretrip Test is terminated by a communications command.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. This is a normal alarm any time the Pretrip Test is terminated before the completion of all tests.
2. Proceed with the corrective actions for any alarm codes that occurred.
3. After repairs, repeat the Pretrip Test. Refer to Section 4 for details.
4. If only Alarm Code 28 is set, the unit may have been turned off during a Pretrip Test, or the test may have been interrupted by a communications request. Clear the alarm and repeat the Pretrip Test.

31 CHECK OIL PRESSURE SWITCH

Alarm Type

Log or Shutdown in Diesel Mode

Log in Electric Mode

Associated Alarm Codes

19 Low Engine Oil Pressure

66 Low Engine Oil Level

Component Description and Location

The oil pressure switch is located at the side of the oil filter housing.

Circuit Description

The low oil pressure switch circuit is a single wire circuit. The 20B wire connects the Base Controller 36 pin connector J7 pin 28 to the low oil pressure switch. The switch is not polarity sensitive and is closed on low oil pressure. This applies chassis ground to the Base Controller. The switch wire is routed in the Main Harness.

Considerations

If this alarm is set as a Shutdown Alarm in diesel mode operation, it becomes a Log Alarm if the unit is switched to electric mode operation.

If the alarm exists in electric mode and the unit is switched to diesel, either condition #1 or #2 below apply.

How Alarm is Set

1. If the unit is in diesel mode but not running (Engine RPM < 40, Alternator frequency < 50), the oil level is good, and the oil pressure switch is not indicating low oil pressure, Alarm Code 31 is set as a Log Alarm.
2. If the unit is in diesel mode but not running (Engine RPM < 40, Alternator frequency < 50), the oil level is not good, and the oil pressure switch is not indicating low oil pressure, Alarm Code 31 is set as a Shutdown Alarm.
3. If the unit is running in electric mode and the oil pressure switch is not indicating low oil pressure, Alarm Code 31 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Display the oil pressure when the unit is not running, using the Gauge Menu. The oil pressure should show [LOW]. If not, the switch may be stuck open or the switch circuit may be open.
2. Check the 20B-01 wires in the controller harness with an ohmmeter for continuity in accordance with Service Procedure H04A.

32 REFRIGERATION CAPACITY LOW (ZONE)

Alarm Type

Shutdown

Associated Alarm Codes

26 Check Refrigeration Capacity

Considerations

Alarm Code 32 requires that Alarm Code 26 has been set first.

How Alarm is Set

If the unit heating or cooling capacity has degraded to the point where it has insufficient capacity to operate, Alarm Code 32 is set as a Shutdown Alarm. The unit's cooling or heating performance is considerably impaired and corrective actions such as defrost have failed to improve performance.

How Alarm is Cleared

This alarm is cleared manually. If the Limited Alarm Restarts feature is active, Alarm Code 32 will be promoted to Guarded Access clear.

If restarts are disabled Alarm Code 32 will be set as a Shutdown Alarm on the first occurrence of the alarm.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check temperature differential by displaying the temperature differential, or by checking the difference between the zone return and discharge air temperature sensors.
2. Check refrigerant level.
3. Attach gauges and evaluate unit refrigeration system performance.
4. Verify that sensor grades are set correctly.
5. Check for proper air flow. Short cycling, caused by a blocked air flow path, may generate this code.
6. Check the compressor and refrigeration system.

33 CHECK ENGINE RPM

Alarm Type

Check (Pretrip Only)

Associated Alarm Codes

07 Engine RPM Sensor

Considerations

Only checked during a Pretrip Test.

How Alarm is Set

1. If during a Pretrip Test the engine high speed RPM is not within the correct range for the unit configuration, Alarm Code 33 is set as a Check Alarm.
2. If during a Pretrip Test the engine low speed RPM is not within the correct range for the unit configuration, Alarm Code 33 is set as a Check Alarm.

Note: *For engine RPM speeds, refer to Specifications.*

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check and adjust high speed in accordance with the Maintenance Manual for the unit.
2. Check and adjust low speed in accordance with the Maintenance Manual for the unit.
3. Check for a binding solenoid or disconnected linkage.
4. Verify unit configuration.

Note: *Use Service Test Mode to run the unit in high speed cool and low speed cool. Refer to Section 4 for details.*

35 CHECK RUN RELAY CIRCUIT

Alarm Type

Shutdown

Associated Alarm Codes

N/A

Circuit Description

The K1 Run Relay, LED 6, and associated fuse are located on the Base Controller. The 7K circuit is internal within the Base Controller.

Power to the Run Relay circuit is supplied by fuse F25. Refer to the schematic diagram for the unit for complete circuit details.

When the Run Relay is energized, 8 circuit power is supplied to the 7K circuit. This alarm code indicates that 7K circuit digital input is not present when the Run Relay output is energized or that 7K power is present when the Run Relay is de-energized.

How Alarm is Set

1. If the Run Relay is energized and the 7K input is low at the Base Controller, Alarm Code 35 is set as a Shutdown Alarm.
2. If the Run Relay is not energized and the 7K input is high at the Base Controller for four seconds, Alarm Code 35 is set as a Shutdown Alarm.
3. If current draw is not between -0.5 to 5 amps when the Run Relay is energized during a Pretrip Test Amps Check, Alarm Code 35 is set as a Shutdown Alarm.
4. If current draw is not less than 0.5 amps when the Run Relay is de-energized during a Pretrip Test Amps Check, Alarm Code 35 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the Run Relay circuit fuse on the Base Controller. Power to the Run Relay circuit is supplied by the 7.5 amp fuse F25. Refer to the schematic diagram for the unit for complete circuit details.
2. Check to verify the K1 Run Relay LED 6 is energized.
3. Check the operation of the K1 Run Relay circuit using Interface Board Test Mode.
4. Check to verify the High Pressure Cutout Switch is closed (HPCO and PHPCO circuits).
5. Check for available voltage at HPCO and PHPCO wires. Battery volts should be present when the unit is turned on.
6. Review the ServiceWatch download. The associated alarm data will show the status of the 7K circuit when the alarm was set.

36 ELECTRIC MOTOR FAILED TO RUN

Alarm Type

Log, Check, Prevent, or Shutdown in Electric Mode

Log in Diesel Mode

Associated Alarm Codes

84 Restart Null

122 Check Diesel/Electric Circuit

Considerations

This alarm becomes a Log Alarm if the unit is switched to diesel.

How Alarm is Set

If the alternator frequency is less than 100 Hz for five seconds when the electric motor should be running, Alarm Code 36 is set as a Prevent or Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

⚠ Warning

Hazardous Voltage!

Units featuring Electric Standby utilize high voltages in 3 phase AC electrical power any time the unit is operating in Electric Mode. This voltage potential is also present any time the unit is connected to a source of external standby power. Extreme care must be used when working on the unit, as these voltages are capable of causing serious injury or death.

1. Check the motor, motor contactor, overload relay, and other associated electric standby motor circuitry. The internal pull coil/hold coil circuits in the contactor may be defective, requiring replacement of contactor.
2. Check the voltages at the phase detect module. Battery voltage should be present on the ER wire and the 8 wire.
3. Check the standby power voltage at the phase detect module. Standby power should be available at L1, L2, and L3.
4. Check the voltage at the motor contactor coils. Battery voltage should be present on either the 7EC or 7EB wire when the motor should be running.
5. Check for a reason that would prevent the motor from turning the alternator, such as slipping belts, clutch, etc.
6. Check the alternator as shown in Alarm Code 25.
7. Download and check the ServiceWatch data logger to determine the operating conditions present when the alarm code was set. Use the running Service Test Mode Feature to duplicate the operating conditions. The alternator frequency and engine RPM are logged in ServiceWatch and this information is viewable in technician mode. This information can be used to confirm the RPM sensor reading and alternator frequency when the alarm was set.

37 CHECK ENGINE COOLANT LEVEL

Alarm Type

Log, Check, or Shutdown in Diesel Mode

Log or Check in Electric Mode

Associated Alarm Codes

"06 Engine Coolant Temperature Sensor,"

Circuit Description

Magnetic Switch: The two wire magnetic switch is actuated by a float inside the coolant expansion tank. The switch is closed if the coolant level is adequate. The two wire switch supplies +5 Vdc from the CLP wire to the CLS wire when the coolant level is adequate. The circuit is opened if coolant level falls below an adequate level. The CLP-01 wire connects the Base Controller 36 pin sensor connector J7 pin 15 to the switch. The CLS-01 wire connects the Base Controller 36 pin sensor connector J7 pin 16 to the switch. The wiring is located in the Main Harness.

Considerations

The Discharge Pressure Transducer, Suction Pressure Transducer, and Coolant Level switch each have a separate 5 Vdc power supply. A short circuit condition in one transducer or switch circuit should not affect the other circuits.

How Alarm is Set

1. If the engine coolant level input indicates low coolant level for three minutes and the unit is in Electric Mode, Alarm Code 37 will be set as a Log Alarm. If the engine coolant level input indicates low coolant level for three minutes and the unit is in Diesel Mode, Alarm Code 37 will be set as a Check Alarm. If the unit is switched to Electric Mode, this alarm remains a Check Alarm.
2. If Alarm Code 06 is set and the engine coolant level input indicates low coolant level for three minutes and the unit is in Electric Mode, Alarm Code 37 will be set as a Check Alarm. If Alarm Code 06 is set and the engine coolant level input indicates low coolant level for three minutes and the unit is in Diesel Mode, Alarm Code 37 will be set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

⚠ Caution

Risk of Injury!

Exercise extreme care when checking hot coolant.

1. Check the engine coolant level and mixture. Verify coolant is above the float switch when the coolant is cold.
2. Check the switch connector for a pushed pin or missing orange pin lock, loose pin crimp, or broken wire.
3. Check that +5 Vdc is present between the CLP-01 wire from the Base Controller and chassis ground.
4. Check the voltage between the CLP-01 wire and the CLS-01 wire. Voltage should be +5 Vdc.
5. If the harness tests are good, test the float switch with an ohmmeter. With normal coolant level (switch closed), the float switch resistance should be less than 1 ohm.
6. If unit is a UTR without coolant level switch installed, it is still possible that this code may set. If set, check the voltage between the CLP-01 wire and the CLS-01 wire. Voltage should be +5 Vdc.

38 ELECTRIC PHASE REVERSED

Alarm Type

Shutdown in Electric Mode

Log in Diesel Mode

Associated Alarm Codes

03 Check Return Air Sensor

04 Check Discharge Air Sensor

90 Electric Overload

Considerations

1. This Shutdown Alarm becomes a Log Alarm if the unit is switched to diesel.
2. This alarm is disabled if Alarm Code 03 or Alarm Code 04 is set for the host unit sensors.

How Alarm is Set

Two phases are reversed on three phase standby power between the motor contactor and the motor or the motor is incorrectly wired. This will cause the compressor and condenser fan to rotate in the wrong direction. This is checked by monitoring the Zone 1 (host) evaporator temperature differential.

1. If the unit is running in Electric Mode in heat or cool for at least 15 minutes and then the temperature differential between return air temperature and discharge air temperature is greater than 50°F (10°C)10°C (50°F) and is still greater than 45°F (7°C)7°C (45°F) after five minutes, Alarm Code 38 is set as a Shutdown Alarm. The large temperature differential indicates the motor is rotating in the wrong direction.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

⚠ Warning

Hazardous Voltage!

Units featuring Electric Standby utilize high voltages in 3 phase AC electrical power any time the unit is operating in Electric Mode. This voltage potential is also present any time the unit is connected to a source of external standby power. Extreme care must be used when working on the unit, as these voltages are capable of causing serious injury or death.

1. Check motor wiring to verify phase rotation is correct.
2. Confirm that the 7EC-01 wire is connected to the MCB motor contactor and the 7EB-01 wire is connected to the MCA motor contactor.
3. Check the voltages at the phase detect module. Battery voltage should be present on the 7EA wire and the 8 wire.
4. Check the standby power voltage at the phase detect module. Standby power should be available at L1, L2, and L3.
5. Confirm that the phase wiring between contactor MCA and MCB is correct.

39 CHECK WATER VALVE CIRCUIT

Alarm Type

Check (Pretrip Only)

Associated Alarm Codes

28 Pretrip Abort

111 Unit Not Configured Correctly

How Alarm is Set

The water valve is not currently used. However, the associated output is checked during the Non-running Pretrip Test to verify nothing has been mistakenly connected to it. The output is energized and then de-energized to verify that no device is connected to the circuit and that the Base Controller is operating properly.

1. If current flow is detected during the output energized phase of the Non-running Pretrip Test, Alarm Code 39 will be set as a Check Alarm and Alarm Code 111 will be set as a Log Alarm. The Non-running Pretrip Test will be allowed to complete.
2. If current flow is detected during the output de-energized phase of the Non-running Pretrip Test, Alarm Code 39 will be set as a Check Alarm, Alarm Code 111 be set as a Log Alarm and Alarm Code 28 will be set as a Shutdown Alarm. The Pretrip Test will be aborted.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check unit configuration to confirm proper setting.
2. Check the Base Controller wiring to verify that there is no connection to connector J7 pin 9.
3. Check the Base Controller in accordance with Service Procedure A01A.

40 CHECK HIGH SPEED CIRCUIT

Alarm Type

Pretrip Only: Log, Check, or Shutdown

Associated Alarm Codes

N/A

Component Description and Location

The high speed solenoid is located at the rear of the injector pump.

Circuit Description

The High Speed Solenoid circuit is a two wire circuit. The High Speed Solenoid is energized by Relay K3 and Fuse F6 on the Base Controller. The 7D wire applies 12 Vdc to one side of the High Speed Solenoid to energize the solenoid. The CHT wire connects the other side of the solenoid to chassis ground at the ground plate. The solenoid is not polarity sensitive, but the suppression diode must be installed with the bar end of the diode toward the 7D wire. The wires are routed in the main harness.

How Alarm is Set

1. If during a Pretrip Test the current is not between 2 to 8 amps when the solenoid is energized, Alarm Code 40 is set as a Check Alarm.
2. If during a Pretrip Test the current does not return to less than 0.5 amps when de-energized, Alarm Code 40 is set as a Shutdown Alarm. If current flow is detected during the output de-energized phase of the Non-running Pretrip Test, Alarm Code 40 is set as a Check Alarm and Alarm Code 28 will be set as a Shutdown Alarm. The Pretrip Test will be aborted.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the operation of the high speed circuit, using Interface Board Test Mode. Verify the High Speed Relay LED 5 illuminates. If LED 5 does not illuminate, the Base Controller may be defective. Check the Base Controller in accordance with Service Procedure A01A.
2. Use the Truck Premium Display amps gauge to check the current drawn by the high speed solenoid, while operating the high speed solenoid with Interface Board Test Mode. The current draw should be approximately 4.6 amps. If the current is greater than 8 amps, check the circuit for a shorted conductor or speed solenoid. If the current draw is zero, check Base Controller fuse F6. Refer to the unit wiring diagrams for wire numbers, locations, and additional details.
3. Energize the high speed solenoid using Interface Board Test Mode, and check for battery voltage on the 7D-01 circuit. If voltage is present at the solenoid terminals and no current was measured in the step above, replace the high speed solenoid. If voltage is not present at the solenoid terminals, check the high speed circuit conductors for continuity. Refer to the unit wiring diagrams for wire numbers, locations, and additional details.

41 CHECK ENGINE COOLANT TEMPERATURE

Alarm Type

Log

Associated Alarm Codes

42 Unit Forced to Low Speed

Considerations

Alarm Code 41 indicates the engine coolant temperature is above expected operating limits, but is not high enough to force a shutdown condition.

How Alarm is Set

1. For all units except T-690/T-890/T-1090/T-1090 Spectrum: If the engine coolant temperature rises above 210°F (98°C) and remains above 205°F (96°C) for 60 seconds, Alarm Code 41 is set as a Log Alarm.
2. For T-690/T-890/T-1090/T-1090 Spectrum units only: If the engine coolant temperature rises above 218°F (103°C) and remains above 218°F (103°C) for 15 seconds, Alarm Code 41 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the engine coolant temperature by pressing the Gauge Key on the Truck Premium Display.

⚠ Caution

Risk of Injury!

Exercise extreme care when checking hot coolant.

2. Check the engine coolant level.
3. Check the water pump drive belt.
4. Check the radiator for airflow or coolant flow blockage.
5. Download and check the ServiceWatch data logger information to determine the operating conditions that were present when the alarm code was set. Use running Service Test Mode to duplicate the operating conditions.

42 UNIT FORCED TO LOW SPEED

Alarm Type

Log or Check

Associated Alarm Codes

09 High Evaporator Temperature

10 High Discharge Pressure

18 High Engine Coolant Temperature

41 Check Engine Coolant Temperature

How Alarm is Set

1. For all units except T-690/T-890/T-1090/T-1090 Spectrum: If the unit has been forced to low speed operation as a result of high engine coolant temperature (210°F or 98°C) and remains above 205°F (96°C) for 60 seconds, Alarm Code 42 will be set as a Log Alarm. Alarm Code 09, 10, 18, 41 will also be set.
2. If the unit is forced to low speed due to low suction pressure, Alarm Code 42 will be set as a Log Alarm. The engine will be put into low speed during this time. If the suction pressure remains low for longer than five minutes, the alarm will be promoted to a Check Alarm. The unit will stay in low speed until suction pressure returns above the threshold.

How Alarm is Cleared

Alarm will self-clear if unit returns to normal operation.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Troubleshoot as shown for the associated alarm code.
2. Download and check the ServiceWatch data logger information to determine the operating conditions that were present when the alarm code was set. Use running Service Test Mode to duplicate the operating conditions.

43 UNIT FORCED TO LOW SPEED MODULATION

Alarm Type

Log

Associated Alarm Codes

10 High Discharge Pressure

18 High Engine Coolant Temperature

41 Check Engine Coolant Temperature

42 Unit Forced to Low Speed

Considerations

Applies to all ETV equipped units.

How Alarm is Set

Unit has been forced to low speed, but the engine coolant temperature is still above acceptable limits. The ETV will be closed to reduce the engine load.

How Alarm is Cleared

Alarm will self-clear if unit returns to normal operation.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Troubleshoot as shown for the associated alarm code.
2. Download and inspect the ServiceWatch data logger information to determine the operating conditions that were present when the alarm code was set. Use running Service Test Mode to duplicate the operating conditions.

44 CHECK FUEL SYSTEM

Alarm Type

Shutdown

Associated Alarm Codes

96 Low Fuel Level

98 Check Fuel Level Sensor

Component Description and Location

Either float style or solid state style fuel level sensor must be installed and selected from Guarded Access > Hardware Configuration > Fuel Sensor Type. Low Fuel Shutdown must be enabled from Guarded Access > Hardware Configuration > Low Fuel Shutdown.

Considerations

Alarm Code 44 is not available if Guarded Access > Programmable Features > Rail Option is set ENABLED.

How Alarm is Set

If a fuel level sensor is enabled and fuel level falls to less than 7% (solid state) or 10% (float) of tank capacity for five minutes, Alarm Code 44 is set as a Shutdown Alarm.

How Alarm is Cleared

If this alarm is set as a Shutdown Alarm, manually clearing the alarm will demote it to a Check Alarm.

This alarm is cleared automatically when the fuel level is increased to more than 15% (solid state) or 20% (float) of tank capacity.

This alarm is cleared automatically if Alarm Code 98 is set.

This alarm is cleared automatically if the unit is switched to Electric Mode operation.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

Important: *Do not open the fuel system unless required.*

1. Check fuel tank level and fill as required.
2. Check fuel and/or fuel tank for contamination.
3. Check the fuel filter/water separator.
4. Check the electric fuel pump filter and clean as necessary.
5. Check fuel level sensor for proper operation.

45 CHECK HOT GAS CIRCUIT (ZONE)

Alarm Type

Zone Specific Check or Shutdown

Associated Alarm Codes

N/A

Component Description and Location

The remote zone hot gas solenoids are located in the remote evaporators.

Circuit Description

The hot gas solenoid circuit is a two wire circuit. Smart FETs in the Expansion Module energize the Hot Gas Solenoids for all zones on multi-temp units. The HGSx wire applies 12 Vdc to one side of the Hot Gas Solenoid to energize the solenoid. The CH wire connects the other side of the solenoid to the remote evaporator chassis ground, which is connected to the unit ground plate via the MT Evap Fan Harness and the MT Fan Harness. Solenoid valves in remote zones have supply circuits with connectors in the remote evaporator and at the condenser unit. The solenoid is not polarity sensitive. The wires are routed in the MT Evap Zone Harness and the MT Harness. Refer to the unit Wiring Diagram for wire numbers, locations, and additional details.

Considerations

1. On systems with remote zone parallel evaporators the respective Expansion Module hot gas valve output will supply power to both of the remote zone hot gas valves. The Pretrip and Smart FET current limits will be adjusted for the increased current drawn by parallel evaporators based on the zone configuration settings.
2. During a non-running Pretrip the current draw is determined by the shunt reading feedback to the Base Controller.
3. During normal operation the current draw is determined by the Smart FET feedback to the Base Controller.
4. If an alarm code is set during normal operation then the ServiceWatch Data Logger will list the Alarm Code, FLTCT (Fault Current), Battery Volts, and the Shunt Current. The FLTCT will be the high or low current draw as determined by the Smart FET feedback that caused the Alarm Code to set.

How Alarm is Set

1. If during normal operation the current is not between 0.5 to 3 amps (1.0 to 6 amps if parallel evaporators) three seconds after the solenoid is energized, Alarm Code 45 is set as a Check Alarm and the output is turned off. If the output circuit is shorted, it will be turned off immediately to protect the circuit and the alarm code will be set. Hot gas valve operation is not allowed until Alarm Code 45 is cleared. The zone will continue to run but with reduced performance until the condition is corrected and the alarm is cleared. If this condition occurs when the unit is in Evacuation Mode, Alarm Code 45 will be set as a Shutdown Alarm.
2. If during normal operation the current does not return to less than 0.5 amps 3 seconds after the solenoid is de-energized, Alarm Code 45 is set as a Check Alarm. Hot gas valve operation is not allowed until Alarm Code 45 is cleared. The zone will continue to run but with reduced performance until the condition is corrected and the alarm is cleared.
3. If during a Pretrip Test the current is not between 0.5 to 3 amps (1.0 to 6 amps if parallel evaporators) when the solenoid is energized, Alarm Code 45 is set as a Check Alarm.
4. If during a Pretrip Test the current does not return to less than 0.5 amps when de-energized, Alarm Code 45 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. FLTCT > 3.0 or 6.0 w/parallel evaporators. The circuit has high amp draw. Check for a shorted circuit or solenoid coil.
2. FLTCT < 0.5. The circuit has low amp draw. Check for high resistance or open in the circuit or solenoid coil.

Indicator LED Diagnosis

1. Verify that the Expansion Module status LED (heartbeat LED) is flashing. If it is not, check the Expansion Module for proper operation in accordance with Service Procedure A01D.

2. If the Expansion Module Status LED is flashing, clear the alarm to reset the Smart FET. Check the operation of the hot gas circuit using Interface Board Test Mode. Verify the appropriate Expansion Module hot gas circuit LED illuminates. For Expansion Module LED identification, refer to the LED decal on the control box door. If the Expansion Module hot gas circuit LED illuminates, proceed to Step 3. If the Expansion Module hot gas circuit LED does not illuminate, proceed to Step 4.
3. If the Expansion Module hot gas circuit LED does illuminate and the alarm is not present, the circuit has high resistance or is open. Use the HMI Control Panel amps gauge to check the current drawn by the hot gas solenoid, while operating the solenoid with Interface Board Test Mode. The current draw should be approximately 1.5 amps (3.0 amps if parallel evaporators). If the current is not within limits, check for high resistance or an open in the circuit or solenoid coil as shown in Step 4. Verify that all circuit connectors are secure.
4. If the Expansion Module hot gas circuit LED does not illuminate and the alarm is present, check for a shorted circuit or solenoid coil. Disconnect the Expansion Module 35 pin connector J1 and check the circuit with an accurate ohmmeter for a short circuit, open circuit, or loose connection. The solenoid coil resistance should be approximately 8.3 ohms (4.1 ohms with parallel evaporators).
5. If no problems are found in steps 1-4 and the output LED does not turn on, replace the Expansion Module.
6. Confirm the unit configuration is correct.
7. To verify the multi-temp refrigeration system operation of the Hot Gas Solenoid, refer to Service Procedure R03A.

48 CHECK BELTS OR CLUTCH

Alarm Type

Shutdown

Associated Alarm Codes

N/A

Considerations

1. This alarm code is checked and set during diesel mode operation only.
2. The ratio between the engine RPM and the alternator frequency is determined by pulley size. It is essential that the correct size pulleys be installed.
3. The engine RPM and alternator frequency are logged by the ServiceWatch Data Logger.

How Alarm is Set

The ratio between the engine RPM and alternator frequency is monitored. If this ratio is not within the specified range, it is an indication that clutch or drive belt slippage is occurring. Should this occur, Alarm Code 48 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Compare the normal engine RPM and alternator frequency to the engine RPM and alternator frequency that existed when this alarm code was set to determine which value changed.
   a. If the engine RPM is low and the alternator frequency is normal, check the RPM sensor and circuit to verify it is reading correctly. Use the Gauges Key to display engine RPM. Monitor alternator frequency with WinTrac or a frequency meter.
   b. If the engine RPM is normal and the alternator frequency is low, check the clutch and belts for condition, operation, or slippage. Also check the alternator for proper operation. Use the Gauges Key to display engine RPM. Monitor alternator frequency with WinTrac or a frequency meter.
   c. If the engine RPM is normal and the alternator frequency is high, check the alternator for proper operation. Check the “W" circuit including the resistor for continuity. Use the Gauges Key to display engine RPM. Monitor alternator frequency with WinTrac or a frequency meter.
2. Verify the unit model is correctly configured. This alarm is dependant on the alternator drive pulley sizes used in the unit. The pulley sizes can vary between unit models.
3. Verify that the correct pulley is installed on the alternator. This code can occur if the alternator is replaced with an alternator with the wrong size pulley installed.
4. Download and check the ServiceWatch data logger to determine the operating conditions present when the alarm code was set. Use the running Service Test Mode Feature to duplicate the operating conditions. The alternator frequency and engine RPM are logged in ServiceWatch and this information is viewable in technician mode. This information can be used to confirm the RPM sensor reading and alternator frequency when the alarm was set.

50 RESET CLOCK

Alarm Type

Log

How Alarm is Set

This alarm indicates that power to the HMI control panel has been interrupted for an extended period and the hold capacitor for the clock/calendar has discharged. As a result, the clock/calendar is no longer accurate. Turning the unit on will recharge the hold capacitor in the HMI control panel.

How Alarm is Cleared

This alarm is cleared manually and automatically when time/date information is updated.

Diagnostic Procedure

1. Turn the unit on to recharge the hold capacitor in the Truck Premium Display (Truck) or HMI Control Panel (Trailer).
2. Reset the clock to the customer's time zone.

54 TEST MODE TIMEOUT

Alarm Type

Shutdown

Associated Alarm Codes

N/A

Considerations

The HMI will display the remaining test time. The timer can be reset by pressing the HMI test "Select" key while the respective Service Test Mode or Interface Board Test Mode test is active.

How Alarm is Set

1. If the unit has been in the same Service Test Mode function for 15 minutes, Alarm Code 54 is set as a Shutdown Alarm.
2. If the unit has been in the same Interface Board Test Mode function for 15 minutes, Alarm Code 54 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Clear the alarm and re-enter the test mode as necessary to complete the diagnosis or repair.

61 LOW BATTERY VOLTAGE

Alarm Type

Log or Shutdown

Associated Alarm Codes

N/A

Considerations

If Alarm Code 61 is set as a Shutdown Alarm, no subsequent alarm codes will be set with the exception of Alarm Code 28.

This alarm code can be set by either low voltage or excessive voltage conditions.

How Alarm is Set

1. If the unit is running, and battery voltage is less than 11.2 volts for three minutes, Alarm Code 61 is set as a Shutdown Alarm.
2. If during the preheat cycle prior to an engine start the battery voltage is below 10.5 volts during an engine start, Alarm Code 61 is set as a Log Alarm.

   Note: *The preheat output will have been de-energized prior to the alarm being set.*
3. If during a Pretrip Test the preheat amps check is not within limits, and battery voltage is less than 11.2 volts, Alarm Code 61 is set as a Shutdown Alarm.
4. If during a Pretrip Test all outputs are de-energized, and battery voltage is not within limits, Alarm Code 61 is set as a Shutdown Alarm.
5. If the unit is in Evacuation Mode, and battery voltage is greater than 17.0 volts for three minutes, Alarm Code 61 is set as a Shutdown Alarm.
6. If three power-up and start attempts are made without a successful start, Alarm Code 61 is set as a Shutdown Alarm. This indicates that the battery voltage dropped low enough during the start sequence that the Base Controller powered down. This can also occur if the unit is turned on and off three times without allowing the unit to start.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check for discharged battery and charge as required.
2. Check the battery terminals for tightness and signs of corrosion.
3. Check battery cable connections between Base Controller and ground plate.
4. Check Base Controller 2, 2A, and CH connections for tightness and signs of corrosion.
5. Load test the battery, replace if necessary.
6. Check the unit ground plate connections for tightness and signs of corrosion.
7. With the engine running, check the battery voltage and charge rate using the Gauge Menu.
8. Check the operation of the alternator. Verify the belt is properly adjusted.
9. Review the ServiceWatch downloads to check for three start attempts and the reason for the start attempts.
10. Review the ServiceWatch data logger to determine the operating conditions present when the alarm code was set. The battery voltage, charge current, and alternator frequency are logged in ServiceWatch and this information is viewable in technician mode. This information can be used to determine which condition caused the alarm to be set.

62 AMMETER OUT OF CALIBRATION

Alarm Type

Check or Shutdown (Pretrip Only)

Associated Alarm Codes

N/A

Considerations

The current shunt on the Base Controller is a surface mount device and is conformal coated for protection. Field resistance measurement of this circuit cannot be made.

How Alarm is Set

1. Shunt calibration check in Pretrip Test shows shunt circuit is out of calibration with all outputs de-energized.
2. Controller shunt current is out of range high (greater than 10 amps).

How Alarm is Cleared

This alarm is cleared manually or automatically.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the ServiceWatch download for abnormal ammeter readings or all dashes [- - - -].
2. Check the current draw with the unit off and compare it to the reading of a clamp-on ammeter.
3. Check the Base Controller assembly in accordance with Service Procedure A01A.

63 ENGINE STOPPED

Alarm Type

Prevent or Shutdown in Diesel Mode

Log in Electric Mode

Associated Alarm Codes

17 Engine Failed To Crank

20 Engine Failed To Start

84 Restart Null

Considerations

Becomes a Log Alarm if unit is switched to Electric Mode.

How Alarm is Set

1. If the unit was running and still should be but has stopped, Alarm Code 63 is set as a Prevent Alarm. This is determined based on multiple factors, and can be caused by an intermittent condition. Three restart attempts will be made to allow continued operation at temporarily reduced performance. The time interval between restart attempts is 15 minutes. If at the end of the three attempts full performance is not possible, the alarm is set as a Shutdown Alarm. If the Restart Unit After Shutdown feature is set for Continuous, the Shutdown Alarm condition is disabled. If the Restart Unit After Shutdown feature is set for Disabled, the alarm will be set as a Shutdown Alarm on the first occurrence.
2. If Alarm Code 17 or Alarm Code 20 occurs after Alarm Code 63 is cleared, Alarm Code 63 will be set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually or automatically.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check for other alarm codes and proceed as indicated for each code.
2. Perform a Pretrip Test to determine cause for shutdown.
3. Verify the fuel level and check the fuel pump and other fuel system components for proper operation. Refer to Service Bulletin SB596 for additional information.
4. Check the air cleaner and intake hose for obstructions.
5. Check the unit fuses.
6. Check the RPM sensor for proper operation.
7. Check Run Relay and fuel solenoid components and circuits.
8. Check for low battery voltage.
9. Verify all ground connections on the master ground plate are secure.
10. Check for a seized compressor or engine.
11. Review the ServiceWatch data logger information to determine the operating conditions that were present when the alarm code was set. Use the running Service Test Mode feature to duplicate the operating conditions as required. Unit operating data is logged in ServiceWatch and the data is viewable in technician mode.
12. Verify Servicewatch download RPM is reading accurately.

64 PRETRIP REMINDER

Alarm Type

Log

Considerations

The alarm is cleared when Pretrip Test is entered. If the Pretrip Test is not successful, the alarm will not be reset. If the Pretrip Test is not successful, diagnose and correct the fault.

Programmable Features

This feature must be programmed. Refer to Hourmeter Setup Menu in Section 3 for additional information.

How Alarm is Set

If a programmable hourmeter is set as a Pretrip Reminder and the hourmeter time expires, Alarm Code 64 is set as a Log Alarm.

How Alarm is Cleared

The alarm self-clears when a Pretrip Test is entered.

Diagnostic Procedure

1. Perform a Pretrip Test to confirm unit operation.
2. Reset the Pretrip Reminder hourmeter after a Pretrip Test is entered.

65 ABNORMAL TEMPERATURE DIFFERENTIAL (ZONE)

Alarm Type

Zone Specific Check or Shutdown

Associated Alarm Codes

13 Sensor Calibration Check

Considerations

1. Alarm Code 65 indicates that the temperature differential is abnormal based on expected unit capacity. It may be an indication of a drifting temperature sensor or an airflow restriction.
2. The temperature differential is monitored in both cool and heat mode. If the temperature differential becomes unrealistic, Alarm Code 65 is set. This alarm may result from incorrect sensor readings, if the defrost damper is stuck closed, if a remote evaporator fan motor(s) has failed, or as a result of severely restricted air flow.
3. Alarm Code 65 checks are not active during defrost mode and for 20 minutes after defrost.

How Alarm is Set

1. Alarm Code 65 is set if there is an abnormally large cooling or heating temperature differential and the offending sensor cannot be determined. Alarm Code 13 will also be set.
2. If Alarm Code 65 occurs with a frozen range setpoint, the alarm is set as a Check Alarm and the unit will be forced to low speed cool. If Alarm Code 65 occurs with a fresh range setpoint, the alarm is set as a zone Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the sensor connector at the affected remote evaporator for pushed or damaged pins.
2. Check the zone to host evaporator sensor connectors for pushed or damaged pins
3. Check for blocked airflow in the affected zone.

66 LOW ENGINE OIL LEVEL

Alarm Type

Shutdown in Diesel Mode

Log in Electric Mode

Associated Alarm Codes

N/A

Component Description and Location

The switch is located on the top of the engine oil pan. The switch is open with full oil level and closed with low oil level.

Circuit Description

The OLS-01 wire connects the Base Controller connector J7 pin 29 to one side of the oil level switch. The CHOL wire connects the other side of the solenoid to chassis ground at the ground plate. The wiring is located in the Main Harness via the OLS and CHOL circuits.

Considerations

A shutdown level Alarm Code 66 becomes a Log Alarm if the unit is switched from Diesel Mode to Electric Mode. A log level Alarm Code 66 becomes a Shutdown Alarm if the unit is switched from Electric to Diesel Mode.

How Alarm is Set

1. If the engine oil level switch indicates low engine oil for three minutes, Alarm Code 66 is set as a Shutdown Alarm.
2. If Alarm Code 66 is manually cleared and the engine oil level is still low, Alarm Code 66 is reset as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check and adjust the engine oil level as required.
2. Check the switch with an ohmmeter. It should be open when the oil level is satisfactory.
3. Turn the unit on and check for battery voltage on the OLS-01 wire at the harness plug.
4. Check for battery voltage from the OLS-01 wire to the CHOL wire at the harness plug.
5. If either test fails, check the harness wires OLS-01 and CHOL with an ohmmeter for continuity in accordance with Service Procedure H04A.

67 CHECK LIQUID LINE SOLENOID (ZONE)

Alarm Type

Zone Specific Check or Shutdown

Associated Alarm Codes

12 Sensor Shutdown

111 Unit Not Configured Correctly

114 Multiple Alarms - Can Not Run

Component Description and Location

The Zone 1 (host) liquid line solenoid is located in the condenser section of the host unit. The remote zone liquid line solenoids are located in the remote evaporators.

Circuit Description

The Liquid Line Solenoid circuit is a two wire circuit. Refer to the unit wiring diagram for connector and pin number identification. The Zone 1 Liquid Line Solenoid is controlled from the Base Controller. The remote zone Liquid Line Solenoids are controlled from the Expansion Module.

Zone 1: The Liquid Line Solenoid is energized by Relay K8 and Fuse F11 (10A) on the Interface Board. The LLS wire applies 12 Vdc to one side of the Liquid Line Solenoid to energize the solenoid. The CH wire connects the other side of the solenoid to the remote evaporator chassis ground, which is connected to the unit ground plate via the MT Evap Fan Harness and the MT Fan Harness. The solenoid is not polarity sensitive. The wires are routed in the MT Evap Zone Harness and the MT Harness. Refer to the unit wiring diagrams for wire numbers, locations and additional details.

Remote Zones: The Liquid Line Solenoid is energized by a Smart FET on the Expansion Module. The LLS wire applies 12 Vdc to one side of the Liquid Line Solenoid to energize the solenoid. The CH wire connects the other side of the solenoid to the remote evaporator chassis ground, which is connected to the unit ground plate via the MT Evap Fan Harness and the MT Fan Harness. Solenoid valves in remote zones have supply circuits with connectors in the remote evaporator and at the condenser unit. The solenoid is not polarity sensitive. The wires are routed in the MT Evap Zone Harness and the MT Harness. Refer to the unit wiring diagrams for wire numbers, locations and additional details.

Considerations

1. On systems with remote zone parallel evaporators, the respective Expansion Module Liquid Line Solenoid output will supply power to both of the remote zone Liquid Line Solenoids. The Pretrip and Smart FET current limits will be adjusted for the increased current drawn by parallel evaporators based on the zone configuration settings.
2. During a non-running Pretrip, the current draw is determined by the Base Controller shunt reading.
3. During normal operation, the current draw is determined by the Smart FET feedback to the Base Controller.
4. If an alarm code is set during normal operation, the ServiceWatch Data Logger will list the Alarm Code, Fault Current (FLTCT), Battery Volts, and the Shunt Current. The FLTCT will be the high or low current draw as determined by the Smart FET feedback that caused the alarm code to set.

How Alarm is Set

1. If during normal operation the current is greater than 3.0 amps or less than 0.5 amps (1.0 to 6 amps if parallel evaporators) at specified intervals after the solenoid is energized, Alarm Code 67 is set as a Check Alarm and the output is turned off. If the output circuit is shorted, it will be turned off immediately to protect the circuit and the alarm code will be set. Liquid Line Solenoid operation is not allowed until Alarm Code 67 is cleared. If this condition occurs when the unit is in Evacuation Mode, Alarm Code 67 will be set as a Shutdown Alarm.
2. If during normal operation the current does not return to less than 0.5 amps at a specified interval after the solenoid is de-energized, Alarm Code 67 is set as a Shutdown Alarm. If the setpoint is in the frozen range and Alarm Code 67 and Alarm Code 12 are set, Alarm Code 114 will be set. In single zone frozen range operation, the unit will shut down. In multiple zone frozen range operation, the offending zone will shut down. The unit or zone will remain shut down until the alarms are cleared.
3. If during a Pretrip Test the current is not between 0.5 to 3 amps (1.0 to 6 amps if parallel evaporators) when the solenoid is energized, Alarm Code 67 is set as a Check Alarm.
4. If during a Pretrip Test the current does not return to less than 0.5 amps when de-energized, Alarm Code 67 is set as a Shutdown Alarm.
5. If during a Pretrip Test current draw for the zone being tested is normal and the zone is not configured, Alarm Code 67 and Alarm Code 111 are set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the ThermoServ Service Tool. Review the data to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

Note: *For PTC units, disable PTC function for diagnostics.*

1. If FLTCT = 3.0 amps (or 6.0 amps w/parallel evaporators), the circuit has high amp draw. Check for a shorted circuit or solenoid coil.
2. If FLTCT is less than 0.5 amps, the circuit has low amp draw. Check for high resistance or an open in the circuit or solenoid coil.

Indicator LED Diagnosis

1. Verify that the Expansion Module status LED (heartbeat LED) is flashing. If not, check the Expansion Module for proper operation in accordance with Service Procedure A01D.
2. If the Expansion Module Status LED is flashing, clear the alarm to reset the Smart FET. Check the operation of the liquid line circuit using Interface Board Test Mode. Verify the appropriate Expansion Module liquid line circuit LED illuminates. For Expansion Module LED identification, refer to the LED decal on the control box door. If the Expansion Module liquid line circuit LED illuminates, proceed to Step 3. If the Expansion Module liquid line circuit LED does not illuminate, proceed to Step 4.
3. If the Expansion Module liquid line circuit LED does illuminate and the alarm is not present, the circuit has high resistance or is open. Use the HMI Control Panel amps gauge to check the current drawn by the liquid line solenoid, while operating the solenoid with Interface Board Test Mode. The current draw should be approximately 1.5 amps (3.0 amps if parallel evaporators). If the current is not within limits, check for high resistance or open in the circuit or solenoid coil as shown in Step 4. Verify that all circuit connectors are secure.
4. If the Expansion Module liquid line circuit LED does not illuminate and the alarm is present, check for a shorted circuit or solenoid coil. Disconnect the Expansion Module 35 pin connector J1 and check the circuit with an accurate ohmmeter for a short circuit, open circuit, or loose connection. The solenoid coil resistance should be approximately 8.3 ohms (4.1 ohms with parallel evaporators).
5. If no problems are found in steps 1-4 and the output LED does not illuminate, replace the Expansion Module.
6. Confirm the unit configuration is correct.
7. To verify the refrigeration system operation of the Liquid Line Solenoid, refer to Service Procedure R04A.

