THERMO KING

Diagnostic Manual

Trailer and Rail Edition
SR-4 Microprocessor Based Control System
Multi-Temperature Units
Precedent™ Series

Revision F

August 2019

TK 55788-2-OD-EN

TRANE TECHNOLOGIES

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Introduction

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

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

Manufacturer shall have no liability to any person or entity for any personal injury, property damage or any other direct, indirect, special, or consequential damages whatsoever, arising out of the use of this manual or any information, recommendations or descriptions contained herein. The procedures described herein should only be undertaken by suitably qualified personnel. Failure to implement these procedures correctly may cause damage to the Thermo King unit or other property or personal injury.

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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 appropriate 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.

Revision History

Revision A	(Nov 2015) New manual format. Add C-600M and S-600DE information and update software revision information throughout manual. Section 1: added additional safety information. Section 2: added optional solar panel information and other general updates. Section 4: added Fuel Usage and Prime Fuel System. Section 5: updated alarm code information, added 06, 07, 17, 33, and 821. Section 6: updated service procedures; added A01A, D01A, F07A, G01A, G04A, H04A. Section 7: general updates. Section 8: removed schematic and wiring diagrams and added references to Precedent Diagrams Manual. Section 9: new section added for specifications.
Revision B	(Aug 2016) Add S-610M and S-610DE information, update software revision information throughout manual, general updates throughout manual. Section 2: added Defrost Dampers information. Section 6: added A01D, F01A - F06A, updated A60A to include Yanmar Engine Tool. Section 7: add Base Controller Software Revisions and HMI Control Panel Revisions information. Section 8: renamed to Specifications. Section 9: new section for Refrigeration Operation & Service Procedures. Section 10: new section number for Diagrams.
Revision C	(Jan 2017) Update to software revision (CA20/7A45), general updates throughout manual. Section 2: add TK BlueBox information. Section 3: add "Precision Temp Control" to Programmable Features; add "Add Precision Temp Control Zone to Mode Menu" to Main Menu Configuration Menu; add "Low Voltage Module Connected" to Unit Configuration Menu. Section 4: add Telematics Status information. Section 5: add 627. Section 6: add A03C; add new style ETV information to G03A and G04A.
Revision D	(Jan 2018) Update to software revision (CA25/7A50), general updates throughout manual. Section 5: add Alarm Code 93. Section 6: update A60A, F01A, F05A, F06A, add F08A, remove F02A.
Revision E	(May 2018) Update software revision (CA30/7A55) related information throughout manual, general updates throughout manual, add Service Tool Information, and replace ThermoServ with WinTrac throughout manual. Section 3: add Low Voltage Module Connected to Unit Configuration Menu. Section 5: update Alarm Code 618, 627, 699. Section 7: add Power On/Off Control and HMI Control Panel Messages/Causes.
Revision F	(Aug 2019) Update software revision (CA35/7A60) related information throughout manual, replace Info Central with Asset Library throughout manual, general updates throughout manual. Section 3: add Engine Break-In to Maintenance Menu Features. Section 4: Add Engine Break-In to Maintenance Menu Choices. Section 5: update Alarm Code 627 and change title from Exhaust Temp Out of Tolerance to Exhaust Temp Sensor; update Alarm Code 25, 520, 528, 618, 699. Section 6: add A61A. Section 9: remove Specifications from manual (Specifications are located in applicable maintenance manual).

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 Temperature Sensor Grade Calibration.
- 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 must be followed.

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-4 control system. Read this material carefully before working on the unit.

Section 2 - Hardware Description

This section describes the SR-4 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-4 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-4 control system . This information is referenced by material in Section 5 Diagnostics.

Section 5 - Diagnostics

This section explains how to diagnose units equipped with the SR-4 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-4 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-4 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-4 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.

Hardware and Software

This manual covers the following hardware versions:

- SR-4 Base Controller with software CA35 and earlier
- HMI Control Panel with software 7A60 and earlier

Important: *Base Controller software CA35 and HMI Control Panel software 7A60 are both required for full feature availability. WinTrac 6.2 or later is required for OptiSet Plus configuration.*

Used On:

- C-600M, S-600DE, S-600M, S-610DE, S-610M

Availability:

Base Controller software CA35 and HMI Control Panel software 7A60 are available through the Dealer Portal/iService. Go to: https://portal.mythermoking.com

Installation:

- CA35 Software
  - Choose Resources > Asset Library. After logging in, select Software & Downloads > Truck & Trailer > Microprocessor > Trailer. Enter CA35 in the Search field. The file name for the *.ZIP file containing the .fli file is

"Micro Code CA35 Update for the SR-4 Multi-Temp Base Controller.zip". Click this file to download the software and select Extract All before using to flashload.

- 7A60 Software
  - Choose Resources > Asset Library. After logging in, select Software & Downloads > Truck & Trailer > Microprocessor > Trailer. Enter 7A60 in the Search field. The file name for the *.ZIP file containing the .fli file is "Micro Code 7A60 Update for the SR-4 HMI Control Panel.zip". Click this file to download the software and select Extract All before using to flashload.

Flashloading:

Precedent™ units only use software files with the *.fli file extension. These *.fli files can be used on either a WinTrac™ 6 configured Flash Drive or with WinTrac 6 and a cable connection to the computer.

If WinTrac is used, a mini USB cable must be connected to the gray USB port (J11) on the Base Controller.

If the USB Flash Drive is used, the appropriate *.fli file must be placed on a WinTrac 6 configured Flash Drive. The *.fli files must be placed in the appropriate folders on the Flash Drive.

Service Tool Information

ThermoServ has been the primary service tool for data storage and display requirements for Thermo King Precedent data logging units. The latest version (ThermoServ 3.3) was replaced by WinTrac 6.1 in January 2018, which incorporates the features of ThermoServ.

ThermoServ 3.3 can still be used for flashloading and downloading. However, for software revision CA25 and later, it is recommended to use WinTrac 6.1 or later.

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 or type the web address https://tranetechnologies.iad1.qualtrics.com/jfe/form/SV_2octfSHoUJxsk6x?Q_CHL=qr&Q_JFE=qdg to complete the survey.

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Table of Contents

Section 1 - Safety Information

Danger, Warning, Caution, and Notice

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

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

DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury and unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

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!

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.

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.

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 when working on a unit. Refrigerant liquid, oil, and battery acid can permanently damage your eyes. See “First Aid”.

⚠ 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.

⚠ WARNING

Strong Magnetic Field!

Separation of the generator and its stator during disassembly will create a strong magnetic field that can interfere with cardiac implants such as pacemakers and defibrillators.

⚠ CAUTION

Sharp Edges!

Exposed coil fins can cause lacerations. Service work on the evaporator or condenser coils is best left to a certified Thermo King technician.

NOTICE

Equipment Damage!

All mounting bolts must be the correct length for their applications and torqued to specification. Incorrect bolt lengths and improper torque specifications can damage equipment.

Auto Start/Stop

⚠ DANGER

Hazardous Voltage!

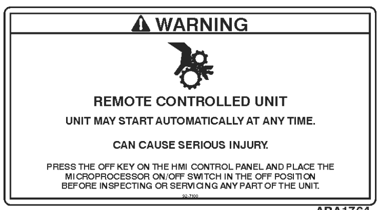
Dangerous three phase AC electric power is present whenever the unit is operating in either Diesel Mode or Electric Mode and whenever the unit is connected to a source of external standby power. Voltages of this magnitude can be lethal. Exercise extreme caution when working on the unit.

⚠ 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.

Figure 1. Warning Nameplate on Units Equipped with 2 Way Communications



⚠ 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 Microprocessor On/Off switch Off 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 Microprocessor On/Off Switch Off before doing inspections or working on any part of the unit.

Electrical Hazards

High Voltage

Important: *All Precedent units utilize nominal 230 Vac power 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 an operating refrigeration unit.

⚠ WARNING

Hazardous Voltage!

SmartPower units use high voltage AC for electric standby operation. Lethal voltage potentials can exist on connections in the high voltage box. Take appropriate precautions and use extreme care when testing the unit.

⚠ WARNING

Risk of Injury!

On SmartPower electric standby equipped units, the power supply voltage and vehicle voltage requirements must be the same before connecting the electric standby power cable. Refer to the electric standby voltage label located near the vehicle power connector.

⚠ WARNING

Risk of Injury!

On SmartPower electric standby equipped units, always turn off the external standby power source before handling, connecting, or disconnecting the power cable. Always disconnect the standby power cord before servicing the unit.

⚠ 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.

⚠ 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.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Safety glasses, rubber-insulated gloves, and cable cutters should be near your work area in the event of an electrical accident.

⚠ WARNING

Risk of Injury!

Do not make rapid moves when working on high voltage circuits in refrigeration units. 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.

Low Voltage

⚠ WARNING

Live Electrical Components!

Control circuits used in refrigeration units are low voltage (12 to 24 volts dc). 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.

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.

Welding

Precautions must be taken before welding on the unit. Refer to Service Procedure A26A Welding on Units Equipped with Microprocessors in Section 6 for additional information.

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!

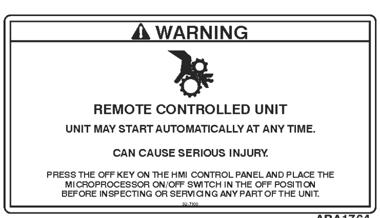
Thermo King units may have options that allow for remote starting from a fully off state. Turn the unit Microprocessor On/Off Switch Off before doing inspections or working on any part of the unit.

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 2. Warning Nameplate on Units Equipped with 2 Way Communications



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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.

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.

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.

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.

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.

Section 2 - Hardware Description

Precedent™ Engine General Description

The Precedent SR-4 control system is a self-contained temperature control unit designed for single temperature and multi-temperature trailer applications. Model 30 units are powered by an electronically controlled common rail fuel injected diesel engine and SmartPower™ Model 50 units are powered by either the diesel engine or an electric motor powered from an external electric standby power source. The unit fans and blowers are driven by AC motors powered by an engine driven AC generator. Defrost is by means of hot gas and optional electric heaters.

Engine

There are two engine types used in Precedent Multi-Temperature Trailer Units: Mechanical and Electronic.

- Mechanical Engine < 25 HP (C-600M)

  Mechanical Engines use the traditional Base Controller Engine Controls.

  TK486V25L and TK486V25L1.

- Electronic Engine > 25 HP (S-600M/S-600DE/S-610M/S-610DE)

  Electronic Engines are controlled by an electronic Engine Control Unit (ECU) rather than by the SR-4 Base Controller. The SR-4 Base Controller supplies a Keyswitch Signal to enable the ECU and a Run Signal when the diesel engine is required to run. All other engine control functions are handled by the ECU and an Engine Control Relay/Fuse Board located at the upper right hand corner of the control box.

  Electronic Engines also feature an Exhaust Gas Recirculation System (EGR) and a Diesel Oxidation Catalyst (DOC) exhaust treatment system. The engines are EPA Tier 4 Compliant and CARB Evergreen. The compressor is directly coupled to the engine on Model 30 units and clutch driven on Model 50 units. Belts drive the AC Generator, water pump, and alternator (if present).

  TK488CR, TK488CR1, and TKDV6.

  The TKDV6 is a turbocharged Electronic Engine and features a Turbocharger, Common Rail Fuel Injection, and an ECU to control and monitor engine functions.

  The TK488CR is an Electronic Engine which features Common Rail Fuel Injection and an ECU to control and monitor engine functions.

Unit Wiring Loom Colors

Precedent applications use both 12 Vdc and 230 Vac power.

- 12 Vdc circuits are routed in wiring harnesses with black wiring looms.
- 230 Vac circuits are routed in wiring harnesses with orange wiring looms.

AC Generator

An AC Generator is used to supply AC power to the Condenser Fan Motors and Evaporator Blower Motors. The engine speed (high speed or low speed) determines the voltage and frequency of the AC power. The AC Generator is belt driven by the diesel engine.

DC Alternator

In standard units, an alternator provides 12 Vdc to charge the battery and power the 12 Vdc control system.

Fan and Blower Motors

⚠ 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.

The Evaporator Blowers and Condenser Fans are powered by three phase AC electric motors. Fan and blower motor speed is dependent upon the AC voltage and frequency supplied by the AC Generator when the diesel engine is running in high speed or low speed. Motor speed of the Evaporator Blower Motor is also controlled by high speed and low speed windings on the motor.

Note: *Fan Motors - Electric Standby Operation 230/3/60 or 460/3/60 (Unit transformer reduces 460/3/60 input voltage to 230/3/60 applied to fan motors).*

Optional Battery Charger

An optional battery charger is available to replace the alternator. The battery charger converts AC power from the AC generator (or the electric standby power source) to 12 Vdc to charge the battery and provide power for the 12 Vdc control system.

Optional SmartPower™ Electric Standby

⚠ 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.

SmartPower™ Model 50 Electric Standby is available as an option. This option allows unit operation on external three phase standby electric power as well as the diesel engine. 460-480 Vac units utilize a step-down transformer to reduce the voltage to 230 Vac. The evaporator and condenser fans run on 230 Vac from supply, or from the step-down if 460-480 supply.

Optional Accessory DC Alternator

On units equipped with the Optional Battery Charger, an optional engine driven DC alternator is also available to supply additional DC power for external loads.

SR-4 Control System

The SR-4 Base Controller Control System consists of the following main components:

- Unit Control Panel
- Microprocessor On/Off Switch
- SR-4 HMI (Human Machine Interface) Control Panel
- SR-4 Base Controller
- Multi-Temperature Expansion Board
- Unit Sensors and Transducers
- Refrigeration Control Components
- Engine Control Unit (ECU)
- AC Generator
- AC Fan and Blower Motors
- USB Communication Ports
- Optional Electric Standby
- Optional Battery Charger
- Optional Alternator

Control System Overview

Figure 3. SR-4 Control System

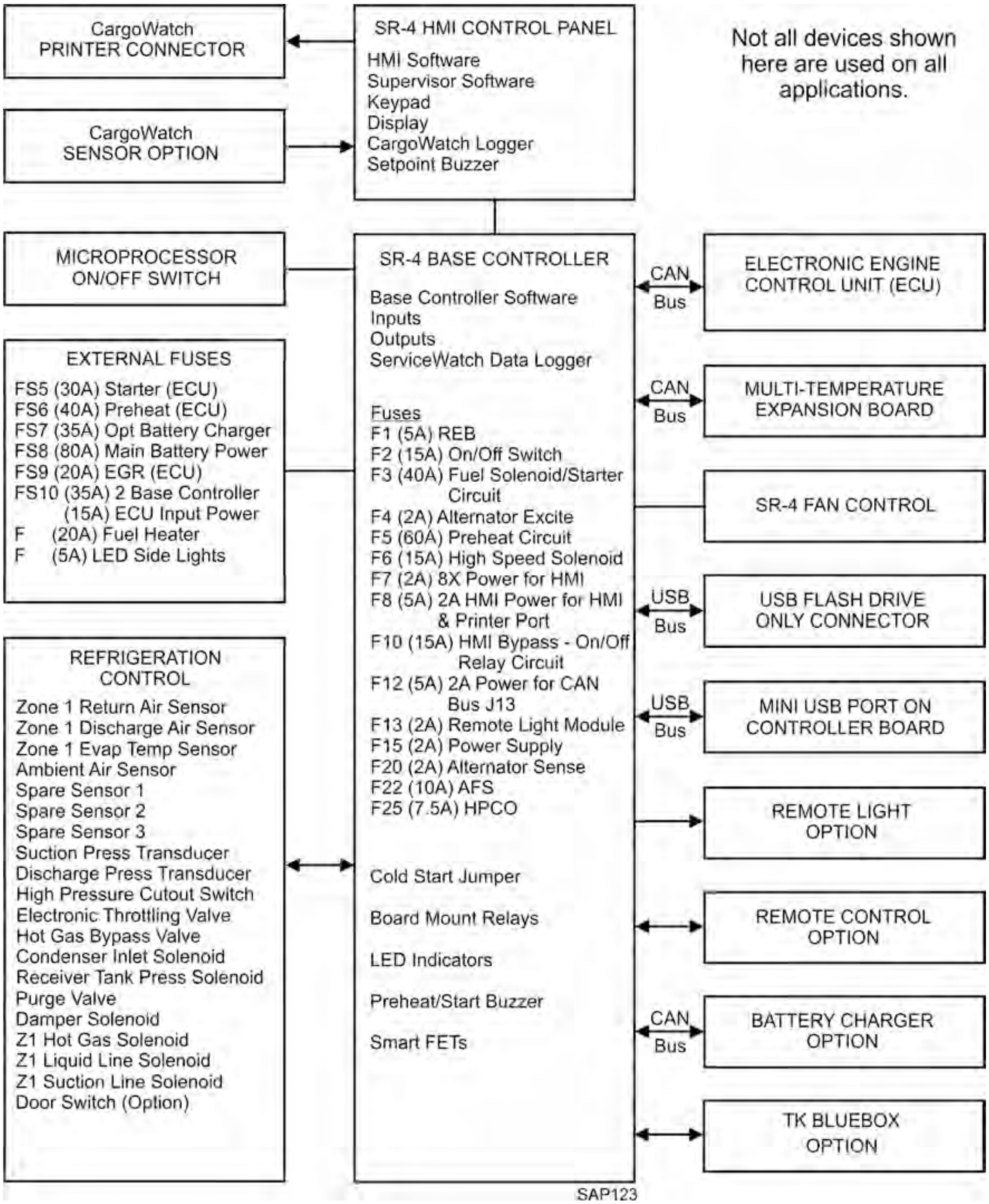


Figure 4. Expansion Board

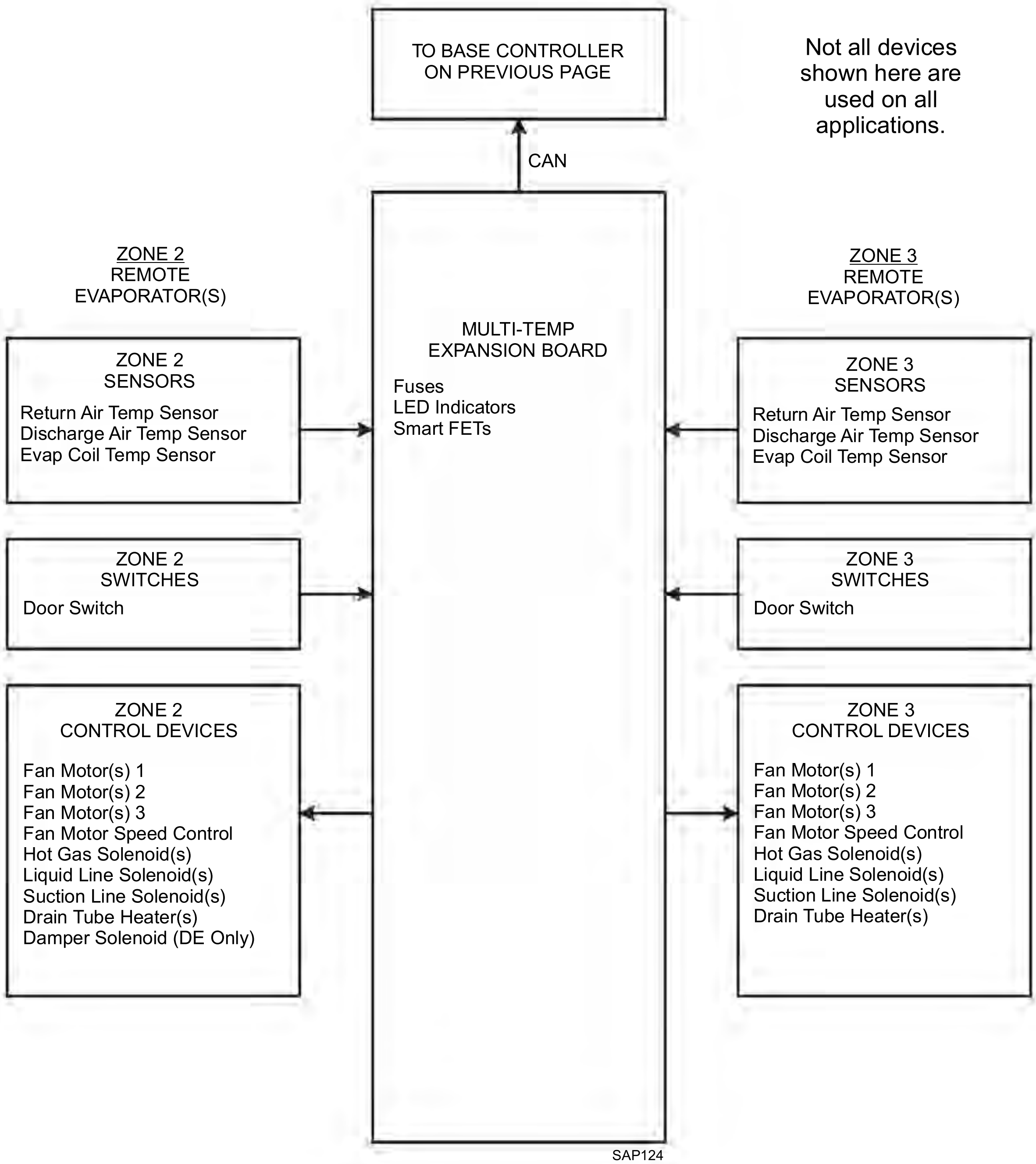


Figure 5. Engine Control Unit (ECU)

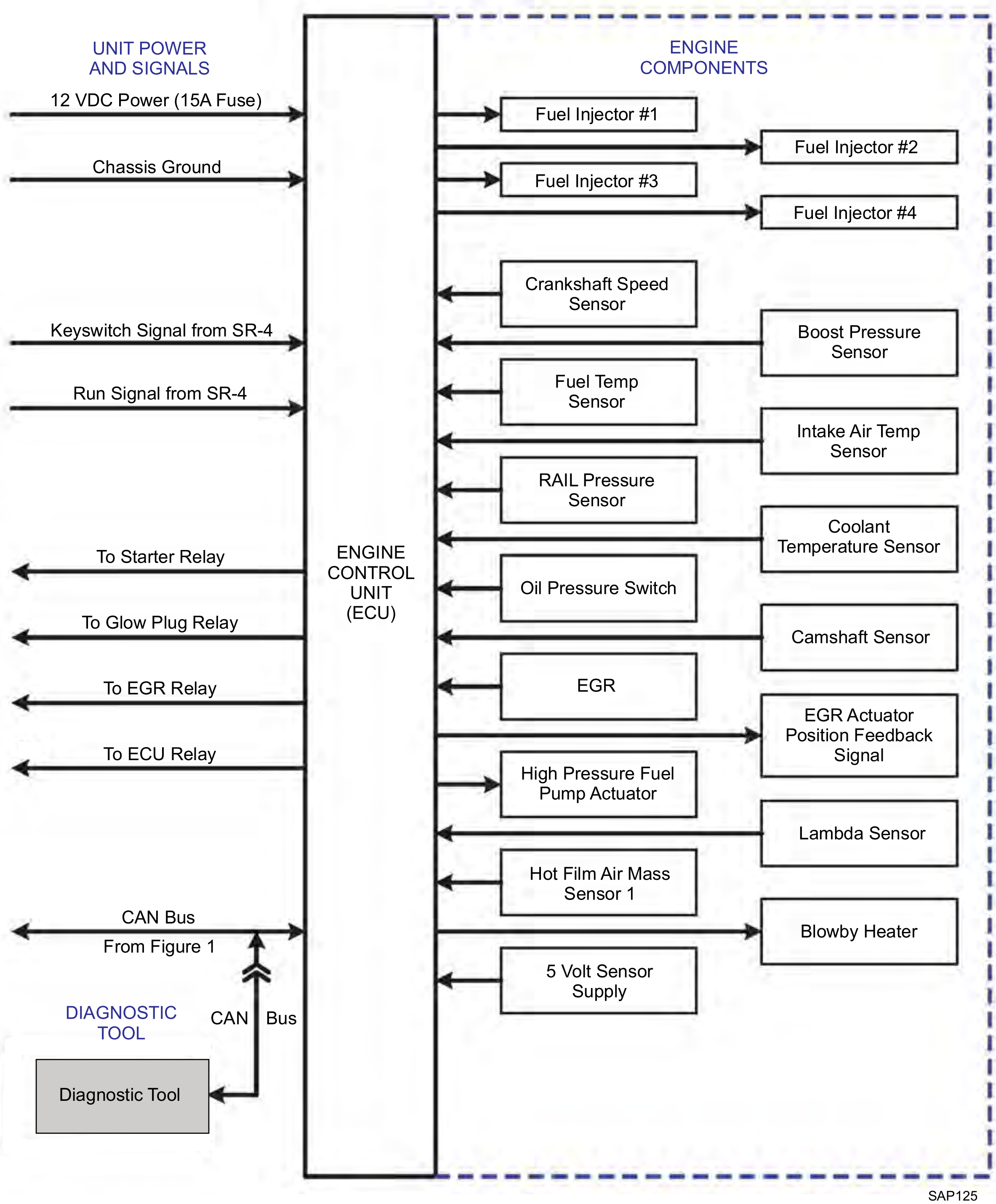


Figure 6. Fan and Blower Control - All Units

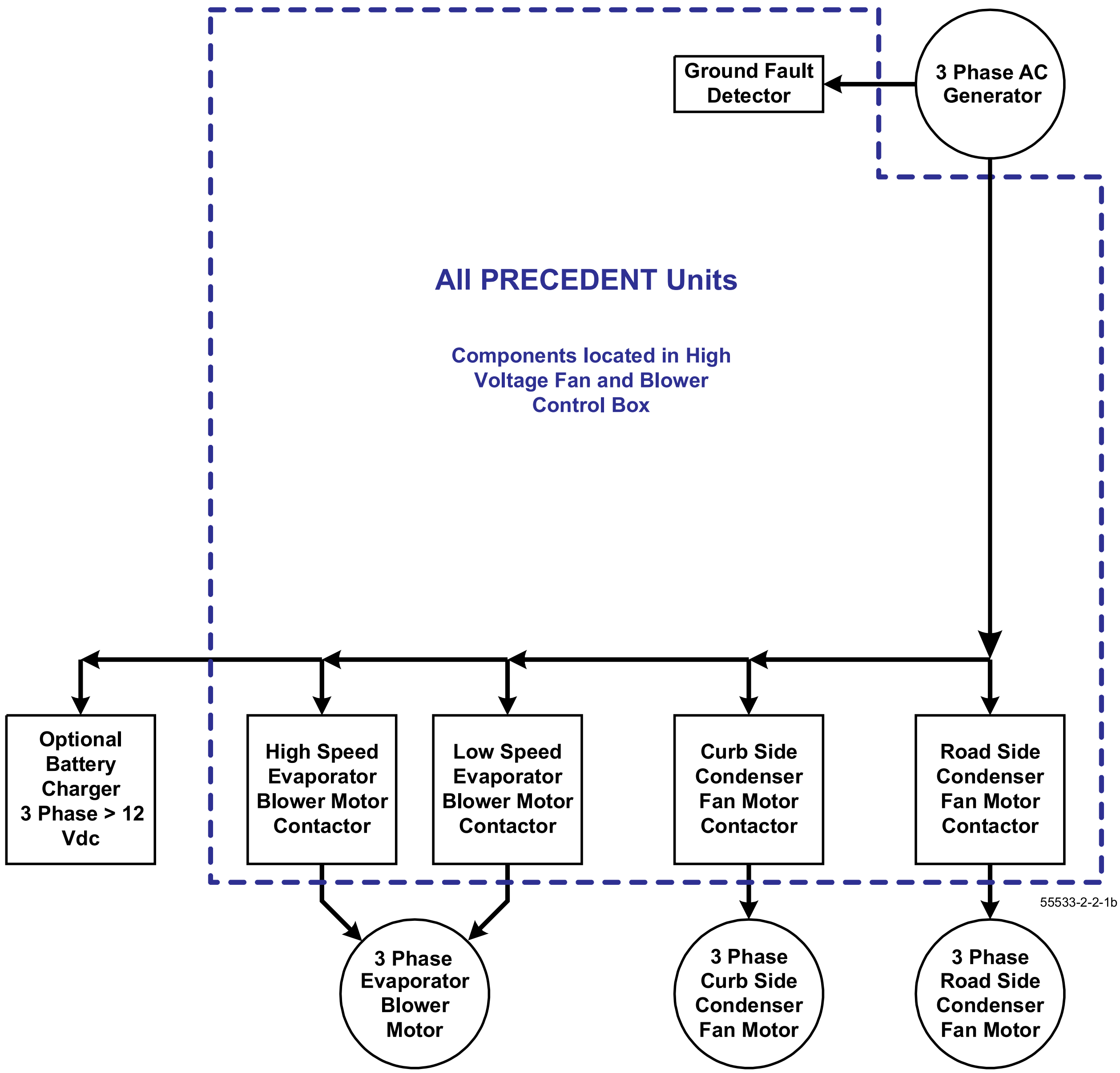


Figure 7. Fan and Blower Control - SmartPower™ 230 Vac

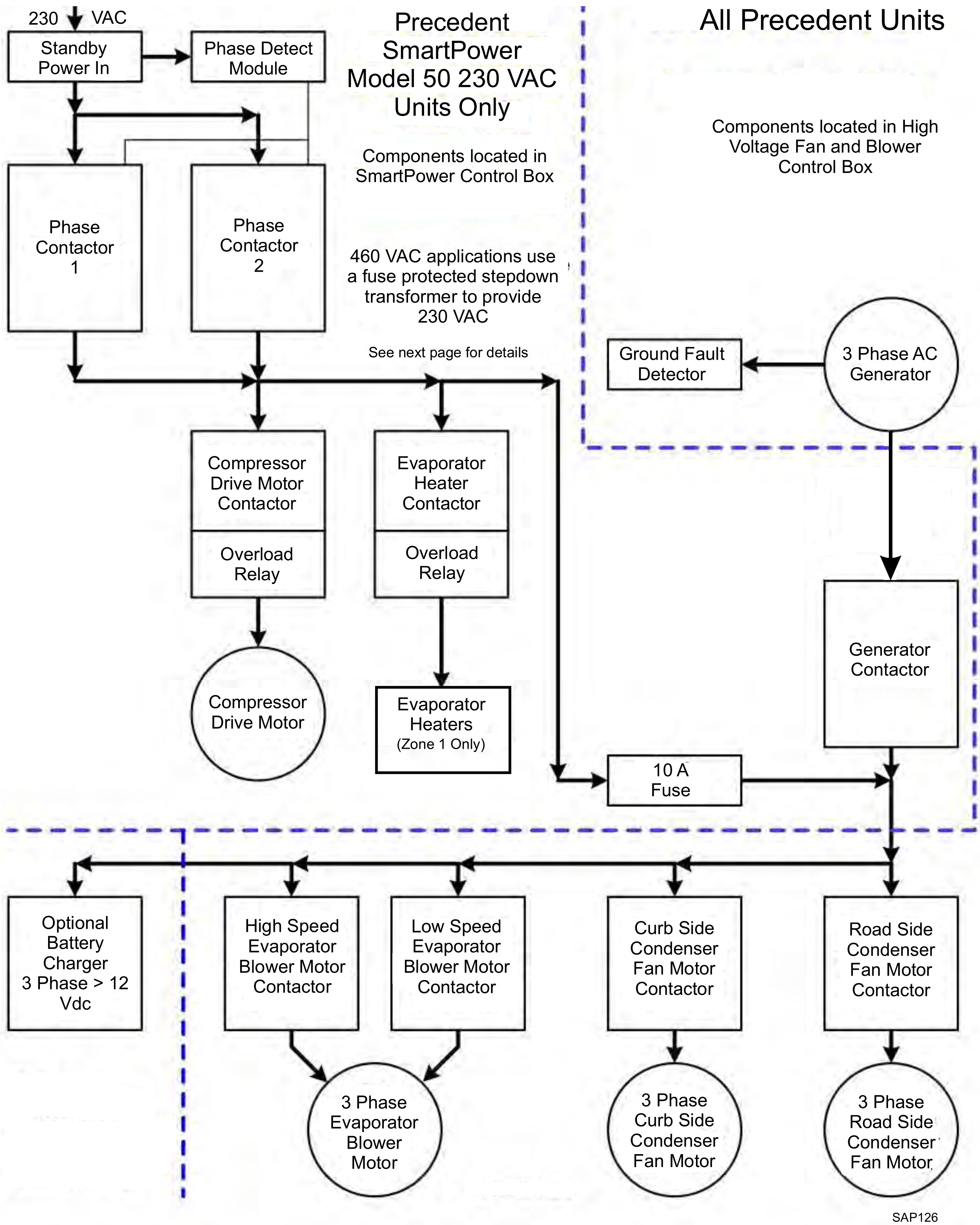


Figure 8. Fan and Blower Control - SmartPower™ 460 Vac

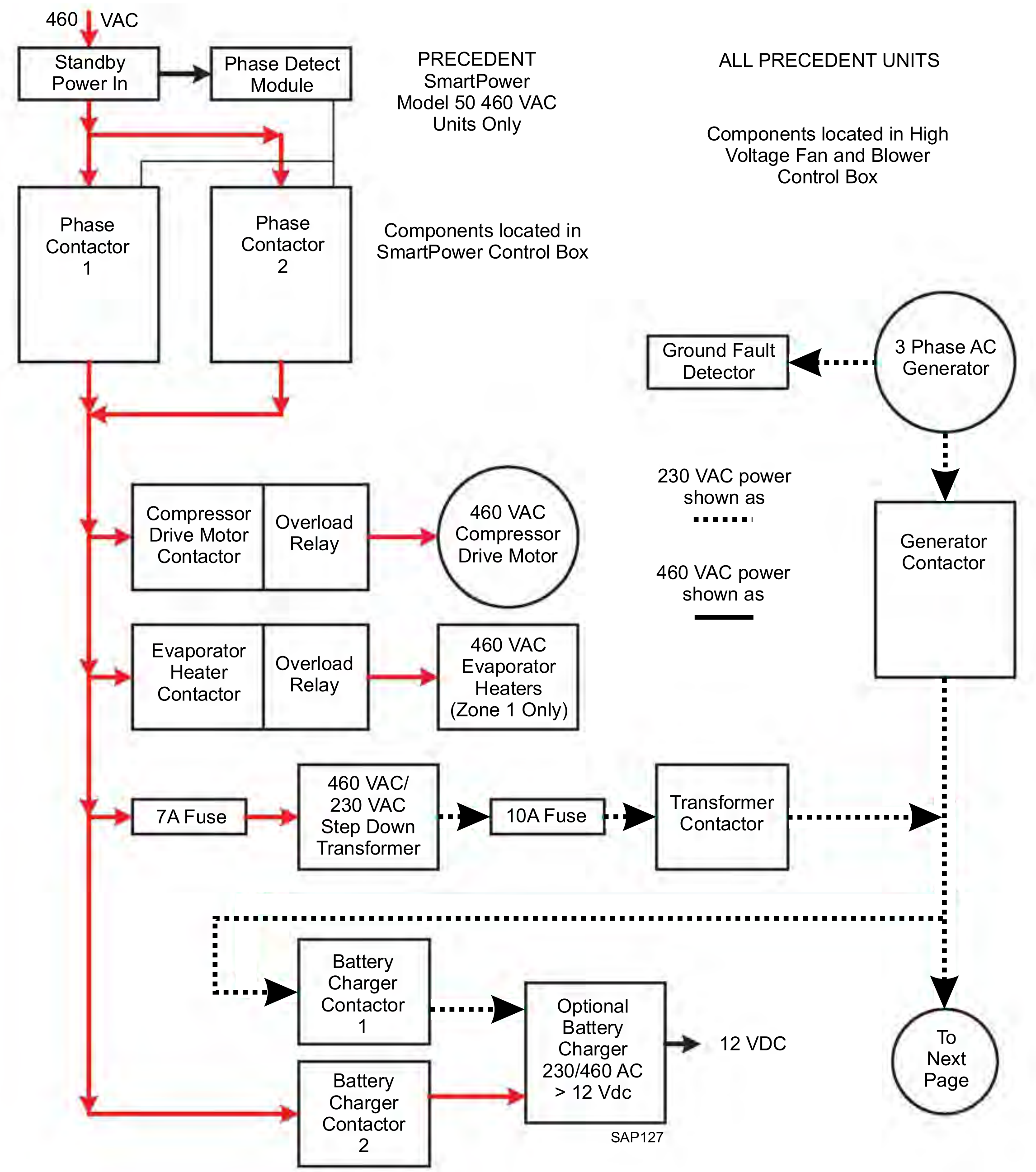
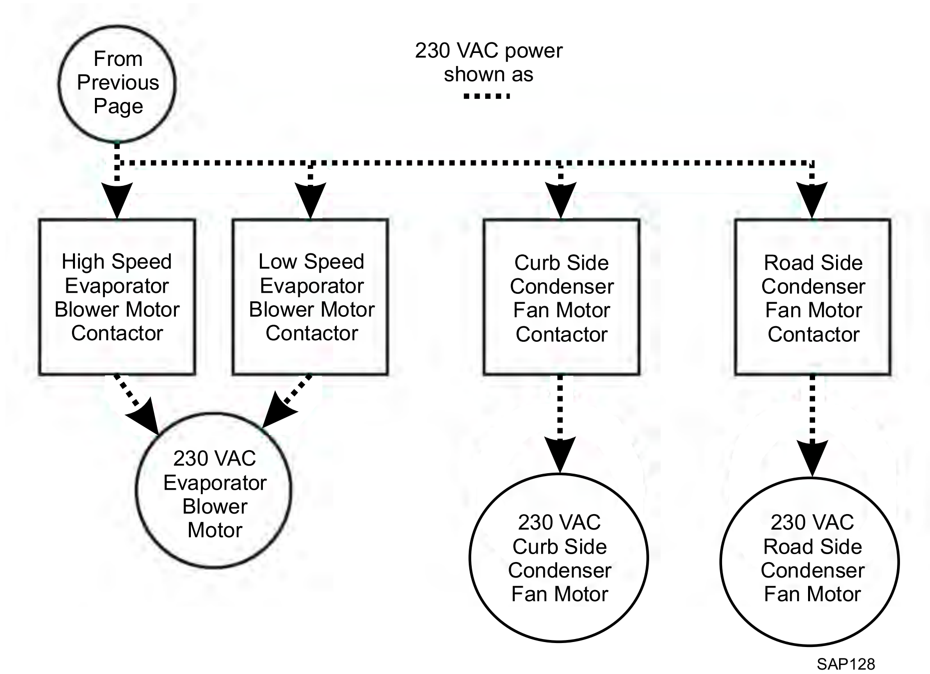


Figure 9. Fan and Blower Control - SmartPower™ 460 Vac



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 and place the microprocessor On/Off switch in the Off position before inspecting or servicing any part of the unit.

The Microprocessor On/Off Switch applies 12 volts DC control power to the Base Controller at the 2 pin connector located immediately below J6. Main power to the controls is supplied by 15 amp fuse F2.

Important: *Always turn the Microprocessor On/Off switch off before inspecting or working on any part of the unit.*

Note: *The Microprocessor On/Off switch disconnects power to the controller and most controller outputs. It does not disconnect the HMI Control Panel supply power. The HMI Control Panel is directly connected to the unit starting battery.*

The Microprocessor On/Off switch is located on the control box door above the HMI Control Panel. It is concealed when the unit side panel is closed.

Figure 10. Microprocessor On/Off Switch

55533-2-2-5

Over-Current Protection

External Unit Fuses

Over-current protection is provided by fuses. The following table shows which external fuses may be used.

Note: *Refer to the applicable Schematic Diagram for locations and the most accurate information.*

Note: *Refer to Section 7 for additional Base Controller information.*

Fuse	Size	Function	Location
FS1	100A	Power to #2 circuit	At Battery
FS2	70A	Power to ECU	At Battery
FS3	70A	Power to starter	At Battery
FS7/Fuse Link	130A	Battery Charger Output	At Battery Charger
FS8/Fuse Link	130A	Battery Power Fuse	At Battery
F	20A	Optional Fuel Heater	In Control Box
F	5A	Optional LED Side Lights	In Control Box
FB1–1	10A	Fuse Block Fans & Battery Charger	SmartPower™ Electric Standby Control Box
FB1–2	10A	Fuse Block Fans & Battery Charger	SmartPower™ Electric Standby Control Box
FB1–3	10A	Fuse Block Fans & Battery Charger	SmartPower™ Electric Standby Control Box
FB2–1	15A	Fuse Block Transformer Secondary (Model 50 - 460 Vac)	SmartPower™ Electric Standby Control Box

Fuse	Size	Function	Location
FB2–2	15A	Fuse Block Transformer Secondary (Model 50 - 460 Vac)	SmartPower™ Electric Standby Control Box
FB2–3	15A	Fuse Block Transformer Secondary (Model 50 - 460 Vac)	SmartPower™ Electric Standby Control Box

Base Controller Fuses and Smart FETs

Outputs are either fuse protected or Smart FET (Field Effect Transistor) protected. Smart FETs halt current flow if an over-current condition exists. Additional information about the Base Controller Fuse Size/Function (“Base Controller Fuse Size & Function,” p. 47) and Smart FET Outputs (“Smart FET Outputs,” p. 48) are presented later in this section.

SR-4 HMI Control Panel

The Precedent Multi-Temperature Unit Control Panel consists of the SR-4 HMI Control Panel and a USB port used to retrieve data from the data logging system.

The SR-4 Human Machine Interface (HMI) Control Panel is connected to the Base Controller and is used to operate the unit and display unit information. The HMI Control Panel communicates with the Base Controller via a Controller Area Network (CAN) bus.

The Microprocessor Power Switch supplies or removes electrical power to the microprocessor and is located above the HMI Control Panel. It is hidden when the lower roadside body panel surrounding the Control Box is closed.

For multi-temp applications, an Expansion Module is connected to the Base Controller via a CAN connection. The Expansion Module provides the inputs and outputs necessary to control the remote zone evaporators. The Expansion Module is a “slave” controller. The “slave” designation indicates that the Expansion Module supports inputs and outputs, but it only executes instructions from the Base Controller. It must be connected to the Base Controller as it is not capable of stand-alone operation.

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

The Flash Drive Only USB port can be used to:

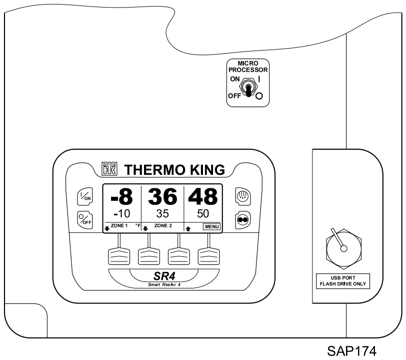
- Download the CargoWatch and ServiceWatch Data Loggers.
- Configure CargoWatch and ServiceWatch Data Loggers.
- Flashload the Base Controller and HMI Control Panel.
- Send Service Modifications.
- Base Controller and HMI Resets.

PC Only USB Port: The PC Only USB Port is the J11 connector located on the Base Controller inside the control box. It is used to connect the controller to a PC with a standard USB to USB mini cable.

The PC Only USB port can be used to:

- Upload trailer ID and Unit Serial Number (For new units and if new controller is installed).
- Download the CargoWatch and ServiceWatch Data Loggers.
- Data Logger setup.
- Flashload the Base Controller and HMI Control Panel.

Figure 11. SR-4 Multi-Temp Control Panel (Shown with Side Panel Open)



Note: *The Microprocessor On/Off Switch is covered by the side panel when it is closed.*

HMI Control Panel

⚠ WARNING

Risk of Injury!

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

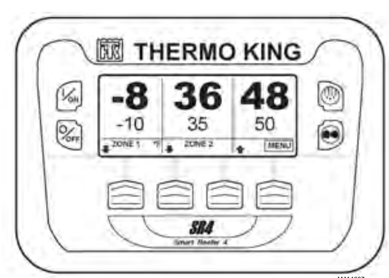
System conditions are displayed and operator instructions are sent using the SR-4 HMI Control Panel. The HMI Control Panel communicates with the Base Controller via CAN bus.

Important: *The SR-4 HMI Control Panel is not compatible with SR-2 and SR-3 Control Systems.*

It is critical that the correct software be used. Units with SR-4 HMI Control Panels must use HMI Control Panel Software Revision 7Axx.

Refer to Section 7 of this manual for additional hardware and software details and requirements.

Figure 12. SR-4 HMI Control Panel



The HMI Control Panel consists of an LCD graphics display screen and eight touch sensitive keys.

- The four keys on the sides of the display screen are used to turn the unit on and off, initiate a manual defrost cycle, and select the desired operating mode. These keys are designated "Hard" keys as their function is always the same.
- The function of the four keys located below the display screen change as required by the current menu. The current function of the key is controlled by software and is displayed directly above the key. These keys are known as software controlled keys or "Soft" keys.
- The same HMI Control Panel is used for single temperature and multi-temperature applications.

HMI Control Panel Operation

The HMI contains a microprocessor and dedicated software. The HMI is a message center and does not directly control the unit operation. It communicates with the Base Controller via a Controller Area Network (CAN) connection. The HMI displays system operating data and sends operating requests to the controller.

The display screen is used by the Base Controller to provide visual prompts and information to the operator, such as operating mode, setpoint temperatures, gauges, hourmeter readings and operating conditions of the diesel engine or electric motor. The HMI also contains the CargoWatch Data Logger.

Information can be displayed in four possible languages (English, Spanish, French, and Portuguese).

If the HMI Control Panel is disconnected from the unit while the unit is running, the unit will shut down. When the HMI Control Panel is reconnected the unit will not restart until the On key is pressed.

Note: *If necessary, the HMI Control Panel can be bypassed using fuse F10. Refer to Section 2 Fuse F10.*

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.

- Clock Power

  The HMI Control Panel features a capacitor to provide backup power to the real time clock. This capacitor is capable of maintaining the clock for approximately two weeks with no power connected to the unit. The capacitor is recharged any time the HMI Control Panel is installed in the unit and a properly functioning starting battery is connected.

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

CargoWatch™ Data Logger

The HMI Control Panel contains the CargoWatch Data Logger. The CargoWatch Data Logger is a fully independent temperature logger. Up to six temperature sensors and three digital inputs can be connected to the CargoWatch Data Logger. The optional CargoWatch temperature sensors are separate sensors installed as desired by each user. The CargoWatch Data Logger records CargoWatch temperature sensors, unit setpoint, unit operating condition, and alarm codes.

The Countdown and Conservative features allow the CargoWatch Data Logger to continue to log after the unit is turned off. Refer to CargoWatch Sensor Configuration in Section 3 for details of operation.

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 HMI Control Panel is changed, the current programmable feature settings will be supplied to the HMI Control Panel when the unit is turned on.

Display Heater

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

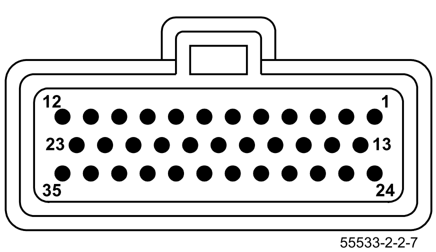
The HMI has its own internal temperature sensor for the display heater. The display heater is energized when the unit is turned on and the temperature sensed by the internal sensor is below 29°F (-2°C). The display heater turns off when the temperature sensed by the internal sensor rises above 37°F (3°C). The display heater draws from 1.4 to 1.7 amps when energized.

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

SR-4 HMI Control Panel Connector Map

HMI Control Panel Connector (arranged by pin location)			HMI Control Panel Connector (arranged by use)		
Pin #	**Wire #**	**Description**	**Pin #**	**Wire #**	**Description**
1	S6P-01	CargoWatch Sensor 6 positive	22	BLK4–CANH	HMI Control Panel CAN Bus
2	S5P-01	CargoWatch Sensor 5 positive	10	RED4–CANL	HMI Control Panel CAN Bus
3	S3P-01	CargoWatch Sensor 3 positive	23	SHLD	HMI Control Panel Shield
4	S1P-01	CargoWatch Sensor 1 positive	34	BLK3–ON	HMI Control Panel On Line
6	BLK2–8XP	8XP Power	33	RED1–OFF	HMI Control Panel Off Line
10	RED4–CANL	HMI Control Panel CAN Bus	12	2AA-01	Human Machine Interface
12	2AA-01	Human Machine Interface	6	BLK2–8XP	8XP Power
13	S5N-01	CargoWatch Sensor 5 negative	35	BLK1–CH	HMI Control Panel Chassis Ground
14	S3N-01	CargoWatch Sensor 3 negative	20	RXD2–01	Printer to HMI
15	S2N-01	CargoWatch Sensor 2 negative	31	TXD2–01	Printer to HMI
16	S1N-01	CargoWatch Sensor 1 negative	19	COM2–01	Printer Common to HMI
19	COM2–01	Printer Common to HMI	29	D14–01	Printer Port
20	RXD2–01	Printer to HMI	4	S1P-01	CargoWatch Sensor 1 positive
22	BLK4–CANH	HMI Control Panel CAN Bus	16	S1N-01	CargoWatch Sensor 1 negative
23	SHLD	HMI Control Panel Shield	27	S2P-01	CargoWatch Sensor 2 positive
24	S6N-01	CargoWatch Sensor 6 negative	15	S2N-01	CargoWatch Sensor 2 negative
25	S4N-01	CargoWatch Sensor 4 negative	3	S3P-01	CargoWatch Sensor 3 positive
26	S4P-01	CargoWatch Sensor 4 positive	14	S3N-01	CargoWatch Sensor 3 negative
27	S2P-01	CargoWatch Sensor 2 positive	26	S4P-01	CargoWatch Sensor 4 positive
29	D14–01	Printer Port	25	S4N-01	CargoWatch Sensor 4 negative
31	TXD2–01	Printer to HMI	2	S5P-01	CargoWatch Sensor 5 positive
33	RED1–OFF	HMI Control Panel Off Line	13	S5N-01	CargoWatch Sensor 5 negative
34	BLK3–ON	HMI Control Panel On Line	1	S6P-01	CargoWatch Sensor 6 positive
35	BLK1–CH	HMI Control Panel Chassis Ground	24	S6N-01	CargoWatch Sensor 6 negative

Figure 13. HMI Control Panel Connector (shown from pin side)



SR-4 Base Controller

⚠ WARNING

Risk of Injury!

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

The heart of the integrated SR-4 control system is the Base Controller. The SR-4 Base Controller is mounted on a molded plastic mounting base that is secured to the back of the control box. The SR-4 Base Controller is not compatible with SR-2 and SR-3 Control Systems.

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.

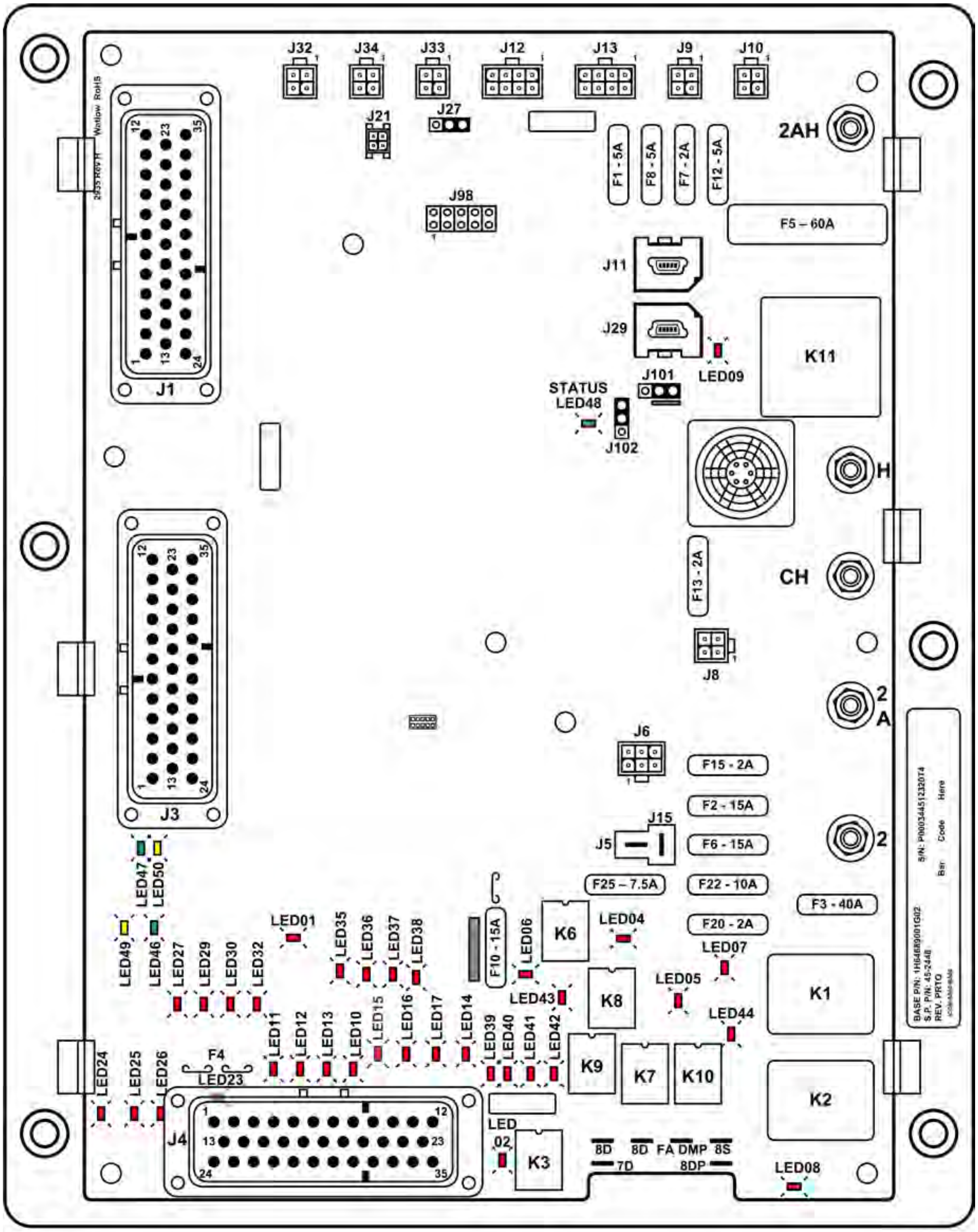
Base Controller Operation

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 . 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.

Figure 14. SR-4 Base Controller



Relay Functions

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

Relay	Function
K1	Starter Solenoid Relay (C-600M)
K2	Fuel Solenoid Pull-In Relay (C-600M)
K3	High Speed Relay (C-600M)
K6	On/Off Relay
K7	Diesel/Electric Relay (Optional)
K8	Run Relay
K9	Electric Standby Motor Relay (Optional)
K10	Fresh Air Exchange Relay (Optional)
K11	Pre-Heat Relay (C-600M)

Base Controller Fuse Size & Function

Fuse	Size	Function
F1	5A	Radio Expansion Board
F2	15A	On/Off Switch
F3	40A	Fuel Solenoid/Starter Circuit (C-600M)
F5	60A	Preheat Circuit (C-600M) (See Note)
F6	15A	High Speed Solenoid (C-600M)
F7	2A	8X Power for HMI
F8	5A	2A HMI Power for HMI and Printer Port
F10	15A	K6 to 8X Power
F12	5A	2A Power for CAN Bus J13
F13	2A	Remote Light Module
F15	2A	SR-4 Controller Power Supply
F20	2A	Alternator Sense Circuit
F22	10A	Auto Fresh Air Solenoid (AFS)
F25	7.5A	High Pressure Cutout Switch

Note: *The F5 preheat fuse is a "slow blow" type fuse. It is designed for use with the Yanmar trailer engine air pre-heater. Always replace the fuse with the TK specified fuse. Service Parts Base Controllers are shipped without the F5 fuse.*

Fuse F10

There are three in-line fuse clips that allow for two configurations of the F10 fuse. The downward position is the normal position. This position has a white bar below it on the circuit board. When fuse F10 is installed in the downward position, control power is routed to the K6 On/Off Relay contacts. The On/Off keys on the HMI Control Panel energize and de-energize the K6 On/Off Relay. When the K6 On/Off Relay is energized, power is supplied through the normally open K6 contacts to turn the unit on.

When fuse F10 is installed in the upward position, power bypasses the K6 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. The unit will control temperature to the last entered setpoint.** The white bar on the relay board represents normal position for the fuse. Do not operate the unit with the F10 fuse installed in the upward position unless absolutely necessary.

Important: *If fuse F10 is installed in the upward 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 upward position, but the Base Controller will remain powered up.*

Important: *If fuse F10 is installed in the upward 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.*

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.

Output	Function
ECUR	Run Signal to ECU
8FH	Fuel Heater Relay
8DF	Fuel Pump
HGB	Hot Gas Bypass Solenoid
26	Pilot Solenoid
ECUKS	ECU Relay
CFC	Condenser Fan Curbside
CFR	Condenser Fan Roadside
EFH	Evaporator Fan High Speed
EFL	Evaporator Fan Low Speed
BCE	Battery Charger Enable
EVA, EVB, EVC, EVD	ETV Outputs
EXC	Alternator Excitation

LED Functions

The LED is illuminated when the associated circuit output is energized. Not all output LEDs shown are used on multi-temperature trailer applications. Refer to the applicable schematic diagram for most accurate info.

LED #	Function	LED #	Function
LED 1	ECUR Output	LED 24	CIS/LV1/Digital Scroll Output
LED 2	K3 High Speed Output (C-600M)	LED 25	Suction Line Solenoid Output
LED 4	K8 Run Relay Output	LED 26	Alternator Excite Output
LED 5	K7 Diesel/Electric Relay Output	LED 27	Evaporator Fan Low Speed Output
LED 6	K6 On/Off Relay Output	LED 29	Evaporator Fan High Speed Output
LED 7	K1 Starter Relay Output (C-600M)	LED 30	Condenser Fan Roadside Output
LED 8	K2 Fuel Solenoid Output (C-600M)	LED 32	Condenser Fan Curbside Output
LED 9	K11 Preheat Relay Output (C-600M)	LED 37	ECU Key Switch Output
LED 10	Hot Gas Solenoid Output	LED 38	Battery Charger Enable Output
LED 11	Purge Valve/Liquid Injection Valve Output	LED 43	K9 Compressor Contactor CC (Electric Standby)
LED 12	Hot Gas Bypass Output	LED 44	K10 Auto Fresh Air Door Output

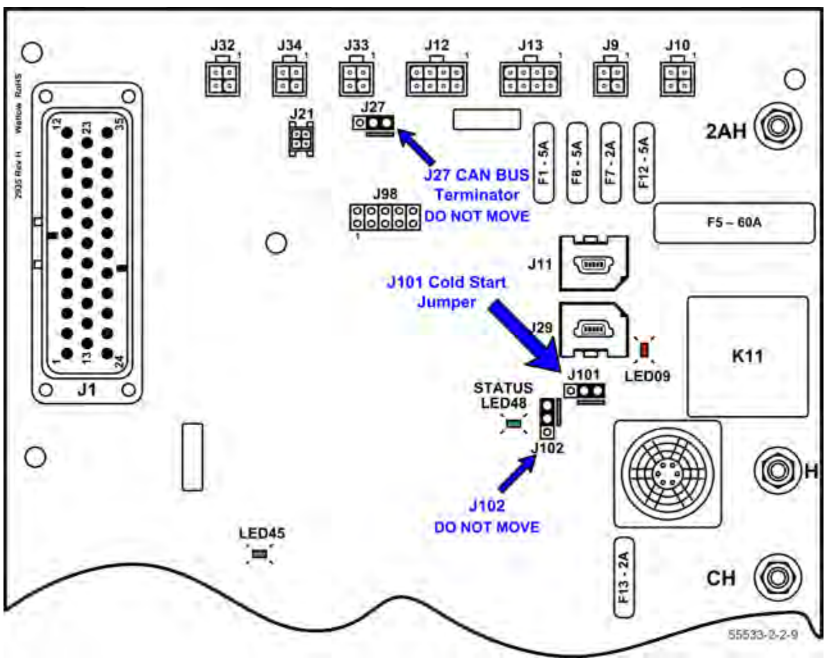
LED #	Function	LED #	Function
LED 13	Receiver Tank Pressure Solenoid Output	LED 45	I/O Micro (See Note 1)
LED 14	Spare 1	LED 46	ETV – D Output (See Note 2)
LED 15	Fuel Pump	LED 47	ETV – B Output (See Note 2)
LED 16	Spare 3	LED 48	Heartbeat (Application Micro) (See Note 1)
LED 17	Spare 2	LED 49	ETV – A Output (See Note 2)
LED 23	Liquid Line Solenoid Output	LED 50	ETV – C Output (See Note 2)

Notes:

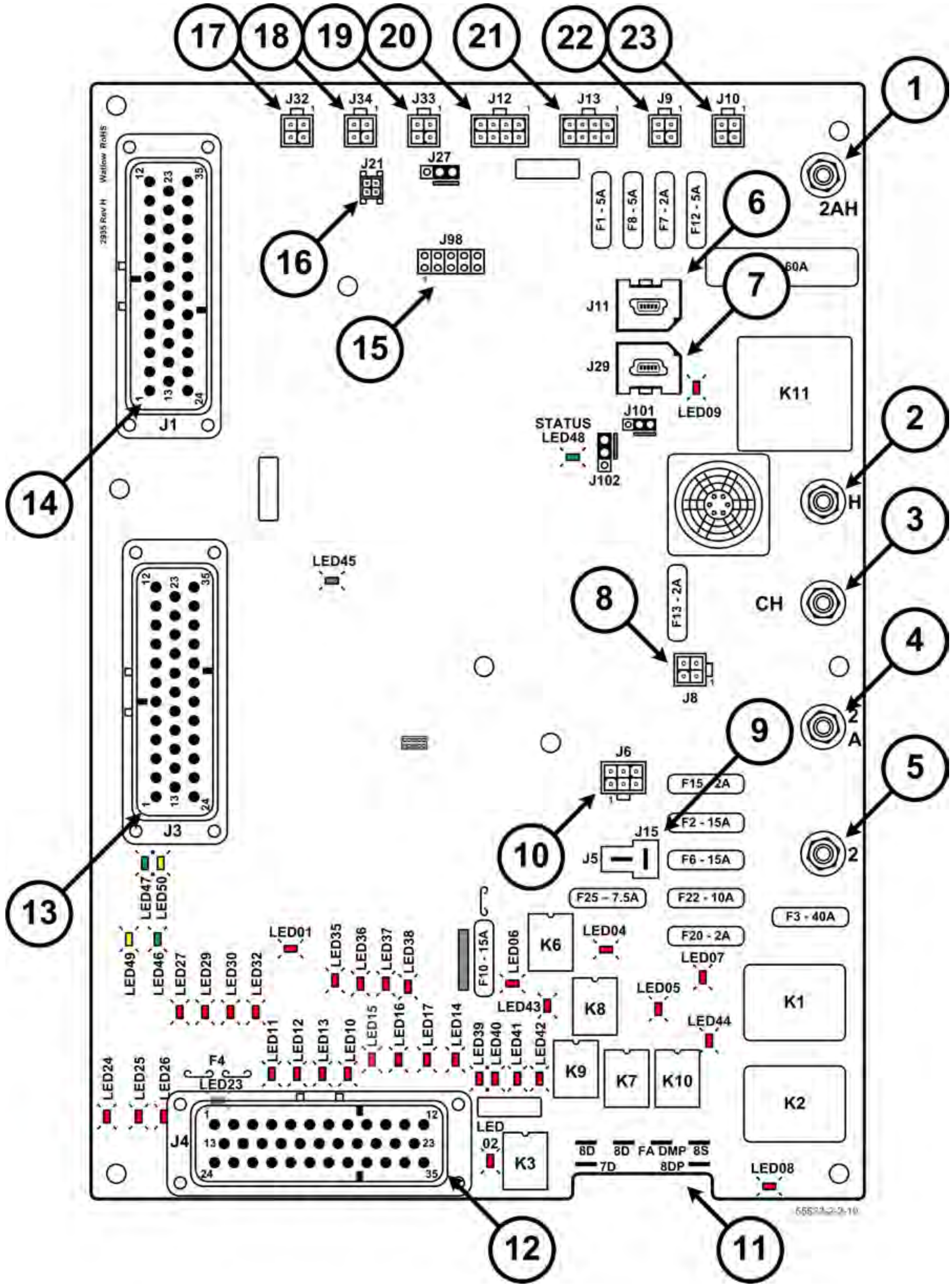
1. *For LED 45, normal heartbeat is approximately a one second cycle rate. For LED 48, normal heartbeat is two flashes (approximately one second pause).*
2. *ETV LEDs are illuminated when the respective ETV output is energized.*

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. The J27 jumper (CAN Bus Terminator) and J102 jumper (Not Used) should not be moved.



Connector Locations



Note: *See Connector Usage for item number information.*

Connector Usage

Number	Connector	Circuit
1	2AH	2AH Power (Battery Positive) (Not used)
2	H	Power to Glow Plugs (Not used)
3	CH	Chassis Ground
4	2A	2A Alternator Power
5	2	2 Battery Power
6	J11	USB Port for PC Only
7	J29	USB Port for Flash Drive Only
8	J8	Remote Light Module
9	J5, J15	Microprocessor Power Switch
10	J6	SmartPower™ Electric Standby
11	J16	8 DP Fuel Solenoid Pull-In Coil 8D Fuel Solenoid 8D Fuel Heater 7D High Speed Solenoid FADE Fresh Air Door 8S Starter
12	J4	Interface Board Output Connector
13	J3	Controller Input/Output Connector
14	J1	Controller Sensor Connector
15	J98	Radio Expansion Board
16	J21	Not Used
17	J32	CAN Bus to Engine Control Unit (ECU) (J1939 CAN Port)
18	J34	CAN Bus (Spare Port) (J1939 CAN Port)
19	J33	CAN Bus to Optional Battery Charger (J1939 CAN Port)
20	J12	CAN Bus to HMI Control Panel (Thermo Bus CAN Port)
21	J13	CAN Bus Communication to Expansion Module
22	J9	Serial Port (Not Used)
23	J10	Rear Flushmount Control Panel (COM 2)

Note: *Refer to the following pages for individual connector maps.*

SR-4 Base Controller Connector Maps

Table 1. J1 - Base Controller Sensor Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	8F-01	Optional Fuel Level Sensor Positive
2	FUEL-01	Optional Fuel Level Sensor
3	FUELN-01	Optional Fuel Level Sensor Negative
5	RTP-01	Display Return Air Temperature Sensor Positive (blue sensor wire)
7	DTP-01	Control Discharge Air Temperature Sensor Positive (blue sensor wire)
8	CTP-01	Evaporator Coil Temperature Sensor Positive (blue sensor wire)
9	ST1P-01	Spare 1 Temperature Sensor Positive (blue sensor wire)
10	ST3P-01	Spare 3 Temperature Sensor Positive
13	SPN-01	Suction Pressure Transducer Negative
14	DPN-01	Discharge Pressure Transducer
16	HSP-01	Humidity Sensor Positive (Not used)
17	RTN-01	Control Return Air Temperature Sensor Negative (brown sensor wire)
19	DTN-01	Control Discharge Air Temperature Sensor Negative (brown sensor wire)
20	CTN-01	Evaporator Coil Temperature Sensor Negative (brown sensor wire)
21	ST1N-01	Spare 1 Temperature Sensor Negative (brown sensor wire)
22	ST3N-01	Spare 3 Temperature Sensor Negative
24	SPI-01	Suction Pressure Transducer Signal (white wire) (SPT)
25	DPI-01	Discharge Pressure Transducer Signal (white wire) (DPT)
26	HSI-01	Humidity Sensor Signal (Not used)
27	HSN-01	Humidity Sensor Negative (Not used)
28	ST2P-01	Spare 2 Temperature Sensor Positive
29	ST2N-01	Spare 2 Temperature Sensor Negative
30	ATP-01	Ambient Temperature Sensor Positive (blue sensor wire)
31	ATN-01	Ambient Temperature Sensor Negative (brown sensor wire)

Table 2. J3 - 35 Pin Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	FS1–01	Flywheel Sensor (C-600M)
2	CHER-01	Compressor Drive Motor RPM Ground
3	WRPM-01	Compressor Drive Motor RPM
4	GSP-01	Generator Current Sensor Positive
5	GSN-01	Generator Current Sensor Negative
6	GSI-01	Generator Current Sensor Signal
11	SPP-01	Suction Pressure Transducer Positive
12	DPP-01	Discharge Pressure Transducer Positive
18	CLS-01	Coolant Level Switch

Table 2. J3 - 35 Pin Connector - Arranged by Pin Number (continued)

Pin #	Wire #	Description
24	OLS-01	Oil Level Sensor (C-600M)
27	20B-01	Low Oil Pressure Switch (C-600M)
29	DSP-01	Door Switch Positive
30	DS-01	Door Switch
31	AFADSP-01	Auto Fresh Air Switch Positive
32	AFADS-01	Auto Fresh Air Switch
33	GFF-01	Ground Fault Failure Signal
34	GFN-01	Ground Fault Sensor Negative
35	GFP-01	Ground Fault Sensor Positive

Table 3. J4 - 35 Pin Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	SLS-01	Suction Line Solenoid Zone 1
2	EXC-01	Alternator Excite
3	LLS-01	Liquid Line Solenoid Zone 1
4	PV-01	Purge Valve
5	HGB-01	Hot Gas Bypass Solenoid
6	RTPS-01	Receiver Tank Pressure Switch
7	HGS-01	Hot Gas Solenoid Zone 1
8	8DF-01	Fuel Pump
12	CC-01	Generator Contactor Auxiliary Contact
13	CIS-01	Condenser Inlet Solenoid
14	EFL-01	Evaporator Fan Low Speed Contactor
15	EFH-01	Evaporator Fan High Speed Contactor
16	CFR-01	Condenser Fan Roadside Contactor
17	CFC-01	Condenser Fan Curbside Contactor
20	ECUKS-01	Engine Control Unit (ECU) Relay Control Signal
21	BCE-01	Battery Charger Enable
23	HPCO-01	High Pressure Cutout Switch
25	EVA-01	Electronic Throttling Valve
26	EVD-01	Electronic Throttling Valve
27	EVC-01	Electronic Throttling Valve
28	EVB-01	Electronic Throttling Valve
30	ECUR-01	Engine Control Unit (ECU) Run Signal
33	2Y-01	Alternator Sense
35	PHPCO-01	High Pressure Cutout Switch Positive

Table 4. J6 - Electric Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	7E-01	Heater Contactor A1 to Phase Select Module (PSM) J6
2	EOL-01	Compressor Drive Motor Overload
3	8-01	On/Off Switch to PSM
4	CH-01	Chassis Ground
5	ER-01	Electric Relay to PSM
6	26E-01	Heater Contactor A2

Table 5. J8 - Remote Status Light Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	ALM-01	Remote Light Option Input
2	8FC-01	Remote Light Power
3	ALPC-01	Remote Light Option Ground
4	8FC-02	Remote Light Power

Table 6. J10 - Remote Controller Connector - Arranged by Pin Number

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

Table 7. J12 - CAN 1 - HMI Connector - Arranged by Pin Number

Pin #	Wire #	Description
1	RED4 (CANL)	HMI CAN Low
2	BLACK4 (CANH)	HMI CAN High
3	SHLD	HMI Shield
4	BLACK3 (ON)	HMI On Signal
5	RED2 (2AA)	HMI Display Power
6	BLACK2 (8XP)	HMI Power
7	RED1 (OFF)	HMI Off Signal
8	BLACK1 (CH)	HMI Ground

Table 8. J13 - CAN 1 - Expansion Module - Arranged by Pin Number

Pin #	Wire #	Description
1	CANL	CAN Low
2	CANH	CAN High
3	SHLD	Shield
4	ON	On Signal

Table 8. J13 - CAN 1 - Expansion Module - Arranged by Pin Number (continued)

Pin #	Wire #	Description
5	2AA	Run Power
6	8XP	Power J12 to HMI
7	Off	Off Signal
8	CH	Ground

Table 9. J5 & J15 - Power Switch Connector - Arranged by Pin Number

J #	Wire #	Description
J5	8	8 Power
J15	2AB	2AB Power

Table 10. J16 - Arranged by Pin Number

J #	Wire #	Description
J16	8DP	Fuel Solenoid Pull-In Coil
J17	8D	Fuel Solenoid
J22	8D	Fuel Heater
J19	7D	High Speed Solenoid
J20	FADE	Fresh Air Door
J18	8S	Starter

Table 11. Screw Terminal Power Connections

Terminal #	Wire #	Description
2	2	Battery Power
2A	2A	Alternator Power
CH	CH	Chassis Ground
H	H	Glow Plugs
2AH	2AH	Air Heater Power

Table 12. J32 - CAN Bus to Engine Control Unit (ECU) - Arranged by Pin Number

Pin #	Wire #	Description
1	CANH	CAN High
2	CANL	CAN Low
3	SHLD	Shield
4	CH	Ground

Table 13. J33 - CAN Bus to Optional Battery Charger - Arranged by Pin Number

Pin #	Wire #	Description
1	CANH	CAN High
2	CANL	CAN Low
3	SHLD	Shield
4	CH	Ground

Figure 15. 35 Pin Sensor Harness Connector (shown from pin side)

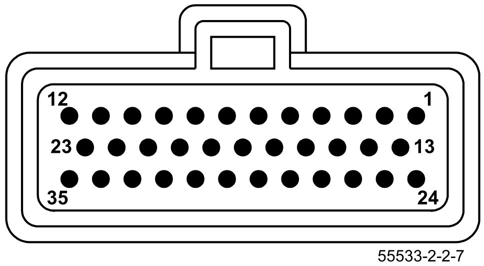
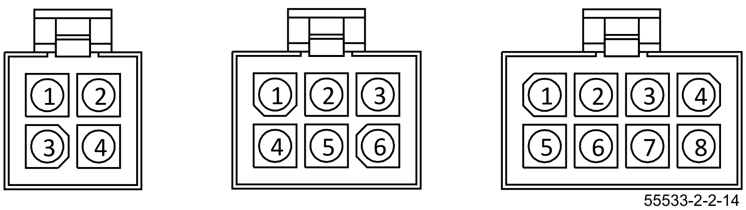
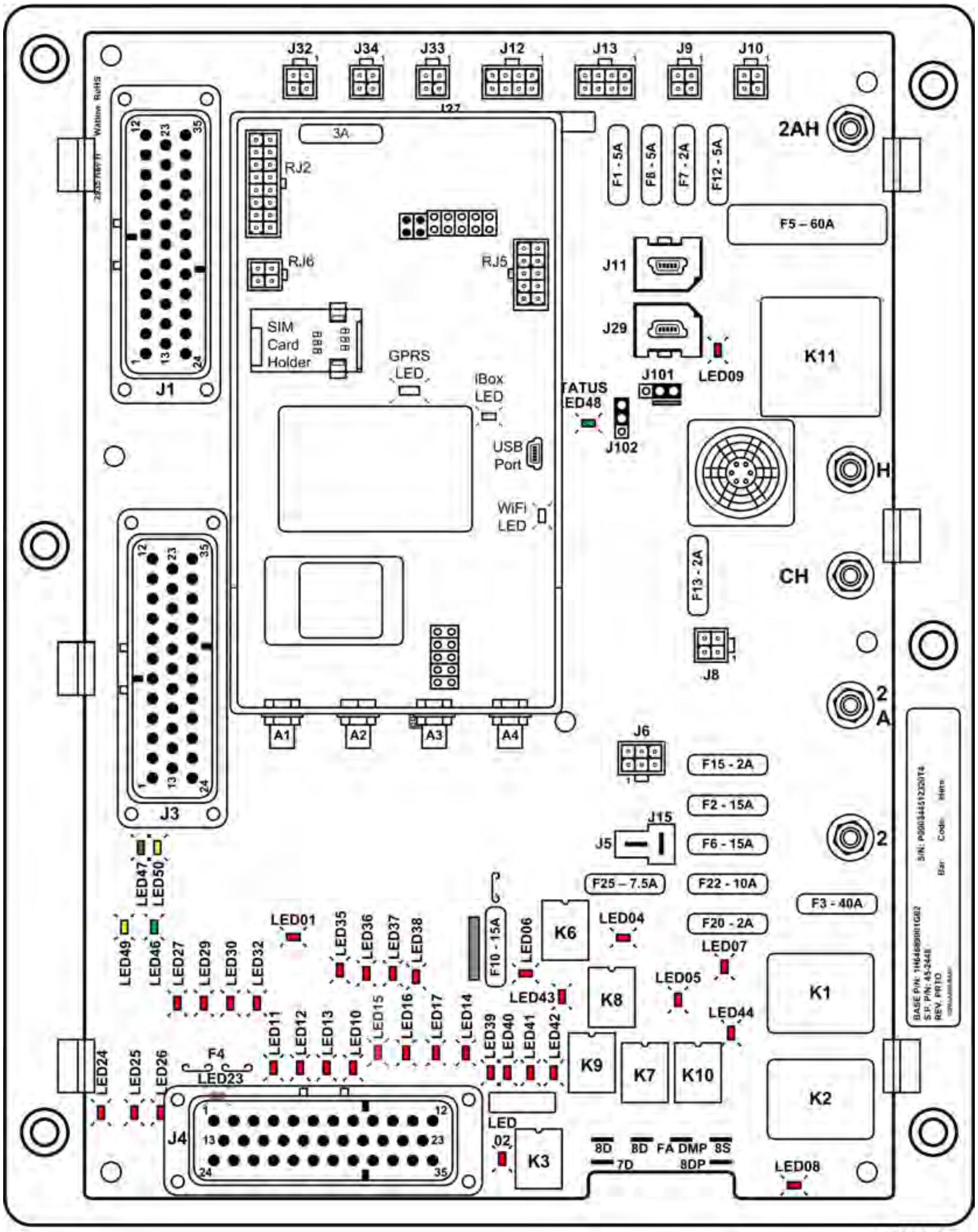


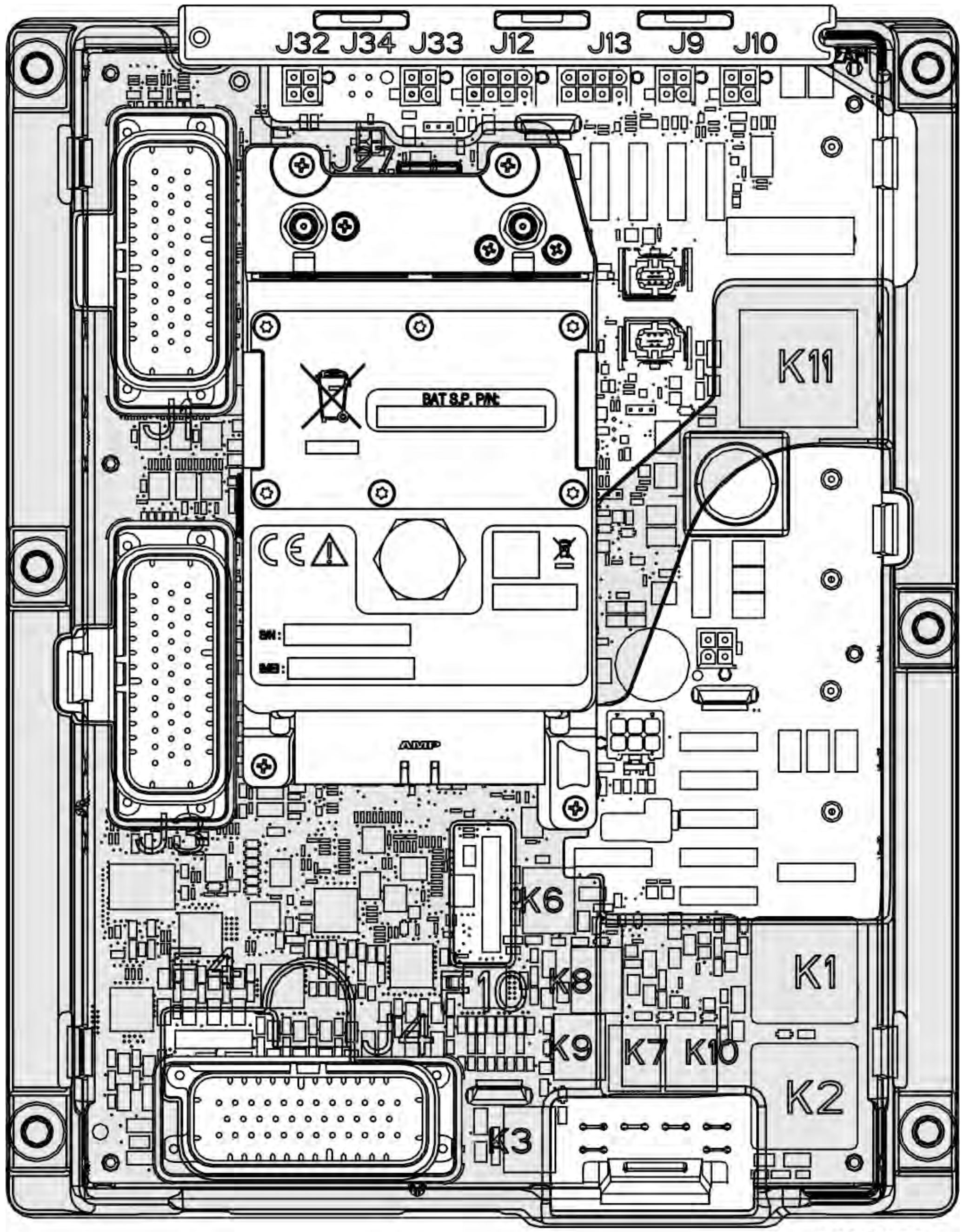
Figure 16. Mini Mate-N-Lok Harness 4/6/8 Pin Connectors (shown from pin side of harness connector)



Complete SR-4 Control System with Radio Expansion Board (REB) Installed



Complete SR-4 Control System with TK BlueBox Installed



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SR-4 Multi-Temp Expansion Module

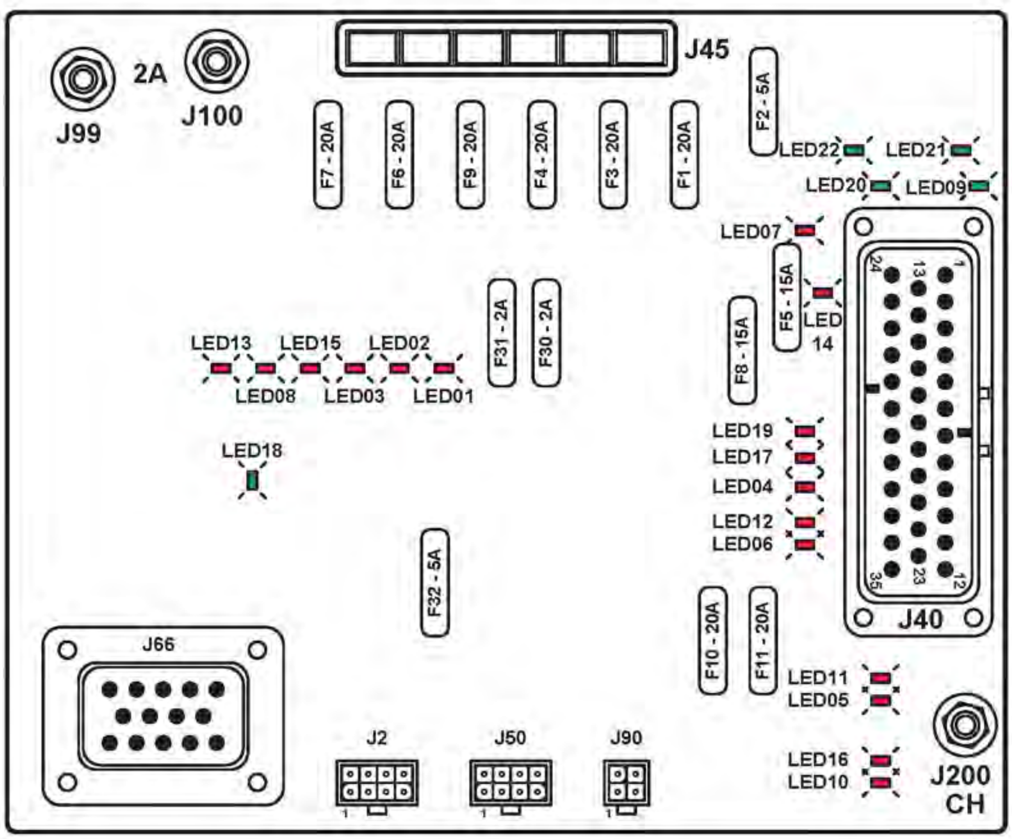
The Multi-Temp Expansion Module is a hardware board that provides input and output for operation of one or two additional temperature controlled zones. It also provides over-current and short circuit protection for the associated circuits. The Expansion Module features 100% solid state outputs that are Smart FET controlled. All remote zone solenoid output functions are connected via the Expansion Module J40 35 pin connector harness; sensor inputs are connected via J66 14 pin connector. It is located below the Base Controller in the Unit Control Box. Other than the fuses, there are no user replaceable components.

