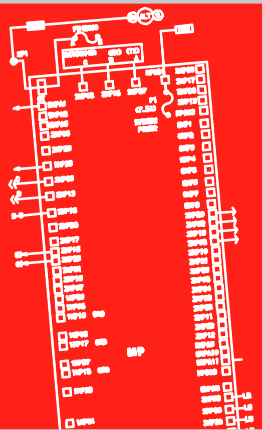
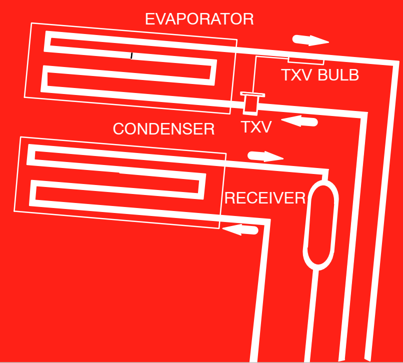
Trailer Refrigeration





OPERATION & SERVICE MANUAL

for

VECTOR 1800 MT

Trailer

Multi–Temp
Refrigeration Units

62–11039 Rev C

OPERATION & SERVICE MANUAL

for

VECTOR 1800 MT

Trailer

Multi–Temp
Refrigeration Units

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

PARAGRAPH NUMBER Page

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Continued)

LIST OF TABLES

SECTION 1

SAFETY PRECAUTIONS

1.1 SAFETY PRECAUTIONS

Your Carrier Transicold refrigeration unit has been designed with the safety of the operator in mind. During normal operation, all moving parts are fully enclosed to help prevent injury. During all pre-trip inspections, daily inspections, and problem troubleshooting, you may be exposed to moving parts. Please stay clear of all moving parts when the unit is in operation and when the unit main power switch is in the START/RUN position.

CAUTION

Under no circumstances should anyone attempt to repair the Logic or Display Boards. Should a problem develop with these component, contact your nearest Carrier Transicold dealer for replacement.

CAUTION

Under no circumstances should a technician electrically probe the processor at any point, other than the connector terminals where the harness attaches. Microprocessor components operate at different voltage levels and at extremely low current levels. Improper use of voltmeters, jumper wires, continuity testers, etc. could permanently damage the processor.

CAUTION

Most electronic components are susceptible to damage caused by electrical static discharge (ESD). In certain cases, the human body can have enough static electricity to cause resultant damage to the components by touch. This is especially true of the integrated circuits found on the truck/trailer microprocessor.

Auto-Start

Your refrigeration unit is equipped with Auto-Start in both Start−Stop and Continuous Run modes. The unit may start at any time when the Start/Run−Off Switch (SROS) is in the Start/Run position. A buzzer will sound for 5 seconds before the unit is started. When performing any check of the refrigeration unit (e.g., checking the belts, checking the oil), make certain that the SROS is in the OFF position.

Engine Coolant

The engine is equipped with a pressurized cooling system. Under normal operating conditions, the coolant in the engine and radiator is under high pressure and is very hot. Contact with hot coolant can cause severe burns. Do not remove the cap from a hot radiator. If the cap must be removed, do so very slowly in order to release the pressure without spray.

Refrigerants

The refrigerant contained in the refrigeration system of your unit can cause frostbite, severe burns, or blindness when in direct contact with the skin or eyes. For this reason, and because of legislation regarding the handling of refrigerants during system service, we recommend that whenever your unit requires service of the refrigeration system you contact your nearest Carrier Transicold authorized repair facility for service.

Battery

This unit is equipped with a lead-acid type battery. The battery normally vents small amounts of flammable hydrogen gas. Do not smoke when checking the battery. A battery explosion can cause serious physical harm and/or blindness.

1.2 SPECIFIC WARNING AND CAUTION STATEMENTS

To help identify the label hazards on the unit and explain the level of awareness each one carries, an explanation is given with the appropriate consequences:

DANGER − warns against an immediate hazard which WILL result in severe personal injury or death.

WARNING − warns against hazards or unsafe conditions which COULD result in severe personal injury or death.

CAUTION − warns against potential hazard or unsafe practice which could result in minor personal injury, or product or property damage.

The statements listed below are specifically applicable to this refrigeration unit and appear elsewhere in this manual. These recommended precautions must be understood and applied during operation and maintenance of the equipment covered herein.

WARNING

Be aware of HIGH VOLTAGE supplied by the generator as the unit may start automatically. Before servicing the unit, make sure the START/RUN–OFF switch is in the OFF position. Also disconnect the negative battery cable. NEVER dis–assemble the generator: HIGH MAGNETIC FIELD INSIDE!

WARNING

Under no circumstances should ether or any other starting aids be used to start engine.

WARNING

When performing service and/or maintenance procedures, make certain the unit is disconnected from the power source and that the RS is in OFF position so that it is impossible for the unit to start up automatically during the maintenance operation.

WARNING

Make sure the power plug is clean and dry before connecting to any electrical outlet/receptacle.

WARNING

Do not connect to any electrical outlet without checking that it meets the 460/3/60 and 30 Amp electrical requirements.

WARNING

Always place RS in the OFF position and turn off the high voltage power supply before disconnecting the high voltage power plug from the unit.

WARNING

Do not place the Start/Run–OFF Switch (RS) in the Start/Run position or the unit will start.

WARNING

Do Not Allow Jumper Wire To Touch Any Ground.

WARNING

Voltage will be applied to high voltage components (i.e. the fan motor contactor) and those components will operate (i.e. the fan blades will turn) when those components are energized and the unit is in standby operation and using component test mode.

WARNING

Carefully protect eyes from solvent.

WARNING

Do not direct water or steam into the generator openings. Do not allow any soap and water solutions to enter the generator.

WARNING

High voltage (dielectric) testing must not be performed to the machine without first observing NEMA rules. The insulation of this generator winding may be safely checked by using a megohm meter. A high reading indicates good insulation.

WARNING

Relieve internal pressure of replacement compressor by slightly loosening the bolts of both service valve flanges/blank valve pads and then lightly tapping the center of the valve flanges/pads with a soft mallet to break the seal.

WARNING

Do not use a nitrogen cylinder without a pressure regulator. Cylinder pressure is approximately 159.9 Bars (2350 PSIG). Do not use oxygen in or near a refrigerant system as an explosion may occur. (See Figure 8–32)

WARNING

The Compressor Discharge Pressure Transducer does not have a Schrader valve in the connecting fitting. Any discharge pressure remaining in the compressor will be released when removing the CDP.

WARNING

Carrier Transicold does not recommend allowing the compressor to pull less than 0 Bar/PSIG at any time.

CAUTION

Service Mode MUST be used whenever removing refrigerant charge, refrigerant leak checking or evacuating.

CAUTION

The display and MessageCenter may behave differently during the software loading process, depending on the version of software currently in the controller. DO NOT INTERRUPT THE SOFTWARE INSTALLATION PROCESS ONCE IT HAS STARTED.

CAUTION

It is important that communications between the Micro and the computer are not disturbed during the software loading process. If using a laptop computer, turn all energy saving features off. Turn off any screen saver, or any hard drive time out settings.

CAUTION

Be certain that the clock you are using is accurate. Also, some customers are located in different time zones from the repair location. If you know the repair location time zone, enter that time. If you don't, enter your current time.

CAUTION

Use only Carrier Transicold approved Polyol Ester Oil (POE). Buy quantities of one quart or less. When using this hygroscopic oil, immediately reseal. Do not leave container of oil open or contamination will occur.

CAUTION

Unit uses R404A and POE oil. The use of inert gas brazing procedures is mandatory for all Carrier Transicold refrigeration units; otherwise compressor failure will occur. For more information Refer to Technical Procedure 98-50553-00 Inert Gas Brazing

CAUTION

Use only ethylene glycol anti-freeze (with inhibitors) in system as glycol by itself will damage the cooling system. Always add pre-mixed 50/50 anti-freeze and water to radiator/engine. Never exceed more than a 60% concentration of anti-freeze. Use a low silicate anti-freeze meeting GM specifications GM 6038M for standard life coolant or use Texaco Havoline extended life coolant or any other extended life coolant which is Dexcool approved and has 5/150 (5 years/150,000 miles) on the label.

CAUTION

When changing oil filters, the new filters should be primed (partially filled) with clean oil if possible. If the filters are not primed, the engine may operate for a period with no oil supplied to the bearings.

CAUTION

The mica shim must be used during disassembly of the generator from the engine. Never attempt to remove the rotor from the stator. Leave the shim in place until the generator is re installed on the engine.

CAUTION

Extreme care must be taken to ensure the manifold common connection remains immersed in oil at all times; otherwise, air and moisture will be drawn into compressor.

CAUTION

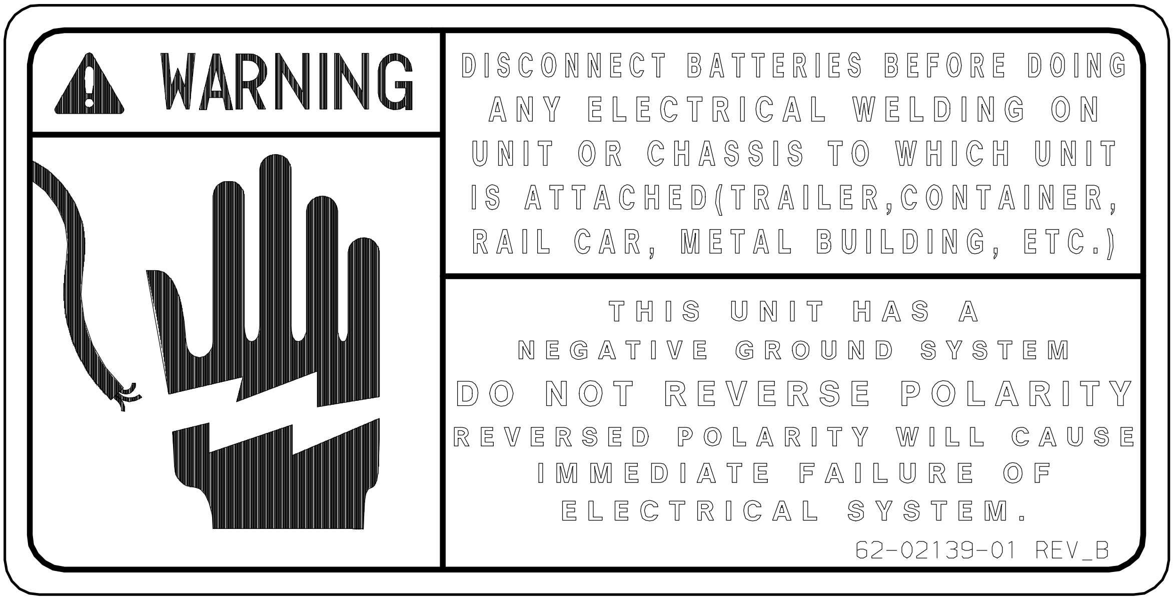
Do not vapor charge R404a systems. Only liquid charging through the receiver outlet (King) valve is acceptable.

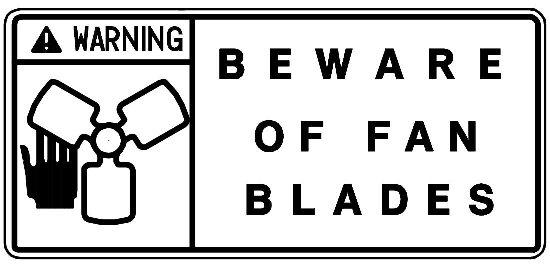
CAUTION

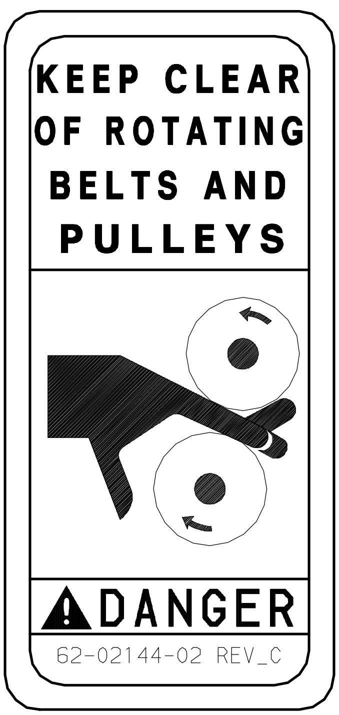
The +5.0 VDC (terminal B) is common between the Compressor Discharge Pressure Transducer, the Compressor Suction Pressure Transducer, and the RPM sensor. If this circuit is shorted to ground (due to one of the mentioned components being defective, or a worn wire) the MessageCenter will show:

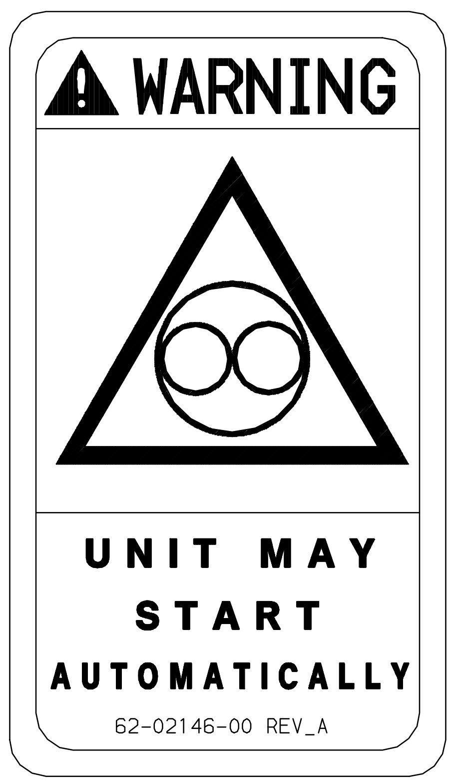
Suction Pressure: −29.9inHg (−1 Bar)
Discharge Pressure: 0 Bar/PSIG
Engine RPM: 0.

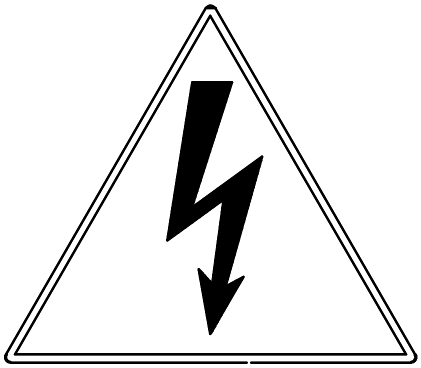
1.3 SAFETY DECALS



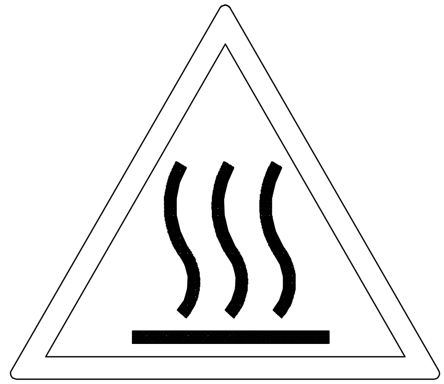




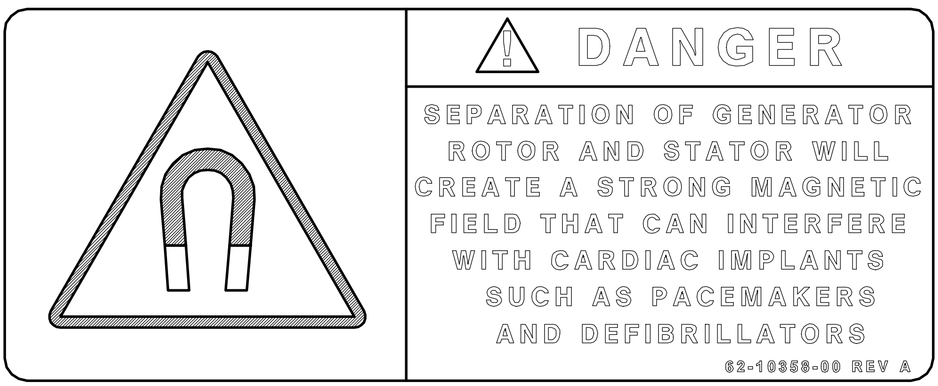


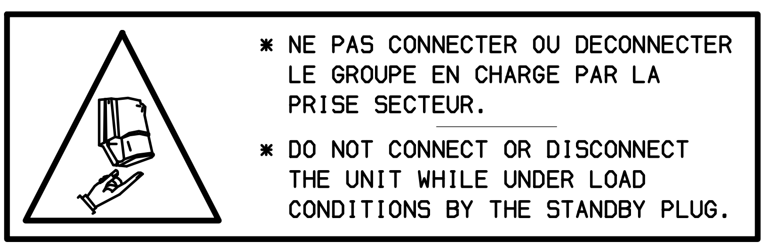


62−03957−01 High Voltage



62−03958−00 Heat Warning





62−60280−00 Standby Safety

SECTION 2

UNIT DESCRIPTION

2.1 INTRODUCTION

WARNING

Be aware of HIGH VOLTAGE supplied by the generator as the unit may start automatically. Before servicing the unit, make sure the START/RUN−OFF switch is in the OFF position. Also disconnect the negative battery cable. NEVER dis−assemble the generator: HIGH MAGNETIC FIELD INSIDE!

This manual contains operating data, electrical data and service instructions for the Vector 1800MT refrigeration system.

Additional support manuals are listed in Table 2-3.

The model/serial number plate is located inside the unit on the frame as shown in Figure 2-2.

Table 2-1. Model Chart

Models	Description	R-404A		Compressor	Engine	Engine Speed	
		LB	KG			High	Low
NDP33GN6HBV2	**2 Comp.**	19	8.3	06D 41cfm	V2203−DI−E2B	1850	1450
NDP33GN6HBV3	**3 Comp.**	19	8.3				

Table 2-2. Compartment Configurations

Description	Available Configurations	Compartment No.	Description of Configuration
2 Comp.	1	2	2200 Single Disch.
	2	2	2200 Dual Discharge
	3	2	1100 Single Disch.
	4	2	1100 Dual Disch.
3 Comp.	5	2	1100 Single Disch
		3	1100 Dual Discharge
	6	2	1100 Dual Discharge
		3	
	7	2	1100 Single Discharge
		3	
	13	2	2200 Single Discharge
		3	1100 Single Discharge
	14	2	2200 Dual Discharge
		3	1100 Dual Discharge
	15	2	2200 Dual Discharge
		3	1100 Single Discharge
	16	2	2200 Single Discharge
		3	1100 Dual Discharge

Table 2-3. Additional Support Manuals

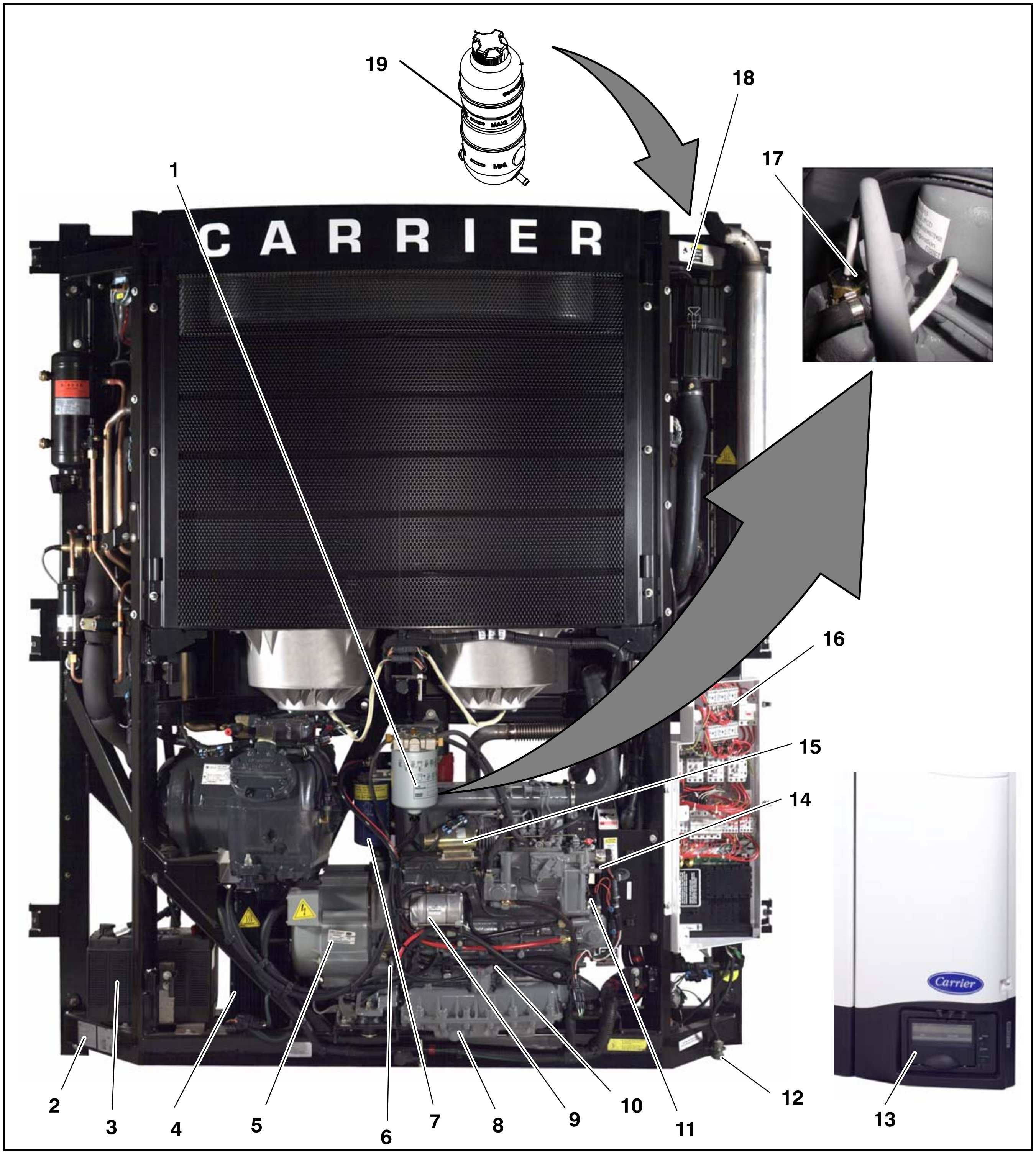
Manual Number	Equipment Covered	Type of Manual
62–11038	Vector 1800MT & 06D Compressor	Service Parts List
62–11040	Vector 1800MT	Operator's Manual
62–11041	Vector 1800M	Easy To Run
62–11095	CT4-134DI-E2B Engine	Parts List
62–10865	CT4-134DI-E2B Engine	Workshop Manual

2.2 GENERAL DESCRIPTION

The VECTOR 1800MT unit is a hybrid diesel/electric, fully charged, pre-wired, refrigeration/heating "nosemount" unit used in conjunction with one or two remote evaporators. The unit is used on insulated trailers to maintain cargo temperatures within very close limits.

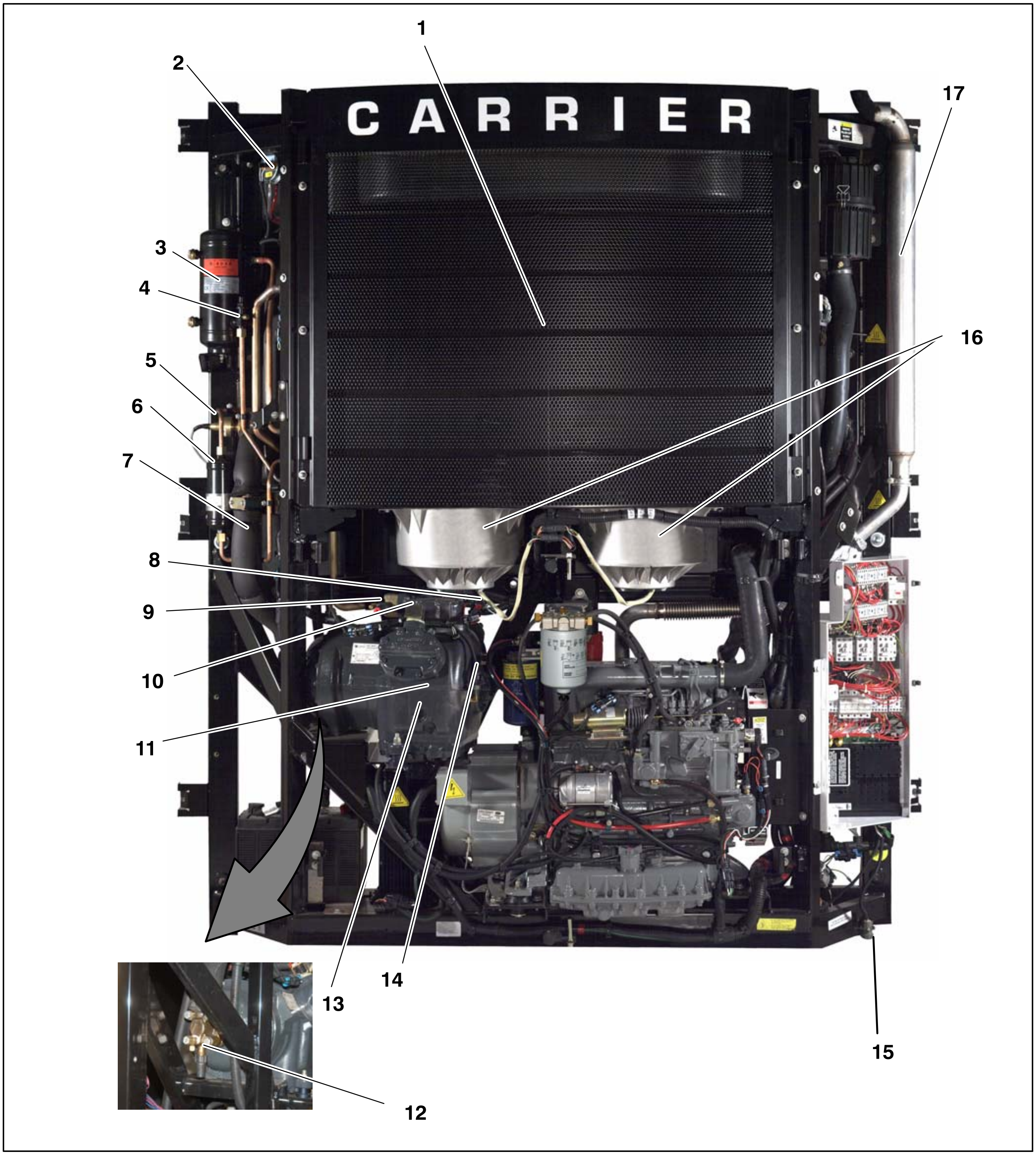
Electrical power is supplied to the unit from a power plug or by the diesel engine / A-C generator which is driven by the engine. The generator provides nominal 480V/3Ø/60Hz power when the engine is in high speed and nominal 300V/3Ø/45Hz in low speed .

The control system is a microprocessor controller. Once the controller is set at the desired temperature, the system automatically selects cooling and heating cycles as necessary to maintain the desired temperature within very close limits.



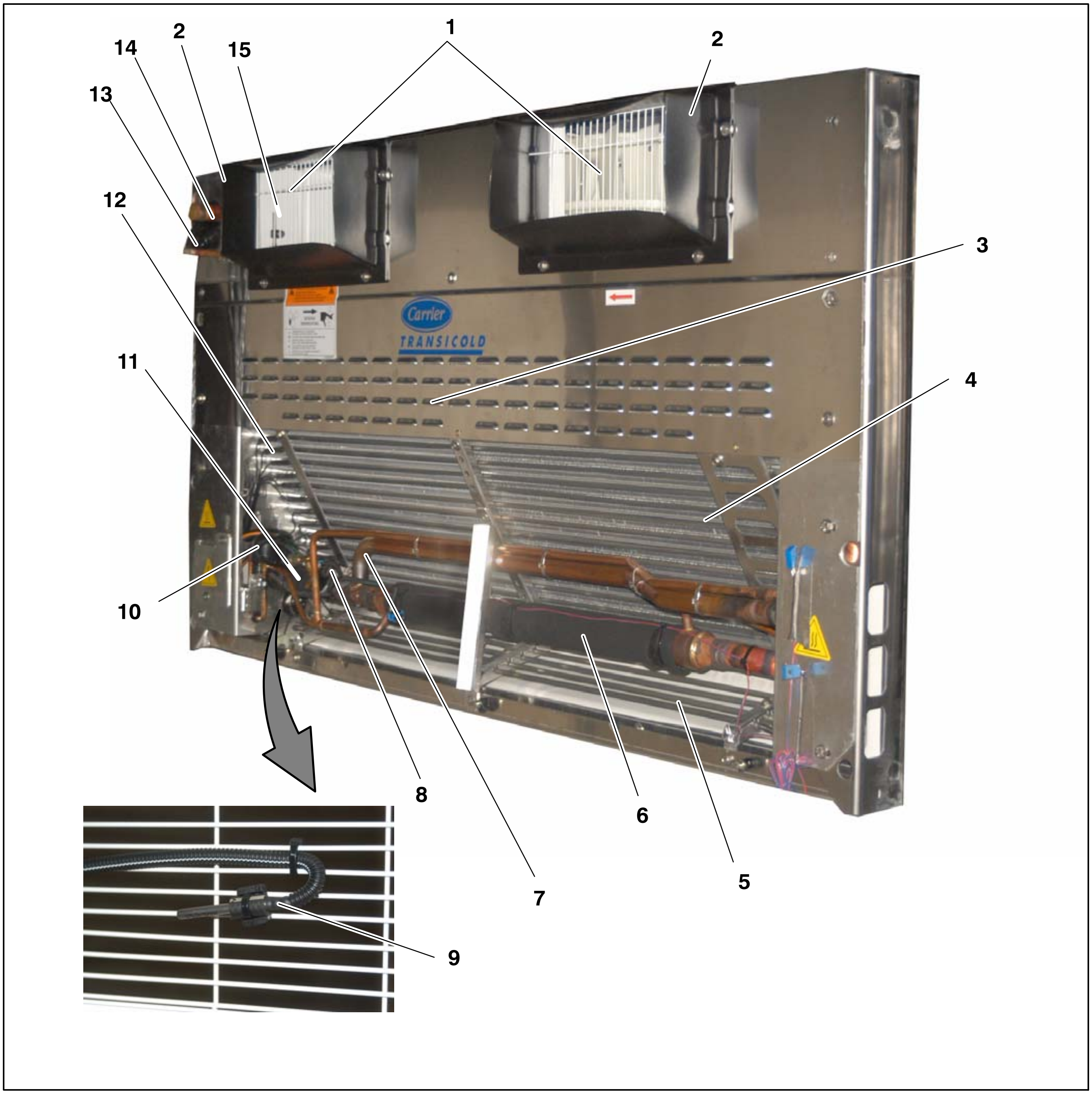
1. Fuel filter
2. Model/Serial number nameplate
3. Battery
4. Battery charger
5. Generator
6. Engine RPM (ENRPM)
7. Lube oil filter
8. Oil drain
9. Starter motor
10. Lube oil fill & dipstick
11. Engine oil pressure switch (ENOPS)
12. Download Port
13. Display and Keypad
14. Fuel solenoid (FS)
15. Speed control solenoid (SCS)
16. Control box
17. Engine coolant temperature (ENCT)
18. Air cleaner
19. Coolant bottle

Figure 2-1. Front View



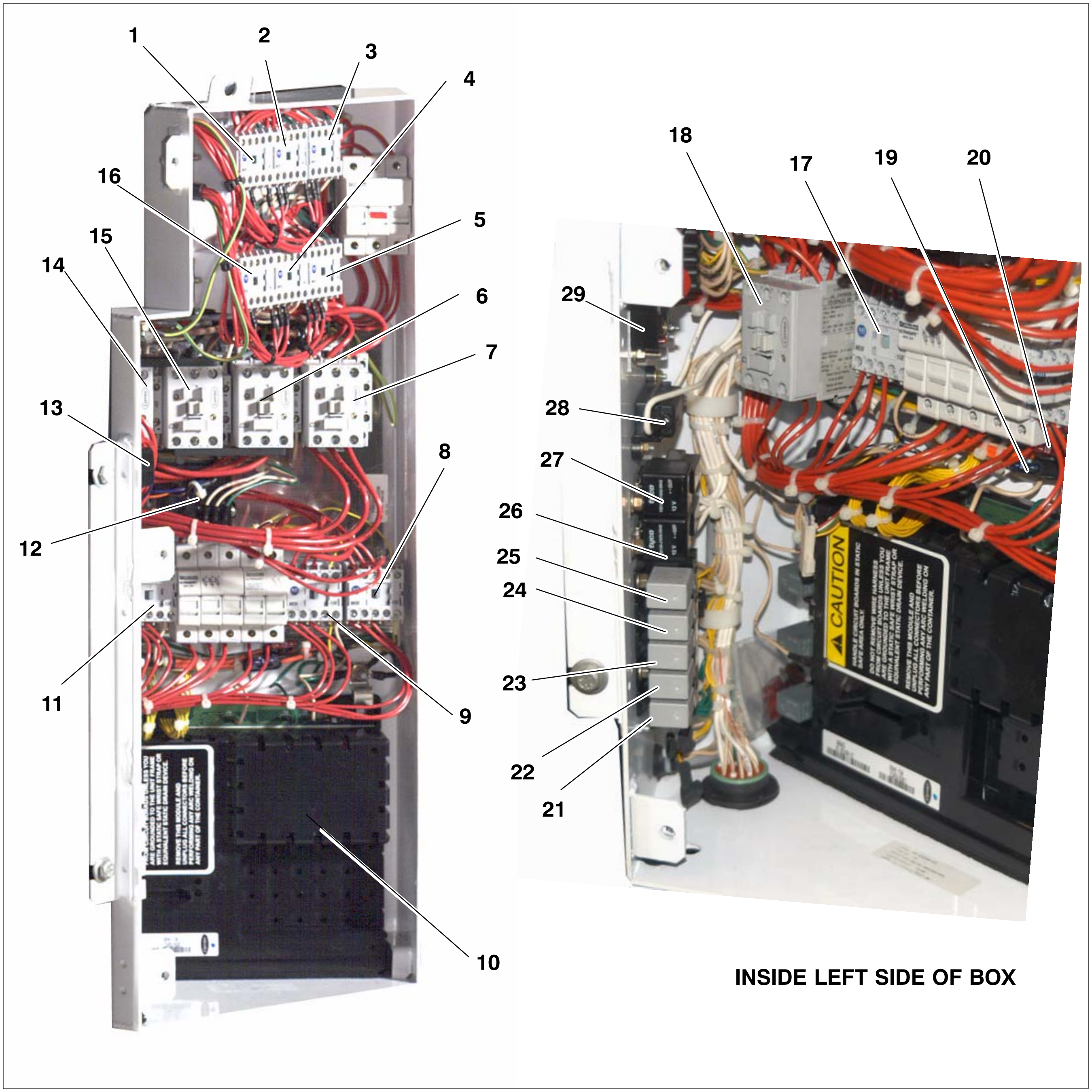
1. Condenser/Radiator
2. Defrost air switch (DAS)
3. Receiver and sight glasses
4. Shutoff (King) valve
5. Compressor suction modulation valve (CSMV)
6. Filter drier
7. Compressor suction temperature (CST)
8. Discharge pressure transducer (CDP), High pressure switch (HP1)
9. Discharge service valve
10. Front unloader solenoid valve
11. Compressor, Compressor discharge temperature (CDT), Rear unloader solenoid, Compressor electrical box (Located on rear of compressor)
12. Suction service valve
13. Compressor sight glass
14. Suction pressure transducer (CSP)
15. Power Supply Receptacle (PSR)
16. Condenser fan and motor
17. Muffler

Figure 2-2. Front View



1. Evaporator fans and motors
2. Nozzle cover
3. Defrost termination thermostat sensor (1DTT)
4. Evaporator Coil
5. Drain pan heater
6. Heat Exchanger
7. Remote suction and liquid lines
8. Evaporator outlet pressure sensor (EVOP
9. Return air thermistor sensor (1RAT)
10. Electronic expansion valve (EVXV)
11. Evaporator outlet temperature sensor (EVOT)
12. Electric heaters
13. Remote evaporator liquid line connection
14. Remote evaporator suction line connection
15. Supply air temperature sensor (1SAT)

Figure 2-3. Evaporator Section – Grille Removed



1. Compartment 2 evaporator contactor (2EVCON)
2. Compartment 2 heater contactor 1 (2HTCON1)
3. Compartment 2 heater contactor 2 (2HTCON2)
4. Compartment 3 heater contactor 1 (3HTCON1)
5. Compartment 3 heater contactor 2 (3HTCON2)
6. Generator contactor (GENCON)
7. Compressor contactor (CCON)
8. Condenser motor contactor (CDCON)
9. Compartment 1 evaporator contactor (1EVCON)
10. Microprocessor
11. Compartment 1 heater contactor 2 (HTCON2)
12. (OGF)
13. Transformer
14. Power source contactor (PSCON)
15. Power source contactor 2 (PSCON2)
16. Compartment 3 evaporator contactor (3EVCON)
17. Compartment 1 heater contactor 2 (HTCON2)
18. Compartment 1 heater contactor 1 (HTCON1)
19. Microprocessor power fuse (F6)
20. Contactor power fuse (F9)
21. Run control relay (RCR)
22. Power supply contactor relay (PSCONR)
23. Generator contactor relay (GENCONR)
24. Heat contactor 1 relay evaporator 1 (HTCONR1)
25. Compressor contactor relay (CCONR)
26. Glow plug relay (GPR)
27. Starter solenoid relay (SSR)
28. Main fuse (F5)
29. Phase reversal module

Figure 2-4. Control Box

2.3 CONDENSING SECTION

The condensing section (Figure 2-2) consists of an engine–compressor drive package, condenser fan, condenser/radiator coil, refrigerant controls, piping, wiring, defrost air switch, and associated components.

The drive equipment includes the engine, generator, air cleaner, muffler, coolant overflow bottle, and drive belts.

Refrigeration components mounted in the condensing section include: the compressor, defrost air switch, suction modulation valve, filter drier, and receiver.

2.3.1 Condenser Coil

The condenser coil is of the tube in fin type and acts as a heat exchanger in which the compressed refrigerant gas is condensed into a liquid and lowered in temperature. Air movement over the condenser is provided by a two electric motor driven fans mounted in the condensing section.

2.3.2 Engine

The engine (Refer to Section 2.9) gives excellent fuel economy and has easy starting characteristics. It is equipped with spin-on lube oil and fuel oil filters for easier filter changes.

Engine Transducers and Sensors:

a. Engine RPM Sensor (ENRPM)

Provides micro with engine rpm information to be displayed and recorded in the data recorder. It is located on the front of the engine near the generator.

b. Engine Oil Pressure Switch (ENOPS)

This normally open switch allows the engine to operate when oil pressure is above 15 $\pm$ 3 PSIG (1.02 $\pm$ 0.2 Bars). The switch will close and automatically stop the engine when pressure drops below 12.3 $\pm$ 3 PSIG (0.84 Bar). There is a 15 second delay after the engine starts to allow the oil pressure to build up before the microprocessor looks at the input from this switch. The switch is located on the front of the engine below the fuel solenoid.

c. Engine Oil Level Switch (ENOLS) (Optional)

ENOLS sets off Alarm when oil level is low. Located on the oil pan next to the oil fill.

d. Engine Coolant Temperature Sensor (ENCT)

Provides micro with engine coolant temperature information to be displayed and recorded in the data recorder . The sensor is located on the starter side of the engine near the #4 Injector.

e. Engine Coolant Level Sensor (ENCLS) (Optional)

Sets off Alarm when coolant level is low. Located in the coolant bottle.

2.3.3 Compressor

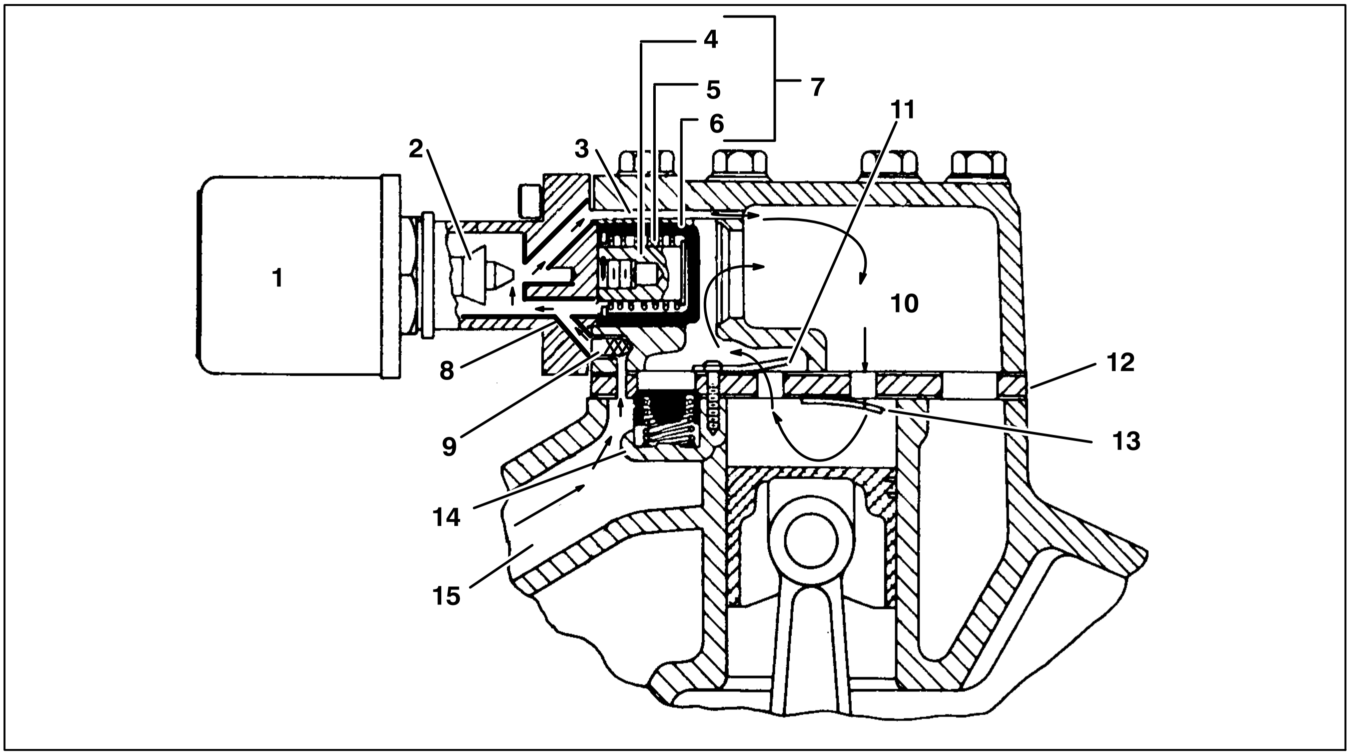
The compressor assembly includes the refrigerant compressor, suction and discharge service valves, high pressure switch, compressor discharge thermistor and the suction and discharge pressure transducers. The compressor draws refrigerant gas from the evaporator and delivers it to the condenser at an increased temperature and pressure. The pressure is such that refrigerant heat can be absorbed by the surrounding air at ambient temperatures.

Compressor Unloaders

The refrigeration compressor used is a 41cfm model 06D, equipped with unloaders as standard equipment. Unloaders are used as a compressor capacity control to unload the compressor during periods of reduced loads. This provides closer temperature control, reduces potential for top freezing and reduces power required to operate the compressor; thus reducing fuel consumption.

a. Major Working Parts

1. Solenoid and valve system
2. Spring loaded piston type bypass control valve
3. Spring loaded discharge check valve



1. Solenoid Valve
2. Valve Stem
3. Gas Bypass Port
4. Spring Guide
5. Spring
6. Piston
7. Piston Bypass Valve
8. Bleed Orifice
9. Strainer
10. Suction Manifold
11. Cylinder Discharge Valve
12. Valve Plate
13. Cylinder Suction Valve
14. Discharge Piston Check Valve Assembly
15. Discharge Manifold

Figure 2-5. Compressor Cylinder Head Unloaded

b. Unloaded Operation

Pressure from the discharge manifold (Figure 2-5, item 15) passes through the strainer (9) and bleed orifice (8) to the back of the piston bypass valve (7). Unless bled away, this pressure would tend to close the piston (6) against the piston spring (5) pressure.

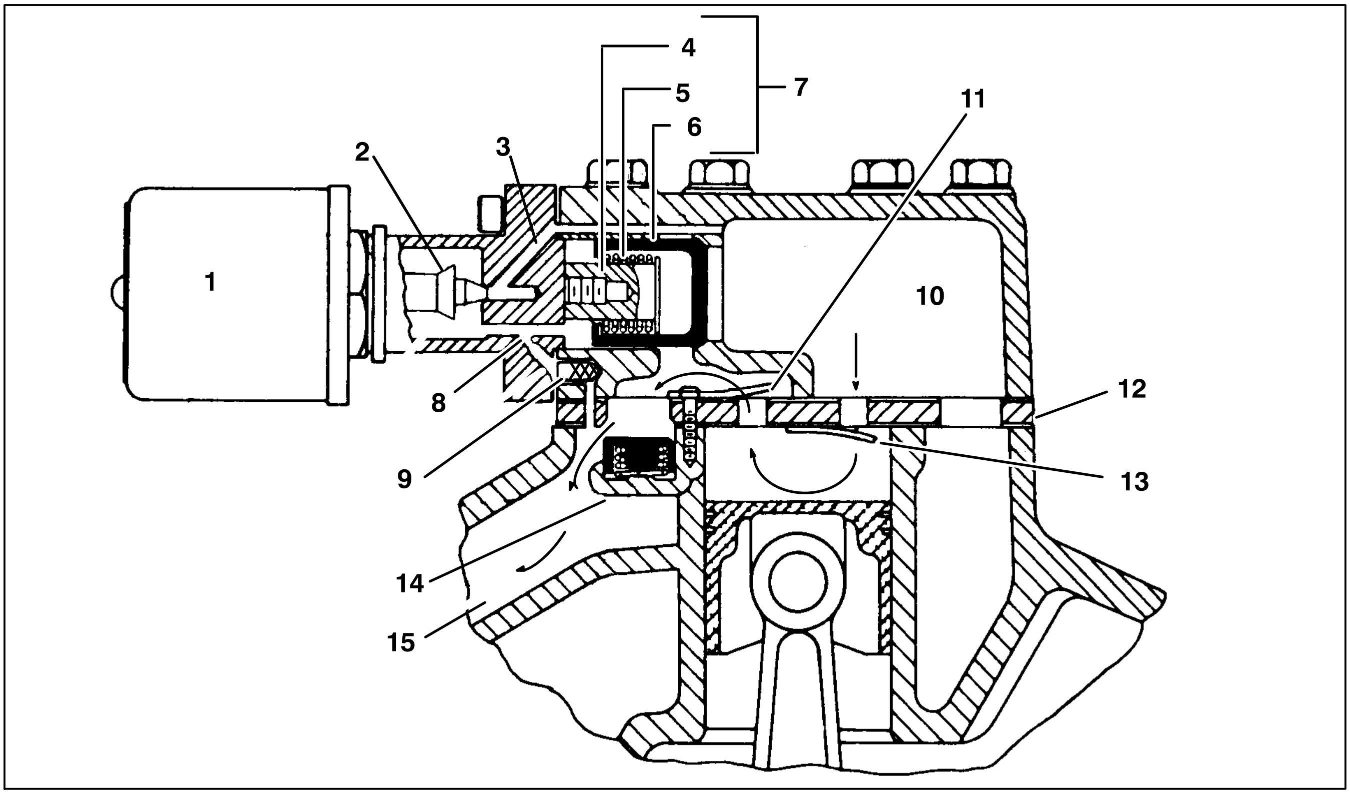
With the solenoid valve (1) *energized* the solenoid valve stem (2) will *open* the gas bypass port (3).

Refrigerant pressure will be bled to the suction manifold (10) through the opened gas bypass port . A reduction in pressure on the piston bypass valve will take place because the rate of bleed through the gas bypass port is greater than the rate of bleed through the *bleed orifice* (8)**.**

When the pressure behind the piston has been reduced sufficiently, the valve spring will force the piston bypass valve *back*, *opening* the gas bypass from the discharge manifold to the suction manifold.

Discharge pressure in the discharge manifold will close the discharge piston check valve assembly (14) isolating the compressor discharge manifold from the individual cylinder bank manifold.

The *unloaded* cylinder bank will continue to operate *fully unloaded* until the solenoid valve control device is *de-energized* and the gas bypass port is closed.



1. Solenoid Valve
2. Valve Stem
3. Gas Bypass Port
4. Spring Guide
5. Spring
6. Piston
7. Piston Bypass Valve
8. Bleed Orifice
9. Strainer
10. Suction Manifold
11. Cylinder Discharge Valve
12. Valve Plate
13. Cylinder Suction Valve
14. Discharge Piston Check Valve Assembly
15. Discharge Manifold

Figure 2-6. Compressor Cylinder Head Loaded

c. Loaded Operation

Discharge pressure bleeds from the discharge manifold (Figure 2-6, item 15) through the strainer (9) and (8) bleed orifice to the solenoid valve stem (2) chamber and the back of the piston bypass valve (7).

With the solenoid valve (1) *de-energized* the solenoid valve stem will *close* the gas bypass port (3).

Refrigerant pressure will overcome the bypass valve spring (5) tension and force the piston (6) *forward closing* the gas bypass from the discharge manifold to the suction manifold (10).

Cylinder discharge pressure will force open the discharge piston check valve assembly (14). Refrigerant gas will pass into the compressor discharge manifold.

The loaded cylinder bank will continue to operate fully loaded until the solenoid valve control device is energized and the gas bypass port is opened. Refer to Section 4.4.7 for more information on Loaded Operation.

2.3.4 Filter Drier

The drier is a cylinder shell containing a drying agent and screen. It is installed in the liquid line and functions to keep the system clean and remove moisture from the refrigerant.

2.3.5 Receiver

Liquid refrigerant from the condenser drains into the receiver. The receiver serves as a liquid reservoir when there are surges due to load changes in the system; as a storage space when pumping down the system and as a liquid seal against the entrance of refrigerant gas into the liquid line.

The receiver is provided with two bull's−eye sight glasses, for the observation of liquid level, and a pressure relief valve.

2.3.6 Transducers and Sensors

a. Compressor Suction Pressure Transducer (CSP)

Provides micro with suction pressure information to be displayed, recorded in the data recorder and used to control the refrigeration system. It cannot be calibrated. It is located near the oil pump on the compressor.

b. Compressor Discharge Pressure Transducer (CDP)

Provides micro with discharge pressure information to be displayed, recorded in the data recorder and used to control the refrigeration system. It can be calibrated. It is located on the center cylinder head of the compressor.

c. Compressor Discharge Temperature Sensor Transducer (CDT)

Provides micro with discharge temperature information to be displayed, recorded in the data recorder and used to control the refrigeration system. It is located on the center cylinder head of the compressor.

d. Compressor Suction Modulation Valve (CSMV)

The CSMV opens and closes as required for capacity control of the refrigeration system cooling cycle. It is located in the suction line at the exit of the evaporator pod.

e. Compressor Suction Temperature Sensor (CST)

Provides micro with suction temperature information to be displayed, recorded in the data recorder and used to control the refrigeration system. It is located on the suction line near the filter drier.

f. Ambient Air Temperature Sensor (AAT)

AAT is a temperature control probe which provides micro with ambient air temperature information to be displayed, recorded in the data recorder and used to control the refrigeration system. It is located behind the condenser grille.

2.4 COMPARTMENT 1 EVAPORATOR SECTION

The main evaporator fits into a rectangular opening in the upper portion of the trailer or rail car front wall. When installed, the evaporator section is located inside this refrigerated compartment, and the condensing section is outside.

The main evaporator assembly consists of an evaporator coil, evaporator fan motors, electronic expansion valve, evaporator coil heaters, heat exchanger, defrost termination sensor and supply and return air sensors (See Figure 2-3) and high temperature safeties.

Heating is accomplished by electric evaporator coil heaters.

Automatic evaporator coil defrosting is initiated by either sensing the air pressure drop across the coil with a differential air switch or with the defrost timer in the microprocessor.

2.4.1 Electronic Expansion Valve (EVXV)

The electronic expansion valve is an electronic device which controls the flow of liquid to the evaporator according to changes in superheat to the refrigerant leaving the evaporator. The expansion valve maintains a relatively constant degree of superheat in the gas leaving the evaporator regardless of suction pressure. The valve has a dual function – automatic expansion control and prevention of liquid return to the compressor.

2.4.2 Heat Exchanger

The heat exchanger is of the tube in tube type connected in the main suction line and liquid line. Within the heat exchanger, the cold suction gas is used to cool the warm liquid refrigerant. This results in greater system capacity and efficiency.

2.4.3 Evaporator Coil

The unit evaporator is a tube in fin type. The operation of the compressor maintains a reduced pressure within the coil. At this reduced pressure, the liquid refrigerant evaporates at a temperature sufficiently low enough to absorb heat from the air.

2.4.4 Transducers and Sensors

a. Evaporator Outlet Pressure Transducer (EVOP)

Provides micro with evaporator outlet suction pressure information to be displayed, recorded in the data recorder and used to control the refrigeration system. It cannot be calibrated. It is located in the evaporator section near the electronic expansion valve in the suction line.

b. Evaporator High Temperature Switch (EVHTS)

EVHTS is a safety switch which turns off the electric heaters if the temperature in the evaporator compartment reaches 130°F (54.4°). It is located on the roadside evaporator support bracket above the coil.

c. Evaporator Outlet Temperature Sensor (EVOT)

Provides micro with evaporator outlet suction temperature information to be displayed, recorded in the data recorder and used to control the refrigeration system. It is located on the suction line near the electronic expansion valve and is wrapped with insulating tape.

d. Defrost Termination Temperature Sensor (1DTT)

1DTT is located on the center tube sheet of the evaporator section. It senses the temperature of the evaporator and allows defrost initiation once the temperature falls below 40°F (4.4°C)

e. Return Air Temperature Sensor (1RAT)

1RAT is a temperature control probe which provides micro with return air temperature information to be displayed, recorded in the data recorder and used to control the refrigeration system. It is located on roadside of the return air grille.

f. Supply Air Temperature Sensor (1SAT)

1SAT is a temperature control probe which provides micro with supply air temperature information to be displayed, recorded in the data recorder and used to control the refrigeration system. It is located on the supply air grille.

2.5 REMOTE EVAPORATOR(S)

The compartments of the MultiTemp system are equipped with separate evaporators.

For MultiTemp remote compartment applications single and dual air discharge evaporators are available. The evaporators are different in size, capacity and number of fans, but all work on the same principle and use the same three-phase 45Hz to 60Hz fan assembly.

The remote evaporator(s) consist of evaporator coil(s), evaporator fan motor(s), thermostatic expansion valve(s), defrost termination sensor(s), 12V liquid line solenoid(s), 12V water drain heater(s), evaporator coil heaters, return air and optional supply air sensor(s) and high temperature safeties.

The bottom section of the evaporator allows easy access to both the electrical and refrigeration hardware.

2.6 SYSTEM OPERATING CONTROLS AND COMPONENTS

The temperature controller is a Carrier Transicold Advance Microprocessor controller (Refer to Section 2.6.3 and 3). Once the controller is set at the desired temperature, the unit will operate automatically to maintain the desired temperature within very close limits.

The microprocessor controller consists of two modules − the control module and display and keypad module. The control box includes manual switches, microprocessor, fuses, and associated wiring.

Standard equipment includes an auto start−stop feature. This feature provides automatic cycling of the diesel engine, which in turn offers an energy efficient alternative to continuous operation of the engine with control of temperature by alternate cooling and heating of the supply air (evaporator outlet air).

2.6.1 Multiple Languages

Messages in the MessageCenter can be displayed in English, French or Spanish.

Press and hold = key for 6 seconds to view or change the current language selection. See Section 3.17 for more information on functional parameters.

2.6.2 Special Features

The following special features are incorporated into the Carrier Transicold Advance Microprocessor:

A MessageCenter which clearly displays all information in dot matrix form.

Unit Operation & Alarms are displayed in English (not in codes)

Large LCD Display

Unit Data and Functional Parameters

Programmable Maintenance Hour Meters

PM Hour Meters are resettable from the Keypad

Bright LED Alarm Light

Bright LED Mode Lights

Fully Automated Pretrip

Automated Micro Self−test

Data Recorder

Data Recorder date & time can be set from the Keypad

Auto Start−Stop

Trip Start to record date/time of trip in Data Recorder memory

PC card functionality for Downloading data, upgrade programming, and Configuration set up

FETs (Field Effect Transistors) for switching components on & off, and checking circuit current

Automatic or Manual Engine Starting

Functional Parameter locks

Alarms are stored in microprocessor memory for future reference

New Menu system to simplify keyboard and enhance functionality

2.6.3 Microprocessor Component Description And Location

The microprocessor controller consists of two modules – the control module (See Figure 2-7) and display and keypad module (See Figure 2-8). The control module is housed in the control box on the lower roadside (right) corner of the unit. This control module consists of a logic board and an input/output board. The control module contains externally accessible relays and fuses. The display and keypad module is located for driver access at the lower roadside corner of the unit.

The processor board in the control module includes the microprocessor, program memory and necessary input/output circuitry to interface with the unit. The microprocessor is totally self contained and does not contain any serviceable components.

The display board is mounted in the keypad and display module. The board includes the LCD display, keypad and keypad interface.

The keypad & display module provides the user with a panel to view and control the functions of the refrigeration unit. The module consists of a switch, keypad, MessageCenter, and Main Display. Setpoints and other system information are selected using the keypad. Figure 2-8 shows the display & keypad module.

CAUTION

Under no circumstances should anyone attempt to repair the Logic or Display Boards. Should a problem develop with either of these components, contact your nearest Carrier Transicold dealer for replacement.

a. Control Module

Figure 2-7 shows the Control Module. The Control Module has 3 relays and 4 fuses that are user accessible.

The PC card slot is also shown in Figure 2-7. This card slot is used with all Carrier Transicold PC Cards. The controller automatically detects the presence and type of PC Card inserted and responds accordingly. The different types of PC Cards are:

•Download Card for copying unit data from Data Recorder.

•Options PC Card for installing optional software programs

•Configuration PC Card for setting the Microprocessor Functions, Configurations and Data Recorder configurations.

•Program PC Card for upgrading the microprocessor software.

There are three LEDs associated with the function of the PC card slot. These are:

•A green Micro Status LED which will blink steadily once per second indicating that the microprocessor is operating and will blink every 0.5 seconds if there is no software or if it is loading software.

•A green (PC) Card Status LED which comes on when there is a PC card inserted in the slot. This LED will:

1. Blink every 0.5 seconds when data is being transferred to or from the PC Card, and Will be on steady when the operation is complete and the PC Card may be removed.
2. During Download, the light will blink once per second and will blink every 1.5 seconds when the Download is complete.

•A red (PC) Card Fault LED blinks if there is a problem transferring data from the PC card that has been plugged into the PC card slot. The red LED will continue to blink until the PC card is removed. The LED will also blink if there is an error reading the card. Check the MessageCenter for description of error.

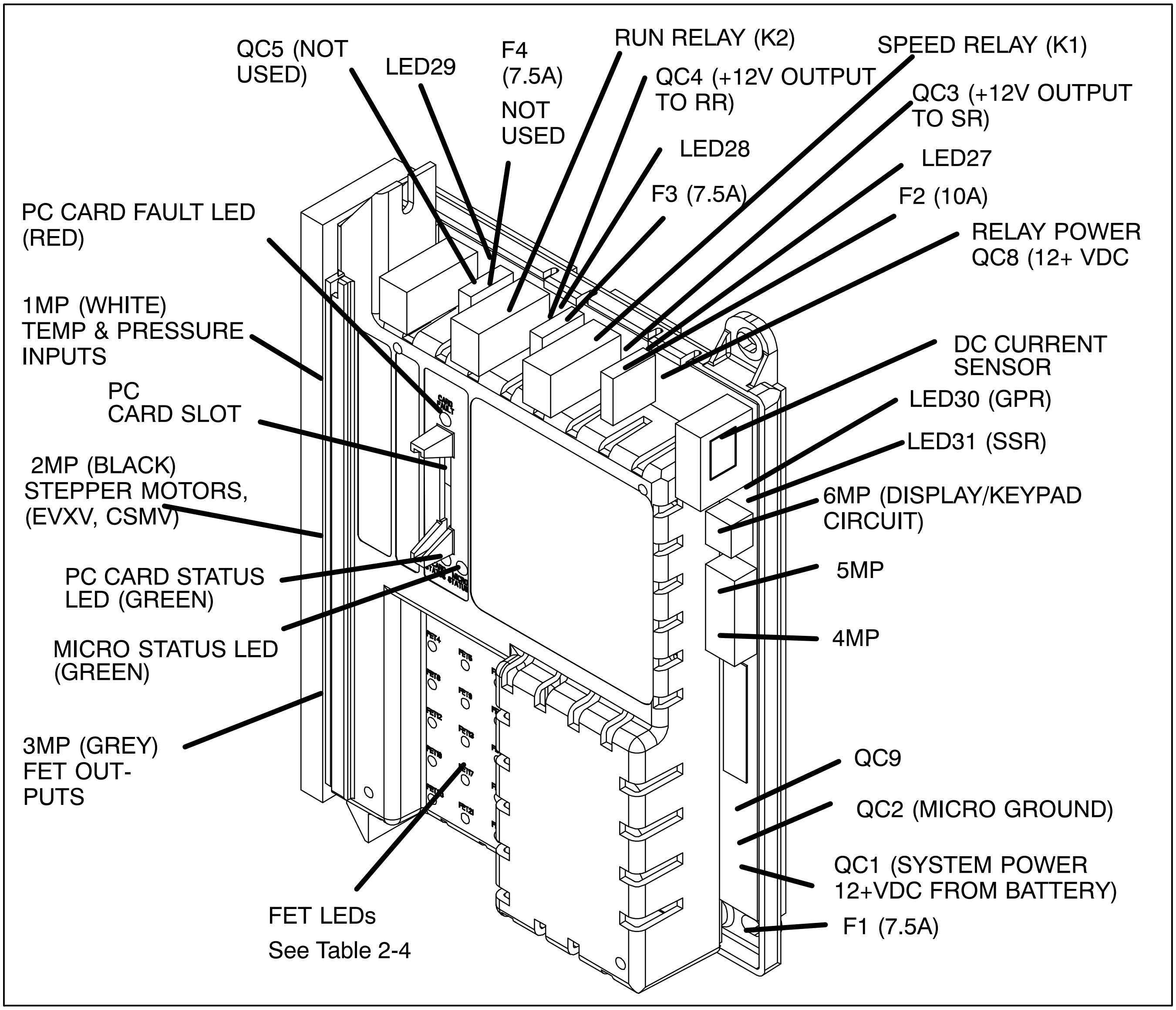
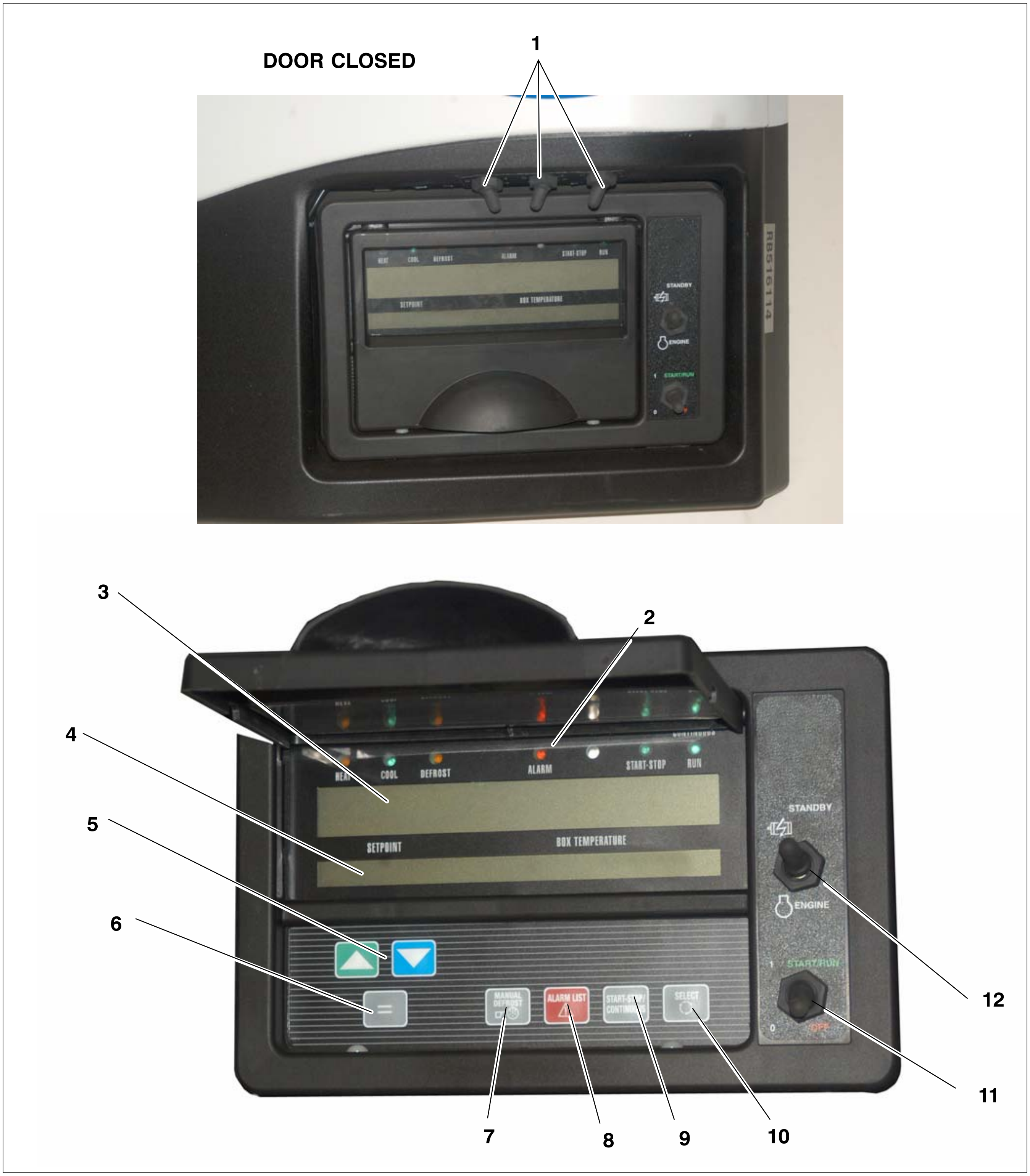


Figure 2-7. Control Module

Table 2-4. FIELD EFFECT TRANSISTORS (Transistors not listed are spares)

STANDARD	
FET	**DESIGNATION**
FET1	Condenser fan motor
FET2	Compressor contactor
FET3	Generator contactor
FET10	Heat contactor 1
FET18	Buzzer
FET19	Standby contactor
FET20	Evaporator motor
FET21	Heat contactor 2
FET22	Rear unloader
FET23	Front unloader
LIGHT BAR OPTIONS	
FET	**DESIGNATION**
FET7	Start−Stop/Continuous
FET8	Heat Light
FET14	Fault Light
FET15	Out−Of−Range Light
FET16	Defrost Light
FET17	Cool Light



1. Compartments ON/OFF switches
2. Mode lights
3. Main Display
4. MessageCenter
5. Up and Down arrow keys
6. Enter key
7. Manual defrost key
8. Alarm list key
9. Start/Stop−Continuous key
10. Select key
11. Start/Run−Stop switch (RS)
12. Standby/Engine switch

Figure 2-8. Display And Keypad

Display

The Main Display has 9 characters (7 seven−segment characters and 2 nine−segment characters), 2 decimal points, 2 commas, and a degree symbol. The display is used to provide the user setpoint and refrigerated compartment temperatures, either in degrees Centigrade or Fahrenheit. The comma symbols are used as the decimal indicators in Europe. When Metric Units is selected in the Functional Parameters, the two comma icons are used instead of decimal points. When English Units is selected in the Functional Parameters, decimal points are used.

Temperature display is right justified, with unused digits blank. A negative sign will be displayed for all setpoint and box temperatures below zero. A positive sign will be displayed for all setpoint and box temperatures above 0°F (−17°C). 0° will not have a sign in front of it.

Indicator LEDs

The display has six LEDs across the top to indicate operation status. These indicators are:

Cool Indicator (Green) − Turned on when the unit is in Cool Mode.

Heat Indicator (Amber) − Turned on when the unit is in Heat Mode.

Defrost Indicator (Amber) − Turned on when the unit is in Defrost Mode.

Start−Stop Indicator (Green) − Turned on when the Start−Stop Mode has been selected.

Continuous Indicator (Green) − Turned on when the Continuous Mode has been selected.

Alarm Indicator (Red) − Off or Flashes at a rate of 0.5 seconds.

NOTE

When the unit is in Null mode (fan only), the mode indicators (cool, heat and defrost) are all off.

NOTE

There is an opening between the Alarm and Start−Stop LEDs that is not used at this time.

MessageCenter

The MessageCenter is used to show messages. Details of the messages are described in Section 6.1 MessageCenter.

NOTE

Messages can be displayed in multiple languages. See Section 3.17 for Functional Parameter settings.

Switch Descriptions

a. ENGINE/STANDBY Switch (SS)

This switch is used to select mode of operation, either engine drive or standby electric motor drive. When this switch is placed in standby position, the electric motor will not start until the oil pressure safety switch (ENOPS) opens.

b. START/RUN−OFF Switch (RS)

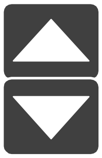
When placed in the **RUN** position, this switch provides power to the microprocessor. The microprocessor performs a self-test (all segments of display are illuminated). Then setpoint and Box Temperature are displayed.

To stop the unit or remove power from the microprocessor, move the RS to the OFF position.

c. REMOTE COMPARTMENT SWITCHES

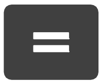
On/Off toggle switches located above the display. Placing a switch in the “ON” (I) position starts remote evaporator in that compartment.

Key Descriptions



UP ARROW and DOWN ARROW Keys

These keys allow you to change the setpoints or other displayed data of the system. They also allow you to scroll through the Unit Data List, Function Parameters List, Alarm List, etc.



EQUAL Key (ENTER)

The EQUAL key is used for many things including entering a setpoint, changing a Functional Parameter, clearing alarms, and locking the data menu.

MANUAL DEFROST Key

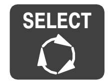
The MANUAL DEFROST key is used to initiate a defrost cycle when the proper conditions are met.

ALARM LIST Key

The ALARM LIST key allows you to view the alarms stored in the microprocessor. The alarm list is displayed in the MessageCenter. Pressing the ALARM LIST key once displays the active alarm list. Each successive press cycles through the list to the end. To view the inactive alarm list, Refer to Section 3.14.

START−STOP/CONTINUOUS Key

This key allows you to change from Start−Stop operation to Continuous Run operation. In Start−Stop operation, when the controller is in Off−Cycle mode, the unit will not be running. During Off−Cycle mode, the microprocessor monitors box temperature, battery voltage and engine coolant temperature and will restart the unit when needed.



SELECT Key

Press the SELECT key to scroll through the menu selections. One of the five standard and 1 optional menu selections will appear in the MessageCenter when the SELECT key is pressed. These are: TO VIEW HOURMETERS, TO START PRETRIP, TO VIEW DATA, TO VIEW SETTINGS, TO MARK TRIP START or TO VIEW PRINT MENU, or one optional selection −TO VIEW INTELLISET. Repeated pressing of the SELECT key will sequence the menu through these selections. The menu wraps around. Press the SELECT key until the desired menu selection appears in the MessageCenter.

The five standard selections are:

•**TO VIEW HOURMETERS**− Displays the hours for individual hour meters. Refer to Section 3.16.

•**TO VIEW PRETRIP** − Used to initiate a pretrip. Refer to Section 3.5.

•**TO VIEW DATA** − Displays Unit Data. Refer to Section 3.15.

•**TO VIEW SETTINGS** − Displays unit Functional Parameter settings. Refer to Section 3.17.

•**TO MARK TRIP START** − This menu selection is only used with the Data Recorder. It is used to record a Trip Start event which is logged in the Data Recorder. This records the time and date of the beginning of the trip. Data can then be downloaded and reviewed by trip, making data review much easier. Refer to Section 3.12.

•**TO VIEW PRINT MENU** − Enables the user to use hand−held Strip Print printer kit P/N 12−00543−10.

The optional selection is:

•**TO VIEW INTELLISET** − Refer to Section 3.21.1.

2.7 ELECTRONIC MODULES

2.7.1 Overload Ground Fault Module (OGF)

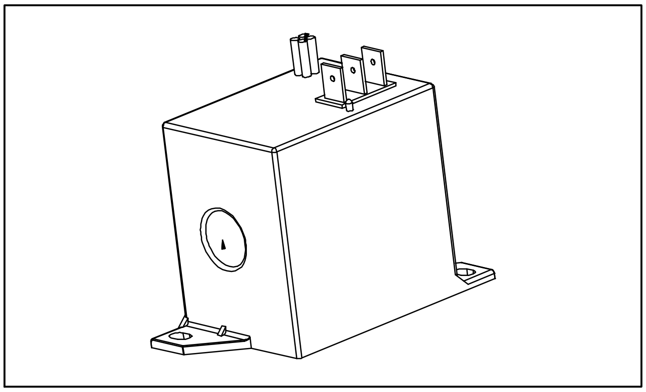


Figure 2-9. OGF Module

The OGF is located in the control box on the relay panel assembly. The module has two electrical safety features in diesel and standby modes:

1. Overload protection function – Overload break current = 40A
2. Ground leakage current protection – ground leakage break current – 150mA

For each case, A100 “OVERLOAD GROUND FAULT” is activated and the unit shuts down.

In case of ground leakage detection, the red LED on the OGF module will be on continuously.

2.7.2 Phase Reversal Module (PRM)

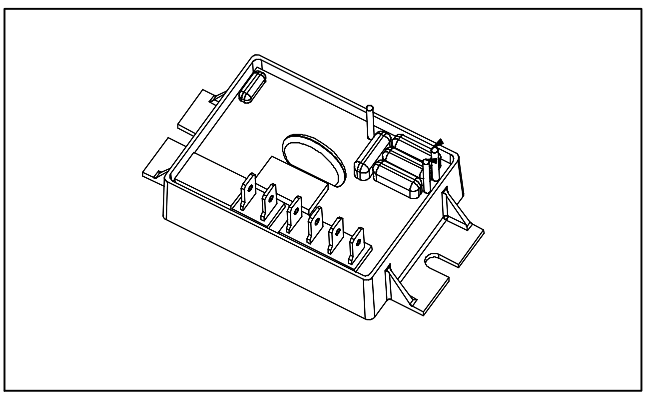


Figure 2-10. PRM Phase Reversal Module

The PRM phase reversal module is located in the control box on the standby panel assembly.