68 INTERNAL CONTROLLER FAULT

Alarm Type

Log, Check, or Shutdown

How Alarm is Set

1. If a shutdown level internal fault occurs in the Base Controller, Alarm Code 68 is set as a Shutdown Alarm.
2. If a check level internal fault occurs in the Base Controller, Alarm Code 68 is set as a Check Alarm.
3. If a log level internal fault occurs in the Base Controller, Alarm Code 68 is set as a Log Alarm.

Diagnostic Procedure

1. Replace the Base Controller.
2. Return the failed Base Controller for failure analysis.

70 HOURMETER FAILURE

Alarm Type

Log

How Alarm is Set

If one or more hourmeters exceeds 499,999 hours, Alarm Code 70 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

1. If the hourmeter readings are normal, perform a Cold Start in accordance with the WinTrac Service Tool.

   Important: *Any time a Cold Start is performed, the Base Controller must be set up using "Service Procedure A04A,". Failure to do so may result in the unit not operating to customer specifications.*

2. If the code can now be cleared, proceed with Base Controller setup in accordance with "Service Procedure A04A,".

74 CONTROLLER RESET TO DEFAULTS

Alarm Type

Check

How Alarm is Set

If all the Base Controller programmable features have been reset to factory defaults, Alarm Code 74 is set as a Check Alarm. Alarm Code 74 is typically set by a cold start.

How Alarm is Cleared

This alarm can only be cleared from the Guarded Access Menu.

Diagnostic Procedure

1. Verify the Base Controller cold start jumper J101/J102 is in the correct (up) position. It should match the white mark on the Base Controller, at the side of the jumper. If the jumper is in the wrong position, a cold start will occur every time the unit is turned on.
2. Complete the Base Controller setup in accordance with "Service Procedure A04A,".

   Important: *Any time Alarm Code 74 occurs, the Base Controller must be set up in accordance with "Service Procedure A04A,". Failure to do so may result in the unit not operating to customer specifications.*

   Note: *If unit configuration is switched from Trailer to Truck, this alarm code could be set.*

   a. Alarm Code 74 will be cleared during the Base Controller setup.

77 CONTROLLER EPROM CHECKSUM FAILURE

Alarm Type

Shutdown

Associated Alarm Codes

N/A

How Alarm is Set

If a shutdown level internal memory fault has occurred in the Base Controller or Data Logger, Alarm Code 77 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm clears automatically if the condition is resolved.

Diagnostic Procedure

1. Replace the Base Controller.
2. Return the failed Base Controller for failure analysis.

79 INTERNAL DATA LOGGER OVERFLOW

Alarm Type

Log

How Alarm is Set

If too many data logger events occurred at once or if too many data logger events occurred during a download, Alarm Code 79 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

No corrective action is possible. This serves only as an indication that an event occurred that was not recorded by the data logger.

80 CHECK COMPRESSOR TEMPERATURE SENSOR

Note: *Units with scroll compressor only.*

Alarm Type

Check

Associated Alarm Codes

111 Unit Not Configured Correctly

Component Description and Location

Compressor Temperature Sensors are only used on scroll compressor applications. This sensor is an un-graded thermistor sensor and does not require calibration. The sensor is located on the discharge end of the scroll compressor.

Circuit Description

The compressor temperature sensor circuit is a two wire circuit. The CTEMP-01 (+) wire connects the Base Controller 35 pin sensor connector J3 pin 34 to one side of the sensor. The CTEMPN-01 (-) wire connects the Base Controller 35 pin sensor connector J3 pin 11 to the other side of the sensor. The sensor wires are routed in the Sensor Harness. The sensor is connected to the sensor harness with a Deutsch connector.

Considerations

Connectors should be positioned to minimize the potential for moisture entry where the wires enter the connector shell.

How Alarm is Set

1. If the sensor reading is over 500°F (260°C) for 10 seconds, Alarm Code 80 is set as a Check Alarm. The sensor reading will display dashes [- - -] and may return to normal.
2. If the sensor reading is under -50°F (-46°C) for 10 seconds, Alarm Code 80 is set as a Check Alarm. The sensor reading will display dashes [- - -] and may return to normal.
3. If the unit is not configured as a scroll compressor and there is a valid reading for the compressor temperature sensor, Alarm Code 80 is set as a Check Alarm and Alarm Code 111 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually. If the sensor is over or under range when the alarm clear is attempted, the alarm will not be cleared.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

- **Alarm Code 80 (Sensor was out of range) Only:**
  1. Display the sensor reading using the Sensor Menu. If the display shows [- - - -], the sensor is defective and should be replaced. If the condition still exists, check the sensor circuit for an open wire or short to ground (Refer to Service Procedure D01A). Check the Base Controller in accordance with Service Procedure A01A.
- **Alarm Code 80 and Alarm Code 111:**
  1. Check the unit configuration to verify it is correct.
- **If all or many of the Sensor Codes (02, 03, 04, 05, 06, 11, 12, and 80) are set:**
  1. Verify the 35 pin Base Controller sensor connector J3 is securely attached.
  2. Check the Base Controller in accordance with Service Procedure A01A.

81 HIGH COMPRESSOR TEMPERATURE

Note: *Units with scroll compressor only.*

Alarm Type

Prevent or Shutdown

Associated Alarm Codes

84 Restart Null

121 Check Liquid Injection Circuit

How Alarm is Set

If the compressor temperature is greater than 300°F (148°C) as determined by the compressor temperature sensor, Alarm Code 81 is set as a Prevent Alarm. Two attempts will be made to allow continued operation at temporarily reduced performance. If, at the end of the two attempts full performance is not possible, the alarm is set as a Shutdown Alarm. Alarm Code 84 is set along with Alarm Code 81 to indicate the unit is in a temporary shutdown mode.

If restarts are disabled, the alarm will be set as a Shutdown Alarm on the first occurrence.

How Alarm is Cleared

1. The alarm can be cleared manually if the condition no longer exists.
2. The alarm will clear automatically at the conclusion of a successful prevent routine.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the condenser for airflow restrictions.
2. Check refrigerant level.
3. Check for air in the refrigeration system.
4. Using Interface Board Test Mode, check the liquid injection solenoid for proper operation. This circuit should be active before this alarm is set.

82 HIGH COMPRESSOR TEMPERATURE SHUTDOWN

Note: *Units with scroll compressor only.*

Alarm Type

Shutdown

Associated Alarm Codes

121 Check Liquid Injection Circuit

How Alarm is Set

If the compressor temperature continues to be greater than 300°F (148°C) as determined by the compressor temperature sensor and the Prevent Alarm routine is not successful, Alarm Code 82 is set as a Shutdown Alarm.

How Alarm is Cleared

The alarm can be cleared manually if the condition no longer exists.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the condenser for airflow restrictions.
2. Check refrigerant level.
3. Check for air in the refrigeration system.
4. Using Interface Board Test Mode, check the liquid injection solenoid for proper operation. This circuit should be active before this alarm is set.
5. Check scroll compressor.

84 RESTART NULL

Alarm Type

Prevent

Associated Alarm Codes

10 High Discharge Pressure
17 Engine Failed to Crank
18 High Engine Coolant Temperature
20 Engine Failed to Start
21 Cooling Cycle Check
22 Heating Cycle Check
36 Electric Motor Failed to Run
42 Unit Forced To Low Speed
63 Engine Stopped
81 High Compressor Temperature
90 Electric Overload
91 Check Electric Ready Input
93 Low Compressor Suction Pressure

Considerations

1. This alarm is a secondary alarm that is set along with the associated primary alarm.
2. The alarm indicates that the unit is in a temporary ("prevent" or "restart null") shutdown. The alarm clears automatically if the condition does not re-occur.
3. Many of these actions include a "waiting period" (to allow the engine to cool down, a high pressure condition to subside or the like). The alarm code that caused the condition and Alarm Code 84 might be present to indicate that the Base Controller is taking a corrective action and that a restart will be attempted when conditions permit.
4. If the corrective action is successful, the original alarm code and Alarm Code 84 are cleared automatically. If the original alarm condition continues to occur, and the corrective actions taken by the Base Controller are not successful, the original alarm code remains. Alarm Code 84 is automatically cleared and the unit shuts down.
5. This alarm occurs if unit operation is not allowed as a result of the associated prevent alarm. For example, if a high discharge pressure condition shuts the unit down, a waiting period occurs to allow system pressures to equalize. A restart occurs when conditions permit.
6. If restarts are disabled, Alarm Code 84 is also disabled.
7. Most Prevent Alarms become Shutdown Alarms if three occurrences of the alarm occur within a set time period.
8. Alarm Codes 32 and 63 are promoted to guarded access clearable Shutdown Alarms if the Limited Restarts Feature is enabled and the Shutdown Alarm occurs three times with a 12 hour time period.
9. If Limited Alarm Restart II is enabled and Alarm Code 18 is set the third time in a continuous 12 hour period after Alarm Code 18 was cleared twice manually via the HMI, the unit will permanently shut down and will not be allowed to restart unless Alarm Code 18 is cleared via Guarded Access. During this permanent shutdown event, Alarm Code 18 cannot be cleared outside of Guarded Access.
10. Some Prevent alarms will result in modified unit operation after the alarm is self cleared. For example, Alarm Code 10 will result in Alarm Code 42 being set and the unit being forced to low speed for a one hour period.
11. If the unit is turned off while Alarm Code 84 is present, the primary alarm becomes a Shutdown Alarm when the unit is turned back on.

How Alarm is Set

This alarm is set with the associated alarm that caused the condition.

How Alarm is Cleared

This alarm clears automatically if the condition is resolved.

Diagnostic Procedure

Check for associated alarms and repair as required.

85 FORCED UNIT OPERATION

Alarm Type

Check

Associated Alarm Codes

26 Check Refrigeration Capacity

Considerations

1. This alarm is a secondary alarm that is set along with the associated primary alarm.
2. This alarm indicates that the unit was forced to a different operating mode than would normally be implemented under the existing conditions. This can occur as result of high discharge pressure. It indicates that normal unit operation has been over-ridden (i.e., the discharge pressure setpoint has been reduced). The alarm is only set if a low cooling capacity condition occurs while the unit is in reduced capacity mode.

How Alarm is Set

This alarm is set only if an alert low refrigeration capacity alarm occurs while the unit is operating in the reduced capacity state.

How Alarm is Cleared

This alarm clears automatically if the condition is resolved.

Diagnostic Procedure

Check for associated alarms and repair as required.

86 CHECK DISCHARGE PRESSURE SENSOR

Alarm Type

Check

Associated Alarm Codes

10 High Discharge Pressure

163 Emissions Control Failure

Circuit Description

The three wire discharge pressure sensor is supplied with +5 Vdc and ground from the Base Controller. The wiring is located in the Sensor Harness via the DPP, DPN, and DPI circuits.

Considerations

The Discharge Pressure Transducer, Suction Pressure Transducer and Coolant Level switch each have a separate 5 Vdc power supply. A short circuit condition in one transducer or switch circuit should not affect the other circuits.

The maximum discharge pressure that can be displayed is 500 psig. If the sensed pressure is greater than 500 psig, the HMI Control Panel will display [- - - -] instead of the discharge pressure.

The minimum discharge pressure that can be sensed is -10 psig. The control system cannot determine if the minimum sensed pressure is the result of an electrical short or very low system pressure.

The Discharge Pressure Transducer will have a “500” on the body of the part. The Suction Pressure Transducer will have a “200” on the body of the part. They are not interchangeable.

How Alarm is Set

1. If the unit is not running and the discharge pressure transducer reading is greater than 500 psig for 10 seconds, Alarm Code 86 is set as a Check Alarm. If the unit is in a Pretrip Test, this alarm is set as a Shutdown Alarm.
2. If the unit is running, the ambient temperature is greater than 10°F (-12°C), and the discharge pressure transducer reading is less than +15 psig for 10 seconds, Alarm Code 86 is set as a Check Alarm. If the unit is in a Pretrip Test, this alarm is set as a Shutdown Alarm.
3. If Alarm Code 10 is cleared and the discharge pressure transducer reading is greater than or equal to 425 psig but less than 500 psig, Alarm Code 86 is set as a Check Alarm.

Note: *Units Equipped with Tier 4 Engines Only. If this alarm code is set, Alarm Code 163 will also be set.*

How Alarm is Cleared

This alarm is cleared manually. Clearing the code will cause the unit to shut down and restart to check the transducer for proper operation by performing an ETV check.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the discharge pressure display using the Gauge Menu.
2. If the discharge pressure is not displayed by the Base Controller, unplug the transducer and check for +5 Vdc between DPP and DPN. If +5 Vdc is not present, check the Base Controller in accordance with Service Procedure A01A.
3. Check the harness wires DPP, DPN, and DPI for continuity using an ohmmeter.
4. Connect refrigeration gauges to verify that the sensor is displaying the correct pressure. Replace the sensor if required.

87 CHECK SUCTION PRESSURE SENSOR

Alarm Type

Check

Associated Alarm Codes

163 Emissions Control Failure

Circuit Description

The three wire suction pressure sensor is supplied with +5 VDC and ground from the Base Controller. The sensor is located in the suction line and downstream of the ETV (if present). The wiring is located in the Sensor Harness via the SPP, SPN, and SPI circuits.

Considerations

The Discharge Pressure Transducer, Suction Pressure Transducer and Coolant Level switch each have a separate 5 Vdc power supply. A short circuit condition in one transducer or switch circuit should not affect the other circuits.

The maximum suction pressure that can be displayed is 200 psig. If the sensed pressure is greater than 200 psig, the HMI Control Panel will display [- - - -] instead of the suction pressure. When the unit is off and the refrigerant pressures have equalized, the system pressure can exceed 200 psig when ambient temperatures are above 90°F (35°C). If this occurs the HMI Control Panel will display [- - - -]. This is normal operation and no cause for concern.

The minimum suction pressure that can be sensed is -12 psig.

If the sensor opens, the display will read -10 psig. An alarm may not be generated immediately but the unit will be forced to low speed due to low suction pressure.

The Suction Pressure Transducer will have a “200” on the body of the part. The Discharge Pressure Transducer will have a “500” on the body of the part. They are not interchangeable.

How Alarm is Set

1. If the unit is running and the suction pressure sensor reading is greater than 186 psig for 10 seconds, Alarm Code 87 is set as a Check Alarm. If the unit is in a Pretrip Test, this alarm is set as a Shutdown Alarm. If the suction pressure is greater than 186 psig, the sensor display will be dashes [- - - -].
2. If the unit is running and the suction pressure sensor reading is less than -10 psig for 10 seconds, Alarm Code 87 is set as a Check Alarm. If the unit is in a Pretrip Test, this alarm is set as a Shutdown Alarm.
3. If suction pressure does not change ±3 psig during the ETV test, Alarm Code 87 is set as a Check Alarm. If the unit is in a Pretrip Test, this alarm is set as a Shutdown Alarm.

Note: *Units Equipped with Tier 4 Engines Only. If this alarm code is set, Alarm Code 163 will also be set.*

How Alarm is Cleared

This alarm is cleared manually. Clearing the code will cause the unit to shut down and restart to check the transducer for proper operation by performing an ETV check.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the suction pressure display using the Gauge Menu. If the suction pressure is -10 psig, turn the unit off and allow the system refrigerant pressures to equalize. If the displayed suction pressure remains at -10 psig, the suction pressure transducer is defective and must be replaced.
2. Check the suction pressure display using the Gauge Menu. If the sensor reads [- - - -] psig, turn the unit off and allow the system pressures to equalize.
   a. If the actual suction pressure is less than 180 psig, but the displayed suction pressure remains at [- - - -], the transducer is defective and must be replaced.
   b. If the suction pressure is greater than 180 psig, the suction pressure transducer may be operating normally. Place Zone 1 in full cool and allow the return air temperature to drop below 50°F (10°C). If the suction pressure display remains at [- - - -], the transducer, controller power supply, or conductors are faulty.

      Note: *System refrigerant pressures can equalized quickly by energizing the zone hot gas valves using Interface Board Test Mode.*

3. If the suction pressure is not displayed by the Base Controller, unplug the transducer and check for +5 Vdc between SPP-01 and SPN-01. If 5 volts is not present, check the Base Controller in accordance with Service Procedure A01A.
4. Connect refrigeration gauges to verify that the sensor is not displaying the correct pressure. Replace the sensor.
5. Check the harness wires SPP-01, SPN-01, and SP-01 for continuity using an ohmmeter.

89 CHECK ELECTRONIC THROTTLING VALVE CIRCUIT

Alarm Type

Check or Shutdown

Associated Alarm Codes

163 Emissions Control Failure

Component Description and Location

The Electronic Throttling Valve (ETV) is located in the suction line.

Circuit Description

The ETV circuit consists of four wires from the ETV driver located on the Base Controller to the ETV. The harness wires to the valve are labeled EVA-01, EVB-01, EVC-01, and EVD-01. These wires are located in the main harness.

How Alarm is Set

The electrical test is performed before every engine or electric motor start. The running test is only performed when the unit restarts after a shutdown or prevent alarm or if the Base Controller senses a problem with either or both of the refrigerant pressure transducers. The running test is also performed when an engine start occurs during a Pretrip Test.

When Alarm Code 89 is cleared, the unit will shut down (if running) and perform a full ETV test to confirm proper ETV operation.

The alarm can be set during the non-running or running phases of the unit engine start routine.

1. During the non-running phase, the ETV driver outputs are checked for error conditions (ETV electrical test).
2. During the first phase of the running test, the ETV is nearly closed. The ETV closing is confirmed by a drop in suction pressure.
3. During the second phase of the running test, the ETV is opened. The ETV opening is confirmed by a rise in suction pressure.
4. If an electrical fault with the ETV system was detected, Alarm Code 89 is set as a Check Alarm.

Note: *Units Equipped with Tier 4 Engines Only. If this alarm code is set, Alarm Code 163 will also be set.*

How Alarm is Cleared

This alarm is cleared manually. The unit will shut down (if running) and perform a full ETV test to confirm proper ETV operation.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the suction and discharge pressures with unit not running, to determine if refrigerant charge appears adequate.
2. Check the electrical operation of electronic throttling valve circuit in accordance with Service Procedure G03A.
3. If the ETV appears to function electrically, check the refrigeration system for low refrigerant, a frozen expansion valve, or a severe restriction in the suction side of the system.

90 ELECTRIC OVERLOAD

Alarm Type

Check or Prevent in Electric Mode

Log in Diesel Mode

Associated Alarm Codes

84 Restart Null

111 Unit Not Configured Correctly

Considerations

This alarm becomes a Log Alarm if the unit is switched from Electric Mode to Diesel Mode.

How Alarm is Set

Alarm conditions are only active when three phase power is connected (ER input is high).

1. This alarm will be set during Electric Mode operation if the Base Controller determines that the electric motor overload relay (EOL) has tripped.
2. If during a Pretrip Test the unit is not configured electric standby and the EOL input is low, Alarm Code 90 is set as a Check Alarm and Alarm Code 111 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

⚠ Warning

Hazardous Voltage!

Units featuring Electric Standby utilize high voltages in 3 phase AC electrical power any time the unit is operating in Electric Mode. This voltage potential is also present any time the unit is connected to a source of external standby power. Extreme care must be used when working on the unit, as these voltages are capable of causing serious injury or death.

1. Check the electric motor for current draw. Refer to the motor nameplate for the Full Load Amperage rating (FLA) of the motor.
2. Check the setting of the motor overload relay. Refer to Specifications for settings.
3. Check the EOL-01 circuit for continuity from J6 pin 2 on the Base Controller to the overload relay.
4. Check for continuity between the overload relay terminals 95 and 96. The contacts should be normally closed.
5. Check the CHHV circuit for continuity to chassis ground.

91 CHECK ELECTRIC READY INPUT

Alarm Type

Prevent in Electric Mode

Log in Diesel Mode

Associated Alarm Codes

"84 Restart Null," p. 263

Considerations

This alarm becomes a Log Alarm if the unit is switched from Electric Mode to Diesel Mode.

How Alarm is Set

This alarm will only be set if the unit is configured for manual switchover from electric to diesel.

1. If Electric Mode operation is selected and the Base Controller determines that three phase standby power is not connected (ER input is low), Alarm Code 91 is set as a Prevent Alarm.
2. If unit switches from electric to diesel and auto switch from electric to diesel is enabled, Alarm Code 91 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared automatically when one of the two following actions occur:

1. The unit is auto switched or manually switched to Diesel Mode operation.
2. Three phase standby power is restored to the unit.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

⚠ Warning

Hazardous Voltage!

Units featuring Electric Standby utilize high voltages in 3 phase AC electrical power any time the unit is operating in Electric Mode. This voltage potential is also present any time the unit is connected to a source of external standby power. Extreme care must be used when working on the unit, as these voltages are capable of causing serious injury or death.

1. Check the ER-01 circuit from the phase detect module for 12 volts to chassis ground when standby power is connected to the unit.
2. Check the 8 circuit at the phase detect module for 12 volts.
3. Check to verify standby power of the correct voltage is present at L1, L2, and L3 on the phase detect module.
4. With unit off, check the ER-01 circuit for continuity from J6 pin 5 on the Base Controller to the phase detect module.
5. If steps 1-4 above are correct, check the Base Controller in accordance with "Service Procedure A01A," p. 308.
6. If steps 1, 2, 4, or 5 above do not correct the fault, replace the phase detect module.

92 SENSOR GRADES NOT SET

Alarm Type

Check

Associated Alarm Codes

03 Return Control Air Sensor

04 Discharge Air Control Sensor

Considerations

The sensor grade must be set using the Sensor Calibration feature in the Guarded Access Menu. If the sensor grade is not properly set, the sensor reading will not be accurate. Grade 5H is set as the default grade on factory Base Controller and is used as an indication that the sensor grade has not been set.

Alarm Code 92 is not set for spare sensors. However, if used, spare sensors should be calibrated to achieve maximum accuracy.

How Alarm is Set

If any graded return or discharge sensor is in valid range and the sensor grade is set to grade 5H (default) when the unit power switch is turned on, Alarm Code 92 is set as a Log Alarm. The offending sensor alarm code (03 or 04) is also set.

How Alarm is Cleared

Clears automatically when the sensor grade is set to other than 5H. The offending sensor alarm code (03 or 04) must be manually cleared in Guarded Access after the sensor grades have been set.

Diagnostic Procedure

1. Verify actual sensor grades for all graded sensors.
2. Using this information, calibrate the sensors using the Sensor Calibration feature in the Guarded Access Menu. For additional details, refer to Service Procedure A15A.

93 LOW COMPRESSOR SUCTION PRESSURE

Alarm Type

Prevent or Shutdown

Associated Alarm Codes

84 Restart Null

87 Check Suction Pressure Sensor

Considerations

1. If Alarm Code 87 is set, Alarm Code 93 is disabled.
2. Previous SR-3 software revisions would allow high speed operation with only one of the remote evaporators running, even though the suction pressure was low. This could result in Alarm Code 93 being set, particularly if running in high speed with low ambient temperature. With Base Controller Software Revision F005 and later, the unit will be forced to low speed operation if low suction pressure occurs with only one remote evaporator running.

How Alarm is Set

If the compressor pressure is low as determined by the suction pressure sensor, Alarm Code 93 is set as a Prevent Alarm. Two attempts will be made to allow continued operation at temporarily reduced performance, including low speed operation and a forced defrost. If, at the end of the two attempts full performance is not possible, the alarm is set as a Shutdown Alarm. Alarm Code 84 is set along with Alarm Code 93 to indicate the unit is in a temporary shutdown mode.

If restarts are disabled, the alarm will be set as a Shutdown Alarm on the first occurrence.

How Alarm is Cleared

1. The alarm can be cleared manually if the condition no longer exists.
2. The alarm will clear automatically at the conclusion of a successful prevent routine.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check refrigerant level.
2. Check for a liquid line restriction such as a plugged drier or expansion valve.
3. Check for a frosted or blocked evaporator coil. Initiate a manual defrost cycle to verify the coil is clear of ice.
4. If equipped with an ETV, check operation in accordance with Service Procedure G03A.
5. Using Interface Board Test Mode, check the liquid injection circuit for proper operation.

94 CHECK LOADER #1 CIRCUIT

Alarm Type

Check (Pretrip Only)

Associated Alarm Codes

28 Pretrip Abort

111 Unit Not Configured Correctly

How Alarm is Set

The Loader #1 is not currently used. However, the associated output is checked during the Non-running Pretrip Test to be certain nothing has been mistakenly connected to it. The output is energized and then de-energized to verify that no device is connected to the circuit and that the Base Controller is operating properly.

1. If current flow is detected during the output energized phase of the Non-running Pretrip Test, Alarm Code 94 will be set as a Check Alarm and Alarm Code 111 will be set as a Log Alarm. The Non-running Pretrip Test will be allowed to complete.
2. If current flow is detected during the output de-energized phase of the Non-running Pretrip Test, Alarm Code 94 will be set as a Check Alarm, Alarm Code 111 will be set as a Log Alarm, and Alarm Code 28 will be set as a Shutdown Alarm. The Pretrip Test will be aborted.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check unit configuration to confirm proper setting.
2. Check the Base Controller wiring to verify there is no connection to connector J7 pin 7.
3. Check the Base Controller in accordance with Service Procedure A01A.

95 CHECK LOADER #2 CIRCUIT

Alarm Type

Check (Pretrip Only)

Associated Alarm Codes

28 Pretrip Abort

111 Unit Not Configured Correctly

How Alarm is Set

The Loader #2 is not currently used. However, the associated output is checked during the Non-running Pretrip Test to be certain nothing has been mistakenly connected to it. The output is energized and then de-energized to verify that no device is connected to the circuit and that the Base Controller is operating properly.

1. If current flow is detected during the output energized phase of the Non-running Pretrip Test, Alarm Code 95 will be set as a Check Alarm and Alarm Code 111 will be set as a Log Alarm. The Non-running Pretrip Test will be allowed to complete.
2. If current flow is detected during the output de-energized phase of the Non-running Pretrip Test, Alarm Code 95 will be set as a Check Alarm, Alarm Code 111 will be set as a Log Alarm, and Alarm Code 28 will be set as a Shutdown Alarm. The Pretrip Test will be aborted.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check unit configuration to confirm proper setting.
2. Check the Base Controller wiring to verify there is no connection to connector J7 pin 7.
3. Check the Base Controller in accordance with Service Procedure A01A.

96 LOW FUEL LEVEL

Alarm Type

Log or Check

Associated Alarm Codes

98 Check Fuel Level Sensor

Considerations

This alarm is enabled only if the unit is configured with a fuel level sensor.

How Alarm is Set

If the fuel level indicated by the fuel level sensor falls to 15% (solid state) or 20% (float) of tank capacity, Alarm Code 96 is set as a Check Alarm.

How Alarm is Cleared

This alarm is cleared automatically when the fuel level exceeds 25% (solid state) or 30% (float) of tank capacity.

Diagnostic Procedure

Check fuel tank level and fill as required.

98 CHECK FUEL LEVEL SENSOR

Alarm Type

Check

Associated Alarm Codes

96 Low Fuel Level

Component Description and Location

The ultrasonic fuel level sensor (if used) is mounted to a flange on top of the fuel tank. The ultrasonic fuel level sensor consists of a sensor, a sensor tube (or focus tube), and two gaskets. The sensor is a transducer that emits ultrasonic sound waves. The sound waves reflect off the fuel in the sensor tube and return to the transducer. The transducer senses the reflected sound waves and determines the fuel level in the sensor tube.

Ultrasonic fuel level sensors are calibrated for use with fuel tanks of particular size and shape. Refer to the appropriate unit Parts Manual for the correct part numbers.

The ultrasonic fuel level sensor and the fuel gauge on the end of the fuel tank measure the fuel level differently. The ultrasonic fuel level sensor measures the actual volume of fuel in the tank. The fuel gauge measures the height of the fuel in the tank. Therefore, the fuel level at which fuel level sensor reading and the fuel gauge reading agree closely is at 50% or 1/2 full. The readings at other fuel levels may not agree as closely. If you think the ultrasonic fuel level sensor is not working correctly, the best thing to do is to check the output voltage as shown in step 4 below. The output voltage should be between approximately 1.0 Vdc for an empty tank to 4.0 Vdc for a full tank.

Considerations

This alarm is enabled only if the unit is configured with a fuel level sensor.

How Alarm is Set

Alarm is set when the fuel level sensor is determined to be out of range.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Use the GAUGES soft key to display the Fuel Level Sensor reading and compare it to the reading of the fuel gauge on the end of the fuel tank. The Fuel Level Sensor reading should be approximately 50% when the fuel gauge reads 1/2 full.
2. Check to verify that the Fuel Sensor Type is set to Solid State in Unit Configuration in the Guarded Access Menu.
3. Turn the unit on and check for battery voltage (12 Vdc) between the 2PL (J3-12 pin) and FUELN (J3-35 pin) wires in the sensor harness at the J3 connector on the base controller. This is the input voltage. If battery voltage is not present, check the microprocessor.
4. If battery voltage is present, check the output voltage between the FLL (J3-23 pin) and FUELN (J3-35 pin) wires in the sensor harness at the J3 connector on the base controller. The voltage should be between 1 and 4 Vdc depending on the fuel level as shown the following table:

Fuel Level	Output Voltage
Empty	Approximately 1.0 Vdc
1/2 Full	Approximately 2.5 Vdc
Full	Approximately 4.0 Vdc

Note: *The output voltages listed above are for the ultrasonic fuel level sensor designed to be used with SR-3 controllers. Other systems such as third party telematics systems may use sensors with slightly different output voltages. Refer to the sensor specifications for those sensors.*

5. If the output voltage is incorrect, check the continuity of the wires that go from the J3 connector on the base controller to the sensor as shown in the following table and verify the connections are clean and tight.

Note: *The sensor cable (or interconnect harness) wires are connected to the sensor wires with solder connections and heat shrink tubing during installation. Refer to the applicable Installation Manual for more information.*

J3 Connector Pin	Sensor Harness Wire	Sensor Cable Connector Pin	Sensor Cable Wire	Sensor Wire
12	2PL	A	Green	Red
23	FLL	B	White	Yellow
35	FUELN	C	Black	Black

6. If the wires have good continuity and the connections are clean and tight, replace the sensor.

105 CHECK RECEIVER TANK PRESSURE SOLENOID CIRCUIT

Alarm Type

Check or Shutdown

Associated Alarm Codes

N/A

Component Description and Location

The Receiver Tank Pressure Solenoid is located in the host unit refrigeration section.

Circuit Description

The Receiver Tank Pressure Solenoid circuit is a two wire circuit. The Receiver Tank Pressure Solenoid is energized by a Smart FET on the Base Controller. The solenoid is not polarity sensitive. The RTPS wire applies 12 Vdc to one side of the Receiver Tank Pressure Solenoid to energize the solenoid. The CHRT wire connects the other side of the solenoid to chassis ground at the ground plate near the unit battery. The solenoid is not polarity sensitive. The wires are routed in the Main Harness.

Considerations

During a non-running Pretrip, the current draw is determined by the shunt reading feedback to the Base Controller.

During normal operation, the current draw is determined by the Smart FET feedback to the Base Controller.

If an Alarm Code is set during normal operation, the ServiceWatch Data Logger will list the Alarm Code, FLTCT (Fault Current), Battery Volts, and the Shunt Current. The FLTCT will be the high or low current draw as determined by the Smart FET feedback that caused the Alarm Code to set.

How Alarm is Set

1. If during normal operation the current is greater than 3 amps or less than 0.5 amps at specified intervals after the solenoid is energized, Alarm Code 105 is set as a Check Alarm and the output is turned off. If the output circuit is shorted, it will be turned off immediately to protect the circuit and the alarm code will be set. Receiver Tank Pressure Solenoid operation is not allowed until Alarm Code 105 is cleared. The unit will continue to run but with reduced performance until the condition is corrected and the alarm is cleared. If this condition occurs when the unit is in Evacuation Mode, Alarm Code 105 will be set as a Shutdown Alarm.
2. If during normal operation the current does not return to less than 0.5 amps at a specified interval after the solenoid is de-energized, Alarm Code 105 is set as a Check Alarm. Receiver Tank Pressure Solenoid operation is not allowed until Alarm Code 105 is cleared.
3. If during a Pretrip Test the current is not between 0.5 to 3 amps when the solenoid is energized, Alarm Code 105 is set as a Check Alarm.
4. If during a Pretrip Test the current does not return to less than 0.5 amps when de-energized, Alarm Code 105 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. If FLTCT is greater than 3.0 amps, the circuit has excessive current flow. Check for a shorted circuit or solenoid coil.
2. If FLTCT is less than 0.5 amps, the circuit has low current flow. Check for high resistance or an open in the circuit or solenoid coil.

Indicator LED Diagnosis

1. Clear the alarm to reset the Smart FET. Check the operation of the receiver tank pressure solenoid circuit using Interface Board Test Mode. Verify the Base Controller receiver tank pressure solenoid circuit LED illuminates. For LED identification, refer to the LED decal on the control box door. If the receiver tank pressure solenoid circuit LED illuminates, proceed to Step 2. If the receiver tank pressure solenoid circuit LED does not illuminate, proceed to Step 3.
2. If the receiver tank pressure solenoid circuit LED does illuminate and the alarm is not present, the circuit has high resistance or is open. Use the HMI Control Panel amps gauge to check the current drawn by the receiver tank

pressure solenoid, while operating the solenoid with Interface Board Test Mode. The current draw should be approximately 0.7 amps. If the current is not within limits, check for high resistance or open in the circuit or solenoid coil as shown in Step 3. Verify that all circuit connectors are secure.

3. If the receiver tank pressure solenoid circuit LED does not illuminate and the alarm is present, check for a shorted circuit or solenoid coil. Disconnect the 36 pin connector J7 and check the circuit with an accurate ohmmeter for a short circuit, open circuit, or loose connection. The solenoid coil resistance should be approximately 17.0 ohms.
4. If no problems are found in steps 1-3 and the output LED does not illuminate, check the Base Controller assembly in accordance with Service Procedure A01A.
5. To verify the refrigeration system operation of the Receiver Tank Pressure Solenoid, refer to Service Procedure R08A.

106 CHECK PURGE VALVE CIRCUIT

Alarm Type

Check or Shutdown

Associated Alarm Codes

N/A

Component Description and Location

The Purge Valve is located in the unit condenser section.

Circuit Description

The purge valve circuit is a two wire circuit. The purge valve is energized by a Smart FET on the Interface Board. The PV wire applies 12 Vdc to one side of the purge valve to energize the solenoid. The CHPV wire connects the other side of the solenoid to chassis ground at the ground plate near the unit battery. The solenoid is not polarity sensitive. The wires are routed in the Main Harness.

Considerations

During a non-running Pretrip, the current draw is determined by the shunt reading feedback to the Base Controller.

During normal operation, the current draw is determined by the Smart FET feedback to the Base Controller.

If an Alarm Code is set during normal operation, the ServiceWatch Data Logger will list the Alarm Code, FLTCT (Fault Current), Battery Volts, and the Shunt Current. The FLTCT will be the high or low current draw as determined by the Smart FET feedback that caused the Alarm Code to set.

How Alarm is Set

1. If during normal operation the current is not between 0.5 to 3 amps three seconds after the solenoid is energized, Alarm Code 106 is set as a Check Alarm and the output is turned off. If the output circuit is shorted, it will be turned off immediately to protect the circuit and the alarm will be set. Purge valve operation is not allowed until Alarm Code 106 is cleared. The unit will continue to run but with reduced performance until the condition is corrected and the alarm is cleared. If this condition occurs when the unit is in Evacuation Mode, Alarm Code 106 will be set as a Shutdown Alarm.
2. If during normal operation the current does not return to less than 0.5 amps three seconds after the solenoid is de-energized, Alarm Code 106 is set as a Check Alarm. Purge valve operation is not allowed until Alarm Code 106 is cleared. The unit will continue to run but with reduced performance until the condition is corrected and the alarm is cleared.
3. If during a Pretrip Test the current is not between 0.5 to 3 amps when the solenoid is energized, Alarm Code 106 is set as a Check Alarm.
4. If during a Pretrip Test the current does not return to less than 0.5 amps when de-energized, Alarm Code 106 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. If FLTCT = 3.0 amps, the circuit has high amp draw. Check for a shorted circuit or solenoid coil.
2. If FLTCT < 0.5 amps, the circuit has low amp draw. Check for high resistance or an open in the circuit or solenoid coil.

Indicator LED Diagnosis

1. Clear the alarm to reset the Smart FET. Check the operation of the purge valve circuit using Interface Board Test Mode. Verify the Base Controller purge valve circuit LED illuminates. For Base Controller LED identification, refer to the LED decal on the control box door. If the Base Controller purge valve circuit LED illuminates, proceed to Step 2. If the Base Controller purge valve circuit LED does not illuminate, proceed to Step 3.
2. If the Base Controller purge valve circuit LED illuminates and the alarm is not present, the circuit has high resistance or is open. Use the Truck Premium Display amps gauge to check the current drawn by the purge valve, while operating the valve with Interface Board Test Mode. The current draw should be approximately 0.7 amps. If the

current is not within limits, check for high resistance or open in the circuit or solenoid coil as shown in Step 3. Verify that all circuit connectors are secure.

3. If the Base Controller purge valve circuit LED does not illuminate and the alarm is present, check for a shorted circuit or solenoid coil. Disconnect the 36 pin connector J7 and check the circuit with an accurate ohmmeter for a short circuit, open circuit, or loose connection. The valve coil resistance should be approximately 17.0 ohms.
4. If no problems are found in steps 1-3 and the output LED does not illuminate, check the Base Controller in accordance with Service Procedure A01A.
5. If Multi-Temp Unit: To verify the refrigeration system operation of the Purge Valve, refer to Service Procedures R07A and R08A.

107 CHECK CONDENSER INLET SOLENOID CIRCUIT

Alarm Type

Check or Shutdown

Associated Alarm Codes

N/A

Component Description and Location

The Condenser Inlet Solenoid is located in the unit condenser section.

Circuit Description

The condenser inlet solenoid circuit is a two wire circuit. The condenser inlet solenoid is energized by a Smart FET on the Base Controller. The CIS wire applies 12 Vdc to one side of the condenser inlet solenoid to energize the solenoid. The CHCI wire connects the other side of the solenoid to chassis ground at the ground plate near the unit battery. The solenoid is not polarity sensitive. The wires are routed in the Main Harness.

Considerations

During a non-running Pretrip, the current draw is determined by the shunt reading feedback to the Base Controller.

During normal operation, the current draw is determined by the Smart FET feedback to the Base Controller.

If an Alarm Code is set during normal operation, the ServiceWatch Data Logger will list the Alarm Code, FLTCT (Fault Current), Battery Volts, and the Shunt Current. The FLTCT will be the high or low current draw as determined by the Smart FET feedback that caused the Alarm Code to set.

How Alarm is Set

1. If during normal operation the current is not between 0.5 to 3 amps three seconds after the solenoid is energized, Alarm Code 107 is set as a Check Alarm and the output is turned off. If the output circuit is shorted, it will be turned off immediately to protect the circuit and the alarm will be set. Condenser inlet solenoid operation is not allowed until Alarm Code 107 is cleared. If this condition occurs when the unit is in Evacuation Mode, Alarm Code 107 will be set as a Shutdown Alarm.
2. If during normal operation the current does not return to less than 0.5 amps three seconds after the solenoid is de-energized, Alarm Code 107 is set as a Check Alarm. Condenser inlet solenoid operation is not allowed until Alarm Code 107 is cleared. The unit will continue to run but with reduced performance until the condition is corrected and the alarm is cleared.
3. If during a Pretrip Test the current is not between 0.5 to 3 amps when the solenoid is energized, Alarm Code 107 is set as a Check Alarm.
4. If during a Pretrip Test the current does not return to less than 0.5 amps when de-energized, Alarm Code 107 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. If FLTCT = 3.0 amps, the circuit has high amp draw. Check for a shorted circuit or solenoid coil.
2. If FLTCT < 0.5 amps, the circuit has low amp draw. Check for high resistance or an open in the circuit or solenoid coil.

Indicator LED Diagnosis

1. Clear the alarm to reset the Smart FET. Check the operation of the condenser inlet solenoid circuit using Interface Board Test Mode. Verify the Base Controller condenser inlet solenoid circuit LED illuminates. For Base Controller LED identification, refer to the LED decal on the control box door. If the Base Controller condenser inlet solenoid circuit LED illuminates, proceed to Step 2. If the Base Controller condenser inlet solenoid circuit LED does not illuminate, proceed to Step 3.
2. If the Base Controller condenser inlet solenoid circuit LED illuminates and the alarm is not present, the circuit has high resistance or is open. Use the Truck Premium Display amps gauge to check the current drawn by the condenser inlet solenoid, while operating the solenoid with Interface Board Test Mode. The current draw should be

approximately 1.3 amps. If the current is not within limits, check for high resistance or open in the circuit or solenoid coil as shown in Step 3. Verify that all circuit connectors are secure.