All engine functions and host unit valves are controlled by the Base Controller and Engine Control Unit (ECU). This includes the Receiver Tank Pressure Solenoid (RTPS), Purge Valve (PV), Condenser Inlet Solenoid (CIS), and Hot Gas Bypass Solenoid (HGBY). In addition, the Zone 1 Liquid Line Solenoid (LLS1), Suction Line Solenoid (SLS), and Hot Gas Solenoid (HGS) are controlled directly from the Base Controller. 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.

Load power is supplied to the Expansion Module by the alternator via the two 2A terminal studs. Expansion Module controller power is supplied via the 8 pin J2 CAN connector at pin 6 (8XP yellow). The Expansion Module also communicates with the Base Controller via the CAN bus connection.

The Expansion Module 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. With trailer applications, the Expansion Module 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.

Figure 17. Expansion Module



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Expansion Module Fuse Size & Function

Fuse	Size	Function
FX1	20A	Fan Motor 1 – Zone 2
FX3	20A	Fan Motor 2 – Zone 2
FX4	20A	Fan Motor 3 – Zone 2
FX6	20A	Fan Motor 2 – Zone 3
FX7	20A	Fan Motor 3 – Zone 2
FX9	20A	Fan Motor 1 – Zone 3
FX10	20A	Liquid Line Solenoids – Zone 2 and Zone 3 Hot Gas Solenoid – Zone 3
FX11	20A	Suction Line Solenoids – Zone 2 and Zone 3 Hot Gas Solenoid – Zone 2
FX30	2A	Spare
FX31	2A	Spare
FX32	5A	Digital Ground

Expansion Module LED Functions

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

LED #	Function
LEDX 1	Fan 1 – Zone 2
LEDX 2	Fan 2 – Zone 2
LEDX 3	Fan 3 – Zone 2
LEDX 4	Hot Gas Solenoid – Zone 3
LEDX 5	Suction Line Solenoid – Zone 3
LEDX 6	Liquid Line Solenoid – Zone 3
LEDX 8	Fan 2 – Zone 3
LEDX 10	Hot Gas Solenoid – Zone 2
LEDX 11	Suction Line Solenoid – Zone 2
LEDX 12	Liquid Line Solenoid – Zone 2
LEDX 13	Fan 3 – Zone 3
LEDX 15	Fan 1 – Zone 3
LEDX 18	**Status** (See Note)

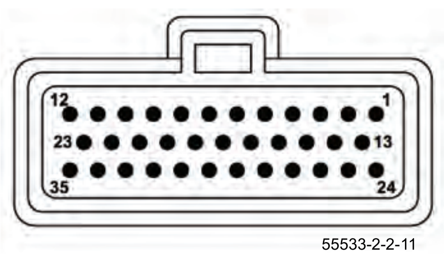
Note: *The Status LED flashes once per second when the Expansion Module is powered and operating normally. The Status LED flashes twice within one second followed by one second off if a CAN communication error is present.*

SR-4 Multi-Temp Expansion Module Connector Map

Table 14. J40 - Multi-Temp Expansion Module Connector - arranged by pin number

Pin #	Wire #	Description
1	DH3-01	Drain Hose Heater Zone 3
2	DH2-01	Drain Hose Heater Zone 2
3	HGS2-01	Hot Gas Solenoid Zone 2
5	SLS3-01	Suction Line Solenoid Zone 3
6	SLS2-01	Suction Line Solenoid Zone 2
9	DS3-01	Door Switch Zone 3
10	DS2-01	Door Switch Zone 2
14	2AF1-01	J40 Expansion PCB
15	LLS2-01	Liquid Line Solenoid Zone 2
19	DSP3-01	Door Switch Zone 3
26	HGS3-01	Hot Gas Solenoid Zone 3
27	LLS3-01	Liquid Line Solenoid Zone 3
32	DSP2-01	Door Switch Zone 2
33	SC3-01	Remote Evaporator Fan Speed Control Zone 3
34	SC2-01	Remote Evaporator Fan Speed Control Zone 2

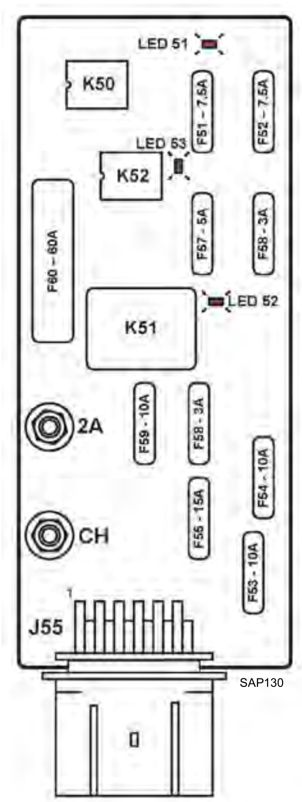
Figure 18. J40 Sensor Harness Connector – shown from pin side



Engine Relay Board

The Peugeot engine does not use the traditional engine control features such as Preheat and Start Relays, RPM Sensor, Coolant Temperature Sensor, and Coolant and Oil Level Sensors on the SR-4 Base Controller. Engine functions are controlled directly by the Engine Control Unit (ECU) and a separate Engine Relay Board. The Relay Board is located to the right of the SR-4 Base Controller in the Unit Control Box.

Figure 19. Engine Relay Board



Relay Board Fuse Size & Function

Fuse	Size	Function
F51	7.5A	Main Relay
F52	7.5A	Power Relay
F53	10A	Blowby Heater
F54	10A	Lambda Sensor, Air Flow
F55	15A	High Pressure Fuel Pump
F56	3A	Starter Relay
F57	5A	Key Switch
F58	3A	On Board Diagnostics (OBD) On
F59	10A	OBD Power
F60	60A	Battery Power (2A)

Relay Board LED Functions

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

LED #	Function
LED 51	Main Relay
LED 52	Power Relay
LED 53	Key Switch Relay

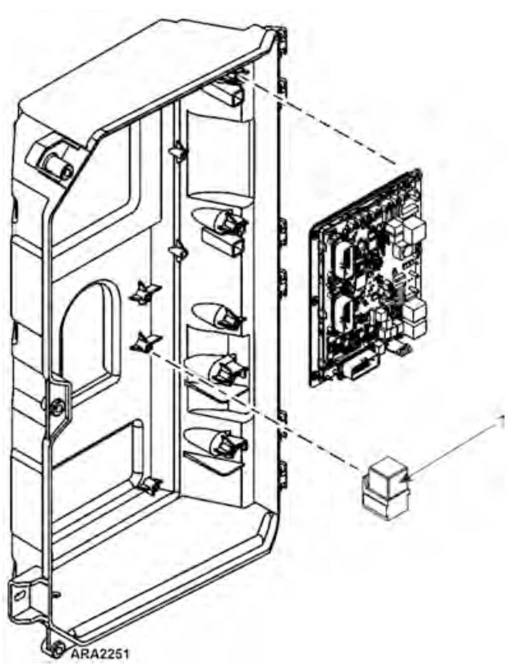
Relay Board Relays

The relays on the Engine Relay Board supply power to high current loads.

Relay	Function
K50	Main Relay
K51	Power Relay
K52	Key Switch Relay

Engine Control Relay/Fuse Board

The Yanmar engine does not use the engine control features such as Preheat and Start Relays, RPM Sensor, Coolant Temperature Sensor, and Coolant and Oil Level Sensors on the SR-4 Base Controller. Engine functions are controlled directly by the Engine Control Unit (ECU) and a separate Engine Relay/Fuse Board. The Engine Relay/Fuse Board is located below the SR-4 Base Controller in the Unit Control Box and contains only one relay.



1.	EGR Relay

Relay Functions

Important: *The relay is a socket mount relay. It can be replaced if necessary.*

Relay	Function
EGR	Exhaust Gas Relay

Fuse Size & Function

Fuse	Size	Function
FS7	35 A	Battery Charger to Load
FS9	20 A	EGR & ECU B42 & K88

Generator

A three phase AC Generator is used to supply power to the Condenser Fans and Evaporator Blower on all Precedent units. The Generator is located below the diesel engine and is belt driven directly from a crankshaft pulley on the front of the engine. Generator bearings are field replaceable. If a generator winding is failed the Generator must be replaced.

⚠ 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.

Generator Output

The voltage and frequency of the AC output varies with the speed of the diesel engine. The voltage and frequency at high speed and low speed diesel are used to control Fan and Blower speed.

- Diesel engine Low Speed operation results in 230 Vac Generator Output.
- Diesel engine High Speed operation results in 345 Vac Generator Output. The Fan and Blower Motors can run at 345 Vac without damage.

Ground Fault Detector

A Ground Fault Detector is used to monitor for a short circuit on any leg of the three phase AC output power.

- If a ground fault condition is detected while the unit is running, Alarm Code 518 will be set and the unit will continue to run.
- If Alarm Code 518 is set and the unit is turned off and back on, the unit fans will not start. If the Condenser Fans cannot run, Alarm Code 10 High Discharge Pressure may be set as a result.

Diagnostics and Alarm Codes

For Generator Diagnostics, refer to Section 5. Typical Generator Alarm Codes are the following:

- Alarm Code 518 Generator Ground Fault
- Alarm Code 524 Generator Operational Limit, Voltage to Frequency Ratio
- Alarm Code 525 Generator Frequency Range Fault
- Alarm Code 526 Generator Operational Limit, Output Current
- Alarm Code 527 System Monitor, Unknown Restarts

SmartPower™ Electric Standby Units

If the unit is equipped with the optional SmartPower, the fans and blower are also operated from Standby Power when connected. When the unit is operating in Electric Mode, the Generator Contactor is open to block Standby Power from reaching the Generator.

High Voltage Fan and Blower Control Box

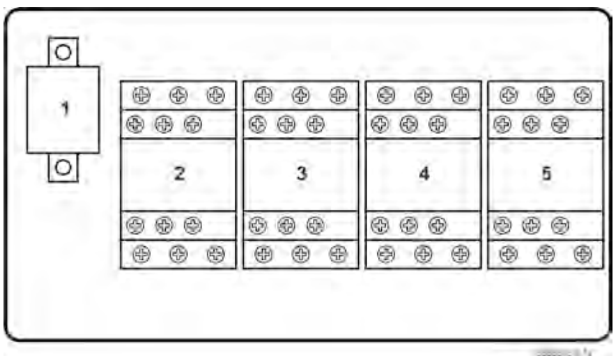
⚠ DANGER

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.

The high voltage controls for the Condenser Fans and Evaporator Blower are located in the High Voltage Fan and Blower Control Box mounted just above the Unit Control Box.

Figure 20. High Voltage Fan and Blower Control Box



1.	Ground Fault Detector	4.	Curbside Condenser Fan
2.	Evaporator Blower High Speed	5.	Roadside Condenser Fan
3.	Evaporator Blower Low Speed		

Fan and Blower Motors

Condenser Fan Motors

There are two three phase Condenser Fan Motors located at the top of the unit. These are identified as the Curbside and Roadside motors. The motors are single speed motors but change speed when engine speed changes from Low Speed to High Speed as a result of the increased voltage and frequency generator output in high speed. Fan Run Timers are used on both Condenser Fans to prevent short cycling.

The Roadside Condenser Fan also moves air over the engine radiator coils. For this reason the Roadside Fan accumulates more run time than the Curbside Fan.

If a Condenser Fan Motor winding is failed, the Condenser Fan Motor must be replaced.

⚠ 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.

Diagnostics and Alarm Codes

As a rule, the same Alarm Codes will be set if a Condenser Fan Motor fails as if a belt failed on a traditional unit. For complete Condenser Fan Motor Diagnostics, refer to Section 5. Typical Alarm Codes caused by a failed Condenser Fan Motor are:

- Alarm Code 10 High Discharge Pressure
- Alarm Code 18 High Coolant Temperature

There are no Alarm Codes specific to the Condenser Fans.

Condenser Fan Motor Control

Condenser Fan Operation in Cool Mode:

- The fan state for curbside and roadside fans for any condition = always on.

Condenser Fan Operation in Heat Mode or Defrost Mode:

Unit is in Heat Mode or Defrost Mode Operation			
Curbside Condenser Fan		**Roadside Condenser Fan**	
Fan State	**Condition**	**Fan State**	**Condition**
ON	ECU requests fan ON for Intercooler	ON	ECU requests fan ON or ECU communication lost
OFF	ECU does not request fan ON or unit in Electric Mode	OFF	ECU requests fan OFF and minimum fan run time expired

Evaporator Blower Motor

There is one three phase two Speed Evaporator Blower Motor located in the front accessible Evaporator Compartment. The motor is a two speed motor that also changes speed when engine speed changes from Low Speed to High Speed as a result of the increased voltage and frequency generator output in high speed. The two speed motor allows constant airflow to be provided regardless of engine speed.

If an Evaporator Blower Motor winding is failed, the Evaporator Blower Motor must be replaced.

⚠ 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.

Diagnostics and Alarm Codes

As a rule, the same Alarm Codes will be set if a Evaporator Fan Motor fails as if a belt failed on a traditional unit. For complete Evaporator Fan Motor Diagnostics, refer to Section 5. Typical Alarm Codes caused by a failed Evaporator Fan Motor are:

- Alarm Code 02 Check Evaporator Coil Sensor
- Alarm Code 04 Check (Control) Discharge Air Sensor
- Alarm Code 09 High Evaporator Temperature
- Alarm Code 10 High Discharge Pressure
- Alarm Code 18 High Coolant Temperature
- Alarm Code 26 Check Refrigeration Capacity
- Alarm Code 32 Refrigeration Capacity Low
- Alarm Code 204 Check Display Discharge Air Sensor

There are no Alarm Codes specific to the Evaporator Fans.

Evaporator Fan Motor Control

The tables show conditions required to turn Evaporator Fan Motors on and off.

Notes:

1. *Fan motors are 2-speed induction motors (High and Low speed).*
2. *Motors change speed with generator output voltage and frequency (Engine in High Speed or Low Speed operation).*

Table 15. Engine and Evaporator Fan Speeds (6/8 Pole Motor)

DIESEL ENGINE SPEED	EVAPORATOR FAN SPEED	EVAPORATOR FAN RPM
HIGH	HIGH	1800 RPM
HIGH	LOW	1350 RPM
LOW	HIGH	1100 RPM (S-600M/S-600DE) 1180 RPM (C-600M)

Unit Sensors

The unit sensors monitor air temperatures at various points in the system, as well as the engine oil pressure, engine oil level, engine coolant temperature, engine speed, and fuel level. The analog sensors (i.e., Fuel Level Sensor) are connected to the Base Controller via the J1 connector and the digital sensors (i.e., Oil Level Switch) via the J3 connector. Remote evaporator temperature sensors are connected to the Expansion Module via the J66 connector.

Air Temperature Sensors

Graded and Un-graded Air Temperature Sensors

The dual 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. The nameplate is mounted on the side of the control box.

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.

Do not replace a graded sensor with an un-graded sensor.

Return Air Sensors - All Installed Zones

These sensors monitor the temperature of the air returning to the evaporator coil. The sensors are located in the return air flow and are connected directly to the Base Controller (Zone 1) or Expansion Module (Zone 2 and Zone 3). 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.

Discharge Air Sensors

These sensors monitor the temperature of the air leaving the evaporator coil. The sensors are located in the evaporator discharge air path and are connected directly to the Base Controller (Zone 1) or Expansion Module (Zone 2 and Zone 3). 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.

Coil Temperature Sensor

This sensors monitors the temperature of the evaporator coil and is an un-graded sensor. The sensor is located on the evaporator coil header plate and is connected directly to the Base Controller. The Zone 1 sensor is connected to the Base Controller. The Zone 2 and Zone 3 sensors are connected to the Expansion Module.

Ambient Temperature Sensor

This sensor monitors the ambient air temperature and is an un-graded sensor. The sensor is located in the main unit adjacent to the roadside condenser coil and is connected directly to the Base Controller via connector J1. It is connected to the Base Controller via the ATP and ATN wires.

Spare 1, Spare 2, and Spare 3 Temperature Sensors

These optional sensors monitor a temperature as selected by the customer and are graded sensors. The optional sensor must be installed as required by the customer. They are connected to the Base Controller.

Alarm Code 92 Sensor Grades Not Set is not used with spare sensors. When used, spare sensors should be calibrated to achieve maximum accuracy.

CargoWatch™ Sensors

The CargoWatch Data Logger is part of the HMI Control Panel. The CargoWatch Data Logger conforms to European standard EN12830. The Data Logger supports up to six temperature sensors and four digital inputs.

The sensors used for the CargoWatch Data Logger are RTD thermistor-type sensors that differ from the sensors used for unit control. The CargoWatch sensors are connected directly to the HMI Control Panel.

Important: *The CargoWatch sensors ARE NOT interchangeable with the unit temperature sensors.*

CargoWatch sensors can be identified by:

- No shrink tubing over sensor barrel
- Shorter sensor barrel than unit sensors
- No sensor grades
- The sensor is not polarity sensitive
- Both wires are black

Figure 21. CargoWatch Sensor - No Shrink Tubing

CargoWatch thermistor type sensors change resistance as the temperature changes. Resistance values can be measured using a high quality ohmmeter and are shown in the table below.

Note: *These resistance values only apply to CargoWatch sensors.*

Table 16. CargoWatch Sensor Resistance vs Temperature

°F	°C	Ohms	°F	°C	Ohms	°F	°C	Ohms
-40°F	-40°C	336,487	20°F	-7°C	47,070	70°F	21°C	11,944
-30°F	-34°C	227,636	30°F	-1°C	34,374	80°F	27°C	9,166
-20°F	-29°C	166,356	32°F	0°C	32,650	90°F	32°C	7,402
-10°F	-23°C	115,757	40°F	4°C	26,688	100°F	38°C	5,775
0°F	-18°C	86,501	50°F	10°C	19,904			
10°F	-12°C	61,737	60°F	16°C	15,002			

Diagnostic Procedure

1. Disconnect the sensor to be tested from the sensor harness at the 12 pin Deutsch connector in the evaporator compartment.
2. Using a high quality meter, check the sensor resistance.
    a. The sensor resistance is dependant on the sensor temperature as shown (Table 16, p. 68). The measured sensor resistance should approximate the value shown for the current sensor temperature.
    b. If the sensor resistance does not match (Table 16, p. 68), the sensor must be replaced.
3. If the resistance measured in the previous step is correct, proceed to Step 4. If the resistance measured is not correct, replace the sensor.
4. Using a high quality meter, check the voltage at the sensor harness wires at the 12 pin Deutsch connector in the evaporator compartment.
    a. The voltage from the HMI Control Panel should be 2.5 Vdc with the sensor disconnected.
5. If the voltage measured in the previous step is correct, proceed to Step 7. If the voltage measured is not correct, proceed to Step 6.

6. If the voltage measured in Step 4 is incorrect, unplug the 35 pin connector at the HMI Control Panel and check the harness for shorts and open wires.
   a. Perform a wiring harness continuity test and repair as required.
7. If the harness passes inspection, check the HMI Control Panel.
   a. If the HMI Control Panel fails the test, it must be replaced.

Unit 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.

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.

Electronic Throttling Valve (ETV)

The Electronic Throttling Valve is capable of opening and closing incrementally and is installed between the evaporator and the compressor.

The ETV is controlled directly by the Base Controller Smart FET outputs. As the temperature approaches setpoint, the ETV begins to close, throttling the suction gas returning to the compressor and thus reducing cooling capacity. As the box temperature approaches setpoint, the ETV becomes more nearly closed. This feature provides very smooth and steady temperature control. The circuit is protected by the ETV Smart FETs.

High Pressure Cutout Switch (HPCO)

The High Pressure Cutout Switch is located on the discharge manifold of four cylinder compressors. The switch is closed with normal pressures and opens with excessive pressures to shut the unit down and prevent damage.

Hot Gas Bypass Solenoid (HGB)

The Hot Gas Bypass Solenoid is used in conjunction with the Electronic Throttling Valve to reduce the capacity of the unit during modulation. The normally closed Hot Gas Bypass Solenoid is opened during modulated cool when the temperature is very close to setpoint. This diverts hot gas from the compressor discharge line through the open Hot Gas Bypass Solenoid to the host unit evaporator distributor to further reduce cooling capacity. This valve is located in the refrigeration line that connects the discharge line to the Zone 1 Hot Gas Line. The Hot Gas Bypass Solenoid is energized (opened) at full modulation. The hot gas bypass valve is de-energized (closed) when modulation is discontinued. The valve also opens if the suction pressure is too low. This solenoid valve is located in the Refrigeration Section of the host unit. The circuit is protected by a Smart FET.

Condenser Inlet Solenoid (CIS)

This valve controls the flow of refrigerant to the condenser. This solenoid is typically energized (closed) when any compartment is operating in heat or defrost mode. This is a normally open valve located in the refrigeration section of the host unit. The condenser inlet solenoid is controlled by a Smart FET output on the Base Controller. This solenoid valve is located in the refrigeration section of the host unit.

Receiver Tank Pressure Solenoid (RTPS)

This valve pressurizes the receiver tank to ensure adequate refrigerant flow into the heating circuits during heat and defrost mode operation. This is a normally closed valve located in the refrigeration section of the host unit. The receiver tank pressure solenoid is controlled by a Smart FET output on the Base Controller.

Purge Valve (PV)

This valve moves refrigerant trapped in the condenser back into the refrigeration circuit. The purge valve is energized (open) during heat and defrost mode. This is a normally closed valve located in the refrigeration section of the host unit. The purge valve is controlled by a Smart FET output on the Base Controller.

Zone Refrigeration Control Components

The following solenoid valves are required for each zone. The Zone 1 valves are located in the host unit. The Zone 2 valves (and Zone 3 valves if present) are located in the remote evaporator(s) for each zone.

Liquid Line Solenoid (LLS)

The normally closed Liquid Line Solenoid is energized (open) any time cooling, heating, or defrosting is required in its zone. The Liquid Line Solenoid is de-energized when the zone is in null to stop refrigerant flow in that zone. The Zone 1 Liquid Line Solenoid is located behind the evaporator panel of the unit. The Smart FET circuit output for Zone 1 is located on the Base Controller. The Zone 2 and Zone 3 Liquid Line Solenoids are located in the Remote Evaporators. The Liquid Line Solenoid Smart FET circuit outputs for Zone 2 and Zone 3 are located on 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 normally open Suction Line Solenoid is energized (closed) when its zone is operating in heat mode as long as at least one other zone is operating in cool mode. The Zone 1 Suction Line Solenoid is located behind the evaporator panel of the unit. The Smart FET circuit output for Zone 1 is located on the Base Controller. The Zone 2 and Zone 3 Suction Line Solenoids are located in the Remote Evaporators. The Suction Line Solenoid Smart FET circuit outputs for Zone 2 and Zone 3 are located on the Expansion Module.

Hot Gas Solenoid (HG)

The normally closed Hot Gas Solenoid is energized (open) when its compartment is operating in heat mode. The Zone 1 Hot Gas Solenoid is located behind the evaporator panel of the unit. The Smart FET circuit output for Zone 1 is located on the Base Controller. The Zone 2 and Zone 3 Hot Gas Solenoids are located in the Remote Evaporators. The Hot Gas Solenoid Smart FET circuit outputs for Zone 2 and Zone 3 are located on the Expansion Module.

Engine Control Components

The engine used by the S-600M/S-600DE/S-610M/S-610DE is controlled by an Electronic Engine Control Unit (ECU). The SR-4 Base Controller supplies a Keyswitch Signal to enable the ECU and a Run Signal when the diesel engine is required to run. All other engine control functions are handled by the ECU and an Engine Relay Board located below the SR-4 Base Controller.

The engine used by the C-600M is controlled by the Base Controller to sense conditions and control operation of the diesel engine (or electric motor, if present).

Table 17. Engine Control Components

Component	Electronic Engine (S-600M/S-600DE/S-610M/S-610DE)	Mechanical Engine (C-600M)
Coolant Temperature Sensor	This sensor monitors the temperature of the coolant in the diesel engine and is monitored by the Engine Control Unit (ECU).	This sensor monitors the temperature of the coolant in the diesel engine and is monitored by the Base Controller via the J1-11 positive and J1-23 negative wires.
Coolant Level Sensor (CLS)	This sensor monitors the engine coolant level. It consists of a magnetic reed switch located on the radiator expansion tank. The magnetic reed switch is a press-in miniature reed switch and a captive magnetic float inside the radiator expansion tank. If the coolant level is low for a specified period of time a low coolant condition is assumed to exist. The switch is connected to the Base Controller connector J3 via the CLS and CLP wire. The switch is closed with adequate coolant level and open with low coolant level.	This sensor monitors the engine coolant level. It consists of a magnetic reed switch located on the radiator expansion tank. The magnetic reed switch is a press-in miniature reed switch and a captive magnetic float inside the radiator expansion tank. If the coolant level is low for a specified period of time a low coolant condition is assumed to exist. The switch is connected to the Base Controller connector J3 via the CLS and CLP wire. The switch is closed with adequate coolant level and open with low coolant level.
Oil Pressure Switch (LOPS)	The normally closed low oil pressure switch monitors the oil pressure of the diesel engine. It is located on the engine block trailer wall side and is connected directly to the Engine Control Unit (ECU). The switch is open when the oil pressure is adequate.	The normally closed low oil pressure switch monitors the oil pressure of the diesel engine. It is located on the oil filter base and is connected to the Base Controller via J3 connector 20B and CH wires. 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.	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 (FWS)	N/A	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 head of the diesel engine. The glow plugs are energized by the Engine Control Unit (ECU). The circuit is protected by the 60 amp fuse located on the Electronic Engine Relay/Fuse Board.	N/A
Intake Air Heater	N/A	The intake air heater is located at the inlet to the intake manifold of the diesel engine. The intake air heater is energized and LED 9 is lit when the Base Controller energizes the K11 Preheat Relay. The K11 Preheat Relay normally open contacts supply power via the H wire to the intake air heater to preheat the engine before starting. The circuit is protected by the 60 amp fuse F5.
Starter Motor (SM)	The starter motor is located on the door side of the engine. The starter motor is energized by the STR Relay. The STR Relay normally open contacts supply power via the 8S wire to the starter solenoid to crank the engine. The circuit is protected by the 70 amp fuse FS3.	The starter motor is located on the door side of the engine. The starter motor is energized by the K1 Starter Solenoid Relay on the Base Controller and LED 7 is lit while K1 is energized. The K1 Starter Solenoid 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.

Table 17. Engine Control Components (continued)

Component	Electronic Engine (S-600M/S-600DE/S-610M/S-610DE)	Mechanical Engine (C-600M)
Fuel Solenoid (FSH, FSP)	N/A	The fuel solenoid is located at the rear of the injection 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 pull-in coil is momentarily energized and LED 8 is momentarily lit in Diesel Mode when the Base Controller energizes the K2 Fuel Solenoid Pull-in Relay for two seconds. The K2 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. • The hold coil is energized in Diesel Mode when the Base Controller energizes the K8 Run Relay. LED 4 is lit when the Run Relay is energized and the contacts have transferred. The K8 Run Relay normally open contacts supply power from the 8 wire thru the normally closed Diesel/Electric relay to the 8D wire to energize the fuel solenoid hold coil. The circuit is protected by the 7.5 amp fuse F25.
High Speed Solenoid (HS)	N/A	The high speed (throttle) solenoid is located behind the fuel injection pump. The high speed solenoid is energized and LED 2 is lit when the Base Controller energizes the K3 High Speed Relay. The K3 High Speed Relay contacts supply power to the 7D wire to the high speed solenoid to enable high speed operation. The circuit is protected by the 15 amp fuse F6.
Electric Standby Motor RPM	Electric Standby Motor RPM is monitored by the microprocessor via the "W" wire (WRPM-02). When a unit equipped with optional Electric Standby is running in Diesel Mode, the ratio between the engine RPM and electric standby motor RPM is monitored. If these values are not in the proper ratio, it is an indication that drive belt slippage is occurring. If this occurs, Alarm Code 48 is set as a Shutdown Alarm.	Electric Standby Motor RPM is monitored by the microprocessor via the "W" wire (WRPM-02). When a unit equipped with optional Electric Standby is running in Diesel Mode, the ratio between the engine RPM and electric standby motor RPM is monitored. If these values are not in the proper ratio, it is an indication that drive belt slippage is occurring. If this occurs, Alarm Code 48 is set as a Shutdown Alarm.
Engine Control Unit (ECU)	The Engine Control Unit (ECU) controls the engine. It is located in the air channel above the battery. The Peugeot or Yanmar Engine Diagnostic Tool is needed to diagnose engine problems/ECU codes.	N/A

Communication Ports

Serial Ports

The SR-4 features three serial communication ports. The CargoWatch, ServiceWatch, and Printer ports are inside the control box.

USB Ports

Thermo King Precedent Trailer Units provide two Universal Serial Bus (USB) Ports. The front panel USB port is reserved for USB Flash Drive only. The port reserved for USB connection to a PC is inside the Control Box on the Base Controller. An optional Panel Mount Kit is available to mount the PC USB Connector on the front panel.

Important: *The Flash Drive must be properly configured and the desired features must be enabled using the WinTrac Service Tool.*

Using a properly configured and enabled flash drive, the following functions may be available:

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

Printer Port

This port is used to print trip records from the CargoWatch Data Logger. The Printer port is located inside the control box.

Optional SmartPower™ Electric Standby

Note: *Model 50 units only.*

The SmartPower Electric Standby option allows the unit to be operated on either the diesel engine or external standby electric power. The units are supplied to operate on 230 or 460 Vac three phase power. Units to be operated on 460 Vac are equipped with a step-down transformer to reduce the voltage from 460 Vac to 230 Vac. The 230 Vac is used to run the blowers while in electric mode.

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.

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 autoswitched to electric mode.*

- **Automatic Overload Reset** - The overload relay resets automatically after the motor cools. When the overload trips, it interrupts power to the motor contactor coil.
- **Electric Heat** - Both hot gas and electric heat is utilized on model 50 units. The electric heaters are also used during defrost. Electric heat is available on 12 HP options.
- **Automatic Phase Correction** - The control system features two motor contactors. One of the connectors 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 mechanically interlocked.
- **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 enclosure or 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 K7

The Diesel/Electric Relay K7 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.

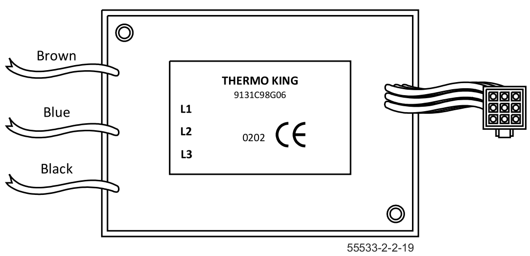
The Diesel/Electric Relay is energized and LED 5 is illuminated when the Base Controller requests Electric Mode operation. The K7 Diesel/Electric Relay normally open contacts supply power to the 7E circuit to enable Electric Mode operation.

Heater Contactor HC

The heater contactor is used to supply standby power to the electric heaters during heat and defrost mode electric operation. The heater contactor is energized and LED 2 is illuminated when the Base Controller energizes the K3 High Speed Relay during electric mode operation. The K3 High Speed Relay Smart FET supplies chassis ground via the 26E wire to the heater contactor. The circuit is protected by the Smart FET.

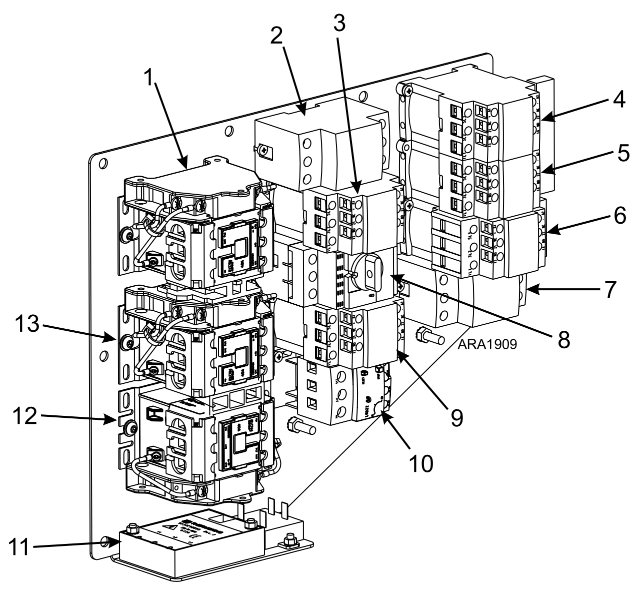
Phase Detect Module

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.



SmartPower™ Electric Standby Components

The SmartPower components are located in a separate SmartPower Control Box located behind the unit control box. The unit control box swings out to provide access to the SmartPower Control Box.



1.	CC – Compressor Motor Contactor	8.	OLH – Heater Overload Relay
2.	FB1 – Fuse Block 1	9.	HC – Heater Contactor
3.	GC – Generator Contactor	10.	OL – Overload Relay (Compressor Motor)
4.	BC1 – Battery Charger Contactor 1 (460 Vac Only)	11.	PSM – Phase Selection Module
5.	BC2 – Battery Charger Contactor 2 (460 Vac Only)	12.	PC1 – Phase Contactor 1

6.	TRC – Transformer Contactor (460 Vac Only)	13.	PC2 – Phase Contactor 2
7.	FB2 – Transformer Secondary Fuse Block 2 (460 Vac Only)		

Optional Battery Charger

An optional Battery Charger is available. The battery charger converts AC power from the generator to DC power to charge the unit battery and power the unit control system.

If present, it is located in the air duct to the left of the control box. Both the input and output are fuse protected.

Optional Fuel Heater

An optional Fuel Heater is available. If present, it is located just to the right of the fuel filter.

Optional Solar Panel

An optional unit mounted solar panel with solar charger and a properly sized harness is available. If installed, it is mounted directly to the top of the unit.

TK BlueBox

The TK BlueBox communication device is available as standard on new units and as an option on certain other units. 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.

The status alarms are listed below. Refer to the TK BlueBox Diagnostic Manual (TK 56469) for complete information and diagnostic procedures.

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 Engine Control Unit (ECU) to control the refrigeration system, engine, and interface with the operator. The Base Controller, HMI Control Panel, and Engine Control Unit 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 or wiring diagrams 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 generally 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.*

The SR-4 system utilizes the following software:

- Base Controller software CAxx.
- HMI Control Panel software 7Axx.

Base Controller and HMI Control Panel software updates are flash loaded using the WinTrac Service Tool. To check the Base Controller or HMI Control Panel software revisions, refer to Section 4.

Engine Control Unit (ECU) software updates are flash loaded and Engine Control Module (ECM) software revisions are checked using the Peugeot PCM Diagnostic Tool (S-600M/S-600DE).

For software revision details, refer to Section 7.

Compatibility

SR-4 Base Controller

The SR-4 Base Controller was designed for the Precedent Series single temperature and multi-temperature trailer units. Multi-temperature applications with SR-4 Base Controllers must use Base Controller Software Revisions CAxx.

- Refer to Section 2 for hardware details.
- Refer to Section 7 for additional hardware and software details and requirements.

SR-4 HMI Control Panel

The SR-4 HMI Control Panel was designed for the Precedent Series single temperature and multi-temperature trailer units. Multi-temperature applications with SR-4 HMI Control Panels must use HMI Control Panel Software Revisions 7Axx.

- Refer to Section 2 for hardware details.
- Refer to Section 7 for additional hardware and software details and requirements.

HMI Menu Structure

The basic HMI Control Panel menu structure consists of the Standard Display, TemperatureWatch™ Display, Main Menu, Maintenance Menu, and Guarded Access Menu. See the following for a general description of each menu and feature. Refer to Section 4 for complete operating instructions.

Standard Display

The Standard Display shows the zone return air temperature and setpoint. The Standard Display or the TemperatureWatch Display is shown when the unit is operating normally. All other menus are accessed from the Standard Display.

- 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 and Zone 2 and Zone 3 can be turned on and off using the soft key located below each zone display.

- If a zone is turned off, the display for that zone will show OFF instead of the setpoint for that zone.
- The readings of the unit gauges and temperature sensors can be shown from the Standard Display using the GAUGES and SENSORS soft keys unless these keys have been assigned different functions from the Guarded Access > Main Menu.
- If a USB Flash Drive or a computer is connected to the unit via a USB Port, a USB Icon will appear in the display.

TemperatureWatch™ Display

The TemperatureWatch Display shows the return air temperature and setpoint using large numbers that allow unit conditions to be checked from a distance. If there are no alarms other than Log Alarms present, the TemperatureWatch Display will appear 2½ minutes after the last key is pressed. Press any soft key to return to the Standard Display.

Main Menu

The Main Menu consists of informational and operational functions intended for the unit operator. The Main Menu is directly accessible from the Standard Display using the MENU Soft Key. The Menu Soft Key is at the bottom right of the Standard Display.

Maintenance Menu

The Maintenance Menu consists of informational, operational, control, and diagnostic functions 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 consists of programmable features that configure the unit, set sensor grades, enable options, and allow the customer to tailor unit operation to their particular requirements. The CargoWatch data logger is configured from this menu. The Guarded Access Menu is indirectly accessible from the Maintenance Menu.

Operator Features

The Precedent SR-4 control system features many special operator functions. These functions are available from the Standard Display. A brief explanation of each menu is included here. For complete operating details, refer to Section 4.

Standard Display

The Standard Display is the default display that appears if no other display function is selected. The Standard Display shows the zone return air temperature and setpoint for up to three zones. The Standard Display soft keys provide direct operator access to turn Zone 2 and Zone 3 on and off, to change the setpoint for each zone, and to select the Main Menu. If a USB Flash Drive or a computer is connected to the unit via a USB Port, a USB Icon will appear in the display.

Turning Zones On and Off

Zone 2 and Zone 3 can be turned on and off from the Standard Display using the soft key under each zone display. Zone 1 is always turned on when the HMI ON hard key is pressed. All zones are turned off when the HMI OFF hard key is pressed.

The On/Off state of Zone 2 and Zone 3 (if present) is saved when the unit is turned off. If Zone 2 or Zone 3 were turned on when the unit the unit was turned off, then they will still be on when the unit is turned back on.

Setpoint Change

The setpoint menu for each zone can be directly accessed from the Standard Display using the soft key under each zone display.

Limited Setpoints

The Limited Setpoint feature limits the number of setpoints available from one to four. Up to four desired setpoints are programmed from the Guarded Access Menu. As an example, if only three setpoints are programmed, such as -10°F (-23°C), 35°F (1.6°C), and 50°F (10°C), pressing the Up or Down keys when selecting a setpoint will scroll between these three setpoints only. The setpoints available are the same for all zones.

TemperatureWatch™ Display

The TemperatureWatch display will not appear if any Check, Prevent, or Shutdown Alarms are present or if the CargoWatch -15°C Alarm is active. If the TemperatureWatch display is active and any of these alarm conditions occur, the display will return to the Standard Display. If a Shutdown Alarm is present, the display will flash. This provides a quick method to check for units that may have an alarm set.

If a USB Flash Drive or a computer is connected to the unit via a USB Port, a USB Icon will appear in the display.

Main Menu

Figure 22. Main Menu Overview

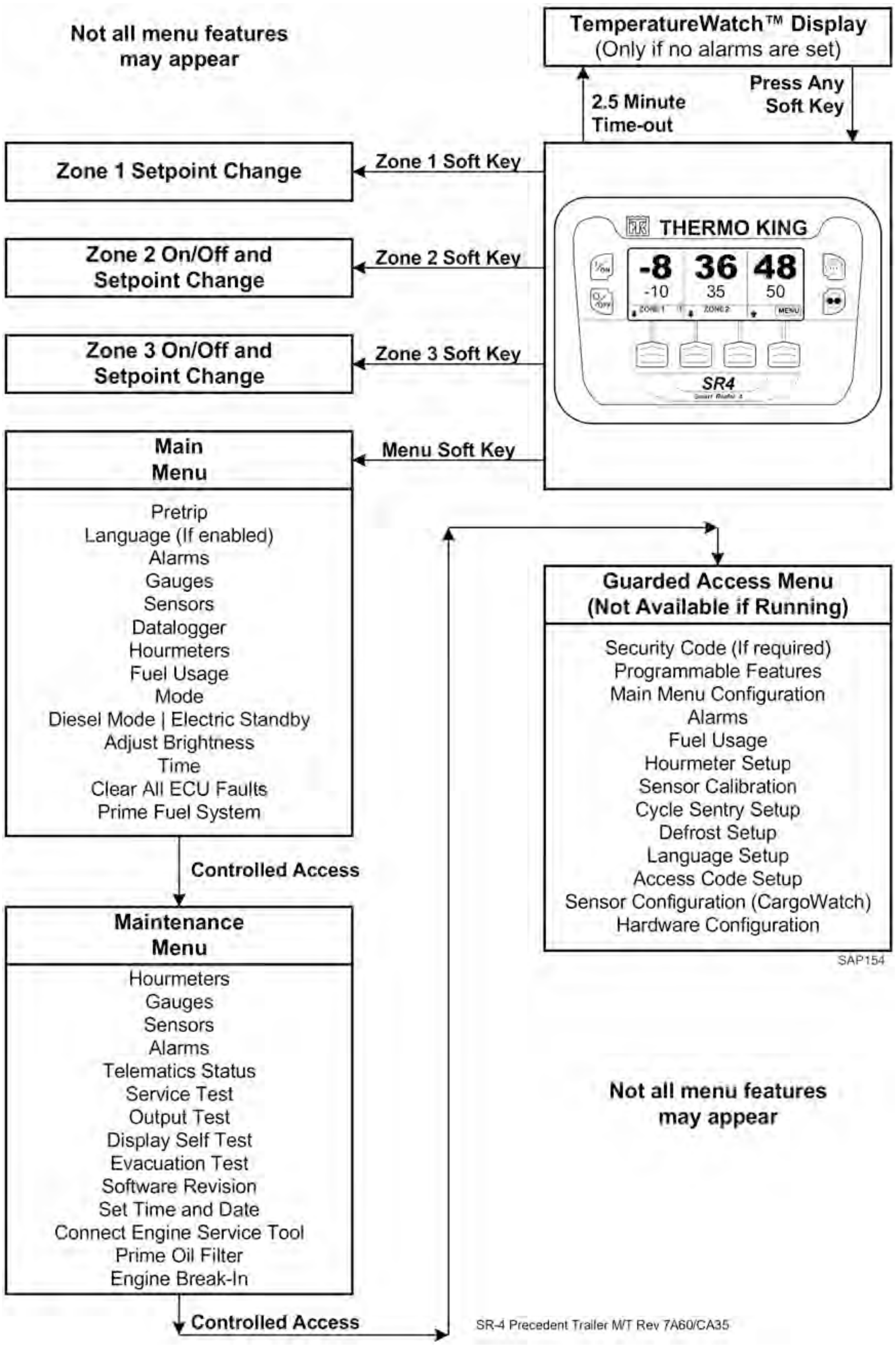


Table 18. Main Menu Features (7A60/CA35)

Main Menu 1 of 3	Main Menu 2 of 3

Pretrip
Full Pretrip if Not Running
Running Pretrip if Running
 	
Language
Select from enabled languages
 	
Alarms
Display all alarms
Clear most alarms
 	
Gauges
Coolant Temperature
Coolant Level
Engine Oil Pressure
Engine Oil Level
Amps
Battery Voltage
Engine RPM
Fuel Level Sensor (if configured)
Discharge Pressure
Suction Pressure
ETV Position (if configured)
I/O (Input/Output State)
    High Speed Relay
    Run Relay
    Run Relay Feedback
    Alternator Excite Output
    Fresh Air Exchange Output (if configured)
    Fresh Air Exchange Feedback (if configured)
    Spare Digital Input 1, 2, 3, 4
    Spare Analog Input 1, 2
    Spare Output 1, 2, 3, 4, 5
    Diesel/Electric Relay
    Electric Ready Input
    Electric Overload
    Condenser Inlet Solenoid
    Receiver Tank Inlet Pressure Solenoid
    Purge Valve
    Liquid Line Solenoid Z1
    Hot Gas Solenoid Z1
    Suction Line Solenoid Z1
    Liquid Line Solenoid Z2
    Hot Gas Solenoid Z2
    Suction Line Solenoid Z2
    Drain Hose Heater Z2
    Fan Output Z2
    Liquid Line Solenoid Z3
    Hot Gas Solenoid Z3
    Suction Line Solenoid Z3
    Drain Hose Heater Z3
    Fan Output Z3
	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
	Spare 1 Temperature
	Spare 2 Temperature
	Spare 3 Temperature
	Humidity Sensor
	Datalogger Sensor 1 Temperature
	Datalogger Sensor 2 Temperature
	Datalogger Sensor 3 Temperature
	Datalogger Sensor 4 Temperature
	Datalogger Sensor 5 Temperature
	Datalogger Sensor 6 Temperature
	Board Temperature Sensor
	
	Datalogger (CargoWatch)
	Start Trip
	Print/View
	    Delivery Ticket
	    Trip Ticket
	
	Hourmeters - View Enabled Hourmeters Only
	Total Controller On Hours
	Total Unit Run Hours
	Total Engine Run Hours
	Total 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
	Eng Timing Belt Accumulated Hours
	
	Not all menu features may appear
	
	7A60/CA35 SR-4 Trailer M\T

Table 19. Main Menu Features (7A60/CA35)

Main Menu 3 of 3

Fuel Usage
Instantaneous Fuel Rate (Gal/Hr)
Trip A Fuel Used (Gal)
Trip A Fuel Used Per Temp Ctrl Hr (Gal/Hr)
Trip A Fuel Used Per Engine Run Hr (Gal/Hr)
Trip B Fuel Used (Gal)
Trip B Fuel Used Per Temp Ctrl Hr (Gal/Hr)
Trip B Fuel Used Per Engine Run Hr (Gal/Hr)
Trip C Fuel Used (Gal)
Trip C Fuel Used Per Temp Ctrl Hr (Gal/Hr)
Trip C Fuel Used Per Engine Run Hr (Gal/Hr)
Lifetime Fuel Used (Gal)
Lifetime Fuel Used In Temp Control (Gal)
 	
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
Open/Close Fresh Air Exchange
Precision Temperature Control Zone
 	
Diesel Mode | Electric Standby (Model 50 Only)
 	
Adjust Brightness
Off - Low - Medium - High
 	
Time (View Only)
Hour/Minute/Day/Date/Month/Year
 	
Clear All ECU Faults
 	
Prime Fuel System
 	
Not all menu features may appear
 	
7A60/CA35 SR-4 Trailer M\T

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.

Pretrip

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 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 motor running, only the running tests are performed. Test results are reported as PASS, CHECK, or FAIL. For additional details, refer to Section 4.

Flash Drive

If a USB Flash Drive is connected to the Control Panel USB Flash Drive Port, this menu item allows the operator to select the desired Flash Drive function.

Important: *The Flash Drive must be properly configured and the desired features must be enabled using the WinTrac Service Tool.*

Using a properly configured and enabled flash drive, the following functions may be available:

- Download the ServiceWatch Data Logger

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

For Flash Drive details, refer to the WinTrac User Guide.

Language

If more than one language is enabled, this menu item allows the operator to select a language from a list of four languages at one time. All subsequent displays are shown in the selected language. Any or all languages may be enabled. English is the default language. 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.*

Note: *Engine Control Unit faults can be cleared from the Main Menu > Clear All ECU Faults Menu. The actual ECU Fault Codes can be viewed and cleared using the applicable engine diagnostic tool. Refer to Section 7 for more information.*

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. Gauges can also be viewed from other menus such as the Service Test Mode and Interface Board Test Mode displays. For additional details, refer to Section 4.

Note: *This menu contains the same information as the Standard Display Gauge Soft Key Menu.*

Sensors

The Sensors Menu allows the operator to display the reading of all unit temperature sensors as well as the calculated temperature differential. CargoWatch Data Logger sensors can also be displayed. For additional details, refer to Section 4.

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

Data Logger

This menu allows the operator to send a Start of Trip marker to the ServiceWatch and CargoWatch Data Loggers. It can also be used to print the contents of the CargoWatch Data Logger.

The unit can also be programmed such that every time the setpoint is changed a Start of Trip Marker is sent to the ServiceWatch and CargoWatch Data Loggers.

ServiceWatch and CargoWatch information can be downloaded and viewed by connecting a computer loaded with the WinTrac Service Tool software.

ServiceWatch and CargoWatch information can also be downloaded by connecting a properly configured and enabled Universal Flash Drive to the USB Flash Drive Port on the unit Control Panel. The Flash Drive is connected to a computer loaded with the WinTrac Service Tool software to save and view the information. For Flash Drive details, refer to the WinTrac User Guide.

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.

Note: *All active hourmeters are available for viewing in the Maintenance Menu.*

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 then the unit runs in Continuous Mode).
- Select temperature displays in either degrees Fahrenheit or degrees Celsius (if enabled).
- Allow Keypad Lockout to be selected (if enabled).
- Start Sleep Mode (if enabled).
- Open or close the optional Fresh Air Exchange vent (if feature is installed and enabled).
- Auto Keypad Lock Time and PIN Number.

Electric Standby (Model 50 units only)

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 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 on board 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.

View 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.

Clear All ECU Fault Codes

Pressing this key will clear all existing ECU Faults. This may allow continued unit operation should an ECU fault code result in engine shutdown. For additional details, refer to Section 4.

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

Fuel Usage

The Precedent platform's electronic engines (TK488CR, TK488CRH, or TKDV6) provide fuel usage (fuel rate, total fuel used) information over J1939 CAN. This information can be used to provide customers with fuel usage values for various scenarios and over specific durations. The Fuel Usage Menu allows the user to monitor fuel usage on up to three separate trips. The Fuel Usage Menus are located under both the Main Menu and Guarded Access Menu.

Prime Fuel System

This function runs the fuel pump for up to five minutes to prime the fuel lines. Fuel priming is always shown on the HMI, but the functionality will only be available if the engine/electric motor is not running.

Maintenance Menu

Table 20. Maintenance Menu Features (7A60/CA35)

Maintenance Menu 1 of 3	Maintenance Menu 2 of 3
Hourmeters - View and Reset Time Total Controller On Hours Total Unit Run Hours Total Engine Run Hours Total 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 Eng Timing Belt Accumulated Hours **Gauges** Coolant Temperature Coolant Level Engine Oil Pressure Engine Oil Level Amps Battery Voltage Engine RPM Fuel Level Sensor (if configured) Discharge Pressure Suction Pressure ETV Position (if configured) Motor RPM Fresh Air Exchange I/O (Input/Output State) High Speed Relay Run Relay Run Relay Feedback Alternator Excite Output Fresh Air Exchange Output (if configured) Fresh Air Exchange Feedback (if configured) Spare Digital Input 1, 2, 3, 4 Spare Analog Input 1, 2 Diesel/Electric Relay Electric Ready Input Electric Overload Spare Output 1, 2, 3, 4, 5 Condenser Inlet Solenoid Receiver Tank Inlet Pressure Solenoid Purge Valve Liquid Line Solenoid Z1 Hot Gas Solenoid Z1 Suction Line Solenoid Z1 Liquid Line Solenoid Z2 Hot Gas Solenoid Z2 Suction Line Solenoid Z2 Drain Hose Heater Z2 Fan Output Z2 Liquid Line Solenoid Z3 Hot Gas Solenoid Z3 Suction Line Solenoid Z3 Drain Hose Heater Z3 Fan Output Z3	**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 Spare 1 Temperature Spare 2 Temperature Spare 3 Temperature Humidity Sensor Datalogger Sensor 1 Temperature Datalogger Sensor 2 Temperature Datalogger Sensor 3 Temperature Datalogger Sensor 4 Temperature Datalogger Sensor 5 Temperature Datalogger Sensor 6 Temperature Board Temperature Sensor **Alarms** Display all alarms Clear most alarms **Telematics Status** Display Status **Service Test Mode** Test with Unit Running? (Yes/No) 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 1 Minimal Heat Zone 1 Condenser Road Fan Zone 1 Condenser Curb Fan Zone 1 Evaporator Fan Low Speed Zone 1 Evaporator Fan High Speed 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 2 Minimal Heat 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 Zone 3 Minimal Heat
Not all menu features may appear	7A60/CA35 SR-4 Trailer M\T

Table 21. Maintenance Menu Features (7A60/CA35)

Maintenance Menu **3 of 3**
Output Test Mode(Order may vary) ECU Keyswitch ECU Run Fresh Air Exchange Mode Evaporator Fan Low Speed Evaporator Fan High Speed Condenser Roadside Condenser Curbside Buzzer Run Relay Indicator Light Diesel/Electric Relay Electric Heat Hot Gas Bypass Zone 1 Liquid Line Solenoid Purge Valve Zone 1 Hot Gas Solenoid Condenser Inlet Solenoid Zone 1 Suction Line Solenoid Alternator Excite Output Receiver Tank Solenoid Remote Fan Motor Zone 2 Output Drain Hose Heater Zone 2 Zone 2 Hot Gas Solenoid Zone 2 Suction Line Solenoid Zone 2 Liquid Line Solenoid Remote Fan Motor Zone 3 Output Drain Hose Heater Zone 3 Zone 3 Hot Gas Solenoid Zone 3 Suction Line Solenoid Zone 3 Liquid Line Solenoid **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 Software Rev Controller Software Rev Supervisor Software Revision **Set Time and Date** Hour Minutes Date Month Year **Engine Break-In** **Connect Engine Service Tool** **Prime Oil Filter** **Not all menu features may appear** 7A60/CA35 SR-4 Trailer M\T

Maintenance Menu Features

The Precedent SR-4 control system features many special technician functions. These functions are available from the Maintenance Menu. A brief explanation of each menu is included here.

For complete details, refer to Section 4 of this manual.

Accessing the Maintenance Menu

The Maintenance Menu is accessible from the Main Menu. From the Standard Display press the MENU Soft Key. The controller will display the Main Menu. From the first Main Menu display press and hold both the EXIT Soft Key and the Soft Key with no label above it (the first and third Soft Keys) for five seconds. After five seconds, the Maintenance Menu will appear.

Hourmeters

The Hourmeters 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, and 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 Output Test Mode displays.

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

Sensors

The Sensors Menu allows the technician to display the reading of all unit temperature sensors as well as the calculated temperature differential. CargoWatch Data Logger sensors can also be displayed.

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

Alarms

The Alarms Menu 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.*

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.

Service Test Mode

The Service Test 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 details.

Output Test Mode

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

Display Self Test

The Display Self Test Menu allows the technician to perform a series of built in tests on the HMI Control Panel.

Evacuation Test

The Evacuation Test Menu 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. 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 displays the software revision of the HMI Control Panel software, Base Controller software, and the Supervisor software.

Set Time and Date

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

Time Zone

The Time Zone Menu allows the time zone to be checked and set as required for the Eastern, Central, Mountain or Pacific Time Zone as specified by the user.

Connect Engine Service Tool

The Connect Engine Service Tool feature allows the unit to be powered down but maintains power to the Engine Control Unit (ECU) for diagnostic purposes. This allows the Peugeot Diagnostic Tool to be connected to the ECU without having the rest of the unit powered up. Refer to Service Procedure A60A for details.

Engine Break-In

Engine Break-In (EBI) Mode allows a user to force the controller to run the engine for a total of six hours, switching the setpoint from high to low as necessary to maintain the required engine loading conditions, with trailer doors closed and regardless of most unit conditions. Refer to (“Engine Break-In,” p. 187) for additional information.

Guarded Access Menu

Table 22. Guarded Access Menu Features (7A60/CA35)

<table>
<tr><th>Guarded Access Menu
1 of 4</th><th>Guarded Access Menu
2 of 4</th></tr>
<tr><td>
Security Code (if enabled)
Enter Access Code

Programmable Features
Temperature Units (F/C)
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)
ECO Mode (Disabled or ECO-Pulldown)
Running Fans in Null (Disabled)
Fresh Frozen Range (15°F/-9°C)
Door Open (Enabled)
Door Open Forces (Log Only)
  Door Open Timeout (HRS:MIN)
  Door Open Timeout Alarm (Enabled)
Sleep Mode After Pretrip (Disabled)
Discharge Pressure Setpoint (415 PSI)
Coolant Temperature Setpoint (210 F)
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)
Number of Limited Setpoint (0)
  Limited Setpoint # 1 (-13°F)
  Limited Setpoint # 2 (32°F)
  Limited Setpoint # 3 (37°F)
  Limited Setpoint # 4 (55°F)
Demand Defrost on Temp Rises (Disabled)
Extended ServiceWatch Logging (Disabled)
Local Auth of Flashload (Disabled) (if REB enabled)
Local Auth of OS+ Upload (Disabled) (if REB enabled)
ServiceWatch Logging Interval (15 Min)
Cond Inlet Sol MOPD Option (Enabled)
Cond Inlet Sol MOPD (200 psi)
Sleep Mode Engine Start Coolant Temp (30°F)
Precision Temperature Control Zone (Off)
Alternate Zone Labels (Disabled)

Main Menu Configuration
Add Keypad Lockout to Mode Menu (Disabled)
Add Sleep to Mode Menu (Disabled)
Show SZC on Mode Menu (Disabled)
Config Soft Key 2 on Std Display (Gauges)
Config Soft Key 3 on Std Display (Sensors)
Add Temperature Units to Mode Menu (Disabled)
Add Precision Temperature Control Zone to Mode Menu (Disabled)
Auto Keypad Lock Time (Disabled)
Auto Keypad Lock PIN Number (No Code)

Alarms
Display all alarms
Clear all alarms except Alarm Code 64
</td><td>
Fuel Usage
Instantaneous Fuel Rate (Gal/Hr)
Trip A Fuel Used (Gal)
Trip A Fuel Used Per Temp Ctrl Hr (Gal/Hr)
Trip A Fuel Used Per Engine Run Hr (Gal/Hr)
Trip B Fuel Used (Gal)
Trip B Fuel Used Per Temp Ctrl Hr (Gal/Hr)
Trip B Fuel Used Per Engine Run Hr (Gal/Hr)
Trip C Fuel Used (Gal)
Trip C Fuel Used Per Temp Ctrl Hr (Gal/Hr)
Trip C Fuel Used Per Engine Run Hr (Gal/Hr)
Lifetime Fuel Used (Gal)
Lifetime Fuel Used In Temp Control (Gal)

Hourmeter Setup
<u>Program Hourmeter</u>
  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)
<u>Viewable Hourmeter Setup</u>
  Total Controller On Hours (Disabled)
  Total Unit Run Hours (Enabled)
  Total Engine Run Hours (Enabled)
  Total 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)
<u>Program Service Due Date</u>
  Engine Run Time Service Due Date
    Date, Month, Year
Eng Timing Belt Accumulated Hours

Sensor Calibration
Zone 1 Return Air Sensor Grade (5H, N5L - 14H)
Zone 1 Discharge Air Sensor Grade (5H, N5L - 14H)
Zone 2 Return Air Sensor Grade (5H, N5L - 14H)
Zone 2 Discharge Air Sensor Grade (5H, N5L - 14H)
Zone 3 Return Air Sensor Grade (5H, N5L - 14H)
Zone 3 Discharge Air Sensor Grade (5H, N5L - 14H)
Spare 1 Sensor Grade (5H, N5L - 14H)
Spare 2 Sensor Grade (5H, N5L - 14H)
Spare 3 Sensor Grade (5H, N5L - 14H)

Not all menu features may appear

7A60/CA35 SR-4 Trailer M\T
</td></tr>
</table>

Table 23. Guarded Access Menu Features (7A60/CA35)

Guarded Access Menu 3 of 4	Guarded Access Menu 4 of 4

Cycle Sentry Setup
Cycle Sentry Amps Level (5)
Battery Sentry Voltage Level (12.2)
Check Battery Condition Alarm (Disabled)
 	
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)
 	
Language Setup
Enable Languages
    English (Enabled)
    Spanish (Disabled)
    French (Disabled)
    Portuguese (Disabled)
 	
Access Code Setup
Enter Access Code
 	
Sensor Configuration (CargoWatch)
SOT on Setpoint (Disabled)
Automatic SOT at Midnight (Disabled)
Logging Interval (15 Minutes)
Log Sensor 1
    Sensor Logging (On)
    Independent Sensor #1 Name (Log Sensor 1)
    Out of Range Checking (Off)
    Italian Option - Available with Sensor 1 only (Off)
    Sensor Averaging (Off)
Log Sensor 2
    Sensor Logging (On)
    Independent Sensor #1 Name (Log Sensor 2)
    Out of Range Checking (Off)
    Sensor Averaging (Off)
Log Sensor 3 - Same as Sensor 2
Log Sensor 4 - Same as Sensor 2
Log Sensor 5 - Same as Sensor 2
Log Sensor 6 - Same as Sensor 2
Digital In 1
    Door Open Logging (On)
    Digital Input #1 Name (Digital Input #1)
Digital In 2 - Same as Digital Input 1
Digital In 3 - Same as Digital Input 1
Countdown Timer (Off)
Conservative Log Count (Off)
	Hardware Configuration
	Unit Model (S-600M, S-600DE, C-600M, S-610M, or S-610DE)
	High Capacity Unit (No)
	How Many Zones in This Unit? (2 or 3)
	Zone 2 Evap Fans Configuration (3 Fans)
	Zone 3 Evap Fans Configuration (3 Fans)
	Engine Type (TK-DV6-NR, TK486V25L1, TK488CR1)
	Compressor Type (Recip)
	ETV Configured (Yes)
	Charger Configuration (37 Amp Alternator, 65 Amp Alternator, 120 Amp Alternator, 30 Amp Battery Charger, or 120 Amp Battery Charger)
	Electric Standby Equipped? (Yes)
	Electric Motor Type (12 HP or 15-19 HP)
	Electric Heat Option (Yes)
	Diesel to Electric Autoswitch Enabled? (No)
	Electric to Diesel Autoswitch Enabled? (No)
	Electric Service Amperage (30 Amp or 50 Amp)
	Humidity Sensor (No)
	Fuel Sensor Type (None)
	Low Fuel Shutdown (Disabled)
	Fuel Heater (No)
	Rear Remote Control (None)
	    Rear Remote Control Action (Stand By)
	3rd Party Device Control (None)
	Telematics Type Configured (None)
	    Telematics Door Switch (Disabled)
	    Telematics Fuel Sensor Type (None)
	Fresh Air Exchange Configured (No)
	Supplemental Alternator (None, 65 Amp, 120 Amp)
	CargoLink (No)
	Engine Timing Belt Expiration Actn (Disabled, Check Alarm, Shutdown Alrm-Clear in Drv Menu, Shutdown Alrm-Clear in GA)
	Low Voltage Module Connected (No)
	
	Not all menu features may appear
	
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Guarded Access Menu Features

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

<u>**For complete details, refer to Section 4 of this manual**</u>.

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.

Entering the Guarded Access Menu

The unit must be turned on but not running. If the unit is running do one of the following:

- If the unit is running, turn the unit Off and back On. Before the unit starts, enter the Guarded Access Menu starting at Step 1 below.
- If the unit is running, enter the Maintenance Menu. Scroll to and enter Output Test Mode. When Output Test Mode is entered, the unit will shut down. Exit Output Test Mode and scroll to the Maintenance Menu > Time Zone Menu. Before the unit starts, enter the Guarded Access Menu starting at Step 4 below.

1. From the Standard Display, press the MENU Soft Key. The controller will display the Main Menu.
2. From the first Main Menu display, press and hold both the EXIT Soft Key and the Soft Key with no label above it (the first and third Soft Keys) for five seconds. After five seconds, the controller will display the Maintenance Menu.
3. From the Maintenance Menu, press the DOWN Soft Key until the last selection appears.
4. From the last selection, press and hold both the EXIT Soft Key and the Soft Key with no label above it (the first and last Soft Keys) for five seconds.
5. After five seconds, the controller will display either a Security Code challenge or the Guarded Access Menu. 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	CA00 and later
HMI Rev	7A20 and later
Choices	FAHRENHEIT or CELSIUS
Factory Set	FAHRENHEIT
Exceptions	The setting selected is used for all ranges.
Description	The controller can be set to display temperatures in either degrees FAHRENHEIT or degrees CELSIUS.

Pressure Units

Control Rev	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED, DISABLED, or CONTINUOUS
Factory Set	ENABLED
Exceptions	Use the CONTINUOUS option for rail applications only.
Description	Standard restart alarms become permanent shutdown alarms after several attempts to start and run. The CONTINUOUS feature is designed for rail applications where the unit runs unattended or is inaccessible for service. It allows unlimited restart attempts to be made if the following restart alarms occur: • Alarm Code 10 High Discharge Pressure • Alarm Code 18 High Engine Coolant Temp • Alarm Code 63 Engine Stopped • Alarm Code 82 High Compressor Temp If restarts are disabled, the unit will shut down on the first alarm event. The following differences exist between a Standard Restart and a Continuous Restart alarm: • Standard Restart alarms force a permanent shutdown if the alarm occurs a pre-determined number of times (usually three). Continuous Restart alarms allow an unlimited number of restarts for the four alarm codes listed above. • Standard Restart alarms typically use a 15 minute timer before a restart is allowed. Continuous Restart alarms use a 1-hour timer before a restart is allowed. • With Continuous Restart alarms ETV Head Pressure Setpoint is lowered based on the alarm type and number of occurrences.

Setpoint High Limit (for the indicated Zone)

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	Maximum is 90°F (32°C), Minimum is Setpoint Low Limit
Factory Set	80°F (27°C)
Exceptions	The Setpoint High Limit setting selected is used for all ranges in the indicated zone.
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. If the Limited Setpoint feature is enabled, this setting is not used. This setting is zone specific.

Setpoint Low Limit (for the indicated Zone)

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	Minimum is -25°F (-32°C), Maximum is Setpoint High Limit
Factory Set	-20°F (-29°C)
Exceptions	The Setpoint Low Limit setting selected is used for all ranges in the indicated zone.
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. If the Limited Setpoint feature is enabled, this setting is not used. This setting is zone specific.

Eco Mode

Control Rev	CA25 and later
HMI Rev	7A50 and later
Choices	DISABLED or ECO-PULLDOWN
Factory Set	DISABLED ***Note:*** *Introduced in CA06, factory set was Enabled. CA25 changed factory set to Disabled.*
Exceptions	
Description	This feature locks out high speed engine operation during pulldown and is indicated by an HMI icon. Eco-Pulldown should be disabled for engine break-in and enabled when break-in is complete. The default setting is Disabled. High speed is locked out when Eco Mode is active until return air temperature in any zone drops to less than 30°F (-1.1°C). The unit will exit Eco Mode when: • Ambient temperature is greater than 110°F (43°C), or • Any zone requests high speed heat, or • Return air temperature in any zone does not fall 1.5°F or 0.83°C ΔT in eight minutes, or • The ambient temperature sensor is failed, or • Return air temperature in any zone falls below the ECO Pulldown exit temperature for that particular model ECO Pulldown Exit Temperatures: • All Units = 30°F (-1.1°C) ***Note:*** *For additional information, refer to Service Bulletin SB613.*

Running Fans in Null

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	On or Off
Factory Set	Off
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	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED

Factory Set	ENABLED
Exceptions	
Description	This feature allows the Door Open function to be enabled or disabled.

Door Open Forces

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	UNIT NULL, ZONE NULL, or LOG ONLY
Factory Set	LOG ONLY
Exceptions	
Description	This feature allows the Door Open action to be set. The setting applies to all zones fitted with door switches. If this feature is set UNIT NULL the Base Controller shuts the unit down and logs the door opening four seconds after the door is opened. If the any zone is in defrost when the door is opened, the defrost cycle will be completed before the unit shuts down. If this feature is set to ZONE NULL the Base Controller shuts the zone down and logs the door opening four seconds after the door is opened. The unit will remain running if any other zone requires cooling or heating. If the zone is in defrost when the door is opened, the defrost cycle will be completed before the zone shuts down. If all zone door switch inputs are open, the unit will be forced to NULL. If this feature is set LOG ONLY the door opening will be logged after four seconds but the unit will continue to run. Door openings are logged in both the CargoWatch 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	CA00 and later
HMI Rev	7A20 and later
Choices	1:00 to 4:00 (Hours) in 10 Min Increments or OFF
Factory Set	OFF
Exceptions	Only appears if the DOOR OPEN FORCES feature is set to ZONE NULL or UNIT NULL.
Description	This feature allows the unit to restart if the door open time exceeds the set limit. Door Open Timeout for the selected range 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 or in zone null until the door is closed. If a time period is selected the unit will restart and run after the time period elapses. It will continue to run even if the door is still open.

Door Timeout Alarm

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	Only appears if the DOOR OPEN FORCES feature is set to UNIT NULL.
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.

Sleep Mode After Pretrip

Control Rev	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 and later
Choices	380 to 440 PSIG
Factory Set	415 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.

Coolant Temperature Setpoint

Control Rev	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	Does not appear unless rail is disabled and restarts are enabled.
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 Comp Discharge Temp 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 DISABLED will allow the above alarms to be cleared conventionally an unlimited number of times.

Remote Device

Control Rev	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 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. The setting of this feature should not be changed.

HMI Control Panel COM 2 Default Baud Rate

Control Rev	CA00 and later
HMI Rev	7A20 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. COM port 2 is used by the CargoWatch printer. The printer baud rate must be set to match the baud rate setting of the Com 2 port. ***Note:*** *If fleets have units with different control systems and are equipped with Telematics, the baud rate must be set for the slowest application to allow printers to print from all units without having to change the printer baud rate.*

HMI Control Panel COM 3 Default Baud Rate

Control Rev	CA00 and later
HMI Rev	7A20 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.

Number of Limited Setpoints (1-4 available)

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	0, 1, 2, 3, or 4
Factory Set	Limited Setpoint #1: -13°F (-25°C) Limited Setpoint #2: 32°F (0°C) Limited Setpoint #3: 37°F (3°C) Limited Setpoint #4: 55°F (13°C)

Exceptions	
Description	This feature allows programming of a limited number of predetermined setpoints to be made available to the driver. From 1 to 4 setpoints can be programmed. Setting this feature to [0] results in normal operation with all setpoints available from the setting of Setpoint Low Limit to Setpoint High Limit. As an example, if this feature is set to [3] then only three setpoints can be programmed. If the Limited Setpoints are set to -10°F, 35°F and 50°F then pressing the Up or Down keys when selecting a setpoint will scroll between these three setpoints only. No other setpoints are available. This feature is not zone specific. The Limited Setpoints selected are available in all zones.

Demand Defrost on Temperature Rise Limit

Control Rev	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 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.

High Temperature Defrost

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	This feature changes the defrost allowed temperature and defrost termination temperature. It should only be used when specified by the customer. If High Temperature Defrost is enabled, a defrost cycle is allowed with an evaporator coil temperature less than or equal to 55°F (13°C) and terminates at 70°F (21°C). ***Important:*** *Unlike the Rail Alternate feature, the Low Fuel Shutdown feature is available when High Temperature Defrost is set ENABLED and a float or solid state fuel level sensor is installed.*

Local Authorization of Flashload

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED

Exceptions	Telematics type configured.
Description	This feature determines if an over the air flashload requires authorization from the HMI Control Panel. If this feature is set ENABLED, an authorization request will be shown on the HMI and must be approved before the flashload can proceed. If this feature is set DISABLED, no local authorization is required to perform a flashload.

ServiceWatch™ Logging Intervals

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	1 Minute, 2 Minutes, 5 Minutes, 10 Minutes, 15 Minutes, 30 Minutes, 1 Hour, 2 Hours, or 4 Hours
Factory Set	1 Minute
Exceptions	
Description	This feature allows the logging interval of the ServiceWatch Data Logger to be set from 1 minute to 4 hours as shown above.

Condenser Inlet Solenoid Maximum Operating Pressure Differential (MOPD) Option

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED
Factory Set	ENABLED
Exceptions	Applies only to Multi-Temp units with MOPD ENABLED.
Description	This feature allows the user to select if preventive action will be taken if the Condenser Inlet Solenoid fails to open. If this feature is set ENABLED, preventive actions will be taken based on the description and pressure shown below. If the feature is set DISABLED, no preventive actions are taken.

Condenser Inlet Solenoid Maximum Operating Pressure Differential (MOPD)

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	100 PSIG, 200 PSIG, 300 PSIG, 400 PSIG
Factory Set	200 PSIG
Exceptions	Applies only to Multi-Temp units with MOPD ENABLED.
Description	This feature allows the user to select the Condenser Inlet Solenoid pressure differential value that will cause a preventive action to be taken should the solenoid fail to open. If the Condenser Inlet Solenoid MOPD option is enabled and the calculated Condenser Inlet Solenoid discharge pressure exceeds the value selected by this feature, the Zone 1 (Host) Hot Gas Solenoid will be energized for five seconds to reduce the discharge pressure. At the end of the five second interval, the Zone 1 Hot Gas Solenoid will be de-energized if there are no other requirements that require it to be energized.

Sleep Mode Engine Start Coolant Temperature

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	-40°F, 0°F, 10°F, 20°F, <u>30°F</u>
Factory Set	30°F
Exceptions	This feature functions in Sleep Mode only.
Description	This feature allows the user to select the coolant temperature that will force an engine start to warm the engine when the unit is in Sleep Mode. This feature is used to reduce the number of engine starts while the unit is in Sleep Mode. Exercise care when changing this setting.

Precision Temp Control (PTC)

Control Rev	CA20 and later
HMI Rev	7A45 and later
Choices	OFF, ZONE 2, ZONE 3
Factory Set	OFF
Exceptions	PTC is only allowed in one remote zone and only for fresh setpoints.
Description	When enabled, Precision Temperature Control (PTC) pulses the Liquid Line Solenoid (LLS) in the selected zone as necessary to control the cooling capacity for more precise temperature control.

Alternate Zone Labels

Control Rev	CA25 and later
HMI Rev	7A50 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	Unit Model = S-600DE or S-610DE
Description	When enabled, this feature changes the zone labels in the Standard Display and the Temperature Watch screen as follows: • ZONE 1 = ROADSIDE • ZONE 2 = CURBSIDE • ZONE 3 (if used) = REAR

Main Menu Configuration Menu

The Main Menu Configuration Menu determines which features will appear 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. The default settings for all features except Cycle Sentry/Continuous are set DISABLED.

The Main Menu Configuration Menu also allows the function of the 2nd and 3rd Standard Display Soft Keys to be reassigned as desired by the customer.

Add Keypad Lockout to Mode Menu

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	When enabled, Keypad Lockout allows the operator to lock the keypad to prevent tampering. Pressing any soft key for five seconds will unlock the keypad. Setting this feature Enabled adds the Keypad Lockout feature to the Mode Menu. Setting this feature Disabled turns the Keypad Lockout feature off and removes the feature from the Mode Menu.

Add Sleep to Mode Menu

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED

Exceptions	
Description	When enabled, Sleep Mode allows the operator to place the unit in Sleep Mode from the Mode Menu. Setting this feature Enabled adds the Sleep Mode feature to the Mode Menu. Setting this feature Disabled removes the Sleep Mode feature from the Mode Menu.

Show Single Zone Control on Mode Menu

Control Rev	CA00 and later
HMI Rev	7A20 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 trailer 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 trailer 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.

Configure Soft Key 2 on Standard Display

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	Sensors, <u>Gauges</u>, Pretrip, Datalogger, SOT, Hourmeters, Sleep
Factory Set	Gauges
Exceptions	For Single Temp Applications or Multi-Temp Applications Operating in Single Zone Control Only. With Multi-Temperature applications, this soft key controls Zone 2 On/Off and Setpoint Change and cannot be reassigned.
Description	This feature allows the function of the 2nd HMI Control Panel Soft Key to be assigned as desired by the end user. The Gauge function remains available in the Main Menu and Maintenance Menu in the same manner as before. The optional selections work in the same manner as if they had been selected from the Main Menu.

Configure Soft Key 3 on Standard Display

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	<u>Sensors</u>, Gauges, Pretrip, Datalogger, SOT, Hourmeters, Sleep
Factory Set	Sensors
Exceptions	For Single Temp Applications or Multi-Temp Applications Operating in Single Zone Control Only. With Multi-Temperature applications this soft key controls Zone 3 On/Off and Setpoint Change and cannot be reassigned.
Description	This feature allows the function of the 3rd HMI Control Panel Soft Key to be assigned as desired by the end user. The Sensors function remains available in the Main Menu and Maintenance Menu in the same manner as before. The optional selections work in the same manner as if they had been selected from the Main Menu.

Add Temperature Units to Mode Menu

Control Rev	CA00 and later
HMI Rev	7A20 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.

Add Precision Temp Control Zone to Mode Menu

Control Rev	CA20 and later
HMI Rev	7A45 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	When Enabled, the Precision Temp Control Zone selection will appear in the Mode Menu. This allows the user to access the Precision Temp Control Zone Menu through the Mode Menu in addition to accessing it though the Guarded Access > Programmable Features Menu.

Auto Keypad Lock Time

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	DISABLED, 3 Minutes, 5 Minutes, 10 Minutes
Factory Set	DISABLED
Exceptions	
Description	If ENABLED, this feature will automatically lock the HMI Keypad after a user selectable 3, 5 or 10 minute interval during which no HMI Key has been pressed. If this feature is DISABLED, the HMI Keypad will not be locked.

Auto Keypad Lock PIN Num

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	NO CODE, 1 - 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 1-99999 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.

Fuel Usage Menu

The Fuel Usage Menu allows the user to monitor fuel usage on up to three separate trips. The Fuel Usage Menus are located under both the Main Menu and Guarded Access Menu.

The Trip A, Trip B, and Trip C Fuel Usage Counters will show Fuel Used in gallons for that trip, Fuel Used per Temperature Control Hour in gallons/hour, and Fuel Used per Engine Run Hour in gallons/hour. Each of the counters can be reset to zero from the Main Menu to start a new trip.

In addition, the current Instantaneous Fuel Rate in gallons/hour, Lifetime Fuel Used in gallons, and Lifetime Fuel Used in Temperature Control in gallons is shown. The Instantaneous Fuel Rate displays real time fuel usage and cannot be reset or logged. The Lifetime Fuel Used and Lifetime Fuel Used in Temperature Control counters can be reset from the Guarded Access Menu.

- A Service Modification will be made available to reset the two lifetime fuel counters if a Base Controller is replaced. The current readings for Lifetime Fuel Used and Lifetime Fuel Used in Temperature Control counters from the original Base Controller must be supplied to the Minneapolis Service Department in order to create the Service Modification.
- The ServiceWatch Data Logger will display fuel quantities only, not fuel usage rate. Fuel quantity is logged by the ServiceWatch Data Logger when the Trip Counter is reset.

Instantaneous Fuel Rate

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	Information Only
Factory Set	None
Exceptions	Only available with Thermo King Electronic Engines (TK488CR or TKDV6)
Description	This feature displays the current instantaneous rate of fuel being consumed in real time. The amount of fuel currently being used is shown in full US gallons and tenths of a US gallon per hour. This information cannot be reset or changed and is not logged by the ServiceWatch Data Logger.

Trip A/B/C Fuel Used (Gallons)

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	Information Only
Factory Set	None
Exceptions	Only available with Thermo King Electronic Engines (TK488CR or TKDV6)
Description	This feature displays the total amount of fuel used since this trip counter was reset by pressing the RESET Soft Key. This feature includes all diesel engine run time for cooling, heating, defrosting, charging the battery, and maintaining the engine temperature. The data is logged in the ServiceWatch Data Logger when the Trip Counter is reset.

Trip A/B/C Fuel Used Per Temperature Control Hour (Gallons per Hour)

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	Information Only
Factory Set	None
Exceptions	Only available with Thermo King Electronic Engines (TK488CR or TKDV6)
Description	This feature displays the total amount of fuel used per hour for temperature control only since this trip counter was reset by pressing the RESET Soft Key. This feature includes all diesel engine run time for cooling, heating defrosting, charging the battery, and maintaining the engine temperature. The data is logged in the ServiceWatch Data Logger when the Trip Counter is reset.

Trip A/B/C Fuel Used Per Engine Run Hour (Gallons per Hour)

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	Information Only

Factory Set	None
Exceptions	Only available with Thermo King Electronic Engines (TK488CR or TKDV6)
Description	This feature displays the total amount of fuel used per hour when the engine is running since this trip counter was reset by pressing the RESET Soft Key. This feature includes all diesel engine run time for cooling, heating defrosting, charging the battery, and maintaining the engine temperature. The data is logged in the ServiceWatch Data Logger when the Trip Counter is reset.

Lifetime Fuel Used (Gallons)

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	Information Only
Factory Set	None
Exceptions	Only available with Thermo King Electronic Engines (TK488CR or TKDV6)
Description	This feature displays the total amount of fuel used since the unit was placed in service including Pretrip Tests and Service Test Mode operation.

Lifetime Fuel Used In Temperature Control (Gallons)

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	Information Only
Factory Set	None
Exceptions	Only available with Thermo King Electronic Engines (TK488CR or TKDV6)
Description	This feature displays the total amount of fuel used for temperature control since the unit was placed in service. This feature includes all diesel engine run time for cooling, heating, and defrosting.

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	CA00 and later
HMI Rev	7A20 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded then 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 then 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	CA00 and later
HMI Rev	7A20 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded then 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 then 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	CA00 and later
HMI Rev	7A20 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded then 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 then 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	CA00 and later
HMI Rev	7A20 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded then Alarm Code 64 will be set as a stored alarm.
Description	Controller Power On Hours is the total amount of time since the last Pretrip Test was performed. If a time limit is set and exceeded then 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	CA00 and later
HMI Rev	7A20 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded then 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 then 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	CA00 and later
HMI Rev	7A20 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded then 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 then 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	CA00 and later
HMI Rev	7A20 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded then 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 then 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	CA00 and later
HMI Rev	7A20 and later
Choices	OFF, 1 to 99,999
Factory Set	OFF
Exceptions	If a time limit is set and exceeded then 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 then 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.

Controller On Hours

Control Rev	CA00 and later
HMI Rev	7A20 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 Unit Run Hours (If Model 50)

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED
Factory Set	ENABLED if Electric Standby Option is installed
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	CA00 and later
HMI Rev	7A20 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.

Total Electric Run Hours (If Model 50)

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED
Factory Set	ENABLED if Electric Standby Option is installed

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.

Total Zone 1 Run Hours

Control Rev	CA00 and later
HMI Rev	7A20 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.

Total Zone 2 Run Hours

Control Rev	CA00 and later
HMI Rev	7A20 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.

Total Zone 3 Run Hours

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED
Factory Set	Disabled
Exceptions	
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	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 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 Power On Reminder Hours

Control Rev	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 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	CA00 and later
HMI Rev	7A20 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.

Important: *Sensor grades cannot be set using OptiSet Plus.*

Note: To verify proper operation, the grades must be properly set to match the actual sensor grades to prevent false alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is to physically check the sensor grade printed on each graded sensor.

Note: Spare Sensor 1 is also a graded sensor but an alarm code is not set if this sensor grade is set to 5H.

Zone 1 Return Air Sensor Grade

Control Rev	CA15 and earlier
HMI Rev	7A40 and earlier
Choices	1L - 9H, N5L - 14H
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 stamped 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 occur. Alarm Code 92 is not set if a Spare Sensor is set to 5H. To verify proper operation, the grades must be properly set to match the actual sensor grades. Failure to do so may result in false alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is to physically check the sensor grade printed on each graded sensor.

Zone 1 Discharge Air Sensor Grade

Control Rev	CA15 and earlier
HMI Rev	7A40 and earlier
Choices	1L - 9H, N5L - 14H
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 stamped 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 occur. Alarm Code 92 is not set if a Spare Sensor is set to 5H. To verify proper operation, the grades must be properly set to match the actual sensor grades. Failure to do so may result in false alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is to physically check the sensor grade printed on each graded sensor.

Zone 2 Return Air Sensor Grade

Control Rev	CA15 and earlier
HMI Rev	7A40 and earlier
Choices	1L - 9H, N5L - 14H
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 stamped 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 occur. Alarm Code 92 is not set if a Spare Sensor is set to 5H. To verify proper operation, the grades must be properly set to match the actual sensor grades. Failure to do so may result in false alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is to physically check the sensor grade printed on each graded sensor.

Zone 2 Discharge Air Sensor Grade

Control Rev	CA15 and earlier
HMI Rev	7A40 and earlier
Choices	1L - 9H, N5L - 14H
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 stamped 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 occur. Alarm Code 92 is not set if a Spare Sensor is set to 5H. To verify proper operation, the grades must be properly set to match the actual sensor grades. Failure to do so may result in false alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is to physically check the sensor grade printed on each graded sensor.

Zone 3 Return Air Sensor Grade

Control Rev	CA15 and earlier
HMI Rev	7A40 and earlier
Choices	1L - 9H, N5L - 14H
Factory Set	5H
Exceptions	Only appears if the unit is configured as being equipped with 3 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 stamped 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 occur. Alarm Code 92 is not set if a Spare Sensor is set to 5H. To verify proper operation, the grades must be properly set to match the actual sensor grades. Failure to do so may result in false alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is to physically check the sensor grade printed on each graded sensor.