In standby mode, the phase reversal module checks the electrical phase and reverses if necessary.

2.8 OPTIONS

2.8.1 Light Bar

The Light Bar is an external set of indicator lights which can be seen in the mirror from the cab of the tractor. They are controlled by the microprocessor. The green LED indicates “STATUS OK”. The amber LED indicates “CHECK UNIT”. Amber follows the microprocessor fault light and alarms can be read on the micro display.

2.8.2 Door Switch(es)

A two compartment unit has provisions to connect a Door Switch (DS) directly to the microprocessor. (This provision is not available for three compartment units.)

The microprocessor will recognize switches with contacts that are either open when the door is open, or that are closed when the door is open. Additionally, the Configuration List gives you the ability to determine whether the switch will: enable the alarm only, enable the alarm and also shut the unit down, enable the alarm and put the unit into low speed while the door is open, or to have no alarm and only record door openings & closings in the data recorder.

If the Door Switch is configured to shut the unit down when the door is open, the unit will shut down for a minimum of 3 minutes. Additionally, there is an Override Door Switch in the functional parameters (Refer to Functional Parameter List, Section 3.17.) When this parameter is set to YES, the Door Switch Alarm will come on when the door is open. However, the unit will not shut down. This feature is included in the event of a door switch failure.

For both two and three compartment units a separate provision is available. Individual door switches for each compartment can be wired directly into the remote compartment ON/OFF switch. This will allow the door switch to shut down a compartment when the door is opened. The Data Recorder will record this in the same manner as if the compartment ON/OFF switch was used to turn the compartment off.

2.8.3 Out of Range Alarm

The Out Of Range Alarm is intended to notify the driver when the box temperature is moving away from Set Point. The Out Of Range Alarm may be configured as an Alarm Only, or as an Alarm and Unit Shutdown. (Refer to Section 5.2 Configuration Mode)

Generally, before the Out of Range Alarm can be triggered, the box temperature must have first been In Range. In Range is defined as the temperature(s) of one or all of the compartments having been within
± 2.7°F (1.5°C) of setpoint in the Perishable Range, or within + 2.7°F (1.5°C) of setpoint in the Frozen Range.

If the Out−Of_Range configuration (Refer to Section 5.2.1) is YES for shutdown, only the compartment that is out of range will shut down IF that compartment has a setpoint in the frozen range or has a setpoint in the perishable range and the actual compartment temperature is out of range is above setpoint.

If the Out−Of−Range configuration is YES for shutdown (Refer to Section 5.2.1), all compartments will shut down if the compartment that is out of range has a setpoint in the perishable range and the actual temperature in that compartment is out of range below setpoint.

If the unit shuts down due to a shutdown alarm, the Out Of Range Alarm will come on after the timer expires (30 or 45 minutes), and when the box temperature goes out of range, regardless if the box temperature was ever within setpoint range or not.

Out of Range is determined by the Functional Parameter setting. Selections of 4°F (2°C), 5.5°F (3°C), 7°F (4°C), and OFF are available. The OFF setting disables the Out of Range Alarm. All other settings allow the user to determine how far away from setpoint the box temperature may move before turning on the Alarm. Once the box temperature has moved away from set point by the selected amount, the Out of Range timer begins. If the alarm is configured for Alarm Only, after 30 minutes the alarm will be activated. If the alarm is configured for Alarm & Shutdown, after 45 minutes the alarm will be activated and the unit will shutdown.

In Sleep Mode, Pretrip, Diagnostic Test Mode, Component Test Mode, or if the unit has a Door Switch, and the door has been opened, the Out of Range Alarm is not in use. After exiting any of these modes, or closing the trailer or rail car door, the box temperature must again come In Range of the set point before the Out of Range Alarm can be activated.

In Defrost and in Start/Stop Off Cycle, the 30 or 45 minute timer does not count. Once the unit leaves these modes, and goes into a temperature control mode (heat, cool, or null), the timer will be reset for the full time, allowing the unit either 30 or 45 minutes to bring the box temperature into range before activating the Out of Range Alarm.

Individual settings are available in functional parameters for compartments 1, 2 and 3. (See Table 3-2).

2.8.4 Remote Control Panel

User-friendly indicator and operator control panels clearly show individual compartment temperatures with easy-to-read displays.

These compact panels can be mounted to suit the individual operator's preferences − on the front bulkhead, or in the refrigerated compartment (including in the wall itself). See Section 3.21.2 for more information on the remote control panels.

2.9 ENGINE DATA

Table 2-5. Engine Data

Engine Model	V2203−DI−E2B−CTD−5S1
Displacement	134 in^3 (2.197 liters)
No. Cylinders	4
Rated Horsepower	35 hp (26.1KW) @1850 rpm
NOTE: See Table 2-1 for actual engine RPM settings	
Weight	417.8 lbs (189.5 kg)
Coolant Capacity	2 gallons (7.6 liters) (50/50 mix − never to exceed 60/40)
Thermostat	Starts to open 177 to 182°F (81 to 83°C) Fully open 203°F (95°C)
Oil Capacity with Filter	15 quarts (14 liters)
Injection Setting	**1st stage:** 2702 to 2915 PSIG (183.8 to 198.3 Bars) **2nd stage:** 3271 to 3555 PSIG (222.6 to 241.9 Bars)
Fuel	Winter: Diesel No. 1 Summer: Diesel No. 2
Firing Order	1−3−4−2
Glow Plug Amperage	6 − 9 amps per plug at 12 VDC
Valve Clearance (Cold) (Intake and Exhaust)	0.0071 to 0.0087 inch (0.18 to 0.22 mm)
Compression	Engine compression must be above 400 PSIG (27.2 Bars) (each cylinder)

a. Lubrication System

Oil Pressure

40 to 60 PSIG (2.7 To 4.1 Bars)

(Engine in high speed)

Oil Pressure Safety Switch Setting Closes

15 (± 3) PSIG [1.02(±.2) Bars]

Lube Oil Viscosity:

Outdoor Temperature		SAE
Centigrade	**Fahrenheit**	
0°	Below 32°	10W or 15W40
0° to 25°	32° to 77°	20W or 15W40
Over +25°	Over 77°	30W or 15W40

Extended Service Interval (ESI) packages are standard. The ESI package reduces the frequency of scheduled service intervals. The two tables below reflect the differences between standard and ESI packages.

Oil Change Intervals − Standard Service Interval	
API Class CI or higher	**MOBIL DELVAC 1**
2000 Hours or 1 yr	4000 Hours or 1 yr

Oil Change Intervals − Extended Service Interval	
API Class CG or higher	**MOBIL DELVAC 1**
3000 Hours or 2 yr	4000 Hours or 2 yr

NOTE

The only approved synthetic lube oil is Mobil Delvac 1. The normal oil change intervals should be reduced if the equipment is operated under extreme conditions such as in dirty environments.

Refer to Section 8.1 for more detailed information on service intervals.

2.10 ENGINE AIR SYSTEM

The air cleaner prolongs the life and performance of the engine by preventing dirt and grit from getting into the engine and causing excessive wear on all operating parts. It is the responsibility of the operator to give the air cleaner equipment regular and constant attention in accordance with the instructions. (Refer to section 8.6.6)

Clean air is supplied to the engine through the air cleaner. The air is necessary for complete combustion and scavenging of the exhaust gases. As the engine piston goes through the intake stroke, the piston draws clean fresh air down into the cylinder for the compression and power strokes. As the engine goes through its exhaust stroke, the upward movement of the piston forces the hot exhaust gases out of the cylinders through the exhaust valves and the exhaust manifold. If the air filter is allowed to become dirty, the operation of the engine would be impaired.

2.11 COMPRESSOR DATA

Table 2-6. Compressor Data

Compressor Model	06D
No. Cylinders	6
No. Unloaders	2
Weight	260 lbs (118 kg)
Oil Charge	7.6 pints (3.6 L)
Approved OIl	Mobil Arctic EAL 68

2.12 REFRIGERATION SYSTEM DATA

a. Defrost Air Switch (DAS)

Initiates Defrost:

1.40 ± .07 inch WG (35 ± 1.8 mm)

b. Defrost Timer (micro controlled)

1.5h, 3h, 6h, or 12 hours

c. Evaporator High Temperature Safety (EVHTS)

Opens on a temperature rise at:
130°± 1°F (55°± 0.5°C)

Closes on a temperature fall at:
100°± 1°F (37.8° ± 0.5°C)

d. Relief Valve Setting

Opens on a pressure rise at:
537 ± 44 psig (37 ± 3 Bar)

e. High Pressure Switch (HP1)

Opens on a pressure rise at:
465 ± 10 psig (34 ± 0.7 bar)

Closes on a pressure fall at:
350 ± 10 psig (24 ± 0.7 bar)

f. Engine Oil Pressure Switch (ENOPS)

Closes on a pressure rise at :
15 psig (1 bar)

Opens on a pressure fall at:
12 psig (0.82 bar)

g. Unit Dry Weight: 2062 LBS. (937KG)

2.13 ELECTRICAL DATA

ELECTRICAL DATA		
Compressor Motor	Full Load Amps (FLA)	Rating: 17.5 amps @460 VAC
		System current limit – high speed: 26 amps
		System current limit – low speed: 22 amps
	Locked Rotor	Locked rotor amps: 77 at 460V
Condenser Fan Motor	Full Load Amps (FLA)	1.5 amps @ 65 Hz
	Horsepower	0.83hp (610 watts) @ 65 Hz
	RPM	3832 rpm @ 65 Hz
	Voltage and frequency	310 to 660 VAC; 45 to 65 Hz
	Bearing lubrication	Factory lubricated, additional grease not required
	Rotation	Clockwise when viewed from shaft end
	Resistance	20 to 21 ohms
HTCON2 and heater dual discharge evaps	Number of heaters	3 (1 assembly)
	Rating per rod	0.81 hp (600 watts) 335 VAC/60Hz ±5% each
	Resistance (cold) per rod	187 ohms ±5
	Type	Sheath
	Current (Low Speed)	4 Amps
	Current (High Speed)	5.1 Amps
HTCON1 and heater single discharge evaps	Number of heaters	6 (2 assemblies)
	Rating per rod	1.56 hp (1150 watts) 335 VAC/60Hz ±5% each
	Resistance (cold) per rod	97.6 ohms ±5
	Type	Sheath
	Current (Low Speed)	2.5 Amps
	Current (High Speed)	3.5 Amps
Main Evaporator Fan Motor	Full Load Amps (FLA)	1.1 amps
	Horsepower	0.66 hp (485 watts) @ 65hz
	Rotations Per Minute	1850 rpm @ 65 hz
	Voltage and Frequency	310 to 660 VAC 45 to 65 Hz
	Bearing Lubrication	Factory lubricated, additional grease not required
	Rotation	Clockwise or Counter-Clockwise
	Resistance	34.2 to 41.8 ohms
Remote Evaporator Fan Motor	Full Load Amps (FLA)	1 amp
Generator	Frequency at High Speed	60 hz
	Frequency at Low Speed	45 hz
	Resistance	0.72 to 0.88 ohms, phase to phase 0.36 to 0.44 ohms phase to ground
	Output	22 KVA @ 0.82 p.f @ 1950 rpm
Battery Charger	Output amps	20A
	Output voltage	14.8 VDC @ 77°F (25°C)
	Input voltage	340 to 590 VAC
	Frequency	43 Hz to 68 Hz
OGF Relay	Trips	40 Amps
Battery	Voltage	13.7 volts @ 80°F (27°C)
Standby Power Requirements	Voltage Current	460/3/60 30A

2.14 COMPONENT RESISTANCE & CURRENT DRAW

Table 2-7. Component Resistance & Current Draw

Component	Ohms	Amps
Unloader	10.6 ± 0.3 Ohms	1.0 to 2.0 Amps
Speed solenoid (SCS)	1.5 to 2.5 Ohms	3.0 − 8.0 Amps
12VDC Relay 10−00328−00	72 Ohms ±10%	0.14 − 0.18 Amps
12VDC Relay 10−00385−00 (RCR, PSCONR, GENCONR, HTCONR1, CCONR)	80 Ohms ±15%	0.12 − 0.17 Amps
12VDC Relay 10−00328−02	97 Ohms ±10%	0.11 − 0.14 Amps
Fuel Solenoid		
Red−Black Wires	11.1 to 13.4 Ohms	0.25 − 2.0 Amps
White−Black wires: Can not be accurately measured with Coil Commander in circuit.		30.0 to 40.0 Amps
Indicator lights	4.8 ± 0.2 Ohms	NA
Unit non-running amps (See Note 2 in Section 7.2)		6−9 Amps
Glow Plug Amps Each Plug		6 - 9 Amps
Glow Plug Total Circuit		25 − 35 Amps
Starter Motor	Less than 1 ohm but more than 0	270 − 380 amps

2.15 SAFETY DEVICES

System components are protected from damage caused by unsafe operating conditions by automatic shut−down of the unit when such conditions occur. This is accomplished by the safety devices listed in Table 2-8.

Table 2-8. Electrical Safety Devices

Unsafe Conditions	Safety Device	Device Setting
Excessive current draw by microprocessor	Fuse (F1)	Opens at 7.5 amps
Excessive current draw by speed relay	Fuse (F2)	Opens at 10 amps
Excessive current draw by run relay	Fuse (F3)	Opens at 7.5 amps
Excessive current draw by battery output	Fuse (F5)	Opens at 80 amps
Excessive current draw by control circuit	Fuse (F6)	Opens at 15 amps
Excessive current draw by battery charger input	Fuse (F7/8)	Opens at 2A*
Excessive current draw by generator/power supply contactors	Fuse (F9)	Opens at 10 amps
Excessive current draw Compartment 1 heaters	Fuse (F10/F11/12)	Opens at 12 amps
Excessive current draw remote evaporator high voltage	Fuse (F13/14/15)	Opens at 12 amps − 2 Comp. Opens at 15 amps − 3 Comp.
Excessive current draw condensate htr. evap 2/3	Fuse (F16/17)	Opens at 5 amps
Excessive temperature in evaporator	High temperature thermostat (EVHTS)	Opens at 130°F (54.4°C) Closes at 100°F (37.8°C)
Excessive condenser fan motor winding temperature	Internal protector	Auto reset
Excessive compressor motor winding temperature	Internal protector	Auto reset
Excessive evaporator motor winding temperature	Internal protector	Auto reset

*4A Fuse is used when there is a second battery charger

2.16 REFRIGERANT CIRCUIT DURING COOLING (See Figure 2-11 thru Figure 2-14)

When cooling, the unit operates as a vapor compression refrigeration system. The main components of the system are: the (1) reciprocating compressor, (2) air-cooled condenser, (3) electronic expansion valve, and (4) direct expansion evaporator.

The compressor raises the pressure and the temperature of the refrigerant and forces it into the condenser tubes. The condenser fan circulates surrounding air over the outside of the condenser tubes. The tubes have fins designed to improve the transfer of heat from the refrigerant gas to the air. This removal of heat causes the refrigerant to liquify. Liquid refrigerant leaves the condenser and flows to the receiver.

The receiver stores the additional charge necessary for low ambient operation. The receiver is equipped with a relief valve (See Section 2.12)

The refrigerant leaves the receiver and flows through the manual shut off valve (King valve) to the subcooler. The subcooler occupies a portion of the main condensing coil surface and gives off further heat to the passing air.

The refrigerant then flows through a filter-drier where an absorbent keeps the refrigerant clean and dry.

The refrigerant flows to the "Liquid/suction" heat exchanger. Here the liquid is further reduced in temperature by giving off some of its heat to the suction gas.

The liquid then flows to an externally equalized electronic expansion valve (EVXV) which reduces the pressure of the liquid and meters the flow of liquid refrigerant to the evaporator to obtain maximum use of the evaporator heat transfer surface.

The refrigerant pressure drop caused by the expansion valve is accompanied by a drop in temperature so the low pressure, low temperature fluid that flows into the evaporator tubes is colder than the air that is circulated over the evaporator tubes by the evaporator fan. The evaporator tubes have aluminum fins to increase heat transfer; therefore heat is removed from the air circulated over the evaporator. This cold air is circulated throughout the box to maintain the cargo at the desired temperature.

The transfer of heat from the air to the low temperature liquid refrigerant causes the liquid to vaporize.

This low temperature, low pressure vapor passes through the evaporator outlet temperature and pressure sensors (EVOT and EVOP) which aid in calculation of superheat. The vapor then passes through the "suction line/liquid line" heat exchanger where it absorbs more heat from the high pressure/high temperature liquid and then returns to the compressor through the compressor suction modulation valve (CSMV). The CSMV controls the compressor suction pressure thereby matching the compressor capacity to the load.

The remote evaporators are equipped with liquid solenoid valves which open or close depending on the thermostat, and are also equipped with externally equalized thermostatic expansion valves (TXV).

2.17 REFRIGERANT CIRCUIT – HEATING AND DEFROSTING (See Figure 2-12 thru Figure 2-15)

Compressor is turned off for all heating and defrost cycles. Heating is always accomplished using electric resistance heaters. Defrost may be accomplished using either electric heaters or return air. See Section 4.4.10 for more information on heating and defrost.

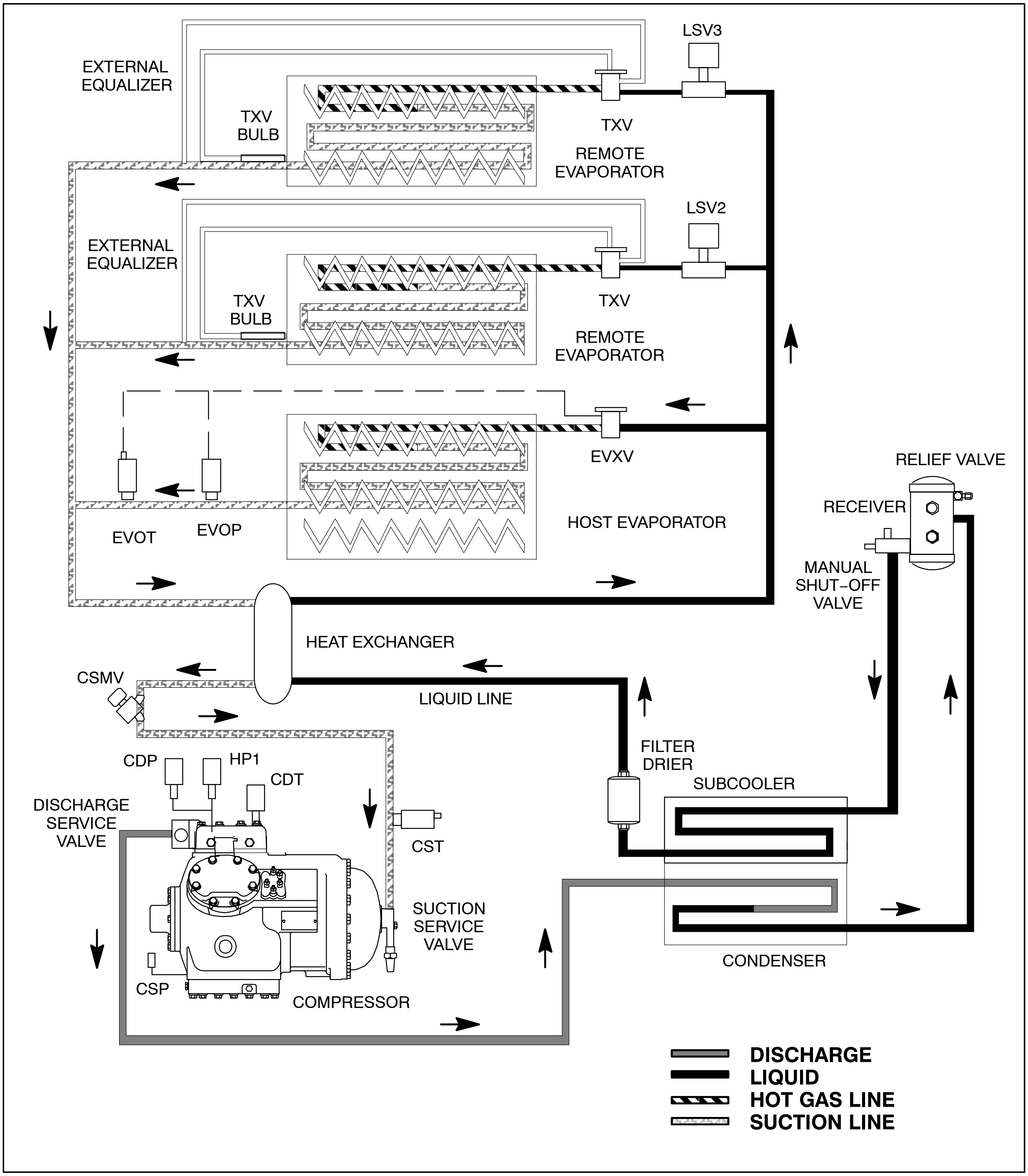


Figure 2-11. Refrigerant Circuit All Compartments Cooling

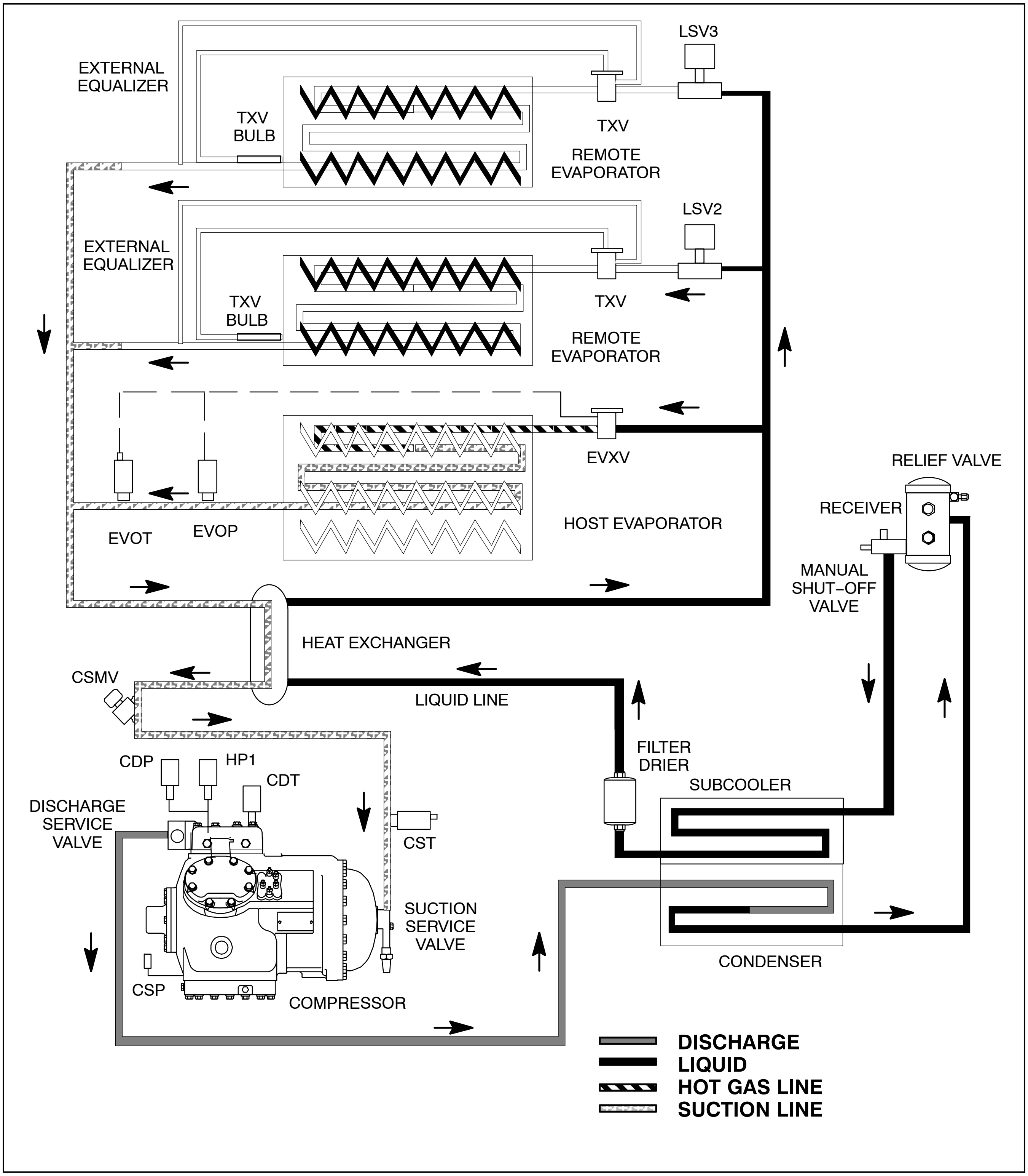


Figure 2-12. Refrigerant Circuit − Compartment One Cooling, Compartments 2 & 3 Heating

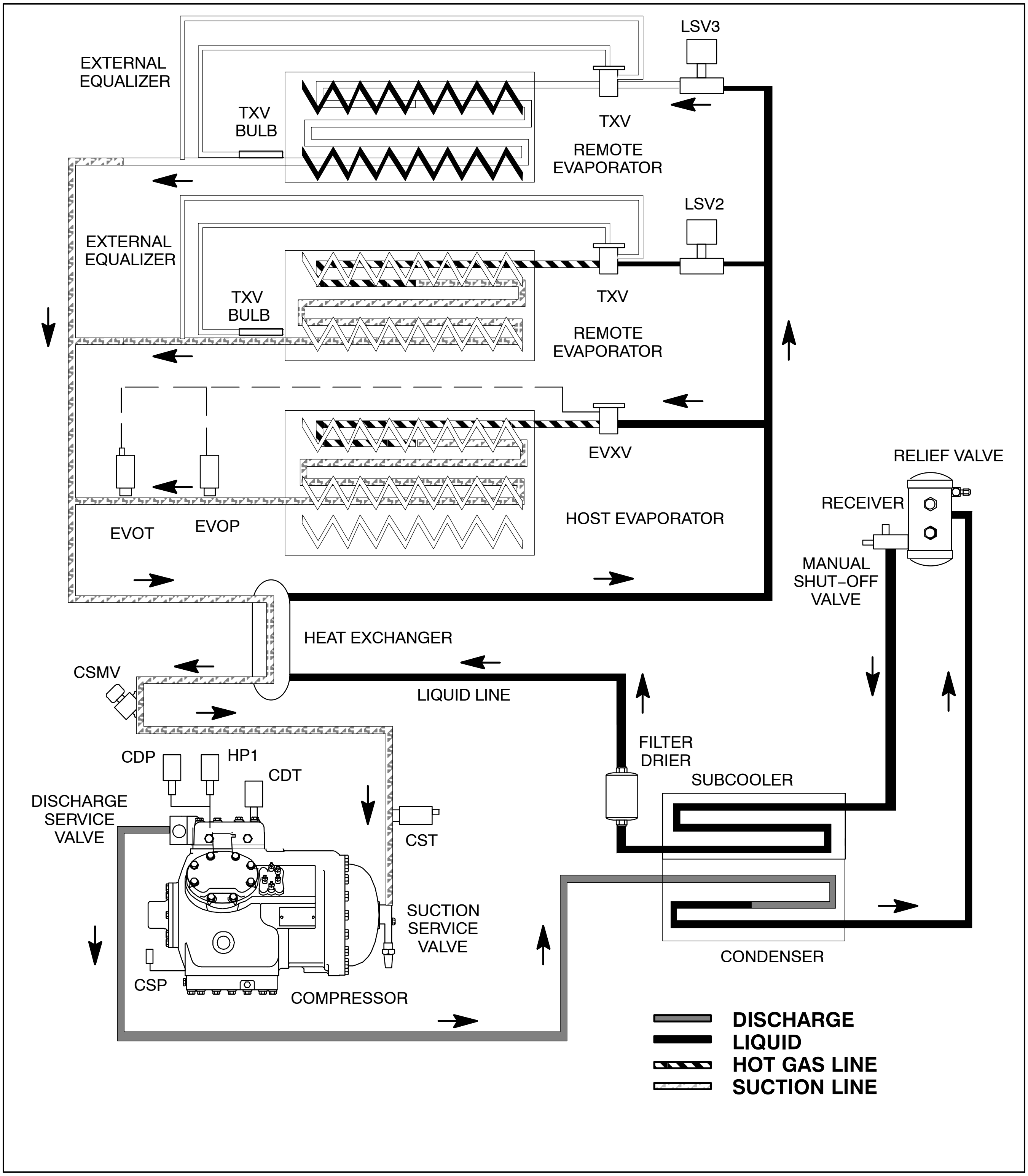


Figure 2-13. Refrigerant Circuit – Compartments One And Two Cooling, Compartment 3 Heating

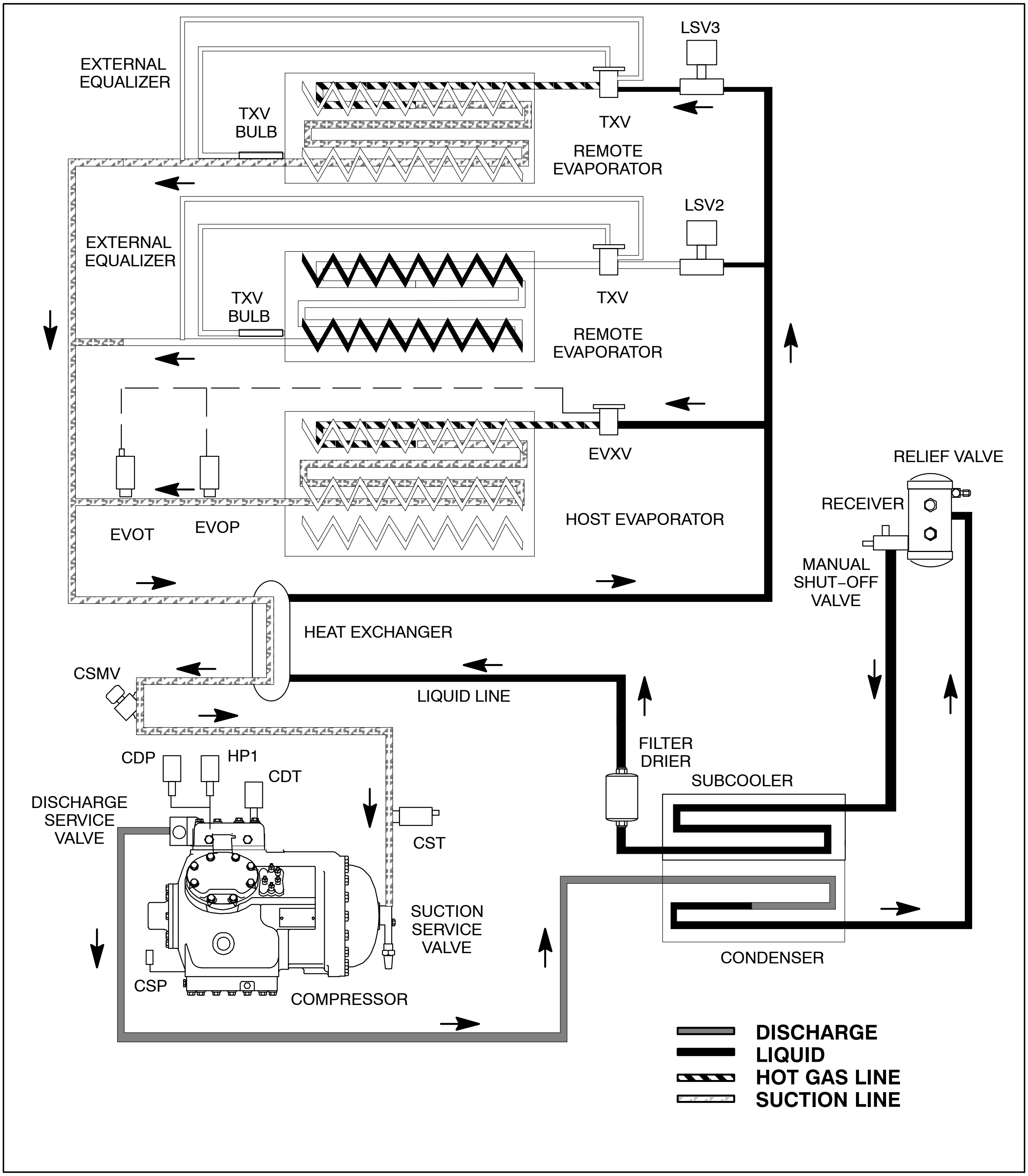


Figure 2-14. Refrigerant Circuit − Compartments One And Three Cooling, Compartment 2 Heating

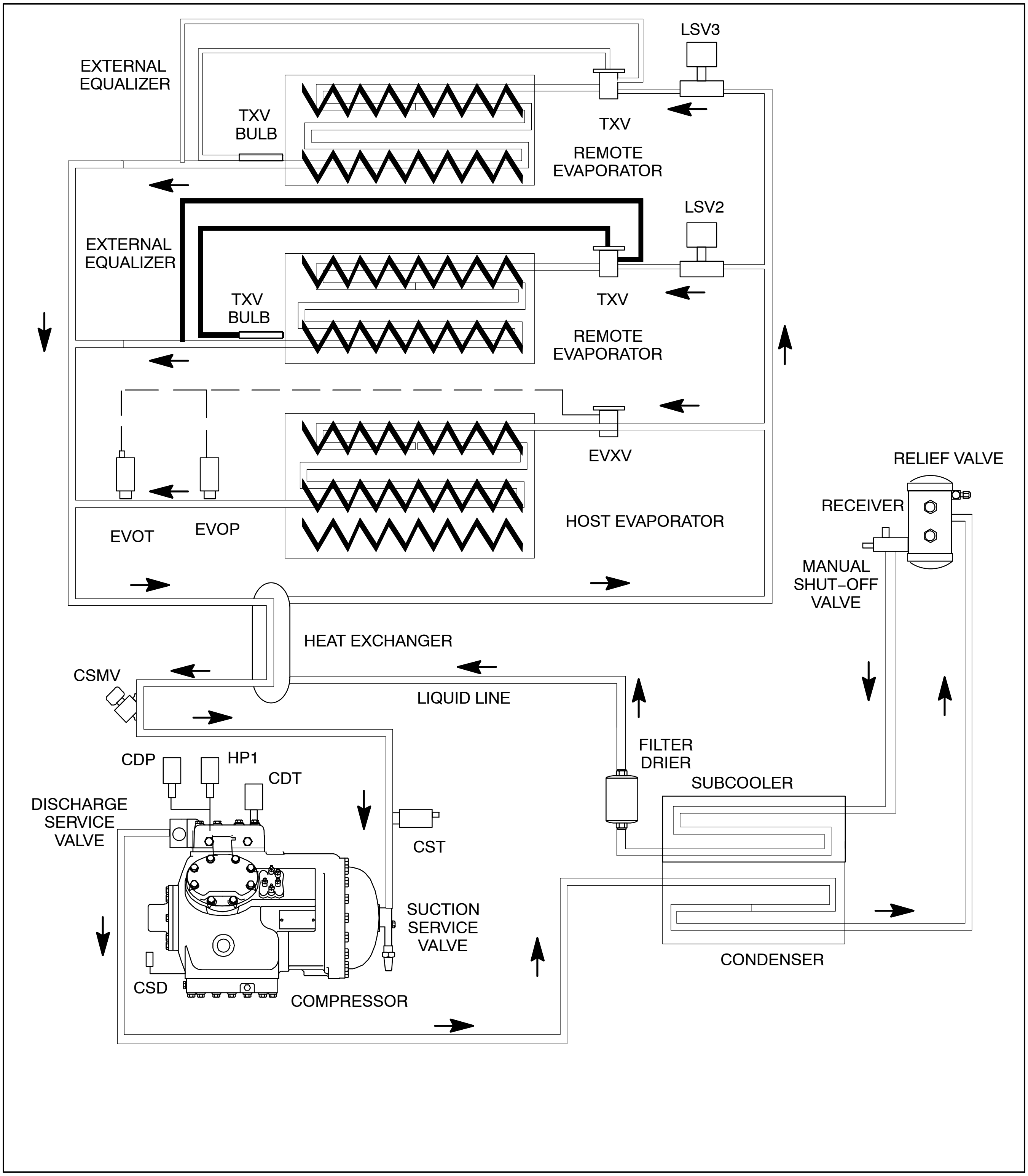
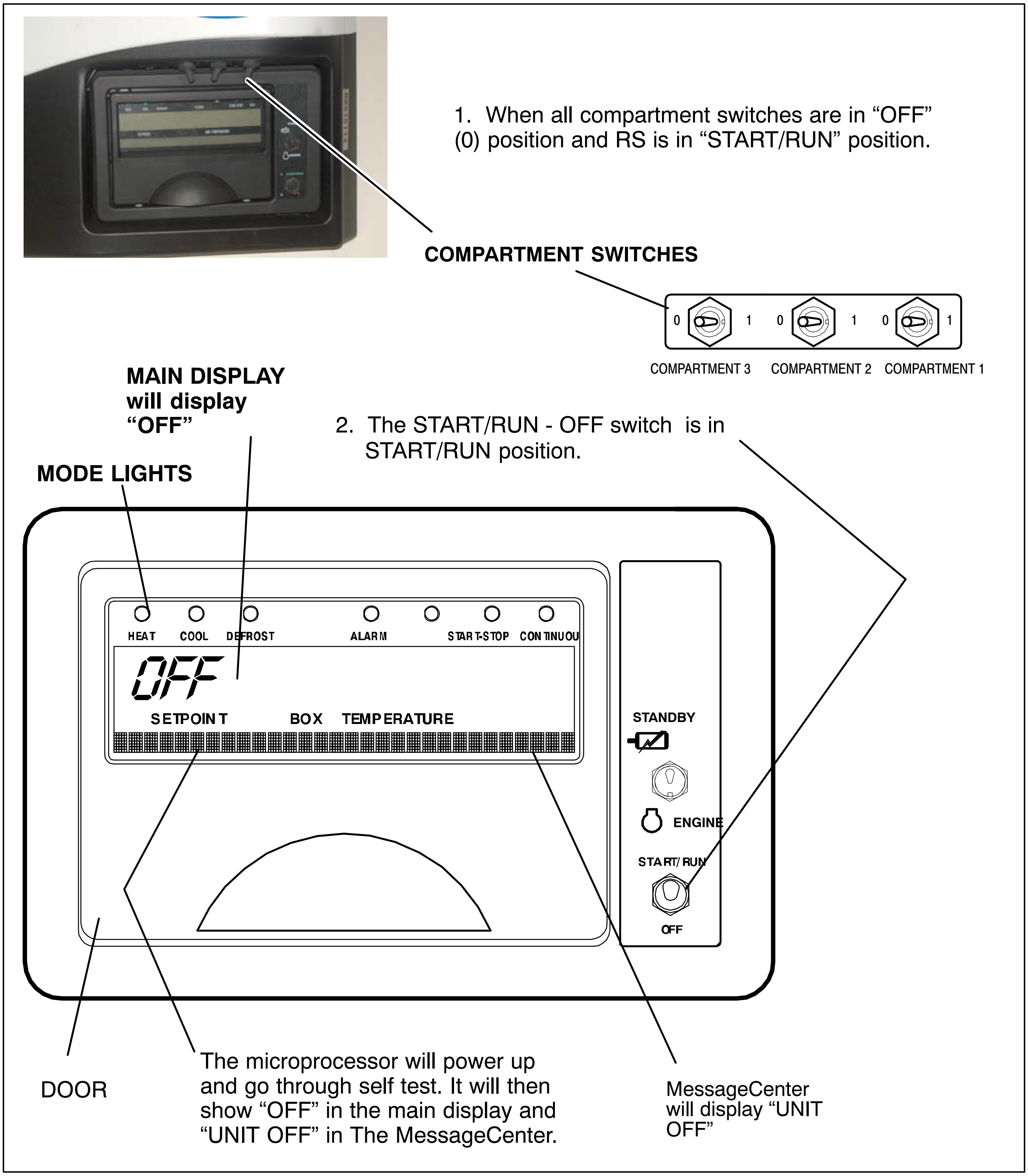


Figure 2-15. Refrigerant Circuit – All Compartments Heating

SECTION 3

OPERATION

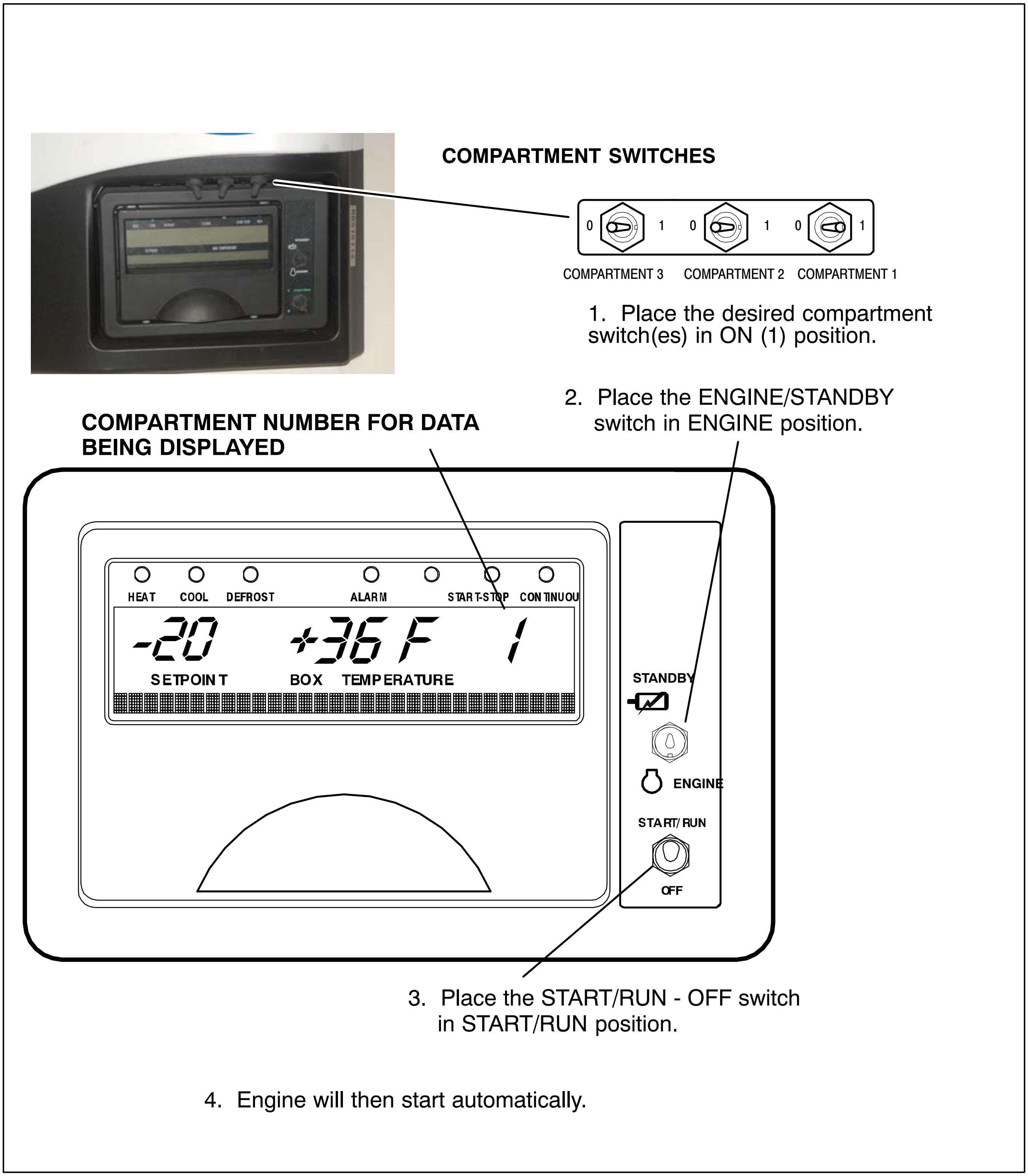
3.1 RS “ON” AND ALL COMPARTMENT SWITCHES “OFF”



3.2 STARTING UNIT – ENGINE/ROAD OPERATION

⚠ WARNING

Under no circumstances should ether or any other starting aids be used to start engine.



3.3 STARTING UNIT – ELECTRIC STANDBY OPERATION

⚠ WARNING

When performing service and/or maintenance procedures, make certain the unit is disconnected from the power source and that the RS is in OFF position so that it is impossible for the unit to start up automatically during the maintenance operation.

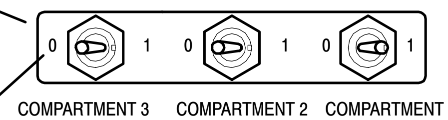
⚠ WARNING

Make sure the power plug is clean and dry before connecting to any electrical outlet/receptacle.

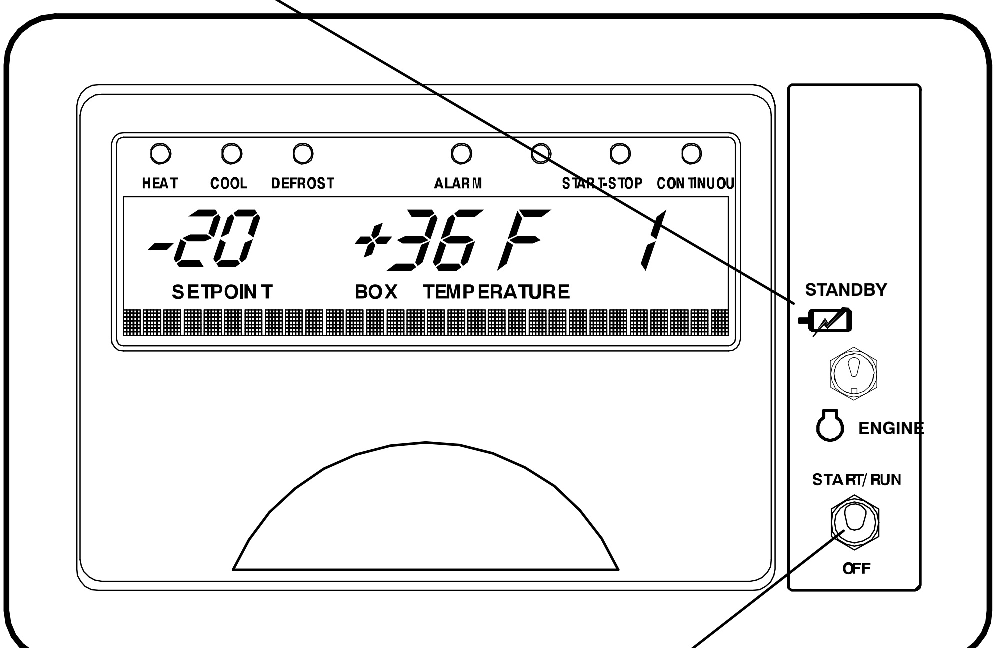
Do not connect to any electrical outlet without checking that it meets the 460/3/60 and 30 Amp electrical requirements of the unit.

1. Put all compartment switches in OFF (0) position and place RS in OFF position **AND** turn off the external power circuit breaker.

COMPARTMENT SWITCHES



2. Connect standby cable to unit and then turn the external power circuit breaker on.
3. Place the ENGINE/STANDBY switch in STANDBY position
4. Place the desired compartment switch(es) to on (1)



5. Place the START/RUN - OFF switch in START/RUN position.
6. The unit will then start automatically.

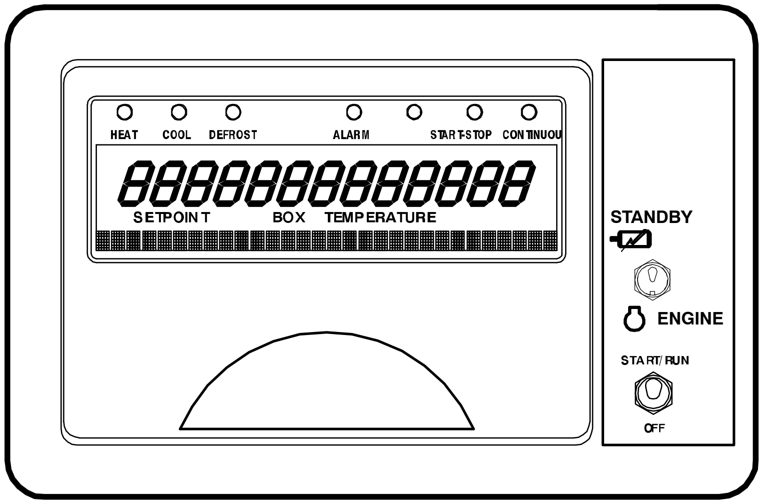
NOTE

The unit is equipped with automatic phase reversal which insures that the electric motors will run in the correct direction.

For safe, reliable operation in electric standby mode, it is important to consider the following guidelines:

- **NEVER** connect the unit to a high voltage power source with the RS in the START/RUN position.
- The power supply cable and circuit breaker must comply with local electrical code and unit specifications. See 2.13.
- The power supply cable must be equipped with a ground connection.
- Repairs or maintenance to the supply voltage circuit should only be performed by licensed/authorized personnel.

3.4 UNIT STARTUP – ENGINE/ROAD AND ELECTRIC STANDBY



SELF TEST

When first powered up:

- The microprocessor controller will run a self test.
- All of the mode lights will light
- All of the segments on the display will turn on
- All of the Liquid Crystal diodes (LCDs) in the MessageCenter will turn on to verify their operation
- The display will then show the setpoint temperature and the compartment temperature. The next character indicates the temperature units as "F" Fahrenheit or "C" Centigrade and the last character indicates the compartment number for the information being displayed.
- The MessageCenter will display the default message, unless there is an alarm(s) stored in the controller. If there is an alarm(s) stored in the controller, "INACTIVE ALARMS IN MEMORY" will be displayed on the MessageCenter and the Alarm LED will flash for 5 seconds, then turn off.
"CHECK AT NEXT SERVICE INTERVAL" will then be displayed if there are any active non-shutdown alarms present. Engine hours (Refer to Section 5.5) and the Active IntelliSet (Refer to Section 3.21.1) will also be shown when configured.
- The MessageCenter will show "STATUS OK" as the microprocessor begins to position the EVXV and the CSMV to unit starting positions.
- In engine operation, after the valves open the glow plugs will energize (as required), the buzzer will sound, and the diesel engine will start.
- For standby, after the valves open the buzzer will sound then the fans and compressor will start.

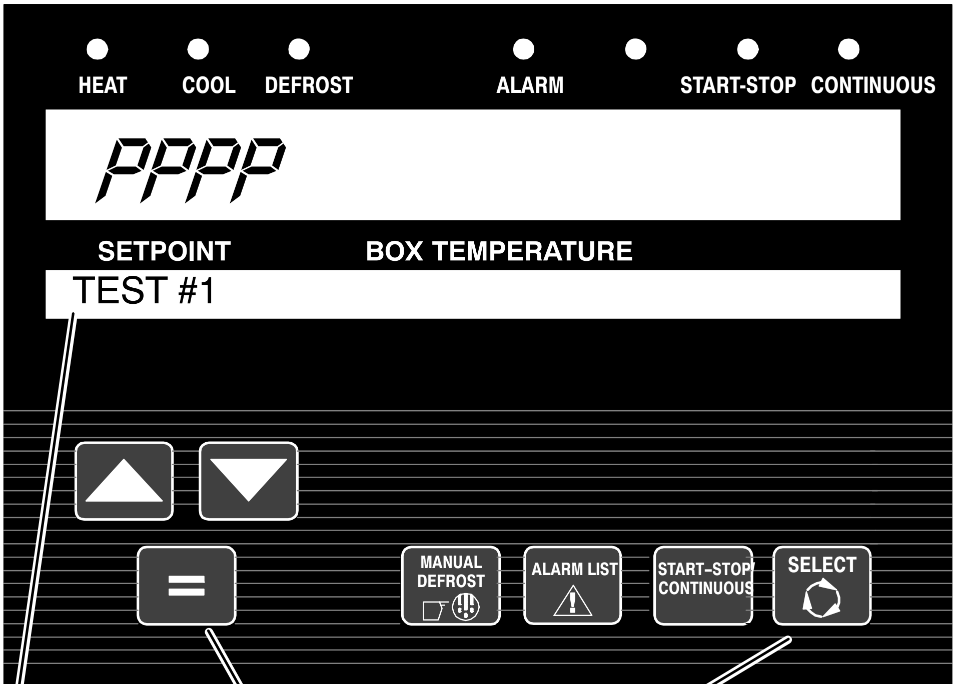
NOTE

Manual Start will automatically put the unit in Continuous Run mode. Placing the unit in Start−Stop will automatically put it back into Auto Start operation.

Manual Start Mode will automatically be cancelled when the Start/Run−Off switch is toggled to Off and then back to Start/Run.

3.5 PRETRIP

1. Place RS in “START/RUN” position.



2. Press the SELECT key until the MessageCenter displays “PRESS THE = KEY TO START PRETRIP”
3. Press the = key to start PRETRIP.
4. Verify that during TEST#1 the complete display is turned on, that the buzzer comes on and that all lights on the Light Bar come on.
5. The remainder of Pretrip will take 7 to 15 minutes, and will run itself automatically.

The PRETRIP mode is for checking unit operation and evaluating operation of all modes. It will indicate a failure when one is detected.

TIP

All compartments will be tested whether compartment switches are in ON or OFF position.

A Pretrip can be started with any box temperature.

The MessageCenter displays the current test and the % complete of the test. When the Pretrip tests are complete the MessageCenter will display one of three different messages:

- “PRETRIP PASS” or
- “PRETRIP FAIL IN TEST X” or
- “PRETRIP FAILED & COMPLETE” and alarm light is ON

Press the ALARM LIST key to review the alarms triggered by the Pretrip tests.

TIP

The Pretrip test “PASS” results message will stay displayed until a key is pressed, or until the RS switch is in the Off position.

The Pretrip test “FAIL” results message will stay displayed until the alarms are cleared

Once Pretrip is started, the control panel keys are disabled until Pretrip is completed.

TIP

If “CAN NOT START PRETRIP” is displayed in the MessageCenter, check to see if the unit is in PC Mode (Refer to Section 5.1) or defrost mode, or check the alarm list (Section 7) for active shutdown alarms.

NOTE

Pretrip will run until completed, unless an alarm occurs that causes Pretrip to be aborted. Only alarms that will result in other erroneous alarms or will affect future Pretrip tests will allow Pretrip to be aborted.

TIP

Pretrip may be stopped by the user by either turning the unit off then back on again, or by pressing and holding the = Key for 5 seconds. “PRETRIP STOPPED BY USER” will appear in the MessageCenter.

Once Pretrip is started: If the unit is running, the microprocessor will shut the unit down by de-energizing the fuel solenoid.

If the unit is not running Pretrip will begin.

NOTE

Before beginning Test 1, PreTrip looks at the status of alarms and if certain alarms are active (for example: Low Fuel Warning, Check Engine Oil Level, Check Coolant Level, Check Coolant Temperature, PreTrip will show “FAILED”, indicating that the unit is not ready to be sent out for a load, but that the alarm list should be checked and all present alarm situations corrected.

TIP

It is always a good idea to clear all alarms from both Alarm Lists before starting Pretrip. The technician will then know that any alarms present following Pretrip occurred during Pretrip, and are not old alarms that had not been cleared.

NOTE

The operator MUST be present and validate this test by watching the microprocessor display during Test 1 – Display Test. The microprocessor will turn on all segments of the LCD and LED display.

Test 1 – Display And Sound Test

The microprocessor activates the LCD/LED display, and all lights on the Light Bar. This test will last 5 seconds. All segments of the display, all LEDs on the microprocessor, all lights of the Light Bar, and the buzzer will be on during this test. This is the only portion of the Pretrip check that requires the operator to determine PASS or FAIL. A defective display and sound test is indicated if: any LCD/LED segments are not visible, any LEDs or lights do not come on, or the buzzer does not sound. Anything that fails during this test should be repaired at the conclusion of the Pretrip cycle. Pretrip will continue regardless of the outcome of this test. A faulty display, light bar or buzzer will not affect the operation of the unit, but will affect what is displayed during unit operation.

Test 2 – Amperage Check of 12VDC Electrical Components

Check the amperage (current) draw of the following components:

- Battery DC Current
  (All Components Turned Off)
- UL1 Front Unloader
- UL2 Rear Unloader
- Speed Solenoid
- Glow Plugs
- Fuel Solenoid
- CDCON
- CCON
- GENCON
- HTCON1
- HTCON2
- 2HTCON1
- 2HTCON2
- 3HTCON1*
- 3HTCON2*
- EVCON
- 2EVCON
- 3EVCON*
- 2LSV
- 3LSV*

NOTE

*Will run test if 3 compartment model is selected.

Each component individually will be individually checked for proper current draw. An alarm will be displayed for any component testing outside the current range (amps).

Test 3 – Refrigeration System Equalization Check

With the engine and the unit off, the CSMV will open to 50% and the EVXV will open to 100% so that the pressure in the refrigeration system can equalize. If the pressure does not equalize to within 80 psig (5.4 Bar) ALARM P171 – Check Evap & Disc Press– will be activated.

Test 4 – Temperature Sensor Check

Check the condition of all of the system temperature sensors.

Test 4 will last approximately 5 seconds. If a problem is detected with any of the sensors, the corresponding alarm will be displayed.

NOTE

Tests 5, 6 an 7 are only performed when unit is in Engine/Road mode. For Electric Standby mode, pretrip will skip to Step 8.

Test 5 – Engine Low Speed

The engine starts up in Low Speed with condenser fans on. The microprocessor verifies that engine rpm are in low speed range. If the engine is not operating within the low speed range, the “CHECK LOW SPEED RPM” alarm will be displayed.

Test 6 – Engine High Speed

The engine switches to High Speed and energizes HTCON1 and HTCON2. The microprocessor verifies that engine rpm are in high speed range. If the engine is not operating within the high speed range, the “CHECK HIGH SPEED RPM” alarm will be displayed.

Test 7 – Engine Low Speed 2

The engine switches back to Low Speed and heaters turn off. The microprocessor verifies that engine rpm are in low speed range. If the engine is not operating within the low speed range, the “CHECK LOW SPEED RPM” alarm will be displayed.

Test 8 – Electric Heater Amperage Check (All Compartments)

Will energize each heater individually and check for proper current draw. An alarm will be displayed for any heater testing outside the current range (amps).

Test 9 – Evaporator Fan Motors Amperage Check (All Compartments)

Will energize each evaporator motor contactor individually and check for proper current draw. An alarm will be displayed for any fan motors testing outside the current range (amps).

Test 10 – Condenser Fan Motors Amperage Check

Will energize condenser motor contactor and check for proper current draw. An alarm will be displayed if fan motor tests outside the current range (amps).

Test 11 – Check Compressor Suction Modulation Valve (CSMV)

This test ensures that the CSMV is opening and closing properly. If suction pressure doesn’t change as expected with CSMV closed then “CHECK SUCTION MOD VALVE” alarm will be displayed. This test may take several minutes.

Test 12 – Electronic Expansion Valve (EVXV)

This test checks the operation of the EVXV. If valve doesn’t test properly “CHECK EVAP SUPERHEAT” alarm will be displayed.

Test 13 – Unloaders

This test checks the operation of the unloaders. If suction and discharge pressures do not change when UL1 and UL2 are energized and de-energized, the “CHECK UL1” or “CHECK UL2” alarm will be displayed.

Test 14 – LSV2 and LSV3

This test will individually check 2LSV and 3LSV for proper opening and closing. The “C2 CHECK LSV VALVE” or “C3 CHECK LSV VALVE” alarm will be displayed.

Test 15 – Check For Other Alarms

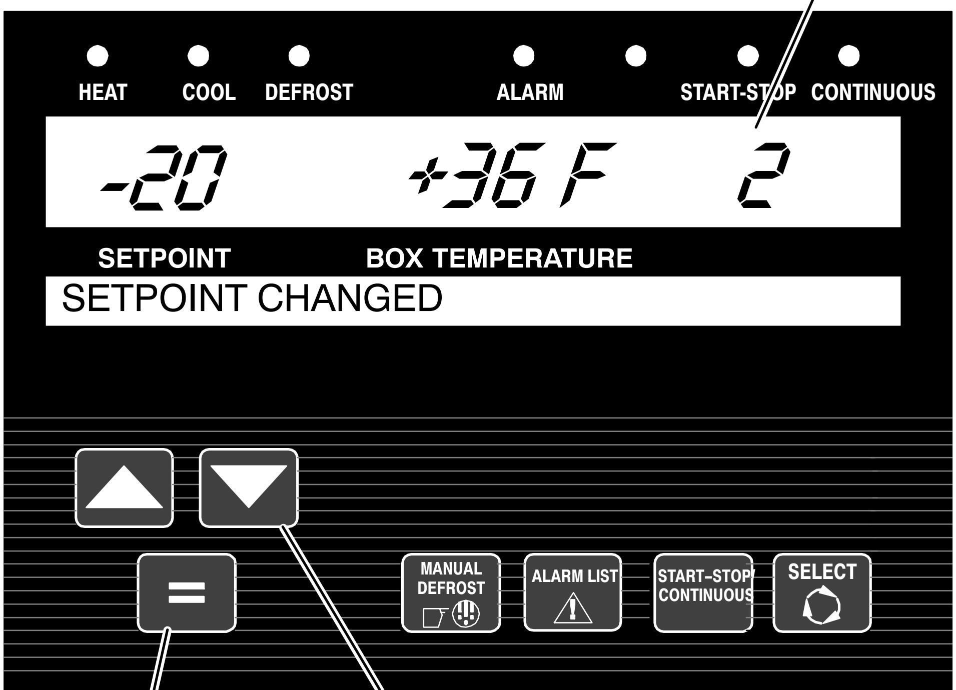
Checks the current alarm list for other active alarms.

Pretrip Termination

When the Pretrip cycle is completed, the unit will return to normal temperature control operation.
“PRETRIP PASS” will be shown in the display until the operator presses any key. In the event that the Pretrip test triggered an alarm(s), the display will show either “PRETRIP FAIL & COMPLETE” (if the entire Pretrip cycle was completed), or “PRETRIP FAIL IN TEST XX”, (if the Pretrip cycle was aborted by an alarm before it was completed).

3.6 CHANGING SETPOINT

1. Wait for desired compartment to be displayed.



2. With the setpoint of the desired compartment displayed, press the UP ARROW or DOWN ARROW key to change the setpoint to the desired value. The MessageCenter will show “↑↓ TO SCROLL, THEN = TO SAVE”.
3. Press the = key to save the new setpoint.

Setpoints of −22°F to +89.6°F (−30°C to +32°C) may be entered via the keypad for each compartment. The controller always retains the last entered setpoint in memory for each compartment. Depending on Microprocessor set−up, the setpoint may be changed up or down in either 0.1° (one−tenth of a degree) or 1° (one full degree) increments by pressing and releasing either the UP ARROW or DOWN ARROW key.

NOTE

Setpoint for a compartment cannot be changed unless the switch for that compartment is “ON”.

The microprocessor Configurations allow a Minimum and Maximum Setpoint to be entered, so that only setpoints within that range may be selected. “MAX SETPOINT HAS BEEN REACHED” or “MIN SETPOINT HAS BEEN REACHED” WILL APPEAR in the MessageCenter when either of these conditions are met.

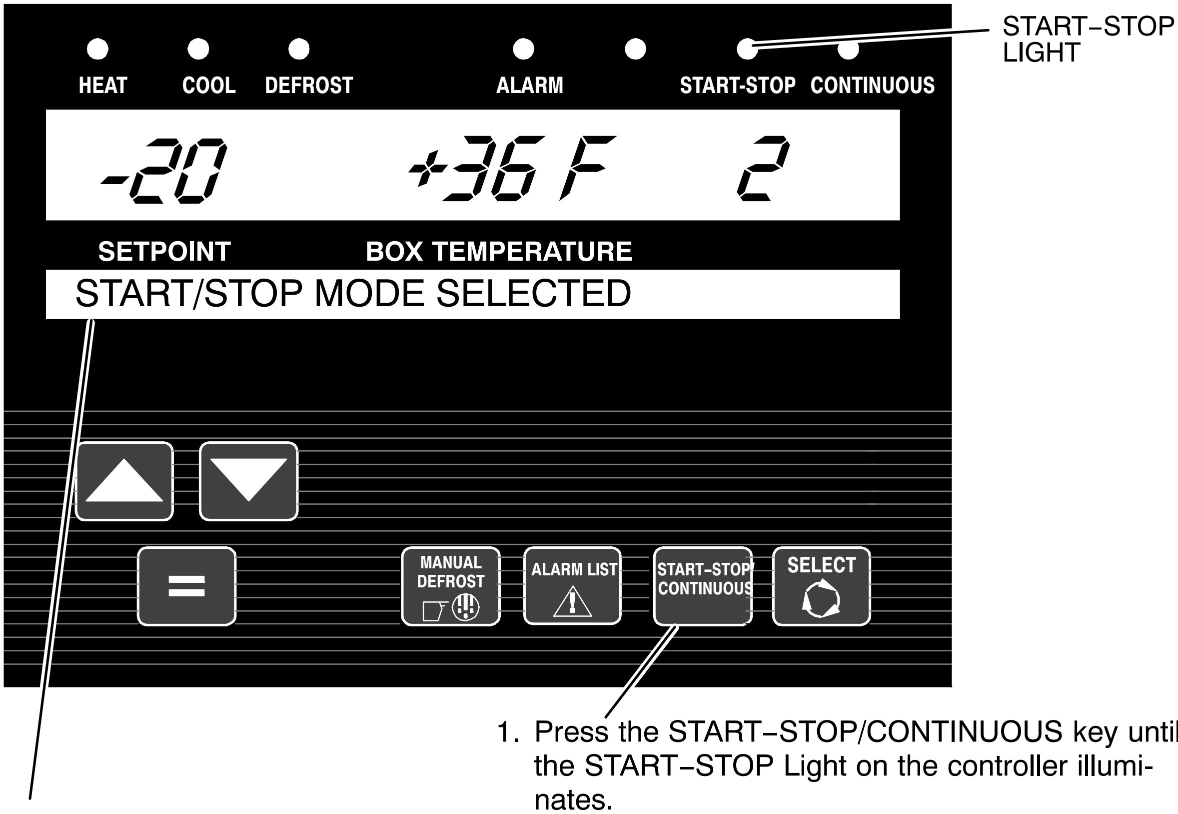
You can not change the setpoint when viewing the Alarm List, Data List or Functional Parameters, or when unit is in Pretrip or is in Sleep Mode. Setpoint may be changed any other time the RS is in the START/RUN position, or with the unit in PC Mode.

Pressing the = key will cause the new displayed setpoint value to become active and “SETPOINT CHANGED” is displayed. If the new value is not entered, after 5 seconds of no keypad activity, the entire display and Light Bar will flash for 15 seconds with “SETPOINT NOT CHANGED” displayed and then revert back to the last entered setpoint for that compartment. All other keys are active at this time and if pressed while the display is flashing, will stop the flashing, and perform the requested function.

TIP

You may press and hold the UP ARROW or DOWN ARROW key to quickly change the setpoint. The longer the key is held, the faster the setting will change.

3.7 START–STOP OPERATION – ENGINE/ROAD AND ELECTRIC STANDBY



1. Press the START–STOP/CONTINUOUS key until the START–STOP Light on the controller illuminates.
2. Verify that “START/STOP MODE SELECTED” is displayed on the MessageCenter and that the START-STOP light is illuminated. The unit is now in Start-Stop operation.

Automatic Start–Stop is provided to permit starting/stopping/restarting of the unit as required. This feature allows full automatic control of the engine or compressor starting and stopping by monitoring box temperature, battery charging amps and engine coolant temperature (Engine/Road only). The main function of automatic cycling is to turn off the refrigeration system near setpoint to provide a energy efficient temperature control system and to initiate a restart sequence when certain conditions are met. The Start–Stop/Continuous key is pressed to select between Continuous Run and Start–Stop operating modes. Refer to Section 4.2 for more detailed information on Start–Stop Mode.

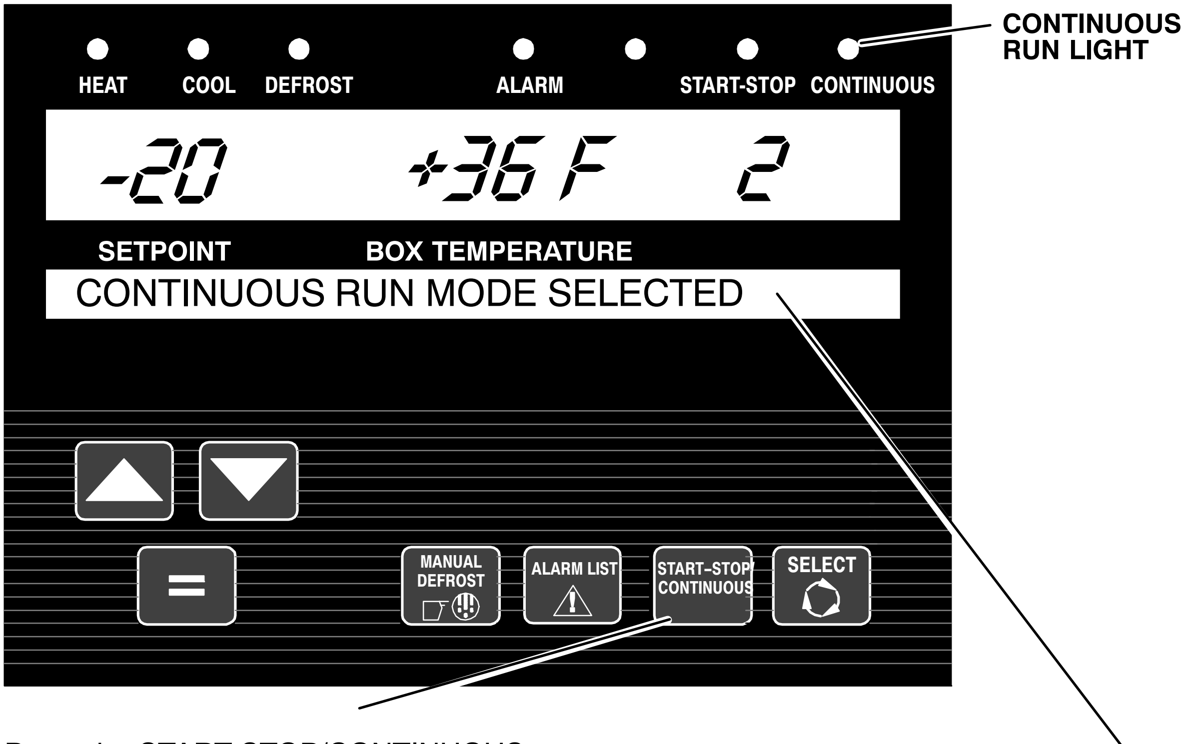
For compartment 1 only Start-Stop operation may be tied to the setpoint ranges for frozen and perishable loads. The START-STOP/CONTINUOUS key is locked out if “START-STOP LOCKED” appears in the MessageCenter when the key is pressed and the unit is in Start–Stop Mode or “CONTINUOUS LOCKED” appears in the MessageCenter when the key is pressed and the unit is in Continuous Run Mode. Refer to the configuration table Section 5.2.

If the engine fails to start after three start attempts, the “FAILED TO START–AUTO MODE” alarm will be activated. While running, if the unit shuts down on a safety, or fails to run for the minimum run time, three consecutive times, the
“FAILED TO RUN MINIMUM TIME” Alarm will be activated. The shutdown counter is cleared when the unit has run for 15 minutes, or when the engine cycles off normally.

NOTE

In electric standby mode, the unit will stop for a minimum of 5 minutes instead of 15 minutes.

3.8 CONTINUOUS RUN OPERATION



1. Press the START-STOP/CONTINUOUS key until the CONTINUOUS RUN Light on the controller illuminates.
2. Verify that "CONTINUOUS RUN MODE SELECTED" is displayed on the MessageCenter and that the CONTINUOUS RUN light is illuminated. The unit is now in Continuous Run operation.

In the Continuous Run Mode, the unit will not shut down except for safeties or if the engine stalls. Refer to Section 4.3 for more detailed information on Continuous Run Operation.

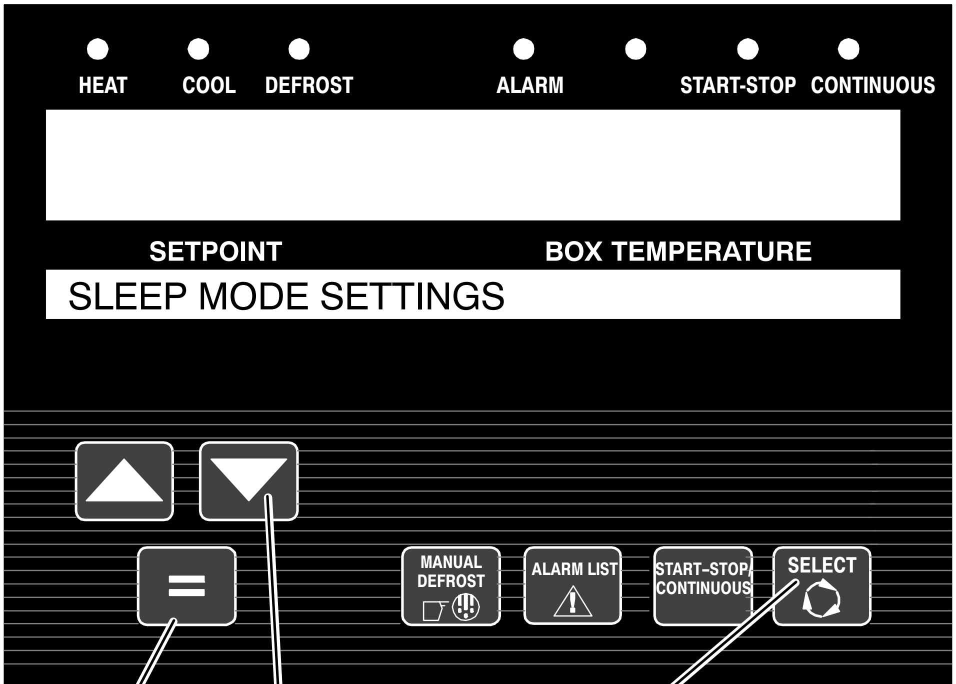
Start-Stop and Continuous operation may be tied to the setpoint ranges for compartment 1 only for frozen and perishable loads. The START-STOP/CONTINUOUS key is locked out if "START-STOP LOCKED" appears in the MessageCenter when the key is pressed and the unit is in Start-Stop Mode or "CONTINUOUS LOCKED" appears in the MessageCenter when the key is pressed and the unit is in Continuous Run Mode. Refer to the configuration table Section 5.2.