3. If the Base Controller condenser inlet solenoid circuit LED does not illuminate and the alarm is present, check for a shorted circuit or solenoid coil. Disconnect the 36 pin connector J7 and check the circuit with an accurate ohmmeter for a short circuit, open circuit, or loose connection. The solenoid coil resistance should be approximately 9.6 ohms.
4. If no problems are found in steps 1-3 and the output LED does not illuminate, check the Base Controller in accordance with Service Procedure A01A.
5. If Multi-Temp Unit: To verify the refrigeration system operation of the Condenser Inlet Solenoid, refer to Service Procedure R08A.

108 DOOR OPEN TIMEOUT

Alarm Type

Check

Considerations

Changes in the door switch state are not recognized for four seconds. This is to prevent rapid unit operation changes if the door is ajar or the door switch is defective.

The unit or zone will be restarted after the off timer expires.

How Alarm is Set

The following conditions must be met:

- The optional door switch must be installed.
- The unit must be programmed (unit null, high speed lockout, or zone null, if multi-temp) to force the unit off/on door opening.
- A maximum door open timeout must be programmed.
- Door open timeout alarm set to enabled.

1. When door open timer expires, the unit will resume normal operation even if the door is still open. Alarm Code 108 is set as a Check Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Download the ServiceWatch data logger and review the information to determine if the door switch is defective or if the door was left open for an extended period of time during loading or unloading of the truck or trailer.
2. Check the operation of the door switches.

110 CHECK SUCTION LINE SOLENOID CIRCUIT (ZONE)

Alarm Type

Zone Specific Check or Shutdown

Associated Alarm Codes

N/A

Component Description and Location

The Suction Line Solenoid is located in the individual remote evaporators.

Circuit Description

The Suction Line Solenoid circuit is a two wire circuit. The Suction Line Solenoids are energized by Smart FETs in the Expansion Module. The SLS wire applies 12 VDC to one side of the Suction Line Solenoid to energize the solenoid. The CHSL wire connects the other side of the solenoid to chassis ground. The solenoid is not polarity sensitive. The wires are routed in the Expansion Module Harness. The circuits have connectors in the remote evaporator and at the host unit.

Considerations

On systems with remote zone parallel evaporators, the respective Expansion Module Suction Line Solenoid output will supply power to both of the remote zone Suction Line Solenoids. The Pretrip and Smart FET current limits will be adjusted for the increased current drawn by parallel evaporators based on the zone configuration settings.

During a non-running Pretrip, the current draw is determined by the shunt reading feedback to the Base Controller.

During normal operation, the current draw is determined by the Smart FET feedback to the Base Controller.

If an Alarm Code is set during normal operation, the ServiceWatch Datalogger will list the Alarm Code, FLTCT (Fault Current), Battery Volts, and the Shunt Current. The FLTCT will be the high or low current draw as determined by the Smart FET feedback that caused the Alarm Code to set.

How Alarm is Set

1. If during normal operation the current is greater than 3 amps or less than 0.5 amps at specified intervals after the solenoid is energized, Alarm Code 110 is set as a Check Alarm and the output is turned off. If the output circuit is shorted, it will be turned off immediately to protect the circuit and the alarm code will be set. Suction Line Solenoid operation is not allowed until Alarm Code 110 is cleared. The unit will continue to run but with reduced performance until the condition is corrected and the alarm is cleared. If this condition occurs when the unit is in Evacuation Mode, Alarm Code 110 will be set as a Shutdown Alarm.

   With a frozen range setpoint the following occurs:

   - If in single zone operation, the unit runs normally.
   - If in multi-zone operation and all the zones are running in cool, heat, or heat and defrost, the unit runs normally.
   - If the offending zone requires heat and one or more zones are in cool, force the offending zone into null.
   - If the offending zone requires defrost and one or more zones are in cool, force all zones in cool into running null. Zones will resume cooling after defrost in the offending zone is completed.

   With a fresh range setpoint the following occurs:

   - If in single zone operation, the unit runs normally.
   - If in multi-zone operation and all the zones are running in cool, heat, or heat and defrost, the unit runs normally.
   - If the offending zone requires heat or defrost and one or more zones are in cool, force all zones in cool into running null. Zones will resume cooling after heating and or defrost in the offending zone is completed.
2. If the current does not return to less than 0.5 amps three seconds after the solenoid is de-energized and the unit is in multi-zone operation, Alarm Code 110 is set as a Check Alarm. If the current does not return to less than 0.5 amps three seconds after the solenoid is de-energized and the unit is in single zone operation, Alarm Code 110 is set as a Shutdown Alarm.
3. If during a Pretrip Test the current is not between 0.5 to 3 amps (1.0 to 6 amps if parallel evaporators) when the solenoid is energized, Alarm Code 110 is set as a Check Alarm.
4. If during a Pretrip Test the current does not return to less than 0.5 amps when de-energized, Alarm Code 110 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. If FLTCT is greater than 3.0 amps or 6.0 amps w/parallel evaporators, the circuit has excessive current flow. Check for a shorted circuit or solenoid coil.
2. If FLTCT is less than 0.5 amps, the circuit has low current flow. Check for high resistance or an open in the circuit or solenoid coil.

Indicator LED Diagnosis

1. Verify that the Expansion Module status LED (heartbeat LED) is flashing. If not, check the Expansion Module for proper operation in accordance with Service Procedure A01D.
2. If the Expansion Module Status LED is flashing, clear the alarm to reset the Smart FET. Check the operation of the suction line solenoid circuit using Interface Board Test Mode. Verify the appropriate Expansion Module suction line solenoid LED illuminates. For Expansion Module LED identification, refer to the LED decal on the control box door. If the Expansion Module suction line solenoid circuit LED illuminates, proceed to Step 3. If the Expansion Module suction line solenoid circuit LED does not illuminate, proceed to Step 4.
3. If the Expansion Module suction line solenoid circuit LED does illuminate and the alarm is not present, the circuit has high resistance or is open. Use the HMI Control Panel amps gauge to check the current drawn by the suction line solenoid, while operating the solenoid with Interface Board Test Mode. The current draw should be approximately 1.3 amps (2.6 amps if parallel evaporators). If the current is not within limits, check for high resistance or an open in the circuit or solenoid coil as shown in Step 4. Verify that all circuit connectors are secure.
4. If the Expansion Module suction line solenoid circuit LED does not illuminate and the alarm is present, check for a shorted circuit or solenoid coil. Disconnect the Expansion Module 35 pin connector J1 and check the circuit with an accurate ohmmeter for a short circuit, open circuit, or loose connection. The solenoid coil resistance should be approximately 9.6 ohms (4.8 ohms with parallel evaporators).
5. If no problems are found in steps 1-4 and the output LED does not illuminate, replace the Expansion Module.
6. Confirm the unit configuration is correct.
7. To verify the refrigeration system operation of the Suction Line Solenoid, refer to Service Procedures R05A and R06A.

111 UNIT NOT CONFIGURED CORRECTLY

Alarm Type

Log

Associated Alarm Codes

02 Check Evaporator Coil Sensor

03 Return Control Air Sensor

04 Discharge Air Control Sensor

29 Defrost Damper Circuit Check

30 Defrost Damper Stuck

45 Hot Gas Bypass Circuit

67 Check Liquid Line Solenoid Circuit

90 Electric Overload

110 Check Suction Line Solenoid Circuit

113 Check Electric Heat Circuit

121 Check PWM/Liquid Injection Circuit

122 Check Diesel/Electric Circuit

137 Damper Gear Motor Heater

143 Check Drain Hose Heater Output

How Alarm is Set

If a mismatch exists between the unit hardware configuration and the unit hardware as detected by the Base Controller, Alarm Code 111 is set as a Log Alarm

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

1. Verify actual unit configuration.
2. Set the unit configuration using the Unit Configuration sub-menu of the Programming Menu in accordance with Service Procedure A04A.
3. Verify correct Base Controller and software installed.

112 CHECK REMOTE FANS (ZONE)

Alarm Type

Check or Shutdown

Associated Alarm Codes

114 Multiple Alarms - Can Not Run

Component Description and Location

The fans are located in the remote evaporator(s). The test values are determined by the type of remote evaporators and the actual unit configuration for number and type of evaporators in a zone.

Circuit Description

The evaporator fans are energized by Smart FETs in the Expansion Module. The blue wires connect the fan motor to chassis ground. All ground wires are run back to the unit ground plate. The wires are routed in the Expansion Module Harness. The circuits have connectors in the remote evaporator and at the host unit.

Considerations

Fan power is supplied from the Expansion Module. 2A power is connected to the Expansion Module at the 2A stud on the Module.

Remote evaporators will have two or three fan motors. Any zone can have a minimum of two fan motors and a maximum of four fan motors. An individual truck unit can support up to six fan motors.

On systems with parallel remote zone evaporators, the respective Expansion Module fan motor output will supply power to two fan motors. Refer to the applicable unit wiring diagram for details.

On systems with single remote zone evaporators, the respective Expansion Module fan motor output will supply power to one fan motor. Refer to the applicable unit wiring diagram for details.

The Pretrip and Smart FET current limits will be adjusted for current draw based on the zone configuration settings.

The circuits have connectors in the remote evaporator and at the host unit.

How Alarm is Set

1. If during normal operation the current is not greater than 0.5 amps 2.5 seconds after the fan(s) are energized, Alarm Code 112 is set as a Check Alarm and the output is turned off.
   a. If the unit is in single temperature operation and all fan motors have Alarm Code 112 set, Alarm Code 114 will be set as a Shutdown Alarm. If one or more fans are allowed to run, the unit will continue to run.
   b. If the unit is in multi-temperature operation and all fan motors in a remote evaporator have Alarm Code 112 set, the remote evaporator will be forced into shutdown and all remote evaporator outputs for that evaporator will be forced off. Alarm Code 112 will be set as a zone Shutdown Alarm.
2. If during normal operation the current is greater than 18.0 amps 2.5 seconds after the fan(s) are energized, Alarm Code 112 is set as a Check Alarm and the output is turned off.
   a. If the unit is in single temperature operation and all fan motors have Alarm Code 112 set, Alarm Code 114 will be set as a Shutdown Alarm. If one or more fans are allowed to run, the unit will continue to run.
   b. If the unit is in multi-temperature operation and all fan motors in a remote evaporator have Alarm Code 112 set, the remote evaporator will be forced into shutdown and all remote evaporator outputs for that evaporator will be forced off. Alarm Code 112 will be set as a zone Shutdown Alarm.
3. If during normal operation the current is greater than 0.5 amps three seconds after the fan(s) are de-energized, Alarm Code 112 is set as a Check Alarm and the output is turned off.
   a. All defrost functions are disabled until the alarm is cleared.
4. If during normal operation the current is greater than the Smart FET current limit one second after the fan(s) are energized, Alarm Code 112 is set as a Check Alarm and the output is turned off.
   a. If the unit is in single temperature operation and all fan motors have Alarm Code 112 set, Alarm Code 114 will be set as a Shutdown Alarm. If one or more fans are allowed to run, the unit will continue to run.
   b. If the unit is in multi-temperature operation and all fan motors in a remote evaporator have Alarm Code 112 set, the remote evaporator will be forced into shutdown and all remote evaporator outputs for that evaporator will be forced off. Alarm Code 112 will be set as a zone Shutdown Alarm.
5. If during a Pretrip Test the current is not within specification when the fans are energized, Alarm Code 112 is set as a Check Alarm.

6. If during a Pretrip Test the current does not return to less than 0.5 amps when the fans are de-energized, Alarm Code 112 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. FLTCT = 20. The circuit has high amp draw. Check for a shorted circuit or fan motor.
2. FLTCT < 0.5. The circuit has low amp draw. Check for high resistance or open in the circuit or fan motor.
3. Check ground connectors and terminal crimps.

Indicator LED Diagnosis

1. Verify that the Expansion Module status LED (heartbeat LED) is flashing. If not, check the Expansion Module for proper operation in accordance with Service Procedure A01D.
2. If the Expansion Module Status LED is flashing, clear the alarm to reset the Smart FET. Check the operation of the fan circuit using Interface Board Test Mode. Verify the appropriate Expansion Module fan circuit LED illuminates. For Expansion Module LED identification, refer to the LED decal on the control box door. If the Expansion Module fan circuit LED illuminates, proceed to Step 3. If the Expansion Module fan circuit LED does not illuminate, proceed to Step 4.
3. If the Expansion Module fan circuit LED does illuminate and the alarm is not present, the circuit has high resistance or is open. Use the HMI Control Panel amps gauge to check the current drawn by the fan circuit, while operating the fans with Interface Board Test Mode. If the current is not within limits, check for high resistance or open in the circuit as shown in Step 4. Verify that all circuit connectors are secure.
4. If the Expansion Module fan circuit LED does not illuminate and the alarm is present, check for a shorted circuit. Disconnect the Expansion Module 6 pin connector J13 and check the circuit with an accurate ohmmeter for a short circuit, open circuit, or loose connection.
5. If no problems are found in steps 1-4 and the output LED does not illuminate, replace the Expansion Module.
6. Confirm the unit configuration is correct.

114 MULTIPLE ALARMS - CAN NOT RUN

Alarm Type

Shutdown

Associated Alarm Codes

03 Return Control Air Sensor

04 Discharge Air Control Sensor

How Alarm is Set

If both pressure transducers are failed and Alarm Code 03 or 04 is set, Alarm Code 114 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually or automatically.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

Proceed as indicated for the associated alarm codes.

117 AUTO OR MANUAL SWITCH FROM DIESEL TO ELECTRIC

Alarm Type

Log or Shutdown

Associated Alarm Codes

118 Auto or Manual Switch from Electric to Diesel

How Alarm is Set

1. If the unit is switched from diesel operation to electric operation during a Pretrip Test, Alarm Code 117 is set as a Log Alarm. The Pretrip Test will be restarted from the beginning in Electric Mode.
2. If the unit is switched from diesel operation to electric operation during a non-running Service Test Mode operation, Alarm Code 117 is set as a Shutdown Alarm.
3. If the unit is switched from diesel operation to electric operation during normal operation, this alarm is set as a Log Alarm for information only.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Information only. No action is required.

118 AUTO OR MANUAL SWITCH FROM ELECTRIC TO DIESEL

Alarm Type

Log or Shutdown

Associated Alarm Codes

117 Auto or Manual Switch from Diesel to Electric

How Alarm is Set

1. If the unit is switched from electric operation to diesel operation during a Pretrip Test, Alarm Code 118 is set as a Log Alarm. The Pretrip Test will be restarted from the beginning in Diesel Mode.
2. If the unit is switched from electric operation to diesel operation during a non-running Service Test Mode operation, Alarm Code 118 is set as a Shutdown Alarm.
3. If the unit is switched from electric operation to diesel operation during normal operation, this alarm is set as a Log Alarm for information only.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Information only. No action is required.

120 CHECK ALTERNATOR EXCITE CIRCUIT

Alarm Type

Check or Shutdown

Associated Alarm Codes

N/A

Circuit Description

The Alternator Excite circuit is a single wire circuit. The EXC wire connects the Base Controller connector J7 pin 33 to the alternator excite terminal. The wire is routed in the main harness. A Smart FET on the Base Controller supplies power to the EXC circuit. LED 18 is turned on when the alternator excite output is energized.

Considerations

The alternator excite input is energized when the engine starts to supply excitation voltage to the alternator.

How Alarm is Set

1. If during normal operation the current is not within specifications (above 2 amps) three seconds after the alternator excite output is energized, Alarm Code 120 is set as a Check Alarm and the output is turned off. Alternator excite operation is not allowed until Alarm Code 120 is cleared. The unit will continue to run but with reduced performance until the condition is corrected and the alarm is cleared.
2. If during normal operation the current does not return to less than 0.5 amps three seconds after the alternator excite output is de-energized, Alarm Code 120 is set as a Check Alarm. Alternator excite operation is not allowed until Alarm Code 120 is cleared. The unit will continue to run but with reduced performance until the condition is corrected and the alarm is cleared.
3. If during a Pretrip Test the current is not within specifications when the alternator excite output is energized, Alarm Code 120 is set as a Check Alarm.
4. If during a Pretrip Test the current does not return to less than 0.5 amps when de-energized, Alarm Code 120 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the operation of the alternator excite circuit using Interface Board Test Mode. Verify the alternator excite circuit LED illuminates . If the alternator excite circuit LED 18 illuminates, proceed to Step 2. If the alternator excite circuit LED 18 does not illuminate, proceed to Step 3.
2. If the alternator excite circuit LED 18 does illuminate, check for 12 Vdc at the alternator excite terminal. If 12 Vdc is not present, check for a short circuit, open circuit, or loose connection.
3. If the alternator excite circuit LED 18 does not illuminate, check the circuit with an accurate ohmmeter for a short circuit, open circuit, shorts to ground, or loose connection.
4. Disconnect the EXC wire at the alternator and check for 12 Vdc when the engine is running. If 12 Vdc is not present, check the EXC circuit for continuity.
5. Check the Base Controller in accordance with Service Procedure A01A.

121 CHECK LIQUID INJECTION CIRCUIT

Note: *Units with scroll compressor only.*

Alarm Type

Log or Shutdown (Pretrip Only)

Associated Alarm Codes

N/A

Component Description and Location

The liquid injection solenoid is located in a branch of the liquid line that attaches to the compressor body. It is a normally closed valve.

Circuit Description

The liquid injection solenoid circuit is a two wire circuit. The LIQ-01 wire connects the Base Controller connector J7 pin 10 to one side of the liquid injection solenoid. The CHQ-01 wire connects the other side of the solenoid to chassis ground at the ground plate. The solenoid is not polarity sensitive. The switch wires are routed in the Main Harness. A Smart FET on the Base Controller supplies power to the LIQ-01 circuit.

Considerations

Liquid injection valves are used on scroll compressors only.

How Alarm is Set

1. If during a Pretrip Test the current is less than 0.5 or greater than 3.0 amps when the solenoid is energized, Alarm Code 121 is set as a Check Alarm.
2. If during a Pretrip Test the current is greater than 0.5 amps when de-energized, Alarm Code 121 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the operation of the liquid injection solenoid circuit using Interface Board Test Mode. Verify the liquid injection line solenoid LED 19 illuminates.
2. Use the Truck Premium Display amps gauge to check the current drawn by the liquid injection solenoid, while operating the solenoid with Interface Board Test Mode. The current draw should be approximately 1.1 amps.
3. Energize the liquid injection solenoid, using Interface Board Test Mode. Check for battery voltage on the LIQ-01 circuit. If voltage is present at the liquid injection solenoid, and no current was measured in the step above, replace the liquid injection solenoid coil.

122 CHECK DIESEL/ELECTRIC CIRCUIT

Alarm Type

Check or Shutdown (Pretrip Test Only)

Associated Alarm Codes

N/A

Circuit Description

The Diesel/Electric circuit is energized by the Diesel/Electric Relay K5 on the Base Controller. The 7E wire supplies 12 Vdc to the Phase Select Module to energize the appropriate Standby Motor contactor.

How Alarm is Set

1. If during a Pretrip Test the unit is configured with Diesel/Electric Relay and current is less than 0.5 amps when the circuit is energized, Alarm Code 122 is set as a Check Alarm.
2. If during a Pretrip Test the zone is configured with Diesel/Electric Relay and current is greater than 0.5 amps of run relay reference when de-energized, Alarm Code 122 is set as a Shutdown Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the operation of the Diesel/Electric relay using Interface Board Test Mode in the Maintenance Menu. Verify the Diesel/Electric LED 7 illuminates.
2. Use the Truck Premium Display amps gauge to check the current drawn by the Diesel/Electric relay while operating the Diesel/Electric relay with Interface Board Test Mode. The current draw should be between 0.1 to 2 amps.

127 SETPOINT NOT ENTERED

Alarm Type

Check

How Alarm is Set

If the setpoint was changed but the change was not confirmed by pressing the YES key, Alarm Code 127 is set as a Check Alarm. The setpoint has not been changed and has returned to the original setting.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Information only. Verify setpoint is adjusted properly.

128 ENGINE RUN TIME MAINTENANCE REMINDER #1

Alarm Type

Log

Considerations

The programmable hourmeter alarms can be cleared from the Guarded Access Menu only.

How Alarm is Set

If one of the user programmed hourmeters has exceeded the time limit, Alarm Code 128 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared from the Guarded Access Menu only.

Diagnostic Procedure

1. Perform required maintenance as dictated by owner requirements.
2. Reset the hourmeter limit after completion in accordance with Service Procedure A28A.

129 ENGINE RUN TIME MAINTENANCE REMINDER #2

Alarm Type

Log

Considerations

The programmable hourmeter alarms can be cleared from the Guarded Access Menu only.

How Alarm is Set

If one of the user programmed hourmeters has exceeded the time limit, Alarm Code 129 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared from the Guarded Access Menu only.

Diagnostic Procedure

1. Perform required maintenance as dictated by owner requirements.
2. Reset the hourmeter limit after completion in accordance with Service Procedure A28A.

130 ELECTRIC RUN TIME MAINTENANCE REMINDER #1

Alarm Type

Log

Considerations

The programmable hourmeter alarms can be cleared from the Guarded Access Menu only.

How Alarm is Set

If one of the user programmed hourmeters has exceeded the time limit, Alarm Code 130 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared from the Guarded Access Menu only.

Diagnostic Procedure

1. Perform required maintenance as dictated by owner requirements.
2. Reset the hourmeter limit after completion in accordance with Service Procedure A28A.

131 ELECTRIC RUN TIME MAINTENANCE REMINDER #2

Alarm Type

Log

Considerations

The programmable hourmeter alarms can be cleared from the Guarded Access Menu only.

How Alarm is Set

If one of the user programmed hourmeters has exceeded the time limit, Alarm Code 131 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared from the Guarded Access Menu only.

Diagnostic Procedure

1. Perform required maintenance as dictated by owner requirements.
2. Reset the hourmeter limit after completion in accordance with Service Procedure A28A.

132 TOTAL UNIT RUN TIME MAINTENANCE REMINDER #1

Alarm Type

Log

Considerations

The programmable hourmeter alarms can be cleared from the Guarded Access Menu only.

How Alarm is Set

If one of the user programmed hourmeters has exceeded the time limit, Alarm Code 132 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared from the Guarded Access Menu only.

Diagnostic Procedure

1. Perform required maintenance as dictated by owner requirements.
2. Reset the hourmeter limit after completion in accordance with Service Procedure A28A.

133 TOTAL UNIT RUN TIME MAINTENANCE REMINDER #2

Alarm Type

Log

Considerations

The programmable hourmeter alarms can be cleared from the Guarded Access Menu only.

How Alarm is Set

If one of the user programmed hourmeters has exceeded the time limit, Alarm Code 133 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared from the Guarded Access Menu only.

Diagnostic Procedure

1. Perform required maintenance as dictated by owner requirements.
2. Reset the hourmeter limit after completion in accordance with Service Procedure A28A.

134 CONTROLLER POWER ON HOURS

Alarm Type

Log

Considerations

The programmable hourmeter alarms can be cleared from the Guarded Access Menu only.

How Alarm is Set

If one of the user programmed hourmeters has exceeded the time limit, Alarm Code 134 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared from the Guarded Access Menu only.

Diagnostic Procedure

1. Perform required maintenance as dictated by owner requirements.
2. Reset the hourmeter limit after completion in accordance with Service Procedure A28A.

136 CHECK SPARE DIGITAL OUTPUT

Alarm Type

Log (Pretrip Only)

Associated Alarm Codes

N/A

How Alarm is Set

If the Pretrip test indicates that a connection is made to a spare digital output and should not be, Alarm Code 136 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Verify that there are no connections made to the following pins of Base Controller connector J7:

- Pin 7
- Pin 8
- Pin 9
- Pin 22
- Pin 27
- Pin 30
- Pin 31
- Pin 32

141 AUTO-SWITCH DIESEL TO ELECTRIC DISABLED

Alarm Type

Check

Associated Alarm Codes

36 Electric Motor Failed to Run

38 Electric Phase Reversed

90 Electric Overload

Considerations

When this alarm is set, the unit will remain in Diesel Mode operation even when connected to a fully functional electric standby power system.

How Alarm is Set

If the Autoswitch Diesel to Electric feature is enabled and the unit switches to Electric Mode operation and an Electric Mode Shutdown Alarm is already set, Alarm Code 141 is set as a Check Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Check for associated alarms and repair as required.

143 CHECK DRAIN HOSE HEATER OUTPUT (ZONE)

Alarm Type

Log, Check, or Shutdown

Associated Alarm Codes

N/A

Component Description and Location

The drain hose heater is used on remote evaporators to keep the evaporator drain hose free of ice. They are located in the remote evaporator drain hoses.

Circuit Description

The drain hose heater circuit is a two wire circuit. Smart FETs in the Expansion Module energize the drain hose heaters for all remote zones on multi-temp units. The DHx wire applies 12 Vdc to one side of the drain hose heater at the terminal strip. The other side of the drain hose heater connects to chassis ground in the evaporator. Drain hose heaters in remote zones have supply circuits with connectors in the remote evaporator and at the host unit. The heater is not polarity sensitive. Refer to the unit wiring diagrams for wire numbers, locations, and additional details.

Considerations

Drain hose heaters are used in remote zones only. On systems with remote zone parallel evaporators, the respective drain hose heater output will supply power to all of the zone heaters. On zones with a single evaporator, there are two heaters. On zones with parallel evaporators, there are four heaters.

On systems with remote zone parallel evaporators, the respective Expansion Module drain hose heater output will supply power to all of the drain tube heaters. The Pretrip and Smart FET current limits will automatically adjust for the increased current drawn by parallel evaporators based on the zone configuration settings.

How Alarm is Set

1. If during normal operation the current is not between 0.5 to 6 amps (1.0 to 12 amps if parallel evaporators) three seconds after the drain hose heater is energized, Alarm Code 143 is set as a Log Alarm (set as Shutdown Alarm if the condition occurs in Evacuation Mode) and the output is turned off. If the output circuit is shorted, it will be turned off immediately to protect the circuit and the alarm will be set. Zone drain hose heater operation is not allowed until Alarm Code 143 is cleared.
2. If during normal operation the current does not return to less than 0.5 amps three seconds after the drain hose heater is de-energized, Alarm Code 143 is set as a Check Alarm. Zone drain hose heater operation is not allowed until Alarm Code 143 is cleared.
3. If during normal operation the current is limited by the Smart FET due to excessive current draw one second after the drain hose heater is energized, Alarm Code 143 is set as a Check Alarm. Zone drain hose heater operation is not allowed until Alarm Code 143 is cleared.
4. If during a Pretrip Test the current is not between 0.5 to 6 amps (single evaporator) or 1.0 to 12 amps (parallel evaporators) when the drain hose heater is energized, Alarm Code 143 is set as a Check Alarm.
5. If during a Pretrip Test the current does not return to less than 0.5 amps when de-energized, Alarm Code 143 is set as a Shutdown Alarm.
6. If during a Pretrip Test the unit is not configured for the zone being tested and amp draw is greater than the allowable limit, Alarm Code 143 and Alarm Code 111 are set as Log Alarms.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. If FLTCT >/= 6 (12 w/parallel evaporators). The circuit has high amp draw. Check for a shorted circuit or solenoid coil.
2. If FLTCT < 0.5. The circuit has low amp draw. Check for high resistance or open in the circuit or solenoid coil.

Indicator LED Diagnosis

1. Verify that the Expansion Module status LED (heartbeat LED) is flashing. If not, check the Expansion Module for proper operation in accordance with Service Procedure A01D.

2. If the Expansion Module Status LED is flashing, clear the alarm to reset the Smart FET. Check the operation of the drain hose heater circuit using Interface Board Test Mode. Verify the appropriate Expansion Module drain hose heater LED illuminates. For Expansion Module LED identification, refer to the LED decal on the control box door. If the Expansion Module drain hose heater circuit LED illuminates, proceed to Step 3. If the Expansion Module drain hose heater circuit LED does not illuminate, proceed to Step 4.
3. If the Expansion Module drain hose heater circuit LED does illuminate and the alarm is not present, the circuit has high resistance or is open. Use the HMI Control Panel amps gauge to check the current drawn by the drain hose heater, while operating the drain hose heater with Interface Board Test Mode. The current draw should be approximately 0.5 to 6 amps (1.0 to 12 amps if parallel evaporators). If the current is not within limits, check for high resistance or an open in the circuit or heater as shown in Step 4. Verify that all circuit connectors are secure.
4. If the Expansion Module drain hose heater circuit LED does not illuminate and the alarm is present, check for a shorted circuit or heater. Disconnect the Expansion Module 35 pin connector J1 and check the circuit with an accurate ohmmeter for a short circuit, open circuit, or loose connection.
5. If no problems are found in steps 1-4 and the output LED does not illuminate, replace the Expansion Module.
6. Confirm the unit configuration is correct.

144 LOSS OF EXPANSION MODULE CAN COMMUNICATION

Alarm Type

Log or Shutdown

Associated Alarm Codes

N/A

Circuit Description

The SR-3 Control Platform utilizes CAN communications to pass information back and forth between the Base Controller, HMI Control Panel, and Expansion Module. These cables are connected as follows:

- J12 - Connects the Base Controller to the Expansion Module.
- J14 - Connects the Base Controller to the HMI Control Panel.

Note: *Refer to the Wiring Diagram for details of each cable.*

How Alarm is Set

If communication is lost between the controller and Expansion Module for five seconds, Alarm Code 144 is set as a Shutdown Alarm and de-energize all outputs.

How Alarm is Cleared

The alarm will clear automatically when communications are re-established.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check all CAN cables to verify they are connected securely.
2. Check the Base Controller in accordance with Service Procedure A01A.
3. Check the Expansion Module in accordance with Service Procedure A01D.

145 LOSS OF CONTROLLER "ON" FEEDBACK SIGNAL

Alarm Type

Log

Associated Alarm Codes

N/A

Circuit Description

The Base Controller "On" feedback signal is supplied by 8X power flowing through fuse F7 (2A) to pin 6 on the CAN connectors J12, J13, and J14. The power on pin 6 of CAN connector J14 flows to the Truck Premium Display pin 6. The presence of power at pin 6 of the Truck Premium Display indicates that power is present on the 8X circuits.

Active CAN communications indicate the K9 On/Off Relay is energized and the Base Controller is running. If CAN communications are active but power is not present at pin 6 of the Truck Premium Display, there is a problem with the 8XP or 8X circuit(s).

How Alarm is Set

If communications have been established between the Base Controller and a CAN connected device such as the Truck Premium Display and the device feedback input is low for three seconds, Alarm Code 145 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

1. Verify that fuse F7 is not blown. If fuse F7 is blown, check the 8XP circuit for shorts. This circuit supplies power to pin 6 of all the CAN communication ports (J12, J13 and J14) on the Base Controller. If necessary, check for shorts at any devices connected to any of the CAN ports.
2. Check for power at pin 6 of the Truck Premium Display. If power is not present, check for an open in the 8XP circuit from fuse F7 to pin 6 of the CAN communication ports.

146 SOFTWARE VERSION MISMATCH

Alarm Type

Shutdown

Associated Alarm Codes

111 Unit Not Configured Correctly

How Alarm is Set

If single temperature software is detected in a unit with a Multi-Temperature Expansion Module connected, Alarm Code 146 is set as a Shutdown Alarm. Alarm Code 111 will also be set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually. The alarm will also clear automatically if the correct version of Base Controller software is flash loaded.

Diagnostic Procedure

Flash load the correct software for the application.

Note: *For the latest information, refer to the Software Compatibility Matrix:*

For North America: Asset Library (Software & Downloads > Truck & Trailer > Microprocessor > Trailer)

For EMEA: Info Central (Software Updates > Microprocessors > Compatibility Matrix)

147 MULTI-TEMP FAN SPEED CONTROL OUTPUT

Alarm Type

Check

Associated Alarm Codes

N/A

How Alarm is Set

If the fan speed feedback control is not within 10% of the requested value, Alarm Code 147 is set as a Check Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check that fan speed wires are connected correctly.
2. On remote zones with single evaporators, the fan speed output will be approximately zero volts during fresh setpoint operation and 4 to 5 volts during frozen operation.
3. On remote zones with dual evaporators, the fan speed output will be approximately 4 to 5 volts during fresh setpoint operation and 3 to 4 volts during frozen operation.

148 AUTO-SWITCH ELECTRIC TO DIESEL DISABLED

Alarm Type

Check

How Alarm is Set

If the Autoswitch Electric to Diesel feature is set yes and the unit switches to Diesel Mode operation and an Diesel Mode Shutdown Alarm is already set, Alarm Code 148 is set as a Check Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Check for associated alarms and repair as required.

149 ALARM NOT IDENTIFIED

Alarm Type

Check

Associated Alarm Codes

N/A

Considerations

This alarm, if present, does not affect unit operation. It is an information only alarm. If set, this alarm code may not appear in either the CargoWatch or ServiceWatch Data Loggers.

How Alarm is Set

This alarm is set by the HMI if the alarm cannot be identified due to a communications error, or if the alarm count exceeds the number of alarms in the alarm queue. Alarm Code 149 is set as a Check Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Note: *This alarm may not be able to be cleared from the Main or Guarded Access Menu. If Alarm Code 149 cannot be cleared, a Cold Start may be required to allow the alarm to be cleared.*

Diagnostic Procedure

Download the ServiceWatch data logger using WinTrac. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is set and cleared. This data can be very helpful in determining the cause of the alarm.

1. Check and correct other existing alarms.
2. Perform a Base Controller Cold Start in accordance with Service Procedure A07A. Record the programmable settings before performing the Cold Start and reprogram all settings after the Cold Start is completed. Clear all alarm codes.
3. If this alarm is still set, it may not be possible to clear it. Should this be the case, consult the District or Area Service Manager for instructions on how to proceed.

153 EXPANSION MODULE FLASH LOAD FAILURE

Alarm Type

Shutdown

Component Description and Location

The Expansion Module is located inside the control box.

Circuit Description

The Expansion Module allows the addition of up to two additional temperature controlled zones. The module provides the interface between the Base Controller and the Zone 1, Zone 2, and Zone 3 multi-temperature components such as sensors, solenoids, valves, and fan motors. It also provides over-current and short circuit protection for the associated circuits.

How Alarm is Set

The controller attempted to flash load the Expansion Module and was unsuccessful.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

The Expansion Module software is automatically flash loaded any time software is flash loaded to the Base Controller. Software cannot be flash loaded directly to the Expansion Module, it is always part of a Base Controller flash load. Refer to "Service Procedure A46A," for flash load details.

1. Check the CAN cable from J12 on the Base Controller to the 8 pin CAN connector on the Expansion Module. Verify connections are secure and all pins are fully seated in the connector.
2. Verify the Expansion Module heartbeat LED is illuminated.
3. Check Expansion Module in accordance with "Service Procedure A01D,".

158 PRIMARY (NEW) SOFTWARE FAILED TO LOAD

Alarm Type

Check

Considerations

1. Base Controller software flashloads via the WinTrac Service Tool, USB Flash Drive, or other methods are all performed and checked in the same manner.
2. When flashloading, verify the correct SR–3/SR–3.1 Base Controller software is flashloaded to the appropriate controller hardware (i.e., the software is not backwards/forwards compatible on old (blue) and new (green) controller hardware).
    a. For the latest information, refer to the Software Compatibility Matrix available through the Dealer Portal/ iService. For North America: Click here. For EMEA: Click here.
3. If non-compatible SR–3/SR–3.1 Base Controller software is incorrectly flashloaded to an SR–3/SR–3.1 Base Controller, Thermo King recommends to flashload the correct SR–3/SR–3.1 Base Controller software to address Alarm Code 158. In such scenarios, Thermo King recommends to flashload via USB Flash Drive as the preferred recovery method, especially if flashloading via the WinTrac Service Tool does not appear to resolve/clear Alarm Code 158.

How Alarm is Set

When new software is being flashloaded to a Base Controller, the current revision software is held intact until the new revision software is installed and verified. If the flashload is unsuccessful, the Base Controller will continue to operate with the current revision software and Alarm Code 158 will be set as a Check Alarm.

How Alarm is Cleared

This alarm is cleared automatically when the new software is successfully flashloaded. The alarm can be cleared manually, but will return when the unit power is switched off and back on.

Diagnostic Procedure

Retry the flashload procedure.

159 CHECK BATTERY CONDITION

Alarm Type

Log

Associated Alarm Codes

N/A

Considerations

1. This feature is included in the Guarded Access Menu to provide users with an alarm which can indicate that the main system battery is not performing well (discharging very quickly). Applicable for both diesel and electric mode. The alarm can be enabled or disabled through the HMI Guarded Access Menu or preset using Optiset (default is disabled).
2. The counter will be cleared whenever any restart other than low voltage restart occurs. The counter will also be cleared whenever the timer expires.
3. The counter for consecutive low battery restarts will be cleared whenever any restart other than low voltage restart occurs. The counter for consecutive low battery restarts, which is different from the counter in #1 below, will be cleared when the timer expires.

How Alarm is Set

1. Three consecutive (i.e., counter is not cleared in-between) low battery voltage restarts will cause Alarm Code 159, if it occurs within an adjustable time frame (minimum = 1 minute, maximum = 60 minutes, default = 30 minutes) after C/S null entries.
2. Two consecutive low battery voltage restarts occurring within an adjustable time frame (minimum = 1 minute, maximum = 10 minutes, default = 5 minutes) after C/S null entries.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check the battery and replace if necessary.
2. Review the ServiceWatch download to check the number of “Non-running” starts during Cycle Sentry operation (after C/S null entry).
3. Verify there are no third party devices connected to the unit which can drain the battery quickly due to a high current draw.

163 EMISSION CONTROL FAILURE

Note: *Tier 4 Engines Only.*

Alarm Type

Check

Associated Alarm Codes

"07 Check Engine RPM Sensor," p. 215

"86 Check Discharge Pressure Transducer," p. 265

"87 Check Suction Pressure Transducer,"

"89 Check Electronic Throttling Valve (ETV) Circuit," p. 268

Considerations

Software revision D050/75A0 or F010/75B0 or later.

How Alarm is Set

1. If the following alarm codes are set, Alarm Code 163 is set as a Check Alarm:
   - Alarm Code 07
   - Alarm Code 86
   - Alarm Code 87
   - Alarm Code 89
2. If Minimum Suction Pressure ETV Control becomes the controlling algorithm, Emission Control is inactive and Alarm Code 163 is set as a Check Alarm.
3. If Compressor Compression Ratio Control becomes the controlling algorithm, Emission Control is inactive and Alarm Code 163 is set as a Check Alarm.

How Alarm is Cleared

This alarm will clear automatically when none of the above conditions exist. This alarm can also be cleared manually, but Alarm Code 163 will be reset if any of the above conditions are still present.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Check and correct any of the above existing alarms.
2. Check the ETV circuit operation using Service Test Mode.
3. Verify that Base Controller software revision is D050/F010 or later.
4. Verify that HMI software revision is 75A0/75B0 or later.
5. Adjust engine speed (RPM) in accordance with "Service Procedure F11A," p. 355.

165 LOW ENGINE POWER AVAILABLE

Note: *T-690/T-890/T-1090/T-1090 Spectrum units and UTR units only.*

Alarm Type

Log

Associated Alarm Codes

"21 Cooling Cycle Check,"

"22 Heating Cycle Check,"

"26 Check Refrigeration Capacity,"

How Alarm is Set

If the unit has been running for at least five minutes following a successful start, engine coolant temperature is greater than 100°F (38°C), and the engine is unable to provide the expected power for one minute, Alarm Code 165 is set as a Log Alarm.

How Alarm is Cleared

This alarm can be cleared manually.

Diagnostic Procedure

Always download the ServiceWatch data logger using the WinTrac Service Tool. Review the data using Technician Level to determine the conditions at the time the alarm was set. Conditions relevant to the alarm are recorded when the alarm is both set and cleared. This data can be invaluable when determining the cause of the alarm.

1. Confirm high speed solenoid is operational and shifting engine into high speed.
2. Adjust engine speed (RPM) in accordance with "Service Procedure F11A," p. 355.
3. Inspect belts and pulleys and fanshafts for excessive drag, alignment, and wear.
4. Check engine mechanical systems for power loss. Refer to Mechanical Diagnosis in applicable Maintenance Manual.

235 HIGH ENGINE COOLANT TEMPERATURE CHECK

Alarm Type

Log

Associated Alarm Codes

18 High Engine Coolant Temperature

How Alarm is Set

This alarm code will be set as a Log Alarm only when:

- Limited Alarm Restarts II is DISABLED, and
- Alarm Code 18 is set the third time in a continuous 12 hour period after Alarm Code 18 is cleared twice manually via the HMI.

How Alarm is Cleared

This alarm can only be cleared via Guarded Access.

Diagnostic Procedure

Clear Alarm Code 18.