Zone 3 Discharge Air Sensor Grade

Control Rev	CA15 and earlier
HMI Rev	7A40 and earlier
Choices	1L - 9H, N5L - 14H
Factory Set	5H
Exceptions	Only appears if the unit is configured as being equipped with 3 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 stamped 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 occur. Alarm Code 92 is not set if a Spare Sensor is set to 5H. To verify proper operation, the grades must be properly set to match the actual sensor grades. Failure to do so may result in false alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is to physically check the sensor grade printed on each graded sensor.

Spare 1 Sensor Grade

Control Rev	CA15 and earlier
HMI Rev	7A40 and earlier
Choices	1L - 9H, N5L - 14H
Factory Set	5H

Exceptions	If the optional Spare 1 Sensor is not present this feature need not be set.
Description	This feature is used to set the sensor grade for the Spare 1 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 stamped 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 occur. Alarm Code 92 is not set if a Spare Sensor is set to 5H. To verify proper operation, the grades must be properly set to match the actual sensor grades. Failure to do so may result in false alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is to physically check the sensor grade printed on each graded sensor.

Spare 2 Sensor Grade

Control Rev	CA15 and earlier
HMI Rev	7A40 and earlier
Choices	1L - 9H, N5L - 14H
Factory Set	5H
Exceptions	If the optional Spare 2 Sensor is not present this feature need not be set.
Description	This feature is used to set the sensor grade for the Spare 2 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 stamped 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 occur. Alarm Code 92 is not set if a Spare Sensor is set to 5H. To verify proper operation, the grades must be properly set to match the actual sensor grades. Failure to do so may result in false alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is to physically check the sensor grade printed on each graded sensor.

Spare 3 Sensor Grade

Control Rev	CA15 and earlier
HMI Rev	7A40 and earlier
Choices	1L - 9H, N5L - 14H
Factory Set	5H
Exceptions	If the optional Spare 3 Sensor is not present this feature need not be set.
Description	This feature is used to set the sensor grade for the Spare 3 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 stamped 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 occur. Alarm Code 92 is not set if a Spare Sensor is set to 5H. To verify proper operation, the grades must be properly set to match the actual sensor grades. Failure to do so may result in false alarm codes. Exercise care to properly identify the sensor grades. The best way to positively identify the sensor grade is to physically check 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	CA00 and later
HMI Rev	7A20 and later
Choices	2A to 8A in 1A increments
Factory Set	8A
Exceptions	
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	CA00 and later
HMI Rev	7A20 and later
Choices	11.8V to 12.6V in 0.1V increments
Factory Set	12.2V
Exceptions	
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.

Check Battery Condition Alarm

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	If Check Battery Condition Alarm is ENABLED, Alarm Code 159 Check Battery Condition will be set if indications exist that the battery may be about to fail. If this feature is set DISABLED, the battery condition check will be disabled and Alarm Code 159 Check Battery Condition will not be set.

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) or less to allow defrost. Defrost cycles will terminate at 58°F (14° C) .
- If High Temperature Defrost is enabled, a defrost cycle is allowed with an evaporator coil temperature less than or equal to 55°F (13°C) and terminates at 70°F (21°C).

Defrost Interval In Range with Fresh Setpoint

Control Rev	CA00 and later
HMI Rev	7A20 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. This setting applies to all zones.

Defrost Interval Not In Range with Fresh Setpoint

Control Rev	CA00 and later
HMI Rev	7A20 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. This setting applies to all zones.

Defrost Interval In Range with Frozen Setpoint

Control Rev	CA00 and later
HMI Rev	7A20 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. This setting applies to all zones.

Defrost Interval Not In Range with Frozen Setpoint

Control Rev	CA00 and later
HMI Rev	7A20 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 not in range. This setting applies to all zones.

Maximum Defrost Duration

Control Rev	CA00 and later
HMI Rev	7A20 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 58°F (14°C). If the evaporator temperature does not reach this temperature, the defrost cycle will terminate after the elapsed time selected here.

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. Any or all languages (English, Spanish, French, and Portuguese) can be enabled. The default language is English and is always enabled.

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	CA00 and later
HMI Rev	7A20 and later
Choices	English, Spanish, French, and Portuguese
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 then the Language Selection Menu will not appear on startup or 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

The + and – keys are used to enter the desired Access Code. When the desired Access Code is displayed, the Enter Key is pressed to load the code. The code should be recorded for future use.

If OptiSet Plus is active, this feature is set using the WinTrac Service Tool.

Sensor Configuration Menu - CargoWatch™ Data Logger

The CargoWatch Data Logger is internal to the HMI Control Panel. This Data Logger conforms to European standard EN12830. The data logger supports up to six temperature sensors and three digital inputs. These sensors are optional sensors and are not the same as the temperature sensors used to control the unit. The CargoWatch Data Logger features the ability to customize logging parameters and enable product temperature checking. The CargoWatch Data Logger does not record unit sensors. Unit sensors and other unit operating data are recorded by the ServiceWatch™ Data Logger. The CargoWatch logger records the unit setpoint, operating mode, and shutdown alarms.

When shipped from the factory, CargoWatch sensors 1 and 2 are turned on to be logged and CargoWatch sensors 3 through 6 are turned off. Also, digital input 1 is turned on to be logged and digital inputs 2 and 3 are turned off. Sensors and digital inputs can be turned on, off, and configured using the CargoWatch menu in Guarded Access or by using the WinTrac Service Tool.

Sensor Configuration (CargoWatch)
- SOT on Setpoint (Disabled)
- Automatic SOT at Midnight (Disabled)
- Logging Interval (15 Minutes)
- Log Sensor 1
  - Sensor Logging (On)
  - Independent Sensor #1 Name (Log Sensor 1)
  - Out of Range Checking (Off)
  - Italian Option - Available with Sensor 1 only (Off)
  - Sensor Averaging (Off)
- Log Sensor 2
  - Sensor Logging (On)
  - Independent Sensor #1 Name (Log Sensor 2)
  - Out of Range Checking (Off)
  - Sensor Averaging (Off)
- Log Sensor 3 - Same as Sensor 2
- Log Sensor 4 - Same as Sensor 2
- Log Sensor 5 - Same as Sensor 2
- Log Sensor 6 - Same as Sensor 2
- Digital In 1
  - Door Open Logging (On)
  - Digital Input #1 Name (Digital Input 1)
- Digital In 2 - Same as Digital Input 1
- Digital In 3 - Same as Digital Input 1
- Countdown Timer (Off)
- Conservative Log Count (Off)

CargoWatch Sensor Programming

Logging Interval

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	1 minute, 2 minutes and 5 to 60 minutes in 5-minute intervals
Factory Set	15 Minutes

Exceptions	WinTrac is capable of setting additional intervals as short as one minute.
Description	This feature allows the desired logging interval to be set.

Log Sensor for CargoWatch sensor 1, 2, 3, 4, 5, or 6

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ON or OFF
Factory Set	Sensors 1-2 ON, sensors 3-6 OFF
Exceptions	
Description	This feature allows the desired sensors to be logged.

Independent Sensor Name for CargoWatch sensor 1, 2, 3, 4, 5, or 6

Control Rev	CA00 and later	
HMI Rev	7A20 and later	
Choices	See below	
Factory Set	Log Sensor 1 through 6	
Exceptions		
Description	This feature allows the desired sensor name to be specified. These names appear only on handheld printer reports. This aids in reading and understanding data logger printer reports.	
Choices	Log Sensor 1, 2, 3, 4, 5 or 6 Spare Ambient Ambient Spare Dry Spare Chilled Spare Frozen Spare Fresh Dry Chilled Fresh Spare Left Side Spare Right Side Spare Side Spare Rear Spare Front Left Side Right Side Side Rear Front	Other Spare Other Spare Spare USDA 1, 2 or 3 USDA 1, 2 or 3 Other Spare Discharge Air Spare Discharge Air Zone 1, 2 or 3 Spare Discharge Air Other Spare Return Air Spare Return Air Zone 1, 2 or 3 Spare Return Air Other Discharge Air Discharge Air Zone 1, 2 or 3 Discharge Air Other Return Air Return Air Zone 1, 2 or 3 Return Air Frozen Independent Sensor 1, 2, 3, 4, 5 or 6

Out of Range Checking (for current sensor)

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ON or OFF
Factory Set	ON
Exceptions	
Description	This feature allows the Out of Range Checking feature to be turned on or off. If Out of Range Checking is turned on, an alarm will be set if the temperature, as sensed by the specified sensor, is above or below setpoint by more than the number of degrees determined by the setting of LOW and HIGH programmable features. The out of range condition must exist for 1 hour before the alarm is set. A visual notification will be provided to the driver on the standard display, as shown below.

Low

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	From -1.0° to -20.0° in 0.1 degree increments, in either Fahrenheit or Celsius.
Factory Set	-10.8°F (-6.0°C)
Exceptions	
Description	This feature allows the low limit for Out of Range Checking to be set.

High

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	From 1.0° to 20.0° in 0.1 degree increments, in either Fahrenheit or Celsius.
Factory Set	10.8°F (6.0°C)
Exceptions	
Description	This feature allows the high limit for Out of Range Checking to be set.

Italian Option

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ON or OFF
Factory Set	OFF
Exceptions	This feature is available with Sensor 1 only.
Description	If this feature is turned ON, the driver is presented a visual “Out of Range Limit” notification and flashes the backlight if the box temperature rises above -15°C (5°F). The visual notification appears on the Standard Display as shown below.

Sensor Averaging

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ON or OFF
Factory Set	OFF
Exceptions	
Description	If this feature is turned OFF, the temperature logged will be the actual instantaneous sensor reading at the time of log. If this feature is turned ON, the sensor is read once each minute. The sensor readings are averaged dependant on the setting of the Logging Interval feature selected above. For example, if the Logging Interval is 15 minutes the previous 15 sensor readings are averaged and logged instead of the actual instantaneous value. If the Logging Interval is set for 10 minutes, the previous 10 sensor readings are averaged and logged.

Digital Input Programming

The digital inputs are used to log the door switch status.

Digital In for CargoWatch digital input 1, 2, or 3

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	Digital Input 1, 2, or 3
Factory Set	
Exceptions	
Description	This feature allows the digital input to be programmed and selected.

Door Open Logging

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ON or OFF
Factory Set	Input 1 ON, inputs 2-4 OFF
Exceptions	
Description	This feature allows the desired digital inputs to be logged or ignored.

Digital Input Name for CargoWatch digital input 1, 2, or 3

Control Rev	CA00 and later	
HMI Rev	7A20 and later	
Choices	See below	
Factory Set	Digital Input 1 through 3	
Exceptions		
Description	This feature allows the desired input name to be specified. This aids in reading and understanding data logger downloads. All digital inputs are connected into the HMI.	
Choices	Digital Input 1, 2, or 3 Door Other Door Main Door Back Door Front Door Side Door Left Door Right Door Other Back Door Other Front Door	Other Side Door Other Left Door Other Right Door Fresh Door Other Fresh Door Frozen Door Other Frozen Door Chilled Door Other Chilled Door Dry Door Other Dry Door

Countdown Timer

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	OFF, 1 - 96 Hours
Factory Set	OFF
Exceptions	The Countdown Timer only affects the CargoWatch Data Logger.
Description	The Countdown Mode feature will keep the HMI Control Panel powered up for a user specified time period after the unit is turned off. Under these conditions the display and backlight are turned off to conserve unit battery power. ***Important:*** *The four Hard Keys will remain illuminated when the unit is in Countdown Mode. This is normal operation.* The CargoWatch data logger will continue to record data according to the current CargoWatch interval settings until the user specified time period expires. This allows data to be recorded during an interval where the unit is turned off. The programmable time intervals are OFF or from 1 Hour to 96 Hours. The default setting for Countdown Mode is OFF.

Conservative Log Count

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	OFF, 1 – 400 Logs
Factory Set	OFF
Exceptions	The Conservative Log Count only affects the CargoWatch Data Logger.
Description	The Conservative Mode can be utilized by the user after the Countdown Mode interval above has expired. When the Countdown Mode has expired, Conservative Mode (if programmed) allows the HMI Control Panel to be temporarily powered up according to the current CargoWatch interval settings to log an additional number of CargoWatch data logs. The HMI Control Panel will be powered up for approximately 30 seconds to perform each data log, and will then turn back off. The possible number of additional Conservative Mode CargoWatch data logs is from 1 Log to 400 Logs. The default setting for Conservative Mode is OFF.

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. The factory settings shown below are for a replacement Base Controller.

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 Model

Control Rev	CA15 and later
HMI Rev	7A40 and later
Choices	C-600M, S-600M, S-600DE, S-610M, S-610DE
Factory Set	To match unit as built. A Base Controller cold start will default this feature to S-600M.
Exceptions	
Description	This feature allows the Unit Model to be selected. Set as appropriate for the unit.

High Capacity Unit?

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	YES or NO
Factory Set	To match unit as built. A Base Controller cold start will default this feature to NO.
Exceptions	
Description	If the unit was built as a High Capacity unit, this setting must be set to YES. If the unit was not built as a High Capacity unit, this setting must be set to NO. ***Important:*** *Improper setting of this feature may cause Alarm Code 33 Check Engine RPM to be set during a Pretrip Test.*

How Many Zones in This Unit?

Control Rev	CA00 and later
HMI Rev	7A20 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 2 Evap Fans Configuration

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	2, 3, 4, or 6 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	CA00 and later
HMI Rev	7A20 and later
Choices	2, 3, 4, or 6 fans
Factory Set	3
Exceptions	This screen only appears if the unit is configured for three zones.
Description	This feature is set to match the number of fans in the remote evaporator(s) used in Zone 3.

Engine Type

Control Rev	CA30 and later
HMI Rev	7A55 and later
Choices	C-600M = TK486V25L or TK486V25L1 S-600M/S-600DE = TKDV6 S-610M/S-610DE = TK488CR or TK488CR1
Factory Set	To match unit as built. A base controller cold start will default this feature to TKDV6.
Exceptions	
Description	This feature allows the engine type to be selected.

Compressor Type

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	Reciprocating
Factory Set	By Unit Model Number
Exceptions	
Description	This feature is set by Unit Model and is shown for information only.

ETV Configured

Control Rev	CA00 and later
HMI Rev	7A20 and later

Choices	YES
Factory Set	To match unit as built. A base controller cold start will default this feature to YES.
Exceptions	
Description	Not user configurable.

Charger Configuration

Control Rev	CA15 and later
HMI Rev	7A40 and later
Choices	65 Amp Alternator (only available for units with Model set to S-600DE, S-610DE) 120 Amp Alternator (only available for units with Model set to S-600M, S-610M) 120 Amp Battery Charger (only available for units with Model set to S-600M, S-600DE, C-600M, S-610M, S-610DE)
Factory Set	To match unit as built.
Exceptions	
Description	None is not a valid selection and will cause Alarm Codes 25 (Alternator/Battery Charger Check) and 111 (Unit Not Configured Correctly) to be set. These alarms will automatically be cleared when a selection other than None is made.

Electric Standby Equipped?

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	YES or NO
Factory Set	To match unit as built. A base controller cold start will default this feature to YES.
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 Smart Power™ Electric Standby. If the unit is equipped with Electric Standby, this feature should be set YES. If the unit is not equipped with Electric Standby, this feature should be set NO.

Electric Motor Type

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	12 HP or optional 15-19 HP
Factory Set	As built. A Base Controller cold start will default this feature to 12 HP.
Exceptions	Units equipped with SmartPower Electric Standby Option only.
Description	This feature specifies which motor is used on units equipped with the optional Smart Power Electric Standby.

Electric Heat Option

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	YES or NO
Factory Set	To match unit as built. A Base Controller cold start will default this feature to YES.
Exceptions	Units equipped with SmartPower Electric Standby Option only.
Description	This feature specifies if the unit is equipped with the Electric Heat option. If the unit is equipped with Electric Heat, this feature should be set YES. If the unit is not equipped with Electric Heat, this feature should be set NO. Electric heat is applicable to Zone 1 host evaporators only.

Diesel to Electric Auto Switch Enabled?

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	YES or NO
Factory Set	NO
Exceptions	
Description	This feature allows the Auto Switch from Diesel to Electric feature to be enabled or disabled. If this feature is set YES, the unit will switch automatically to electric mode when standby power is connected. If the feature is set NO, the operator must manually switch the unit to electric mode using the HMI Control Panel Mode Menu or by following the HMI Control Panel prompts when standby power is connected.

Electric to Diesel Auto Switch Enabled?

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	YES or NO
Factory Set	NO
Exceptions	
Description	This feature allows the Auto Switch from Electric to Diesel feature to be enabled or disabled. If this feature is set YES, the unit will switch automatically to diesel mode when standby power is disconnected or fails. If the feature is set NO, the operator must manually switch the unit to diesel mode using the HMI Control Panel Mode Menu or by following the HMI Control Panel prompts when standby power is disconnected or fails. ***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 where engine operation is strictly prohibited.*

Electric Service Amperage Menu

Control Rev	CA15 and later
HMI Rev	7A40 and later
Choices	30 amp or 50 amp
Factory Set	To match unit as built.
Exceptions	Only appears on units equipped with SmartPower that have electric motor type set to 15-19 HP.
Description	This feature is set to 30 amp for units equipped with 15 or 16 HP SmartPower options.

Humidity Sensor

Control Rev	CA30 and later
HMI Rev	7A55 and later
Choices	DISABLED or ENABLED
Factory Set	DISABLED
Exceptions	
Description	When enabled, this feature displays the Humidity Sensor in the Maintenance Menu > Sensors Menu. It also appears in the Sensors Menu if accessed through the Main Menu or if the Sensors Key is pressed.

Fuel Level Sensor Type

Control Rev	CA00 and later
HMI Rev	7A20 and later

Choices	NONE, SOLID STATE, FLOAT or SWITCH
Factory Set	NONE
Exceptions	
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.

Low Fuel Shutdown

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	This feature is used to enable or disable Low Fuel Shutdown. The default setting is DISABLED. Less than approximately 7% of fuel level. Fuel level sensor type set to solid state or float to be applicable. Not applicable to electric operation.

Fuel Heater

Control Rev	CA10 and later
HMI Rev	7A35 and later
Choices	YES or NO
Factory Set	NO
Exceptions	
Description	This selection should be set to NO for units that are not equipped with a fuel heater and YES for units that are equipped.

Rear Remote Control Panel

Control Rev	CA00 and later
HMI Rev	7A20 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 Panel. If the unit is equipped with the flush mount Rear Remote Control Panel this feature should be set to COM 2 and the flush mount Rear Remote Control Panel should be connected to the COM2 port on the interface board. If the unit is not equipped with a flush mount Rear Remote Control Panel, this feature should be set NONE. Refer to Section 4 for more information on using the Rear Remote Control Panel.

Rear Remote Control Panel Action

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	STAND BY, RUN
Factory Set	STAND BY

Exceptions	Only appears if Rear Remote Control Panel is set for COM 2.
Description	If the Action is set to STAND BY, the unit will power up when the Rear Remote Control Panel ON key is pressed. The setpoints can be changed from the Rear Remote Control Panel but the unit will not start and run. The unit must be started from the HMI Control Panel on the unit. Pressing the Rear Remote Control Panel OFF key will power down the control system. All Rear Remote Control Panel functions are present except the engine will not start and a Manual Defrost Cycle or Pretrip Test cannot be initiated. If the Action is set to RUN the unit will automatically start and run when the Rear Remote Control Panel ON key is pressed. Pressing the Rear Remote Control Panel OFF key will power down the control system. All Rear Remote Control Panel functions are present. Refer to Section 4 for more information on using the Rear Remote Control Panel.

3rd Party Device Control

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	NONE, COM 1, COM 2
Factory Set	NONE
Exceptions	
Description	This feature selects the communications port on the SR-4 Base Controller 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 NONE. If the unit is equipped with TK BlueBox, this feature should be set to NONE.

Telematics Type Configured

Note: *Prior to BA55/CA30/7A55, this feature was named REB Type Configured.*

Control Rev	CA30 and later
HMI Rev	7A55 and later
Choices	NONE, REB iBox, REB iBox + CELL + GPS, REB WIFI + GPS, REB CELL + GPS + WIFI
Factory Set	NONE
Exceptions	
Description	The Telematics Type Configured feature should be set to match the options installed on the unit.

Telematics Door Switch

Note: *Prior to BA55/CA30/7A55, this feature was named REB Door Switch.*

Control Rev	CA30 and later
HMI Rev	7A55 and later
Choices	ENABLED or DISABLED
Factory Set	DISABLED
Exceptions	
Description	If a dedicated Telematics Door Switch is installed, this feature should be set ENABLED. If no dedicated Telematics Door Switch is installed, this feature should be set DISABLED.

Telematics Fuel Sensor Type

Note: *Prior to BA55/CA30/7A55, this feature was named REB Fuel Sensor Type.*

Control Rev	CA30 and later
HMI Rev	7A55 and later
Choices	NONE, SOLID STATE, FLOAT, or SWITCH

Factory Set	NONE
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 NONE.

Fresh Air Exchange

Control Rev	CA00 and later
HMI Rev	7A20 and later
Choices	YES or NO
Factory Set	NO
Exceptions	The Fresh Air Exchange Feature must be installed on the unit.
Description	The Fresh Air Exchange option allows fresh outside air to be drawn into the trailer and the interior air to be exhausted by opening the Fresh Air Exchange doors. This feature is beneficial when hauling loads that release gas as they ripen, such as potatoes. The Fresh Air Exchange feature should be used exactly as specified by the customer. The Fresh Air Exchange feature is only available with setpoints above 32°F (0°C). The feature is disabled with setpoints of 32°F (0°C) and below. A solenoid is used to open and close the Fresh Air Exchange Door. Note that the Fresh Air Exchange door will only be open when the unit engine is running, as it is held in the open position by the Fresh Air Exchange Solenoid. The door will close when the engine shuts down to preserve unit battery life. The setting of the Fresh Air Exchange door will survive power off / power on cycles – if the door is set to "Open" by the operator it will continue to open any time the engine is running until it is set to "Close" by the operator. If Fresh Air Exchange is set YES, the Fresh Air Exchange Open / Close feature will be shown in the Mode Menu. If Fresh Air Exchange is set NO, the Fresh Air Exchange Open / Close feature will not appear in the Mode Menu.

Supplemental Alternator

Control Rev	CA15 and later
HMI Rev	7A40 and later
Choices	NONE, 65 Amp, 120 Amp
Factory Set	NONE
Exceptions	NONE and 120 amp alternator will be available choices when unit model is S-600M, S-610M, S-600DE, or S-610DE and charger configuration is set to 30 or 120 amp battery charger. NONE and 65 amp alternator will be available choices when unit model is C-600M and charger configuration is set to 120 amp battery charger.
Description	This feature determines if the unit has an optional aftermarket alternator used with the Aftermarket Power Package.

CargoLink

Control Rev	CA06 and later
HMI Rev	7A30 and later
Choices	YES or NO
Factory Set	NO
Exceptions	
Description	When ENABLED, this feature will allow the HMI to read the sensor data from the COM ports. ***Note:*** *When set to Yes, CargoWatch sensors connected directly to the HMI will not read the sensor data.*

Engine Timing Belt Expiration Actn

Control Rev	CA06 and later
HMI Rev	7A30 and later

Choices	DISABLED, CHECK ALARM, SHUTDOWN ALRM-CLEAR IN DRV MENU, SHUTDOWN ALRM-CLEAR IN GA
Factory Set	CHECK ALARM
Exceptions	
Description	Allows the user to select which action to take if the Engine Timing Belt Accumulated Hours reaches 6,000 hours.

Low Voltage Module Connected

Control Rev	CA20 and later
HMI Rev	7A45 and later
Choices	YES or NO
Factory Set	NO
Exceptions	
Description	This feature should be set to YES if the unit is equipped with an aftermarket Low Voltage Module.

Section 4 - Operation

SR-4 HMI Control Panel

⚠ WARNING

Risk of Injury!

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

Use the HMI control panel to operate the unit.

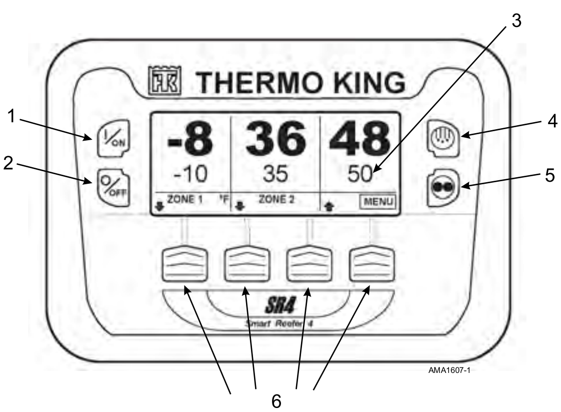
The HMI control panel has a display and eight touch sensitive keys. The display is capable of showing both text and graphics. The four keys on the left and right sides of the display are “hard” (dedicated) keys. The four keys under the display are “soft” keys. The function of soft keys change depending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

Control Panel Display

The display is used to present unit information to the operator. This information can include setpoint and temperature for each zone, unit or zone operating information, gauge readings, temperatures, and other information as selected by the operator.

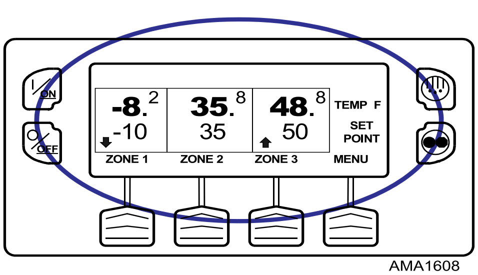
The default display is called the Standard Display (Figure 23, p. 126). It is described in detail later in this section.

Figure 23. Control Panel Display and Keys



1.	On Key (Hard Key)	4.	Defrost Key (Hard Key)
2.	Off Key (Hard Key)	5.	CYCLE-SENTRY/Continuous Mode Key (Hard Key)
3.	Display	6.	Soft Keys

Figure 24. Display



The Standard Display of box temperature and setpoint for three zones is shown (Figure 24, p. 126). The unit is running in Continuous 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.*

Pressing the soft key under each zone allows the setpoint for that zone to be changed. In addition, the soft keys under Zone 2 and Zone 3 are used to turn those zones on and off. Pressing the soft key under MENU accesses the MAIN MENU.

Note: *Zone 1 is always on when the control system is powered up.*

Display Icons

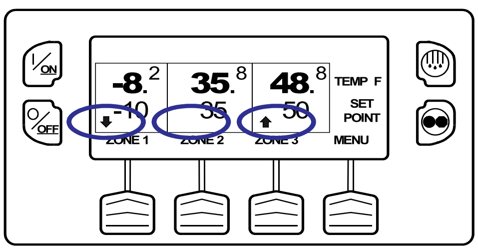
Display symbols or icons are used to indicate the following:

- If a zone is cooling, heating, or in null.
- If the unit is operating in Cycle Sentry or Continuous Mode.
- If unit level or zone level alarm conditions have occurred.

Zone Cooling, Heating, or Null

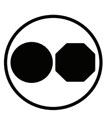
Arrows are used to indicate if a zone is cooling, heating, or in null.

Figure 25. Cooling, Heating, Null Arrows



AMA1609

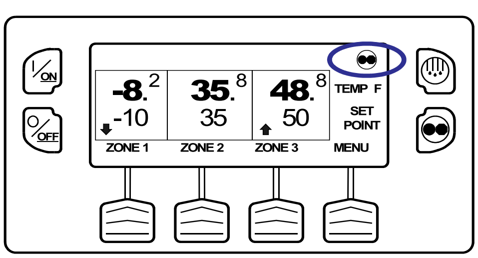
Arrows: (At the left side of the display) Figure 25, p. 127 shows Zone 1 is cooling. If the arrow were pointing upward, Zone 1 would be heating. The absence of an arrow indicates that a Zone is in Null.



CYCLE SENTRY/Continuous Mode Key: If the Cycle Sentry Icon is present as shown (Figure 26, p. 127), the unit is operating in Cycle Sentry Mode. Absence of the Cycle Sentry Icon indicates the unit is operating in Continuous Mode.

If the Standard Display is shown, the Cycle Sentry Icon will appear in the upper right corner of the display as shown (Figure 26, p. 127).

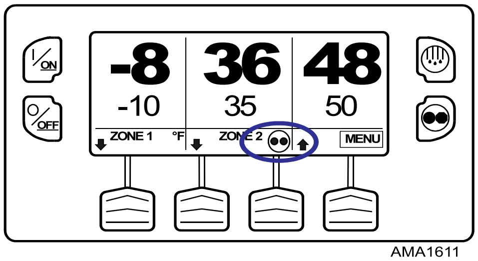
Figure 26. Cycle Sentry Icon



AMA1610

If the TemperatureWatch Display is shown, the Cycle Sentry Icon will appear in the lower part of the display as shown (Figure 27, p. 128).

Figure 27. Three Zone TemperatureWatch Display - Unit in Cycle Sentry Mode



ECO Pulldown Mode

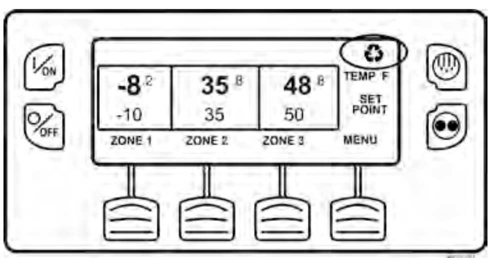
This programmable feature allows the unit to operate in low speed during initial pulldown until the temperature in any one zone inside the trailer reaches 30°F. At this point, it automatically switches the unit to high speed operation.

Operating the unit in low speed pulldown can save up to 15% fuel during the initial pulldown without significantly increasing the overall unit run time.

For set points above 30°F, the unit will operate in ECO Pulldown mode until set point is achieved, possibly never operating in high speed mode.

All Thermo King Multi-Temperature units come factory set with ECO Pulldown Mode enabled. When the Standard Display is shown, the ECO Pulldown icon will appear in the upper right corner of the display.

Figure 28. ECO Pulldown Mode Icon

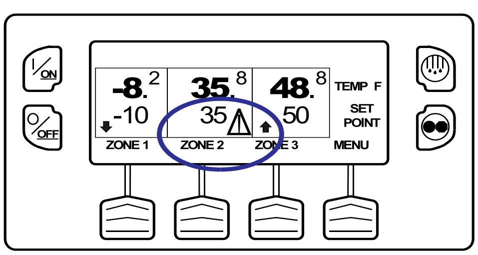


Zone Level or Unit Level Alarm Codes

Alarm Icon: The Alarm Icon is used to indicate the presence of one or more alarm codes. If the Alarm Icon is present, an alarm condition has occurred and an Alarm Code has been set. Absence of the Alarm Icon indicates no Check, Prevent or Shutdown Alarm Codes exist.

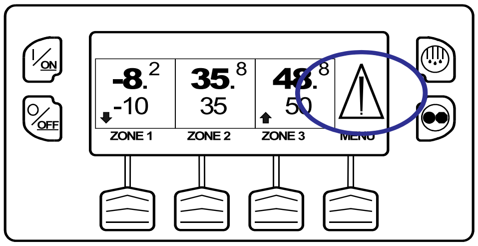
If a Zone Level (an alarm pertaining only to a particular zone) Alarm condition exists, the Alarm Icon will appear in the offending zone as shown (Figure 29, p. 128) (A Zone Level alarm exists in Zone 2).

Figure 29. Zone Level Alarm



If a Unit Level (an alarm pertaining to the entire unit independent of zone) Alarm condition exists, the Alarm Icon will appear at the right side of the display as shown (Figure 30, p. 129).

Figure 30. Unit Level Alarm

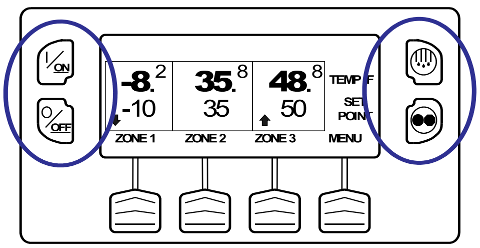


AMA1613

Hard Keys

The keys on either side of the display are dedicated or hard keys (Figure 31, p. 129). Their function always remains the same.

Figure 31. Hard Keys

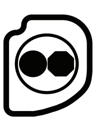


AMA1614

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

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

Defrost Key: Press this key to initiate a Manual Defrost cycle. For more information see "Initiating a Manual Defrost Cycle".

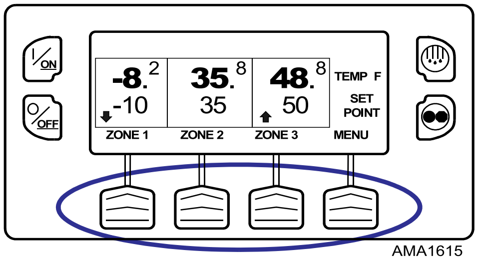


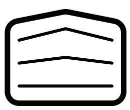
CYCLE SENTRY: Used to select Cycle Sentry Mode or Continuous Mode operation. For more information see "Selecting Cycle Sentry or Continuous Mode".

Important: *If the Hard Keys are illuminated, the HMI Control Panel is powered up even if the display is off. Typically, this indicates the CargoWatch Data Logger is active even when the unit is turned off.*

Soft Keys

Figure 32. Soft Keys





The four soft keys under the display are multi-purpose keys (Figure 32, p. 130). Their function changes depending on the operation being performed. If a soft key is active, the key function is shown in the display directly above the key. The keys are numbered from left to right, with Key 1 on the far left and Key 4 on the far right.

Typical soft key applications:

- ZONE ON/OFF and SETPOINT CHANGE

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

Display Heater

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

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

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

Turning The Unit On And Off

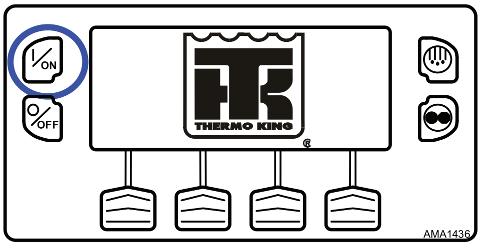
The unit is turned on by pressing the ON Key (Figure 33, p. 131) and off by pressing the OFF Key. When the On Key is pressed the display briefly shows the THERMO KING Logo as the display initializes.

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

Note: *With Multi-Temp applications, Zone 1 is turned on any time the host unit is turned on. Zone 1 is turned off when the host unit is turned off.*

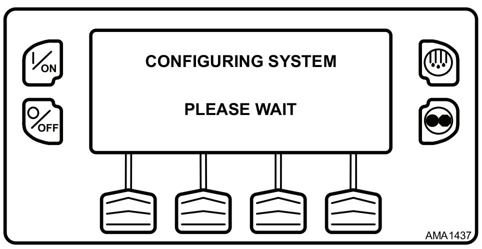
Note: *With extremely cold ambient temperatures, it may take up to 15 seconds for the display to appear on initial startup.*

Figure 33. ON Key



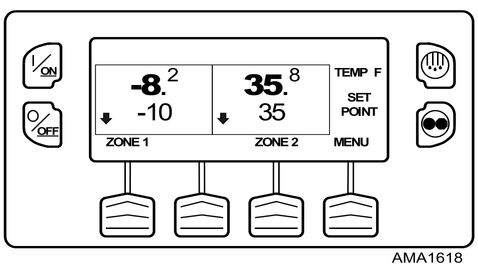
The startup screen appears while communications are established and the unit prepares for operation.

Figure 34. Startup Screen



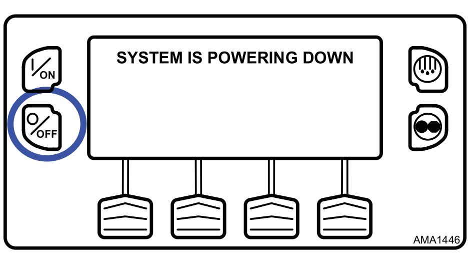
When the unit is ready to run, the Standard Display appears. The Two Zone display is shown (Figure 35, p. 131).

Figure 35. Two Zone Display



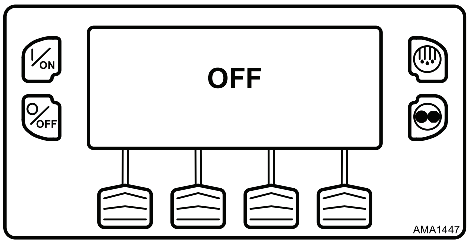
Pressing the OFF hard key stops unit operation. The controller shuts down immediately and the display briefly shows the power down message as shown (Figure 36, p. 131).

Figure 36. Power Down Message



The display briefly shows OFF (Figure 37, p. 132) and then goes blank. To start the unit again, press the ON hard key.

Figure 37. Display Shows OFF

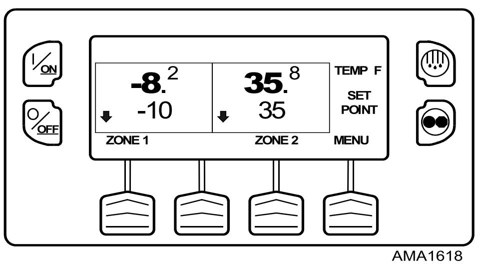


Two Zone Standard Display

Note: *Fahrenheit is shown, Celsius display is similar.*

The Standard Display is the default display that appears if no other display function is selected. The Two Zone Standard Display shows the return air temperature and setpoint for two zones. The absence of the Cycle Sentry Icon at the top of the display shows that the unit is operating in Continuous 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 allows the setpoint for that zone to be changed. In addition, the soft key under Zone 2 is used to turn that zone on and off. The soft key labeled MENU allows the Main Menu to be selected.

Figure 38. Two Zone Standard Display

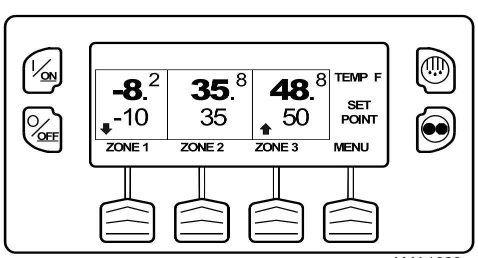


Three Zone Standard Display

Note: *Fahrenheit is shown, Celsius display is similar.*

The Three Zone Standard Display adds a third zone and functions the same way as the Two Zone Standard Display, but with another temperature controlled zone. The absence of the Cycle Sentry Icon at the top of the display (Figure 39, p. 132) shows that the unit is operating in Continuous 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 absence of the Up or Down pointing arrow indicates that Zone 2 is in Null. 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 allows the setpoint for that zone to be changed. In addition, the soft keys under Zone 2 and Zone 3 are used to turn those zones on and off. The soft key labeled MENU allows the Main Menu to be selected.

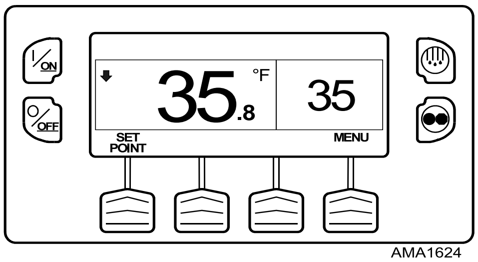
Figure 39. Three Zone Standard Display



Single Zone Control Standard Display

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 the Mode Submenu. When this feature is selected, all zones will be forced on and will control to the same selected setpoint. The Single Zone Control Standard Display (Figure 40, p. 133) functions the same way as the other Standard Displays. The absence of the Cycle Sentry Icon at the top of the display shows that the unit is operating in Continuous mode. The box temperature for 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.

Figure 40. Single Zone Control Standard Display



Operating the Unit in Single Zone Control Mode

The following differences exist when operating the unit in Single Zone Control Mode:

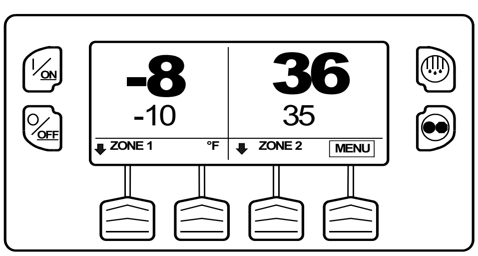
- Single Zone Control Mode will appear in the Mode Menu only if the Single Zone Control feature has been enabled in the Guarded Access/Main Menu Configuration Menu. If the feature is enabled, Single Zone Control will appear in the Main Menu/Mode Menu.
- If Single Zone Control operation is selected, all zones will be forced on and will control to the same setpoint. The Zone 1 sensors are used to determine box temperature. All 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 the 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 only 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.

The TemperatureWatch™ Display

The TemperatureWatch Display appears 2 ½ minutes after the Standard Display appears so long as there is no key activity and no Check, Prevent, or Shutdown alarms present. The TemperatureWatch Display (Figure 41, p. 133) will remain on until any key is pressed or a Check, Prevent, or Shutdown alarm occurs.

The TemperatureWatch Display shows the return air temperature and setpoint for each zone. Tenths of a degree are not shown by the TemperatureWatch display. The large numbers allow unit conditions to be checked from a distance. Pressing any soft key returns the display to the Standard Display.

Figure 41. Two Zone TemperatureWatch Display

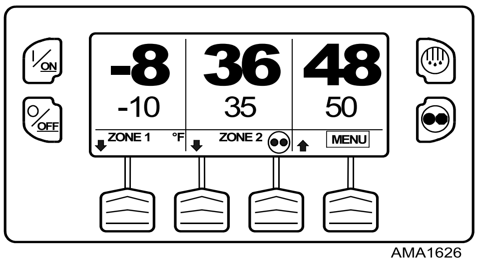


If an alarm condition (other than a Log Alarm) is present, the TemperatureWatch Display will not appear. If an alarm condition occurs while the TemperatureWatch Display is present, the display will return to the Standard Display.

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

In the Three Zone TemperatureWatch display, the Menu soft key label covers the Zone 3 label as shown (Figure 42, p. 134).

Figure 42. Three Zone TemperatureWatch Display

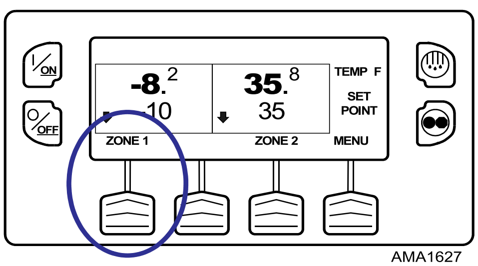


If the unit is operating in Cycle Sentry Mode, the Cycle Sentry icon will appear near Zone 2 as shown. If the unit is operating in Continuous Mode, the Cycle Sentry icon will not be present.

Changing the Setpoint

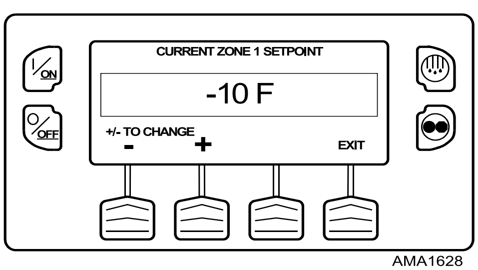
If the TemperatureWatch display is shown, press any soft key to return to the Standard Display. From the Standard Display, press the ZONE soft key for the desired zone. Zone 1 is shown (Figure 43, p. 134).

Figure 43. Zone 1



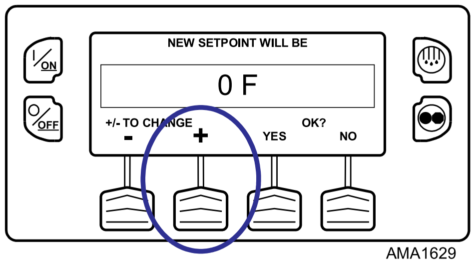
The setpoint display appears as shown (Figure 44, p. 134).

Figure 44. Setpoint Display



The “-” and “+” soft keys are used to increase or decrease the setpoint until the desired setpoint is shown. The setpoint has been changed to 0°F using the “+” soft key as shown (Figure 45, p. 135).

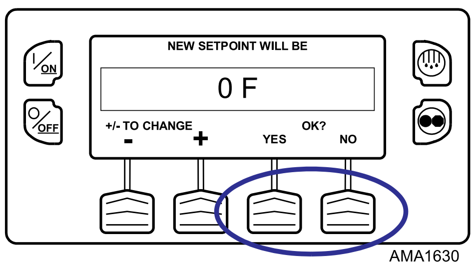
Figure 45. Setpoint Changed



AMA1629

The YES and NO soft keys confirm the setpoint change (Figure 46, p. 135). When the desired setpoint has been selected using the “+” and/or “-” soft keys, press the YES soft key to confirm and load the new setpoint. If the setpoint is changed using the “+” or “-” soft keys, the change must be confirmed or rejected by pressing the YES or NO soft key within 10 seconds of changing the setpoint. A warning beep will sound after five seconds as a reminder. Failure to confirm the new setpoint by pressing YES or NO within 10 seconds of changing the setpoint will result in no setpoint change. If the setpoint is not confirmed, Alarm Code 127 Setpoint Not Entered is set, to indicate that the setpoint change was not completed.

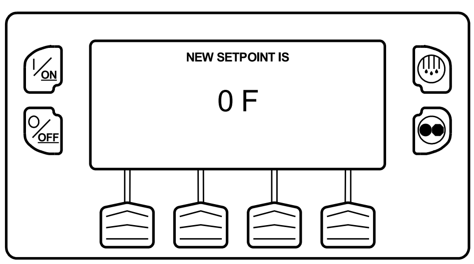
Figure 46. YES and NO Keys



AMA1630

After the YES soft key has been pressed, the display will briefly show PROGRAMMING NEW SETPOINT - PLEASE WAIT. The display then confirms the new setpoint for two seconds (Figure 47, p. 135).

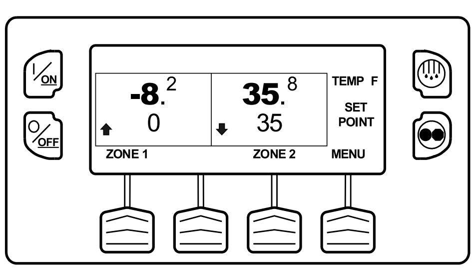
Figure 47. New Setpoint Confirmation



AMA1631

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.

Figure 48. Standard Display, New Setpoint



AMA1632

The display then returns to the Standard Display showing the new setpoint. The Zone 1 arrow now points up, to indicate that Zone 1 is heating.

Important: *If the setpoint is changed using the "+" or "-" soft 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 soft key is pressed, the setpoint change made with the "+" or "-" soft key is accepted, the setpoint changes, and the display returns to the Standard Display.
- If the NO soft key is pressed the setpoint change made with the "+" or "-" soft key is not accepted, the setpoint is not changed, and the display returns to the Setpoint Display.
- If the YES or NO soft key is not pressed within 10 seconds of making a change with the "+" or "-" soft 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 the setpoint change was started but not completed.

Turning a Zone On and Off

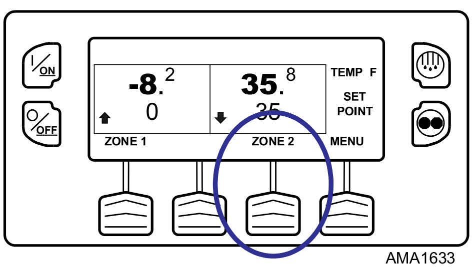
Zone 1 will always be turned on any time the unit is turned on. Zone 2 and Zone 3 (if present) can be turned on and off as desired.

The state of each zone is retained when the unit is turned off and on. For example, on a three zone unit if Zone 2 is 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 Zone 2 will still be off and Zone 3 will still be on.

Note: *Units equipped with a remote control may operate in a slightly different manner. Refer to Rear Remote Control Panel (Optional) for additional details.*

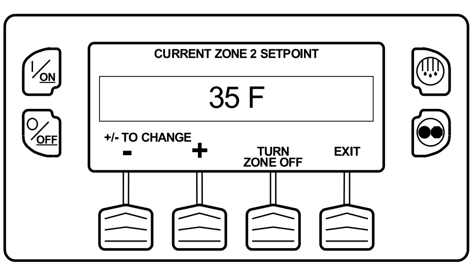
To turn Zone 2 or Zone 3 on or off, press the soft key under the desired zone. Zone 2 is selected (Figure 49, p. 136).

Figure 49. Zone 2 Selected



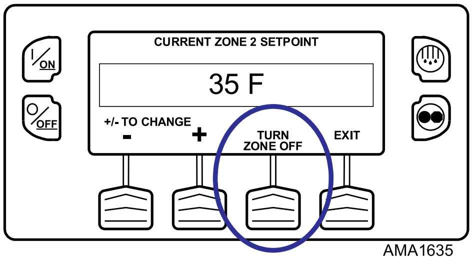
The Zone 2 setpoint display appears as shown (Figure 50, p. 136). If the zone is turned on, the third soft key will be labeled TURN ZONE OFF. If the zone is turned off, the third soft key will be labeled TURN ZONE ON. In this case TURN ZONE OFF is shown.

Figure 50. Zone 2 Setpoint Display



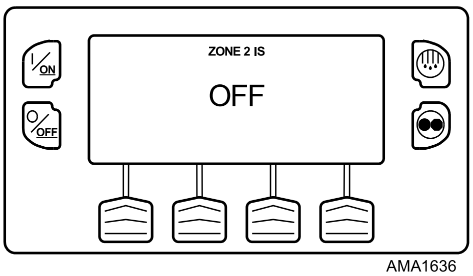
Press the TURN ZONE OFF soft key to turn the zone off (Figure 51, p. 137).

Figure 51. TURN ZONE OFF soft key



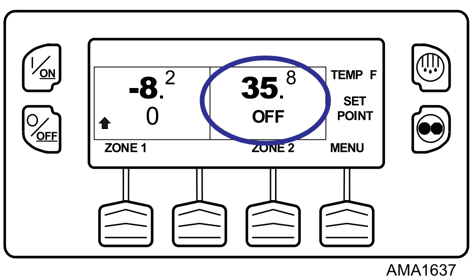
The display briefly shows PROGRAMMING ZONE ON/OFF - PLEASE WAIT. The display then confirms the new Zone 2 setting for several seconds (Figure 52, p. 137).

Figure 52. New Zone 2 Setting



The display returns to the Standard Display showing Zone 2 is off. The setpoint for Zone 2 has been replaced with OFF as shown (Figure 53, p. 137) to indicate that the zone is now off.

Figure 53. Zone Off



Starting the Diesel Engine

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

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

⚠ CAUTION

Risk of Injury!

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

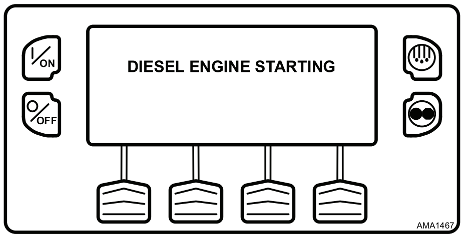
NOTICE

Equipment Damage!

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

When the engine is preparing to start, the HMI Control Panel will display the engine start screen as shown (Figure 54, p. 138). The preheat buzzer sounds during the engine preheat and crank sequence.

Figure 54. Engine Start Screen



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

Starting the Electric Motor

⚠ CAUTION

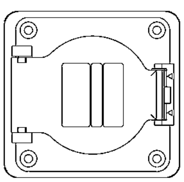
Risk of Injury!

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

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

Electric Power Receptacle: The electric power receptacle is used to connect the unit to an appropriate electric power source for electric standby operation (Figure 55, p. 138). The electric power receptacle is located next to the HMI Control Panel. Verify the unit and the power supply are turned off before connecting or disconnecting a power cord.

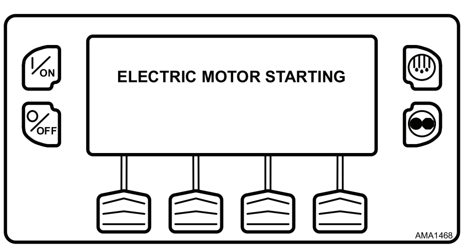
Figure 55. Electric Power Receptacle



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

When the motor is preparing to start, the HMI Control Panel will display the motor start screen (Figure 56, p. 138). The preheat buzzer sounds for 20 seconds before the electric motor starts.

Figure 56. Motor Start Screen



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

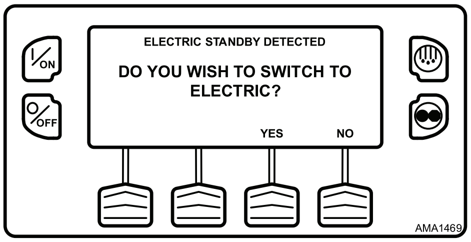
Switching from Diesel to Electric

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

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

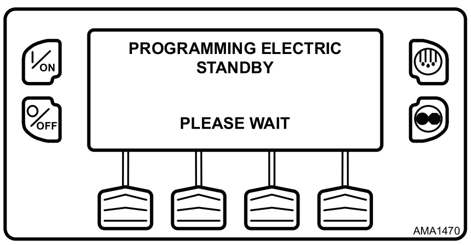
If the Diesel to Electric Auto-Switch Enabled feature in Guarded Access is set NO, the prompt screen (Figure 57, p. 139) will appear when standby power is connected and available.

Figure 57. Standby Power Connected



If NO is selected, the unit will continue to operate in Diesel Mode. If YES is selected, the display will briefly show the screen (Figure 58, p. 139).

Figure 58. YES Selected



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

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

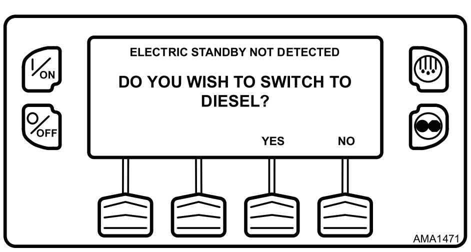
Switching from Electric to Diesel

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

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

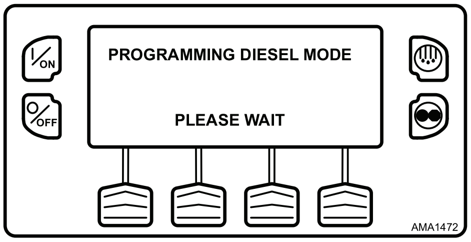
If the Electric to Diesel Auto-Switch Enabled feature in Guarded Access is set NO and standby power is disconnected or fails, the unit will not automatically switch to Diesel mode. This is primarily designed to prevent unauthorized diesel engine starts when the truck is indoors or on a ferry where engine operation is strictly prohibited. If the Electric to Diesel Auto-Switch Enabled feature in Guarded Access is set NO, the prompt screen (Figure 59, p. 139) will appear when standby power is turned off or is no longer available.

Figure 59. Standby Power is Off



If YES is selected, the display will briefly show the screen (Figure 60, p. 140).

Figure 60. Yes Selected



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

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

Initiating a Manual Defrost Cycle

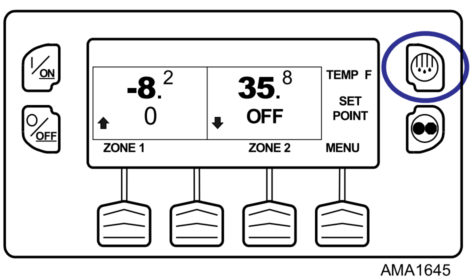
Defrost cycles are usually initiated automatically based on time or demand. Manual defrost is also available.

Manual defrost is 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.

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

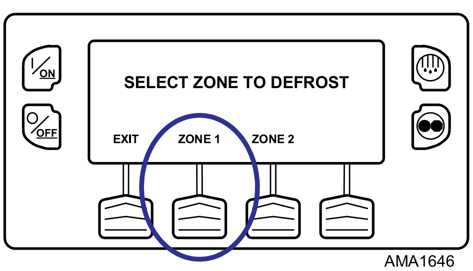
To initiate a manual defrost cycle, press the Defrost Key as shown (Figure 61, p. 140).

Figure 61. Defrost Key



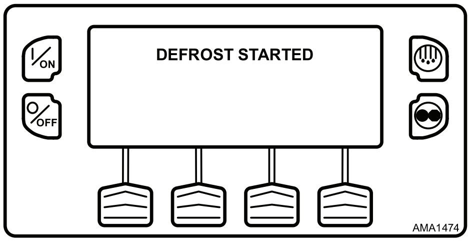
The display will briefly show [DEFROST]. Then the Zone Select display appears. Zone 1 selected is shown (Figure 62, p. 140).

Figure 62. Zone 1 Selected



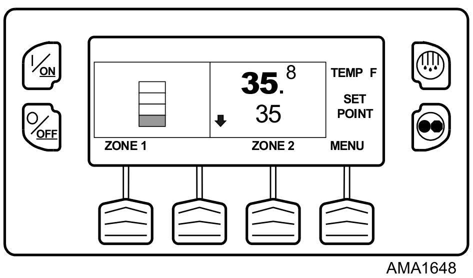
The display briefly shows [DEFROST], [PROGRAMMING DEFROST - PLEASE WAIT] and then [DEFROST STARTED] (Figure 63, p. 141).

Figure 63. Defrost Started



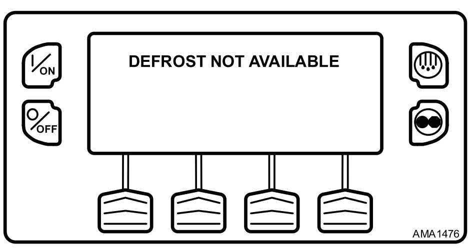
The display then shows the Defrost display. The bar indicator shows approximately the percentage of time remaining to complete the defrost cycle. The bar indicator (Figure 64, p. 141) shows that the Zone 1 defrost cycle is approximately 25% complete.

Figure 64. Bar Indicator



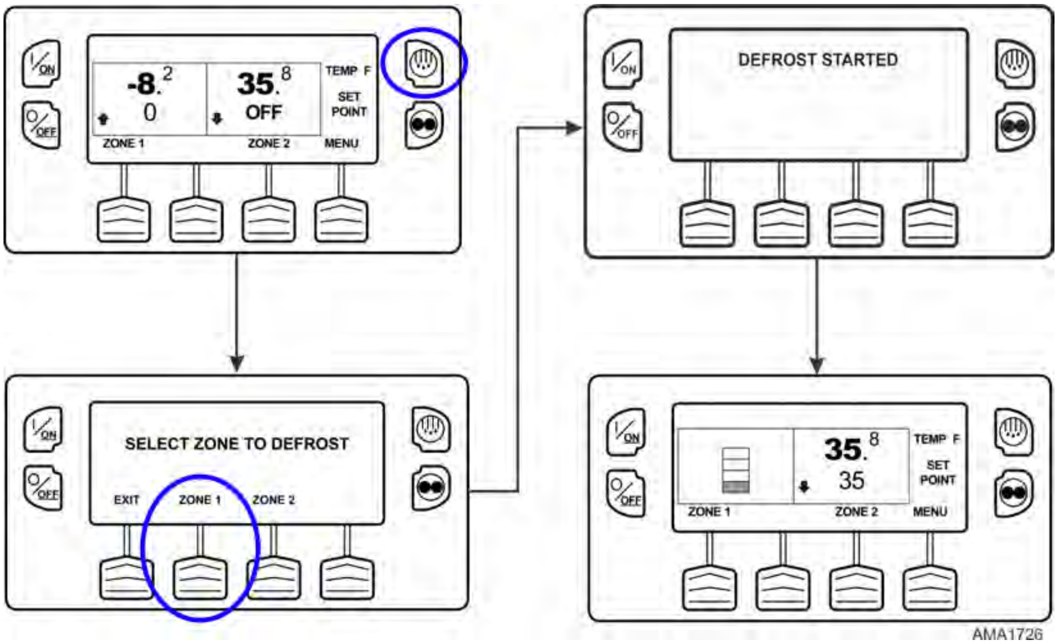
If conditions do not allow a defrost cycle, the display shown (Figure 65, p. 141) will briefly appear. The display will then return to the Standard Display.

Figure 65. Defrost Not Available



See summary of "Initiating a Manual Defrost Cycle" displays (Figure 66, p. 142).

Figure 66. Initiating a Manual Defrost Cycle



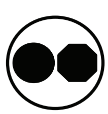
Terminating a Defrost Cycle

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

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

Selecting Cycle Sentry or Continuous Mode

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



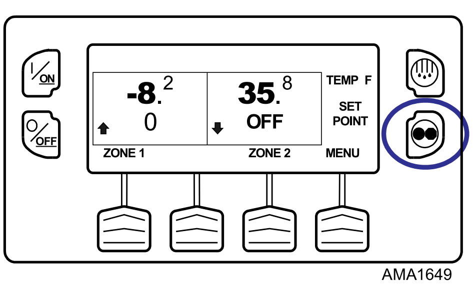
If the unit is operating in Cycle Sentry Mode, the Cycle Sentry Icon will appear in the display.

- The Cycle Sentry Icon appears in the upper right corner of the Standard Display (Figure 70, p. 143).
- The Cycle Sentry Icon appears in the lower right of the TemperatureWatch Display (Figure 71, p. 143).
- If the Cycle Sentry Icon is not shown, the unit is operating in Continuous Mode.

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

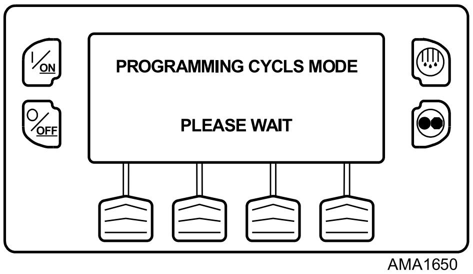
Cycle Sentry or Continuous Mode is selected by pressing the Cycle Sentry/Continuous Key (Figure 67, p. 142). The unit is currently operating in Continuous Mode as shown by the absence of the Cycle Sentry Icon.

Figure 67. Cycle Sentry/Continuous Key



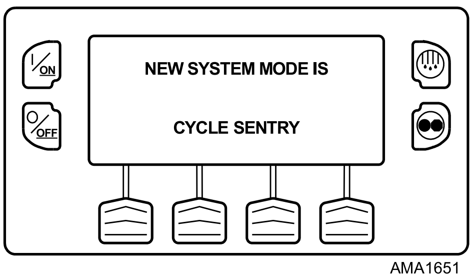
If the unit is operating in Continuous Mode, pressing the Cycle Sentry/Continuous Key changes the mode from Continuous Mode to Cycle Sentry Mode. The display confirms the change, as shown (Figure 68, p. 143).

Figure 68. Mode Change Confirmed



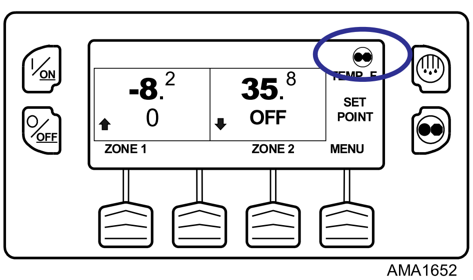
The new mode is confirmed for two seconds (Figure 69, p. 143).

Figure 69. Mode Confirmed



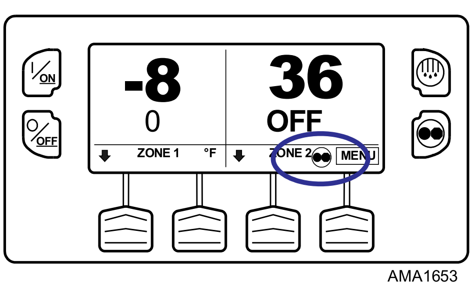
The display then returns to the Standard Display. In the example here, the unit is running in Cycle Sentry Mode as shown by the presence of the Cycle Sentry Icon at the upper right corner of the display (Figure 70, p. 143).

Figure 70. Cycle Sentry Icon, Upper Right Corner



When the TemperatureWatch Display is shown, the Cycle Sentry Icon appears in the lower right corner (Figure 71, p. 143).

Figure 71. Cycle Sentry Icon, Lower Right Corner

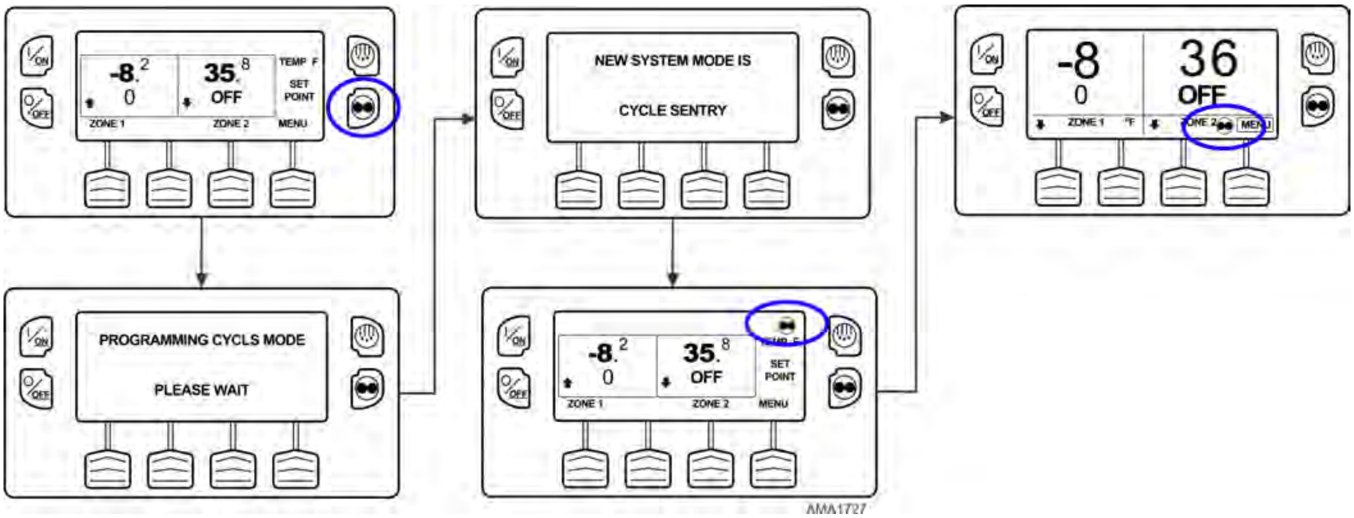


Pressing the Cycle Sentry/Continuous key again allows the operator to change back to Continuous Mode operation.

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

See summary of “Selecting Cycle Sentry or Continuous Mode” displays (Figure 72, p. 144).

Figure 72. Selecting Cycle Sentry or Continuous Mode



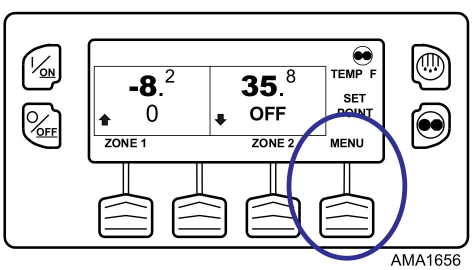
Gauges

The Gauges Menu allows the operator to view the unit gauges and I/O conditions. The unit gauges can always be viewed from the Main Menu and also from the Maintenance Menu.

Displaying Gauges

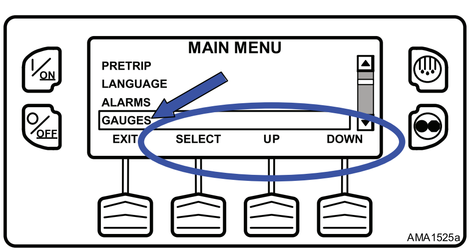
Gauges are displayed using the Gauges Menu. From the Standard Display, press the MENU Key (Figure 73, p. 144).

Figure 73. Menu Key



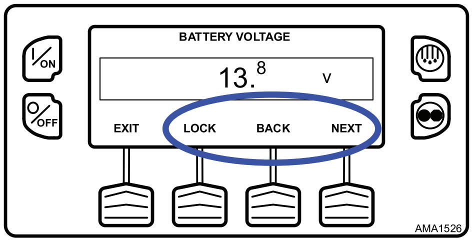
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Gauges Menu. When the Gauges Menu is selected, press the SELECT Key to choose the Gauges Menu (Figure 74, p. 144).

Figure 74. Up, Down, Select Keys



The first gauge display will appear. Press the NEXT and BACK Keys to scroll through the gauges and I/O conditions. Pressing the LOCK Key will lock the current gauge on the display (Figure 75, p. 145).

Figure 75. Next, Back, Lock Keys



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

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

Gauges Available

Coolant Temperature: Displays the temperature of the engine coolant.

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

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

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

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

Battery Voltage: Displays the voltage of the unit battery.

Engine RPM: Displays the engine speed in RPMs.

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

Discharge Pressure: Displays the unit discharge pressure.

Suction Pressure: Displays the unit suction pressure.

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

Motor RPM: Displays motor RPM.

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

High Speed Relay	Spare Digital Input 1, 2, 3, 4	Diesel/Electric Relay (SmartPower™ units only)	Liquid Line Solenoid Zone 3
Run Relay	Spare Analog Input 1, 2	Hot Gas Solenoid Zone 1	Hot Gas Solenoid Zone 3
Run Relay Feedback	Spare Output 1, 2, 3, 4, 5	Suction Line Solenoid Zone 1	Suction Line Solenoid Zone 3
Alternator Excite Output	Purge Valve	Liquid Line Solenoid Zone 2	Drain Hose Heater Zone 3
Condenser Inlet Solenoid	Liquid Line Solenoid Zone 1	Hot Gas Solenoid Zone 2	Fan Output Zone 2
Receiver Tank Inlet Pressure Solenoid	Fresh Air Exchange Output (if configured)	Suction Line Solenoid Zone 2	Fan Output Zone 3
Motor RPM	Fresh Air Exchange Feedback (if configured)	Drain Hose Heater Zone 2	Electric Ready Input (SmartPower™ units only)
Electric Overload (SmartPower™ units only)			

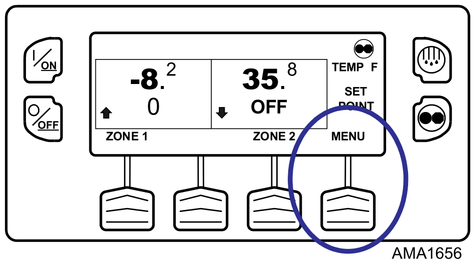
Sensors

The Sensors Menu allows the operator to view the unit and CargoWatch Data Logger temperature sensors. The sensors can always be viewed from the Main Menu and also from the Maintenance Menu.

Displaying Sensors

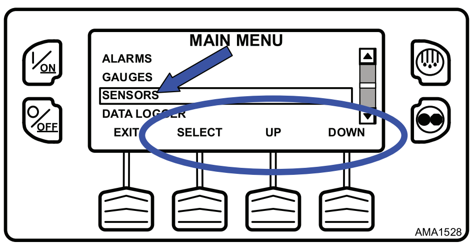
Sensors are displayed using the Sensors Menu. From the Standard Display, press the MENU Key (Figure 76, p. 146).

Figure 76. Menu Key



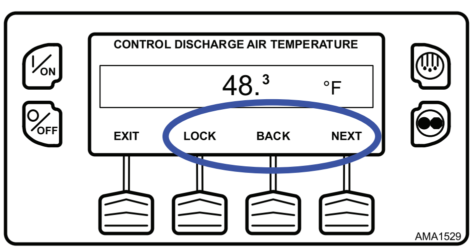
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Sensors Menu. When the Sensors Menu is selected, press the SELECT Key to choose the Sensors Menu (Figure 77, p. 146).

Figure 77. Up, Down, Select Keys



The first sensors display will appear. Press the NEXT and BACK Keys to scroll through the sensors and I/O conditions. Pressing the LOCK Key will lock the current sensor on the display (Figure 78, p. 146).

Figure 78. Next, Back, Lock Keys



The sensors available are shown below.

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

Sensors Available

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.

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

Spare 2 Temperature: Displays the temperature of the Spare 2 temperature sensor.

Spare 3 Temperature: Displays the temperature of the Spare 3 temperature sensor.

Data Logger Sensor 1 Temperature: Displays the temperature of the CargoWatch Data Logger 1 temp sensor.

Data Logger Sensor 2 Temperature: Displays the temperature of the CargoWatch Data Logger 2 temp sensor.

Data Logger Sensor 3 Temperature: Displays the temperature of the CargoWatch Data Logger 3 temp sensor.

Data Logger Sensor 4 Temperature: Displays the temperature of the CargoWatch Data Logger 4 temp sensor.

Data Logger Sensor 5 Temperature: Displays the temperature of the CargoWatch Data Logger 5 temp sensor.

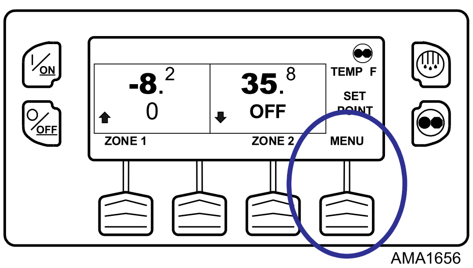
Data Logger Sensor 6 Temperature: Displays the temperature of the CargoWatch Data Logger 6 temp sensor.

Board Temperature Sensor: Displays the temperature of the HMI control panel PC board.

Using the Main Menu

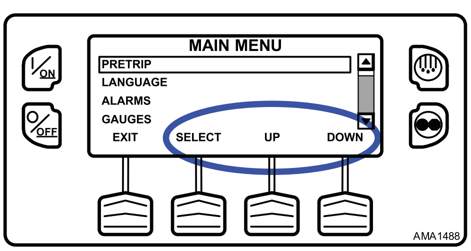
The Main Menu contains submenus that allow the operator to view information and modify unit operation. To access the Main Menu press the MENU soft key (Figure 79, p. 147).

Figure 79. MENU Soft Key



The first Main Menu choice will appear. Press and hold the UP and DOWN Keys to scroll thru the menu choices (Figure 80, p. 147). When the desired selection is shown on the display, press the SELECT Key to access it. The Pretrip Submenu is shown.

Figure 80. Pretrip Submenu



Main Menu Choices

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

Pretrip: A Pretrip Test verifies unit operation.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Fuel Usage: On unit's with an ECU, the engine provides fuel usage (fuel rate, total fuel used) information that can be used to give the operators fuel usage values for various scenarios and over specific durations.

Prime Fuel System: This function runs the fuel pump for up to five minutes to prime the fuel lines. Fuel priming is always shown on the HMI, but the functionality will only be available if the engine/electric motor is not running.

Flashload: The HMI will remind the user of a pending flashload at REB with the help of this screen.

Pretrip

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

Pretrip Test Conditions

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

Conditions Where Pretrip Tests Are Not Allowed

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

Pretrip Test Considerations

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

- If running a Pretrip Test on a trailer loaded with dry cargo, insure that proper airflow can occur around the load. If the load restricts airflow, false test results may occur. Also, these units have high refrigeration capacity which results in rapid temperature changes. Sensitive dry cargo may be damaged as a result.
- If running a Pretrip Test on a trailer that has just been washed down, the extremely high humidity inside the trailer may result in false test results.
- If running a Pretrip Test on a trailer loaded with sensitive cargo, monitor the load temperature during the test as normal temperature control is suspended during pre-trip operation.
- Always perform Pretrip Tests with the trailer cargo doors closed to prevent false test failures.

Pretrip Test Sequence

Pretrip tests proceed in the order shown below. A Full Pretrip Test is started with the engine or 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 is below 45 F (7 C), a defrost cycle is initiated.
- **RPM Check:** The engine RPM in high and low speed is checked during the Cool Check.
- **Zone 1 Cool Check:** The ability of the unit to cool in low speed is checked.
- **Zone 1 Heat Check:** The ability of the unit to heat in low speed is checked.
- **Zone 1 Return to Cool Check:** The ability of the unit to return to cool mode is checked.
- **Zone 2 Cool Check:** The ability of the unit to cool in low speed is checked.
- **Zone 2 Heat Check:** The ability of the unit to heat in low speed is checked.
- **Zone 2 Return to Cool Check:** The ability of the unit to return to cool mode is checked.
- **Zone 3 Cool Check:** The ability of the unit to cool in low speed is checked.
- **Zone 3 Heat Check:** The ability of the unit to heat in low speed is checked.
- **Zone 3 Return to Cool Check:** The ability of the unit 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.

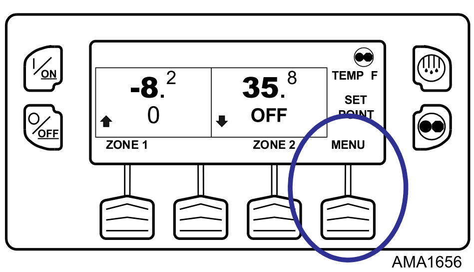
Performing a Pretrip Test

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 motor running, a Running Pretrip Test is performed.

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

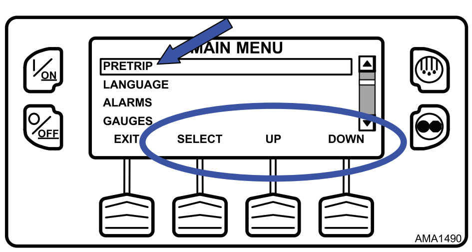
Pretrip Tests are initiated using the Pretrip Menu. From the Standard Display, press the MENU Key (Figure 81, p. 149).

Figure 81. MENU Key



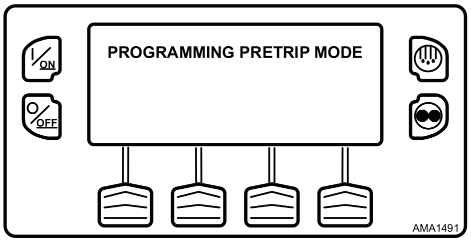
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Pretrip Menu. When the Pretrip Menu is shown press the SELECT Key to start a Pretrip Test (Figure 82, p. 149).

Figure 82. Select Key



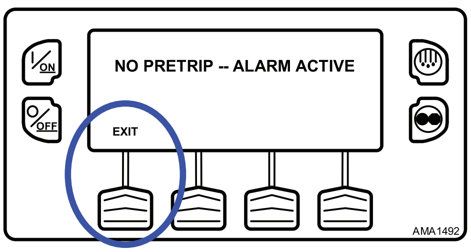
The display will briefly show PROGRAMMING PRETRIP MODE (Figure 83, p. 150). If the unit is not running, a Full Pretrip Test will be initiated. If the unit is running in either diesel or electric mode, a Running Pretrip Test will be performed.

Figure 83. Programming Trip Mode



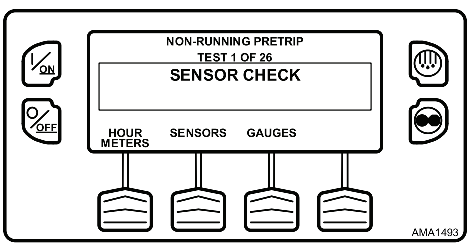
If all alarms were not cleared, a prompt appears (Figure 84, p. 150). Exit the Pretrip Test, clear all alarms, and repeat the Pretrip Test.

Figure 84. Alarms Not Cleared



If all alarms were cleared, the Pretrip Test display appears (Figure 85, p. 150).

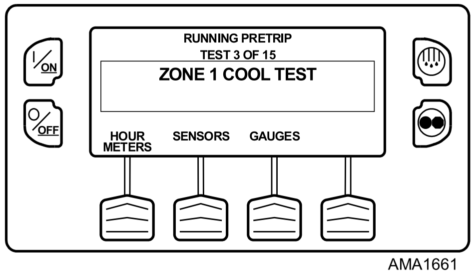
Figure 85. Pretrip Test



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

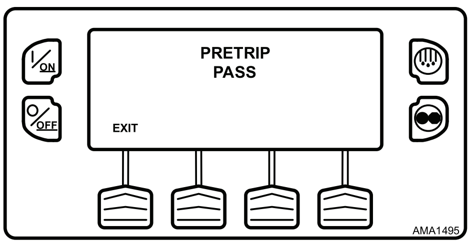
When the non-running tests are complete, the unit will start automatically and continue with the Running Pretrip Test. In the example shown (Figure 86, p. 151) the unit is in the Running Pretrip and is performing Test 3 of 15, Cool Test.

Figure 86. Cool Test



When all tests are complete, the results are reported as PASS, CHECK, or FAIL (Figure 87, p. 151). If the results are CHECK or FAIL, the accompanying alarm codes will direct the technician to the cause of the problem.

Figure 87. Pretrip Pass



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

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

See summary of “Performing a Pretrip Test” displays (Figure 88, p. 151) and (Figure 89, p. 152).

Figure 88. Performing a Pretrip Test (1)

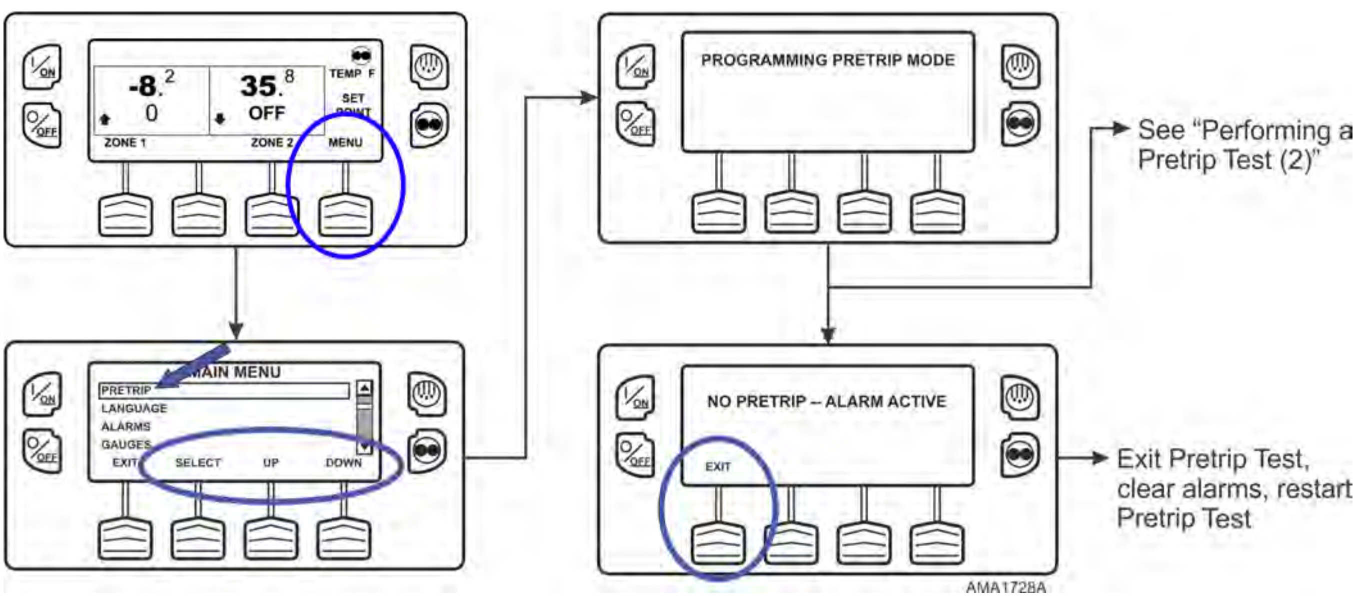
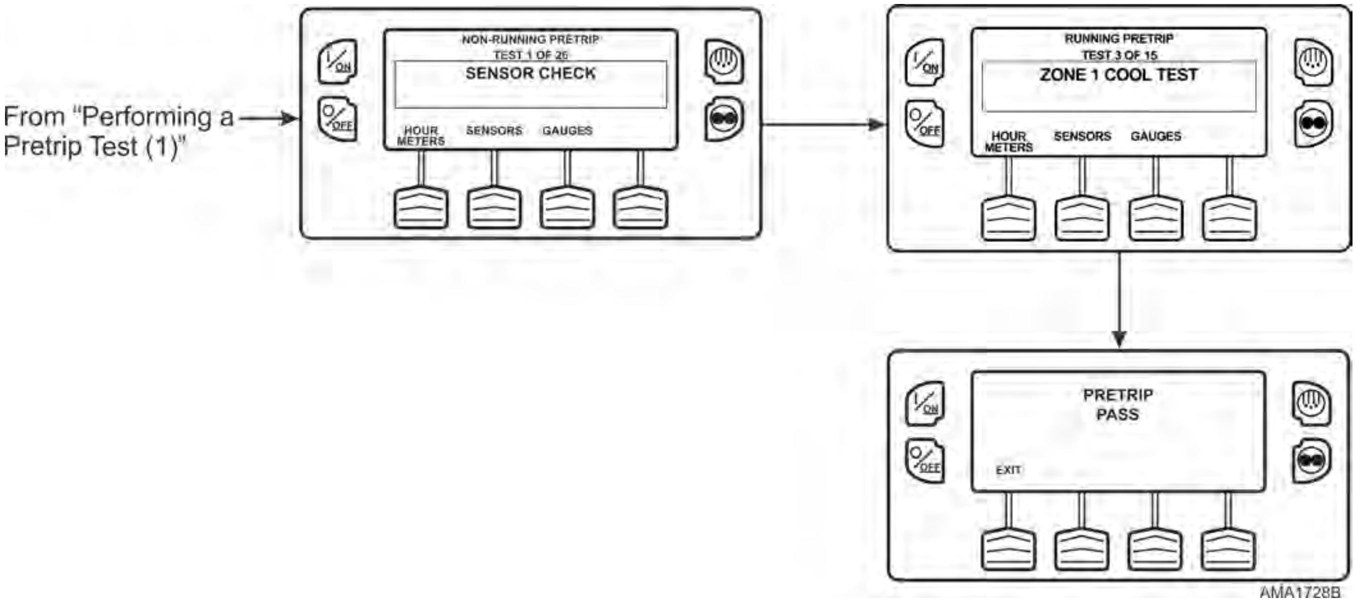


Figure 89. Performing a Pretrip Test (2)



Flash Drive

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

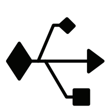
Download

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

Flashload

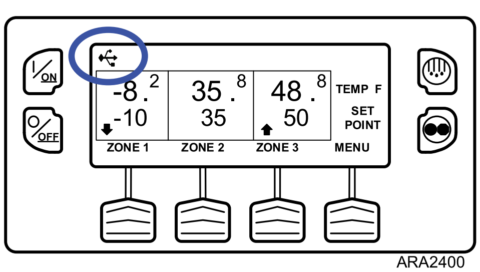
- Flash load Base Controller Software
- Flash load HMI Control Panel Software

Flash Drive Icon



- The USB Icon (Figure 90, p. 152) will appear in the upper left corner of the display as shown below when a USB Flash Drive is inserted in the USB Flash Drive USB Port on the Unit Control Panel.
- The USB Icon will also appear if a computer is connected to the USB PC USB Port on the Unit Control Panel or inside the control box.