If the unit fails to start after three start attempts, the "FAILED TO START–AUTO MODE" alarm will be activated. While running, if the unit shuts down on a safety device three consecutive times, without running a minimum of 15 minutes between shutdowns, the "FAILED TO RUN MINIMUM TIME" Alarm will be activated. The shutdown counter is cleared when the unit has run for 15 minutes.

NOTE

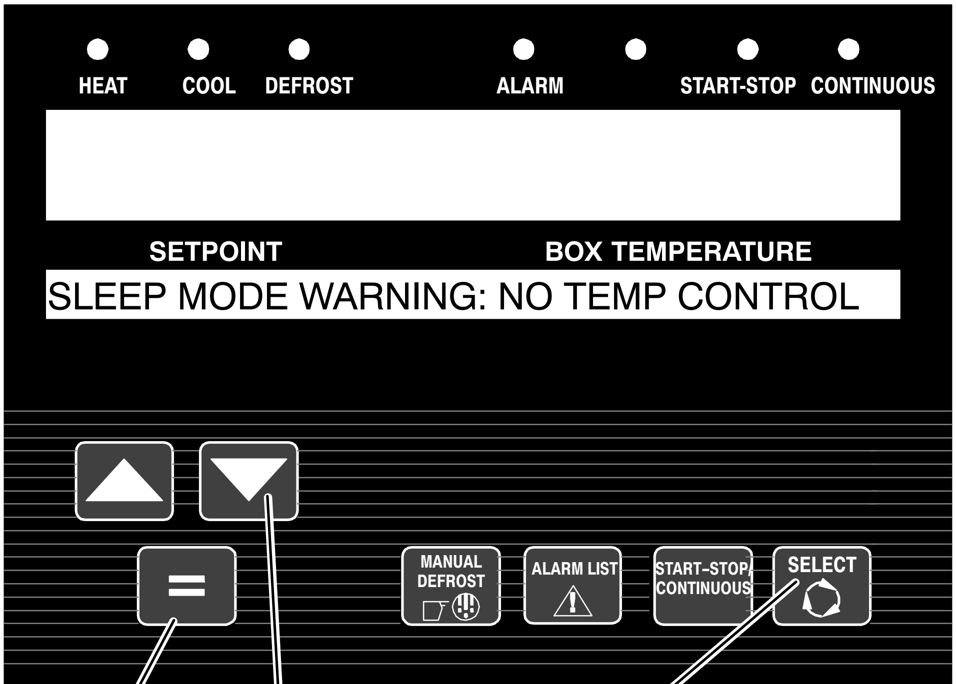
In electric standby mode, any compartment with setpoint equal to or less than 10°F (–12°C) will cycle off at setpoint. If all compartments are less than or equal to 10°F (–12°C) the unit will shut down at setpoint.

3.9 SLEEP MODE ON



1. Press the SELECT key until the MessageCenter displays "PRESS ↑↓ TO VIEW SETTINGS".
2. By pressing the UP or DOWN ARROW key, you will move through the Function List until "SLEEP MODE SETTINGS" appears in the MessageCenter.
3. Press the = key. "↑ ↓ TO SCROLL, THEN = TO SAVE" will show in the MessageCenter.
4. Press the = key to select Sleep Mode Settings.
5. "SLEEP MODE: YES OR NO" will show in the MessageCenter. Press either the UP or DOWN ARROW key to change the Sleep Mode to "YES".

3.10 SLEEP MODE OFF



1. Press the SELECT key until the MessageCenter displays “PRESS ↑↓ TO VIEW SETTINGS”.
2. By pressing the UP or DOWN ARROW key, you will move through the Function List until “SLEEP MODE SETTINGS” appears in the MessageCenter.
3. Press the = key. “↑ ↓ TO SCROLL, THEN = TO SAVE” will show in the MessageCenter.
4. Press the = key to select Sleep Mode Settings.
5. “SLEEP MODE: YES OR NO” will show in the MessageCenter. Press either UP or DOWN ARROW key to change the Sleep Mode to “NO”.

OR

1. To take the unit out of Sleep Mode, place the START/RUN - OFF switch to OFF position, then back to Start/Run.

SLEEP MODE ON (Continued)

No further menu selections are available when NO is selected from the
"SLEEP MODE: YES OF NO" menu. The following sub menus are available when YES is selected:

1. "WAKE UP TIME"

   a. When "WAKE UP TIME" is set to NO the unit will remain in Sleep Mode until it is taken out manually per Section 3.10

   b. When "WAKE UP TIME" is set to YES the "SET WAKEUP TIME" menu will become available.

Pressing the "=" key will allow the user to select the time the unit is to automatically wake up. The wake up time must be at least 1 hour and no more than 8 days from the time the clock is set. The following information can be entered:

- Month
- Day
- Year
- Hour
- Minute

NOTE

The clock is a 24 hour clock. Hours 1 thru 12 are AM and hours 13 thru 24 are PM.

2.'RUN PRETRIP TEST AT WAKE"

   a. When "PRETRIP TEST AT WAKE" is set to NO the unit will wake up at the designated time and control to setpoint.

   b. When "PRETRIP TEST AT WAKE" is set to YES. the unit will wake up at the designated time, automatically run Pretrip and then control to setpoint. "PRETRIP PASS/FAIL" will remain in the MessageCenter until it is manually cleared.

If Sleep Mode is selected, when the unit is not running (Start-Stop Off Cycle), any remaining Minimum Off Time will be ignored, and the engine will start. It will run for 4 minutes (minimum), until the Engine Coolant Temperature is above 122°F (50°C), and the battery is fully charged (O.K. appears in the Data List voltage line, and charging amps are less than amps set in the Configuration List). While the unit is running in Sleep Mode, "SLEEP WARNING: NO TEMP CONTROL" will flash in the MessageCenter, and the Main Display (setpoint and box temperature) will be turned off. This is because box temperature does not have to be at setpoint to allow the unit to cycle off (go to sleep).

If the unit is already running when Sleep Mode is selected, it will continue to run until the conditions described above are met, then shut off (go to sleep).

There is **NO TEMPERATURE CONTROL** in Sleep Mode and it should never be used for hauling perishable or frozen products.

While the unit is cycled off in Sleep Mode,
"SLEEP MODE, OFF/ON TO WAKE" will be displayed in the MessageCenter. The display backlight will turn off after 5 minutes. Sleep Mode may be exited by either turning the Start / Run – OFF switch to the OFF position, then back to the ON position, or by accessing the Functional Parameter list, and selecting
"SLEEP MODE: OFF".

While in Sleep Mode, Unit Data and Alarm Lists may be viewed, and Functional Parameters may be viewed and changed as necessary. However,
Start–Stop /Continuous Run selections, and setpoint can not be changed. Manual Defrost and Pretrip can be initiated.

The unit will restart when engine coolant temperature drops below 34°F (1°C) or if the battery voltage drops below the battery restart value selected in the configurations (See 5.2.1)

Sleep Mode is used generally in cold ambients when the trailer may be parked or not used and the unit is OFF for an extended period of time (1 day to several weeks) with no product inside the refrigerated compartment. Many times units are very difficult to start due to a discharged battery, thickened engine oil, etc. after that time in cold ambients.

In Sleep Mode in Engine/Road Operation the unit will "Wake Up" periodically and run to keep the battery charged and the engine warm.

In Sleep Mode in Electric Standby Operation the compressor will be off and the the battery charger will keep the battery charged.

NOTE (FOR ENGINE OPERATION ONLY)

In the event that the Engine Coolant Temperature sensor fails, Sleep Mode will operate as follows:

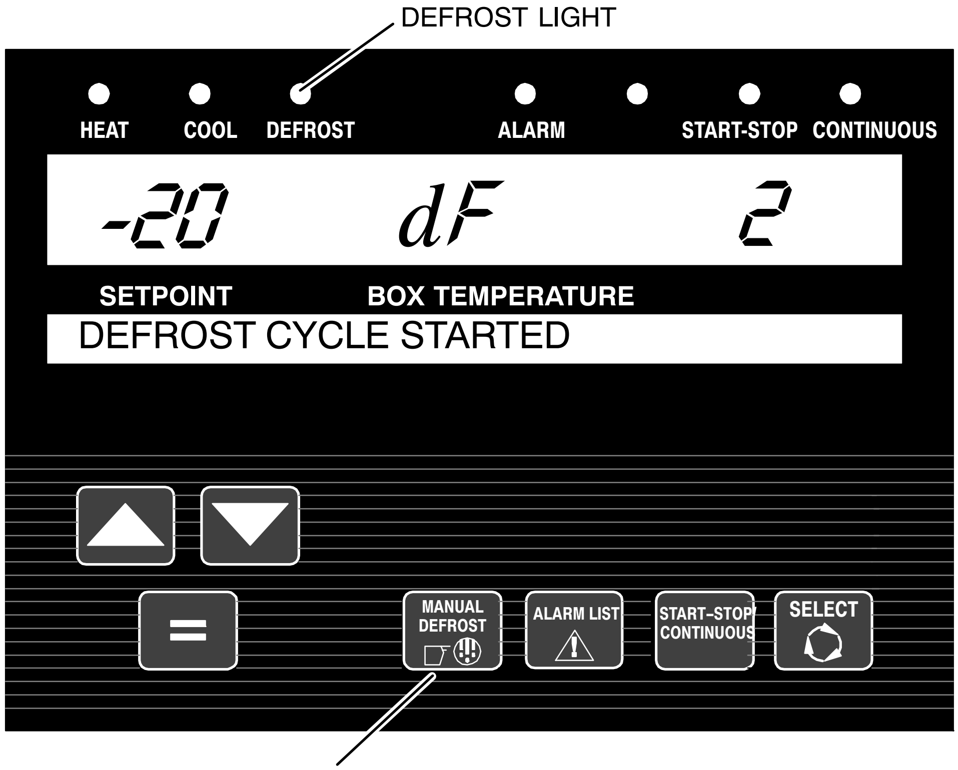
In ambients above +32°F (0°C), the unit will run as above, and will monitor battery voltage and charging amps only (according to the configuration setting).

In ambients below +32°F (0°C), the unit will run for 20 minutes minimum run time, then restart every 60 minutes (maximum off time). Battery voltage and amperage will be monitored normally.

NOTE

Units equipped with IntelliSet option can select sleep mode by choosing IntelliSleep. (See Section 3.21.1).

3.11 MANUAL DEFROST



1. Press the MANUAL DEFROST key. The DEFROST light will come on and the MessageCenter will display "DEFROST CYCLE STARTED" for 5 seconds, or flash "CANNOT START DEFROST CYCLE" for 5 seconds.

3.11.1 Manual Defrost

The defrost mode can not be manually initiated if:

- "CANNOT START DEFROST CYCLE" is displayed when the manual defrost key is pressed thus indicating that none of the Defrost Termination Temperature Sensors (1DTT, 2DTT or 3DTT) is below 40°F (4°C).
- The engine has not run 15 seconds after starting.
- The unit is in PC Mode.
- The unit is in Pretrip.
- There is an active shutdown Alarm.

TIP

The Manual Defrost Key can be used at any time to start a Defrost Cycle as long as one of the DTTs is below 40°F (4.4°C).

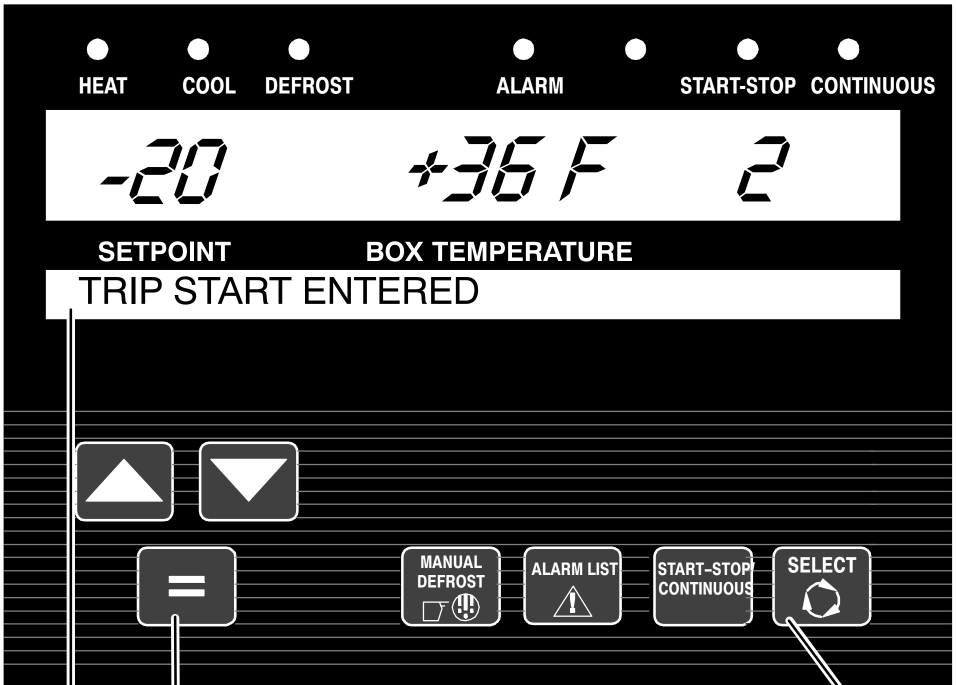
NOTE

All compartments will go into defrost at the same time.

NOTE

Refer to Section 4.4.10 for more detailed information on Defrost.

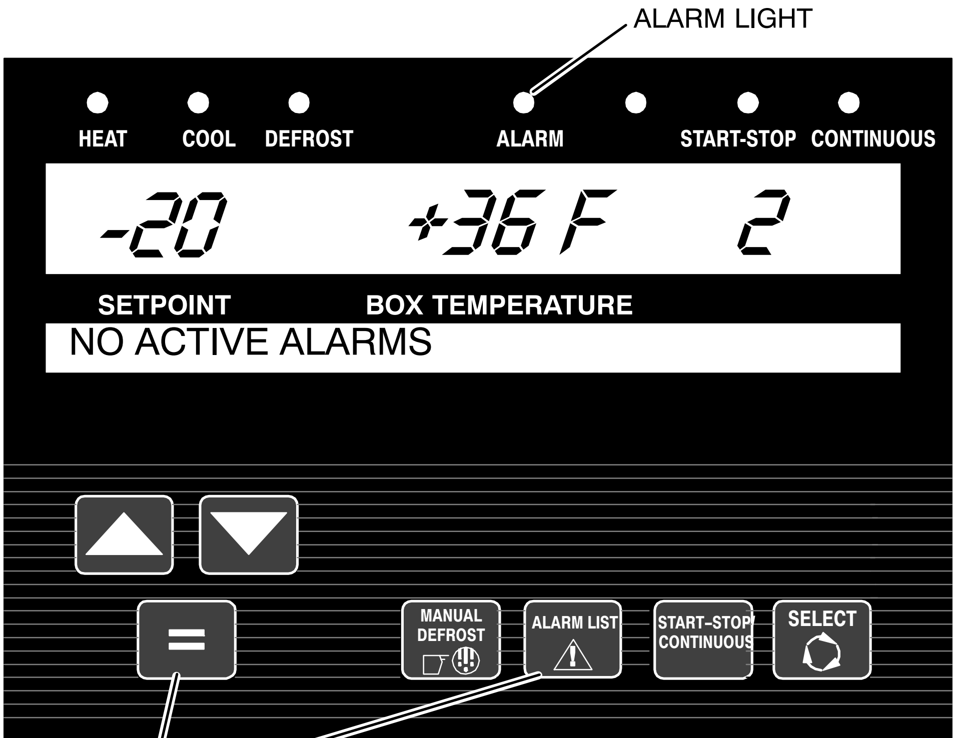
3.12 TRIP START



1. To mark the start of a trip in the data recorder, press the SELECT key until The MessageCenter displays “PRESS = TO MARK TRIP START”.
2. Press the = key.
3. If trip start is acknowledged by the data recorder, “TRIP START ENTERED” will be displayed for 5 seconds and then the display will revert back to the normal display. Otherwise CANNOT ENTER TRIP START will flash and then the display will revert back to the normal display.

Trip Start places a time stamp in the data recorder memory to allow easy review of the data from the last trip, and to allow downloading data from a specific trip. A trip begins at a Trip Start, and ends at the next Trip Start. Trip Start tells the data recorder that the present date and time is the beginning of a new trip.

3.13 VIEW ACTIVE ALARMS



1. Press the ALARM LIST key. If there are no active alarms, the display will say “NO ACTIVE ALARMS” for 5 seconds.
2. If there are active alarms, the display will be ‘A’ and the alarm number and message. The last Alarm that occurred will be the first Alarm displayed and so on.
3. Press the ALARM LIST or UP ARROW key to scroll through the list of alarms.
4. When you reach the end of the alarm list, “LIST END, = TO CLEAR ALARMS” is displayed for 5 seconds.
5. To clear the alarm list, press the = key while “LIST END, = TO CLEAR ALARMS” is being displayed. “ACTIVE ALARMS LIST CLEAR” is displayed. This will move all Alarms to the Inactive Alarm list.

Alarms that occur are stored in the Alarm List in the controller. Stored alarms may be viewed in the MessageCenter.

For a complete list of alarms, their meanings, and troubleshooting refer to Section 7.

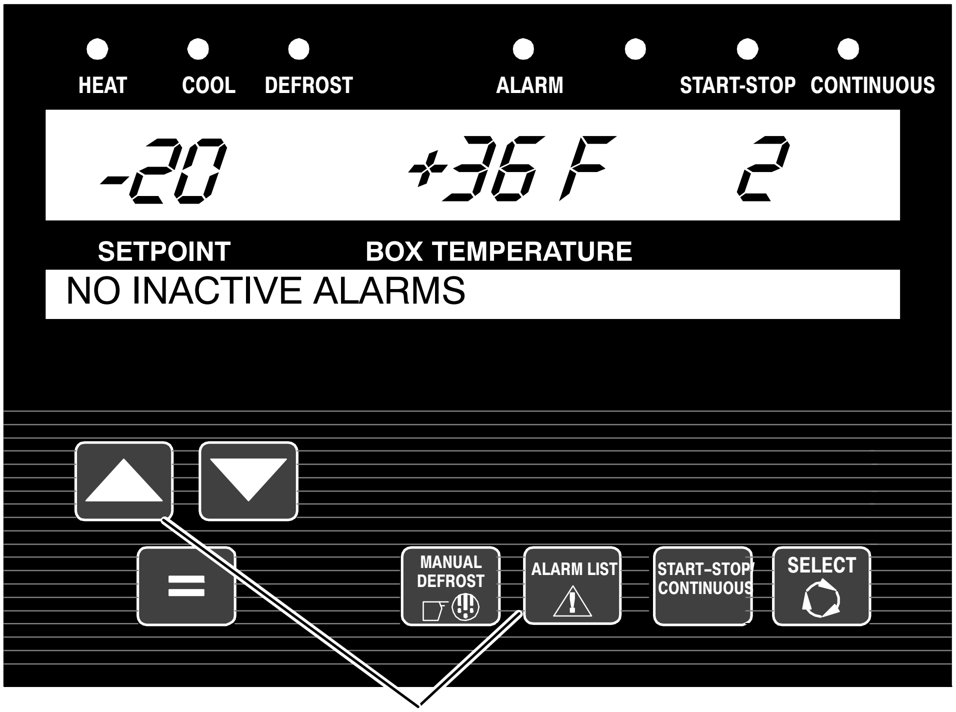
TIP

Another way to clear active alarms is to turn the controller OFF and then back ON using the START/RUN – OFF switch (RS).

TIP

“CHECK MICROPROCESSOR” means there is a wiring problem between the microprocessor and the display module.

3.14 VIEW INACTIVE ALARMS



1. Press and hold both the ALARM LIST key and the UP ARROW key for 6 seconds. If there are no inactive alarms, the display will say "NO INACTIVE ALARMS" for 5 seconds.
2. If there are inactive alarms, the display will be 'I' and the alarm number and message.
3. Press the ALARM LIST or UP or DOWN key to scroll through the list of alarms.
4. When you reach the end of the alarm list, "LIST END, = TO CLEAR ALARMS" is displayed for 5 seconds.
5. To clear the active and inactive alarm list, press the = key while "LIST END, = TO CLEAR ALARMS" is being displayed. "ALL ALARMS CLEAR" is displayed.

The microprocessor can hold up to 16 alarms within the Active and Inactive Alarm Lists combined. The list can be read via the MessageCenter or using the ReeferManager PC Program. There are 2 sections in the Alarm List, an Active Alarm Section and Inactive Alarm Section. Alarms in these sections are in the order in which the alarms activate and deactivate, respectively. On startup, all alarms are marked as inactive in the entire list. If an inactive alarm becomes active, the alarm is moved from the Inactive Alarm List (section) to the Active Alarm List (section).

As additional alarms occur, they will be placed first in the Active Alarm List. An alarm can not be active and inactive at the same time. Each alarm can only be present in either the Active or Inactive Alarm List at any given time. As conditions changed, alarms may be moved from the Active Alarm List to the Inactive alarm list and back.

Alarms are also recorded in the Data Recorder. They are recorded at the time they occur (become active), and the time they become inactive.

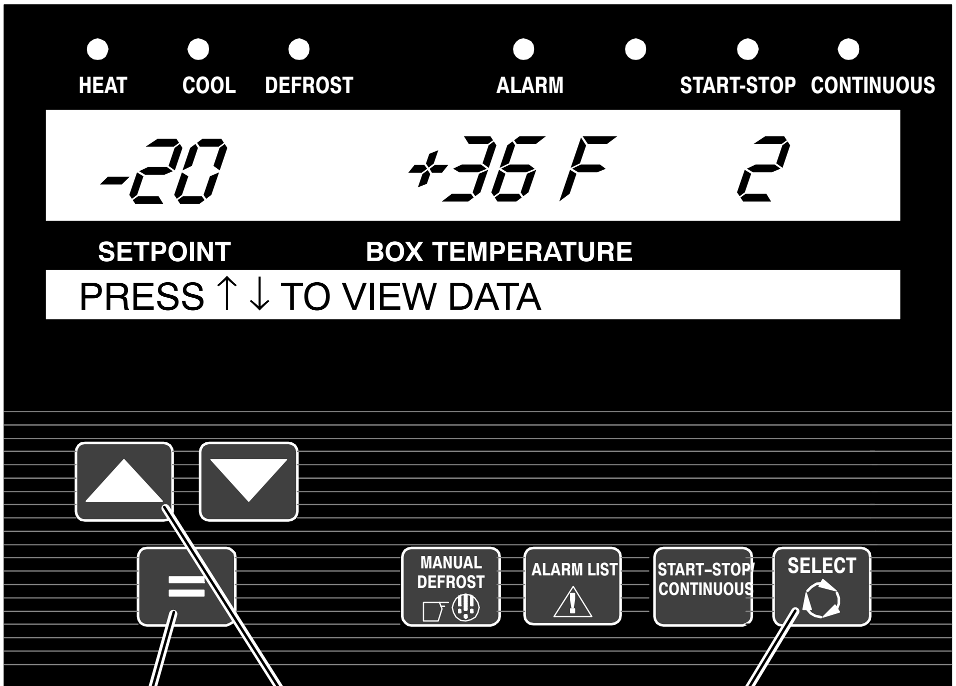
For a complete list of Alarms and troubleshooting information Refer to Section 7.

TIP

When alarms are cleared from the Inactive Alarm List, both active and inactive alarm lists are cleared.

If there is a safety shutdown, **UNIT SHUTDOWN – SEE ALARM LIST** will be shown. See Section 7 for complete list of Alarms and their descriptions.

3.15 UNIT DATA



1. Press the SELECT key until the MessageCenter displays “PRESS ↑↓ TO VIEW DATA”.

2. By pressing the UP ARROW key, you will move through the Data List beginning at the top and moving toward the bottom, or by pressing the DOWN ARROW key, you will move through the Data List beginning at the bottom, and moving toward the top.

3. Data items will remain in the MessageCenter for 10 seconds. After that, the default message will be displayed.

4. To lock a Data List item in the MessageCenter, press the = key. The Data item will flash continuously to indicate it is locked. Press any key to stop flashing and unlock the item.

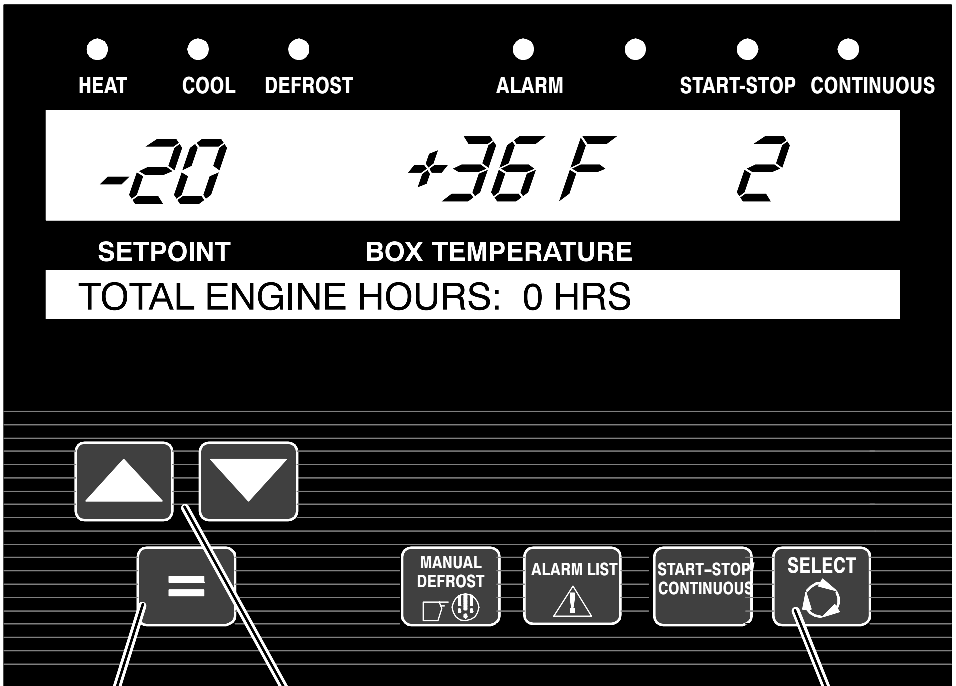
4. Pressing UP or DOWN key will unlock that item and move to the next data item. Pressing the = key will unlock the item.

Table 3-1. UNIT DATA		
* Also appear in Configurations		
+ May or may not be displayed depending on functional parameter settings		
	DATA	**DEFINITION**
	SUCTION PRESSURE	Compressor suction pressure
	DISCHARGE PRESSURE	Compressor discharge pressure
	EVAPORATOR PRESSURE	Suction pressure in the evaporator section
	ENGINE COOLANT TEMP	Engine coolant temperature
	RETURN AIR TEMP	Compartment 1 return (air entering evaporator) air temperature
	C2 RETURN AIR TEMP	Compartment 2 return (air entering evaporator) air temperature
	C3 RETURN AIR TEMP	Compartment 3 return (air entering evaporator) air temperature
	SUPPLY AIR TEMP	Compartment 1 supply (air leaving evaporator) air temperature
	C2 SUPPLY AIR TEMP	Compartment 2 supply (air leaving evaporator) air temperature
	DELTA–T	Return air temperature minus Supply air temperature in compartment 1 only
	AMBIENT AIR TEMP	Ambient (air entering condenser) air temperature
	DEFROST TERM TEMP 1	Compartment 1 defrost termination temperature
	C2 DEFROST TERM TEMP	Compartment 2 defrost termination temperature
	C3 DEFROST TERM TEMP	Compartment 3 defrost termination temperature
	SUCTION LINE TEMP	Suction line temperature at the compressor
	EVAP OUTLET TEMP	Suction line temperature at the evaporator outlet
	DISCHARGE TEMP	Compressor discharge temperature
	BATTERY	Battery voltage
	CURRENT DRAW	Battery charging or discharging amps.
	ENGINE RPM	Engine revolutions per minute
	UNIT AC CURRENT #1	High voltage current draw on circuit #1.
	UNIT AC CURRENT #2	High voltage current draw on circuit #2.
	FUEL LEVEL	% of fuel in tank. (This is only shown when 0% – 100% sensor is configured ON.)
	SUCTION MOD VALVE	% open of CSMV
	EXPANSION VALVE	% open of EVXV
	START MODE	AUTO if the engine will start automatically MANUAL if the engine must be started manually
	INSTALLED OPTIONS INTELLISET INSTALLED	Applies only if unit has these installed options.
	SOFTWARE REVISION	Revision of the software that is operating the microprocessor
	DISPLAY SOFTWARE REV	Revision of the software that is operating the display
	CONTROL SERIAL #	Serial Number of the microprocessor
*	TRAILER ID #	ID (as entered by the user)
*	UNIT SERIAL #	Unit serial number

Table 3-1. UNIT DATA		
* Also appear in Configurations		
+ May or may not be displayed depending on functional parameter settings		
*	UNIT MODEL #	Unit model number (selected through configurations)
+	HOURS TO ENGINE MAINT	Number of engine hours until the next programmed engine maintenance.
+	HOURS TO S/B MTR MAINT	Number of engine hours until the next programmed electric standby motor maintenance.
+	HOURS TO UNIT MAINT	Number of switch−on hours until the next programmed general unit maintenance.
+	TIME LEFT TO PM (1−5)	Number of hours until the next programmed maintenance.
*	PRODUCTSHIELD SETUP:	Indicates that unit has IntelliSet installed and displays ProductShield settings.
	PRODUCTSHIELD ECONO:	Indicates if ProductShield Econo is **OFF** OR **Go To Start/Stop** OR **Go To Continuous Run**
	ECONO MIN TEMP	Minimum ambient temperature of range for activation of ProductShield Econo (Will only be displayed if Econo is **NOT OFF**)
	ECONO MAX TEMP	Maximum ambient temperature of range for activation of ProductShield Econo (Will only be displayed if Econo is **NOT OFF**)
	ECONO DELTA−T	Delta−T value for activation of ProductShield Econo (Will only be displayed if Econo is **NOT OFF**)
	PRODUCTSHIELD HIGH AIR:	Indicates if Product Shield High Air is **ON** or **OFF**
	HIGH AIR MIN TEMP	Minimum ambient temperature of range for activation of Product Shield High Air (Will only be displayed if High Air is **ON**)
	HIGH AIR MAX TEMP	Maximum ambient temperature of range for activation of Product Shield High Air (Will only be displayed if High Air is **ON**)
	HIGH AIR DELTA−T	Delta−T value for activation of Product Shield High Air (Will only be displayed if High Air is **ON**)
	PRODUCTSHIELD: WINTER − xx°	Indicates the ambient temperature that is controlling ProductShield Winter (Will only be displayed if WINTER is **NOT OFF**)
* +	RANGE 1 LOCK Compartment 1 Only	OFF − Temperature Range 1 Lock is turned off. CONTINUOUS − When the setpoint is set between Range 1 Minimum & Maximum Temperatures, the unit is set to operate only in Continuous Run. START−STOP − When the setpoint is set between Range 1 Minimum & Maximum Temperatures, the unit is set to operate only in Start−Stop.
* +	RANGE 1 MINIMUM TEMP	This is the lower limit for Range 1.
* +	RANGE 1 MAXIMUM TEMP	This is the upper limit for Range 1.
* +	RANGE 2 LOCK Compartment 1 Only	OFF − Temperature Range 2 Lock is turned off. CONTINUOUS − When the setpoint is set between Range 2 Minimum & Maximum Temperatures, the unit is set to operate only in Continuous Run. START−STOP − When the setpoint is set between Range 2 Minimum & Maximum Temperatures, the unit is set to operate only in Start−Stop.
* +	RANGE 2 MIN. TEMP	This is the lower limit for Range 2.
* +	RANGE 2 MAX. TEMP	This is the upper limit for Range 2.

Table 3-1. UNIT DATA		
* Also appear in Configurations		
+ May or may not be displayed depending on functional parameter settings		
* +	REMOTE SENSOR (1−3)	This is the temperature at remote Temperature Sensor 1, 2, and 3. (These sensors are optional, and may not be applicable to your unit. Up to 3 remote sensors may be listed.)
*	DATALOGGER	This is the current Date and Time that the Data Recorder is using. This may be different than your actual time, depending on the Time Zone and Daylight Savings Time selections made by the owner of the unit.

3.16 VIEW HOURMETERS



1. Press the SELECT key until the MessageCenter displays "PRESS ↑↓ TO VIEW HOURMETERS".

2. Press the UP or DOWN ARROW key to move through the Hourmeter List.

3. Displayed hourmeters will depend on unit configurations (See Section 5.2.1). Typical displayed meters are: "TOTAL ENGINE HOURS", "STANDBY RUN HOURS" and "TOTAL SWITCH ON HOURS".

4. Pressing the = key will access all other meters and display "OTHER METERS AND COUNTERS".

5. Selected Hourmeter will remain in the MessageCenter for 10 seconds, then the default message (STATUS OK) or other customer specified message) will appear.

6. To lock an hourmeter in the MessageCenter, press the = key. The Data item will flash continuously to indicate it is locked.

7. Pressing any key on the keypad will unlock the item. Pressing the UP or DOWN ARROW key will move to the next hourmeter.

Hourmeters available when "OTHER METERS AND COUNTERS" is chosen are:

•Meters listed in Step 3 above.

•Switch On Standby Hours

•Engine Protect Hours

•Switch On Protect Hours

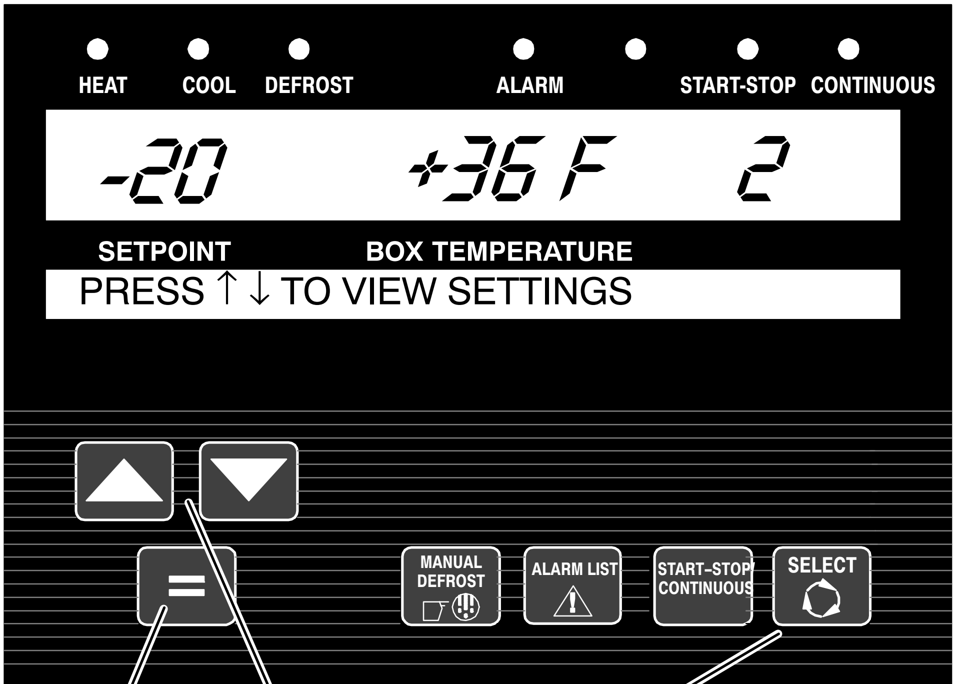
•Switch On Sleep Hours

•Engine Sleep Hours

•High Speed Hours

•Start cycles

3.17 FUNCTIONAL CHANGE (PARAMETERS)



1. Press the SELECT key until the MessageCenter displays "PRESS ↑↓ TO VIEW SETTINGS".

2. By pressing the UP ARROW key, you will move through the Function List beginning at the top or by pressing the DOWN ARROW key, you will move through the Function List beginning at the bottom.

3. To change one of the Functions, bring the Function you wish to change into the MessageCenter, and press the = key. "↑ ↓ TO SCROLL, THEN = TO SAVE" will show in the MessageCenter. Pressing either UP or DOWN ARROW key will begin to change the Function setting. The MessageCenter will flash, indicating that a change has been made that has not been entered into memory.

4. Continue pressing UP or DOWN ARROW key until the desired value is showing, then press the = key. The MessageCenter will stop flashing. The new value is now in memory. If the = key is not pressed within 10 seconds, the MessageCenter will change to "FUNCTION NOT CHANGED". This will appear for 5 seconds, then return to the last Functional Parameter shown. If no further keys are pressed, the default message will be displayed another 10 seconds.

NOTE

Any Function that is shown with a padlock symbol cannot be changed from the keypad.

Table 3-2. Functional Parameters

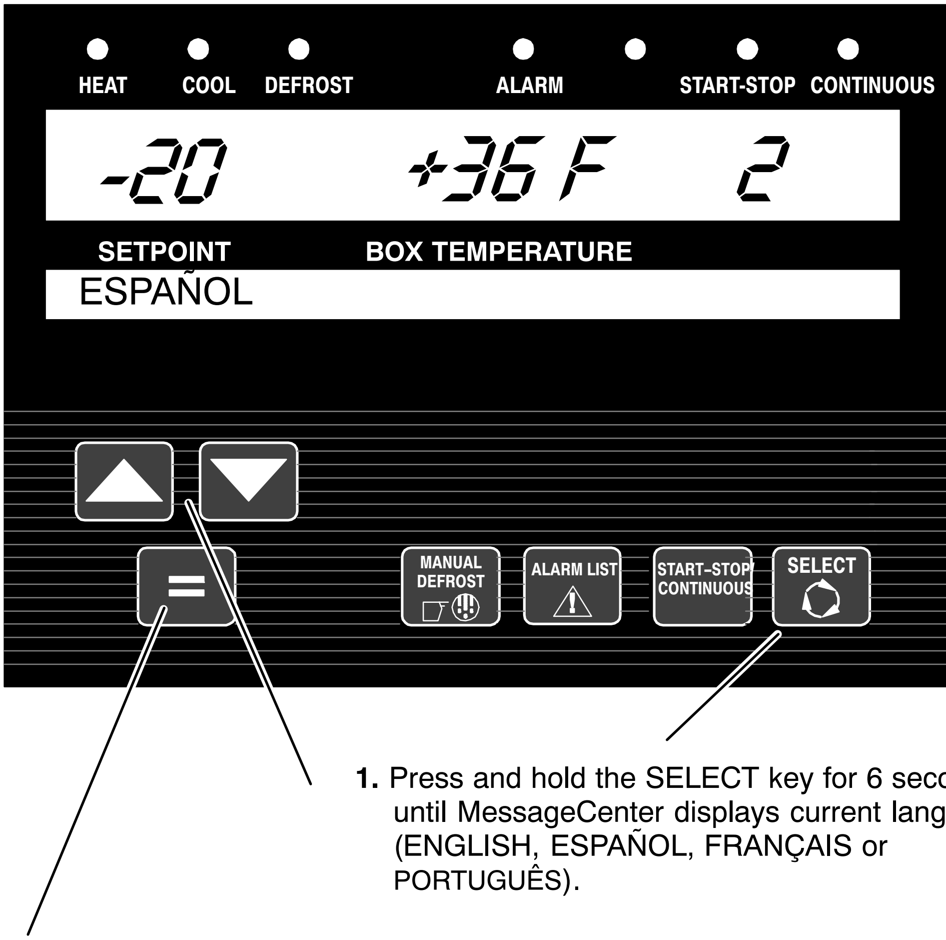
FUNCTIONAL PARAMETER	SELECTIONS	DESCRIPTION
SILENT MODE	**NO** YES	NO – Normal engine speed operation. YES – Low engine speed operation.
DEFROST INTERVAL TIMER SET FOR	1.5HRS 3HRS **6HRS** 12HRS	The defrost timer will automatically put the unit into the defrost cycle at the interval selected if any one compartment DTT is below 40°F (4.4°C). Shorter times are generally used for warm, humid products like produce. Longer times can be used for dry and frozen products.
SET S/S PARAMETERS (These may be displayed individually (8 parameters) as PERISH and FROZEN, or combined (4 parameters) with no designation.)		Time and Temperature values that control the Automatic Start–Stop operation are set in this section. When "TOGETHER" is selected in Configurations, only Perishable Settings are used.
• (PERISH / FROZEN) MIN RUN TIME:	**4MINS** TO 60MINS (in 1 minute increments)	This determines the minimum length of time the unit will run every time the unit starts in Auto Start–Stop Modes.
• (PERISH / FROZEN) MIN OFF TIME:	10MINS TO 90MINS **20MINS** (in 1 minute increments)	This determines the minimum length of time the unit will remain off whenever the unit cycles off in Auto Start–Stop Modes.
• (PERISH / FROZEN) OVERRIDE TEMP:	3.6°F (2°C) TO 18°F (10°C) **11°F (6°C)** (in 0.5°F or C increments)	This selects the override temperature for the Auto Start–Stop Off Cycle. During the Minimum Off Time, should the refrigerated compartment temperature drift this far above or below setpoint in the Perishable Range, or above setpoint in the Frozen Range, the unit will override the Minimum Off Time, and restart.
• (PERISH / FROZEN) MAX OFF TIME:	**OFF** 10MINS TO 255MINS (in 1 minute increments)	OFF – There is no maximum off time. When a minute value is selected, this is the longest amount of time the unit will remain off during a (Perishable or Frozen or both) Auto Start–Stop Off Cycle. When this time expires, the unit will restart and run for the Minimum Run Time, regardless of any temperature change inside the refrigerated compartment.

FUNCTIONAL PARAMETER	SELECTIONS	DESCRIPTION
FROZEN SHUT-DOWN OFFSET	**0°F (0°C)** TO 3.6°F (2°C) (in 0.5°F or C increments)	This only applies to Frozen Setpoints in Start−Stop operation. This offset is the number of degrees below setpoint that the unit will run before cycling off. This will allow for a lower average refrigerated compartment temperature when considering temperature rises during off cycles.
TEMP CONTROL: Compartment 1 Only	**RETURN AIR** SUPPLY AIR	Compartment 1 evaporator has both a Return Air Sensor and a Supply Air Sensor. This selection determines which sensor temperature will be used for setpoint selections above 10°F (−12.2°C) to determine when setpoint is reached. Return Air is generally selected for most products. Products that are sensitive to small temperature changes may use the Supply Air setting. Supply Air limits the temperature of the air leaving the evaporator to the setpoint setting.
PERISH SENSITIVE PRODUCT	OFF **ON**	Used to determine the supply air temperature limit in cool mode when return air control is selected. OFF − 32°F (0°C) or colder depending on the pre set limit. ON − setpoint minus the selected limit value [0 to 21.6°F (0 to 12°C)]
DISPLAY IN	**ENGLISH UNITS** METRIC UNITS	The display will show temperatures & pressures in either English (°F & PSIG) or Metric (°C & Bar)
ECO MODE	**NO** YES	NO − Normal temperature control operation YES − Fuel saving operation
* RESET PM HOURMETERS		Maintenance Hour Meters that are enabled will appear in this list.
RESET PM HOURMETERS	NO METERS TO RESET **OR** Expired Hourmeters	When the Hour Meter has timed out, and preventative maintenance has been performed, selecting RESET and pressing the = key will de−activate the alarm, and reset the Hour Meter for the next service interval.
• ELECTRIC STANDBY	RESET	
• SWITCH ON	RESET	
• PM 1 Thru 5	RESET	
OUT OF RANGE ALARM: (For compartment 1)	English Metric OFF OFF 4°F 2°C 5°F 3°C **7°F 4°C**	Once the unit is at setpoint, then drifted away for more than 30 minutes, an Out−Of−Range Alarm will come on. (Or, if configured for Out Of Range Shutdown, after 45 minutes the unit will shut down.) This setting determines how far away from setpoint the temperature must move before the timer is started. 4°F (2°C) may be used for very critical temperature products, 7°F (4°C) may be used for less critical products. The alarm may be turned off by selecting the OFF setting.
C2 OUT OF RANGE ALARM:		
C3 OUT OF RANGE ALARM:		

FUNCTIONAL PARAMETER	SELECTIONS	DESCRIPTION
SLEEP MODE SETTINGS The following sub menus determine whether sleep mode is to be used and what the settings will be.		
• SLEEP MODE The following two sub menu selections will be available if YES is selected.	**NO** YES	NO − is the normal operating selection and no further selections will be available. YES− selects Sleep Mode. In this mode the unit will operate only as needed to keep the engine warm, and the battery charged. There is NO TEMPERATURE CONTROL in Sleep Mode.
The following Sleep Mode parameters were added in Software Version 04.07.00		
• WAKE UP TIME	**NO** YES	NO − the unit will remain in Sleep Mode until it is taken out manually. This can be accomplished either through the Functional Parameter list or by turning the Run/Stop switch to STOP and then back to RUN. YES− the SET WAKE UP TIME sub menu will be available
SET WAKE UP TIME		This setting is used to set Sleep Mode wake up time. The clock is a 24 hour clock. Hours 1 thru 12 are AM and 13 thru 24 are PM. The wake up time must be at least 1 hour and no more than 8 days from the time the clock is set
• MONTH	1−12	Select the correct month of the year.
•DAY	1−31	Select the correct day of the month.
•YEAR	1998 − 2037	Select the correct year.
•HOURS	0−23	Select the correct hour (0−11 is AM / 12−23 is PM)
•MINUTES	0−59	Select the correct minute.

FUNCTIONAL PARAMETER	SELECTIONS	DESCRIPTION
• RUN PRETRIP AT WAKE	**NO** YES	NO – The unit will wake up at the designated time and control to setpoint. YES – The unit will wake up at the designated time, automatically run Pretrip and then control to setpoint. The Pretrip Pass/Fail message will remain in the MessageCenter until the message is manually cleared.
* OVERRIDE DOOR SHUTDOWN Two compartment only	**NO** YES	NO – allows the door switch to shut the unit down whenever the refrigerated compartment door is opened and the door switch is configured for shutdown. YES – allows you to override the refrigerated compartment door shutdown switch, and allow the unit to continue to run, even with the refrigerated compartment door open.
* NO POWER – SWITCH TO DIESEL	NO **YES**	YES – The unit will shutdown when electric standby power is lost. NO – The unit will change automatically to engine operation when standby power is lost.
LANGUAGE / IDIOMAS: LANGUE: LINGUAGEM:	**ENGLISH** ESPAÑOL FRANÇAIS PORTUGUÊS	**ENGLISH**– All information displayed in the MessageCenter will be shown in English. FRANÇAIS– All information displayed in the MessageCenter will be shown in French. ESPAÑOL– All information displayed in the MessageCenter will be shown in Spanish. PORTUGUÊS – All information displayed in the MessageCenter will be shown in Portuguese. **NOTE:** This parameter can be quickly accessed by pressing and holding the Select Key for 6 seconds.
Selections in **BOLD** are the default settings.		
* This Functional Parameter may not appear in the list for your unit, depending on how the microprocessor has been configured.		

3.18 LANGUAGE SELECTION



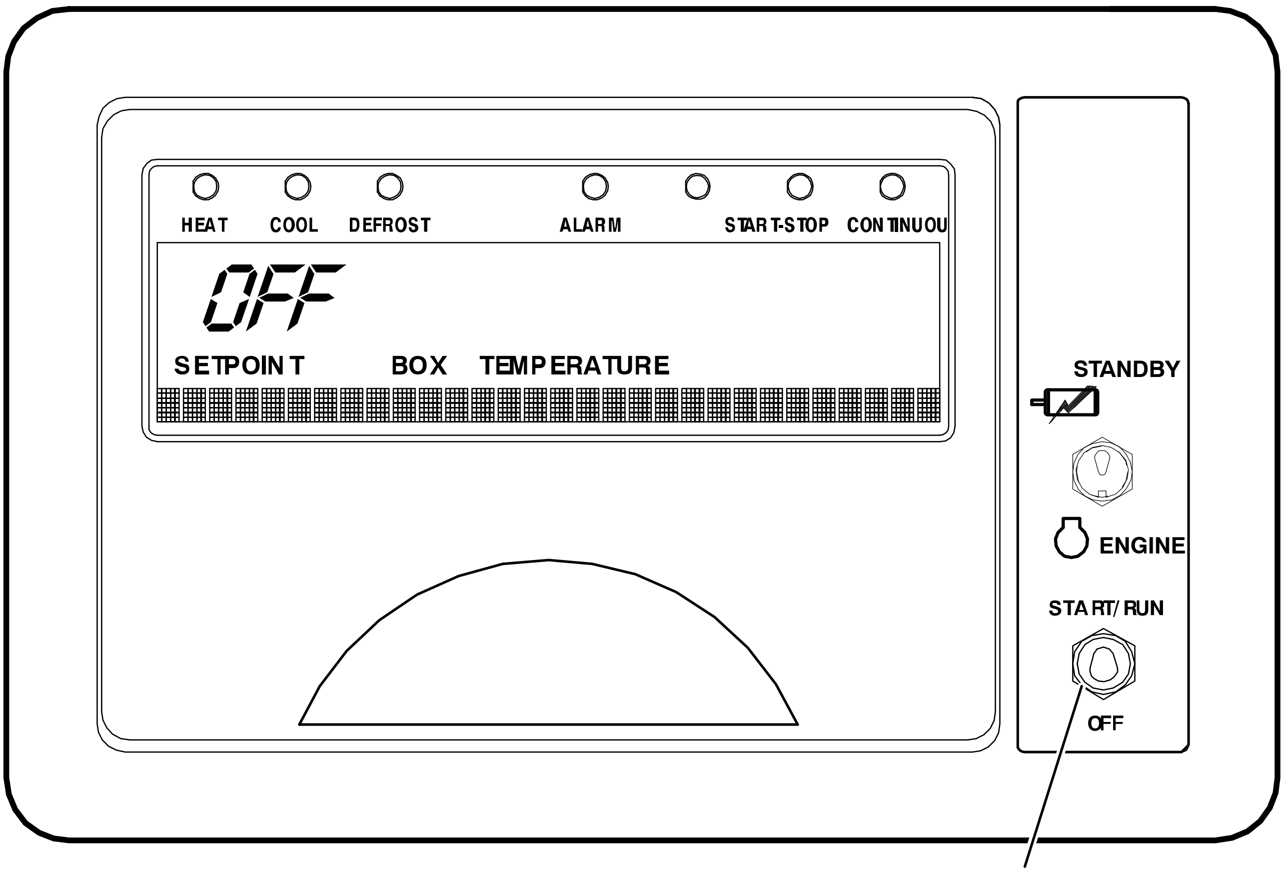
1. Press and hold the SELECT key for 6 seconds until MessageCenter displays current language (ENGLISH, ESPAÑOL, FRANÇAIS or PORTUGUÊS).

2. Press the UP or DOWN ARROW key until the MessageCenter indicates the desired language. Press the = key. The new language will now be active.
If the = key is not pressed within 10 seconds, the MessageCenter will change to "FUNCTION NOT CHANGED". This will flash for 5 seconds, then return to the current language. If no further keys are pressed, the default display will return in another 10 seconds.

3.19 STOPPING UNIT

⚠ WARNING

Always place RS in the OFF position and turn off the high voltage power supply before disconnecting the high voltage power plug from the unit.



1. To stop the unit, place the START/RUN - OFF switch in the OFF position.

The diesel engine will stop and the microprocessor controller will turn off. The Microprocessor Main Display, MessageCenter, and all indicator LEDs will also turn off.

NOTE

Due to internal processing within the microprocessor, turning the RS OFF then back to START/RUN will result in a 4 to 50 second delay between the display going off and coming back on again.

NOTE

The microprocessor will close the Electronic Expansion Valve (EVXV) and the CSMV before turning off.

NOTE

If all compartments are off and the RS is still in the START/RUN position, the unit will stop but the microprocessor will stay energized.

3.20 DATA RECORDING

The Advance Microprocessor contains a built−in Data Recorder with 512K of memory. The Data Recorder reads the same input information as the microprocessor (Functional Parameters, Configurations, and Unit Data) at all times. The Data Recorder records events as they occur, such as setpoint changes and Defrost Initiation and Termination, and also records all data values including temperature and pressure sensors in either averaged or snapshot format. The details are provided below.

3.20.1 Microprocessor Information

The microprocessor information that is available to be recorded is as follows:

Data Recorder Setup (Logging Intervals, Events and Sensors)

Data Recorder Time Clock Date / Time

Setpoints (And all setpoint changes.)

ID Number

Unit Serial Number

Unit Model Number

Current System Mode

Functional Parameters

Controller Configurations

3.20.2 Data Recording

The Data Recorder data comes from four general categories of information:

1) Microprocessor Information as described in Section 3.20.1 above.

2) Sensor Data

This information is recorded at pre−determined intervals as a snapshot of the sensor at the time of the recording, or an averaged reading of the sensor readings since the last recording. The user can determine which sensor(s) will be recorded, at what interval, and whether snapshot or averaged readings are preferred. (Snapshot readings of sensors are also taken at the time of a shutdown alarm.)

3) Event Occurrences

This information is any additional data that is recorded on a "when it occurs" basis. Events are recorded by the recorder as they occur. An Event is defined as something that happens (i.e. setpoint changed, Defrost Cycle Started, or Main Power On, etc.). Hourmeters are recorded at midnight or the first time of day the switch is turned to the ON position.

4) User Area Data

The User or service technician is able to enter a Comment into the Data Recorder using ReeferManager Program.

3.20.3 Sensor & Event Data

Sensors

The following sensors may be recorded either with an averaged reading, or snapshot or may not be recorded at all.

Return Air Temperature

Supply Air Temperature

Ambient Air Temperature

1 Defrost Termination Temperature

Compressor Discharge Temperature

Engine Coolant Temperature

Compressor Discharge Pressure

Compressor Suction Pressure

Evaporator Outlet Pressure

Evaporator Outlet Temperature

Total AC #1 and #2

Battery Voltage

Battery DC Current

Engine RPM

C2 Return Air Temp

C2 Supply Air Temp

C3 Return Air Temp

2 Defrost Termination Temperature

Fuel Level Sensor

Compressor Suction Temperature

Events (Selectable)

User may determine whether the following events are recorded. All other events such as ON/OFF, Defrost start will be recorded.

Pretrip Start

Pretrip End

Trailer ID

Unit S/N

Unit Mode

Control Mode

Optional Sensors & Events

In addition to the above Sensors and Events, the Data Recorder also has the capabilities to record the following:

Remote Temperature Sensor 1

Remote Temperature Sensor 2 (Two compartment units only)

Door Switch (Two compartment units only)

Fuel Tank % Level

DATA RECORDING (CONTINUED)

Time Intervals

The following intervals are available for sensor recording:

2 Minutes

5 Minutes

10 Minutes

15 Minutes

30 Minutes

1 Hour

2 Hours

4 Hours

3.20.4 Data Downloading

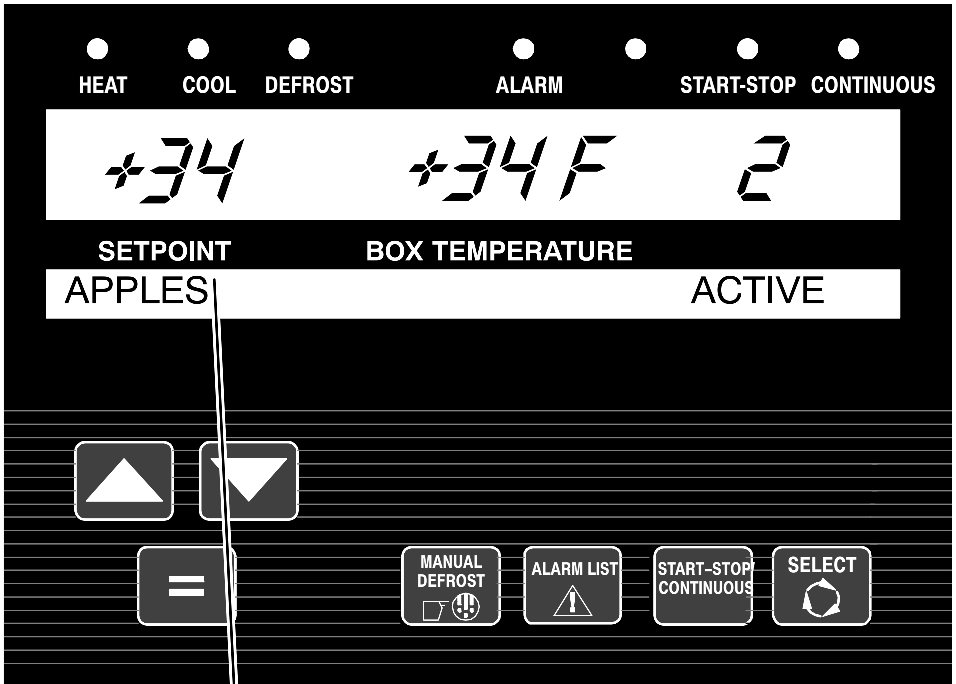
The data within the Data Recorder can be downloaded by either the ReeferManager Program, using a PC and a Download Cable connected to the Download Port (Refer to Section 5.1) or with a Download PC Card (Refer to Section 5.3).

3.20.5 Data Recorder Power−Up

The Data Recorder records data the entire time the Start/Run−Off switch is in the Run position. A configuration exists which allows the user to select either an additional 8 hours of sensor data to be recorded after the Start/Run−Off Switch (RS) is placed in the OFF position, or to stop recording at the same time the (RS) is turned to the Off position.

3.21 OPTIONS

3.21.1 IntelliSet



DURING START UP

Observe the MessageCenter during the Power−Up process. If the unit is equipped with IntelliSet, the name of the active or modified IntelliSet will be displayed for approximately 10 seconds before the engine starts.

DURING OPERATION

Press the SELECT key to view current IntelliSet. You will be prompted to press either the "=" key or the UP or DOWN ARROW Key to scroll through list of IntelliSets. The current IntelliSet will have either the word ACTIVE or MODIFIED after it. MODIFIED indicates that one or more of the IntelliSet settings (other than setpoint) have been changed. To change MODIFIED to ACTIVE, press = key while the IntelliSet is shown in the MessageCenter.

The Advance Microprocessor offers over 48 parameters that may be set depending on the product being carried. IntelliSet allows the owner to pre−program specific product settings into the microprocessor and give the settings a name. The operator may then call up these settings by simply selecting the IntelliSet name.

For example: Apples may require continuous operation at 35°F (1.7°C) with a defrost every 3 hours while a load of cheese may require the same operation with setpoints ranging from 35°F to 42°F (1.7°C to 5.6°C) and a load of ice cream requires Start−Stop operation at −22°F (−30°C) with defrost at 12 hour intervals. The settings required for each product may be entered into the microprocessor and then locked so they cannot be changed. In the case of the cheese, the range of setpoints may be locked, leaving the operator the ability to change the setpoint within the locked range.

When a load of apples is going to be picked up, the operator simply selects "APPLES" from the IntelliSet menu; for cheese, "CHEESE" is selected ; for ice cream, "ICE CREAM" is selected. With each selection, the microprocessor automatically re−programs the settings to provide the best temperature control, fuel economy, and performance for that particular product.

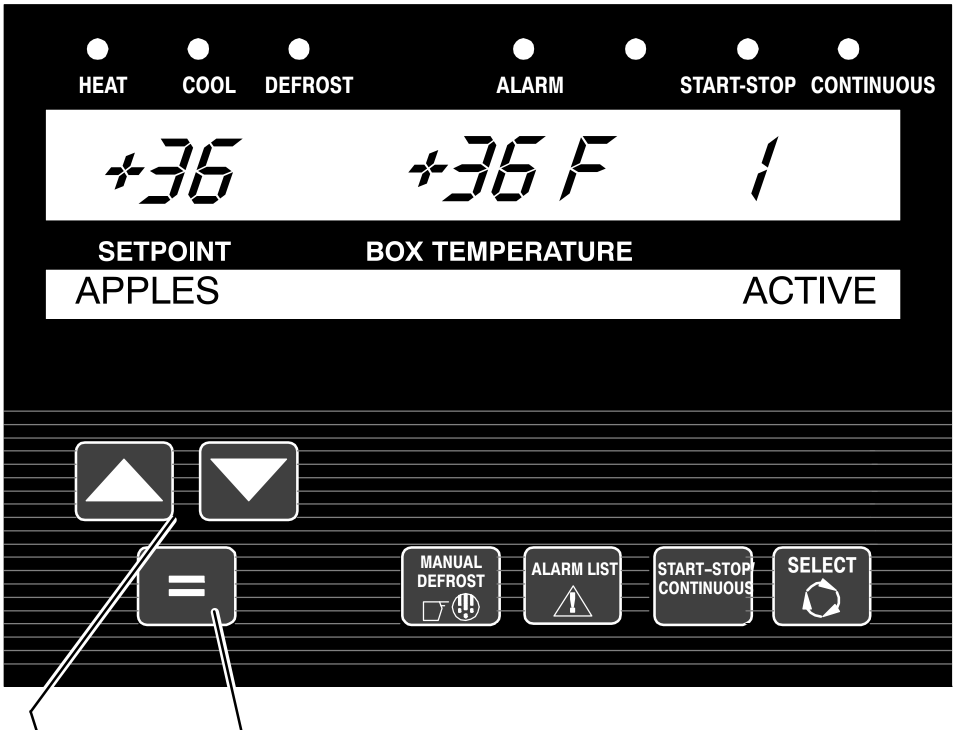
NOTE

IntelliSet #31 is pre−programmed as "IntelliSleep" which allows Sleep Mode (See Section 3.9) to be entered by simply changing to that IntelliSet.

NOTE

The above settings are **examples** of possible settings. Except for IntelliSleep, IntelliSets are not factory set. They are developed by individual customers.

a. Changing IntelliSets – With "=" Key Enabled



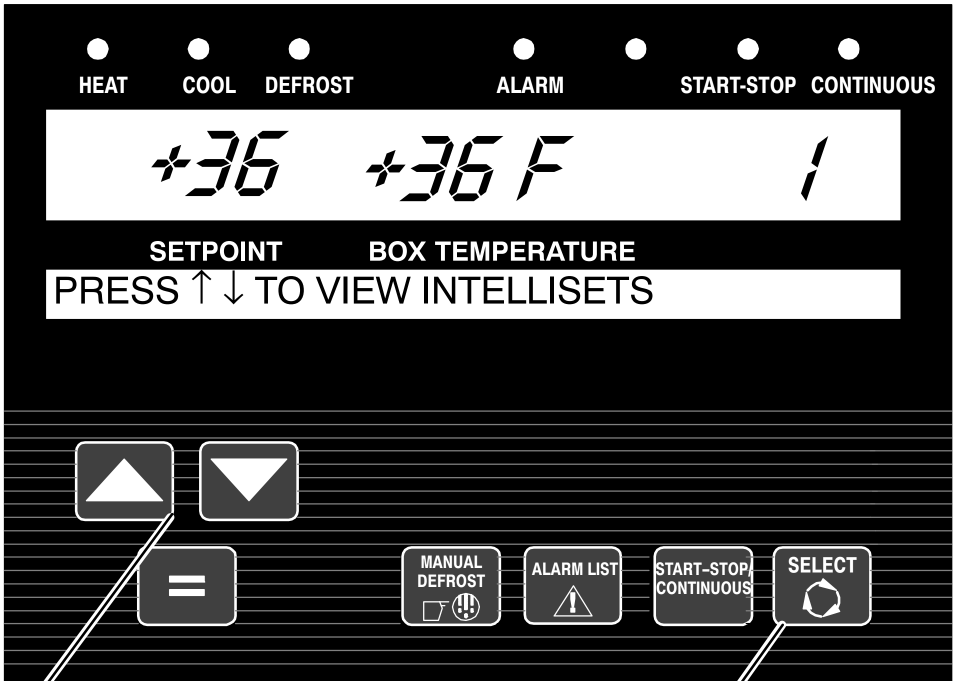
1. PRESS the = Key to display current IntelliSet. (Enable IntelliSet at = Key must be configured ON. See Section 5.2.1.)

2. Pressing the UP or DOWN ARROW key, to move through the IntelliSet List. The current IntelliSet will have either ACTIVE or MODIFIED to the right of the name.

3. To use a different IntelliSet, bring the IntelliSet you wish to use into the MessageCenter and press the = Key.

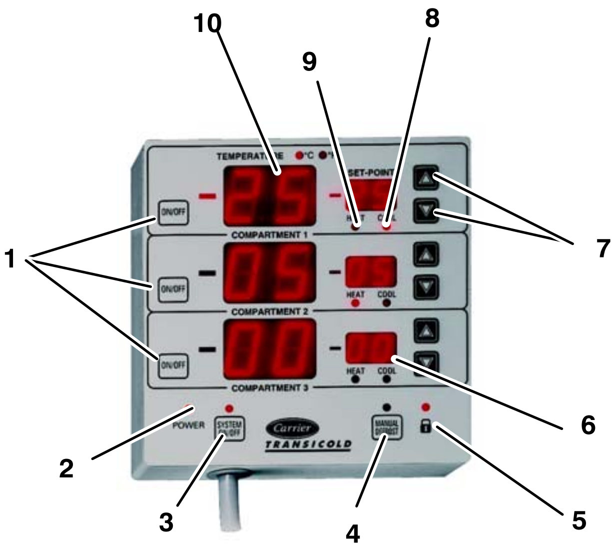
NOTE: If pressing the = key does not bring up this message, press the SELECT key until the message appears.

b. Changing IntelliSets – Without "=" Key Enabled



1. Press the SELECT key until MessageCenter displays PRESS ↑↓ TO VIEW INTELLISETS.
2. By pressing the UP ARROW key, you will move through the IntelliSet List beginning at the top or by pressing the DOWN ARROW key, you will move through the IntelliSet List beginning at the bottom. The current IntelliSet will have either ACTIVE or MODIFIED to the right of the name.
3. After selecting the new IntelliSet press the = key.

3.21.2 Remote Control Panel



1 Compartment On/Off Key
2 Control Panel Power On LED
3 System On/Off Key
4 Manual Defrost Key
5 Control Panel Lock LED
6 Setpoint Display
7 Up And Down Arrow Keys
8 Cool Mode LED
9 Heat Mode LED
10 Temperature Display in °F or °C

THREE COMPARTMENT PANEL SHOWN. THERE IS ALSO A TWO COMPARTMENT PANEL AVAILABLE

The remote control panel can be used to :

Turn on/off the unit

Check compartment 1, 2 or 3 temperature(s)

Check and change setpoint(s)

Initiate manual defrost

Check mode of operation for each compartment

NOTE

The unit can be shut down using either the remote panel or the main START/RUN−OFF switch. The RS must be in the “START/RUN” position in order for the remote panel to operate.

a.Remote Control Panel Display

TEMP. DISPLAY	SETPOINT DISPLAY	
--		WAITING FOR COMMUNICATION WITH MICROPROCESSOR
-20		COMPARTMENT TEMPERATURE DISPLAY
	-20	SETPOINT TEMPERATURE DISPLAY
		COMPARTMENT MODE STATUS (HEAT, COOL OR NULL)
	OF	COMPARTMENT WAS TURNED OFF VIA REMOTE CONTROL
dF	-20	COMPARTMENT IN DEFROST MODE
--	-20	COMPARTMENT TEMPERATURE SENSOR MALFUNCTION
P1	-20	PRESET SETPOINT

NOTE: TEMPERATURE IS DISPLAYED IN °F OR °C DEPENDING ON CONFIGURATION OF MICROPROCESSOR

b.Starting Unit with Remote Control Panel

1. Put RS in "START/RUN" position.

2. Press The System On/Off Key. Power Light Will Go On.

3. Press The On/Off Key To Energize Selected Compartment.

c.Changing Setpoint with Remote Control Panel

1. Press the UP or DOWN ARROW key to increase or decrease setpoint. This is the same operation for each compartment.

d.Lock/Unlocking the Remote Control Panel

LOCKING THE PANEL:
Press and release the Carrier Logo
The lock indicator light will come on.

UNLOCKING THE PANEL:
Press the Carrier Logo for 10 seconds
The lock indicator light will go off.

e. Pre-setting Setpoints with Remote Control Panel

1. Place RS in the “START/RUN” position and required compartment switches on the unit to the “ON” (1) position.

2. Press Carrier logo and the lock light will be displayed.
3. Press compartment 1 UP ARROW for 10 seconds. P1 will be displayed in all compartments.
4. Set lowest setpoint required.
5. Press Carrier logo and P2 will be displayed. Set next highest temperature required.
6. Follow same procedure for the next three temperatures.
7. Pressing the second compartment UP or DOWN ARROW key for 10 seconds will allow P1 to be displayed and the lowest setpoint for compartment 2 to be set. Continue with steps 5 and 6.
8. Repeat step 7 for compartment 3.

Pre-setting Setpoints

The control panel allows the user to pre-set 5 different temperatures for each compartment.

NOTE

Once pre-set setpoints have been chosen, only those 5 designated setpoints can be used.

f. Removing Pre-set Setpoints With Remote Control Panel

1. Place RS in the “START/RUN” position and required compartment switches on the unit to the “ON” (1) position.

2. Press Carrier logo and the lock light will be displayed.
3. Press compartment 1 UP ARROW for 10 seconds. P1 will be displayed in all compartments.
4. Set temperature to lowest pre-set setpoint and OFF will be displayed

Pre-setting Setpoints

The control panel allows the user to pre-set 5 different temperatures for each compartment.

NOTE

Once pre-set setpoints have been chosen, only those 5 designated setpoints can be used.

SECTION 4

TEMPERATURE CONTROL

4.1 SYSTEM START−UP

This section describes the unit operation in relation to temperature control in both diesel and electric standby operation.

Upon initial start up, when the starting conditions are met, CSMV and EVXV open to equalize the compressor discharge and suction pressures so that there is less than 70 psig (4.8 Bar) difference between them before the compressor starts.

Once the system is equalized, the CSMV and EVXV will both close (0% open).

LSV2 & LSV3 will be de−energized (closed)

UL1 & UL2 will be energized (unloaded)

If the unit is in an off cycle and operating in Electric Standby, the buzzer will come on for 5 seconds prior to the compressor starting. This does not occur if the unit is operating in diesel engine mode, and the engine is already running.

The Speed Solenoid will be de−energized (low speed).

If the engine is not running, it will start now. If the engine is already running, then it doesn't have to start again.

The condenser fans turn on.

The compressor starts.

If any compartment is calling for heat, there will be a 10 second delay after the compressor starts and the heater contactors energize.

The evaporator fan motors will start 10 seconds after the compressor has started if the suction pressure is lower than 100 psig (6.8 Bar), or after a maximum of 20 seconds after the compressor starts. Compartment 1 fans will come on first, then Compartment 2, then Compartment 3, with a 5 second delay between each compartment.

The compressor will only turn on when the engine is operating in low speed. When the compressor starts, the engine will always continue to operate in low speed for a minimum of 2 minutes before high speed is allowed.

Whenever the compressor comes on, it will run for a minimum of 3 minutes. If all compartment temperatures are satisfied before the 3 minutes are up, the frozen compartment will continue to operate in cool. If all compartments have a perishable setpoint, then the lowest numbered compartment will continue to operate in cool mode, and the heaters will also come on at the same time if necessary to maintain the proper compartment temperature.

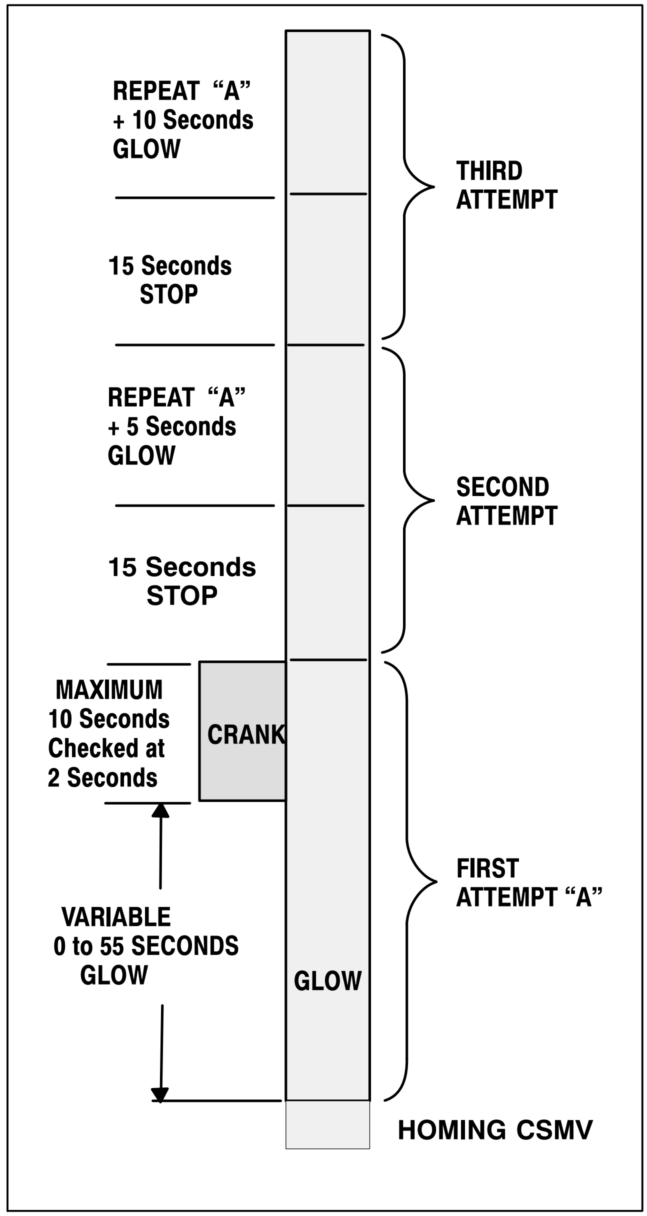


Figure 4−1 Auto Start Sequence

4.1.1 Variable Glow Time

The glow time for the first start attempt will vary in duration based on engine coolant temperature and how the microprocessor is configured: TV/Short or DI/Long as follows:

Table 4-1. Glow Time		
Engine Coolant Temp	Glow Time in Seconds	
	SHORT	LONG
Less than 32°F (0°C)	15	55
33°F to 50°F (1°C to 10°C)	10	40
51°F to 77°F (11°C to 25°C)	5	25
Greater than 78°F (26°C)	0	10

The second start attempt has 5 seconds of glow time added to the time shown in the table. The third start attempt will have 10 seconds added. If the coolant temperature sensor is defective the microprocessor assumes a temperature of less than 32°F (0°C) for the glow timing.