THERMO KING

Section 6 - Service Procedures

A01A - Base Controller Functional Test

Purpose:

To confirm proper operation of the SR-3 Base Controller.

Materials Required:

- Fluke Digital Multimeter
- Truck Premium HMI or Mechanics Service Tool

Operation:

Base Controller

- LED 21 Application Micro: Heartbeat - two flashes (approximately one second pause)

Important Notes:

- Always do a quick visual inspection of all connectors to verify that they are seated prior to replacing a component. Correct any issue identified prior to completing the following Procedure. Check the following:

  Note: *Any external component attached to the Base Controller that is not properly operating may impact the operation of the Base Controller.*

  – Gaskets properly seated.
  – Wires and pins properly seated into connector body.
  – Loose pins, wires, or connections.
  – Signs of corrosion on connectors, fuse holders, etc.
  – If any open fuses, check harness for pinched/chafed wires or cut jackets.
  – Battery terminals for loose connections.
  – Security of frame grounds.
  – F10 fuse correctly positioned (downward = normal). If F10 fuse is in bypass position (upward), auto start may result.
- This procedure only checks circuits, inputs, outputs, etc. For a complete automated test of the Base Controller, refer to Service Procedure A01A-1.

Procedure:

All SR–3 controller replacements under warranty MUST include the following information, which needs to be attached to the TAVANT warranty claim:

- ServiceWatch Download (if Controller is functional) OR
- If unable to connect to the Controller to perform the ServiceWatch Download, complete the Failure Report (TK 54903) AND
- A01A Base Controller Functional Test Fail Step

At the conclusion of performing the Base Controller Functional Test, complete the following information:

Base Controller Functional Test

Which decision tree reference number best describes the repair that was made? Example: 1.2.6 Replace Controller	**Reference Number:**
Enter the removed component serial number.	**Serial Number:**
Enter the installed component serial number.	**Serial Number:**

To complete this procedure, refer to the following Figures.

Note: *For truck units using the HMI adapter harness, if the HMI is not powering up correctly, check the adapter harness connections when checking the J12, J13, and J14 connectors.*

Figure 199. Base Controller Functional Test

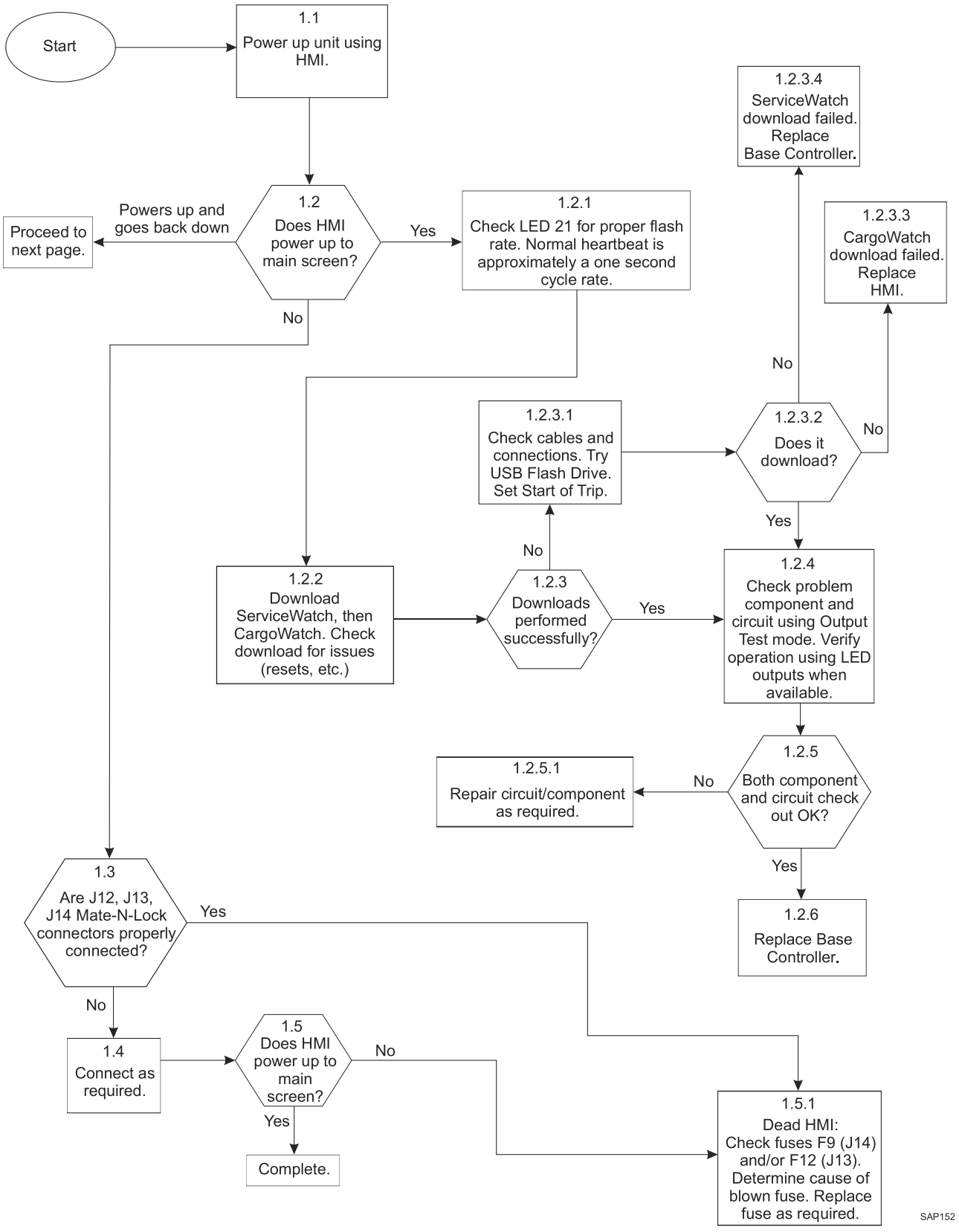


Figure 200. Base Controller Functional Test

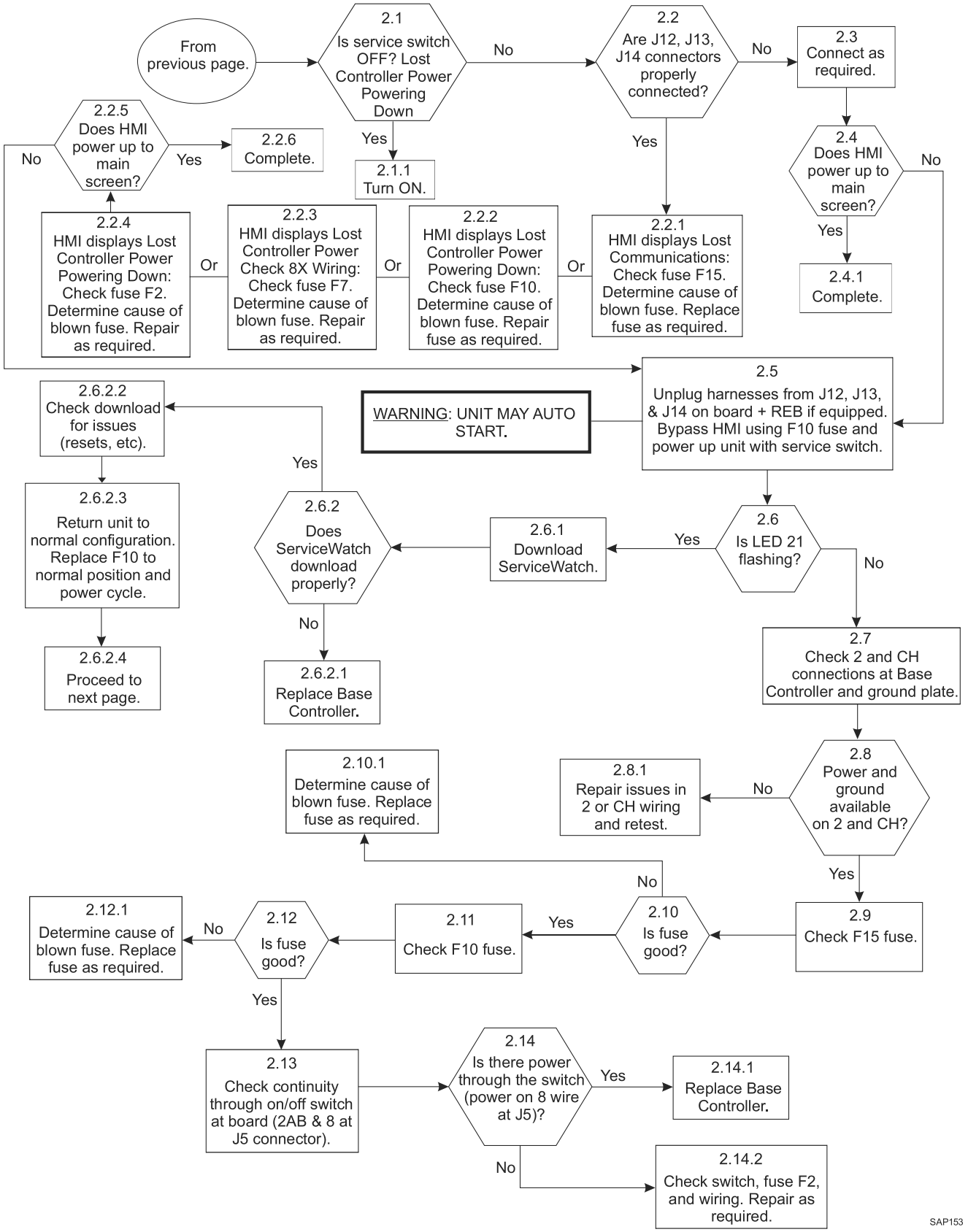
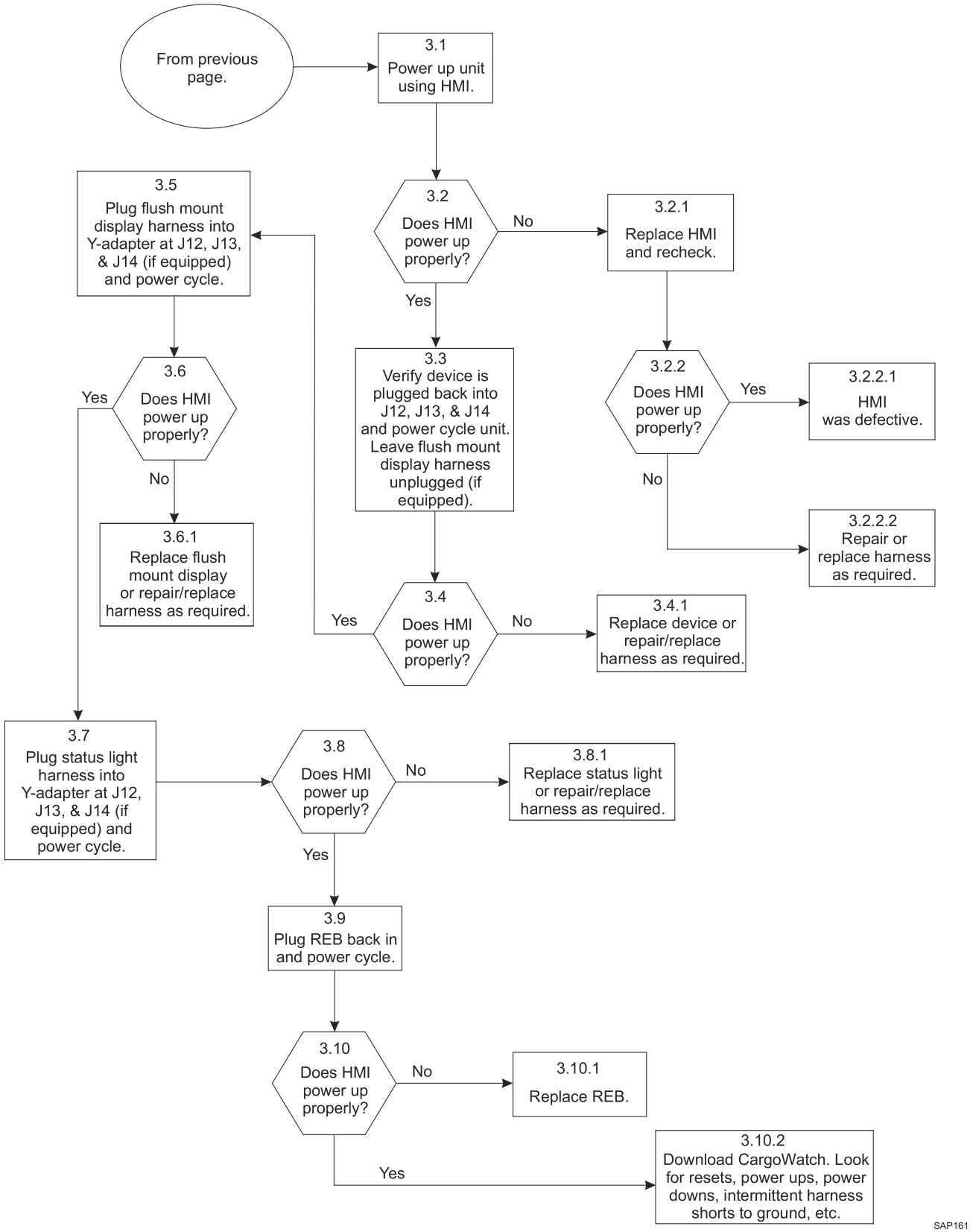


Figure 201. Base Controller Functional Test



A01A-1 - Base Controller Automated Test

Purpose:

To confirm proper operation of the Base Controller.

Materials Required:

Diagnostic Tool (P/N 204-1930)

Note: *Refer to Section 7 for details.*

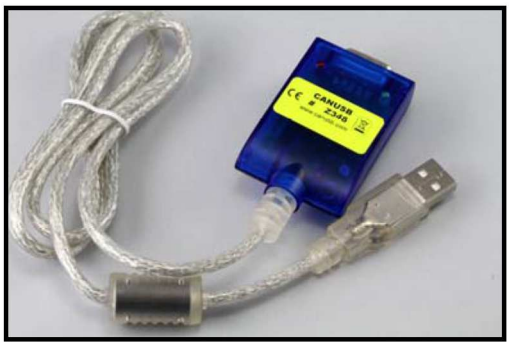
Operation:

Base Controller - LED 21 Application Micro (Heartbeat)

- Flashing once per second - Indicates normal Base Controller operation.
- Flashing several times per second - Indicates the Base Controller is in flash load mode. Flash loading the controller usually resolves this situation. If this condition cannot be resolved, the Base Controller may need to be replaced. Refer to the Regional Service Department if condition cannot be corrected.
- Always off - Indicates the Base Controller is not operating. This may occur for reasons other than a defective Base Controller. Verify power is available, all connections are secure, and harnesses are in good condition. Verify the unit battery is not dead. Check the unit fuses.
- Always on - Indicates the Base Controller is rebooting or is under test by the Diagnostic Tool. If this condition cannot be resolved, the Base Controller must be replaced.

Important Notes:

- The Diagnostic Tool Software provides detailed and illustrated on-screen instructions for connecting the Diagnostic Tool and performing the tests. Follow the instructions carefully. The instructions in this Service Procedure are intended to support the instructions provided by the software, not replace them.
- When using the Diagnostic Tool, supply power from a known good battery, a suitable power supply, or by connecting a battery charger to the unit battery. Low voltage caused by a low unit battery will affect the test results. The threshold for battery power influencing test results is about 11.5 Vdc.
- When testing a Base Controller, supply power to the Base Controller power connections as shown in the instructions. Do not supply power to the Diagnostic Tool. Supplying power to the Diagnostic Tool may result in a communication failure.
- If communications problems have been experienced with the components under test, the CAN Test should be performed. The CAN Test cannot be run without a USB to CAN Adaptor and a CAN Test Cable as shown below.



SAP337

USB to CAN Adapter

The USB Connector on the adaptor cable is attached to the test PC computer. The 9 Pin Connector on the blue adaptor body is attached to the CAN Test Cable.



SAP338

CAN Test Cable

The 9 Pin Connector on the cable is attached to the 9 pin connector on the USB to CAN Adaptor body. The Red J1 Connector is attached to the J1 Connector on the Blue Diagnostic Tool.

- Verify all connections are secure when attaching the tester and reconnecting the unit wiring harnesses.
- If a component fails the test, verify all wiring is correctly connected.
- Complete the Control System Warranty Report (TK 54903-9-FO) if the repair is covered under warranty. This Warranty Report, as well as a printed copy of the Diagnostic Tool Test Report is necessary to process a warranty

claim. In addition, appropriate ServiceWatch and CargoWatch data logger downloads that relate to the issue can be extremely helpful for failure analysis studies.

Table 31. Procedure

Step	Action	Result	Comments
1	Turn the Microprocessor On/Off switch off.		Failure to do so may damage the unit components.
2	Start the TK Diagnostic Tool software on the computer.		The TK Diagnostic Tool Software provides illustrated step by step connection and test instructions.
3	Diagnostic Tool software version 4.x will prompt the technician to use the correct Diagnostic Tool.		If the prompt does not appear, you are using software prior to Revision 4.1. This software will not test SR-3 Base Controller assemblies.
4	From the Diagnostic Tool software menu, select "SR-3 Series - English".		
5	Left click RUN SELECTED TEST.		
6	Confirm the test selection by left clicking RUN TEST WITH SERVICE REPORT.		
7	Follow the prompts to connect the Diagnostic Tool to the unit Base Controller assembly and perform the test.		
8	When the test is complete, the results will be reported on the computer.		
9	If the assembly failed the test, check the test results for possible causes and correct as directed.	The test results will indicate if a problem exists with the Base Controller.	
10	Retest the assembly if necessary to confirm the test results.		If the component fails the test, verify the wiring is correctly connected.
11	Record the data as requested by the test report.		Complete the Control System Warranty Report (TK 54903-9-FO) if the repair is covered under warranty. The form is included with the replacement component.
12	Print the test report for future use.		A copy of the Diagnostic Tool Test Report is also necessary to process a warranty claim.
13	Disconnect the Diagnostic Tool and reconnect the unit harnesses and wires.		Verify all connectors are secure and harnesses are properly routed and held in place with tie bands.
14	After repairs are completed, perform a Full Pretrip Test to confirm unit operation.		

A01B - Truck Display Panel Functional Test

Purpose:

To confirm proper operation of the Truck Display Panel.

Materials Required:

- Fluke Digital Multimeter

Operation:

⚠ Caution

Risk of Injury!

Power is present on the display even if the unit On/Off switch is turned off.

The Truck Standard Display (TSD) and Truck Premium Display (TPD) receive power directly from the unit battery via the 2A/2P circuit. The following procedure allows the technician to determine if the TSD or TPD requires replacement.

Important Notes:

- If the Truck Standard Display or Truck Premium Display fails the test, verify all wiring is securely and correctly connected.
- Only one Truck Standard Display or Truck Premium Display should be connected to the Base Controller at a time.

Table 32. Procedure

Step	Action	Result	Comments
1	If the unit is equipped with a Truck Premium Display, perform a Truck Premium Display Self Test as shown in Section 4. ***Note:*** *A Truck Standard Display can be checked by substituting a known good Display.*		If the Truck Premium Display passes all of the self tests, it can be assumed to be functional.
2	If the Display does not power up, check the voltage on both sides of fuse F9. ***Note:*** *Battery voltage should be present on both sides of fuse F9.*	If battery voltage is only present on one side of fuse F9, check and replace fuse F9. Determine if the circuit from fuse F9 to the Display has shorted to chassis ground. If this circuit is good and fuse F9 still blows, check for a defective Truck Standard Display or Truck Premium Display. If battery voltage is not present at fuse F9, check the 2A circuit and fuse F3.	
3	If battery voltage is present at both sides of fuse F9 and the Truck Standard Display or Truck Premium Display does not power up, disconnect the harness connector at the rear of the Display.	Truck Standard Display: Battery voltage should be present between Pin 5 (battery power) and Pin 8 (chassis ground). If battery voltage is not present, check the Display harness. Truck Premium Display: Battery voltage should be present between Pin 1 (battery power) and Pin 2 (chassis ground). If battery voltage is not present, check the Display harness.	
4	If battery voltage is present on the Display harness connector and the Truck Standard Display or Truck Premium Display does not power up, the Truck Standard Display or Truck Premium Display must be replaced.		

A01D - Expansion Module Test

Purpose:

To confirm proper operation of the SR-3 Expansion Module.

Materials Required:

- Fluke Digital Multimeter
- Truck Premium HMI or Mechanics Service Tool

Operation:

Expansion Module

- LED 18 Application Micro: Heartbeat - once per second (Green LED)

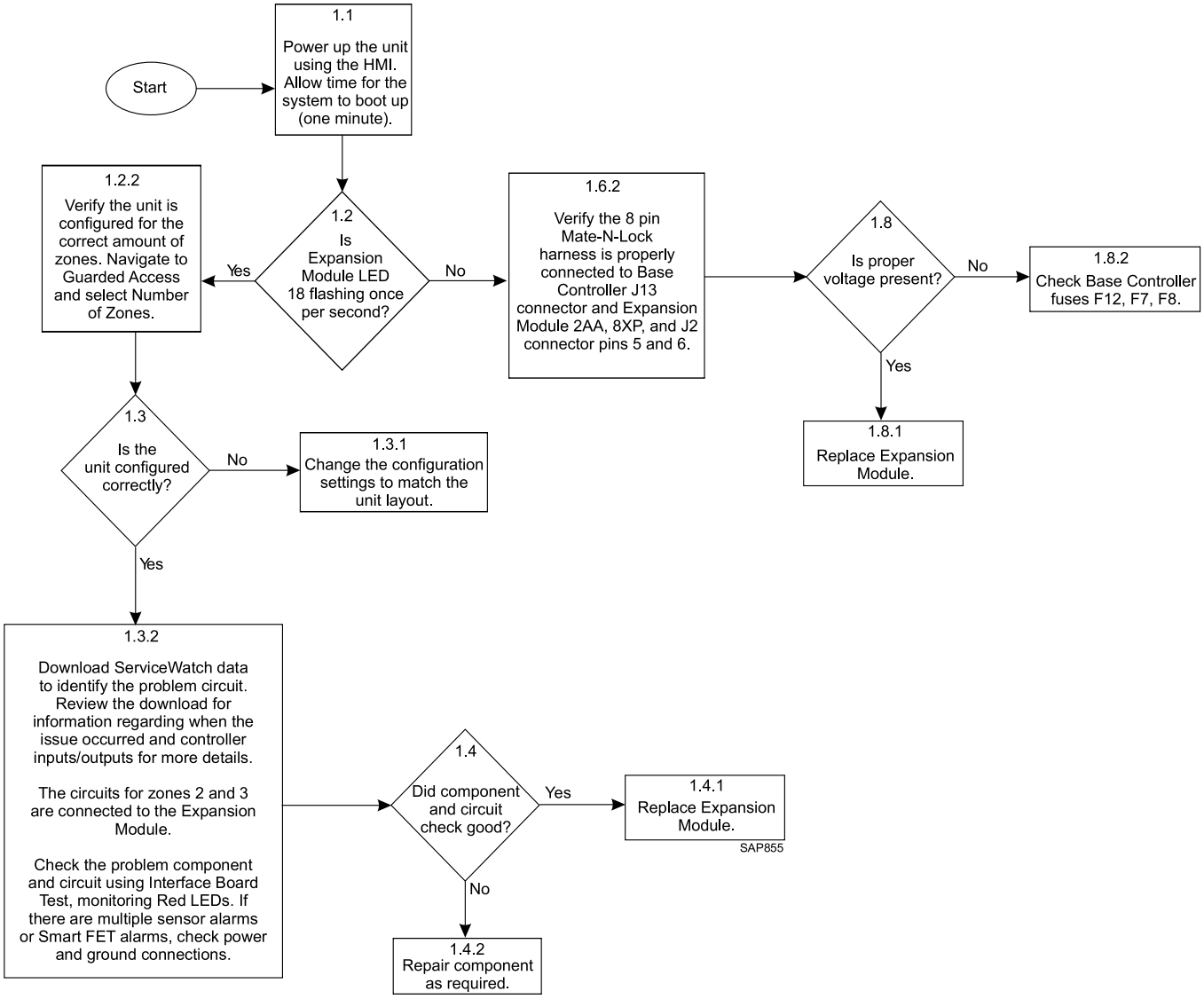
Important Notes:

- Any external component attached to the Expansion Module that is not properly operating may impact the operation of the Expansion Module.
- Always do a quick visual inspection of all connectors to verify that they are seated prior to replacing a component. Correct any issue identified prior to completing the following Procedure. Check the following:
  - Gaskets properly seated.
  - Wires and pins properly seated into connector body.
  - Loose pins, wires, or connections.
  - Signs of corrosion on connectors, fuse holders, etc.
  - If any open fuses, check harness for pinched/chafed wires or cut jackets.
  - Battery terminals for loose connections.
  - Security of frame grounds.

Procedure:

To complete this procedure, refer to the Figure on the following page.

Figure 202. Expansion Module Functional Test



A02A - Recording Existing Programmable Feature Settings Using Truck Premium Display

Purpose:

To manually retrieve and record the sensor grades and programmable feature settings of an SR-3 Base Controller using the Truck Premium Display or the Mechanics Service Tool.

Note: *The programmable features may also be retrieved using the Retrieve OptiSet Plus feature in the WinTrac™ Tools menu. Refer to Service Procedure A02B for details.*

Materials Required:

- A Truck Premium Display or Mechanics Service Tool connected to the Base Controller/Interface Board CAN Connector J14.

  Note: *Only one Truck Standard Display or Truck Premium Display should be connected to the Base Controller/ Interface Board at a time.*

- A copy of the Setup Sheet located in this Service Procedure.

Operation:

- The settings of the graded sensors and all programmable features must be retrieved before replacing a Base Controller/Interface Board or performing a Base Controller/Interface Board Cold Start. These settings will then be duplicated in the replacement Base Controller/Interface Board or after the Cold Start.
- The default settings are shown on the Setup Sheet in this Service Procedure.
- If a sensor grade is not shown on the setup sheet, physically check the sensor to determine the grade. It is very important that sensor grades be set properly.
- Refer to Section 3 for a complete description of programmable features.

Table 33. Procedure

Step	Action	Result	Comments
1	Verify that the Microprocessor On/Off switch is turned on. Turn the unit on using the Truck Premium Display or Mechanics Service Tool.	The Standard Display will appear.	
2	Press the MENU key.	The Operator Menu appears.	Do not let the unit start. The Guarded Access Menu cannot be entered if the unit is running.
3	Press and hold both the EXIT and unlabeled soft key for five seconds.	The Maintenance Menu appears.	
4	Press the NEXT key as required to display the Software Revision Menu. Then press the SELECT key to enter the Software Revision Menu.		
5	Use the NEXT and/or BACK keys to scroll through the HMI Control Panel and Base Controller software revisions.	Record the software revisions on the Setup Sheet.	
6	When the software revisions have been recorded, press the EXIT key to return to the Maintenance Menu.		
7	Press the NEXT key as required to display the Set Time and Date Menu. Then press the SELECT key to enter the Set Time and Date Menu.		The real time clock is located in the Truck Standard Display (TSD) or Truck Premium Display (TPD). The time is supplied to the Base Controller each time the unit is turned on. If the Base Controller is changed, the clock setting will be supplied to the Base Controller when the unit is turned on. If the Truck Standard Display (TSD) or Truck Premium Display (TPD) is changed, the time and date must be checked and set if necessary.

Table 33. Procedure (continued)

Step	Action	Result	Comments
8	Check the Time to determine the time zone used by the customer.	Record the time zone on the Setup Sheet.	Compare local time to unit time to determine time zone.
9	When the time zone has been recorded, press the EXIT key to return to the Maintenance Menu.		
10	Verify the unit is not running. The unit will not enter the Guarded Access Menu if it is running.		If the unit is running, scroll back and enter Interface Board Test Mode. This will cause the unit to shut down. Press the Exit key to return to the Maintenance Menu. Scroll back to the Set Time and Date Menu and proceed with the next step.
11	Press and hold both the EXIT and unlabeled key for five seconds.	The Guarded Access Menu appears.	If a Security Code is requested, enter the Security Code or [4444] to enter the Guarded Access Menu.
12	The Programmable Features Menu will appear. Press the SELECT key to enter the Programmable Features Menu.		
13	Use the NEXT and/or BACK keys to scroll through all settings in the Programmable Features Menu.	Record all Programmable Features settings on the Setup Sheet.	
14	When all Programmable Features settings have been recorded, press the EXIT key to return to the Guarded Access Menu.		
15	Use the NEXT and/or BACK keys to scroll to the next Guarded Access Menu.		Use the Setup Sheet as a guide.
16	Use the SELECT key to enter the next Guarded Access Menu.		Use the Setup Sheet as a guide.
17	Use the NEXT and/or BACK keys to scroll through all settings in the Menu.	Record all Programmable Features settings on the Setup Sheet.	
18	Use the EXIT key to return to the Guarded Access Menu.		
19	Continue to use Steps 15 – 18 as required to complete the Setup Sheet.		
20	When all settings have been recorded, press the EXIT key to return to the Guarded Access Menu.		
21	Press the EXIT key again to return to the Standard Display.		
22	Download the ServiceWatch data logger.		This information may be needed for diagnostics.

Setup Sheet - XXxx Software

Important: *Not all features shown on the Setup Sheet may appear. This is dependent on hardware type, software revision, and unit settings.*

Table 34. Software Revision

Function	Default Setting	Recorded Setting
Standard Truck HMI Control Panel	2204 or later	
Premium Truck HMI Control Panel	75xx, 76xx, or 77xx	
Base Controller	XXxx	

Table 35. Set Date and Time

Function	Default Setting	Recorded Setting
Time Zone	As specified by customer	
Compare local time to unit time to determine time zone. The real time clock is located in the HMI Control Panel. The time is supplied to the Base Controller each time the unit is turned on. If the Base Controller is changed, the clock setting will be supplied to the Base Controller when the unit is turned on. If the HMI Control Panel is changed, the time and date must be checked and set if necessary.		

Table 36. Security Code

Function	Default Setting	Recorded Setting
Security Code as specified by customer	No code	
Note: *If an unknown security code is set, use Security Code 4444 to gain access.*		

Table 37. Programmable Features

Function	Default Setting	Recorded Setting
Temperature Units	FAHRENHEIT/CELSIUS	
Pressure Units	PSI	
Restart Unit After Shutdown	ENABLED	
Setpoint High Limit Zone 1	80°F (27°C)	
Setpoint Low Limit Zone 1	-20°F (-29°C)	
Setpoint High Limit Zone 2	80°F (27°C)	
Setpoint Low Limit Zone 2	-20°F (-29°C)	
Setpoint High Limit Zone 3	80°F (27°C)	
Setpoint Low Limit Zone 3	-20°F (-29°C)	
Running Fans in Null	DISABLED	
Fresh Frozen Range	15°F (-9.4°C)	
Door Open	ENABLED	
Door Open Forces	LOG ONLY	
Door Open Timeout (HRS:MIN)	OFF	
Host Null	DISABLED	
High Speed Lockout Key	ENABLED	
High Speed Inhibit Timeout	OFF	
Sleep Mode After Pretrip	DISABLED	

Table 37. Programmable Features (continued)

Function	Default Setting	Recorded Setting
Discharge Pressure Setpoint	420 PSIG	
Water Temperature Setpoint	210°F (98°C)	
Limited Alarm Restarts	DISABLED	
Remote Device	DISABLED	
COM 1 Default Baud Rate	1200	
COM 2 Default Baud Rate	9600	
COM 3 Default Baud Rate	9600	
Demand Defrost on Temp Rises	DISABLED	
Extended ServiceWatch Logging	DISABLED	
Zone Priority	DISABLED	
Local Authorization of OptiSet Upload	DISABLED	
Local Authorization of Flash Load	DISABLED	
ServiceWatch Logging Interval	15 Minutes	
Limited Alarm Restart II	ENABLED	

Table 38. Main Menu Configuration

Function	Default Setting	Recorded Setting
Add Keypad Lockout to Mode Menu	DISABLED	
Add Sleep to Mode Menu	DISABLED	
Show SZC on Mode Menu	DISABLED	
Add Temperature Units to Mode Menu	DISABLED	
Keypad Lock PIN	NO CODE	
Easy Cargo Sensor Access	DISABLED	

Table 39. Hourmeter Setup - Program Hourmeter

Function	Default Setting	Recorded Setting
Total Run Time Reminder # 1 Hours	OFF	
Total Run Time Reminder # 2 Hours	OFF	
Controller Power On Hours	OFF	
Pretrip Reminder Hours	OFF	
Engine Run Time Reminder # 1	OFF	
Engine Run Time Reminder # 2	OFF	
Electric Run Time Reminder # 1	OFF	
Electric Run Time Reminder # 2	OFF	

Table 40. Hourmeter Setup - Viewable Hourmeter Setup

Function	Default Setting	Recorded Setting
Total Hours	DISABLED	
Total Run Time Hours	ENABLED	

Table 40. Hourmeter Setup - Viewable Hourmeter Setup (continued)

Function	Default Setting	Recorded Setting
Engine Hours	ENABLED	
Electric Hours	ENABLED	
Zone 1 Run Time Hours	DISABLED	
Zone 2 Run Time Hours	DISABLED	
Zone 3 Run Time Hours	DISABLED	
Total Run Time Reminder # 1 Hours	DISABLED	
Total Run Time Reminder # 2 Hours	DISABLED	
Controller Power On Hours	DISABLED	
Pretrip Reminder Hours	DISABLED	
Engine Run Time Reminder # 1 Hours	DISABLED	
Engine Run Time Reminder # 2 Hours	DISABLED	
Electric Run Time Reminder # 1 Hours	DISABLED	
Electric Run Time Reminder # 2 Hours	DISABLED	

Table 41. Hourmeter Setup - Programmable Service Due Date

Function	Default Setting	Recorded Setting
Engine Run Time Service Due Date	DISABLED	

Table 42. Sensor Calibration

Function	Default Setting	Recorded Setting
Zone 1 Return Air Sensor Grade	5H	
Zone 1 Discharge Air Sensor Grade	5H	
Zone 2 Return Air Sensor Grade	5H	
Zone 2 Discharge Air Sensor Grade	5H	
Zone 3 Return Air Sensor Grade	5H	
Zone 3 Discharge Air Sensor Grade	5H	

Table 43. Cycle Sentry Setup

Function	Default Setting	Recorded Setting
Cycle Sentry Amps	5 AMPS	
Cycle Sentry Battery Voltage	12.2 VOLTS	

Table 44. Defrost Setup

Function	Default Setting	Recorded Setting
Defrost Interval In Range with Fresh Setpoint	6 HOURS	
Defrost Interval Not In Range with Fresh Setpoint	4 HOURS	
Defrost Interval In Range with Frozen Setpoint	6 HOURS	
Defrost Interval Not In Range with Frozen Setpoint	4 HOURS	

Table 44. Defrost Setup (continued)

Function	Default Setting	Recorded Setting
Maximum Defrost Duration	45 MINUTES	
High Speed Defrost	DISABLED	

Table 45. Language Setup (First Language = 75xx, Second Language = 76xx, Third Language = 77xx)

Function	75xx	76xx	77xx	Default Setting	Recorded Setting
Default Language				ENGLISH	
Enable Language	English	English	English	ENABLED	
Enable Language	Spanish	Danish	Japanese	DISABLED	
Enable Language	French	Russian	Chinese	DISABLED	
Enable Language	German	Norwegian		DISABLED	
Enable Language	Italian	Swedish		DISABLED	
Enable Language	Dutch	Finnish		DISABLED	
Enable Language	Portuguese	Polish		DISABLED	
Enable Language	Greek	Hungarian		DISABLED	
Enable Language	Turkish	Romanian		DISABLED	
Enable Language	Hebrew	Bulgarian		DISABLED	
Enable Language	Arabic	Czech		DISABLED	

Table 46. Access Code Setup

Function	Default Setting	Recorded Setting
Enter Access Code	NO CODE	

Table 47. Unit Configuration

Function	Default Setting	Recorded Setting
Unit Type	TRUCK	
Engine Type	As Built	
Compressor Type	As Built	
ETV Configured	As built	
How Many Zones in this Unit	2 or 3	
Zone 1 Evaporator Fans Configuration	3 Fans	
Zone 2 Evaporator Fans Configuration	3 Fans	
Zone 3 Evaporator Fans Configuration	3 Fans	
Electric Standby Equipped (Model 50)	YES	
Diesel to Electric Auto Switch Enabled (Model 50)	YES	
Electric to Diesel Auto Switch Enabled (Model 50)	NO	
Unit Model	As Built	
Fuel Sensor Type	NONE	

Table 47. Unit Configuration (continued)

Function	Default Setting	Recorded Setting
Rear Remote Control	NONE	
Rear Remote Control Action (If Rear Remote installed)	STANDBY	
Pretrip/Sleep Switch Options	DISABLED	
3rd Party Device Control	NONE	

A02B - Recording Existing Programmable Feature Settings Using WinTrac™

Purpose:

To retrieve and record the programmable feature settings of an SR-3 Base Controller using a PC and the WinTrac Service Tool. The information will be saved in a *.XML file. This Service Procedure may be done with either the Standard Truck HMI Control Panel or Premium Truck HMI Control Panel installed.

Important: *Sensor grades are not retrieved using this procedure. They must be manually retrieved using the Truck Premium Display or Mechanics Service Tool and Service Procedure A15A.*

Note: *The programmable features may also be retrieved manually using the Truck Premium Display or Mechanics Service Tool. Refer to Service Procedure A02A for details.*

Materials Required:

- A PC equipped with WinTrac 5.7 or later.
- Interconnect Cable, Thermo King Service Part Number TK 44-9417 (20 foot, 6 meter) or TK 44-9418 (50 foot, 15 meter).
- Adapter Cable, Thermo King Service Part Number TK 204-918, 15 Pin “D” connector to 5 pin Deutsch.
- A Truck Premium Display or Mechanics Service Tool.

Operation:

- The settings of the graded sensors and all programmable features must be retrieved before replacing a Base Controller or performing a Base Controller Cold Start. These settings will then be duplicated in the replacement Base Controller.
- If a sensor grade is not known, physically check the sensor to determine the grade. It is very important that sensor grades be set properly.
- Refer to Section 3 for a complete description of programmable features.
- The Retrieve OptiSet Plus function in the WinTrac Tools menu is used to retrieve the programmable feature settings and to write them to a Unit Configuration file.
- The Send OptiSet Plus function in the WinTrac Tools menu is used to flash load the Unit Configuration File into the Base Controller. Refer to Service Procedure A04B for details.
- WinTrac 5.3 or later is required. For additional details, refer to the WinTrac Service Tool Help File.

Procedure:

Refer to the WinTrac Service Tool OptiSet Plus function.

A03A - Base Controller Replacement

Purpose:

To replace the Base Controller.

Materials Required:

- Cable ties

Operation:

The Base Controller is removed from the control box as an assembly.

Important Notes:

- It is very important that the correct Base Controller be used for replacement. Refer to Section 7 to determine the required Base Controller for the application.
- It is very important that the correct Base Controller software be used. Base Controllers are supplied from Service Parts with the most recent software at the time of manufacture. The anti-static shipping bags are also marked with pertinent information. Refer to Section 7 to determine the required Base Controller software for the application. Check the available software in the Asset Library for the current released software version.
- Some applications may require the 40 amp fuse be removed from the old Base Controller and installed in the replacement Base Controller.
- Verify the harnesses are reconnected properly and do not place excessive strain on the connectors. Secure the harnesses with cable ties as required.

Table 48. Procedure

Step	Action	Result	Comments
1	Log the existing Base Controller settings using Service Procedure A02A or A02B. This step is not necessary if replacing the Interface Board.		This information will be used to set up the replacement Base Controller.
2	Turn the unit off at the HMI Control Panel. Turn the microprocessor On/Off switch off.		
3	Disconnect standby power, if connected.		
4	Disconnect the unit battery.		Some circuits are directly connected to the unit battery.
5	Disconnect all harness connectors from the Base Controller/Interface Board assembly.		
6	Remove the screws securing the Base Controller to the control box and remove the Base Controller/Interface Board assembly from the control box.		
7	Place the Base Controller/Interface Board assembly on a clean bench for further disassembly if replacing the base controller or the interface board.		
8	To remove the Interface Board from the Base Controller, remove the Interface Board mounting screws. Release the retaining snap arms and carefully pull the Interface Board straight back from the Base Controller. Current Interface Boards have two screws and five snap arm retainers.		
9	Reassemble the components in the reverse order, using the replacement part. Verify the correct hardware is used, as some screw lengths may vary. Take care not to over-tighten the screws.		If the Base Controller is replaced, remove the cardboard protectors from J1 and J2 on the new Base Controller and place on the old Base Controller to prevent pin damage.
10	Install the new Base Controller/Interface Board assembly in the control box.		