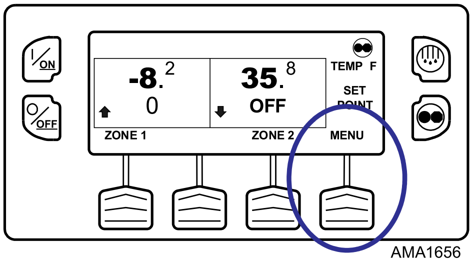
Figure 90. Flash Drive Icon



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

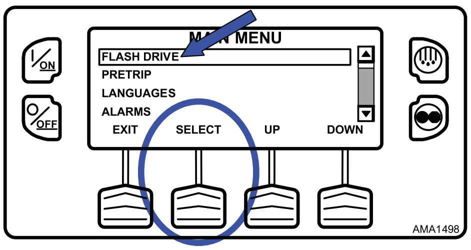
To select the Flash Drive Menu, press the MENU Key (Figure 91, p. 153). The Main Menu will appear.

Figure 91. Menu Key



If a properly configured USB Flash Drive is connected to the Flash Drive Only USB Port on the Control Panel, the Flash Drive Menu will appear as a main Menu selection. Press the UP or DOWN Key as required to choose the Flash Drive Menu. When the Flash Drive Menu is shown, press the SELECT Key to select the Flash Drive Menu (Figure 92, p. 153).

Figure 92. Flash Drive Menu



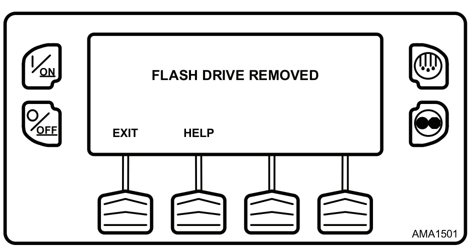
Flash Drive (If Connected While the Unit is Turned On)

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

Removing the Flash Drive

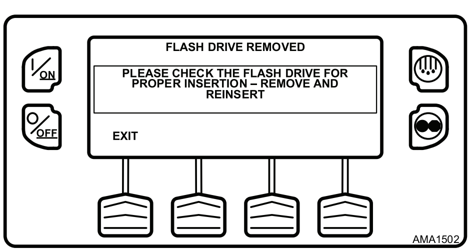
If the Flash Drive is disconnected, the display shown (Figure 93, p. 153) will appear for 30 seconds and the display will return to the Standard Display. To return to the Standard Display, immediately press the EXIT Soft Key.

Figure 93. Flash Drive Removed



If the HELP Soft Key is pressed, the display shown (Figure 94, p. 153) will appear.

Figure 94. Help Soft Key Pressed



Languages

If more than one language is enabled from the Guarded Access > Language Menu, this menu item will appear. If only one language is enabled, this menu will not appear. The Language Menu allows the operator to select a language from a list of up to four enabled languages. All subsequent displays are shown in the selected language. English is the default language. Refer to the Language Setup Menu in Section 3 for details.

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

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

Available Languages

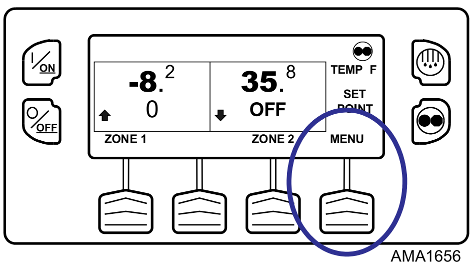
The following languages are available:

English French Spanish Portuguese

Selecting an Alternate Language

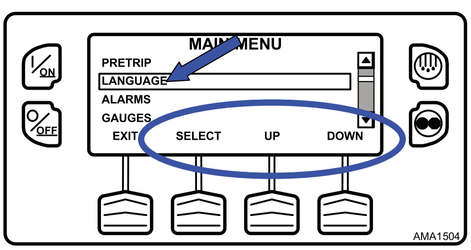
To select an alternate language, press the MENU Key (Figure 95, p. 154).

Figure 95. Menu Key



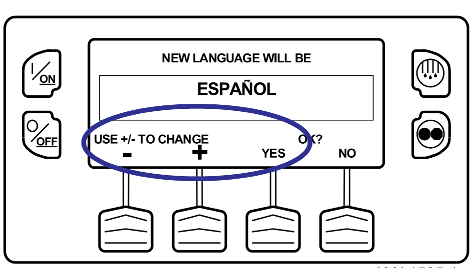
The Main Menu will appear. If more than one language is enabled, the Language Menu will appear as a Main Menu selection (Figure 96, p. 154). Press the UP or DOWN Key as required to choose the Language Menu. When the Language Menu is shown press the SELECT Key to select the Language Menu.

Figure 96. Main Menu



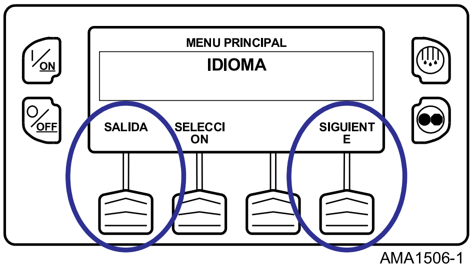
The Language Menu will appear as shown (Figure 97, p. 154). Press the + or - Keys to select the desired language. Only languages enabled from the Guarded Access Menu are available. When the desired language is shown, press the YES Key to confirm the choice.

Figure 97. Language Menu



The display will briefly show PROGRAMMING LANGUAGE - PLEASE WAIT in the new language. The display will then return to the Language Menu, but will show the new language. Spanish is shown in the example (Figure 98, p. 155).

Figure 98. New Language (Example: Spanish)



Repeat the process to select a different language. To select a different Main Menu item, press the NEXT (SIGUIENTE) Key. To return to the Standard Display, press the EXIT (SALIDA) Key. All displays will now be in the new language. Español (Spanish) is shown in the example (Figure 99, p. 155).

See summary of "Languages (If Enabled)" displays (Figure 100, p. 155).

Figure 99. Spanish (Example)

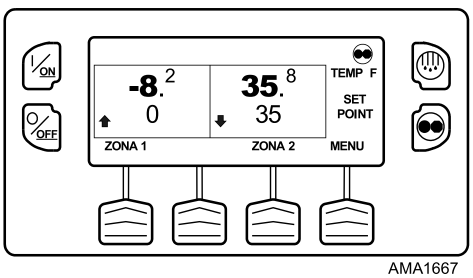
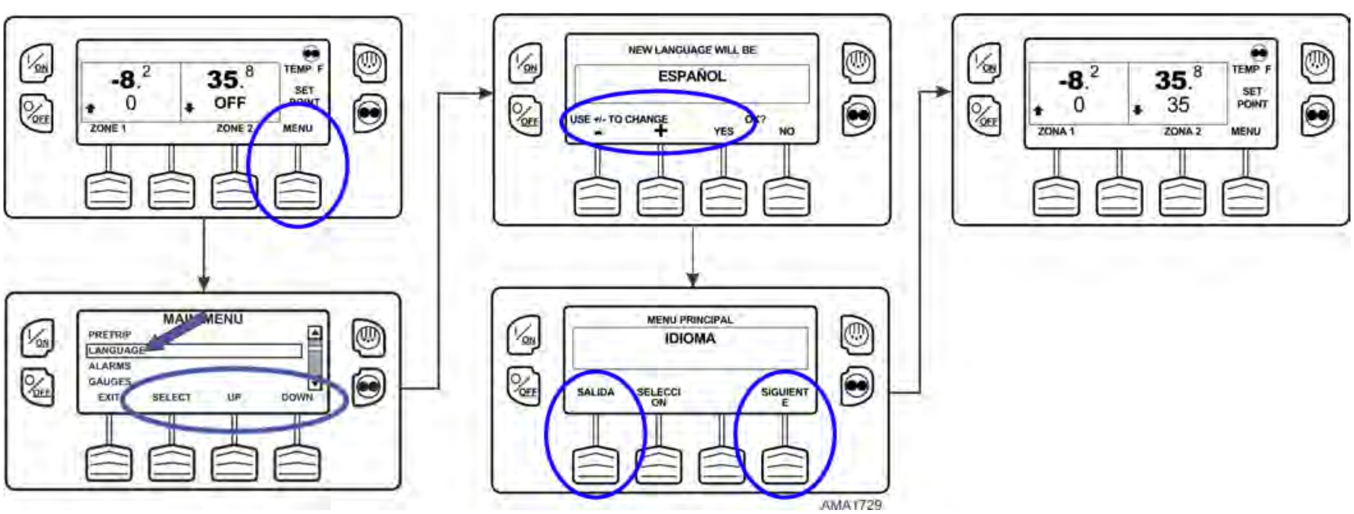


Figure 100. Languages (If Enabled)



Language Menu Quick Access

Should it be necessary at any time to change to English or any other installed language, return to the Standard Display and then press and hold the first and last soft keys for five seconds as shown below. The Standard Display shown (Figure 101, p. 156) is Español (Spanish).

After five seconds, the Language Menu will appear in the current language as shown (Figure 102, p. 156). Press the + or - Keys to select the desired language. When the desired language is shown, press the SI (YES) Key to confirm the choice.

Figure 101. First, Last Keys

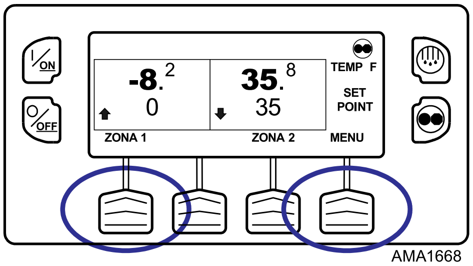
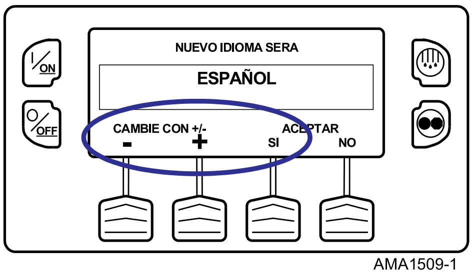


Figure 102. Select Desired Language



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

Alarms

The Alarms Menu allows the operator to view all alarms and clear most alarms. Refer to Section 5 for more information about alarm codes and their diagnosis.

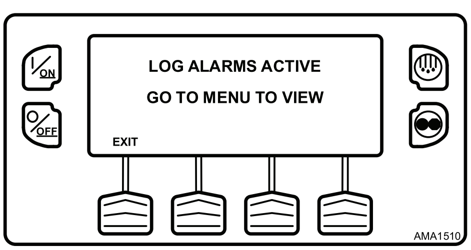
Log Alarm

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

When the unit is turned on, the display will show the Thermo King Logo and then the “Configuring System” message. If Log Alarm(s) are present, the Log Alarm notice will appear on the display for 30 seconds as shown (Figure 103, p. 156). The remote indicator alarm light (if installed) will also be on during this period. After 30 seconds, the Standard Display will appear and the remote indicator alarm light will go off.

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

Figure 103. Log Alarm Notice



Note: *If required, an engine start may occur while the display above is shown. This is normal operation.*

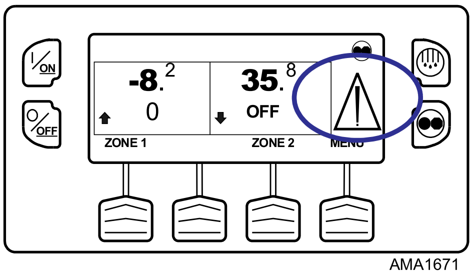
Check Alarm

Check Alarms are indicated by a steady alarm icon at the side of the display. If the alarm is specific to a zone, a smaller alarm icon will appear next to the affected zone. This level of alarm serves as a notice to take corrective action before a problem becomes severe. The unit will run with Check Alarms but some features and functions may be inhibited. The TemperatureWatch screen is disabled if a Check Alarm is active.

Unit Level Check Alarm

If the alarm pertains to the entire system (not an individual zone, e.g, Alarm Code 10), the alarm icon will appear at the right side of the display as shown (Figure 104, p. 157). Both Zone Specific and Unit Specific Alarms can exist at the same time.

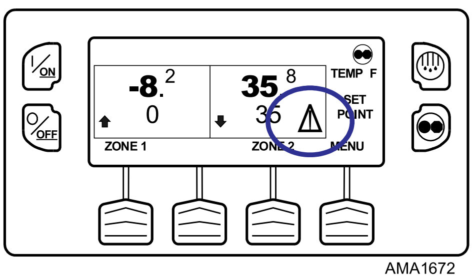
Figure 104. Alarm Icon



Zone Level Check Alarm

If the alarm is zone specific, the Alarm Icon will appear in the offending zone as shown (Figure 105, p. 157). In the example, an alarm exists in Zone 2.

Figure 105. Alarm for Zone 2



Unit Level Prevent Alarm

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

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

Zone Level Prevent Alarm

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 zone Prevent Alarms occur in all zones, the unit will be forced into a unit level Prevent Shutdown. The TemperatureWatch screen is disabled if a Zone Level Prevent Alarm is active.

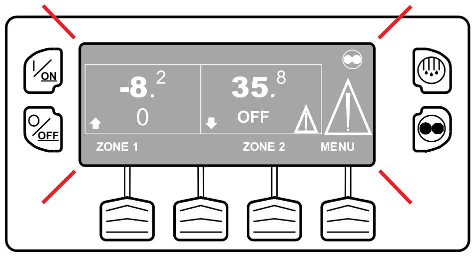
Shutdown Alarm

If a Shutdown Alarm occurs while the unit is running, it will be indicated by all of the following (Figure 106, p. 158):

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

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

Figure 106. Shutdown Alarm Screen



Unit Level Shutdown Alarm

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

Zone Level Shutdown Alarm

A zone Shutdown Alarm will force the affected zone to 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 and blink with a period of half second on - half second off. If zone Shutdown Alarms occur in all zones, the unit will shut down and Alarm Code 114 Multiple Alarms - Can Not Run will be set.

Pretrip Alarm

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

Zone Off Alarm

If the host unit is turned on, zone conditions are monitored even if the zone is turned off. For example, temperature sensor Alarm Codes 02, 03, and 04 can be set for a zone even when that zone is turned off.

Low Battery Voltage

If Alarm Code 61 Low Battery Voltage is set as a Shutdown Alarm, no subsequent alarm codes will be set with the exception of Alarm Code 28 Pretrip Abort.

Alarm Codes When Switching Between Diesel and Electric

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

In the same manner, if a shutdown alarm occurs that affects only electric mode operation and the unit is switched to diesel, the electric mode shutdown alarm becomes a diesel mode log alarm to allow diesel mode operation. If the unit is switched back to electric mode, the alarm reverts to an electric mode shutdown alarm and prevents unit operation. If the unit is configured for electric to diesel Auto-Switch, it automatically starts and runs in diesel mode if an electric shutdown occurs.

Clearing Alarm Codes

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

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

- Alarm Code 03 Check Control Return Air Sensor
- Alarm Code 04 Check Control Discharge Air Sensor

- Alarm Code 74 Controller Reset to Defaults.

The following alarm codes clear automatically:

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

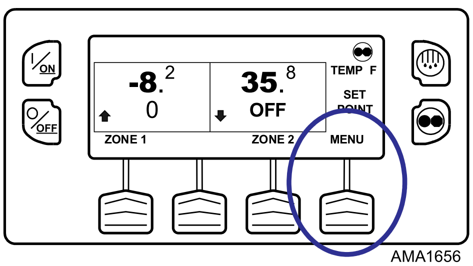
If the Limited Alarm Restarts feature is enabled, the following additional alarm codes may only be cleared from the Guarded Access Menu. If this is the case, the CLEAR soft key will not appear if the alarms are displayed from the Main Menu or the Maintenance Menu.

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

Displaying and Clearing Alarm Codes

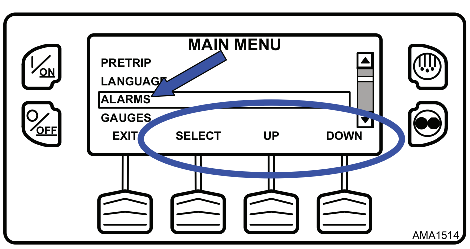
Alarms are displayed and cleared using the Alarm Menu. From the Standard Display, press the MENU Key (Figure 107, p. 159).

Figure 107. Menu Key



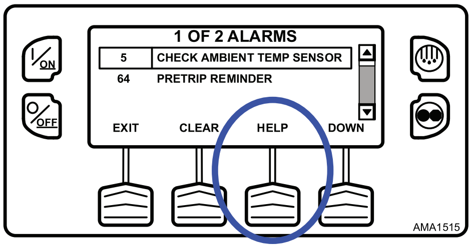
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Alarms Menu (Figure 108, p. 159). When the Alarms Menu is shown, press the SELECT Key to select the Alarms Menu.

Figure 108. Up/Down, Select Keys



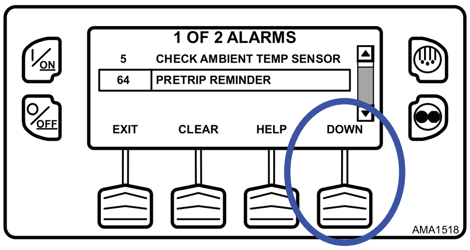
The number of alarms (if more than one) and a list of the alarms with the most recent alarm first will be shown. In the example shown (Figure 109, p. 160), there are two alarms. The most recent is Alarm Code 5 Check Ambient Temp Sensor.

Figure 109. Alarms Menu



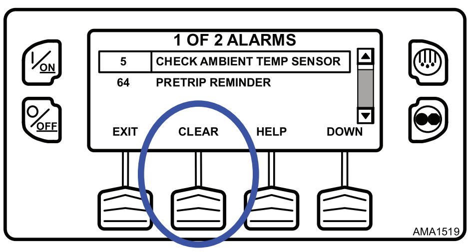
If necessary to view all alarms, scroll down using the DOWN Key (Figure 110, p. 160).

Figure 110. Down Key



If the alarm situation has been resolved, press the CLEAR Key to clear the alarm (Figure 111, p. 160).

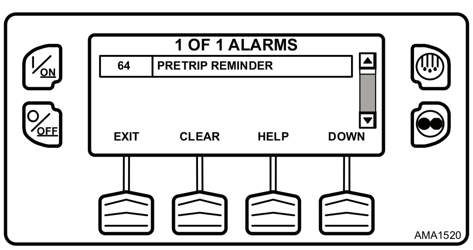
Figure 111. Clear Key



The display will briefly show CLEARING ALARM 5 – PLEASE WAIT and the Alarm Menu will reappear (Figure 112, p. 160).

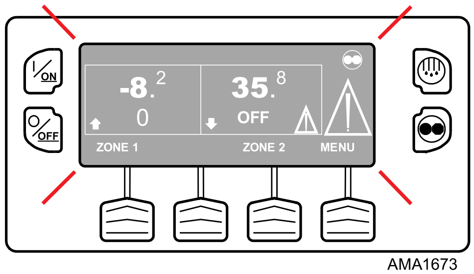
Alarm Code 64 Pretrip Reminder cannot be cleared using the CLEAR Key. This alarm will clear automatically when a Pretrip Test is run.

Figure 112. Pretrip Reminder



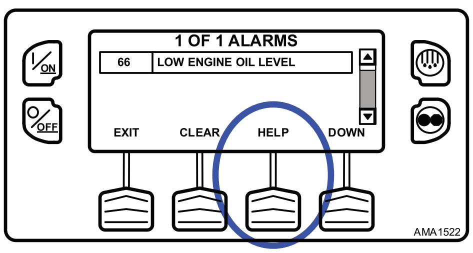
If a serious condition occurs, the unit will be shut down to prevent damage to the unit or the load. If this occurs, the Alarm Icon will appear, the display and backlight will flash on and off (Figure 113, p. 161).

Figure 113. Alarm Screen



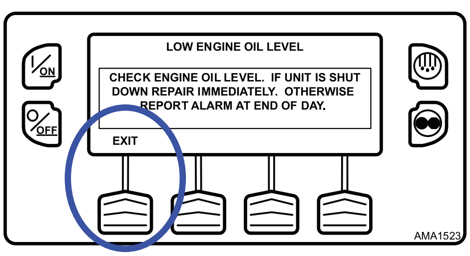
The Alarm Menu display will display the Shutdown Alarm Code. For additional information regarding the alarm shown on the display, press the HELP Key (Figure 114, p. 161).

Figure 114. Help Key



A help message will appear. Press the EXIT Key to return to the Alarms Menu (Figure 115, p. 161). Check the oil level and add oil as required, clear the alarm and restart the engine.

Figure 115. Exit Key



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

Important Alarm Notes

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

See summary of “Displaying and Clearing Alarm Codes” displays (Figure 116, p. 162) (Figure 117, p. 162).

Figure 116. Displaying and Clearing Alarm Codes (1)

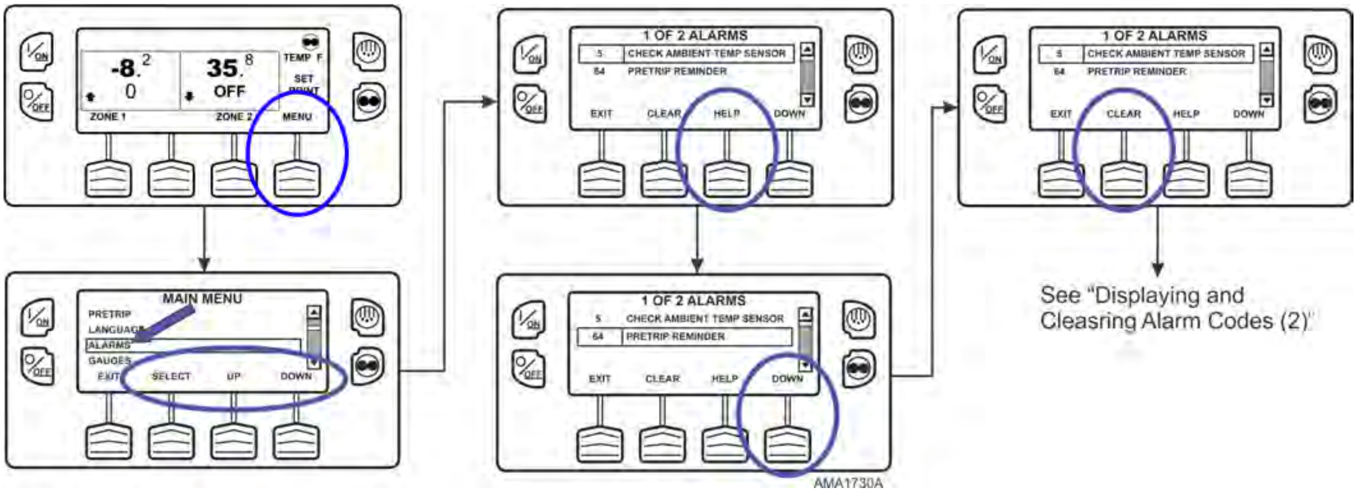
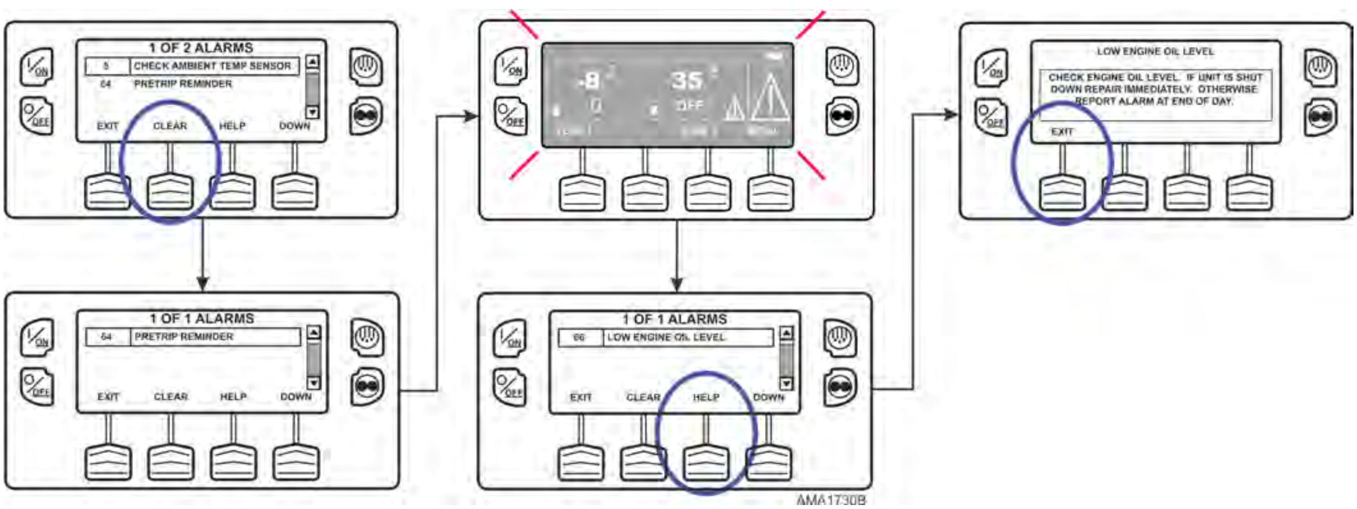


Figure 117. Displaying and Clearing Alarm Codes (2)



Data Logger (CargoWatch™)

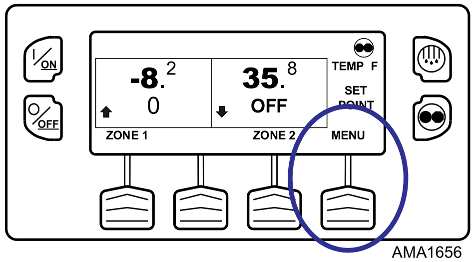
The CargoWatch Data Logger is physically located in the HMI Control Panel. It can support up to six optional temperature sensors.

When shipped from the factory, CargoWatch sensors 1 and 2 are turned on to be logged and CargoWatch sensors 3 through 6 are turned off. Also, digital input 1 is turned on to be logged and digital inputs 2 through 4 are turned off. Sensors and digital inputs can be turned on, off, and configured using the CargoWatch menu in Guarded Access or with WinTrac.

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

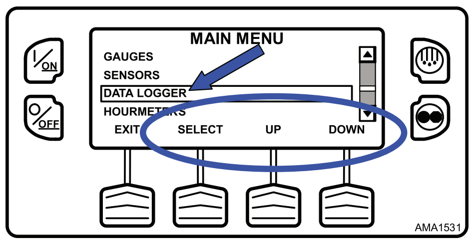
The ServiceWatch and CargoWatch Data Logger are accessed using the Data Logger Menu. From the Standard Display, press the MENU Key (Figure 118, p. 163).

Figure 118. Menu Key



The Main Menu will appear. Press the UP or DOWN Key as required to choose the Data Logger Menu. When the Data Logger Menu is selected, press the SELECT Key to choose the Data Logger Menu (Figure 119, p. 163).

Figure 119. Up, Down, Select Keys

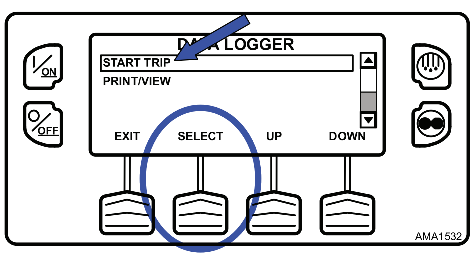


The Data Logger Menu will appear.

Sending Start of Trip Marker to CargoWatch and ServiceWatch Data Loggers

To send a Start of Trip marker to the CargoWatch and ServiceWatch Data Loggers, press the SELECT Key. The display will briefly show START OF TRIP COMPLETE to confirm that a Start of Trip marker was set in the CargoWatch Data Logger (Figure 120, p. 163).

Figure 120. Select Key, Start of Trip Complete

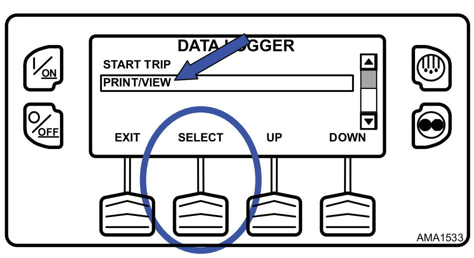


Note: *The start of trip marker is sent to both the CargoWatch and ServiceWatch data loggers.*

Printing CargoWatch Data Logger Reports

Press the DOWN Key to select the PRINT / VIEW feature and press the SELECT Key to choose Print/View (Figure 121, p. 163).

Figure 121. Select Key, Print/View



The Print Data Menu will appear. The first Print Data Menu allows the operator to print a Delivery Ticket using a hand held printer. Pressing the SELECT Key will print the ticket (Figure 122, p. 164). The Delivery Ticket is a short ticket that shows delivery specific details including the current temperature. A Sample Delivery Ticket is shown (Figure 123, p. 164).

Figure 122. Select Key, Print Delivery Ticket

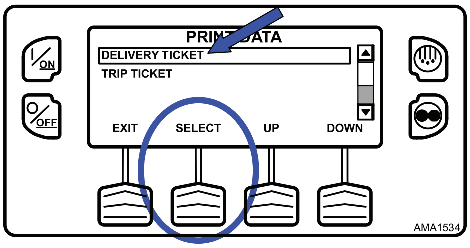
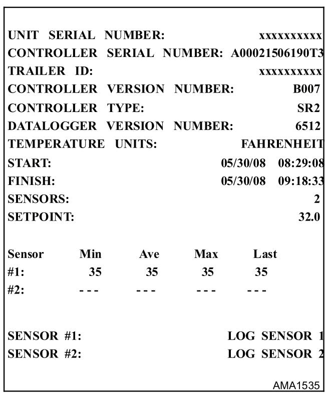


Figure 123. Sample Delivery Ticket



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

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

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

AMA1535

Pressing the DOWN Key allows the operator to print a Trip Ticket using a hand held printer. Press the SELECT Key to print the ticket (Figure 124, p. 164). The Trip Ticket is a long ticket that shows details for the current trip including a temperature history. The Trip Ticket is also called a Journey Ticket. A sample Trip Ticket is shown (Figure 125, p. 165).

Figure 124. Select Key, Print Trip Ticket

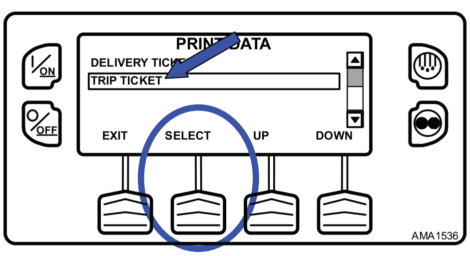


Figure 125. Sample Trip Ticket

UNIT SERIAL NUMBER:	xxxxxxxxxx
CONTROLLER SERIAL NUMBER:	A00021506190T3
TRAILER ID:	xxxxxxxxxx
CONTROLLER VERSION NUMBER:	B007
CONTROLLER TYPE:	SR2
DATALOGGER VERSION NUMBER:	6512
TEMPERATURE UNITS:	FAHRENHEIT
START:	05/30/08 09:50:08
FINISH:	05/30/08 13:07:33
SENSORS:	1
SETPOINT:	32.0
30 - MAY - 2008	
1305	35.0
1250	35.2
1235	35.1
1220	35.2
1205	35.1
30 - MAY - 2008	
1150	35.0
1135	35.0
1120	35.0
1105	34.9
1050	35.0
1035	35.0
1020	35.0
1005	35.1
0950	35.1
SENSOR #1:	LOG SENSOR 1
SENSOR #2:	LOG SENSOR 2

AMA1537

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

Hourmeters

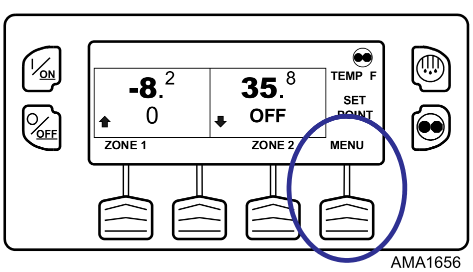
The Hourmeters Menu allows the operator to view the unit hourmeters that have the view feature enabled in the Guarded Access Menu. If the view feature for a particular hourmeter is not enabled, that hourmeter will continue to accumulate time but cannot be viewed from the Main Menu. However, all hourmeters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

Viewing Hourmeters

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

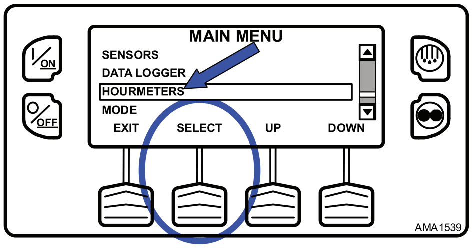
Hourmeters are displayed using the Hourmeter Display. From the Standard Display, press the MENU Key (Figure 126, p. 165).

Figure 126. Menu Key



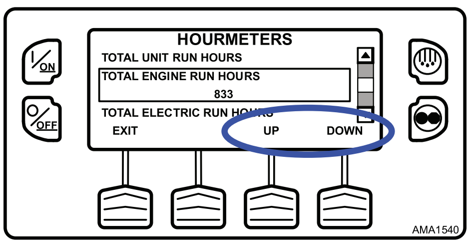
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Hourmeter Menu. When the Hourmeter Menu is selected, press the SELECT Key to choose the Hourmeter Menu (Figure 127, p. 166).

Figure 127. Select Key



Press the UP or DOWN Key to scroll through the hourmeters (Figure 128, p. 166).

Figure 128. Up/Down Keys



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

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

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

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

Hourmeter Names and Definitions

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

Hourmeter Name	Definition
Total Hours	Total number of hours the unit has been turned on (protection hours).
Total Run Time Hours	Total number of hours the unit has run in both diesel and electric mode.
Total Engine Run Hours	Total number of hours the unit has run in diesel mode.
Total 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 any mode.
Zone 2 Run Time Hours	Total number of hours Zone 2 has run in any mode.
Zone 3 Run Time Hours	Total number of hours Zone 3 has run in any 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.
Pretrip Reminder	User Programmable - number of hours before a Pretrip Reminder occurs.
Engine Reminder 1	User Programmable - The number of hours before an Engine Run Time Maintenance Reminder 1 occurs.
Engine Reminder 2	User Programmable - The number of hours before an Engine Run Time Maintenance Reminder 2 occurs.
Electric Reminder 1	User Programmable - The number of hours before an Electric Run Time Maintenance Reminder 1 occurs.

Hourmeter Name	Definition
Electric Reminder 2	User Programmable - The number of hours before an Electric Run Time Maintenance Reminder 2 occurs.
Engine Timing Belt Accumulated Hours	Total number of hours the engine timing belt has accrued in diesel mode.

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

Mode

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

- Turns Off Cycle Sentry Mode/Turns On Cycle Sentry Mode (If Cycle Sentry is turned Off, unit runs in Continuous).

  Note: *Selecting Cycle Sentry Mode or Continuous Mode can also be accomplished using the Cycle Sentry Key to the right of the display.*

- Allows Single Zone Control to be selected (if enabled from the Guarded Access > Main Menu Configuration Menu).
- Allows temperatures to be displayed in either Fahrenheit or Celsius degrees (if enabled from the Guarded Access > Main Menu Configuration Menu).
- Allows Keypad Lockout to be selected (if enabled from the Guarded Access > Main Menu Configuration Menu).
- Allows Sleep Mode to be set up and started (if enabled from the Guarded Access > Main Menu Configuration Menu).

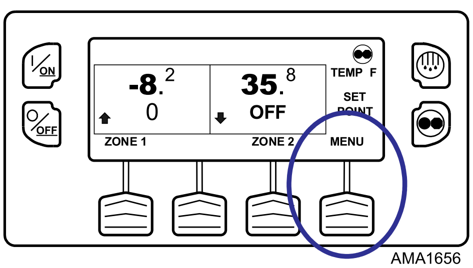
When shipped from the factory, only the Cycle Sentry/Continuous Mode is enabled.

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

Using the Change Mode Menu

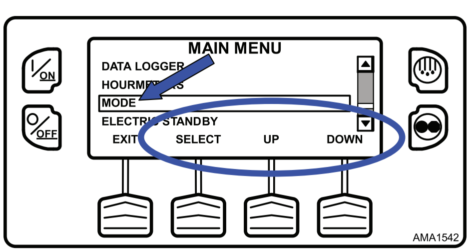
Mode changes are made using the Mode Menu. From the Standard Display, press the MENU Key (Figure 129, p. 167).

Figure 129. Menu Key



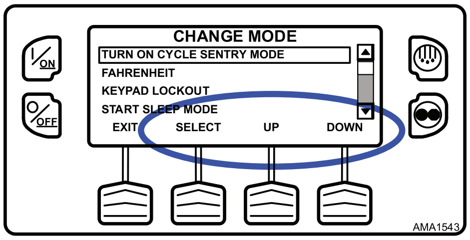
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Mode Menu. When the Mode Menu is selected, press the SELECT Key to choose the Mode Menu (Figure 130, p. 167).

Figure 130. Up, Down, Select Keys



The first enabled Change Mode Menu selection will appear. To choose that function, press the SELECT Soft Key. To Scroll through the enabled features in the Change Mode Menu, press the UP and DOWN Soft Keys (Figure 131, p. 168).

Figure 131. Select, Up, Down Keys



Possible mode selections are shown later in this section.

- Only those modes that have been enabled in Guarded Access > Main Menu Configuration will appear.
- To return to the Standard Display, press the EXIT Key.

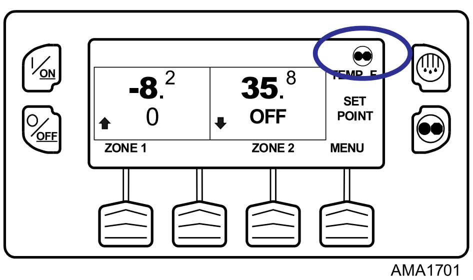
Turn Cycle Sentry On or Off

Cycle Sentry can be turned on and off either by using the Cycle Sentry hard key at the lower right side of the display or from the Main Menu.

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

If the unit is operating in Cycle Sentry Mode, the Cycle Sentry Icon will be present in the upper right corner of the display as shown (Figure 132, p. 168). If the Cycle Sentry Icon is not present the unit is operating in Continuous Mode.

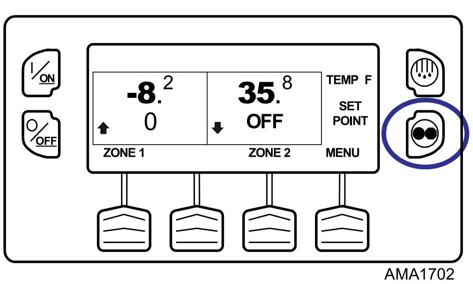
Figure 132. Cycle Sentry Icon



Using the Cycle Sentry Key

Cycle Sentry Mode or Continuous Mode is selected by pressing the Cycle Sentry Key as shown (Figure 133, p. 168).

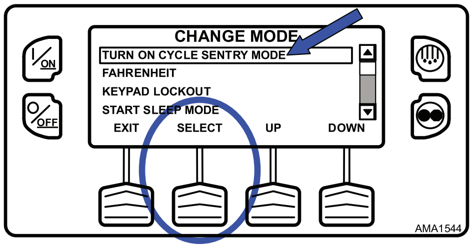
Figure 133. Cycle Sentry Key



Using the Main Menu

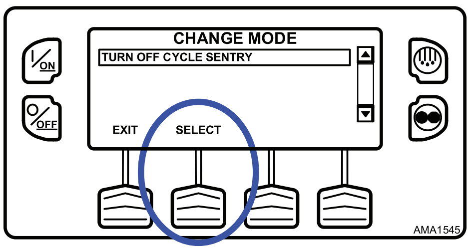
From the Main Menu > Change Mode menu choose Turn On/Off Cycle Sentry Mode and press the SELECT Soft Key.

Figure 134. Select Key



If the unit is running in Cycle Sentry Mode, press the SELECT Soft Key (Figure 135, p. 169) to turn off Cycle Sentry Mode as shown.

Figure 135. Select Key



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

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

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

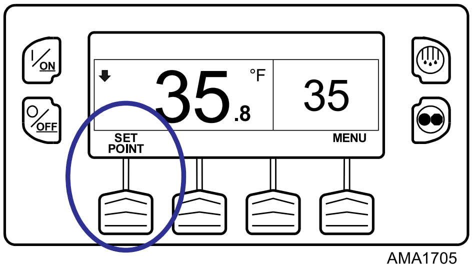
Important: *If the unit is in Cycle Sentry Null and the mode is switched to Continuous Mode, the unit will start automatically.*

Single Zone Control - Multi Zone Control

The following differences exist when operating the unit in Single Zone Control Mode.

- Single Zone Control Mode will appear in the Mode Menu only if the Single Zone Control feature has been enabled in the Guarded Access > Main Menu Configuration Menu. If the feature is enabled, Single Zone Control will appear in the Main Menu > Mode Menu.
- If Single Zone Control operation is selected, all zones will be forced on and will control to the same setpoint. All 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 one zone. Zone 1 is controlling or host, Zones 2 and 3 are backup.
- If Single Zone Control operation is selected the Single Zone Standard Display provides one soft key labeled Set Point as shown (Figure 136, p. 170). 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.

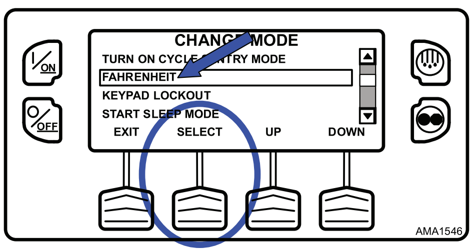
Figure 136. Setpoint



Select Temperature Units

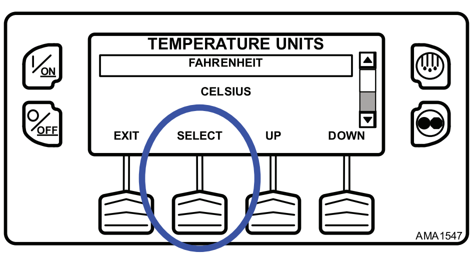
If this feature enabled in Guarded Access > Main Menu Configuration, the operator can select temperature units to be displayed as either degrees Fahrenheit or degrees Celsius. From the Main Menu > Change Mode Menu choose Fahrenheit or Celsius and press the SELECT Soft Key (Figure 137, p. 170).

Figure 137. Fahrenheit or Celsius, Select Key



Choose the desired Temperature Units using the UP and DOWN Soft Keys and press the SELECT Soft Key to select the choice (Figure 138, p. 170).

Figure 138. Up, Down, Select Keys



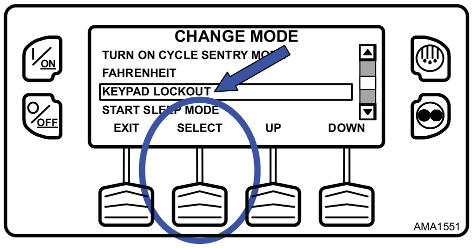
Temperatures will be displayed in the selected units.

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

Keypad Lockout

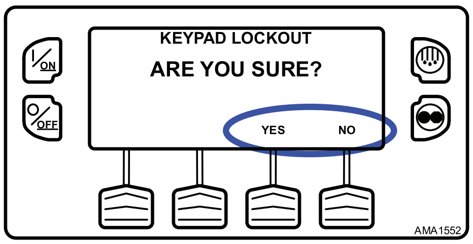
If enabled in Guarded Access > Main Menu Configuration, the keypad can be locked to prevent unauthorized use. If the keypad is locked, only the On Key and Off Key function. The keypad will remain locked even if the unit is turned off and back on. If Keypad Lockout is active, press and hold any soft key for five seconds to deactivate the feature. To turn the feature on, from the Change Mode Menu choose Keypad Lockout and press the SELECT Soft Key (Figure 139, p. 171).

Figure 139. Select Key



A Confirmation Request will appear. To activate Keypad Lockout press the YES Soft Key. To leave this menu without turning the Keypad Lockout feature on, press the NO Soft Key (Figure 140, p. 171).

Figure 140. Yes, No Soft Keys



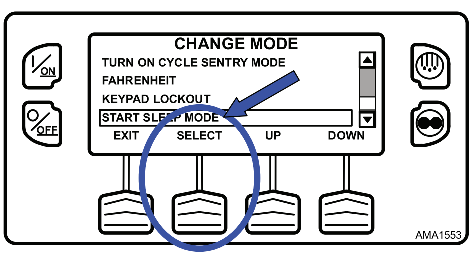
If the YES Soft Key was pressed, Keypad Lockout is active.

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

Start Sleep Mode

If this feature enabled in Guarded Access > Main Menu Configuration, the operator can select and set Sleep Mode from the Mode Menu. Sleep Mode is used to keep the engine warm and the battery charged when the unit is not in use. When the unit is Sleep Mode, the display will show "SLEEP" and the current time. To turn the feature on, from the Change Mode Menu choose Start Sleep Mode and press the SELECT Soft Key (Figure 141, p. 171).

Figure 141. Select Soft Key



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

- **Program Wakeup Time:** This feature allows a wakeup time to be specified. When the selected time is reached, the unit will start and resume normal operation. If a Wakeup Time is selected, the following features are available:
  - Day to Wake Up: This feature allows the day the unit is to wake up to be specified.
  - Hour to Wake Up: This feature allows the hour the unit is to wake up to be specified.
  - Minute to Wake Up: This feature allows the minute the unit is to wake up to be specified.
  - Run Pretrip on Wakeup: This feature allows a Pretrip Test to be automatically run when the unit wakes up.

SmartPower™ Electric Standby Option

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

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

Electric Mode Operation

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

Diesel Mode Operation

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

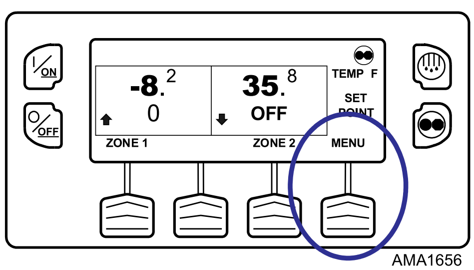
Switching from Diesel to Electric

If the unit is running in Diesel Mode and the Diesel to Electric Auto-Switch Enabled feature in Guarded Access is set YES, the unit will automatically switch to Electric Mode operation when standby power is connected and available. The screens shown (Figure 142, p. 172) (Figure 143, p. 172) will not appear.

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

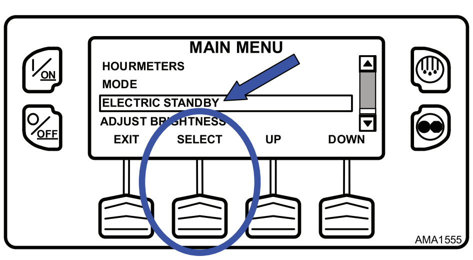
From the Standard Display, press the MENU Key.

Figure 142. Menu Key



From the Main Menu, choose Electric Standby and press the SELECT Soft Key (Figure 143, p. 172).

Figure 143. Select Key



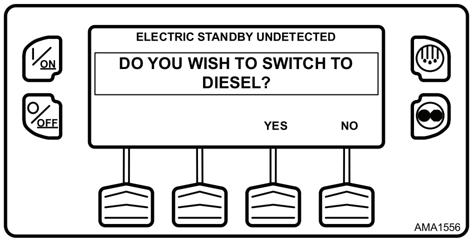
If the unit has standby power available and is turned on, the electric standby run screen will appear. The new mode is confirmed for 10 seconds. The unit will start and run in Electric Mode.

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

Electric Standby Power Fails or is Disconnected

If the electric standby power source fails or is disconnected and manual switching to Diesel Mode is selected, the unit will prompt for a switch to Diesel Mode (Figure 144, p. 173).

Figure 144. Diesel Mode Prompt



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

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

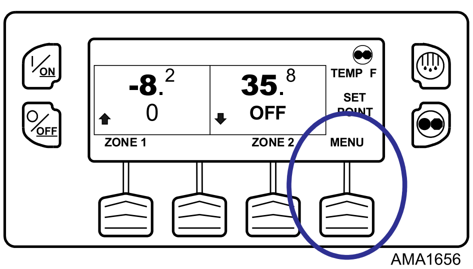
Switching from Electric to Diesel

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

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

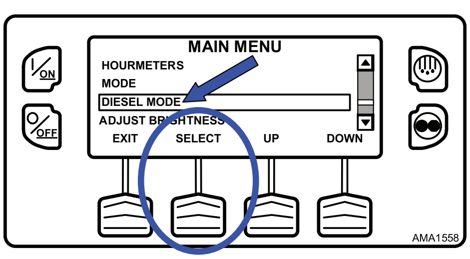
From the Standard Display, press the MENU Key (Figure 145, p. 173).

Figure 145. Menu Key



From the Main Menu, choose Diesel Mode and press the SELECT Soft Key (Figure 146, p. 173).

Figure 146. Select Key



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

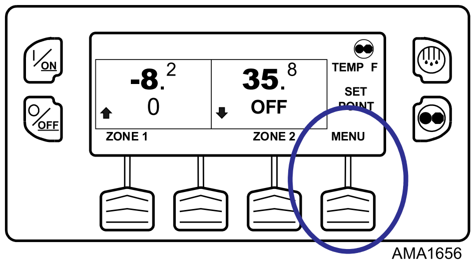
Any electric standby related Shutdown Alarms become Log Alarms when the unit is switched to Diesel Mode operation. If the unit is switched back to Electric Mode, these alarms again become Shutdown Alarms.

Adjust Brightness

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

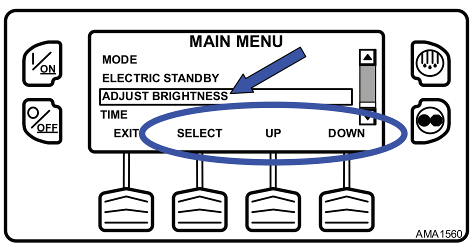
Display brightness is adjusted using the Adjust Brightness Menu. From the Standard Display, press the MENU Key (Figure 147, p. 174).

Figure 147. Menu Key



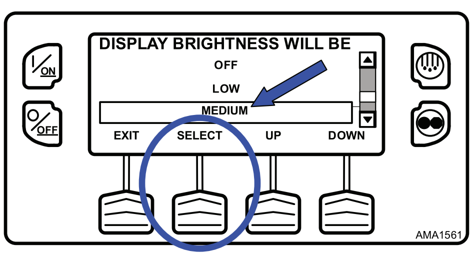
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Adjust Brightness Menu. When the Adjust Brightness is selected, press the SELECT Key to choose the Adjust Brightness (Figure 148, p. 174).

Figure 148. Select Key



The Display Brightness menu will appear as shown. Press the UP or DOWN Soft Keys to select the desired display brightness. When the desired brightness is shown, press the SELECT Soft Key to confirm the choice (Figure 149, p. 174).

Figure 149. Select Key

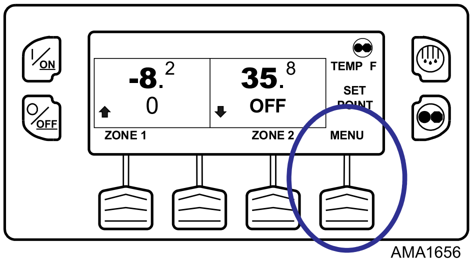


To return to the Main Menu, press the EXIT Key. To return to the Standard Display, press the EXIT Key again.

Time

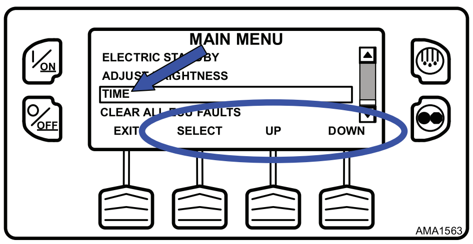
The Time and Date held by the HMI Control Panel can be checked. Time and Date cannot be changed from the Main Menu. The time and date is accessed using the Main Menu. From the Standard Display, press the MENU Key (Figure 150, p. 175).

Figure 150. Menu Key



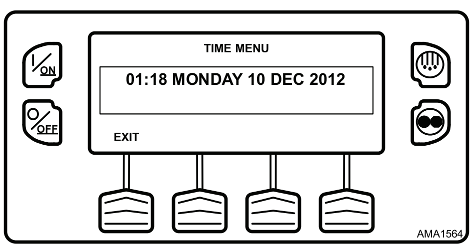
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Time Menu. When the Time Menu is selected, press the SELECT Key to choose the Time Menu (Figure 151, p. 175).

Figure 151. Select Key



The date and time held in the HMI Control Panel will be shown on the display (Figure 152, p. 175). Time and Date cannot be changed from the Main Menu.

Figure 152. Date and Time



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

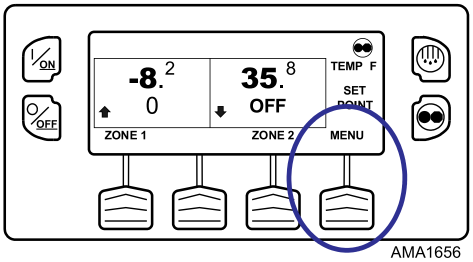
Clear All ECU Faults

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

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

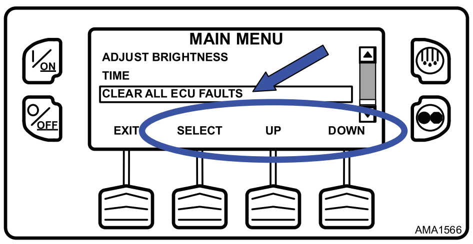
Engine Control Unit (ECU) Fault Codes are cleared using the Clear All ECU Faults Menu. From the Standard Display, press the MENU Key (Figure 153, p. 176).

Figure 153. Menu Key



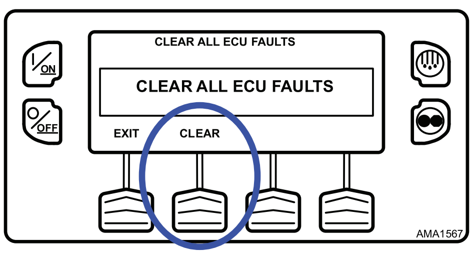
The Main Menu will appear. Press the UP or DOWN Key as required to choose the Clear All ECU Faults Menu. When the Clear All ECU Faults Menu is selected, press the SELECT Key to choose the Clear All ECU Faults Menu (Figure 154, p. 176).

Figure 154. Select Key



The Clear All ECU Faults Prompt will appear. To clear all ECU Faults and associated Thermo King Faults, press the CLEAR Soft Key (Figure 155, p. 176).

Figure 155. Clear Key



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

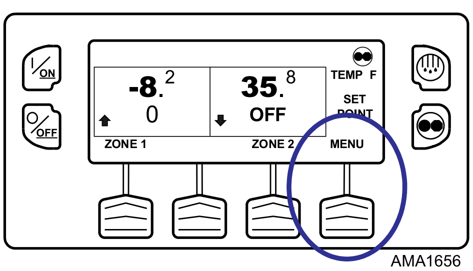
To return to the Main Menu, press the EXIT Key. To return to the Standard Display, press the EXIT Key again.

Fuel Usage

Note: *Only available on units equipped with TK488CR, TK488CRH, and TKDV6 engines.*

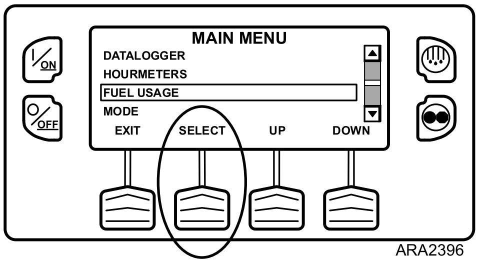
Fuel Usage can be checked from the HMI Control Panel by accessing the Main Menu. From the Standard Display, press the MENU Key (Figure 156, p. 176).

Figure 156. Menu Key



From the Main Menu, choose Fuel Usage and press the SELECT soft key (Figure 157, p. 177).

Figure 157. Select Key

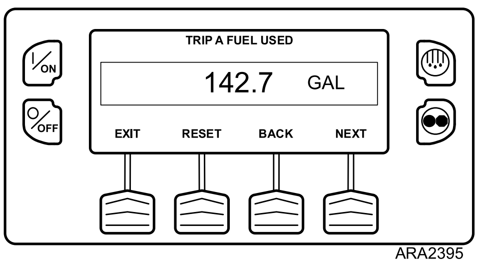


The first of the Fuel Usage screens (Figure 158, p. 177) will appear. The name of the gauge appears in the title of the Fuel Usage screen and the current value of the gauge appears in the main field. To return to the Main Menu, press the EXIT key.

Pressing the RESET key will reset the Trip's Fuel Used, Fuel Used per Temperature Control Hour, and Fuel Used per Engine Run Hour values back to zero.

Pressing the BACK key will return to the previous Fuel Usage parameter screen. Pressing the NEXT key will forward to the next Fuel Usage parameter screen.

Figure 158. Trip A Fuel Used



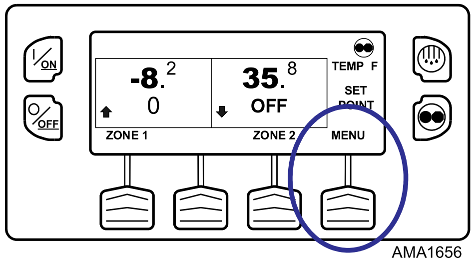
Fuel Usage parameter screens include:

- Instantaneous Fuel Rate
- Trip A Fuel Used
- Trip A Fuel Used per Temperature Control Hour
- Trip A Fuel Used per Engine Run Hour
- Trip B Fuel Used
- Trip B Fuel Used per Temperature Control Hour
- Trip B Fuel Used per Engine Run Hour
- Trip C Fuel Used
- Trip C Fuel Used per Temperature Control Hour
- Trip C Fuel Used per Engine Run Hour
- Lifetime Fuel Used (can only be reset from Guarded Access)
- Lifetime Fuel Used in Temperature Control (can only be reset from Guarded Access)

Prime Fuel System

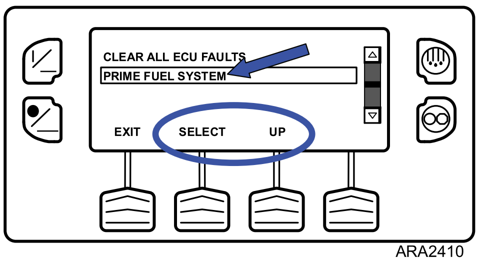
The Prime Fuel System function runs the fuel pump for up to five minutes to prime the fuel lines. Fuel priming is always shown on the HMI, but the functionality will only be available if the engine/electric motor is not running. From the Standard Display, press the MENU Key (Figure 159, p. 178).

Figure 159. Menu Key



From the Main Menu, choose Prime Fuel System and press the SELECT soft key (Figure 160, p. 178).

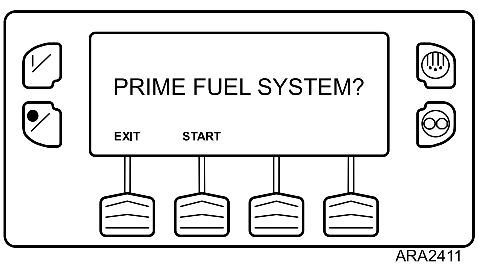
Figure 160. Select Key



The first of the Prime Fuel System screens will appear (Figure 161, p. 178).

- Prime Fuel System will remain active until either Exit or Start is selected. If Start is selected, Priming Fuel System will be displayed.
- Priming Fuel System will remain active while the fuel system is being primed. If either Exit or Stop is selected, Fuel System Prime Failed will display.
- Fuel System Prime Failed will remain active until Exit is selected.
- Fuel System Prime Complete will be displayed when the fuel system priming has been allowed to complete.

Figure 161. Prime Fuel System

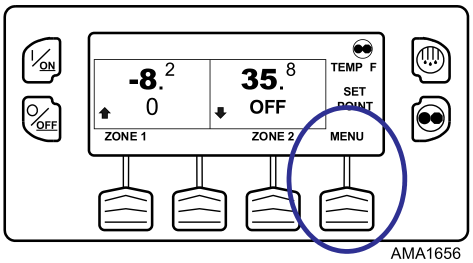


Using the Maintenance Menu

The Maintenance Menu contains features that allow the technician to view additional information, perform unit diagnostics using Service Test Mode and Output Test Mode and evacuate using Evacuation Mode. Software revisions can be checked and the time, date and time zone can be set.

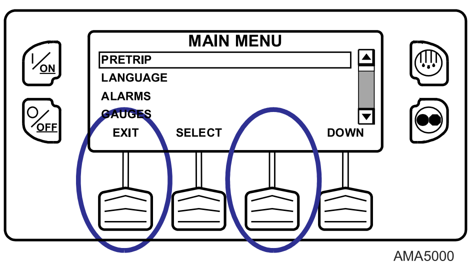
Entering the Maintenance Menu

From the Standard Display, press the MENU Soft Key.



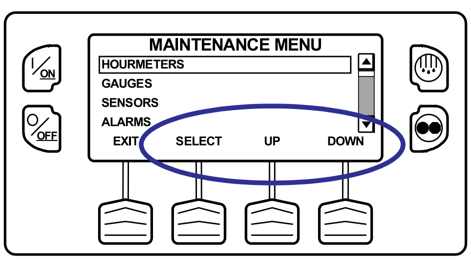
AMA1656

The Maintenance Menu is accessed from the first Main Menu screen that appears, usually the Pretrip Menu. The third Soft Key from the left will be unlabeled. Press and hold both the Exit Soft Key and the unlabeled Soft Key for five seconds as shown below.



AMA5000

The Maintenance Menu will appear. Press the UP and DOWN Soft Keys to scroll through the Maintenance Menu selections. When the desired choice is shown on the display, press the SELECT Soft Key to access it.



AMA5001

To return to the Standard Display press the EXIT Soft Key. The HMI Control Panel will automatically 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

The Hourmeters 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. Hourmeters can also be viewed from the Main Menu if enabled in Guarded Access. Refer to Using the Main Menu (“Hourmeters,” p. 165) for detailed information.

Gauges

The Gauge Menu allows the technician to view the unit gauges. The Gauge Menu can also be accessed from the Main Menu. Refer to Using the Main Menu (“Gauges,” p. 144) for detailed information.

Sensors

The Sensors Menu allows the technician to view the unit and zone temperature sensors. The Sensors Menu can also be accessed from the Main Menu. Refer to Using the Main Menu (“Sensors,” p. 145) for detailed information.

Alarms

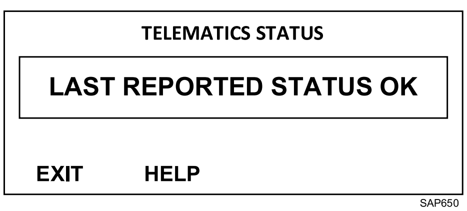
The Alarm Menu allows the technician to view any active alarms, and allows most alarms to be cleared. The Alarm Menu is also available from the Main Menu. Refer to Using the Main Menu (“Alarms,” p. 156) for detailed information.

Telematics Status

Note: *Only available with TK BlueBox installed.*

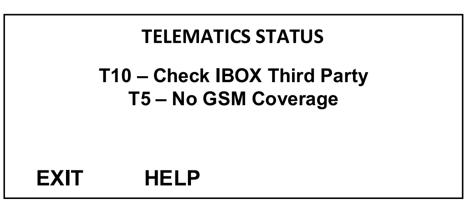
The Telematics Status Menu will appear in the Maintenance Menu if the Guarded Access > REB Type Configured is set to anything except NONE. Selecting it allows the user to check the status of the Telematics System. It will display descriptions of possible causes if it detects any problems. If no problems are detected, the screen shown below appears.

Figure 162. Status OK



If problems are detected, the screen shown below will display multiple descriptions. Press the HELP Key to display a help screen. Press the EXIT Key to return to the Maintenance Menu.

Figure 163. Status Descriptions



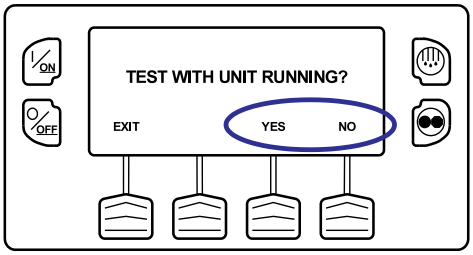
Service Test Mode

Service Test Mode 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.

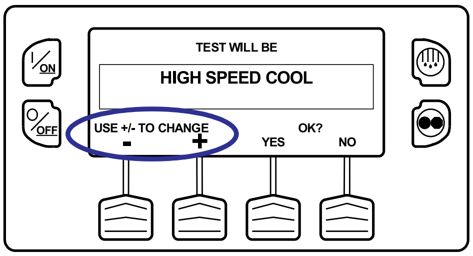
Important: *Service Test Mode is not allowed if any Shutdown Alarms exist or if the unit is in a Prevent Mode Shutdown Null (Alarm Code 84 is set). Clear all alarms before using Service Test Mode.*

Choose Service Test Mode by pressing the SELECT Soft Key when SERVICE TEST is shown in the Maintenance Menu. The TEST WITH UNIT RUNNING prompt will appear. Select YES or NO as desired by pressing the appropriate Soft Key.



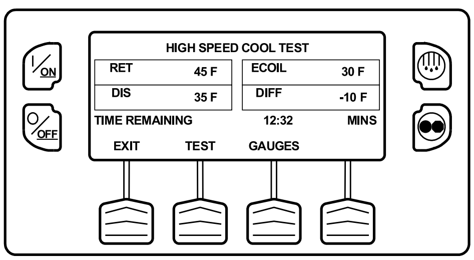
AMA5004

The SERVICE TEST Selection Menu appears as shown. Use the + and – Soft Keys to scroll through the available tests. When the desired test is shown, press the YES Soft Key to select it.



AMA5005

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.



AMA5006

- A test will remain active for 15 minutes. A countdown timer 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 Soft Key is used to scroll through the gauges.
- The TEST Soft Key allows the various tests to be selected.
- The EXIT Soft Key returns to the Maintenance Menu.

Not all tests are available on all units. Only tests used by the specific unit configuration will appear.

Service Test Modes

- 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 Evaporator Fan Low Speed
- Zone 1 Evaporator Fan High Speed
- Zone 2 Null
- Zone 2 Low Speed Cool
- Zone 2 High Speed Cool
- Zone 3 Null
- Zone 3 Low Speed Cool
- Zone 3 High Speed Cool
- Zone 3 Low Speed Heat
- Zone 3 High Speed Heat

- Zone 1 Defrost
- Zone 1 Minimal Heat
- Zone 1 Condenser Road Fan
- Zone 1 Condenser Curb Fan
- Zone 2 Low Speed Heat
- Zone 2 High Speed Heat
- Zone 2 Defrost
- Zone 2 Minimal Heat
- Zone 3 Defrost
- Zone 3 Minimal Heat
- ETV Check

Table 24. Devices Energized - Diesel Mode

Service Test Mode Test	Run Relay	High Speed	Heat	D/E Relay	Hot Gas Bypass	ETV	Damper (S-600DE/S-610DE)
Off/Null							
High Speed Cool	ON	ON				Enabled	
Low Speed Cool	ON					Enabled	
Low Speed Heat	ON		ON			Enabled	
High Speed Heat	ON	ON	ON			Enabled	
Defrost	ON		ON			Enabled	ON
Cool Bypass	ON				ON	Enabled	
Mod Cool 100% HGB	ON				ON	100 Steps Open	
Mod Cool 100%	ON					100 Steps Open	
Mod Heat 100%	ON		ON			100 Steps Open	

Table 25. Devices Energized - Electric Mode

Service Test Mode Test	Run Relay	High Speed/ Electric Heat	Heat	D/E Relay	Hot Gas Bypass	ETV	Damper (S-600DE/S-610DE)
Null							
Cool	ON			ON		Enabled	
Hot Gas Heat	ON		ON	ON		Enabled	
Hot Gas & Elec Heat	ON	ON	ON	ON		Enabled	
Defrost	ON	ON	ON	ON		Enabled	ON
Cool Bypass	ON			ON	ON	Enabled	
Mod Cool 100% HGB	ON			ON	ON	100 Steps Open	
Mod Cool 100%	ON			ON		100 Steps Open	
Mod Heat 100%	ON		ON	ON		100 Steps Open	

Note: *If a Condenser Fan or Evaporator Blower Test is selected, only that fan or blower will be energized.*

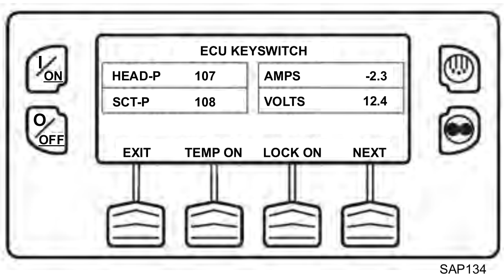
Output Test Mode

Output Test Mode allows the technician to energize and de-energize individual control devices for diagnostic purposes. The engine will not run when in Output Test Mode. If the test is entered with the unit running, the engine will stop.

Important: *Output Test Mode is not allowed if any Shutdown Alarms exist or if the unit is in a Prevent Mode Shutdown Null (Alarm Code 84 is set). Clear all alarms before using Output Test Mode.*

Choose Output Test Mode by pressing the SELECT Soft Key when OUTPUT TEST is shown in the Maintenance Menu. The OUTPUT TEST Menu appears as shown (Figure 164, p. 183).

Figure 164. ECU Keyswitch



Discharge Pressure, Suction Pressure, Amps, and Volts are shown.

The NEXT Soft Key is used to scroll down through the test menu.

The TEMP ON Soft Key is used to momentarily energize the device shown.

The LOCK ON Soft Key energizes the device shown 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 Soft Key de-energizes the device shown and returns to the Output Test.

The EXIT Soft Key returns to the Maintenance Menu.

Not all tests are available on all units. Only tests used by the specific unit will appear.

Table 26. Output Test Modes and Current Draw

Output Test	Approximate Device Current Draw	Comments
ECU Keyswitch		
ECU Run		
Evap Fan Low Speed		
Evap Fan High Speed		
Condenser Fan Roadside		
Condenser Fan Curbside		
Buzzer	Negligible	Temporary On only
Run Relay	0.5 - 1.0 Amps	
Damper Relay	5.7 Amps	
Indicator Light	0.1 Amps	
Diesel/Electric Relay	0.5 Amps	Not available if ER is high
Electric Heat	0.1 Amps	
Zone 1 Liquid Line Solenoid	2.3 Amps	
Purge Valve	0.7 - 0.8 Amps	
Zone 1 Hot Gas Solenoid	1.5 Amps	
Condenser Inlet Solenoid	1.3 - 1.6 Amps	
Zone 1 Suction Line Solenoid	1.5 - 1.7 Amps	
Alternator Excite Output	0.1 - 0.7 Amps	

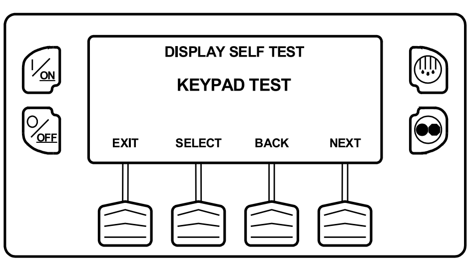
Table 26. Output Test Modes and Current Draw (continued)

Output Test	Approximate Device Current Draw	Comments
Receiver Tank Solenoid	0.7 - 0.8 Amps	
Damper Gear Motor 1 (S-600DE)	0.2 - 0.4 Amps (Normal) 0.65 Amps (Maximum)	
Damper Gear Motor 2 (S-600DE)	0.2 - 0.4 Amps (Normal) 0.65 Amps (Maximum)	
Remote Fan Motor 2 (C-600M/S-600M)		
Zone 2 Hot Gas Solenoid	1.5 Amps	Current doubles if Parallel Evaporators
Zone 2 Suction Line Solenoid	1.3 Amps	Current doubles if Parallel Evaporators
Zone 2 Liquid Line Solenoid	1.3 Amps	Current doubles if Parallel Evaporators
Fan Motor Zone 2 Output	8.0 Amps (Per Motor)	Depends on unit configuration
Drain Hose Heater Zone 2	2.0 Amps (Each)	Current doubles if Parallel Evaporators
Fan Motor Zone 3 Output	8.0 Amps (Per Motor)	Depends on unit configuration
Drain Hose Heater Zone 3	2.0 Amps (Each)	Current doubles if Parallel Evaporators
Zone 3 Hot Gas Solenoid	1.5 Amps	Current doubles if Parallel Evaporators
Zone 3 Suction Line Solenoid	1.3 Amps	Current doubles if Parallel Evaporators
Zone 3 Liquid Line Solenoid	1.3 Amps	Current doubles if Parallel Evaporators
Note: *Device current will vary dependant on battery voltage and battery condition.*		

Display Self Test

The Display Self Test 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 Soft Key when DISPLAY SELF TEST is chosen in the Maintenance Menu. The Display Self Test screen appears. Select a test from the Display Self Test Menu.



AMA5008

- The NEXT and BACK Soft Keys are used to scroll through the tests.
- The SELECT Soft Key starts the selected test.
- The EXIT Soft Key returns to the Maintenance Menu.

Available Tests:

- 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 allows the technician to perform an internal HMI CargoWatch data logger memory test. The test takes less than one second and the results are reported as PASS or FAIL.
- 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

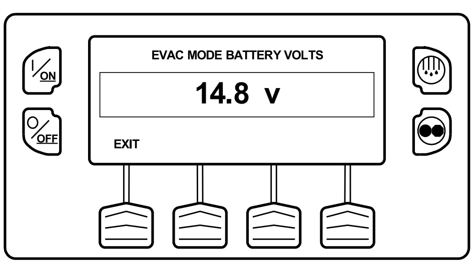
This menu allows the technician to open all normally closed refrigeration system valves to evacuate and charge the unit with refrigerant. If the battery voltage falls below 13.0 Vdc the technician is prompted to connect a battery charger to maintain sufficient voltage to hold all valves open.

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 unit will not start.

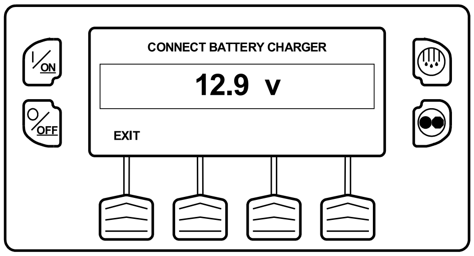
- **Evacuation mode is not allowed if:**
  - Any shutdown alarms are present.
  - The unit is in restart null.
  - The unit is in a start sequence.
- **When in evacuation mode:**
  - If the unit is running it will shut down automatically when entering Evacuation Mode.
  - Alarm Code 86 Check Discharge 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 Soft Key when EVACUATION TEST is shown by the Maintenance Menu. The Evacuation Test display shown below 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 system evacuation to effectively remove air and moisture from the refrigeration system.



AMA5009

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.



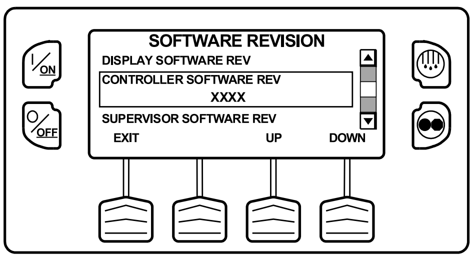
AMA5010

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 current installed software revision for the HMI Control Panel and the Base Controller.

Choose Software Revision by pressing the SELECT Soft Key when SOFTWARE REVISION is shown by the Maintenance Menu. The Software Revision display appears as shown below.



AMA5011

The NEXT and BACK Soft Keys allow the technician to scroll through the software revisions. Software revisions appear in the order shown below:

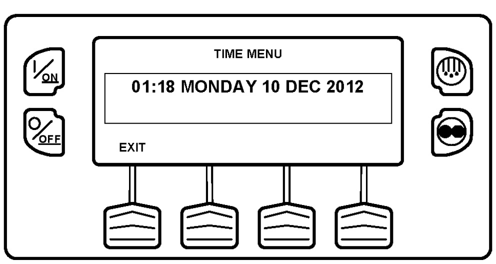
- Display Software Revision
- Controller Software Revision
- Supervisor Software Revision (Determined by HMI Control Panel software revision)

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 Soft Key when SET TIME AND DATE is shown by the Maintenance Menu. The Set Time and Date display appears as shown.



AMA5012

The - and + Soft Keys are used to change the hour as required. Pressing the YES Soft Key changes the hour to the selected time and then shows the next Time/Date screen. The screens appear in the order shown below:

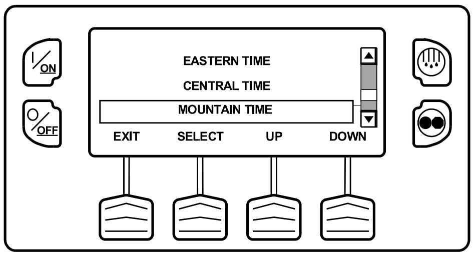
- Hour
- Minute

- Date (Day)
- Month
- Year

Time Zone

This menu allows the technician to view and change the Time Zone.

Choose Time Zone by pressing the SELECT Soft Key when Time Zone is shown by the Maintenance Menu. The Time Zone Menu appears as shown below.



The UP and Down Soft Keys are used to change the Time Zone as required. Pressing the SELECT Soft Key changes the Time Zone to the selected zone. The screens appear in the order shown below:

- Eastern Time
- Central Time
- Mountain Time
- Pacific Time

Connect Engine Service Tool

The Connect Engine Service Tool feature allows the unit to be powered down but maintains power to the Engine Control Unit (ECU) for diagnostic purposes. This allows the Peugeot Diagnostic Tool to be connected to the ECU without having the rest of the unit powered up. Refer to Service Procedure A60A for details.

Engine Break-In

Engine Break-In (EBI) mode is a Transport Refrigeration Unit (TRU) Controller feature that allows a user to force the controller to run the engine for a total of six hours, switching the setpoint from high to low as necessary to maintain the required engine loading conditions, with trailer doors closed and regardless of most unit conditions. The Engine Break-In feature is primarily used in the process of commissioning the unit after installation. EBI mode is designed to give dealers the opportunity to help meet break-in guidelines and reduce warranty claims. This feature is designed to be initiated through the TRU Controller Human Machine Interface (HMI) Module.

Engine Break-In Conditions

- Engine Break-In mode is available only in Diesel mode. Electric motor operation is not allowed.
- The Base Controller will store unit settings (those settings that the controller will be changing during engine break-in mode) when entering Engine Break-In mode and then restore unit settings upon exiting Engine Break-In mode.
- Multi-temperature units will enter Single Zone Control for Engine Break-In mode, then exit when complete.

Conditions Where Engine Break-In is Not Allowed

- If any Shutdown Alarms are present, Alarm Code 5 is present, unit is in Prevent Null, or has a Prevent Alarm.
- If the unit is in any mode other than normal operation, including but not limited to, Sleep Mode, Pretrip Test Mode, Service Test Mode, Output Test Mode, Evacuation Mode, or any Flashload Mode including OptiSet.
- If the unit is in Electric motor operation.

Engine Break-In Considerations

When entering Engine Break-In mode, the following should be considered:

- Engine Break-In mode should NOT be entered when the trailer is loaded with product. The unit will adjust setpoint to maintain proper load on the engine and will not control based on Load Temperature.
- While in Engine Break-In mode, only Shutdown and Prevent Alarms will stop Engine Break-In mode.
- Engine Break-In mode will be logged in ServiceWatch when entered and when completed.
- Timed or variable temperature demand defrost will be allowed in Engine Break-In mode. Manual defrost requests will be ignored.
- During Engine Break-In mode, Cycle Sentry mode will not be allowed and Telematics commands will be ignored.
- Completed hours run in EBI will be stored in the controller allowing the user to resume where left off if needed. The user can start again instead of resume and it will reset EBI hours and allow the full run. Once complete, it is logged in the controller.

Engine Break-In Sequence

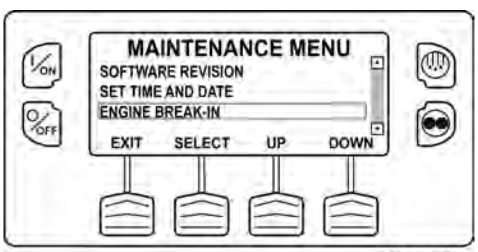
The Break-In sequence will run the engine at either High Speed or Low Speed and with the doors either open or closed. The controller will determine starting setpoint for Engine Break-In mode, then change the setpoint as needed during the mode to maintain the needed engine load level.

Performing an Engine Break-In

Engine Break-In mode is initiated using the Maintenance Menu. From the Standard Display, press the MENU Key. Press UP or DOWN as required to choose the Maintenance Menu and press SELECT.

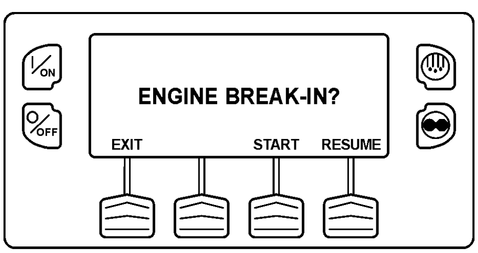
- Before initiating Engine Break-In mode, clear all alarm codes.
- To stop Engine Break-In mode at any time, push the stop button or turn the unit off.

In the Maintenance Menu, press UP or DOWN as required to choose Engine Break-In, press the SELECT key to enter EBI mode. If there is a consideration that does not allow EBI, the display will show Engine Break-In Not Available.



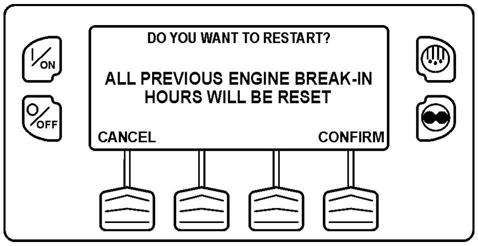
SAP1281

Press START to begin Engine Break-In. If a key is not selected within 15 minutes, the screen will timeout and Alarm Code 54 will generate. If there has already been some run time in EBI, the RESUME key will appear. Selecting RESUME will continue the EBI process.



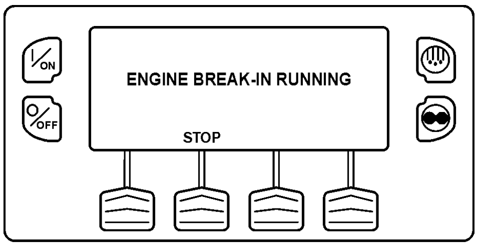
SAP1282

If START is pressed and there has already been run time in EBI, it will ask to confirm restarting. All previous Engine Break-In hours will be reset.



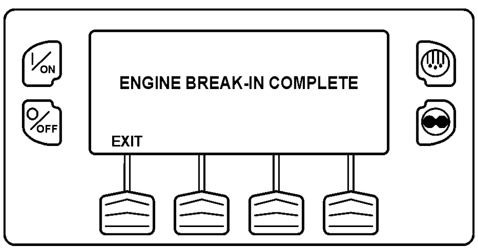
SAP1283

Engine Break-In running.



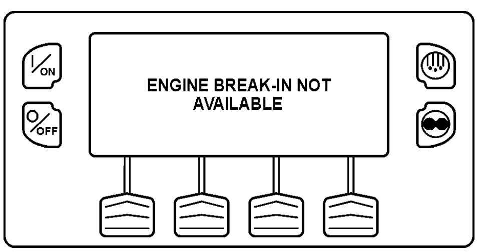
SAP1284

After Engine Break-In successful completion, the engine will turn off and the screen below will be displayed. Press EXIT to go back to the main menu.