4.1.2 Engine Running

The engine is considered to be running when:

1.Engine RPM are greater than 1000, and

2. For ambient temperatures at or above 32°F (0°C), oil pressure is ok. For ambient temperature below 32°F (0°C), oil pressure is ok and DC current is more than 2 amps.

4.2 START−STOP OPERATION

Start−Stop is provided to permit starting/stopping/restarting of the engine−driven compressor as required. This feature allows full automatic control of the engine starting and stopping by monitoring box temperature, battery charging amps and engine coolant temperature. The main function of automatic engine cycling is to turn off the refrigeration system near setpoint to provide a fuel efficient temperature control system and to initiate a restart sequence after certain conditions are met. The Start−Stop/Continuous key is pressed to select between Continuous Run and Start−Stop operating modes.

NOTE

The microprocessor may be locked so that the unit will always operate in Start−Stop whenever the setpoint is within a specific range. Refer to Range Lock (Section 4.5) and ProductShield (Section 4.6) for additional information.

4.2.1 Whenever the unit starts in Start−Stop Mode, it will continue to run until **all four** of the following criteria have been satisfied:

1) It has run for the pre−determined Minimum Run Time. The Minimum Run Time is selected in the microprocessor Functional Parameter List. (Refer to Section 3.17). The purpose of this is to force the unit to run long enough to completely circulate the air inside the compartment, and to ensure that the product temperature is at setpoint. This may be set for any value between 4 minutes and 60 minutes in 1 minute intervals. The engine must run for the Minimum Run Time before cycling off. The factory setting is 4 minutes.

After the Minimum Run Time expires, the unit may be shut down when the compartment temperature is within ±0.5°F (±0.3°C) of setpoint for setpoints in the Perishable range or is less than +0.5°F (+0.3°C) above setpoint for setpoints in the Frozen range.

NOTE

All enabled compartments must be within the specified range of setpoint in order for unit to go to an off cycle.

2) The engine coolant temperature is above 122°F (50°C). If the unit can not cycle off, it will operate as if in Continuous Run mode. The engine coolant temperature will override the minimum off time and out-of-range condition to force engine restarting when the engine coolant temperature drops below 34°F (1°C).

3) The battery is fully charged. Provisions are made to sense when the battery charge is correct. A good battery is defined as having 13.4 VDC at 75°F (23.9°C), and the charging rate is below that selected in the Configuration List. This condition is used to allow cycle off of the engine.

Table 4-2 Battery Voltages	
Voltage	Description
10 VDC or Less	Unit will shut down except during cranking.
12.2 to 13.4 VDC	If the unit has cycled off in Start−Stop mode and battery voltage drops below voltage selected in the configurations (See Section 5.2.1) , the unit is automatically started to charge battery. Unit will operate until the battery voltage is high enough to allow unit to cycle off, provided that all other conditions required for an off cycle are met. When battery voltage is above minimum limits, “O.K.” will appear in the MessageCenter right after the voltage in the Unit Data list.
17 VDC or more	Unit will shut down.

4) The box temperature is at setpoint.

4.2.2 A restart will be initiated when **one** of the following conditions occurs:

1) Engine coolant temperature drops below 34°F (1°C). However, if the coolant sensor alarm is active, the unit will restart if the ambient air temperature drops to 32°F (0°C) after the unit has been in the OFF cycle for 60 minutes.

2) Battery voltage falls below voltage selected in the configuration list. (See Section 5.2.1)

3) Box Temperature has exceeded Off Time Override Temperature

During the Minimum Off Time, the microprocessor continually monitors the Box Temperature. If the temperature should go beyond the Off Time Override Temperature (above or below setpoint in the perishable range or above setpoint in the frozen range), the unit will restart, regardless of how much Off Time remains. The Off Time Override Temperature is selected in the microprocessor Functional Parameter List. (Refer to Section 3.17) This can be set for 3.6°F to 18°F (2°C to 10°C) in 0.5° increments.

After the Minimum Off Time (if the unit is still in the off cycle), the unit will restart when the box temperature goes beyond ±3.6°F (±2.0°C) of setpoint for the Perishable range or above +3.6°F (+2.0°C) of setpoint for the Frozen range.

4) The Minimum Off Time Has Expired

The Minimum Off Time allows the unit to remain off for extended periods of time, maximizing fuel economy. The Minimum Off Time is selected in the microprocessor Functional Parameter List. (Refer to Section 3.17). Settings may be for 10 minutes to 90 minutes in 1 minute intervals. The factory setting is 20 minutes.

After the Minimum Off Time (if the unit is still in the off cycle), the unit will restart when the box temperature goes beyond ±3.6°F (±2.0°C) of setpoint for the Perishable range or above +3.6°F (+2.0°C) of setpoint for the Frozen range.

5) The Maximum Off Time has expired.

In some ambient conditions, there are times when the unit may be off for very long periods of time. To ensure that the entire load stays within safe temperature ranges, the Maximum Off Time may be used to force the unit to restart. Maximum Off Time is selected in the microprocessor Functional Parameter List. This may be set for OFF, or 10 minutes to 255 minutes in 1 minute intervals. When the Maximum Off Time expires, the unit will restart, regardless of any change in box temperature.

NOTE

The unit may remain in low speed for 10 minutes (Factory Setting) after engine start-up when in Start−Stop Mode. High speed delay can be set from Off to 255 minutes in 1 minute increments. (Refer to Functional Parameters, Section 3.17).

TIP

While the unit is running, the status of the unit battery and engine coolant temperature can be readily checked by reading the Battery Voltage in the Data List. If "O.K." appears after the voltage reading, both battery volts and engine coolant temperature are sufficient to allow the unit to cycle off. If "O.K." does not appear, then one or both of these conditions have not been met, and the unit is not ready to cycle off.

4.2.3 Start−Stop Indicator

To indicate that the unit is in the "Start−Stop" mode, the Start−Stop LED indicator and Engine Auto Start lights on the light bar will be illuminated.

4.2.4 Failed To Start − Auto Mode

If the unit fails to start after three start attempts, the Alarm A31 −FAILED TO START−AUTO MODE will appear in the MessageCenter, and the Alarm LED on the Keypad and the Fault light on the light bar will flash on and off once a second.

4.2.5 Start−Stop Parameters

The selectable Start−Stop parameters in the Functional Parameter list can be applied to Start−Stop operation so that:

- The same settings apply to any setpoint, or
- The settings can be specified to be different, depending on whether the setpoint is above +10.4°F (−12°C) (in the perishable range), or +10.4°F (−12°C) or below (in the frozen range.)

The decision as to whether the same settings will be used together for all setpoints or if they will be separated between Perishable and Frozen is made in the Configuration List. (Refer to Section 5.2.)

If **TOGETHER** is selected in the Configuration List, then the following Functional Parameter values will be available for use:

- MINIMUM RUN TIME
- MINIMUM OFF TIME
- OVERRIDE TEMP
- MAXIMUM OFF TIME
- FROZEN SHUTDOWN OFFSET

If **SEPARATE** is selected in the Configuration List, then the following Functional Parameter values will be available for use:

- PERISHABLE MINIMUM RUN TIME
- PERISHABLE MINIMUM OFF TIME
- PERISHABLE OVERRIDE TEMP
- PERISHABLE MAXIMUM OFF TIME
- FROZEN MINIMUM RUN TIME
- FROZEN MINIMUM OFF TIME
- FROZEN OVERRIDE TEMP
- FROZEN MAXIMUM OFF TIME
- FROZEN SHUTDOWN OFFSET

NOTE

In the event that different values for both Perishable and Frozen Start−Stop times are selected in the Functional Parameter list, then the Configuration is changed from Separate to Together. The values from the Perishable times will be the ones that will be used.

4.2.6 Charging Amps

A Configuration for Start−Stop Shutoff exists which allows the microprocessor to monitor battery charging amperage in addition to battery voltage. The battery charging rate (as seen in the Data List) must be below the selected amp setting to allow the unit to cycle off.

The Configuration may be set from 1.0 to 10.0 Amps in 0.5 amp increments. A weak or defective battery may show a suitable voltage charge while the alternator is putting a high charging rate into it, then not be sufficiently charged to restart the engine at the end of a Start-Stop Off Cycle.

The factory setting for this configuration is 6.5 amps. This is a general setting that may need to be adjusted for the operating environment of the unit. Units operated in colder ambient temperatures may want to decrease this setting to force a higher charge in the battery prior to Start-Stop Off Cycle. Units operated in warmer ambient temperatures may use a higher setting.

As a battery ages, it is normal for it to require longer re-charging periods. If the running time is gradually increasing in Start-Stop operation due to the battery requiring a longer charging period, this run time may be shortened by raising the amp setting. (This may be seen by reviewing downloaded data and looking at the amp reading during prolonged engine Start-Stop On Cycles.)

4.2.7 Restart Voltage

A configuration for Start−Stop Restart on Battery Voltage allows the microprocessor to restart the unit when the voltage selection has been reached.

The Configuration may be set from 11.5 to 12.8 Amps in 0.1V increments. The factory setting for this configuration is 12.2VA.

A lower voltage selection may result in a longer off cycle (based on battery voltage) and possibly overall shorter battery life. A higher voltage selection may result in a shorter off cycle (based on battery voltage) and possibly overall longer battery life.

4.3 CONTINUOUS RUN OPERATION

In the Continuous Run mode, the engine will not shut down except for safeties or if the engine stalls. Continuous Run operation is normally used for fresh produce and other sensitive product loads. The Start-Stop/Continuous key is pressed to switch between Continuous Run and Start-Stop operating modes.

NOTE

The microprocessor may be locked so that the unit will always operate in Start−Stop or in Continuous Run whenever the setpoint is within a specific range. Refer to Section 4.5 − Range Lock for additional information.

NOTE

The unit will remain in low speed until water temperature reads 79°F (26°C) in Continuous Run Mode. High Speed Delay can be changed from OFF to 255 minutes. Refer to Functional Parameters in Section 3.17.

4.4 TEMPERATURE CONTROL

4.4.1 Cool Mode

When Compartment 1 is calling for cool (box temperature is above setpoint), the EVXV will open to the appropriate position and allow refrigerant to flow into Compartment 1 evaporator.

When either the second or third compartment(s) are calling for cool, the LSV for that compartment(s) will be energized to allow refrigerant to flow into the evaporator for that compartment.

For compartments with setpoints in the perishable range [greater than 10° F (−12.2°C)]
When compartment 1 temperature reaches 1.5° F (0.8°C) above setpoint, the EVXV will close to 0%. When the second or third compartment temperature reaches 1.5° F (0.8°C) above setpoint, the LSV for that compartment will de−energize. Should all compartment temperatures reach setpoint and stop cooling, the compressor will turn off.

If the temperature within a compartment that has cycled off should rise to 3.5° F (1.9°C) above setpoint, the compartment will begin to cool again.

For compartments with setpoints in the frozen range [less than 10° F (−12.2°C)] operating in Continuous Run:
When temperature in compartment 1 reaches 3.5° F (1.9°C) below setpoint, the EVXV will close to 0%. When the second or third compartment temperature reaches 3.5° F (1.9°C) below setpoint, the LSV for that compartment will de−energize. Should all compartment temperatures reach setpoint and stop cooling, the compressor will turn off.

If the temperature within a compartment that has cycled off should rise to setpoint that compartment will begin to cool again.

For compartments with setpoints in the frozen range [less than 10° F(−12.2°C)] operating in Start/Stop:
When temperature in compartment 1 reaches setpoint, the EVXV will close to 0%. When the second or third compartment temperature reaches setpoint, the LSV for that compartment will de−energize. Should all compartment temperatures reach setpoint and stop cooling, the compressor and engine will turn off.

If the temperature within a compartment that has cycled off should rise to 1° F (0.6°C) above setpoint, the compartment will begin to cool again.

4.4.2 Pulse Cool Mode

When Frozen Compartment Priority Cooling (see section 4.4.3 below) is not used Pulse Cool Mode is available to provide additional cooling capacity for compartment(s) with frozen setpoints [+10.4°F (–12°C) or lower]. Pulse Cool Mode begins when the box temperatures in all compartment(s) with perishable setpoints [higher than +10.4°F (–12°C)] are no higher than +2.3°F (1.3°C) above setpoint, and are still calling for Cool.

When all compartment(s) with perishable setpoints have a box temperature of+2.3°F (1.3°C) below setpoint or less, and that compartment is still calling for Cool, and there is another compartment which has a setpoint in the frozen range – and is calling for Cool - the perishable compartment(s) will go into Pulse Cool Mode to drop the cooling capacity in that compartment(s). During Pulse Cool Mode, the refrigerant control device in the perishable compartment – EVXV (Compartment 1) or the LSV (Compartments 2 and 3) – will be open for 4 seconds, then close for 26 seconds. This 30 second cycle will repeat itself as long as the perishable compartment temperature remains less than 2.7°F (1.5°C) above setpoint, and is still calling for Cool. Should the return air temperature in the perishable compartment(s) rise more than 2.7°F (1.5°C) above setpoint, that/those compartment(s) will go into Cool Mode. Should the return air temperature in the perishable compartment(s) fall to 1.5° F (0.8°C) above setpoint, that/those compartment(s) will shut off.

4.4.3 Priority Modes

Frozen Compartment Priority has 3 available settings: OFF, NORMAL, and HI CAPACITY.

When either Normal or Hi Capacity is selected, the following settings are also available:

- Frozen Priority Time (may be set from 5 – 60 minutes) – Factory setting is 5 minutes
- Non–Priority Time (may be set from 5 – 60 minutes) – Factory setting is 5 minutes
- Perishable Override Temp (may be set from 3.6°F to 27°F (2°C to 15°C)) or OFF. – Factory setting is OFF

When OFF is selected, the unit will operate normally, providing Cooling and Heating to each compartment as required, without regard to any compartment priority over another.

a. Frozen Compartment Priority

Frozen Compartment Priority will operate when:

- The Frozen Comp Priority configuration is set to either Normal or Hi Capacity; AND
- One or more of the currently enabled compartments has a setpoint in the frozen range [10.4°F (–12°C) or less]; AND
- The box temperature of the compartment with the frozen setpoint is less than 32°F (0°C); AND
- The compartment with the frozen setpoint is calling for Cool; AND
- One or more of the currently enabled compartments has a setpoint in the perishable range [higher than 10.4°F (–12°C)]; AND
- The compartment(s) with the perishable setpoint is calling for Cool.

Hi Capacity

When the conditions described above are met, the unit will automatically switch to Frozen Compartment Priority Hi Capacity Cool Mode and remain in this mode for the length of time selected (Frozen Priority Time). During Frozen Compartment Priority Hi Capacity Cool Mode, the refrigerant flow and the evaporator fans to the compartments with perishable setpoints will stop, and the evaporator fans in those compartments will also stop.

When the Frozen Priority Time runs out, the unit mode will change to Frozen Compartment Priority Non–Priority Cool Mode. In Non–Priority Cool Mode, the fans for the perishable compartments will operate. Compartment(s) with frozen setpoints will cool continually. Compartment(s) with perishable setpoints will operate by opening and closing the EVXV (Compartment 1 only) or the LSV (remote compartments) to limit the refrigerant flow to those compartments. The EVXV or LSV will be open for 8 seconds, then close for 12 seconds. This cycle will repeat itself every 20 seconds for the duration of the time set for (Non–Priority Time), or until the compartment no longer is calling for cool.

In Frozen Compartment Priority Non–Priority Cool Mode, the evaporator fans will operate continually in the Perishable compartments.

When Perishable Override Temp is set to OFF, then the unit will remain in Frozen Compartment Priority Hi Capacity Cool Mode for the Priority Cool Time.

When Perishable Override Temp is set to a temperature value, the unit will always operate in Frozen Compartment Priority Hi Capacity Cool Mode for a minimum of 5 minutes. Once the box temperature in the perishable compartment moves away from setpoint by the selected number of degrees, Frozen Compartment Priority Hi Capacity Cool Mode will end, and the unit will operate in Frozen Compartment Priority Non–Priority Mode for the time selected before returning to Frozen Compartment Priority Hi Capacity Cool Mode again.

Normal

When the conditions described above are met, the unit will automatically switch to Frozen Compartment Priority Normal Cool Mode and remain in this mode for the length of time selected for Frozen Priority Time. In Frozen Compartment Priority Normal Cool Mode, compartment(s) with frozen setpoints will cool continually. Compartment(s) with perishable setpoints will operate by opening and closing the EVXV (Compartment 1 only) or the LSV (remote compartments) to limit the refrigerant flow to those compartments. The EVXV or LSV will be open for 8 seconds, and then close for 12 seconds. This cycle will repeat itself every 20 seconds for the duration of the Frozen Priority Time or until the compartment no longer is calling for cool.

Perishable Override Temp is not available when Normal is selected.

After the unit has operated in Frozen Compartment Priority Normal Cool Mode for the Frozen Priority Time selected, the unit will change to Frozen Compartment Priority Normal Non−Priority Mode. In this mode, all compartments will operate in Cool or Heat as needed. The unit will continue to operate in this manner until the Non−Priority Timer expires, and then the unit will return to Frozen Compartment Priority Normal Cool Mode.

4.4.4 Supply Air Limit Control

Supply Air Limit Control is available for setpoints above +32°F (0°C) only. In a 2 Compartment system, Supply Air Temperature Control is always available for Compartment 1 and–is optional for Compartment 2. When a Supply Air Temperature Sensor is installed for Compartment 2, it must be configured ON in the configuration list.

For 3 Compartment units, Supply Air Temperature Control is only available in Compartment 1. Supply Air Temperature Control is selectable for both Continuous Run and Start/Stop Operation. Two configurations allow the user to determine what the Supply Air Temperature limit(s) will be. Configuration "Supply Air Limit S/S" is the limit for the Supply Air Temperature when the unit is operating in Start/Stop. The default value is –10.8°F (6°C), meaning that the Supply Air Temperature is allowed to go 10.8°F (6°C) below setpoint during temperature pulldown. Configuration "Supply Air Limit Cont" is the limit for the Supply Air Temperature when the unit is operating in Continuous Run. The default value is –9°F (5°C), meaning that the Supply Air Temperature is allowed to go 9°F (5°C) below setpoint during temperature pulldown.

For any compartment that has a perishable [32°F (0°C) or greater] setpoint and is calling for Cool, and the Supply Air Temperature is less than the value selected in the configuration list for Supply Air Limit, the LSV (Compartment 2) or the EVXV (Compartment 1) will shut off for that compartment until the Supply Air Temperature increases 1.8°F (1°C) above the Supply Air Limit.

4.4.5 Heat Mode

For both 2 and 3 Compartment units, only HTCON1 will be used for heating in Compartment 1. Compartment(s) 2 and 3 will use both HTCON1 and HTCON2 heaters, depending on how far below setpoint the box temperature is. Heat Mode is only allowed when the compartment setpoint is in the perishable range. Heat Mode is not used for any compartment with a setpoint in the frozen range.

Contactor	Turn On	Turn Off
1/2/3HTCON1	Return Air Temp is more than 0.5°F (0.8°C) below setpoint.	Return Air Temp is less than 0.3°F (0.2°C) below setpoint.
2/3HTCON2	Return Air Temp is more than 1.8°F (1.0°C) below setpoint.	Return Air Temp is less than 1.5°F (0.8°C) below setpoint.
1HTCON2	OFF	OFF

When the compartment temperature falls more than 0.5° F (0.8°C) below setpoint, (1/2/3)HTCON1 will energize for that compartment to bring the temperature up. The heat mode will turn off when the compartment temperature is 0.3° F (0.2°C) below setpoint.

When only Compartment 1 is being used, and all other compartments are Off, 1HTCON2 will also operate if Compartment 1 is calling for Heat.

4.4.6 Null Mode

In Null Mode, the compartment is not in Cool Mode OR Heat Mode. If the set point is in the Frozen Range, the evaporator fan motors will stop. If the set point is in the perishable range, the fan motors will stop. If the Perishable Fan Mode Configuration is set for OFF, the evaporator fans will continue to run in Null Mode. If the Perishable Fan Mode Configuration is set for ON, the evaporator fans will cycle off in Null Mode.

4.4.7 Unloaders

Compressor unloaders are only used when one or more compartment(s) are calling for cool. The unloaders energize (unload) and de−energize (load) depending on the compartment that is furthest away from setpoint.

When the unit is set for Start/Stop operation, and any compartment has a frozen setpoint, the compressor will operate with both unloaders de−energized (fully loaded / 6−cylinder operation) while the compartment is calling for cool.

Unloader operation is shown in the following table for other cool modes:

Mode	LOAD (de−energize) UL1 and UL2 − 6 Cylinder	LOAD (de−energize) UL1 UNLOAD (energize) UL2 − 4 Cyl	UNLOAD (energize) UL1 and UL2 − 2 Cylinder
COOL (Perishable) Start/Stop or Continuous Run	Return Air Temp is more than 2.7°F (1.5°C) above setpoint	Return Air Temp is between 2.3°F (1.3°C) and 1.5°F (0.8°C) above setpoint.	Return Air Temp is less than 0.9°F (0.5°C) above setpoint.
COOL (Frozen) Start/Stop	Return Air Temp is more than 1.8°F (1.0°C) above setpoint	Return Air Temp reaches or falls below setpoint.	N/A

4.4.8 Speed Control

The engine will operate the compressor at two different speeds (low and high). Speed Control will use the differences of Controlling Temperature and setpoint as follows:

Mode	HIGH SPEED (SCS ENERGIZED)	LOW SPEED (SCS DE−ENERGIZED)
COOL (Perishable)	Return Air Temp is more than 2.7°F (1.5°C) above setpoint	Return Air Temp is less than 2.3°F (1.3°C) above setpoint.
COOL (Frozen)	Return Air Temp is more than 3.6°F (2.0°C) above setpoint	Return Air Temp is less than 1.8°F (1.0°C) below setpoint
HEAT (Perishable)	Return Air Temp is more than 2.7°F (1.5°C) above setpoint	Return Air Temp is less than 2.3°F (1.3°C) above setpoint.
HEAT (Frozen)	Low Speed Only	
NULL	Low Speed Only	

NOTE

The compartment furthest away from setpoint is used to determine speed. This compartment will fluctuate depending on other control conditions.

4.4.9 Default Mode

When both the RAT and SAT alarms are on for Compartment 1, or the RAT alarm is on for either Compartment 2 or 3, the temperature control for that compartment will go to default mode.

For compartments where the setpoint is in the perishable range [+10.5°F (−12.1°C) or higher] or higher), the LSV, heaters and fan motors will be turned off for that compartment.

For compartments where the setpoint is in the frozen range [+10.4°F (−12°C) or lower] or lower, the compartment will operate in cool, and will only require low speed. If the unit is operating on engine/road, the compressor will fully unload (2−cylinder operation). If the unit is operating on electric standby, the compressor will be fully loaded (6−cylinder operation). (The engine may still operate in high speed if another compartment is calling for high speed.)

4.4.10Defrost Operation

Defrost is an independent cycle overriding cooling and heating functions in order to de-ice the evaporators as required. When the unit is in defrost, the DEFROST LED will be on, the MessageCenter will display DEFROST CYCLE STARTED for 5 seconds. The center of the Main Display will show “dF”. The CSMV will close in the defrost cycle.

TIP

Ice is not the only thing that will cause the air differential to increase across the evaporator coil. Shrink wrap, paper, plastic bags, and other such items when caught in the return air stream and pulled up against the evaporator coil or the return air grille can also cause the DAS contacts to close.

NOTE

The unit will operate in high speed in the defrost mode.

1) Defrost Modes

There are two different Defrost Modes available:

- Return Air Defrost Mode does not use electric heaters, but uses the heat from the product to melt any ice. Return Air Defrost is ONLY available when the unit is being operated with Compartment 1 only, AND when the RAT is 35.6°F (2°C) or higher, AND the SAT is 39.2°F (4°C) or higher. Defrost will be accomplished by turning off the compressor and the refrigeration system, and allowing the evaporator fans to operate. Blowing compartment air over the evaporator coil will melt the ice and prevent heat from entering the compartment from the heaters.
- Normal (Electric) defrost mode can be started when the DTT in any compartment is below 40°F (4.4°C). When Defrost is called for, all active compartments will stop normal cooling (or heating) and defrost at the same time. Compartments where the DTT is above 40°F (4.4°C) will turn off and remain off until all other compartments have completed defrost.

NOTE

NOTE: For both 2 and 3 compartment units: During defrost, if the RAT for *any* enabled compartment goes above 95°F (35°C), or if the SAT in Compartment 1 is above 113°F (45°C), all of the electric heaters will de−energized, and wait until the RAT temperature drops below 89.6°F (32°C), or the SAT temperature drops below 107.6°F (42°C). This is an overheat protection feature.

a. For 2 compartment units, when both evaporators require defrost, HTCON1 and HTCON2 will be energized for Compartment 1, and 2HTCON1 and 2HTCON2 will be energized for Compartment 2. When the DTT for any compartment reaches 55°F (12.8°C), that compartment will stop defrost by de−energizing HTCON1 & 2 for that compartment, and waiting for the remaining compartment to complete defrost.

b. For 3 compartment units, 1/2/3HTCON1 heaters may be used at the same time, but only 2 of the HTCON2 heaters may be used. (There are a total of 6 HTCONs in a 3−compartment unit − HTCON1 and HTCON2 for each compartment. A maximum of 5

HTCONs may be energized at the same time.) All dual discharge style remote evaporators must have both HTCON1 and HTCON2 on at the same time for defrost.

c. For 3 compartment units where both Compartment 2 and Compartment 3 evaporators are dual air discharge style (Systems 6 & 16), and both are calling for defrost, HTCON2 will not be on in Compartment 1 until one of the other evaporators terminates defrost. In this case,
2 HTCON1 and 2HTCON2 will be on in Compartment 2, and 3HTCON1 and 3HTCON2 will be on for Compartment 3, and only HTCON1 will be on for Compartment 1. When either of the remote evaporators terminate defrost and the HTCON1 & HTCON2 for that compartment turn off, and Compartment 1 is still in defrost, then HTCON2 will turn on for Compartment 1.

d. For 3 compartment units where only one of the evaporators used in Compartment 2 or Compartment 3 is a dual air discharge style, an d the other is a single air discharge style (Systems 5, 14, & 15) the evaporator with the dual air discharge (if it is calling for defrost) will have both of its HTCON1 and HTCON2 on. If only one other evaporator is calling for defrost, both HTCON1 and HTCON2 will be on in that compartment. If both other evaporators are calling for defrost, HTCON2 priority will be determined by RAT temperature for each compartment. The compartment with the coldest RAT temperature of the two will have HTCON2 energized, while the other uses only HTCON1. When any compartment using both HTCON1 and HTCON2 ends defrost, if any compartment is still in defrost, and is using only HTCON1, then HTCON2 for that compartment will be energized.

e. For 3 Compartment units where both Compartment 2 and Compartment 3 have single air discharge evaporators, and all 3 evaporators are calling for defrost, the compartments with the coldest RAT temperatures will use both HTCON1 and HTCON2, while the warmest compartment will use only HTCON1 until one of the other compartments terminates defrost.

2) Defrost Initiation And Start

Defrost can be initiated manually, by keypad, or automatically, by the microprocessor. Microprocessor initiation is based on expiration of the defrost timer or by measurement of coil condition.

In compartment 1, the microprocessor determines the condition of the coil by measuring the air pressure differential across the coil then closing the defrost air switch contacts when the pressure differential is great enough to indicate a restriction caused by ice build up. In compartments 1, 2 and 3, the microprocessor determines the condition of the coil by comparing the DTT temperature to the RAT temperature (temperature difference across the coil). Defrost will be initiated in these compartments when the DTT is more than 18°F (10°C) colder than the RAT for 15 continuous minutes. This method of defrost initiation will only be used for 3 consecutive defrosts. After three consecutive defrost initiations by this method the counter will be reset to allow this defrost initiation again after a defrost cycle is initiated by another method (timer, air switch or manual).

Before defrost can be initiated, the DTT in at least one compartment must be below 40°F (4.4°C). Additionally, defrost will be performed only in those compartments where the DTT is 40°F (4.4°C) or below. During Defrost, the Defrost LED will be on, and dF will be displayed in place of the box temperature.

During Defrost, the Defrost LED will be on, and dF will be displayed in place of the box temperature.

NOTE

If the DTT Sensor Alarm is active, defrost initiation for that compartment will be based on the RAT temperature for that compartment. If the RAT temperature is 45°F (7.2°C) or lower, defrost will be allowed in that compartment. If the DTT and RAT alarms are both active for the same compartment, and that compartment has an SAT, then the SAT temperature will be used. If the SAT temperature is 45°F (7.2°C) or lower, defrost will be allowed in that compartment. If both DTT and RAT alarms are active in the same compartment, and there is no SAT, defrost will only be allowed if the set point is in the frozen range.

Any time there is a DTT alarm − if other criteria allow that compartment to go into defrost − that compartment will defrost for 10 minutes, then end the defrost cycle for that compartment.

When defrost is called for in any compartment, all compartments will go through defrost. Cooling is not allowed when any compartment is in defrost. Compartments that do not require defrost (DTT above 40°F (4.4°C), or compartments that have already completed a defrost cycle will continue with their respective evaporator fans off, heaters off, and
LSV (s) off in compartments 2 & 3 or EVXV is closed (0% open) in compartment 1, and wait for any remaining compartments to complete defrost.

When the electric heaters are used for defrost, the engine will operate in high speed during the defrost cycle. When electric heaters are not used for defrost, the engine will operate in low speed.

3) Defrost Termination

When the DTT for an evaporator rises to 55°F (12.8°C), the heaters for that compartment will turn off, the evaporator fan motors will remain off, and the LSV will remain off until all other evaporators have also terminated Defrost.

If there is a DTT sensor alarm present, that compartment evaporator will end defrost after 10 minutes.

When Compartment 1 is operating in Return Air Defrost, it will operate in defrost for a minimum of 5 minutes, a maximum of 10 minutes, or until the SAT is equal to or higher than the RAT.

During Defrost Termination, all the heaters will de−energize, and the engine will go to low speed. dF will continue to be displayed in the place of Box Temperature, and the Cool LED will come on when the compressor starts. Any compartments that call for Heat will have the heaters come on 10 seconds after the compressor starts.

Each compartment that is calling for cool will have the EVXV (Compartment 1) or LSV (Compartment(s) 2 and/or 3) open, and the evaporator coils will begin to cool down. The evaporator fans will not come on right away, so that warm air is not blown into the compartment, but will wait for the evaporator to cool down, up to a maximum of 8 minutes. Once all the evaporator fans have started, the DF will no longer be displayed, and Box Temperature will again be shown in the main display.

NOTE

Defrost Mode uses a Defrost Duration Timer that allows for a maximum of 45 minutes in defrost. If any compartments have not automatically terminated defrost during 45 minutes, the micro will end the defrost cycle, and show the alarm
"DEFROST NOT COMPLETE". When this occurs, the Defrost Interval Timer is set for 1.5 hours, at which time the unit will go into defrost again.

4.5 Temperature Range Lock 1 & 2

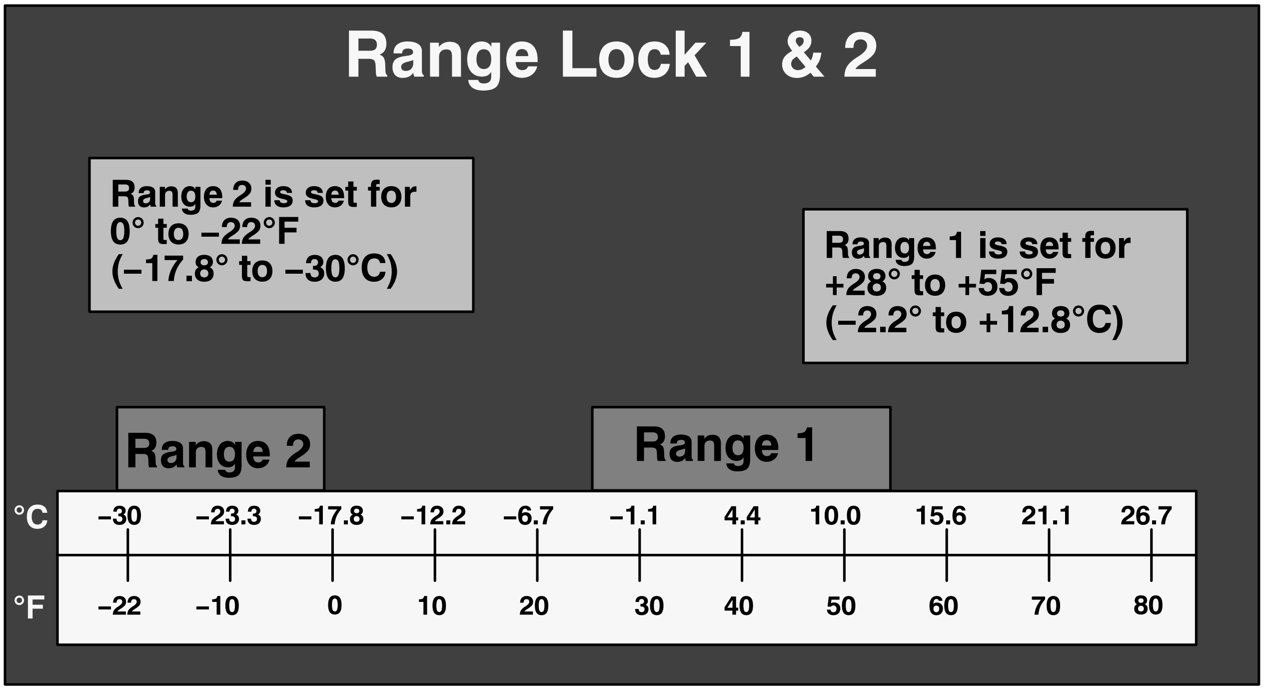
NOTE

Temperature range locks are only permitted for Compartment 1.

The unit can be locked into Start−Stop or Continuous Run operation for various setpoints. Two ranges are available for setpoint range lock selection. Each Range can be independently set to lock it's setpoint temperatures into either Start−Stop or Continuous Run.

Each Range has it's own selectable minimum and maximum temperatures, which define the span of the range. If some setpoint temperatures are contained in both ranges due to range overlap, Range 1 will always have priority over Range 2.

For example (Refer to following figure), if Continuous Run operation is ALWAYS required whenever the setpoint is between +28°F and +55°F (−2.2°C and −12.8°C), Range 1 will be set for Continuous Run, with a Minimum Temperature of +28°F (−2.2°C) and a Maximum Temperature of +55°F (−12.8°C). Should Continuous Run operation ALWAYS also be required with setpoints between −22°F (−30°C) and 0°F (−17.8°C), then Range 2 will be set for Continuous Run, with a Minimum Temperature of −22°F (−30°C) and a Maximum Temperature of 0°F (−17.8°C). Any setpoint outside of Range 1 or 2 will allow changes between Start−Stop and Continuous Run.



In the same example as above, Range 1 or Range 2 can be changed to lock the unit operation into Start–Stop. The primary time that it is important to determine which range is to be Range 1 and which is to be Range 2 is when the ranges overlap each other.

In example 2 (Refer to Figure below), the ranges will be set to lock all setpoints into Start–Stop, except for a small range between 0° and 5.6°C (+32° and +42°F) where the unit will always operate in Continuous Run. Range 1 Minimum Temperature will be set for 0°C (+32°F), and Maximum Temperature of 5.6°C (+42°F). Range 2 will be set for a Minimum Temperature of –30°C (–22°F) and a Maximum Temperature of 32°C (+89.6°F).

4.6 ProductShield ™

ProductShield is a group of configuration settings within the microprocessor that work together with the IntelliSet option to allow improved operating efficiency while providing customized product protection for up to 30 different commodities.

4.6.1 Modes

There are 4 modes to ProductShield:

a. ProductShield: Econo: Go To Start/Stop

ProductShield Econo allows the unit to have the ability to automatically switch from Start/Stop operation to Continuous run or vice versa. This allows maximum product protection while providing for fuel savings depending on ambient conditions.

When the unit is set for Continuous Run, ProductShield Econo: Go To Start/Stop allows the unit to change to Start/Stop when the unit has run in Continuous Run for a minimum of 15 minutes and the ambient temperature falls **within** a pre−programmed temperature range. (See Section d. below). The operator can also optionally pre−program a maximum temperature differential (delta−t) between the return air and supply air sensors as an additional criteria for switching to Start/Stop if the Econo Delta−T configuration is not OFF. The unit must bring the delta−t below this setting before going to Start/Stop if this option is chosen. If unit is set for Continuous Run and ProductShield Econo is configured for GO TO CONTINUOUS, the unit will remain in Continuous Run.

Once the micro detects that the above criteria have been met, the unit will switch from Continuous Run to auto Start/Stop for a minimum of 30 minutes or until the unit cycles off. After 30 minutes the unit will return to Continuous Run once the ambient temperature falls **outside** the pre−programmed temperature range by ±3.6° F (±2° C).

If the unit shuts down in Auto Start/Stop, it will remain shut down according to the pre−programmed start/stop parameters. When the unit restarts it will return to Continuous Run operation for a minimum of 15 minutes. The original activation conditions must again be met in order for the unit to return to auto Start/Stop.

b. ProductShield: Econo: Go To Continuous Run

When the unit is set for Start/Stop, ProductShield Econo: Go To Continuous Run allows the unit to run at Continuous Run for periods providing ProductShield Econo configuration is set to GO TO CONTINUOUS (See Section 5.2.1), the unit has run in Start/Stop for a minimum of 15 minutes or the Minimum Run Time minus 60 seconds (See Table 3-2) and the ambient temperature falls **outside** a pre−programmed temperature range. If unit is set for Start/Stop and ProductShield Econo is configured for GO TO START/STOP, the unit will remain in Start/Stop.

Once the micro detects that the above criteria have been met, the unit will switch from Start/Stop to Continuous Run for a minimum of 30 minutes. After 30 minutes the unit will return to Continuous Run once the ambient temperature falls **within** the pre−programmed temperature range by ±3.6° F (±2° C). Delta−t logic is not used when unit is configured for GO TO CONTINUOUS.

c. ProductShield: High Air

High air mode allows the unit to provide increased airflow with a reduced delta−t under the pre−programmed criteria. This can maximize product protection under difficult conditions while allowing the unit to operate more efficiently during less demanding conditions.

When the refrigeration unit is set for normal airflow, ProductShield High Air allows the unit to run at high air operation for periods providing the ambient temperature falls within a pre−programmed temperature range. The operator can also optionally pre−program a maximum temperature differential (delta−t) between the return air and supply air sensors as an additional criteria for switching to high air if the Econo Delta−T configuration is not OFF. The unit must bring the delta−t above this setting before going to high air if this option is chosen.

Once the micro detects that the pre−programmed criteria have been met, the unit will switch from normal operation to High Air. The unit will continue to operate in High Air for a minimum of 30 minutes. After 30 minutes the unit will return to normal operation once the ambient temperature falls outside the pre−programmed temperature range by ±3.6° F (±2° C).

If the unit shuts down in Auto Start/Stop during high speed, it will not be in ProductShield High Air when it restarts and will return to normal operation for a minimum of 15 minutes. The original activation conditions must then be met in order for the unit to return to high air.

d. ProductShield: Winter

When the unit is set for Start/Stop operation, ProductShield Winter allows it to switch to continuous run when the ambient temperature falls below a pre−programmed temperature. This will protect the unit from the complication of fuel gelling.

Once the micro detects that the ambient temperature has dropped below the pre−programmed temperature, the unit will switch from auto Start/Stop to Continuous Run. The unit will continue to operate in Continuous Run for a minimum of 30 minutes. After 30 minutes, the unit will return to auto Start/Stop once the ambient temperature has risen more than 3.6° F (2° C) above the pre−programmed ProductShield Winter temperature.

All of the ProductShield settings are in the Data List (Refer to Section 3.15). The Data List will reflect the ProductShield settings for the IntelliSet commodity that is currently active.

NOTE

ProductShield does not operate within Sleep Mode.

4.6.2 Temperature Ranges

Each ProductShield setting allows the user to select a ambient temperature range in which to operate.

The Minimum and Maximum range values can be set to OFF, or any value from −19°F to +119°F (−28.3°C to +48.3°C).

The examples below all use the same settings and illustrate the differences in unit operation for the various ProductShield selections.

a. ProductShield: Econo: Go To Start/Stop Examples

The following examples apply in situations where all other Start/Stop conditions have been met.

If the Minimum is set to 30°F (−1.1°C) and the Maximum is set to 42°F (5.6°C) and the *ambient air* temperature falls **between** these temperatures, the unit operation can change to Econo Start/Stop.

If the Minimum is set to OFF and the Maximum is set to 35°F (1.7°C) and the *ambient air* temperature falls **below** 35°F (1.7°C), the unit operation can change to Econo Start/Stop.

If the Minimum is set to 70°F (21.1°) and the Maximum is set to OFF and the *ambient air* temperature is **above** 70°F (1.7°C), the unit operation can change to Econo Start/Stop.

b. ProductShield: Econo: Go To Continuous Run Examples

If the Minimum is set to 30°F (−1.1°C) and the Maximum is set to 42°F (5.6°C) and the *ambient air* temperature falls **outside** these temperatures, the unit operation will change to Econo Continuous Run.

If the Minimum is set to OFF and the Maximum is set to 35°F (1.7°C) and the *ambient air* temperature falls **above** 35°F (1.7°C), the unit operation will change to Econo Continuous Run.

If the Minimum is set to 70°F (21.1°) and the Maximum is set to OFF and the *ambient air* temperature is **below** 70°F (1.7°C), the unit operation will change to Econo Continuous Run.

c. ProductShield: High Air Examples

If the Minimum is set to 15°F (−9.4°C) and the Maximum is set to 85°F (29.4°C) and the *ambient air* temperature falls **outside** these temperatures, the unit operation will change to Econo High Air.

If the Minimum is set to OFF and the Maximum is set to 35°F (1.7°C) and the *ambient air* temperature falls **above** 35°F (1.7°C), the unit operation will change to Econo High Air.

If the Minimum is set to 70°F (21.1°) and the Maximum is set to OFF and the *ambient air* temperature is **below** 70°F (1.7°C), the unit operation will change to Econo High Air.

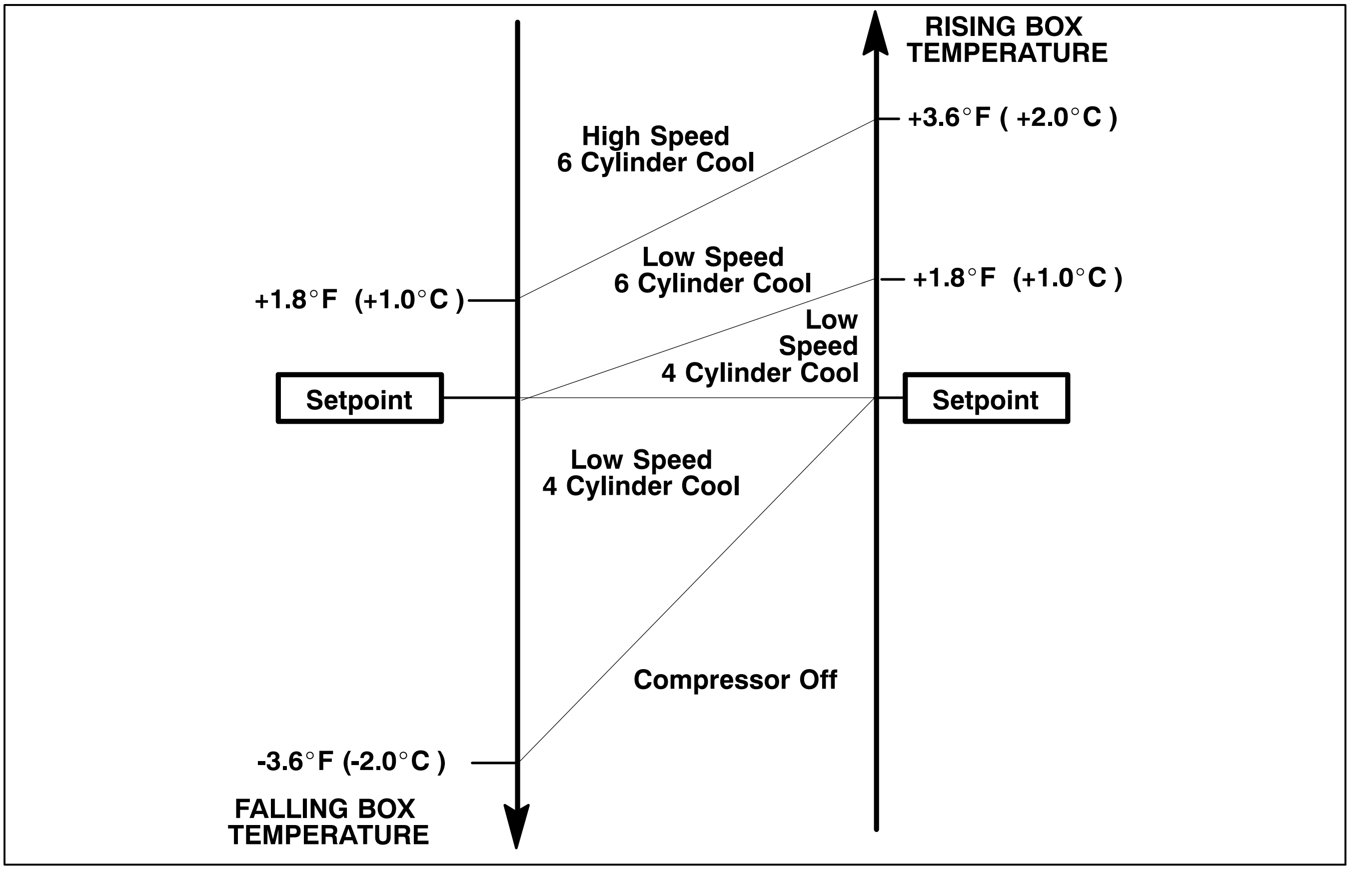


Figure 4−2. Continuous Run Frozen Temperature Control

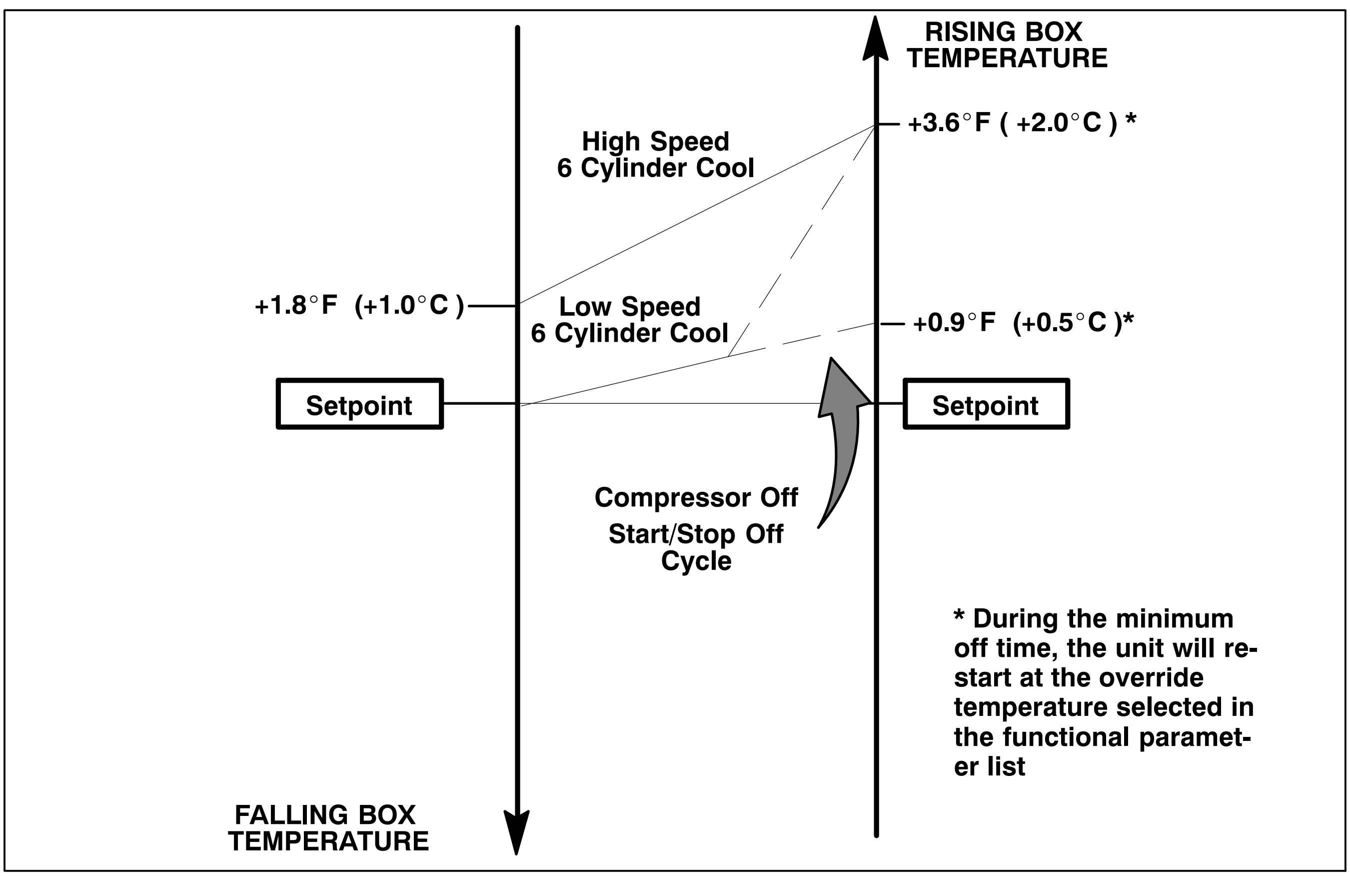


Figure 4−3. Start/Stop Frozen Temperature Control

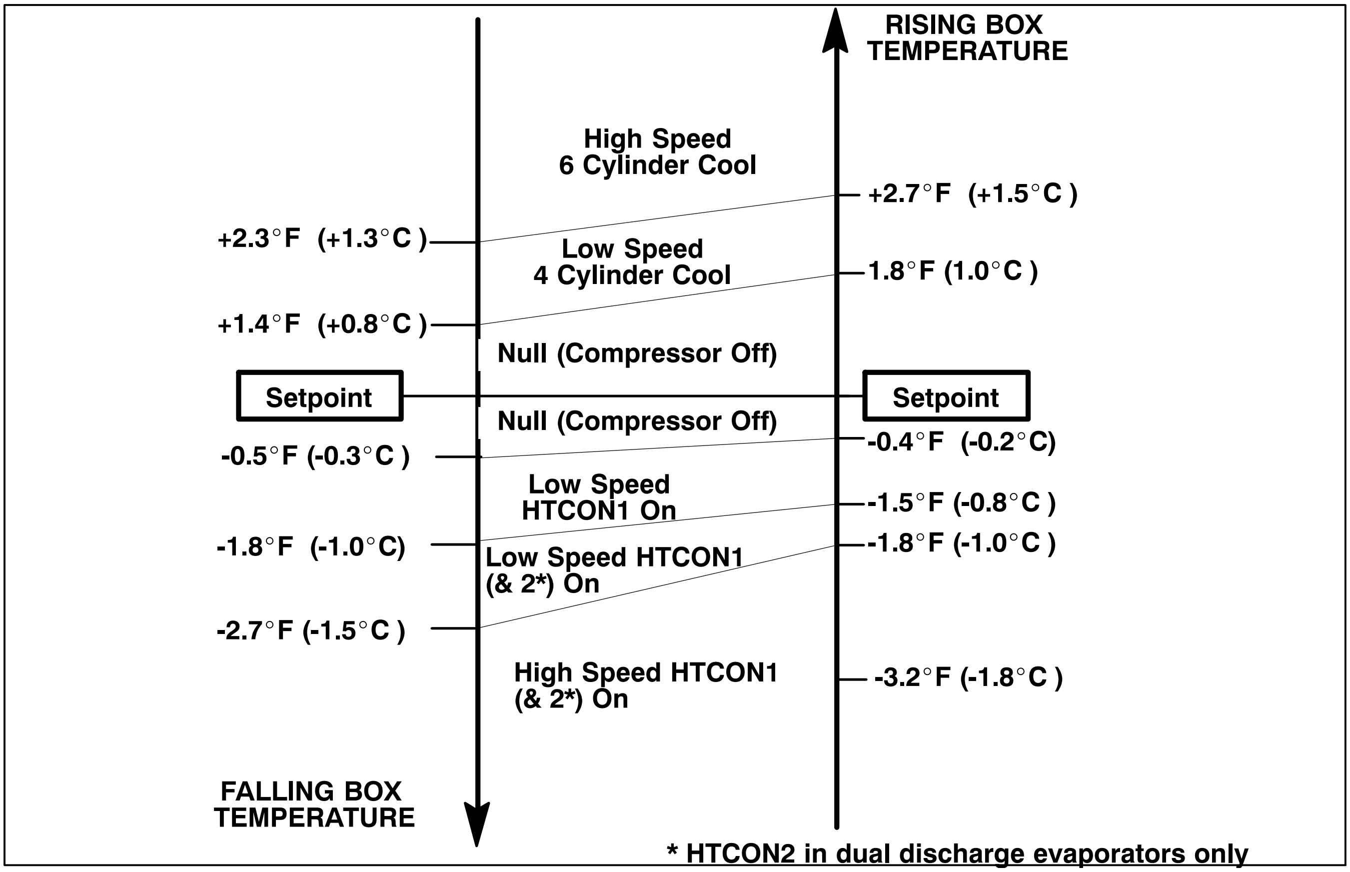


Figure 4–4. Continuous Run Perishable Temperature Control

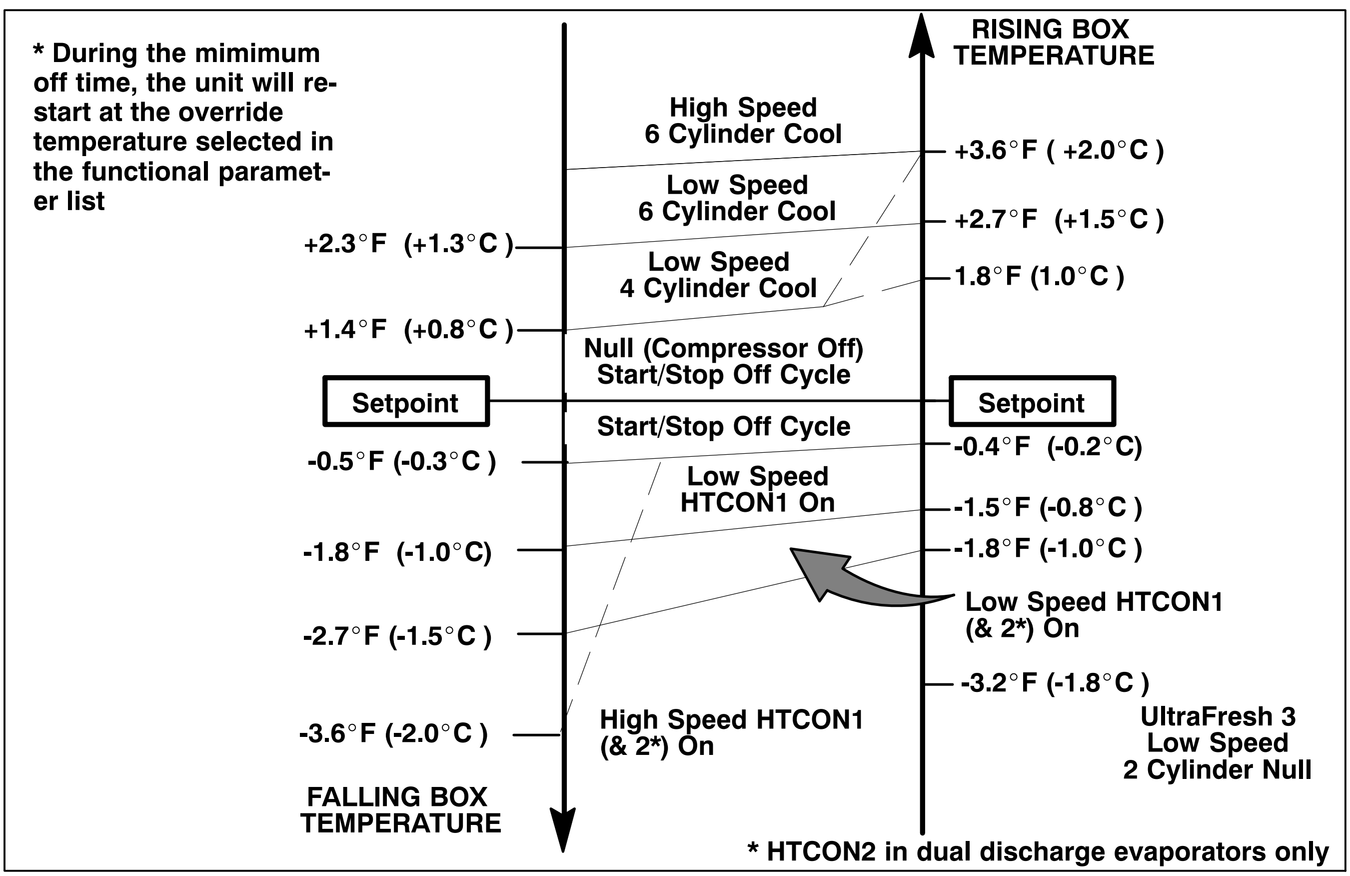


Figure 4–5. Start/Stop Perishable Temperature Control

4.7 OUTPUT OVERRIDES

4.7.1 Speed Control Solenoid (SCS) Overrides

NOTE

When any enabled compartment is calling for High Speed, the engine will operate in High Speed, without regard to other compartments. In order for the engine to operate in Low Speed, all compartments must be calling for Low Speed.

With the complex control systems in use with the Advance Microprocessor, there are many different reasons the engine may be operating in either High Speed or in Low Speed besides the number of degrees the box temperature is away from setpoint . This section lists the different factors that determine the speed of the engine, in the order of their priority.

Speed Control Solenoid Overrides in priority order:

1. DEFAULT MODE

Refer to Section 4.4.9

2. HIGH SPEED TO LOW SPEED DELAY

When the unit is operating in High Speed, and the controller calls for Low Speed,k the engine will remain in High Speed until the high voltage current draw is less than 22 Amps, or for 40 seconds if the amperage is already higher than 22 Amps. It will then to go Low Speed.

3. SILENT MODE

When the Silent Mode is set for ON in the Functional Parameter List, the unit will operate in low speed only

4. LOW SPEED ENGINE COOLANT WARM−UP

If engine Coolant Temperature Sensor Alarm is not active the engine will run in low speed until the coolant is above 79°F (26°C).

5. DEFROST − Refer to Defrost Control (Section 4.4.10)

6. DOOR/REMOTE SWITCH CONFIGURED FOR LOW SPEED

The unit will be forced into low speed if the door/remote switch is open (active) and is configured for low speed.

7. AUTO START/STOP ECONO MODE

When the unit restarts from an Off Cycle in Start/Stop due to any reason except for box temperature away from setpoint, the engine will run in low speed for the same time as the Minimum Off Time (unless all conditions are met for another Off Cycle, and the engine shuts off in less time). If ProductShield Econo: Go To Continuous becomes active during this time, the engine will go to normal speed operation until the next On Cycle. (See Section 4.6 for more information on ProductShield)

8. HIGH SPEED DELAY

- The compressor must operate for 2 minutes before the engine will go to high speed.
- When the unit is operating in low speed, and the control calls for high speed, the engine will continue to operate in low speed for the length of time selected in the Configuration List (0 to 10 minutes). This includes engine start−up, defrost termination, and normal temperature control.

9. START−STOP WITH A FROZEN SETPOINT

In Start/Stop Mode, when any compartment setpoint is in the frozen range, and the minimum run time has expired, and the box temperature is not at setpoint, the engine will be forced to high speed.

10. FROZEN SETPOINT

If any compartment setpoint is in the frozen range, and the box temperature in that compartment is below setpoint, that compartment will call for low speed.

11. LOW SUCTION PRESSURE

If the suction pressure falls to 4 inHg (0.14 Bar) for more than 20 seconds, and both UL1 and UL2 are energized, the unit will be forced into low speed for a minimum of 5 minutes, then remain in low speed until the suction pressure is greater than 4 inHg (0.14 Bar).

12. START−STOP WITH A PERISHABLE SETPOINT

When only Compartment 1 is enabled, and the setpoint in Compartment 1 is in the perishable range, and the unit is operating in Start/Stop and all conditions for an OFF Cycle are met except for setpoint, the engine will operate in High Speed to pull down to setpoint and cycle off quicker.

NOTE

Generally, the unit will go into an Off cycle from High Speed when this condition occurs. However, if one of the required conditions for shut down is no longer met during this time, (for example, the battery voltage drops below the configured value, or the charging amps increase above the configured value, or the engine coolant temperature drops below 122°F (50°C), the engine may return to Low Speed operation until the shut down condition is satisfied, then shut down from Low Speed.

13. HIGH SPEED PULLDOWN

When only Compartment 1 is enabled, and the setpoint for Compartment 1 is in the perishable range, and the unit is operating in Continuous Run, and the High Speed Pulldown configuration is set for YES, the engine will operate in High Speed until the box temperature is within ±0.4°F (0.2°C) of setpoint.

14. PRODUCT SHIELD HIGH AIR

- When ProductShield High Air is configured on, the engine will operate in High Speed whenever the ambient air temperature is outside the Minimum / Maximum temperature range selected in the configuration list, and if the Delta−T parameter is not set for OFF in the configuration list, the Delta−T of the unit must be greater than the selected value. (See Section 4.6 for more information on ProductShield.

4.7.2 Unloader Control Overrides

With the complex control systems in use with the Advance Microprocessor, there are many different reasons − other than the number of degrees the box temperature is away from setpoint − that the compressor unloaders may be operating loaded or unloaded This section lists the different factors that determine the operation (loading and unloading) of the unloaders.

Unloaders operate in priority order for cool mode ONLY:

The overrides will be allowed in default mode if the override does not use the return or supply temperature.

There is always a minimum delay of 20 seconds between LOADING and UNLOADING cylinders under all operating conditions except when the engine is starting.

When the Compressor is Off the Unloaders are always de−energized.

1. LOW GENERATOR AMP DRAW

When alarm A128 “LOW AC AMPS” is active, the compressor will only operate on 2 or 4 cylinders.

2. HIGH GENERATOR AMP DRAW

When the compressor is operating and either one or both of the unloaders is energized (unloaded), they will not be allowed to de−energize whenever the compressor discharge pressure is above 415 psig (28.2 Bar) OR when the compressor Amp draw is more than 25 Amps when operating in diesel engine mode or more than 21 Amps when in standby.

3. FAN MOTOR DELAY

When ever any fan motor has been energized, there will be a 3 second delay before either unloader is allowed to de−energize.

4. 2−MINUTE DELAY

If the compressor is on and an unloader is energized due to a refrigeration system pressure (override overrides # 4, 7, 8, or 9), the unloader remains energized for 2 minutes.

5. COMPRESSOR STARTUP

- UL1 remains energized (unloaded) for a minimum of 10 seconds when the ambient is above 100°F (37.8°C) or 5 seconds when the ambient is at or below 100°F (37.8°C) after Compressor Motor Contactor is energized.
- UL2 remains energized (unloaded) for a minimum of 60 seconds when the ambient is above 100°F (37.8°C) or 30 seconds when the ambient is at or below 100°F (37.8°C) (ambient is greater than 37.8°C) after Compressor Motor Contactor is energized

6. HIGH EVAPORATOR PRESSURE

UL2 will always be energized (unloaded) when the suction pressure reaches the value shown in the chart below, according to the current ambient temperature. For example, at an ambient temperature of 100°F, UL2 will be energized when the suction pressure rises to approximately 75 psig (5 Bar).

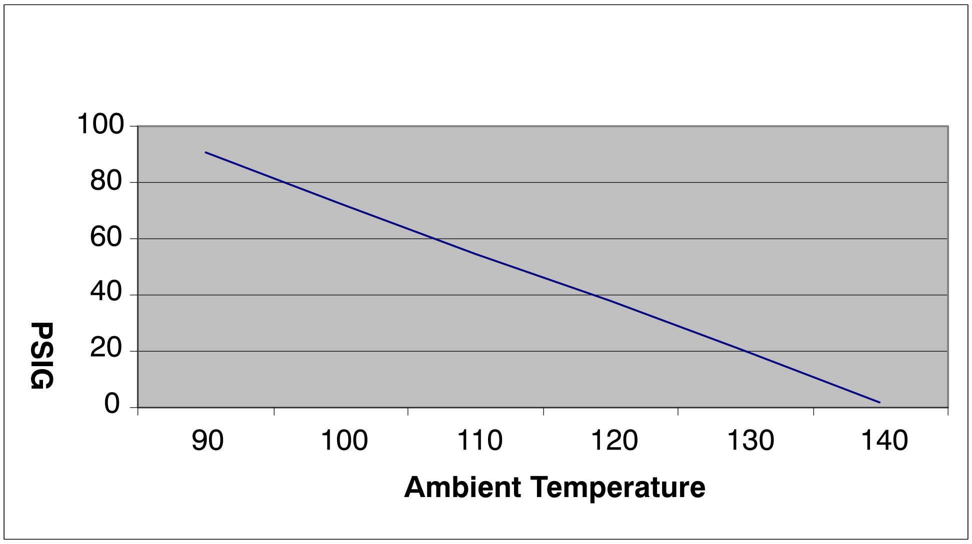


Figure 4-6.Evaporator Pressure Chart

7. HIGH DISCHARGE PRESSURE

- When the compressor discharge pressure reaches 435 psig (30 Bar) for more than 1 minute, UL2 will energize (unload). UL2 will remain energized until the compressor discharge pressure drops below 415 psig.

- If both UL1 and UL2 are energized (unloaded), and the discharge pressure drops below 415 psig (28.2 Bar), UL1 will be de-energized (loaded).

8. LOW SUCTION PRESSURE

- If suction pressure falls below 4" Hg (vacuum) for more than 20 seconds, energize (unload) UL2.

- Once the suction pressure rises above 5 psig, de-energize (load) UL2 (after the 2-Minute Delay mentioned above.) OR…

- After 20 seconds: if suction pressure is still less than 4" Hg, energize (unload) UL1.

- If both UL2 and UL1 are energized (unloaded) AND 20 seconds has elapsed since energizing (unloading) UL1 AND the suction pressure rises above 5 psig, de-energize (load) UL1.

9. HIGH CDT

If the compressor is operating with both UL1 and UL2 energized (unloaded), and the CDT rises to 285°F (140°C), UL1 will be de-energized (loaded), and will remain de-energized until the CDT drops below 265°F (130°C) for at least 2 minutes.

10.DEFAULT MODE

Refer to Section 4.4.9

11.START-STOP WITH A FROZEN SETPOINT

In Start/Stop Mode, when any compartment setpoint is in the frozen range, and the minimum run time has expired, and the box temperature is not at setpoint, both UL1 and UL2 will be de-energized and the compressor will operate on 6-cylinders.

12.HIGH SPEED PULLDOWN

When only Compartment 1 is enabled, and the setpoint for Compartment 1 is in the perishable range, and the unit is operating in Continuous Run, and the High Speed Pulldown configuration is set for YES, then the compressor will operate with both unloaders de-energized (6-cylinder operation) until the box temperature is within +/- 0.4°F (0.2C) of setpoint.

4.7.3 Suction Pressure Operation

At ambient temperatures of 90°F (32.2°C) <u>or below</u>

When the system is operating in *high speed* and the suction pressure is greater than 63 PSIG (4.29 Bars), both unloaders are unloaded. As the suction pressure drops below 63 PSIG (4.29 Bars), the UL2 unloader is loaded. If the suction pressure drops below 32 PSIG (2.18 Bars), the UL1 unloader is loaded.

When the system is operating in *low speed* and the suction pressure is greater than 65 PSIG (4.42 Bars), both unloaders are unloaded. As the suction pressure drops below 64 PSIG (4.35 Bars), the UL2 unloader is loaded. If the suction pressure drops below 35 PSIG (2.38 Bars), the UL1 unloader is loaded.

At ambient temperatures of 90°F (32.2°C) <u>or higher</u>

At ambient temperatures of 90°F (32.2°C) or higher the unloading suction pressure settings relative to ambient temperatures follow a descending straight line. (Refer to following chart)

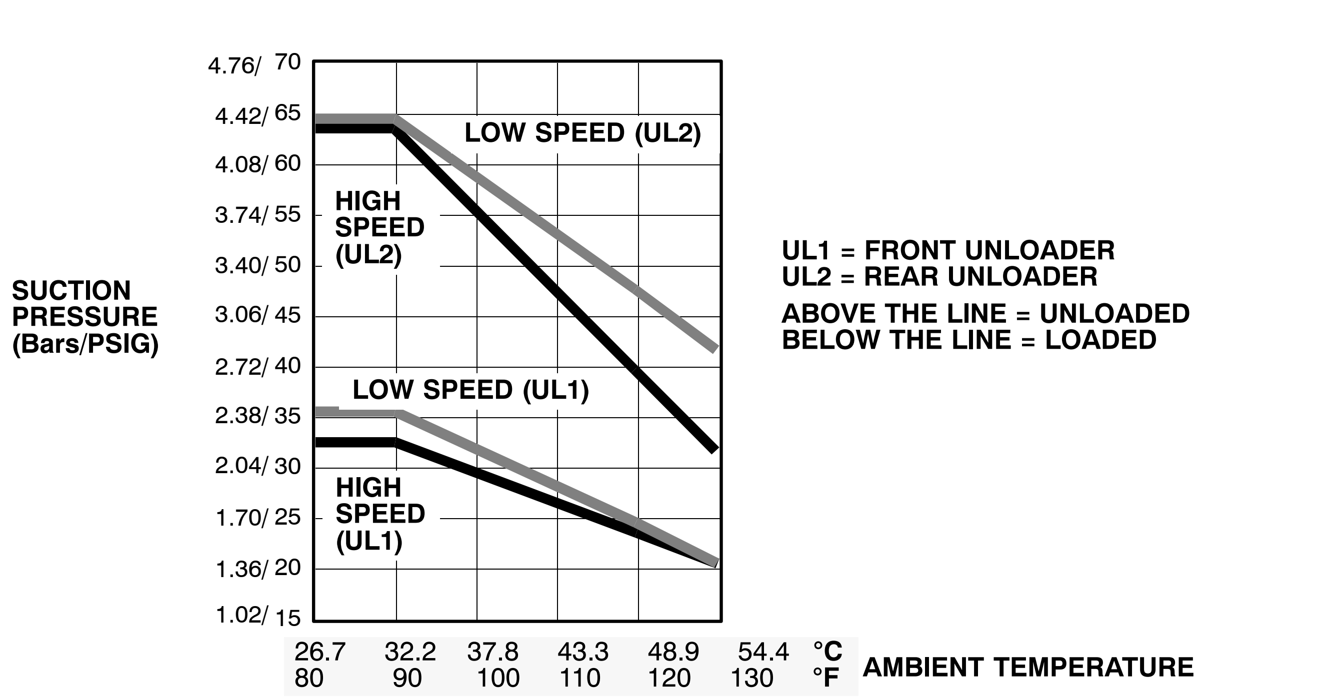


Figure 4-7.Refrigeration System Suction Pressures Unloading (Heat and Defrost Only)

SECTION 5

TECHNICIAN INTERFACE

5.1 PC MODE/DOWNLOAD PORT

PC Mode allows the user to access and download data using a computer when the unit is not running and without starting the 8 hour data recorder timer. Connecting a download cable to the Download Port, with the RS in the OFF position, allows the Advance Microprocessor to power up, and communicate with the computer.

All functions available from the Keypad may be viewed or changed using the Reefer Manager Program, and a Personal Computer (PC) connected to the Download Port. Using the PC will provide additional programming and configuring capabilities that will not be available through the Keypad.

The Data Recorder may also be configured and downloaded through the Download Port using the Data Manager Program.

Some of the things that you may want to use PC Mode for are:

- •Changing any of the functional parameters for the next load
- •Reading Engine hour meters
- •Reading Maintenance hour meters
- •Resetting Maintenance hour meters
- •Viewing the Active and Inactive alarm lists.
- •Entering a Trip Start
- •Keeping the microprocessor powered up after turning the RS to the OFF position.
- •Demonstrating the operation of the microprocessor.

To better utilize PC Mode, a PC Mode Jumper 22-50180-01 is available. This looks very similar to the Configuration Jumper (Refer to Section 5.2), but has a **GREEN WIRE** on it. With the unit off, locate the download port. Remove the protective plug to gain access to the wire terminals. Plug in Jumper or connect an ***insulated jumper*** wire to terminals C and E.

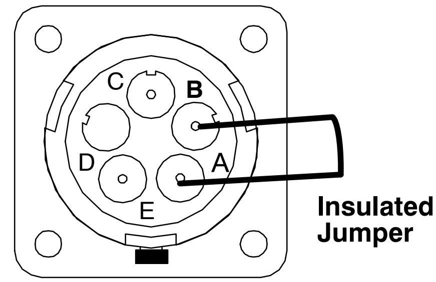
If the RS is put into the Start/Run position, the microprocessor will go to normal operation. If the unit is shut down with the PC Cable or jumper still in place, the engine will shut down, and the microprocessor will remain powered up.

⚠ WARNING

Do not place the Start/Run−OFF Switch (RS) in the Start/Run position or the unit will start.

5.2 MICROPROCESSOR CONFIGURATION AND TECHNICIAN TEST MODES (REMOVE JUMPER MODE)

1. Turn the Start/Run-Off switch to the Off position.
2. With the unit off, locate the download port. Remove the protective plug to gain access to the wire terminals. Plug in Jumper P/N 22-50180-00 or connect an ***insulated jumper*** wire between plug terminals A and B.



Download Port

Jumper P/N 22-50180-00

⚠ WARNING

Do Not Allow Jumper Wire To Touch Any Ground.