Table 48. Procedure (continued)

Step	Action	Result	Comments
11	Reconnect all harness connectors to the Base Controller and Interface Board.		Apply Super Lube as needed. Verify all connectors are securely mated and secure the harnesses with cable ties as required.
12	Reconnect the unit battery.		
13	Reconnect the standby power if needed.		
14	Turn the microprocessor On/Off switch on. Turn the unit on by pressing the ON key on the HMI Control Panel.		The real time clock settings will be loaded from the HMI Control Panel when the unit is turned on.
15	Clear any alarm codes.		
16	If the Base Controller was replaced, set up all programmable features using Service Procedure A04A or A04B.		
17	Run a Pretrip Test to verify proper unit operation.		

A03B - Truck Standard Display or Truck Premium Display Replacement

Purpose:

To replace the Truck Standard Display or Truck Premium Display.

Materials Required:

- Cable ties

Operation:

The Truck Standard Display or Truck Premium Display is removed from the truck instrument panel, mounting bracket, or flush mount control box as an assembly.

Important Notes:

- It is very important that the correct display be used for replacement. Refer to Section 7 to determine the required display for the application.
- It is very important that the correct Display Software be used. Truck Standard Displays or Truck Premium Displays are supplied from Service Parts with the most recent software at the time of manufacture. The anti-static shipping bags are also marked with pertinent information. Refer to Section 7 to determine the required Truck Standard Display or Truck Premium Display software for the application. Check the available software in the Asset Library for the current released software version.
- Verify the harnesses are reconnected properly and do not place excessive strain on the connectors. Secure the harnesses with cable ties as required.

Table 49. Procedure

Step	Action	Result	Comments
1	Turn the Truck Standard Display or Truck Premium Display off. Turn the Microprocessor On/Off switch off.		
2	Remove the Display from the truck instrument panel, mounting bracket, or flush mount control box.		
3	Disconnect the harness connector from the Truck Standard Display or Truck Premium Display. Save the retaining screws.		
4	Re-connect the harness connector to the new Truck Standard Display or Truck Premium Display. Apply Super Lube as required.		Verify all connectors are securely mated and secure the harnesses with cable ties as required. Do not over-tighten the retaining screws.
5	If replacing a Standard Truck Display, access to the 15 pin connector on the back of the Display may be required to set the time and date. Position the Display as required to allow this access.		
6	Turn the Microprocessor On/Off switch on. Turn the unit on by pressing the Truck Standard Display or Truck Premium Display ON Key.		
7	Clear any alarm codes.		
8	Check the setting of the real time clock and correct if necessary.		
9	Turn the Truck Standard Display or Truck Premium Display off. Turn the Microprocessor On/Off switch off.		
10	Install the new Truck Standard Display or Truck Premium Display in the truck instrument panel, mounting bracket, or flush mount control box.		

Table 49. Procedure (continued)

Step	Action	Result	Comments
11	Turn the Microprocessor On/Off switch on. Turn the unit on by pressing the Truck Standard Display or Truck Premium Display ON Key.		
12	Run a Full Pretrip Test to verify proper unit operation.		

A04A - Programmable Feature Setup Using Truck Premium Display

Purpose:

To manually set the sensor grades and programmable features of an SR-3 Base Controller to customer specifications using the Truck Premium Display or the Mechanics Service Tool.

Note: *The programmable features may also be set using the Send OptiSet Plus feature in the WinTrac Tools menu. Refer to Service Procedure A04B for details.*

Materials Required:

- A Truck Premium Display or Mechanics Service Tool connected to the Base Controller CAN Connector J14.

  Note: *Only one Truck Standard Display or Truck Premium Display should be connected to the Base Controller at a time.*

- A completed copy of the Setup Sheet located in Service Procedure A02A.

Operation:

- The settings of the graded sensors and all programmable features must be retrieved before replacing a Base Controller or performing a Base Controller Cold Start. The settings will then be duplicated in the replacement Base Controller or after Cold Start.
- Refer to Section 3 for a complete description of programmable features.
- The default settings are shown on the Setup Sheet in Service Procedure A02A.
- If a sensor grade is not known, visually check the sensor to determine the grade. It is very important that sensor grades be set properly.

Table 50. Procedure

Step	Action	Result	Comments
1	Verify that the Microprocessor On/Off switch is turned on. Turn the unit on using the Truck Premium Display or Mechanics Service Tool.	The Standard Display will appear.	
2	Press the MENU key.	The Operator Menu appears.	Do not let the unit start. The Guarded Access Menu cannot be entered if the unit is running.
3	Press and hold both the EXIT and unlabeled soft key for five seconds.	The Maintenance Menu appears.	
4	Press the NEXT key as required to display the Software Revision Menu. Then press the SELECT key to enter the Software Revision Menu.		
5	Use the NEXT and/or BACK keys to scroll through the HMI Control Panel and Base Controller software revisions.	Verify the Software revisions are as desired.	
6	When the software revisions have been recorded, press the EXIT key to return to the Maintenance Menu.		
7	Press the NEXT key as required to display the Set Time and Date Menu. Then press the SELECT key to enter the Set Time and Date Menu.		The real time clock is located in the Truck Standard Display (TSD) or Truck Premium Display (TPD). The time is supplied to the Base Controller each time the unit is turned on. If the Base Controller is changed, the clock setting will be supplied to the Base Controller when the unit is turned on. If the Truck Standard Display (TSD) or Truck Premium Display (TPD) is changed, the time and date must be checked and set if necessary.
8	Verify that the Time is set to the time zone used by the customer as shown on the setup sheet.		

Table 50. Procedure (continued)

Step	Action	Result	Comments
9	When the time zone has been verified, press the EXIT key to return to the Maintenance Menu.		
10	Verify the unit is not running. The unit will not enter the Guarded Access Menu if it is running.		If the unit is running, scroll back and enter Interface Board Test Mode. This will cause the unit to shut down. Press the Exit key to return to the Maintenance Menu. Scroll back to the Set Time and Date Menu and proceed with the next step.
11	Press and hold both the EXIT and unlabeled key for five seconds.	The Guarded Access Menu appears.	If a Security Code is requested, enter the Security Code or [4444] to enter the Guarded Access Menu.
12	The Programmable Features Menu will appear. Press the SELECT key to enter the Programmable Features Menu.		
13	Use the NEXT and/or BACK keys to scroll through all settings in the Programmable Features Menu.	Set all Programmable Features settings to those shown on the Setup Sheet.	
14	When all Programmable Features settings have been set, press the EXIT key to return to the Guarded Access Menu.		
15	Use the NEXT and/or BACK keys to scroll to the next Guarded Access Menu.		Use the Setup Sheet as a guide.
16	Use the SELECT key to enter the next Guarded Access Menu.		Use the Setup Sheet as a guide.
17	Use the NEXT and/or BACK keys to scroll through all settings in the Menu.	Set all menu settings to those shown on the Setup Sheet.	
18	Use the EXIT key to return to the Guarded Access Menu.		
19	Continue to use Steps 15 – 18 as required to complete the Setup Sheet.		
20	When all settings have been recorded, press the EXIT key to return to the Guarded Access Menu.		
21	Press the EXIT key again to return to the Standard Display.		
22	Run a Pretrip Test to verify proper unit operation.		

A04B - Programmable Feature Setup Using WinTrac®

Purpose:

To set the programmable feature settings of an SR-3 Base Controller using a PC and the WinTrac Service Tool. The information will be saved in a *.XML file. This Service Procedure may be done with either the Truck Standard HMI Control Panel or Truck Premium HMI Control Panel installed.

Important: *Sensor grades are not set using this procedure. They must be set using the Truck Premium Display or Mechanics Service Tool and Service Procedure "A15A," p. 335.*

Note: *The programmable features may also be set manually using the Truck Premium Display or Mechanics Service Tool. Refer to "Service Procedure A04A," p. 329 for details.*

Materials Required:

- A PC equipped with WinTrac 5.7 or later.
- Interconnect Cable, Thermo King Service Part Number TK 44-9417 (20 foot, 6 meter) or TK 44-9418 (50 foot, 15 meter).
- Adapter Cable, Thermo King Service Part Number TK 204-918, 15 Pin "D" connector to 5 pin Deutsch.
- The *.XML Unit Configuration File containing the desired unit setup information.
- A Truck Premium Display or Mechanics Service Tool.

Operation:

- The settings of the graded sensors and all programmable features must be retrieved before replacing a Base Controller or performing a Base Controller Cold Start. These settings will then be duplicated in the replacement Base Controller.
- This Service Procedure and the desired *.XML Unit Configuration File can be used to duplicate a unit setup to additional units. This is particularly useful when working with large fleets.

  Important: *The sensor grades for each unit must be individually noted and set using "Service Procedure A15A," p. 335.*

  Important: *The sensor grade settings are not set using a *.XML Unit Configuration File. They must be manually retrieved and set using the Truck Premium Display or Mechanics Service Tool and "Service Procedure A15A," p. 335.*
- If a sensor grade is not known, physically check the sensor to determine the grade. It is very important that sensor grades be set properly.
- Refer to Section 3 for a complete description of programmable features.
- The Retrieve OptiSet Plus function in the WinTrac Tools menu is used to retrieve the programmable feature settings and to write them to a Unit Configuration file. Refer to "Service Procedure A02B," p. 324 for details.
- The Send OptiSet Plus function in the WinTrac Tools menu is used to flash load the Unit Configuration File into the Base Controller.
- WinTrac 5.7 or later is required. For additional details, refer to the WinTrac Service Tool Help File.

Procedure:

Refer to the WinTrac Service Tool OptiSet Plus function.

A07A - Performing a Base Controller/Interface Board Cold Restart

Purpose:

To perform a Cold Restart on the Base Controller/Interface Board.

Materials Required:

- WinTrac Service Tool software loaded on a PC
- Download Cable (44-9417)
- Data port adapter (204-918)
- Truck Premium Display or Mechanics Service Tool

Operation:

This procedure will perform a Cold Restart on the Base Controller.

- The Unit Serial Number and Truck ID Number will both be reset to 0000000000.
- All programmable features and unit configuration settings except the hourmeters are reset to factory default settings.
- All sensor grades are reset to factory default settings (5H).
- The ServiceWatch Data Logger will be cleared.

Important:

1. *The Unit Serial Number, Truck ID Number, and all programmable features such as sensor calibration, defrost settings, and other feature settings will be reset to the standard (default) settings. They must be set up using Service Procedure A04A or A04B after performing a Cold Restart or the unit may not operate to the customer's requirements.*
2. *The ServiceWatch Data Logger data will be cleared when a Cold Restart is performed. Download and save the ServiceWatch Data Logger before performing a Cold Restart.*

Procedure:

Refer to the WinTrac Service Tool Tools Menu and select Cold Restart.

A07B - Performing an HMI Control Panel Cold Restart

Purpose:

To perform a Cold Restart on the Truck Premium Display .

Materials Required:

- WinTrac Service Tool software loaded on a PC
- Download Cable (44-9417)

Important: *Connect the download cable to the HMI Control Panel port on the HMI Control Panel harness inside the control box. This 15 pin "D" connector is located with the CAN bus connector at the control box end of the HMI Control Panel cable.*

Note: *If the download cable is connected to the ServiceWatch port, the Base Controller will be restarted.*

Procedure:

Refer to the WinTrac Service Tool Tools Menu and select Cold Restart.

A07C - Performing a Base Controller Cold Restart Using the Interface Board Jumper

Purpose:

To perform a Cold Restart on the Base Controller/Interface Board.

Materials Required:

- Truck Premium Display or Mechanics Service Tool

Operation:

This procedure will perform a Cold Restart on the Base Controller.

- The Unit Serial Number and Truck ID Number will both be reset to 0000000000.
- All programmable features and unit configuration settings except the hourmeters are reset to factory default settings.
- All sensor grades are reset to factory default settings (5H).
- The ServiceWatch Data Logger will be cleared.

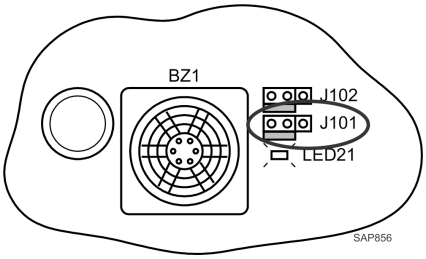
Important:

1. *The Unit Serial Number, Truck ID Number, and all programmable features such as sensor calibration, defrost settings, and other feature settings will be reset to the standard (default) settings. They must be set up using Service Procedure A04A or A04B after performing a Cold Restart or the unit may not operate to the customer's requirements.*
2. *The ServiceWatch Data Logger data will be cleared when a Cold Restart is performed. Download and save the ServiceWatch Data Logger before performing a Cold Restart.*

Table 51. Procedure

Step	Action	Result	Comments
1	Connect a Premium HMI or Service Tool if necessary. Record existing Base Controller settings using Service Procedure A02A or A02B.	This information will be used to set up the Base Controller after performing the Cold Restart.	If the information cannot be retrieved, the customer specified settings must be used.
2	Turn the unit off using the HMI Control Panel and turn the microprocessor On/Off Switch off.		
3	Locate the J101 jumper on the Interface Board as shown below.		Refer to Section 2, Interface Board Jumpers.

SR-3 Interface Board J101 Cold Start Jumper (Shown in Normal Position)



4	Move the J101 jumper from the upper (normal) position to the lower position		
5	Turn the microprocessor On/Off Switch on and turn the unit on using the HMI Control Panel.	The HMI standard display will appear. The Alarm Icon will be present.	This performs the Cold Restart.
6	Press the MENU Key. Press the NEXT Key as required to display the Alarm Menu. Press the SELECT Key to scroll through the alarms.	Alarm Code 74 must be present indicating a successful Cold Restart has been performed.	Other alarms may be present. This is normal. If Alarm Code 74 is not present, the Cold Restart was not successful. Repeat steps 2 through 5.

Table 51. Procedure (continued)

Step	Action	Result	Comments
7	Turn the unit off using the HMI Control Panel. Turn the microprocessor On/Off Switch off.		
8	Move the J101 jumper from the lower position to the upper (normal) position		
9	Turn the microprocessor On/Off Switch on and turn the unit on using the HMI Control Panel.	The HMI standard display will appear. The Alarm Icon will be present.	
10	Set up all programmable features using Service Procedure A04A or A04B.		
11	Clear any alarm codes.		Verify all alarms have been cleared.
12	Perform a Pretrip Test as shown in Section 4 to verify proper unit operation.		

A15A - Unit Temperature Sensor Grade Calibration

Purpose:

To retrieve, record, and set the sensor grades of graded sensors.

Materials Required:

- Truck Premium Display or Mechanics Service Tool

Operation:

The following sensors are graded sensors and must be properly calibrated.

- For Single Temperature Units: The control and display return air temperature sensors and the control and display discharge air temperature sensors are graded sensors. The Spare 1 temperature sensor is also a graded sensor.
- For Multi-Temperature Units: The return air temperature sensors and discharge air temperature sensors for all zones are graded sensors. The three spare temperature sensors are also graded sensors.

Any time these sensors are replaced, a Cold Start performed, or a Base Controller changed, the sensor grade must be correctly entered to verify optimum performance of the unit. The sensor grade is stamped on the barrel of each sensor. Failure to properly calibrate sensors may result in nuisance alarm codes.

Important Notes:

- Always record the marked sensor grades of any replacement return, discharge, or spare temperature sensors. The grade is required to complete the sensor calibration procedure.
- If any return air temperature or discharge air temperature sensor grade is set to 5H, Alarm Code 92 will be set. Calibrating the sensor grades automatically clears Alarm Code 92. This alarm code does not apply to spare sensors. However, when used, spare sensors should still be calibrated to achieve maximum accuracy.

Table 52. Retrieving the Sensor Grades

Step	Action	Result	Comments
1	Verify that the Microprocessor On/Off switch is turned on. Turn the unit on using the Truck Premium Display or Mechanics Service Tool.		
2	Press the MENU key.	The Main Menu appears.	
3	Press and hold both the EXIT and unlabeled key for five seconds.	The Maintenance Menu appears.	
4	Press the NEXT key as required to display the Set Time and Date Menu.		The real time clock is located in the HMI Control Panel. The time is supplied to the Base Controller each time the unit is turned on. If the Base Controller is changed, the clock setting will be supplied to the Base Controller when the unit is turned on. If the HMI Control Panel is changed, the time and date must be checked and set as necessary.
5	Verify the unit is not running. The unit will not enter the Guarded Access Menu if it is running.		If the unit is running, scroll back and enter Interface Board Test Mode. This will cause the unit to shut down. Press the Exit key to return to the Maintenance Menu. Scroll back to the Set Time and Date Menu and proceed with the next step.
6	Press and hold both the EXIT and unlabeled key for five seconds.	The Guarded Access Menu appears. The Programmable Features Menu will appear.	If a Security Code is requested, enter the Security Code or [4444] to enter the Guarded Access Menu.
7	Use the NEXT and/or BACK keys to scroll to the Sensor Calibration Menu.		
8	Use the SELECT key to enter the next Sensor Calibration Menu.		

Table 52. Retrieving the Sensor Grades (continued)

Step	Action	Result	Comments
9	Use the NEXT and/or BACK keys to scroll through all the sensor grade settings.	Record all the sensor grades. They will be needed after performing a Cold Start or changing the Base Controller.	If necessary, verify the sensor grades of all return air, discharge air, and spare sensors (if used) by physically checking the sensor grade marked on the sensor.
10	When all settings have been recorded, press the EXIT key to return to the Guarded Access Menu.		
11	Press the EXIT key again to return to the Standard Display.		

Table 53. Setting the Sensor Grades

Step	Action	Result	Comments
1	Verify and record the sensor grades of all return air, discharge air, and spare sensors (if used) by physically checking the sensor.		Alarm Code 92 does not apply to spare sensors. However, when used, spare sensors should still be calibrated to achieve maximum accuracy.
2	Verify that the Microprocessor On/Off switch is turned on. Turn the unit on using the Truck Premium Display or Mechanics Service Tool.	The Standard Display will appear.	
3	Press the MENU key.	The Main Menu appears.	Do not let the unit start. The Guarded Access Menu cannot be entered if the unit is running.
4	Press and hold both the EXIT and unlabeled key for five seconds.	The Maintenance Menu appears.	
5	Press the NEXT key as required to display the Set Time and Date Menu.	The Set Time and Date Menu appears.	The real time clock is located in the HMI Control Panel. The time is supplied to the Base Controller each time the unit is turned on. If the Base Controller is changed, the clock setting will be supplied to the Base Controller when the unit is turned on. If the HMI Control Panel is changed, the time and date must be checked and set as necessary.
6	Verify the unit is not running. The unit will not enter the Guarded Access Menu if it is running.		If the unit is running, scroll back and enter Interface Board Test Mode. This will cause the unit to shut down. Press the Exit key to return to the Maintenance Menu. Scroll back to the Set Time and Date Menu and proceed with the next step.
7	Press and hold both the EXIT and unlabeled key for five seconds.	The Guarded Access Menu appears.	If a Security Code is requested, enter the Security Code or [4444] to enter the Guarded Access Menu.
8	Press the NEXT key as required to display the Sensor Calibration Menu.	The Sensor Calibration Menu appears.	
9	When the Sensor Calibration Menu is shown, press the SELECT key to access the Sensor Calibration Menu.	The first graded sensor and the current grade appear.	
10	If necessary, use the NEXT and/or BACK keys to select the sensor to be calibrated.	These keys scroll through all graded sensors installed on the unit.	Verify the correct sensor is selected.
11	When the sensor to be calibrated is shown on the display, press the SELECT key.	The Sensor Change menu for the selected sensor will appear.	
12	Use the + and - keys to change the sensor grade to match the grade printed on the sensor.		

Table 53. Setting the Sensor Grades (continued)

Step	Action	Result	Comments
13	When the correct grade is shown, press the YES key to confirm the choice.		
14	If necessary, repeat steps 10 - 13 to change any other sensor grades that are not correct.		
15	Press Exit to leave the Sensor Calibration Menu.		
16	If graded sensor alarms exist (Alarm Codes 03 and/or 04), use the BACK key to return to the Alarms Menu in Guarded Access.	The Alarms Menu will appear.	Alarm Code 92 Sensor Grades Not Set will clear automatically when no sensor grades are set to 5H.
17	Press the SELECT key to enter the Alarms Menu.		
18	Press the CLEAR key to clear the sensor alarms.		
19	When finished, press the EXIT key several times or turn the unit off to exit the Sensor Calibration Menu.		

A26A - Welding on Units Equipped with Microprocessors

Purpose:

To prevent damage to the Base Controller/Interface Board and other components during welding operations.

Operation:

Electric welding generates high amperage currents that can damage electrical and electronic components. In order to minimize the possibility of damage the following procedures should be followed.

Table 54. Before Welding

Step	Action	Result	Comments
1	Turn the unit Off.		
2	Disconnect standby power, if connected.		
3	Disconnect both battery cables.		
4	Connect the welder ground cable as close as possible to the area where the welding is to be performed. Move the welder ground cable as required.		

Table 55. After Welding

Step	Action	Result	Comments
1	Reconnect both battery cables.		
2	Reconnect the standby power if needed.		
3	Perform a Pretrip Test to verify proper operation.		

A28A - Setting Unit Running Time Hourmeters

Purpose:

This procedure should be followed to set the fixed running time hourmeters such as Total Hours, Total Run Time Hours, Engine Hours, Electric Run Time Hours, and Zone Run Hours after replacing a Base Controller with a new replacement Base Controller.

Materials Required:

- Truck Premium Display or Mechanics Service Tool

Important Notes:

- Time can only be added if all hourmeters have less than 100 hours accumulated. If hourmeter time exceeds 100 hours, the hourmeter time can no longer be changed.
- If time in excess of 100 hours has been entered, the hourmeters can no longer be changed. Exercise care when changing these hourmeter settings. Verify the correct number of hours are selected for each hourmeter.
- Do not allow the three minute Guarded Access keypad timeout to occur during this procedure. If the keypad times out before all desired changes are made and a hourmeter exceeds 100 hours, the hourmeters can no longer be changed.
- Do not exit hourmeter setup until all hourmeters have been set as required. Once the hourmeter setup has been exited, this menu is locked out and the hourmeters can no longer be changed.

Table 56. Procedure

Step	Action	Result	Comments
1	Determine the number of hours to be set on each hourmeter. If the unit is a Model 50 unit, verify the total of Engine Hours and Electric Run Time Hours is equal to the number of hours to be set as Total Run Time Hours.		
2	Turn the unit on.		
3	Press the MENU key.	The Main Menu appears.	Press the MENU key.
4	Press and hold both the EXIT and unlabeled key for five seconds.	The Maintenance Menu appears.	
5	Press the NEXT key as required to display the Set Time and Date Menu.		
6	Press and hold both the EXIT and unlabeled key for five seconds. If a Security Code is requested, enter the Security Code or [4444] to enter the Guarded Access Menu.	The Guarded Access Menu appears.	
7	Press the EXIT key to display the Hourmeter Setup Menu.	The Hourmeter Setup Menu appears.	
8	Press the SELECT key to choose the Hourmeter Setup Menu.		
9	Press the SELECT key again to choose the Program Hourmeter Menu.		
10	Press the EXIT key to scroll to the last item in the Program Hourmeter Menu. The NEXT key will disappear.		
11	Press and hold both the EXIT and unlabeled key for five seconds. This will add the non-programmable hourmeters to the menu only if the number of hours in these hourmeters are less than 100 hours.	***Important:*** *Do not exit the hourmeter setup or allow the Guarded Access keypad timeout to occur during this procedure. If the keypad times out and an hourmeter exceeds 100 hours, the hourmeters will be locked and can no longer be changed.*	
12	Use the NEXT and/or BACK keys to show the desired hourmeter. When the desired hourmeter is shown, press the SELECT key to chose it.		

Table 56. Procedure (continued)

Step	Action	Result	Comments
13	Change the value of the hourmeter by pressing the + or - keys.		
14	When the correct number of hours is shown, press the YES key to accept the change.	***Important:*** *If time in excess of 100 hours has been entered the hourmeters can no longer be changed. Exercise care when changing hourmeter settings.*	
15	Repeat Steps 12-14 as necessary to change the remaining hourmeters.		
16	When all hourmeters are set, press the EXIT key to return to the Program Hourmeter Menu.	***Important:*** *If time in excess of 100 hours has been entered the hourmeters can no longer be changed. Verify all settings are correct before leaving this menu.*	

A46A - Flash Loading Base Controller Software

Purpose:

To update software for the Base Controller using a computer and the WinTrac Service Tool.

Materials Required:

- Truck Premium Display or Mechanics Service Tool.
- WinTrac application software loaded on a computer.
- Interconnect Cable, Thermo King Service Part Number TK 44-9417 (20 foot, 6 meter) or TK 44-9418 (50 foot, 15 meter).
- Adapter Cable, Thermo King Service Part Number TK 204-918, 15 Pin “D” connector to 5 pin Deutsch.
- The correct Base Controller Flash Load files.

Procedure:

Refer to the WinTrac Service Tool Tools Menu and select Flash Load.

A46B - Flash Loading HMI Control Panel Software

Purpose:

To update software for the Truck Premium Display using a computer and the WinTrac Service Tool.

Note: *This flash load may take approximately 10 minutes or longer.*

Materials Required:

- Truck Premium Display or Mechanics Service Tool.
- WinTrac application software loaded on a computer.
- Interconnect Cable, Thermo King Service Part Number TK 44-9417 (20 foot, 6 meter) or TK 44-9418 (50 foot, 15 meter).
- Adapter Cable, Thermo King Service Part Number TK 204-918, 15 Pin “D” connector to 5 pin Deutsch.
- The correct HMI Flash Load files.

Procedure:

Refer to the WinTrac Service Tool Tools Menu and select Flash Load.

A47B - Retrieving and Sending OptiSet Plus Configurations

Purpose:

To retrieve and send OptiSet Plus configurations to and from the Base Controller using a computer and the WinTrac Service Tool.

Procedure:

Refer to the WinTrac Service Tool OptiSet Plus function.

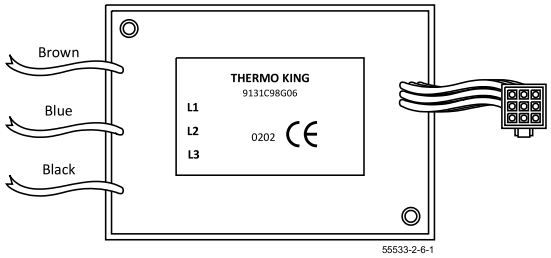
A48A - Phase Detect Module Operation and Diagnostics

Purpose:

To understand phase detect module operation and diagnostic procedures.

Description:

The phase detect module is designed to monitor three phase voltages from 160 volts AC to 510 volts AC.



⚠ Warning

Hazardous Voltage!

Units featuring Electric Standby utilize high voltages in 3 phase AC electrical power any time the unit is operating in Electric Mode. This voltage potential is also present any time the unit is connected to a source of external standby power. Extreme care must be used when working on the unit, as these voltages are capable of causing serious injury or death.

Operation:

The brown, blue and black wires are used to sample the power at L1, L2 and L3 respectively. Operating power from 12 to 24 Vdc is supplied to the module via the 8 wire and CH wire.

When the voltage sensed rises above 180 volts AC and all three phases are present the module ER wire will output 12-24 Vdc after the conditions exist for 2 to 4 seconds. This signal informs the base controller that electric standby operation is possible. If the voltage drops below 160 volts AC or a phase is lost, the output is turned off after the condition exists for 8 to 10 seconds. The module continues to monitor the power and will again output 12-24 Vdc within 2 to 4 seconds after the voltage rises above 180 volts AC and all three phases are present.

If phase rotation is L1, L2, L3, the 7EB wire will supply 12 to 24 Vdc to energize the appropriate phase rotation contactor. If phase rotation is L1, L3, L2, the 7EC wire will supply a chassis ground to energize the appropriate phase rotation contactor. The 7EB and 7EC wires are interlocked to prevent both phase contactors from being energized at once.

Connections:

Connections to the module are shown in the tables below.

Table 57. Power Connections

Input	Description
8F	Supplies nominal 12-24 volt DC power to the phase detect module.
CH	Chassis ground.

Table 58. Inputs

Input	Description
L1	This brown wire supplies standby power L1 to the phase detect module.
L2	This blue wire supplies standby power L2 to the phase detect module.
L3	This black wire supplies standby power L3 to the phase detect module.

Table 59. Outputs

Input	Description
7EH	With 12-24 Vdc is supplied, then outputs 7EB and 7EC will be at 12-24 Vdc.
7EB	If phase rotation is L1, L2, L3, this wire will provide 12-24 Vdc to energize the appropriate phase rotation contactor. The 7EC wire is interlocked to prevent both phase contactors from being energized at once.
7EC	If phase rotation is L1, L3, L2, this wire will provide 12-24 Vdc to energize the appropriate phase rotation contactor. The 7EB wire is interlocked to prevent both phase contactors from being energized at once.
ER	This wire will output 12-24 Vdc two to four seconds after the voltage rises above 180 volts AC and all three phases are present. If the voltage drops below 160 volts AC or a phase is lost and the condition remains for 8 to 10 seconds, the output is turned off. The module continues to monitor and will again output 12-24 Vdc two to four seconds after the power returns to normal (voltage rises above 180 volts AC and all three phases are present).

Table 60. Connector Pinout

Pin	Wire	Description
1	8F	Power to Module
2	CH	Chassis ground
3	ER	Power OK
4	7EH	Switches the 7EC and 7EB from grounding to power logic
5	7EB	Phase A-B-C
6	7EC	Phase A-C-B
7	Unused	
8	Unused	
9	Unused	

Removal and Replacement:

⚠ Warning

Hazardous Voltage!

Units featuring Electric Standby utilize high voltages in 3 phase AC electrical power any time the unit is operating in Electric Mode. This voltage potential is also present any time the unit is connected to a source of external standby power. Extreme care must be used when working on the unit, as these voltages are capable of causing serious injury or death.

1. Turn the unit off.
2. Disconnect the unit battery.
3. Disconnect the standby power.
4. Disconnect the three wires from the phase detect module at the motor contactor.
5. Unplug the phase detect module harness.
6. Remove the old phase detect module.
7. Install the new phase detect module.
8. Connect the new phase detect module wires to the upper contactor as follows:
   a. Connect the brown wire to L1 on the contactor.
   b. Connect the blue wire to L2 on the contactor.
   c. Connect the black wire to L3 on the contactor.
   d. Use crimp-on terminals as required.
   e. Connect the plug on the short harness from the phase detect module.
9. Install the high voltage cover.

10. Secure wires and wire harnesses as required using cable ties.
11. Connect the unit battery.
12. Connect standby power.
13. Perform a Pretrip Test to verify proper operation.

⚠ Warning

Hazardous Voltage!

Units featuring Electric Standby utilize high voltages in 3 phase AC electrical power any time the unit is operating in Electric Mode. This voltage potential is also present any time the unit is connected to a source of external standby power. Extreme care must be used when working on the unit, as these voltages are capable of causing serious injury or death.

Table 61. Diagnostics

Step	Action	Result	Comments
1	Plug the standby power cord into a known good standby power supply and turn the unit on.		
2	Using a Fluke Meter, measure the standby voltage between phases L1 - L2, L2 - L3 and L3 - L1 at the input to the terminals where the Brown, Blue, and Black wires are connected.	The standby voltage between phases should be between 200 - 500 Vac. If not, repair as necessary to supply the needed voltage to the unit.	
3	Check the 8F and CH circuits to the phase detect module. 12-24 Vdc must be present from 8F to CH.	If this power is not present, check the 8 circuit from the On/Off switch.	
4	If correct power is present in the test above, the ER circuit on the base controller should have 12-24 Vdc present.	If power is not present, replace the phase detect module.	Removal and replacement of the phase detect module is detailed on a previous page.
5	If LED 7 on the base controller is illuminated, the 7EH circuit should have 12-24 Vdc present.	If power is not present, check the Diesel/ Electric Relay circuit on the base controller.	
6	If the unit is calling for operation (LED 7 illuminated), one of the phase select contactors should be energized.	If neither contactor is energized, check for 12-24 Vdc. If voltage is not present, replace the phase detect module.	Removal and replacement of the phase detect module is detailed on a previous page.

A50A - ServiceWatch Data Logger

Purpose:

To understand and use the ServiceWatch Data Logger.

Materials Required:

WinTrac application software loaded on a computer.

Description:

Allows the user to manage, download, and view ServiceWatch data. Configure the ServiceWatch Data Logger and sensor settings.

Procedure:

Refer to the WinTrac Service Tool USB Flash Drive Menu.

D01A - Temperature Sensor Test

Purpose:

To confirm the proper operation of the unit temperature sensors.

Materials Required:

- Fluke Digital Multimeter

Operation:

Both graded and ungraded sensors are used on SR-3 applications. Graded sensors are used to sense return air and discharge air temperatures. The spare sensor (if used) is also a graded sensor. Ungraded sensors are used to sense coil temperatures and ambient air temperature. Both graded and ungraded sensors are checked in the same manner.

Return Air Sensor:

These sensors monitor the temperature of the air returning to the evaporator coils. The sensors are located in the return air flow. The Zone 1 sensor is connected to the Base Controller connector J3. The Zone 2 and Zone 3 sensors are connected to the Expansion Module connector J1. These sensors are graded sensors and must be replaced with graded sensors. The Base Controller must be calibrated to the respective grade of the installed sensor in order to operate properly. The Return Air Sensors are connected to the Base Controller and the Expansion Module via the RTP and RTN wires. When replacing a sensor, verify the sensor is connected properly.

Discharge Air Sensor:

These sensors monitor the temperature of the air leaving the evaporator coils. The sensors are located in the evaporator discharge air path. The Zone 1 sensor is connected to the Base Controller via connector J3. The Zone 2 and Zone 3 sensors are connected to the Expansion Module connector J1. These sensors are graded sensors and must be replaced with graded sensors. The Base Controller must be calibrated to the respective grade of the installed sensor, in order to operate properly. The Discharge Air Sensors are connected to the Base Controller and the Expansion Module via the DTP and DTN wires. When replacing a sensor, verify the sensor is connected properly.

Hard and Soft Failure:

Sensor alarms can occur in the following ways:

- Hard Failure - is defined by an out of range sensor reading, typically caused by an open or shorted sensor. The sensor display will show dashes if a hard failure occurs. If this occurs only the alarm code for that sensor will be set. Alarm Code 13 will not be present. The controller may not be showing dashes for the sensor reading, but the alarm will be active when the unit is inspected. If a sensor alarm code is set, a failure did occur at some point. Checking a ServiceWatch Data Logger download at Technician Level may indicate when the hard failure occurred.
- Soft Failure - is defined by erratic operation or sensor drift that exceeds acceptable tolerances (sensor is out of calibration). If this occurs, the alarm code for the suspect sensor or sensors will be set along with Alarm Code 13. This indicates a potential problem that may not be immediately apparent, and that a hard failure as defined above did not occur. Checking a ServiceWatch Data Logger download at Technician Level may indicate when the soft failure occurred.

Important Notes:

- Polarity must be considered when connecting temperature sensors. If the sensors are connected backwards, the display will show dashes (- - - -). Refer to the schematic or wiring diagram for the correct connections.

Table 62. Procedure

Step	Action	Result	Comments
1	Disconnect the sensor to be replaced from the sensor harness.		
2	If the sensor is a soft failure, replace the sensor and proceed to Step 7.		
3	If the sensor is a hard failure, turn the unit off. Disconnect the J3 plug at the Base Controller or the J1 plug at the Expansion Module as necessary.		
4	Locate the plug terminals for the sensor. Using a high quality meter, check the resistance of the sensor harness and sensor.	The resistance should be from 30 kΩ to 40 kΩ for any sensor except the compressor temperature sensor, which should be from 830 Ω to 2.8 mΩ.	This verifies a complete sensor circuit but does not check the accuracy of the sensor.

Table 62. Procedure (continued)

Step	Action	Result	Comments
5	If circuit resistance is not normal, disconnect and bypass the sensor and retest.	If resistance is near 0 ohms, replace the sensor. If resistance is high or reads OL, test and repair the harness as required.	
6	If circuit resistance is normal, check continuity from the positive wire to chassis ground.	The meter should read OL.	This verifies that the circuit is not shorted to chassis ground.
7	If the harness passes inspection, check the Base Controller in accordance with Service Procedure A01A.	If the Base Controller fails the test, it must be replaced.	

D03A - Pressure Transducer Test

Purpose:

To confirm the proper operation of the suction or discharge pressure transducers.

Materials Required:

- Fluke Digital Multimeter
- Truck Premium HMI Control Panel or Mechanics Service Tool

Operation:

The Base Controller has a separate 5 Vdc power supply for the Discharge Pressure Transducer, Suction Pressure Transducer, and Coolant Level switch. A short circuit condition in one transducer or switch circuit should not affect the other devices.

Discharge Pressure Transducers:

The maximum discharge pressure that can be displayed is 500 psig. If the sensed pressure is greater than 500 psig, the HMI Control Panel will display [- - - -] instead of the discharge pressure.

The minimum discharge pressure that can be sensed is -10 psig. The control system cannot determine if the minimum sensed pressure is the result of an electrical short or very low system pressure.

Suction Pressure Transducers:

The maximum suction pressure that can be displayed is 200 psig. If the sensed pressure is greater than 200 psig, the HMI Control Panel will display [- - - -] instead of the suction pressure. When the unit is off and the refrigerant pressures have equalized, the system pressure can exceed 200 psig when ambient temperatures are above 90°F (35°C)35°C (90°F). If this occurs, the HMI Control Panel will display [- - - -]. This is normal operation and no cause for concern.

The minimum suction pressure that can be sensed is -12 psig.

If the suction pressure transducer opens, the display will read -10 psig. An alarm may not be generated immediately but the unit will be forced to low speed due to low suction pressure.

Pressure Transducer Identification:

The Discharge Pressure Transducer will have “500” on the body of the part. The Suction Pressure Transducer will have “200” on the body of the part. The transducers are not interchangeable.

Table 63. Procedure

Step	Action	Result	Comments
1	Turn the unit on.		
2	Access the Gauge Menu and display the suction pressure or discharge pressure.	The display should show the pressure reading for the transducer. If the transducer reading is obviously incorrect or the display shows [- - - -], proceed as shown below.	Confirm the reading with refrigeration gauges as necessary.
3	Turn the unit off and disconnect the suction or discharge pressure transducer at the transducer plug.		
4	Turn the unit on.		
5	Check the voltage at the transducer harness connector.	The voltage between the DPP and DPN wires (Discharge Pressure) or SPP and SPN wires (Suction Pressure) must be from 4.90 to 5.10 Vdc. If the voltage is not present, proceed to Step 6. If the voltage is correct, proceed to Step 7.	
6	If the voltage is not present, check the harness continuity of the DPP-DPN or SPP-SPN wires.	If the continuity checks good and voltage is still not present, check the Base Controller in accordance with Service Procedure A01A. Replace the Base Controller if necessary.	

Table 63. Procedure (continued)

Step	Action	Result	Comments
7	If the voltage is correct, check the harness continuity of the DPI or SPI wires.	If the voltage is correct and the DPI or SPI wire has continuity, replace the transducer in question.	
8	Transducer circuit operation can be verified by installing a known good transducer in the center port of a gauge manifold. Connect the transducer to the unit wiring harness and check the gauge reading.	If the transducer in the gauge manifold reads properly, the unit transducer is bad.	Apply discharge or suction pressure to the test transducer via the gauge manifold center port.

F01A - Oil Level Switch Check and Replacement

Purpose:

To test the oil level switch for proper operation.

Materials Required:

- Digital Multimeter

Operation:

The switch is open with the float up (indicating full oil level). The switch is closed with the float down (indicating low oil level).

Important Notes:

- Not applicable for two cylinder engines (TK270).

Table 64. Procedure

Step	Action	Result	Comments
1	Turn the unit off.		
2	Disconnect the Deutsch connector at the switch.		The oil level switch is located on the top of the oil pan.
3	Use an ohmmeter to check switch continuity.	With the oil above the "add" mark, the switch should be open. If the engine is six or more quarts low, the switch should be closed.	This check can be performed while changing the oil.
4	Reconnect the Deutsch connector.		

Table 65. Replacing Switch - Screw In Applications

Step	Action	Result	Comments
1	Turn the unit off.		
2	Disconnect the Deutsch connector at the switch.		The oil level switch is located on the top of the oil pan.
3	Unscrew and remove the old switch.		
4	Apply Teflon tape to the threads on the new switch.		
5	Screw the new switch into the hole in the oil pan. Tighten until snug. Do not over-tighten.		
6	Reconnect the Deutsch switch connector.		

F05A - Oil Pressure Switch Test

Purpose:

To test the oil pressure switch for proper operation.

Materials Required:

- Digital Multimeter

Table 66. Procedure

Step	Action	Result	Comments
1	Connect a multimeter set for DC Volts between the 20B wire at the oil pressure shutdown switch and chassis ground.		
2	Turn the unit on and observe the meter reading.	The voltage with the unit on and the engine not running should be zero. If there is voltage present, the switch is defective.	
3	Start the engine and observe the meter reading.	Battery voltage should be present when the engine is running. If the voltage is low or is zero, proceed to Step 4.	
4	With the unit running, disconnect the 20B wire from the switch. Measure the voltage from the 20B wire to chassis ground.	If the battery voltage is present on the wire, the switch is defective and should be replaced. If the voltage on the 20B wire is low or zero, there is a problem in the 20B circuit.	Check the 20B circuit as required to determine the cause.