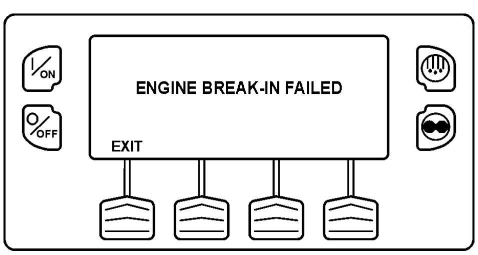
SAP1285

If you start Engine Break-In when there is a Shutdown Alarm, the “Engine Break-In Not Available” screen will appear.



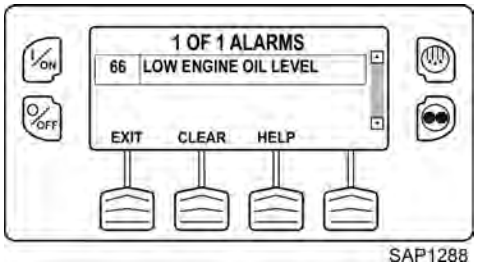
SAP1286

If the unit shuts down during Engine Break-In, the following window will appear.



SAP1287

When Exit is pressed, the alarm screen is shown.



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 of this manual. Service Procedure A02A explains how to display and record the Guarded Access programmable feature settings using the HMI Control Panel Keypad. Service Procedure A04A explains how to set the Guarded Access programmable features using the HMI Control Panel Keypad.

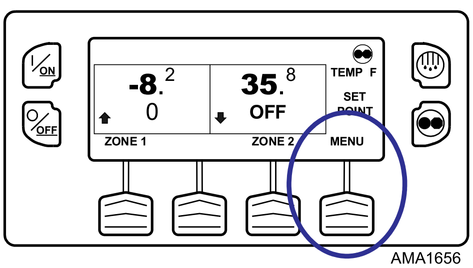
The Guarded Access programmable features can also be changed using the WinTrac Service Tool. Once created, a Unit Setup file can be transferred to a USB Flash Drive to send the file to the unit. For more information, refer to the WinTrac User Guide.

Note: *The Guarded Access Menu is entered from the last feature of the Maintenance Menu. The unit <u>must not be running</u> in order to enter the Guarded Access Menu. If the unit is running, entering Output Test Mode from the Maintenance menu will 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 enter the Guarded Access Menu*

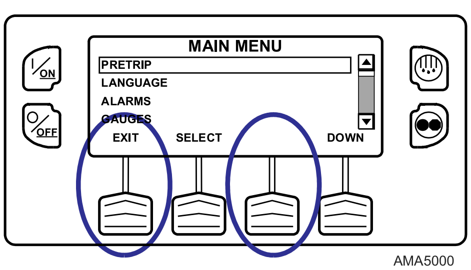
Entering the Guarded Access Menu

From the Standard Display, press the MENU Key.

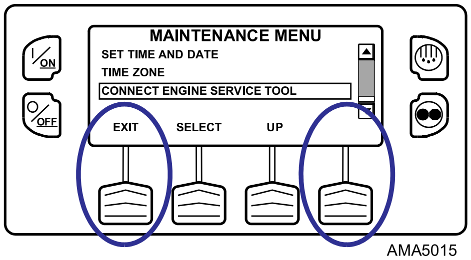
Figure 165. Menu Key



The Maintenance Menu is accessed from the first Main Menu screen that appears, usually the Pretrip Menu. The third Soft Key from the left will be unlabeled. Press and hold both the Exit Soft Key and the unlabeled Soft Key for five seconds as shown below.

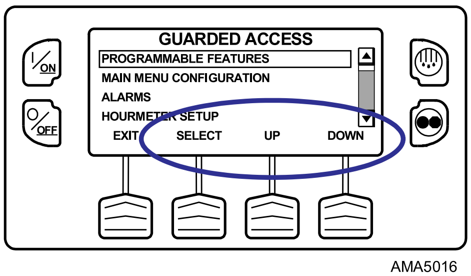


The Maintenance Menu will appear. Press the DOWN Soft Key to scroll to the end of the Maintenance Menu choices. The fourth Soft Key from the left will be unlabeled. Press and hold both the unlabeled soft key and the Exit Key for five seconds.



Important: *If a Security Code has been set, the correct code must be entered here to gain access to the Guarded Access Menu. If an Access Code is requested 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 UP and DOWN Soft Keys to scroll thru 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.

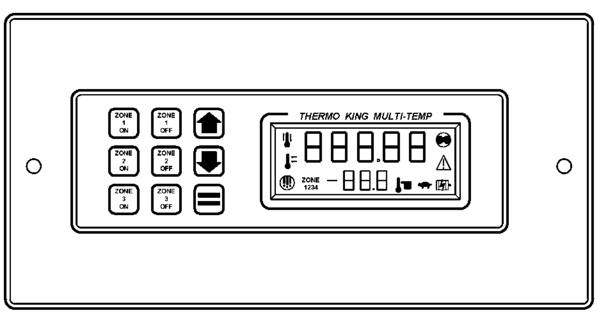
Note: *A warm restart is performed when the Guarded Access menu is exited. The unit is reconfigured so that any changes that were made from the Guarded Access menu take effect. This will occur even if no changes were made to any of the Guarded Access Menu features.*

Rear Remote Control Panel (Optional)

The optional flush mount remote control panel is connected to the control system and is used to operate the unit from a remote location, typically the rear of the trailer. All remote control panels feature three zones. The third zone is not used on two zone applications.

When turned on, either the Standard Display for each installed zone or [STAnd by] will appear on the display. The zone being shown is identified by the zone icon.

Figure 166. Rear Remote Control Panel



Important: *There are several versions of the Rear Remote Control Panel available. They can be identified by the color of the wide border around the actual control panel. SR-4 Single Temperature Rear Remote Control Panels have a <u>black</u> border. SR-4 Multi-Temperature Rear Remote Control Panels have a <u>blue</u> border. They are two separate control panels and <u>are not</u> interchangeable.*

Remote Control Panel Functions

The remote control panel functions that are available are determined by the setting of the Rear Remote Control Action feature in the Guarded Access Unit Configuration menu. The Rear Remote Control Action feature will not appear and the remote control panel will not operate unless the Rear Remote Control feature is set for COM 2. Refer to Unit Configuration in Section 3 for details of these features.

Stand By

If the Rear Remote Control Action feature is set for STAND BY, the following functions are available from the remote control panel:

- When powered up, the unit will not start and run. The unit must be started from the HMI Control Panel on the unit. The control system can only be powered up to change the setpoint(s).
- The control system can be powered up to change setpoints by pressing the ZONE 1 ON Key. If the control system is powered up from the rear control panel, both the rear control panel and the unit HMI control panel will display a stand by message as shown below.
- The setpoints can be changed in all installed zones.
- The installed zones can not be turned on or off.
- The control system can be powered down by pressing the ZONE 1 OFF Key.
- The unit can be started and run by pressing the unit HMI control panel ON Key.

Rear Remote Control Panel

Unit HMI Control Panel

Run All Zones

If the Rear Remote Control Action feature is set for RUN ALL ZONES, the following functions are available from the remote control panel:

- When powered up, the unit will start and run Zone 1 and all installed zones.
- The unit and Zone 1 can be powered up and will start and run by pressing the ZONE 1 ON Key. All installed zones will be turned on, even if they were previously turned off.
- The setpoints can be changed in all installed zones.
- The installed zones can be turned on or off.
- The unit can be powered down by pressing the ZONE 1 OFF Key.

Run Last Config

If the Rear Remote Control Action feature is set for RUN LAST CONFIG, the following functions are available from the remote control panel:

- When powered up, the unit will start and run Zone 1 and all installed zones that were turned on when the unit was last powered down. Zones that were turned off when the unit was last powered down will remain off.
- The unit and Zone 1 can be powered up and will start and run by pressing the ZONE 1 ON Key. All installed zones will be turned on if they were previously on, and remain off if they were previously off.
- The setpoints can be changed in all installed zones.
- The installed zones can be turned on or off.
- The unit can be powered down by pressing the ZONE 1 OFF Key.

Keypad

The nine touch sensitive keys are used to turn the unit and all installed zones on and off. They also allow the setpoint to be changed in all installed zones.

ZONE 1 ON KEY	Turns the unit on. Also turns Zone 1 on unless Rear Remote Control Action is set for STAND BY. It is not necessary to turn the host unit on for the remote control panel to operate.
ZONE 1 OFF KEY	Turns the unit off. Also turns Zone 1 off.
ZONE 2 ON KEY	Turns Zone 2 on unless Rear Remote Control Action is set for STAND BY.
ZONE 2 OFF KEY	Turns Zone 2 off.
ZONE 3 ON KEY	Turns Zone 3 on (if installed) unless Rear Remote Control Action is set for STAND BY.
ZONE 3 OFF KEY	Turns Zone 3 off (if installed).
UP ARROW KEY	Increases setpoint for the selected zone.
DOWN ARROW KEY	Decreases setpoint for the selected zone.
ENTER KEY	Loads the new setpoint for the selected zone.

Display

The display normally shows the Standard Display of return air temperature, setpoint, and zone. If a zone is turned on, the operating mode is also shown. If a zone is turned off, the display will show the return air temperature and OFF. The display shown (Figure 166, p. 191) here has all possible segments illuminated. The display icons are defined below.

Cool Icon	This icon appears when the unit is cooling.
Heat Icon	This icon appears when the unit is heating.

	Modulation Icon	This icon appears when the unit is in modulation.
	Defrost Icon	This icon appears when the unit is defrosting.
	Cycle Sentry Icon	This icon appears when the unit is operating in Cycle Sentry mode.
	Alarm Icon	This icon appears when an alarm condition has been detected.
	Electric Standby Icon	This icon appears when the unit is operating in the optional electric standby mode.
	Setpoint Icon	This icon appears when the setpoint is being shown in the display.
	Not Used	This icon appears during a remote control panel test but is not currently used.
ZONE 1234	**Zone Icon**	This icon indicates which zone is currently being shown on the display.

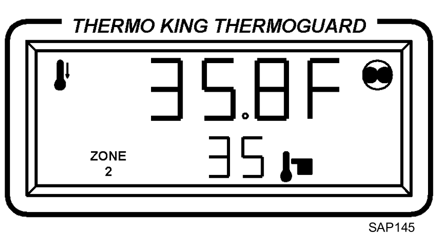
Reading a Typical Remote Standard Display

Note: *Fahrenheit is shown, Celsius display is similar.*

The Remote Standard Display for each installed zone will appear on the display for 10 seconds, then the next installed zone will appear. Only installed zones will appear. The Remote Standard Display shows the following information:

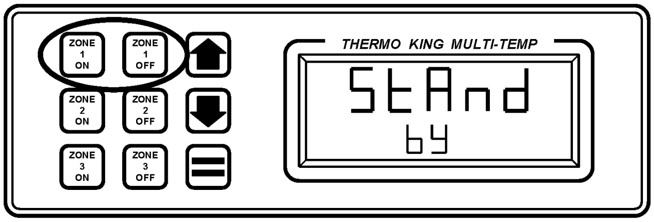
- Zone 2 is being shown in the display.
- Zone 2 is cooling.
- The unit is operating in Cycle Sentry Mode.
- The Zone 2 return air temperature is 35.8°F and the Zone 2 setpoint is 35°F.

Figure 167. Remote Standard Display



Turning the Unit and Zone 1 On or Off (Configured for STAND BY)

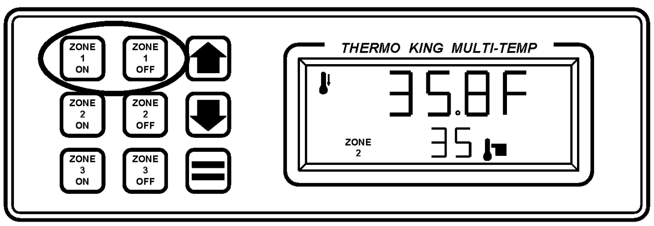
The control system is turned on by pressing the ON Key and off by pressing the OFF Key. When the ON Key is pressed, the remote display briefly shows all segments and STAnd by as shown. A stand by message will also appear on the unit HMI control panel display. All setpoints can be changed, but the unit will not start and run. The unit can be started and run by pressing the unit HMI control panel ON Key.



SAP146

Turning the Unit and Zone 1 On or Off (Configured for RUN ALL ZONES or RUN LAST CONFIG)

The unit and Zone 1 are turned on by pressing the ON Key and off by pressing the OFF Key. When the ON Key is pressed, the remote display briefly shows all segments and COn Flg as the control system initializes. The Remote Standard Display will appear as shown. The unit will start and run if necessary.



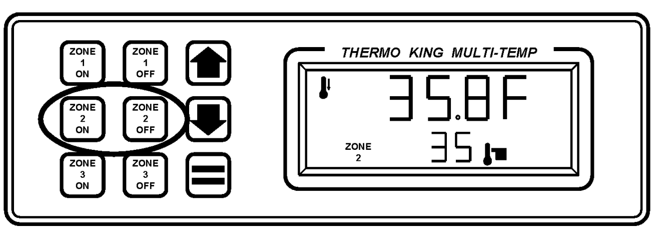
SAP147

Turning Remote Zones On and Off (Configured for STAND BY only)

The remote zones cannot be turned on and off - only the setpoints can be changed.

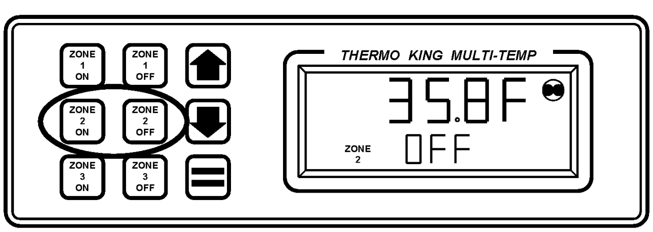
Turning Remote Zones On and Off (Configured for RUN ALL ZONES or RUN LAST CONFIG only)

Zone 2 and Zone 3 (if installed) are turned on by pressing the ON Key and off by pressing the OFF Key for the appropriate zone. When a zone is turned on, the return air temperature and setpoint is shown on the remote standard display for that zone. Zone 2 is shown turned on.



SAP148

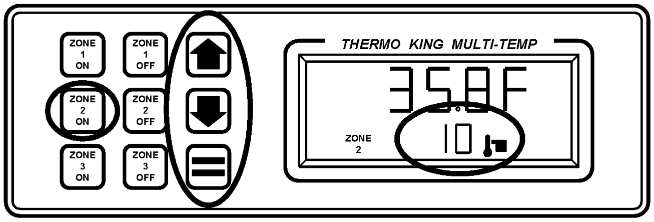
When a zone is turned off, the return air temperature and OFF is shown on the remote standard display for that zone. Zone 2 is shown turned off.



SAP149

Changing a Zone Setpoint

A zone must be currently shown on the display in order to change the zone setpoint.



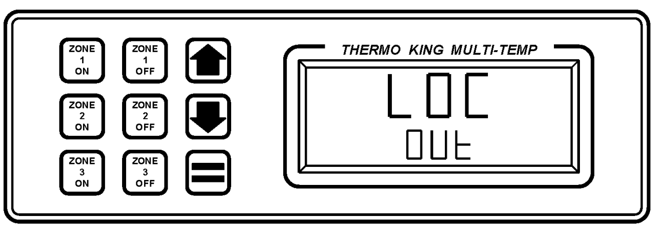
SAP150

1. Press the ON Key for the desired zone or wait until the desired zone is shown on the display. Pressing the ON Key will immediately display that zone. If the Rear Remote Control Action feature is set for RUN ALL ZONES or RUN LAST CONFIG, pressing the ON Key will also turn the zone on if it was not already on.
2. Immediately press the Up or Down Arrow Keys to select the desired setpoint for the selected zone.
3. When the desired setpoint for the selected zone is shown on the display, immediately press the Enter Key to load the new setpoint into the microprocessor. The display will briefly show [Lod] and then the new setpoint will reappear in the display.

   Important: *The Enter Key must be pressed or the setpoint will not be changed. The display will return to the Standard Display and the setpoint will return to the old setpoint in about 10 seconds if the Enter Key is not pressed.*
4. Confirm that the correct setpoint is set for each zone.

Remote Control Panel Lockout

During some control system functions such as Pretrip Tests, Service Test Mode, Output Test Mode, and while setting programmable features, the remote control panel may be locked out. If this is the case, the display shown will appear. The display will return to normal function when allowed by the control system.



SAP151

Section 5 - Diagnostics

SR-4 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:

- 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 Output 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.

General 0-200 Series Alarm Codes

The following 0–200 Series Alarm Codes are general alarms.

00 NO ALARMS EXIST

No action required.

02 CHECK 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

The Evaporator Coil Temperature Sensor circuit is a two wire circuit. The Zone 1 Evaporator Coil Sensor is connected to the Base Controller. The Zone 2 and Zone 3 sensors are connected to the Expansion Module. Refer to the Wiring Diagram for connector pin numbers. The sensor is connected to the sensor harness with a Deutsch connector.

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 or 04 can only be cleared from the Guarded Access Menu. If the unit has only Alarm Code 03 or 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 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 under -50°F (-46°C) 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 the unit is in Pretrip and a valid sensor reading is detected for a non-configured zone, Alarm Code 111 is also set.

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.

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.

- **Alarm Code 02 (Sensor was out of range):**
  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):**
  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.
- **If all or many of the Sensor Codes (02, 03, 04, 05, 06, 11, 12 and 13) are set:**
  1. Verify Base Controller Sensor Connector J1 and the Expansion Module Sensor Connector J66 are securely attached.
  2. Check the Base Controller in accordance with Service Procedure A01A.

03 CHECK (CONTROL) RETURN AIR SENSOR (ZONE)

Alarm Type

Check (Shutdown during a Pretrip Test)

Associated Alarm Codes

11 Unit or Zone Controlling on Alternate Sensor

13 Sensor Calibration Check

92 Sensor Grades Not Set

111 Unit Not Configured Correctly

Component Description and Location

This sensor 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. Refer to Service Procedure A15A Temperature Sensor Grade Calibration. If the sensor grade is not set, Alarm Code 92 may be set. The sensor is located in the return air stream of the host unit or remote evaporator.

Circuit Description

The Return Air Temperature Sensor circuit is a two wire circuit. The Zone 1 Return Air Temperature Sensor is connected to the Base Controller. The Zone 2 and Zone 3 sensors are connected to the Expansion Module. Refer to the Wiring Diagram for connector pin numbers. The sensor is hard wired to the sensor harness.

Considerations

1. If the unit is controlling on return air temperature and a problem occurs with either return air sensor, the unit will switch to Discharge 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 or 04 can only be cleared from the Guarded Access Menu. If the unit has only Alarm Code 03 or 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 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. The temperatures of the control return air sensor and display return air sensor twins are not within a specified range. If the faulty sensor can be determined, only the alarm code for that sensor and Alarm Code 13 will be set. Alarm Codes 03 and 13 are set if the faulty sensor cannot be determined.
7. If the unit is in Pretrip and a valid sensor reading is detected for a non-configured zone, Alarm Code 111 is also set.

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.

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 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):**
  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)**:
  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.
- **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 J1 is connected securely.
  2. Check the Base Controller in accordance with Service Procedure A01A.

04 CHECK (CONTROL) DISCHARGE AIR SENSOR (ZONE)

Alarm Type

Check (Shutdown during a Pretrip Test)

Associated Alarm Codes

11 Unit or Zone Controlling on Alternate Sensor

13 Sensor Calibration Check

92 Sensor Grades Not Set

111 Unit Not Configured Correctly

Component Description and Location

This sensor 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 Temperature Sensor Grade Calibration. The sensor is located in the discharge air stream of the host unit or remote evaporator.

Circuit Description

The Discharge Air Temperature Sensor circuit is a two wire circuit. The Zone 1 Discharge Air Temperature Sensor is connected to the Base Controller. The Zone 2 and Zone 3 sensors are connected to the Expansion Module. Refer to the Wiring Diagram for connector pin numbers. The sensor is hard wired to the sensor harness.

Considerations

1. If the unit is controlling on discharge air temperature and a problem occurs with either 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 or 04 can only be cleared from the Guarded Access Menu. If the unit has only Alarm Code 03 or 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 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. The temperatures of the control discharge air sensor and display discharge air sensor twins are not within a specified range. If the faulty sensor can be determined, only the alarm code for that sensor and Alarm Code 13 will be set. Alarm Codes 04 and 13 are set if the faulty sensor cannot be determined.
7. If the unit is in Pretrip and a valid sensor reading is detected for a non-configured zone, Alarm Code 111 is also set.

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 Sensor Calibration Check 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.

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 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):**
  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):**
  1. Review the ServiceWatch data logger and check the senor 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 is set with Alarm Code 13 (Dual sensors don’t agree):**
  1. Review the ServiceWatch data logger and check the sensor readings at the time the alarm was set. Also, review the history to see if previous alarm codes exist that would indicate the problem sensor. If a sensor appears to have read incorrectly, it should be replaced.
  2. Check for an airflow obstruction and correct sensor mounting.
  3. Verify the sensor grades are set to the actual sensor grade, and are not transposed.
  4. If the offending sensor cannot be determined, either ice bath both discharge air sensors simultaneously to determine which sensor is inaccurate or replace both sensors.
- **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 J1 is connected securely.
  2. Check the Base Controller in accordance with Service Procedure A01A.

05 CHECK AMBIENT TEMPERATURE SENSOR

Alarm Type

Check (Shutdown Alarm 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

The ambient temperature sensor circuit is a two wire circuit. The ATP-01 (+) wire connects the Base Controller 35 pin sensor connector J1 pin 30 to the blue sensor wire. The ATN-01 (-) wire connects the Base Controller 35 pin sensor connector J1 pin 31 to the brown sensor wire. The sensor wires are routed in the Sensor Harness. The sensor is connected to the sensor harness with a Deutsch connector.

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 or 04 can only be cleared from the Guarded Access Menu. If the unit has only Alarm Code 03 or 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, set alarm code 05 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, set alarm code 05 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 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**:
  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):**
  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 J1 is connected securely.
  2. Check the Base Controller in accordance with Service Procedure A01A.

06 CHECK ENGINE COOLANT TEMPERATURE SENSOR

Note: *C-600M Only.*

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

N/A

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

The coolant temperature sensor circuit is a two wire circuit. The WTP-01 (+) wire connects the Base Controller 35 pin sensor connector J1 pin 11 to the blue sensor wire. The WTN-01 (-) wire connects the Base Controller 35 pin sensor connector J1 pin 23 to the brown sensor wire. 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 250°F (121°C) 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 under -50°F (-46°C) 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 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:**
  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.
- **If all or many of the Sensor Codes (02, 03, 04, 05, 06, 11, and 12) are set:**
  1. Verify that the 35 pin Base Controller sensor connector J1 is connected securely.
  2. Check the Base Controller in accordance with Service Procedure A01A.

07 CHECK ENGINE RPM SENSOR

Note: *C-600M Only.*

Alarm Type

Check

Associated Alarm Codes

N/A

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. The flywheel sensor 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 J3 pin 1 to one side of the flywheel sensor. The FS2-01 wire connects the Base Controller 36 pin connector J3 pin 2 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 four 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.

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. 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. 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.
3. 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 1 ohm. If the circuit is open, check the harness using the wiring diagram for the unit.
4. 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.

09 HIGH EVAPORATOR TEMPERATURE

Alarm Type

Shutdown

Associated Alarm Codes

84 Restart Null

Component Description and Location

This sensor is an un-graded sensor and does not require calibration. The sensor is located on the evaporator coil header plate.

Considerations

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.

How Alarm is Set

1. If the unit is running and the evaporator coil temperature was greater than or equal to 155°F (68°C) and the discharge air temperature was greater than or equal to 135°F (57°C) for two minutes, Alarm Code 09 is set as a Shutdown Alarm.
2. If coil temperature is greater than 155°F (68°C) and Alarm Code 04 is set, Alarm Code 09 is set as a Shutdown Alarm.
3. If Alarm Code 02 is set and discharge air temperature is 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 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 may be set if the evaporator fans are not operating while the unit is in heat mode.
2. Check the evaporator fan for proper operation.
3. Check evaporator coil sensor operation, as shown in Alarm Code 02 Check Evaporator Coil Sensor. If the evaporator coil sensor reads high due to a defective sensor, Alarm Code 09 may be set as a result.

10 HIGH DISCHARGE PRESSURE

Alarm Type

Prevent or Shutdown

Associated Alarm Codes

84 Restart Null

Component Description and Location

The High Pressure Cutout Switch (HPCO) is located on the compressor discharge manifold.

Circuit Description

The high pressure cutout circuit is a two wire circuit. The PHPC-01 wire connects the Base Controller 35 pin connector J4 pin 23 to one side of the high pressure cutout switch. The HPCO-01 wire connects the Base Controller 35 pin connector J4 pin 35 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 Restart Null 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 Restart Null 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 (470 PSIG) 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 Restart Null 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 Restart Null 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 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. Verify the Condenser Fans are operating properly using Output Test Mode.
3. Check the High Pressure Cutout Switch for proper operation (closed under normal conditions). Check the switch for excessive resistance. The nominal switch resistance is less than 1 ohm.
4. Check the High Pressure Cutout Switch circuit for shorts to ground or open circuits.
5. Check the Base Controller High Pressure Cutout fuse F25.
6. Check the discharge pressure transducer for correct and accurate readings.
7. 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.

8. 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, not high discharge pressure.

11 UNIT OR ZONE CONTROLLING ON ALTERNATE SENSOR

Alarm Type

Check

Associated Alarm Codes

03 Check (Control) Return Air Sensor

04 Check (Control) Discharge Air Sensor

Component Description and Location

See Alarm Codes indicated above.

Circuit Description

See Alarm Codes indicated above.

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 either of the dual return air sensors fails, the unit will control using the discharge air sensor. If the unit is operating with discharge air sensor control, and either of the discharge air sensors fails, the unit will control using the return air sensor.

How Alarm is Cleared

This alarm is cleared automatically. The associated sensor alarm code (03 or 04) must be cleared before Alarm Code 11 can be cleared.

If Alarm Code 12 Sensor Shutdown 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 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 (03 or 04) are present. Proceed as shown for that Alarm Code.

12 SENSOR SHUTDOWN (ZONE)

Alarm Type

Check or Shutdown

Associated Alarm Codes

03 Check (Control) Return Air Sensor

04 Check (Control) Discharge Air Sensor

13 Sensor Calibration Check

52 Check Heat Circuit

65 Abnormal Temperature Differential

Component Description and Location

See Alarm Codes indicated above.

Circuit Description

See Alarm Codes indicated above.

How Alarm is Set

Fresh Setpoints: Both return and discharge sensors have failed or have been disabled by the dual sensor alarm control or if Alarm Code 65 and Alarm Code 13 are set. With a fresh range setpoint, the alarm is set as a Shutdown Alarm.

Frozen Setpoints: Both return and discharge sensors have failed or have been disabled by the dual sensor alarm control or if Alarm Code 65 and Alarm Code 13 are set. With a frozen range setpoint, the alarm is set as a Check Alarm. The unit will be forced into continuous low speed cool.

How Alarm is Cleared

This alarm is cleared automatically or 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.

Determine which sensor Alarm Codes (03 or 04) are present. Proceed as shown for that Alarm Code.

13 SENSOR CALIBRATION CHECK

Alarm Type

Check

Associated Alarm Codes

02 Check Evaporator Coil Sensor

03 Check (Control) Return Air Sensor

04 Check (Control) Discharge Air Sensor

05 Check Ambient Temperature Sensor

Component Description and Location

See Alarm Codes indicated above.

Circuit Description

See Alarm Codes indicated above.

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 or 04 can only be cleared from the Guarded Access Menu. If the unit has only Alarm Code 03 or 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. The alarm is set (after five seconds) after clearing Alarm Codes 02, 03, or 04, all return, discharge, and coil sensors do not read within a specified number of degrees of each other.
3. Return, Discharge, and Evaporator Coil Sensor Check: If the return, discharge, or evaporator coil 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 04).

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 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.

17 ENGINE FAILED TO CRANK

Alarm Type

For S-600M/S-600DE: Prevent or Shutdown

For C-600M: Log, Check, Prevent, or Shutdown in Diesel Mode; Log in Electric Mode

Associated Alarm Codes

63 Engine Stopped Reason Unknown

84 Restart Null

Component Description and Location

For S-600M/S-600DE:

- Engine Starter is located on front side of engine.
- Starter Relay is located within the harness by the relay board.
- Cam Speed Sensor is located at the front of the engine and is positioned behind the camshaft sprocket on the exhaust side.
- Crank Speed Sensor is located at the front of the engine behind the vibration damper pulley on the fuel pump side of the engine.
- Unit battery is located behind lower roadside panel.
- Use battery group 31 (12V) (950CCA recommended for use below -15F).

For C-600M:

- Engine Starter is located on front side of engine.
- Starter Relay is labeled K1 and is located on external relay board on early units, and built into base controller on later units.
- Unit battery is located behind lower roadside panel.
- Use battery group 31 (12V) (950CCA recommended for use below -15F).

Circuit Description

For S-600M/S-600DE:

- Starter Relay is protected by fuse FS3 40A, but controlled by the ECU via external F56 3A (on ECU Relay Board).
- K1 Starter Relay powers 8S wire to starter when energized.
- LED 7 is lit when Starter Relay is activated by ECU.
- Crankshaft Speed Sensor is a three wire circuit. Pin 9 at CMI = Wire 1312, Pin 27 at CMI = Wire 1361B, and Pin 28 at CMI = Wire1313B.
- Camshaft Sensor is a three wire circuit. Pin D2 at CME = Wire 1352D, Pin D3 at CME = Wire 1353D, and Pin E3 at CME = Wire 1356D.

For C-600M:

- Starter Relay is protected by FS5 30A fuse wire 2S.
- K1 Starter Relay powers 8S wire to starter when energized.
- LED 7 is lit when Starter Relay is activated by ECU.
- Crankshaft Rotation Sensor is a three wire circuit Pin 39 at ECU = Wire A39, Pin 54 = Wire A54, Pin 38 = Wire A38.
- Camshaft Sensor is a three wire circuit Pin 08 at ECU = Wire A08, Pin 52 at ECU = Wire A52, Pin 37 = Wire A37.

How Alarm is Set

For S-600M/S-600DE:

Alarm Code 17 is set as a supporting Log Alarm if the ECU determines the engine failed to crank.

For C-600M:

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.

An Alarm Code 17 that follows an Alarm Code 20/84 will be set as a Shutdown Alarm.

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 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.

For S-600M/S-600DE:

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

For S-610M/S-610DE:

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

For C-600M:

1. Check the battery, battery cables, and starter.
2. Verify the Base Controller fuse F3 is not blown.
3. Check the operation of the starter circuit by forcing an engine start in Continuous Mode. LED 25 should illuminate indicating the starter motor is energized and the engine should start.
4. Check the 8S circuit for a pushed pin, loose pin crimp or broken wire.
5. Check the High Current Harness 8S wire with an ohmmeter for continuity in accordance with Service Procedure H04A.
6. Check for a seized compressor or engine.
7. If a Model 50 Electric Standby unit, check for a failed clutch or seized electric motor.

18 HIGH ENGINE COOLANT TEMPERATURE

Alarm Type

Prevent or Shutdown in Diesel Mode

Log in Electric Mode

Associated Alarm Codes

84 Restart Null

Considerations

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.

How Alarm is Set

For S-600M:

Alarm Code 18 is set as a supporting Log Alarm if the ECU determines the engine coolant temperature is high (above 220°F (104°C) for 30 seconds).

For C-600M:

1. If the coolant temperature is high 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.
2. 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.

How Alarm is Cleared

1. The alarm can be cleared manually if the condition no longer exists. If condition still exists, it will be 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 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.

For S-610M/S-610DE:

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

For S-600M/S-600DE:

1. Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

⚠ CAUTION

Hazardous Pressures!

Do not remove expansion tank cap while coolant is hot.

2. Check the engine coolant level. Bleed air from the cooling system if necessary.
3. Check the water pump drive belt.
4. Check the radiator for airflow and coolant flow restrictions.

For C-600M:

1. Check the engine water temperature using the Gauge Menu. If the temperature is above 220°F (104°C), check the engine cooling system to determine the cause of overheating.

⚠ CAUTION

Hazardous Pressures!

Do not remove expansion tank cap while coolant is hot.

2. Check the engine coolant level. Bleed air from the cooling system if necessary.
3. Check the water pump drive belt.
4. Check the radiator for airflow and coolant flow restrictions.
5. 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 directly into the block behind the starter.

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

For S-600M/S-600DE:

Alarm Code 19 is set as a Shutdown Alarm if the engine oil pressure is low (for 30 seconds) while the engine is running.

For C-600M:

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 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 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.

For S-600M/S-600DE:

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

For S-610M/S-610DE:

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

For C-600M:

1. Check for Alarm Code 31 as an associated 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 J3 pin 27. 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

Prevent or Shutdown in Diesel Mode

Log in Electric Mode

Associated Alarm Codes

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

For S-600M:

Alarm Code 20 is set as a Prevent or Shutdown Alarm if the engine failed to start.

For C-600M:

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

The alarm is cleared manually.

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 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.

For S-600M/S-600DE:

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

For S-610M/S-610DE:

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

For C-600M/S-600M:

1. Check the unit fuel level.
2. Check fuel solenoid (C-600M), fuel pump, fuel system electrically and 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. If a Model 50 electric standby unit, check for a failed clutch or seized electric motor.

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 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.

22 HEATING CYCLE CHECK (ZONE)

Alarm Type

Check or Prevent

Associated Alarm Codes

24 Heating Cycle Fault

28 Pre trip or Self Check Abort

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 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 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 hot gas solenoid. If it fails to open, it may cause this alarm.

23 COOLING CYCLE FAULT (ZONE)

Alarm Type

Check or Shutdown

Associated Alarm Codes

21 Cooling Cycle Check

Considerations

1. The zone may be heating when it should be cooling.
2. If another zone is allowed to run, Alarm Code 23 is a Check Alarm. If no other zones are allowed to run, Alarm Code 23 is a 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 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.

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. 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 hot gas solenoid for proper operation. A leaking solenoid may cause this alarm.

24 HEATING CYCLE FAULT (ZONE)

Alarm Type

Check or Shutdown

Associated Alarm Codes

22 Heating Cycle Check

114 Multiple Alarm - Cannot Run System

Considerations

1. The zone may be cooling when it should be heating.
2. If another zone is allowed to run, Alarm Code 24 is a Check Alarm. If no other zones are allowed to run, Alarm Code 24 is a Shutdown Alarm.
3. If restarts are disabled, Alarm Code 24 will be set as a Shutdown Alarm on the first occurrence of the alarm.
4. The alarm is set as a check level alarm if the zone 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.

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. 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 hot gas solenoid. If it fails to open, it may cause this alarm.

25 ALTERNATOR/BATTERY CHARGER 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 unit is running, charge amps are less than -1.0 amps, and battery volts are less than 13.2 volts for 150 seconds (2.5 minutes), the alarm is set as a Check Alarm in normal operation and as a Shutdown Alarm in Sleep Mode and Pretrip Test.
2. If the unit is running and battery volts are greater than 16.0 volts for 150 seconds (2.5 minutes), the alarm 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.

Note: *The diagnostic procedure outlined below is for units with an alternator. For units with a battery charger, refer to ("A61A - Battery Charger Operation and Diagnostics," p. 398).*

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. Test and repair charging system as required.
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 Output Test Mode. Verify the Alternator Excite LED 26 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. If unit is equipped with electric battery charger, check battery charger for proper operation.

26 CHECK REFRIGERATION CAPACITY (ZONE)

Alarm Type

Check

Associated Alarm Codes

32 Refrigeration Capacity Low

85 Forced Unit Operation

How Alarm is Set

If the unit or zone 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 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. For C-600M: verify that when the high speed solenoid is energized, the throttle touches the screw stop.

   Important: *In a light horsepower demand on the engine state, the high speed will exceed 2200 RPM (normal). If the RPM is below 2200, the controller will close the ETV in an effort to return to 2200 RPM.*

2. Check zone temperature differential by displaying the temperature differential, or by checking the difference between the control return and control discharge sensors.
3. Check refrigerant level.
4. Attach gauges and evaluate unit refrigeration system performance.
5. Verify that sensor grades are set correctly.
6. Check for proper air flow. Short cycling, caused by a blocked air flow path, may generate this code.
7. Check zone refrigeration solenoids for proper operation.

28 PRETRIP 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.

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. 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.

29 CHECK DEFROST DAMPER CIRCUIT (ZONE)

Note: *S-600DE/S-610DE Only*

Alarm Type

Check or Shutdown

Associated Alarm Codes

111 Unit Not Configured Correctly

Considerations

1. The damper gear motor requires the use of the appropriate Expansion Module with the damper gear motor circuitry.
2. Alarm is applicable to host unit evaporators only.
3. Alarm Code 29 indicates that the amp draw on the damper gear motor circuit was out of the expected range.

How Alarm is Set

1. During a non-running Pretrip, if the Expansion Module does not detect damper gear motor hardware, Alarm Code 29 is set as a Check Alarm.
2. If during a Pretrip Test the zone is configured with a damper gear motor and current does not return to less than or equal to 0.5 amps when de-energized, Alarm Code 29 is set as a Shutdown Alarm along with Alarm Code 111.
3. If the unit is equipped with a damper gear motor and the motor travel timer exceeds its limit and the motor maximum current has not been exceeded, Alarm Code 29 is set as a Check Alarm.
4. If the Expansion Module detects a damper driver fault, Alarm Code 29 is set as a Check Alarm.
5. If a damper movement request is sent to the Expansion Module and no damper movement is detected, Alarm Code 29 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 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. Visually check the damper door for damage and proper attachment to the damper gear motor shaft.
2. Use Output Test Mode to see if the damper moves.
3. Check the continuity of the GM1WHT and GM1BLK circuits from the J40 connector on the expansion module to the Zone 1 damper gear motor. Check the continuity of the GM2WHT and GM2BLK circuits from the J40 connector on the expansion module to the Zone 2 damper gear motor.
4. Disconnect the damper gear motor harness from the expansion harness at the DM1 or DM2 connector near the damper motor. Check the resistance of the damper gear motor between pins 1 and 2 in connector on the damper gear motor harness. The resistance should be 4 to 12 ohms. If the resistance is out of range, check the continuity of the wires from the connector to the damper gear motor. If these wires have good continuity, the damper gear motor is probably defective.

Note: *For additional details, refer to Service Bulletin SB605.*

30 DEFROST DAMPER STUCK (ZONE)

Note: *S-600DE/S-610DE Only.*

Alarm Type

Check

Associated Alarm Codes

N/A

Component Description and Location

The defrost damper door is located in the discharge air stream at the top of the unit. It is closed during defrost to prevent warm air from being circulated over the load. The Damper Gear Motor is mounted just outside the discharge plenum and is connected to the damper door by means of mechanical linkage.

Circuit Description

The damper motor circuit is a two wire circuit. The GM (black) wire is connected to one side of the damper gear motor and the GM+ (red) wire is connected to the other side of the gear motor. The motor wires are routed in the Main Harness.

Considerations

1. The damper gear motor requires the use of the appropriate Expansion Module with the damper gear motor circuitry.
2. Alarm is applicable to host unit evaporators only.

How Alarm is Set

If the damper gear motor draws excessive current for a specified time (indicating that the damper is frozen or stalled), Alarm Code 30 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 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. Visually check the damper for damage, stuck, or frozen in place.
2. Check the GM1WHT and GM1BLK circuits, or the GM2WHT and GM2BLK circuits for a short to ground.
3. Disconnect the damper gear motor harness from the expansion harness at the DM1 or DM2 connector near the damper motor. Check the resistance of the damper gear motor between pins 1 and 2 in connector on the damper gear motor harness. The resistance should be 4 to 12 ohms. If the resistance is out of range, check the continuity of the wires from the connector to the damper gear motor. If these wires have good continuity, the damper gear motor is probably defective.

Note: *For additional details, refer to Service Bulletin SB605.*

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 on engine block behind starter.

Considerations

Alarm will only become active if switch is closed before engine start.

If this alarm is set as a Shutdown Alarm in Diesel Mode operation, it becomes a Log Alarm if unit is switched to Electric Mode operation.

How Alarm is Set

1. If unit is in diesel mode but not running, 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 unit is in diesel mode but not running, 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 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 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.

For S-600M/S-600DE:

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

For S-610M/S-610DE:

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

For C-600M:

1. Check for Alarm Code 19 as an associated 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.
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 35 pin Base Controller connector J3 pin 27. 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.

32 REFRIGERATION CAPACITY LOW (ZONE)

Alarm Type

Shutdown

Associated Alarm Codes

26 Check Refrigeration Capacity

Considerations

Alarm Code 32 Refrigeration Capacity Low requires that Alarm Code 26 Check Refrigeration Capacity 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. Corrective actions such as defrost have failed to improve performance. Alarm Code 26 will be set in all zones or Alarm Code 26 is set in at least one zone and the other zones have a Shutdown Alarm set or are turned off.

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. For C-600M: verify that when the high speed solenoid is energized, the throttle touches the screw stop.

   Important: *In a light horsepower demand on the engine state, the high speed will exceed 2200 RPM (normal). If the RPM is below 2200, the controller will close the ETV in an effort to return to 2200 RPM.*

2. Check zone temperature differential by displaying the temperature differential, or by checking the difference between the return and discharge air temperature sensors.
3. Check refrigerant level.
4. Attach gauges and evaluate unit refrigeration system performance.
5. Verify that sensor grades are set correctly.
6. Check for proper air flow. Short cycling, caused by a blocked air flow path, may generate this code.
7. Check the compressor and refrigeration system.
8. Check zone refrigeration solenoids for proper operation.

33 CHECK ENGINE RPM

Alarm Type

Check (Pretrip Only)

Associated Alarm Codes

07 Check Engine RPM Sensor (C-600M)

Considerations

Only checked during a Pretrip Test.

How Alarm is Set

For S-600M/S-600DE:

Alarm Code 33 is set as a supporting Log Alarm if the ECU determines the engine RPM is not in range.

For C-600M:

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 Section 8 - 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 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.

For S-600M/S-600DE:

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

For S-610M/S-610DE:

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

For C-600M:

1. Check and adjust high speed, as shown in the Maintenance Manual for the unit.
2. Check and adjust low speed, as shown in the Maintenance Manual for the unit.
3. Check for a binding solenoid or disconnected linkage.
4. Verify the selected High and Low speeds match the programmed unit configuration.
5. Check the High Capacity settings in the Guarded Access - Unit Configuration Menu. Improper high capacity settings can cause this alarm.

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 K8 Run Relay, LED 4, and associated fuse are located on the Base Controller. The 7K circuit is internal within the SR-4 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 4 seconds, Alarm Code 35 is set as a Shutdown Alarm.
3. If current draw is not between 0.25 to 0.5 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 0.25 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 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 K8 Run Relay LED 4 is energized.
3. Check the operation of the K8 Run Relay circuit using Output 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

1. If the motor RPM is less than 70% of nominal running RPM within five seconds of start attempt, Alarm Code 36 is set as Prevent or Shutdown.

   Note: *Nominal running RPM for 12 HP = 1750 RPM, 19 HP = 3500 RPM.*

2. While running, if motor RPM drops below 65% of nominal running RPM, Alarm Code 36 is set as a Prevent or Shutdown.

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.

⚠ WARNING

Hazardous Voltage!

Units featuring optional Electric Standby utilize 460, 400, or 230 volt 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. If the electric motor does run, check the electric motor RPM sensor for proper adjustment. If the sensor is properly adjusted, check the electric motor RPM sensor circuit from the motor to the base controller for a complete circuit.
2. 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.
3. Check the voltages at the phase detect module. Battery voltage should be present on the ER 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. 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.
6. Check for reason that would prevent the motor from turning the alternator, such as slipping belts, clutch, etc.

37 CHECK ENGINE COOLANT LEVEL

Alarm Type

Log, Check, or Shutdown in Diesel Mode

Log or Check in Electric Mode

Associated Alarm Codes

06 Check Engine Coolant Temperature Sensor

18 High Engine Coolant Temperature

42 Unit Forced to Low Speed

Circuit Description

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 12 Vdc to the CLS wire when the coolant level is adequate. The circuit is opened if coolant level falls below an adequate level. This alarm will self-clear automatically if the coolant level rises above the sensor location. The wiring is located in the Main Harness.

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

The alarm self-clears if coolant level input indicates good coolant level for three seconds. It can also be manually cleared.

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.

⚠ CAUTION

Risk of Injury!

Exercise extreme care when checking hot coolant.

1. Check the engine coolant level. Verify coolant is above sensor when the coolant is cold.
2. Check the sensor connector for a pushed pin, loose pin crimp, or broken wire.
3. Check that 12 Vdc is present between the CLS-01 wire from the Base Controller and chassis ground.

38 ELECTRIC PHASE REVERSED

Alarm Type

Shutdown in Electric Mode

Log in Diesel Mode

Associated Alarm Codes

90 Electric Overload

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 evaporator temperature differential.

1. If the unit is running in Electric Mode and the temperature differential between return air temperature and discharge air temperature is greater than 50°F (10°C) and is still greater than 45°F (7°C) 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 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 optional Electric Standby utilize 460, 400, or 230 volt 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.

40 CHECK HIGH SPEED CIRCUIT

Alarm Type

Pretrip Only: Log, Check, or Shutdown

Associated Alarm Codes

111 Unit Not Configured Correctly

How Alarm is Set

S-600M/S-600DE:

1. Amp draw is greater than specified limit on high speed circuit set within Base Controller. Amp draw should be +/- .5 after startup.
2. After running pretrip and the high speed output is de-energized, the amp draw on the run relay circuit did not return to zero.

C-600M:

1. During pretrip, the amp draw on the run relay circuit is high while high speed output circuit is energized. Amperage should be between 2 and 8 amps.
2. After pre-trip is completed and amp draw on the high speed output circuit has been deenergized, circuit amperage did not return to zero.

Note: *When Alarm Code 40 is set, volts and amps on the circuit will be logged. Remainder of pretrip tests will be performed with high speed circuit de-energized.*

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.

S-600M/S-600DE:

1. Verify unit configuration is set to proper model type (S-600M or S-600DE) using the Guarded Access Menu.
2. Using Output Test Mode, energize the run relay (LED 4 on Base Controller) and verify it is within .5 amps (amperage will vary slightly based on battery voltage).
   a. If amperage is out of range, check the Base Controller in accordance with Service Procedure A01A.
3. Verify no load is connected to 7D output on Base Controller.

For S-610M/S-610DE:

Note: *The High Speed Relay K3 is not used on engines with electronic control, and primarily used as a system configuration check.*

1. Verify unit configuration is set to proper model type (S-610M/S-610DE) using the Guarded Access Menu.
2. Using Output Test Mode, energize the run relay (LED 4 on Base Controller) and verify it is within .5 amps (Amperage will vary slightly based on battery voltage).
   a. If amperage is out of range, check the Base Controller in accordance with Service Procedure A01A.

C-600M:

1. Verify unit configuration is set to proper model type (C-600M) using the Guarded Access Menu.
2. Using Output Test Mode, energize the high speed circuit. LED 2 and K3 relay on Base Controller should energize the solenoid with an amp draw on circuit displayed.
3. While Output Test Mode is still energized, use a multimeter to check for battery voltage between wire 7D-01 and CH at high speed solenoid (verify battery is fully charged).
4. If amp draw on high speed solenoid is high, verify plunger and linkage components move freely and are not stuck or broken.
5. If Base Controller reads 0 amp draw, check the F6 15A fuse on Base Controller, and wire terminal connections at solenoid. If fuse or terminal ring is defective, replace with same amperage rating and terminal and check circuit.

6. If full battery voltage is not present, check plug wire 7D on Base Controller. Remove 7D wire and test for battery voltage between 7D and CH.
7. If full battery voltage is present at the Base Controller, check condition of 7D and CH wire going to high speed solenoid.
8. If full battery voltage is not present at Base Controller while high speed output is energized, check Base Controller in accordance with Service Procedure A01A.

42 UNIT FORCED TO LOW SPEED

Alarm Type

Log

Associated Alarm Codes

10 High Discharge Pressure

How Alarm is Set

1. If the unit has been forced to low speed operation as a result of high engine coolant temperature or high discharge pressure, Alarm Code 42 will be set as a Log Alarm. Alarm Code 10 will also be set.
2. If there is a loss of communication to the ECU, Alarm Code 42 will be set as a Log Alarm.

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 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.
   a. For S-600M/S-600DE: use the Peugeot Diagnostic Tool if required.
   b. For S-610M/S-610DE: use the YSAD Diagnostic Tool if required.
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.

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.

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 Check Fuel Level Sensor 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 fuel level sensor for proper operation.
5. Check the electric fuel pump filter and clean as necessary.
6. Verify correct fuel pump for the unit is being used.

45 HOT GAS BYPASS CIRCUIT

Alarm Type

Check or Shutdown

Associated Alarm Codes

28 Pretrip Abort

Component Description and Location

The hot gas/hot gas bypass solenoid is located in the condenser section next to the receiver tank. It is a normally closed valve.

Circuit Description

The hot gas/hot gas bypass solenoid circuit is a two wire circuit and is non-polarized. For the Hot Gas Solenoid, HGS-01 is connected to the Base Controller via J4-7 with the other side wire CHHG-01 connected to the ground plate. For the Hot Gas Bypass Solenoid, HGB-01 is connected to the Base Controller via J4-7 with the other side wire CHH-01 connected to the ground plate. The wires controlling the solenoids (from Base Controller to Solenoids) are routed in the Main Harness. A Smart FET on the Base Controller supplies power to the HGS-01 and HGB-01 circuit.

Considerations

1. During a non-running Pretrip the current draw is determined by the Base Controller shunt reading.
2. During normal operation the current draw is determined by the Smart FET feedback to the Base Controller.
3. 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.
4. Each Hot Gas Solenoid draws approximately 1.5 amps when energized.

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 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 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 45 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 45 is set as a Check Alarm. Hot gas valve operation is not allowed until Alarm Code 45 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 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 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 Hot Gas Solenoid circuit using Output Test Mode. Verify the Base Controller Hot Gas Solenoid circuit LED illuminates. For Base Controller LED identification, see the LED decal on the control box door. If the Base Controller Hot Gas Solenoid circuit LED illuminates, go to Step 2. If the Base Controller Hot Gas Solenoid circuit LED does not illuminate, go to Step 3.

2. If the Base Controller Hot Gas Solenoid circuit LED illuminates and Alarm Code 45 is set, 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 Output Test Mode. The current draw should be approximately 1.5 amps. If the current is not within limits, then 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 Hot Gas Solenoid circuit LED does not illuminate and Alarm Code 45 is set, check for a shorted circuit or solenoid coil. Disconnect connector at Base Controller or Expansion Module and check Hot Gas Circuit for shorts to ground using a multi-meter. The solenoid coil resistance should be approximately 8.3 ohms.

48 CHECK BELTS OR CLUTCH

Alarm Type

Shutdown

Associated Alarm Codes

N/A

Considerations

Applies to units equipped with electric standby only.

How Alarm is Set

The ratio between the engine RPM and electric standby motor RPM is monitored. If these values are not in the proper ratio, it is an indication that drive belt slippage is occurring and 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 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 belts and clutch for condition, operation, and slippage.
2. Check for a stuck compressor.
3. Check unit configuration if this alarm occurs on a Model 30 (diesel only) unit.
4. Use the running Service Test Mode Feature to duplicate the operating conditions. The motor RPM 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 motor RPM when the alarm was set.

49 CHECK SPARE SENSOR 1

Alarm Type

Check

Component Description and Location

Spare Sensor 1 is an optional field installed sensor, installed near the end of the discharge air chute. It is connected to the Base Controller via the STIP and STIN wires.

Considerations

It is recommended Spare Sensor 1 be programmed in the Sensor Calibration Menu to achieve highest accuracy temperature readings. If sensor grade is not configured from 5H (default), Alarm Code 92 will not be triggered.

How Alarm is Set

1. If the spare sensor reading is greater than 250°F and the Blocked Air Chute Detect option is enabled, the SR-4 interprets that sensors as unavailable. If the sensor reads a temperature change to less than 245°F, the actual sensor reading will be displayed. If after 10 seconds there is no change, Alarm Code 49 will be set as a Check Alarm.
2. If the spare sensor reading is less than -50°F and the Blocked Air Chute Detect option is enabled, the SR-4 interprets that sensor as unavailable. If the sensor reads a temperature change to -45°F or more, the actual sensor reading will be displayed. If after 10 seconds there is no change, Alarm Code 49 will be 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 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: *Polarity must be considered when connecting temperature sensors. If the sensors are connected backwards, the display will show dashes (- - - -). The brown wire connected to the sensor is the negative lead. The blue wire connected to the sensor is the positive lead. Refer to the applicable schematic or wiring diagram for the correct harness connections.*

1. Check harness for open or short.
   a. Turn off the Base Controller.
   b. Disconnect the sensor plug from the Base Controller.
   c. In the plug, locate the pins for the sensor circuit.
      - 35 - 45 kΩ = normal. Proceed to step 2.
      - OL = open harness / sensor.
      - Near 0Ω = STIP shorted to STIN (may be a shorted sensor). Disconnect sensor and recheck the harness. With sensor disconnected, near 0Ω = shorted harness, OL = shorted sensor. Proceed to step 3.
2. Check voltage between STIP and STIN at the Base Controller.
   a. Turn on the Base Controller.
   b. Using a high quality digital multimeter, check the voltage at the corresponding circuits in the sensor connector on the Base Controller.
      - 4.9 - 5.1 Vdc = replace sensor.
      - Incorrect voltage = check Base Controller in accordance with Service Procedure A01A.
3. Check for short to chassis ground.
   a. Place multimeter from STIP pin to chassis ground.
      - OL = normal.
      - Near 0Ω = short to chassis.

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.

52 CHECK HEAT CIRCUIT (ZONE)

Alarm Type

Check or Shutdown

Associated Alarm Codes

N/A

Circuit Description

The Hot Gas Solenoid circuit is a two wire circuit. The solenoid is not polarity sensitive. A Smart FET on the Base Controller or Expansion Module supplies power to the appropriate HGS circuit.

Considerations

1. On systems with remote zone parallel evaporators, the respective Expansion Module hot gas solenoid output will supply power to both of the remote zone Hot Gas 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, 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 52 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 Solenoid operation is not allowed until Alarm Code 52 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 52 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 52 is set as a Check Alarm. Hot Gas Solenoid operation is not allowed until Alarm Code 52 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 52 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 52 is set as a Shutdown Alarm.
5. If Alarm Code 21 and 23 have been set and a high rate of increase in evaporator coil temperature is detected, Alarm Code 52 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 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 Hot Gas Solenoid circuit using Output Test Mode. Verify the Base Controller Hot Gas Solenoid circuit LED illuminates. For Base Controller LED identification, refer to the LED decal on the control box door. If the Base Controller Hot Gas Solenoid circuit LED illuminates, proceed to Step 2. If the Base Controller Hot Gas Solenoid circuit LED does not illuminate, proceed to Step 3.
2. If the Base Controller Hot Gas Solenoid circuit LED illuminates and Alarm Code 52 is set, 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 Output Test Mode. The current draw should be approximately 1.5 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 Hot Gas Solenoid circuit LED does not illuminate and Alarm Code 52 is set, check for a shorted circuit or solenoid coil. Disconnect connector at Base Controller or Expansion Module and check Hot Gas Circuit for shorts to ground using a multi-meter. The solenoid coil resistance should be approximately 8.3 ohms.

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 Output 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 Output 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

1. 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 Pretrip Abort.

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 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 11.3 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 16.0 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 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 corrosion.
3. Check the unit ground plate connections for tightness and corrosion.
4. With the engine running, check the battery voltage and charge rate using the Gauge Menu.
5. Check the operation of the alternator. Verify the belt is properly adjusted.
6. Load test the battery, replace if necessary.
7. Review the ServiceWatch downloads to check for three start attempts and the reason for the start attempts.
8. 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

Associated Alarm Codes

28 Pretrip Abort

Considerations

The current shunt on SR-4 Base Controllers 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 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 - REASON UNKNOWN

Alarm Type

Prevent or Shutdown in Diesel Mode

Log in Electric Mode

Associated Alarm Codes

84 Restart Null

Considerations

Becomes a Log Alarm if unit is switched to Electric Mode.

If the Restart Unit After Shutdown feature is set for Continuous, the Shutdown Alarm condition is disabled and the interval between restart attempts is increased from 15 minutes to 1 hour.

How Alarm is Set

For S-600M/S-600DE:

Alarm Code 63 is set as a supporting Log Alarm if the ECU determines the engine should be running and is not.

For C-600M:

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 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.

For S-600M/S-600DE:

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

For S-610M/S-610DE:

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

For C-600M:

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 for proper operation.
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. Download and inspect 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.

64 PRETRIP REMINDER

Alarm Type

Log

Associated Alarm Codes

N/A

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 Hourmeters in Section 3 for details.

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

Check

Associated Alarm Codes

13 Sensor Calibration Check

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 or 04 can only be cleared from the Guarded Access Menu. If the unit has only Alarm Code 03 or 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

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.

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.

Determine which sensor Alarm Codes (02, 03, 04, or 05) are present along with Alarm Code 13. Proceed as shown for that Alarm Code.

66 LOW ENGINE OIL LEVEL

Alarm Type

Check or 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 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

For S-600M/S-600DE:

Alarm Code 66 is set as a supporting Log Alarm if the ECU determines the engine oil level is low.

For C-600M:

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 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.

For S-600M/S-600DE:

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

For S-610M/S-610DE:

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

For C-600M:

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. 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

Log, Check, or Shutdown

Associated Alarm Codes

28 Pretrip Abort

111 Unit Not Configured Correctly

Component Description and Location

The Liquid Line Solenoid is located in the refrigeration section and the individual remote evaporators.

Circuit Description

The Liquid Line Solenoid circuit is a two wire circuit. The solenoid is not polarity sensitive. A Smart FET on the Base Controller supplies power to the Liquid Line Solenoid circuit.

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, 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 three amps or less than 0.5 amps 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 Check Alarm.
3. If during a Pretrip Test the current is not between 0.5 to 3 amps 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 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 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 Liquid Line Solenoid circuit using Output Test Mode. Verify the Base Controller Liquid Line Solenoid circuit LED illuminates. For Base Controller LED identification, refer to the LED decal on the control box door. If the Base Controller Liquid Line Solenoid circuit LED illuminates, proceed to Step 2. If the Base Controller Liquid Line Solenoid circuit LED does not illuminate, proceed to Step 3.

2. If the Base Controller Liquid Line Solenoid circuit LED illuminates and Alarm Code 67 is set, 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 Output Test Mode. The current draw should be approximately 1.1 amps. If the current is not within limits, check for high resistance or open in the circuit or solenoid coil as shown in Step 1. Verify that all circuit connectors are secure.
3. If the Base Controller Liquid Line Solenoid circuit LED does not illuminate and Alarm Code 67 is set, check for a shorted circuit or solenoid coil. Check the Liquid Line Solenoid 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. If no problems are found and the output LED does not turn on, replace the Base Controller.
5. Check unit configuration to confirm proper setting.
6. Check the Base Controller wiring to verify that there is no connection to the output if the zone is not configured.

68 INTERNAL CONTROLLER FAULT

Alarm Type

Log, Check, or Shutdown

Associated Alarm Codes

N/A

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

Associated Alarm Codes

N/A

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 Service Procedure A07A.

   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.

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

90 Electric Overload

91 Check Electric Ready Input

540 Illegal Engine Operating State

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 10, 18, and 63 are not promoted to shutdown level if the Continuous Restarts feature is enabled.
9. 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.
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

10 High Discharge Pressure

26 Check Refrigeration Capacity

87 Check Suction Pressure Sensor

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

N/A

Circuit Description

The 3-wire discharge pressure sensor is supplied with +5 Vdc and ground from the Base Controller. The third wire is the input to the Base Controller from the Transducer. 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.

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 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

Circuit Description

The 3-wire suction pressure sensor is supplied with +5 Vdc and ground from the Base Controller. The third wire is the input to the Base Controller from the Transducer. The sensor is located in the suction line and downstream of the ETV. 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 200 PSIG with one zone in cool and no configured zones evaporator coil sensor temperature exceeding 90 degrees 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 200 PSIG, the sensor display will be dashes [- - - -].
2. If the unit is running and the suction pressure sensor reading is less than -9 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.

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 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 the unit 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.
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

Component Description and Location

The Electronic Throttling Valve (ETV) is located in the suction line and is accessible from the front of the unit.

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 Pre-trip 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 first phase of the running test, the ETV is nearly closed. The ETV closing is confirmed by a drop in suction pressure.
2. During the second phase of the running test, the ETV is opened. The ETV opening is confirmed by a rise in suction pressure.
3. During the non-running phase, the ETV driver outputs are checked for error conditions (ETV electrical test).

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 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 electronic throttling valve 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 optional Electric Standby utilize 460, 400, or 230 volt 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

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 optional Electric Standby utilize 460, 400, or 230 volt 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.
6. If steps 1, 2, 4, or 5 above do not correct the fault, replace the phase detect module.

92 SENSOR GRADES NOT SET (ZONE)

Alarm Type

Check

Associated Alarm Codes

03 Check (Control) Return Air Sensor

04 Check (Control) Discharge Air 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

Log

Associated Alarm Codes

N/A

How Alarm is Set

If the compressor pressure is low as determined by the suction pressure transducer, Alarm Code 93 is set as a Log 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.

96 LOW FUEL LEVEL

Alarm Type

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

1. 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 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 8F (J1-1 pin) and FUELN (J1-3 pin) wires in the sensor harness at the J1 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 FUEL (J1-2 pin) and FUELN (J1-3 pin) wires in the main/unified harness at the J1 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 the SR-2, SR-3, and SR-4 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 J1 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 wires are connected to the sensor wires with solder connections and heat shrink tubing during installation. Refer to the applicable Precedent Installation Manual for more information.*

J1 Connector Pin	Main/Unified Harness Wire	Sensor Cable Wire	Sensor Wire
1	8F-01	Green	Red
2	FUEL-01	White	Yellow
3	FUELN-01	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

28 Pretrip Abort

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.

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 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 Output Test Mode. Verify the Base Controller Receiver Tank Pressure Solenoid circuit LED illuminates. For Base Controller LED identification, refer to the LED decal on the control box door. If the Base Controller Receiver Tank Pressure Solenoid circuit LED illuminates, proceed to Step 2. If the Base Controller Receiver Tank Pressure Solenoid circuit LED does not light, proceed to Step 3.
2. If the Base Controller Receiver Tank Pressure Solenoid circuit LED illuminates and Alarm Code 105 is set, 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 Output Test Mode. The current draw should be approximately 1.1 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 Receiver Tank Pressure Solenoid circuit LED does not illuminate and Alarm Code 105 is set, check for a shorted circuit or solenoid coil. Check the Receiver Tank Pressure Solenoid circuit with an accurate ohmmeter for a short circuit, open circuit, or loose connection. The solenoid coil resistance should be approximately 8.3 ohms.

106 CHECK PURGE VALVE CIRCUIT

Alarm Type

Check or Shutdown

Associated Alarm Codes

28 Pretrip Abort

Component Description and Location

The Purge Valve is located in the refrigeration cluster by the Receiver Tank.

Circuit Description

The Purge Valve circuit is a two wire circuit. The Purge Valve is energized by a Smart FET on the Base Controller. The solenoid is not polarity sensitive.

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 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 code 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 at a specified interval 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.
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 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 Purge Valve circuit using Output 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 Alarm Code 106 is set, the circuit has high resistance or is open. Use the HMI Control Panel amps gauge to check the current drawn by the Purge Valve, while operating the solenoid with Output Test Mode. The current draw should be approximately 1.1 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 Alarm Code 106 is set, check for a shorted circuit or solenoid coil. Check the Purge Valve circuit with an accurate ohmmeter for a short circuit, open circuit, or loose connection. The solenoid coil resistance should be approximately 8.3 ohms.

107 CHECK CONDENSER INLET SOLENOID CIRCUIT

Alarm Type

Check or Shutdown

Associated Alarm Codes

28 Pretrip Abort

Component Description and Location

The Condenser Inlet Solenoid is located in the host unit refrigeration 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 solenoid is not polarity sensitive.

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 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 code will be set. 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. 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 at a specified interval 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.
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 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 Condenser Inlet Solenoid circuit using Output 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 Alarm Code 107 is set, the circuit has high resistance or is open. Use the HMI Control Panel amps gauge to check the current drawn by the Condenser Inlet Solenoid, while operating the solenoid with Output Test Mode. The current draw should be approximately 1.1 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 Alarm Code 107 is set, check for a shorted circuit or solenoid coil. Check the Condenser Inlet Solenoid circuit with an accurate ohmmeter for a short circuit, open circuit, or loose connection. The solenoid coil resistance should be approximately 8.3 ohms.

108 DOOR OPEN TIMEOUT

Alarm Type

Check

Associated Alarm Codes

N/A

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

Check or Shutdown

Associated Alarm Codes

28 Pretrip Abort

111 Unit Not Configured Correctly

Component Description and Location

The Suction Line Solenoid is located in the refrigeration section and the individual remote evaporators.

Note: *If the unit is a DE, the Zone 2 Suction Line Solenoid is located in the host unit Zone 2 evaporator section.*

Circuit Description

The Suction Line Solenoid circuit is a two wire circuit. The solenoid is not polarity sensitive. A Smart FET on the Base Controller supplies power to the Suction Line Solenoid circuit.

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.
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 110 is set as a Check Alarm. 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.
3. If during a Pretrip Test the current is not between 0.5 to 3 amps 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.
5. If during a Pretrip Test current draw for the zone being tested is normal and the zone is not configured, Alarm Code 110 and Alarm Code 111 are set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually or automatically in Pretrip.

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 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 Suction Line Solenoid circuit using Output Test Mode. Verify the Base Controller Suction Line Solenoid circuit LED illuminates. For Base Controller LED identification, refer to the LED decal on the control box door. If the Base Controller Suction Line Solenoid circuit LED illuminates, proceed to Step 2. If the Base Controller Suction Line Solenoid circuit LED does not illuminate, proceed to Step 3.
2. If the Base Controller Suction Line Solenoid circuit LED illuminates and Alarm Code 110 is set, 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 Output Test Mode. The current draw should be approximately 1.1 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 Suction Line Solenoid circuit LED does not illuminate and Alarm Code 110 is set, check for a shorted circuit or solenoid coil. Check the Suction Line Solenoid circuit with an accurate ohmmeter for a short circuit, open circuit, or loose connection. The solenoid coil resistance should be approximately 8.3 ohms.

111 UNIT NOT CONFIGURED CORRECTLY (ZONE)

Alarm Type

Log

Associated Alarm Codes

02 Check Evaporator Coil Sensor

03 Check Return Air Sensor

04 Check Discharge Air Sensor

25 Alternator/Battery Charger Check

29 Check Defrost Damper Circuit

30 Defrost Damper Stuck

40 Check Engine Coolant Temperature

45 Hot Gas Bypass Circuit

53 Test Mode Timeout

67 Check Liquid Line Solenoid Circuit

90 Electric Overload

110 Check Suction Line Solenoid Circuit

112 Check Remote Fans

113 Check Electric Heat Circuit

121 Check PWM/Liquid Injection Circuit

122 Check Diesel/Electric Circuit

143 Check Drain Hose Heater Output

234 Check Relative Humidity Sensor

How Alarm is Set

1. 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.
2. If Charger configuration is set to none, Alarm Code 25 and 111 are set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually or automatically if configuration is set to something other than none.

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.

112 CHECK REMOTE FANS (ZONE)

Alarm Type

Check or Shutdown

Associated Alarm Codes

111 Unit Not Configured Correctly

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 six fan motors. An individual unit can support up to 12 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 30 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 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 45 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 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 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 in specification (6 - 48 amps) 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 or automatically in Pretrip.

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. FLTCT = 20. The circuit has high amp draw. Check for a shorted circuit.
2. FLTCT < 0.5. The circuit has low amp draw. Check for high resistance or open in the circuit.

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 Output 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 Output 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.

113 CHECK ELECTRIC HEAT CIRCUIT (ZONE)

Alarm Type

Check or Shutdown (Pretrip Test Only)

Associated Alarm Codes

28 Pretrip Abort

111 Unit Not Configured Correctly

Circuit Description

The optional electric heat contactor (HC) is located on the high voltage tray. The contactor coil is powered by 7E from the Diesel/Electric relay. The coil is energized when 26E is grounded by the Base Controller.

Considerations

Electric Standby Equipped and Electric Heat Option both configured YES.

Not tested if unit is connected to external standby power.

Electric heat is applicable to the Host Zone evaporator on Model 50 trailer units only.

How Alarm is Set

This alarm is set if the measured shunt current is incorrect during a non-running pretrip test. Current is measured with the output on and off.

1. The alarm is set as a Check Alarm if the current is not within specifications when the solenoid is energized.
2. The alarm is set as a Shutdown Alarm if the current does not return to zero when the device is de-energized.
3. The alarm is set as a Shutdown Alarm if the unit is not configured as a Model 50 unit and the current flow is within specifications when the solenoid is energized.

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. Check for battery voltage at the 7E wire on the heater contactor.
2. Check the heater contactor coil for continuity.
3. Verify actual unit configuration.

114 MULTIPLE ALARM - CANNOT RUN SYSTEM

Alarm Type

Shutdown

Associated Alarm Codes

Associated alarm indicating cause of shutdown.

How Alarm is Set

If a multi-temp unit has zone shutdown alarms in all configured zones, 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 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 code(s).

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.

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. Check the operation of the alternator excite circuit using Output 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, 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.

122 CHECK DIESEL/ELECTRIC CIRCUIT

Alarm Type

Check or Shutdown (Pretrip Test Only)

Associated Alarm Codes

111 Unit Not Configured Correctly

Circuit Description

The Diesel/Electric circuit is energized by the Diesel/Electric Relay K7 on the Base Controller. The 7E wire supplies 12 Vdc the Phase Select Module to energize the appropriate Standby Motor contactor.

Considerations

The following is true on all units, even if Electric Standby is not present:

- When the Diesel/Electric Relay is energized during a Pretrip Test, the Fuel Solenoid is de-energized. The current flow measured by the shunt should decrease to indicate that the Fuel Solenoid is actually de-energized. If the current flow does not decrease, the Fuel Solenoid was not de-energized and Alarm Code 122 is set. This is normal operation.
- If the current flow decreases by less than 0.75 Amps when the Fuel Solenoid is de-energized, the Fuel Solenoid is presumed to be de-energized and the Pretrip Test continues.
- If the current flow decreases by more than 0.75 Amps when the Fuel Solenoid is de-energized, Alarm Code 122 is also set. This indicates that the Fuel Solenoid is drawing excessive current. Alarm Code 35 is not set under these conditions.

How Alarm is Set

1. If during a Pretrip Test the unit is configured with Diesel/Electric Relay and current is not greater 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 does not return to less 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 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 Output Test Mode in the Maintenance Menu. Verify the Diesel/Electric LED 5 illuminates.
2. Use the HMI control panel amps gauge to check the current drawn by the Diesel/Electric relay while operating the Diesel/Electric relay with Output Test Mode. The current draw should be between 0.5 to 2 amps.

127 SETPOINT NOT ENTERED

Alarm Type

Check

Associated Alarm Codes

N/A

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

Associated Alarm Codes

N/A

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

Associated Alarm Codes

N/A

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

Associated Alarm Codes

N/A

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

Associated Alarm Codes

N/A

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

Associated Alarm Codes

N/A

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

Associated Alarm Codes

N/A

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

Associated Alarm Codes

N/A

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.

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

28 Pretrip Abort

111 Unit Not Configured Correctly

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 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 Output Test Mode. Verify the applicable 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. Check available voltage at the DH terminal at the remote evaporator terminal strip. Source voltage should be present. If not, check the harness between the Expansion Module and Remote Evaporator for an open or high resistance circuit. If source voltage is present at the Remote Evaporator terminal strip, check the drain tube heater wire for a poor ground or open circuit. Replace the drain tube heater wire if an open circuit is found.
4. Check the harness from the Expansion Module to the Remote Evaporator as well as the drain tube heater wire itself for shorts to ground.
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, Check, or Shutdown

Associated Alarm Codes

N/A

Circuit Description

The SR-4 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:

- J13 - Connects the Base Controller to the Expansion Module.
- J12 - 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 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 HMI Control Panel pin 6. The presence of power at pin 6 of the HMI Control Panel indicates that power is present on the 8X circuits.

Active CAN communications indicate the K6 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 HMI Control Panel, 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 HMI Control Panel 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 of 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 HMI Control Panel. 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)

148 AUTO-SWITCH ELECTRIC TO DIESEL DISABLED

Alarm Type

Check

Associated Alarm Codes

N/A

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.

150 OUT OF RANGE LOW (HMI) (ZONE)

Alarm Type

Log

Associated Alarm Codes

N/A

Considerations

The CargoWatch temperatures and times that will cause an alarm to be set are user programmable. These CargoWatch Data Logger features are configured as required for the particular customer applications. Refer to the Sensor Configuration Menu - CargoWatch Data Logger in Section 3 for details.

This alarm is only logged in the CargoWatch Data Logger.

Verify the CargoWatch Data Logger is downloaded before installing HMI Control Panel software. The HMI Control Panel Cold Start will erase any existing data in the CargoWatch Logger.

How Alarm is Set

1. If the temperature falls below the user programmed temperature for the user programmed time interval, Alarm Code 150 is set as a Log Alarm.
2. If a CargoWatch sensor is open or shorted, Alarm Code 150 is set as a Log Alarm.
3. If Out of Range Checking is turned On and no CargoWatch sensors are connected, Alarm Code 150 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the CargoWatch 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. Determine the cause of low CargoWatch sensor temperature and correct as necessary.
2. Verify the CargoWatch Data Logger is downloaded before installing HMI Control Panel software. The HMI Control Panel Cold Start will erase any existing data in the CargoWatch Data Logger.
3. If no CargoWatch sensors are connected and the Out of Range feature is turned On, perform an HMI Control Panel Cold Start on the WinTrac Service Tool. The Cold Start will set the Out of Range Checking to Off.

Important: *Do not attempt a cold start using the Base Controller jumpers or with the download cable connected to the ServiceWatch port as this will restart the SR-4 Base Controller, not the HMI Control Panel.*

151 OUT OF RANGE HIGH (HMI) (ZONE)

Alarm Type

Log

Associated Alarm Codes

N/A

Considerations

The CargoWatch temperatures and times that will cause an alarm to be set are user programmable. These CargoWatch Data Logger features are configured as required for the particular customer applications. Refer to the Sensor Configuration Menu - CargoWatch Data Logger in Section 3 for details.

This alarm is only logged in the CargoWatch Data Logger.

Verify the CargoWatch Data Logger is downloaded before installing HMI Control Panel software. The HMI Control Panel Cold Start will erase any existing data in the CargoWatch Logger.

How Alarm is Set

1. If the temperature falls above the user programmed temperature for the user programmed time interval, Alarm Code 151 is set as a Log Alarm.
2. If a CargoWatch sensor is open or shorted, Alarm Code 151 is set as a Log Alarm.
3. If Out of Range Checking is turned On and no CargoWatch sensors are connected, Alarm Code 151 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the CargoWatch 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. Determine the cause of high CargoWatch sensor temperature and correct as necessary.
2. Verify the CargoWatch Data Logger is downloaded before installing HMI Control Panel software. The HMI Control Panel Cold Start will erase any existing data in the CargoWatch Data Logger.
3. If no CargoWatch sensors are connected and the Out of Range feature is turned On, perform an HMI Control Panel Cold Start on the WinTrac Service Tool. The Cold Start will set the Out of Range Checking to Off.

Important: *Do not attempt a cold start using the Base Controller jumpers or with the download cable connected to the ServiceWatch port as this will restart the SR-4 Base Controller, not the HMI Control Panel.*

152 CARGOWATCH SENSOR FAILED (ZONE)

Alarm Type

Log

Associated Alarm Codes

N/A

Considerations

The CargoWatch temperatures and times that will cause an alarm to be set are user programmable. These CargoWatch Data Logger features are configured as required for the particular customer applications. Refer to the Sensor Configuration Menu - CargoWatch Data Logger in Section 3 for details.

This alarm is only logged in the CargoWatch Data Logger.

Verify the CargoWatch Data Logger is downloaded before installing HMI Control Panel software. The HMI Control Panel Cold Start will erase any existing data in the CargoWatch Logger.

How Alarm is Set

1. If the temperature falls above or below the user programmed temperature for the user programmed time interval, Alarm Code 152 is set as a Log Alarm.
2. If a CargoWatch sensor is open or shorted, Alarm Code 152 is set as a Log Alarm.
3. If Out of Range Checking is turned On and no CargoWatch sensors are connected, Alarm Code 152 is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

Always download the CargoWatch 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. Determine the cause of high or low CargoWatch sensor temperature and correct as necessary.
2. Verify the CargoWatch Data Logger is downloaded before installing HMI Control Panel software. The HMI Control Panel Cold Start will erase any existing data in the CargoWatch Data Logger.
3. If no CargoWatch sensors are connected and the Out of Range feature is turned On, perform an HMI Control Panel Cold Start on the WinTrac Service Tool. The Cold Start will set the Out of Range Checking to Off.

Important: *Do not attempt a cold start using the Base Controller jumpers or with the download cable connected to the ServiceWatch port as this will restart the SR-4 Base Controller, not the HMI Control Panel.*

153 EXPANSION MODULE FLASH LOAD FAILURE

Alarm Type

Shutdown

Associated Alarm Codes

N/A

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

Associated Alarm Codes

N/A

Considerations

Base Controller Software flash loads via the WinTrac Service Tool, USB Flash Drive, or other methods are all performed and checked in the same manner.

How Alarm is Set

1. When new software is being flash loaded to a Base Controller, the current revision software is held intact until the new revision software is installed and verified. If the flash load 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.
2. Alarm is set if the ALM and/or GDT Master File does not load correctly.

How Alarm is Cleared

This alarm is cleared automatically when the new software is successfully flash loaded. The alarm can be cleared manually, but will return when the unit power is switched off and back on.

Diagnostic Procedure

Retry the flash load procedure.

159 CHECK BATTERY CONDITION

Alarm Type

Log

Associated Alarm Codes

N/A

How Alarm is Set

If the unit is running in Cycle Sentry Mode:

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

Check the battery and replace if necessary.

234 CHECK RELATIVE HUMIDITY SENSOR

Alarm Type

Check

Associated Alarm Codes

N/A

How Alarm is Set

1. This alarm is set as a Check Alarm if the input is not linear and is not between 1 Vdc and 5 Vdc.
2. If a connection is made to the Humidity Sensor inputs and the unit is not configured with a Humidity Sensor, Alarm Code 111 Unit Not Configured Correctly is set as a Check Alarm.

How Alarm is Cleared

This alarm is cleared manually.

Diagnostic Procedure

1. If this alarm is set by Condition 1, check the voltage levels at the humidity sensor and replace sensor if indicated.
2. If this alarm is set by Condition 2, check and correct the unit Configuration in the Guarded Access > Unit Configuration Menu.

252 AUTO FRESH AIR EXCHANGE DOOR (AFAED)

Alarm Type

Check or Shutdown

Associated Alarm Codes

111 Unit Not Configured Correctly

Component Description and Location

Fresh Air Exchange allows fresh outside air to be drawn into the trailer and the interior air to be exhausted. This feature is beneficial when hauling loads that release gas as they ripen, such as potatoes. The Fresh Air Exchange feature should be used exactly as specified by the customer.

A Damper Solenoid and mechanical linkage is used to open and close the Fresh Air Exchange door.

Circuit Description

The Fresh Air Exchange circuit is a two wire circuit. The Fresh Air Exchange Solenoid is energized by Relay K10 and Fuse F22 on the Base Controller. The J16 AFADE wire applies 12 Vdc to one side of the Fresh Air Exchange Solenoid to energize the solenoid. The CHFA 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, but the suppression diode must be installed with the bar end of the diode toward the J16 AFADE wire. The AFADE wire is routed in the Main Harness from the SR-4 Controller, and is connected to the Fresh Air Harness. The CHFA wire is routed in the Fresh Air Harness.

The Fresh Air Reed Switch is closed when the fresh air door is closed and open when the fresh air door is open. Wire numbers AFADSP and AFADS supply door position information to the microprocessor digital input at J3 pin 31 and 32 respectively.

Considerations

In normal operation, the Auto Fresh Air Solenoid is energized only when the unit engine is running.

How Alarm is Set

1. When the Fresh Air Exchange Solenoid is energized, the fresh air door will open and the Auto Fresh Air Reed Switch will also be open. If a mismatch exists between the Fresh Air Exchange and the Auto Fresh Air Reed Switch, up to three additional attempts to open the door will be made by de-energizing and energizing the Fresh Air Exchange Solenoid at one second intervals. If the door still fails to open as indicated by the Auto Fresh Air Reed Switch, Alarm Code 252 is set as a Check Alarm. The Fresh Air Exchange Solenoid will remain energized to open the door if conditions change (e.g., should some ice melt that was restricting door movement).
2. If during a Pretrip Test the unit is configured with Fresh Air Exchange and current is greater than 0.5 amps when the Fresh Air Exchange Solenoid is energized, Alarm Code 252 is set as a Check Alarm.
3. If during a Pretrip Test the unit is configured with Fresh Air Exchange and current does not return to less than or equal to 0.5 amps when de-energized, Alarm Code 252 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. Check the operation of the Fresh Air Exchange circuit using Output Test Mode. Verify the Fresh Air Exchange LED 44 illuminates.
2. Use the HMI Control Panel amps gauge to check the current drawn by the Fresh Air Exchange Solenoid while operating the Fresh Air Exchange Door with Output Test Mode. The current draw should be approximately 6 amps.
3. Energize the Fresh Air Exchange Solenoid using Output Test Mode and check for battery voltage on the AFA circuit. If voltage is present and no current was measured in the step above replace the Fresh Air Exchange Solenoid.
4. Verify that the Auto Fresh Air Reed Switch is closed when the fresh air door is closed and open when the fresh air door is open. Battery voltage should be present at J3 pin 31 when the switch is open (door is open). 0 volts should be present at J3 pin 31 when the switch is closed (door is closed).
5. Inspect the Fresh Air Exchange mechanical components for binding or ice buildup.

Precedent 500 Series Alarm Codes

The following 500 Series Alarm Codes apply to Precedent applications only.

508 SPEED REQUEST COMMUNICATIONS ERROR

Alarm Type

Log

Associated Alarm Codes

N/A

How Alarm is Set

- Condition 1 – Diesel Mode Low Speed Operation

  If the Low Speed Request has not been received by the Engine Control Unit (ECU), Alarm Code 508 is set as a Log Alarm.

- Condition 2 – Diesel Mode High Speed Operation

  If the High Speed Request has not been received by the Engine Control Unit (ECU), Alarm Code 508 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 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.

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

509 ECU FAILED TO ENABLE

Alarm Type

Log or Shutdown

Associated Alarm Codes

N/A

How Alarm is Set

- Condition 1 – ECU Enable Maximum Retries has been reached

  If the maximum number of attempts (3) to enable the Engine Control Unit (ECU) has been exceeded, this alarm is set as a Shutdown Alarm in Diesel Mode and a Log Alarm in Electric Mode.

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.

For S-600M/S-600DE:

1. Verify battery voltage is greater than 12.0 volts.
2. Verify CANL and CANH are securely plugged into J32
   a. Unplug J33 and J34. If Alarm Code 509 does not appear, inspect those circuits for shorts to power or ground.
3. Place unit into Connect Engine Service Tool mode to lock Keyswitch signal on.
   a. Verify LED 37 is illuminated on SR-4 controller.
   b. Verify LED 53 is illuminated on the engine relay board.
   c. Check fuse F60, F57, F52, F51.

   d. Verify power on wire 319, 302, and 305 at the ECU.
4. Check battery ground at ECU (circuit 303, 304, 353).
5. Verify CANL and CANH are not shorted to power or ground. Verify continuity and connection to ECU.
6. If all connections, power, and ground check good, replace the ECU.

For C-600M/S-610M/S-610DE:

1. Verify battery voltage is greater than 12.0 volts.
2. Verify 8 pin Deutsch connector inside control box is securely connected and corrosion free.
3. Verify J32 CANL and CANH is secure.
   a. Unplug J33 and J34. If Alarm Code 509 does not appear, inspect those circuits for shorts to power or ground.
4. Place unit in Connect Engine Service Tool mode and verify the Keyswitch signal is present (K88 Pre March 2014, ECUKS Post March 2014) at the ECU Connector Pin 8.
   a. Verify LED 37 is illuminated on SR-4 controller.
5. Verify power to ground at ECU.
   a. Power circuit B01A and K88A.
   b. Ground circuit B00.
6. If power, Keyswitch signal, and ground are all good, verify CAN communication wires are securely connected and corrosion free.
7. If all connections, power, and ground check good, replace the ECU.