3. Turn the Start/Run-Off switch to the Start/Run position. The ALARM LED will come on, the setpoint will appear, but the Box Temperature will not, and "REMOVE JUMPER" will appear in the MessageCenter for 10 seconds. Remove the jumper at this time. ↑↓ TO SCROLL, THEN = TO SELECT" will appear in the MessageCenter for 10 seconds, or until either the UP or DOWN ARROW keys are pressed.
4. Press the UP ARROW Key to scroll through the Main Menu beginning at the top.
   Press the DOWN ARROW Key to scroll through the Main Menu beginning at the bottom.
5. Select the Mode you wish to access, and press the = key. See the following pages for information on these test modes:

- **•Configuration Mode**
- **•Component Test Mode**
- **•Service Mode**

5.2.1 Configuration Mode

NOTE

To enter Configuration Mode Refer to Section 5.2.

a. "↑ ↓ TO SCROLL, THEN = TO SELECT" will appear in the MessageCenter.

b. Press the UP ARROW Key to scroll through the Configuration list beginning at the top.
Press the DOWN ARROW Key to scroll through the Configuration list beginning at the bottom.

c. To read through the Configuration list, continue to press either the UP or DOWN ARROW keys. The list is circular meaning that once the end is reached, it is repeated from the beginning.

d. To change one of the Configurations, bring the Configuration to change into the MessageCenter, and press "=". ↑ ↓ TO SCROLL, THEN = TO SAVE" will show in the MessageCenter for 10 seconds Then the selected Configuration will flash, showing the current value. Press the UP or DOWN ARROW Key to scroll through the list of available selections for this Configuration.

e. Once a new value is showing in the MessageCenter, press the = Key to save the selection. The MessageCenter will stop flashing. The new value is now in memory.

f. Press the UP ARROW Key to continue to scroll through the Configuration list.

CONFIGURATION	SELECTIONS	DESCRIPTION
UNIT MODEL NUMBER # Pick one of these two models from the Vector model family	NDP33GN6HBV2 NDP33GN6HBV3	The correct model number must be selected for proper operation and control. This is also part of the Unit Data where user can read the information. Configuration mode is the only way user can write information.
COMPARTMENT CONFIGURATION (NDP33GN6HBV2)	**2** 1 thru 4	Select correct system from Table 2-2
COMPARTMENT CONFIGURATION (NDP33GN6HBV3)	**6** 5 thru 16	
UNIT SERIAL NUMBER #		The unit S/N may be entered. This may be up to 10 characters long. Numbers, Letters, and a space are available by scrolling through the available list.
TRAILER ID #		The ID # may be entered. This may be up to 10 characters long. Numbers, Letters, and a space are available by scrolling through the available list.
SET NEW HOURS		Hours from existing micro can be installed into replacement micro.
GLOW TIME	**SHORT** LONG	Indicates to the controller how long to energize the glow plugs LONG = Longer glow times are used SHORT= Shorter glow times are used. NOTE: Refer to Section 4.1.1 for glow time table.
OUT OF RANGE SHUTDOWN: (Refer to Section 2.8.3)	YES / **NO**	YES = When the box temperature has been out–of–range for 45 minutes, the alarm light will come on, and the unit will shut down. NO = When the box temperature has been out–of–range for 30 minutes, the alarm light will come on and the unit will continue to run.
PARAMETERS LOCKOUT:	YES / **NO**	YES = All Functional Parameters in the function list are locked in place. NO = All Functional Parameters in the function list can be changed using the keypad, unless individually locked out by Reefer Manager.
RPM ALARM SHUTDOWN:	**YES** / NO	YES = When alarm 39 is active the alarm light will be on and the engine will shut off. NO = When alarm 39 is active the alarm light will be on and the engine will continue to run.
LOW PRESSURE SHUTDOWN:	**YES** / NO	YES = When alarm 18 is active the alarm light will be on and the unit will shut off. NO = When alarm 18 is active the alarm light will be on and the unit continue to run.
LP SHUTDOWN DELAY:	**255 SECS** (0 – 255 seconds)	After the Low Pressure signal is received, how long shall the unit continue to run before it is shut down.

CONFIGURATION	SELECTIONS	DESCRIPTION
HIGH SUCT PRESS SHUTDOWN	YES / **NO**	YES = When alarm 27 is active the alarm light will be on and the unit will shut off. NO = When alarm 27 is active the alarm light will be on and the unit will continue to run.
REFRIGERATION SYS SHUTDOWN	**YES** / NO	YES = When alarm 28 is active the alarm light will be on and the unit will shut off. NO = When alarm 28 is active the alarm light will be on and the unit will continue to run.
COMPRESSOR ALARM SHUTDOWN (Special option card required)	YES / **NO**	YES = The unit will shutdown and not restart when alarms 13, 17, 18 or 56 occur 3 times within 2 hours. NO = Normal shutdown rules for above alarms.
SUCTION PRESSURE	**30 PSIG (2.0 BAR)** 0 – 50 psig (0 to 3.4 Bar) [in 1 psig (0.1 Bar) increments]	Pressure to maintain if discharge pressure transducer is opened or shorted.
CURRENT FOR S/S SHUTOFF	**7.0A** 1A TO 10A (in 0.5A increments)	This is the maximum charging amps permitted for start–stop off cycle.
VOLTAGE FOR S/S RESTART	**12.2V** 11.5 TO 12.8V	The engine will restart from a Start/Stop Off cycle or a Sleep Mode Off cycle when the battery drops to this value.
ALTERNATOR CHECK SHUTDOWN:	YES / **NO**	YES = When alarm 51 is active the alarm light will be on and the unit will shut off. NO = When alarm 51 is active the alarm light will be on and the unit will continue to run.
ENGINE OIL LEVEL SWITCH	YES / **NO**	YES = An Engine Oil Level Switch is installed. NO = An Engine Oil Level Switch is not installed.
ENGINE OIL LEVEL SHUTDOWN	YES / **NO**	YES = The low engine oil level alarm will shutdown the unit. NO = The low engine oil level alarm will not shutdown the unit.
LOW COOLANT LEVEL	YES / **NO**	YES = A Coolant Level Sensor is installed. NO = A Coolant Level Sensor is not installed..
ENGINE OIL PRESS SHUTDOWN	YES / **NO**	YES = When the A11 – “LOW ENGINE OIL PRESSURE“ alarm has been activated three times in the last two hours of engine operation the A21 – “TECHNICIAN RESET REQUIRED“ alarm will be activated. NO = A21 will not be activated.
HIGH ENGINE TEMP SHUTDOWN	YES / **NO**	YES = When the A12 – “HIGH COOLANT TEMPERATURE” alarm has been activated three times in the last two hours of engine operation the A21 – TECHNICIAN RESET REQUIRED alarm will be activated. NO = A21 will not be activated.
FUEL TANK	**NO DEVICE** SWITCH INSTALLED 0 TO 100% SENSOR	NO DEVICE = There is no Low Fuel Level Sensor installed in the fuel tank. SWITCH INSTALLED = A Low Fuel Level Switch is installed in the fuel tank. 0 to 100% SENSOR = A Low Fuel Level Sensor is installed in the fuel tank. The fuel level may be read in the unit data list.

CONFIGURATION	SELECTIONS	DESCRIPTION
FUEL TANK SIZE	**OFF** 30 GALLONS 50 GALLONS 75 GALLONS 100 GALLONS 120 GALLONS	OFF = No Low Fuel Level *Switch* or *0 to 100% Sensor* is installed in the tank; OR A Low Fuel Level *Switch* or a *0 to 100% Sensor* is installed in the tank, but the unit will not shutdown due to a Low Fuel Level Alarm. 30 – 120 GALLONS = When a Low Fuel Level *Switch* is installed, and the LOW FUEL LEVEL WARNING (alarm 1) is on, the unit will shutdown (alarm 19) after a time delay (Refer to chart below) 30 gal 30 min 50 gal 60 min 75 gal 90 min 100 gal 120 min 120 gal 150 min OR If a *0 to 100% Sensor* is installed, the low fuel level WARNING (alarm 1) will come on when the level reaches 15% or less, and the unit will shutdown (alarm 19) when the level reaches 10%.
DIESEL MAX GEN AMPS:xx.xA	**26A** 10 TO 35 in 0.5A increments	Use factory default settings only. DO NOT OPERATE UNIT WITH DIFFERENT SETTINGS.
STANDBY MAX GEN AMPS:xx.xA	**22A** 10 TO 35 in 0.5A increments	Use factory default settings only. DO NOT OPERATE UNIT WITH DIFFERENT SETTINGS.
STARTUP GEN MAX AMPS:xx.xA	**17A** 10 TO 35 in 0.5A increments	Use factory default settings only. DO NOT OPERATE UNIT WITH DIFFERENT SETTINGS.
DIESEL OFFSET MAX AMPS:xx.xA	**4A** 0 TO 10 in 0.5A increments	Use factory default settings only. DO NOT OPERATE UNIT WITH DIFFERENT SETTINGS.
STANDBY STARTUP DELAY	**OFF** 5 10 15 20 SECONDS	Used in starting the system in standby from power up. This helps to prevent multiple units on the same power drop from restarting at the same time.
DISPLAY TOTAL ENGINE HR	NO / **YES**	YES = This hourmeter will be displayed during the startup messaging sequence and will be in hourmeter menu. NO = This hourmeter will not be displayed during the startup messaging sequence and will be shown with the “other meters and counters”.
DISPLAY STANDBY RUN HR	NO / **YES**	YES = This hourmeter will be displayed during the startup messaging sequence and will be in hourmeter menu. NO = This hourmeter will not be displayed during the startup messaging sequence and will be shown with the “other meters and counters”.

CONFIGURATION	SELECTIONS	DESCRIPTION
DISPLAY TOTAL SWITCH ON HR	NO / **YES**	YES = This hourmeter will be displayed during the startup messaging sequence and will be in hourmeter menu. NO = This hourmeter will not be displayed during the startup messaging sequence and will be shown with the "other meters and counters".
DIESEL RESET VALUE (Refer to Section 2.9 for oil change intervals)	**0** 50 TO 30,000 HRS in 50 hr increments	0 = The Engine Maintenance Hour Meter is turned off. 50 – 30,000 hrs = The value selected here will be the number of hours between engine service intervals.
STANDBY RESET VALUE	**0** 50 TO 30,000 HRS in 50 hr increments	0 = The Standby Run Time Maintenance Hour Meter is turned off. 50 – 30,000 hrs = The value selected here will be the number of hours between standby run time service intervals.
SWITCH ON RESET VALUE	**0** 50 TO 30,000 HRS in 50 hr increments	0 = The Switch–On Maintenance Hour Meter is turned off. 50 – 30,000 hrs = The value selected here will be the number of hours between Switch–On service intervals.
PM (1–5)	**OFF** ENGINE HOURS SWITCH ON HOURS STANDBY HOURS START CYCLES HIGH SPEED HOURS	OFF = The PM 1–5 Maintenance Hour Meter(s) is turned off. ENGINE HOURS = PM Meter will count engine hours until the next service interval. SWITCH ON HOURS = PM Meter will count Switch On Hours until the next service interval. STANDBY HOURS = PM Meter will count Run Time Hours until the next service interval. START CYCLES = PM Meter will count how many times the engine has started until the next service interval. HIGH SPEED HOURS = PM Meter will count how many hours the unit operated in high speed until the next service interval.

CONFIGURATION	SELECTIONS	DESCRIPTION
PM (1–5) RESET INTERVAL	**NOT DISPLAYED** ENGINE HOURS OFF or 50 TO 30,000 HRS in 50 hr increments SWITCH ON HOURS OFF or 50 TO 30,000 HRS in 50 hr increments STANDBY HOURS OFF or 50 TO 30,000 HRS in 50 hr increments START CYCLES 1,000 TO 90,000 CYCLES OFF or in 1,000 cycle increments HIGH SPEED HOURS OFF or 50 TO 30,000 HRS in 50 hr increments	0 = PM (1–5) is not being used. ENGINE HOURS = PM (1–5) is connected to the engine hour meter. The reset interval will be (50 – 30,000 hrs). SWITCH ON HOURS = PM (1–5) is connected to the switch on hour meter. The reset interval will be (50 – 30,000 hrs). STANDBY HOURS = PM (1–5) is connected to the Standby Run Time hour meter. The reset interval will be (50 – 30,000 hrs). START CYCLES = PM (1–5) is connected to the clutch cycle meter. This meter counts every time the engine starter engages. The reset interval will be (1,000 to 90,000 cycles) HIGH SPEED HOURS = PM (1–5) is connected to the high engine speed hour meter, which counts only high speed engine hours. The reset interval will be (50 – 30,000 hrs).
PRODUCTSHIELD SETUP Note: ProductShield is only available when IntelliSet is installed.		This message will only appear if ProductShield is installed. The information set in the following configurations can be read in the Unit Data List.
•PRODUCTSHIELD ECONO	**OFF** GO TO S/S GO TO CONT	OFF = ProductShield Econo is OFF GO TO START/STOP = Allows unit to be set for and operate in Continuous Run until ambient temperature falls **within** a user–defined range when unit will go to Start/Stop. This allows fuel savings while offering Continuous Run operation protection when ambient is outside range. Unit will return to Continuous Run when ambient goes beyond range. GO TO CONTINUOUS = Allows unit to be set for and operate in Start/Stop until ambient temperature falls **outside** a user–defined range when unit will go to Continuous Run. This provides continuous air flow and good product protection for extreme ambient temperatures. Unit will return to Start/Stop when ambient comes back inside range. The minimum range allowed for this selection is 10°F (5.5°C).This means that the MIN temperature will never be closer to the MAX temperature than 10°
• ECONO MIN. TEMP	–19°F to +119°F (–28.3°C to +48.3°C) in 0.5°F or °C increments Default: **119°F (48.3°C)** OFF	Select the lower limit of the ambient range desired for this parameter. See Section 4.6 for more information on Econo Min. Temp.

CONFIGURATION	SELECTIONS	DESCRIPTION
• ECONO MAX. TEMP	−19°F to +119°F (−28.3°C to +48.3°C) in 0.5°F or °C increments Default: **119°F (48.3°C)** OFF	Select the upper limit of the ambient range desired for this parameter. See Section 4.6 for more information on Econo Max. Temp.
• ECONO DELTA−T	**OFF** +3.6°F to +27.0°F (+2°C to 15°C) in 0.5° C or °F increments	Select the desired Delta−T value for activation of ProductShield Econo: Go To S/S This parameter is not available for Econo: Go To Continuous Run
•PRODUCTSHIELD HIGH AIR	**OFF** ON	OFF = The unit will operate normally in high and low speeds. ON = The unit will operate in high speed when the ambient air temperature falls OUTSIDE the minimum / maximum temperature range (selected settings for HIGH AIR MIN TEMP, HIGH AIR MAX TEMP, AND HIGH AIR DELTA−T − see below)
•HIGH AIR MIN. TEMP	−19°F to +119°F (−28.3°C to +48.3°C) in 0.5°F or °C increments Default: **119°F (48.3°C)** OFF	Select the lower limit of the ambient range desired for this parameter. See Section 4.6 for more information on High Air Min. Temp.
•HIGH AIR MAX. TEMP	−19°F to +119°F (−28.3°C to +48.3°C) in 0.5°F or °C increments Default: **119°F (48.3°C)** OFF	Select the upper limit of the ambient range desired for this parameter. See Section 4.6 for more information on Econo Max. Temp.
•HIGH AIR DELTA−T	**OFF** +3.6° F to +27.0°F (+2°C to 15°C) in 0.5° C or °F increments	Select the desired Delta−T value for activation of ProductShield High Air
PRODUCTSHIELD WINTER	**OFF** −20°F to +32.0°F (−28.9°C to 0°C) in 0.5° C or °F increments	Select the desired ambient temperature for activation of installed ProductShield Winter. When ambient temperature falls below this selected value, the unit will run in Continuous Run only. See Section 4.6 for more information on ProductShield Winter.
RANGE (1−2) LOCK COMPARTMENT 1 ONLY	**OFF** START−STOP CONTINUOUS	OFF = If both Range 1 & Range 2 Locks are off, Start−Stop or Continuous Run may be selected. If either Range 1 or Range 2 is not OFF, the unit will operate in the selected mode whenever the setpoint is within that range. START−STOP = The unit will always operate in Start−Stop whenever the setpoint is between the minimum & maximum temperatures for that range (see below). CONTINUOUS = The unit will always operate in Continuous Run whenever the setpoint is between the minimum & maximum temperatures for that range (see below).

CONFIGURATION	SELECTIONS	DESCRIPTION
RANGE (1−2) MINIMUM TEMP	−22°F TO +**89.6**°F (−30°C to +**32**°C) in 0.1°F or °C increments	Select the lowest temperature desired for either Range 1 and/or Range 2.
RANGE (1−2) MAXIMUM TEMP	−22°F TO +**89.6**°F (−30°C to +**32**°**C**) in 0.1°F or °C increments	Select the highest temperature desired for either Range 1 and/or Range 2.
MIN SETPOINT C2 MIN SETPOINT C3 MIN SETPOINT	**−22°F** TO +89.6°F (−30°C to +30°C) in 0.1°F or C increments	Select the lowest temperature that will ever be used as setpoint. Setpoint can not be set lower than this value.
MAX SETPOINT C2 MAX SETPOINT C3 MAX SETPOINT	−22°F TO +**89.6**°F (−30°C to +**32**°**C**) in 0.1°F or °C increments	Select the highest temperature that will ever be used as setpoint. Setpoint can not be set higher than this value.
NO POWER	**NOT INSTALLED** / INSTALLED & SHUTDOWN SWITCH TO ENGINE	NOT INSTALLED − Standby operation is not installed INSTALLED & SHUTDOWN − Standby is installed. If standby power is lost unit will shut down SWITCH TO ENGINE − Standby is installed. If standby power is lost diesel engine will start.
S/S PARAMETERS	**TOGETHER** SEPARATE	TOGETHER = When the Minimum Run Time, Minimum Off Time, Maximum Off Time, and Override Temperatures are set in the Functional Parameter List, the same values will be used for both Frozen and Perishable setpoints. SEPARATE = When the Minimum Run Time, Minimum Off Time, Maximum Off Time, and Override Temperatures are set in the Functional Parameter List, different values may be entered for Perishable and Frozen setpoints.
REMOTE TEMP SENSOR 1 (Optional) REMOTE TEMP SENSOR 2 (Optional and Available for 2 Compartment Units Only)	ON / **OFF**	ON=A remote sensor has been added to the unit, and connected into the wire harness at Remote Temp Sensor (1−2) plug. This enables Remote Temp Sensor (1−2) to be read through the Data List. OFF=There is no Remote Sensor (1−2) in this unit.
DOOR SWITCH: (Optional) NOT AVAILABLE FOR 3 COMPARTMENT UNITS	**SWITCH NOT INSTALLED** DOOR OPEN SWITCH OPEN DOOR OPEN SWITCH CLOSED	SWITCH NOT INSTALLED = There is no door switch in this box. DOOR OPEN SWITCH OPEN = A Door Switch has been installed on one of the box doors. The switch contacts will be OPEN whenever the door is OPEN. DOOR OPEN SWITCH CLOSED = A Door Switch has been installed on one of the box doors. The switch contacts will be CLOSED whenever the door is OPEN.

CONFIGURATION	SELECTIONS	DESCRIPTION
DOOR SWITCH UNIT SHUT-DOWN: (Optional) NOT AVAILABLE FOR 3 COMPARTMENT UNITS	**ALARM ONLY** UNIT SHUTDOWN LOW ENGINE SPEED DATA RECORDER ONLY	ALARM ONLY = When Door Switch indicates that the door is open, a warning alarm will be displayed in the MessageCenter. UNIT SHUTDOWN = When Door Switch indicates that the door is open, a warning alarm will be displayed in the MessageCenter, and the unit will shutdown. LOW ENGINE SPEED = When Door Switch indicates that the door is open, the engine will be forced to low speed. DATA RECORDER ONLY = The data recorder will record every time the door is opened or closed. There will be no alarms or messages displayed in the MessageCenter.
SET TIME		The following will allow the Real Time Clock in the Data Recorder to be set. The time set here can be read in the unit data list.
• MONTH	1−12	Select the correct month of the year.
•DAY	1−31	Select the correct day of the month.
•YEAR	1998 − 2037	Select the correct year.
•HOURS	0−23	Select the correct hour (0−11 is AM / 12−23 is PM)
•MINUTES	0−59	Select the correct minute.
PERISHABLE FAN MODE	ON / **OFF**	If perishable setpoint is in a specified range and this mode is enabled, the fan will be set off.
FROZEN PRIORITY COOLING Refer to Section 4.4.3 This configuration is for units with software version prior to 04.07.00	ON / **OFF**	ON = Coolant capacity priority will be to the compartments with setpoints in the frozen range. OFF = Normal unit operation.
FRZN COMP PRIORITY Refer to Section 4.4.3 This configuration is for for units with software version beginning with 04.07.00	OFF NORMAL **HI CAPACITY**	NORMAL = Coolant capacity priority will be to the compartments with setpoints in the frozen range. When NORMAL is chosen, FROZEN PRIORITY TIME AND NON−PRIORITY TIME will be available. OFF = Normal unit operation. HI CAPACITY = Coolant capacity priority will be to the compartments with setpoints in the frozen range.
•FROZEN PRIORITY TIME Older units will display FROZEN PRIORITY TIMER	**5 MIN** 5−60 MINUTES IN 1 MINUTE INCREMENTS	Defines the number of minutes spent in Frozen Priority Cooling when enabled.
•NON−PRIORITY TIME Older units will display PERISH PRIORITY TIMER	**5 MIN** 5−60 MINUTES IN 1 MINUTE INCREMENTS	Defines the number of minutes spent in Perishable Priority Cooling when Frozen Priority Cooling is enabled.
PERISHABLE OVERRIDE TEMP Older units will display PERISH PRIORITY TEMP	**OFF** 3.6°F to 27°F (2°C to 15°C) (in 0.5° C or °F increments	Allowable number of degrees from setpoint that box temperature can change before overriding frozen priority cooling mode and entering normal unit operation.
8 HR ADDITIONAL DATA:	YES / **NO**	YES = When the RS is turned OFF, the data recorder will continue to record data for an additional 8 hours. NO = When the RS is turned OFF, the data recorder will stop recording data.

CONFIGURATION	SELECTIONS	DESCRIPTION
CONDENSER PRESS CONTROL	**YES**/NO	YES = Condenser fan will cycle on & off as discharge pressure rises or drops. NO = Condenser fan will be on when the engine is running and in standby when the compressor is running.
HIGH SPEED DELAY	**1 MIN** 0 TO 10 MINUTES IN 0.5 MINUTE INCREMENTS	Select the length of time unit remains in low speed before transitioning to high speed.
SATELLITE COMM (Optional) (NOT SUPPORTED IN VECTOR MT)		This feature is not supported for Vector MultiTemp models at this time.
UNIT OPERATION:	**STANDARD** RAIL	STANDARD = The microprocessor is set to control trailer refrigeration operation. RAIL = Not recommended for Vector MT
ENABLE INTELLISET AT = KEY	**NO** YES	YES = Allows access to the Intelliset menu using the = key. NO = Allows access to the Intelliset menu using the SELECT key.
SUPPLY AIR LIMIT FOR S/S	–21.6° to 0° F (–12° to +0°C) (in 0.5°F or °C increments) **DEFAULT: 10.8°F (–6°C)**	Coldest allowable supply air temperature for Compartment 1 when unit is running in Start/Stop.
SUPPLY AIR LIMIT FOR CONT	–21.6° to 0° F (–12° to +0°C) (in 0.5°F or °C increments) **DEFAULT: –9°F (–5°C)**	Coldest allowable supply air temperature for Compartment 1 when unit is running in Continuous.
SAT2 (Optional and available for 2 Compartment Units)	**NOT INSTALLED** INSTALLED	NOT INSTALLED– Supply Air Temperature Sensor is not installed in Compartment 2 evaporator. INSTALLED – Supply Air Temperature Sensor is installed in Compartment 2 evaporator.
C2 SUPPLY AIR LIMIT FOR S/S	–21.6° to 0° F (–12° to +0°C) (in 0.5°F or °C increments) **DEFAULT: –5.4°F (–3°C)**	Coldest allowable supply air temperature for Compartment 2 when unit is running in Start/Stop.
C2 SUPPLY AIR LIMIT FOR CONT	10.4°F TO +32°F (–12° to +0°C) (in 0.5°F or °C increments) **DEFAULT: 30.2°F (–1°C)**	Coldest allowable supply air temperature for Compartment 2 when unit is running in Continuous.
HIGH SPEED PULLDOWN	ON / **OFF**	When active, this logic indicates if temperature limits regulating the exit of pulldown mode are modified or not. ON = Allows for high speed cool pulldown when only one compartment is configured. OFF = Normal unit operation.

5.2.2 Component Test Mode

NOTE

To enter Component Test Mode Refer to Section 5.2.

WARNING

Voltage will be applied to high voltage components (i.e. the fan motor contactor) and those components will operate (i.e. the fan blades will turn) when those components are energized and the unit is in standby operation and using component test mode.

Component Test Mode allows the Technician to energize individual circuits for 5 minutes at a time. The engine is not allowed to start when the Micro is in Component Test Mode.

From the Main Menu, select Component Test Mode, and press =. Use the UP or Down arrow keys to scroll through the list when
"↑ ↓ TO SCROLL, THEN = TO SELECT" appears in the MessageCenter. Press = to select the component you wish to test. For example, if the Cool Light is selected, the Cool Light on the Light Bar will come on, and "COOL LIGHT OFF IN 5 MINUTES" will appear in the MessageCenter. The minutes will count down to 0 at which time the Cool Light circuit will be de-energized, and the MessageCenter will display the last component tested.

The test may be stopped at any time by turning the Start/Run−Off Switch to the Off position, or by pressing and holding the = key for 6 seconds. Should you need more than 5 minutes, the timer may be reset to 5 minutes anytime during the test by pressing the = key. The timer may only be reset once during each test. After the 5 minute timer expires, the MessageCenter will return to the Component Test Mode Menu, and display the last component tested.

To retest the same component and circuit again, press =. To select another component to test, press the UP or DOWN Arrow keys to select another component, and press = to select. To go to Diagnostic Mode or Configuration Mode, select Main Menu and press =.

The only keys that operate during Component Test Mode are the Alarm and Select keys. The alarm list is available for you to look at any active or inactive alarms. The Select key will only allow access to the Current Draw item in the Data List.

When Component Test Mode is selected, the Main Display will show OFF.

The following components may be tested during the Component Test Mode:

Component / Menu List	MessageCenter	FET	Board LED
Defrost Light	DEFROST LIGHT OFF IN X MINS	16	14
Auto Restart Light	ARL LIGHT OFF IN X MINS	7	15
Fault Light	FAULT LIGHT OFF IN X MINS.	14	17
Unloader 1 (front)	UL1 OFF IN X MINS	23	4
Unloader 2 (rear)	UL2 OFF IN X MINS	22	5
Speed Relay	SR OFF IN X MINS		27
Run Relay	RR OFF IN X MINS		28
Buzzer	BUZZER OFF IN X MINS	18	11
Glow Plug Relay	GPR OFF IN X MINS		30
Heater Contactor 1	HEATER CONT 1 OFF IN 5 MINS	10	6
Heater Contactor 2	HEATER CONT 2 OFF IN 5 MINS	21	7
C2 Heater Contactor 1	C2 HEATER CONT 1 OFF IN X MINS	9	9
C2 Heater Contactor 2	C2 HEATER CONT 2 OFF IN X MINS	11	25
C3 Heater Contactor 1	GPR OFF IN X MINS	8	12
C3 Heater Contactor 2	C3 HEATER CONT 2 OFF IN X MINS	13	22
Evaporator Motor Contactor 1	EVAPORATOR CONT 1 OFF IN 5 MIN	20	8
C2 Evap Contactor	C2 EVAP CONTACTOR OFF IN X MIN	5	24
C3 Evap Contactor	C3 EVAP CONTACTOR OFF IN X MIN	15	16
Power Supply Contactor	POWER SUPPLY CONT OFF IN X MIN		
Compressor Motor Contactor 1	COMPRESSOR CONT OFF IN X MINS	2	10
Condenser Motor Contactor 1	CONDENSER CONT OFF IN X MINS	1	19
Generator Contactor	GENERATOR CONT OFF IN 5 MINS	3	20
C2 LSV	C2 LSV OFF IN X MINS	12	23
C3 LSV	C3 LSV OFF IN X MINS	17	
Main Menu (To access Component Test Mode, or Configuration Mode)			

5.2.3 Service Mode

CAUTION

Service Mode MUST be used whenever removing refrigerant charge, refrigerant leak checking or evacuating.

NOTE

Unit Start/Run−Off switch (RS) MUST be in Start/Run position to keep unit in Service Mode. If the switch is turned OFF, the unit exits Service Mode and closes CSMV to 0% open and de−energizes UL1.

a. Press = key when SERVICE MODE appears in the MessageCenter.

b. ENTERING SERVICE MODE will appear in the MessageCenter.

When entering Service Mode the microprocessor opens the CSMV to 100% open and energizes UL1.

c. Once the CSMV is 100% open, “RECOVER / LEAK CHK / EVAC MODE” is displayed in the MessageCenter.

d. Refrigerant recovery, leak checking, or evacuation may be performed on the unit at this time. Refer to Service Procedures in Section 8.11.2.

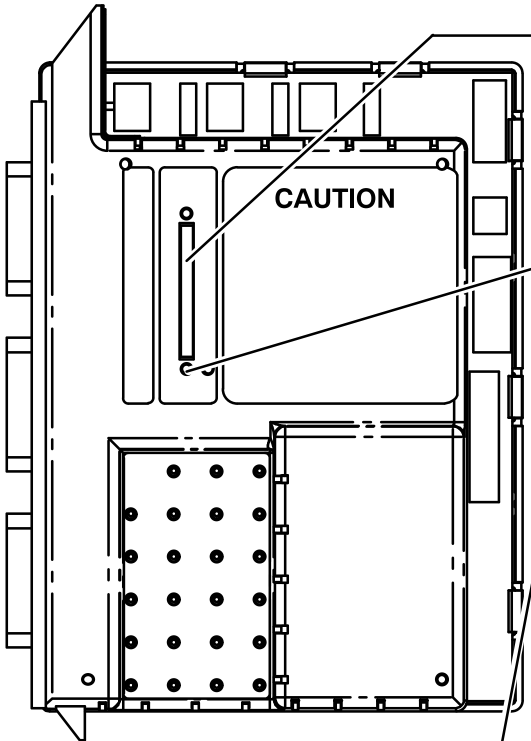
e. To prevent refrigerant migration to the compressor during charging, if all pressure transducers (CSP and CDP) drop below –20 inHg (0.68 Bar), and then 3 of the 4 pressure transducers rise above 5 PSIG (0.34 Bar), the microprocessor will close the CSMV to 0% open and de-energize UL1. When the valve is closed, “CHARGE MODE – HOLD = TO EXIT” is displayed in the MessageCenter.

f. If the unit shifts to Charge Mode and “CHARGE MODE – HOLD = TO EXIT” is displayed in the MessageCenter, DO NOT perform refrigerant recovery, leak checking, or evacuation at this time. Exit Service Mode and then re-enter, making sure that “RECOVER / LEAK CHK / EVAC MODE” is displayed in the MessageCenter before performing any of these services.

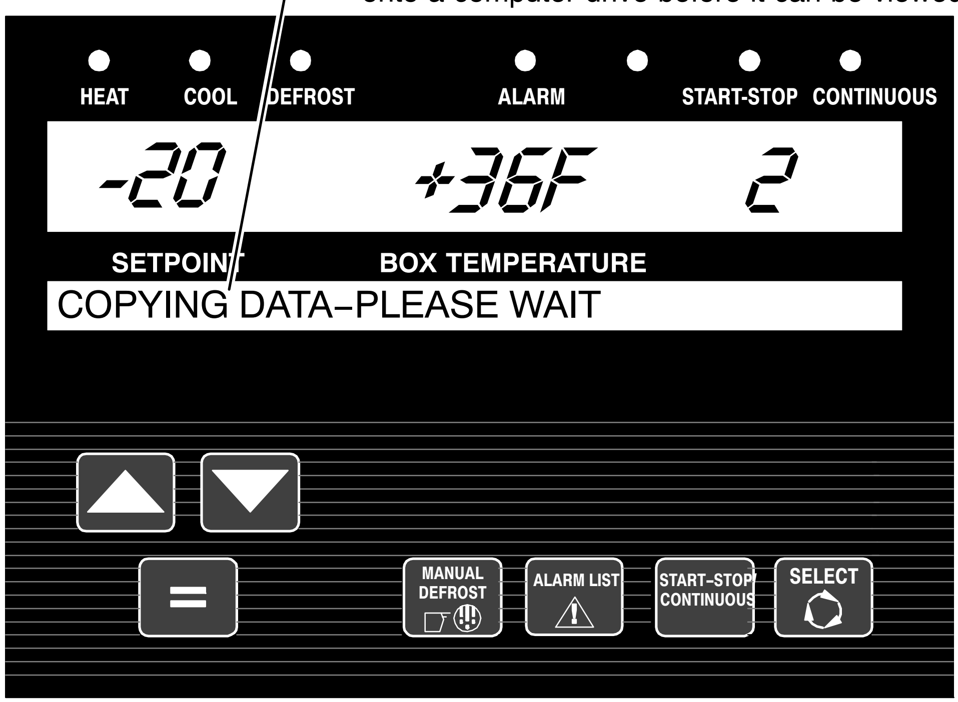
g. To exit Service Mode at any time, press and hold the = key for 3 seconds. “EXITING SERVICE MODE” will then appear in the MessageCenter.

When exiting Service Mode the microprocessor closes the CSMV to 0% open and de-energizes UL1.

5.3 DOWNLOADING DATA WITH THE PC CARD



1. Place the Micro in PC Mode (Refer to Section 5.1), or place the RS switch in the Start/Run Position.
2. Insert a Download Card into the PC card slot on the front of the microprocessor. Be certain that the instruction label is facing the “Caution” label. Do not force card into slot.
3. The MessageCenter will show “COPYING DATA–PLEASE WAIT”. While the data is being copied, the green PC CARD STATUS LED will flash.
4. When the copy is complete, “COPY COMPLETE, REMOVE CARD X” (“X” is the number of empty spaces remaining on the card) will show in the MessageCenter. The PC Card Status LED will be solid. You may then remove the PC card. ***Do not remove the card until prompted to do so.***
5. When the card is removed, the MessageCenter will return to the default message.
6. If any other messages appear, refer to Section 6.1 MessageCenter for an explanation of the error message. If there is an error, the PC CARD FAULT LED will be on until the card is removed.
7. Data must be uploaded off of the Download Card onto a computer drive before it can be viewed.



5.4 INSTALLING NEW SOFTWARE

5.4.1 Using The Program PC Card

TIP

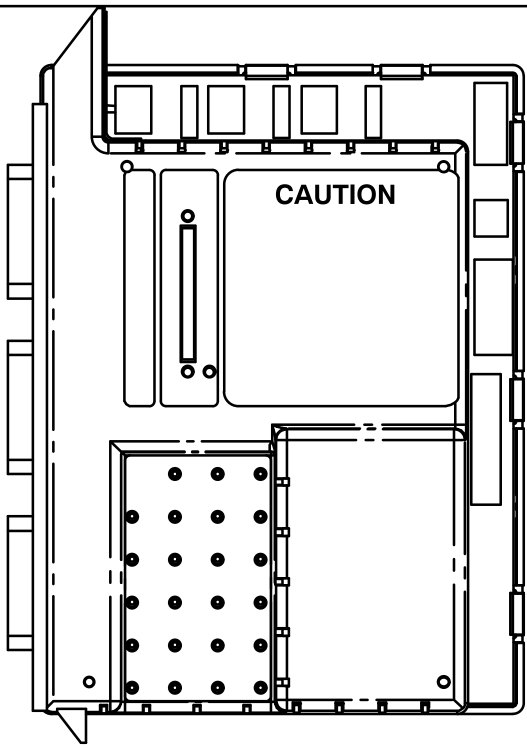
Whenever performing a major operation to a microprocessor, such as installing new operating software, it is always a good idea to start the unit and give it a quick check over *prior* to performing the operation.

NOTE

Once the unit shuts down to begin the software install process, the Compressor Suction Modulation Valve closing process begins. The software installation processes will not begin until the CSMV is completely closed, which will delay the actual process for about 45 seconds.

CAUTION

The display and MessageCenter may behave differently during the software loading process, depending on the version of software currently in the controller. DO NOT INTERRUPT THE SOFTWARE INSTALLATION PROCESS ONCE IT HAS STARTED.



1. Place the Micro in PC Mode (Refer to Section 5.1), or place the RS switch in the Start/Run Position.
2. Insert a Download Card into the PC card slot on the front of the microprocessor. Be certain that the instruction label on Download Card is facing the "Caution" label on the microprocessor. Do not force card into slot.
3. The MessageCenter will show one of 3 different messages:
   Same SW: "= to Load, ↑ To Cancel"
   Old SW: "= to Load, ↑ To Cancel"
   New SW: "= to Load, ↑ To Cancel"
4. Choose New.
5. Press = to load the program. The MessageCenter will go blank. If the engine is running, it will shut down. After a few seconds, the display will power up, and the MessageCenter will show INSTALLING PROGRAM SOFTWARE during the software install process. The Card Status LED adjacent to the PC Card slot will blink together with the Micro Status LED during this installation process. Once the entire program has been loaded, the MessageCenter will show INSTALL COMPLETE – REMOVE CARD. At the same time, the Card Status LED will stop blinking and be on solid, indicating that the software install is complete.
6. When the card is removed, the Micro will power up as it was prior to inserting the card (PC Mode or unit running). Allow the Micro to completely power up (Main Display and MessageCenter displaying appropriate messages) once after installing the new software before turning the power off, or removing the PC Mode jumper. **DO NOT TURN THE RS SWITCH OFF DURING THE INITIAL START FOLLOWING A SOFTWARE UPGRADE**.

5.4.2 Using MicroProgrammer

CAUTION

It is important that communications between the Micro and the computer are not disturbed during the software loading process. If using a laptop computer, turn all energy saving features off. Turn off any screen saver, or any hard drive time out settings.

New software can be installed using either the preferred previously described Program PC card method, or by using MicroProgrammer 3.14 and a computer. Existing Program PC cards may be upgraded to 04.03.00 by using the ReeferManager program.

Only MicroProgrammer version 3.14 is to be used to properly install new software. Earlier versions of MicroProgrammer should be discarded. MicroProgrammer ONLY RUNS ON Windows 95/98. ***It will NOT RUN on Windows 2000 or XP.***

a. Connect the computer to the microprocessor using a Download Cable. Once the cable is connected to the download port, the microprocessor will power up, and show “PC MODE”.

b. Start the program by double clicking on the MicroProgrammer icon on your computer desktop.

c. Click on the Load File button. The Open box will appear on the screen.

d. Using the mouse, select the file you want to load (this will be a .bex file) by clicking once on it to highlight it.

e. Click the OK button. Watch the lower left message area of the program. Once the file is validated, the Program Micro button will become active.

f. Turn the RS switch to the Start/Run position. Wait for the Main Display and MessageCenter to power up.

g. Click on the Program Micro button. The MessageCenter will go blank. If the engine was running, it will shut down. Nothing will happen for the first 5−10 seconds, then the software will begin to load. The Micro Status LED will start blinking at the rate of .5 seconds on / .5 seconds off.

h. The % complete value on the computer screen will increment itself as the program is loaded. The % complete will stop several times during the loading process for up to 15 seconds. This is normal. DO NOT STOP THE PROCESS. The time to load the program is dependent upon the speed of the computer. This will generally take from 4 to 6 minutes.

i. It is important that the program is not interrupted from the time the “Program Micro” button is clicked until the program is completely loaded. Once the % complete reaches 100%, the shutdown box will appear. Click the OK button.

j. The microprocessor will power up, and the unit will start. Allow the engine to start completely the first time after loading software. **DO NOT TURN THE RS SWITCH OFF DURING THE INITIAL START FOLLOWING A SOFTWARE UPGRADE**.

5.4.3 Troubleshooting Software Loading Problems

If after loading the software program, the microprocessor does not power up, or the engine does not start, use the following to isolate the problem.

a. Did the unit perform properly prior to loading the software? If not, the problem most likely is not a result of the software loading process.

b. Check the Micro Status LED near the PC Card slot on the microprocessor. It should be blinking continuously at the rate of 1 second on and 1 second off. This is the “normal” heartbeat rate of the microprocessor.

c. If the Micro Status LED is blinking at the rate of .5 seconds on and .5 seconds off, the microprocessor is still in Program Mode, and the software is not fully loaded into memory. Load the software again, being careful to follow each step completely in sequence.

d. If the Micro Status LED is not on at all, check voltage to QC1 & QC2. Also check for voltage from the RS at 5MPA1. If voltage and grounds check OK, the microprocessor may be dead and require replacement.

5.5 SETTING PM (PREVENTATIVE MAINTENANCE) HOURMETERS

The programmable PM Hourmeters (PM1 – PM5) which can be configured to count any of the following

- Diesel Engine Hours
- Standby Electric Motor Hours
- Switch On Hours
- Start Cycles
- High Speed Hours

The PM Hourmeters are activated and the reset interval is selected from the Configuration List. To turn on the Engine PM Hourmeter, select the desired maintenance interval (in hours), and enter as the "DIESEL RESET VALUE" in the Configuration List. Selecting OFF will completely turn the Engine PM Hourmeter off. The reset value selected here will be the value used when the PM Hourmeter is reset from the Functional Parameter List.

To turn on the Switch On PM Hourmeter, select the desired maintenance interval (in hours), and enter as the "SWITCH ON RESET VALUE" in the Configuration List. Selecting OFF will completely turn the Switch On PM Hourmeter off.

To turn on any of the Programmable PM Hourmeters, they must first be programmed to count one of the available parameters from the list above. (For example, PM 1 may be programmed to count start cycles.) Selecting OFF will completely disable the PM Hourmeter. Once a selection is made, then a reset interval may be selected. For hours, the PM Hourmeter may be set in 50 hour increments anywhere from 50 to 30,000 hours. For cycles, the PM Hourmeter may be set in 1,000 cycle increments anywhere from 1,000 to 90,000 cycles. Selecting OFF instead of an interval will also disable the PM Hourmeter.

Once the PM Hourmeters are activated from the Configuration List, they can be turned OFF; once off the operation can be RESUMED; or it can be RESET for a new interval, all from the Functional Parameter List.

The PM Hourmeters may be reset using either a PC or the Keypad. RESET is only available when the accumulated hours are more than 95% of the reset value for that Hourmeter. (For example: the Engine PM Hourmeter Reset Interval is 1000 hrs. Reset will be allowed anytime after 950 hours have expired.)

TIP

Factory default is OFF for all PM Hourmeters.

To change the PM Hourmeter to On and set the desired number of hours:

1. From the Configuration List, select the PM Hourmeter.
2. Press = to enter.
3. Now select the desired new interval.
4. Press = to enter.
5. Turn the Start/Run Off switch off then back to Start/Run. Check the Data List. The correct number of hours should be showing as "HOURS TO ENGINE MAINT".

5.6 MICROPROCESSOR DISPLAY DIAGNOSTICS

Before replacing a microprocessor or display, the following procedure should be done to determine if the problem is with the microprocessor, display or interconnecting wiring.

CAUTION

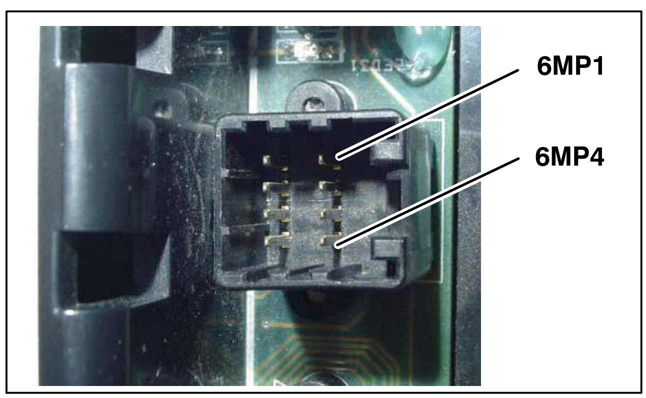
Most electronic components are susceptible to damage caused by electrical static discharge (ESD). In certain cases, the human body can have enough static electricity to cause resultant damage to the components by touch. This is especially true of the integrated circuits found in the Advance microprocessor.

a. Attach a grounded wrist strap (CTD P/N 07–00304–00) and ground it to a good unit frame ground.

b. With the microprocessor powered up (check the Microprocessor Status LED – See Figure 2-7 – is blinking at a 1 second pulse) and without removing the spade connectors, check voltage between microprocessor terminal QC1 (+) and QC2 (–). Minimum voltage to microprocessor is 11 VDC. If voltage is not correct, repair wiring to microprocessor.

c. Unplug the 6MP connector from the microprocessor.

d. With the negative meter lead on QC2 (without removing the spade connector), test voltage at the microprocessor 6MP1 terminal, see figure. If nominal 12 VDC is not present, the microprocessor has failed and must be replaced.

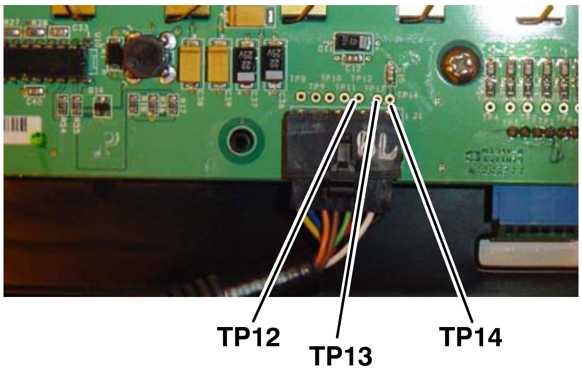


Connector 6MP Connections

e. With the negative meter lead on QC2 (without removing the spade connector), test voltage at the microprocessor 6MP4 terminal. If nominal 5 VDC is not present, the microprocessor has failed and must be replaced.

f. Plug the 6MP connector back into the microprocessor.

g. Disassemble display to gain access to the display test points. Refer to Section 5.7.9 for display disassembly.



Display Test Points

h. With the negative meter lead on TP12, test voltage at TP14. If nominal 12 VDC is not present, check wiring from microprocessor to display.

i. With the negative meter lead on TP13, test voltage at TP12. If nominal 5 VDC is not present, check wiring from microprocessor to display.

j. If connections are good, replace the display board.

5.7 ADVANCE MICROPROCESSOR REPLACEMENT & CONFIGURATION SETUP

When field diagnosis of a Carrier Transicold Trailer refrigeration unit determines that an Advance Microprocessor is not performing properly and must be replaced, the following steps MUST be taken to ensure correct operation of the unit following the repair.

Prior to beginning work on the unit, be certain that the current configuration file has been downloaded for the customer, from the Carrier Transicold Information Center, and written onto a Configuration PC Card, using the ReeferManager Program. If the original microprocessor was equipped with the IntelliSet option, this file will need to be on a Config Card in order to install the IntelliSet parameters into the replacement microprocessor. A computer is needed to enter the engine and switch on hours into the new microprocessor.

NOTE

Before replacing a microprocessor or display perform the procedures of Section 5.6 to determine if problem is with the microprocessor, display or interconnecting wiring.

5.7.1 Microprocessor Replacement

a. If possible, power the microprocessor up, either using a PC Mode Jumper, or by turning the RS to the Run position. If the microprocessor will not power up, skip ahead to step 6.

b. Insert a Download PC Card into the PC Card slot and download all data from the data recorder. If a Download Card is not available, data may also be downloaded using a download cable and the ReeferManager PC Program.

c. Then, scroll through the Data List and make note of the following from the MessageCenter:

- ID Number
- Unit Serial Number
- Unit Model Number
- Engine Hours
- Switch On Hours
- Date and Time

d. Remove PC Jumper or turn RS to Off.

e. Remove negative battery cable from battery.

f. Remove Connectors 1MP, 2MP, & 3MP from the outside of the Control Box.

g. Open Keypad side door. Open control box door.

h. Remove Connectors 5MP & 6MP inside the Control Box. Remove all wires from the Micro.

i. Locate wire to 80A fuse that runs through the Current Sensor. Note the orientation of the wire through the Current Sensor, to be certain that the wire is reinstalled through the new Current Sensor in the same direction. (Inserting the wire through the Current Sensor in the opposite direction will result in erroneous current readings.) Remove wire from fuse holder and gently pull through the Current Sensor.

j. Remove the screws holding the sides of the Micro into the Control Box. Remove the single screw holding the top of the Micro in place.

k. Pull the Micro back, and twist out of the Control Box.

l. Install the new Micro by reversing steps a. thru k.

5.7.2 Microprocessor Setup

NOTE

Before starting the unit, the microprocessor must be configured for the model unit it is installed in. Refer to Microprocessor Setup information below.

a. Ensure that the new microprocessor is in place, all wires connected and the negative battery cable is reconnected.

b. Place the RS in the Start/Run position. The controller will immediately go into the Configuration List so that the correct model number can be selected. Using the Up or Down Arrow Keys, scroll through the list until the correct Model Number appears (verify the Model / Serial Plate on the unit). Press the = Key to enter the new model number.

c. Press the Up Arrow Key again, and the Unit Serial Number field will appear. Press the = Key, then the Up Arrow Key. You will see a blinking cursor in the field. Now, using the Up or Down Arrow Keys, scroll through the Number / Letter list, until the first letter of the serial number you recorded above appears. Press the = Key to enter that letter, and advance the cursor to the next place. Repeat this process until the entire Unit Serial Number is entered (i.e. HAY90512345).

d. Press the Up Arrow Key again, and the ID field will appear. Press the = Key, then the Up Arrow Key. You will see a blinking cursor in the field. Using the Up or Down Arrow Keys, scroll through the Number / Letter list, until the first letter / number of the ID you recorded above appears. Press the = Key to enter that number / letter, and advance the cursor to the next place. Repeat this process until the entire ID number is entered. If the cursor is still blinking in a blank space after you are finished, slowly (wait 2–3 seconds between presses) press the = Key to leave blanks in the remaining spaces. When you reach the end, the message "↑↓ TO SCROLL, THEN = TO SELECT" will appear (i.e. XYZ5678).

e. Now, press the Down Arrow Key until SET TIME appears. Press the = Key then the Up Arrow Key to enter that menu.

⚠ CAUTION

Be certain that the clock you are using is accurate. Also, some customers are located in different time zones from the repair location. If you know the repair location time zone, enter that time. If you don't, enter your current time.

f. When MONTH appears, press the = Key, then the Up Arrow Key. The MessageCenter will begin to flash, indicating that it is ready to accept changes. Use the Up or Down Arrow Keys to scroll through the number list until the correct number of the current month appears. Press the = Key to enter that number for the month.

g. Now, press the Up Arrow Key to go to Day.

h. Using the same key presses as in f. and g. above, continue to enter the correct numerical value for the Day, Year, Hour and Minute.

i. When you are finished, the MessageCenter will show PRESS = TO SAVE TIME CHANGES.

NOTE

If you do not press the = Key, none of the time changes you just made will be saved.

NOTE

If a Config Card will be used to configure the microprocessor, skip ahead to CONFIGURATION CARD, Section **5.7.7** If the Configurations and Functional Parameters will be set from the keypad, continue with following steps 5.7.3 and 5.7.4

5.7.3 Configurations Via Keypad

a. Refer to Section 5.2 for list of available microprocessor Configurations.

NOTE

Units equipped with IntelliSet MUST have the settings installed using ReeferManager. IntelliSet settings CANNOT be installed by using either the Keypad, or by using a laptop computer.

b. Press the Up Arrow Key to go to the next Configuration. Compare the setting already in the micro with the setting required.

c. When a parameter needs to be changed, first press the = Key. This allows the parameter to be changed.

d. Press the Up or Down Arrow Keys to scroll through the selections for that parameter.

e. When the parameter you need is visible in the MessageCenter, press the = Key.

f. Repeat steps b. thru e. until you have gone through the entire list.

g. To exit the Configuration Settings, place the RS in the Off position.

5.7.4 Functional Parameters Via Keypad

a. Refer to Section 3.17 for list of available Microprocessor Functional Parameters.

b. Press the Select Key, until PRESS ↑ ↓ TO VIEW SETTINGS appears in the MessageCenter

c. Pressing the Up Arrow Key will bring ↑ ↓ TO SCROLL, THEN = TO SELECT into the MessageCenter.

d. Press the Up Arrow Key to go to the first Functional Parameter. The MessageCenter will show DEFROST TIMER SET FOR X HRS.

e. To keep this setting and go to the next setting, press the Up Arrow Key.

f. To change the parameter, press the = Key. ↑ ↓TO SCROLL, = TO SAVE will show in the MessageCenter.

g. Press the Up Arrow Key and the parameter will be flashing on and off, indicating that changes are possible.

h. Press the Up Arrow Key to scroll through the available selections for the parameter. When the setting you desire appears, press the = Key to enter and save your selection.

i. Repeat steps e. thru h. and continue through the entire list of Functional Parameters.

j. Leave the microprocessor powered up as you continue with the next section.

5.7.5 DataRecorder Via ReeferManager PC Program

NOTE

If the factory settings are used, you can skip this section and proceed to Hourmeter Setup.

a. Refer to Section 3.20 for list of DataRecorder Setups.

b. Power up the microprocessor. If it is not already powered up, refer to directions under Microprocessor Setup – Functional Parameters via Keypad, Section **5.7.4** above.

c. Connect your computer to the Download Port of the unit (use cable 22−001737) and start the ReeferManager program. You will need ReeferManager version 03.00.00 or higher.

NOTE

ReeferManager 03.00.00 is **REQUIRED** in order to view, change and send new features to and from the microprocessor.

d. In ReeferManager, go to the Serial Operations Tab, and then click on Data Recorder/Microprocessor setup button.

e. Select the Sensors to be recorded and whether you wish averaged or snapshot recordings (averaged is recommended for all temperature sensors; snapshot is recommended for voltage, amperage, & RPM).

f. When the setup is correct, press the Send button to send the new settings to the microprocessor.

g. Verify that the settings were sent, by waiting for the confirmation pop up message.

NOTE

If the data recorder date and time were not set earlier, they can be set from this screen by clicking on Tools>set date and time.

h. Leave the microprocessor powered up as you continue with the next section.

5.7.6 Engine And Switch−on Hour Meters Via ReeferManager PC Program

a. Start the ReeferManager program. Go to the Serial Operations Tab.

b. Click on Microprocessor Setup button.

c. In the upper left menu bar, click on Tools>Set New Micro Hours.

d. At this screen, enter the Engine and Switch On hours that were recorded in step b. of Section 5.7.1. Send the new readings to the microprocessor.

NOTE

The program will only allow hours to be changed until the Engine Hourmeters reach 25. Once the Hourmeter shows 25 or more hours, no changes may be made to it. BE CERTAIN THAT YOU HAVE ENTERED ALL HOUR AND CYCLE METER NUMBERS BEFORE PRESSING THE OK BUTTON.

e. Your computer may now be disconnected and turned off.

5.7.7 Configuration/IntelliSet Card

a. Place the RS in the Off position to power down the microprocessor and to take it out of Configuration Mode.

b. Power the microprocessor up by either turning the RS to the Start/Run position (ok to place in Manual Start Operation if desired), or by inserting a PC Mode jumper into the Download Port.

c. Insert your Configuration PC Card into the PC Card slot in the microprocessor and watch the MessageCenter. When the MessageCenter shows "CFG, = TO LOAD, ↑ TO CANCEL", press the = Key. It will take 10 – 15 seconds to load the IntelliSets off the card. "LOADING INFO" will be displayed during this time. When finished, the MessageCenter will show "ALL INFO LOADED – REMOVE CARD". Remove the PC Config Card.

d. If the unit is not equipped with the IntelliSet Option, or there is only a single set of settings on the PC Card, the MessageCenter will show "MICRO WILL RESET AND RESTART NOW".

NOTE

Units with IntelliSet will not automatically reset and shutdown when the PC Card is removed, as do units without IntelliSet. Units with IntelliSet will NOT indicate ANY change in operating parameters UNTIL an IntelliSet is selected

e. Press the = Key to display default IntelliSet. (Enable IntelliSet at = Key must be configured ON. See Section 5.2.1.)

f. Default Intelliset will appear in the MessageCenter. Press either the UP or Down Arrow keys to move through the IntelliSet List. Move to the desired IntelliSet and press the = Key. The desired IntelliSet is automatically active.

5.7.8 Microprocessor Final Checkout

a. Start the unit and allow it to run for a few minutes.

b. While the unit is running, scroll through the Data List of the microprocessor. Verify that all the data that was recorded in Step b. of Section 5.7.1 is now accurately displayed in the Data List. Also, verify that the correct date and time is being displayed.

c. Initiate a Pretrip test. Allow the unit to complete the Pretrip and check for any alarms. Make any necessary repairs before returning the unit into service.

5.7.9 Replacing Keypad, Window or Door

Should damage to the keypad of the microprocessor occur, it is possible to replace only the keypad.

All replacement keypads are packaged with replacement gaskets.

NOTE

Before replacing a microprocessor or display, follow the procedures of Section 5.6 to determine if the problem is with the microprocessor, display or interconnecting wiring.

Keypad Removal

a. Place the (SROS) in the “OFF” position and disconnect the negative battery cable. Attach a grounded wrist strap (CTD P/N 07−00304−00) and ground it to a good unit frame ground.

b. Open the roadside side door of the unit and loosen the (2) hex/slotted head 1/4−20 bolts that hold the control box cover/bezel assembly onto the front of the control box. Lift the cover and use prop rod to hold cover up.

c. Remove the wires connected to the SROS. Unplug the 14−pin cable from the display board.

d. Loosen the (4) 5mm X 20mm hex head bolts that secure the display board to the control box cover.

e. Unplug the 10−pin ribbon cable that attaches the keypad board to the display board. Remove the (4) Phillips head screws that attach the display board to the keypad board and place the display board aside.

f. Remove the (11) Phillips head screws that attach the keypad and window to the bezel. Gently remove the window and keypad from the bezel. Discard the old keypad.

NOTE

All gaskets must be replaced any time the keypad is removed from the bezel.

Keypad Installation

⚠ CAUTION

Do not overtorque screws.

a. Remove both gaskets from the clear window. Ensure that the surface is completely free of old gasket material and install the new gaskets.

NOTE

The two window gaskets are different. The gasket for the window and bezel is notched for clearance around the detents.

b. Place the clear window and new keypad on the (3) alignment pins of the bezel.

c. Loosely install the (11) Phillips head screws, [(8) 3/4” lg and (3) 3/8” lg with a blunt tip] to the keypad board. Check alignment of window and keypad to endure proper sealing at bezel. Torque screws to 12 in.lbs. (1.3 Nm).

d. Hold the display board in place and connect the ribbon cable from the keypad and window assembly while you can still see the pins on the circuit board.

e. Place display board onto the (2) locating pins and secure display board with the (4) 3/8” lg Phillips head screws. Torque screws to 12 in.lbs. (1.3 Nm).

f. Remove old gasket from door mounting bracket.

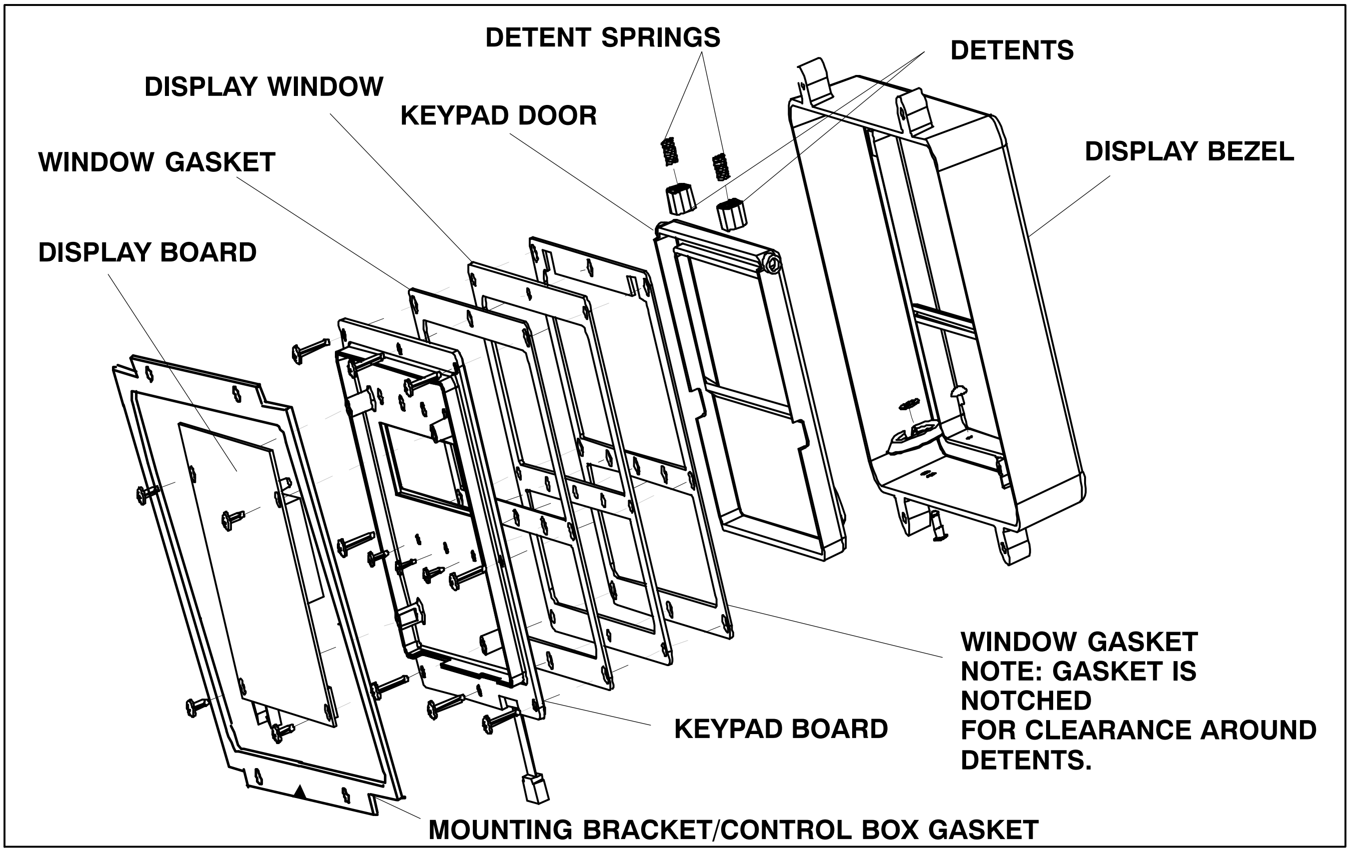
g. Ensure surface is completely free of old gasket material and install new gasket.

h. Plug 10−pin wire harness into new display board and reconnect wires to SROS.

i. Secure the bezel to the control door with the (4) 5mm X 20mm lg. hex head bolts. Torque bolts to 26 in. lbs. (3 Nm).

j. Reconnect wiring harness (14−pin connector) from microprocessor.

k. Reconnect negative battery cable and check unit operation.



Display Module Assembly

SECTION 6

MessageCenter

6.1 MessageCenter MESSAGES

The following table lists all of the messages which do not appear in other lists in this manual and a description of their meaning. Refer to Section 7 for a list of Alarm messages. Refer to Section 3.15 for a list of Unit Data messages. Refer to Section 3.17 for a list of Functional Parameter messages. Refer to Section 5.2.1 for a list of Configuration messages.

MessageCenter MESSAGES	
Message	Description
↑↓ TO SCROLL, THEN = TO LOCK	This message is used when viewing Unit Data. Use the UP & DOWN arrow keys to move through the Data list. Press the = key to lock a Data item in the MessageCenter
↑↓ TO SCROLL, THEN = TO SAVE	Press the UP or DOWN arrow keys to scroll through menu selections available in this mode. When you reach the desired selection, press the = key to store new value in microprocessor's memory.
↑↓ TO SCROLL, THEN = TO SELECT	Press the UP or DOWN arrow keys to scroll through menu selections available in this mode. When you reach the desired selection, press the = key to select it.
= TO INSTALL, INSTALLS LEFT XX	An Options PC Card has been inserted into the PC Card slot. Press = to install the option into the Micro. The number of installs remaining on the PC Card will be shown.
ACTIVE ALARM LIST CLEARED	The list of active alarms in the Micro alarm has been erased. (This does *not* remove alarms from the data recorder.)
ALL ALARMS CLEARED	The list of active and inactive alarms in the Micro alarm lists have been erased. (This does *not* remove alarms from the data recorder.)
ALL INFO LOADED – REMOVE CARD	All data has been loaded into the Micro from the PC Card. The card may be safely removed from the Micro.
CALIBRATION UNSUCCESSFUL	Transducer calibration was unsuccessful.
CANNOT ENTER TRIP START	Cannot enter trip start. A problem has been detected within the Data Recorder.
CANNOT START DEFROST CYCLE	Cannot start defrost cycle. Refer to Defrost Sections 3.11, 4.4.10, and 8.25.
CANNOT START PRETRIP	Cannot start pretrip. Refer to Pre Trip Section 3.5.
CARD FULL, REMOVE CARD	The PC Downloader Card is full of downloaded files. There is no additional room to download the Micro. You may safely remove the PC Card from the slot.
CARD LOCKED – REMOVE CARD	The lock switch on the PC Card is in the "Locked" position. To use the PC Card, move the switch to the "Unlocked" position.
CARD REMOVED, DATA NOT COPIED	The PC Card was removed before all data was copied onto the card.
CARD REMOVED, REINSERT CARD	The PC Card was removed from the card slot before the operation was completed. Reinsert the PC Card into the card slot to perform the operation.
CFG: =TO LOAD,↑ TO CANCEL	A Configuration Card has been inserted into the PC Card slot. Press = to load configurations or IntelliSets into microprocessor.
CHANGE INTELLISET TO EXIT	Sleep Mode and IntelliSleep Intelliset is active. Alternates with IntelliSleep Mode at 5 second interval whether unit is running or not.
CHARGE MODE–HOLD=TO EXIT	Ready to charge system with refrigerant.
CHECK AT NEXT SERVICE INTERVAL	The unit needs to be checked at next service interval. There is currently an active non–shutdown alarm in the alarm list.
CHECK COOLANT LEVEL	The engine coolant level is not full. (Requires optional sensor)
CHECK ENGINE OIL LEVEL	The oil level in the diesel engine is low. (Requires optional sensor)

MessageCenter MESSAGES	
Message	Description
CHECK FUEL LEVEL	The level in the fuel tank is very close to empty. (Requires optional sensor)
CONFIG ERROR, REMOVE CARD	There was an error configuring the Micro with the Configuration PC Card. Remove the PC Card from the slot.
CONFIGS COMPLETE,= TO EXIT	The user has reached the end of the Configurations List. Pressing the ↑ or ↓ arrow keys will start list over. Press = to exit Configuration List.
CONFIGURATION MODE	Press = to enter Configuration Mode.
CONFIGURATION NOT CHANGED	New configuration selection was not Entered (saved).
CONTINUOUS LOCKED	The current setpoint is within a range that has been locked into the Continuous Run mode. Start−Stop can not be selected.
CONTINUOUS RUN MODE SELECTED	Continuous run mode is selected.
COPY COMPLETE, REMOVE CARD XX	A DownLoad PC Card has been inserted into the PC Card slot, and all data from the Data Recorder has been copied onto the PC Card. You may safely remove PC Card from the slot. XX=number of empty download slots remaining on the card.
COPY ERROR, REMOVE CARD XX	A DownLoad PC Card has been inserted into the PC Card slot, and an error occurred while the data was being copied onto the PC Card. You may safely remove the PC Card from the slot. XX=number of empty download slots remaining on the card.
COPYING DATA−PLEASE WAIT	A DownLoad PC Card has been inserted into the PC Card slot, and all data from the Data Recorder is being copied onto the PC Card. DO NOT REMOVE THE CARD WHILE THIS MESSAGE IS BEING DISPLAYED.
DATA RECORDER FAILURE	The controller has stopped recording unit data.
DEFROST CYCLE STARTED	The unit has gone into defrost.
DOOR OPEN	The trailer compartment door is open.
DOOR OPEN − LOW SPEED	Shows that the door is open and that the unit is running in low speed.
ENTERING SERVICE MODE	The initial message for Service Mode.
ERROR: ENG HRS > SWITCH ON HRS	Incorrect hours have been entered.
ERROR: HI SP HRS >TOTAL ENG HRS	
ERROR: SBY HRS > SW ON SBY HRS	
EVAC / CHARGE MODE	This message will be displayed when the unit is in Service Mode and the system is ready for recovery and leak testing.
EXITING SERVICE MODE	Service Mode has been turned off and unit is returning to normal operation.
FUNCTION NOT CHANGED	The = key was not pressed in the allotted amount of time to select the new Functional Parameter setting. The new setting was not stored and the old setting will be used.
HOUR METERS NOT CHANGED	Indicates that no changes have been made to the hourmeters in either the configuration or functional parameter lists.
INACTIVE ALARMS IN MEMORY	There are inactive alarms in the Micro alarm list which have not yet been cleared out.
INSTALLED, REMOVE CARD XX	An Option PC Card has been inserted into the PC Card slot, and the option has been installed in the Micro. The PC Card may safely be removed from the slot. XX indicates number of option installations remaining on card.
INSTALLING OPTION, PLEASE WAIT	An Option PC Card has been inserted into the PC Card slot, and the option is being installed in the Micro. DO NOT REMOVE THE CARD WHILE THIS MESSAGE IS BEING DISPLAYED.
INSTALL STOPPED, REINSERT CARD	An Option PC Card has been inserted into the PC Card slot, and the install process has been stopped by the PC Card not being fully inserted in the slot, or by being removed. Remove and reinsert PC Card to continue.

MessageCenter MESSAGES	
Message	Description
INTELLI−SLEEP MODE	Sleep Mode and IntelliSleep Intelliset is active. Alternates with CHANGE INTELLISET TO EXIT at 5 second interval whether unit is running or not
KEYPAD LOCKED−BATTERY TOO LOW	If any keys are pressed while “UNIT BATTERY−xx V” message is being displayed this message will be displayed as a warning that no changes can be made and information can not be viewed until the battery voltage is brought back up above 10 volts for more than 10 seconds.
LOADING INFO	A Configuration PC Card has been inserted into the PC Card slot, and information from the Config card is being loaded into the Micro. DO NOT REMOVE THE CARD WHILE THIS MESSAGE IS BEING DISPLAYED.
MAIN MENU	Consists of Configuration Mode, Component Test and Service Modes.
MAX SETPOINT HAS BEEN REACHED	Maximum setpoint allowed by configuration settings has been reached.
MICRO WILL STOP IN XXX SECONDS	The RS has been turned OFF and the system valves are closing. The display will turn off when the count down reaches zero.
MIN SETPOINT HAS BEEN REACHED	Minimum setpoint defined by functional parameters has been reached.
NEW SW: = TO LOAD, TO ↑ CANCEL	A Program PC Card has been inserted into the PC Card slot, and the program on the PC Card is a newer version than what is already loaded in the Micro. Press = to load the program.
NO ACTION TAKEN, REMOVE CARD	A Program PC Card has been inserted into the PC Card slot, and no key presses have been made to install the program into the Micro. The PC Card may be safely removed from the slot.
NO ACTIVE ALARMS	There are no active alarms in the Micro Alarm List.
NO DATA ON CARD, REMOVE CARD	A Program or Configuration PC Card has been inserted into the PC Card slot, and no valid data is present on the PC Card. The PC Card may safely be removed from the unit.
NO DATA TO COPY, REMOVE CARD	A Download PC Card has been inserted into the PC Card slot, and there is no valid data in the Data Recorder to copy onto the PC Card. The PC Card may safely be removed from the unit.
NO INACTIVE ALARMS	There are no inactive alarms in the Alarm List
NO INSTALLS LEFT, REMOVE CARD	An Option PC Card has been inserted into the PC Card slot, and all install options have been used. The PC Card may safely be removed from the unit.
OLD INTELLISETS−USE REEFERMAN	A Program PC Card has been inserted into the PC Card slot and the unit model type on the card is not within the same unit family as the controller model type
OLD SW:CANNOT LOAD−REMOVE CARD	A Program PC Card has been inserted into the PC Card slot, and the program on the PC Card is a much older version that can not be loaded in the Micro.
OLD SW, = TO LOAD, ↑ TO CANCEL	A Program PC Card has been inserted into the PC Card slot, and the program on the PC Card is an older version than what is already loaded in the Micro. Press = to load the older program.
PC MODE	Start/Run−Off Switch is OFF, the PC Mode Jumper is connected and engine is not running in order to enter PC Mode. PC Mode allows the user to access and download data using a computer when the unit is not running and without starting the 8 hour data recorder timer. Refer to Section 5.1.
PM DUE	Preventative Maintenance is now due on the unit.
PRESS ↑↓ TO VIEW DATA	Press the up or down arrow key to scroll through the Data List.
PRESS ↑↓ TO VIEW SETTINGS	Press the up or down arrow key to scroll through Functional Parameter Settings
PRESS ↑↓ TO VIEW PRINT MENU	Press the up or down arrow key to view the Strip Print setup menu.