F07B - Magnetic Coolant Level Sensor Test

Note: *Not applicable for UTR units.*

Purpose:

To confirm proper operation of the magnetic coolant level sensor (if installed/applicable).

Materials Required:

- Fluke Digital Multimeter

Operation:

A magnetic float type switch is used to determine the coolant level. This two wire switch is supplied with +5 Vdc from the Base Controller on the CLP wire (J7 Pin 15). The switch outputs +5 Vdc on the CLS wire to the Base Controller (J7 Pin 16) when coolant level is above the sensor and less than 0 Vdc when the coolant level is below the sensor.

For units built prior to October 2016: The float switch is screwed into the coolant tank. The switch closes or opens as the magnetic float rises or falls with the coolant level. Coolant must be drained from the coolant tank to replace the switch. When installing the switch, verify that the float hangs down and is free to move. For units built after October 2016: The coolant expansion tank uses a reed type coolant level switch. The coolant level switch senses the position of the magnetic float inside the expansion tank. When the coolant level is above the switch, the float is in the upper position and the switch is closed. When the coolant level is below the switch, the float is in the lower position and the switch is open.

The float switch is screwed into the coolant tank. The switch closes or opens as the magnetic float rises or falls with the coolant level. Coolant must be drained from the coolant tank to replace the switch. When installing the switch, verify that the float hangs down and is free to move.

⚠ Caution

Hazardous Pressures!

Do not remove expansion tank cap while coolant is hot.

Table 67. Procedure

Step	Action	Result	Comments
1	Disconnect the switch and check the voltage between the CLP wire at the sensor harness connector and chassis ground.	+ 5 Vdc should be present between the CLP wire and chassis ground. If not, check the harness and connectors to determine the cause.	This shows the +5 Vdc power supply is operational.
2	If + 5 Vdc is present on CLP at the sensor, check the voltage from CLP to the CLS wire at the sensor harness connector.	+ 5 Vdc should be present between the CLP wire and CLS. If not, check the harness and connectors as required.	If 5 Vdc is present at the harness switch connector, the harness is good.
3	If +5 Vdc is present between the CLP and CLS wires at the switch connector, the switch itself must be checked. Connect each terminal of the switch to a high quality multimeter set to measure resistance.	With coolant level above the switch (normal coolant level), the meter should show a very low resistance (less than 1.0 ohm), indicating a closed switch. A high resistance reading with coolant level above the switch indicates an open or corroded switch that must be replaced. With coolant level below the switch (low coolant level), the meter should show a very high resistance or OL, indicating an open switch. If the switch resistance is not as stated, the switch must be replaced.	Verify the ohmmeter battery is good and the meter zeros with the leads held together to prevent misleading results.
4	For units built prior to October 2016: The switch is screwed into the coolant tank. The switch cannot be changed without removing coolant from the tank. For units built after October 2016: The switch is a quarter-turn fastened to the coolant tank. The switch can be changed without removing coolant from the tank. The switch is screwed into the coolant tank. The switch cannot be changed without removing coolant from the tank.		For units built prior to October 2016: Exercise care when installing the switch. It must be oriented so the float will hang down. For units built after October 2016: When installing the switch, verify the open end of the connector on the switch faces away from the tank. Exercise care when installing the switch. It must be oriented so the float will hang down.

F08A - Coolant Temperature Sensor Test

Purpose:

To test the coolant temperature sensor for proper operation.

Materials Required:

- Fluke Digital Multimeter
- Truck Premium HMI Control Panel or Mechanics Service Tool

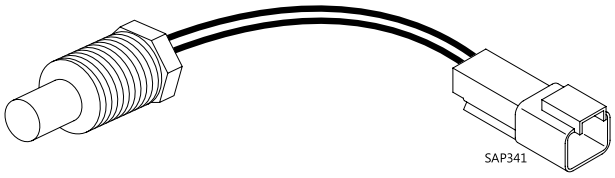
Important Notes:

- Polarity must be considered when connecting temperature sensors. If the sensors are connected backwards, the display will show dashes (- - - -). Refer to the schematic or wiring diagram for the correct connections.

Table 68. Procedure

Step	Action	Result	Comments
1	Turn the unit off.		
2	If necessary, connect a Truck Premium Display or Mechanics Service Tool.		Only one display should be connected at a time.
3	Disconnect the sensor at the plug next to the sensor.		
4	Turn the unit on.	The Standard Display will appear.	
5	Access the Gauge Menu and display Coolant Temperature.	The display for the Engine Coolant Temperature sensor should show dashes [- - - -].	If all the temperature sensors show dashes [- - - -] without being disconnected, the Base Controller is defective.
6	Using a multimeter, check the voltage at the sensor plug on the harness.	The voltage must be from 4.90 to 5.10 volts DC.	
7	If the voltage at the harness connector is correct, replace the sensor.		
8	If the voltage measured in Step 7 is incorrect, check the Base Controller in accordance with Service Procedure A01A.	If the Base Controller fails the test it must be replaced.	
9	If the Base Controller passes the test, the problem is in the wiring harness. Test and repair the harness as required.		
10	If necessary, remove the Truck Premium Display or Mechanics Service Tool.		

Figure 203. Coolant Temperature Sensor



F09A - RPM Sensor Test and Adjustment

Purpose:

To test and adjust the RPM sensor.

Materials Required:

- Fluke Digital Multimeter
- Truck Premium HMI Control Panel or Mechanics Service Tool

Operation:

The RPM sensor rarely fails but may require adjustment for proper operation.

Table 69. Procedure

Step	Action	Result	Comments
1	Turn the unit off.		
2	If necessary, connect a Truck Premium Display or Mechanics Service Tool.		Only one display should be connected at a time.
3	Remove the FS1 and FS2 wires from the sensor.		
4	Check the sensor resistance using a multimeter.	The sensor resistance should be 250 to 300 ohms with the wires removed. If not, the sensor should be replaced.	
5	Loosen the lock nut, turn the sensor in until it contacts the ring gear on the flywheel, then back it out ½ turn and tighten the lock nut.		
6	Turn the unit on.		
7	Using Service Test Mode, place the unit in High Speed Cool (HSC).		For information on Service Test Mode, refer to Section 4.
8	Check the voltage across the sensor terminals with the FS1 and FS2 wires removed.	The voltage in high speed should read from 1.0 to 5.0 Vac.	Set the meter to read AC volts.
9	If the required voltage is not present, replace the RPM sensor. If the required voltage is present, check the harness wires and repair as required.		
10	Reattach the FS1 and FS2 wires to the sensor.		Polarity is not important.
11	Access the Gauge Menu and display Engine RPM.	The display should show the engine RPM.	
12	If the RPM reading does not appear in the display, check the Base Controller in accordance with Service Procedure A01A.	If the Base Controller fails the test, it must be replaced.	
13	If necessary, disconnect the Truck Premium Display or Mechanics Service Tool.		

F11A - Engine Speed Setting (RPM)

Note: *T-90 and UTR units only.*

Purpose:

To adjust the RPM setting of the engine.

Materials Required:

- WinTrac application software loaded on a computer.
  - WinTrac version 6.11 or later is required.
- Truck Premium HMI Control Panel or Mechanics Service Tool

Table 70. Procedure (T-590)

Step	Action	Result	Comments
1	Refer to Engine Speed Setting (RPM) in Maintenance Manual TK 56698-1.		

Table 71. Procedure (T-690/T-890/T-1090/T-1090 Spectrum/UT-1000R/UT-1200 Spectrum/UT-1400R/UTR Spectrum)

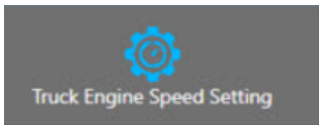
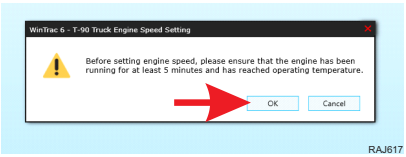
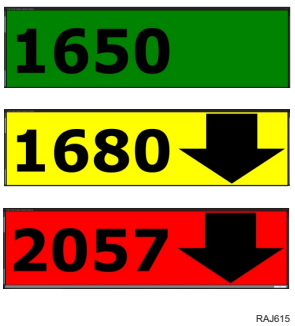
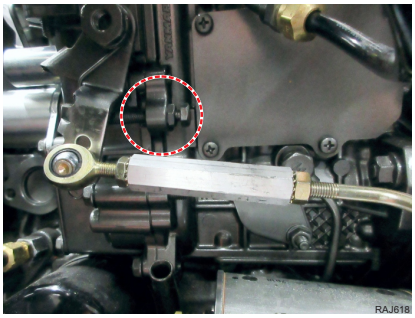
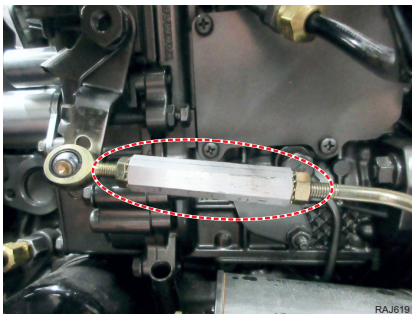
Step	Action	Result	Comments
1	Start and run the unit for at least five minutes so engine reaches operating temperature.		Run the unit in heat.
2	Connect to unit using WinTrac version 6.11 or later.		
3	Press Ctrl - Shift - T.	A tools menu will pop up on the upper bar of the screen.	
4	Select Truck Engine Speed Setting.		
5	Select OK.		
6	Use service test mode or high speed lockout to lock the unit in low speed. Three screen colors are available while in WinTrac; Green, Yellow, and Red: • **GREEN:** The RPM setting is correct. • **YELLOW:** The RPM is close, but needs adjustment. Follow the arrow and adjust the RPM up or down until the screen is green. • **RED:** The RPM is incorrect. Follow the arrow and adjust the RPM up or down until the screen is green.		***Note:*** *The specific RPM numbers and arrows displayed below are just for reference. The arrow direction and colors will change. Follow the on screen colors and arrows while performing this procedure.*
7	Open the engine curbside door. The low speed RPM adjustment screw is located on the side of the engine.		

Table 71. Procedure (T-690/T-890/T-1090/T-1090 Spectrum/UT-1000R/UT-1200 Spectrum/UT-1400R/UTR Spectrum) (continued)

Step	Action	Result	Comments
8	The low speed engine RPM is adjusted by loosening the jam nut and turning the low speed RPM screw as shown. When the engine RPM is adjusted correctly, the WinTrac screen will be GREEN. Tighten the jam nut when the RPM setting is correct.		
9	Turn off the high speed lockout previously engaged.	Verify the engine is at operating temperature and in high speed.	
10	The high speed engine RPM is adjusted by loosening the jam nuts, and turning the high speed solenoid rod adjuster as shown. When the engine RPM is adjusted correctly, the WinTrac screen will be GREEN. Tighten the jam nuts when the RPM setting is correct.		
11	Press the "OK" button when the RPM settings are correct.		
12	Close the engine curbside door and verify proper unit function.		

G03A - Electronic Throttling Valve (ETV) Test

Purpose:

To confirm proper operation of the Electronic Throttling Valve.

Note: *If the ETV must be changed, refer to the Maintenance Manual for the specific unit.*

Materials Required:

- Fluke Digital Multimeter
- Truck Premium HMI Control Panel or Mechanics Service Tool

Operation:

This procedure should be used to check the operation of the Electronic Throttling Valve (ETV) if Alarm Code 89 occurs. Alarm Code 89 indicates that refrigeration system pressures did not respond as expected when the Electronic Throttling Valve was opened and closed, or that an electrical fault with the ETV system was detected (Condition #3). This may be caused by a malfunction in the Electronic Throttling Valve or associated circuit or a refrigeration system problem such as low refrigerant level, frozen expansion valve or severe suction side restriction. If an electrical fault with the ETV system was detected, the ETV should be replaced.

The ETV has two internal coils. The Base Controller operates the valve by energizing the coils with a variable frequency AC signal. The sequence in which the Base Controller energizes the coils determines the direction of travel and the frequency or "speed" of the signal determines the speed of valve motion (i.e., how fast the valve travels). Wires EVA and EVB energize one coil and wires EVC and EVD energize the other coil. The ETV circuits are protected by Smart FETs. Valve position may be monitored by using the Gauges key on the HMI. 0 indicates the valve is fully closed and 800 indicates the valve is fully opened.

Important: *The LEDs on the Base Controller can be used to verify Base Controller output to the ETV.*

Electronic Throttling Valve Types and Wire Color Codes:

The round style ETV does not have a removable connector on the valve. There is a sheathed cable consisting of colored wires that run from the valve to the Deutsch connector on the cable. The square style ETV has a change in design of the valve body and stepper motor. It also has an integrated four-pin Deutsch connector located at the end of the stepper motor (no harness). The square design allows for ease of service and a low torque setting, providing low strain to piping during service and repair work.

SR-3 Base Controllers feature yellow and green ETV LEDs located at the right edge of the board just above the J7 connector. These LEDs flash when a signal is being sent to the ETV. The LEDs flash rapidly for a brief period of time on initial startup and at a slower rate when the valve is opening or closing normally. If the LEDs are flashing, a signal is being sent to the ETV.

Round Style ETV



Square Style ETV



Table 72. ETV Harness Connections

Round Style		Square Style
Harness Wire #	**Wire Colors**	**Harness Wire #**
EVA	Red	EVA
EVB	Green	EVB
EVC	White	EVC
EVD	Black	EVD

Table 73. Procedure

Step	Action	Result	Comments
1	Power down the unit and verify that all connectors are secure.		
2	Disconnect Base Controller connector J7 and measure resistance between the EVA and EVB wires at the connector. • J7 Pin 24 – EVA wire • J7 Pin 23 – EVB wire	The resistance should be from 20 to 35 ohms. If the resistance is incorrect, check the EVA and EVB wires and connectors leading to the ETV. Verify the valve connector is properly attached to the valve.	Identify the associated pins on the ETV and check for continuity at the valve. If the resistance from the EVA and EVB pins directly on the valve is not from 20 to 35 ohms, the valve is defective.
3	Measure the resistance between EVA and ground, and EVB and ground (should be an open circuit).		Neither pin should show a short to ground.
4	Measure resistance between the EVC and EVD wires at the connector. • J7 Pin 11 – EVC wire • J7 Pin 12 – EVD wire	The resistance should be from 20 to 35 ohms. If the resistance is incorrect, check the EVC and EVD wires and connectors leading to the ETV. Verify the valve connector is properly attached to the valve.	Identify the associated pins on the ETV and check for continuity at the valve. If the resistance from the EVC and EVD pins directly on the valve is not from 20 to 35 ohms, the valve is defective.
5	Measure the resistance between EVC and ground, and EVD and ground (should be an open circuit).		Neither pin should show a short to ground.
6	Reconnect J7 to the Base Controller.		
7	Disconnect the ETV from the main unit harness.		
8	Set the multimeter to read AC (alternating current) voltage and connect the leads to the EVA and EVB wires in the main unit harness at the ETV.		Check voltage between EVA and EVB, not the green and red wires attached to the ETV.
9	Turn the unit on and enter Evacuation Test from the Maintenance Menu. Pay attention to the ETV LEDs on the board. When all four LEDs appear to blink at the same time, read AC voltage between EVA and EVB.	AC voltage between EVA and EVB with the valve opening during Evacuation Test should be between 8-13 Vac.	Prior to the LEDs blinking, it is normal for the AC voltage read on the meter to fluctuate. Pay attention to voltage only when all four LEDs are blinking. The voltage read on the multimeter may be higher (up to 16 Vac) if a battery charger is connected to the unit.
10	Turn the unit off.		
11	With the multimeter set to read AC volts, connect the leads to the EVC and EVD wires in the main unit harness at the ETV.		Check voltage between EVC and EVD, not the white and black wires attached to the ETV.
12	Turn the unit on and enter Evacuation Test from the Maintenance Menu. Pay attention to the ETV LEDs on the board. When all four LEDs appear to blink at the same time, read AC voltage between EVC and EVD.	AC voltage between EVC and EVD with the valve opening during Evacuation Test should be between 6-10 Vac.	
13	Turn the unit off.		

Table 73. Procedure (continued)

Step	Action	Result	Comments
14	If the tests above were successful, the electronic throttling valve should be operational. If the tests were not successful, proceed with step 14.		If the electronic throttling valve appears to function electrically and problems still exist, check the refrigeration system for low refrigerant, frozen expansion valve, a severe restriction in the low side of the system, or a mechanically failed ETV.
15	If the electronic throttling valve circuit is not functioning electrically, replace the controller.		

H04A - Wiring Harness Continuity Test

Purpose:

To illustrate the correct procedures for checking harness continuity on equipment utilizing solid state devices.

Materials Required:

- Fluke Digital Multimeter
- Jumper wires as required

Important Notes:

- Do not use battery and light test tools to check continuity.
  - Using these devices may present excessive voltage or current to solid state devices, causing damage or destroying the solid state device.
- Never test a circuit to see if it is energized by tapping the circuit wire to ground and watching for a spark.
  - This will damage solid state components or blow a fuse.
- Use a high quality digital multimeter or an analog meter with high input impedance.
  - Older analog (needle type meter movement) meters and some inexpensive “mechanic tool box” meters present a large load to the circuit being tested. This can significantly alter the meter reading, especially when measuring small voltages or currents.

Procedure

Step	Action	Result	Comments
1	Locate the suspect circuit on the appropriate wiring diagram.		
2	Isolate both ends of the circuit using the following methods as required: • Disconnect the appropriate connector at the Controller. • Disconnect the device connector at the device. • Remove the wire from the device terminal.	***Important:*** *Failure to isolate both ends may cause misleading results.*	Harness connections are identified in the Service Procedures appropriate to the device in question. They may also be determined by referring to the appropriate wiring diagrams.
3	Using jumpers as required, connect each end of the circuit to a high quality multimeter.	The meter must show a very low resistance (less than 1.0 ohm), indicating circuit continuity. If not, the circuit is open or has excessive resistance. Troubleshoot the circuit to determine the cause using the wiring diagrams.	Verify the ohmmeter battery is good and the meter zeros with the leads held together to prevent misleading results.
4	After determining that the circuit passes a continuity test, remove one test meter lead and connect it to the chassis ground to check for a short to ground.	The meter should indicate an open circuit. If not, the circuit is shorted to ground. Troubleshoot the circuit to determine the cause using the wiring diagrams.	

Section 7 - Service Information

SR-3/SR–3.1 Integrated Base Controller

Hardware Versions and Service Part Numbers

The Base Controller is available in two versions.

- The first version features a USB port but does not have circuitry for damper gear motor applications. The USB connector is located at the right edge of the Base Controller just above the CH Screw Terminal. This version is used for North American SPECTRUM Multi-Temperature Truck units.
- The second version does not have a USB port but does feature circuitry for damper gear motor applications. This version is used for European SPECTRUM Multi-Temperature Truck units.

For the latest information, refer to the applicable Part Catalog (New) available through the Dealer Portal/iService.

Base Controller Color Identification

The SR–3 Base Controller can easily be identified by the color of the board.

- SR-3 Base Controller (2024 and earlier) are colored Blue.
- SR-3.1 Base Controller (2024 and later) are colored Green.

Label Identification

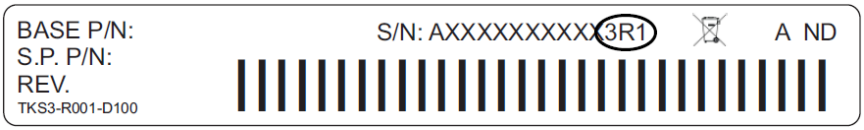
The label is located on the edge of the Base Controller Mounting Base. The label shows the base or assembly TK Engineering Part Number, Service Part Number, Serial Number, and installed Software Revision.

Important: *The Serial Number for Blue colored controllers ends in "3T1". The Serial Number for Green colored controllers ends in "3R1" or "3R2".*

SR-3 Base Controller (Blue)



SR-3.1 Base Controller (Green)



Software Requirements

Multi-Temperature applications with SR-3 Base Controller/Interface Boards must use Base Controller/Interface Board Software Revision F0xx or later. Multi-Temperature applications with SR-3.1 Base Controller/Interface Boards must use Base Controller/Interface Board Software Revision F1xx or later.

Compatibility

For the latest information, refer to the Software Compatibility Matrix available through the Dealer Portal/iService:

- For North America: Click here.
- For EMEA: Click here.

SR-3 HMI Control Panel

Hardware Versions and Service Part Numbers

For the latest information, refer to the applicable Part Catalog (New) available through the Dealer Portal/iService.

Software Requirements

Truck Standard Displays for use with SR-3 applications must use software revision 2204 or later.

Truck Premium Displays for use with SR-3 applications must use software revision 7575 or later.

Compatibility

For the latest information, refer to the Software Compatibility Matrix available through the Dealer Portal/iService:

- For North America: Click here.
- For EMEA: Click here.

Multi-Temperature Expansion Module

The Expansion Module (EM) is a hardware module that allows for operation of up to three temperature controlled zones. The module provides the interface between the Base Controller and the multi-temperature zone components such as sensors, solenoids, valves, and fan motors. It also provides over-current and short circuit protection for the associated circuits. The EM features 100% solid state outputs. All outputs are Smart FET outputs.

- The Expansion Module is used on SR-3 multi-temperature trailer and truck applications only.
- The Expansion Module software is determined by the Base Controller multi-temperature software and cannot be changed independently. Expansion Module software is automatically updated when the Base Controller and Expansion Module establish communications.

For the latest information, refer to the applicable Part Catalog (New) available through the Dealer Portal/iService.

SR-2/SR-3 Diagnostic Tool

An SR-2/SR-3 Diagnostic Tool with Diagnostic Tool Software 4.1 or greater is required to test the SR-3 Base Controller. It is available as a complete tool and also as an update kit for the SR-2 Blue Diagnostic Tool.

Features:

The SR-2/SR-3 Diagnostic Tool includes the following new features:

- Tests the SR-3 Base Controller.
- Tests the SR-3 USB Communications Port.
- Tests the SR-3 Base Controller and HMI Control Panel CAN Ports using a USB to CAN Adaptor.

Complete SR-2/SR-3 Diagnostic Tool:

The complete SR-2/SR-3 Diagnostic Tool is available as Service Part Number 204-1930. It includes the following:

- The Blue Diagnostic Tool. This component is the same as the Blue Diagnostic Tool supplied with earlier versions of the Diagnostic Tool.
- All cables supplied with previous Blue Diagnostic Tool.
- A USB Cable to connect the USB Port on the SR-3 Base Controller to a USB Flash Drive.
- A USB to CAN Adaptor. This adaptor is required to perform the CAN Test that is part of the new Diagnostic Tool.
- A CAN Test Cable to connect the USB to CAN Adaptor to the Diagnostic Tool J1 Connector.
- SR-2/SR-3 Diagnostic Tool Software Revision 4.x.
- Instructions and Storage Box.

SR-2/SR-3 Diagnostic Tool Upgrade Kit:

The SR-2/SR-3 Diagnostic Tool Upgrade Kit is available as Service Part Number 204-1931. It utilizes the current Blue SR-2 Diagnostic Tool hardware (Part Number 204-1196) and cables with no changes and includes the following:

- A USB Cable to connect the USB Port on the SR-3 Base Controller to a USB Flash Drive.
- A USB to CAN Adaptor. This adaptor is required to perform the CAN Test that is part of the new Diagnostic Tool.
- A CAN Test Cable to connect the USB to CAN Adaptor to the Diagnostic Tool J1 Connector.
- SR-2/SR-3 Diagnostic Tool Software Revision 4.x.
- Instructions.

SR-2/SR-3 Diagnostic Tool Software:

The diagnostic tool software is available through the Dealer Portal/iService in the Asset Library or EMEA Info Central website. Go to http://www.thermoking.com/tk/index.asp

For North America: choose Asset Library (Software and Downloads > PC Software > SR-2 and SR-3 Diagnostic Tool).
For EMEA: choose EMEA Info Central and select Home > Software Updates > Tester Software > SR-2 and SR-3 Diagnostic Tool. It will take a few moments to load. Save and unzip the file to the desired directory on your computer. It will take a few moments to unzip and there will be several files as a result. If necessary, double click Setup.exe to install the software.

SR-3 Truck Diagnostic Tool

The Truck Premium Display is also available as a Mechanics Truck Diagnostic Tool. The Mechanics Truck Diagnostic Tool (P/N 204-1916) is required to display all unit information and to access the Maintenance Menu and Guarded Access Menu on units equipped with the Standard HMI Control Panel.

Note: *Refer to Section 4 - Truck Premium Display for operation and additional details.*

Software Requirements

The Truck Diagnostic Tool for use with SR-3 applications must use software revision 7595 or later.

Figure 204. Mechanics Truck Service Tool



SAP516

Base Controller Software Revisions

The Base Controller software family for multi-temperature applications is F0xx/F1xx. For North America: Base Controller software is available here. For EMEA: Base Controller software is available here.

Important: *When necessary to flashload new software to a Base Controller, use the most recent revision available.*

Important: *Unless otherwise noted, software upgrades made to units with previous software revisions are not covered by a warranty labor allowance. The upgrades are made at the discretion of dealers and with the agreement of the unit owner or operator.*

Software Revision F000

Dates	Features	Interchange With:
Released 1st Quarter 2013	• Production release • Same feature set as SR-2 Base Controller C050 • Refer to Service Bulletin TT636 (North America) for details	None

Software Revision F005

Dates	Features	Interchange With:
Released 2nd Quarter 2013	• Field release • Forces low speed operation with low suction pressure • Refer to Service Bulletin TT653 (North America) or Service Bulletin SB 950 (EMEA) for details	All previous

Software Revision F010

Dates	Features	Interchange With:
Released 4th Quarter 2013	• T-Series Multi-Temperature EPA 2013 Engine Compliance • ETV support for Scroll Compressor • ServiceWatch Data Logger records ETV State and Position for M/T truck applications with Scroll Compressor and ETV • Cycle Sentry/Continuous Mode setting will remain the same when unit is switched between Diesel and Electric • Refer to Service Bulletin TT684 (North America) or Service Bulletin SB 977 (EMEA) for details	All previous

Software Revision F012

Dates	Features	Interchange With:
Released 1st Quarter 2014	• Resolves nuisance Alarm Code 45 Check Hot Gas Solenoid • Refer to Service Bulletin TT700-1 (North America) or Service Bulletin SB 990 (EMEA) for details	All previous

Software Revision F020

Dates	Features	Interchange With:
Released 2nd Quarter 2015	• Single zone control holds host setpoint • Engine start events logged • Associate sensors to zones • CargoLink support • Limited Alarm Restart II • New Alarm Code 235 High Engine Coolant Temperature Check • CargoWatch Sensor Screen for Truck Units • RTPS and PV Control • Refer to Service Bulletin TT743-2 (North America) or Service Bulletin SB 1035 (EMEA) for details	All previous

Software Revision F030

Dates	Features	Interchange With:
Released 3rd Quarter 2016	• Software solution to ETV not opening fully during EVAC mode • Software solution to Low Fuel Shutdown alarm (Alarm Code 44) not triggering to prevent unit running out of fuel • Software solution to nuisance Alarm Code 42 while protecting sensitive loads • Refer to Service Bulletin SB 1083 (EMEA) for details	All previous

Software Revision F031

Dates	Features	Interchange With:
Released 3rd Quarter 2016	• Alarm Code 45 Enhancements • To eliminate any risk of nuisance alarms, F030 is no longer available to download from Info Central and we recommend that any F030 version be deleted • Refer to Service Bulletin SB632-1 (North America) or Service Bulletin SB 1103 (EMEA) for details	All previous

Software Revision F035

Dates	Features	Interchange With:
Released 4th Quarter 2017	• Cycle Sentry Low Voltage Restart Enhancements • T-1080S Spectrum Heating Capacity Enhancements • Miscellaneous Enhancements • Refer to Service Bulletin SB699 (North America) or Service Bulletin SB 1163 (EMEA) for details	All previous

Software Revision F040

Dates	Features	Interchange With:
Released 3rd Quarter of 2019	• Cycle Sentry Null Restart • Alarm Code 25 Enhancements • Enhanced Low Coolant Protection for Engine • TK BlueBox added • Alarm Code 15 • Glow Plug Timing • ServiceWatch™ • Alarm Code 45 Updated Parameters • Alarm Code 10 Eliminate Nuisance Alarm Code 10 • Update ETV Close Rate • Miscellaneous Enhancements • Refer to Service Bulletin SB760 (North America) or Service Bulletin SB 1250 (EMEA) for details	All previous

Software Revision F041

Dates	Features	Interchange With:
Released 1st Quarter of 2020	• Supports the launch of T-90 models • Refer to Service Bulletin SB778 (North America) or Service Bulletin SB 1259 (EMEA) for details	All previous

Software Revision F045

Dates	Features	Interchange With:
Released 1st Quarter of 2023	• Supports new unit model: UT-R Spectrum • Supports new style expansion module hardware • Supports whisper pro option for T-1200 Spectrum • Supports S4.2 configuration (dual discharge) remote evaporator on T-Series MT	All previous

Software Revision F046

Dates	Features	Interchange With:
Released 2nd Quarter of 2023	• Miscellaneous enhancements related to supporting whisper pro option for T-1200 Spectrum (EMEA)	All previous

Software Revision F047

Dates	Features	Interchange With:
Released 2nd Quarter of 2024	• Miscellaneous software enhancements related to new style expansion module hardware to address nuisance alarms • Refer to Service Bulletin SB932 (North America) or Service Bulletin SB 1401 (EMEA) for details	All previous

Software Revision F100

Dates	Features	Interchange With:
Released TBD	• All previous features supported, baselined from F047 software revision • New software revision branch to support new SR-3.1 base controller hardware, not compatible with earlier SR-3 base controller hardware • Refer to Service Bulletin SB XXXX for details	None

HMI Control Panel Software Revisions

There are currently two different HMI Control Panels used with Truck applications. Only one Display Panel can be used at a time. The Truck Standard Display (TSD) HMI is supplied with truck units and the Truck Premium Display (TPD) HMI is available as an option. For North America: HMI software is available here. For EMEA: HMI software is available here.

Important: *When necessary to flashload new software to an HMI Control Panel, use the most recent revision available.*

Important: *Unless otherwise noted, software upgrades made to units with previous software revisions are not covered by a warranty labor allowance. The upgrades are made at the discretion of dealers and with the agreement of the unit owner or operator.*

SR-3 Base Controller Software and Premium HMI Control Panel Software Requirements

Base Controller Software	8 MB Premium HMI Control Panel Software	Base Controller Software	8 MB Premium HMI Control Panel Software
F000	7595/7695/7795 and later	F040	75C4 and later
F005	7595/7695/7795 and later	F041	75C4 and later
F010	75B0/76B0/77B0 and later	F045	75C6 and later
F012	75B0/76B0/77B0 and later	F046	75C6 and later
F020	75C0/76C0/77C0 and later	F047	75C6 and later
F031	75C2 and later	F100	75C8 and later
F035	75C3 and later		

Truck Standard Display Software Revision 2204

Dates	Features	Interchange With:
Released 4th Quarter 2011	• Clock Set Capability • Clearing Alarm Codes • Refer to Service Bulletin TT589-1 (North America) for details	All previous

Truck Premium Display Software Revision 7595/7695/7795

Dates	Features	Interchange With:
Released 1st Quarter 2013	• Production release • Refer to Service Bulletin TT636 (North America)	None

Truck Premium Display Software Revision 75B0/76B0/77B0

Dates	Features	Interchange With:
Released 4th Quarter 2012	• Required for use with SR-3 Base Controller Software Revision F010 • Added Spectrum T-1080S to the Unit Model selections available in Guarded Access>Unit Configuration>Unit Model • Added Fuel Level Sensor functionality • Refer to Service Bulletin TT684 (North America) or Service Bulletin SB 969 (EMEA) for details	All previous

Truck Premium Display Software Revision 75C0/76C0/77C0

Dates	Features	Interchange With:
Released 2nd Quarter 2015	• Required for use with SR-3 Base Controller Software Revision F020 • Added Keypad Lock PIN to Guarded Access>Main Menu Configuration Menu • Added Easy Cargo Sensor Access to Guarded Access>Main Menu Configuration Menu • Refer to Service Bulletin TT743-2 (North America) or Service Bulletin SB 1022 (EMEA) for details	All previous

Truck Premium Display Software Revision 75C2/76C2/77C2

Dates	Features	Interchange With:
Released 3rd Quarter 2016	• Add new unit model selection for UT-1200 SPECTRUM (EMEA only) • The T-1080S was renamed to T-1080S SPECTRUM • Refer to Service Bulletin SB632-1 (North America) or Service Bulletin SB 1107 (EMEA) for details	All previous

Truck Premium Display Software Revision 75C3/76C3/77C3

Dates	Features	Interchange With:
Released 4th Quarter 2017	• Add new unit model selection for T-1280R SPECTRUM • Refer to Service Bulletin SB699 (North America) or Service Bulletin SB 1163 (EMEA) for details	All previous

Truck Premium Display Software Revision 75C4/76C4/77C4

Dates	Features	Interchange With:
Released 3rd Quarter 2019	• TK Telematics now replaces the word REB. TK Telematics support and diagnostic menus added to the maintenance and unit configuration menus. • Refer to Service Bulletin SB760 (North America) or Service Bulletin SB 1250 (EMEA) for details	All previous

Truck Premium Display Software Revision 75C5/76C5/77C5

Dates	Features	Interchange With:
Released 1st Quarter 2020	• Supports S4.2 configuration (dual discharge) remote evaporator on T-Series MT	All previous

Truck Premium Display Software Revision 75C7/76C7/77C7

Dates	Features	Interchange With:
Released 4th Quarter 2022	• A new microchip is being used that requires a new software, 75C7 • Supports whisper pro option for T-1200 Spectrum • Supports new unit models: UT-R Spectrum • Refer to Service Bulletin SB882 (North America) or Service Bulletin SB 1367 for details	All previous

Truck Premium Display Software Revision 75C8/76C8/77C8

Dates	Features	Interchange With:
Released TBD	• Supports new SR-3.1 base controller hardware (Green) • Supports flashloading of Truck Premium HMI (HMI with new internal microprocessor hardware changes) • Refer to Service Bulletin XXXX for details	

Truck Premium Display Error Messages

The following error messages will appear on the Truck Premium Display if the stated conditions occur.

[SYSTEM IS POWERING DOWN]

If the Truck Premium Display ON key is pressed and the TK Logo display is shown and then [SYSTEM IS POWERING DOWN] appears, the OFF Line between a remote control panel and the Truck Premium Display is likely shorted to ground. The Truck Premium Display will not remain powered up if the OFF Line is shorted to ground. The OFF Line (OFF – YEL wire) circuit is located in the remote control harness that is routed from the control box to a plug in the evaporator. An additional harness may be connected to a remote control panel.

Note: *In some cases, if the OFF Line (OFF – YEL wire) is shorted to ground the Truck Premium Display may not power up at all.*

[SOFTWARE MISMATCH - - FLASHLOAD REQUIRED]

This message indicates one of the following conditions has been detected:

- The Truck Premium Display is detecting a single temperature software revision (D0xx) in the SR-3 Base Controller and is also detecting the presence of a multi-temperature Expansion Module. This would occur if an SR-3 multi-temperature unit had single temperature (D0xx) software installed in the Base Controller. Multi-temperature Base Controller software revision (F0xx) must be flash loaded to the Base Controller.
- The Truck Premium Display is detecting a multi-temperature software revision (F0xx) in the SR-3 Base Controller and is not detecting the presence of a multi-temperature Expansion Module. This would occur if an SR-3 single temperature unit had multi-temperature (F0xx) software installed in the Base Controller. Single temperature Base Controller software revision (D0xx) must be flash loaded to the Base Controller.

[COMMUNICATIONS FAILURE - - LOST CONTROLLER CONNECT]

This message indicates that the Truck Premium Display has not received any messages from the Base Controller for 20 seconds. The Truck Premium Display will stay powered up and try to re-establish communications with the Base Controller via the CAN Bus. This message can result from one of the following conditions:

- If there are open or shorted circuits on the CANL or CANH wires between the Truck Premium Display and the Base Controller CAN Bus circuits.
- If the CAN communications fail between the Truck Premium Display and Base Controller or if CAN communications are not operational.
- If the Truck Premium Display or Base Controller is defective.

[LOST CONTROLLER POWER]

This message indicates that the Truck Premium Display has detected a loss of power on the 8XP circuit and that the Base Controller did not respond to messages from the Truck Premium Display for at least three seconds. If this occurs, the Truck Premium Display will display LOST CONTROLLER POWER - - POWERING DOWN and shut down. This message can result from one of the following conditions:

- If the Base Controller On/Off switch is in the off position or if fuse F2 is blown. This interrupts power to the 8 circuit.
- If there are open circuits or bad connections on the 8XP and CAN Bus circuits between the Truck Premium Display and the Base Controller.
- If Fuse F10 is blown or if the K9 On/Off Relay on the Base Controller is defective. This interrupts power to the 8X circuit.
- If the Base Controller is defective.

[CHECK 8X WIRING]

If this message appears, it indicates that the Truck Premium Display has detected a loss of power on the 8XP circuit but CAN communications between the Truck Premium Display and the Base Controller still exist. This message can result if 8XP power is lost as a result of one of the following conditions:

- Loss of 8XP power could be caused by an open 8XP circuit or a bad connection between the Truck Premium Display and the Base Controller.
- Loss of 8XP power will occur if Fuse F7 on the Base Controller is blown.

Section 8 - Refrigeration Operation and Service Procedures

Multi-Temperature Refrigeration Principles and Components

Multi-Temperature System Features

- **Reverse Cycle Heat** - When the unit is operating in reverse cycle heat, the evaporator coil in the zone that is in heat mode is used as the condenser coil for the system. The Condenser Inlet Solenoid (CIS) energizes (closes) to stop refrigerant flow through the host unit condenser. The heating coil provides liquid refrigerant to other cooling zones. The suction line in the heating zone is closed and the liquid refrigerant is sent through a liquid return line to the system liquid line. In some cases, the direction of flow in the liquid line is reversed compared to cool mode. This only occurs when at least one other zone is operating in cool mode.
- All multi-temperature systems are capable of maintaining any temperature in any zone. They can also heat or cool in any zone at any time.
- The multi-temperature refrigeration and control system is a very robust and complex system. As a result, it is difficult to predict the unit operating mode at any given moment. Service Test Mode allows the technician to force the unit to a known operating mode for diagnostic purposes.

Multi-Temperature Host Unit Components

The Condenser Inlet Solenoid, Receiver Tank Pressure Solenoid, Purge Valve, Hot Gas Bypass Solenoid, and Liquid Injection Valve are located in the condenser section of the unit and serve all zones. They are controlled by zone requirements and are affected by the suction pressure transducer or discharge pressure transducer. These components are controlled by electrical outputs that are part of the Base Controller/Interface Board assembly.

Condenser Inlet Solenoid (CIS)

This valve controls the flow of refrigerant to the host unit's condenser. This normally open solenoid is typically energized (closed) when any zone is operating in heat or defrost mode. The base controller will supply 12 volts from a Smart FET to energize (close) this valve. The base controller may de-energize the condenser inlet solenoid as required to increase cooling capacity or control discharge pressure. This is determined by box temperature vs ambient temperature. The condenser inlet solenoid will be de-energized under the following conditions:

- If the refrigerant discharge pressure becomes excessive.
- If the temperature control algorithm allows low heating capacity to increase cooling capacity.

Receiver Tank Pressure Solenoid (RTPS)

This normally closed valve is energized (open) when any zone is operating in heat or defrost mode and the refrigerant discharge pressure is low. It pressurizes the receiver tank to push stored liquid refrigerant into the system. This verifies adequate refrigerant is available to heat or defrost the zone. The RTPS is always energized at the same time as the Purge Valve (Purge Valve and Receiver Tank Pressure Solenoid are controlled by separate electronic outputs). As discharge pressure rises, the RTPS may de-energize to limit the amount of refrigerant available to the system. The Base Controller will supply 12 volts from a Smart FET to energize (open) the valve.

Purge Valve (PV)

This normally closed valve is energized (open) when any zone is operating in heat or defrost mode and the refrigerant discharge pressure is low. It allows liquid refrigerant trapped in the host unit condenser to be transferred to the system. This verifies adequate refrigerant is available to heat or defrost the zone. The Purge Valve is always energized at the same time as the Receiver Tank Pressure Solenoid valve (Purge Valve and Receiver Tank Pressure Solenoid are controlled by separate electronic outputs). As discharge pressure rises, the PV may de-energize to limit the amount of refrigerant available to the system. The Base Controller will supply 12 volts from a Smart FET to energize (open) the valve.

Hot Gas Bypass Solenoid (HGBS)

Note: *Units with scroll compressor only.*

The Base Controller energizes (opens) the Hot Gas Bypass Solenoid during heat mode or defrost mode operation. This normally closed solenoid valve is located in the hot gas line. It opens when the controller senses low suction pressure. The HGBS is energized and LED 10 is illuminated when the Base Controller energizes the HG Smart FET. This supplies

power via the HG wire to the HGBS. The HGBS is grounded by means of a CH wire to chassis ground. The circuit is protected by the Smart FET.