510 ECU RUN SIGNAL FAILED

Alarm Type

Log or Shutdown

Associated Alarm Codes

N/A

How Alarm is Set

- Condition 1 – Run Signal Enable Maximum Retries has been reached

  If the maximum number of attempts (3) to enable the Run Signal to the Engine Control Unit (ECU) has been exceeded, this alarm is set as a Shutdown Alarm in Diesel Mode and a Log Alarm in Electric Mode.

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. Verify the Run Signal (ECUR) is present at the ECU Connector Pin 7.
2. Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

511 ENGINE WAIT TO START TIME DELAY EXPIRED

Alarm Type

Log

How Alarm is Set

- Condition 1 – Maximum Time for Engine Wait to Start Lamp has been reached

  If the Engine Wait to Start Timer has been exceeded (30 seconds), this alarm 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 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. Verify the Run Signal (ECUR) is present at the ECU Connector Pin 7.
2. Check the Can Bus circuit to the ECU. Verify connectors are fully seated.

516 I/O CONTROLLER TO APPLICATION CONTROLLER COMM FAILURE

Alarm Type

Shutdown

How Alarm is Set

- Condition 1 - The application processor is not receiving messages properly from Input/Output processor for five consecutive seconds.
- Condition 2 - The application processor is not properly communicating with Input/Output processor and enters fail safe mode.

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. Unplug accessories that are connected to J12 or J13 such as the rear remote controller or combination status light. Also disconnect TK BlueBox or unplug the REB from the controller board to assist in diagnosis.
2. Verify heartbeat LED 48 is blinking properly (mimicking a heartbeat with two pulses) and LED 45 with a single flash.
3. Verify both of these LEDs are blinking at described rate. If only one of the two is blinking, processors on the Base Controller are not properly communicating.
4. Check the Base Controller in accordance with Service Procedure A01A.

518 GENERATOR GROUND FAULT

Alarm Type

Check

Component Description and Location

The Ground Fault Detect (GFD) Module is located in the contactor box above the control box. The Generator is located beneath the crank pulley end of the engine.

Circuit Description

- The HRGC and HRGN wires at the GFD Module connect to the generator windings.
- GFF connects pin 33 of the J3 connector to the GFD Module and is the signal wire to the Base Controller.
- GFN connects pin 34 of the J3 connector to the GFD Module and provides ground to the Module
- GFP connects pin 35 of the J3 connector to the GFD Module and provides +5 Vdc to the Module.
- During normal operation, GFF supplies +5 Vdc to pin 33 of the J3 connector at the Base Controller.
- When a ground fault is detected, GFF supplies 0 Vdc to pin 33 of the J3 connector.

Considerations

This alarm only occurs when running in Diesel Mode.

Ground Fault Detector (GFD) detects high voltage short to ground.

The red LED On indicates a fault.

How Alarm is Set

- Condition 1 – Ground Fault Detected

  If the Ground Fault Detection Sensor output to the SR-4 Base Controller is low for three seconds (indicating a ground fault condition exists), this alarm is set as a Check Alarm.

How Alarm is Cleared

This alarm is cleared from Guarded Access only.

This alarm will auto clear if a ground fault condition is no longer detected.

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. With unit turned off, check for resistance between high voltage leads to ground using an Ohmmeter.
   - Motor winding should be open i.e., no reading or OL.

Notes: *For Ground Fault Detection Sensor:*

- *3 Pin connector to SR-4 Base Controller*
  - *5V power (GFP), ground (GFN), and output (GFF)*
- *2 Pin connector to Generator*
  - *Generator neutral (HGRC) and ground (HGRN)*
  - *Not polarity sensitive*

2. With unit turned off:
   a. Disconnect the Generator output wiring from the bus bar in the Fan Contactor Box. Check resistance from each Generator output wire to chassis ground.
      - Generator windings will read about 50kΩ with GFD plugged in or 150kΩ with GFD unplugged.

   b. Disconnect each of the three high voltage wires that connect to the Battery Charger (if equipped). Check resistance of each Battery Charger high voltage input terminal to chassis ground.
3. For Blower Motor wires to ground, check T1, T2, and T3 at each contactor output to verify each Blower Motor circuit.
   - Motor winding should be open i.e., no reading or OL.
4. Check for pinched wires or damaged insulation.
   - A high resistance reading could result.

5. To perform a Ground Fault Detect (GFD) Module Test, refer to Service Procedure G01A.

519 BATTERY CHARGER INPUT VOLTAGE OUT OF RANGE

Alarm Type

Check

How Alarm is Set

The Battery Charger J1939 Output sends messages to the SR-4 Base Controller.

- Condition 1 – Operating Input Voltage Out of Range

  If the input to the Battery Charger is not within allowable limits (180-506 for normal operation), this alarm is set as a Check Alarm.

How Alarm is Cleared

This alarm will auto clear if the setting condition no longer exists.

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. Check the battery input voltage on the download (Charger VIN Column).
2. Check generator output voltage.
3. For SmartPower units: check the generator contactor, and fuses in the fuse block.

520 BATTERY CHARGER OUTPUT FAULT

Alarm Type

Log or Check

How Alarm is Set

The Battery Charger J1939 Output sends messages to the SR-4 Base Controller.

- Condition 1 – Battery Charger Output Fault or Battery Charger Battery Operating, Battery Fault

  If the Battery Charger detects a reversed battery connection on the Battery Output circuit, this alarm is set as a Check Alarm.

- Condition 2 – Excessive Load on Battery Charger Load Terminal

  If the load connected to the Battery Charger appears excessive, this alarm is set as a Log Alarm.

- Condition 3 – Battery not Drawing Current

  If the battery does not appear to be drawing charge current, this alarm is set as a Log Alarm.

How Alarm is Cleared

This alarm will auto clear if the setting condition no longer exists.

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. Verify a good battery is properly connected to the Battery Charger. Check all connections for reverse polarity.
2. Check battery condition.
3. Verify controller software is CA30 or later.

521 BATTERY CHARGER OVERHEAT SHUTDOWN

Alarm Type

Check

How Alarm is Set

The Battery Charger J1939 Output sends messages to the SR-4 Base Controller.

- Condition 1 – High Battery Charger Temperature

  If battery charger senses high battery charger temperature, this alarm is set as a Check Alarm.

How Alarm is Cleared

This alarm will auto clear if the setting condition no longer exists.

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. Verify the Roadside Condenser Fan is operating.
2. Check for plugged air duct.

522 BATTERY CHARGER TEMPERATURE SENSOR FAILED

Alarm Type

Log

How Alarm is Set

The Battery Charger J1939 Output sends messages to the SR-4 Base Controller.

- Condition 1 – Battery Temperature Sensor Failed

  If the Battery Temperature Sensor is failed, this alarm is set as a Log Alarm.

How Alarm is Cleared

This alarm will auto clear if the setting condition no longer exists.

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. Check battery temperature sensor.

   Note: *This is an ungraded sensor and can be replaced.*

2. Check battery temperature sensor harness for opens or shorts to ground. Pin 7 = BS, pin 8 = BSN.

528 CONTROLLER NOT RECEIVING MESSAGES FROM BATTERY CHARGER

Alarm Type

Check

Considerations

Review (“A61A - Battery Charger Operation and Diagnostics,” p. 398) for battery charger operation, wiring, and connections.

How Alarm is Set

The Battery Charger J1939 Output sends messages to the SR-4 Base Controller.

- Condition 1 – Controller Not Receiving Message From Battery Charger

  If the SR-4 Base Controller is expecting messages from the Battery Charger but is not receiving them, this alarm is set as a Check Alarm.

How Alarm is Cleared

This alarm is cleared manually and automatically when battery charger CAN communication is re-established.

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. Check J33 plug on Controller Board and related wiring.
2. Check the CAN Bus connection to the Battery Charger.
3. Check BCE wire in 3-pin connector in the control box.
4. If no battery charge installed, check charger configuration, harnesses, and battery charger wiring.

529 CHECK FUEL PUMP CIRCUIT

Alarm Type

Check

Considerations

This alarm is set in Diesel Mode operation only.

How Alarm is Set

- Condition 9 – SmartFET Check

  If output is on, the SmartFET check determines if the fuel pump circuit is open.

- Condition 10 – SmartFET Check

  If output is on, the SmartFET check determines if the fuel pump circuit is shorted.

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. Inspect wiring for an open or short circuit condition.
2. Manually clear Alarm Code 529. If HMI displays "Lost Controller Communication" after clearing the code, it is possible that the fuel pump is shorted internally or the 8DF circuit is shorted, causing the F10 and/or F2 fuse to fail.

538 J1939 CAN DATALINK DEGRADED

Alarm Type

Log or Check

Associated Alarm Codes

42 Unit Forced to Low Speed

Considerations

This alarm applies only to applications with electronic controlled engines.

ECU to Controller communication is unreliable.

How Alarm is Set

The Controller intermittently receives messages from the ECU.

How Alarm is Cleared

This alarm auto clears only when Engine J1939 CAN Data Link status = ACTIVE.

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. Check CAN Bus connectors and continuity.
2. Check Keyswitch Signal and continuity.
3. Check ECU input voltage.

539 J1939 CAN DATALINK FAILED

Alarm Type

Log or Shutdown

Associated Alarm Codes

42 Unit Forced to Low Speed

509 ECU Failed to Enable

Considerations

This alarm applies only to applications with electronic controlled engines.

ECU to Controller communication has been established and then lost.

How Alarm is Set

The Controller is not receiving messages from the ECU.

How Alarm is Cleared

This alarm is cleared manually.

After an Alarm Code 539 Shutdown occurs the ECU Disable Sequence is executed. After a specified time delay, the ECU Enable Sequence is executed. If the ECU Enable Sequence is successful, Alarm Code 539 is auto cleared.

If Alarm Code 539 is set as a Log Alarm, it will be auto cleared when Engine J1939 CAN Data Link status = ACTIVE or DEGRADED.

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. Check CAN Bus connectors and continuity.
2. Check Keyswitch Signal and continuity.
3. Check ECU input voltage.

540 ILLEGAL ENGINE OPERATION

Alarm Type

Shutdown

Associated Alarm Codes

For S-600M/S-600DE:

84 Restart Null

For C-600M:

07 Check Engine RPM Sensor

Considerations

For S-600M/S-600DE: The ECU will send engine RPM to the SR-4 Controller over the CAN Bus.

For C-600M: Will read engine speed off of magnetic flywheel sensor beneath engine starter.

How Alarm is Set

Engine did not reach required operating RPM. If engine RPM cannot be read from flywheel sensor (C-600M) or ECU sends invalid message (S-600M), the Base Controller will use alternative frequencies to calculate engine RPM.

If engine loading is not allowed and engine running was detected, Alarm Code 540 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.

For S-600M/S-600DE:

1. Verify the unit is configured correctly.
2. Verify engine is running at correct RPM.
3. Upgrade Base Controller software to CA10 or later.
4. Check for ECU software update.

For S-610M/S-610DE:

1. Verify the unit is configured correctly.
2. Verify engine is running at correct RPM.
3. Upgrade Base Controller software to CA10 or later.
4. Check for ECU software update.

For C-600M:

1. Verify throttle linkage is set properly.
2. Verify engine is running at correct RPM.
3. Verify engine speed sensor is reading correctly.
4. Upgrade Base Controller software to CA10 or later.

542 BATTERY CHARGER FAULT, UNIT FORCED TO LOW SPEED

Alarm Type

Check

Associated Alarm Codes

549 Battery Charger Input AC Overvoltage

Component Description and Location

The electronic battery charger is located between the battery and engine in the ECU control box (cooling channel). The charger utilizes AC power from the generator and electric standby system and provides low voltage DC power for charging the battery and running the control system. A battery temperature sensor is connected to the charger and monitors temperature at the unit battery.

Circuit Description

The electronic battery charger contains three input terminals (L1, L2, and L3) to supply AC power from the generator or electric standby system. An 8 pin connector also located on the charger contains battery temperature sensor wiring, CAN bus wiring, and control connections to the SR-4 Controller. The battery charger also contains DC output connections for the unit battery, ECU (if equipped), and chassis ground.

Considerations

Both battery charger normal operating and alarm conditions are passed to the SR-4 Controller via CAN bus connection.

How Alarm is Set

If the electronic battery charger detects AC input voltage that exceeds a preset limit, Alarm Code 549 is set as a Check Alarm, Alarm Code 542 is set as a Check Alarm, and the engine will be forced to low speed.

How Alarm is Cleared

This alarm clears automatically if it has been active for one hour.

This alarm becomes a Log Alarm if unit operation is switched to electric mode.

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.

543 BATTERY CHARGER INTERNAL SHORT

Alarm Type

Check

Component Description and Location

The electronic battery charger is located between the battery and engine in the ECU control box (cooling channel). The charger utilizes AC power from the generator and electric standby system and provides low voltage DC power for charging the battery and running the control system. A battery temperature sensor is connected to the charger and monitors temperature at the unit battery.

Circuit Description

The electronic battery charger contains three input terminals (L1, L2, and L3) to supply AC power from the generator or electric standby system. An 8 pin connector also located on the charger contains battery temperature sensor wiring, CAN bus wiring, and control connections to the SR-4 Controller. The battery charger also contains DC output connections for the unit battery, ECU (if equipped), and chassis ground.

Considerations

Both battery charger normal operating and alarm conditions are passed to the SR-4 Controller via CAN bus connection.

How Alarm is Set

If the electronic battery charger senses a short circuit condition of its internal circuitry, Alarm Code 543 is set as a Check Alarm.

How Alarm is Cleared

This alarm will clear automatically if the battery charger no longer senses an internal short circuit condition.

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.

544 BATTERY CHARGER EXTERNAL SHORT

Alarm Type

Check

Component Description and Location

The electronic battery charger is located between the battery and engine in the ECU control box (cooling channel). The charger utilizes AC power from the generator and electric standby system and provides low voltage DC power for charging the battery and running the control system. A battery temperature sensor is connected to the charger and monitors temperature at the unit battery.

Circuit Description

The electronic battery charger contains three input terminals (L1, L2, and L3) to supply AC power from the generator or electric standby system. An 8 pin connector also located on the charger contains battery temperature sensor wiring, CAN bus wiring, and control connections to the SR-4 Controller. The battery charger also contains DC output connections for the unit battery, ECU (if equipped), and chassis ground.

Considerations

Both battery charger normal operating and alarm conditions are passed to the SR-4 Controller via CAN bus connection.

How Alarm is Set

If the electronic battery charger senses a short circuit condition of the DC output terminals, Alarm Code 544 is set as a Check Alarm.

How Alarm is Cleared

This alarm will clear automatically if the battery charger no longer senses a short circuit condition of the DC output terminals.

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.

545 BATTERY CHARGER OUTPUT DC VOLTAGE EXCEEDED LIMIT

Alarm Type

Check

Component Description and Location

The electronic battery charger is located between the battery and engine in the ECU control box (cooling channel). The charger utilizes AC power from the generator and electric standby system and provides low voltage DC power for charging the battery and running the control system. A battery temperature sensor is connected to the charger and monitors temperature at the unit battery.

Circuit Description

The electronic battery charger contains three input terminals (L1, L2, and L3) to supply AC power from the generator or electric standby system. An 8 pin connector also located on the charger contains battery temperature sensor wiring, CAN bus wiring, and control connections to the SR-4 Controller. The battery charger also contains DC output connections for the unit battery, ECU (if equipped), and chassis ground.

Considerations

Both battery charger normal operating and alarm conditions are passed to the SR-4 Controller via CAN bus connection.

How Alarm is Set

If the electronic battery charger DC output voltage exceeds a preset limit, Alarm Code 545 is set as a Check Alarm.

How Alarm is Cleared

This alarm will clear automatically if battery charger DC output voltage returns to normal levels.

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.

546 BATTERY CHARGER OPERATING BULK VOLTAGE OUT OF RANGE

Alarm Type

Check

Component Description and Location

The electronic battery charger is located between the battery and engine in the ECU control box (cooling channel). The charger utilizes AC power from the generator and electric standby system and provides low voltage DC power for charging the battery and running the control system. A battery temperature sensor is connected to the charger and monitors temperature at the unit battery.

Circuit Description

The electronic battery charger contains three input terminals (L1, L2, and L3) to supply AC power from the generator or electric standby system. An 8 pin connector also located on the charger contains battery temperature sensor wiring, CAN bus wiring, and control connections to the SR-4 Controller. The battery charger also contains DC output connections for the unit battery, ECU (if equipped), and chassis ground.

Considerations

Both battery charger normal operating and alarm conditions are passed to the SR-4 Controller via CAN bus connection.

How Alarm is Set

If the electronic battery charger detects an internal voltage out-of-range condition, Alarm Code 546 is set as a Check Alarm.

How Alarm is Cleared

This alarm will clear automatically if the battery charger no longer senses an internal voltage out-of-range condition.

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.

547 AC BUS PHASE LOSS

Alarm Type

Check

Component Description and Location

The electronic battery charger is located between the battery and engine in the ECU control box (cooling channel). The charger utilizes AC power from the generator and electric standby system and provides low voltage DC power for charging the battery and running the control system. A battery temperature sensor is connected to the charger and monitors temperature at the unit battery.

Circuit Description

The electronic battery charger contains three input terminals (L1, L2, and L3) to supply AC power from the generator or electric standby system. An 8 pin connector also located on the charger contains battery temperature sensor wiring, CAN bus wiring, and control connections to the SR-4 Controller. The battery charger also contains DC output connections for the unit battery, ECU (if equipped), and chassis ground.

Considerations

Both battery charger normal operating and alarm conditions are passed to the SR-4 Controller via CAN bus connection.

How Alarm is Set

If the electronic battery charger does not detect AC voltage on all three input legs, Alarm Code 547 is set as a Check Alarm.

How Alarm is Cleared

This alarm will clear automatically when the power to all three battery charger input legs is restored.

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.

548 BATTERY CHARGER TEMPERATURE BELOW OPERATING RANGE

Alarm Type

Log

Component Description and Location

The electronic battery charger is located between the battery and engine in the ECU control box (cooling channel). The charger utilizes AC power from the generator and electric standby system and provides low voltage DC power for charging the battery and running the control system. A battery temperature sensor is connected to the charger and monitors temperature at the unit battery.

Circuit Description

The electronic battery charger contains three input terminals (L1, L2, and L3) to supply AC power from the generator or electric standby system. An 8 pin connector also located on the charger contains battery temperature sensor wiring, CAN bus wiring, and control connections to the SR-4 Controller. The battery charger also contains DC output connections for the unit battery, ECU (if equipped), and chassis ground.

Considerations

Both battery charger normal operating and alarm conditions are passed to the SR-4 Controller via CAN bus connection.

How Alarm is Set

If the electronic battery charger internal temperature sensor reports a temperature of less than -40°C, Alarm Code 548 is set as a Log Alarm.

How Alarm is Cleared

This alarm will clear automatically if the battery charger senses an internal temperature greater than -40°C.

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.

549 BATTERY CHARGER INPUT AC OVERVOLTAGE

Alarm Type

Check

Associated Alarm Codes

542 Battery Charger Fault, Unit Forced to Low Speed

Component Description and Location

The electronic battery charger is located between the battery and engine in the ECU control box (cooling channel). The charger utilizes AC power from the generator and electric standby system and provides low voltage DC power for charging the battery and running the control system. A battery temperature sensor is connected to the charger and monitors temperature at the unit battery.

Circuit Description

The electronic battery charger contains three input terminals (L1, L2, and L3) to supply AC power from the generator or electric standby system. An 8 pin connector also located on the charger contains battery temperature sensor wiring, CAN bus wiring, and control connections to the SR-4 Controller. The battery charger also contains DC output connections for the unit battery, ECU (if equipped), and chassis ground.

Considerations

Both battery charger normal operating and alarm conditions are passed to the SR-4 Controller via CAN bus connection.

How Alarm is Set

If the electronic battery charger detects AC input voltage that exceeds a preset limit, Alarm Code 549 is set as a Check Alarm.

How Alarm is Cleared

This alarm will clear automatically when battery charger AC input voltage returns to the normal range.

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.

551 BATTERY CHARGER INTERNAL TEMPERATURE SENSOR FAULT

Alarm Type

Check

Component Description and Location

The electronic battery charger is located between the battery and engine in the ECU control box (cooling channel). The charger utilizes AC power from the generator and electric standby system and provides low voltage DC power for charging the battery and running the control system. A battery temperature sensor is connected to the charger and monitors temperature at the unit battery.

Circuit Description

The electronic battery charger contains three input terminals (L1, L2, and L3) to supply AC power from the generator or electric standby system. An 8 pin connector also located on the charger contains battery temperature sensor wiring, CAN bus wiring, and control connections to the SR-4 Controller. The battery charger also contains DC output connections for the unit battery, ECU (if equipped), and chassis ground.

Considerations

Both battery charger normal operating and alarm conditions are passed to the SR-4 Controller via CAN bus connection.

Battery charger will not shutdown unless secondary internal temperature sensor also fails.

How Alarm is Set

If the electronic battery charger senses a failed internal temperature sensor, Alarm Code 551 is set as a Check Alarm.

How Alarm is Cleared

This alarm will clear automatically if the battery charger no longer senses a failed internal temperature sensor.

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.

552 BATTERY CHARGER CHARGING, LOW BATTERY

Alarm Type

Log

Component Description and Location

The electronic battery charger is located between the battery and engine in the ECU control box (cooling channel). The charger utilizes AC power from the generator and electric standby system and provides low voltage DC power for charging the battery and running the control system. A battery temperature sensor is connected to the charger and monitors temperature at the unit battery.

Circuit Description

The electronic battery charger contains three input terminals (L1, L2, and L3) to supply AC power from the generator or electric standby system. An 8 pin connector also located on the charger contains battery temperature sensor wiring, CAN bus wiring, and control connections to the SR-4 Controller. The battery charger also contains DC output connections for the unit battery, ECU (if equipped), and chassis ground.

Considerations

Both battery charger normal operating and alarm conditions are passed to the SR-4 Controller via CAN bus connection.

How Alarm is Set

If the electronic battery charger DC output voltage indicates the unit battery charge is low, Alarm Code 552 is set as a Log Alarm.

How Alarm is Cleared

This alarm will clear automatically if battery charger output voltage increases to within normal range.

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.

553 BATTERY CHARGER OPERATING DERATED DUE TO HIGH TEMP CONDITIONS

Alarm Type

Log

Component Description and Location

The electronic battery charger is located between the battery and engine in the ECU control box (cooling channel). The charger utilizes AC power from the generator and electric standby system and provides low voltage DC power for charging the battery and running the control system. A battery temperature sensor is connected to the charger and monitors temperature at the unit battery.

Circuit Description

The electronic battery charger contains three input terminals (L1, L2, and L3) to supply AC power from the generator or electric standby system. An 8 pin connector also located on the charger contains battery temperature sensor wiring, CAN bus wiring, and control connections to the SR-4 Controller. The battery charger also contains DC output connections for the unit battery, ECU (if equipped), and chassis ground.

Considerations

Both battery charger normal operating and alarm conditions are passed to the SR-4 Controller via CAN bus connection.

How Alarm is Set

1. If the electronic battery charger output is reduced due to a high temperature condition while in Bulk Charge Mode, Alarm Code 553 is set as a Log Alarm.
2. If the electronic battery charger output is reduced due to a high temperature condition while in Absorption Charge Mode, Alarm Code 553 is set as a Log Alarm.
3. If the electronic battery charger output is reduced due to a high temperature condition while in Float Charge Mode, Alarm Code 553 is set as a Log Alarm.
4. If the electronic battery charger output is reduced due to a high temperature condition while in Charging, Low Battery Mode, Alarm Code 553 is set as a Log Alarm.
5. If the electronic battery charger output is reduced due to a high temperature condition while in Charging, Open Battery Mode, Alarm Code 553 is set as a Log Alarm.

How Alarm is Cleared

This alarm will clear automatically when the battery charger no longer senses a high temperature condition.

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.

599 ENGINE SERVICE TOOL CONNECTED

Alarm Type

Log

Considerations

Alarm Code 599 is set as an information alarm to indicate that the Engine Service Tool was connected.

How Alarm is Set

- Condition 1 – Engine Service Tool Connected

  If the user selects Maintenance Menu > Connect Engine Service Tool from the Maintenance Menu, this alarm code is set as a Log Alarm.

How Alarm is Cleared

This alarm is cleared manually.

This alarm is auto cleared if the user exits Maintenance Menu > Connect Engine Service Tool from the Maintenance Menu.

Diagnostic Procedure

None.

Precedent 600 Series Yanmar Diagnostic Trouble Codes (DTC)

Precedent 600 Series Alarm Codes are triggered by Yanmar Common Rail Engine ECU Diagnostic Trouble Codes.

Viewing Yanmar Diagnostic Trouble Codes

If the Yanmar Engine Control Unit (ECU) determines a problem exists, one or more DTCs will be set.

Engine DTCs are viewed by means of the Yanmar Engine Diagnostic Tool. The following information should be used along with Service Procedure A60A.

Yanmar Diagnostic Trouble Codes (DTC) and Associated Thermo King Alarm Codes

When a Yanmar DTC Code is set, a corresponding 600 Series Thermo King Alarm Code is also set. The 600 Series Alarm Code is a general indication of what issues may exist. Always connect the Yanmar Service Tool and read all existing DTC codes. Use this information to diagnose the problem using the Yanmar Service documentation.

Clearing Yanmar DTC Codes and Associated Thermo King Alarm Codes

Yanmar DTC Codes are cleared using the Yanmar Service tool. When the Yanmar Fault Codes are cleared, the associated Thermo King Alarm Code is also cleared. The codes are still available by downloading the ServiceWatch Data Logger using the WinTrac Service Tool.

600 CRANKSHAFT SENSOR

Fault Type

Check

Associated Thermo King Alarm Codes

42 Unit Forced to Low Speed

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:
  - P0336 Abnormal Signal
  - P0337 No Signal

Thermo King Alarm Code 42 Unit Forced to Low Speed is also set as a Log Alarm.

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

601 CAMSHAFT SENSOR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:
  - P0341 Abnormal Signal
  - P0342 No Signal
  - P1341 Phase Difference with Crankshaft

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

603 EXHAUST PRESSURE SENSOR

Fault Type

Shutdown or Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Shutdown Alarm while the unit is running in Diesel Mode or a Log Alarm while the unit is running in Electric Mode if the ECU sends one or more of the following P Codes:

  P0473 Voltage High

  P0472 Voltage Low

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

604 COOLANT TEMPERATURE SENSOR

Fault Type

Check

Associated Thermo King Alarm Codes

42 Unit Forced to Low Speed

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0118 Voltage High

  P0117 Voltage Low

Thermo King Alarm Code 42 Unit Forced to Low Speed is also set as a Log Alarm.

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

605 FRESH AIR TEMPERATURE SENSOR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:
  - P0113 Voltage High
  - P0112 Voltage Low

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

607 FUEL TEMPERATURE SENSOR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:
  - P0183 Voltage High
  - P0182 Voltage Low

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

608 RAIL PRESSURE SENSOR

Fault Type

Shutdown or Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Shutdown Alarm while the unit is running in Diesel Mode or a Log Alarm while the unit is running in Electric Mode if the ECU sends one or more of the following P Codes:

  P0193 Voltage High

  P0192 Voltage Low

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

609 INTAKE PRESSURE SENSOR

Fault Type

Shutdown or Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Shutdown Alarm while the unit is running in Diesel Mode or a Log Alarm while the unit is running in Electric Mode if the ECU sends one or more of the following P Codes:

  P0238 Voltage High

  P0237 Voltage Low

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

610 ATMOSPHERIC PRESSURE SENSOR

Fault Type

Check

Associated Thermo King Alarm Codes

42 Unit Forced to Low Speed

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:
  - P2229 Voltage High
  - P2228 Voltage Low
  - P1231 Abnormal Signal

Thermo King Alarm Code 42 Unit Forced to Low Speed is also set as a Log Alarm.

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Alarm Code 42 Unit Forced to Low Speed is cleared.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

611 CHECK GLOW PLUG CIRCUIT

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:
  - P0543 Disconnected or VB short circuit
  - P0541 Short Circuit to Chassis Ground

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

613 INJECTOR(S)

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 Injector #1 Fault - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0204 Disconnected

  P1272 Unclassified

  P1271 Short Circuit in Drive Circuit

  P0271 Short Circuit in Inner Coil

- Condition 2 Injector #2 Fault - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0202 Disconnected

  P1266 Unclassified

  P1265 Short Circuit in Drive Circuit

  P0265 Short Circuit in Inner Coil

- Condition 3 Injector #3 Fault - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0201 Disconnected

  P1263 Unclassified

  P1262 Short Circuit in Drive Circuit

  P0262 Short Circuit in Inner Coil

- Condition 4 Injector #4 Fault - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0203 Disconnected

  P1269 Unclassified

  P1268 Short Circuit in Drive Circuit

  P0268 Short Circuit in Inner Coil

- Condition 5 Multiple Injector Faults - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0203 Disconnected

  P1269 Unclassified

  P1268 Short Circuit in Drive Circuit

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

614 HIGH PRESSURE FUEL PUMP

Note: *SCV Circuit.*

Fault Type

Shutdown or Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Shutdown Alarm while the unit is running in Diesel Mode or a Log Alarm while the unit is running in Electric Mode if the ECU sends one or more of the following P Codes:

  P062A Driver Current (High level failure)

  P0627 Disconnected

  P0629 High Side VB Short Circuit

  P1642 High Side Short Circuit to Chassis Ground

  P1641 Low Side Short Circuit to Power Supply

  P1643 Low Side GND Short Circuit

  P1645 Overload Error

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

615 RAIL PRESSURE FAULT

Fault Type

Check or Log

Associated Thermo King Alarm Codes

42 Unit Forced to Low Speed

How Fault is Set

- Condition 1 High Rail Pressure - This fault is set as a Check Alarm while the unit is running in Diesel Mode or a Log Alarm while the unit is running in Electric Mode if the ECU sends one or more of the following P Codes:

  P0093 Pressure Deviation High

  P0088 Over-pressure

- Condition 2 Low Rail Pressure - This fault is set as a Check Alarm while the unit is running in Diesel Mode or a Log Alarm while the unit is running in Electric Mode if the ECU sends one or more of the following P Codes:

  P0094 Pressure Deviation Low

- Condition 3 Pressure Control Valve - This fault is set as a Check Alarm while the unit is running in Diesel Mode or a Log Alarm while the unit is running in Electric Mode if the ECU sends one or more of the following P Codes:

  P000F Relief Valve Open

  P1666 PLV Open - Valve Number Error

  P1667 PLV Open - Valve Total Hour Error

  P1669 Fuel Temperature Failure after PLV Open-Valve

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

1. Any fuel restriction (e.g., plugged fuel filter, prescreen plugged, gelled fuel, plugged lines, etc.) or unit out of fuel can be the cause.
2. Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

616 ENGINE OVERSPEED

Fault Type

Shutdown or Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Shutdown Alarm while the unit is running in Diesel Mode or a Log Alarm while the unit is running in Electric Mode if the ECU sends one or more of the following P Codes:

  P0219 Actual Engine Speed > Rated Speed + 600 RPM

Note: *Nominal high speed or rated speed: 2050 RPM for TK488CR, 2600 RPM for TK488CRH.*

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

617 INTERNAL ECU FAULT

Fault Type

Shutdown or Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 Critical Internal Fault - This fault is set as a Shutdown Alarm while the unit is running in Diesel Mode or a Log Alarm while the unit is running in Electric Mode if the ECU sends one or more of the following P Codes:
  - P1607 WDA/ABE Communication Error
  - P1613 CY146 SPI Communication Error
  - P1615 CY320 SPI Communication Error
  - P1616 R2S2 MSC Communication Error
  - P1608 Sensor Power Supply 1 Voltage High
  - P1617 Sensor Power Supply 1 Voltage Low
  - P1609 Sensor Power Supply 1 Voltage Error
  - P1618 Sensor Power Supply 2 Voltage Error
  - P1619 Sensor Power Supply 3 Voltage Error
  - P1624 Internal Sense Power Supply Voltage Low
  - P160D WDA/ABE Shutoff - Low Voltage
  - P1639 WDA/ABE Shutoff - High Voltage
  - P1640 WDA/ABE Shutoff - Operational Malfunction
- Condition 2 Other Internal Fault - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:
  - P160A Actuator Driver Circuit 1 - VB Short
  - P1625 Actuator Driver Circuit 2 - VB Short
  - P1626 Actuator Driver Circuit 1 - Ground short
  - P1633 Actuator Driver Circuit 2 - Ground short
  - P160B ECU Soft Reset 1
  - P1636 ECU Soft Reset 2
  - P1637 ECU Soft Reset 3
- Condition 3 EEPROM Fault - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:
  - P0601 Deletion Error
  - P160E Read Error
  - P160F Write Error
- Condition 4 Injector Correction Error - This fault is set as a Shutdown Alarm while the unit is running in Diesel Mode or a Log Alarm while the unit is running in Electric Mode if the ECU sends one or more of the following P Codes:
  - P1648 Injector 1 Correction Fuel Amount Error
  - P1649 Injector 2 Correction Fuel Amount Error
  - P1650 Injector 3 Correction Fuel Amount Error
  - P1651 Injector 4 Correction Fuel Amount Error

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

618 EGR

Fault Type

Check

Associated Thermo King Alarm Codes

42 Unit Forced to Low Speed

How Fault is Set

- Condition 1 Actuator Error - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P148A Valve Stuck Open Fault

  P049D Initializing Fault

  Thermo King Alarm Code 42 Unit Forced to Low Speed is also set as a Log Alarm.
- Condition 2 CAN Communication Error - This fault is set as a Check Alarm if the ECU sends one or more of the following DTC Codes:

  U010B Timeout Error (Received Message)
- Condition 3 Actuator Error - This fault is set as a Check Alarm if the ECU sends one or more of the following DTC and P Codes:

  P0404 Over Voltage

  P1404 Under Voltage

  P1409 Feedback Vault

  U0401 ECM Data Fault

  P0403 Disconnection in Motor Coil

  P1405 Short Circuit in Motor Coil

  P0488 Position Sensor Fault

  P1410 High Temperature Thermistor Fault

  P1411 Low Temperature Thermistor Fault

  U1401 Out of Target Value Range

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Alarm Code 42 Unit Forced to Low Speed is cleared.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

If P1409 is generated after an EGR service, the gaskets could have been installed incorrectly. Black gasket should be between EGR valve and pipe.

619 ECU MAIN RELAY FAULT

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:
  P068B Relay Contact Stuck
  P068A Power-off without Self Hold (ECU lost battery voltage while key switch is on)

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

620 NO RPM DETECTED DURING START ATTEMPT

Fault Type

Shutdown

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Shutdown Alarm if the ECU sends one or more of the following P Codes:
  P0008 No Crank or Cam Sensor

How Fault is Cleared

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Diagnostic Procedure

1. Verify starter operation.
2. Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

623 TRU CAN MESSAGE TIMEOUT

Fault Type

Check

Associated Thermo King Alarm Codes

42 Unit Forced to Low Speed

How Fault is Set

- Condition 1 TSC1 Timeout (ECU has stopped receiving engine speed request from controller) - This fault is set as a Check Alarm if the ECU sends one or more of the following DTC Codes:

  U0292 TSC1 Timeout

  Thermo King Alarm Code 42 Unit Forced to Low Speed is also set as a Log Alarm.

- Condition 2 ECR1 Timeout (ECU stops receiving crank request from controller) - This fault is set as a Check Alarm if the ECU sends one or more of the following DTC Codes:

  U1292 Y-ECR1 Timeout

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Alarm Code 42 Unit Forced to Low Speed is cleared.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

624 EGR TEMPERATURE SENSOR

Fault Type

Check

Associated Thermo King Alarm Codes

42 Unit Forced to Low Speed

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P041D Voltage High

  P041C Voltage Low

Thermo King Alarm Code 42 Unit Forced to Low Speed is also set as a Log Alarm.

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Alarm Code 42 Unit Forced to Low Speed is cleared.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

625 INTAKE AIR TEMPERATURE SENSOR

Fault Type

Shutdown or Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Shutdown Alarm while the unit is running in Diesel Mode or a Log Alarm while the unit is running in Electric Mode if the ECU sends one or more of the following P Codes:

  P040D Voltage High

  P040C Voltage Low

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

626 EXHAUST TEMPERATURE SENSOR

Fault Type

Check

Associated Thermo King Alarm Codes

42 Unit Forced to Low Speed

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0546 Voltage High

  P0545 Voltage Low

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Alarm Code 42 Unit Forced to Low Speed is cleared.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

627 EGT OR FUEL SYSTEM FAULT

Fault Type

Shutdown

Associated Thermo King Alarm Codes

N/A

Considerations

Yanmar Common Rail equipped units with Base Controller/HMI software revisions prior to BA45/7A45 or CA20/7A45 will generate Alarm Code 699 when P2428 is present.

How Fault is Set

- Condition 1 - This fault is set as a Shutdown Alarm if the ECU sends one or more of the following P Codes:
  P2428 Exhaust Gas Temperature Too High
- Condition 2 - This fault is set as a Shutdown Alarm if the ECU sends one or more of the following P Codes:
  P1080 MPROP from HPCR, Low Speed and Low Load Only
- Condition 3 - This fault is set as a Shutdown Alarm if the ECU sends one or more of the following P Codes:
  P1081 MPROP from HPCR, All Speed and All Loads
- Condition 4 - This fault is set as a Shutdown Alarm if the ECU sends one or more of the following P Codes:
  P1447 EGT Sensor at DOC Outlet

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Diagnostic Procedure

1. Check for the following:
   - Injector over-fueling
   - Cylinder misfire
   - Air intake restriction
   - Exhaust restriction
   - Exhaust temperature sensor
2. Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

Note: *For additional diagnostic procedures, refer to Service Bulletin SB710-2.*

699 UNKNOWN ECU FAULT

Fault Type

Shutdown or Check

Associated Thermo King Alarm Codes

42 Unit Forced to Low Speed

Considerations

Yanmar Common Rail equipped units with Base Controller/HMI software revisions prior to BA45/7A45 or CA20/7A45 will generate Alarm Code 699 when P2428 is present.

How Fault is Set

This fault is set by the SR-4 Base Controller one second after the ECU sends an unmapped code.

- Condition 1 - If the engine is in Running Safe Mode, Fault Code 699 is set as a Check Alarm and Alarm Code 42 is set as a Log Alarm.
- Condition 2 - If the engine is in Stopped Safe Mode, Fault Code 699 is set as a Shutdown Alarm.
- Condition 3 - If the engine is not in Running Safe Mode or Stopped Safe Mode, Fault Code 699 is set as a Check Alarm.

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Alarm Code 42 Unit Forced to Low Speed is cleared.

Log Alarm cleared.

Diagnostic Procedure

Use the Yanmar SmartAssist Direct (YSAD) Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Yanmar Troubleshooting Guide.

Note: *For additional diagnostic procedures, refer to Service Bulletin SB710-2.*

Precedent 800 Series Peugeot Diagnostic Trouble Codes (DTC)

Precedent 800 Series Alarm Codes are triggered by Peugeot Engine ECU Diagnostic Trouble Codes.

Viewing Peugeot Diagnostic Trouble Codes

If the Peugeot Engine Control Unit (ECU) determines a problem exists, one or more DTCs will be set.

Engine DTCs are viewed by means of the Peugeot Engine Diagnostic Tool. The following information should be used along with Service Procedure A60A.

Peugeot Diagnostic Trouble Codes with Thermo King Alarm Codes

When a Peugeot DTC is set, a corresponding 800 Series Thermo King alarm code is also set. The 800 Series alarm code is a general indication of what issues may exist. Always connect the Peugeot Service Tool and read all existing DTCs. Use this information to diagnose the problem using the Peugeot Service documentation.

Clearing Peugeot DTCs and Associated Thermo King Alarm Codes

Peugeot DTCs are cleared using the Peugeot Service tool. When the Peugeot Fault Codes are cleared, the associated Thermo King Alarm Code is also cleared. The codes are still available by downloading the ServiceWatch Data Logger using the WinTrac Service Tool.

800 CRANKSHAFT POSITION SENSOR ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

42 Unit Forced to Low Speed

842 Engine Running in Safe Mode, Low Speed

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes and the engine does not stop within five seconds:

  P0335 No Signal

  P0336 Crankshaft Position Sensor Error

Thermo King Alarm Code 42 Unit Forced to Low Speed is also set as a Log Alarm.

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Alarm Code 42 is also cleared unless also generated by other active alarms.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

801 CAMSHAFT POSITION SENSOR ERROR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P0341 No Signal

  P0344 Number and/or position of camshaft edges implausible

  P0016 Phase difference with crankshaft

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

804 ENGINE COOLANT TEMP SENSOR ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:
  P0118 Electrical defect of coolant temp sensor - high voltage
  P0117 Electrical defect of coolant temp sensor - minimum voltage
  P0115 Defect fault check for dynamic plausibility test

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

807 FUEL TEMPERATURE SENSOR ERROR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:
  P0183 Fuel temp sensor electrical defect - open load or SCB
  P0182 Fuel temp sensor electrical defect - SCG

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

808 RAIL PRESSURE SENSOR ERROR

Fault Type

Log or Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm in Diesel Mode and a Log Alarm in Electric Mode if the ECU sends one or more of the following P Codes and the engine does not stop within a five second time period:

  P0192 Signal voltage low

  P0193 Signal voltage high

- Condition 2 - This fault is set as a Check Alarm in Diesel Mode and a Log Alarm in Electric Mode if the ECU sends one or more of the following P Codes

  P0191 Voltage intermittent

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

This alarm is auto cleared if the unit is switched from Electric Mode to Diesel Mode.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

809 INTAKE AIR PRESSURE SENSOR ERROR

Fault Type

Log or Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm in Diesel Mode and a Log Alarm in Electric Mode if the ECU sends one or more of the following P Codes:

  P0069 Boost pressure sensor plausibility defective

  P0237 Air admission pressure sensor - voltage < minimum

  P0238 Air admission pressure sensor - voltage > maximum

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

810 ATMOSPHERIC PRESSURE SENSOR ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:
  - P2228 Signal Voltage Low
  - P2229 Signal Voltage High

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

811 GLOW PLUG CIRCUIT ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:
  - P1349 Load error
  - P1350 Electrical defects of glows control - CCG
  - P1352 Plausibility defect between glows command and glow states

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

813 GENERAL INJECTOR ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:
  - P1600 Check of missing injector adjustment value programming for 1, 2, 3, 4 injector(s)
- Condition 2 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:
  - P2146 Injector Bank #1 short circuit
  - P2149 Injector Bank #2 short circuit
  - P1641 Injector Bank chip error
- Condition 3 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:
  - P0201 Injector #1 Open Load Error
  - P0202 Injector #2 Open Load Error
  - P0203 Injector #3 Open Load Error
  - P0204 Injector #4 Open Load Error
- Condition 4 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:
  - P0261 Injector #1 short circuit in cylinder error
  - P0267 Injector #2 short circuit in cylinder error
  - P0270 Injector #3 short circuit in cylinder error
  - P0264 Injector #4 short circuit in cylinder error
- Condition 5 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:
  - P0262 Injector #1 HS/LS short circuit
  - P0268 Injector #2 HS/LS short circuit
  - P0271 Injector #3 HS/LS short circuit
  - P0265 Injector #4 HS/LS short circuit

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

815 FUEL PRESSURE REGULATOR ERROR

Fault Type

Log or Shutdown

Associated Thermo King Alarm Codes

N/A

Considerations

The engine stopped when it should be running as defined below:

- Run Relay input is energized (high).
- High Pressure Cutout (HPCO) input is high (switch is closed).
- Engine RPM < 300.
- One of the following is true based on the hardware configurations below:
  - If Electric Standby Equipped, Electric Motor RPM < 200.
  - If not Electric Standby Equipped and no Electronic Battery Charger (alternator equipped), Alternator Frequency < 100 Hz.
  - If not Electric Standby Equipped and Electronic Battery Charger = 30 amp or 120 amp, Battery Charger Input Frequency < 30 Hz.

How Fault is Set

- Condition 1 - This fault is set as a Shutdown Alarm in Diesel Mode or a Log Alarm in Electric Mode if the engine is stopped when it should be running and the ECU sends one or more of the following P Codes:

  P0093 Rail Pressure Regulation Error - Positive governor deviation and setpoint value of the fuel volume flow through the metering unit.
- Condition 2 - This fault is set as a Shutdown Alarm in Diesel Mode or a Log Alarm in Electric Mode if the engine is stopped when it should be running and the ECU sends one or more of the following P Codes:

  P1113 Rail Pressure Regulation Error - Monitoring for minimum rail pressure.
- Condition 3 - This fault is set as a Shutdown Alarm in Diesel Mode or a Log Alarm in Electric Mode if the engine is stopped when it should be running and the ECU sends one or more of the following P Codes:

  P1166 Rail Pressure Regulation Error - Monitoring for maximum rail pressure - exceeds maximum or threshold.
- Condition 4 - This fault is set as a Shutdown Alarm in Diesel Mode or a Log Alarm in Electric Mode if the engine is stopped when it should be running and the ECU sends one or more of the following P Codes:

  P1199 Rail Pressure Regulation Error - Monitoring for minimum rail pressure.

  P1199 Rail Pressure Regulation Error - Pressure regulation positive step - the pressure is not sufficient at low fuel tank level.

  P1199 Rail Pressure Regulation Error - Pressure regulation negative step – the pressure is higher than the setpoint at low fuel tank level.

  P1199 Rail Pressure Regulation Error - The Rail Pressure value is low function engine speed.

  P1199 Rail Pressure Regulation Error - The Rail Pressure value is high function engine speed during the last 10 milliseconds.

  P1199 Rail Pressure Regulation Error - The Rail Pressure value is high function engine speed during a fixed period.

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

818 EGR VALVE ACTUATOR ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0401 EGR Regulation Fault

  P2143 Diagnostic fault check for open load

  P2144 Short circuit to ground on Out1 or Out2 error

  P2145 Diagnostic fault check for short circuit to battery for Out1 or Out2

  P2413 Diagnostic fault check for temperature dependant over-current or Diagnostic fault check for over-current

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

819 ECU POWER RELAY ERROR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

    P0685 The Powerstage hardware reports an overtemp error, actuator relay, or secondary relay open load error

    P0686 Secondary relay - short circuit to ground

    P0687 Secondary relay - short circuit to battery

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

820 MAIN ECU RELAY ERROR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

    P0215 Main Relay

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

821 ENGINE TIMING BELT CHANGE REQUIRED

Fault Type

Check or Shutdown

Associated Thermo King Alarm Codes

N/A

Considerations

Whenever engine timing belt is changed, the Engine Timing Belt Accumulated Hours must be reset to zero in Guarded Access > Hourmeter Setup.

Important: *The Engine Timing Belt Accumulated Hours should not be reset unless the timing belt has been replaced.*

When the Engine Timing Belt Accumulated Hours reaches 6000 hours, the user can select which action to take in Guarded Access > Hardware Configuration > Engine Timing Belt Expiration Action.

The fault type is determined by the Engine Timing Belt Expiration Action setting in Guarded Access.

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm when the timing belt accumulated hours reaches 5800.
- Condition 2 - This fault is set as a “persist” Check Alarm when the timing belt accumulated hours reaches 5960 and cannot be cleared.
- Condition 3 - The controller will take the action selected in the Engine Timing Belt Expiration Action Menu when the timing belt accumulated hours reaches 6000. The default action is to set the Check Alarm. If set to Shutdown Alarm, the unit will not start after next power cycle.

How Fault is Cleared

This fault is cleared manually and automatically.

Diagnostic Procedure

1. Change timing belt when required.
2. Check timing belt for damage and replace as required.

825 T1 AIR INTAKE TEMPERATURE SENSOR ERROR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:
  - P0112 Default fault check for signal value above maximum limit
  - P0113 Default fault check for signal value below minimum limit

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

826 T2 AIR INTAKE TEMPERATURE SENSOR ERROR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P0097 Short circuit to ground

  P0098 Open circuit and short circuit to battery

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

827 EGR VALVE POSITION SENSOR ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0405 DFC for SRC low

  P0406 DFC for SRC high

  P0490 EGR Control Loop defect - positive deviation

  P1461 EGR Valve low end learning defect - short time drift

  P1462 EGR Valve 1st learning defect

  P14A7 DFC to indicate a first learning of EGR Valve

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

828 LAMBDA SYSTEM ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0130 Electrical defect - open load or ground defect

- Condition 2 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P2231 Defect fault check for heater coupling check

  P0032 Short circuit to battery of the LSU heater power stag

  P0031 Short circuit to ground of the LSU heater power stage

  P0030 Overtemp error of the LSU power stage or no load condition of the heater power stage

- Condition 3 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0133 The measured O2-concentration LSU_rO2RawTempComp [%] requires for the load-overrun transition

  P2246 The analog signal for the O2 ratio from the sensor after PT1 filtering, during the calibration mode. The analog signal for the O2 ratio from the sensor during the normal operation exceeds the maximum

  P2245 The analog signal for the O2 ratio from the sensor after PT1 filtering, during the calibration is below

  P2191 The measured O2-concentration LSU_rO2Raw [%], SU_rO2RawTempComp [%] or LSU_rO2Adap

  P2297 Error on O2 concentration at Foot off: Max Value

  P2187 Error on O2 concentration at Partial Load: Max Value

  P2192 Error on O2 concentration at Full Load: Min Value (Plausibility)

  P2188 Error on O2 concentration at Partial Load: Min Value

  P0134 Indicates low battery condition detected at CJ125

  P2244 Defect code for SPI-chip monitoring

  P0135 LSU sensor temperature exceeds the maximum limit or LSU sensor temperature below the minimum limit

  P0132 "Short circuit to battery" of the sensor lines

  P0131 "Short circuit to ground" of the sensor lines

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

829 ENGINE COMMUNICATION ERROR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following DTC Codes:

    U11D8 Acknowledge: Timeout Error of CAN-send-Frame ACK

    U11D9 Ambiante condition Frame: Timeout Error of CAN-Transmit-Frame AmbCon

    U11DA Intercooler Fan Speed Request and Engine Coolant Fan Request: Timeout Error of CAN-Transmit- Frame CF

    U11DB Crank Request Frame: DLC Error of CAN-Receive-Frame

    U11DC Crank Request Frame: Non-plausible content of CRRQ Message

    U11DD Crank Request Frame: Timeout Error of CAN-Receive-Frame

    U11DE Engine Percent Torque, Engine Speed, Engine Starter Mode and Engine Demand Torque: Timeout Error of CAN-Transmit-Frame

    U11DF Engine percent load at cur-rent speed: Timeout Error of CAN-Transmit-Frame

    U11E1 Engine fluid level: Timeout Error of CAN-Transmit-Frame

    U11E2 Engine Operating State: Timeout Error of CAN-Receive-Frame

    U11E3 Engine Coolant Temperature, Fuel Temperature and Engine Intercooler Temperature: Timeout Error of CAN-Transmit-Frame

    U11E4 Total Fuel Consumption: Timeout Error of CAN-Transmit-Frame

    U11E5 Total Fuel Consumption: Timeout Error of CAN-Transmit-Frame

    U11E6 Engine Wait to start lamp: Timeout Error of CAN-Transmit-Frame

    U11EC Battery Potential: Timeout Error of CAN-Transmit-Frame

    U11ED Water in Fuel indicator: Timeout Error of CAN-Transmit-Frame

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

830 AIR FLOW METER ERROR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P0102 SRC low error for corrected value in HFM sensor or SRC low error for raw value in HFM6 sensor

  P0103 SRC high error for corrected value in HFM sensor

  P3007 Default check for stuck main relay error

  P3008 Air flow plausibility defect: Measured air flow is higher than the estimated airflow value OBD threshold

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

832 ENGINE SENSOR POWER SUPPLY ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0658 Sensor Power Supply #1

  P2670 Sensor Power Supply #2

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

833 HIGH PRESSURE PUMP FUEL METERING UNIT ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P0001 Open load defect of fuel metering unit

  P0002 Detection of a metering unit power stage over-temperature

  P0003 Fuel metering unit electrical defect - SCG detected

  P0004 Fuel metering unit electrical defect - SCB detected

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

836 MAJOR ECU FAILURES

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P1621 Diagnostic fault check to report the NTP error in ADC monitoring

  P1621 Error on Analogic/Numeric converter: test impulse error

  P1621 Error on Analogic/Numeric converter: non plausible ratio tension

  P1621 Plausibility error between function controller and Monitoring

  P1621 SPI communication defect

  P1621 Error during ROM testing

  P1621 Loss of synchronization sending bytes to the MM (Monitoring module) from CPU

  P1621 Error during SOP test; uncertain cause (defective injector or shut-off path)

  P1621 Wrong set response time between Controller and CPU

  P1621 Too many SPI errors during MoCSOP execution

  P1621 Voltage monitoring lower limit shut off path defect

  P1621 Error in the shut-off path of monitoring module

  P1621 OS timeout in the shut off path test. Failure setting the alarm task period

  P1621 Error in the time monitoring of the shut-off path module

  P1621 Voltage monitoring upper limit shut off path defect

  P1621 Diagnosis quantity path limitation due to a functional control unit monitoring

  P1622 Diagnosis air path limitation due to a functional control unit monitoring

  P1623 Diagnosis rail pressure path limitation due to a functional control unit monitoring

  P1624 Fuel metering unit electrical defect: SCB detected

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

838 INTAKE AIR SYSTEM ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P16C8 Control Air Cooler Fan: Plausibility error of the intake air temperature

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

839 ENGINE SPEED ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P061C Impermissible offset between the engine speed of level 2 and level 1

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

840 FUEL INJECTION ENERGIZING ERROR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P16CD Energizing time calibration Injector 1: error state on comparing energizing time to Max value

  P16CE Energizing time calibration Injector 3: error state on comparing energizing time to Max value

  P16CF Energizing time calibration Injector 4: error state on comparing energizing time to Max value

  P16D1 Energizing time calibration Injector 2: error state on comparing energizing time to Max value

  P16D2 Energizing time calibration Injector 1: error state on comparing energizing time to Min value

  P16D3 Energizing time calibration Injector 3: error state on comparing energizing time to Min value

  P16D4 Energizing time calibration Injector 4: error state on comparing energizing time to Min value

  P16D5 Energizing time calibration Injector 2: error state on comparing energizing time to Max value

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

841 HIGH PRESSURE PUMP WEAR

Fault Type

Check

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if the ECU sends one or more of the following P Codes:

  P11B5 High Pressure Pump Wear

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

842 ENGINE RUNNING IN SAFE MODE, LOW SPEED

Fault Type

Check

Associated Thermo King Alarm Codes

42 Unit Forced to Low Speed

How Fault is Set

- Condition 1 - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P0100 Air flow meter

- Condition 2 Injector Bank Error - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P2149 Bank2 short circuit

  P2146 Bank1 short circuit

  P1641 Chip error in the CY33x power stage component

- Condition 3 Rail Pressure Regulation - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P0087 Positive Governor Deviation

  P0088 Negative Governor Deviation at Zero Delivery

  P1199 Monitoring for minimum rail pressure

  P1166 Monitoring for maximum rail pressure - exceeds maximum or threshold

- Condition 4 - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P1600 Injector 1,2, 3, or 4 Missing injector adjustment value programming

- Condition 5 Variant Coding or EEPROM - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P0610 Variant coding

  P0605 EEPROM

  P0603 EEPROM

  P0621 ECU Failure

- Condition 6 - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P0489 EGR valve position sensor

- Condition 7 Safety Level 2 Error - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P1631 Air flow meter

  P061C

  P1624

- Condition 8 Injector #1 Error - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P0204 Injector #1:Open load error

  P0270 Injector #1:Short circuit in cylinder

  P0271 Injector #1:HS/LS short circuit

- Condition 9 Injector #2 Error - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P0204 Injector #2:Open load error

  P0270 Injector #2:Short circuit in cylinder

  P0271 Injector #2:HS/LS short circuit

- Condition 10 Injector #3 Error - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P0204 Injector #3:Open load error

  P0270 Injector #3:Short circuit in cylinder

  P0271 Injector #3:HS/LS short circuit

- Condition 11 Injector #4 Error - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P0204 Injector #4:Open load error

  P0270 Injector #4:Short circuit in cylinder

  P0271 Injector #4:HS/LS short circuit

- Condition 12 Common Rail Pressure Sensor - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P0190 Common rail pressure sensor

- Condition 13 Sensors Supply #3 - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P2685 Sensors supply #3

- Condition 14 Communication - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P11E7 Engine speed demand Frame: Active DFC TimeOut of TSC1PE Message

  P11E8 Engine speed demand Frame: Passive DFC TimeOut of TSC1PE Message

  P11E9 Engine speed demand Frame: DLC Error of CAN-Receive-Frame

  P11EA Engine speed demand Frame: Non-plausible content of TSC1PE Message

  P11EB Engine speed demand Frame: Timeout Error of CAN-Receive-Frame

- Condition 15 Boost Pump Pressure Loop Error - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P0299 Positive step between set point and effective value High load Zone

- Condition 16 Sensors Supply #1 - This fault is set as a Check Alarm if both the ECU sends one or more of the following P Codes and engine speed is greater than or equal to 800 RPM but less than or equal to 1500 RPM for five consecutive seconds:

  P0658 Sensors supply #1

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

843 FUEL INJECTION SYSTEM ERROR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P16EE ET correction of ZFL Injector 1: error state on comparing energizing time to Max value

  P16EF ET correction of ZFL Injector 3: error state on comparing energizing time to Max value

  P16F1 ET correction of ZFL Frame Injector 4: error state on comparing energizing time to Max value

  P16F2 ET correction of ZFL Frame Injector 2: error state on comparing energizing time to Max value

  P16F3 ET correction of ZFL Frame Injector 1: error state on comparing energizing time to Min value

  P16F4 ET correction of ZFL Frame Injector 3: error state on comparing energizing time to Min value

  P16F5 ET correction of ZFL Frame Injector 4: error state on comparing energizing time to Min value

  P16F6 ET correction of ZFL Frame Injector 2: error state on comparing energizing time to Min value

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

844 FAILED TO CRANK

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 Start Actuator - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P1694 No change in engine speed during starter activation diagnostic Fault check for NON PLAUSIBILITY

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

845 STARTER RELAY ERROR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P0615 Default Fault Check for open load error in Starter relay

  P0616 Default Fault Check for short circuit to battery error in Starter relay

  P0617 Diagnostic Fault Check for short circuit to battery error in Starter relay

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

846 T50 SWITCH ERROR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:
  P16ED Defective T50 Switch

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

847 VARIANT CODING ERROR

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:
  P0630 DTC to indicate an invalid vehicle identification number
  P160A DTC to indicate an invalid calibration identification

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

854 ECU SELF COMMANDED SHUTDOWN

Fault Type

Log

Associated Thermo King Alarm Codes

N/A

How Fault is Set

- Condition 1

  Engine was running and should be running but is stopped

  and

  Engine is stopped if one or more of the following is true:

  – Engine Operating Mode [24H, 24H] is not = to:
    - Engine Running Low Speed
    - or, Engine Running High Speed
    - or, Engine Running Low Speed Safe Mode

  – or, Engine Operating State (SPN 3543, GDT [24:1C]) is = to Standby, Ready, Stopping, or Finish

  – or, Engine RPM is valid and < 300

  – or, One of the following is true based on the hardware configurations below:
    - if Electric Standby Equipped, use Electric Motor RPM < 200
    - or, if Electric Standby not Equipped and no Electronic Battery Charger (alternator equipped), use Alternator Frequency < 100 Hz
    - or, if Electric Standby not Equipped and Electronic Battery Charger 120 amp, use Battery Charger Input Frequency < 30 Hz

- Condition 2 Engine Protection - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P1625 Shut-off request of the injection cut-off for the shut-off coordinator in case of a standard ICO

- Condition 3 Pump Fuel Metering Unit - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P0001 Open load defect of fuel metering unit

  P0002 Detection of a metering unit power stage over temperature

- Condition 4 Pump Fuel Metering Unit Electrical - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P0003 Fuel metering unit electrical defect: SCG detected

  P0004 Fuel metering unit electrical defect: SCB detected

- Condition 5 Common Rail Pressure Sensor - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P0192 Common Rail Pressure Sensor Error < Min Threshold

  P0193 Common Rail Pressure Sensor Error > Max Threshold

- Condition 6 Crankshaft Position Sensor - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P0335 Crankshaft signal loss

  P0336 Crankshaft signal disturbance

- Condition 7 Power Relay Error - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P0685 Secondary relay: open load error

  P0685 The powerstage hardware reports an "over temperature" error Actuator Relay

  P0686 Secondary relay: Short circuit to GND

P0687 Secondary relay: Short circuit to battery

- Condition 13 Sensor Supply #3 - This fault is set as a Log Alarm if the ECU sends one or more of the following P Codes:

  P2265 Sensor Supply #3

How Fault is Cleared

This alarm is clearable using the HMI Control Panel Main Menu > Clear All ECU Faults.

This alarm is auto cleared if the ECU stops sending the P Codes shown above.

Log Alarm cleared.

Diagnostic Procedure

Use the Peugeot Diagnostic Tool to determine what DTC Codes are set. For corrective actions, refer to the Peugeot Troubleshooting Guide.

Section 6 - Service Procedures

A01A - Base Controller Functional Test

Purpose:

To confirm proper operation of the SR-4 Base Controller.

Materials Required:

- Multimeter

Operation:

Base Controller

- LED 48 Application Micro: Heartbeat - two flashes (approximately one second pause)
- LED 45 I/O Micro: Single flash - repeats approximately at a one second cycle rate

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.

Procedure:

To complete this procedure, refer to the Figures on the following pages.

Figure 168. Base Controller Functional Test

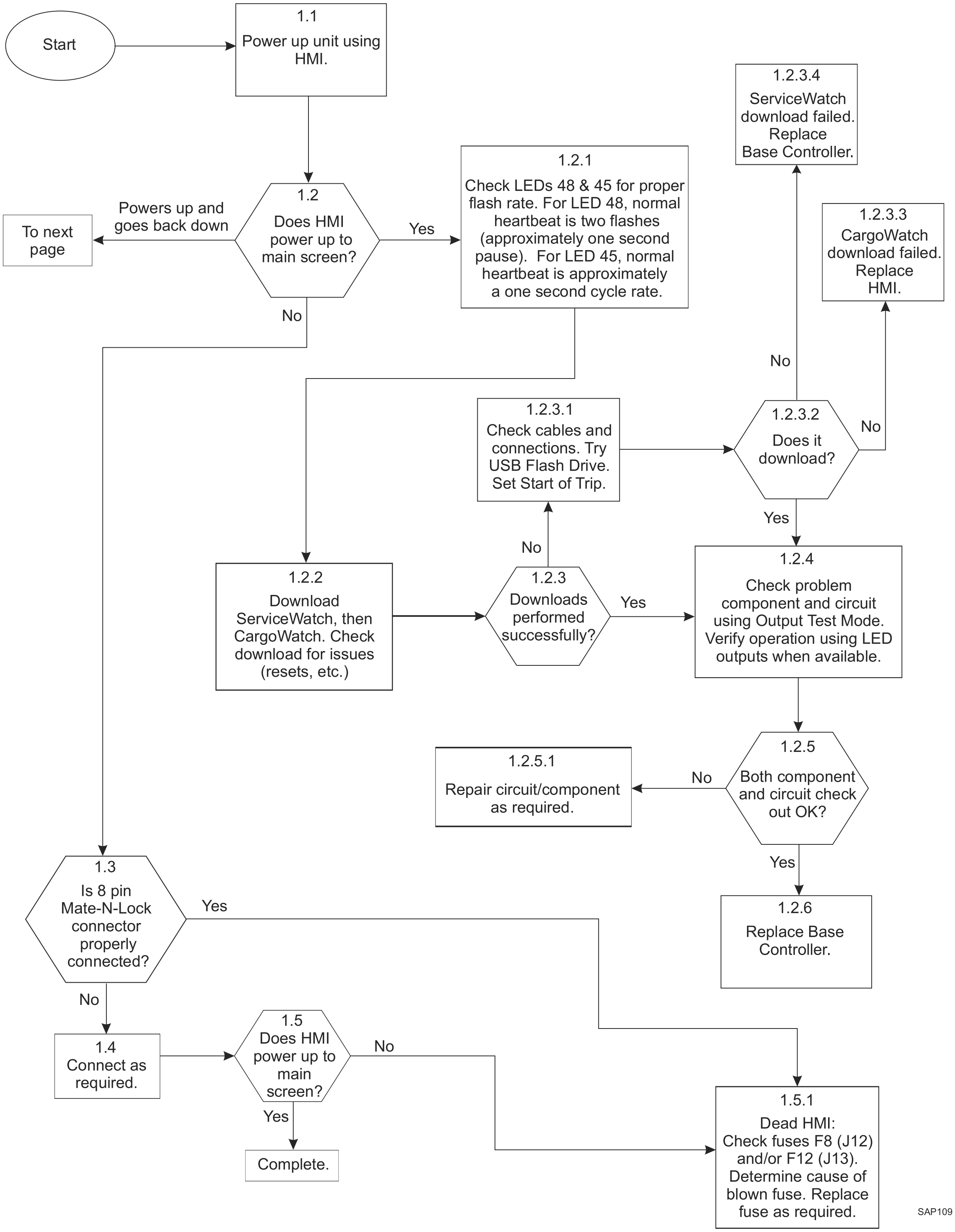


Figure 169. Base Controller Functional Test

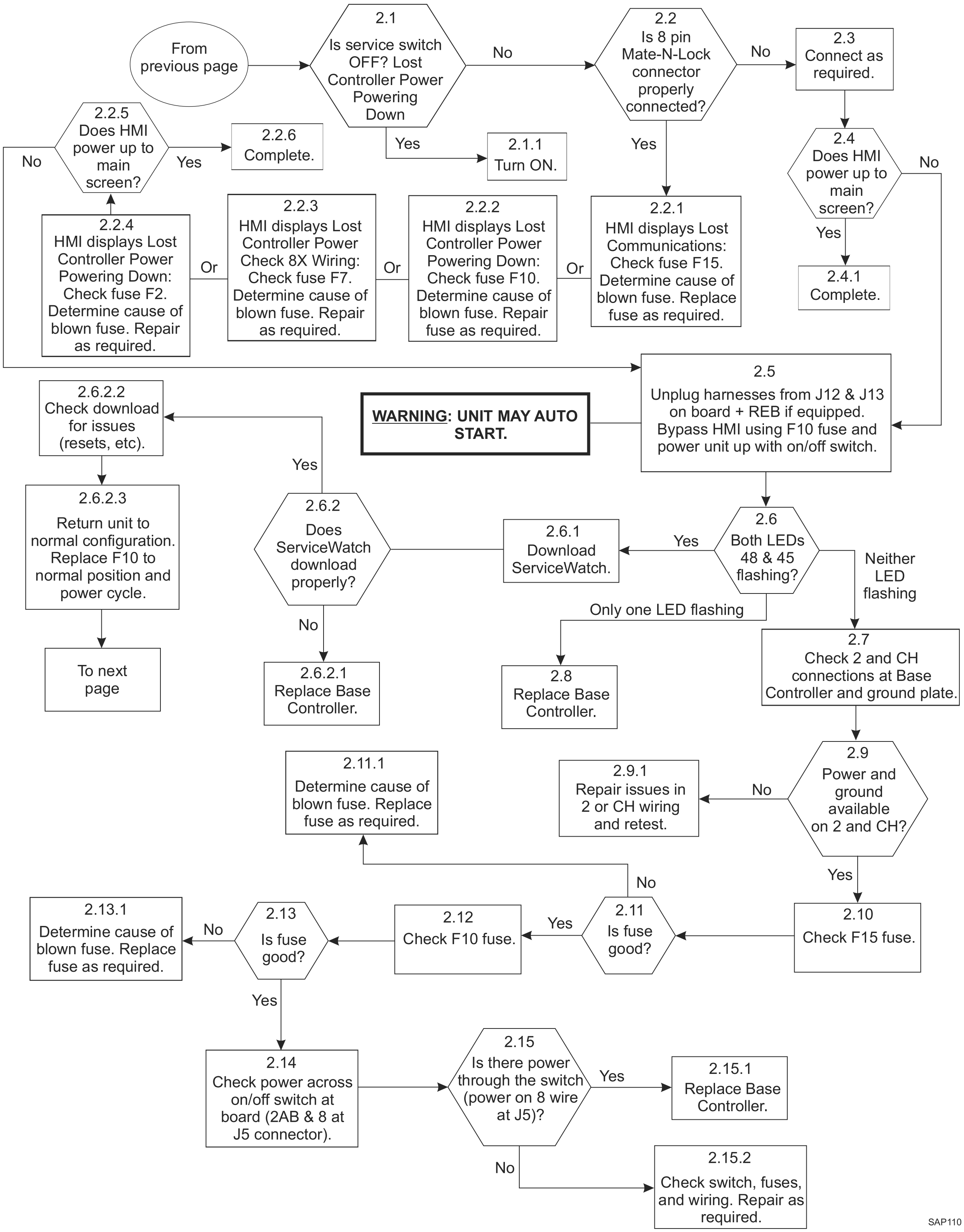
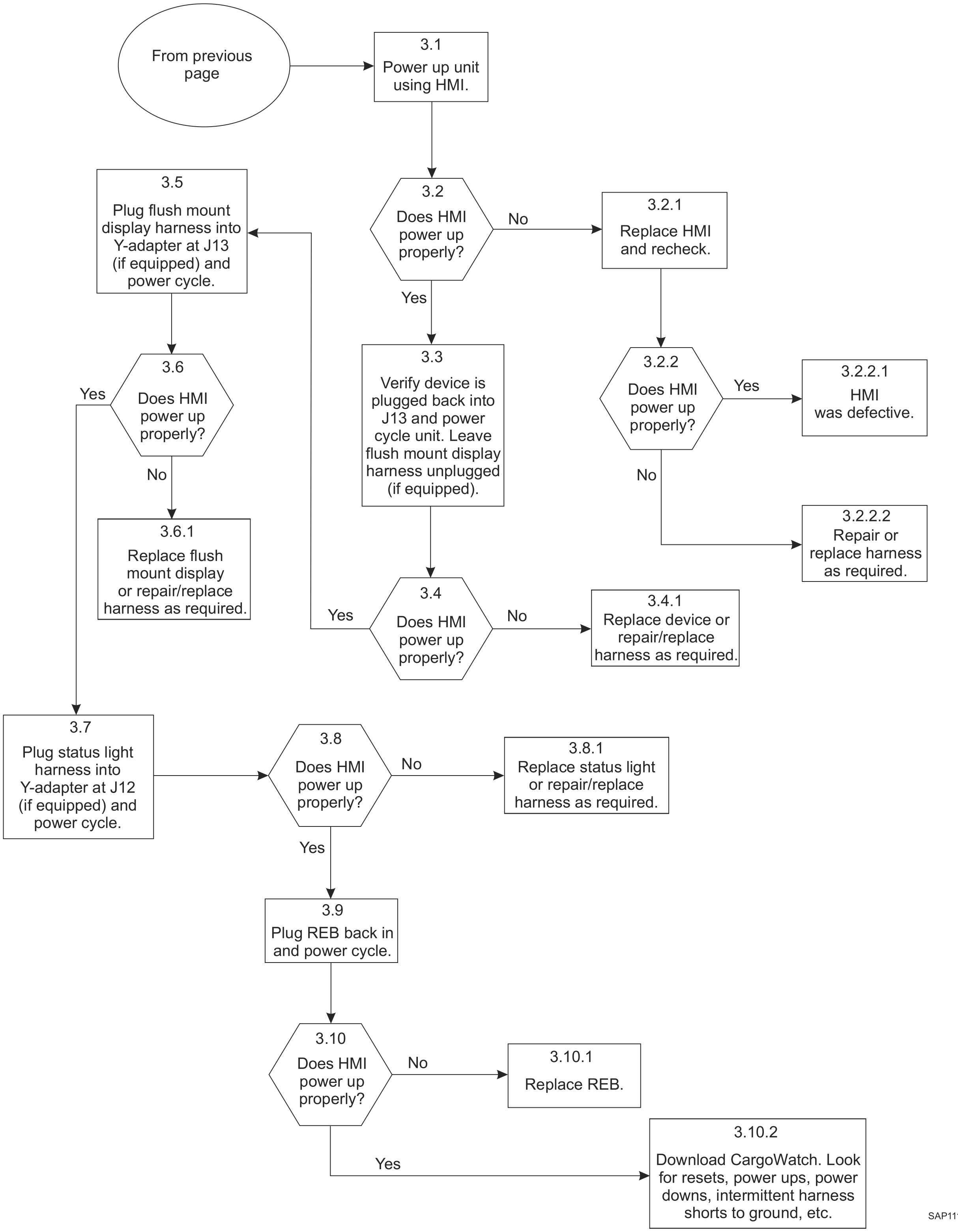


Figure 170. Base Controller Functional Test



A01C - HMI Control Panel Self Test

Purpose:

To confirm proper operation of the HMI Control Panel using the built in Display Self Test.

Operation:

The following procedure allows the technician to determine if the HMI Control Panel is operating properly using the built in HMI Self Tests.

Important Notes:

- Replace only one component at a time to verify the problem component is correctly identified.

Table 27. Procedure

Step	Action	Result	Comments
	HMI Control Panel Self Test		
1	To access the Maintenance Menu, press the MENU key.		
2	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.		
3	The first Maintenance Menu feature will appear. Press the UP and DOWN Keys to scroll through the Maintenance Menu choices. When DISPLAY SELF TEST is shown on the display, press the SELECT Key to access it.		
4	The DISPLAY SELF TEST menu appears. The available tests are shown below.		
5	Press the UP and DOWN Keys to scroll through the Display Self Test Menu choices.		
6	When DISPLAY SELF TEST is shown on the display, press the SELECT Key to access it.		
7	When the individual test is complete another test can be selected.		
8	When testing is finished press EXIT to return to the Maintenance Menu.		

Available Tests:

- **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.
- **Unit On/Off Output Test** – This test allows the technician to turn the Unit On/Off output off. This turns the unit off to confirm that the output can be turned off. To restart the unit, press the On key.
- **SPR Digital Output Test** – This test allows the technician to turn digital output 2 on and off. This allows the operation of a device attached to this output to be checked.

- **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.
- **Datalog Flash** – This test allows the technician to perform an internal HMI CargoWatch data logger memory test. The test takes less than one second and the results are reported as PASS or FAIL.
- **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.

A01D - Expansion Module Functional Test

Purpose:

To confirm proper operation of the SR-4 Expansion Module.

Materials Required:

- Multimeter

Operation:

Expansion Module

- LED 18 Application Micro: Heartbeat - once per second

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:

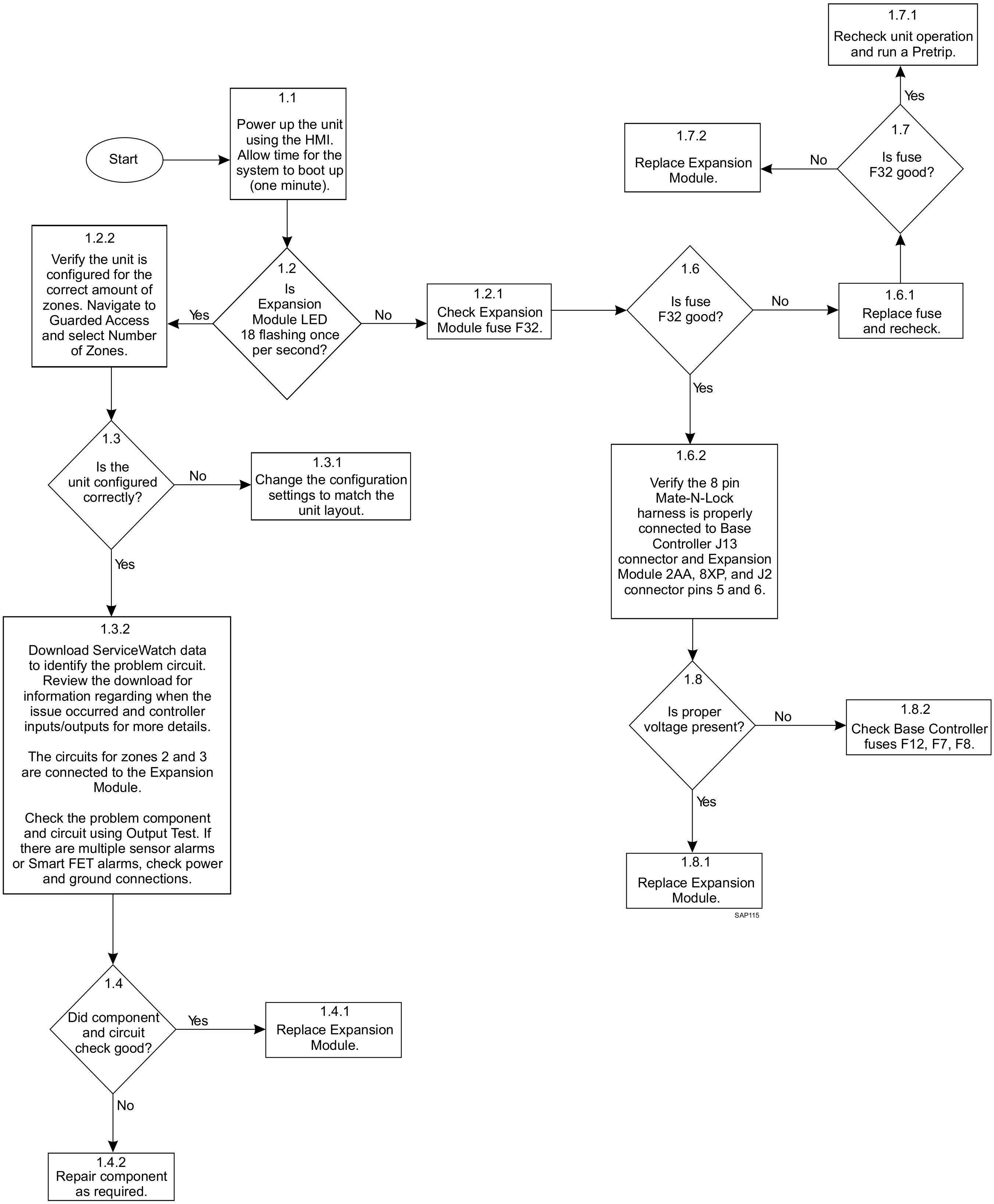
  Note: *Any external component attached to the Expansion Module that is not properly operating may impact the operation of the Expansion Module.*

  – 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 171. Expansion Module Functional Test



A02A - Recording Existing Programmable Feature Settings

Purpose:

To retrieve and record the sensor grades and programmable feature settings of an SR-4 Base Controller.

Materials Required:

- 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 or performing a Base Controller Cold Start. These settings will then be duplicated in the replacement Base Controller 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 28. Procedure

Step	Action	Result	Comments
1	Turn the unit on.		
2	Press the MENU key.	The Operator Menu appears.	Do not let the unit start. The Guarded Access Menu cannot be entered in the unit is running.
3	Press and hold both the EXIT and unlabeled key for 5 seconds.	The Maintenance Menu appears.	
4	Press the DOWN key as required to display the Software Revision Menu. Then press the SELECT key to enter the Software Revision menu.		
5	Use the UP and/or DOWN 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 UP and DOWN 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 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.
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 Output 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 5 seconds.	The Guarded Access Menu appears.	If a Security Code is requested then enter the Security Code or [4444] to enter the Guarded Access Menu.

Table 28. Procedure (continued)

Step	Action	Result	Comments
12	The Programmable Features Menu will appear. Press the SELECT key to enter the Programmable Features Menu.		
13	Use the UP and/or DOWN 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 UP and/or DOWN 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 UP and/or DOWN 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 and CargoWatch data loggers.		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 29. Software Revision

Function	Default Setting	Recorded Setting
HMI Control Panel	XXxx	
Base Controller	XXxx	

Table 30. 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 31. Security Code

Function	Default Setting	Recorded Setting
Security Code as specified by customer	None	
Note: *If an unknown security code is set then use Security Code 4444 to gain access.*		

Table 32. Programmable Features

Function	Default Setting	Recorded Setting
Temperature Units	FAHRENHEIT	
Pressure Units	PSI	
Restart Unit After Shutdown	ENABLED	
Setpoint High Limit Zone 1	80°F	
Setpoint Low Limit Zone 1	-20°F	
Setpoint High Limit Zone 2	80°F	
Setpoint Low Limit Zone 2	-20°F	
Setpoint High Limit Zone 3	80°F	
Setpoint Low Limit Zone 3	-20°F	
Running Fans in Null	DISABLED	
Fresh Frozen Range	15°F	
Door Open	ENABLED ONLY	
Door Open Forces	LOG ONLY	
Door Open Timeout (HRS:MIN)	OFF	
Door Open Timeout Alarm	ENABLED	
Sleep Mode After Pretrip	DISABLED	
Discharge Pressure Setpoint	415 PSIG	
Water Temperature Setpoint	210°F	
Limited Alarm Restarts	DISABLED	

Table 32. Programmable Features (continued)

Function	Default Setting	Recorded Setting
Remote Device	DISABLED	
COM 1 Default Baud Rate	1200	
COM 2 Default Baud Rate	9600	
COM 3 Default Baud Rate	9600	
Number of Limited Setpoints	0	
Limited Setpoint #1	-13°F	
Limited Setpoint #2	32°F	
Limited Setpoint #3	37°F	
Limited Setpoint #4	55°F	
Demand Defrost on Temperature Rises	DISABLED	
Extended ServiceWatch Data Logging	DISABLED	
High Temperature Defrost	DISABLED	
Local Authorization of OS+ Upload (Not Currently Used)	DISABLED	
Local Authorization of Flash Load (Not Currently Used)	DISABLED	
ServiceWatch Logging Interval	15 MINUTES	
Condenser Inlet Solenoid MOPD Option	ENABLED	
Condenser Inlet Solenoid MOPD	200 PSI	
Sleep Mode Engine Start Coolant	30°F	

Table 33. 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	
Configure Soft Key 2 on Standard Display	GAUGES	
Configure Soft Key 3 on Standard Display	SENSORS	
Add Temperature Units to Mode Menu	DISABLED	
Auto Keypad Lock Time	DISABLED	
Auto Keypad Lock PIN Number	NO CODE	

Table 34. Fuel Usage

Function	Default Setting	Recorded Setting
Instantaneous Fuel Rate	DISABLED	
Trip A Fuel Used	GALLONS	
Trip A	GALLONS/HOUR	
Trip A	GALLONS/HOUR	
Trip B	GALLONS	
Trip B	GALLONS/HOUR	

Table 34. Fuel Usage (continued)

Function	Default Setting	Recorded Setting
Trip B	GALLONS/HOUR	
Trip C	GALLONS	
Trip C	GALLONS/HOUR	
Trip C	GALLONS/HOUR	
Lifetime Fuel Used	GALLONS	
Lifetime Fuel Used for Temperature Control	GALLONS	

Table 35. 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 36. Hourmeter Setup - Viewable Hourmeter

Function	Default Setting	Recorded Setting
Total Controller Run Hours	DISABLED	
Total Unit Run Time Hours	ENABLED	
Total Engine Run Time Hours	ENABLED	
Total Electric Run Time Hours	ENABLED (Mod 50)	
Total Zone 1 Run Time Hours	DISABLED	
Total Zone 2 Run Time Hours	DISABLED	
Total 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 37. 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	
Spare 1 Sensor Grade	5H	
Spare 2 Sensor Grade	5H	
Spare 3 Sensor Grade	5H	

Table 38. Cycle Sentry Setup

Function	Default Setting	Recorded Setting
Cycle Sentry Amperes Level	8 AMPS	
Battery Sentry Voltage Level	12.2 VOLTS	
Check Battery Condition Alarm	DISABLED	

Table 39. 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	
Maximum Defrost Duration	45 MINUTES	

Table 40. Language Setup

Function	Default Setting	Recorded Setting
Default Language: English	ENGLISH	
Enable Language: Spanish	DISABLED	
Enable Language: French	DISABLED	
Enable Language: Portuguese	DISABLED	

Table 41. Access Code Setup

Function	Default Setting	Recorded Setting
Enter Access Code	NO CODE	

Table 42. Sensor Configuration - CargoWatch

Function	Default Setting	Recorded Setting
SOT on Setpoint Change	DISABLED	
Automatic SOT at Midnight	DISABLED	

Table 42. Sensor Configuration - CargoWatch (continued)

Function	Default Setting	Recorded Setting
Logging Interval	15 Minutes	
Note: *Log interval is set for all sensors.*		

Table 43. Sensor Configuration - Up to Six Sensors Configured

Function	Default Setting	1	2	3	4	5	6
Sensor Logging	1-2 On, 3-6 Off						
Sensor Name	Log Sensor X						
Out of Range Checking	OFF						
Low Limit	-10.8°						
High Limit	10.8°						
Italian Logging	OFF						
Sensor Averaging	OFF						

Table 44. Sensor Configuration - Up to Four Digital Inputs Configured

Function	Default Setting	1	2	3	4
Door Open Logging	1 On, 2-4 Off				
Digital Input #X Name	Digital Input #X				

Table 45. Sensor Configuration - Features that Allow Extended Data Logging when Unit is Turned Off

Function	Default Setting	Recorded Setting
Countdown	OFF	
Conservative	OFF	

Table 46. Unit Configuration

Function	Default Setting	Recorded Setting
Unit Model	S-600M	
High Capacity Unit	NO	
How Many Zones in the Unit	2 or 3	
Zone 2 Evaporator Fans Configuration	3	
Zone 3 Evaporator Fans Configuration	3	
Engine Type	Peugeot TKDV6	
Compressor Type	RECIP	
ETV Configured	YES	
Battery Charger	NONE	
Electric Standby Equipped (Model 50)	YES	
Electric Heat Option (Model 50)	YES	
Electric Motor Type (14 HP Type, 24 HP Type) (Model 50)	14 HP	
Diesel to Electric Auto Switch Enabled (Model 50)	NO	

Table 46. Unit Configuration (continued)

Function	Default Setting	Recorded Setting
Electric to Diesel Auto Switch Enabled (Model 50)	NO	
Humidity Sensor	NO	
Fuel Level Sensor Type	NONE	
Low Fuel Shutdown	DISABLED	
Rear Remote Control	NONE	
Rear Remote Control Action (If Rear Remote installed)	STAND BY	
3rd Party Device Control	NONE	
REB Type Configured	NONE	
Fresh Air Exchange	NO	
REB Door Switch	DISABLED	
REB Fuel Sensor Type	NONE	

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 60 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 47. Procedure

Step	Action	Result	Comments
1	Log the existing Base Controller settings using Service Procedure A02A.		This information will be used to set up the replacement Base Controller.
2	Turn the unit 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 assembly.		
6	Remove the screws securing the Base Controller to the control box and remove the Base Controller assembly from the control box.		
7	Install the new Base Controller assembly in the control box.		
8	Reconnect all harness connectors to the Base Controller.		Apply Super Lube as needed. Verify all connectors are securely mated and secure the harnesses with cable ties as required.
9	Reconnect the unit battery.		
10	Reconnect the standby power if needed.		
11	Turn the unit on.		The real time clock settings will be loaded from the HMI Control Panel when the unit is turned on.
12	Clear any alarm codes.		
13	Set up all programmable features using Service Procedure A04A.		
14	Run a Pretrip Test to verify proper unit operation.		