MessageCenter MESSAGES	
Message	Description
PRESS = TO MARK TRIP START	Press the = key to mark the start of the trip in the Data Recorder.
PRESS = TO START PRETRIP	Press the = key to begin pretrip tests.
PRETRIP FAIL & COMPLETED	Some of the pretrip tests did not pass.
PRETRIP FAIL IN TEST XX	Some pretrip tests did not pass and the pretrip was not completed.
PRETRIP PASS	All of the pretrip tests were ok.
PRETRIP STOPPED BY USER	Pretrip has been stopped by user.
PRODUCTSHIELD: HIGH AIR ON	The unit is operating in ProductShield High Air which overrides normal unit operation. See Section 4.6
PRODUCTSHIELD: WINTER ON	The unit is operating in ProductShield Winter which overrides normal unit operation. See Section 4.6
PRODUCTSHIELD: ECONO ON	The unit is operating in ProductShield Econo which overrides normal unit operation. See Section 4.6
RECOVER / LEAK CHK / EVAC MODE	This message will be displayed when the unit is in Service Mode and the system is ready for recovery and leak testing.
REMOVE JUMPER	The Configuration / Technician Test Mode has been entered. Remove the jumper wire before continuing.
SAME SW, = TO LOAD, ↑ TO CANCEL	A Program PC Card has been inserted into the PC Card slot, and the program on the PC Card is the same as the program currently in the Micro. Press = to reload the same program or ↑ to cancel and remove card.
SERVICE MODE	Selection in Configuration and Test Modes which allows servicing of the refrigeration system.
SETPOINT CHANGED	The new setpoint has been entered (saved into Micro memory), the new setpoint will be used.
SETPOINT NOT CHANGED	The new setpoint has NOT been entered (NOT saved into Micro memory), the old setpoint will be used.
SETTING SMV: XXX %	The Start/Run−Off switch has been placed in the Start/Run position and at least one compartment is on and CSMV is opening.
SLEEP MODE, OFF / ON TO WAKE	The unit is cycled off in Sleep Mode. Turn the Start/Run−Off Switch OFF, then back ON to wake the Micro up.
SLEEP WARNING: NO TEMP CONTROL	The unit is running in Sleep Mode.
SMV CLOSING: WAIT XXX SECONDS	Power Up and CSMV is closing. XX is number of seconds remaining until valve is fully closed.
START STOP LOCKED	The setpoint has been locked into the Start−Stop mode. Continuous Run can not be selected.
START/STOP MODE SELECTED	Start/Stop Mode has been selected.
STATUS OK−COMPARTMENT X	Everything is working well where X is the compartment number.
TECHNICIAN RESET REQUIRED (A21)	AL11 (Low Engine Oil Pressure) or AL12 (High Coolant Temperature) has been activated three times in the last two hours and the unit has been locked out. The unit must be brought to a Carrier Transicold Dealer for Service.
TEST #1 to #15	Pretrip is currently running this test and is x% complete
TIME SELECTION NOT CHANGED	A time change was started but not in Configuration List.
TRIP START ENTERED	The Trip start marker has been placed in the Data Recorder.
UNIT BATTERY DEAD −xx V	Unit battery has dropped below 7 volts for more than 10 seconds.
UNIT OFF	All compartment enable switches are Off
UNIT SHUTDOWN − SEE ALARM LIST	An active shutdown alarm has shut the unit down.
UNKNOWN CARD − REMOVE CARD	A defective PC Card has been inserted into the PC Card slot. The Micro can not recognize any data on the card. The card may be safely removed from the Micro.
WARNING: DIESEL RESTART ON	When electric power is not available while the unit is operating in Electric Standby mode, the unit will switch to diesel operation.

MessageCenter MESSAGES	
Message	Description
WARNING: NO TEMP CONTROL	The temperature sensor(s) have failed In a compartment with a frozen setpoint and the compartment is operating only in cool mode OR one one of the active compartments has shut down on an alarm and is not operating. Check active alarm list.
WRONG UNIT TYPE, REMOVE CARD	A config PC Card has been inserted into the PC Card slot. The unit model family type on the PC card is not in the same unit family type as the controller. The card may be safely removed from the Micro.

SECTION 7

ALARM TROUBLESHOOTING

7.1 INTRODUCTION TO ALARM TROUBLESHOOTING GUIDE

The Alarm Troubleshooting Guide should be used whenever an alarm occurs. Alarms will appear in the Message Center and will begin with the alarm number. Alarms are listed in the Troubleshooting Guide by alarm number.

When an alarm occurs, look through both Active and Inactive alarm lists in the microprocessor. (See Note 1 Section 7.2) and make note of all alarms.

Before beginning to actually troubleshoot a unit, visually inspect the unit, in particular the area of the unit that is causing a problem. In many cases the cause of the problem will be obvious once a visual inspection is performed. For those cases where the cause of the problem is not obvious, this troubleshooting guide will be of assistance.

Usually you should begin troubleshooting with the first alarm that appears in the active alarm list. Other alarms in the list may have contributed to the occurrence of the first alarm. The first alarm that appears is the last alarm that was recorded.

The check items in the troubleshooting guide are listed in order of their likeliness of occurrence and ease of testing. We recommend that you follow the order in which they are presented; however, there may be times when situations or experience directs you to use a different order. For example, if the trailer is loaded, you may want to perform all the condensing unit checks first, even though some evaporator section checks may be listed before them.

As you go through the troubleshooting steps, you will find the cause of the problem. When you find and correct the problem, it is not necessary to continue through the remainder of the steps. Some active alarms will clear (inactivate) themselves automatically once the cause has been corrected. You then only need to go to the inactive list to clear all alarms before verifying the remainder of the unit operation. Alarms that do not inactivate themselves automatically must be cleared manually. (See Note 1 Section 7.2)

When you are finished making repairs, run the unit through a Pretrip cycle and verify that no further active alarms occur. Also, both alarm lists should be cleared so that there are no ‘old’ alarms in memory when the unit leaves your repair facility.

If the message **CHECK MICROPROCESSOR** or **CHK WIRES FROM MICRO TO KEYPAD** appears in the MessageCenter, there is a communication error between the keypad and the microprocessor. With no communication, there will not be an associated alarm. Should this occur, check the wire connections behind the keypad assembly, at the keypad itself (remove the rear cover from it to check), and at connector 5 on the microprocessor. Check for microprocessor status led blinking at 1 second rate (1 second ON/1 second OFF).

When working on the refrigeration system, an accurately calibrated manifold test set should always be installed. It is not necessary to connect an additional high pressure gauge to the king valve. The MessageCenter, under DATA, will display suction pressure, discharge pressure and evaporator pressure.

In high or low ambients it may be necessary to cool or warm the box temperature before performing specific tests providing that the compartment is not loaded with perishable product.

WARNING

When performing service and/or maintenance procedures, make certain the unit is disconnected from the power source and that the RS is in OFF position so that it is impossible for the unit to start up automatically during the maintenance operation.

7.2 NOTES

Note 1 Active alarms will always be in the Alarm List. They will have an "A" in front of the alarm number. Active alarms may be inactivated by going to the end of the Active Alarm list. "LIST END, = TO CLEAR ALARMS" will appear in the MessageCenter. Pressing = will clear or inactivate the alarms. This moves the alarm to the Inactive Alarm list, *if* the condition that caused the alarm has been corrected. When Shutdown Alarms are cleared, the unit will attempt to restart (if the micro is set for auto-start). When non-Shutdown Alarms are cleared, there will be no noticeable change in the unit's operation.

The Inactive Alarm list is reached by first pressing and holding the Alarm List key, then the UP Key, and holding both of them for 3 seconds. Alarms in this list will begin with "I" (Inactive) followed by the alarm number.

Clearing alarms from the Inactive Alarm list will also clear alarms from the Active Alarm List. Go to the end of the Inactive Alarm List. "LIST END, = TO CLEAR ALARMS" will show in the Message Center. Press = to clear all alarms from both lists.

Note 2 Many electrical circuits may be tested by leaving all compartment switches in the "O" (OFF) position and turning the RS to the START/RUN position. At least one compartment must be in the "1" (ON) position. In this mode, RCR will be energized and the main display will show "OFF".

Note 3 Many checks will be made with the microprocessor powered up, but with no outputs to the unit components. The unit may be put into PC Mode to do this. For additional information see PC Mode – Section 5.1.

Note 4 Sensors may be tested at the component plug using an ohmmeter. If required, sensor circuits may be tested at the 1MP plug. Remove plug from Microprocessor and, using an ohmmeter, test resistance of circuits. Be careful not to damage the connector pins. (See Section 8.29 for chart of resistances for different sensors.)

Note 5 The Defrost Air Switch, RPM Sensor, Engine Oil Level Switch, Fuel Level Sensor, Door Switch, or HP1 can be tested as components alone. If required, the circuits may be tested at the 2MP plug. Remove plug from Microprocessor and using the wiring diagram, check for voltage at the appropriate terminal.

Note 6 Some tests can only be conducted with the unit operating. The unit may be started automatically by placing the RS in the Start/Run position and at least one compartment also in the "1" (ON) position.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
7.3 DRIVER/OPERATOR ALARMS			
1	**LOW FUEL LEVEL WARNING**		
Note: This is an optional alarm which will not occur unless a fuel level sensor is present and configured ON. • TRIGGER ON: Fuel level is 15% or less for more than 30 seconds. • UNIT CONTROL: Engine operation: Alarm only. Standby operation: Will not activate in standby. • RESET CONDITION: Auto reset when the fuel level is above 17% for more than 30 seconds, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Low Fuel Level**	
		a. Check fuel level in the fuel tank	Add fuel as needed to the fuel tank.
	2.	**Check Fuel Level Sensor**	
		a. Inspect fuel level sensor& connector pins & terminals	No physical damage to switch. No damaged or corroded pins in plug.
		b. Check fuel level sensor operation	Energize circuit. See Note 2.
		c. Check for voltage at harness plug between pins for BLACK (SP24) negative and RED (SPK5) positive wires	Voltage should be approximately12VDC.
		d. Check for voltage at harness plug between pins for BLACK (SP24) negative and WHITE (1MP26)	Voltage should be greater than 0 VDC and less than 5 VDC, unless the probe is completely dry.
		e. Check continuity of the wire from the harness plug, pin C to the micro-processor plug 1MP26	Place Start−Run/Off Switch in OFF position prior to checking for continuity. Must be less than 10 ohms.
	3.	**Check Fuel Level Sensor Calibration**	
		a. Check fuel level sensor calibration	See Section (8.5.1) for sensor calibration procedure.
	4.	**Check Circuits With Test (Substitute) Sensor**	
		a. Substitute known good sensor and clear alarm. Start unit and run for 30 seconds.	
		b. Check to see if alarm re-occurs.	Alarm should not come on. (Install new sensor if necessary)

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
2	**LOW ENGINE OIL LEVEL**		
Note: This is an optional alarm which will not occur unless a fuel level sensor is present and configured ON. • TRIGGER–ON: Engine oil level is sensed approx. 4 or more qts. (4.54 or more liters) low for longer than 30 seconds. • UNIT CONTROL: Engine Operation: Alarm only or (if configured for shutdown) engine and unit shutdown. Standby operation: Alarm only. • RESET CONDITION: Auto reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Engine Oil Level**	
		a. Check engine oil dipstick	Add engine oil as needed to fill.
	2.	**Check Engine Oil Level Switch**	
		a. Inspect engine oil level switch & connector pins & terminals	No physical damage to switch. No damaged or corroded pins in plug.
		b. Check engine oil level switch operation	Contacts open when level is more than 7 qts low Contacts closed when level is less than 4 qts low
	3.	**Check Engine Oil Level Switch Harness**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
		b. Check for shorted circuit in harness, and continuity through the harness	Energize circuit (See Note 2). DO NOT START UNIT. Battery voltage reading (12−13 VDC) between wires in plug
	4.	**Check Oil Level Switch**	
		a. Drain oil level to approximately 2.8 to 3−4 quarts (3.8 liters) low. Remove switch.	
		b. Visually and physically inspect upper and lower float stops.	Must be securely fastened to center rod.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
3	**LOW COOLANT LEVEL**		
Note: This is an optional alarm which will not occur unless a fuel level sensor is present and configured ON. • TRIGGER ON: Engine coolant level is 1 or more quarts (.95 or more liters) low for more than 30 seconds. • UNIT CONTROL: Engine operation: Alarm only. Standby operation: Will not activate in standby. • RESET CONDITION: Auto reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Low Coolant Level**	
		a. Check engine coolant level in the coolant bottle	Add coolant as needed to the coolant reservoir and to the fill tube on the radiator
		b. Check coolant hoses for leaks or breaks	Repair all leaks and breaks as necessary Add coolant as needed to the coolant reservoir and to the fill tube on the radiator
	2.	**Check Engine Coolant Level Switch**	
		a. Inspect engine coolant level switch & connector pins & terminals	No physical damage to switch. No damaged or corroded pins in plug.
		b. Check harness wiring to plug.	Verify wires are in correct plug orifice.
		c. Check engine coolant level switch operation	Energize circuit. See Note 2. DO NOT START UNIT.
		d. Check for voltage at harness plug between pins A and B	Voltage should be 12 volts at harness plug between pins A and B.
		e. Check continuity of the wire from the harness plug, pin C to the microprocessor plug 2MP15	Place Start−Run/Off Switch in OFF position prior to checking for continuity. Must be less than 10 ohms.
	3.	**Check Circuits With Test (Substitute) Switch**	
		a. Substitute known good sensor and clear alarm. Start unit and run for 30 seconds. b. Check to see if alarm re-occurs.	 Alarm should not come on. (Install new sensor)

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
7.4 SHUTDOWN ALARMS			
11	**LOW ENGINE OIL PRESSURE**		
	• TRIGGER–ON: Engine oil pressure is below 12 PSIG (0.82 Bar) for longer than 5 seconds while the engine is running. • UNIT CONTROL: Engine operation: Engine and unit shutdown and alarm. Standby operation: This alarm will not activate in standby operation. • RESET CONDITION: Auto Reset or Alarm may be manually reset via Keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the active alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Low Engine Oil Level Alarm**	
		a. Check for alarm 2	Alarm conditions must be corrected and the alarm cleared to continue
	2.	**Check Engine Oil Level**	
		a.Check engine oil dipstick.	Add engine oil as needed to fill.
	3.	**Check Engine Oil Pressure Switch**	
		a. Inspect switch & connector pins & terminals	No physical damage to switch. No damaged or corroded pins in plug.
		b. Check engine oil switch operation.	Contacts closed when oil pressure is above 15 PSIG (1.02 Bars) Contacts open when oil pressure is below 12 PSIG (0.82 Bar)
	4.	**Check Engine Oil Switch Harness**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
		b. Check for shorted circuit in harness, and continuity through the harness	Energize circuit. See Note 2. Battery voltage reading (12–13 VDC) between wires in plug
	5.	**Check Engine Oil Pressure**	
		a. Connect mechanical oil gauge	Oil pressure must be greater than 15 PSIG (1.02 Bars)

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
12	**HIGH COOLANT TEMPERATURE**		
	• TRIGGER–ON: If system in engine mode: For ambient temperatures below 120°F (48.9°C) Engine coolant temperature is above 230°F (110°C), or Ambient temperatures above 120°F (48.9°C), engine coolant temp is over 241°F (116°C), or Engine coolant temperature is between 230°F and 241°F (110°C and 116°C) for more than 5 minutes. • UNIT CONTROL: Engine operation: Engine and unit shutdown and alarm. Standby operation: This alarm will not activate in standby operation. • RESET CONDITION: Auto Reset after 15 minutes if the engine coolant temp falls below 212°F (100°C), or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Coolant Level**	
		a. Check coolant level in overflow bottle	Level must be in the Normal range.
		b. Check coolant level in radiator **Do not remove the cap from a hot radiator; if the cap must be removed, do so very slowly in order to release the pressure without spray.**	Level must be at the top of the radiator fill tube.
		c. Inspect connecting tube between overflow bottle and radiator	Connections must be airtight. No leakage or holes in tube.
	2.	**Check For Bad Eng Coolant Sensor Alarm**	
		a. Check for Alarm 129	Alarm conditions must be corrected and the alarm cleared to continue
	3.	**Check Freeze Point Of Coolant**	
		a. Use Coolant Tester to check concentration of anti-freeze mixture.	Must be between 40% to 60% Ethylene Glycol to water mixture.
	4.	**Check Airflow Through Radiator / Condenser Coil**	
		a. Inspect condenser/ radiator fins	Fins must be straight. 90% or more of the coil surface must be undamaged. No “dead” air spaces. Condenser / Radiator coil must be clean.
		b. Check condenser fan rotation / operation	Fans should operate correctly. Air should be directed in through the grill, and into the engine compartment.
	5.	**Check Water Pump Belt**	
		a. Check engine water pump belt.	No Glazing, no cracking, no slipping
	6.	**Check Engine Cooling System**	
		a. Compare actual engine temperature to the microprocessor reading	Temperature must be within ±20°F (±11.1°C).
		b. Test operation of engine coolant thermostat	Must operate correctly
		c. Check water pump operation	No seepage at weep hole. Bearings tight and quiet. Impeller firmly attached to shaft.
		d. Check water pump bypass hose to thermostat housing for internal blockage	Must be clear and open

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
13	**HIGH DISCHARGE PRESSURE (ALARM 75 WILL ACTIVATE)**		
	• TRIGGER–ON: Compressor discharge pressure is over 465 PSIG (31.6 Bars) • UNIT CONTROL: Engine operation: engine and unit shutdown and alarm. Standby operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto Reset after 15 minutes if the compressor discharge pressure falls below 350 PSIG (23.8 Bars), or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check System Pressures**	
		a. Install Manifold Test Set and check and compare compressor discharge & suction pressures with those shown on the microprocessor controller.	Suction & Discharge Pressures must have the same reading on gauges & on micro display. Pressures must be in the normal range for ambient & box temperature conditions. **NOTE: Microprocessor suction pressure reading has a maximum value of 100 psig (7.5 bar)**
	2.	**Check For Refrigerant Overcharge**	
		a. Check refrigerant level in the receiver tank.	Level must be between upper & lower sight glasses with a box temperature of 35°F (1.0C) or lower
	3.	**Check Airflow Through Condenser Coil**	
		a. Inspect condenser / radiator fins	Fins must be straight. 90% or more of the coil surface must be undamaged. No “dead” air spaces. Condenser / Radiator coil must be clean.
		b. Check airflow (with unit running).	Even airflow through the entire coil No “dead” spots
		c. Check condenser fan rotation/operation	Both fans should operate correctly. Air should be directed in through the grill, and into the engine compartment.
	4.	**Check HP1 Switch**	
		a. Inspect switch & connector pins & terminals	No physical damage to switch. No damaged or corroded pins in plug.
		b. Check switch operation (Refer to Section 2.12 for pressure settings)	Contacts open when compressor discharge pressure is above cut-out point ± 10 PSIG (±0.68 Bar) Contacts closed when compressor discharge pressure is below cut-in point ± 10 PSIG (±0.68 Bar)
	5.	**Check HP1 Switch Harness**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
		b. Check for shorted circuit in harness, and continuity through the harness	Energize Circuit. (See Note 2). Battery voltage reading (12–13 VDC) between wire HP1A–SPKS and between HP1B to Ground.
	6.	**Perform Pretrip Check**	
		a. Run Pretrip & check for alarms	Any active alarms must be corrected and cleared before proceeding.
	7.	**See Refrigeration Trouble Shooting Section 9**	Discharge Pressure must be in normal range for the current ambient and box temperature conditions.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
14	**ELECTRICAL CIRCUIT**		
	• TRIGGER–ON: AC Current Sensor 1 is greater than 40A or AC Current Sensor 2 is greater than 40A for 3 seconds • UNIT CONTROL: Engine operation: alarm will not activate. Standby operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto reset after 15 minutes if the AC current sensor readings are less than 38 amps or alarm may be manually reset via keypad or by turning unit off then back on.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Generator Voltage (If Used When Alarm Occurred)**	
		a. Check voltage at GENCON L1−L2, L1−L3, L2−L3	Should be 440 to 580 VAC
	2.	**Check Power Source Voltage (If Used When Alarm Occurred)**	
		a. Check voltage at PSCON L1−L2, L1−L3, L2−L3	Should be 440 to 580 VAC
	3.	**Check Voltage Output From Contactors**	
		a. Check voltage at GENCON T1−T2, T1−T3, T2−T3	Should be 440 to 580 VAC
		b. Check voltage at CCON with compressor operating. T1−T2, T1−T3, T2−T3	Should be 440 to 580 VAC
	4.	**Verify AC Current Sensor Accuracy**	
		a. Turn all compartment switches OFF, and RS ON.	Unit AC Current #1 and #2 reading in Data List must be 0.0 ± 1.0 amp.
	5.	**Check High Voltage Components Amp Draw**	
		a. Check condenser fan amp draw on all 3 legs.	See Section 2.13
		b. Check evaporator fan motor amp draw for Compartment 1 on all 3 legs.	
		c. Check evaporator fan motor amp draw for Compartment 2 on all 3 legs.	
		d. Check evaporator fan motor amp draw for Compartment 3 on all 3 legs.	
		e. Check compressor amp draw on all 3 legs.	
		f. Check Compartment 1 Heater amp draw for HTCON1	
		g. Check Compartment 1 Heater amp draw for HTCON2	
		h. Check Compartment 1 Heater amp draw for 2HTCON1	
		i. Check Compartment 1 Heater amp draw for 2HTCON2	
		j. Check Compartment 1 Heater amp draw for 3HTCON1	
		k. Check Compartment 1 Heater amp draw for3HTCON2	

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
15	**BATTERY VOLTAGE TOO HIGH**		
	• TRIGGER–ON: Voltage at the microprocessor is greater than 17 VDC. • UNIT CONTROL: Engine operation: engine and unit shutdown and alarm. Standby operation: refrigeration system shutdown and alarm. PSCON de−energized. • RESET CONDITION: Auto Reset after 15 minutes when the voltage at the microprocessor is between 11 and 14 VDC, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Battery Voltage**	
		a. Test voltage at battery with unit off.	Must be between 12−16 VDC
		b. Test voltage at battery with unit running.	Must be between 12−16 VDC
	2.	**Check Battery Charger Voltage**	
		a. Test voltage at battery charger output terminal with unit off	Must be between 12−16 VDC
		b. Test voltage at battery charger output terminal with unit running.	Must be between 12−16 VDC
	3.	**Check Voltage At Microprocessor**	
		a. Check voltage reading at microprocessor input (QC1+ to QC2−)	Energize circuit. (See Note 2) Must be between 12−16 VDC
		b. Check voltage reading on microprocessor display	Must be within 0.5 VDC of reading obtained in 3a (above)

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
16	**BATTERY VOLTAGE TOO LOW**		
	• TRIGGER–ON: Voltage at the microprocessor is less than 10 VDC (except when the engine starter is engaged) • UNIT CONTROL: Unit Shutdown & Alarm. Alarm condition only if activated while starting unit. • RESET CONDITION: Auto Reset after 15 minutes when the voltage at the microprocessor is between 11 – 14 VDC, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Alarm 51**	
		a. Check for Alternator Not Charging Alarm	Alarm conditions must be corrected and the alarm cleared to continue
	2.	**Check Battery Voltage**	
		a. Inspect battery cable ends and posts	Must be clean and tight
		b. Test voltage at battery with unit off.	Must be above 11 VDC
		c. Test voltage at battery with unit running.	Must be above 11 VDC
		d. Test specific gravity of battery	(Check for battery specifications)
		e. Perform load test on battery (Follow battery manufacturer's procedure)	(Check for battery specifications)
	3.	**Check Voltage At Microprocessor**	
		a. Check voltage reading at microprocessor input (MPQC1+ to MPQC2–).	Energize circuit. (See Note 2) Must be above 11 VDC
		b. Check voltage reading on microprocessor display	Must be within 0.5 VDC of reading obtained in 3a (above)

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
17	**HIGH COMP DISCHARGE TEMP**		
	• TRIGGER–ON: Discharge sensor alarm not active AND: Ambient temp below 120°F (48.9°C) and discharge temp was between 310°F – 349°F (154.4°C – 176.7°C) for 3 minutes, or Ambient temp above 120°F (48.9°C) and discharge temp was between 340°F – 349°F (171.1°C – 176.7°C) for 3 minutes, or Discharge temp ever reaches 350°F (176.7°C) • UNIT CONTROL: Engine operation: engine and unit shutdown and alarm. Standby operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto Reset after 15 minutes with Ambient temp below 120°F (48.9°C) the discharge temp falls below 300°F (148.8°C), or Auto Reset after 15 minutes with Ambient temp above 120°F (48.9°C) the discharge temp falls below 330°F (165.4°C), or alarm may be manually reset via Keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Bad Compressor Discharge Temperature Sensor**	
		a. Check for Alarm 125	Alarm conditions must be corrected and the alarm cleared to continue
	2.	**Check Refrigerant Charge**	
		a. Check for undercharged system	Level must be above lower sight glass
	3.	**Check Airflow Through Condenser Coil**	
		a. Inspect condenser / radiator fins	Fins must be straight. 90% or more of the coil surface must be undamaged. No “dead” air spaces. Condenser / Radiator coil must be clean.
	4.	**Check CSMV**	
		a. Check compressor suction modulation valve	See procedure “How To Check CSMV,” Section 8.24
	5.	**Check System Pressures**	
		a. Install Manifold Test Set and check and compare compressor discharge & suction pressures with those shown on the microprocessor controller.	Suction & Discharge Pressures must have the same reading on gauges & on micro display. **NOTE: Microprocessor suction pressure reading has a maximum value of 100 psig (7.5 bar)**
	6.	**Perform Pretrip Check**	
		a. Run Pretrip & check for alarms	Any active alarms must be corrected and cleared before proceeding.
	7.	**Check Compressor Reed Valves & Gaskets**	
		a. Remove compressor heads & inspect condition of all reeds & gaskets	Must be in good condition.
	8.	**Check Expansion Valve (EVXV)**	
		a. Check superheat of valve	Refer to Section 2.12 See 8.17
	9.	**Check System For Non-Condensables**	
		a. Check refrigeration system for non-condensable gas(es)	No non–condensable gas(es) may be present.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
18	**LOW REFRIGERANT PRESSURE**		
	• TRIGGER–ON (A): Both UL1 and UL2 are energized AND unit is in engine mode AND in low speed AND compressor is running AND low suction pressure shutdown delay in configurations has elapsed since energizing UL1 AND Suction Pressure is less than −10 in. Hg (0.3 Bar) • UNIT CONTROL: Engine operation: alarm only or (if configured for shutdown) engine and unit shutdown and alarm. Standby operation: alarm only or (if configured for shutdown) refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: If alarm only, auto reset when either UL1 or UL2 is de−energized. If unit and system shut down and alarm, auto reset after 15 minutes. Alarm may be manually reset via keypad or by turning the unit OFF, then ON again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Refrigerant Charge**	
		a. Check for undercharged system	Level must be above lower sight glass
	2.	**Check System Pressures**	
		a. Install Manifold Test Set and check and compare compressor discharge & suction pressures with those shown on the microprocessor controller.	Suction pressure must be above 3 PSIG (0.2 Bar) Suction & Discharge Pressures must have the same reading on gauges & on micro display. **NOTE: Microprocessor suction pressure reading has a maximum value of 100 psig (7.5 bar)**
	3.	**Manually Defrost Unit**	
		a. Defrost unit and terminate automatically.	Typical defrost cycle time is 5−20 minutes Suction pressure should rise gradually during cycle.
	4.	**Perform Pre−Trip Check**	
		a. Run Pre−Trip & check for alarms	Any active alarms must be corrected and cleared before proceeding.
	5.	**Check Unloader Operation**	
		a. Check front and rear unloaders	See Alarms 85 and 86
	6.	**Check CSMV**	
		a. Check compressor suction modulation valve	See procedure “How To Check CSMV” See Section 8.23
		b. Check airflow (with unit running).	Even airflow through the entire coil No “dead” spots
	7.		
		a. Check evaporator section, return air bulkhead, air chute, cleanliness of evap. coil	Good Air Flow Return air not restricted Air chute in good condition No damage to blower wheel Evap. coil clean Evap. fan rotation ok
	8.	**Check Expansion Valve (EVXV)**	
	9.	**Check Expansion Valve For Compartment 2**	
		a. Check superheat of valve	Refer to Section 8.19.2
	10.	**Check Expansion Valve For Compartment 3**	
		a. Check superheat of valve	Refer to Section 2.12

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
19	**LOW FUEL SHUTDOWN** This is an optional alarm. This alarm will not occur unless a fuel level sensor is present and configured ON and a fuel tank size must be selected. • TRIGGER ON: Fuel level is 10% or less for more than 1 minute AND the unit is operating on diesel AND Alarm 126 is not active. • UNIT CONTROL: Engine operation: alarm only or (if configured for shutdown) engine and unit shutdown and alarm. Standby operation: this alarm will not activate in standby operation. • RESET CONDITION: Auto reset when fuel level is above 12% for more than 1 minute, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Low Fuel Level Warning Alarm**	
		a. Check for alarm 1	Must be cleared.
	2.	**Check For Low Fuel Level**	
		a. Check fuel level in tank.	Add fuel as needed to the fuel tank.
20	**MAXIMUM COMPRESSOR ALARMS** • TRIGGER ON: Option must be installed and alarm must be enabled by configuring the Compressor Alarm Shutdown to YES. Alarms 13, 17, 18, 27, 28, 29 or 56 individually occur 3 times within the last 2 hours of engine running time. • UNIT CONTROL: Engine operation: engine and unit shutdown and alarm. Standby operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Reset from inactive alarm list only. Can not be reset by turning switch OFF and then ON again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Determine Which Alarm Caused This Alarm To Be Active.**	
		a. Check active alarm list for Alarm #'s 13, 17, 18, 27, 28, 29, or 56.	One or more of these alarms will be present.
		b. Follow the steps for the alarm(s) found above, and correct the alarm condition.	All alarms condition must be fixed.
	2.	**Reset Alarm**	
		a. Reset all alarms from the inactive alarm list.	All alarms must be cleared to start unit.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
21	**TECHNICIAN RESET REQUIRED**		
	• TRIGGER ON: The High Engine Temp Shutdown Configuration and/or Engine Oil Pressure Shutdown Configuration is/are set to YES, and either Alarm 11 – Low Engine Oil Pressure, **or** Alarm 12 – High Coolant Temperature has become active and shut the unit down three times within the past 2 hours • UNIT CONTROL: Unit shutdown and alarm • RESET CONDITION: Reset from inactive alarm list only. Can not be reset by turning switch OFF and then ON again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Determine Which Alarm Caused This Alarm To Be Active.**	
		a. Check active alarm list for Alarm #'s 11 or 12.	One or more of these alarms will be present.
		b. Follow the steps for the alarm(s) found above, and correct the alarm condition.	All alarms condition must be corrected.
	2.	**Reset Alarm**	
		Reset all alarms from the inactive alarm list.	All alarms must be cleared to start unit.
22	**LOW SUCTION SUPERHEAT**		
	• TRIGGER ON: Compressor suction superheat less than 9°F (5°C) for more than 2 minutes. • UNIT CONTROL: Engine operation: engine and unit shutdown and alarm. Standby operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto reset after 15 minutes, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check System Pressures**	
		a. Install Manifold Test Set and check and compare compressor discharge & suction pressures with those shown on the microprocessor controller.	Suction & Discharge Pressures must have the same reading on gauges & on micro display. **NOTE: Microprocessor suction pressure reading has a maximum value of 100 psig (7.5 bar)**
	2.	**Restricted Evaporator Airflow**	
		a. Check for restricted evaporator airflow in all enabled compartments.	Check for proper Evaporator Fan operation Check data sheet for proper defrost air switch specs and air switch hoses Check for restricted bulkhead or air chute installation
	3.	**Check For Any Ice On Compartment 2 Or 3 Suction Lines**	
		a. Check fans for compartment.	Must be running and blow in the correct direction.
		b. Run through defrost.	Clean all ice off coil.
		c. Recheck for ice on suction line.	If suction line continues to show signs of ice, check expansion valve superheat.
	4.	**Run Pre–Trip. See Alarm 18, Step 4**	
	5.	**Check EVXV**	
		a. Check for defective EVXV	See Section 8.18

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
23	**A/C CURRENT OVER LIMIT**		
	• TRIGGER ON: The high voltage amp draw is over the limit shown in the table below for more than 10 seconds.		

Condition	1 Compartment Enabled	2 Compartments Enabled	3 Compartments Enabled
Diesel High Speed Cool	30A	30A	30A
Diesel Low Speed or Standby Cool	30A	30A	30A
Diesel High Speed Heat	18A	24A	28A
Diesel Low Speed or Standby Heat	14A	20A	24A
Diesel High Speed Heat Defrost	16A	22A	26A
Diesel Low Speed or Standby Heat Defrost	12A	18A	22A
Diesel High Speed Null or Fan Defrost	8A	10A	12A
Diesel Low Speed or Standby Null or Fan Defrost	6A	8A	9A

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
23	**A/C CURRENT OVER LIMIT (Continued)** • UNIT CONTROL: Engine operation: refrigeration system shutdown and alarm. Standby operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto reset after 15 minutes or alarm may be manually reset via keypad or by turning the unit OFF, then back ON.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Electrical Failure In System**	
		a. Check electrical motors	Run pre−trip; Determine motor or refrigeration component failure per pre−trip Alarm. Ohm test component per Section 2.13 Listen for noise caused by failed bearing or motor obstruction
		b. Defective wiring	Check for discolored wiring at contactors and loose connections
		c. Defective contactor	Remove and replace suspected contactor
	2.	**Check High Voltage Components Amp Draw**	
		a. Check condenser fan amp draw on all 3 legs.	See Section 2.13
		b. Check evaporator fan motor amp draw for Compartment 1 on all 3 legs.	
		c. Check evaporator fan motor amp draw for Compartment 2 on all 3 legs.	
		d. Check evaporator fan motor amp draw for Compartment 3 on all 3 legs.	
		e. Check compressor amp draw on all 3 legs.	
		f. Check Compartment 1 Heater amp draw for HTCON1	
		g. Check Compartment 1 Heater amp draw for HTCON2	
		h. Check Compartment 1 Heater amp draw for 2HTCON1	
		i. Check Compartment 1 Heater amp draw for 2HTCON2	
		j. Check Compartment 1 Heater amp draw for 3HTCON1	
		k. Check Compartment 1 Heater amp draw for3HTCON2	
	3.	**Check Generator Voltage (If Used When Alarm Occurred)**	
		a. Check voltage at GENCON L1−L2, L1−L3, L2−L3	Should be 440 to 580 VAC
	4.	**Check Power Source Voltage (If Used When Alarm Occurred)**	
		a. Check voltage at PSCON L1−L2, L1−L3, L2−L3	Should be 440 to 580 VAC

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
23	**A/C CURRENT OVER LIMIT (Continued)**		
	5.	**Check Voltage Output From Contactors**	
		a. Check voltage at GENCON T1−T2, T1−T3, T2−T3	Should be 440 to 580 VAC
		b. Check voltage at CCON with compressor operating. T1−T2, T1−T3, T2−T3	Should be 440 to 580 VAC
	6.	**Verify AC Current Sensor Accuracy**	
		a. Turn all compartment switches OFF, and RS ON.	Unit AC Current #1 and #2 reading in Data List must be 0.0 ± 1.0 amp.
	7.	**Defective OGF**	
		a. Opens prematurely	Remove and replace
	8.	**Defective Current Sensor**	
		a. Reads too high	Remove and replace

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
27	HIGH SUCTION PRESSURE		
• TRIGGER ON: The refrigeration system is running and the suction pressure has been greater than 98 PSIG (6.7 Bars) for more than 10 minutes • UNIT CONTROL: Engine operation: alarm only or (if configured for shutdown) engine and unit shutdown and alarm. Standby operation: alarm only or (if configured for shutdown) refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto reset when suction pressure is less than 75 PSIG (5.1 Bars) for 5 minutes and configured for Alarm Only, or Auto Reset after 15 minutes if configured as a Shutdown Alarm or, alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check System Pressures**	
		a. Install Manifold Test Set and check and compare compressor discharge & suction pressures with those shown on the microprocessor controller.	Suction pressure must be above 3 PSIG (0.2 Bar) Suction & Discharge Pressures must have the same reading on gauges & on micro display. **NOTE: Microprocessor suction pressure reading has a maximum value of 100 psig (7.5 bar)**
	2.	**Check For Refrigerant Overcharge**	
		a. Check refrigerant level in the receiver tank.	Level must be between upper & lower sight glasses with a box temperature of 35°F (1.0C) or lower
	3.	**Perform Pre-trip Check**	
		a. Run pre-trip & check for alarms	Any active alarms must be corrected and cleared before proceeding.
	4.	**Check EVXV**	
		a. Check wiring and connections to EVXV.	No physical damage to harness. No damage or corroded pins. Connector tight on valve.
		b. Check EVXV Superheat.	See Section 8.18
	5.	**Check Compressor.**	
		a. Perform Pump-Down Test. See Section 8.11.1	Must pump down to 5 PSI and hold for minimum of 1 minute.
		b. Cover condenser and build-up discharge pressure.	Must be able to pump up to 400 PSI.
		c. Disassemble and inspect compressor valve plates, reeds, pistons, etc.	Must be intact, clean, and in good working order.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
28	**CHECK REFRIGERATION SYSTEM**		
	• TRIGGER ON: The refrigeration system is running and the discharge pressure is less than 5 PSIG (0.34 Bar) higher than suction pressure for more than 10 minutes • UNIT CONTROL: Engine operation: alarm only or (if configured for shutdown) engine and unit shutdown and alarm. Standby operation: alarm only or (if configured for shutdown) refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto reset when discharge pressure is more than 20 PSIG (1.36 Bars) above the suction pressure when in alarm only, or auto reset after 15 minutes when shutdown is configured or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Verify Compressor Is Running.**	
		a. Check compressor Amp draw − CCON T1−T2, T1−T3, T2−T3.	
	2.	**Check System Pressures**	
		a. Install Manifold Test Set and check and compare compressor discharge & suction pressures with those shown on the microprocessor controller.	Suction pressure must be above 3 PSIG (0.2 Bar) Suction & Discharge Pressures must have the same reading on gauges & on micro display. **NOTE: Microprocessor suction pressure reading has a maximum value of 100 psig (7.5 bar)**
	3.	**Perform Pre−trip Check**	
		a. Run pre−trip & check for alarms	Any active alarms must be corrected and cleared before proceeding.
	4.	**Check Compressor.**	
		a. Perform Pump−Down Test. See Section 8.11.1	Must pump down to 5 PSI and hold for minimum of 1 minute.
		b. Cover condenser and build−up discharge pressure.	Must be able to pump up to 400 PSI.
		c. Disassemble and inspect compressor valve plates, reeds, pistons, etc.	Must be intact, clean, and in good working order.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
7.5 START UP/ENGINE ALARMS			
30	**FAILED TO RUN MINIMUM TIME**		
	• TRIGGER–ON: Engine has shut down on an alarm 3 times without having run for at least 15 minutes between each shutdown (not including Door or Remote Switch shut downs) AND unit is in automatic start mode. • UNIT CONTROL: Engine operation: engine and unit shutdown and alarm. Standby operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check For Alarms**	
		a. Check for shut down alarms	Alarm conditions must be corrected and the alarm(s) cleared to continue.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
31	**FAILED TO START – AUTO MODE**		
	• TRIGGER–ON: In engine mode, engine has tried to start 3 times unsuccessfully in the auto start mode. • UNIT CONTROL: Engine operation:engine and unit shutdown and alarm. Standby operation: this alarm will not activate in standby operation. • RESET CONDITION: Change unit to standby operation or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Fuel Level In Tank**	
		a. Check fuel gauge on tank.	Fill tank as needed.
	2.	**Check For Alarms**	
		a. Check for the following alarms: 71 Check for Bad F2 or F3 Fuse alarm 40 Check Glow Plugs alarm 35 Check Starter Circuit alarm	Alarm conditions must be corrected and the alarm cleared to continue
	3.	**Check Fuel Solenoid**	
		a.Check run relay.	Unit in component test mode – run relay ON.
		b. Check Run Relay LED	Must be ON.
		c. Check voltage to fuel solenoid	12 VDC between FSC–C (ground) & FSH–A (hold) with engine starter energized 12 VDC between FSC–C (ground) & FSP–B (pick)
		d. Inspect solenoid & connector pins & terminals	No damage to solenoid No damaged or corroded pins
		e. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
		f. Check resistance of solenoid	Refer to Section 2.14
		g. Check operation of solenoid	Plunger must move in when energized
	4.	**Check Fuel System**	
		a. Check fuel system prime	No air in fuel system
		b. Check fuel flow	Unrestricted fuel flow through system
		c. Check voltage to glow plugs	Glow Plug switch ON, Manual Start Mode More than 11 VDC
	5.	**Check Engine Air–intake System**	
		a. Check air filter indicator	Flag must not be visible.
		b. Inspect air intake system	Hoses & tubes in good condition. No kinks or restrictions
	6.	**Check For Correct Engine Oil**	
		a. Check for correct oil viscosity (weight) for conditions	Refer to Section 2.9 Must be correct for ambient conditions
	7.	**Check Engine Exhaust System**	
		a. Inspect the exhaust system	Must be clear and un–obstructed
	8.	**Check Engine**	
		a. Check engine compression	Refer to Section 2.9
	9.	**Check RPM Sensor**	
		a. Check sensor	See Section 8.6.3

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
34	**ENGINE FAILED TO STOP**		
	• TRIGGER–ON: In engine mode, engine is turning more than 500 RPM for 20 seconds after unit shut down or cycled off or Oil Pressure Switch is closed longer than 20 seconds after unit shut down or cycle off. • UNIT CONTROL: Engine operation: alarm only. Standby operation: this alarm will not activate in standby operation. • RESET CONDITION: Alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Engine Running**	
		a. Verify that engine is still running.	Engine should not be running.
	2.	**Check For Rpm Sensor**	
		a. Check actual engine RPM using hand held tachometer.	Refer to Section 8.6 Adjust engine linkage setting as needed.
		b. Compare actual RPM with those shown on display.	Both readings within +/– 50 RPM.
	3.	**Check For Bad Engine RPM Sensor Alarm**	
		a. Check for Alarm 130	Alarm conditions must be corrected and the alarm cleared to continue
	4.	**Check Engine Oil Pressure Switch**	
		a. Inspect switch & connector pins & terminals	No physical damage to switch. No damaged or corroded pins in plug.
		b. Check engine oil switch operation.	Contacts closed when oil pressure is above 15 PSIG (1.02 Bars) Contacts open when oil pressure is below 12 PSIG (0.82 Bar)
	5.	**Check Engine Oil Switch Harness**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
		b. Check for shorted circuit in harness, and continuity through the harness	Energize circuit. (See Note 2) Battery voltage reading (12–13 VDC) between wires in plug
	6.	**Check Fuel Solenoid & Circuit**	
		a. Check Run Relay LED	LED 28 must be OFF.
		b. Check voltage at harness to fuel solenoid	Must be 0 VDC
		c. Check voltage at harness to fuel solenoid	Must be 0 VDC
		d. Check fuel solenoid stopper	Must be free to move

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
35	**CHECK STARTER CIRCUIT**		
	• TRIGGER–ON: Condition 1: Engine speed fails to reach 50 RPM during 2 start attempts. Condition 2: Applies to software version V05.07.00 ONLY. The oil pressure switch contacts are sensed closed (oil pressure is present) before the run relay is energized. • UNIT CONTROL: Engine operation:engine and unit shutdown and alarm. Standby operation: this alarm will not activate in standby operation. • RESET CONDITION: Change unit to standby operation or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Engine Start–Up**	
		a. Does the alarm come on before the engine tries to crank?	If NO, continue with step b. If YES, continue with step c., then step 2.
		b. Does engine actually start, run for a few seconds then shut off?	If NO, continue with step 3. If YES, check RPM sensor wiring for a broken wire.
		c. Check for correct engine oil.	Engine oil viscosity must be correct for ambient conditions. Refer to Section 2.9.
	2.	**Check Oil Pressure Switch & Circuit.**	
		a. Check oil pressure switch .	Contacts must be open with no pressure on switch.
		b. Check oil pressure switch circuit	Must be no continuity between the wires.
	3.	**Check Starter Relay Circuit**	
		a. Check operation of starter solenoid relay	Locate the three wires in control box that connect to, or previously connected to, the GLOW–CRANK switch. Place the START/RUN–OFF switch in the START/RUN position. Connect the GSC1 wire to the 5MPA5–GCS2 wire. The relay contacts must go closed when these wires are connected together.
		b. Check relay socket and terminals	No signs of discoloration from overheating No corrosion
		c. Check voltage to starter solenoid relay	Negative lead on 85, Positive lead on 86 = 12 VDC Negative lead on Gnd, Positive lead on 87 & 30 = 12 VDC
		d. Inspect wiring to starter solenoid and starter motor	No physical damage to wiring or battery cable end. No damaged or corroded terminals.
		e. Check voltage to starter solenoid	Must be above 11.5 VDC
		f. Check voltage to starter motor	Must be above 10 VDC while cranking
	4.	**Check Starter**	
		a. Inspect starter and wiring	No damage or corrosion Wiring and battery cable must be clean and tight
		b. Check resistance of solenoid.	Refer to Section 2.14
		c. Check resistance of starter motor.	See Section 2.14
		d. Check amperage draw of starter.	See Section 2.14
	5.	**Check Battery Voltage**	
		a. Inspect battery cable ends and posts	Must be clean and tight No corrosion
		b. Test voltage at battery with unit off	Must be above 11 VDC
		c. Test specific gravity of battery	Check
		d. Perform load test on battery (Follow battery manufacturer's procedure)	Check

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
36	**CHECK COOLANT TEMPERATURE**		
	• TRIGGER–ON: Coolant temperature is below 32°F (0°C) after the engine has been running for 5 minutes • UNIT CONTROL: Engine operation: alarm only. Standby operation: this alarm will not activate in standby operation. • RESET CONDITION: Auto reset when coolant temperature >36°F (2.2°C) or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Coolant Temperature**	
		a. Check temperature of coolant or upper radiator hose	Must be above 32°F (0°C)
	2.	**Check Engine Coolant Sensor**	
		a. Check resistance of engine coolant sensor (See Note 4)	See Section 2.14
		b. Check harness and control box connector pins and terminals (See wiring diagram)	No physical damage to harness No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
37	**CHECK LOW SPEED RPM**		
• TRIGGER–ON: Controller is set for low engine speed operation, and engine RPM are: less than 1300 or greater than 1550 for more than 60 seconds • UNIT CONTROL: Engine operation: alarm only. Standby operation: this alarm will not activate in standby operation. • RESET CONDITION: Auto Reset if controller is set for low speed operation and RPM falls back between 1320 and 1530 RPM for 60 seconds. Change unit to standby operation, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Verify That Correct Model Number Is Selected**	
		a. Compare model number from unit I.D. label and model number in micro Data List.	The model numbers must be the same.
	2.	**Check Speed Solenoid & Linkage**	
		a. Check speed solenoid plunger	Must move in and out freely
		b. Check engine speed arm & linkage	Must move freely
	3.	**Check Engine RPM**	
		a. Check actual engine RPM using hand held tachometer	Refer to Section 2.9 Adjust engine linkage setting as needed.
		b. Compare actual RPM with those shown on display.	Both readings within ± 50 RPM
	4.	**Force Low Speed Operation**	
		a.Change setpoint to within ± 0.5° (± 0.3°C) of box temperature.	Unit will run in low speed. RPM must be within range shown above for each specific model. Adjust speed linkage as needed.
		b. Check operation of Speed Relay LED	LED 27 must be OFF
		c. Check voltage to speed solenoid	Must be 0 VDC
	5.	**Check Engine Air–intake System**	
		a. Check air filter indicator	Flag must not be visible.
		b. Inspect air intake system	Hoses & tubes in good condition. No kinks or restrictions
	6.	**Check Engine Exhaust System**	
		a. Inspect the exhaust system	Must be clear and unobstructed

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
38	**CHECK HIGH SPEED RPM**		
• TRIGGER–ON: Controller is set for low engine speed operation, and engine RPM are: Less than 1670, or greater than 1900 for more than 60 seconds • UNIT CONTROL: Engine operation: alarm only. Standby operation: this alarm will not activate in standby operation. • RESET CONDITION: Auto Reset if controller is set for high speed operation and RPM is between 1670 and 1930 for 60 seconds or change unit to standby operation or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Verify That Correct Model Number Is Selected**	
		a. Compare model number from unit I.D. label and model number in Micro Data List.	The model numbers must be the same.
	2.	**Check Speed Solenoid Linkage**	
		a. Check speed solenoid plunger	Must move in and out freely
		b. Check engine speed arm & linkage	Must move freely
	3.	**Force High Speed Operation** (See Note 6)	
		a. Change setpoint if necessary to more than 10°F (5.6°C) away from setpoint.	Controller will call for High Speed operation.
		b. Check operation of Speed Relay	LED 27 must be ON
		c. Check voltage to speed solenoid	Must be 12–14 VDC
	4.	**Check Speed Circuit**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins or terminals
		b. Check resistance of speed solenoid	Refer to Section 2.14
		c. Check amp draw of speed solenoid	Refer to Section 2.14
	5.	**Check Engine RPM**	
		a. Check actual engine RPM using hand held tachometer	Refer to Section 2.9 Adjust engine linkage setting as needed.
		b. Compare actual RPM with those shown on display	Both readings within ± 50 RPM
	6.	**Check Engine Air–intake System**	
		a. Check air filter indicator	Flag must not be visible.
		b. Inspect air intake system	Hoses & tubes in good condition. No kinks or restrictions
	7.	**Check Engine Exhaust System**	
		a. Inspect the exhaust system	Must be clear and unobstructed

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
39	**CHECK ENGINE RPM**		
	• TRIGGER–ON: In engine mode and Alarm 130 is not active and engine rpm is less than 1250 or greater than 2000 for 5 minutes or engine rpm drops to less than 1200 for 2 seconds after the engine rpm has been greater than 1250. • UNIT CONTROL: Engine operation: alarm only or (if configured for shutdown) engine and unit shutdown and alarm. Standby operation: this alarm will not activate in standby operation. • RESET CONDITION: Auto Reset if engine rpm is greater than 1250 and less than 2000 for 5 minutes or after 15 minutes if the engine has been shutdown or change unit to standby operation or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Engine Stalled Alarm**	
		a. Check for Alarm 41	When both alarms are present, unit may have been run out of fuel.
	2.	**Check Speed Solenoid & Linkage**	
		a. Check speed solenoid plunger	Must move in and out freely
		b. Check engine speed arm & linkage	Must move freely
	3.	**Check Fuel System**	
		a. Check for Alarm 1. Check fuel tank level.	Fill tank as needed
		b. Check fuel flow	Unrestricted fuel flow through system Fuel not gelled
		c. Check fuel system prime	No air in fuel system
	4.	**Check Engine Air–intake System**	
		a. Check air filter indicator	Flag must not be visible.
		b. Check air filter	Must be clean.
		c. Inspect air intake system	Hoses and tubes in good condition. No kinks or restrictions.
	5.	**Check Low Speed Engine RPM**	
		a. Check actual engine RPM using hand held tachometer	Refer to Section 2.9 Adjust engine linkage setting as needed.
		b. Compare actual RPM with those shown on display	Both readings within ± 50 RPM
	6.	**Check High Speed Engine RPM**	
		a. Check actual engine RPM using hand held tachometer	Refer to Section 2.9 Adjust engine linkage setting as needed.
		b. Compare actual RPM with those shown on display	Both readings within ± 50 RPM

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>ALARM / CAUSE</th><th>CORRECTIVE ACTION</th></tr>
<tr><td colspan="4">40 CHECK GLOW PLUGS
• TRIGGER–ON: During engine startup glow plug amperage is less than 30 Amps, or greater than 43 Amps after 13 seconds of glow time (NOTE: In auto start, this can only occur when the Engine Coolant Temperature is below 32°F (0°C) and the glow time is configured SHORT.)
• UNIT CONTROL: Engine operation: alarm only. Standby operation: this alarm will not activate in standby operation.
• RESET CONDITION: Auto Reset if glow plug amperage is between 30 to 43 amps for at least 13 seconds during the glow cycle or alarm may be manually reset via keypad or by turning the unit off, then back on again.</td></tr>
<tr><td colspan="4">NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.</td></tr>
<tr><td></td><td>1.</td><td colspan="2">Check Glow Plug Circuit</td></tr>
<tr><td></td><td></td><td>a. Inspect glow plug relay & socket</td><td>No signs of discoloration from overheating
No corrosion</td></tr>
<tr><td></td><td></td><td>b. Check operation of Glow Plug Relay</td><td>Energize circuit. (See Note 2). Put GPR on GPR85.
LED 30 must be ON</td></tr>
<tr><td></td><td></td><td>c. Check Non–Running Amps</td><td>View Current Draw in Data List
Refer to Section 2.14.
Energize GPR using component test mode.</td></tr>
<tr><td></td><td></td><td>d. Check Glow Plug circuit amperage</td><td>Current Draw = Non–Running Amps + Glow Plug Amps</td></tr>
<tr><td></td><td></td><td>e. Check voltage to glow plugs</td><td>Must be 11 VDC or higher</td></tr>
<tr><td></td><td>2.</td><td colspan="2">Check Glow Plug Circuit Wiring</td></tr>
<tr><td></td><td></td><td>a. Inspect harness & control box connector pins & terminals (See wiring schematic)</td><td>No physical damage to harness.
No damaged or corroded pins</td></tr>
<tr><td></td><td>3.</td><td colspan="2">Check Glow Plugs</td></tr>
<tr><td></td><td></td><td>a. Check amp draw of each glow plug</td><td>Refer to Section 2.14</td></tr>
</table>

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
41	**ENGINE STALLED**		
	• TRIGGER–ON: In engine mode, the engine is running, RPM sensor is good, and engine speed is less than 10 RPM; or The engine is running, RPM sensor alarm is ON, and the Oil Pressure switch contacts are open. • UNIT CONTROL: Unit shutdown in electric. Alarm only in standby. • RESET CONDITION: Auto Reset after 15 minutes, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Was Engine Shut Off Manually?**	
		a. Check for external cause	Correct problem.
	2.	**Check For RPM Sensor Alarm**	
		a. Check for Alarm 130	When both Alarm 41 and (usually) Alarm 130 are present, there is insufficient fuel to run engine.
	3.	**Check Engine Oil Pressure Switch**	
		a. Inspect switch, connector pins, and terminals.	No physical damage to switch. No damaged or corroded pins in plug.
		b. Check engine oil switch operation.	Contacts closed when oil pressure is above 15 PSIG (1.02 Bars). Contacts open when oil pressure is below 12 PSIG (0.82 Bars).
	4.	**Check For Bad F2 or F3 Fuse Alarm**	
		a. Check for Alarm 71	Alarm conditions must be corrected and the alarm cleared to continue.
	5.	**Check Fuel System**	
		a. Check for Alarm 1	Fill tank as needed
		b. Check fuel gauge and fuel tank level.	Fill tank as needed
		c. Check fuel flow	Unrestricted fuel flow through system Fuel not gelled
		d. Check fuel system prime	No air in fuel system
		e. Check fuel system check valve from filter to injection pump.	Check valve must hold fuel and not leak back
	6.	**Check Fuel Solenoid**	
		a. Check run relay.	Unit in Component Test mode – Run Relay ON.
		b. Check Run Relay LED	Must be ON
		c. Check voltage to fuel solenoid	12 VDC between FSC–C (ground) and FSH–A (hold) with engine starter energized. 12 VDC between FSC–C (ground) and FSP–B (pick)
		d. Inspect solenoid, connector pins, and terminals.	No damage to solenoid. No damaged or corroded pins.
		e. Inspect harness, control box connector pins, and terminals. (See wiring schematic).	No physical damage to harness. No damaged or corroded pins.
		f. Check resistance of solenoid	Refer to Section 2.14.
		g. Check operation of solenoid	Plunger must move in when energized.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
41	**ENGINE STALLED (Continued)**		
	• TRIGGER–ON: In engine mode, the engine is running, RPM sensor is good, and engine speed is less than 10 RPM; or The engine is running, RPM sensor alarm is ON, and the Oil Pressure switch contacts are open. • UNIT CONTROL: Unit shutdown in electric. Alarm only in standby. • RESET CONDITION: Auto Reset after 15 minutes, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
	7.	**Check Engine RPM**	
		a. Check actual engine RPM using hand held tachometer.	Adjust engine linkage setting as needed.
		b. Compare actual RPM with those shown on display.	Both readings within ± 50 RPM.
	8.	**Check Engine Air–intake System**	
		a. Check air filter indicator	Flag must not be visible.
		b. Inspect air intake system	Hoses & tubes in good condition. No kinks or restrictions
	9.	**Check Engine Exhaust System**	
		a. Inspect the exhaust system	Must be clear and unobstructed
	10.	**Check Engine**	
		a. Check Injection pump timing	Timing must be correct
		b. Check engine valve adjustment	Rocker arm clearance must be correct
		c. Check engine compression	Compression must be above 400 PSIG (27.2 Bar)
	11.	**Check Refrigeration System**	
		a. Check discharge & suction pressures	Must be within normal operating range for conditions
	12.	**Check Electrical System For Overload**	
		a. Generator or motor electrical overload (short to ground, phase to phase short)	Ohm the electrical components and circuits to ground. Repair and replace damaged parts as necessary

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
7.6 WARNING / STATUS ALARMS			
51	**ALTERNATOR NOT CHARGING**		
	• TRIGGER–ON: Unit is running on either engine or standby and the current flow is more than −1.0 amps (discharge) between the battery charger and the battery for 3 continuous minutes. • UNIT CONTROL: Engine operation: alarm only or (if configured for shutdown)engine and unit shutdown and alarm. Standby operation: alarm only. • RESET CONDITION: Auto Reset (if not shut down) when alternator is charging if not shutdown or change unit to standby operation or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Microprocessor Current Sensor**	
		a. Check micro current value	Power up micro in PC Mode. (See Note 3.) Must be −2.0 to 1.5A with no load.
	2.	**Check Wire Direction Through Current Sensor**	
		a. Visually inspect wire at current sensor.	Must go through current sensor in the direction of the arrow on the sensor **toward** F−5 (80A) fuse.
	3.	**Check Battery Charger Wiring**	
		a. Check output & ground wire (unit OFF)	Negative lead on Ground terminal Positive lead on Output terminal = same as battery voltage.
		b. Check battery charger input	Must be between 350 VAC and 575 VAC Must be between the two red Wires
		c. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
		d. Check output wire (unit running)	Must have 13 or more VDC (when tested against − battery post)
		e. Check ground wire (unit running)	Must have 13 or move VDC (when tested against + battery post)
	4.	**Check For Add–on Equipment Drawing Too Much Current**	
		a. Check amperage of added–on components & accessories	All add–on components & accessories must draw less than 20 Amps
	5.	**Perform Pre−trip Check**	
		a. Run pre−trip & check for alarms	Any active alarms must be corrected and cleared before proceeding.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
53	**BOX TEMP OUT−OF−RANGE**		
	• TRIGGER−ON: **Alarm Only:** **Condition One:** If the unit is not running in Sleep Mode and Compartment One box temperature has been in range [within ±2.7°F (±1.5°C) for perishable setpoints or +2.7°F (±1.5°C) for frozen setpoints] at least once since the unit was started and is now further away from setpoint than the limit set in the functional parameters for the Out−of−Range Value [4°, 5°, or 7°F (2°, 3°, or 4°C)] for 30 continuous minutes OR **Condition Two:** If SAT is configured ON and Compartment One is running in cool and the DeltaT (SAT minus RAT) is not greater than −1°F (0.56°C) for 30 continuous minutes or if Compartment One is running in heat and the SAT2 is not greater than the RAT2 for 30 continuous minutes. OR **Condition Three:** If a shutdown alarm occurs and the RAT2 temperature is further away from setpoint than the limit set in the functional parameters for the Out−of−Range value [4°, 5°, or 7°F (2°, 3°, or 4°C)] for more than 30 continuous minutes regardless if Compartment One box temperature has been in−range. **Shut Down & Alarm:** **Condition One:** When configured for shutdown the unit will shut down when the conditions for Alarm Only Condition One are met for 45 continuous minutes. **Condition Two:** When configured for shutdown the unit will shut down when the conditions for Alarm Only Condition Two are met for 30 continuous minutes. • UNIT CONTROL: Engine and standby operation: If the micro is configured for shutdown and the setpoint for Compartment 2 is in the perishable range − engine and unit shutdown and alarm. If the micro is configured for shutdown and the setpoint for Compartment 2 is in the frozen range, only Compartment 2 will shut off. Otherwise, alarm only. • RESET CONDITION: Auto Reset or Alarm may be manually reset via Keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Compartment Doors**	
		a. Inspect all trailer compartment doors	Must be closed, no air leakage
	2.	**Defrost Evaporator**	
		a. Initiate Manual Defrost Cycle	Must terminate automatically.
	3.	**Check For Low Refrigerant Pressure Alarm**	
		a. Check for alarm 18	Alarm conditions must be corrected and the alarm cleared to continue
	4.	**Check Refrigerant Level**	
		a. Visually check refrigerant level in receiver tank.	Must be at correct level.
	5.	**Check Evaporator Airflow Alarm**	
		a. Check for alarm 56	Must be corrected and cleared to continue
	6.	**Perform Pre−trip Check**	
		a. Run pre−trip & check for alarms	Any active alarms must be corrected and cleared before proceeding.
	7.	**Check System Pressures**	
		a. Install Manifold Test Set and check system pressures.	Suction & Discharge Pressures must be in the normal range. Suction & Discharge Pressures must have the same reading on gauges & on micro display.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
53	**TEMP OUT−OF−RANGE (Continued)**		
NOTE: For Condition One, the temperature criteria for this alarm is reset, and the box temperature must again go In−Range before this alarm can be triggered if any of the following occur: •pre−trip is started •Setpoint is changed •A door switch or remote switch is installed and configured as a door switch			
NOTE: The15, 30, or 45 minute timer is reset and starts again whenever: •The unit cycles off and restarts in Start−Stop •The unit goes into and comes out of Defrost NOTE: This alarm does not go into the Inactive alarm List when it becomes inactive or is cleared. NOTE: This alarm will not be used in Sleep Mode			
54	**DEFROST NOT COMPLETE**		
	• TRIGGER–ON: Defrost cycle did not complete within 45 minutes • UNIT CONTROL: Engine and standby operation: alarm only. While this alarm is active, the Defrost Timer will be set to initiate a defrost cycle 90 minutes (1.5 hours) of unit running time after the alarm comes on. • RESET CONDITION: Auto Reset when defrost cycle is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Perform Pre−trip Check**	
		a. Run pre−trip & check for alarms	Any active alarms must be corrected and cleared before proceeding.
	2.	**Check For Defective Defrost Sensor Location/ Correct Installation**	
		a. Has sensor fallen from location	Must be corrected to continue
	3.	**Check Evaporator Fan Contactor**	
		a. Check that contactor is in operation in defrost	Must disengage fan during defrost

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
55	**CHECK DEFROST AIR SWITCH**		
	• TRIGGER–ON: The defrost air switch has called for a defrost cycle within 8 minutes of a defrost termination for 2 consecutive defrost cycles. (The air switch contact must be closed continuously for 15 seconds before the defrost cycle is started.) • UNIT CONTROL: Engine and standby operation: alarm only. While this alarm is active, the defrost air switch will NOT be used to initiate a defrost cycle; however the Defrost Timer will initiate a defrost cycle 90 minutes after the alarm comes on, and the manual defrost switch will remain operative. • RESET CONDITION: Auto Reset when defrost cycle terminates correctly, and the air switch does not call for a defrost cycle within the 8 minutes following defrost termination, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Defrost Air Switch**	
		a. Inspect switch & connector pins & terminals	No damaged or corroded pins
		b. Check switch setting and resistance of switch contacts	Refer to Section 2.12 Contacts closed with pressure applied to high side Contacts open with no pressure applied
	2.	**Check Switch Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Note 5 No physical damage to harness. No damaged or corroded pins
	3.	**Check Air Switch Hoses**	
		a. Inspect air hoses to switch	No kinks or other obstructions No holes Connected to correct nipple
	4.	**Check Condition Of Evaporator**	
		a. Visually inspect evaporator following defrost.	Coil must be clean and cleared of ice or any other material.
	5.	**Perform Pre–Trip**	
		a. Run Pre–Trip and check for alarms.	Any active alarms must be corrected and cleared before proceeding.
	6.	**Check Evaporator Pressure Drop**	
		a. Check pressure reading with Magnehelic Gauge	Refer to Section 2.12
	7.	**Check Evaporator Contactor**	
		a. Check Evap Fan operation in defrost	Must disengage fan.
	8.	**Check Condition Of Trailer Compartment & Load**	
		a. Check condition of trailer compartment doors & seals	Doors must be closed, and door seals must seal and prevent outside air from leaking in.
		b. Check condition of product. If it is warm and moist, frequent defrost cycles can be expected.	

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
59	**DATALOGGER NOT RECORDING**		
	• TRIGGER–ON: No data is being recorded by the data recorder. • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Alarm may be manually reset via keypad.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Clear Alarm**	
		a. Clear Active Alarm(s)	Alarms Clear
		b. Check for Active Alarm reoccurrence	If Inactive, download all data & retain. If Active, go to next step
	2.	**Microprocessor Defective**	
		a. Download previous data using Download PC Card, or DataManager Program.	Data retrieval OK
		b. Replace microprocessor & set Configurations, Functional Parameters, Enter hours from removed microprocessor, set Maintenance Hour Meters, and Data Recorder Setup.	New microprocessor in place
NOTE: Specific configurations or IntelliSet settings may be found on the TransCentral Website (Authorized Carrier Transicold Dealers only.)			

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
60	**DATALOGGER TIME WRONG**		
	• TRIGGER–ON: The real time clock in the Data Recorder does not contain a valid date. • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset when the Data Recorder Real Time Clock is reset, or alarm may be manually reset by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Real Time Clock**	
		a. Check Real Time Clock in the Data List, or using DataManager or Service Manager.	Must show correct date and time. Change as needed (Configuration List).
	2.	**Reset Microprocessor**	
		a. Turn main switch off for 30 seconds, then turn on.	Microprocessor powers up OK
		b. Check for valid Real Time Clock reading in Data List	Valid date and time in memory. Alarm is cleared automatically
		c. Real Time Clock can not be changed.	Replace microprocessor
	3.	**Microprocessor Defective**	
		a. Download previous data using Download PC Card, or DataManager Program.	Data retrieval OK
		b. Replace microprocessor & set Configurations, Functional Parameters, Enter hours from removed microprocessor, set Maintenance Hour Meters, and Data Recorder Setup.	New microprocessor in place

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
62	**C2 BOX TEMP OUT–OF–RANGE**		
	• TRIGGER–ON: **Alarm Only:** **Condition One:** If the unit is not running in Sleep Mode and Compartment Two box temperature has been in range [within ±2.7°F (±1.5°C) for perishable setpoints or +2.7°F (±1.5°C) for frozen setpoints] at least once since the unit was started and is now further away from setpoint than the limit set in the functional parameters for the Out–of–Range Value [4°, 5°, or 7°F (2°, 3°, or 4°C)] for 30 continuous minutes OR **Condition Two:** If SAT is configured ON and Compartment 2 is running in cool and the DeltaT (SAT minus RAT) is not greater than +1°F (0.56°C) for 30 continuous minutes or if Compartment 2 is running in heat and the SAT2 is not greater than the RAT2 for 30 continuous minutes. OR **Condition Three:** If a shutdown alarm occurs and the RAT2 temperature is further away from setpoint than the limit set in the functional parameters for the Out–of–Range value [4°, 5°, or 7°F (2°, 3°, or 4°C)] for more than 30 continuous minutes regardless if Compartment 2 box temperature has been in–range. **Shut Down & Alarm:** **Condition One:** When configured for shutdown the unit will shut down when the conditions for Alarm Only Condition One are met for 45 continuous minutes. **Condition Two:** When configured for shutdown the unit will shut down when the conditions for Alarm Only Condition Two are met for 30 continuous minutes. • UNIT CONTROL: Engine and standby operation: If the micro is configured for shutdown and the setpoint for Compartment 2 is in the perishable range – engine and unit shutdown and alarm. If the micro is configured for shutdown and the setpoint for Compartment 2 is in the frozen range, only Compartment 2 will shut off. Otherwise, alarm only. • RESET CONDITION: Auto Reset or Alarm may be manually reset via Keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Trailer Compartment Doors**	
		a. Inspect all trailer compartment doors	Must be closed, no air leakage
	2.	**Defrost Evaporator**	
		a. Initiate Manual Defrost Cycle	Must terminate automatically.
	3.	**Check For Low Refrigerant Pressure Alarm**	
		a. Check for Alarm 18	Alarm conditions must be corrected and the alarm cleared to continue
	4.	**Check Refrigerant Level**	
		a. Visually check refrigerant level in receiver tank.	Must be at correct level.
	5.	**Check Evaporator Airflow Alarm**	
		a. Check for Alarm 56	Must be corrected and cleared to continue

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
62	**C2 BOX TEMP OUT−OF−RANGE (Continued)**		
	6.	**Perform Pre−trip Check**	
		a. Run pre−trip & check for alarms	Any active alarms must be corrected and cleared before proceeding.
	7.	**Check System Pressures**	
		a. Install Manifold Test Set and check system pressures.	Suction & Discharge Pressures must be in the normal range. Suction & Discharge Pressures must have the same reading on gauges & on micro display.
NOTE: The temperature criteria for this alarm is reset, and the box temperature must again go In−Range before this alarm can be triggered if any of the following occur: •pre−trip is started •Setpoint is changed •A door switch or remote switch is installed and configured as a door switch			

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
63	**C3 BOX TEMP OUT–OF–RANGE**		
	• TRIGGER–ON: **<u>Alarm Only</u>:** **Condition One:** If the unit is not running in Sleep Mode and Compartment 3 box temperature has been in range [within ±2.7°F (±1.5°C) for perishable setpoints or +2.7°F (±1.5°C) for frozen setpoints] at least once since the unit was started and is now further away from setpoint than the limit set in the functional parameters for the Out–of–Range Value [4°, 5°, or 7°F (2°, 3°, or 4°C)] for 30 continuous minutes OR **Condition Two:** If SAT is configured ON and Compartment 3 is running in cool and the DeltaT (SAT minus RAT) is not greater than −1°F (0.56°C) for 30 continuous minutes or if Compartment 3 is running in heat and the SAT3 is not greater than the RAT3 for 30 continuous minutes. OR **Condition Three:** If a shutdown alarm occurs and the RAT3 temperature is further away from setpoint than the limit set in the functional parameters for the Out–of–Range value [4°, 5°, or 7° F (2°, 3°, or 4° C)] for more than 30 continuous minutes regardless if Compartment 3 box temperature has been in–range. **<u>Shut Down & Alarm</u>:** **Condition One:** When configured for shutdown the unit will shut down when the conditions for Alarm Only Condition One are met for 45 continuous minutes. **Condition Two:** When configured for shutdown the unit will shut down when the conditions for Alarm Only Condition Two are met for 30 continuous minutes. • UNIT CONTROL: Engine and standby operation: If the micro is configured for shutdown and the setpoint for Compartment 3 is in the perishable range – engine and unit shutdown and alarm. If the micro is configured for shutdown and the setpoint for Compartment 3 is in the frozen range, only Compartment 3 will shut off. Otherwise, alarm only. • RESET CONDITION: Auto Reset or Alarm may be manually reset via Keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Trailer Compartment Doors**	
		a. Inspect all trailer compartment doors	Must be closed, no air leakage
	2.	**Defrost Evaporator**	
		a. Initiate Manual Defrost Cycle	Must terminate automatically.
	3.	**Check For Low Refrigerant Pressure Alarm**	
		a. Check for Alarm 18	Alarm conditions must be corrected and the alarm cleared to continue
	4.	**Check Refrigerant Level**	
		a. Visually check refrigerant level in receiver tank.	Must be at correct level.
	5.	**Check Evaporator Airflow Alarm**	
		a. Check for Alarm 56	Must be corrected and cleared to continue

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
63	**C3 BOX TEMP OUT−OF−RANGE (Continued)**		
	6.	**Perform Pre−trip Check**	
		a. Run pre−trip & check for alarms	Any active alarms must be corrected and cleared before proceeding.
	7.	**Check System Pressures**	
		a. Install Manifold Test Set and check system pressures.	Suction & Discharge Pressures must be in the normal range. Suction & Discharge Pressures must have the same reading on gauges & on micro display.
NOTE: The temperature criteria for this alarm is reset, and the box temperature must again go In−Range before this alarm can be triggered if any of the following occur: •pre−trip is started •Setpoint is changed •A door switch or remote switch is installed and configured as a door switch			

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
7.7 ELECTRICAL ALARMS			
71	**BAD F2 OR F3 FUSE**		
	• TRIGGER–ON: One or more of the following fuse circuits have been open for more than 2 seconds: F2, F3 • UNIT CONTROL: Engine operation: this alarm will not activate in engine operation. Standby operation: if the “No Power” configuration is set for “Installed and Shut Down” the refrigeration system will shut down with the alarm on and PSCON still energized. • RESET CONDITION: Alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Unit Operation**	
		a. Did engine shut down?	Yes Check F3 No Check F2
	2.	**Check Fuses**	
		a. Locate blown fuse(s)	Will have open circuit
		b. Verify fuse size	Refer to Section 2.15 Must be correct rating for circuit (see wiring diagram)
		c. Inspect fuse & fuse holder	Terminals tight; No signs of overheating, melting or discoloration
	3.	**Check Circuit**	
		a. Check amperage draw on Speed Relay circuit	Refer to Section 2.14
		b. Check amperage draw on Run Relay circuit	Refer to Section 2.14

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
73	**NO POWER–CHECK POWER CORD**		
	• TRIGGER–ON: In standby mode AND no AC power • UNIT CONTROL: Engine operation: this alarm will not activate in engine operation. Standby operation: if the “No Power” configuration is set for “Installed and Shut Down” the refrigeration system will shut down with the alarm on and PSCON still energized. • RESET CONDITION: Auto Reset when AC power is present AND configuration is set to shutdown or if the user changes the switch to standby operation or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Circuit Breaker On The Main Supply**	
		a. Check circuit breaker	30A supply circuit breaker
		b. Check the voltage in the plug	460V/3/60Hz
	2.	**Check Power Cord**	
		a. Inspect connections in the socket and the plug	Connections must be tight
		b. Inspect the cable	Cable must not be frayed, cut or damaged
	3.	**Check For Power In The Control Box**	
		a. Check for voltage at PSCON L1–L2, L2–L3, L1–L3	All three readings must be 460V ± 10%
		b. Check for voltage at PSCON2 L1–L2, L2–L3, L1–L3	All three readings must be 460V ± 10%
	4.	**Check Connections**	
		a. Check for bad connections in the control box	Connections and wire crimps must be tight

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
75	**COMP MOTOR OVERLOAD**		
	• TRIGGER–ON: Compressor Motor Overload (IPC) circuit is open. • UNIT CONTROL: Engine operation: engine and unit shutdown and alarm. Standby operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto Reset when motor overload input is within limits, or change to engine operation, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For A−13 (Check Download)**	
		a. A13 will always cause this alarm to activate	Review steps for A13 and correct if necessary.
	2.	**Check For Power At MP1**	
		a. If no power (0VDC)	Test IP circuit from compressor motor to microprocessor
		b. If 12VDC	Continue troubleshooting
	3.	**Check Compressor Motor Contactor**	
		a. Inspect the three contacts behind the top cover	If the contactor buttons are blue due to chattering caused by a defective compressor internal protection device, replace the contactor.
		b. Check tightness of the contactor wire connections	Tighten with screwdriver and check for discoloration of wires.
	4.	**Check Motor Operation**	
		a. Turn the unit ON in Engine or Standby mode	Check voltage and current on each phase (must be less than 22 amps)
		b. If current is high	Run pre−trip to check if unloaders and current are excessive

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
76	**CONDENSER MOTOR OVERHEATED**		
	• TRIGGER–ON: One or both of the condenser fan motor (IPCDM1 AND 2) in Compartment One circuit is open. • UNIT CONTROL: Engine operation: engine and unit shutdown and alarm. Standby operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto Reset when motor overload input is within limits, or change to engine operation, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Condenser Fan Motor Contactor**	
		a. Inspect the three contacts behind the top cover	If the contactor buttons are blue due to chattering caused by a defective IP, replace the contactor.
		b. Check tightness of the contactor wire connections	Tighten with screwdriver and check for discoloration of wires.
	2.	**Check Condenser Fan Motors**	
		a. Disconnect power plug at motor	Test IP circuit for continuity using ohmmeter If open, remove and replace motor If closed, then an intermittent IP circuit is suspect. Check phase to phase and phase to ground for short or open circuits See Section 2.13. If motor tests good, check the DC IP circuit to microprocessor.
	3.	**Check Motor Operation**	
		a. Turn the unit ON	Check current on each phase (must be less than shown on Section 2.13). Check voltage on each phase (must be at least 440VAC).