Liquid Injection Solenoid (LIS)

Note: *Units with scroll compressor only.*

The Liquid Injection Solenoid is used only on units with scroll compressors. The Base Controller monitors the Compressor Temperature Sensor. When the compressor temperature is determined to be high, the Base Controller energizes (opens) the Liquid Injection Solenoid to inject liquid refrigerant into the suction line side of the compressor. When the liquid refrigerant flashes to a gas, it cools the compressor. This normally closed solenoid valve is located in a branch of the liquid line that attaches to the compressor body. The Liquid Injection Valve is energized and LED 19 is illuminated when the Base Controller energizes the LIQ Smart FET. This supplies power via the LIQ wire to the Liquid Injection Solenoid. The Liquid Injection Solenoid is grounded by means of a CH wire to chassis ground. The circuit is protected by the Smart FET.

Electronic Throttling Valve (ETV)

Some later model SPECTRUM units have an ETV instead of a Suction Pressure Regulator. The ETV is an electronic valve that the microprocessor uses to control the suction pressure to the compressor. The ETV is a variable position valve operated by a stepper motor. The ETV system also uses the discharge and suction pressure transducers.

Note: *All Tier 4 units will have an ETV.*

Multi-Temperature Evaporator Components

The Liquid Line Solenoid, Hot Gas Solenoid, and Suction Line Solenoid for each zone are located in the evaporator for that zone and are controlled by zone requirements. The remote evaporators also include the 12 Vdc electrical fans with electronic speed control and the drain hose heaters. With the exception of the Zone 1 Liquid Line Solenoid, these components are controlled by Smart FET outputs located in the Expansion Module. The Zone 1 Liquid Line Solenoid is controlled by an output on the Base Controller. This allows Zone 1 cool operation with a failed Expansion Module.

Liquid Line Solenoid (LLS)

The Liquid Line Solenoid is energized (open) any time cooling, heating, or defrosting is required in its zone. The valve is de-energized when the zone is in null or off to stop refrigerant flow in that zone. These solenoids are normally closed valves. The Liquid Line Solenoid for Zone 1 is controlled by relay K8 located on the Base Controller. The Liquid Line Solenoids for Zones 2 and 3 are controlled by Smart FET outputs on the Expansion Module. Relay K8 (Zone 1) or the Expansion Module (Zones 2 and 3) will supply 12 volts to energize (open) the respective valve.

Hot Gas Solenoid (HGS)

The Hot Gas Solenoid is energized (open) any time heating or defrosting is required in the zone. This makes hot gas from the compressor discharge and hot gas line available to the zone. These solenoids are normally closed valves and are controlled by Smart FET outputs located on the Expansion Module. The Expansion Module will supply 12 volts to energize (open) the respective valve.

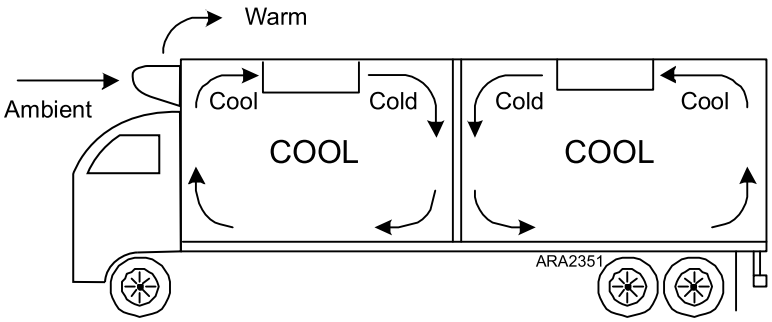
Suction Line Solenoid (SLS)

The Suction Line Solenoid is energized (closed) when its zone is operating in reverse cycle heat (Refer to Reverse Cycle Heat in "Multi-Temperature System Features," p. 371). The Suction Line Solenoid prevents refrigerant from escaping into the suction line. This causes the liquid refrigerant being condensed to flow through the liquid return line to the system liquid line. The Suction Line Solenoid is not energized (closed) if there are no other zones operating in cool mode. These solenoids are normally open valves and are controlled by Smart FET outputs located on the Expansion Module. The Expansion Module will supply 12 volts to energize (close) the respective valve.

Multi-Temperature Operation

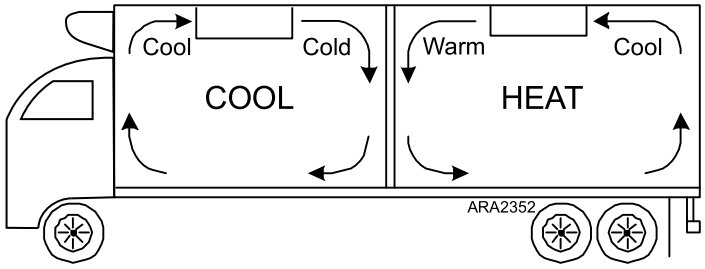
All Zones Cooling

When all zones are cooling, the host unit condenser is used to eliminate the heat from all zones. This is Conventional Cooling operation.



One Zone Cooling/One Zone Heating or Defrosting

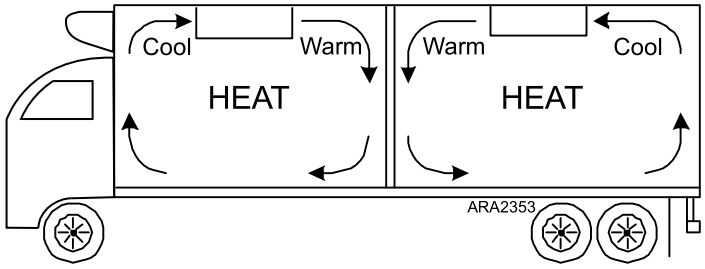
When at least one zone is cooling and another zone is heating or defrosting, the evaporator in the heating zone is used as a condenser to remove the heat from the zone that is cooling. The host unit condenser is not used. This is Reverse Cycle operation.



All Zones Heating or Defrosting

When all zones are heating or defrosting, the host unit condenser is not used. This is Hot Gas Heat operation.

Note: *When a zone is defrosting, the other zone(s) are forced to Null.*



Solenoids and Valves

Item	Smart FET	Solenoid Type	Null	Running Null	Cool	Heat and Defrost (Note 1)	Reverse Cycle Heat and Defrost	Single Zone Heat (Note 3)
Condenser Inlet Solenoid (CIS)	Yes	NO				Energized (closed)	Energized (closed)	Energized (closed)
Receiver Tank Pressure Sol (RTPS)	Yes	NC				Energized (open)	Energized (open)	
Purge Valve (PV)	Yes	NC				Energized (open)	Energized (open)	
Zone Liquid Line Solenoid (LLS)	Yes	NC			Ener-gized (open)	Energized (open)	Energized (open)	Energized (open)
Zone Hot Gas Solenoid (HGS)	Yes	NC				Energized (open)	Energized (open)	Energized (open)
Zone Suction Line Solenoid (SLS)	Yes	NO					Energized (closed)	
Evaporator Fans	Yes	N/A	Off	On	On	On (Off for defrost)	On (Off for defrost)	On

Notes:

1. *When a zone is running defrost, the other zone(s) are forced to null.*
2. *The fans in zones with fresh range setpoints will run in full speed if there are no more than three fans in a zone. If there are four or more fans per zone, the fan speed is reduced for power management. The fans in zones with frozen range setpoints will run at a lower speed than fans in fresh zones with four or more fans.*

   If the Run Fans in Null feature is enabled and the unit is running, when a zone is in running null, the zone fans will run for three minutes, shut down for three minutes, and then restart for three minutes. This maintains airflow in the zone and is normally used with fresh loads.
3. *Single Zone Heat is used when there are no other zones operating in cool mode. The heating zone will use conventional hot gas heat.*

Summary

- When a zone is cooling, the Liquid Line Solenoid (LLS) is energized (open), the Hot Gas Solenoid (HGS) is de-energized (closed), and the Suction Line Solenoid (SLS) is de-energized (open).
- When a zone is heating or defrosting in single zone heat, the Liquid Line Solenoid (LLS) is energized (open), the Hot Gas Solenoid (HGS) is energized (open), and the Suction Line Solenoid (SLS) is de-energized (open).
- When a zone is in reverse cycle heat, the Liquid Line Solenoid (LLS) is energized (open), the Hot Gas Solenoid (HGS) is energized (open), and the Suction Line Solenoid (SLS) is energized (closed).
- When a zone is in Null or running null, no zone valves are energized.
- When a zone is off, no zone valves are energized.

Transducers and Switches

Compressor Discharge Pressure Transducer

This transducer supplies the discharge pressure at the compressor to the base controller. This information is used by the software to determine which solenoids should be energized or de-energized.

Suction Pressure Transducer

This transducer supplies the suction pressure to the base controller. This information is used by the software to determine if the engine is allowed to operate at high speed.

High Pressure Cutout Switch

The high pressure cutout switch monitors the discharge pressure at the compressor. The switch is closed with normal pressures and will open with excessive pressures. The actual pressure is determined by the refrigerant used in the unit. The high pressure cutout is located on the compressor discharge manifold.

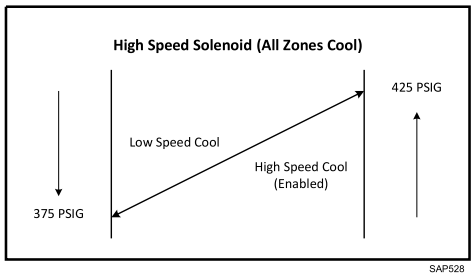
Discharge Transducer Pressure Control

The base controller monitors the discharge pressure of the compressor using the Discharge Pressure Transducer. This information is used to control unit operation.

Refrigeration Control

High Speed Solenoid (All Zones Cool)

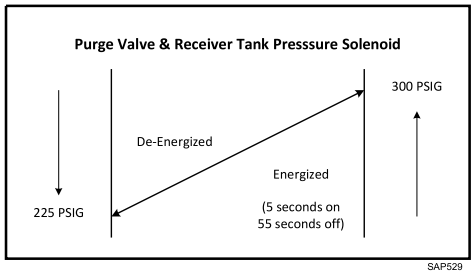
When all zones are in cool mode, the base controller will enable the unit to run in high speed if required until the discharge pressure exceeds 425 psig. At that time the unit will be forced to low speed to prevent a shut down on high discharge pressure. When the discharge pressure drops below 375 psig, the base controller will enable the unit to go back to high speed if required.



Purge Valve and Receiver Tank Pressure Solenoids

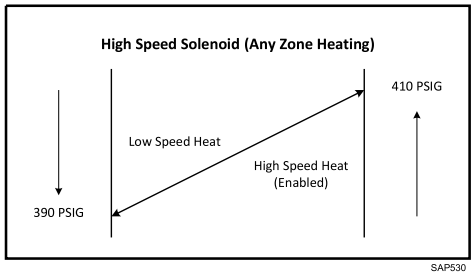
When any zone is in heat or defrost mode with the Condenser Inlet Solenoid energized, the base controller will energize the Purge Valve (PV) and Receiver Tank Pressure Solenoid (RTPS) until the discharge pressure exceeds 300 psig. At that time the unit will de-energize the solenoids. This controls the amount of refrigerant available when the unit is heating or defrosting. When the discharge pressure drops below 225 psig, the base controller will again energize the Purge Valve and Receiver Tank Pressure Solenoid to add additional refrigerant to the system.

The Purge Valve and RTPS will be energized for 48 seconds and then de-energized for 300 seconds if the discharge pressure is between 225 and 300 psig.



High Speed Solenoid (Any Zone Heating)

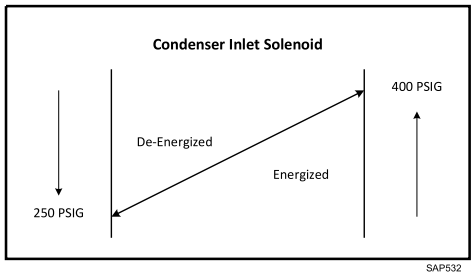
When any zone is in heat mode, the base controller will enable the unit to run in high speed heat if required until the discharge pressure exceeds 410 psig. At that time the unit will be forced to low speed heat to prevent a shut down on high discharge pressure. When the discharge pressure drops below 390 psig, the controller will enable the unit to go back to high speed heat if required.



Condenser Inlet Solenoid

When any zone is in heat or defrost mode, the base controller will energize the condenser inlet solenoid only when required to increase capacity. This is determined by box temperature vs ambient temperature.

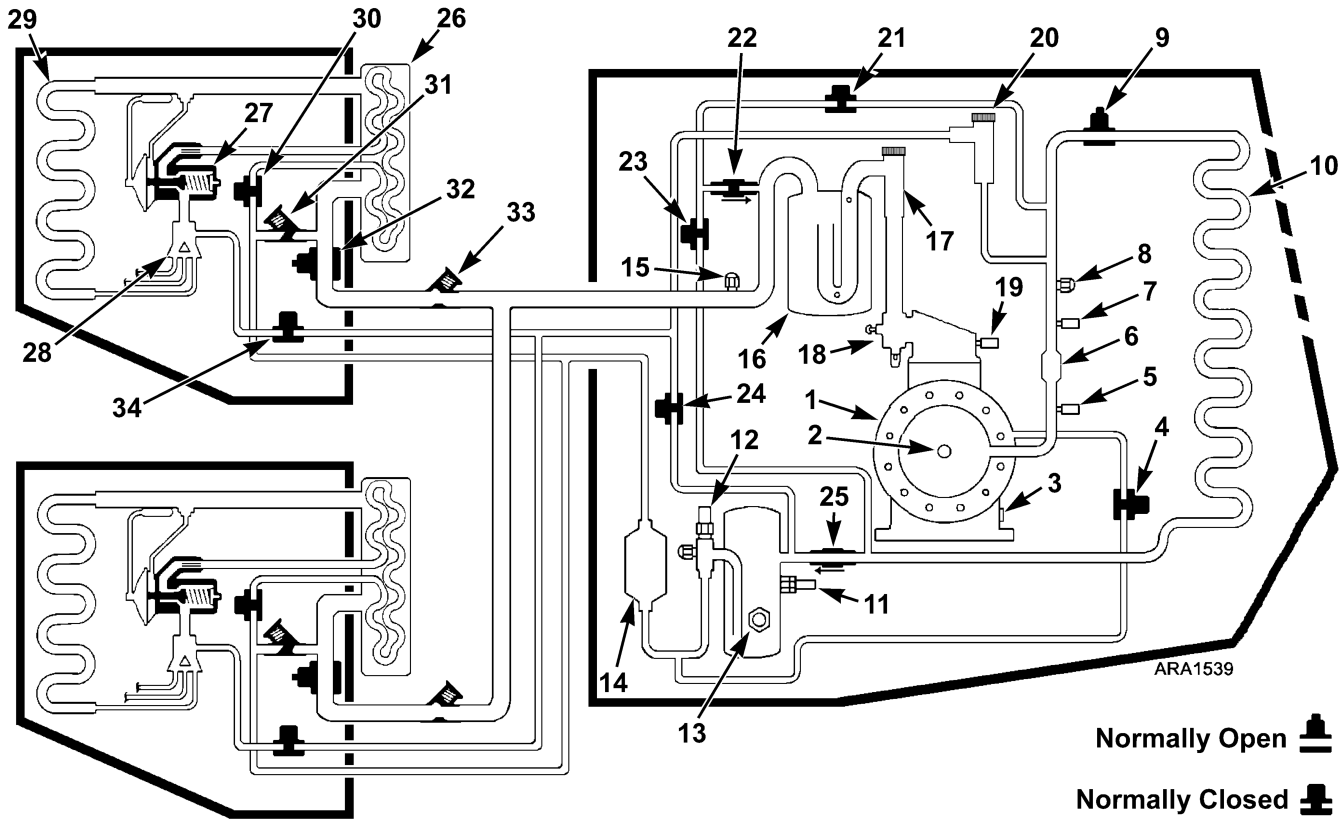
When energized, the condenser inlet solenoid will stay energized until the discharge pressure exceeds 400 psig. At that time the condenser inlet solenoid is de-energized to prevent a shut down on high discharge pressure. When the discharge pressure drops below 250 psig, the controller will again energize the condenser inlet solenoid if required.



Refrigeration Diagrams

SPECTRUM Two Zone Unit with Scroll Compressor and Suction Pressure Regulator (SPR)

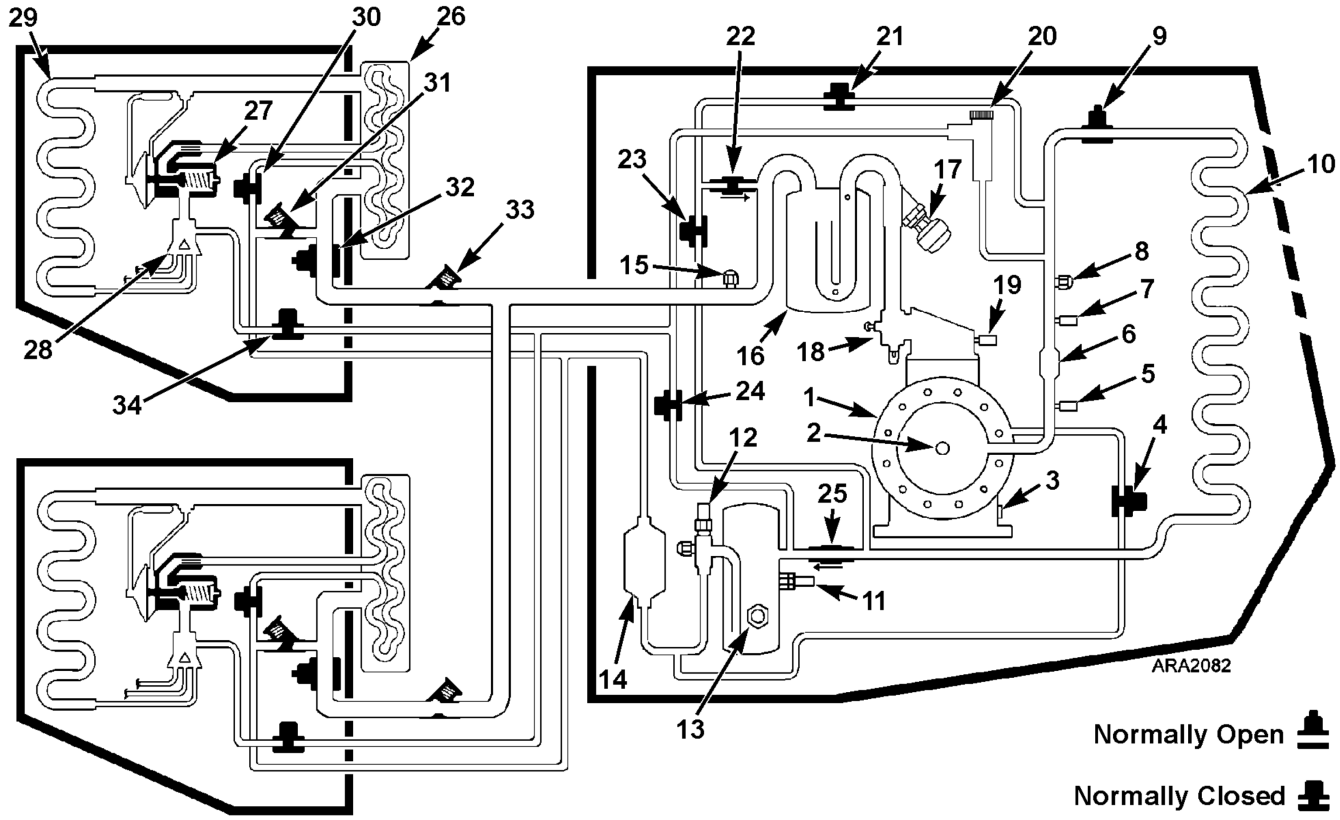
Note: *Three zones adds an additional zone.*



1.	Scroll Compressor	13.	Suction Service Valve	25.	Condenser Check Valve (CCV)
2.	Compressor Temperature Sensor	14.	Suction Pressure Transducer	26.	Heat Exchanger – Remote
3.	Compressor Sight Glass	15.	Discharge Pressure Regulator (DPR)	27.	Expansion Valve – Remote
4.	Liquid Injection Solenoid (LIS)	16.	Hot Gas Bypass Solenoid (HGBS)	28.	Distributor – Remote
5.	High Pressure Cutout Switch (HPCO)	17.	Purge Check Valve (PCV)	29.	Evaporator Coil – Remote
6.	Discharge Strainer	18.	Purge Valve (PV)	30.	Liquid Line Solenoid (LLS)
7.	Discharge Pressure Transducer	19.	Receiver Tank Pressure Solenoid (RTPS)	31.	Liquid Return Check Valve (LRCV)
8.	Discharge Service Port	20.	Receiver Tank Sight Glass	32.	Suction Line Solenoid (SLS) – Remote
9.	Condenser Inlet Solenoid (CIS)	21.	Dehydrator (Filter-Drier)	33.	Suction Line Check Valve (SLCV) – Remote
10.	Condenser Coil	22.	Suction Access Port	34.	Hot Gas Solenoid (HGS) – Remote
11.	High Pressure Relief Valve	23.	Accumulator		
12.	Receiver Tank Outlet Valve	24.	Suction Pressure Regulator (SPR)		

SPECTRUM Two Zone Unit with Scroll Compressor and Electronic Throttling Valve (ETV)

Note: *Three zones adds an additional zone.*

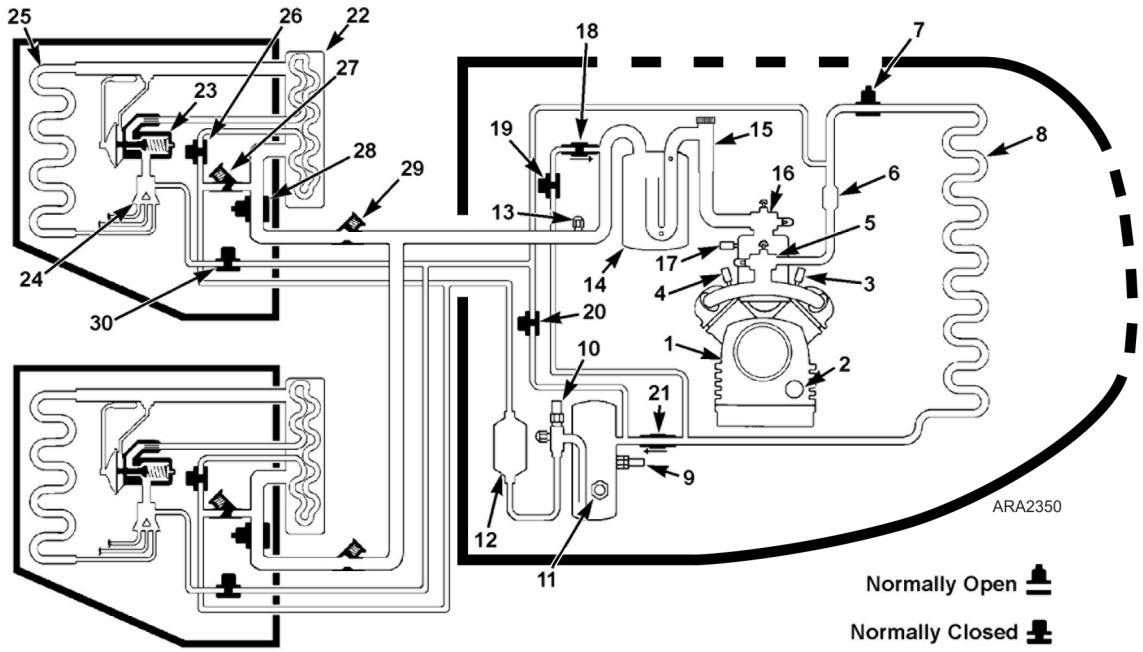


1.	Scroll Compressor	13.	Receiver Tank Sight Glass	25.	Condenser Check Valve (CCV)
2.	Compressor Temperature Sensor	14.	Dehydrator (Filter-Drier)	26.	Heat Exchanger – Remote
3.	Compressor Sight Glass	15.	Suction Access Port	27.	Expansion Valve – Remote
4.	Liquid Injection Solenoid (LIS)	16.	Accumulator	28.	Distributor – Remote
5.	High Pressure Cutout Switch (HPCO)	17.	Electronic Throttling Valve (ETV)	29.	Evaporator Coil – Remote
6.	Discharge Strainer	18.	Suction Service Valve	30.	Liquid Line Solenoid (LLS)
7.	Discharge Pressure Transducer	19.	Suction Pressure Transducer	31.	Liquid Return Check Valve (LRCV)
8.	Discharge Service Port	20.	Discharge Pressure Regulator (DPR)	32.	Suction Line Solenoid (SLS) – Remote
9.	Condenser Inlet Solenoid (CIS)	21.	Hot Gas Bypass Solenoid (HGBS)	33.	Suction Line Check Valve (SLCV) – Remote
10.	Condenser Coil	22.	Purge Check Valve (PCV)	34.	Hot Gas Solenoid (HGS) – Remote
11.	High Pressure Relief Valve	23.	Purge Valve (PV)		
12.	Receiver Tank Outlet Valve	24.	Receiver Tank Pressure Solenoid (RTPS)		

SPECTRUM Two Zone Unit with Reciprocating Compressor and Suction Pressure Regulator (SPR)

Notes:

1. *The diagram shows the refrigeration system with a four-cylinder compressor. The refrigeration system with the two-cylinder compressor is basically the same except for the compressor.*
2. *Three zones adds an additional zone.*

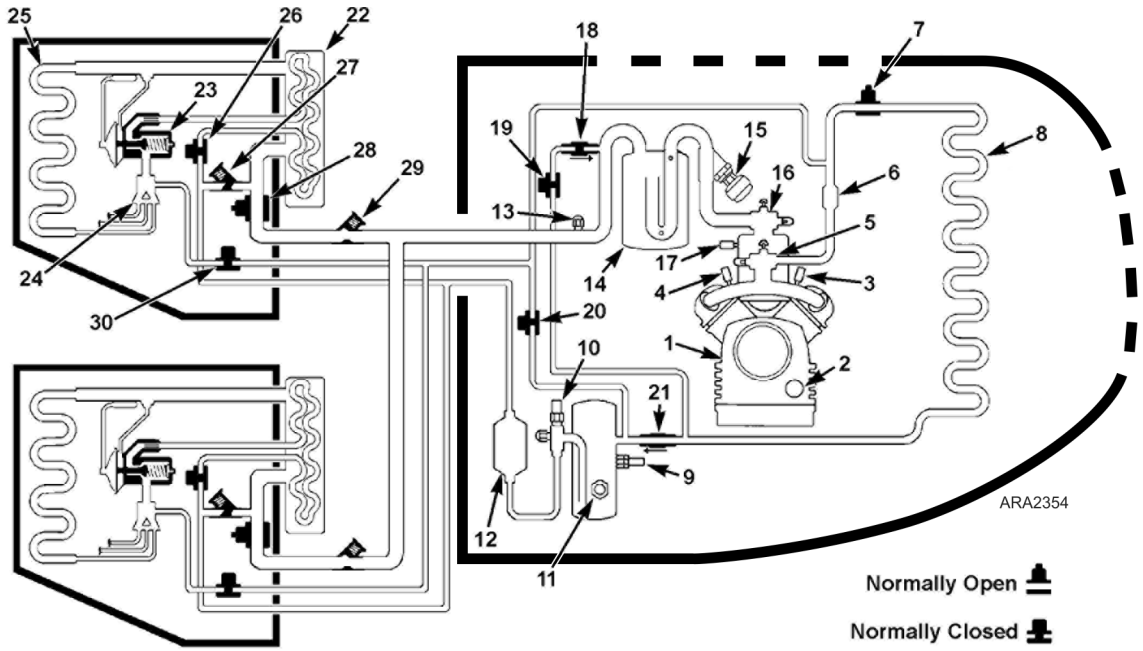


1.	Reciprocating Compressor	11.	Receiver Tank Sight Glass	21.	Condenser Check Valve (CCV)
2.	Compressor Sight Glass	12.	Dehydrator (Filter-Drier)	22.	Heat Exchanger – Remote
3.	Discharge Pressure Transducer	13.	Suction Access Port	23.	Expansion Valve – Remote
4.	High Pressure Cutout Switch (HPCO)	14.	Accumulator	24.	Distributor – Remote
5.	Discharge Service Valve	15.	Suction Pressure Regulator (SPR)	25.	Evaporator Coil – Remote
6.	Discharge Strainer	16.	Suction Service Valve	26.	Liquid Line Solenoid (LLS)
7.	Condenser Inlet Solenoid (CIS)	17.	Suction Pressure Transducer	27.	Liquid Return Check Valve (LRCV)
8.	Condenser Coil	18.	Purge Check Valve (PCV)	28.	Suction Line Solenoid (SLS) – Remote
9.	High Pressure Relief Valve	19.	Purge Valve (PV)	29.	Suction Line Check Valve (SLCV) – Remote
10.	Receiver Tank Outlet Valve	20.	Receiver Tank Pressure Solenoid (RTPS)	30.	Hot Gas Solenoid (HGS) – Remote

SPECTRUM Two Zone Unit with Reciprocating Compressor and Electronic Throttling Valve (ETV)

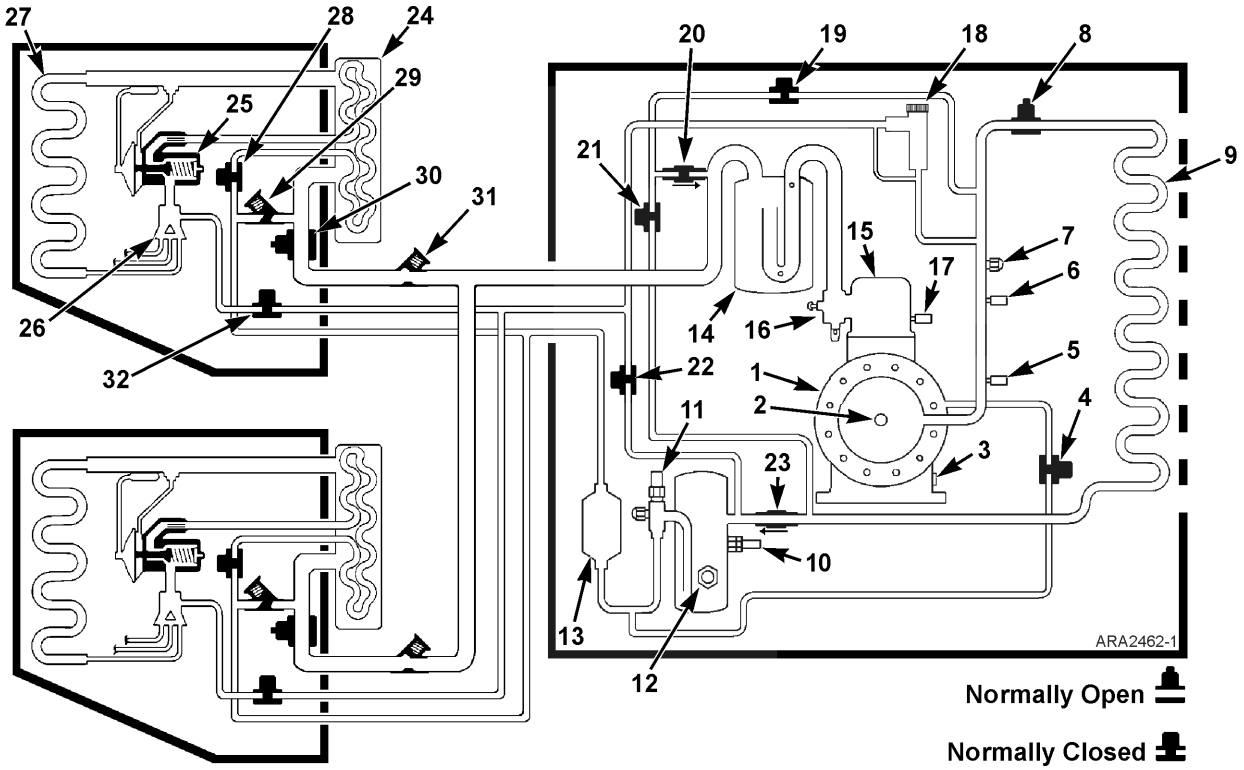
Notes:

1. *The diagram shows the refrigeration system with a four-cylinder compressor. The refrigeration system with the two-cylinder compressor is basically the same except for the compressor.*
2. *Three zones adds an additional zone.*



1.	Reciprocating Compressor	11.	Receiver Tank Sight Glass	21.	Condenser Check Valve (CCV)
2.	Compressor Sight Glass	12.	Dehydrator (Filter-Drier)	22.	Heat Exchanger – Remote
3.	Discharge Pressure Transducer	13.	Suction Access Port	23.	Expansion Valve – Remote
4.	High Pressure Cutout Switch (HPCO)	14.	Accumulator	24.	Distributor – Remote
5.	Discharge Service Valve	15.	Electronic Throttling Valve (ETV)	25.	Evaporator Coil – Remote
6.	Discharge Strainer	16.	Suction Service Valve	26.	Liquid Line Solenoid (LLS)
7.	Condenser Inlet Solenoid (CIS)	17.	Suction Pressure Transducer	27.	Liquid Return Check Valve (LRCV)
8.	Condenser Coil	18.	Purge Check Valve (PCV)	28.	Suction Line Solenoid (SLS) – Remote
9.	High Pressure Relief Valve	19.	Purge Valve (PV)	29.	Suction Line Check Valve (SLCV) – Remote
10.	Receiver Tank Outlet Valve	20.	Receiver Tank Pressure Solenoid (RTPS)	30.	Hot Gas Solenoid (HGS) – Remote

UT SPECTRUM Unit with Scroll Compressor



1.	Scroll Compressor	12.	Receiver Tank Sight Glass	23.	Condenser Check Valve (CCV)
2.	Compressor Temperature Sensor	13.	Dehydrator (Filter-Drier)	24.	Heat Exchanger – Remote
3.	Compressor Sight Glass	14.	Accumulator	25.	Expansion Valve – Remote
4.	Liquid Injection Solenoid (LIS)	15.	Mechanical Throttling Valve	26.	Distributor – Remote
5.	High Pressure Cutout Switch (HPCO)	16.	Suction Service Valve	27.	Evaporator Coil – Remote
6.	Discharge Pressure Transducer	17.	Suction Pressure Transducer	28.	Liquid Line Solenoid (LLS) – Remote
7.	Discharge Service Port	18.	Discharge Pressure Regulator (DPR)	29.	Liquid Return Check Valve (LRCV)
8.	Condenser Inlet Solenoid (CIS)	19.	Hot Gas Bypass Solenoid (HGBS)	30.	Suction Line Solenoid (SLS) – Remote
9.	Condenser Coil	20.	Purge Check Valve (PCV)	31.	Suction Line Check Valve (SLCV) – Remote
10.	High Pressure Relief Valve	21.	Purge Valve (PV)	32.	Hot Gas Solenoid (HGS) – Remote
11.	Receiver Tank Outlet Valve	22.	Receiver Tank Pressure Solenoid (RTPS)		

Refrigeration Service Procedures

R01A - System Evacuation and Charging Procedure

Purpose:

To evacuate and charge a multi-temperature refrigeration system.

Materials Required:

- Thermo King Evacuation Station (P/N 204-725 or 204-744).
- Evacuation Station Operation and Field Application (TK 40612-2).
- Truck Premium HMI or Mechanics Service Tool

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) before releasing the unit for service or performing another refrigeration service procedure.
- For additional information, refer to the appropriate Maintenance Manual.

⚠ Caution

Service Procedure!

Do not evacuate the system until it is leak free. A unit with less than full refrigerant charge should be leak checked and all leaks must be repaired.

Table 74. Evacuation Procedure

Step	Action	Result	Comments
1	Recover any refrigerant to 0 psig. Regulations may require recovery machine to pull system pressure lower than 0 psig.		Refer to Refrigeration Service Procedure R10A for refrigerant recovery details.
2	Before connecting refrigerant hoses to unit, close valves V1 and V4 on the evacuation system and turn micron gauge ON.		
3	Back seat suction and receiver tank service valves. Attach evacuation hoses to these two valves as well as the discharge service port (check condition of hose seals).		
4	With service valves fully back seated, turn evacuation pump ON and open valve V1 (V2 and V3 should also be open).	Micron gauge should move to a deep vacuum.	Verify unit is in Evacuation Mode and that a battery charger is connected.
5	Open valve V4.	Micron reading will rise. If micron gauge returns to reading less than 500 microns, proceed to step 6. If micron reading remains high, a leak exists at hose fittings or packing glands. Locate and correct problem.	Packing glands that do not seal can be corrected by installing valve stem covers (step 6).
6	If step 5 was successful, close valve V2 to isolate thermistor. Open suction, discharge, and receiver service valves to port. Install brass and steel valve stem covers (with sealing washers) on service valves and tighten. Let vacuum pump continue to operate.		
7	After five minutes of evacuation, open valve V2 to access thermistor and micron gauge.	Micron reading now shows system pressure.	
8	Evacuate system to 500 microns or lowest achievable level between 500 and 1000 microns.		Multi-Temp units should be evacuated for an additional hour once 500 microns is reached.
9	When acceptable micron level is achieved (500 to 1000 microns plus one hour for Multi-Temp units), close valve V1 to isolate pump. Turn pump OFF.		

Table 74. Evacuation Procedure (continued)

Step	Action	Result	Comments
10	Observe reading on micron gauge after five minutes have elapsed.	If vacuum level exceeds 2000 microns after five minutes, leak is present or additional evacuation time is required.	
11	If vacuum level is acceptable, start pump and open valve V1 to evacuate pressure rise (five minutes).		
12	With vacuum pump running, back seat suction service valve. Observe micron gauge and continue to operate vacuum pump until an acceptable micron level is achieved.		
13	Close valve V1 and stop pump. Observe micron gauge to confirm that system remains in a deep vacuum. Close valve V4. Unit is ready to charge.		

Important: *Unit must be leak checked and fully evacuated before charging.*

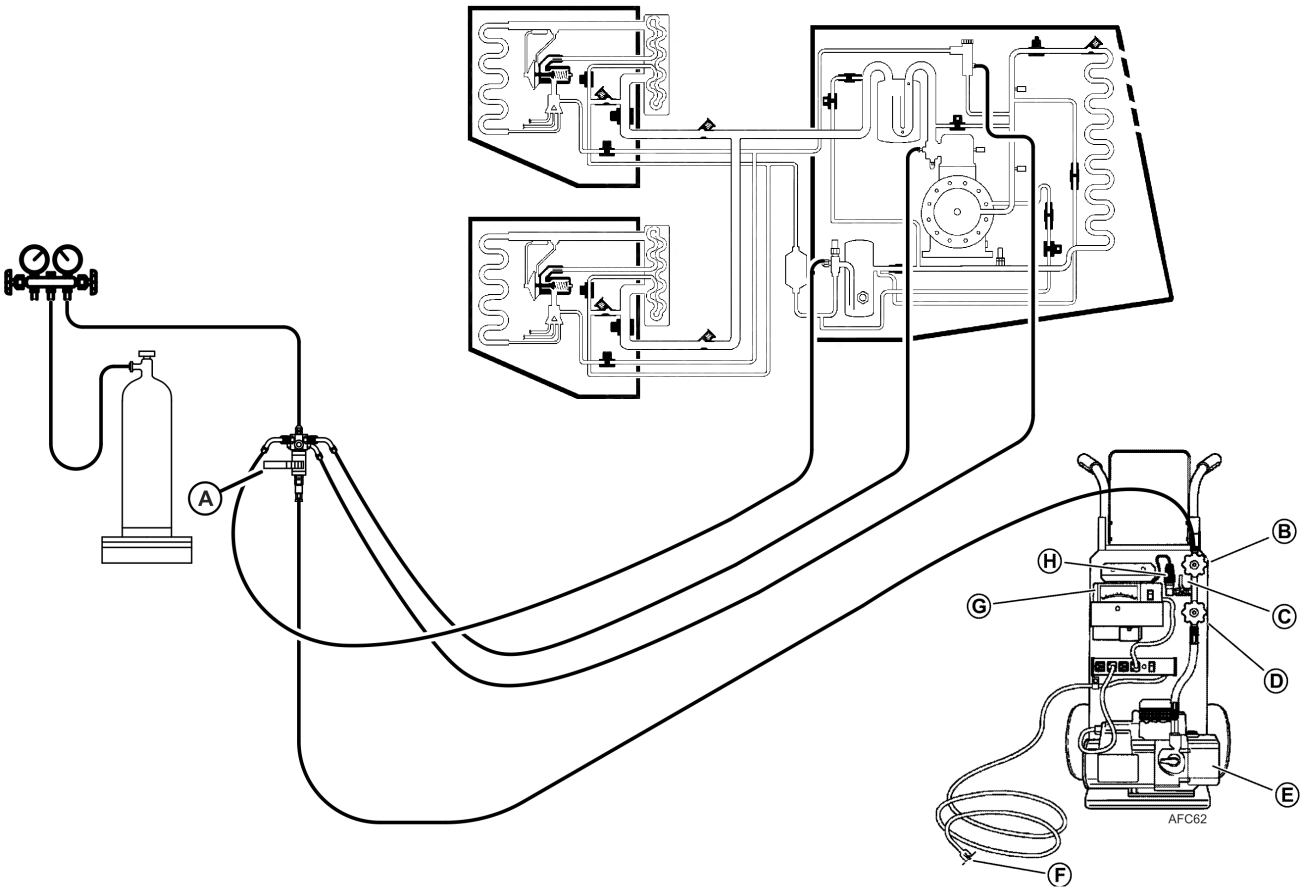
Table 75. Charging Procedure

Step	Action	Result	Comments
1	Install a gauge manifold. Attach the low side gauge to the service port on the suction service valve. Attach the high side gauge to the service port on the discharge line near the condenser.		Prior to charging, it is necessary to make a rough estimate of the charge requirements of the unit. Refer to TK 60484-1-MM "Charging Procedure for T-Spectrum & UT units" for details.
2	Close the valves on the gauge manifold.		
3	Mid seat the compressor suction service valve.		
4	Connect a refrigerant supply to the gauge manifold service line and purge the line.		
5	Set the refrigerant supply bottle to liquid and open the hand valve.		
6	Open the high side gauge manifold valve. Liquid charge the unit in accordance with Thermo King procedures with the exact calculated amount from step 1, utilizing weighing scales to verify accurate measurement.		
7	Set all zones to HIGH SPEED COOL through the HMI Service Test Mode.		
8	Maintain unit running in high speed cool and check refrigerant level. Cover condenser to raise discharge pressure to approximately 325 psig to 350 psig (22 Bar to 23 Bar gauge). Ball in receiver sight glass should be between 1/3 and 1/2 full. If the ball is not floating, add charge at 0.55 lb (0.25 kg) increments until the ball floats.		
9	If the starting charge level is exceeded by 2.2 lb (1 kg), this indicates that the unit may now be overcharged and the installation should be checked for possible problems.		
10	Establish a return air temperature of 0°F (-18°C), a suction pressure of 13 to 18 psig (90 to 124 kPa), and a discharge pressure of 300 psig (2068 kPa).		