A03B - HMI Control Panel Replacement

Purpose:

To replace the HMI Control Panel.

Materials Required:

- Cable ties

Operation:

The HMI Control Panel is removed from the control box door as an assembly.

Important Notes:

- It is very important that the correct HMI Control Panel software be used. HMI Control Panels 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 HMI Control Panel 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 48. Procedure

Step	Action	Result	Comments
1	Turn the unit off.		
2	Disconnect standby power, if connected.		
3	Disconnect the unit battery.		
4	Disconnect the harness connector from the HMI Control Panel.		
5	Remove the four screws securing the HMI Control Panel to the control box and remove the HMI Control Panel from the control box.		
6	Install the new HMI Control Panel in the control box.		
7	Re-connect the harness connector to the HMI Control Panel. Apply Super Lube as required.		Verify all connectors are securely mated and secure the harnesses with cable ties as required.
8	Reconnect the unit battery.		
9	Reconnect the standby power if needed.		
10	Turn the unit on.		The programmable feature settings will be loaded from the Base Controller when the unit is turned on.
11	Clear any alarm codes.		
12	Check the setting of the real time clock and correct if necessary.		The clock may be set from the Maintenance Menu or with the WinTrac Service Tool.
13	Run a Full Pretrip Test to verify proper unit operation.		

A03C - Expansion Module Replacement

Purpose:

To replace the Expansion Module.

Materials Required:

- Cable ties

Operation:

The Expansion Module is removed from the control box as an assembly. It has no user repairable parts.

Important Notes:

- 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 unit off.		
2	Disconnect standby power, if connected.		
3	Disconnect the unit battery.		The battery must be disconnected since the 2A wires on the expansion module are energized any time the battery is connected.
4	Disconnect all plug in connectors. Pay attention to the proper locations.		
5	Disconnect the wires from screw terminals and note the location of the wires.		
5	Remove the hardware securing the expansion module to the control box and remove the expansion module.		
6	Install the new expansion module in the control box using the existing hardware.		
7	Reconnect the wires to the screw terminals.		
8	Reconnect all plug in connectors.		Verify all connectors are securely mated and secure the harnesses with cable ties as required.
9	Reconnect the unit battery.		
10	Reconnect the standby power if needed.		
11	Turn the unit on.		
12	Clear any alarm codes.		
13	Run a Full Pretrip Test to verify proper unit operation.		

A04A - Programmable Feature Setup

Purpose:

To set the sensor grades and programmable features of an SR-4 Base Controller to customer specifications.

Materials Required:

- A completed copy of the Setup Sheet from Service Procedure A02A.

Operation:

- The settings of the graded sensors and all programmable features must be programmed after replacing a Base Controller or performing a Base Controller 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 shown on the Setup Sheet, 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	Turn the unit on.		
2	Press the MENU key.	The Operator Menu appears.	
3	Press and hold both the EXIT and unlabeled key for 5 seconds.	The Maintenance Menu appears.	
4	Press the DOWN key as required to display the Software Revision Menu.		
5	Use the UP and/or DOWN 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 verified 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 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.
8	Verify that the Time is set to the time zone used by the customer as shown on the setup sheet.		
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 Output 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 5 seconds.	The Guarded Access Menu appears.	If a Security Code is requested then 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.		

Table 50. Procedure (continued)

Step	Action	Result	Comments
13	Use the UP and/or DOWN keys to scroll through all the features in the Programmable Features Menu.	Set all Programmable Features settings to those shown on the Setup Sheet.	
14	When all Programmable Features have been set press the EXIT key to return to the Guarded Access Menu.		
15	Use the UP and/or DOWN 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 UP and/or DOWN 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.		
23	Run a Pretrip Test as shown in Section 4 to verify proper unit operation.		

A07A - Performing a Base Controller Cold Restart

Purpose:

To perform a Cold Restart on the Base Controller.

Materials Required:

- WinTrac Service Tool software loaded on a PC

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 HMI Control Panel.

Materials Required:

- WinTrac Service Tool software loaded on a PC

Procedure:

Refer to the WinTrac Service Tool Tools Menu and select Cold Restart.

A15A - Setting Unit Temperature Sensor Grade

Purpose:

To set the sensor grades of graded sensors.

Operation:

The following sensors are graded sensors and must be properly calibrated.

- For Single Temperature Units: Single temperature units use two sensors for return air temperature and discharge air temperatures. One of the two sensors is used for unit control, the other is used for the HMI Control Panel display. Both Control and Display Return Air Temperature Sensors and both Control and Display Discharge Air Temperature Sensors are graded sensors. The Spare 1 temperature sensor is also a graded sensor. The Coil Temperature Sensor is not a graded sensor.
- For Multi-Temperature Units: Multi-temperature units use one sensor for both return air temperature and discharge air temperatures in each zone that is installed. The Return Air Temperature Sensor and Discharge Air Temperature Sensor for each zone are graded sensors. The Spare 1, 2, and 3 temperature sensors are also graded sensors. The Coil Temperature Sensors are not graded sensors.

Any time these sensors are replaced or a Cold Start is performed, the sensor grade must be correctly entered to insure 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 Sensor Grades Not Set 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 51. Procedure

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	Turn the unit on.		
3	Press the MENU key.	The Main Menu appears.	
4	Press and hold both the EXIT and unlabeled key for 5 seconds.	The Maintenance Menu appears.	
5	Press the DOWN key as required to display the Set Time and Date Menu.	The Set Time and Date Menu appears.	
6	Press and hold both the EXIT and unlabeled key for 5 seconds.	The Guarded Access Menu appears.	
7	Press the DOWN key as required to display the Sensor Calibration Menu.	The Sensor Calibration Menu appears.	
8	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.	
9	If necessary, use the UP and/or DOWN 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.
10	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.	
11	Use the "+" and "-" keys to change the sensor grade to match the grade stamped on the sensor.		

Table 51. Procedure (continued)

Step	Action	Result	Comments
12	When the correct grade is shown press the YES key to confirm the choice.		
13	If necessary, repeat steps 9 – 12 to change any other sensor grades that are not correct.		
14	Press Exit to leave the Sensor Calibration Menu.		
15	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.	
16	Press the SELECT key to enter the Alarms Menu.		
17	Press the CLEAR key to clear the sensor alarms.		
18	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 Base Controllers

Purpose:

To prevent damage to the Base Controller, Engine Control Unit (ECU), Battery Charger, 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 52. Before Welding

Step	Action	Result	Comments
1	Turn the unit off.		
2	Disconnect standby power, if connected.		
3	Disconnect both battery cables and battery charger (if equipped).		
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 53. After Welding

Step	Action	Result	Comments
1	Reconnect both battery cables and battery charger (if equipped).		
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.

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 54. 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 DOWN 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 DOWN 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 UP and/or DOWN keys to show the desired hourmeter. When the desired hourmeter is shown, press the SELECT key to chose it.		
13	Change the value of the hourmeter by pressing the + or - keys.		

Table 54. Procedure (continued)

Step	Action	Result	Comments
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:

WinTrac application software loaded on a computer.

Flash Loading using USB Flash Drive:

Units equipped with a USB Port can flash load Base Controller software using a WinTrac Service Tool configured USB Flash Drive. Refer to Section 4 for details.

Important Notes:

- SR-4 controllers can be converted for single temperature or multi-temperature use by flash loading the appropriate version of software. Refer to Section 7 for details.

Procedure:

Refer to the WinTrac Service Tool Tools Menu and select Flashload.

A46B - Flash Loading HMI Control Panel Software

Purpose:

To update software for the HMI Control Panel using a computer and WinTrac Service Tool.

Materials Required:

WinTrac application software loaded on a computer.

Flash Loading using USB Flash Drive:

Units equipped with a USB Port can flash load HMI Control Panel software using a WinTrac Service Tool configured USB Flash Drive. Refer to Section 4 for details.

Procedure:

Refer to the WinTrac Service Tool Tools Menu and select Flash Load.

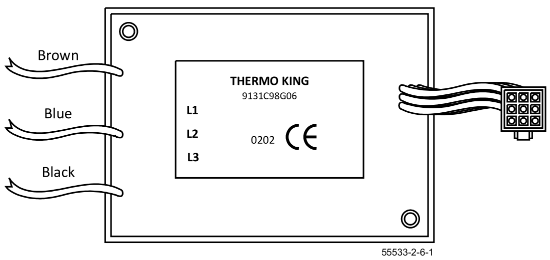
A48A - Phase Detect Module Operation and Diagnostics

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 optional Electric Standby utilize 460, 400, or 230 volt 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 55. Power Connections

Input	Description
8F	Supplies nominal 12-24 volt DC power to the phase detect module.
CH	Chassis ground.

Table 56. 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 57. 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 58. 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 optional Electric Standby utilize 460, 400, or 230 volt 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 optional Electric Standby utilize 460, 400, or 230 volt 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 59. 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 5 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 5 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.

A49A - CargoWatch Data Logger

Purpose:

To understand, use, and diagnose the CargoWatch Data Logger.

Materials Required:

WinTrac application software loaded on a computer.

Description:

Allows the user to manage, download, and view CargoWatch data. Configure the CargoWatch Data Logger and sensor settings.

Procedure:

Refer to the WinTrac Service Tool USB Flash Drive Menu.

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.

A60A - Connecting and Using the Peugeot and Yanmar Engine Diagnostic Tools

Peugeot EXXODiag Diagnostic Tool

Purpose:

To connect and use the EXXODiag Diagnostic Tool.

Materials Required:

- EXXODiag Diagnostic Tool
- Peugeot EXXODiag Diagnostic Software installed on a PC

Availability:

The Peugeot EXXODiag Diagnostic Tool is available from Service Parts. Each kit will have a card containing information to obtain and register the EXXODiag Software.

Figure 172. EXXODiag Engine Diagnostic Tool Kit

SAP162

To download the software and activate the tool, send an email to TKServiceTools@irco.com. Use the subject line: Activate PCM Diagnostic Tool, and include the Interface Box Serial Number, Dealership Code, and contact information in the body of the email.

Table 60. Procedure

Step	Action	Result	Comments
1	The unit battery must be connected and the Microprocessor Power Switch turned on.		
2	Turn the unit on and enter the Maintenance Menu.		
3	In the Maintenance Menu, scroll to and select Connect Engine Service Tool.		Connect Engine Service Tool is the last item in the Maintenance Menu.

Table 60. Procedure (continued)

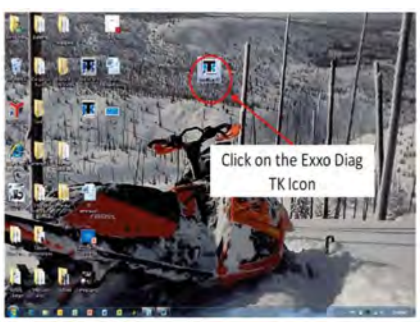
Step	Action	Result	Comments
4	Open the Control Box and locate the Engine Diagnostic Connector.	 SAP164	
5	Connect the EXXODiag Diagnostic Tool to the Engine Diagnostic Connector in the unit Control Box using the supplied cable.	 SAP163	
6	Connect the EXXODiag Diagnostic Tool to the PC using the supplied cable.		This cable is a standard USB cable. Excessive cable length of the USB cable may affect operation.
7	To start the EXXODiag software, click on the EXXODiag TK icon.  SAP165	The Main Menu will appear.  SAP166	
8	To begin, select Diagnostics and follow the prompts. Fill out the required fields.		All fields must be completed.

Table 60. Procedure (continued)

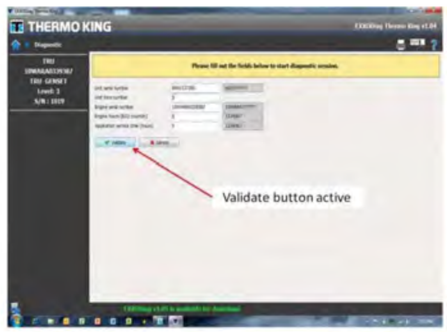
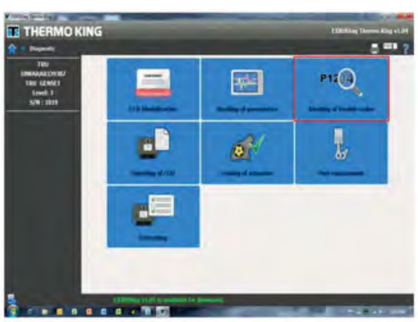
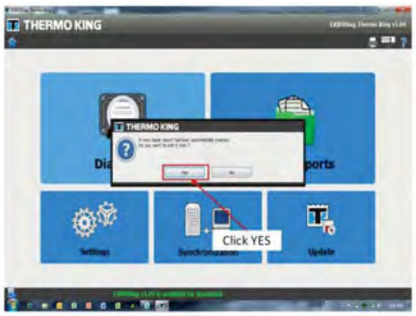
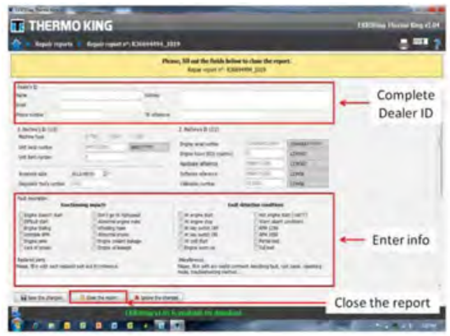
Step	Action	Result	Comments
		 SAP167	
9	When all fields are complete, press "Validate".	 SAP168	
10	In the example shown, Reading of Trouble Codes has been selected. Click the code to see freeze frame data when the code was set. Proceed as required to complete the diagnosis and repair.  SAP169	 SAP170	
11	Complete a Repair Report after parts are replaced.	The report will update the Peugeot database with the new parts installed on the engine.	The Repair Report is created automatically.

Table 60. Procedure (continued)

Step	Action	Result	Comments
	 SAP171	 SAP172	
12	Verify the report is complete before closing and sending it. Click Yes to close the report.	 SAP173	Once the report is closed it can no longer be edited.

Yanmar Engine Diagnostic Tool

Purpose:

To connect and use the Yanmar Diagnostic Tool.

Materials Required:

- Yanmar Diagnostic Tool
- Yanmar SmartAssist Direct Diagnostic Software installed on a PC

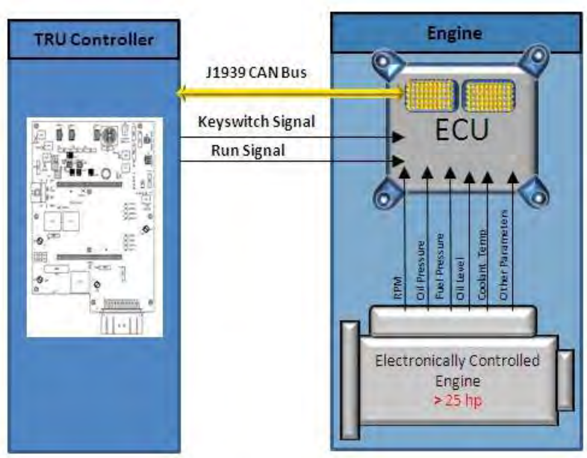
Operation:

The Yanmar Diagnostic Tool is used to connect the Computer USB Port to the Yanmar Engine Control Unit data connector located in the Unit Control Box. Yanmar SmartAssist Direct (YSAD) Software installed on the Computer is used to communicate with the Yanmar Engine Control Unit (ECU). This allows ECU information to be retrieved, Yanmar Fault Codes to be read, operational data to be examined and updated and other diagnostic functions to be performed.

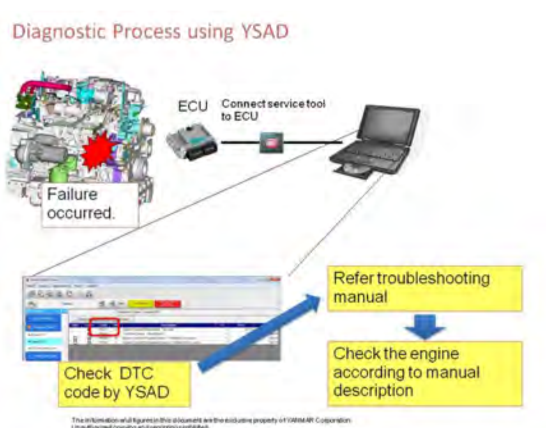
Connection:

There are three connections from the Thermo King Base Controller to the Yanmar Engine Control Unit (ECU):

- Keyswitch Signal – This signal sends power to the ECU.
- Run Signal – This signal is high when the Base Controller is requesting the engine to run.
- CAN Bus – All other communications between the Base Controller and the ECU are via the CAN Bus.



55533-2-5-2



55533-2-5-1

Table 61. Procedure

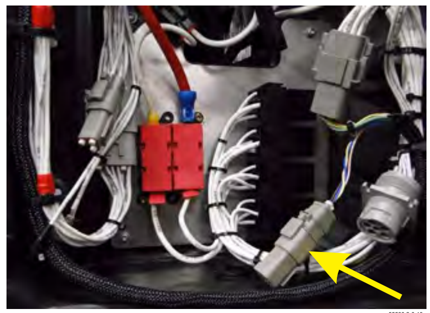
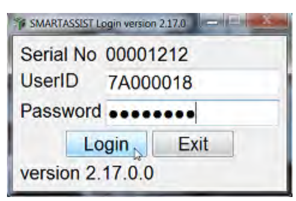
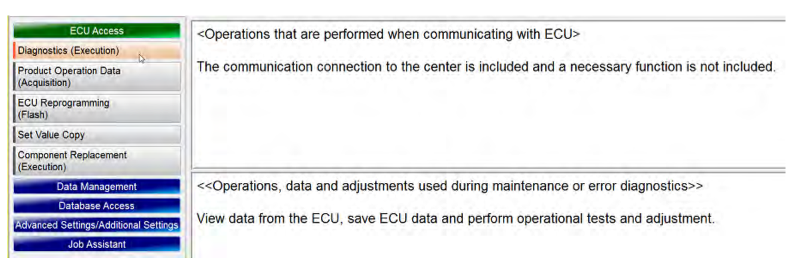
Step	Action	Result	Comments
1	The unit battery must be connected and the Microprocessor Power Switch must be turned on.		
2	Turn the unit on and enter the Maintenance Menu.		
3	In the Maintenance Menu, scroll to and select Connect Engine Service Tool.		Connect Engine Service Tool is the last item in the Maintenance Menu.
4	Open the Control Box and locate the Yanmar Diagnostic Connector.	 55533-2-6-13	
5	Connect the Yanmar Diagnostic Tool to the Yanmar Diagnostic Connector in the unit Control Box using the supplied cable.	 55533-2-6-3	
6	Connect the Yanmar Diagnostic Tool to the PC using the supplied cable.		This cable is a standard USB cable. Excessive cable length of the USB cable may affect operation.
7	Start the Yanmar SA-Direct (YSAD) software.	To maintain current status, the Yanmar SmartAssist Direct (YSAD) software must be started every 90 days while the PC is connected to the internet.	This verifies the YSAD software and extends the license for another 90 days.
8	Complete the login information as shown.		
9	Select ECU Access, then select Diagnostics (Execution).		

Table 61. Procedure (continued)

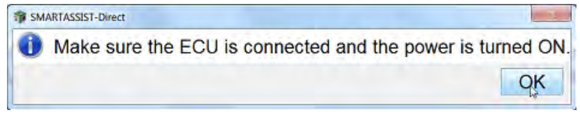
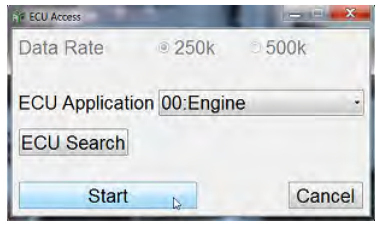
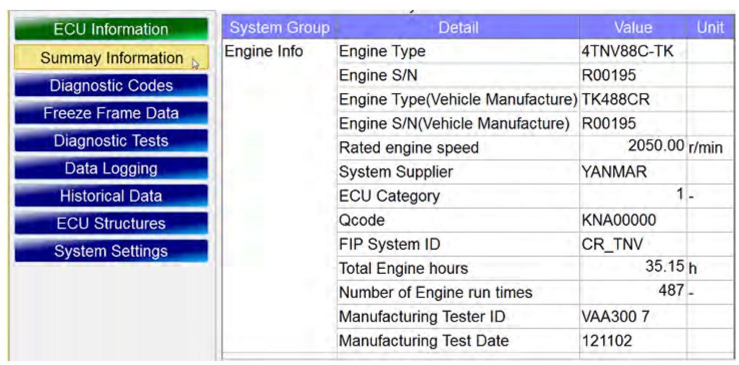
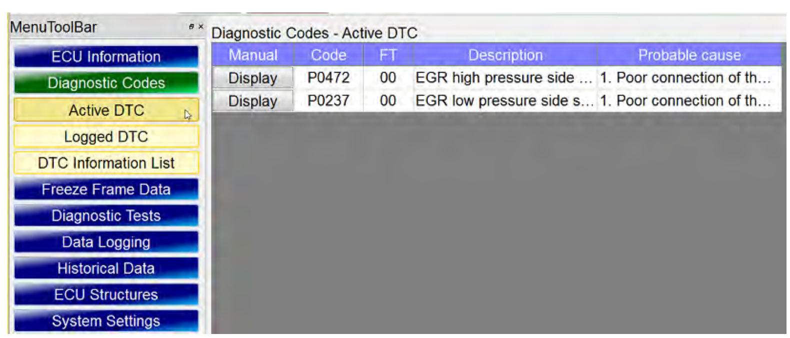
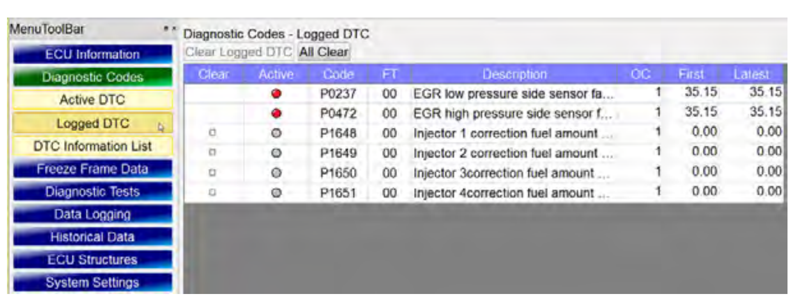
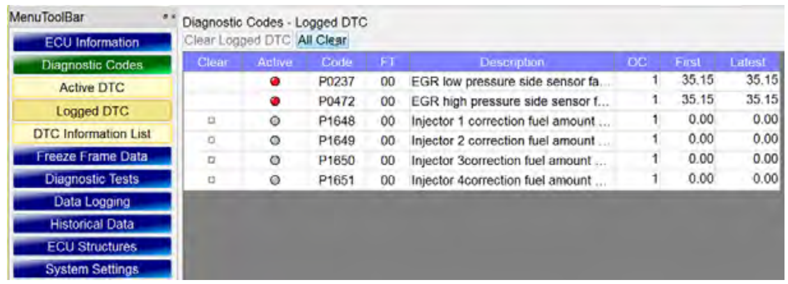
Step	Action	Result	Comments
10	Click OK.		
11	Click Start.		
12	Select ECU Information - Summary Information.		This displays engine information, such as the engine serial number, run hours, and start cycles.
13	Select Diagnostic Codes – Active DTC.		
14	Select Diagnostic Codes – Logged DTC.		Any logged fault codes will be added to the list.

Table 61. Procedure (continued)

Step	Action	Result	Comments
15	To clear all fault codes, click the All Clear button. Enter your password in the popup window when prompted.	All fault codes in the ECU will be cleared.	Operation must be performed in Connect Engine Service Tool mode. YSAD will not allow codes to be cleared while engine is operating.



For additional information, refer to the Yanmar Diagnostic Documentation.

A61A - Battery Charger Operation and Diagnostics

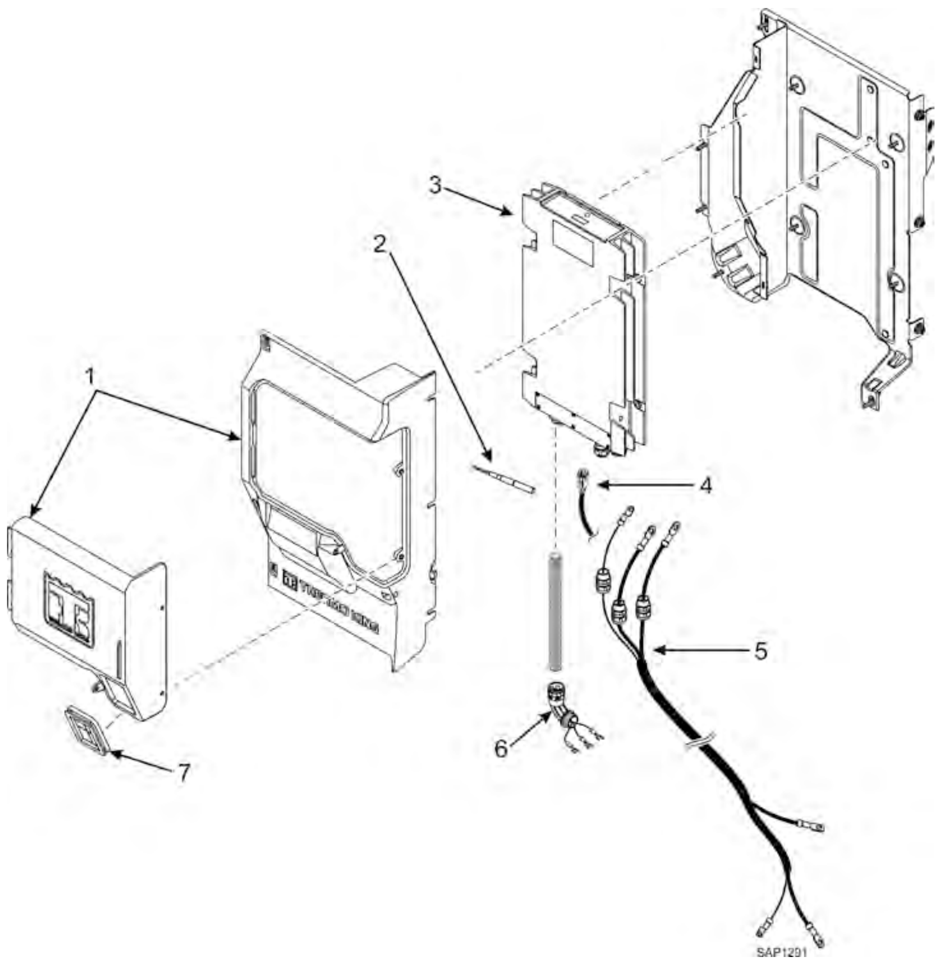
Purpose:

To understand battery charger operation and diagnostic procedures.

Description:

The optional battery charger is a power supply component that can be used in place of an alternator to power the electrical charging system of the TRU. Its operation is very similar to an alternator. The battery charger converts AC power from the AC generator or electric standby power source. The battery charger takes that AC power source and converts it to 12 Vdc to charge the battery and provide power for the 12 Vdc control system.

There are two ratings of battery charger available, 30A output for single temperature and 120A output for multi-temperature units.



1.	Air Channel Cover	4.	8–Pin Signal Connector	7.	LED Access Cover
2.	Air Temperature Sensor	5.	DC Battery Charger Output Harness		
3.	Battery Charger	6.	AC Power Connection		

⚠ 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.

⚠ WARNING

Hazardous Voltage!

These units use high voltage AC from the AC generator for the condenser fans, evaporator fans, and battery charger. Lethal voltage potentials can exist on connections in the fan control box. Take appropriate precautions and use extreme care when testing the unit.

NOTICE

Equipment Damage!

The battery charger is not field serviceable. Do not attempt to open, doing so will damage the unit and void the warranty.

Operation:

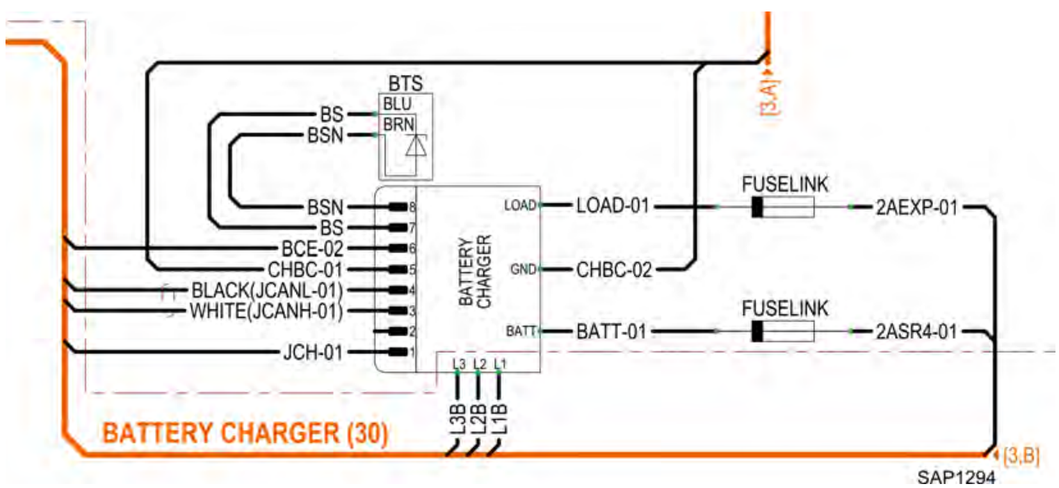
When there is adequate AC three phase voltage into the battery charger on the L1B, L2B, L3B, the battery charger will convert that to a 12 Vdc output on the BATT and LOAD connections.

The battery charger has its own internal controller to manage charger operation and to communicate with the SR-4 base controller via CAN Communications (J1939) to send charger status messages and other information. If the communication between battery charger and SR-4 base controller is lost, the charger will continue to function with reduced capability.

The battery charger internal controller will be active when either:

- 3 phase power is applied to the AC input terminals or
- The BCE wire is energized by the SR-4 controller and a charged battery is connected to the output.

Connections:



Connections to the module are shown in the tables below.

Table 62. AC Power Connections

Input	Description
L1B, L2B, L3B	Three phase leads connector in the High Voltage Contactor box. If unit is a 30 model they are connected to the input side of Evaporator High Fan speed contactor and receive power directly from the Generator. If the unit has Standby power, the leads are connected to the Battery Charger Contactor or Fuse Block 1 depending on Voltage input. The leads connect internally to the Battery Charger and are not serviceable.

Table 63. DC Battery Charger Output

Output	Description
BATT-01	DC output from the charger which supplies power through a fuse link to the controller 2A terminal to: • Charge the battery through SR-4 shunt measurement • Power the controller / HMI • Power all the other outputs driven by the controller
LOAD-01	DC output which provides power through a fuse link to the expansion module (multi-temp units) or ECU (single temp units).
CHBC-02	Charger ground, runs to the ground plate.

Table 64. 8-Pin Signal Connector Pinout

Pin	Wire	Description
1	JCH-01	J1939 communication wires between the charger and SR-4 controller to send status and other information.
2		
3	JCANH-01	J1939 communication wires between the charger and SR-4 controller to send status and other information.
4	JCANL-01	J1939 communication wires between the charger and SR-4 controller to send status and other information.
5	CHBC-01	Ground connection for the battery charger internal controller signals.
6	BCE-02	Battery Charger Enable - 12 Vdc output from the SR-4 controller to power the battery charger internal microprocessor. Keeps battery charger powered when unit is in NULL and there is no AC output from the generator allowing SR-4 controller to continue to communicate with battery charger.
7	BS	Battery temperature sensor positive wiring. Used to provide ambient temperature compensation to adjust output voltage of battery charger to have lower output voltage at higher temperatures.
8	BSN	Battery temperature sensor negative wiring.

Diagnostic Procedure Important Notes:

- The most common alarm associated with the Battery Charger is Alarm Code 25. The conditions that the alarm is generated are the same as an alternator.
- Poor charging performance may not be caused by a failed battery charger. The following conditions can cause improper battery charging, even with an operational battery charger.
  - A problem may exist in the BATT-01/2ASR4-01 output circuit from the battery charger to the base controller or in the 2 circuit from the base controller to the battery. Check for an open 2 or 2A circuits, loose/poor connections or defective battery cables.
  - Check the BATT-01, LOAD-01, and CHBC-01 battery charger output wires for loose connections, bad crimps, or wires chaffing and/or shorting.
  - The battery charger must be properly grounded. Check CHBC-02 from battery charger to the ground plate and to the battery.
  - The battery must be in good condition and capable of accepting a charge. Check for a damaged battery, correct electrolyte level, and loose or corroded connections.
  - The generator output can be low or erratic if the generator belt or pulleys are defective or the belt is not properly adjusted. Verify the belt is not loose or cracked and the pulleys are in good condition.
  - The battery charger must receive adequate AC voltage from the generator. Verify that at least 180 to 500 Vac are available in low or high engine speed from the generator or stand-by input. This voltage is best measured on the fork terminals on the battery charger flying lead harness.
  - The unit control circuits or installed accessories may be drawing excessive current.
  - When testing a battery charger, use accurate equipment such as a Thermo King P/N 204-1079 digital multimeter and a Thermo King P/N 204-947 amp clamp or equivalent.

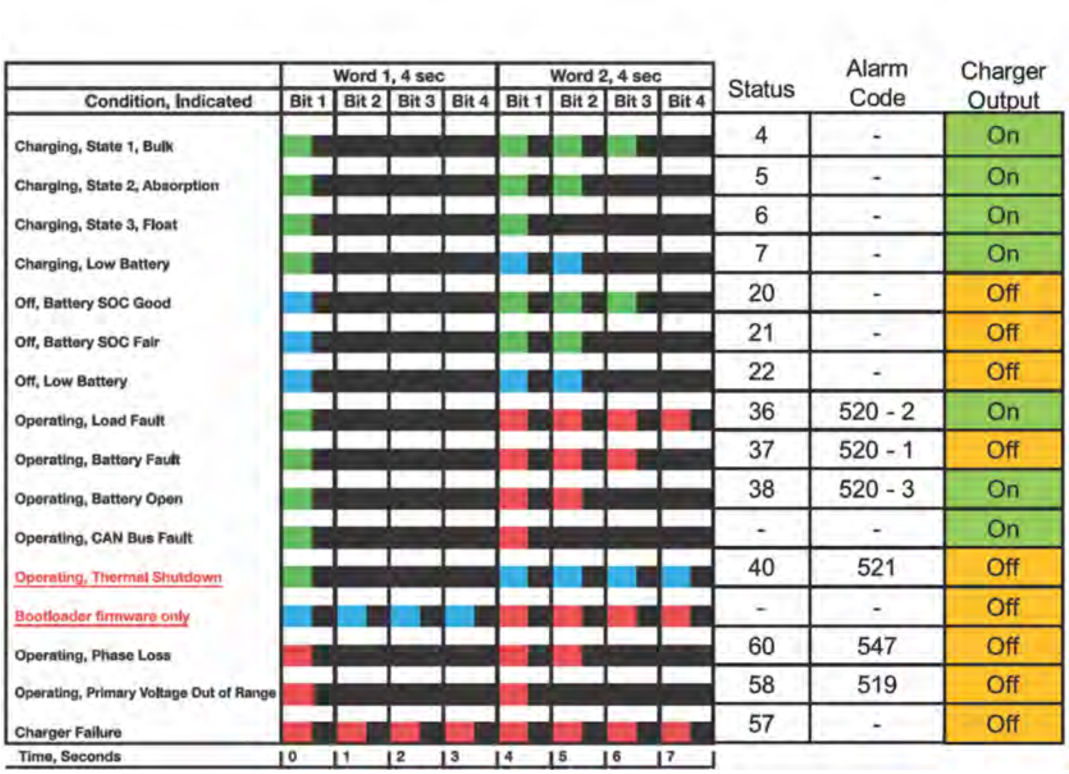
Table 65. Diagnostics

Step	Action	Result	Comments
1	Physically check 2A output circuit from the battery charger to the base controller or in the 2 circuit from the base controller to the battery.	Check for open 2 or 2A circuits, loose/poor connections or defective battery cables.	
2	Physically check the battery charger output wires (BATT-01, LOAD-01, and CHBC-01).	Check for proper routing and chaffing.	
3	Physically check the battery charger AC power connections (L1B, L2B, L3B) in the high voltage contactor box.	Check that they are properly tightened and the wires are secure in the fork terminal crimps.	
4	Turn on the unit and enter Service Test Mode, High Speed Cool. On HMI Gauges screen, view and record Amps and Battery Voltage.	The Amps should show a positive value on average and will jump around especially from intermittent system load peaks such as fuel pumps. The battery voltage should increase and stabilize above 13.2 Vdc. If not, proceed to next step.	Periodically it will peak to ~15 Vdc and then drop in order to check for the presence and condition of the battery.
	⚠ WARNING **Hazardous Voltage!** **These units use high voltage AC from the AC generator for the condenser fans, evaporator fans, and battery charger. Lethal voltage potentials can exist on connections in the fan control box. Take appropriate precautions and use extreme care when testing the unit.**		
5	Measure for correct AC voltage at L1, L2, L3 connections to battery charger in contactor box.	Measurements should be approximately 345 Vac in test mode High Speed Cool across phases. L1-L2, L1-L3, L2-L3. Each phase should be within 10% of each other. If voltage is not acceptable, check and verify connections and proper generator operation. If AC voltage is acceptable, proceed to next step.	
6	Turn unit off and remove air channel covers to gain access to battery charger.		
	⚠ CAUTION **Risk of Injury!** **The unit can start and run automatically any time the unit is turned on. Turn the Microprocessor On/Off switch Off before doing inspections or working on any part of the unit. Please note that only Qualified and Certified personnel should attempt to service your Thermo King unit.**		
7	With the unit off, measure and record battery voltage at unit battery.		
8	Measure and record DC voltage at the 2A stud on the SR-4 controller to battery negative stud.	It should be within 0.5 volts of battery voltage. If voltage measured is acceptable, proceed to next step. If not acceptable, check the 2 circuit from controller to battery.	
9	Measure and record DC voltage at battery charger output from BATT to battery negative stud.	It should be within 0.5 volts of battery voltage. If not, check the 2ASR4-01 wire from the controller 2A stud to the battery charger BATT-01 output. If voltage is acceptable, and AC voltage was verified correctly in step 6, the battery charger (including AC harness) is probably faulty and needs to be replaced.	Refer to Table 66, p. 402.

Battery Charger Self Diagnostics:

- The charger will send status messages and other information to the SR-4 controller during operation. These messages come in over J1939 and the SR-4 controller records them in the ServiceWatch download.
- The two columns in the download that are useful to diagnosing are the “Charger Volts In” and “Charger Status”.
  – Prior to WinTrac 6.3, view the download in engineering mode to see these columns.
- The “Charger Volts In” reading is the AC voltage Input that the Battery Charger is reading internally. This voltage has to be between 180 to 518 Vac. This voltage should be coming in whenever there is engine RPM or standby motor input.
- The “Charger Status” reading is the battery charger internal controllers report to the SR-4 of its mode of operation. When the unit changes mode of operation (e.g., low speed to high speed or fan motor on/off) the charger status will briefly change and shall be ignored during transient events. There is a three second delay. Read the charger status when the mode of operation is stable.
- The blinking LED that is visible behind the access cover on the unit is based on the Charger Status.
- Use the table below to see the LED flash code to the corresponding “Charger Status”.

Figure 173. Battery Charger LED Indicator Flash Code Table



Condition, Indicated	Status	Alarm Code	Charger Output
Charging, State 1, Bulk	4	-	On
Charging, State 2, Absorption	5	-	On
Charging, State 3, Float	6	-	On
Charging, Low Battery	7	-	On
Off, Battery SOC Good	20	-	Off
Off, Battery SOC Fair	21	-	Off
Off, Low Battery	22	-	Off
Operating, Load Fault	36	520 - 2	On
Operating, Battery Fault	37	520 - 1	Off
Operating, Battery Open	38	520 - 3	On
Operating, CAN Bus Fault	-	-	On
Operating, Thermal Shutdown	40	521	Off
Bootloader firmware only	-	-	Off
Operating, Phase Loss	60	547	Off
Operating, Primary Voltage Out of Range	58	519	Off
Charger Failure	57	-	Off

Advanced Diagnostics Using Download and Status Messages:

Table 66. Status Messages

Status	Reason
4, 5, 6	Normal static operation of the battery charger. The battery charger adjusts from Status 4 with a low battery state of charge and moves to 5 and 6 when the battery is more charged.
7	Check battery or external loads connected bringing battery voltage down.
20, 21, 22	Indicate that the battery charger’s output is off for another reason and will turn back on. Look for other statuses to determine the issue.
36	Load fault - check LOAD output.

Table 66. Status Messages (continued)

Status	Reason
37	Battery fault - check BATT output.
38	Battery open - check for open or loose connection on BATT output from battery charger through controller to battery.
40	Thermal shutdown - internal battery charger temperature too high to operate.
57	Charger failure - critical shutdown failure occurred.
58	Primary voltage out of range - check input. Normal input voltage is 180 to 518 Vac.
59	AC input boost stage intermittent fault - check the AC voltage from the generator to the battery charger circuitry for rapid fluctuations (e.g., AC fan cycling, loose wires/terminals, contactor chatter (loose ground), or slipping generator belt).
60	Phase loss - check battery charger input AC voltage, verify wiring. This status may come from the battery charger being supplied from only one or two phases of the three phase supply. Check that all three phases are sufficiently supplying voltage to the battery charger input harness.
62	Primary AC overvoltage - the voltage measured by the battery charger at the operational speed is higher than anticipated. Check AC generator loads as quick loss of load on the generator would cause this (e.g., loose wires/terminals, contactor chatter (loose ground)).

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-4 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.

Dual Sensors:

Dual temperature sensors are provided for both return air temperature and discharge air temperature. The sensors are physically located next to each other to insure common readings. The control sensor is used for unit control and the display sensor is used by the HMI Control Panel to display the return and discharge temperatures.

Return Air Sensor:

These sensors monitor the temperature of the air returning to the evaporator coil. The sensors are located in the return air flow. These sensors are graded sensors and must be replaced with graded sensors. The controller must be calibrated to the respective grade of the installed sensor in order to operate properly. The Return Air Sensor is connected to the base controller via RTP and RTN wires at connector J1. Refer to the wiring diagram for exact wire numbers. When replacing a sensor, verify the sensors are connected properly.

Discharge Air Sensor:

These sensors monitor the temperature of the air leaving the evaporator coil. The sensors are located in the evaporator discharge air path. These sensors are graded sensors and must be replaced with graded sensors. The controller must be calibrated to the respective grade of the installed sensor in order to operate properly. The Discharge Air Sensor is connected to the base controller via RTP and RTN wires at connector J1. Refer to the wiring diagram for exact wire numbers. When replacing a sensor, verify the sensors are 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 diagram or wiring diagram for the correct connections.

Table 67. 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 J1 plug at the Base Controller.		
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 35 kΩ to 45 kΩ.	This verifies a complete sensor circuit but does not check the accuracy of the sensor.

Table 67. 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.	

F01A - Software Download for Flash to Replacement ECU

Where Used:

Yanmar Engines.

Purpose:

Preparing ECU for Replacement.

Materials Required:

- Yanmar Diagnostic Tool
- Computer with current Yanmar SmartAssist Direct Diagnostic Software

Operation:

The Yanmar Diagnostic Tool is used to connect the computer USB Port to the Yanmar Engine Control Unit data connector located in the Unit Control Box. Yanmar SmartAssist Direct (YSAD) Software installed on the computer is used to communicate with the Yanmar Engine Control Unit (ECU). This allows ECU information to be retrieved, Yanmar Fault Codes to be read, operational data to be examined and updated, and other diagnostic functions to be performed.

Table 68. Procedure

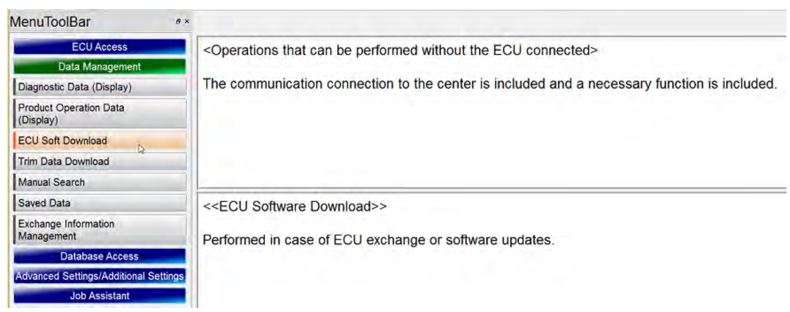
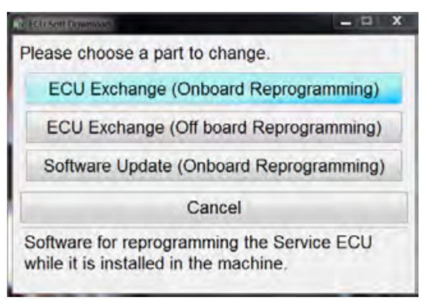
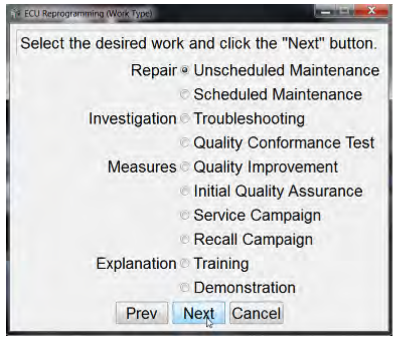
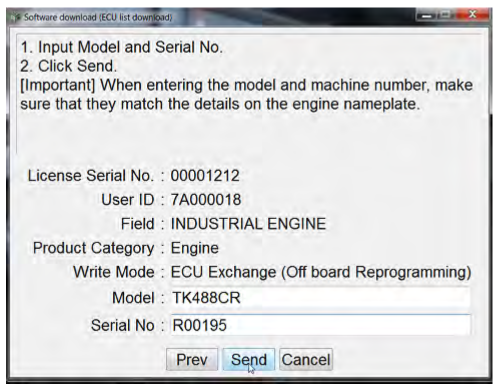
Step	Action	Result	Comments
1	With an internet connection, open YSAD, select Data Management tab, and click on ECU Soft Download.		
2	Select ECU Exchange (Onboard Reprogramming)		Onboard programming is currently not supported.
3	Choose the reason for reprogramming the ECU and click Next.		This information is only used for data collection purposes, and does not affect the version of software downloaded.

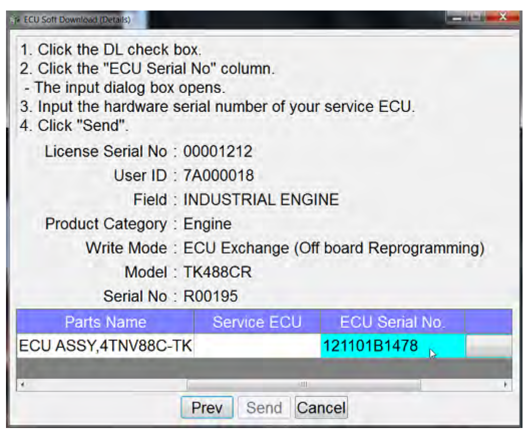
Table 68. Procedure (continued)

<table>
<tr><th>Step</th><th>Action</th><th>Result</th><th>Comments</th></tr>
<tr><td></td><td></td><td>


</td><td></td></tr>
<tr><td>4</td><td>Locate engine model number, serial number, and enter the values into data fields. Click Send when finished.

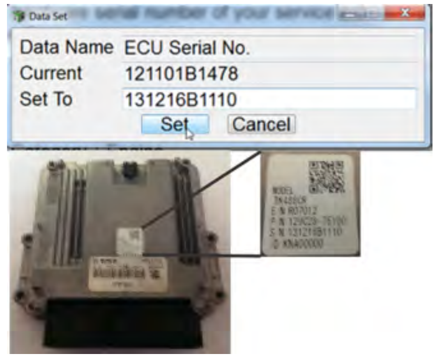
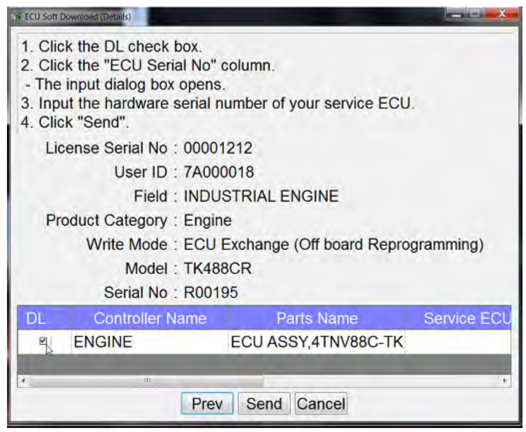
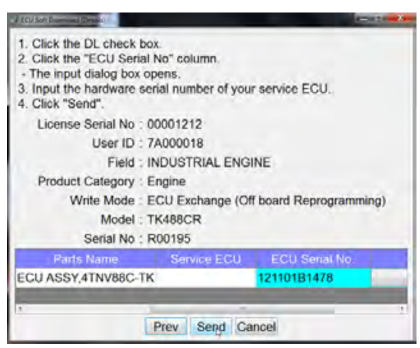
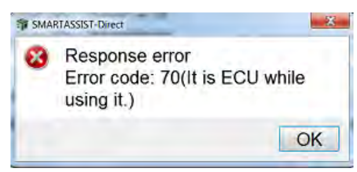
Note: Use upper case letters when entering values.</td><td>


</td><td>This information is used to compare ECU and engine serial number data against Yanmar's database.</td></tr>
<tr><td>5</td><td>Click the ECU Serial No field.

Note: Use scroll bar located at bottom of screen if required.</td><td>


</td><td></td></tr>
</table>

Table 68. Procedure (continued)

<table>
<tr><th>Step</th><th>Action</th><th>Result</th><th>Comments</th></tr>
<tr><td>6</td><td>Enter the serial number of the new ECU and click Set.</td><td>
</td><td></td></tr>
<tr><td>7</td><td>Click the DL check box.</td><td>
</td><td></td></tr>
<tr><td>8</td><td>Verify Serial Number entered is correct and click Send. Download will start.</td><td>ECU software has been downloaded to PC.

</td><td>If the following error is shown, the ECU serial number is already programmed to a different engine serial number.

</td></tr>
<tr><td>9</td><td>Proceed to step 9 of Service Procedure F06A to continue.</td><td></td><td></td></tr>
</table>

F03A - Engine Control Unit Removal

Where Used:

Yanmar Engines.

Purpose:

For ECU replacement.

Materials Required:

- 10 mm socket or T30 Torx
- 9/16 socket
- Extension
- Ratchet

Operation:

Electronic Engines are controlled by an electronic Engine Control Unit (ECU) rather than by the Base Controller. Engine sensors such as the engine oil pressure, engine oil level, engine coolant level, engine coolant temperature, and engine speed are monitored by the ECU.

Table 69. Procedure

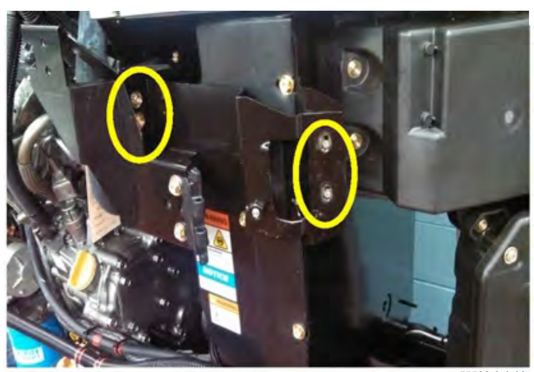
Step	Action	Result	Comments
1	Verify unit is not connected to any standby power source, and remove negative power cable from battery terminal.		Leaving unit plugged into shore power can be DANGEROUS. Unplug the unit.
2	Open road side engine compartment door, remove hinge pins, and remove door.		
3	Open road side condenser panel.		
4	Remove the four bracket bolts attached to the upper door mounting hardware.	 55533-2-6-33	
5	Remove the bolt holding the starter power cable to the cooling channel. Remove the four bolts holding the cooling channel to unit.		Use of a long extension is required to remove the rear bolts.

Table 69. Procedure (continued)

Step	Action	Result	Comments
		 55533-2-6-34	
6	Remove the cooling channel to access the ECU.	 55533-2-6-35	Verify all electrical connections are unplugged.

F04A - Engine Control Unit Installation

Where Used:

Yanmar Engines.

Purpose:

For ECU installationt.

Materials Required:

- 10 mm socket or T30 Torx
- Extension

Operation:

Electronic Engines are controlled by an electronic Engine Control Unit (ECU) rather than by the Base Controller. Engine sensors such as the engine oil pressure, engine oil level, engine coolant level, engine coolant temperature, and engine speed are monitored by the ECU.

Table 70. Procedure

Step	Action	Result	Comments
1	Attach electrical connectors and bolts to the ECU. Slide ECU back into the channel and line up mounting bolts with holes.	Rear ECU plate alignment notch must be seated properly for outer mounting bolts to match up.	ECU programming is recommended before cooling channel is reassembled.
2	Insert four outer bolts holding plastic ECU channel to bracket. Use a long extension to fasten lower rear bolts.	Seal ECU channel to road side condenser.	It is not recommended to use air tools for fastening bolts with inserts. Do not over tighten, some inserts molded into plastic are not replaceable.
3	Attach starter power cable strap to cooling channel.		
4	Attach upper door mounting hardware with removed four bolts to frame.		Align bolts with previously imprinted marks on brackets.
5	Attach road side engine compartment door by aligning hinge surfaces and insert hinge pins and lock in place.		Snapping hinge pin into locking area is crucial to prevent panel from detaching from unit.
6	Attach negative battery terminal to battery post.		

F05A - Uploading Information to Yanmar

Where Used:

Yanmar Engines.

Purpose:

To send ECU software back to database after ECU flash or if flash was cancelled.

Materials Required:

- Yanmar Diagnostic Tool
- Computer with current Yanmar SmartAssist Direct Diagnostic Software

Operation:

The Yanmar Diagnostic Tool is used to connect the Computer USB Port to the Yanmar Engine Control Unit data connector located in the Unit Control Box. Yanmar SmartAssist Direct (YSAD) Software installed on the computer is used to communicate with the Yanmar Engine Control Unit (ECU). This allows ECU information to be retrieved, Yanmar Fault Codes to be read, operational data to be examined and updated, and other diagnostic functions to be performed.

Table 71. Procedure

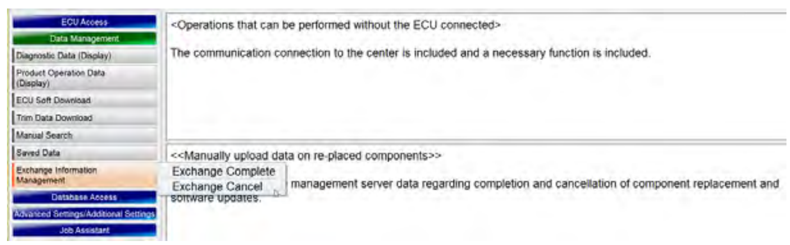
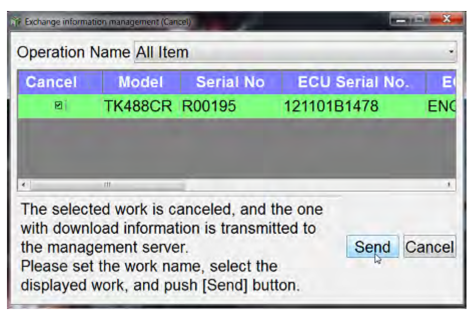
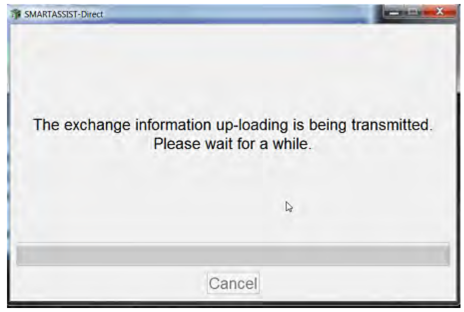
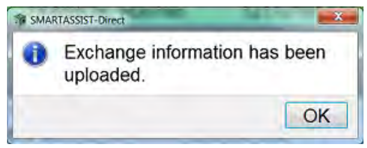
Step	Action	Result	Comments
1	Select Data Management, click on Exchange Information, then choose either Exchange Complete or Exchange Cancel.		Choose Exchange Complete after ECU flash or use Exchange Cancel if ECU flash was not performed.
2	Click check box to select software and click Send.		

Table 71. Procedure (continued)

Step	Action	Result	Comments
3	ECU software is being sent back to the Yanmar core.		
4	Upload complete.		

F06A - Updating ECU Software From Yanmar Core Database

Where Used:

Yanmar Engines.

Purpose:

To reprogram ECU / Required Data Exchange.

Materials Required:

- Yanmar Diagnostic Tool
- Computer with current Yanmar SmartAssist Direct Diagnostic Software

Operation:

The Yanmar Diagnostic Tool is used to connect the Computer USB Port to the Yanmar Engine Control Unit data connector located in the Unit Control Box. Yanmar SmartAssist Direct (YSAD) Software installed on the computer is used to communicate with the Yanmar Engine Control Unit (ECU). This allows ECU information to be retrieved, Yanmar Fault Codes to be read, operational data to be examined and updated, and other diagnostic functions to be performed.

Table 72. Procedure

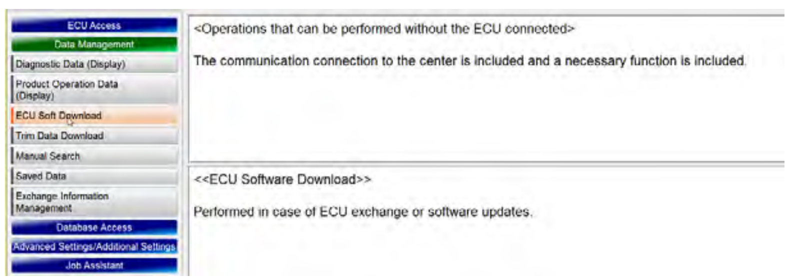
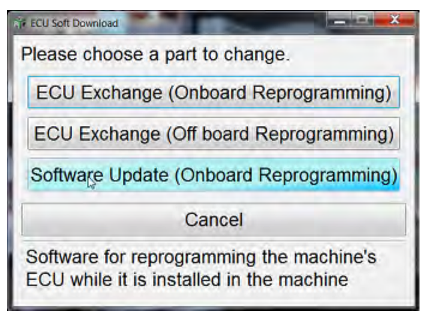
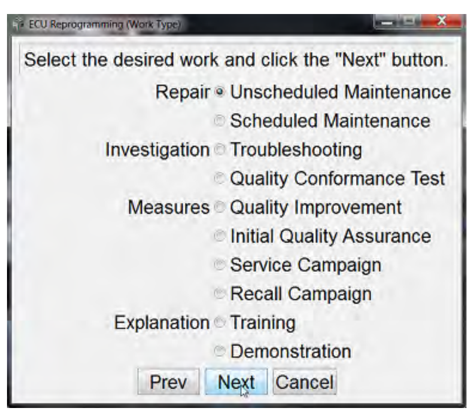
Step	Action	Result	Comments
1	With an internet connection, open YSAD, select Data Management, and click on ECU Soft Download.		
2	Choose Software Update (Onboard Reprogramming) and click Select.		
3	Choose reason for ECU Reprogramming (Quality Improvement) and click Next.		

Table 72. Procedure (continued)

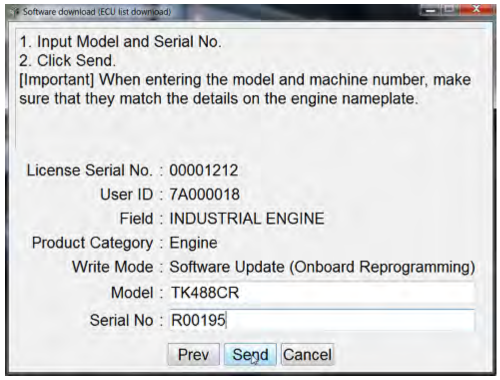
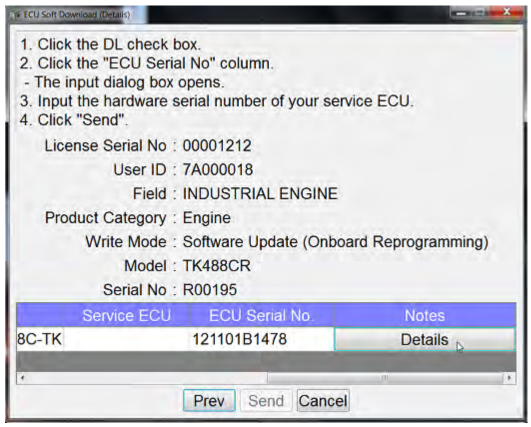
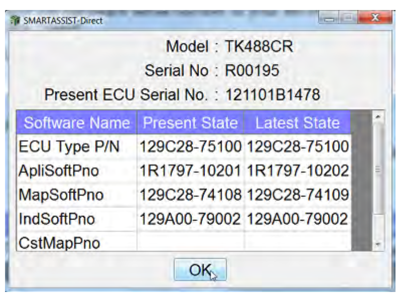
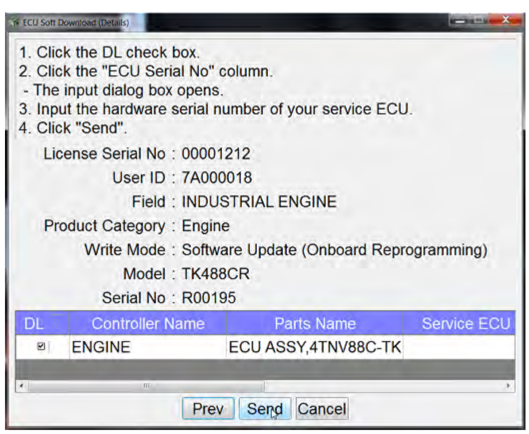
Step	Action	Result	Comments
4	Enter Engine Model Number and Serial Number into data boxes and click Send. ***Note:*** *Use upper case letters when entering values.*		
5	Click on the Details button underneath the Notes heading. ***Note:*** *Use scroll bar located at bottom of screen if required.*		
6	Compare MapSoftPno Pre Code and New Code. New code should be a different number if there is a software update available. Click OK.		
7	Click the DL check box and click Send.		

Table 72. Procedure (continued)

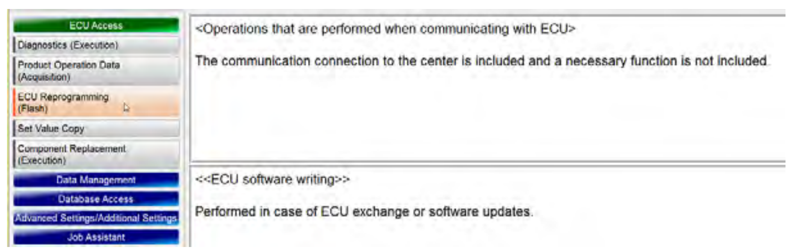
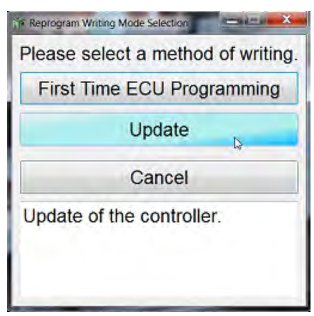
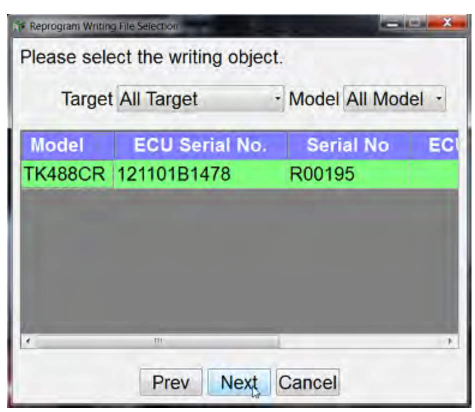
Step	Action	Result	Comments
8	Software update has been downloaded. Click OK.		Begin to write software to ECU using YSAD.
9	Connect YSAD to unit. ***Important:*** *Unit must be in Connect Engine Service Tool mode.*		Use Service Procedure A60A steps 1 to 8.
10	From the YSAD Main Menu, click the ECU Access tab and click ECU Programming.		
11	If ECU replacement, select First Time ECU Programming. If software update only, select Update.		
12	Click on correct engine serial number and click Next.		

Table 72. Procedure (continued)

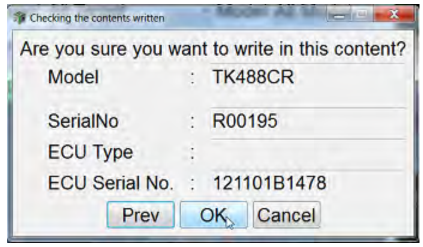
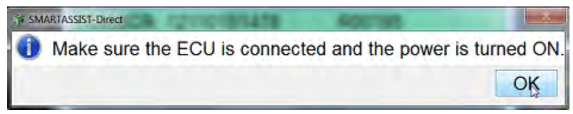
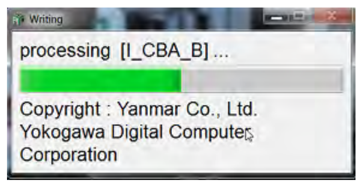
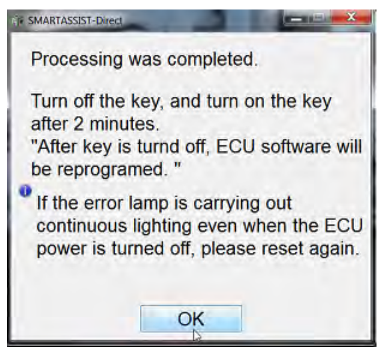
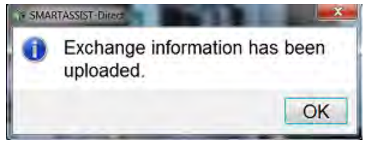
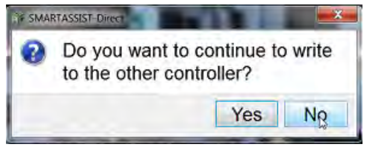
Step	Action	Result	Comments
13	Click OK.		
14	Click OK.		
15	Progress bar is shown as ECU is being flashed. This may take over 10 minutes.		Programming will not initiate if YSAD is not properly connected.
16	Processing completed. Turn the unit off for a minimum of two minutes. Click OK.		
17	Click Yes.		

Table 72. Procedure (continued)

Step	Action	Result	Comments
18	Exchange information is being transmitted to the YSAD core. Uploaded screen is displayed.		
19	Click No.		

F07A - RPM Sensor Test and Adjustment

Where Used:

Precedent C-600M Trailer Multi-Temperature units.

Purpose:

To test and adjust the RPM sensor.

Materials Required:

- Fluke Digital Multimeter

Operation:

The RPM sensor rarely fails, but may require adjustment for proper operation.

Table 73. Procedure

Step	Action	Result	Comments
1	Turn the unit off.		
2	Remove the FS1 and FS2 wires from the sensor.		
3	Check the sensor resistance using a high quality multimeter.	The sensor resistance should be 250 to 300 ohms with the wires removed. If not, the sensor should be replaced.	
4	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.		
5	Start the unit.		
6	Using Service Test Mode, place the unit in high speed cool [HSC].		For information on Service Test Mode, refer to Section 4.
7	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.
8	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.		
9	Reattach the FS1 and FS2 wires to the sensor.		Polarity is not important.
10	Access the Gauge menu and display Engine RPM.	The display should show the engine RPM.	

F08A - ECU Recovery/Failures During Flash Load Procedures

Where Used:

Yanmar Engines.

Purpose:

In case of power failure or accidental disconnect etc. while performing F01A, F05A, or F06A.

Materials Required:

- Yanmar Diagnostic Tool
- Computer with current Yanmar SmartAssist Direct Diagnostic Software

Operation:

The Yanmar Diagnostic Tool is used to connect the computer USB Port to the Yanmar Engine Control Unit data connector located in the Unit Control Box. Yanmar SmartAssist Direct (YSAD) Software installed on the computer is used to communicate with the Yanmar Engine Control Unit (ECU). This allows ECU information to be retrieved, Yanmar Fault Codes to be read, operational data to be examined and updated, and other diagnostic functions to be performed.

Important Notes:

- The procedures below include four types of ECU programming failure.

ECU Programming or ECU Updating of Software Failure During Flash

Table 74. Procedure

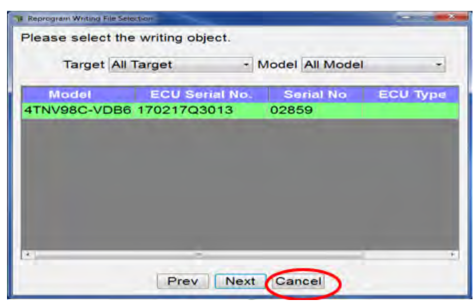
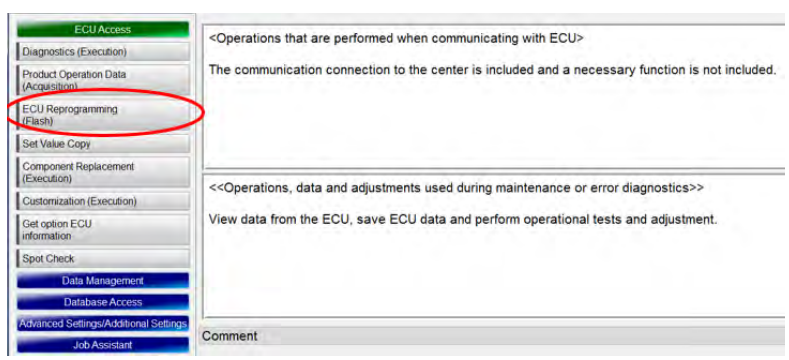
Step	Action	Result	Comments
1	Download of object failed during ECU update/ flash. Click OK.		
2	Click Cancel.		
3	From ECU Access, select ECU Reprogramming (Flash).		

Table 74. Procedure (continued)

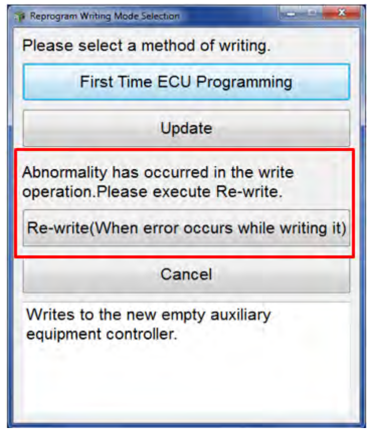
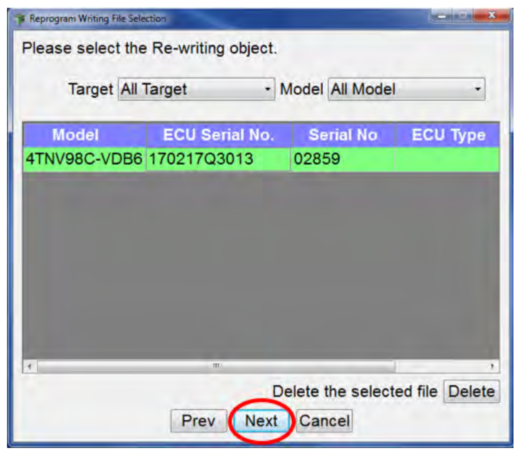
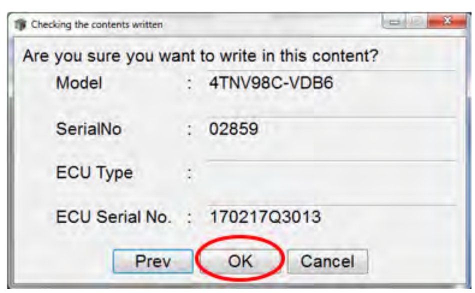
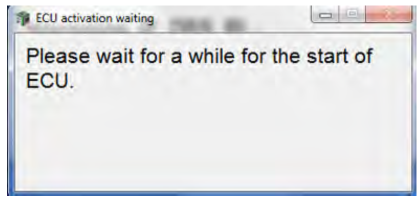
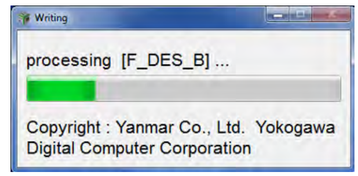
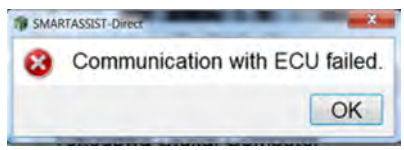
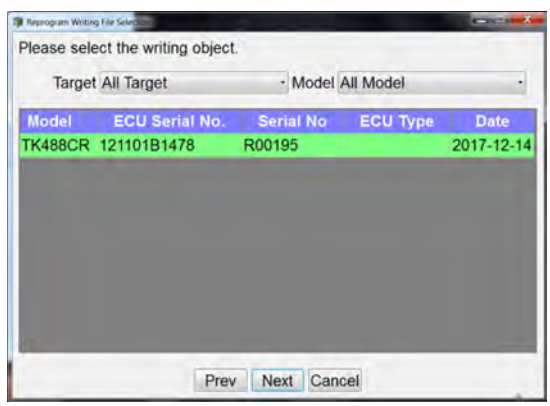
Step	Action	Result	Comments
4	Select Re-write (When error occurs while writing it).		
5	Select engine model to begin re-write and click Next.		
6	Verify engine model and serial number and click OK.		

Table 74. Procedure (continued)

Step	Action	Result	Comments
7	Verify and click OK.		
8	ECU activation flashing process is resumed.		

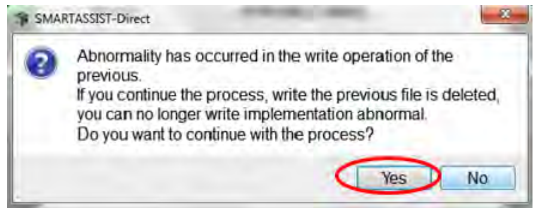
Communication Interruption During Flashing Process

Table 75. Procedure

Step	Action	Result	Comments
1	Communication with ECU failed message is displayed. Click OK.		
2	Select the engine model to begin reprogramming and click Next.	Reprogramming will be restarted. 	

Abnormality Occurrence During Flashing Process

Table 76. Procedure

Step	Action	Result	Comments
1	Abnormality message is displayed. Click Yes and flash process should continue.		

G01A - Ground Fault Detect (GFD) Module Test

Purpose:

To confirm proper operation of the Ground Fault Detect Module.

- Test GFD circuits to confirm operation.

Materials Required:

- True RMS Digital Multimeter

Operation:

This procedure should be used to check the operation of the Ground Fault Detect module if it is suspected of defective operation. It may be worthwhile to test the module for proper operation if:

- Alarm Code 518 is present and:
  - The AC electrical system has been checked but no shorts to ground were located
  - The AC connection at the Ground Fault Detect Module has been disconnected and Alarm Code 518 will not clear

The Ground Fault Detect Module is located inside the fan contactor box cover and operates in a manner similar to a relay. The module senses AC voltage potential between generator neutral and ground and switches a low voltage DC signal to the Base Controller indicating a ground fault condition exists. A two wire plug contains a connection to the generator neutral and ground, while the three wire plug contains a +5 Vdc power source from the Base Controller, a ground connection, and a signal wire between the module and Base Controller.

During normal operation, there is no voltage potential between generator neutral and ground and the GFD Module will supply a +5 Vdc signal to the Base Controller. During a ground fault condition, a voltage potential develops between generator neutral and ground causing the module to remove the +5 Vdc signal to the Base Controller. The loss of signal at the Base Controller indicates a ground fault condition and generates Alarm Code 518. An LED on the GFD Module also illuminates when a ground fault condition is present.

Wiring and Circuit Description:

The Ground Fault Detect Module is a non-serviceable component. It contains two plugs, a two wire and a three wire, which handle ground fault detection and signaling, as well as an LED for visual indication a ground fault condition exists. The HRGC and HRGN wires connect the module to the generator ground and neutral connections and are located in a two wire plug. GFF, GFP, and GFN are low voltage wiring between the module and Base Controller and are located in a three wire plug.

55533-2-6-66

The harness wire number, wire color, and additional information for the module wiring is shown in the table.

Table 77. Ground Fault Detect Module Harness Connections

Harness Wire #	Wire Color on Module	Purpose	Notes
HRGC	Yellow	Connection to generator ground	AC voltage
HRGN	Yellow	Connection to generator neutral	AC voltage

Table 77. Ground Fault Detect Module Harness Connections (continued)

Harness Wire #	Wire Color on Module	Purpose	Notes
GFF	Blue	Ground fault signal to base controller	DC voltage
GFN	Black	Module ground	Ground
GFP	Red	Module +5 Vdc power	DC voltage

Table 78. Procedure

Step	Action	Result	Comments
1	Power down the unit and verify that it is disconnected from electric standby power.		
2	Locate the Ground Fault Detect Module in the fan contactor box. It will be bolted to the cover and connected by two harness plugs.		
3	Unplug the two wire plug at the Ground Fault Detect Module.		After disconnecting the plug, the module should no longer register a ground fault condition.
4	Start and run the unit for 2-3 minutes. If Alarm Code 518 was present, it should clear automatically.	Alarm Code 518 should not be present as long as the two wire plug at the module is disconnected.	The module will be unable to sense a ground fault condition with the two wire plug disconnected and the alarm should clear automatically.
5	Check to see if Alarm Code 518 is still present, then turn the unit off.	If Alarm Code 518 is no longer present, then a ground fault condition likely exists. Check the generator, fans, and AC harness for shorts to ground. If Alarm Code 518 was still present on the HMI, then the module or harness may be defective. Proceed to step 6.	Alarm Code 518 with a disconnected sense plug indicates an issue with the module or the harness between the base controller and module.
6	Unplug the three wire connector at the Ground Fault Detect Module.		The connector contains the power, ground and signal connections between the base controller and module.
7	Turn the unit on and enter Service Test Mode from the Maintenance Menu. Select Low Speed Cool. ***Important:*** *The engine should not be running for this portion of the test.*	This powers the controller and applies power to the Ground Fault Detect module.	The following steps check the low voltage control circuit.
8	Using a multimeter, check available voltage between the GFP-02 wire at the GFD module harness plug and chassis ground.	Voltage should read between 4.9 and 5.1 Vdc. If voltage reads less than 4.9 volts at the GFP-02 wire, proceed to step 9. If appropriate voltage is present, proceed to step 11.	This is a regulated +5 Vdc source from the base controller.
9	Disconnect the J3 connector at the base controller. Using a multimeter, check resistance between the GFP-02 wire at the GFD module and chassis ground.	Resistance should read OL on a multimeter. If resistance is less than OL, a short to ground is present and should be repaired. Repair the short and retest.	A short to ground on the power wire will cause low voltage at the GFD module.
10	Using a multimeter, check available voltage between the GFP-01 wire at the base controller J3 connector pin 35 and chassis ground.	Voltage should read between 4.9 and 5.1 Vdc. If voltage reads less than 4.9 volts at the GFP-01 wire, inspect the J3 connector for a poor connection or failed base controller. If voltage reads between 4.9 to 5.1 Vdc, inspect wiring between the base controller and module for an open or resisted circuit.	The GFP circuit contains a plug connection between the J3 connector and Ground Fault Detect Module.
11	Power down the unit.		The +5 Vdc power supply circuit has been checked. The next step is to test the module ground circuit.

Table 78. Procedure (continued)

Step	Action	Result	Comments
12	Using a multimeter, check resistance of the GFN-02 wire at the module harness connector to the GFN-01 wire at J3 connector pin 34.	Resistance of a properly operating circuit should read near 0 ohms on a multimeter. If resistance reads greater than near 0 ohms, inspect the wiring for a resisted or open circuit. If the resistance reads near 0 ohms, go to step 13.	The GFN circuit contains a plug connection between the J3 connector and Ground Fault Detect Module. The ground circuit has been checked. The next step is to check the signal circuit.
13	Using a multimeter, check resistance of the GFF-02 wire at the module harness connector to the GFF-01 wire at J3 connector pin 33.	Resistance of a properly operating circuit should read near 0 ohms on a multimeter. If resistance reads greater than near 0 ohms, inspect the wiring for a resisted or open circuit. If the resistance reads near 0 ohms, go to step 14.	The GFF circuit contains a plug connection between the J3 connector and Ground Fault Detect Module. The ground circuit has been checked. The next step is to check the signal circuit.
14	If all associated circuits are operational, the module is likely defective.	Replace the Ground Fault Detect Module.	If this procedure fails with a new Ground Fault Detect Module, the base controller may be defective.

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:

- True RMS Digital Multimeter

Operation:

This procedure should be used to check the operation of the Electronic Throttling Valve (ETV) if Alarm Code 89 Check Electronic Throttling Valve Circuit 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. 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.

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-01 and EVB-01 energize one coil and wires EVC-01 and EVD-01 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.*

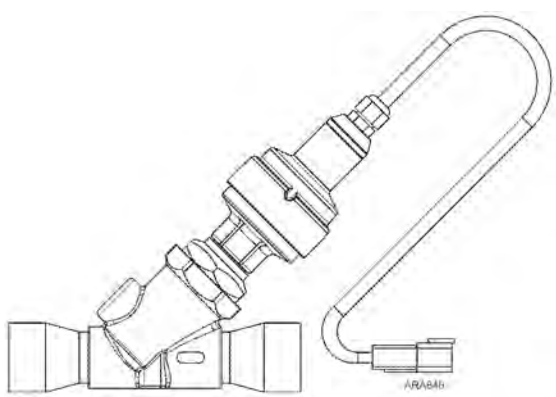
Electronic Throttling Valve Types and Wire Color Codes:

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-4 Base Controllers feature yellow and green ETV LEDs located at the lower left edge of the board. These LEDs flash when a signal is being sent to the ETV. These LEDs flash rapidly for a brief period of time on initial startup. They flash at a slower rate when the valve is opening or closing normally. If LEDs are flashing, a signal is being sent to the ETV.