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
77	EVAP MOTOR OVERHEATED		
	• TRIGGER–ON: One or both of the evaporator fan motor (IPEVM1 AND 2) in Compartment One circuit is open. • UNIT CONTROL: Engine and standby operation: compartment 1 evaporator will shut down. All other enabled compartments will continue to run. • RESET CONDITION: Auto Reset when motor overload input is within limits, or change to engine operation, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Evaporator Fan Motor Contactor**	
		a. Inspect the three contacts behind the top cover	If the contactor buttons are blue due to chattering caused by a defective IP, replace the contactor.
		b. Check tightness of the contactor wire connections	Tighten with screwdriver and check for discoloration of wires.
	2.	**Check Evaporator Fan Motors**	
		a. Disconnect power plug at motor	Test IP circuit for continuity using ohmmeter If open, remove and replace motor If closed, then an intermittent IP circuit is suspect. Check phase to phase and phase to ground for short or open circuits See Section 2.13. If motor tests good, check the DC IP circuit to microprocessor.
	3.	**Check Motor Operation**	
		a. Turn the unit ON	Check current on each phase (must be less than shown on Section 2.13). Check voltage on each phase (must be at least 440VAC)
	4.	**Check Motor Operation**	
		a. Turn the unit ON	Check current on each phase (must be less than shown on Section 2.13). Check voltage on each phase (must be at least 440VAC).
83	CHECK REMOTE DEFROST LIGHT		
	• TRIGGER–ON: Defrost light current (amp) draw is higher than 0.8 Amps. • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset when Defrost light current (amp) draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Defrost Light**	
		a. Inspect Defrost light & socket	No damaged or corroded pins
		b. Check resistance of light bulb	Refer to Section 2.14
	2.	**Check Defrost Light Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
84	**CHECK REMOTE ALARM LIGHT**		
	• TRIGGER–ON: Remote Alarm light current (amp) draw is higher than 0.8 Amps. • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset when Alarm light current (amp) draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Alarm Light**	
		a. Inspect Remote Alarm light & socket	No damaged or corroded pins
		b. Check resistance of light bulb	Refer to Section 2.14
	2.		
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins
85	**CHECK UL1 CIRCUIT**		
	• TRIGGER–ON: Front Unloader Coil current (amp) draw is higher than 2.0 Amps. • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset when the UL1 Coil current (amp) draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check UL1 (Front) Unloader Coil**	
		a. Inspect UL1 Unloader coil & terminals	No damage to coil No damaged or corroded pins
		b. Check resistance of coil	Refer to Section 2.14
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check UL1**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check UL1 Unloader Coil Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
86	**CHECK UL2 CIRCUIT** • TRIGGER–ON: Rear Unloader Coil current (amp) draw is higher than 2.0 Amps. • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset when the UL2 Coil current (amp) draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check UL2 (Rear) Unloader Coil**	
		a. Inspect UL2 Unloader coil & terminals	No damage to coil No damaged or corroded pins
		b. Check resistance of coil	Refer to Section 2.14
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check UL2 Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check UL2 Coil Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins
89	**CHECK REMOTE AUTO LIGHT** • TRIGGER–ON: Remote Auto light current (amp) draw is higher than 0.8 Amps. • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset when Auto light current (amp) draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Auto Light**	
		a. Inspect Auto light & socket	No damaged or corroded pins
		b. Check resistance of light bulb	Refer to Section 2.14
	2.	**Check Auto Light Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
91	**CHECK HTCON1 RELAY COIL**		
	• TRIGGER–ON: Heater Contactor 1 Relay (HTCON1R) coil current is more 5 Amps • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check HTCON1R**	
		a. Inspect heater contactor relay coil and terminals	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check HTCON1R Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check HTCON1R Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins
92	**CHECK HTCON2 RELAY COIL**		
	• TRIGGER–ON: Heater contactor 2 Relay (HTCONR2) coil current is more than 5 Amps • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check HTCON2R**	
		a. Inspect heater contactor coil and terminals	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check HTCON2R Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check HTCON2R Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
93	**CHECK START UP BUZZER**		
	• TRIGGER–ON: The Buzzer circuit is shorted. (The Buzzer output from the micro is negative, so the circuit will not be shorted to ground, but is shorted either within the Buzzer itself, or to a positive wire.) • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset when Buzzer amp draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Buzzer**	
		a. Inspect Buzzer & wire connections	No damage to buzzer No damaged or corroded pins
		b. Check resistance of buzzer	Refer to Section 2.14
	2.	**Check Buzzer Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins
	3.	**Check Buzzer Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
94	**CHECK COMP CONTACTOR 1**		
	• TRIGGER–ON: Compressor motor contactor relay (CCONR) coil current is excessive. • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check CCONR**	
		a. Inspect compressor contactor relay coil and terminals	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check CCONR Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins
	3.	**Check CCONR Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
95	**CHECK CDCON RELAY COIL**		
	• TRIGGER–ON: Condenser fan motor contactor coil (CDCON) current is more than 5 Amps • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check CDCON**	
		a. Inspect condenser fan contactor coil and terminals	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check CDCON Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check CDCON**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins
96	**CHECK GENCONR RELAY COIL**		
	• TRIGGER–ON: Generator contactor relay coil (GENCONR) current is more than 5 Amps • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check GENCONR**	
		a. Inspect generator contactor relay coil and terminals	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check GENCONR Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check GENCONR Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
98 **CHECK HIGH TEMP THERMOSTAT** • TRIGGER–ON: With RS in ON position and EVHTS circuit is open. • UNIT CONTROL: Alarm AND no heat allowed for any compartment. • RESET CONDITION: Auto Reset when temperature is okay for 15 minutes, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check High Temperature Thermostat**	
		a. Inspect high temperature thermostat and connector	No damage to switch No damage or corrosion in connector
	2.	**Check High Temperature Contact**	
		a. Contact must be closed when temperature is normal	Unplug EVHTS and check for continuity Check for power on SPK5. Check for power at 4MP4
99 **CHECK STANDBY CONTACTOR** • TRIGGER–ON: Standby motor contactor relay (PSCONR) current is higher than normal. (See Table 2-7). • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset when the PSCONR Coil current (amp) draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check PSCONR**	
		a. Inspect standby contactor relay coil and terminals	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check PSCONR Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check PSCONR Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
100	**OVERLOAD / GROUND FAULT**		
	• TRIGGER–ON: The RS switch is ON and the overload and ground fault detector is reading more than 40 Amps on any A/C current leg OR there is A/C voltage leaking to ground of more than 150 mAmps. • UNIT CONTROL: Engine operation: engine and unit shutdown and alarm. Standby operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto Reset in engine mode. Alarm may be manually reset via Keypad or, alarm may be reset by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Electrical Overload**	
		a. Check amp draw from GENCON if running on engine or PSCON2 if running on standby.	Must be less than 40 Amps
	2.	**Check For High Voltage Short To Ground**	
		a. Check for ohm reading from T1, T2 and T3 of **ALL** High voltage contactors to ground	Reading must be greater than 25.000 Ohms
	3.	**Perform Pre−trip Check**	
		a. Run pre−trip	Note during which test Alarm 100 occurs
		b. Further test circuit from Step a.	If necessary use a megohmmeter to test
	4.	**Check Overload / Ground Fault Device**	
		a. With the engine OFF and standby power disconnected, turn the RS switch one of the compartment switches ON	Must have 12 VDC at HC19 and 2MP26

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
101	**C2 EVAP MOTOR OVERHEATED** • TRIGGER–ON: One or more of the two EVM Internal Motor Protectors (IP) is open. • UNIT CONTROL: In engine and standby: Compartment 2 shutdown only • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Compartment 2 Evaporator Motor Contactor**	
		a. Inspect the three contacts behind the top cover	If the contactor buttons are blue due to chattering caused by a defective IP, replace the contactor.
		b. Check tightness of the contactor wire connections	Tighten with screwdriver and check for discoloration of wires.
	2.	**Check Motor Operation**	
		a. Turn the unit ON	Check current on each phase (must be less than shown on Section 2.13). Check voltage on each phase (must be at least 440VAC).
	3.	**Check Compartment 2 Evaporator Motors**	
		a. Disconnect power plug at motor	Test IP circuit for continuity using ohmmeter If open, remove and replace motor If closed, then an intermittent IP circuit is suspect. Check phase to phase and phase to ground for short or open circuits See Section 2.13. If motor tests good, check the DC IP circuit to microprocessor.
	4.	**Perform Pre–trip Check**	
		a. Run pre–trip & check for alarms	Any active alarms must be corrected and cleared before proceeding.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
102	**C3 EVAP MOTOR OVERHEATED**		
	• TRIGGER–ON: The Remote Fan (3rd compartment) input is outside limits AND not cranking the engine and RS is on. • UNIT CONTROL: Engine and standby: Compartment 3 shutdown only • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Compartment 3 Evaporator Motor Contactor**	
		a. Inspect the three contacts behind the top cover	If the contactor buttons are blue due to chattering caused by a defective IP, replace the contactor.
		b. Check tightness of the contactor wire connections	Tighten with screwdriver and check for discoloration of wires.
	2.	**Check Motor Operation**	
		a. Turn the unit ON	Check current on each phase (must be less than shown on Section 2.13). Check voltage on each phase (must be at least 440VAC).
	3.	**Check Compartment 3 Evaporator Motor**	
		a. Disconnect power plug at motor	Test IP circuit for continuity using ohmmeter If open, remove and replace motor If closed, then an intermittent IP circuit is suspect. Check phase to phase and phase to ground for short or open circuits See Section 2.13. If motor tests good, check the DC IP circuit to microprocessor.
	4.	**Perform Pre–trip Check**	
		a. Run pre–trip & check for alarms	Any active alarms must be corrected and cleared before proceeding.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
103	**CHECK 2HTCON1 RELAY COIL**		
	• TRIGGER–ON: Heater contactor coil current is more than 5 Amps • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check 2HTCON1**	
		a. Inspect heater contactor coil and terminals	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check 2HTCON1 Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check HTCON1 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins
104	**CHECK 2HTCON2 RELAY COIL**		
	• TRIGGER–ON: Heater contactor coil current is more than 5 Amps • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check 2HTCON2**	
		a. Inspect heater contactor coil and terminals	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check 2HTCON2 Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check 2HTCON2 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
105	**CHECK 3HTCON1 RELAY COIL** • TRIGGER–ON: Heater contactor coil current is more than 5 Amps • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check 3HTCON1**	
		a. Inspect heater contactor coil and terminals	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check 3HTCON1 Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check 3HTCON1 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins
106	**CHECK 3HTCON2 RELAY COIL** • TRIGGER–ON: Heater contactor coil current is excessive • UNIT CONTROL: Alarm only • RESET CONDITION: Auto reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check 3HTCON2**	
		a. Inspect heater contactor coil and terminals	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check 3HTCON2 Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check 3HTCON2 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
107	**CHECK 2LSV CIRCUIT**		
	• TRIGGER–ON: Compartment 2 Liquid Solenoid Valve (LSV2) current is more than 5 Amps • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check LSV2**	
		a. Inspect component and wire connections	No damage to coil No damaged or corroded pins
		b. Check coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check LSV2 Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check LSV2 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins
108	**CHECK 3LSV CIRCUIT**		
	• TRIGGER–ON: Compartment 3 Liquid Solenoid Valve (LSV3) current is more than 5 Amps • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check LSV3**	
		a. Inspect component and wire connections	No damage to coil No damaged or corroded pins
		b. Check coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
	2.	**Check LSV3 Current Draw**	
		a. Use Component Test Mode (Refer to Section 5.2.5.2.2) to test actual current draw of the circuit.	Refer to Section 2.14 for normal current values. View current draw in Data List.
	3.	**Check LSV3 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
109	**CHECK 1EVCON RELAY COIL**		
	• TRIGGER–ON: Evaporator fan motor contactor (EVCON) current is more than 5 Amps • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check EVCON**	
		a. Inspect evaporator fan contactor coil and terminals	No damage to coil No damaged or corroded pins
		b. Check coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check EVCON Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins
110	**CHECK 2EVCON RELAY COIL**		
	• TRIGGER–ON: Evaporator fan motor contactor (2EVCON) current is more than 5 Amps • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check 2EVCON**	
		a. Inspect compartment 2 evaporator fan contactor coil and terminals	No damage to coil No damaged or corroded pins
		b. Check coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check 2EVCON Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
111	**CHECK 3EVCON RELAY COIL**		
	• TRIGGER–ON: Evaporator fan motor contactor (3EVCON) current is more than 5 Amps • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check 3EVCON**	
		a. Inspect compartment 3 evaporator fan contactor coil and terminals	No damage to coil No damaged or corroded pins
		b. Check coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil.	Refer to Section 2.14. Use ammeter.
	2.	**Check 3EVCON Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
7.8 SENSOR ALARMS			
121	**CHECK AMBIENT AIR SENSOR**		
	• TRIGGER–ON: Ambient Air Sensor is not within the range of −53°F to +158°F (−47°C to +70° C) • UNIT CONTROL: A value of 122°F (50°C) will be used for any calculations. • RESET CONDITION: Auto Reset when Ambient Air Sensor is in range or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Ambient Air Sensor**	
		a. Inspect Ambient Air Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Ambient Air Sensor resistance (See Note 4)	(Refer to Section 8.29 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Ambient Air Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals. (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
122	**CHECK RETURN AIR SENSOR**		
	• TRIGGER–ON: Return Air Sensor is not within the range of −53°F to +158°F (−47°C to +70° C) • UNIT CONTROL: If Alarm 123 − Check Supply Air Sensor − is not active: alarm only and switch to supply air control. If Alarm 123 is active and functional parameter temperature control is set for return air and the setpoint for compartment One is in the perishable range: alarm and compartment 1 will shut down. If Alarm 123 is active and setpoint is frozen: alarm and compartment one will operate in reduced capacity cool mode. • RESET CONDITION: Auto Reset when Return Air Sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Return Air Sensor**	
		a. Inspect Return Air Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Return Air Sensor resistance (See Note 4)	(Refer to Section 8.29 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Return Air Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
123	**CHECK SUPPLY AIR SENSOR**		
	• TRIGGER–ON: Supply Air Sensor is not within the range of −53°F to +158°F (−47°C to +70° C) • UNIT CONTROL: Engine and standby: If Alarm 122 is not active and functional parameter temperature control is set for supply air and the setpoint for compartment One is in the perishable range: alarm only and switch to return air control. If Alarm 122 is active: set unit control for Alarm 122 • RESET CONDITION: Auto Reset when Supply Air Sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Supply Air Sensor**	
		a. Inspect Supply Air Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Supply Air Sensor resistance (See Note 4)	(Refer to Section 8.29 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Supply Air Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
124	**CHECK DEFROST TERM 1 SENSOR (COMPARTMENT #1)**		
	• TRIGGER–ON: Defrost Term Sensor is not within the range of −53°F to +158°F (−47°C to +70° C) • UNIT CONTROL: Engine and standby: If Alarm 122 is not active: Alarm and RAT will be used for defrost initiation and a heat defrost will end after 10 minutes. If Alarms 122 and 123 are also both active: alarm and defrost will not be allowed. • RESET CONDITION: Auto Reset when DTT1 is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Defrost Termination Sensor 1**	
		a. Inspect Defrost Termination Temperature Sensor 1 & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Defrost Termination Temperature Sensor 1 resistance (See Note 4)	(Refer to Table 8-8 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Defrost Termination Sensor 1 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
125	**CHECK COMP DISCHARGE SENSOR (CDT)**		
	• TRIGGER–ON: Compressor Disch Sensor is not within the range of –40°F to +392°F (–40°C to +200°C) • UNIT CONTROL: Alarm Only • RESET CONDITION: Auto Reset when Compressor Discharge Sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Compressor Discharge Sensor**	
		a. Inspect Compressor Discharge Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Compressor Discharge Sensor resistance (See Note 4)	(Refer to Table 8-8 for complete resistance chart) 100,000 Ohms @ 77°F (25°C)
	2.	**Check Compressor Discharge Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See Wiring schematic)	No physical damage to harness. No damaged or corroded pins
126	**CHECK FUEL SENSOR CIRCUIT**		
	• TRIGGER–ON: The fuel level reading (in the data list) is less than 2% for 30 seconds. • UNIT CONTROL: Alarm Only • RESET CONDITION: Auto Reset when fuel level is sensed above 4% for 30 seconds or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Low Fuel Level**	
		a. Check fuel level in the fuel tank	Add fuel as needed to the fuel tank.
	2.	**Check Fuel Level Sensor**	
		a. Inspect fuel level sensor& connector pins & terminals	No physical damage to sensor. No damaged or corroded pins in plug.
		b. Check fuel level sensor operation	Energize circuit (see Note 2), DO NOT START UNIT.
		c. Check for voltage at harness plug between pins for BLACK (SPK6) and RED (SPK5) wires	Voltage should be 12 volts at harness plug between pins for BLACK (SP24) and RED (SPK5) wires
		d. Check continuity of the wire from the harness plug, pin C to the microprocessor plug 1MP26	RS in OFF position prior to checking for continuity. Must be less than 10 ohms.
	3.	**Check Fuel Level Sensor Calibration**	
		a. Check fuel level sensor calibration	See Section (8.5.1) for sensor calibration procedure.
	4.	**Check Circuits With Test (Substitute) Sensor**	
		a.Substitute known good sensor and clear alarm. Start unit and run for 30 seconds.	
		b.Check to see if alarm re-occurs.	Alarm should not come on. (Install new sensor)
NOTE: If new sensor is not available, the sensor may be configured OFF temporarily. See Section 5.2.1 – Configurations.)			

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
127	**CHECK SUCTION TEMP SENSOR (CST)** • TRIGGER–ON: Suction temp. sensor is not within the range of–53°F to +158°F (–47°C to +70° C) • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Suction Temp Sensor**	
		a. Inspect Suction Temp Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Suction Temp Sensor resistance (See Note 4)	(Refer to Table 8-8 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Suction Temp Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
128	**LOW A/C AMPS** • TRIGGER–ON: If the compressor is on and AC Current Sensor 1 or 2 is less than 5 amps for 10 seconds OR If the difference between AC Current 1 and AC Current 2 is greater than 10 amps for 10 seconds • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Change unit to standby operation when AC Current Sensor 1 and 2 is greater than 7 amps for 5 minutes AND difference between AC Current 1 and AC Current 2 is less than 7 amps for 5 minutes OR alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Perform Pre−trip Check**	
		a. Run pre−trip & check for alarms	Any active alarms must be corrected and cleared before proceeding.
	2.	**Check Current Draw**	
		a. Use a clamp around A/C ammeter to check amps at power wires	Must be ± 1.0 Amp of reading in Data List.
		b. Check A/C amps with compressor running	Must be greater than 5 Amps.
		c. Compare A/C Amp readings between L1−L2−L3	Maximum allowable difference is 10 Amps.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
129	**CHECK ENG COOLANT SENSOR**		
	• TRIGGER–ON: Engine Coolant Sensor is not within the range of −58°F to +266°F (−50°C to +130°C) • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Engine Coolant Sensor**	
		a. Inspect Engine Coolant Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Engine Coolant Sensor resistance (See Note 4)	(Refer to Table 8-8 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Engine Coolant Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
130	**CHECK ENGINE RPM SENSOR**		
	• TRIGGER–ON: Engine mode only. This alarm does not activate in standby. In Auto Start, after the 2nd or 3rd start attempt the Engine Oil Pressure switch is closed (oil pressure good) and engine RPM are sensed at less than 1000 RPM; NOTE: This alarm can only be triggered during the engine starting sequence and during the 20 seconds immediately following. • UNIT CONTROL: Alarm Only and engine will be considered running. • RESET CONDITION: Auto Reset in Auto Start when engine RPM are greater than 1,000 or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Alarm List**	
		a. Check for Alarm 41	When both Alarm 41 and (usually) Alarm 130 are present, there is insufficient fuel to run engine.
	2.	**Check Engine RPM Sensor**	
		a. Inspect Engine RPM Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Compare actual engine RPM with those shown on the display using hand held tachometer.	Must be ± 20 RPM Must be a steady reading.
	3.	**Check Engine RPM Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Note 6 No physical damage to harness. No damaged or corroded pins
		b. Check RPM wiring	Energize circuit (see Note 2). DO NOT START UNIT.
		c. Check voltage reading between plug terminals A & B.	With + lead on A and – lead on C reading should be 5 VDC ±.2 volts. If it is not, check for grounded positive circuit at CSP and CDP transducers.
	4.	**Check Circuits With Test Sensor**	
		a. Substitute known good sensor and check Data reading.	Must be within ± 20 RPM or reading on tachometer

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
131	**CHECK EVAP TEMP SENSOR**		
	• TRIGGER–ON: Evap Temperature Sensor is not within the range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Engine and standby: alarm only and superheat will be calculated using SAT • RESET CONDITION: Auto Reset when Evap Temp Sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Evap Temp Sensor**	
		a. Inspect Evap Temp Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Evap Temp Sensor resistance (See Note 4)	(Refer to Table 8-8 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Evap Temp Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
133	**CHECK REMOTE TEMP SENSOR 1 (2 Compartment Units Only)**		
	• TRIGGER–ON: Remote Temperature Sensor 1 is not within the maximum range of −53°F to +158°F (−47 °C to +70°C) • UNIT CONTROL: Alarm only. • RESET CONDITION: Auto Reset when Remote Temperature Sensor 1 is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Remote Temp Sensor 1**	
		a. Inspect Remote Temp Sensor 1 & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Remote Temp Sensor 1 resistance (See Note 4)	(Refer to Table 8-8 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Remote Temp Sensor 1 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
134	**CHECK REMOTE TEMP SENSOR 2 (2 Compartment Units Only)**		
	• TRIGGER–ON: Remote Temperature Sensor 2 is not within the maximum range of −53°F to +158°F (−47° C to +70°C) • UNIT CONTROL: Alarm only. • RESET CONDITION: Auto Reset when Remote Temperature Sensor 2 is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Remote Temp Sensor 2**	
		a. Inspect Remote Temp Sensor 2 & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Remote Temp Sensor 2 resistance (See Note 4)	(Refer to Table 8-8 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Remote Temp Sensor 2 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
136	**C2 CHK SUPPLY AIR SENSOR (2 Compartment Units Only)**		
	• TRIGGER–ON: Supply Air Temp Sensor 2 is not within the range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Engine and standby operation: alarm only. • RESET CONDITION: Auto Reset when sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Supply Air Temp Sensor 2**	
		a. Inspect Remoter Temp Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Remote Temp Sensor resistance (See Note 4)	(Refer to Table 8-8 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Supply Air Temp 2 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
137	**C2 CHECK RETURN AIR SENSOR (2RAT)**		
	• TRIGGER–ON: Return Air Sensor 2 is not within the range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Engine and standby: If setpoint is in the perishable range, compartment 2 will shut down. If setpoint is in the frozen range, compartment 2 will run in reduced capacity cool. • RESET CONDITION: Auto Reset when sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check 2RAT Sensor**	
		a. Inspect Return Air Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Return Air Sensor resistance (See Note 4)	(Refer to Table 8-8 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check 2RAT Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
138	**C3 CHECK RETURN AIR SENSOR (3RAT)**		
	• TRIGGER–ON: Return Air Sensor 3 is not within the range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Engine and standby: If setpoint is in the perishable range, compartment 3 will shut down. If setpoint is in the frozen range, compartment 3 will run in reduced capacity cool. • RESET CONDITION: Auto Reset when sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check 3RAT Sensor**	
		a. Inspect Return Air Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Return Air Sensor resistance (See Note 4)	(Refer to Table 8-8 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check 3RAT Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
139	**C2 CHECK DEFROST SENSOR (COMPARTMENT 2)**		
	• TRIGGER–ON: Defrost Temp Sensor for Comp 2 is not within the range of –53°F to +158°F (–47°C to +70°C) • UNIT CONTROL: Engine and standby: If Alarm 137 is not active: alarm and 2RAT will be used for defrost initiation and defrost will terminate after 10 minutes. **OR** If Alarm 137 is active and 2SAT is installed and Alarm 136 is not active: alarm and 2SAT will be used for defrost initiation and defrost will terminate after 10 minutes. If Alarm 137 is active and there is no 2SAT OR if both Alarm 137 and 138 are active: alarm and defrost is not allowed for compartment 2. • RESET CONDITION: Auto Reset when sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Compartment 2 Defrost Sensor**	
		a. Inspect compartment 2 Defrost Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check compartment 2 Defrost Sensor resistance (See Note 4)	(Refer to Table 8-8 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Compartment 2 Defrost Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
140	**C3 CHECK DEFROST SENSOR (COMPARTMENT 3)**		
	• TRIGGER–ON: Defrost Temp Sensor for Comp 3 is not within the range of –53°F to +158°F (–47°C to +70°C) • UNIT CONTROL: Engine and standby: If Alarm 138 is not active: alarm and 3RAT will be used for defrost initiation and defrost will terminate after 10 minutes. If Alarm 138 is active : alarm and defrost is not allowed for compartment 3. • RESET CONDITION: Auto Reset when sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Compartment 3 Defrost Sensor**	
		a. Inspect compartment 3 Defrost Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check compartment 3 Defrost Sensor resistance (See Note 4)	(Refer to Table 8-8 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Compartment 3 Defrost Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
7.9 PRE−TRIP ALARMS			
P141 PRE−TRIP STOPPED BY USER • TRIGGER–ON: Pre−trip cycle was stopped by user before the pre−trip cycle ended automatically • UNIT CONTROL: Alarm Only • RESET CONDITION: Alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Any Pre−trip Alarms**	
		a. Scroll the alarm list for any Active pre−trip alarms	Alarm conditions must be corrected and the alarm cleared to continue
	2.	**Rerun Pre−trip Check (If Desired)**	
		a. Place into pre−trip mode	Unit running in pre−trip mode
		b. Allow to terminate automatically	pre−trip cycle operates normally.
P144 CHECK UL1 CIRCUIT • TRIGGER–ON: Normal Amps for the UL1 (Front) Unloader Circuit is 0.75 to 2.0 Amps. The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Bad F4 And F6 Alarm**	
		a. Check for Alarm 72	Pull fuse and test. Replace if required.
	2.	**Check UL1**	
		a. Check amp draw of coil.	Use Component Test Mode (Section 5.2.5.2.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
		b. Check resistance of UL1 coil	Refer to Section 2.14
	3.	**Check UL1 And Circuit**	
		a. Inspect UL1 and wiring	No damage or corrosion Connector fits together tightly, no moisture inside
		b. Check operation of UL1 FET (23)	Energize circuit (see Note 2) LED must be ON
		c. Check voltage to front unloader	Must be 11 VDC or higher across the 2 wires
	4.	**Check UL1 Circuit Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P145 CHECK SPEED SOL CIRCUIT • TRIGGER–ON: Normal Amps for the Speed Solenoid Circuit is 3.0 to 9.0 Amps. The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “pre−trip FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Bad F2 Or F3 Fuse Alarm**	
		a. Check for Alarm 71	Alarm conditions must be corrected and the alarm cleared to continue.
	2.	**Check Speed Solenoid**	
		a. Check amp draw of speed solenoid.	Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
		b. Check resistance of solenoid.	Refer to Section 2.14
	3.	**Check Speed Solenoid & Circuit**	
		a. Inspect speed solenoid and wiring	No physical damage to harness. No damaged or corroded pins No damage to solenoid
		b. Start unit, put setpoint more than 10° away from box temperature and set for Continuous Run. See Note 6	Controller will call for High Speed operation.
		c. Check operation of Speed Relay LED	LED 27 must be ON
		d. Check voltage to speed solenoid	Must be 11 VDC or higher across the 2 wires
	4.	**Check Speed Solenoid Circuit Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>ALARM / CAUSE</th><th>CORRECTIVE ACTION</th></tr>
<tr><td colspan="4">P146 C2 CHECK HEATER 1 CIRCUIT
This device is checked twice in pre−trip − once in Test 2 and again in Test 8.
• TRIGGER–ON TEST 2: Normal amps for the 2HTCON1 contactor coil are .05 to 2.0 D/C Amps (12 VDC). The circuit tests outside this range.
• TRIGGER–ON TEST 8: Normal amps for the 2HTCON1 heaters are 1.0 to 7.0 A/C Amps (460 VAC). The circuit tests outside this range.
• UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”.
• RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via
keypad or by turning the unit off, then back on again.</td></tr>
<tr><td colspan="4">NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.</td></tr>
<tr><td rowspan="5"></td><td>1.</td><td colspan="2">Determine Which Test This Alarm Occurred In</td></tr>
<tr><td rowspan="4"></td><td>a. Review active alarm list</td><td>Make a note of all alarms</td></tr>
<tr><td>b. Clear active alarm list</td><td></td></tr>
<tr><td>c. Restart and monitor pre−trip</td><td>Stop pre−trip during Test #3 by holding = Key for 6 seconds</td></tr>
<tr><td>d. Review active alarm list for Alarm 146</td><td>If alarm is present, follow steps 2 thru 4. If alarm is not present, follow steps 5 thru 10.</td></tr>
<tr><td rowspan="9">12 VDC CIR-CUIT</td><td>2.</td><td colspan="2">Check 2HTCON1</td></tr>
<tr><td rowspan="2"></td><td>a. Inspect heater contactor coil and wire connections</td><td>No damage to coil
No damaged or corroded pins</td></tr>
<tr><td>b. Check contactor coil resistance</td><td>Refer to Section 2.14</td></tr>
<tr><td>3.</td><td colspan="2">Check 2HTCON1 Amp Draw</td></tr>
<tr><td></td><td>a. Check 2HTCON1 amp draw</td><td>Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.</td></tr>
<tr><td>4.</td><td colspan="2">Check 2HTCON1 Wiring</td></tr>
<tr><td></td><td>a. Inspect harness & control box connector pins & terminals (See wiring schematic)</td><td>See Notes 2 & 6
No physical damage to harness.
No damaged or corroded pins</td></tr>
</table>

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P146 C2 CHECK HEATER 1 CIRCUIT (Continued)			
460 VAC CIRCUIT	5.	**Check Evaporator High Temperature Switch (2EVHTS)**	
		a. Inspect for open 2EVHTS per wiring diagram	If open, replace switch as required
	6.	**Check Amp Draw of 2HTCON1 Heater Circuit**	
		a. Use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.13 for all three legs.
	7.	**Check Heater Elements**	
		a. Check heater elements	No visual physical damage No blockage due to debris Remove and replace if required
	8.	**Check Heater Element Plugs And Connections**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	9.	**Verify Accuracy of AC Current Sensor**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	10.	**Check Heater Wiring**	
		a. Use a clamp on ammeter to check the total current draw	Compare to Unit Data
		b. If no fault was found in previous tests	Remove and replace contactor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P147 C2 CHECK HEATER 2 CIRCUIT This device is checked twice in pre−trip − once in Test 2 and again in Test 8. • TRIGGER–ON TEST 2: Normal amps for the 2HTCON2 contactor coil are .05 to 5.0 D/C Amps (12 VDC). The circuit tests outside this range. • TRIGGER–ON TEST 8: Normal amps for the 2HTCON2 heaters are 1.0 to 7.0 A/C Amps (460 VAC). The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “pre−trip FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Determine Which Test This Alarm Occurred In**	
		a. Review active alarm list	Make a note of all alarms
		b. Clear active alarm list	
		c. Restart and monitor pre−trip	Stop pre−trip during Test #3 by holding = Key for 6 seconds
		d. Review active alarm list for Alarm 146	If alarm is present, follow steps 2 thru 4. If alarm is not present, follow steps 5 thru 10.
12 VDC CIR-CUIT	2.	**Check 2HTCON2**	
		a. Inspect heater contactor coil and wire connections	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
	3.	**Check 2HTCON2 Amp Draw**	
		a. Check 2HTCON1 amp draw	Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
	4.	**Check 2HTCON2 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P147 C2 CHECK HEATER 2 CIRCUIT (Continued)			
460 VAC CIRCUIT	5.	**Check Evaporator High Temperature Switch (2EVHTS)**	
		a. Inspect for open 2EVHTS per wiring diagram	If open, replace switch as required
	6.	**Check Amp Draw of 2HTCON2 Heater Circuit**	
		a. Use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.13 for all three legs.
	7.	**Check Heater Elements**	
		a. Check heater elements	No visual physical damage No blockage due to debris Remove and replace if required
	8.	**Check Heater Element Plugs And Connections**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	9.	**Verify Accuracy of AC Current Sensor**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	10.	**Check Heater Wiring**	
		a. Use a clamp on ammeter to check the total current draw	Compare to Unit Data
		b. If no fault was found in previous tests	Remove and replace contactor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P151 CHECK GLOW PLUG CIRCUIT • TRIGGER–ON: Normal Amps for the Glow Plugs Circuit is 23 to 35 Amps after 15 seconds. The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “pre−trip FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Glow Plug Circuit**	
		a. Check voltage to glow plugs	Must be 11 VDC or higher If Power is present, remove buss bar from glow plugs and test individual glow plugs per Table 2-7 If Power is not present, go to step b.
		b. Check operation of Glow Plug Relay	Use component test mode. Energize glow plug circuit. LED 30 must be ON. 12VDC to glow plugs
		c. Check Glow Plug circuit Amps in Component Test Mode	Refer to Section 2.14 for amp values. Use ammeter.
		d. Inspect glow plug relay & socket	No signs of discoloration from overheating No corrosion
	2.	**Check Glow Plug Circuit Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P152 CHECK FUEL SOLENOID CIRCUIT			
		• TRIGGER–ON: Normal Amps for the Fuel Solenoid Hold Circuit is 0.4 to 3.5 Amps (including possible electric fuel pump). The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display "PRE−TRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.	
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Bad F2 Or F3 Fuse Alarm**	
		a. Check for Alarm 71	Alarm conditions must be corrected and the alarm cleared to continue.
	2.	**Check Fuel Solenoid & Circuit**	
		a. Inspect fuel solenoid and wiring	No physical damage to harness. No damaged or corroded pins No damage to solenoid
		b. Check operation of Run Relay	Energize circuits. (See Note 2) LED 28 must be ON
		c. Check voltage to fuel solenoid	RS in Start/Run, Manual Start Mode (See Note 2) 12 VDC between FSCC (ground) & FSHA (hold) With Manual Crank Switch in crank position 12 VDC between FSCC (ground) & FSPB (pick)
	3.	**Check Fuel Solenoid Circuit Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
		b. Check operation of solenoid	Plunger must move in when energized
	4.	**Check Fuel Solenoid**	
		a. Check resistance of fuel solenoid	Refer to Section 2.14
		b. Check amp draw of fuel solenoid.	Use Component Test Mode (Section 5.2.5.2.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
		c. Check operation of solenoid	Plunger must move in when energized

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P153 CHECK RETURN AIR SENSOR			
		• TRIGGER–ON: Return Air Sensor is not within the range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.	
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Return Air Sensor**	
		a. Inspect Return Air Sensor & connector	No physical damage to harness. No moisture, damaged or corroded pins 1MP Plug is connected tightly to microprocessor. No wires are pushed back through plug.
		b. Check Return Air Sensor resistance (See Note 4)	10,000 Ohms @ 77°F (25°C) [See manual for complete table of temperatures and resistance values.]
	2.	**Check Return Air Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
	3.	**Check Remote Sensor Connector (2 Compartment Unit Only)**	
		a.Locate and inspect remote sensor connector	Cap is in place. No physical damage. No moisture or corrosion.
P154 CHECK SUPPLY AIR SENSOR			
		• TRIGGER–ON: Supply Air Sensor is not within the maximum range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.	
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Supply Air Sensor**	
		a. Inspect Supply Air Sensor & connector	No physical damage to harness. No moisture, damaged or corroded pins
		b. Check Supply Air Sensor resistance (See Note 4)	10,000 Ohms @ 77°F (25°C) [See manual for complete table of temperatures and resistance values.]
	2.	**Check Supply Air Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
	3.	**Check Supply Sensor Connector**	
		a.Locate and inspect remote sensor connector	Cap is in place. No physical damage. No moisture or corrosion.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P155 CHECK COOLANT TEMP SENSOR			
• TRIGGER–ON: Engine Coolant Temp Sensor is not within the maximum range of −58°F to +266°F (−50°C to +130°C) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display "PRE−TRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Engine Coolant Sensor**	
		a. Inspect Engine Coolant Sensor & connector	No damage to sensor No moisture, damage or corrosion in connector
		b. Check Engine Coolant Sensor resistance (See Note 4)	10,000 Ohms @ 77°F (25°C) [See manual for complete table of temperatures and resistance values.]
	2.	**Check Engine Coolant Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
P156 CHECK BATTERY VOLTS			
• TRIGGER–ON: Battery voltage is less than 11 VDC or greater than 17 VDC • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display "pre−trip FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check for Battery Voltage Too High Alarm**	
		a. Check for Alarm 15	Alarm conditions must be corrected and the alarm cleared to continue. Test battery charger output Test battery condition Check wiring connections between battery and battery charger
	2.	**Check for Battery Voltage Too Low Alarm**	
		a. Check for Alarm 16	Alarm conditions must be corrected and the alarm cleared to continue. Test battery charger output Test battery condition Check wiring connections between battery and battery charger

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P157 CHECK BATTERY CURRENT • TRIGGER–ON: With all circuits off current flow of more than 1.5 amps is detected in the electrical circuits. NOTE: If this alarm occurs, pre−trip Test #2 will not be performed. You will need to run pre−trip again. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display "PRE−TRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Battery Current Draw.**	
		a. Observe current draw on microprocessor display. (See Note 3)	Must show plus or minus 0.2 amps
	2.	**Check No Load Current Draw**	
		a. Check current draw at 12 VDC current sensor at micro	Energize circuit (see Note 2)
		b. Check micro current reading with no load	Remove wire from inside current sensor and check current draw in Unit Data List. Must be less than 1.0 Amp
	3.	**Check Individual Circuits**	
		a. Isolate individual circuits and test amp draw	Must be in range. (Refer to Section 2.14)
P158 CHECK AMBIENT AIR SENSOR • TRIGGER–ON: Ambient Air Sensor is not within the maximum range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display "PRE−TRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Ambient Air Sensor**	
		a. Inspect Ambient Air Sensor & connector	No damage to sensor No moisture, damage or corrosion in connector
		b. Check Ambient Air Sensor resistance (See Note 4)	10,000 Ohms @ 77°F (25°C) [See manual for complete table of temperatures and resistance values.]
	2.	**Check Ambient Air Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
	3.	**Check Ambient Air Sensor Connector**	
		a. Locate and inspect remote sensor connector	Cap is in place. No physical damage. No moisture or corrosion.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P159 CHECK DEFROST TERM 1 SENSOR (COMPARTMENT 1)			
• TRIGGER–ON: Defrost Termination Temperature Sensor 1 is not within the maximum range of −53°F to +158°F (−47 °C to +70°0 C) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display "PRE−TRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Defrost Termination Temperature Sensor 1**	
		a. Inspect Defrost Termination Temperature Sensor 1 & connector	No damage to sensor No moisture, damage or corrosion in connector
		b. Check Defrost Termination Temperature Sensor 1 resistance (See Note 4)	10,000 Ohms @ 77°F (25°C) [See manual for complete table of temperatures and resistance values.]
	2.	**Check Defrost Termination Temperature Sensor 1 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
	3.	**Check Defrost Termination Temperature Sensor 1 Connector**	
		a.Locate and inspect remote sensor connector	Cap is in place. No physical damage. No moisture or corrosion.
P160 CHECK DISCHARGE TEMP SENSOR			
• TRIGGER–ON: Compressor Discharge Temp Sensor is not within the maximum range of −40°F to +392°F (−40°C to +200°C) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display "PRE−TRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Compressor Discharge Temp Sensor**	
		a. Inspect Compressor Discharge Temp Sensor & connector	No damage to sensor No damage or corrosion in connector 1MP Plug is connected tightly to microprocessor. No wires are pushed back through plug.
		b. Check Compressor Discharge Temp Sensor resistance (See Note 4)	100,000 Ohms @ 77°F (25°C) [See manual for complete table of temperatures and resistance values.]
	2.	**Check Compressor Discharge Temp Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P161 CHECK SUCTION TEMP SENSOR (CST) • TRIGGER–ON: Suction Temp Sensor (CST) is not within the maximum range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset when suction temperature sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Suction Temp Sensor**	
		a. Inspect Suction Temp Sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check Suction Temp Sensor resistance (See Note 4)	(Refer to Section 8.29 for complete resistance chart) 10,000 Ohms @ 77°F (25°C)
	2.	**Check Suction Temp Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
	3.	**Check Suction Temp Sensor Connector**	
		a. Locate and inspect remote sensor connector	Cap is in place. No physical damage. No moisture or corrosion.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P163 C3 CHECK HEATER 1 CIRCUIT This device is checked twice in pre−trip − once in Test 2 and again in Test 8. • TRIGGER–ON TEST 2: Normal amps for the 3HTCON1 contactor coil are .05 to 2.0 D/C Amps (12 VDC). The circuit tests outside this range. • TRIGGER–ON TEST 8: Normal amps for the 3HTCON1 heaters are 0.5 to 7.0 A/C Amps (460 VAC). The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Determine Which Test This Alarm Occurred In**	
		a. Review active alarm list	Make a note of all alarms
		b. Clear active alarm list	
		c. Restart and monitor pre−trip	Stop pre−trip during Test #3 by holding = Key for 6 seconds
		d. Review active alarm list for Alarm 146	If alarm is present, follow steps 2 thru 4. If alarm is not present, follow steps 5 thru 10.
12 VDC CIR-CUIT	2.	**Check 3HTCON1**	
		a. Inspect heater contactor coil and wire connections	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
	3.	**Check 3HTCON1 Amp Draw**	
		a. Check 2HTCON1 amp draw	Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
	4.	**Check 3HTCON1 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P163 C3 CHECK HEATER 1 CIRCUIT (Continued)			
460 VAC CIRCUIT	5.	**Check Evaporator High Temperature Switch (2EVHTS)**	
		a. Inspect for open 2EVHTS per wiring diagram	If open, replace switch as required
	6.	**Check Amp Draw of 3HTCON1 Heater Circuit**	
		a. Use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.13 for all three legs.
	7.	**Check Heater Elements**	
		a. Check heater elements	No visual physical damage No blockage due to debris Remove and replace if required
	8.	**Check Heater Element Plugs And Connections**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	9.	**Verify Accuracy of AC Current Sensor**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	10.	**Check Heater Wiring**	
		a. Use a clamp on ammeter to check the total current draw	Compare to Unit Data
		b. If no fault was found in previous tests	Remove and replace contactor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P164 CHECK UL2 CIRCUIT • TRIGGER–ON: Normal Amps for the UL2 (Rear) Unloader Circuit is 0.75 to 2.0 Amps. The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check For Bad F4 And F6 Alarm**	
		a. Check for Alarm 72	Pull fuse and test. Replace if required.
	2.	**Check UL2**	
		a. Check amp draw of coil.	Use Component Test Mode (Section 5.2.5.2.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
		b. Check resistance of UL1 coil	Refer to Section 2.14
	3.	**Check UL2 And Circuit**	
		a. Inspect UL1 and wiring	No damage or corrosion Connector fits together tightly, no moisture inside
		b. Check operation of UL1 FET (23)	Energize circuit (see Note 2) LED must be ON
		c. Check voltage to front unloader	Must be 11 VDC or higher across the 2 wires
	4.	**Check UL2 Circuit Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P166 C2 CHK SUPPLY AIR SENSOR			
• TRIGGER–ON: Supply Air Sensor is not within the range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Supply Air Sensor**	
		a. Inspect Return Air Sensor & connector	No physical damage to harness. No moisture, damaged or corroded pins 1MP Plug is connected tightly to microprocessor. No wires are pushed back through plug.
		b. Check Return Air Sensor resistance (See Note 4)	10,000 Ohms @ 77°F (25°C) [See manual for complete table of temperatures and resistance values.]
	2.	**Check Supply Air Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
	3.	**Check Remote Sensor Connector (2 Compartment Unit Only)**	
		a. Locate and inspect remote sensor connector	Cap is in place. No physical damage. No moisture or corrosion.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P167 C3 CHECK HEATER 2 CIRCUIT This device is checked twice in pre−trip − once in Test 2 and again in Test 8. • TRIGGER–ON TEST 2: Normal amps for the 3HTCON2 contactor coil are .05 to 5.0 D/C Amps (12 VDC). The circuit tests outside this range. • TRIGGER–ON TEST 8: Normal amps for the 3HTCON2 heaters are 0.5 to 7.0 A/C Amps (460 VAC). The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Determine Which Test This Alarm Occurred In**	
		a. Review active alarm list	Make a note of all alarms
		b. Clear active alarm list	
		c. Restart and monitor pre−trip	Stop pre−trip during Test #3 by holding = Key for 6 seconds
		d. Review active alarm list for Alarm 146	If alarm is present, follow steps 2 thru 4. If alarm is not present, follow steps 5 thru 10.
12 VDC CIR-CUIT	2.	**Check 3HTCON2**	
		a. Inspect heater contactor coil and wire connections	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
	3.	**Check 3HTCON2 Amp Draw**	
		a. Check 2HTCON1 amp draw	Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
	4.	**Check 3HTCON2 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P167 C3 CHECK HEATER 2 CIRCUIT (Continued)			
460 VAC CIRCUIT	5.	**Check Evaporator High Temperature Switch (2EVHTS)**	
		a. Inspect for open 2EVHTS per wiring diagram	If open, replace switch as required
	6.	**Check Amp Draw of 3HTCON2 Heater Circuit**	
		a. Use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.13 for all three legs.
	7.	**Check Heater Elements**	
		a. Check heater elements	No visual physical damage No blockage due to debris Remove and replace if required
	8.	**Check Heater Element Plugs And Connections**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	9.	**Verify Accuracy of AC Current Sensor**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	10.	**Check Heater Wiring**	
		a. Use a clamp on ammeter to check the total current draw	Compare to Unit Data
		b. If no fault was found in previous tests	Remove and replace contactor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P168 C2 CHECK LSV VALVE • TRIGGER–ON: In Test 2: Compartment 2 Liquid Solenoid Valve (LSV2) current is outside the range of 0.75A to 2.0A; OR In Test 14: The suction pressure did not rise as expected when the LSV2 was energized (opened). • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset when LSV2 output is active, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Test 2 alarm:Check C2 LSV Coil**	
		a. Inspect component & wire connections	No damage to coil No damage, moisture, or corrosion in pins Use component test mode to check circuit
		b. Check resistance of UL1 coil	Refer to Section 2.14
	2.	**Test 2 alarm:Check C2 LSV Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
	3.	**Test 14 alarm: Check C2 LSV Valve**	
		a. Manually check operation of C2 LSV valve for proper opening and closing.	Refer to section 8.10. C2 LSV must open and close correctly.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P171 CHECK EVAP & DISC PRESS • TRIGGER–ON: During Test 3, prior to the engine starting, the SMV and the EVXV are both opened to allow the refrigerant system high and low side pressures to equalize. The compressor discharge pressure is less than 170 psig, and the evaporator pressure is more than 80 psig less than the discharge pressure. (This alarm will not become active when the discharge pressure is above 170 psig.) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset when LSV2 output is active, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check that King Valve is open**	
		a. Verify that the King Valve is fully backseated.	King Valve must be backseated to proceed.
	1.	**Check SMV**	
		a. Inspect component & wire connections	No damage to coil No damage, moisture, or corrosion in pins Connections all plugged in securely.
		b. Check	Refer to Section 2.14.
		a.Check CSMV operation using check out procedure (See Section 8.24.2)	Must perform correctly.
	2.	**Check EVXV**	
		a. Inspect EVXV	Check to see if coil is seated on valve properly. (See Section 8.18 for checking and servicing EVXV)
		b. Inspect component and wire connections	
		c.Check coil resistance	
		d.Check coil resistance	
		e. Check basic refrigeration system	
		f. Check the EVXV electrical system	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P174 CHECK LOW SPEED RPM			
		• TRIGGER–ON: With speed relay turned off (speed solenoid de−energized), engine speed is NOT between 1350 and 1580 rpm. If rpm sensor alarm is active, this test will be skipped. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display "PRE−TRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.	
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Verify That Correct Model Number Is Selected**	
		a. Compare model number from unit I.D. label and model number in micro Data List.	The model numbers must be the same.
	2.	**Check Speed Solenoid & Linkage**	
		a. Check speed solenoid plunger	Must move in and out freely
		b. Check engine speed arm & linkage	Must move freely
	3.	**Force Low Speed Operation**	
		a.Change setpoint to within ± 0.5° (± 0.3°C) of box temperature.	Unit will run in low speed. RPM must be within range shown above for each specific model. Adjust speed linkage as needed.
		b. Check operation of Speed Relay LED	LED 27 must be OFF
		c. Check voltage to speed solenoid	Must be 0 VDC
	4.	**Check Engine Air-intake System**	
		a. Check air filter indicator	Flag must not be visible.
		b. Inspect air intake system	Hoses & tubes in good condition. No kinks or restrictions
	5.	**Check Engine Exhaust System**	
		a. Inspect the exhaust system	Must be clear and unobstructed
	6.	**Check Engine RPM**	
		a. Check actual engine RPM using hand held tachometer	Refer to Section 2.9 Adjust engine linkage setting as needed.
		b. Compare actual RPM with those shown on display.	Both readings within ± 50 RPM

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P175 CHECK HIGH SPEED RPM • TRIGGER–ON: With Speed Relay turned on (speed solenoid energized), engine RPM are <u>NOT</u> between 1700 and 2075. If RPM sensor alarm is active, this test will be skipped • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Verify That Correct Model Number Is Selected**	
		a. Compare model number from unit I.D. label and model number in micro Data List.	The model numbers must be the same.
	2.	**Check Speed Solenoid Linkage**	
		a. Check speed solenoid plunger	Must move in and out freely
		b. Check engine speed arm & linkage	Must move freely
	3.	**Force High Speed Operation (See Note 6)**	
		a. Change setpoint if necessary to more than 10°F (5.6°C) away from setpoint.	Controller will call for High Speed operation.
		b. Check operation of Speed Relay	LED 27 must be ON
		c. Check voltage to speed solenoid	Must be 12−14 VDC
	4.	**Check Engine Air-intake System**	
		a. Check air filter indicator	Flag must not be visible.
		b. Inspect air intake system	Hoses & tubes in good condition. No kinks or restrictions
	5.	**Check Engine Exhaust System**	
		a. Inspect the exhaust system	Must be clear and unobstructed
	6.	**Check Engine RPM**	
		a. Check actual engine RPM using hand held tachometer	Refer to Section 2.9 Adjust engine linkage setting as needed.
		b. Compare actual RPM with those shown on display	Both readings within ± 50 RPM

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P176 C3 CHECK LSV VALVE • TRIGGER–ON: Compartment 3 Liquid Solenoid Valve (LSV3) current is outside the range of 0.75A to 2.0A • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset when LSV2 output is active, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check LSV3**	
		a. Inspect component & wire connections	No damage to coil No damage, moisture, or corrosion in pins Use component test mode to check circuit
		b. Check resistance of LSV3 coil	Refer to Section 2.14
	2.	**Check LSV3 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
P177 CHECK EVAP SUPERHEAT • TRIGGER–ON: After microprocessor closes the EVXV, evaporator pressure fails to drop by 20 psig (1.36 Bar) or fails to go below 0 psig • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Valve**	
		a. Inspect EVXV	Check to see if coil is seated on valve properly. (See Section 8.18 for checking and servicing EVXV)
		b. Inspect component and wire connections	
		c.Check coil resistance	
		d.Check coil resistance	
		e. Check basic refrigeration system	
		f. Check the EVXV electrical system	

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P178 CHECK UL1			
		• TRIGGER–ON: The pressure differential between suction and discharge pressures did not change as expected when the UL1 (Front/Rear) Unloader was de-energized/loaded (discharge pressure should rise and suction pressure should drop) or when it was energized/unloaded (discharge pressure should drop and suction pressure should rise. • UNIT CONTROL: Engine and standby operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.	
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check wiring to DPT & SPT**	
		a. Verify that correct wires are connected to each transducer	Plugs to transducers are the same. The correct wire plug must be connected to the proper transducer.
	2.	**Check for Check UL1 Alarm**	
		a. Check for alarm 85 or P144	Alarm conditions must be corrected and the alarm cleared to continue
	3.	**Confirm Compressor Suction Pressure Transducer Is Working**	
		a. Check CSP	Attach manifold gauge set and compare CSP reading from microprocessor display. Repair and Replace if required.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P180 CHECK SUCTION MOD VALVE			
• TRIGGER–ON: After microprocessor attempts to close CSMV, suction pressure fails to drop below 4in. Hg (−0.14 Bar) • UNIT CONTROL: Engine and standby operation: Pretrip will fail and display "PRETRIP FAIL IN TEST 11". • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Software Revision Level**	
		a.Upgrade software.	Revision level must be 04.06.00 or higher.
	2.	**Check Compressor Operation**	
		a.Close suction service valve	Check to see if compressor is capable of pulling a vacuum. During test, do not stay in a vacuum longer than 2 minutes. Vacuum should read −4.13−in. Hg (–0.14 Bar) If compressor will not pump down, repair or replace compressor.
	3.	**Check Suction Modulating Valve**	
		a.Check CSMV operation using check out procedure (See Section 8.24.2)	Must perform correctly.
	4.	**Check Suction Modulating Valve (With Good Compressor)**	
		a.Inspect CSMV	Check to see if coil is operating per Section 8.24.1
		b.Inspect component and wire connections	No damage to coil No damaged or corroded pins
		c.Check the CSMV electrical system	Remove and replace piston and coil assembly if required See Section 8.24.1

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P184 C2 CHECK EVAP FAN MOTOR This device is checked twice in pre−trip − once in Test 2 and again in Test 8. • TRIGGER–ON TEST 2: Normal amps for the 2EVCON contactor coil are .05 to 2.0 D/C Amps (12 VDC). The circuit tests outside this range. • TRIGGER–ON TEST 8: Normal amps for the Compartment 2 Evap Fan motors are 0.1 to 2.0 A/C Amps (460 VAC). The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Determine Which Test This Alarm Occurred In**	
		a. Review active alarm list	Make a note of all alarms
		b. Clear active alarm list	
		c. Restart and monitor pre−trip	Stop pre−trip during Test #3 by holding = Key for 6 seconds
		d. Review active alarm list for Alarm 146	If alarm is present, follow steps 2 thru 4. If alarm is not present, follow steps 5 thru 10.
12 VDC CIR-CUIT	2.	**Check 2EVCON**	
		a. Inspect heater contactor coil and wire connections	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Refer to Section 2.14
	3.	**Check 2EVCON Amp Draw**	
		a. Check 2HTCON1 amp draw	Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
	4.	**Check 2EVCON Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P184 C2 CHECK EVAP FAN MOTOR (Continued)			
460 VAC CIR-CUIT	5.	**Check Evaporator High Temperature Switch (2EVHTS)**	
		a. Inspect for open 2EVHTS per wiring diagram	If open, replace switch as required
	6.	**Check Amp Draw of 2EVCON Heater Circuit**	
		a. Use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.13 for all three legs.
	7.	**Check Heater Elements**	
		a. Check heater elements	No visual physical damage No blockage due to debris Remove and replace if required
	8.	**Check Heater Element Plugs And Connections**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	9.	**Verify Accuracy of AC Current Sensor**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	10.	**Check Heater Wiring**	
		a. Use a clamp on ammeter to check the total current draw	Compare to Unit Data
		b. If no fault was found in previous tests	Remove and replace contactor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P185 C3 CHECK EVAP FAN MOTOR This device is checked twice in pre−trip − once in Test 2 and again in Test 8. • TRIGGER–ON TEST 2: Normal amps for the 3EVCON contactor coil are .05 to 2.0 D/C Amps (12 VDC). The circuit tests outside this range. • TRIGGER–ON TEST 8: Normal amps for the Compartment 3 Evap Fan motors are 0.1 to 2.0 A/C Amps (460 VAC). The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Determine Which Test This Alarm Occurred In**	
		a. Review active alarm list	Make a note of all alarms
		b. Clear active alarm list	
		c. Restart and monitor pre−trip	Stop pre−trip during Test #3 by holding = Key for 6 seconds
		d. Review active alarm list for Alarm 146	If alarm is present, follow steps 2 thru 4. If alarm is not present, follow steps 5 thru 10.
12 VDC CIR-CUIT	2.	**Check 3EVCON**	
		a. Inspect heater contactor coil and wire connections	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Refer to Section 2.14
	3.	**Check 3EVCON Amp Draw**	
		a. Check 2HTCON1 amp draw	Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
	4.	**Check 3EVCON Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P185 C3 CHECK EVAP FAN MOTOR (Continued)			
460 VAC CIRCUIT	5.	**Check Evaporator High Temperature Switch (2EVHTS)**	
		a. Inspect for open 2EVHTS per wiring diagram	If open, replace switch as required
	6.	**Check Amp Draw of 3EVCON Heater Circuit**	
		a. Use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.13 for all three legs.
	7.	**Check Heater Elements**	
		a. Check heater elements	No visual physical damage No blockage due to debris Remove and replace if required
	8.	**Check Heater Element Plugs And Connections**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	9.	**Verify Accuracy of AC Current Sensor**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	10.	**Check Heater Wiring**	
		a. Use a clamp on ammeter to check the total current draw	Compare to Unit Data
		b. If no fault was found in previous tests	Remove and replace contactor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P186 CHECK EVAP OUTLET TEMP • TRIGGER–ON: Evaporator Outlet Temperature Sensor is not within the maximum range of −53°F to +158°F (–47°C to +70°C) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Return Air Sensor**	
		a. Inspect Return Air Sensor & connector	No physical damage to harness. No moisture, damaged or corroded pins 1MP Plug is connected tightly to microprocessor. No wires are pushed back through plug.
		b. Check Return Air Sensor resistance (See Note 4)	10,000 Ohms @ 77°F (25°C) [See manual for complete table of temperatures and resistance values.]
	2.	**Check Return Air Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
	3.	**Check Remote Sensor Connector (Two Compartment Units Only)**	
		a.Locate and inspect remote sensor connector	Cap is in place. No physical damage. No moisture or corrosion.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P187 CHECK HEATER 1 CIRCUIT			
This device is checked twice in pre−trip − once in Test 2 and again in Test 8. • TRIGGER–ON TEST 2: Normal amps for the HTCON1R relay coil are 0 to 1.0 D/C Amps (12 VDC). The circuit tests outside this range. • TRIGGER–ON TEST 8: Normal amps for the HTCON1 heaters are 2.0 to 7.5 A/C Amps (460 VAC). The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display "PRE−TRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Determine Which Test This Alarm Occurred In**	
		a. Review active alarm list	Make a note of all alarms
		b. Clear active alarm list	
		c. Restart and monitor pre−trip	Stop pre−trip during Test #3 by holding = Key for 6 seconds
		d. Review active alarm list for Alarm 146	If alarm is present, follow steps 2 thru 4. If alarm is not present, follow steps 5 thru 10.
12 VDC CIR-CUIT	2.	**Check HTCON1R**	
		a. Inspect heater contactor coil and wire connections	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Refer to Section 2.14
	3.	**Check HTCON1R Amp Draw**	
		a. Check 2HTCON1 amp draw	Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
	4.	**Check HTCON1R Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P187 CHECK HEATER 1 CIRCUIT (Continued)			
460 VAC CIRCUIT	5.	**Check Evaporator High Temperature Switch (2EVHTS)**	
		a. Inspect for open 2EVHTS per wiring diagram	If open, replace switch as required
	6.	**Check Amp Draw of** HTCON1R **Heater Circuit**	
		a. Use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.13 for all three legs.
	7.	**Check Heater Elements**	
		a. Check heater elements	No visual physical damage No blockage due to debris Remove and replace if required
	8.	**Check Heater Element Plugs And Connections**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	9.	**Verify Accuracy of AC Current Sensor**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	10.	**Check Heater Wiring**	
		a. Use a clamp on ammeter to check the total current draw	Compare to Unit Data
		b. If no fault was found in previous tests	Remove and replace contactor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P188 CHECK HEATER 2 CIRCUIT This device is checked twice in pre−trip − once in Test 2 and again in Test 8. • TRIGGER–ON TEST 2: Normal amps for the HTCON2 contactor coil are .05 to 2.0 D/C Amps (12 VDC). The circuit tests outside this range. • TRIGGER–ON TEST 8: Normal amps for the HTCON2 heaters are 1.0 to 3.5 A/C Amps (460 VAC). The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Determine Which Test This Alarm Occurred In**	
		a. Review active alarm list	Make a note of all alarms
		b. Clear active alarm list	
		c. Restart and monitor pre−trip	Stop pre−trip during Test #3 by holding = Key for 6 seconds
		d. Review active alarm list for Alarm 146	If alarm is present, follow steps 2 thru 4. If alarm is not present, follow steps 5 thru 10.
12 VDC CIR-CUIT	2.	**Check HTCON2**	
		a. Inspect heater contactor coil and wire connections	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Refer to Section 2.14
	3.	**Check HTCON2 Amp Draw**	
		a. Check 2HTCON1 amp draw	Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
	4.	**Check HTCON2 Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P188 CHECK HEATER 2 CIRCUIT (Continued)			
460 VAC CIR-CUIT	5.	**Check Evaporator High Temperature Switch (2EVHTS)**	
		a. Inspect for open 2EVHTS per wiring diagram	If open, replace switch as required
	6.	**Check Amp Draw of HTCON2 Heater Circuit**	
		a. Use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.13 for all three legs.
	7.	**Check Heater Elements**	
		a. Check heater elements	No visual physical damage No blockage due to debris Remove and replace if required
	8.	**Check Heater Element Plugs And Connections**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	9.	**Verify Accuracy of AC Current Sensor**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	10.	**Check Heater Wiring**	
		a. Use a clamp on ammeter to check the total current draw	Compare to Unit Data
		b. If no fault was found in previous tests	Remove and replace contactor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P189 CHECK EVAPORATOR FAN MOTOR This device is checked twice in pre−trip − once in Test 2 and again in Test 8. • TRIGGER–ON TEST 2: Normal amps for the 1EVCON contactor coil are .05 to 2.0 D/C Amps (12 VDC). The circuit tests outside this range. • TRIGGER–ON TEST 8: Normal amps for the Compartment 1 Evaporator Fan motors are 0.7 to 3.5 A/C Amps (460 VAC). The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Determine Which Test This Alarm Occurred In**	
		a. Review active alarm list	Make a note of all alarms
		b. Clear active alarm list	
		c. Restart and monitor pre−trip	Stop pre−trip during Test #3 by holding = Key for 6 seconds
		d. Review active alarm list for Alarm 146	If alarm is present, follow steps 2 thru 4. If alarm is not present, follow Steps 5 thru 10.
12 VDC CIR-CUIT	2.	**Check 1EVCON**	
		a. Inspect heater contactor coil and wire connections	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Refer to Section 2.14
	3.	**Check 1EVCON Amp Draw**	
		a. Check 2HTCON1 amp draw	Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
	4.	**Check 1EVCON Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P189 CHECK EVAPORATOR FAN MOTOR (Continued)			
460 VAC CIR-CUIT	5.	**Check Evaporator High Temperature Switch (2EVHTS)**	
		a. Inspect for open 2EVHTS per wiring diagram	If open, replace switch as required
	6.	**Check Amp Draw of 1EVCON Heater Circuit**	
		a. Use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.13 for all three legs.
	7.	**Check Heater Elements**	
		a. Check heater elements	No visual physical damage No blockage due to debris Remove and replace if required
	8.	**Check Heater Element Plugs And Connections**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	9.	**Verify Accuracy of AC Current Sensor**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	10.	**Check Heater Wiring**	
		a. Use a clamp on ammeter to check the total current draw	Compare to Unit Data
		b. If no fault was found in previous tests	Remove and replace contactor

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>ALARM / CAUSE</th><th>CORRECTIVE ACTION</th></tr>
<tr><td colspan="4">P190 CHECK CONDENSER FAN MOTOR
This device is checked twice in pre−trip − once in Test 2 and again in Test 8.
• TRIGGER–ON TEST 2: Normal amps for the CDCON contactor coil are .05 to 2.0 D/C Amps (12 VDC). The circuit tests outside this range.
• TRIGGER–ON TEST 8: Normal amps for the condenser fan motors are 0.8 to 3.5 A/C Amps (460 VAC). The circuit tests outside this range.
• UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”.
• RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via
keypad or by turning the unit off, then back on again.</td></tr>
<tr><td colspan="4">NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.</td></tr>
<tr><td rowspan="17">460 VAC CIR-CUIT</td><td>1.</td><td colspan="2">Check Evaporator High Temperature Switch (2EVHTS)</td></tr>
<tr><td></td><td>a. Inspect for open 2EVHTS per wiring diagram</td><td>If open, replace switch as required</td></tr>
<tr><td>2.</td><td colspan="2">Check Amp Draw of CDCON Heater Circuit</td></tr>
<tr><td></td><td>a. Use a clamp on ammeter to check the current draw of all 3 legs.</td><td>Must be within range shown in Section 2.13 for all three legs.</td></tr>
<tr><td>3.</td><td colspan="2">Check Heater Elements</td></tr>
<tr><td></td><td>a. Check heater elements</td><td>No visual physical damage
No blockage due to debris
Remove and replace if required</td></tr>
<tr><td>4.</td><td colspan="2">Check Heater Element Plugs And Connections</td></tr>
<tr><td rowspan="2"></td><td>a. Disconnect heater element plug</td><td>Heater resistance per Section 2.13
Remove and replace heaters if required</td></tr>
<tr><td>b. Inspect plugs, plug seal and connectors.</td><td>No corrosion, water damage or burning/discoloration
Remove and replace if required</td></tr>
<tr><td>5.</td><td colspan="2">Verify Accuracy of AC Current Sensor</td></tr>
<tr><td rowspan="2"></td><td>a. Disconnect heater element plug</td><td>Heater resistance per Section 2.13
Remove and replace heaters if required</td></tr>
<tr><td>b. Inspect plugs, plug seal and connectors.</td><td>No corrosion, water damage or burning/discoloration
Remove and replace if required</td></tr>
<tr><td>6.</td><td colspan="2">Check Heater Wiring</td></tr>
<tr><td rowspan="2"></td><td>a. Use a clamp on ammeter to check the total current draw</td><td>Compare to Unit Data</td></tr>
<tr><td>b. If no fault was found in previous tests</td><td>Remove and replace contactor</td></tr>
</table>

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P191 CHECK UL2			
		• TRIGGER–ON: The pressure differential between suction and discharge pressures did not change as expected when the UL2 (Front/Rear) Unloader was de-energized/loaded (discharge pressure should rise and suction pressure should drop) or when it was energized/unloaded (discharge pressure should drop and suction pressure should rise. • UNIT CONTROL: Engine and standby operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.	
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check wiring to DPT & SPT**	
		a. Verify that correct wires are connected to each transducer	Plugs to transducers are the same. The correct wire plug must be connected to the proper transducer.
	2.	**Check for Check UL2 Alarm**	
		a. Check for alarm 86 or P164	Alarm conditions must be corrected and the alarm cleared to continue
	3.	**Confirm Compressor Suction Pressure Transducer Is Working**	
		a. Check CSP	Attach manifold gauge set and compare CSP reading from microprocessor display. Repair and Replace if required.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P199 C2 CHECK RETURN AIR SENSOR • TRIGGER–ON: Compartment 2 Return Air Sensor is not within the maximum range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Return Air Sensor**	
		a. Inspect Return Air Sensor & connector	No physical damage to harness. No moisture, damaged or corroded pins 1MP Plug is connected tightly to microprocessor. No wires are pushed back through plug.
		b. Check Return Air Sensor resistance (See Note 4)	10,000 Ohms @ 77°F (25°C) [See manual for complete table of temperatures and resistance values.]
	2.	**Check Return Air Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>ALARM / CAUSE</th><th>CORRECTIVE ACTION</th></tr>
<tr><td colspan="4">P206 CHECK CONDENSER FAN CIRCUIT
This device is checked twice in pre−trip − once in Test 2 and again in Test 8.
• TRIGGER–ON TEST 2: Normal amps for the CDCON contactor are .05 to 2.0 D/C Amps (12 VDC). The circuit tests outside this range.
• TRIGGER–ON TEST 8: Normal amps for the Condenser Fan motors are 0.7 to 3.5 A/C Amps (460 VAC). The circuit tests outside this range.
• UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”.
• RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via
keypad or by turning the unit off, then back on again.</td></tr>
<tr><td colspan="4">NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.</td></tr>
<tr><td rowspan="5"></td><td>1.</td><td colspan="2">Determine Which Test This Alarm Occurred In</td></tr>
<tr><td rowspan="4"></td><td>a. Review active alarm list</td><td>Make a note of all alarms</td></tr>
<tr><td>b. Clear active alarm list</td><td></td></tr>
<tr><td>c. Restart and monitor pre−trip</td><td>Stop pre−trip during Test #3 by holding = Key for 6 seconds</td></tr>
<tr><td>d. Review active alarm list for Alarm 146</td><td>If alarm is present, follow steps 2 thru 4. If alarm is not present, follow Steps 5 thru 10.</td></tr>
<tr><td rowspan="8">12 VDC CIR-CUIT</td><td>2.</td><td colspan="2">Check CDCON</td></tr>
<tr><td rowspan="2"></td><td>a. Inspect heater contactor coil and wire connections</td><td>No damage to coil
No damaged or corroded pins</td></tr>
<tr><td>b. Check contactor coil resistance</td><td>Refer to Section 2.14</td></tr>
<tr><td>3.</td><td colspan="2">Check CDCON Amp Draw</td></tr>
<tr><td></td><td>a. Check 2HTCON1 amp draw</td><td>Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.</td></tr>
<tr><td>4.</td><td colspan="2">Check CDCON Wiring</td></tr>
<tr><td></td><td>a. Inspect harness & control box connector pins & terminals (See wiring schematic)</td><td>See Notes 2 & 6
No physical damage to harness.
No damaged or corroded pins</td></tr>
</table>

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P206 CHECK CONDENSER FAN CIRCUIT (Continued)			
460 VAC CIRCUIT	5.	**Check Evaporator High Temperature Switch (2EVHTS)**	
		a. Inspect for open 2EVHTS per wiring diagram	If open, replace switch as required
	6.	**Check Amp Draw of 1EVCON Heater Circuit**	
		a. Use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.13 for all three legs.
	7.	**Check Heater Elements**	
		a. Check heater elements	No visual physical damage No blockage due to debris Remove and replace if required
	8.	**Check Heater Element Plugs And Connections**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	9.	**Verify Accuracy of AC Current Sensor**	
		a. Disconnect heater element plug	Heater resistance per Section 2.13 Remove and replace heaters if required
		b. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning/discoloration Remove and replace if required
	10.	**Check Heater Wiring**	
		a. Use a clamp on ammeter to check the total current draw	Compare to Unit Data
		b. If no fault was found in previous tests	Remove and replace contactor

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>ALARM / CAUSE</th><th>CORRECTIVE ACTION</th></tr>
<tr><td colspan="4">P207 CHK COMPRESSOR CONTACT CIRC
This device is checked twice in pre−trip − once in Test 2 and again in Test 8.
• TRIGGER–ON: Normal amps for the CCONR relay coil are .0 to 1.0 D/C Amps (12 VDC). The circuit tests outside this range.
• UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”.
• RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via
keypad or by turning the unit off, then back on again.</td></tr>
<tr><td colspan="4">NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.</td></tr>
<tr><td rowspan="9">12 VDC CIR-CUIT</td><td>1.</td><td colspan="2">Check CCONR</td></tr>
<tr><td rowspan="2"></td><td>a. Inspect heater contactor coil and wire connections</td><td>No damage to coil
No damaged or corroded pins</td></tr>
<tr><td>b. Check contactor coil resistance</td><td>Refer to Section 2.14</td></tr>
<tr><td>2.</td><td colspan="2">Check CCONR Amp Draw</td></tr>
<tr><td></td><td>a. Check 2HTCON1 amp draw</td><td>Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.</td></tr>
<tr><td>3.</td><td colspan="2">Check CCONR Wiring</td></tr>
<tr><td></td><td>a. Inspect harness & control box connector pins & terminals (See wiring schematic)</td><td>See Notes 2 & 6
No physical damage to harness.
No damaged or corroded pins</td></tr>
</table>