Table 75. Charging Procedure (continued)

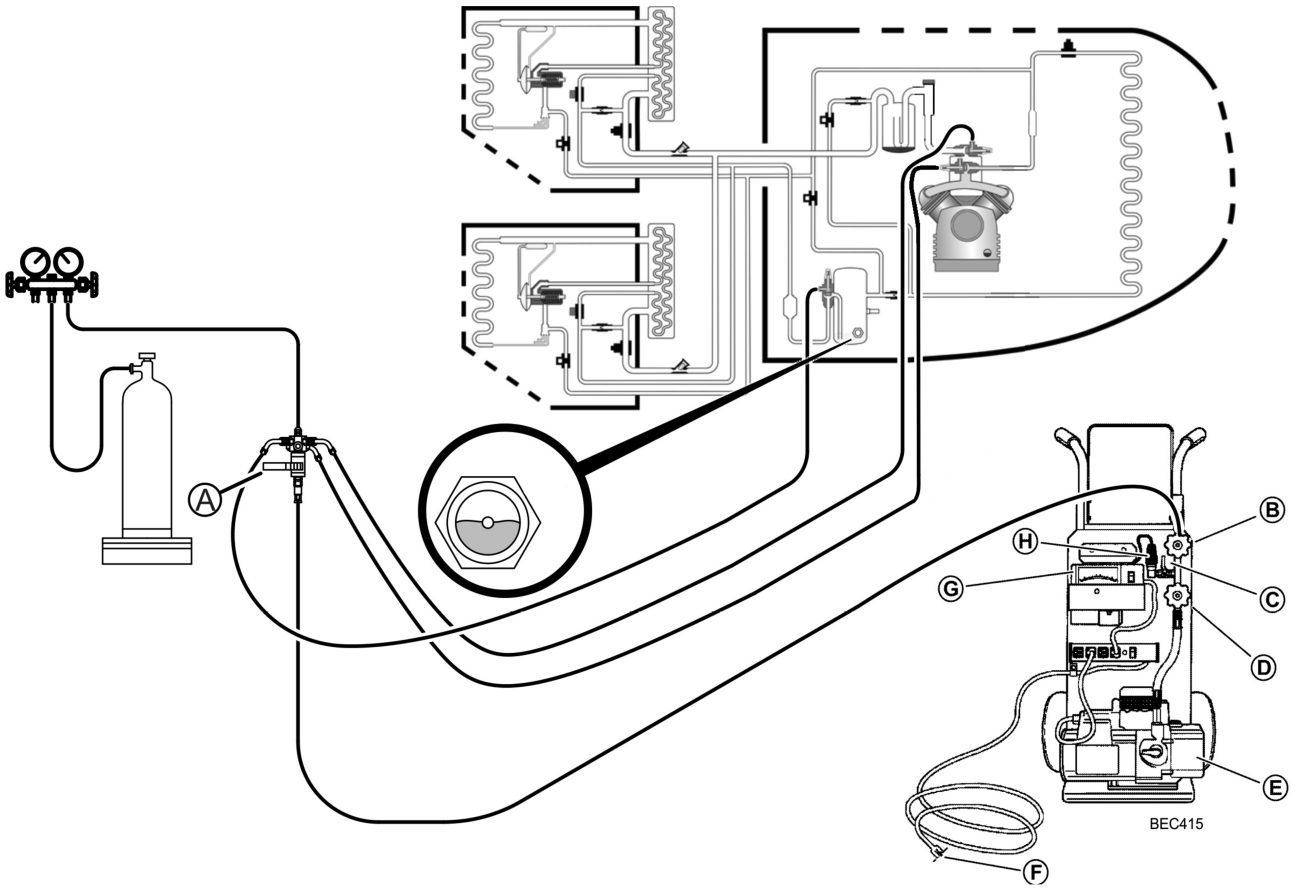
Step	Action	Result	Comments
11	Check the receiver tank sight glass. The refrigerant level should remain between 1/2 and 3/4 full over a period of no less than five minutes.		Units with scroll compressors: At these conditions, the Liquid Injection Valve will cycle on and off. As this happens, the refrigerant level in the receiver tank sight glass will raise and lower. Monitoring the receiver tank sight glass for a period of five minutes to verify the average level of refrigerant over this five-minute period is between 1/2 and 3/4 full is required.
12	Once the system is charged and prior to placing the unit into service, verify the correct refrigerant charge is entered into the refrigerant charge decal on the frame near the serial plate. Verify that the installed date information is also entered.		This must be filled in so the next technician knows the quantity required for the system.

Figure 205. Unit with Scroll Compressor



A.	V-4	E.	Two Stage Vacuum Pump
B.	V-3	F.	To AC Power
C.	V-2	G.	Micron Gauge
D.	V-1	H.	Thermistor

Figure 206. Unit with Reciprocating Compressor



A.	V-4	E.	Two Stage Vacuum Pump
B.	V-3	F.	To AC Power
C.	V-2	G.	Micron Gauge
D.	V-1	H.	Thermistor

R02A - Low Side Pump Down Test

Purpose:

To perform a low side pump down on a multi-temperature refrigeration system to test internal high side to low side seals.

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) before releasing the unit for service or performing another refrigeration service procedure.

Notice

Equipment Damage!

Do not pull scroll compressor into a vacuum below 10 inch Hg vacuum (-34 kPa) to perform routine maintenance procedures.

Notice

Equipment Damage!

Do not run scroll compressor in a vacuum for more than one minute.

Table 76. Reciprocating Compressor

Step	Action	Result	Comments
1	Operate the unit in cool for 10 minutes before performing the low side pump down.		
2	Attach a gauge manifold to the suction service valve and the discharge service valve.		
3	Operate the unit in high speed cool. Discharge pressure should be greater than 325 psig.		
4	Front seat the receiver tank outlet valve and allow the low side to pump down to a 15 inch Hg vacuum (-51 kPa).		
5	Turn the unit Off.	If low side pressure does not hold, check the Receiver Tank Outlet Valve, Hot Gas Solenoids in all zones, Purge Valve, and the compressor valve plates for internal leaks.	
6	If low side pressure holds, proceed with desired test.		
7	Back seat the receiver tank outlet valve. Perform a "Refrigerant Gauge Removal" procedure.		

Table 77. Scroll Compressor

Step	Action	Result	Comments
1	Operate the unit in cool for 2 to 5 minutes before performing the low side pump down.		
2	Attach a gauge manifold to the suction service valve and the discharge service port. Attach another low pressure gauge to the suction access port located in the suction line near the accumulator inlet.		Low loss fittings must be used on the hoses connected to the discharge service port and the suction access port.
3	Operate the unit in low speed cool.		

Table 77. Scroll Compressor (continued)

Step	Action	Result	Comments
4	Front seat the receiver tank outlet valve and allow the low side to pump down to 0 to 5 inch Hg vacuum (0 to -17 kPa).	To check certain components, front seat the suction service valve to isolate the low side while it is still in a vacuum. Refer to "Refrigeration System Checks" and the individual component tests for more information.	After several minutes of operation with suction pressure in a vacuum, the unit may shut down and Alarm Code 93 will be set.
5	Turn the unit Off.		
6	Front seat the suction service valve to isolate the low side.		The discharge check valve in the compressor is an imperfect seal and will not keep the discharge pressure from leaking back through the compressor. Use the suction access port located near the accumulator inlet to access the low side for leak testing and evacuation.
7	Back seat the suction service valve and then the receiver tank outlet valve. Perform a "Refrigerant Gauge Removal" procedure.		

R03A - Hot Gas Solenoid Test

Purpose:

To test the hot gas solenoid, and control circuit on a multi-temperature refrigeration system.

Materials Required:

- Truck Premium HMI or Mechanics Service Tool

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) before releasing the unit for service or performing another refrigeration service procedure.

Notice

Equipment Damage!

Do not run scroll compressor in a vacuum for more than one minute.

Table 78. Procedure

Step	Action	Result	Comments
1	Attach the gauge set.		
2	Set all zone setpoints for the lowest possible temperature to verify all zones run in Cool Mode.		Service Test Mode can be used to place all zones in Cool Mode.
3	Start and run all zones in Cool Mode for 10 minutes. Discharge pressure should be greater than 325 psig.		
4	Front seat the receiver tank outlet valve and perform a Low Side Pump Down to a 20 - 25 inch vacuum.		After several minutes of operation with suction pressure in a vacuum, the unit may shut down and Alarm Code 93 will be set. Refer to Refrigeration Service Procedure R02A for additional information.
5	Shut the unit down and observe the gauges. The low side should not rise above a 15 inch vacuum in less than two minutes. If low side pressure holds proceed with desired test.	If low side pressure does not hold check the Hot Gas Solenoids in all zones, Purge Valve, and the compressor valve plates for internal leaks.	
6	From the HMI, access the Maintenance Menu.	The display will show MAINTENANCE MENU.	
7	Use the NEXT key to choose INTERFACE BOARD TEST and press SELECT to load.	The display will show PREHEAT RELAY and gauge information.	
8	Press the NEXT key to choose ZONE 1 HOT GAS SOLENOID.	The display will show ZONE 1 HOT GAS SOLENOID and gauge information.	In zones with parallel evaporators, the solenoids will energize together.
9	Press the TEMP ON key. The display will show ZONE 1 HOT GAS SOLENOID ON for about three seconds.	The low side gauge should rise. If low side pressure does not rise, check the Hot Gas Solenoid for Zone 1.	***Important:*** *If suction and discharge pressure equalizes, it may be necessary to start the engine and allow the system to pump down to 20-25 inch vacuum before proceeding.*
10	Press the NEXT key to choose ZONE 2 HOT GAS SOLENOID.	The display will show ZONE 2 HOT GAS SOLENOID and gauge information.	
11	Press the TEMP ON key. The display will show ZONE 2 HOT GAS SOLENOID ON for about three seconds.	The low side gauge should rise. If low side pressure does not rise, check the Hot Gas Solenoid for Zone 2. If the low side pressure rises proceed with test. In zones with parallel evaporators the solenoids will energize together.	***Important:*** *If suction and discharge pressure equalizes, it may be necessary to start the engine and allow the system to pump down to 20-25 inch vacuum before proceeding.*

Table 78. Procedure (continued)

Step	Action	Result	Comments
12	If the unit is equipped with three zones, press the NEXT key to choose ZONE 3 HOT GAS SOLENOID.	The display will show ZONE 3 HOT GAS SOLENOID and gauge information.	If a third zone is not present, proceed to step 14.
13	Press the TEMP ON key. The display will show ZONE 3 HOT GAS SOLENOID ON for about 3 seconds.	The low side gauge should rise. If low side pressure does not rise, check the Hot Gas Solenoid for Zone 3. If the low side pressure rises proceed with test.	In zones with parallel evaporators the solenoids will energize together.
14	Exit the Interface Board Test by pressing the EXIT key.		
15	If no further testing is required, backseat all service valves, remove gauges, and securely replace valve stem covers with seals and service port caps before returning unit to service.		

R04A - Liquid Line Solenoid/Liquid Return Check Valve Test

Purpose:

To test the liquid line solenoids and control circuits on a multi-temperature refrigeration system.

Materials Required:

- Truck Premium HMI or Mechanics Service Tool

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) before releasing the unit for service or performing another refrigeration service procedure.

Notice

Equipment Damage!

Do not run scroll compressor in a vacuum for more than one minute.

Table 79. Procedure

Step	Action	Result	Comments
1	Attach the gauge set.		
2	Set all zone setpoints for the lowest possible temperature to verify all zones run in Cool Mode.		Service Test Mode can be used to place all zones in Cool Mode.
3	Start and run all zones in Cool Mode for 10 minutes. Discharge pressure should be greater than 325 psig.		
4	Front seat the receiver tank outlet valve and perform a Low Side Pump Down to 20 - 25 inch vacuum.		After several minutes of operation with suction pressure in a vacuum, the unit will shut down and Alarm Code 93. Refer to Refrigeration Service Procedure R02A for additional information.
5	Shut the unit down and observe the gauges. The low side should not rise above a 15 inch vacuum in less than two minutes. If the low side pressure holds proceed with desired test.	If the low side pressure does not hold, check the Receiver Tank Outlet Valve, Hot Gas Solenoids in all zones, Purge Valve, and the compressor valve plates for internal leaks.	
6	Open (back seat) the receiver tank outlet valve and observe the gauges. If the low side pressure holds, proceed with test	The low side should not rise. If low side pressure does not hold, check the liquid line solenoids and liquid return check valves in all zones.	Leaking liquid return check valves will cause cooling problems. Leaking liquid line solenoids may allow cooling during null operation.
7	From the HMI, access the Maintenance Menu.	The display will show MAINTENANCE MENU.	
8	Use the NEXT key to choose INTERFACE BOARD TEST and press SELECT to load.	The display will show PREHEAT RELAY and gauge information.	
9	Press the NEXT key to choose ZONE 1 LIQUID LINE SOLENOID.	The display will show ZONE 1 LIQUID LINE SOLENOID and gauge information.	In zones with parallel evaporators the solenoids will energize together.
10	Press the TEMP ON key. The display will show ZONE 1 LIQUID LINE SOLENOID ON for about three seconds.	The low side gauge should rise. If low side pressure does not rise, check the Liquid Line Solenoid for Zone 1.	Verify the Receiver Tank Outlet Valve is open (back seated). ***Important:*** *If suction and discharge pressure equalizes, it may be necessary to start the engine and allow the system to pump down to 20-25 inch vacuum before proceeding.*
11	Press the NEXT key to choose ZONE 2 LIQUID LINE SOLENOID.	The display will show ZONE 2 LIQUID LINE SOLENOID and gauge information.	In zones with parallel evaporators the solenoids will energize together.

Table 79. Procedure (continued)

Step	Action	Result	Comments
12	Press the TEMP ON key. The display will show ZONE 2 LIQUID LINE SOLENOID ON for about three seconds.	The low side gauge should rise. If low side pressure does not rise, check the Liquid Line Solenoid for Zone 2. If the low side pressure rises, proceed with test.	***Important:*** *If suction and discharge pressure equalizes, it may be necessary to start the engine and allow the system to pump down to 20-25 inch vacuum before proceeding.*
13	If the unit is equipped with three zones, press the NEXT key to choose ZONE 3 LIQUID LINE SOLENOID.	The display will show ZONE 3 LIQUID LINE SOLENOID and gauge information.	In zones with parallel evaporators, the solenoids will energize together. If a third zone is not present, proceed to step 15.
14	Press the TEMP ON key. The display will show ZONE 3 LIQUID SOLENOID ON for about three seconds.	The low side gauge should rise. If low side pressure does not rise, check the Liquid Line Solenoid for Zone 3. If the low side pressure rises, proceed with test.	
15	Exit the Interface Board Test by pressing the EXIT key.		
16	If no further testing is required, backseat all service valves, remove gauges, and securely replace valve stem covers with seals and service port caps before returning unit to service.		

R06A - Suction Line Check Valve/Condenser Inlet Check Valve Test

Purpose:

To test the Suction Line Check Valves and Condenser Inlet Check Valve on a multi-temperature refrigeration system.

Materials Required:

- Truck Premium HMI or Mechanics Service Tool

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) before releasing the unit for service or performing another refrigeration service procedure.

Notice

Equipment Damage!

Do not run scroll compressor in a vacuum for more than one minute.

Table 80. Procedure

Step	Action	Result	Comments
1	Attach the gauge set.		
2	Set all zone setpoints for the lowest possible temperature to verify that all zones run in Cool Mode.		Service Test Mode can be used to place all zones in Cool Mode.
3	Start and run all zones in Cool Mode for 10 minutes or until stable. Discharge pressure should be greater than 325 PSIG.		
4	Front seat the receiver tank outlet valve and perform a Low Side Pump Down to a 20 - 25 inch vacuum.		After several minutes of operation with suction pressure in a vacuum, the unit may shut down and Alarm Code 93 will be set. Refer to Refrigeration Service Procedure R02A for additional information.
5	Shut the unit down and observe the gauges. The low side should not rise above a 15 inch vacuum in less than two minutes. If the low side pressure holds proceed with desired test.	If the low side pressure does not hold, check the Receiver Tank Outlet Valve, Hot Gas Solenoids in all zones, Purge Valve, and the compressor valve plates for internal leaks.	
6	Front seat the Bypass Service Valve on the receiver tank.		
7	Bleed through the gauge manifold to the low side and establish a pressure of 5 - 20 PSIG. Close the hand valves on the gauge set.		
8	Observe the low pressure gauge.	If the pressure on the gauge manifold drops within two minutes, check the suction line check valves for leaks under low pressure.	
9	If the low side pressure holds for two minutes, proceed with the test.		
10	Equalize the system through the gauge manifold to the low side. Close the hand valves on the gauge set.		
11	Observe both the low pressure and high pressure gauges.	If the pressure on the gauge manifold drops within two minutes, check the suction line check valves for leaks under high pressure. If high side pressure increases within two minutes, the condenser inlet check valve is leaking or the bypass service valve on the receiver tank is open or leaking.	
12	If the pressure holds for two minutes, proceed with the test.		

Table 80. Procedure (continued)

Step	Action	Result	Comments
13	From the HMI, access the Maintenance Menu.	The display will show MAINTENANCE MENU.	
14	Use the NEXT key to choose INTERFACE BOARD TEST and press SELECT to load.	The display will show PREHEAT RELAY and gauge information.	
15	Press the NEXT key to choose Zone 1 Hot Gas Solenoid.	The display will show ZONE 1 HOT GAS SOLENOID and gauge information.	
16	Press the TEMP ON key. The display will show ZONE 1 HOT GAS SOLENOID ON for about three seconds.	The high side gauge should fall. If high side pressure does not fall, check the suction line check valve for Zone 1. If the high side pressure does fall, proceed with test.	In zones with parallel evaporators, the solenoids will energize together.
17	Crack the bypass service valve on the receiver tank to charge the high side to no more than the pressure shown on the low side gauge. Do not exceed the pressure shown on the low side gauge. Front seat the bypass service valve.		This is necessary to provide adequate pressure for the next test.
18	Press the NEXT key to choose Zone 2 Hot Gas Solenoid.	The display will show ZONE 2 HOT GAS SOLENOID and gauge information.	
19	Press the TEMP ON key. The display will show ZONE 2 HOT GAS SOLENOID ON for about three seconds.	The high side gauge should fall. If high side pressure does not fall, check the suction line check valve for Zone 2. If the high side pressure does fall, proceed with test.	In zones with parallel evaporators, the solenoids will energize together.
20	If the unit is equipped with three zones, crack the bypass service valve on the receiver tank to charge the high side to no more than the pressure shown on the low side gauge. Do not exceed the pressure shown on the low side gauge. Front seat the valve.		If a third zone is not present, proceed to step 23.
21	Press the NEXT key to choose Zone 3 Hot Gas Solenoid.	The display will show ZONE 3 HOT GAS SOLENOID and gauge information.	
22	Press the TEMP ON key. The display will show ZONE 3 HOT GAS SOLENOID ON for about three seconds.	The high side gauge should fall. If high side pressure does not fall, check the suction line check valve for Zone 3. If the high side pressure does fall, proceed with test.	In zones with parallel evaporators, the solenoids will energize together.
23	Exit the Interface Board Test by pressing the EXIT key.		
24	If no further testing is required, backseat all service valves, remove gauges, and securely replace valve stem covers with seals and service port caps before returning unit to service.		

R07A - Purge Valve Test

Purpose:

To test the Purge Valve on a multi-temperature refrigeration system.

Materials Required:

- Truck Premium HMI or Mechanics Service Tool

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) before releasing the unit for service or performing another refrigeration service procedure.

Notice

Equipment Damage!

Do not run scroll compressor in a vacuum for more than one minute.

Table 81. Procedure

Step	Action	Result	Comments
1	Attach the gauge set.		
2	Set all zone setpoints for the lowest possible temperature to verify that all zones run in Cool Mode.		Service Test Mode can be used to place all zones in Cool Mode.
3	Start and run all zones in Cool Mode for 10 minutes or until stable. Discharge pressure should be greater than 325 PSIG.		
4	Front seat the receiver tank outlet valve and perform a Low Side Pump Down to a 20 - 25 inch vacuum.		After several minutes of operation with suction pressure in a vacuum, the unit may shut down and Alarm Code 93 will be set. Refer to Refrigeration Service Procedure R02A for additional information.
5	Shut the unit down and observe the gauges. The low side should not rise above a 15 inch vacuum in less than two minutes. If low side pressure holds proceed with desired test.	If low side pressure does not hold, check the Receiver Tank Outlet Valve, Hot Gas Solenoids in all zones, Purge Valve, and the compressor valve plates for internal leaks.	
6	From the HMI, access the Maintenance Menu.	The display will show MAINTENANCE MENU.	
7	Use the NEXT key to choose INTERFACE BOARD TEST and press SELECT to load.	The display will show PREHEAT RELAY and gauge information.	
8	Press the NEXT key to choose Purge Valve.	The display will show PURGE VALVE and gauge information.	
9	Press the TEMP ON key. The display will show PURGE VALVE ON for about three seconds.	The low side gauge should rise. If low side pressure does not rise, check the purge valve.	
10	Exit Interface Board Test by pressing the EXIT key.		
11	If no further testing is required, backseat all service valves, remove gauges, and securely replace valve stem covers with seals and service port caps before returning unit to service.		

R08A - Condenser Inlet Solenoid/Receiver Tank Pressure Solenoid/Purge Check Valve Test

Purpose:

To test the Condenser Inlet Solenoid, Receiver Pressure Tank Solenoid, and Purge Check Valve on a multi-temperature refrigeration system.

Materials Required:

- Truck Premium HMI or Mechanics Service Tool

Important Notes:

- This test will require the removal of some refrigerant using a recovery machine. Refer to Refrigeration Service Procedure R10A for details.
- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) before releasing the unit for service or performing another refrigeration service procedure.

Notice

Equipment Damage!

Do not run scroll compressor in a vacuum for more than one minute.

Table 82. Preparation

Step	Action	Result	Comments
1	Attach the gauge set.		
2	Connect a recovery machine to the receiver tank outlet valve service port using a manifold gauge set.		The gauge set will allow the receiver tank pressure to be monitored.
3	Set all zone setpoints for the lowest possible temperature to verify that all zones run in Cool Mode.		Service Test Mode can be used to place all zones in Cool Mode.
4	Start and run all zones in Cool Mode for 10 minutes or until stable. Discharge pressure should be greater than 325 PSIG.		
5	Front seat the receiver tank outlet valve and perform a Low Side Pump Down to a 20 - 25 inch vacuum.		After several minutes of operation with suction pressure in a vacuum, the unit may shut down and Alarm Code 93 will be set. Refer to Refrigeration Service Procedure R02A for additional information.
6	Shut the unit down and observe the gauges. The low side should not rise above a 15 inch vacuum in less than two minutes. If low side pressure holds proceed with desired test.	If low side pressure does not hold, check the Receiver Tank Outlet Valve, Hot Gas Solenoids in all zones, Purge Solenoid, and the compressor valve plates.	

Table 83. Condenser Inlet Solenoid Test

Step	Action	Result	Comments
1	Front seat the bypass service valve on receiver tank.		
2	From the HMI, access the Maintenance Menu.	The display will show MAINTENANCE MENU and HOURMETERS.	
3	Use the NEXT key to choose INTERFACE BOARD TEST and press SELECT to load.	The display will show PREHEAT RELAY and gauge information.	
4	Press the NEXT key to choose Condenser Inlet Solenoid.	The display will show CONDENSER INLET SOLENOID and gauge information.	

Table 83. Condenser Inlet Solenoid Test (continued)

Step	Action	Result	Comments
5	Press the LOCK ON key. The display will show CONDENSER INLET SOL LOCKED ON.	The condenser inlet solenoid is energized (the valve is closed).	The condenser inlet solenoid will remain energized (closed) for a maximum 15 minute timeout. If 15 minutes is exceeded, Alarm Code 54 will be set and the unit will exit Interface Board Test Mode. This is normal operation. If the test time is expected to exceed 15 minutes, this step must be repeated about every ten minutes to prevent timeout.
6	Start the recovery machine to remove refrigerant from the condenser and receiver tank and observe the receiver tank pressure.		The refrigerant recovered will be added back into the system later.
7	Reduce the pressure at the receiver tank outlet valve to 100 psig below the starting pressure. Observe the high side gauge at the compressor discharge valve. The high side pressure should not change.	If high side pressure does not hold, check the condenser inlet solenoid for an internal leak.	
8	If the high side pressure holds, proceed with the next test.	The condenser inlet solenoid is not leaking internally.	

Table 84. Receiver Tank Pressure Solenoid Test

Step	Action	Result	Comments
1	Backseat the bypass service valve on the receiver tank and observe the high side gauge at the compressor discharge valve. The pressure should not change.	If the high side pressure does not hold, check the receiver tank pressure solenoid for an internal leak. If the high side pressure holds, the receiver tank pressure solenoid is not leaking internally. Proceed with the next step.	
2	Disconnect the receiver tank pressure solenoid plug. Energize the receiver tank pressure solenoid for at least one half second by using jumper wires to apply +12 Vdc and chassis ground to the valve. Observe the high side gauge at the compressor discharge valve when the receiver tank pressure solenoid is energized. The pressure should fall.	If the high side pressure does not fall, check the receiver tank pressure solenoid for a valve that is stuck closed. If the high side pressure falls, reconnect the receiver tank pressure solenoid plug (the receiver tank pressure solenoid opens) and proceed with the next step.	
3	Press the UNLOCK key to de-energize (open) the condenser inlet solenoid. Observe the high side gauge at the compressor discharge valve. The pressure should fall.	If the high side pressure does not fall, check the condenser inlet solenoid for a valve that is stuck closed. If the high side pressure falls, the condenser inlet solenoid opens. Proceed with the next test.	

Table 85. Purge Check Valve Test

Step	Action	Result	Comments
1	The CONDENSER INLET SOLENOID should still be shown on the display along with gauge information.		
2	Press the LOCK ON key. The display will show CONDENSER INLET SOL LOCKED ON.	The condenser inlet solenoid is energized (the valve is closed).	The condenser inlet solenoid will remain energized (closed) for a maximum 15 minute timeout. If 15 minutes is exceeded, Alarm Code 54 will be set and the unit will exit Interface Board Test Mode. This is normal operation. If the test time is expected to exceed 15 minutes, this step must be repeated about every ten minutes to prevent timeout.

Table 85. Purge Check Valve Test (continued)

Step	Action	Result	Comments
3	Pressurize the low side of the system using the refrigerant recovered earlier and observe the receiver tank pressure gauge. The pressure should not change.	If the receiver tank pressure changes, check the purge check valve for an internal leak.	
4	Exit the INTERFACE BOARD Test by pressing the EXIT key.	The condenser inlet solenoid is de-energized (open).	
5	If no further testing is required, backseat all service valves, remove gauges, and securely replace valve stem covers with seals and service port caps before returning unit to service.		

R09A - Low Side Service Pump Down

Purpose:

To perform a service pump down on a multi-temperature refrigeration system to allow service of all low side components, compressor, discharge manifold, discharge vibrasorber, receiver tank pressure solenoid, and condenser inlet solenoid.

Materials Required:

- Truck Premium HMI or Mechanics Service Tool

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) before releasing the unit for service or performing another refrigeration service procedure.

Notice

Equipment Damage!

Do not run scroll compressor in a vacuum for more than one minute.

Table 86. Procedure

Step	Action	Result	Comments
1	Attach the gauge set.		
2	Set all zone setpoints for the lowest possible temperature to verify that all zones run in Cool Mode.		Service Test Mode can be used to place all zones in Cool Mode.
3	Start and run all zones in Cool Mode for 10 minutes or until stable.		
4	Front seat the receiver tank outlet valve and perform a low side pumpdown to 20 - 25 inch vacuum.		After several minutes of operation with suction pressure below -10 psig, the unit will shut down and Alarm code 93 will be set. Refer to Refrigeration Procedure R02A for additional information.
5	Front seat the receiver tank bypass service valve.		
6	Shut the unit down and observe the gauges. The low side should not rise above a 15 inch vacuum in less than two minutes.	If low side pressure holds, proceed with desired test. If low side pressure does not hold, check the Receiver Tank Outlet Valve, Hot Gas Solenoids in all zones, Purge Solenoid, and the compressor valve plates for internal leaks.	If the low side pressure cannot be maintained below 15 PSIG, the refrigerant must be recovered before opening the system. Refer to Refrigeration Service Procedure R10A for details.
7	From the HMI, access the Maintenance Menu.	The display will show MAINTENANCE MENU.	
8	Use the NEXT key to choose INTERFACE BOARD TEST and press SELECT to load.	The display will show PREHEAT RELAY and gauge information.	
9	Press the NEXT key to choose Zone 1 Hot Gas Solenoid.	The display will show ZONE 1 HOT GAS SOLENOID and gauge information.	In zones with parallel evaporators, the solenoids will energize together.
10	Press the TEMP ON key. The display will show ZONE 1 HOT GAS SOLENOID ON for about three seconds.	The low side gauge should rise. If low side pressure does not rise, check the hot gas solenoid for Zone 1. Continue to press the TEMP ON key until the low side pressure is slightly above 0 psig.	This breaks the vacuum in the Zone 1 evaporator and checks the opening of the Zone 1 hot gas solenoid. If pressure does not rise, check the Zone 1 Hot Gas Solenoid.
11	Press the NEXT key to choose Zone 2 Hot Gas Solenoid.	The display will show ZONE 2 HOT GAS SOLENOID and gauge information.	In zones with parallel evaporators, the solenoids will energize together.
12	Press the TEMP ON key. The display will show ZONE 2 HOT GAS SOLENOID ON for about three seconds.	The low side gauge should rise. Continue to press the TEMP ON key until the low side pressure is slightly above the previous reading. If low side pressure does not rise, check the hot gas solenoid for Zone 2. If the low side pressure rises, proceed with test.	This breaks the vacuum in the Zone 2 evaporator and checks the opening of the Zone 2 hot gas solenoid. If pressure does not rise, check the Zone 2 Hot Gas Solenoid.

Table 86. Procedure (continued)

Step	Action	Result	Comments
13	If the unit is equipped with three zones, press the NEXT key to choose Zone 3 Hot Gas Solenoid.	The display will show ZONE 3 HOT GAS SOLENOID and gauge information.	In zones with parallel evaporators the solenoids will energize together. If a third zone is not present, proceed to step 15.
14	Press the TEMP ON key. The display will show ZONE 3 HOT GAS SOLENOID ON for about three seconds.	The low side gauge should rise. Continue to press the TEMP ON key until the low side pressure is slightly above the previous reading. If low side pressure does not rise, check the hot gas solenoid for Zone 3. If the low side pressure rises, proceed with test.	This breaks the vacuum in the Zone 3 evaporator and checks the opening of the Zone 3 hot gas solenoid. If pressure does not rise, check the Zone 3 Hot Gas Solenoid.
15	If all zones are slightly greater than 0 psig, work can proceed on low side components in all zones, compressor oil level, and filter.		If certain high side components need to be serviced, proceed to step 16.
16	To access the discharge manifold and compressor heads, front seat the discharge service valve. Open both gauge manifold hand valves.	High pressure trapped in the heads and manifold is dumped into the low pressure area of the low side.	
17	When service is complete, perform a low side evacuation, backseat all service valves, remove gauges, and securely replace valve stem covers with seals and service port caps before returning unit to service.	Add back any refrigerant which was recovered during the procedure.	Refer to Refrigeration Service Procedure R11A for details.

R10A - Refrigerant Recovery

Purpose:

To recover the refrigerant charge from a multi-temperature refrigeration system.

Materials Required:

- Truck Premium HMI or Mechanics Service Tool

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) before releasing the unit for service or performing another refrigeration service procedure.

Table 87. Procedure - For a Unit with an Operating Compressor

Step	Action	Result	Comments
1	Connect the refrigerant recovery equipment to recover from the suction and discharge service valves, and receiver tank outlet valve.		Refer to the Operation Manual for your refrigerant recovery equipment.
2	If the compressor is operable, perform a low side pump down in accordance with Refrigeration Service Procedure R02A.		
3	Recover the liquid refrigerant from the receiver tank.		
4	To recover the remaining refrigerant vapor, mid-seat the suction service valve, discharge service valve, and receiver tank outlet valve.		
5	Connect a battery charger to the unit battery. The battery charger must be capable of at least 15 amperes output.	This will maintain the charge level of the battery during the time required to recover the refrigerant charge.	Evacuation Test Mode is used to open the normally closed solenoid valves as required for evacuation. Failure to connect a battery charger may result in the battery voltage falling too low to operate reliably.
6	Turn the unit on but do not allow the engine or motor to start. Access the Maintenance Menu.	The display will show MAINTENANCE MENU and HOURMETERS.	Evacuation Test Mode is not available if the unit is running. ***Important:*** *Evacuation Test is not available if the unit is running. If the unit is running, access the Maintenance Menu and select INTERFACE BOARD TEST. This will shut the unit down. Press EXIT to leave the INTERFACE BOARD TEST. Proceed with the next step.*
7	Use the NEXT key to choose EVACUATION TEST and press SELECT to load.	The display will show EVAC MODE BATTERY VOLTS and the battery voltage. If the battery voltage falls below 13.0 volts, a prompt to connect a battery charger will appear on the display.	Evacuation Test Mode is not available if the unit is running.
8	All normally closed valves will be energized to allow the refrigerant to be recovered efficiently.	This prevents refrigerant from being trapped in the system.	Evacuation Test does not have a time limit.
9	Continue to recover the refrigerant as a vapor from all three points.	Continue recovery until system pressure will remain at or below 0 psig when the recovery machine is off.	If pressure rises above 0 psig, there is still refrigerant left in the system. Continue to recover.

Table 88. Procedure - For a Unit with an Inoperative Compressor

Step	Action	Result	Comments
1	Connect the refrigerant recovery equipment to recover from the suction and discharge service valves, and receiver tank outlet valve.		Refer to the Operation Manual for your refrigerant recovery equipment.
2	Mid-seat the receiver tank outlet valve, suction service valve, and discharge service valve.		
3	Connect a battery charger to the unit battery. The battery charger must be capable of at least 15 amperes output.	This will maintain the charge level of the battery during the time required to recover the refrigerant charge.	EVACUATION MODE is used to open the normally closed valves as required for evacuation. Failure to connect a battery charger may result in the battery voltage falling too low to operate reliably.
4	Turn the unit on but do not allow the engine or motor to start. Access the Maintenance Menu.	The display will show MAINTENANCE MENU and HOURMETERS.	Evacuation Test Mode is not available if the unit is running. ***Important:*** *Evacuation Test is not available if the unit is running. If the unit is running, access the Maintenance Menu and select INTERFACE BOARD TEST. This will shut the unit down. Press EXIT to leave the INTERFACE BOARD TEST. Proceed with the next step.*
5	Use the NEXT key to choose EVACUATION TEST and press SELECT to load.	The display will show EVAC MODE BATTERY VOLTS and the battery voltage. If the battery voltage falls below 13.0 volts, a prompt to connect a battery charger will appear on the display.	Evacuation Test Mode is not available if the unit is running.
6	All normally closed valves will be energized to allow the refrigerant to be recovered efficiently.	This prevents refrigerant from being trapped in the system.	Evacuation Test does not have a time limit.
7	Continue to recover the refrigerant as a vapor from all three points.	Continue recovery until system pressure will remain at or below 0 psig when the recovery equipment is off.	If system pressure rises above 0 psig, there is still refrigerant left in the system. Continue to recover refrigerant until the system pressure remains below 0 psig when the recovery equipment is turned off.

R11A - Low Side Evacuation

Purpose:

To evacuate the low side of a multi-temperature refrigeration system after performing a low side repair on a system that is charged with refrigerant. Refer to Refrigeration Service Procedure R09A Low Side Service Pumpdown.

Materials Required:

- Truck Premium HMI or Mechanics Service Tool

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions before releasing the unit for service or performing another refrigeration service procedure.

Table 89. Procedure

Step	Action	Result	Comments
1	After low side service is completed, verify refrigerant has been purged from the discharge line.	Discharge line must be purged to allow evacuation through the discharge and suction line.	Refer to Refrigeration Service Procedure R09A.
2	Attach gauge set and vacuum pump to the suction and discharge service valves.		
3	Mid seat the suction and discharge service valve and open both hand valves of the gauge manifold.		
4	Connect a battery charger to the unit battery. The battery charger must be capable of at least 15 amperes output.	This will maintain the charge level of the battery during the time required to evacuate and charge the unit.	Evacuation Test Mode is used to open the unit valves as required for proper evacuation. Failure to connect a battery charger may result in the battery voltage falling too low to operate reliably.
5	Disconnect the purge valve harness from its connector.	The purge valve will be disabled in Evacuation Mode.	***Important:*** *The purge valve must not be allowed to energize during evacuation. Failure to disable the purge valve will allow refrigerant contained in the condenser to escape to the low side of the refrigeration system.*
6	Turn the unit on but do not allow the engine or motor to start. Access the Maintenance Menu.	The display will show MAINTENANCE MENU.	
7	Use the NEXT key to choose EVACUATION TEST and press SELECT to load.	The display will show Evacuation Mode and the battery volts. All required valves will energize. The purge valve should not energize. Verify the battery charger is turned on. The display will prompt the technician to connect a battery charger if the voltage falls below 13.0 volts.	
8	Turn on the vacuum pump. Allow to evacuate to at least a 25 inch vacuum.	Low side of the system is evacuated. High side of the system evacuated up to the condenser inlet check valve, purge valve, bypass hand valve, and receiver tank outlet hand valve.	Refrigerant is contained in the receiver tank and condenser by receiver tank hand valves, purge valve, and condenser inlet check valve.
9	Close both hand valves of the gauge manifold. Stop the vacuum pump.		If continued evacuation is recommended or a leak has to be identified and repaired, a vacuum is not maintained.
10	Turn the unit off. Turn battery charge off and disconnect it from the unit.	Evacuation Mode will be exited.	

Table 89. Procedure (continued)

Step	Action	Result	Comments
11	Verify a 25 inch vacuum or more is maintained.	If an acceptable vacuum level is maintained, proceed to step 12.	If an acceptable vacuum level is not maintained, continued evacuation is recommended or a leak has to be identified and repaired.
12	Backseat the receiver tank outlet and bypass hand valves. Start the unit to verify repairs and refrigerant level.		A small amount of refrigerant may be required.
13	Remove the gauge manifold. Install and tighten all service valve caps and service port caps.		

Section 9 - Diagrams

Diagram Index

The following table lists the SR-3 control system schematic and wiring diagrams. The diagrams are available in the T-80 Series Diagrams Manual (TK 56539-1-DM), the T-90 Series Diagrams Manual (TK 56707-1-DM), or in e-Tech Library (TK Americas and EMEA).

Drawing No.	Title
1E28188	T-1080S SPECTRUM and T-1280R SPECTRUM Schematic Diagram
1E28189	T-1080S SPECTRUM and T-1280R SPECTRUM Wiring Diagram
1E59997	UT-1280 Schematic Diagram
3E10135	UT-1280 Wiring Diagram
3E60989	Truck T-Series Spectrum Schematic Diagram
3E60990	Truck T-Series Spectrum Wiring Diagram

Notes

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