The harness wire number, wire color and Base Controller LED number for the valve are shown in the tables.

Round Style ETV



Square Style ETV

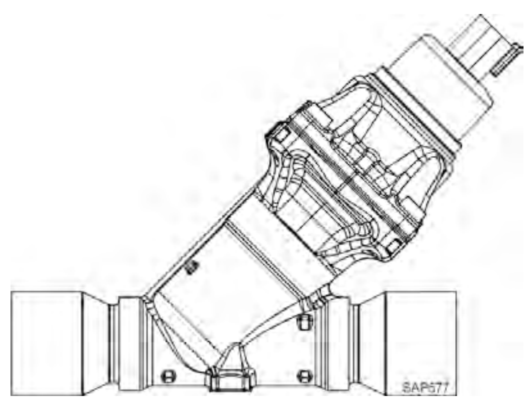


Table 79. ETV Harness Connections and Driver LEDs - Round Style

Harness Wire #	Wire Color on ETV	LED #	LED Color
EVA-01	Red	LED 49	Yellow
EVB-01	Green	LED 47	Green
EVC-01	White	LED 50	Yellow
EVD-01	Black	LED 46	Green

Table 80. ETV Harness Connections and Driver LEDs - Square Style

Harness Wire #	LED #	LED Color
EVA-01	LED 49	Yellow
EVB-01	LED 47	Green
EVC-01	LED 50	Yellow
EVD-01	LED 46	Green

Table 81. Procedure

Step	Action	Result	Comments
1	Power down the unit and verify that all connectors are secure.		
2	Disconnect Base Controller connector J4 and measure resistance between the EVA-01 and EVB-01 wires at the connector. Also measure the resistance between EVA-01 and ground, and EVB-01 and ground (should be an open circuit). • J4 Pin 25 – EVA-01 wire • J4 Pin 28 – EVB-01 wire	The resistance should be from 20 to 35 ohms. If the resistance is incorrect, check the EVA-01 and EVB-01 wires and connectors leading to the Electronic Throttling Valve. 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-01 and EVB-01 pins directly on the valve is not from 20 to 35 ohms the valve is defective. Neither pin should show a short to ground.
3	Measure resistance between the EVC-01 and EVD-01 wires at the connector. Also measure the resistance between EVC-01 and ground, and EVD-01 and ground (should be an open circuit). • J4 Pin 27 – EVC-01 wire • J4 Pin 26 – EVD-01 wire	The resistance should be from 20 to 35 ohms. If the resistance is incorrect check the EVC-01 and EVD-01 wires and connectors leading to the Electronic Throttling Valve. 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-01 and EVD-01 pins directly on the valve is not from 20 to 35 ohms the valve is defective. Neither pin should show a short to ground.
4	Reconnect J4 to the Base Controller.		
5	Disconnect the ETV from the main unit harness.		
6	Set the multimeter to read AC (alternating current) voltage and connect the leads to the EVA-01 and EVB-01 wires in the main unit harness at the ETV.		Check voltage between EVA-01 and EVB-01, not the green and red wires attached to the ETV.
7	Turn the unit on and enter Evacuation Test from the Maintenance Menu. Pay attention to the ETV LEDs on the board. When all 4 LEDs appear to blink at the same time, read AC voltage between EVA-01 and EVB-01.	AC voltage between EVA-01 and EVB-01 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 4 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.
8	Turn the unit off.		
9	With the multimeter set to read AC volts, connect the leads to the EVC-01 and EVD-01 wires in the main unit harness at the ETV.		Check voltage between EVC-01 and EVD-01, not the white and black wires attached to the ETV.
10	Turn the unit on and enter Evacuation Test from the Maintenance Menu. Pay attention to the ETV LEDs on the board. When all 4 LEDs appear to blink at the same time, read AC voltage between EVC-01 and EVD-01.	AC voltage between EVC-01 and EVD-01 with the valve opening during Evacuation Test should be between 6-10 Vac.	Voltage read on the multimeter may be higher (up to 12 Vac) if a battery charger is connected to the unit. The voltage read between EVC-01 and EVD-01 should be less than voltage between EVA-01 and EVB-01 based on how the controller steps the ETV. This is entirely normal.
11	Turn the unit off.		

Table 81. Procedure (continued)

Step	Action	Result	Comments
12	***Note:*** *If the tests above were successful, the electronic throttling valve should be operational. If the tests were not successful, proceed with step 13.*		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.
13	If the electronic throttling valve circuit is not functioning electrically, replace the controller.		

G04A - Electronic Throttling Valve (ETV) Mechanical Operation Test

Purpose:

To confirm proper mechanical operation of the Electronic Throttling Valve.

Note: *If the ETV must be changed, refer to the Maintenance Manual for the specific unit.*

Materials Required:

- Stepper Valve Tester

Operation:

This procedure should be used to check mechanical operation of the Electronic Throttling Valve (ETV) whenever an ETV is suspected faulty. Alarm Code 89 indicates that refrigeration system pressures did not respond as expected when the ETV was opened and closed, or that an electrical fault with the ETV system was detected. Other alarm codes may be generated if the ETV fails to regulate suction pressure, such as Alarm Codes 10 and 18. These alarms may be caused by a malfunction in the ETV or associated circuit.

The ETV contains a Stepper Motor that moves a piston located in the valve body. The piston position in the valve body determines the amount of refrigerant flow through the valve. Refrigerant flow through the valve is decreased as the piston is extended into the valve body. Suction pressure will drop as the amount of flow through the valve decreases. As the piston retracts, more refrigerant is able to flow through the valve and suction pressure increases.

The position of the ETV can be read in the Gauges Menu. A position of 0 indicates the piston is fully extended in the valve body and that the valve is fully closed. A position of 800 indicates the piston is fully retracted and that the valve is fully open.

Electronic Throttling Valve Types and Wire Color Codes:

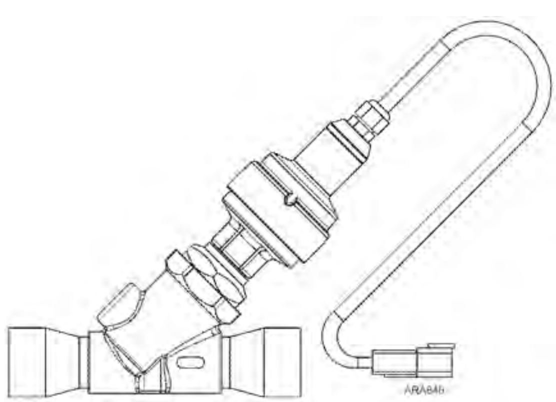
The round style ETV does not have a removable connector on the valve. There is a sheathed cable consisting of colored wires that run from the valve to the Deutsch connector on the cable. The Stepper Motor Tester is connected to the ETV using this Deutsch connector. A pigtail must be constructed in order to connect the tester to the ETV. The ETV may operate backwards if the connections are reversed. The square tyle 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.

When using the Stepper Motor Tester, the ETV position displayed on the HMI does not indicate actual valve position; the valve is being controlled manually by the tester. The unit harness from the Base Controller must be disconnected from the valve at the Deutsch plug in order to connect the ETV tester. The Base Controller will attempt to control the valve position but will be unable to since the valve is disconnected. The HMI will display requested ETV position, however, the valve will not respond to requests from the Base Controller and the displayed position will likely not be the actual position of the valve. Alarm Code 89 will likely not be generated in this case.

Important: *DO NOT open the valve too far, this may cause a possible Alarm Code 10 in high ambient or stall the engine if in low speed.*

The harness wire number, wire color on ETV, and binding post color on the tester are shown in the table (Table 82, p. 431).

Round Style ETV



Square Style ETV

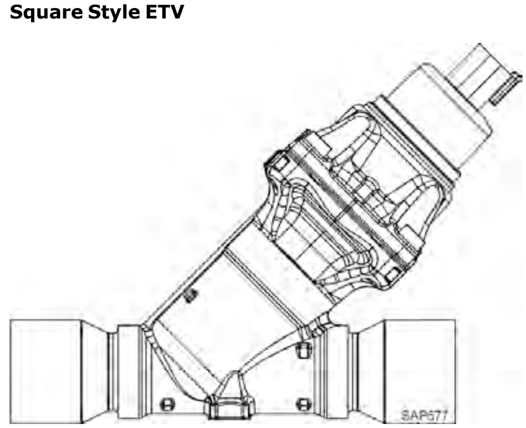


Table 82. ETV Harness and Tester Connections

Harness Wire #	Wire Color on ETV	Post Color on Tester
EVA-01	Red	White
EVB-01	Green	Black
EVC-01	White	Red
EVD-01	Black	Green

Table 83. Procedure

Step	Action	Result	Comments
1	Power down the unit.		
2	Disconnect the ETV from the main unit harness and connect the ETV to the Stepper Motor Tester using a pigtail.		
3	Set the tester to 50 steps per second and press the rocker switch to the "CLOSE" position for 10-15 seconds.	This closes the ETV. Near the end of 10-15 seconds you will hear the valve fully closing.	The LEDs on the tester will blink as the valve is being positioned.
4	Press the rocker switch to the "OPEN" position for 2-3 seconds.	This slightly opens the ETV and prevents the unit from running in a vacuum on startup.	ETV position displayed on the HMI will not be accurate as the tester is positioning the valve, not the base controller.
5	Turn the unit on and enter Service Test Mode in the Maintenance Menu. Select Engine Running Low Speed Cool.	The engine will start and the unit will enter low speed cool operation.	
6	While monitoring suction pressure in the Gauges menu on the HMI, press the tester rocker switch to the "OPEN" position for 3-5 seconds.	Suction pressure shown on the HMI should increase as the valve is being opened.	
7	While monitoring suction pressure on the HMI, press the tester rocker switch to the "CLOSED" position for 3-5 seconds.	Suction pressure shown on the HMI should decrease as the valve is being closed.	Suction pressure will go into a vacuum if the valve fully closes during this test. Depending on suction pressure, more than 3-5 seconds of closing the valve may be required to notice a pressure decrease.
8	Repeat steps 6 and 7 as necessary to confirm ETV operation.		If suction pressure rises and falls when using the tester to position the ETV, the valve is mechanically functioning. Accomplish Service Procedure G03A to confirm electrical operation of the ETV circuit.
9	Turn the unit off.		
10	If the suction pressure does not rise and fall when using the tester to position the ETV, the valve is likely failed. Check the unit for causes of low suction pressure and non-responsive suction pressure.		Causes of low suction pressure include a restricted expansion valve, low charge or a heavily frosted evaporator coil. Causes of non-responsive suction pressure include an inoperative compressor or front seated suction service valve.

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.

Table 84. 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 Base 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-4 Base Controller

Hardware Versions and Service Part Numbers

For the latest information, refer to the applicable Part Catalog (New) available through the Dealer Portal/iService.

Label Identification

The label is located on the edge of the Base Controller Mounting Base. The label shows board Engineering Part Number, Service Part Number, and installed Software Revision. The Base Controller Serial Number for SR-4 applications ends in “4T1” as shown in the example below.

BASE P/N: XXXXXXXXXX
S.P. P/N: XX-XXXX
REV: XXXX
ICON-XXXX-XXXX

S/N: A002192113094T1

Bar Code Here

55533-2-7-1

S/N Legend
A = Assembly
0021921 = Serial Number
1309 = Date Code YYWW (Year 2013 Week 09)
4T1 = Controller Identifier (SR-4 Tier 1)

Software Requirements

Multi-temperature applications with SR-4 Base Controllers must use SR-4 Base Controller Software Revision CAxx.

Software Compatibility

For the latest information, refer to the Software Compatibility Matrix available through the Dealer Portal/iService (Asset Library > Software & Downloads > Truck & Trailer > Microprocessor > Trailer).

Controller Conversion

Multi-Temperature to Single Temperature Controller Conversion

Multi-Temperature base controller software version CA10 or higher may be converted to single temperature software version BA35 or higher in order to work with a single temperature unit by flash loading the appropriate software using the WinTrac Service Tool or a USB Flash Drive (UFD). When converting, verify expansion module is disconnected until conversion is complete.

To convert a controller from multi-temperature to single temperature or single temperature to multi-temperature, it must have a Total Controller On Hours of less than 100 in order for the controller to allow this flash load to take place. This hourmeter limit only applies when converting from multi-temperature to single temperature or single temperature to multi-temperature. Refer to the table below for typical scenarios.

Current Software Version	ST <-> MT Flash Load Options
BA30 or below	Must load BA35 before flashing to CA10 or higher
BA35 or higher	Can flash directly to CA10 or higher
CA06 or below	Must load CA10 before flashing to BA35 or higher
CA10 or higher	Can flash directly to BA35 or higher

SR-4 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.

Label Identification

The label is located on the back of the HMI Control Panel. The label shows Engineering Part Number, Service Part Number, and installed Software Revision. The HMI Control Panel Serial Number for SR-4 applications ends in “0T4” as shown in the example below.

55533-2-7-3

S/N Legend
H = HMI
1071221 = Serial Number
1237 = Date Code YYWW (Year 2012 Week 37)
0T4 = Identifier (SR-4)

Software Requirements

Single temperature or multi-temperature applications with SR-4 Base Controllers must use SR-4 HMI Control Panel Software Revision 7Axx.

Compatibility

For the latest information, refer to the Software Compatibility Matrix available through the Dealer Portal/iService (Asset Library > Software & Downloads > Truck & Trailer > Microprocessor > Trailer).

SR-4 Multi-Temperature Expansion Module

Hardware Versions and Service Part Numbers

For the latest information, refer to the applicable Part Catalog (New) available through the Dealer Portal/iService.

SR-4 Multi-Temperature Electronic Engine Relay Board

Hardware Versions and Service Part Numbers

For the latest information, refer to the applicable Part Catalog (New) available through the Dealer Portal/iService.

SR-4 Power On/Off Control

HMI Control Panel - Turning Unit On

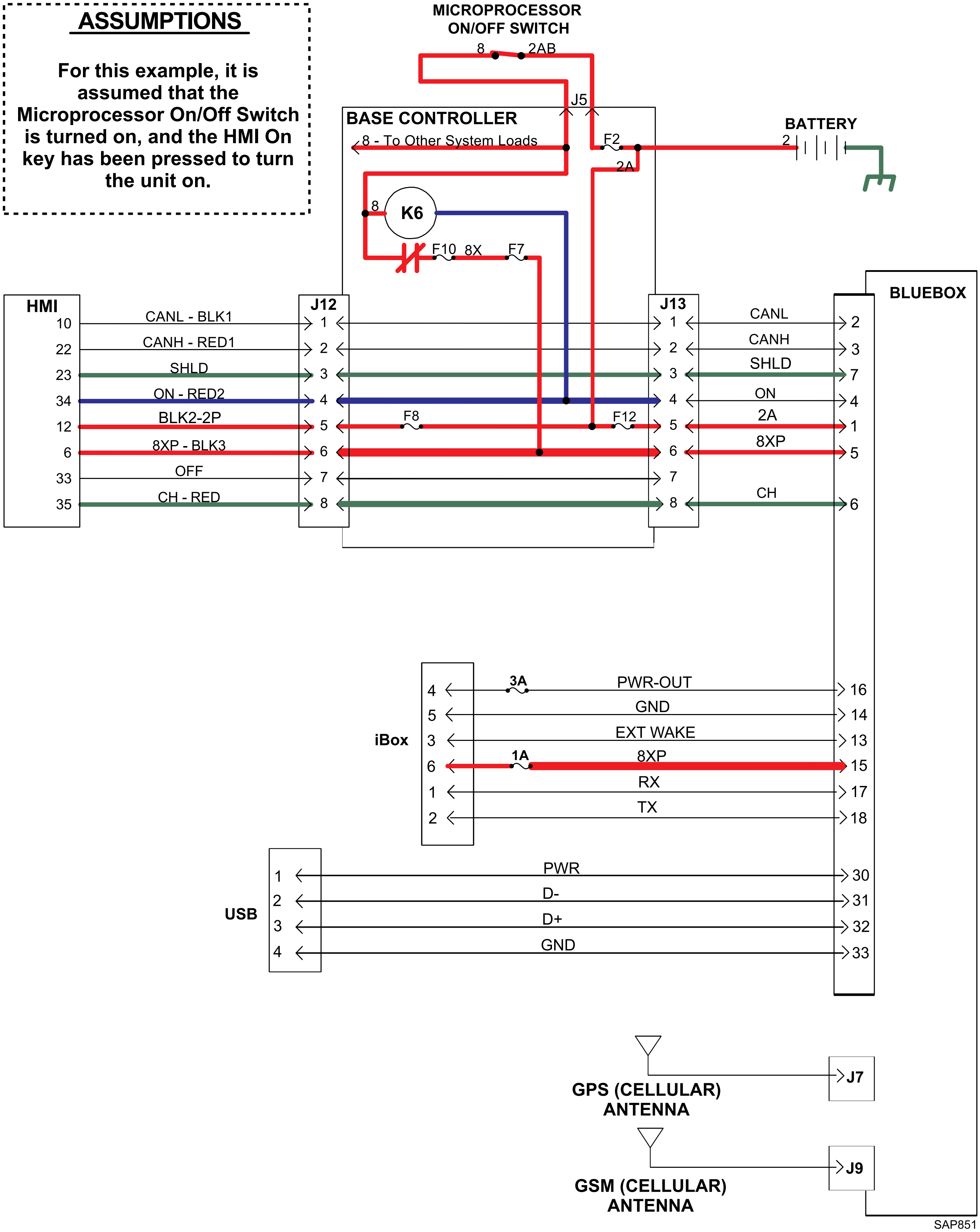
The diagram (Figure 174, p. 436) shows the power present with the Microprocessor On/Off switch in the On position and the unit turned on by pressing the ON key on the HMI Control Panel. The unit will start and run (if required).

1. Pressing the ON key on the HMI Control Panel grounds the ON circuit at HMI pin 34 as shown in blue on the diagram.
2. This energizes the K6 relay, which closes the contacts that supply power to the 8X, 8XP - BLK3, and 8XP circuits as shown in red on the diagram.

Table 85. Diagram Text Color Definitions

Chassis grounds are shown in green on the diagram.
Unit 2, 2A, 2AB, and 8 battery power is shown in red on the diagram.

Figure 174. Turning the Unit On with SR-4 HMI Control Panel



HMI Control Panel - Turning Unit Off

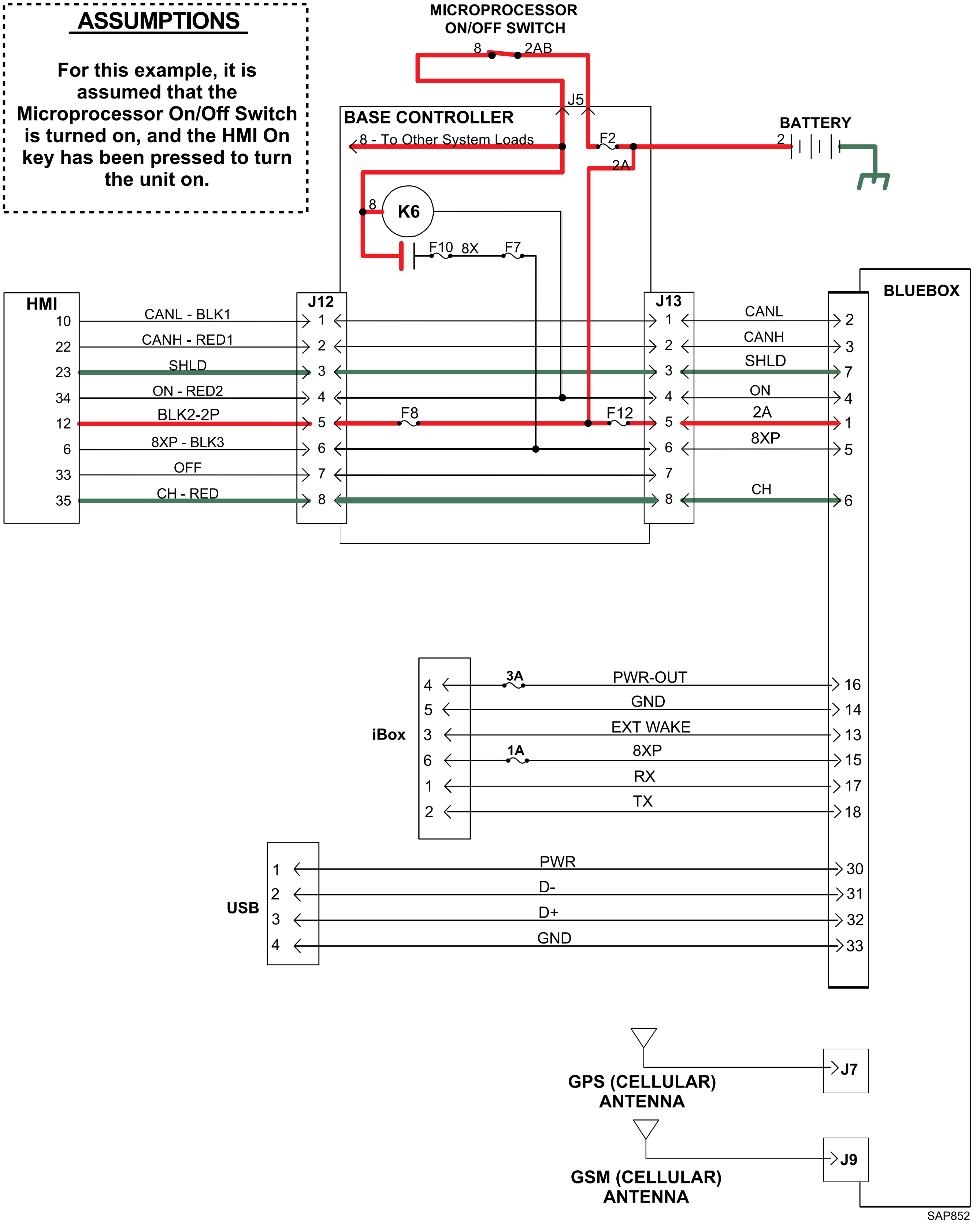
The diagram (Figure 175, p. 438) shows the power present with the Microprocessor On/Off switch in the On position and the unit turned off by pressing the OFF key on the HMI Control Panel. The unit is not running.

1. Pressing the OFF key on the HMI Control Panel removes the ground from the ON circuit at HMI pin 34 as shown in thin black on the diagram.
2. This de-energizes the K6 relay, which opens the contacts and removes the power from the 8X, 8XP - BLK3, and 8XP circuits as shown in thin black on the diagram.

Table 86. Diagram Text Color Definitions

Chassis grounds are shown in green on the diagram.
Unit 2, 2A, 2AB, and 8 battery power is shown in red on the diagram.

Figure 175. Turning the Unit Off with SR-4 HMI Control Panel



HMI Control Panel - Turning The Unit On From A Remote Control Panel

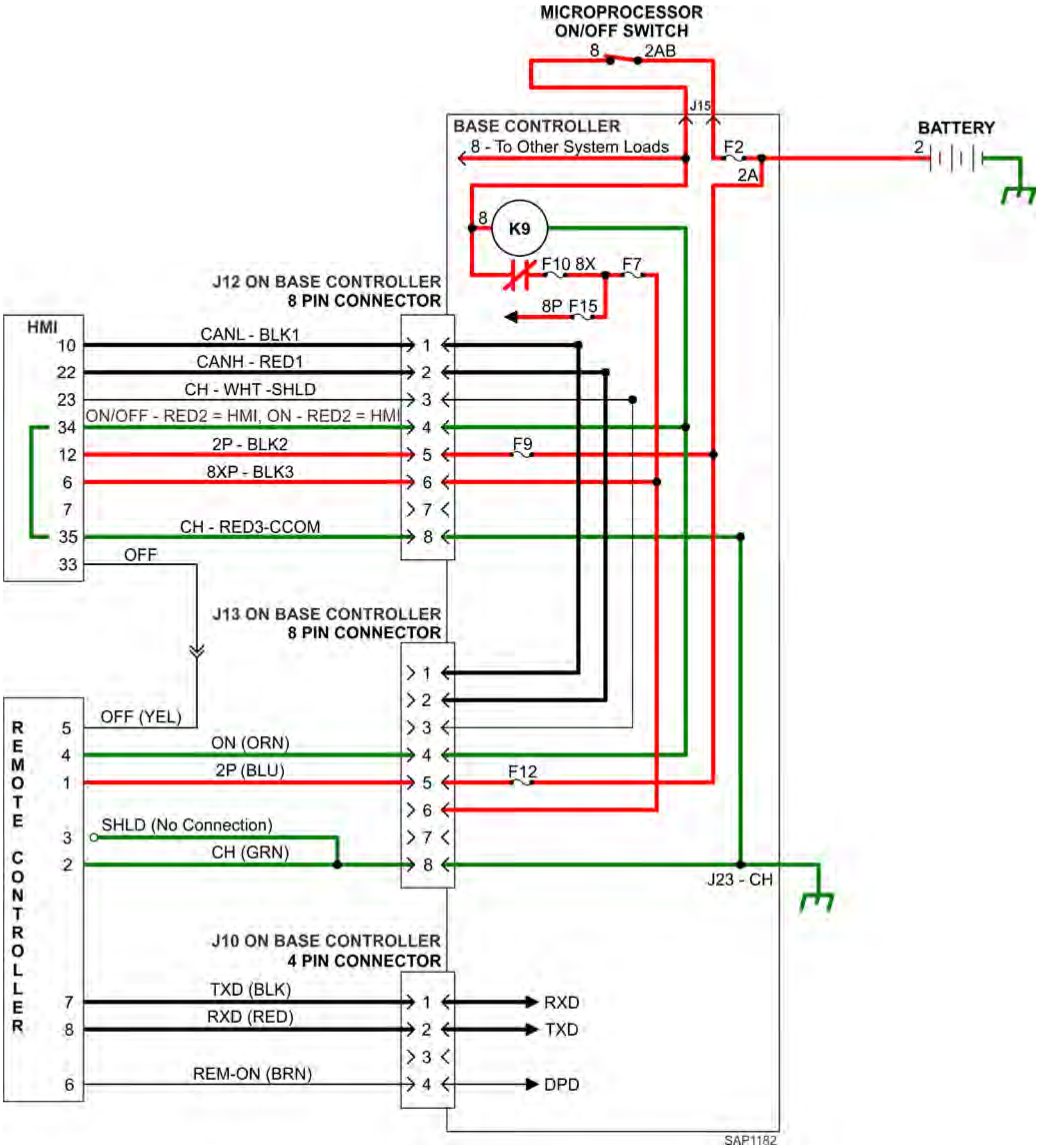
The diagram (Figure 176, p. 440) shows the power conditions present when the unit has been turned on by pressing the Remote Control Panel On Key on a unit equipped with an HMI Control Panel.

1. Pressing the Remote Control Panel On Key initiates turning the unit on by supplying chassis ground to the ON (ORN) circuit at the Remote Control Panel Pin 4 for five seconds. This turns the HMI Control Panel on and energizes the On/Off Relay K9. During this five second interval, the communications in steps 2 through 7 occur. After five seconds, the Remote Control Panel removes the ground from the ON (ORN) circuit but the On/Off Relay K9 is now provided a ground by the HMI Control Panel (step 7) and will remain on.
2. **The HMI Control Panel powers up and displays the "REMOTE START-PLEASE WAIT" screen.**
3. The HMI Control Panel sends a query via the CAN Bus to the Base Controller asking if the Remote Control Panel is attempting to turn the unit on.
4. The Base Controller sends a query via the RS-232 serial port (RXD and TXD circuits) to the Remote Control Panel asking if the Remote Control Panel is attempting to turn the unit on.
5. The Remote Control Panel will reply via the RS-232 serial port (RXD and TXD circuits) to the Base Controller that it is attempting to turn the unit on.
6. The Base Controller replies to the HMI Control Panel via the CAN Bus that the Remote Control Panel is attempting to turn the unit on.
7. The HMI Control Panel microprocessor supplies chassis ground to the ON/OFF circuit at HMI Control Panel Pin 34 by connecting it internally to HMI Control Panel Pin 35.
8. This energizes the On/Off Relay K9, which closes the normally open K9 contacts to supply power to the 8X, 8P, and 8XP - BLK3 circuits. The K9 LED 23 will illuminate to indicate the On/Off Relay K9 is energized. The 8P circuit signals the Base Controller to turn on. The Base Controller Heart Beat LED 21 will begin to flash, indicating that the Base Controller is powered up. The 8XP - BLK3 wire supplies feedback to Pin 6 of the HMI Control Panel that the Base Controller is powered up.
9. **The unit will start and run as determined by the Base Controller and the Remote Control Panel programmable feature settings.**

Table 87. Schematic Diagram Text Color Definitions

CH chassis ground circuits are shown in green on the diagrams.
Power circuits are shown in red on the diagrams.
Other text colors are defined in the descriptions.
The Microprocessor On/Off Switch is turned on (closed).

Figure 176. Turning Unit On with HMI Control Panel and Remote Control Panel



Note: *This simplified diagram does not show the remote controller harness connector located in the evaporator.*

HMI Control Panel - Turning The Unit Off From A Remote Control Panel

The diagram (Figure 177, p. 442) shows the power conditions present when the unit has been turned off by pressing the Remote Control Panel Off Key on a unit equipped with an HMI Control Panel.

1. Pressing the Remote Control Panel Off Key momentarily supplies a chassis ground to the OFF circuit at the Remote Control Panel Pin 5 as shown by the green dashed lines. This causes the HMI Control Panel to begin to power down.
2. The HMI Control Panel powers down. This turns the unit off by removing the ground from the ON/OFF circuit at HMI Control Panel Pin 34 to de-energize the On/Off Relay K9 relay as shown by bold blue dashed lines.
3. **When the On/Off Relay is de-energized, power is removed from the 8X, 8P, and 8XP - BLK3 circuits as shown in thin black on the diagram. When power is removed from the 8P circuit, this signals the Base Controller to turn off. The Base Controller Heart Beat LED 21 will stop flashing, indicating that the Base Controller is powered down.**

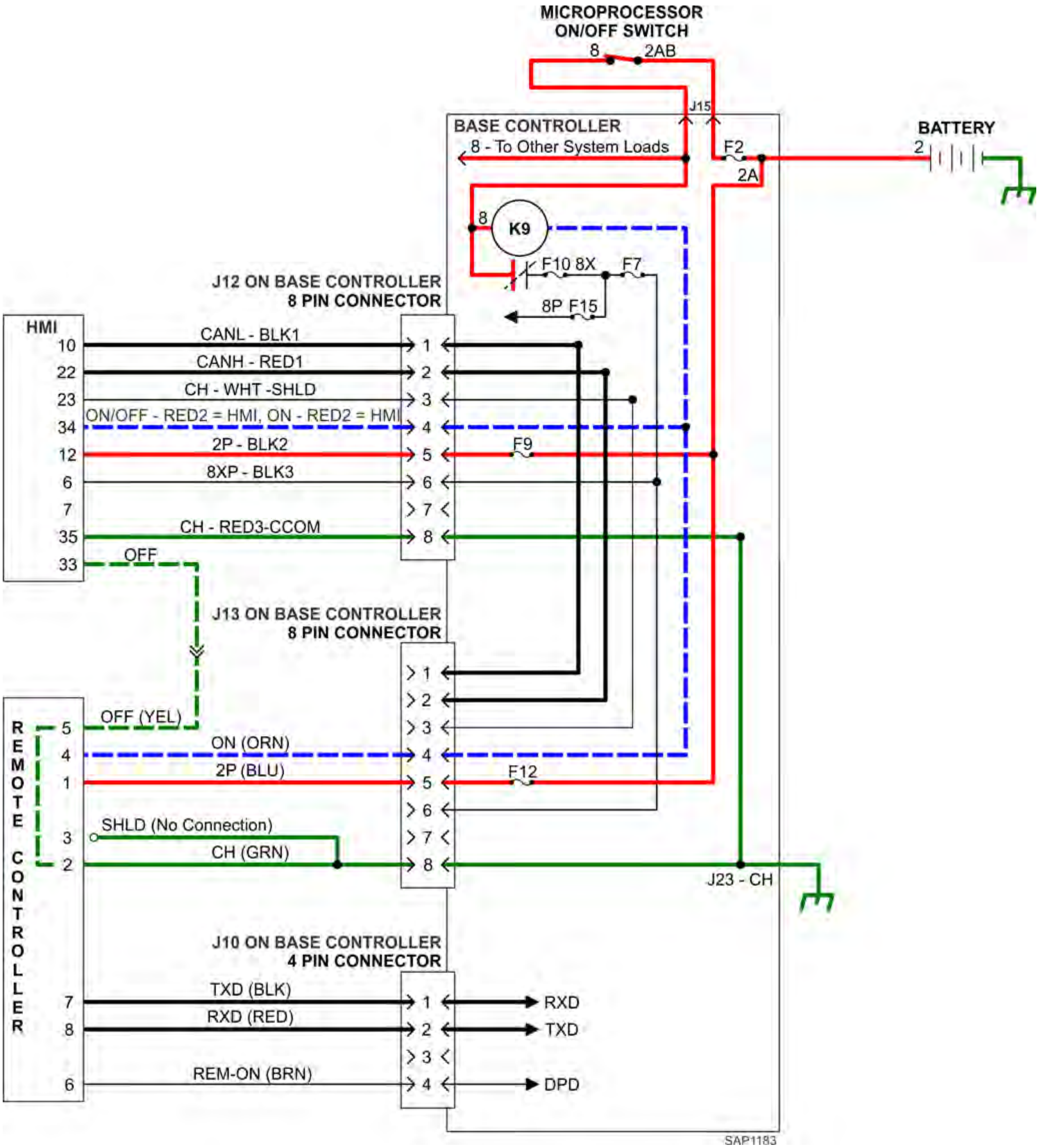
Notes:

1. *If the OFF (YEL) circuit from the Remote Controller to the HMI Control Panel is not connected, the HMI Control Panel will power down by sending messages via the communication ports.*
2. *On SR-3 applications, the OFF Line is connected to CAN Connectors J12, J13, and J14 at Pin 7. The OFF Line is also connected to CAN Connector J98 Pin 10.*

Table 88. Schematic Diagram Text Color Definitions

CH chassis ground circuits are shown in green on the diagrams.
Power circuits are shown in red on the diagrams.
Other text colors are defined in the descriptions.
The Microprocessor On/Off Switch is turned on (closed).

Figure 177. Turning Unit Off with HMI Control Panel and Remote Control Panel



HMI Control Panel Messages/Causes

The following error messages will appear on the HMI Control Panel display if the stated conditions occur.

[SYSTEM IS POWERING DOWN]

If the HMI Control Panel 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 device and the HMI Control Panel is likely shorted to ground. The HMI Control Panel will not remain powered up if the OFF Line is shorted to ground. On SR-4 applications, the OFF Line is connected to CAN Connectors J12 and J13 at Pin 7. The OFF Line is also connected to CAN Connector J98 Pin 10. On Multi-Temp Expansion Boards the OFF line is connected to J2 and J50 at Pin 7.

Note: *In some cases, if the OFF Line circuit is shorted to ground, the HMI Control Panel may not power up at all.*

[COMMUNICATIONS FAILURE - - LOST CONTROLLER CONNECT]

This message indicates that the HMI Control Panel has not received any messages from the Base Controller for 20 seconds. The HMI Control Panel 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 HMI Control Panel and the Base Controller CAN Bus circuits.
- If the CAN communications fail between the HMI Control Panel and Base Controller or if CAN communications are not operational.
- If the HMI Control Panel or Base Controller is defective.
- If the USB cable is found to be shorted/corroded.

[LOST CONTROLLER POWER]

This message indicates that the HMI Control Panel has detected a loss of power on the 8XP circuit and that the Base Controller did not respond to messages from the HMI Control Panel for at least three seconds. If this occurs, the HMI Control Panel will display LOST CONTROLLER POWER - - POWERING DOWN and shut down. This message can result from one of the following conditions:

- If there are open circuits or bad connections on the 8XP and CAN Bus circuits between the HMI Control Panel and the Base Controller.
- If Fuse F10 is blown or if the K6 On/Off Relay on the Base Controller is defective.
- If the Base Controller is defective.

[CHECK 8X WIRING]

If this message appears, it indicates that the HMI Control Panel has detected a loss of power on the 8XP circuit but CAN communications between the HMI Control Panel 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 HMI Control Panel and the Base Controller.
- Loss of 8XP power will occur if Fuse F7 on the Base Controller is blown.

Base Controller Software Revisions

The Base Controller software family for multi-temperature applications is CAxx. The current multi-temperature SR-4 Base Controller software is available through the Dealer Portal/iService (Asset Library > Software & Downloads > Truck & Trailer > Microprocessor > Trailer).

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.*

Table 89. Software Revision CA05

Dates	Features	Interchange With:
Released 3rd Quarter 2014	• ServiceWatch Datalogger updated • ECU Keyswitch • Miscellaneous Enhancements • Refer to Service Bulletin TT691 for details	All previous

Table 90. Software Revision CA06

Dates	Features	Interchange With:
Released 2nd Quarter 2015	• Eco Pulldown • Engine Timing Belt Reminder • Miscellaneous Enhancements • Refer to Service Bulletin TT750 for details	All previous

Table 91. Software Revision CA10

Dates	Features	Interchange With:
Released 4th Quarter 2015	• Added support for C-600M and S-600DE • Door Open Timeout enhanced • Alarm Code 528 improvements • Miscellaneous Enhancements • Refer to Service Bulletin SB600 for details	All previous

Table 92. Software Revision CA15

Dates	Features	Interchange With:
Released 2nd Quarter 2016	• Added support for S-610M and S-610DE • Added support for Zone 3 in S-600DE and S-610DE • Added support for additional sensor grade capability • Added support for 30 amp electric standby option • Miscellaneous Enhancements • Refer to Service Bulletin SB634 for details	All previous

Table 93. Software Revision CA20

Dates	Features	Interchange With:
Released 1st Quarter 2017	• Added support for next generation telematics - TK BlueBox • Added Precision Temperature Control (PTC) • Added support for Low Voltage Module • Added Alarm Code 627 • Miscellaneous Enhancements • Refer to Service Bulletin SB666 for details	All previous

Table 94. Software Revision CA25

Dates	Features	Interchange With:
Released 4th Quarter 2017	• Datalogger Enhancements • ECO Mode Default Setting Changed • Miscellaneous Enhancements • Refer to Service Bulletin SB696 for details	All previous

Table 95. Software Revision CA30

Dates	Features	Interchange With:
Released 2nd Quarter 2018	• Alarm Code 520 Enhancements • Added Support for Humidity Sensor • Added Support for TK486V25L1 and TK488CR1 Engines • Expanded the list of Existing Programmable Features and Unit configuration settings able to be modified with OptiSet Plus Profiles • Added "Cycle Sentry Fresh Null to Low Speed Cool Restart" and "Cycle Sentry Frozen Null to Low Speed Cool Restart" to Programmable Features • Miscellaneous Enhancements • Refer to Service Bulletin SB714 for details	All previous

Table 96. Software Revision CA35

Dates	Features	Interchange With:
Released 1st Quarter 2019	• Added support for remaining Programmable Features • Enhancements to Fuel Priming • Added support for engine updates; Updates to Alarm Code 627; Added new condition codes to Alarm Code 627 based on ECU P Codes set • Added new feature - Engine Break-in Mode • Miscellaneous Enhancements • Refer to Service Bulletin SB744 for details	All previous

HMI Control Panel Software Revisions

The HMI Control Panel software family for multi-temperature and single temperature applications is 7Axx. The current HMI Control Panel software is available through the Dealer Portal/iService (Asset Library > Software & Downloads > Truck & Trailer > Microprocessor > Trailer).

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.*

Table 97. Software Revision 7A25

Dates	Features	Interchange With:
Released 3rd Quarter 2014	• Added Portuguese to Language Setup • Connect Engine Service Tool option • Refer to Service Bulletin TT691 for details	All previous

Table 98. Software Revision 7A30

Dates	Features	Interchange With:
Released 2nd Quarter 2015	• Pretrip Progress Bar • Updated Charger Configuration Selections • Added Engine Timing Belt Accumulated Hours • Added Eco Mode to Programmable Features • Added Engine Timing Belt Expiration Action • Refer to Service Bulletin TT750 for details	All previous

Table 99. Software Revision 7A35

Dates	Features	Interchange With:
Released 4th Quarter 2015	• Added Prime Fuel System • Updated Charger Configuration Selections • Added Fuel Heater Menu • Refer to Service Bulletin SB600 for details	All previous

Table 100. Software Revision 7A40

Dates	Features	Interchange With:
Released 2nd Quarter 2016	• Added S-610M and S-610DE to Unit Model Menu • Added Additional Sensor Grades to Sensor Calibration Menu • Electric Motor Type Menu 15 HP renamed to 15-19 HP • Added Electric Service Amperage Menu • Aftermarket Alternator Menu renamed to Supplemental Alternator Menu • Added Sleep Mode Selection to Soft Key 2 and Soft Key 3 Menu Selections • Refer to Service Bulletin SB634 for details	All previous

Table 101. Software Revision 7A45

Dates	Features	Interchange With:
Released 1st Quarter 2017	• Failed flash load recovery via UFD – Beginning with HMI Control Panel Software revision 7A45 users will be able to recover an HMI that has failed a flash load using only a flash drive rather than ThermoServ and USB cable. If HMI flash loading fails while installing 7A45, the HMI will have to be recovered using ThermoServ and a USB cable • Added Telematics Status Menu to Unit Maintenance Menu • Added Precision Temp Control Zone to Programmable Features Menu • Added "Add Precision Temp Control Zone to Mode Menu" to Main Menu Configuration Menu • Added Low Voltage Module Connected to Hardware Configuration Menu • Refer to Service Bulletin SB666 for details	All previous

Table 102. Software Revision 7A50

Dates	Features	Interchange With:
Released 4th Quarter 2017	• Service Test Mode Enhancements • Flashload Enhancements • Added Alternate Zone Labels to Programmable Features Menu • Miscellaneous Enhancements • Refer to Service Bulletin SB696 for details	All previous

Table 103. Software Revision 7A55

Dates	Features	Interchange With:
Released 2nd Quarter 2018	• Added Humidity Sensor to Hardware Configuration Menu • Added TK486V25L1 and TK488CR1 to Engine Type Menu • Changed "REB Door Switch" to "Telematics Door Switch" in Hardware Configuration Menu • Changed "REB Fuel Sensor Type" to "Telematics Fuel Sensor Type" in Hardware Configuration Menu • Added Number of Zones Mismatch Warning • Added more information to Telematics Status Menu • Miscellaneous Enhancements • Refer to Service Bulletin SB714 for details	All previous

Table 104. Software Revision 7A60

Dates	Features	Interchange With:
Released 1st Quarter 2019	• Added new feature - Engine Break-in Mode • Refer to Service Bulletin SB744 for details	All previous

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 or defrost 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. These systems include conventional host units as well as Dual Evaporator (DE) systems.
- 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 Solenoids and Valves

The Condenser Inlet Solenoid, Receiver Tank Pressure Solenoid, and Purge Valve are located in the condenser section of the host unit and serve all zones. They are controlled by zone requirements and are affected by the discharge pressure transducer. These three components are controlled by electrical outputs that are part of the Base Controller 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 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.

This solenoid is a normally open valve. The Base Controller will supply 12 volts from a Smart FET to energize (close) this valve.

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 Receiver Tank Pressure Solenoid 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 Valve (HGBV)

This normally closed valve is energized (open) only when the host zone is operating in modulation cool with all other zones switched off and when the unit reaches full modulation and is de-energized (closed) when the modulation cycle ends. It reduces the capacity of the unit during modulation and also aids suction pressure control. The Base Controller will supply 12 volts from a Smart FET to energize (open) the valve.

Electronic Throttling Valve (ETV)

The ETV is a variable position valve operated by a stepper motor. The ETV is located in the suction line between the heat exchanger and the accumulator. The ETV controls the flow of refrigerant returning to the compressor, replacing the modulation valve and compressor throttling valve. During the Full Cool mode, the unit controller sends an electrical signal to adjust the ETV to maximize system cooling capacity. During Modulation Cool mode, the unit controller sends a signal to close the ETV a precise amount. This throttles the suction gas returning to the compressor and reduces the system cooling capacity to match the load requirements.

Multi-Temperature Evaporator Components

The Liquid Line Solenoid, Hot Gas Solenoid, Suction Line Solenoid, and Hot Gas Bypass 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 or defrost (Refer to Reverse Cycle Heat in “Multi-Temperature System Features,” p. 448). 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.

Hot Gas Bypass Solenoid (HGB)

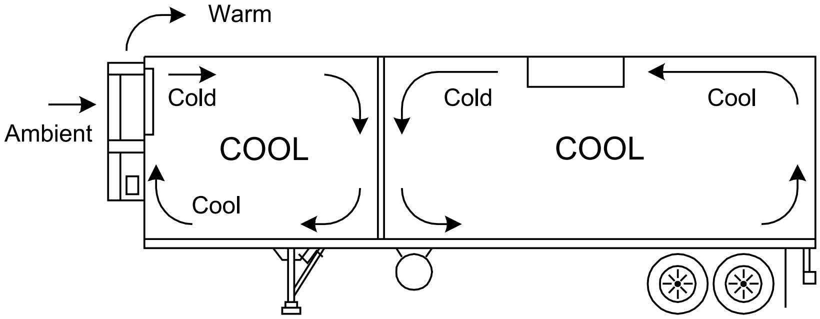
The Hot Gas Bypass Solenoid may be energized (open) when the host unit is running in modulation. Modulation for Zone 1 of a multi-temperature unit is only available when Zone 2 and 3 (if equipped) are turned off. Modulation for Zone 2 or 3 (if equipped) is not available. This solenoid may be energized during Zone 1 modulation while in the cool mode to control the Discharge Air Temperature or to prevent the Suction Pressure from going to low. It is normal for the solenoid to be cycling on and off during Zone 1 modulation.

The Hot Gas Bypass Solenoid is a normally closed valve. The Base Controller will supply 12 volts from a Smart FET to energize (open) the valve.

Multi-Temperature Operation

All Zones Cooling

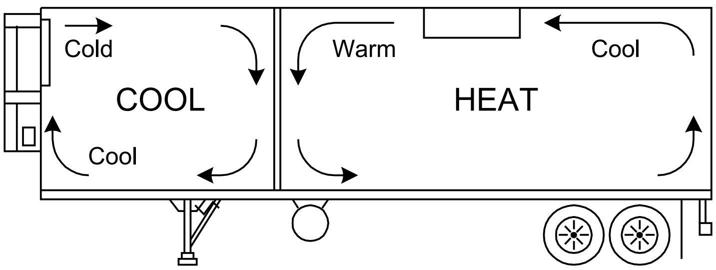
When all zones are cooling, the host unit condenser is used to eliminate the heat from all zones. This is Conventional Cooling operation.



SAP525

One Zone Cooling/One Zone Heating or Defrosting

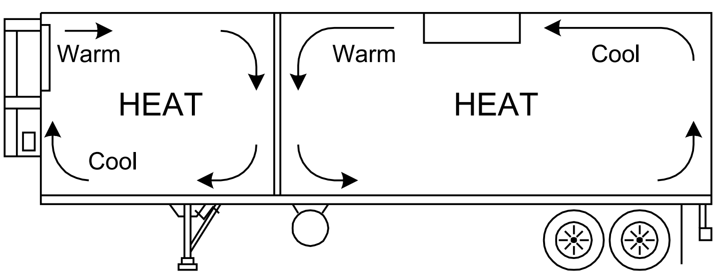
When at least one zone is cooling and another zone is heating or defrosting, the evaporator in the heating zone is used as a condenser to remove the heat from the zone that is cooling. The host unit condenser is not used. This is Reverse Cycle operation.



SAP526

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.



SAP527

Solenoids and Valves

Item	Smart FET	Solenoid Type	Null	Running Null	Cool	Z1 Cool Modulation	Heat and Defrost	Reverse Cycle Heat and Defrost	Reduced Reverse Cycle Heat and Defrost	Single Zone Heat (Note 3)
Condenser Inlet Solenoid (CIS) (Note 1)	Yes	NO					Energized (closed)	Energized (closed)	Note 1	Energized (closed)
Receiver Tank Pressure Sol (RTPS) (Note 1)	Yes	NC					Energized (open)	Energized (open)	Note 1	
Purge Valve (PV) (Note 1)	Yes	NC					Energized (open)	Energized (open)	Note 1	
Zone Liquid Line Solenoid (LLS) (Note 1)	Yes	NC			Energized (open)	Energized (open)	Energized (open)	Energized (open)	Energized (open)	Energized (open)
Zone Hot Gas Solenoid (HGS)	Yes	NC					Energized (open)	Energized (open)	Energized (open)	Energized (open)
Zone Suction Line Solenoid (SLS)	Yes	NO						Energized (closed)	Energized (closed)	
Hot Gas Bypass Solenoid (HGB)	Yes	NC				Note 4				
Evaporator Fans	Yes	N/A	Off	On	On		On (Off for defrost)	On (Off for defrost)	On	On

Notes:

1. *Reduced Reverse Cycle Heat is used to prevent excessive heating and to allow both the remote evaporator of the zone in heat and the unit condenser to be utilized by zones that are cooling.*

   If the setpoint in the heating zone is equal to or more than 20°F or 11.1°C below the ambient temperature, the following valves are de-energized:

   - *Condenser Inlet Solenoid*
   - *Purge Valve*
   - *Receiver Tank Pressure Solenoid*

   The zone is in Reduced Reverse Cycle Heat.

   If the setpoint in the heating zone becomes less than 15°F or 8.3°C below the ambient temperature, the following valves are energized:

   - *Condenser Inlet Solenoid*
   - *Purge Valve (dependent on discharge pressure)*
   - *Receiver Tank Pressure Solenoid (dependent on discharge pressure)*

   The zone is in Normal Reverse Cycle Heat.

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.*

4. *Zone 1 modulation is only present with a Fresh Set Point in Zone 1 with Zone 2 and 3 (if equipped) turned off. The Hot Gas Bypass may be cycling on and off to assist in controlling the Discharge Air Temperature and Suction Pressure.*

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 defrost with other zones cooling, the Liquid Line Solenoid (LLS) is energized (open) and the Hot Gas Solenoid (HGS) is energized (open). The Suction Line Solenoid (SLS) will be energized (closed) in the early stages of defrost but will be de-energized (open) as coil temperature rises. This will cause a temporary loss of capacity in the cooling zones.
- 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.

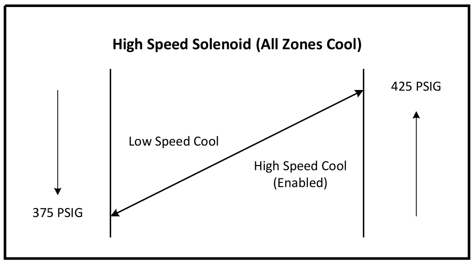
Discharge Transducer Pressure Control

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.



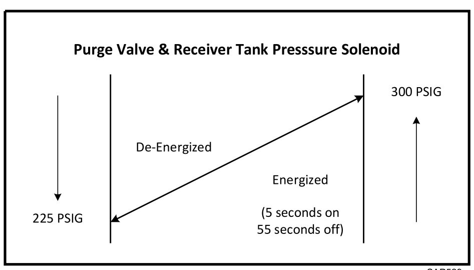
SAP528

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.

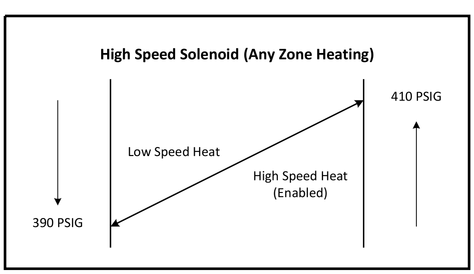
Note: *This only applies to heat or reverse cycle heat, not to reduced reverse cycle heat.*



SAP529

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.



SAP530

Reduced Reverse Cycle Heat Control

Reduced Reverse Cycle Heat is used to prevent excessive heating and to allow both the remote evaporator of the zone in heat and the unit condenser to be utilized by zones that are cooling.

If the setpoint in the heating zone is equal to or more than 20°F or 11°C below the ambient temperature, the following valves in that zone are de-energized:

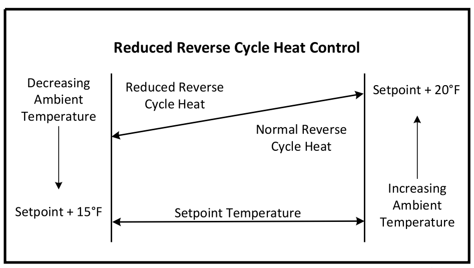
- Condenser Inlet Solenoid
- Purge Valve
- Receiver Tank Pressure Solenoid

The zone is in Reduced Reverse Cycle Heat.

If the setpoint in the heating zone becomes less than 15°F or 8°C below the ambient temperature, the following valves are energized:

- Condenser Inlet Solenoid
- Purge Valve (dependent on discharge pressure)
- Receiver Tank Pressure Solenoid (dependent on discharge pressure)

The zone is in Normal Reverse Cycle Heat.

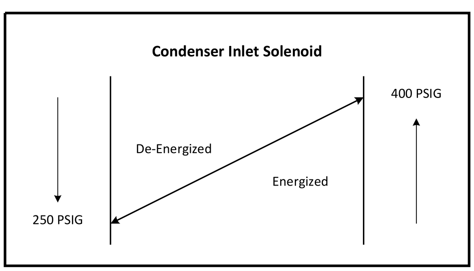


SAP531

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.



SAP532

Refrigeration Service Procedures

R01A - 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).

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.

NOTICE

Service Procedures!

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 105. Evacuation Procedure

Step	Action	Result	Comments
1	Verify all refrigerant has been recovered from the unit.		Refer to Refrigeration Service Procedure R10A for refrigerant recovery details.
2	Connect a vacuum pump and gauge manifold for three-point evacuation to the suction service valve, discharge service valve, and receiver tank outlet valve.		The use of the Thermo King Evacuation Station (P/N 204-725 or 204-744) is recommended. Refer to Evacuation Station Operation and Field Application (TK 40612-2) additional information.
3	Verify proper operation of the Evacuation Station as shown in the Evacuation Station Operation and Field Application (TK 40612).		
4	Start the vacuum pump and mid-seat the suction service valve, discharge service valve, and receiver tank outlet valve.		
5	Install service valve stem caps with seals and tighten them.		The valve stems should remain capped while evacuating the unit.
6	Evacuate the unit to 500 microns, or the lowest achievable level between 500 and 1,000 microns.		
7	Continue to evacuate the unit for one additional hour after reaching 500 microns, or the lowest achievable level between 500 and 1,000 microns.	This verifies complete evacuation of the remote evaporators and tubes.	
8	Close the Evacuation Station valve nearest the vacuum pump (V1) to isolate the vacuum pump from the system. Turn the vacuum pump off.		
9	Observe the micron gauge.	The system pressure should remain below 2000 microns for five minutes. If the pressure does not hold, check for leaks (if a leak is suspected) or continue evacuation (if system is not dry).	

Table 105. Evacuation Procedure (continued)

Step	Action	Result	Comments
10	Restart the vacuum pump, open the Evacuation Station valve nearest the vacuum pump (V1) and repeat steps 6, 8, and 9 as required until system pressure remains below 2000 microns for five minutes.		
11	When system pressure remains below 2000 microns for five minutes, restart the vacuum pump and open the Evacuation Station valve nearest the vacuum pump (V1).		
12	With the vacuum pump running, back seat the suction and discharge service valves. Replace the valve cap, re-close the Evacuation Station valve nearest the vacuum pump (V1), and stop the vacuum pump.		
13	Close valve V4. The unit is ready to charge.		Do not exercise the service valves with the unit in a deep vacuum unless the vacuum pump is operating.

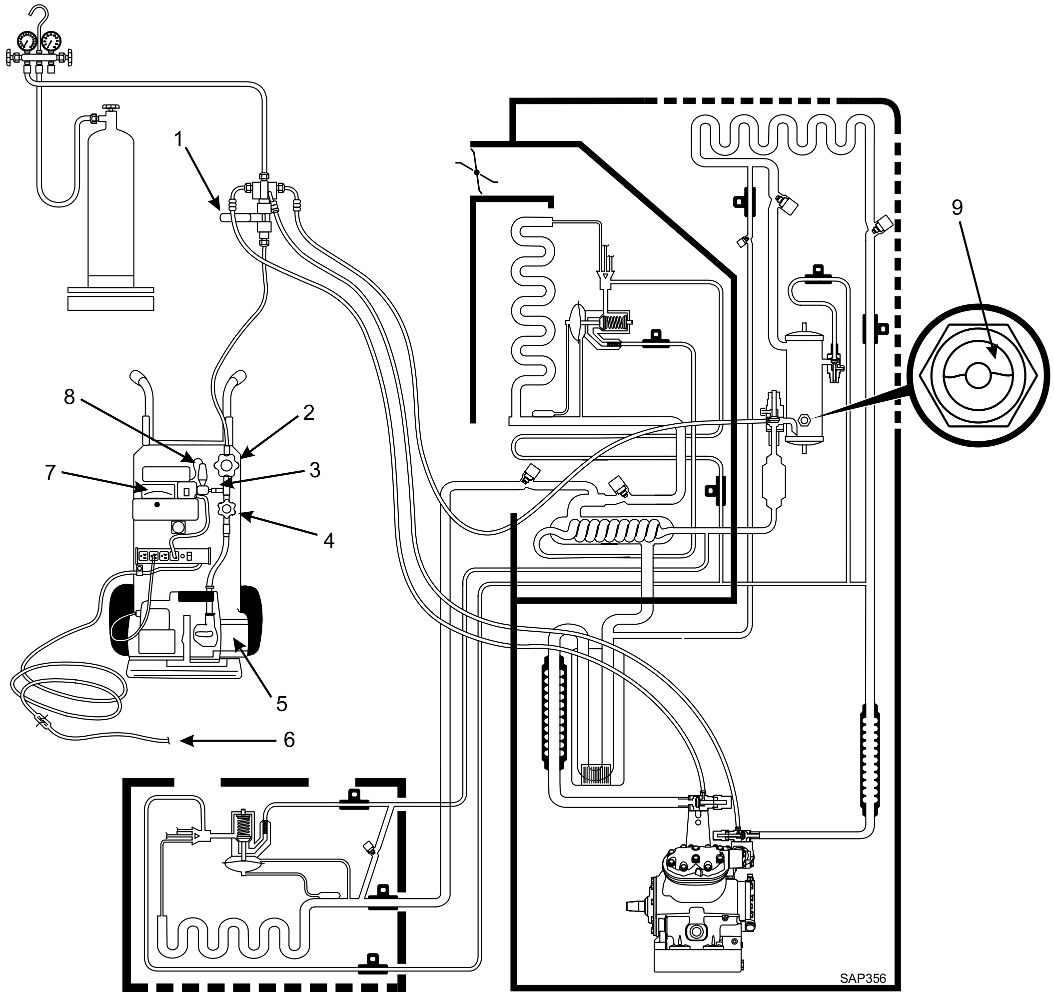
Table 106. Charging Procedure

Step	Action	Result	Comments
1	Verify all compartment dividing wall(s) are open. ***Note:*** *The unit must be left in the Evacuation Test.*		Ceiling mounted dividing wall(s) should not be stored close to the evaporator outlets as this will restrict airflow.
2	Before charging system, verify refrigerant lines from the gauge manifold to refrigerant supply bottle have been evacuated or purged, the suction and discharge service valves are back seated, and receiver tank outlet valve is still open.		
3	Set refrigerant supply bottle for liquid. Open gauge manifold hand valve and add a partial charge of R-404A through the receiver tank outlet valve. Add 14 lb (6.4 kg) to a unit with one remote evaporator. Add 15 lb (6.8 kg) to a unit with two remote evaporators. Do not add more than this. The remainder of charge will be added through suction service valve while unit is running.		
4	Close gauge manifold hand valve.		
5	Back seat (close) the receiver tank outlet valve.		
6	Exit Evacuation Test by turning unit Off and then back On.		
7	Turn all zones On and set all zone set points for lowest possible temperature to verify that all zones run in Cool mode. Allow unit to start.		
8	Front seat suction service valve and allow compressor to pump down to 1 to 3 psi (7 to 21 kPa). Stop the unit.		
9	Remove evacuation manifold hoses from receiver tank outlet valve, discharge service valve, and suction service valve. Replace and tighten service port and valve stem caps on receiver tank outlet valve.		

Table 106. Charging Procedure (continued)

Step	Action	Result	Comments
10	Attach gauge manifold (with refrigerant supply bottle still connected) to compressor. Attach low side gauge to suction service valve. Mid-seat suction service valve. Attach high pressure gauge on to discharge service valve. Open discharge service valve to monitor discharge pressure.		
11	Turn unit On, turn all zones On (with all zone set points set to the lowest possible temperature), and allow unit to start.		
12	Observe suction pressure and slowly open gauge manifold hand valve to allow liquid refrigerant to flow into suction service valve. Control liquid flow so suction pressure increases 20 to 25 psi (138 to 172 kPa). Maintain a discharge pressure of 325 to 400 psi (2241 to 2758 kPa).		
13	Add refrigerant until ball in receiver tank sight glass rises to middle of sight glass, then close gauge manifold hand valve.		Verify liquid level does not rise above top of sight glass.
14	Continue to operate unit and monitor sight glass until all compartment temperatures are at or below 0 F (-18 C).		
15	Check position of ball in receiver tank sight glass. If liquid level has dropped, add liquid refrigerant until level stabilizes near middle of sight glass.		Do not exceed recommended refrigerant charge for unit model.
16	Close hand valve on refrigerant supply bottle.		
17	Back seat discharge service valve.		
18	Open both hand valves on gauge manifold.		
19	Front seat suction service valve and allow compressor to pump down to 1 to 3 psi (7 to 21 kPa). Stop the unit.		
20	Remove gauge line from suction service valve and cap service port.		
21	Remove gauge line from discharge service valve and cap service port.		
22	Back seat suction service valve and cap valve stem.		
23	Cap valve stem on discharge service valve.		
24	Secure all gauge lines to gauge line anchors.		

Figure 178. Multi-Temp Evacuation and Charging (Two Zone Unit Shown Other Units Similar)



1	V-4	6	To AC Power
2	V-3	7	Vacuum or Micron Gauge
3	V-2	8	Thermistor
4	V-1	9	Correct Refrigerant Level
5	Two-Stage Vacuum Pump		

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.

Table 107. 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. Discharge pressure should be greater than 325 psig with R-404A.		Failure to operate the unit to normal temperature and pressure may yield unreliable results.
4	With the unit running in high speed cool, disconnect the ETV connector from the ETV harness.		The ETV is disconnected to prevent closure of the ETV when the unit is turned off. This may prevent observing pressure rise on the low side during testing.
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.
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 does not hold, check the Receiver Tank Outlet Valve, Hot Gas Solenoids in all zones, Purge Valve, Hot Gas Bypass Valve, and the compressor valve plates for internal leaks.	The unit may already be shut down due to an Alarm Code 93.
7	If low side pressure holds, proceed with desired test.		

R03A - Hot Gas Solenoid Test

Purpose:

To test the hot gas, hot gas bypass solenoids, and control circuits on a multi-temperature refrigeration system.

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) and reconnect the ETV harness before releasing the unit for service or performing another refrigeration service procedure.

Table 108. 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 with R-404a.		
4	With the unit running in high speed cool, disconnect the ETV connector from the ETV harness.		The ETV is disconnected to prevent closure of the ETV when the unit is turned off. This may prevent observing pressure rise on the low side during testing.
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. If low side pressure holds, proceed with desired test.	The low side should not rise above a 15 inch vacuum in less than two minutes. If low side pressure does not hold, check the hot gas solenoids in all zones, purge valve, hot gas bypass, and the compressor valve plates for internal leaks.	
7	From the HMI, access the Maintenance Menu.	The display will show MAINTENANCE MENU.	
8	Use the NEXT key to choose OUTPUT TEST and press SELECT to load.		
9	Press the NEXT key to choose Hot Gas Bypass.	The display will show HOT GAS BYPASS and gauge information.	
10	Press the TEMP ON key. The display will show HOT GAS BYPASS ON for about three seconds.	The low side gauge should rise. If low side pressure does not rise, check the Hot Gas Bypass Solenoid.	***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 1 HOT GAS SOLENOID.	The display will show ZONE 1 HOT GAS SOLENOID and gauge information.	
12	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.*

Table 108. Procedure (continued)

Step	Action	Result	Comments
13	Press the NEXT key to choose ZONE 2 HOT GAS SOLENOID. ***Note:*** *In zones with parallel evaporators, the solenoids will energize together.* For parallel evaporators, at the master Zone 2 evaporator terminal strip, disconnect the HGS2 wire from the Expansion Module and the HGS wire in the interconnect harness going to the slave evaporator HGS.	The display will show ZONE 2 HOT GAS SOLENOID and gauge information.	
14	Press the LOCK ON key. The display will show ZONE 2 HOT GAS SOLENOID ON for about three seconds. ***Note:*** *In zones with parallel evaporators, press the LOCK ON key. The display will indicate ZONE 2 HOT GAS SOLENOID ON. Proceed to Zone 2 and momentarily connect the HGS2 wire to the HGS for each evaporator. Monitor valve activation and pressure rise for each valve when it is activated. After testing, reconnect the wires to terminal strip.*	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 to next step.	***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.*
15	If the unit is equipped with three zones, press the NEXT key to choose ZONE 3 HOT GAS SOLENOID. ***Note:*** *In zones with parallel evaporators, the solenoids will energize together.* For parallel evaporators, at the master Zone 3 evaporator terminal strip, disconnect the HGS3 wire from the Expansion Module and the HGS wire in the interconnect harness going to the slave evaporator HGS.	The display will show ZONE 3 HOT GAS SOLENOID and gauge information.	If a third zone is not present, proceed to step 18.
16	Press the TEMP ON key. The display will show ZONE 3 HOT GAS SOLENOID ON for about three seconds. ***Note:*** *In zones with parallel evaporators, press the LOCK ON key. The display will indicate ZONE 3 HOT GAS SOLENOID ON. Proceed to Zone 3 and momentarily connect the HGS3 wire to the HGS for each evaporator. Monitor valve activation and pressure rise for each valve when it is activated. After testing, reconnect the wires to terminal strip.*	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 to next step.	
17	Exit the Output Test by pressing the EXIT key.		
18	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.		
19	Reconnect the ETV harness.		

R04A - Liquid Return Check Valve/Liquid Line Solenoid Test

Purpose:

To test the liquid return check valve, liquid line solenoids, and control circuits on a multi-temperature refrigeration system.

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) and reconnect the ETV harness before releasing the unit for service or performing another refrigeration service procedure.

Table 109. 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 with R-404a.		
4	With the unit running in high speed cool, disconnect the ETV connector from the ETV harness.		The ETV is disconnected to prevent closure of the ETV when the unit is turned off. This may prevent observing pressure rise on the low side during testing.
5	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.
6	Shut the unit down and observe the gauges. If the low side pressure holds, proceed with desired test.	The low side should not rise above a 15 inch vacuum in less than two minutes. If the low side pressure does not hold, check the receiver tank outlet valve, hot gas bypass solenoid valve, hot gas solenoids in all zones, purge valve, and the compressor valve plates for internal leaks.	
7	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.
8	From the HMI, access the Maintenance Menu.	The display will show MAINTENANCE MENU.	
9	Use the NEXT key to choose OUTPUT TEST and press SELECT to load.		
10	Press the NEXT key to choose ZONE 1 LIQUID LINE SOLENOID.	The display will show ZONE 1 LIQUID LINE SOLENOID and gauge information.	
11	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.*

Table 109. Procedure (continued)

Step	Action	Result	Comments
12	Press the NEXT key to choose ZONE 2 LIQUID LINE SOLENOID. ***Note:*** *In zones with parallel evaporators the LLS solenoids will energize together.* For parallel evaporators, at the Zone 2 master evaporator terminal strip, disconnect the LLS2 wire from the Expansion Module and the LLS wire in the interconnect harness going to the slave evaporator LLS.	The display will show ZONE 2 LIQUID LINE SOLENOID and gauge information.	
13	Press the TEMP ON key. The display will show ZONE 2 LIQUID LINE SOLENOID ON for about three seconds. ***Note:*** *In zones with parallel evaporators, press the LOCK ON key. The display will indicate ZONE 2 LIQUID LINE SOLENOID ON. Proceed to Zone 2 and momentarily connect the LLS2 wire to the LLS for each evaporator. Monitor valve activation and pressure rise for each valve when it is activated. After testing, reconnect the wires to terminal strip.*	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.*
14	If the unit is equipped with three zones, press the NEXT key to choose ZONE 3 LIQUID LINE SOLENOID. ***Note:*** *In zones with parallel evaporators the LLS solenoids will energize together.* For parallel evaporators, at the Zone 3 master evaporator terminal strip, disconnect the LLS3 wire from the Expansion Module and the LLS wire in the interconnect harness to the slave evaporator LLS.	The display will show ZONE 3 LIQUID LINE SOLENOID and gauge information.	If a third zone is not present, proceed to step 16.
15	Press the TEMP ON key. The display will show ZONE 3 LIQUID SOLENOID ON for about three seconds. ***Note:*** *In zones with parallel evaporators, press the LOCK ON key. The display will indicate ZONE 3 LIQUID LINE SOLENOID ON. Proceed to Zone 3 and momentarily connect the LLS3 wire to the LLS for each evaporator. Monitor valve activation and pressure rise for each valve when it is activated. After testing, reconnect the wires to terminal strip.*	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.	
16	Exit the Output Test by pressing the EXIT key.		
17	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.		
18	Reconnect the ETV harness.		

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.

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) and reconnect the ETV harness before releasing the unit for service or performing another refrigeration service procedure.

Table 110. Procedure

Step	Action	Result	Comments
1	Attach the gauge set.		
2	Attach additional low side gauge to suction line port of S-3 remote evaporator(s).		Monitoring of the S-3 remote evaporator(s) pressure is now possible later in the procedure. Parallel evaporators require only one gauge to be attached to one of the evaporators.
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 with R-404a.		
5	With the unit running in high speed cool, disconnect the ETV connector from the ETV harness.		The ETV is disconnected to prevent closure of the ETV when the unit is turned off. This may prevent observing pressure rise on the low side during testing.
6	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.
7	Shut the unit down and observe the gauges. If low side pressure holds, proceed with desired test.	The low side should not rise above a 15 inch vacuum in less than two minutes. If low side pressure does not hold, check the receiver tank outlet valve, hot gas bypass solenoid, hot gas solenoids in all zones, purge valve, and the compressor valve plates for internal leaks.	
8	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.	5-20 PSIG will now be present in the suction lines up to the suction check valves. The evaporators should remain in a vacuum.	***Note:*** *An evaporator with an open suction line check valve or one with a large leak will allow the evaporator pressure to equalize with the suction line.* The S-3 remote evaporator may be monitored to verify the evaporator remains in a vacuum via the extra low side gauge. If the extra low side gauge is equal to the gauge manifold low side gauge, the remote evaporator suction check valve is stuck open or has a major leak. The host and DE style evaporators do not have evaporator suction line ports to monitor that they remain in a vacuum.

Table 110. Procedure (continued)

Step	Action	Result	Comments
9	Observe the low pressure gauges on the manifold and remote evaporator(s).	If the pressure on the gauge manifold drops within two minutes, check the suction line check valves for leaks under low pressure. A slight rise in pressure on an S-3 remote evaporator low side gauge will help identify a leaking check valve for that evaporator.	***Note:*** *This observation will identify a slow leak under low pressure in a suction line check valve.* The host and DE style evaporators do not have evaporator suction line ports to monitor a slight pressure rise in the evaporator. A decrease in the low side manifold gauge and S-3 remote evaporator gauges that remain in a stable vacuum may indicate the host suction line check valve is leaking under low pressure.
10	If the low side pressure holds for two minutes, proceed with the test.		
11	Equalize the system through the gauge manifold to the low side. Close the hand valves on the gauge set.		
12	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. A rise in pressure on an S-3 remote evaporator low side gauge will help identify a leaking check valve for that evaporator. If high side pressure increases within two minutes, the condenser inlet check valve is leaking.	The host and DE style evaporators do not have evaporator suction line ports to monitor a slight pressure rise in the evaporator. A decrease in the low side manifold gauge and S-3 remote evaporator gauges that remain in a stable vacuum may indicate the host suction line check valve is leaking under low pressure.
13	If the pressure holds for two minutes, proceed with the test.		
14	From the HMI, access the Maintenance Menu.	The display will show MAINTENANCE MENU.	
15	Use the NEXT key to choose OUTPUT TEST and press SELECT to load.		
16	Press the NEXT key to choose Zone 1 Hot Gas Solenoid.	The display will show ZONE 1 HOT GAS SOLENOID and gauge information.	
17	Press the TEMP ON key. The display will show ZONE 1 HOT GAS SOLENOID ON for about three seconds.	The high side and low side gauge manifold pressure should fall. If gauge manifold pressures does not fall, check the suction line check valve for Zone 1. If the high side pressure does fall, proceed with the test.	Gauge manifold pressure that does not fall is an indication the Zone 1 suction line check valve allowed the evaporator to rise out of a vacuum and equalize with the suction line in Step 8. Typically, this would indicate the Zone 1 suction line check valve is stuck open or has a major leak.
18	Press the NEXT key to choose Zone 2 Hot Gas Solenoid.	The display will show ZONE 2 HOT GAS SOLENOID and gauge information.	

Table 110. Procedure (continued)

Step	Action	Result	Comments
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 and the extra low side gauge at the evaporator suction line port should rise out of a vacuum.	**Note:** *This step is required to verify Zone 2 DE style evaporator suction line check valve is not stuck open or has a major leak.* Gauge manifold pressure that does not fall is an indication the Zone 2 suction line check valve allowed the evaporator to rise out of a vacuum and equalize with the suction line in Step 8. Typically, this would indicate the Zone 2 suction line check valve is stuck open or has a major leak. If the Zone 2 S-3 remote evaporator is in a vacuum as indicated by the extra low side gauge prior to initiating this step, the suction line check valve is not leaking. The purpose of performing this step is to bring the evaporator out of a vacuum. In zones with parallel evaporators, the solenoids will energize together.
20	Press the NEXT key to choose Zone 3 Hot Gas Solenoid.	The display will show ZONE 3 HOT GAS SOLENOID and gauge information.	
21	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 and the extra low side gauge at the evaporator suction line port should rise out of a vacuum.	If the Zone 3 evaporator is in a vacuum as indicated by the extra low side gauge prior to initiating this step, the suction line check valve is not leaking. The purpose of performing this step is to bring the evaporator out of a vacuum. In zones with parallel evaporators, the solenoids will energize together.
22	Exit the OUTPUT TEST by pressing the EXIT key.		
23	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.		
24	Reconnect the ETV harness.		

R07A - Purge Valve Test

Purpose:

To test the Purge Valve on a multi-temperature refrigeration system.

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) and reconnect the ETV harness before releasing the unit for service or performing another refrigeration service procedure.

Table 111. 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 with R-404a.		
4	With the unit running in high speed cool, disconnect the ETV connector from the ETV harness.		The ETV is disconnected to prevent closure of the ETV when the unit is turned off. This may prevent observing pressure rise on the low side during testing.
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. If low side pressure holds, proceed with desired test.	The low side should not rise above a 15 inch vacuum in less than two minutes. If low side pressure does not hold, check the receiver tank outlet valve, hot gas bypass solenoid, hot gas solenoids in all zones, purge valve, and the compressor valve plates for internal leaks.	
7	From the HMI, access the Maintenance Menu.	The display will show MAINTENANCE MENU.	
8	Use the NEXT key to choose OUTPUT TEST and press SELECT to load.		
9	Press the NEXT key to choose Purge Valve.	The display will show PURGE VALVE and gauge information.	
10	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.	
11	Exit the OUTPUT TEST by pressing the EXIT key.		
12	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.		
13	Reconnect the ETV harness.		

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.

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) and reconnect the ETV harness before releasing the unit for service or performing another refrigeration service procedure.

Table 112. 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 with R-404a.		
5	With the unit running in high speed cool, disconnect the ETV connector from the ETV harness.		The ETV is disconnected to prevent closure of the ETV when the unit is turned off. This may prevent observing pressure rise on the low side during testing.
6	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.
7	Shut the unit down and observe the gauges. If low side pressure holds, proceed with desired test.	The low side should not rise above a 15 inch vacuum in less than two minutes. If low side pressure does not hold, check the receiver tank outlet valve, hot gas bypass solenoid, hot gas solenoids in all zones, purge valve, and the compressor valve plates for internal leaks.	

Table 113. 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 OUTPUT TEST and press SELECT to load.		
4	Press the NEXT key to choose Condenser Inlet Solenoid.	The display will show CONDENSER INLET SOLENOID and gauge information.	

Table 113. 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 Output 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 114. 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, proceed with next step.	
3	Reconnect the receiver tank pressure solenoid plug and proceed with the next step.	The receiver tank pressure solenoid opens.	
4	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 115. 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 Output 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.
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 OUTPUT 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.		
6	Reconnect the ETV harness.		

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, hot gas bypass solenoid, condenser inlet solenoid, and purge check valve.

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions (back seat) and reconnect the ETV harness before releasing the unit for service or performing another refrigeration service procedure.

Table 116. 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	With the unit running in high speed cool, disconnect the ETV connector from the ETV harness.		The ETV is disconnected to prevent closure of the ETV when the unit is turned off. This may prevent observing pressure rise on the low side during testing.
5	Front seat the receiver tank bypass service valve.		
6	Shut the unit down and observe the gauges. If low side pressure holds, proceed with desired test.	The low side should not rise above a 15 inch vacuum in less than two minutes. If low side pressure does not hold, check the receiver tank outlet valve, hot gas bypass solenoid, hot gas solenoids in all zones, purge valve, 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 OUTPUT TEST and press SELECT to load.		
	Important: *Each zone must have the vacuum broken by momentarily energizing the zone hot gas valve. The suction line check valve (s) will preserve vacuum in a zone evaporator even if a positive pressure is indicated on the suction gauge of the gauge manifold.*		
9	Press the NEXT key to choose Zone 1 Hot Gas Solenoid.	The display will show ZONE 1 HOT GAS SOLENOID and gauge information.	
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.
11	Press the NEXT key to choose Zone 2 Hot Gas Solenoid.	The display will show ZONE 2 HOT GAS SOLENOID and gauge information.	
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.
13	If the unit is equipped with 3 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 with step 15.

Table 116. Procedure (continued)

Step	Action	Result	Comments
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.
15	If all zones are slightly greater than 0 psig, work can proceed on low side components in all zones.	All low side components may now be serviced.	If certain high side components need to be serviced, proceed to step 16.
16	Open both gauge manifold hand valves. This will allow remaining high side pressure to equalize to the low side of the system.	Pressures will equalize. If the equalized pressure is 15 PSIG or less, service work may be performed. If equalized pressure is greater than 15 PSIG, refer to Refrigeration Service Procedure R10A to recover the refrigerant.	In addition to all low side components, service work may be done on the discharge vibrasorber, receiver tank pressure solenoid, hot gas bypass solenoid, all hot gas solenoids, condenser inlet solenoid, and purge check valve.
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.
18	Reconnect the ETV harness.		

R10A - Refrigerant Recovery

Purpose:

To recover the refrigerant charge from a Multi-Temperature refrigeration system.

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 117. 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 OUTPUT TEST. This will shut the unit down. Press EXIT to leave the OUTPUT 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 118. 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 OUTPUT TEST. This will shut the unit down. Press EXIT to leave the OUTPUT 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.

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions and reconnect the purge valve and ETV harness before releasing the unit for service or performing another refrigeration service procedure.

Table 119. 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.	
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.

Table 119. Procedure (continued)

Step	Action	Result	Comments
12	Reconnect purge valve and ETV harness.	Purge valve and ETV are now functional.	
13	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.
14	Remove the gauge manifold. Install and tighten all service valve caps and service port caps.		

R12A - Condenser Check Valve Test

Purpose:

To test the Condenser Check Valve on a multi-temperature refrigeration system.

Important Notes:

- When finished with this refrigeration service procedure, return all service valves to the normal operating positions and connect the ETV harness before releasing the unit for service or performing another refrigeration service procedure.

Table 120. Procedure

Step	Action	Result	Comments
1	Attach the gauge set.		
2	Attach an additional high side gauge to the Receiver Tank Outlet Valve (RTOV). **⚠ WARNING** **Risk of Injury!** **Verify the Receiver Tank Outlet Valve (RTOV) is back seated prior to removing the service port cap. Failure to back seat the RTOV may result in severe personal injury.**	Receiver tank pressure may now be monitored during the test procedure.	
3	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.
4	Start and run all zones in Cool Mode for 10 minutes. Discharge pressure should be greater than 325 psig with R-404a.		Cover the condensers as required to build head pressure. Allow enough air flow through the roadside condenser for engine radiator cooling. **Note:** *You may have to open the grilles and place the cover directly on the condenser to get the pressure to climb high enough.*
5	With the unit running in high speed cool, disconnect the ETV connector from the ETV harness.		The ETV is disconnected to prevent closure of the ETV when the unit is turned off. This may prevent observing pressure rise on the low side during testing.
6	Front seat the receiver tank outlet valve and perform a Low Side Pump Down. When the discharge pressure begins to decrease and the low pressure gauge reaches a 10 inch vacuum, remove the condenser covers to reduce the discharge pressure. When the discharge pressure drops approximately 100 psig, shut the unit down.		From the HMI, access the Maintenance Menu and scroll to Output Test and press Select, this will shut the unit down. Entering Output Test is required in Step 9.
7	With the unit shut down, observe the gauge readings.	The low side gauge should remain in a vacuum. The high side gauge should be about 100 psig lower than the receiver tank pressure. The receiver tank pressure should be close to where it was when the unit was shut down.	The receiver tank pressure may begin to slowly fall as the receiver tank begins to cool but should be close to what it was when the unit was shut down. Receiver tank refrigerant should be contained between the RTOV and condenser check valve. Condenser refrigerant should be contained between the condenser check valve and condenser inlet check valve.
8	From the HMI, access the Maintenance Menu as quickly as possible.	The display will show MAINTENANCE MENU.	

Table 120. Procedure (continued)

Step	Action	Result	Comments
9	Use the NEXT key to choose OUTPUT TEST and press SELECT to load.		
10	Press the NEXT key to choose Purge Valve.	The display will show PURGE VALVE and gauge information.	
11	Press the LOCK ON key. The purge valve will turn On and stay On.	The low side gauge should rise as the condenser refrigerant is allowed to equalize with the low side. The high side gauge should eventually drop and will equalize with the low side gauge. The receiver tank pressure should remain close to its original value.	Energizing the purge valve allows refrigerant between the condenser check valve and condenser inlet check valve to equalize with the low side very quickly. It is normal for the purge line and suction line to be cold during the equalization process.
12	After condenser and low side pressures have fully equalized, Output Test may be exited and the unit may be turned Off.		Alarm Code 54 will be set after 15 minutes if left in Output Test.
13	Continue to observe the receiver tank pressure gauge and condenser check valve.	The receiver tank pressure gauge should remain relatively close to where it was when the unit was shut down and remain stable. A slight and slow pressure drop is acceptable due to the slow ambient cooling of the receiver tank. The condenser check valve temperature should remain stable. Typically, it will be warm/hot similar to the receiver tank.	A receiver tank pressure gauge that equalizes rapidly to the same value as the high and low side gauge indicates a condenser check valve that is stuck open or has a major leak. A cold condenser check valve and/or a valve that is noisy or vibrating indicates a leaky valve.
14	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 the unit to service.		
15	Reconnect the ETV harness.		

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Section 9 - Diagrams

Diagram Index

The following table lists the SR-4 control system schematic and wiring diagrams. The diagrams are available through the Dealer Portal/iService (Asset Library > Technical Literature > Diagrams). Enter the drawing number or the Precedent Diagrams Manual (TK 55849-2-DM) as search criteria.

Drawing No.	Title
2H08434	C-600M Schematic Diagram
2H08435	C-600M Wiring Diagram
1H94045	S-600DE Schematic Diagram
1H94046	S-600DE Wiring Diagram
1H78684 Rev E	S-600M Schematic Diagram (Evaporator Heaters on 12 and 19 HP SmartPower Units)
1H78685 Rev D	S-600M Wiring Diagram (Evaporator Heaters on 12 and 19 HP SmartPower Units)
1H78684 Rev G	S-600M Schematic Diagram (Evaporator Heaters on 12 HP SmartPower Units only)
1H78685 Rev F	S-600M Wiring Diagram (Evaporator Heaters on 12 HP SmartPower Units only)
1H99103	S-610M Schematic Diagram
1H99104	S-610M Wiring Diagram
2H23813	S-610DE Schematic Diagram
2H23814	S-610DE Wiring Diagram

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