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P208 CHK GENERATOR CONT CIRC This device is checked twice in pre−trip − once in Test 2 and again in Test 8. • TRIGGER–ON: Normal amps for the GENCONR relay coil are .0 to 1.0 D/C Amps (12 VDC). The circuit tests outside this range. • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
12 VDC CIR-CUIT	1.	**Check GENCONR**	
		a. Inspect heater contactor coil and wire connections	No damage to coil No damaged or corroded pins
		b. Check contactor coil resistance	Refer to Section 2.14
	2.	**Check GENCONR Amp Draw**	
		a. Check 2HTCON1 amp draw	Use Component Test Mode (Section 5.2) to test. Refer to Section 2.14 for amp values. View current draw in Data List.
	3.	**Check GENCONR Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	See Notes 2 & 6 No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P209 CHECK STANDBY CONT CIRCUIT			
		• TRIGGER–ON: Normal amps for the PSCONR relay coil and PSCON or PSCON2 contactor coils is 0.0 to 1.0 amps. The circuit(s) test outside this range. (During this test either PSCON or PSCON2 will be tested depending on the phase reversal module.) • UNIT CONTROL: Engine and standby operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.	
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
NOTE: **IF PRE−TRIP IS DONE IN STANDBY MODE, THIS PRE−TRIP ALARM WILL GENERATE MANY OTHER PRE−TRIP ALARMS. THEREFORE, IT SHOULD BE ADDRESSED FIRST**			
	1.	**Determine Which Component/Circuit Is At Fault**	
		a. Test PSCONR, PSCON and PSCON2 b. Check relay coil resistance	Use Component Test Modes Refer to Section 2.14 for Amp Values
	2.	**Check Faulty Component/Circuit From Test 1 Above**	
		a. Check relay coil resistance	Refer to Section 2.14
	3.	**Check Component Circuit Wiring**	
		a. Inspect component and wiring	No damage or corrosion Connector fits together tightly, no moisture inside
		b. Check operation of component FET (19)	Energize circuit (see Note 2) LED must be ON
		c. Check voltage to component	Must be 11 VDC or higher across the 2 wires
	4.	**Check Component Circuit Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P210 C3 CHECK RETURN AIR SENSOR • TRIGGER–ON: Compartment 3 Return Air Sensor is not within the maximum range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Alarm Only • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Return Air Sensor**	
		a. Inspect Return Air Sensor & connector	No physical damage to harness. No moisture, damaged or corroded pins 1MP Plug is connected tightly to microprocessor. No wires are pushed back through plug.
		b. Check Return Air Sensor resistance (See Note 4)	10,000 Ohms @ 77°F (25°C) [See manual for complete table of temperatures and resistance values.]
	2.	**Check Return Air Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
P211 CHECK DEFROST SENSOR (2DTT) • TRIGGER–ON: Defrost Sensor for Compartment 2 is not within the range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Compartment 2 Defrost Sensor**	
		a. Inspect Return Air Sensor & connector	No physical damage to harness. No moisture, damaged or corroded pins 1MP Plug is connected tightly to microprocessor. No wires are pushed back through plug.
		b. Check Return Air Sensor resistance (See Note 4)	10,000 Ohms @ 77°F (25°C) [See manual for complete table of temperatures and resistance values.]
	2.	**Check Compartment 2 Defrost Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
	3.	**Check Remote Sensor Connector (2 Compartment Units Only)**	
		a.Locate and inspect remote sensor connector	Cap is in place. No physical damage. No moisture or corrosion.
P212 C3 CHECK DEFROST SENSOR (3DTT) • TRIGGER–ON: Defrost Sensor for Compartment 3 is not within the range of −53°F to +158°F (−47°C to +70°C) • UNIT CONTROL: Engine and standby operation: pre−trip will fail and display “PRE−TRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if pre−trip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Compartment 3 Defrost Sensor**	
		a. Inspect Return Air Sensor & connector	No physical damage to harness. No moisture, damaged or corroded pins 1MP Plug is connected tightly to microprocessor. No wires are pushed back through plug.
		b. Check Return Air Sensor resistance (See Note 4)	10,000 Ohms @ 77°F (25°C) [See manual for complete table of temperatures and resistance values.]
	2.	**Check Compartment 3 Defrost Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
7.10 MAINTENANCE ALARMS			
223	**ENGINE MAINTENANCE DUE**		
	• TRIGGER–ON: The Engine Maintenance Hour Meter time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1.	**Check Unit Maintenance Records**	
		a. Schedule unit into service facility for maintenance	Must be done soon!
	2.	**Perform Maintenance**	
		a. Perform appropriate engine & unit maintenance	Follow instructions on proper maintenance form
	3.	**Reset Engine Maintenance Hour Meter**	
		a. Check that the Engine Maintenance Hour Meter interval is set for your requirements.	Reset Interval in Configuration List as required.
		b. Reset Engine Maintenance Hour Meter for the next service interval	Hour Meter is reset in the Functional Parameter list. Follow maintenance interval recommendations in Section 8.1.
224	**STANDBY MAINTENANCE DUE**		
	• TRIGGER–ON: The electric motor Hour Meter time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1.	**Check Unit Maintenance Records**	
		a. Schedule unit into service facility for maintenance	Must be done soon!
	2.	**Perform Maintenance**	
		a. Perform appropriate engine & unit maintenance	Follow instructions on proper maintenance form
	3.	**Reset General Maintenance Hour Meter**	
		a. Check that the General Maintenance Hour Meter interval is set for your requirements.	Reset Interval in Configuration List as required.
		b. Reset General Maintenance Hour Meter for the next service interval	Hour Meter is reset in the Functional Parameter list. Follow maintenance interval recommendations in Section 8.1.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
225	**GENERAL MAINTENANCE DUE**		
	• TRIGGER–ON: The General Maintenance Hour Meter time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1.	**Check Unit Maintenance Records**	
		a. Schedule unit into service facility for maintenance	Must be done soon!
	2.	**Perform Maintenance**	
		a. Perform appropriate engine & unit maintenance	Follow instructions on proper maintenance form
	3.	**Reset General Maintenance Hour Meter**	
		a. Check that the General Maintenance Hour Meter interval is set for your requirements.	Reset Interval in Configuration List as required.
		b. Reset General Maintenance Hour Meter for the next service interval	Hour Meter is reset in the Functional Parameter list. Follow maintenance interval recommendations in Section 8.1.
226	**SERVICE SOON–PM #1 DUE**		
	• TRIGGER–ON: The Maintenance Hour Meter #1 time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1.	**Check Unit Maintenance Records**	
		a. Schedule unit into service facility for maintenance	Must be done soon!
	2.	**Perform Maintenance**	
		a. Perform appropriate engine & unit maintenance	Follow instructions on proper maintenance form
	3.	**Reset Maintenance Hour Meter #1**	
		a. Check that Maintenance Hour Meter #1 interval is set for your requirements.	Reset Interval in Configuration List as required.
		b. Reset Maintenance Hour Meter #1 for the next service interval	Hour Meter is reset in the Functional Parameter list. Follow maintenance interval recommendations in Section 8.1.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
227	**SERVICE SOON−PM #2 DUE**		
	• TRIGGER–ON: The Maintenance Hour Meter #2 time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1.	**Check Unit Maintenance Records**	
		a. Schedule unit into service facility for maintenance	Must be done soon!
	2.	**Perform Maintenance**	
		a. Perform appropriate engine & unit maintenance	Follow instructions on proper maintenance form
	3.	**Reset Maintenance Hour Meter #2**	
		a. Check that Maintenance Hour Meter #2 interval is set for your requirements.	Reset Interval in Configuration List as required.
		b. Reset Maintenance Hour Meter #2 for the next service interval	Hour Meter is reset in the Functional Parameter list. Follow maintenance interval recommendations in Section 8.1.
228	**SERVICE SOON−PM #3 DUE**		
	• TRIGGER–ON: The Maintenance Hour Meter #3 time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1.	**Check Unit Maintenance Records**	
		a. Schedule unit into service facility for maintenance	Must be done soon!
	2.	**Perform Maintenance**	
		a. Perform appropriate engine & unit maintenance	Follow instructions on proper maintenance form
	3.	**Reset Maintenance Hour Meter #3**	
		a. Check that Maintenance Hour Meter #3 interval is set for your requirements.	Reset Interval in Configuration List as required.
		b. Reset Maintenance Hour Meter #3 for the next service interval	Hour Meter is reset in the Functional Parameter list. Follow maintenance interval recommendations in Section 8.1.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
229	**SERVICE SOON–PM #4 DUE** • TRIGGER–ON: The Maintenance Hour Meter #4 time has expired. • Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1.	**Check Unit Maintenance Records**	
		a. Schedule unit into service facility for maintenance	Must be done soon!
	2.	**Perform Maintenance**	
		a. Perform appropriate engine & unit maintenance	Follow instructions on proper maintenance form
	3.	**Reset Maintenance Hour Meter #4**	
		a. Check that Maintenance Hour Meter #4 interval is set for your requirements.	Reset Interval in Configuration List as required.
		b. Reset Maintenance Hour Meter #4 for the next service interval	Hour Meter is reset in the Functional Parameter list. Follow maintenance interval recommendations in Section 8.1.
230	**SERVICE SOON–PM #5 DUE** • TRIGGER–ON: The Maintenance Hour Meter #5 time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1.	**Check Unit Maintenance Records**	
		a. Schedule unit into service facility for maintenance	Must be done soon!
	2.	**Perform Maintenance**	
		a. Perform appropriate engine & unit maintenance	Follow instructions on proper maintenance form
	3.	**Reset Maintenance Hour Meter #5**	
		a. Check that Maintenance Hour Meter #5 interval is set for your requirements.	Reset Interval in Configuration List as required.
		b. Reset Maintenance Hour Meter #5 for the next service interval	Hour Meter is reset in the Functional Parameter list. Follow maintenance interval recommendations in Section 8.1.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
7.11 MICROPROCESSOR ALARMS			
232 SETPOINT ERROR			
• TRIGGER–ON: There is an error in the Setpoint that is stored in the microprocessor memory • UNIT CONTROL: Unit Shutdown & Alarm • RESET CONDITION: Auto Reset when a valid Setpoint is entered, or alarm may be manually reset by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Setpoint**	
		a. Check Setpoint setting b. Enter new Setpoint	Must be between −30°C to +32°C (−22°F to +89.6°F)
	2.	**Reset Microprocessor**	
		a. Turn the RS off for 30 seconds, then turn back on. b. Valid Setpoint can not be entered.	The microprocessor powers up OK and the latest setpoint appears in the display. Replace microprocessor
233 MODEL # ERROR			
• TRIGGER–ON: There is an error in the Model Number that is stored in the microprocessor memory • UNIT CONTROL: Unit Shutdown & Alarm • RESET CONDITION: Auto Reset only when a valid Model number is entered.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Model Number**	
		a. Check Model Number in microprocessor b. Enter correct Model Number	Must be a valid Model Number from Configuration List. From Configuration List, select correct Model Number.
	2.	**Reset Microprocessor**	
		a. Turn RS off for 30 seconds, then turn back on. b. Check for valid Model number in Data List. c. Valid model number can not be entered.	Microprocessor powers up OK Valid number is present. Alarm is cleared Replace microprocessor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
234	**UNIT SERIAL # ERROR**		
	• TRIGGER–ON: There is an error in the Unit Serial Number that is stored in the microprocessor memory • UNIT CONTROL: Unit Shutdown & Alarm • RESET CONDITION: Auto Reset only when a valid Model number is entered.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Unit Serial Number**	
		a. Check Model Number in microprocessor	Must be a valid Model Number from Configuration List.
		b. Enter correct Model Number	From Configuration List, select correct Model Number.
	2.	**Reset Microprocessor**	
		a. Turn RS off for 30 seconds, then turn back on.	Microprocessor powers up OK
		b. Check for valid Model number in Data List.	Valid number is present. Alarm is cleared
		c. Valid model number can not be entered.	Replace microprocessor
235	**CONTROL SERIAL # ERROR**		
	• TRIGGER–ON: There is an error in the Microprocessor Serial Number that is stored in the microprocessor memory • UNIT CONTROL: Unit Shutdown & Alarm • RESET CONDITION: Auto Reset only when a valid Model number is entered.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Microprocessor Serial Number**	
		a. Check Model Number in microprocessor	Must be a valid Model Number from Configuration List.
		b. Enter correct Model Number	From Configuration List, select correct Model Number.
	2.	**Reset Microprocessor**	
		a. Turn RS off for 30 seconds, then turn back on.	Microprocessor powers up OK
		b. Check for valid Model number in Data List.	Valid number is present. Alarm is cleared
		c. Valid model number can not be entered.	Replace microprocessor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
236	**TRAILER ID # ERROR**		
	• TRIGGER–ON: There is an error in the Trailer ID Number that is stored in the Microprocessor memory • UNIT CONTROL: Unit Shutdown & Alarm. • RESET CONDITION: Auto Reset when valid Functional Parameters are entered, or alarm may be manually reset by turning the unit off, then back on again		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Trailer ID Number**	
		a. Check Functional Parameters	All must be set for selectable values
	2.	**Reset Microprocessor**	
		a. Turn RS off for 30 seconds, then turn back on. b. Check for valid Functional Parameters in Functional Parameters List. c. Valid Functional Parameter(s) can not be entered.	Microprocessor powers up OK Valid number is present. Alarm is cleared Replace microprocessor
237	**FUNCTION PARAMETERS ERROR**		
	• TRIGGER–ON: There is an error in one or more of the Functional Parameters that are stored in the microprocessor memory • UNIT CONTROL: Incorrect Functional Parameter(s) will be automatically set for default value. • RESET CONDITION: Auto Reset when valid Functional Parameters are entered, or alarm may be manually reset by turning the unit off, then back on again		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Functional Parameters**	
		a. Check Functional Parameters	All must be set for selectable values
	2.	**Reset Microprocessor**	
		a. Turn RS off for 30 seconds, then turn back on. b. Check for valid Functional Parameters in Functional Parameters List. c. Valid Functional Parameter(s) can not be entered.	Microprocessor powers up OK Valid number is present. Alarm is cleared Replace microprocessor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
238	**CONFIGURATIONS 1 ERROR**		
	• TRIGGER–ON: There is an error in Configuration Group 1 that is stored in the microprocessor memory • UNIT CONTROL: Incorrect Configuration(s) will be automatically set for default value. • RESET CONDITION: Auto Reset when valid Configuration(s) are entered, or alarm may be manually reset by turning the unit off, then back on again		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Configurations**	
		a. Check Configurations	All must be set for selectable values
	2.	**Reset Microprocessor**	
		a. Turn RS off for 30 seconds, then turn back on.	Microprocessor powers up OK
		b. Check for valid Configurations in Data List.	Valid number is present. Alarm is cleared
		c. Valid Configurations can not be entered.	Replace microprocessor
239	**CONFIGURATIONS 2 ERROR**		
	• TRIGGER–ON: There is an error in Configuration Group 2 that is stored in the microprocessor memory • UNIT CONTROL: Incorrect Configuration(s) will be automatically set for default value. • RESET CONDITION: Auto Reset when valid Configuration(s) are entered, or alarm may be manually reset by turning the unit off, then back on again		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Configurations**	
		a. Check Configurations	All must be set for selectable values
	2.	**Reset Microprocessor**	
		a. Turn RS off for 30 seconds, then turn back on.	Microprocessor powers up OK
		b. Check for valid Configurations in Data List.	Valid number is present. Alarm is cleared
		c. Valid Configurations can not be entered.	Replace microprocessor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
240	**HOUR METER ERROR**		
	• TRIGGER–ON: there is an error in the number of hours in memory for one or more of the system Hour Meters • UNIT CONTROL: Alarm Only • RESET CONDITION: Auto Reset when the Discharge Pressure Sensor is calibrated successfully, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Hour Meters**	
		a. Check Configurations	All must be set for selectable values
	2.	**Reset microprocessor**	
		a. Turn RS off for 30 seconds, then turn back on. b. Check for valid Configurations in Data List. c. Valid Configurations can not be entered.	Microprocessor powers up OK Valid number is present. Alarm is cleared Replace microprocessor
241	**ALARM STATUS ERROR**		
	• TRIGGER–ON: There is an error in an Alarm that is stored in the Microprocessor memory • UNIT CONTROL: Alarm Only • RESET CONDITION: Auto Reset when valid Configuration(s) are entered, or alarm may be manually reset by turning the unit off, then back on again		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Alarms**	
		a. Check Configurations	All must be set for selectable values
	2.	**Reset microprocessor**	
		a. Turn RS off for 30 seconds, then turn back on. b. Check for valid Configurations in Data List. c. Valid Configurations can not be entered.	Microprocessor powers up OK Valid number is present. Alarm is cleared Replace microprocessor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
242	**DIS PRESS CALIBRATE ERROR**		
	• TRIGGER–ON: There is an error in the Discharge Pressure Sensor Calibration value stored in memory • UNIT CONTROL: Alarm Only • RESET CONDITION: Auto Reset when the Discharge Pressure Sensor is calibrated successfully, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Discharge Pressure Reading**	
		a. Check Discharge Pressure Reading	Must read valid data.
	2.	**Calibrate Discharge Pressure Sensor**	
		a. Calibrate Discharge Pressure Sensor. b. Discharge Pressure Sensor can not be successfully calibrated.	Calibration successful. Replace microprocessor
243	**SUCTION/EVAP CALIBRATE ERROR**		
	• TRIGGER–ON: There is an error in the Suction / Evaporator Pressure Sensor Calibration value stored in the microprocessor memory • UNIT CONTROL: Alarm only • RESET CONDITION: Auto Reset when the Suction / Evaporator Pressure Sensor is calibrated successfully, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Suction / Evaporator Pressure Reading**	
		a. Check Suction / Evaporator Pressure Reading	Must read valid data.
	2.	**Calibrate Suction / Evaporator Pressure Sensor**	
		a. Calibrate Suction / Evaporator Pressure Sensor. b. Suction / Evaporator Pressure Sensor can not be successfully calibrated.	Calibration successful. Replace microprocessor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
245	**MICRO SW REV ERROR** • TRIGGER–ON: There is an error in the Microprocessor Revision Number that is stored in the Microprocessor memory. • UNIT CONTROL: Alarm only • RESET CONDITION: Alarm may be manually reset via Keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Microprocessor Software Revision**	
		a. Check Microprocessor Software Revision	Will be a 6 digit number
	2.	**Reset microprocessor**	
		a. Turn RS off for 30 seconds, then turn back on. b. Check for valid Configurations in Data List. c. Valid Configurations can not be entered.	Microprocessor powers up OK Valid number is present. Alarm is cleared Replace microprocessor
246	**EEPROM WRITE FAILURE** • TRIGGER–ON: here is an error in the ability to write information to be stored in the memory. • UNIT CONTROL: Alarm only • RESET CONDITION: Alarm may be manually reset via Keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Microprocessor**	
		a. Check Setpoint setting b.Enter new Setpoint	Must be between −22°F to +89.6°F (−30°C to +32°C) Must be between −22°F to +89.6°F (−30°C to +32°C)
	2.	**Reset Microprocessor**	
		a. Turn main switch off for 30 seconds, then turn on. b. Alarm 246 remains active.	Microprocessor powers up OK Replace microprocessor

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
247	**CONFIGURATIONS 3 ERROR**		
	• TRIGGER–ON: There is an error in Configuration Group 3 that is stored in the microprocessor memory • UNIT CONTROL: Incorrect Configuration(s) will be automatically set for default value. • RESET CONDITION: Alarm may be manually reset via Keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check Configurations**	
		a. Check Configurations	All must be set for selectable values
	2.	**Reset microprocessor**	
		a. Turn RS off for 30 seconds, then turn back on. b. Check for valid Configurations in Data List. c. Valid Configurations can not be entered.	Microprocessor powers up OK Valid number is present. Alarm is cleared Replace microprocessor
248	**CONFIGURATION MODE / HP2 ERROR**		
	• TRIGGER–ON: EEPROM configuration is out of range • UNIT CONTROL: Shutdown and alarm • RESET CONDITION: Auto Reset only when valid info is available for the microprocessor are entered.		
Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1.	**Check microprocessor**	
		a. Check Setpoint setting b. Enter new Setpoint c. Check Functional Parameters	Must be between −22°F to +89.6°F (−30°C to +32°C) Must be between −22°F to +89.6°F (−30°C to +32°C) All settings must be valid.
	2.	**Reset microprocessor**	
		a. Turn RS off for 30 seconds, then turn back on. b. Alarm 248 remains active.	Microprocessor powers up OK Replace microprocessor.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
249	**MICROPROCESSOR ERROR**		
	• TRIGGER–ON: Microprocessor Input Conversion Error • UNIT CONTROL: Shutdown and alarm • RESET CONDITION: Auto Reset when input conversions are valid, or Alarm may be manually reset by turning the unit off, then back on again.		
Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Microprocessor**	
		a. Check Temperature Sensor Data	Must be valid reading for RAT, SAT, AAT, etc.
		b. Check for any Active Sensor Alarms	Must all be cleared.
	2	**Check Microprocessor & Unit Wiring**	
		a. Check Wiring to Micro and at input devices to the micro.	Must not be miss wired to allow 12 VDC on any of the sensor input circuits.
	3	**Reset Microprocessor**	
		a. Turn Start/Run–Off switch off for 30 seconds, then turn back on.	Microprocessor powers up OK
		b. Alarm 249 remains active.	Replace microprocessor.

SECTION 8

SERVICE

WARNING

When performing service and/or maintenance procedures, make certain the unit is disconnected from the power source and that the RS is in OFF position so that it is impossible for the unit to start up automatically during the maintenance operation.

CAUTION

Unit uses R404A and POE oil. The use of inert gas brazing procedures is mandatory for all Carrier Transicold refrigeration units; otherwise compressor failure will occur. For more information Refer to Technical Procedure 98-50553-00 Inert Gas Brazing

NOTE

To avoid damage to the earth's ozone layer, use a refrigerant recovery system whenever removing refrigerant. When working with refrigerants you must comply with all local government environmental laws, U.S.A. EPA section 608.

8.1 MAINTENANCE SCHEDULE

For the most reliable operation and for maximum life, your unit requires regular maintenance. This includes oil and filter changes, fuel and air filter replacement, coolant replacement and pretrip inspections. Maintenance should be performed according to the following schedule:

Table 8-1. Maintenance Schedule

SYSTEM	OPERATION	REFERENCE SECTION
a. Daily Maintenance		
	Pre-Trip Inspection – before starting Pre-Trip Inspection – after starting Check Engine Hours	3.5 3.5 Check
b. Every Service Interval or Annually		
Unit	1. Check unit mounting bolts 2. Check engine and compressor mounting bolts 3. Check door latches & hinges 4. Check gauges, switches and electrical connections 5. Check control box / relay box condition	Check Check Check Check Check
Engine	1. Check engine oil and filter change interval (refer to section **e.** of this table) 2. Check engine hour meter, adjust valves every 4,000 hours 3. Check low oil pressure safety 4. Clean crankcase breather 5. Check engine speeds	8.6.4 Engine manual Check 2.15 2.3

SYSTEM	OPERATION	REFERENCE SECTION
b. Every Service Interval or Annually (Continued)		
Fuel System	1. Clean fuel pump strainer 2. Change fuel filter 3. Check fuel heater (if equipped)	8.4 8.4 ---
Cooling System	1. Check antifreeze using a refractometer (CTD P/N 07-00435-00) 2. Clean radiator/condenser fin surface 3. Check water pump 4. Check water temperature sensor	8.6.2 8.6.2 and 8.28 Check 2.9
Exhaust System	1. Check mounting hardware 2. Check muffler and exhaust pipes	Check Check
Air Intake System	1. Check and reset air filter indicator (if equipped) 2. Check air cleaner element	Check 8.6.6
Starting System	1. Check battery condition 2. Clean battery connections and cable ends 3. Check battery hold down clamps 4. Check starter operation	Check/Replace Check/Replace Check Check
Charging System	1. Check battery charger output voltage 2. Check battery charger amperage	2.13 2.13
A.C. Generator	1. Check voltage output 2. Check amperage output 3. Check condenser and evaporator fan amperages 4. Check compressor amperage 5. Check heater amperages	2.13 2.13 2.13 2.13 2.13
Refrigera-tion System	1. Check air switch and calibrate 2. Check & clean evaporator coil and defrost drain hoses 3. Check operating refrigerant pressure 4. Check calibration of suction pressure transducer 5. Perform Quick Check procedure 6. Perform Pre-Trip inspection 7. Check manual defrost operation	2.12 8.27 Check 8.22 8.2 8.2 Check
Remote Evaporators	1. Check remote evaporator mounting bolts 2. Check & clean remote evaporator coil(s) 3. Check and clear all remote evaporator defrost drains 4. Check remote compartment switches and electrical connections 5. Check remote compartment manual defrost operation 6. Check remote evaporator fan amperage 7. Check remote evaporator heaters 8. At annual service interval see Technical Instruction 98-50264-00 for proper installation and wiring ground inspections.	Check 8.27 Check 8.12 Check 2.13 8.7
c. Every 6000 Hour Maintenance (Normal Operating Conditions)		
Cooling System	1. Drain and flush cooling system **(12,000 hours with Extended Life Coolant)**	Engine Service Guide
d. Every 10,000 Hour Maintenance		
Perform complete annual Preventive Maintenance and the following:		
Fuel System	1. Clean and adjust injector nozzles.	Engine Service Guide

e. Oil Change Intervals	
Oil Type	**Oil Change/ESI Filter Change**
Petroleum	3000 hours/2 yrs
Synthetic*	4000 hours /2 yrs

* Mobil Delvac1 is the only approved synthetic oil. Maximum oil drain interval is two (2) years.

These maintenance schedules are based on the use of approved oils and regular Pretrip inspections of the unit. Failure to follow the recommended maintenance schedule may affect the life and reliability of the refrigeration unit.

8.2 PRETRIP INSPECTION

The following pretrip inspection should be performed before every trip and at regular maintenance intervals.

WARNING
Inspect battery cables for signs of wear, abrasion or damage at every pre trip inspection and replace if necessary. Also check battery cable routing to ensure that clamps are secure and that cables are not pinched or chafing against any components.
BEFORE STARTING ENGINE
Drain water from bottom of fuel tank
Drain water from water separator on fuel filter (if applicable)
Check radiator coolant level
Check condenser coil for cleanliness
Check radiator coil for cleanliness
Check air cleaner and hoses
Check engine oil level
Check condition of water pump belt
Check battery fluid level (if applicable)
Check battery cables and terminals
Check evaporator coil(s) for cleanliness
Check bulkhead and return air screen
Check all defrost water drains
Place in Continuous Run, and start unit.
IMMEDIATELY AFTER STARTING ENGINE
Check fuel lines and filters for leaks
Check oil lines and filters for leaks
Check coolant hoses for leaks
Check exhaust system for leaks
Check condenser fan for proper airflow.
Check evaporator fan for proper airflow.
Check for unusual noises
PRETRIP
Initiate Pre−Trip
List any Pre−trip Alarms

AFTER OPERATING UNIT FOR 15 MINUTES OR MORE
Check refrigerant level
Check compressor oil level
Check for proper temperature control
Check auto−start/stop operation
Initiate defrost and allow to terminate
Check engine speeds
OPERATE IN HIGH SPEED COOL AND RECORD (From Microprocessor Unit Data List)
SUCTION PRESSURE ....
DISCHARGE PRESSURE ....
ENGINE COOLANT TEMP ....
C1 RETURN AIR TEMP ....
C2 RETURN AIR TEMP ....
C3 RETURN AIR TEMP ....
AMBIENT AIR TEMP ....
DEFROST TERM TEMP #1 ....
DEFROST TERM TEMP #2 ....
DEFROST TERM TEMP #3 ....
COMP DISCH TEMP ....
CSMV % ....
EXV % ....
BATTERY VOLTAGE ....
DC CURRENT DRAW ....
ENGINE RPM ....
SOFTWARE REVISION ....
CONTROL SERIAL # ....
UNIT MODEL # ....
HOURS TO ENGINE MAINTENANCE .
HOURS TO UNIT MAINTENANCE ....
TIME LEFT TO PM1 ....
TIME LEFT TO PM2 ....
TIME LEFT TO PM3 ....
TIME LEFT TO PM4 ....
TIME LEFT TO PM5 ....
DATALOGGER TIME & DATE ....
FINAL
Review Functional Parameters
Download recorder data (if required)
Enter Trip Start in Micro

8.3 PRIMING FUEL SYSTEM

8.3.1 Mechanical Fuel Pump

The mechanical fuel lift pump is mounted on the engine next to the injection pump. This pump has a manual plunger for priming the fuel system when the fuel tank has been run dry. (See Figure 8-1).

To prime the fuel system, use the following steps:

a. Turn the bleed valve (Red) counter-clockwise until fully opened.

b. Turn the top of the manual fuel pump plunger counter-clockwise to unlock it. **S-L-O-W-L-Y** (up/down once per second) pump the manual plunger until positive pressure (resistance) is felt. This may take up to 200 strokes. This will indicate fuel flow.

c. Continue to pump **S-L-O-W-L-Y** (up/down once per second) approximately 100 more strokes to fill the filter and bleed the air out of the lines.

d. Start engine. It may be necessary to continue to pump until the engine starts.

e. Depress and turn the top of the manual plunger clockwise to **lock in place.**

f. When engine is running smoothly, turn bleed valve clockwise until fully closed.

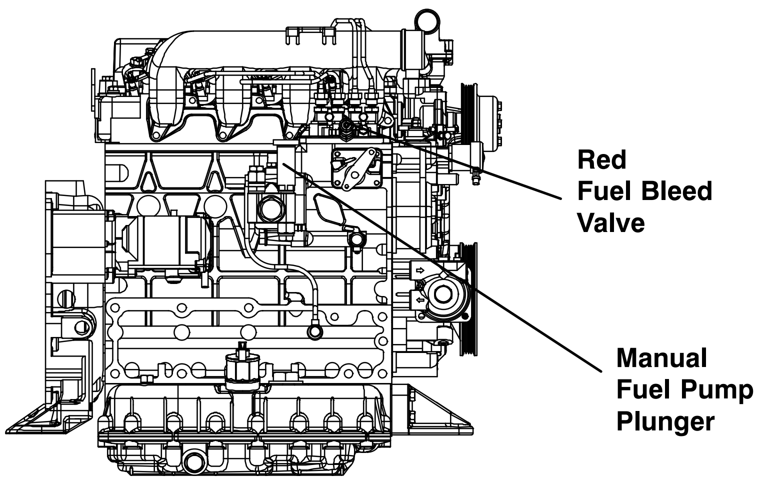
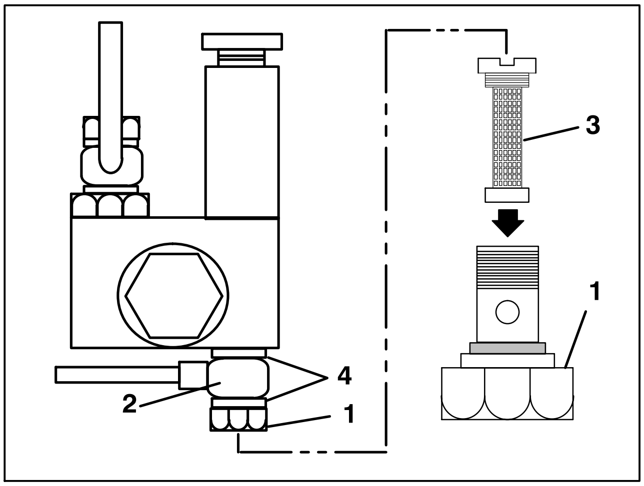


Figure 8-1. Priming Fuel Pump

8.4 SERVICING FUEL PUMP

8.4.1 Mechanical Pump (See Figure 8–2)

Due to foreign particles in the fuel and wax as a result of using the wrong grade of fuel or untreated fuel in cold weather, the fuel filter may become plugged or restricted, and the engine will lose capacity. The filter must be cleaned on a regular schedule such as unit pre-trip or when the oil and fuel filters are changed (Refer to Section 8.1).



1. Nut
2. Banjo
3. Filter
4. Copper Rings

Figure 8–2. Mechanical Fuel Pump

a. Turn nut counter-clockwise to loosen and remove (item 1, Figure 8–2).

b. Remove banjo fitting (item 2) and let it hang loose, making sure to keep copper rings (item 4) for replacement.

c. Turn filter (item 3) counter-clockwise and remove. Check and clean.

d. To install reverse steps 1 through 3.

8.4.2 Electrical Pump – Optional (See Figure 8–3)

To Check or Replace Filter

a. Remove 3 screws from cover (item 1, Figure 8–3).

b. Remove cover, gasket and filter.

c. Wash filter in cleaning solvent and blow out with air pressure. Clean cover.

WARNING

Carefully protect eyes from solvent.

d. To Install reverse above steps.

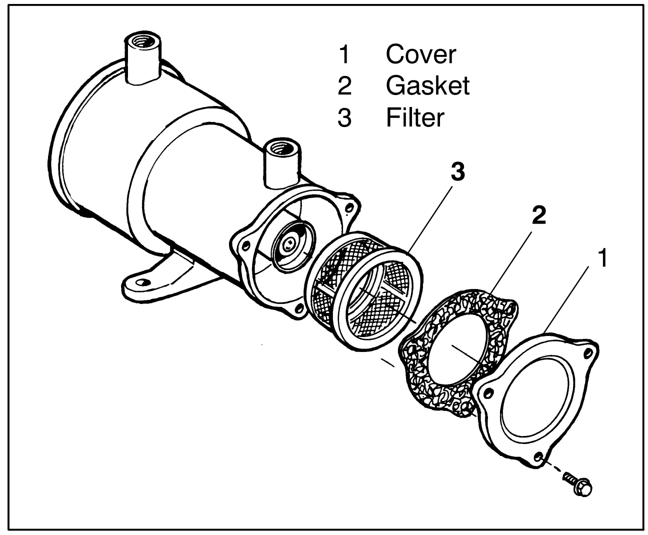


Figure 8–3. Electric Fuel Pump (Optional)

8.5 FUEL LEVEL SENSOR

An optional fuel level sensor (p/n 12-00548-07) supplies an input signal to the microprocessor as to the % of fuel remaining in the fuel tank. The microprocessor then turns on the Check Fuel Level Alarm when the level reaches 15%, and (if configured to do so) turns the engine off when the level reaches 10%.

The 12-00548-07 sensor has the capability of sending the fuel level (from 0% to 100%) to the microprocessor. The fuel tank level will be displayed in the Unit Data List. This sensor may be calibrated if necessary.

8.5.1 Calibrating The 0 To 100% Fuel Level Sensor

NOTE

Both the Empty and the Full level settings should be calibrated whenever a new sensor is installed into a fuel tank.

a. Verify that the wiring is correct. See Figure 8−4 for correct wiring.

b. To adjust the Empty setting, make certain that the fuel tank is empty, and that the sensor is dry. If the sensor has been in the fuel, let it hang to dry for 2 hours before attempting to calibrate.

c. With the sensor in the tank, dry, and the tank empty, turn both the Full and Empty Adjustments to the full *clockwise* position.

d. Turn all Compartment switches OFF and place SROS in Start/Run position.

e. Press the Select Key to bring up the Unit Data List. Scroll through the list until you reach FUEL LEVEL :___%. Press the = key to lock the fuel level into the MessageCenter.

f. Slowly turn the Empty screw counter−clockwise until the display indicates 0%. DO NOT ADJUST ANY FURTHER.

g. Fill the tank with fuel until full.

h. Slowly turn the Full adjusting screw counter−clockwise until the display indicates 100%. DO NOT ADJUST ANY FURTHER.

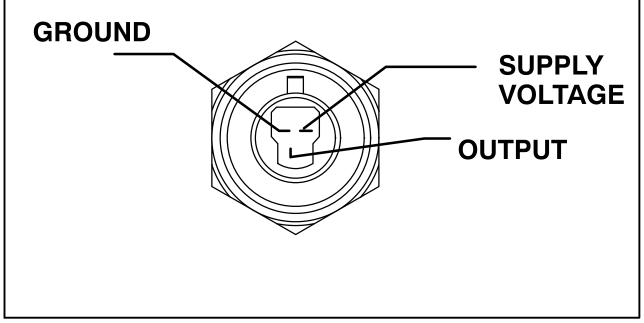


Figure 8−4. Fuel Level Sensor Wiring

8.5.2 Testing The 0 To 100% Fuel Level Sensor

a. Verify that the wiring to sensor is correct.

b. Check voltage at the Fuel Level Sensor with the SROS in the Start/Run position.

c. Voltage between Red Wire (positive) and Black Wire (negative) should be 12.5 to 13.5 VDC. Do not disconnect the Red or Black wires from the switch.

d. Disconnect the White Wire (output) from the sensor. Voltage between Black Wire (negative) and White Wire (output) should be 0 VDC when the switch is dry and out of the fuel.

e. When the switch is immersed into fuel, the voltage reading between Black Wire (negative) and White Wire (output) increase up to 5 VDC when fuel has reached the full mark.

8.6 ENGINE SERVICE AND COMPONENTS

8.6.1 Engine RPM Setup

NOTE

1. The Engine Speeds can ONLY be checked if the Machine is in **Defrost**.
2. Check operation of speed solenoid before setting speed. If solenoid is sticking, clean and lubricate the solenoid in accordance with Technical Instruction 98−50234.

Control

a. Start the unit in Cool Mode.

NOTE

ALL Remote Compartments MUST be Shut Off and only Compartment 1 enabled.

b. Check DDT Temp in Data Menu (See Section 3.15), DTT must be less than 39.9°F (4.4°C)

c. Initiate Manual Defrost (See Section 3.11)

d. Check total current on each phase at AC1 & AC2 output of generator

e. Monitor current and adjust RPM on the engine to obtain 1850 RPM for a current range of 10 to 11.5A. If adjustment is required:

1) Loosen but do not remove the 4−speed solenoid mounting nuts.

2) Turn the jacking nut, allowing the solenoid to move along the slots until the desired high speed is reached. Tighten the solenoid mounting bolts and verify correct high and low speed RPM.

f. Force the machine into low speed

NOTE

NEVER disconnect the Speed Control Solenoid (SCS)

Select Functional Change menu (See Section 3.17)

Select the Parameter “Silent Mode” − “Yes”

g. Check total current on each phase at AC1 & AC2

h. Monitor current & adjust RPM to obtain 1450 RPM for a current range of 8.5 to 8.9A. If adjustment is required hold the speed lever against the low speed stop and check the RPM. Adjust the low speed stop screw if necessary.

i. Check for proper unit operation by running Pretrip (Refer to Section 3.5)

8.6.2 Cooling System

Air flows through the condenser/radiator. The condenser/radiator must be internally and externally clean for adequate cooling. The water pump V-belt must be adjusted periodically to provide maximum air flow. (Refer to Section 8.6.9)

CAUTION

Use only ethylene glycol anti-freeze (with inhibitors) in system as glycol by itself will damage the cooling system. Always add pre-mixed 50/50 anti-freeze and water to radiator/engine. Never exceed more than a 60% concentration of anti-freeze. Use a low silicate anti-freeze meeting GM specifications GM 6038M for standard life coolant or use Texaco Havoline extended life coolant or any other extended life coolant which is Dexcool approved and has 5/150 (5 years/150,000 miles) on the label.

Do the following to service the cooling system:

a. Remove all foreign material from the condenser/radiator coil. Compressed air or water may be used as a cleaning agent. It may be necessary to use warm water mixed with any good commercial dishwasher detergent. Rinse coil with fresh water if a detergent is used.

NOTE

Draining the coolant from the engine petcock will leave approximately 1 quart (.9 liters) of coolant in the block.

b. Drain coolant completely by removing lower radiator hose and radiator cap.

c. Install hose and fill system with clean, untreated water to which 3 − 5% of an alkaline based radiator cleaner is added − 6 oz. (151 grams) to 1 gallon (3.78 liters) of water.

d. Run engine 6 to 12 hours and drain system while warm. Rinse system three times after it has cooled down. Refill system with water.

e. Run engine to operating temperature. Drain system again and fill with 50/50 water/anti-freeze mixture. (see Caution Note and Refer to Section 2.9)

NEVER POUR COLD WATER INTO A HOT ENGINE, however hot water can always be added to a cold engine.

8.6.3 Testing The RPM Sensor

a. Verify that the wiring to sensor is correct.

b. Check voltage at the RPM Sensor connector with the Run Relay energized (Unit running, Unit off, Manual Start Mode selected, and test must be completed within 5 minutes − before the Failed To Start Manual Mode occurs, or Component Test Mode will energize the Run Relay for 5 minutes without starting the unit.)

c. Voltage between ENRPMA−2MP31 and ENRPMC−2MP7 should be 5.0 VDC.

d. Check continuity between ENRPMB and 2MP18.

e. If the above tests check OK, read Warning below. If the RPM display is still not correct, replace the RPM sensor.

WARNING

The +5.0 VDC (terminal B) is common between the Compressor Discharge Pressure Transducer, the Compressor Suction Pressure Transducer, and the RPM sensor. If this circuit is shorted to ground (due to one of the mentioned components being defective, or a worn wire) the MessageCenter will show

Suction Pressure: −14.7 PSIG (−1 Bar)
Discharge Pressure: PSIG/0 Bar
Engine RPM: 0.

8.6.4 Lube Oil Filters

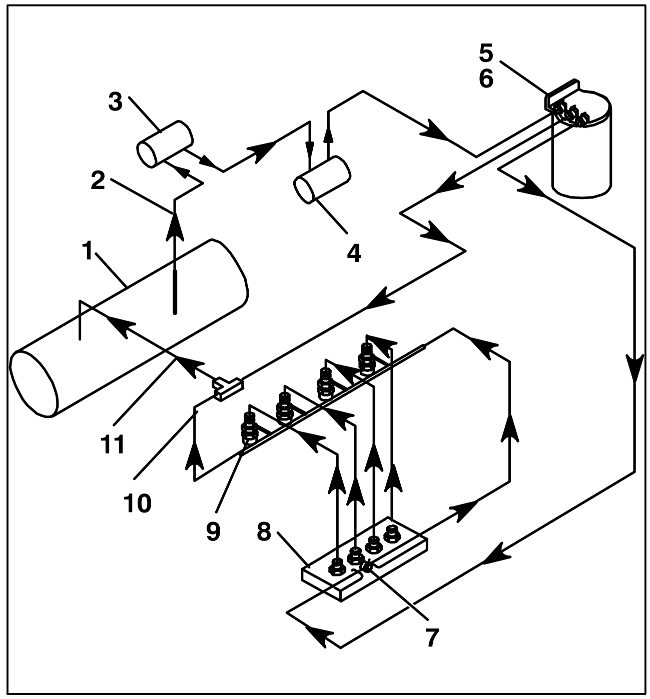
After warming up the engine, stop engine, place shallow drain pan under filter and remove filter. Lightly oil gasket on new filter before installing. Tighten per the filter manufacturer's directions.

CAUTION

When changing oil filters, the new filters should be primed (partially filled) with clean oil if possible. If the filters are not primed, the engine may operate for a period with no oil supplied to the bearings.

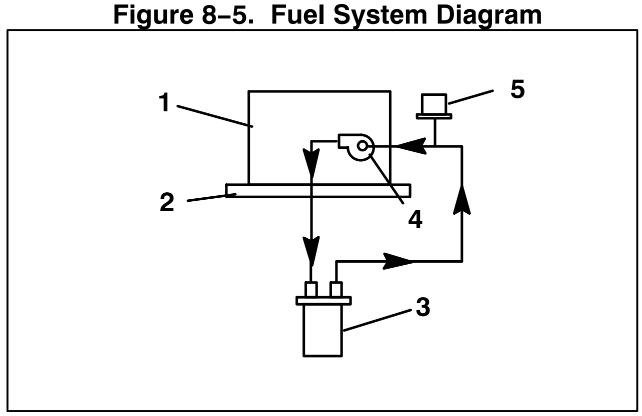
Replace filter(s) and add lube oil. (Refer to Section 2.9) Warm up engine and check for leaks.

a. Lube Oil And Fuel Flow Diagrams



1. Fuel Tank
2. Fuel Supply Line
3. Electric Fuel Pump (Optional)
4. Mechanical Lift Pump
5. Fuel Filter
6. Fuel Warmer (Opti
7. Fuel Bleed Valve
8. Injection Pump
9. Injector Nozzles
10. Fuel Leak-off Line
11. Fuel Return Line

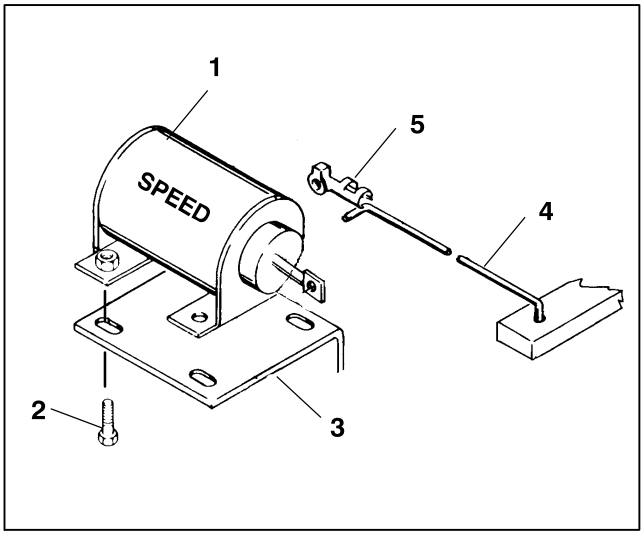
Figure 8−5. Fuel System Diagram



1. Engine Block
2. Oil Pan
3. Full Flow Oil Filter
4. Engine Oil Connection
5. Oil Pressure Switch

Figure 8−6. Lube Oil Flow Diagram

8.6.5 Servicing The Speed Control Solenoid And Linkage



1. Solenoid
2. Bolt
3. Solenoid Bracket
4. Linkage (Speed)
5. Clip

Figure 8-7. Speed Control Solenoid

Solenoid Removal/Replacement (See Section 8.6.1 for RPM adjustment)

a. Disconnect wiring to solenoid. Disconnect linkage arm (Item 4, Figure 8-7) from solenoid. Remove mounting hardware from solenoid and then remove solenoid.

b. Install replacement solenoid and mounting hardware. Do not tighten at this time.

c. Attach linkage to solenoid and install the clip to the linkage rod.

8.6.6 Engine Air Cleaner

Inspection

The dry type air cleaner should be inspected regularly for leaks. A damaged air cleaner or hose can seriously affect the performance and life of the engine. The air cleaner is designed to effectively remove contaminants from the air stream entering the engine. An excessive accumulation of these contaminants in the air cleaner will impair its operation; therefore, a service schedule should be set up and followed. The following simple service steps are easily made while the engine is being serviced in the field:

a. Check all connections for mechanical tightness. Be sure cleaner outlet pipe is not fractured.

b. In case of leakage and if adjustment does not correct the trouble, replace necessary parts or gaskets. *Swelled or distorted gaskets must always be replaced.*

Air Cleaner Service Indicator

The air cleaner indicator is connected to the engine air intake manifold and its function is to indicate when the air cleaner requires replacing. When a plugged air cleaner decreases intake manifold pressure to 20” (500 mm) WG, the indicator moves to the red line. The air cleaner should be replaced and the indicator reset by pressing the reset button.

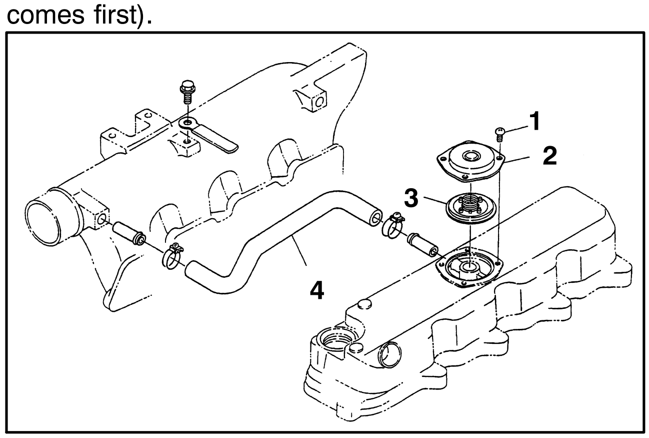
Service Procedure

1. Stop the engine, remove air cleaner. Install new air cleaner.

8.6.7 Engine Crankcase Breather

The engine uses a closed type breather with the breather line attached to the cylinder head cover. (See Figure 8-8)

The breather assembly should be cleaned once a year or at every 3000 hours maintenance interval (whichever comes first).



1. Screw
2. Breather Cover
3. Breather Valve
4. Breather Tube

Figure 8-8. Engine Crankcase Breather

8.6.8 Servicing Glow Plugs

The total circuit amp draw for the glow plug circuit is checked during a Pretrip cycle. When servicing, the glow plug is to be fitted carefully into the cylinder head to prevent damage to glow plug. Torque value for the glow plug is 14 to 18 ft-lb (1.9 to 2.5 Mkg).

Checking for a Defective Glow Plug

a. The entire circuit may be tested using Component Test Mode. (Refer to Section 5.2.2.)

b. To test individual glow plugs, disconnect all glow plugs from each other, and place an ammeter (or clip-on ammeter) in series with each glow plug and energize the plugs. See Table 2-5 for glow plug amperage.

8.6.9 Water Pump V−Belt

The water pump v-belt is driven by a sheave on the engine crankshaft. Frayed, cracked or worn belts must be replaced. This belt is a one time use only type and require no tension adjustment.

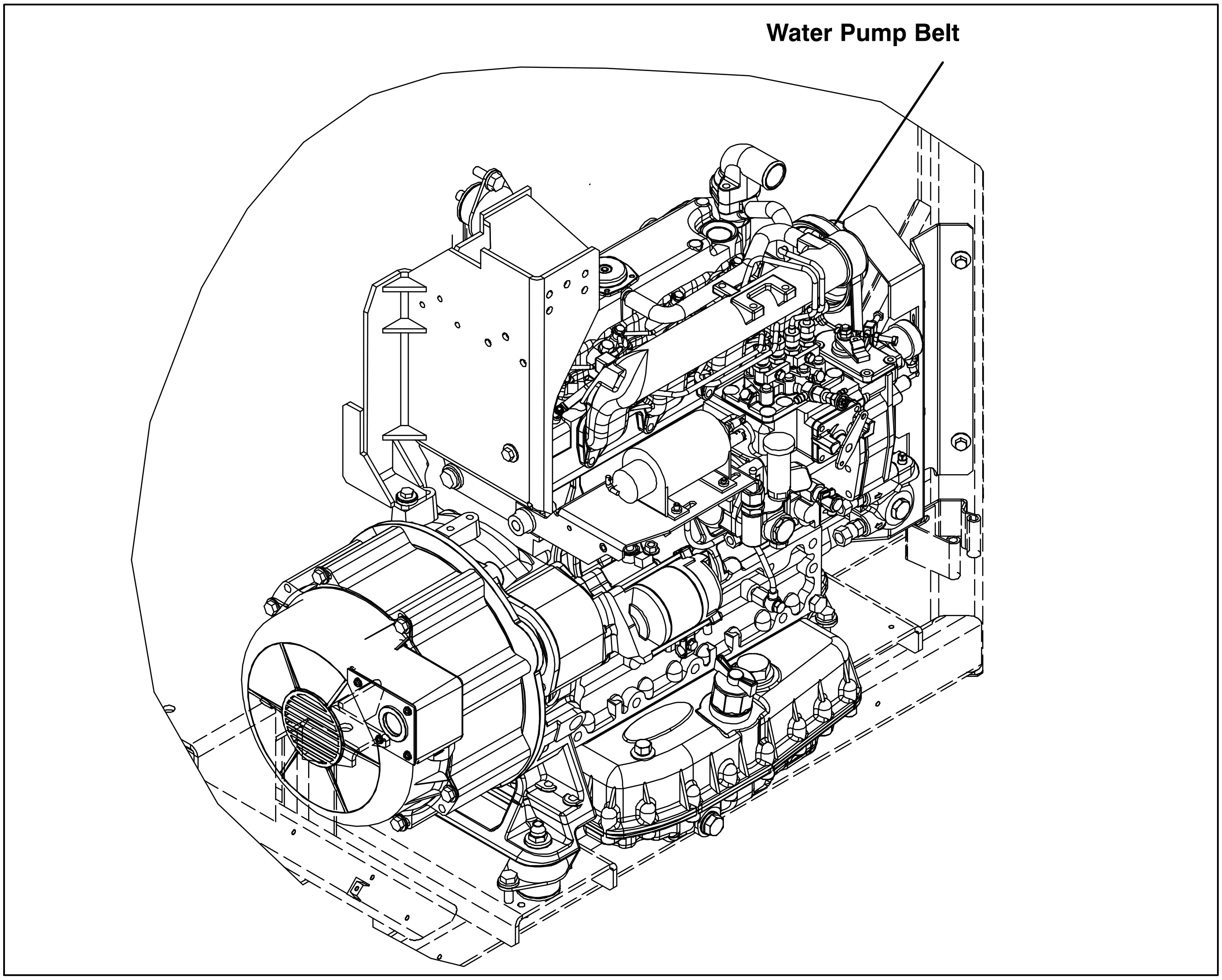


Figure 8−9. Water Pump V−Belt

8.7 EVAPORATOR HEATERS

8.7.1 Description

The evaporator coil heaters are energized through the power supply or the AC generator driven by the diesel engine. They are used to defrost or heat the evaporator coil.

8.7.2 Replacing Heaters

WARNING

When performing service and/or maintenance procedures, make certain the unit is disconnected from the power source and that the RS is in OFF position so that it is impossible for the unit to start up automatically during the maintenance operation.

a. Remove the access panel.

b. Determine which heater(s) need replacing by checking resistance on each heater as shown in section 2.13.

c. Remove hold-down clamp securing heaters to coil.

d. Lift the "U" portion of the heater (with the opposite end down and away from coil). Move heater left (or right) enough to clear the heater end support.

8.7.3 Compartment One Evaporator Blower and Motor

The evaporator blowers circulate air throughout the compartment. The air is drawn through the evaporator coil where it is either heated or cooled and then discharged out the nozzles into the compartment. (Refer to section 2.16.) The blower motor bearings are factory lubricated and do not require additional grease.

NOTE

The evaporator blower assemblies are different for each side and will rotate in opposite directions. There are two blower motor assemblies. See Table 8-2 for correct identification.

Table 8-2 Blower wheels identification

DESCRIPTION	ROTATION	FAN COLOR
Road Side Blower	Counter Clockwise	Black
Curb Side Blower	Clockwise	Off White

Replacing Blower Assembly (See Figure 8–10)

a. From condenser topside of unit : open electrical junction box and disconnect wires for motor to be removed.

b. From condenser topside of unit : unscrew the 4 screws (item 1) and remove. Leave cover plate (item 2) in place.

c. From inside of trailer, remove access grill, back panel and fan guard by removing screws.

d. Evaporator blower assembly (wheel and motor) is an integral part of the blower housing. Unscrew the 4 screws (item 7) and remove both parts (blower assembly and housing) from the pod.

e. Remove blower assembly from housing.

f. Remove spacer (item 5) from old motor and install on new motor.

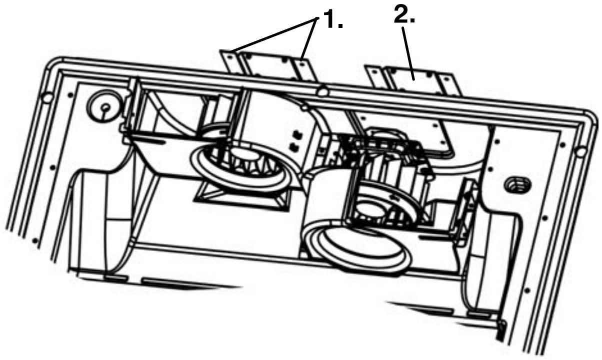
g. Install new blower assembly into blower housing. Install blower assembly and housing back into the pod.

h. From condenser topside of unit : use a screwdriver (item 6) through cover plate and spacer to align spacer.

i. Install bolts (item 1). Start with 2 screws, remove screwdriver and finish assembly with the last 2 screws.

j. Check that fan does not touch ring of the blower housing.

k. Complete the assembly in reverse order of removal.



1. Screws
2. Cover plate
3. Blower housing
4. Evaporator fan
5. Spacer
6. Screw driver
7. Screws

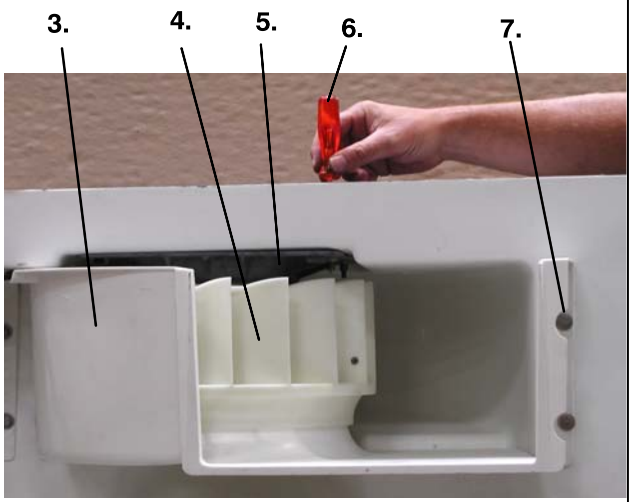


Figure 8−10 Evaporator fan bolts

8.7.4 Condenser Fan And Motor Assemblies

The condenser fans pull air through the condenser coil and discharges over the engine. To replace motor assembly:

a. Open the front door

b. Disconnect wiring. Loosen securing bolts.

c. Remove motor assembly and replace the motor.

d. Install the condenser fan assembly in reverse order of removal.

8.8 BATTERY CHARGER

8.8.1 Description

The battery charger is powered by the generator and charges the 12 Vdc battery.

Figure 8−11. Battery Charger

8.8.2 Checking Battery Charger

NOTE

The battery must be in good condition before doing the following test.

a. Run the unit with the battery charger connected as usual.

NOTE

If there is no load connected at the Vdc output, the battery charger will not deliver voltage.

b. Put an ammeter on the +12 Vdc output of the battery charger. If current are between 3 and 21 Amps the battery charger is functioning correctly.

c. If Amps = 0 check the battery charger input AC voltage. It must be between 350 and 670 Volts.

d. If there is no AC voltage, stop the unit and, if required, disconnect the standby plug. Check the high voltage 3−way connector and the 12 Vdc 2−way connections.

e. If connections are good, replace battery charger.

8.9 GENERATOR

8.9.1 Description

Driven by the diesel engine, the generator delivers AC power to the battery charger, and all the electric motors for the compressor, condenser fans and evaporator fans.

When the unit is in heating or defrost mode, the generator also delivers the AC power to the heater rods located on the evaporator coil.

8.9.2 Preventive Maintenance and Operating Precautions

Costly repairs and down time can usually be prevented by operating electrical equipment under conditions which are compatible with those at which the equipment was designed. Follow the instructions outlined below to ensure maximum efficiency of the electrical equipment.

Cooling

Keep all cooling parts clean. *DO NOT EXCEED TEMPERATURE RISE OF 80°C (176°F) ABOVE A 40°C (104°F) AMBIENT*. This ensures that the NEMA Class "F" insulation will not be damaged. *DO NOT EXCEED RATED LOAD* except as specified for the equipment. *OPERATE GENERATOR AT RATED SPEED*. Failure to operate generators at rated load or speed will cause overheating and possible damage to windings due to over voltage or current.

Drying the Generator Windings

WARNING

Do not direct water or steam into the generator openings. Do not allow any soap and water solutions to enter the generator.

WARNING

High voltage (dielectric) testing must not be performed to the machine without first observing NEMA rules. The insulation of this generator winding may be safely checked by using a megohm meter. A high reading indicates good insulation.

WARNING

Generators of this type should not be "flashed". Operation with external voltage source or momentary shorting of leads will damage the generator and may cause injury.

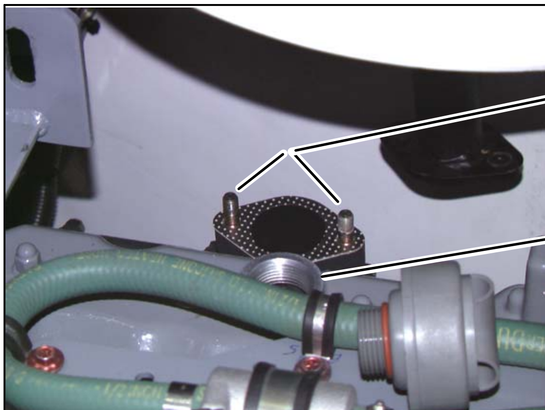
Generators that have been in transit, recently steam cleaned, or in storage for long periods may be subjected to extreme temperature and moisture changes. This can cause excessive condensation, and the generator windings should be thoroughly dried out before bringing the generator up to full nameplate voltage. If this precaution is not taken, serious damage to the generator can result.

The windings may be dried by placing generator in drying oven or hot room or dry with warm air blower directed through windings.

8.9.3 Generator Removal

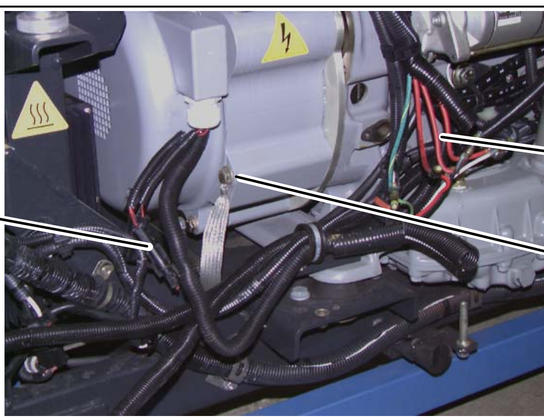
WARNING

Be aware of HIGH VOLTAGE supplied by the generator as the unit may start automatically. Before servicing the unit, make sure the START/RUN-OFF switch is in the OFF position. Also disconnect the negative battery cable. NEVER dis-assemble the generator: HIGH MAGNETIC FIELD INSIDE!



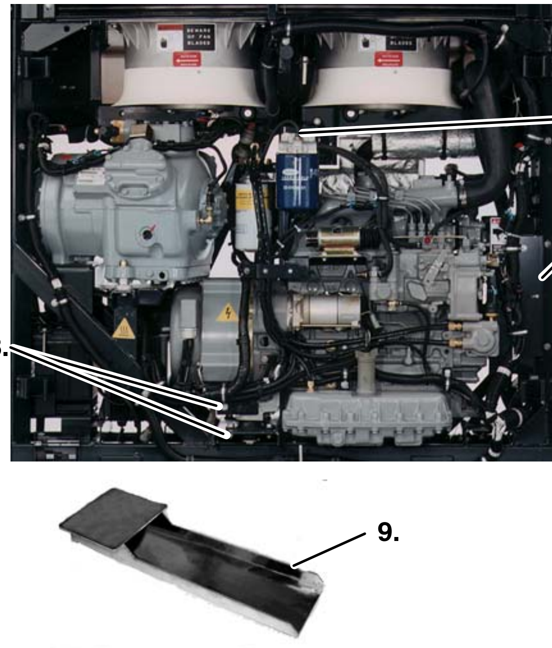
1. Disconnect the battery.
2. Remove the engine oil fill cap.
3. Remove muffler nuts.

Figure 8-12 Generator Removal



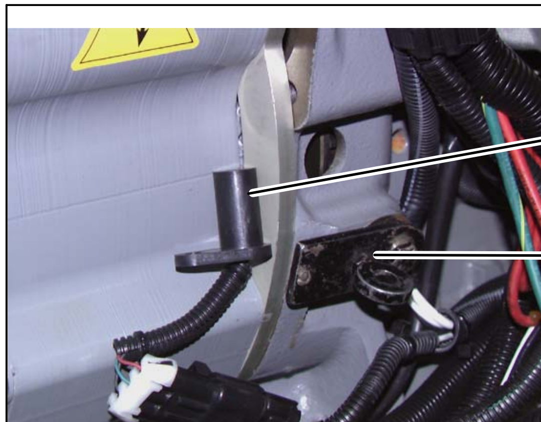
4. Disconnect ground wire.
5. Disconnect the 2 generator sensors (GENT) (if existing)
6. Cut the 3 generator cables (near ground strap)

Figure 8-13 Generator Removal



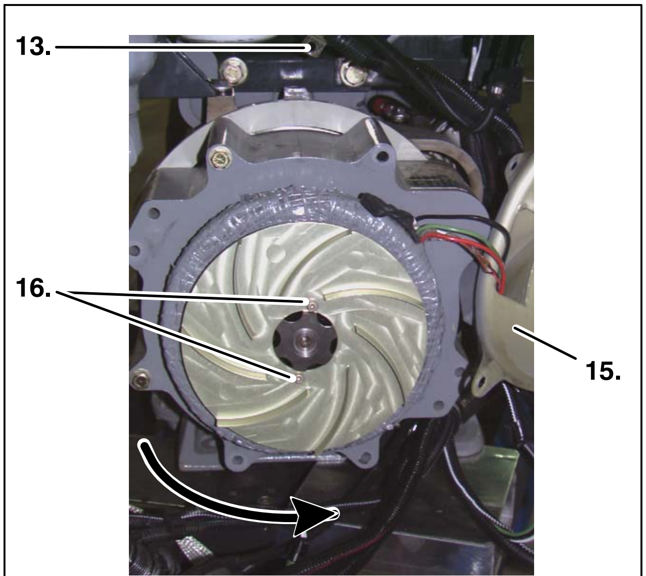
7. Loosen the harness plate on the right side (4 bolts)
8. Remove the engine frame bolts (H1, H2, H3, – H2 shorter than H3)
9. Place the engine support tool (P/N SKM 5670)
10. Unscrew the engine frame bolt

Figure 8-14 Generator Removal



11. Disconnect the RPM sensor.
12. Use tool (P/N : 07-60083-00) to lock the engine flywheel

Figure 8-15 Generator Removal

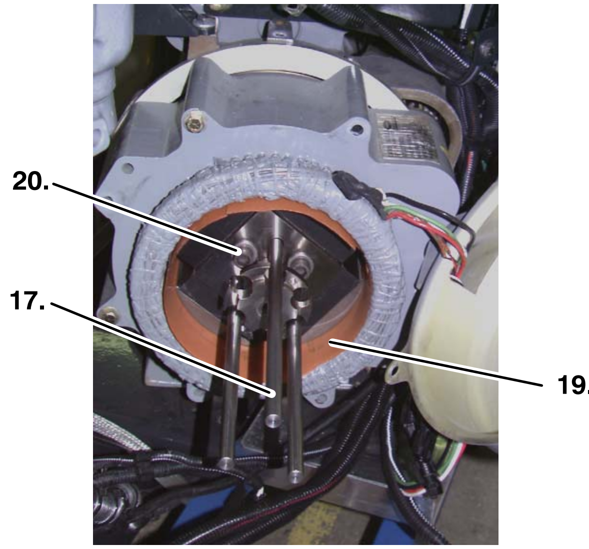


13. Pull the harness on the top of generator out of the way.
14. Swing out the engine.
15. Remove the fan cover (4 bolts)
16. Remove the fan blade. (1 screw)

Figure 8−16 Generator Removal

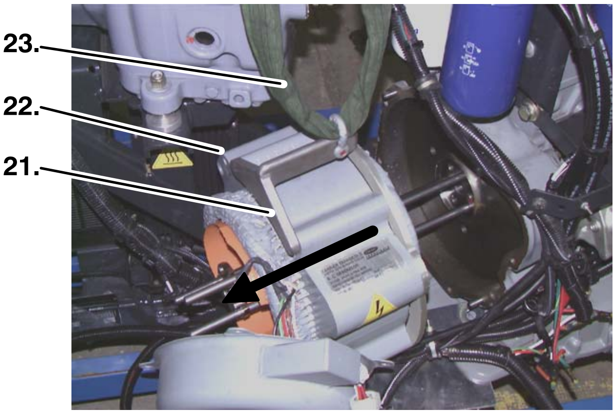
⚠ CAUTION

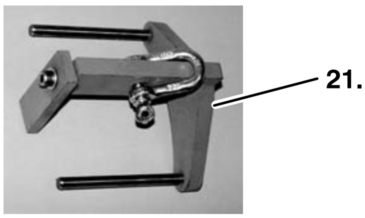
The mica shim must be used during disassembly of the generator from the engine. Never attempt to remove the rotor from the stator. Leave the shim in place until the generator is re installed on the engine.



17. Remove 3 of the 6 flywheel bolts on generator.
18. Insert 3 guiding rods (P/N : SKM 5671)
19. Place the mica shim between the rotor and the stator prior to loosening any other bolts.
20. Remove the last 3 flywheel bolts.

Figure 8−17 Generator Removal

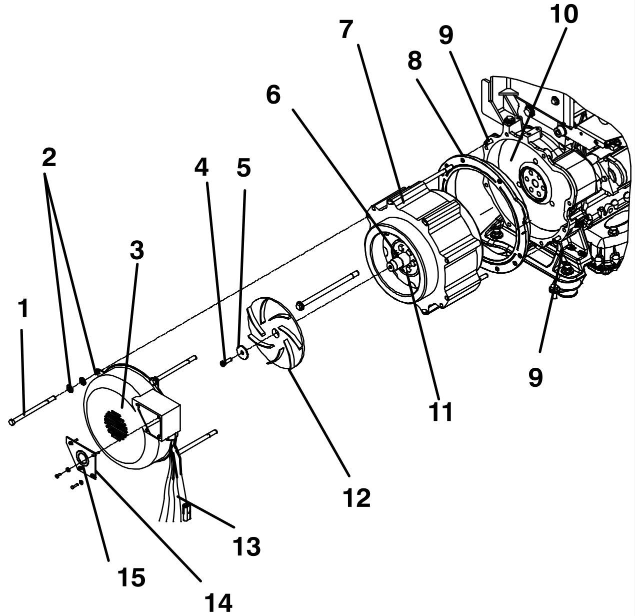




21. Install the lifting tool (P/N :07−60085−00).
22. Remove the remaining stator bolts.
23. Remove the generator with a sling.

Figure 8−18 Generator Removal

8.9.4 Generator Assembly Procedure



1. Screw, Stator/ Cover
2. Washer, Stator/Cover
3. Fan Cover
4. Fan Mount Screw
5. Fan Mount Washer
6. Rotor
7. Stator
8. Spacer
9. Dowel Pin
10. Bell Housing
11. Flywheel Bolt
12. Fan
13. Generator Leads
14. Access Cover
15. Grommet

Figure 8−19 Generator Assy (P/N 54−00553−51)

a. Install two dowel pins (CTD P/N 34−06210−00 – not included in the kit) in the bell housing. Install the pins with the chamfer facing out into the two holes indicated in Figure 8−20.

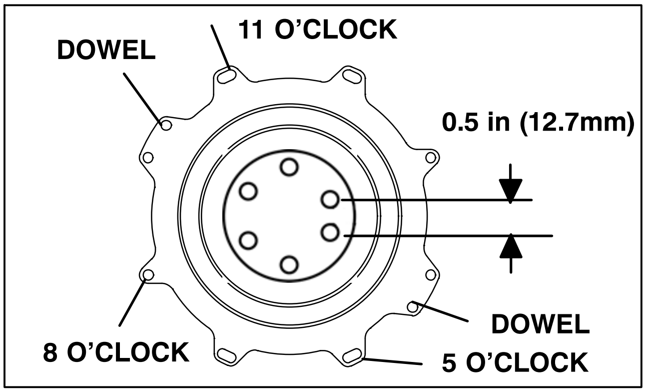


Figure 8−20 Bolt Hole Pattern For Bell Housing and Crankshaft

b. Remove the flywheel and inspect it for any debris or damage.

c. Install spacer (Item 8) onto the bell housing using the dowel pins.

NOTE

The spacer is in two pieces. Install them so the irregularly shaped piece covers the starter opening.

d. Locate two screw holes on the face of the crankshaft which are located approximately 0.5 in (12.7mm) apart. All other screw holes are approximately 0.75 in (19mm) apart (See Figure 8−20).

e. Assemble two guide rods into the two holes on the crankshaft located in the previous step. Assemble the third rod across from the first two rods. See Figure 8−20.

f. Install the flywheel on the crankshaft using the guide rods to align properly. Make sure the flywheel mates with the crankshaft with no rocking or side to side movement.

g. Lift the generator using the lifting tool and hang it in front of the engine. Make sure the generator leads (Item 13) exit the stator winding on the side away from the engine.

h. The mounting holes on the generator rotor (Item 6) have two holes offset to match the ones in the crankshaft and flywheel. Locate them and turn the engine to line up the guide rods in the crankshaft with the offset holes in the generator rotor.

NOTE

The generator rotor does not turn in the stator.

i. Slide the generator rotor over the guide rods and mate the stator with the spacer installed in step c. Ensure the dowel pins in the bell housing are fully engaged in the stator.

NOTE

The generator should slide freely on the guide rods if the holes in the generator rotor are matched correctly with the crank shaft holes. Otherwise it will bind up and the stator will not mate properly with the spacer.

j. Install three screws and three washers to the rotor and tighten.

NOTE

The screws will be torqued later.

k. Remove the guide rods and assemble and tighten the remaining three rotor screws and washers.

NOTE

The screws will be torqued later.

l. Install and tighten three stator screws and two washers with each screw in the following locations (See Figure 8−20) :

One in five o'clock location

One in eight o'clock location

One in eleven o'clock location

NOTE

The remaining four stator mounting bolts will be installed and will all be torqued after the fan cover is installed.

m. Torque the rotor bolts to 90−110 foot−pounds (12.5 to 15.2 Mkg) using an alternating sequence.

NOTE

Mark each rotor screw after it is torqued to ensure that all the screws are torqued.

n. Remove the mica shim that is between the stator and the rotor.

o. Install the fan onto the rotor using two washers and one screw).

NOTE

The fan must be installed with blades away from the engine.

p. Torque the fan screws to 10−12 foot−pounds (1.4 to 1.7 Mkg.

q. Remove the connectors from the thermistors using a pin extraction tool. (Packerd Tool No. 12014012)

r. Feed all the wires through the inside of the fan cover side opening.

s. Install the fan cover (Item 3) onto the generator stator and install the remaining mounting screws and washers.

NOTE

Make sure the insulation on lead wires is not damaged during assembling of the fan cover.

Each mounting screw must be assembled with two washers.

t. Torque the stator mounting screws to 33−37 foot pounds (4.6 to 5.1 Mkg).

NOTE

Mark each stator screw after it is torqued to ensure that all the screws are torqued.

u. Look through the opening in the fan cover and ensure that the wires are not pinched and that they are adequately routed.
v. Install the access cover (Item 14) using four screws and washers (screws and washer are not included in the kit).
w. Assemble the strain grommet (Item 15).
x. Reconnect wires, sensors and thermistor.
y. Reassemble engine into unit.

8.10 REMOTE COMPARTMENT LSVs

8.10.1 Checking Operation Of C2 LSV & C3 LSV & EVXV

C2 LSV and C3 LSV are used to control the flow of refrigerant to Remote Compartments 2 and 3. Generally, when a compartment is enabled, and the box temperature is above setpoint, the controller will be calling for that compartment to operate in Cool. When either of these compartments is calling for Cool, the LSV for that compartment will be energized, allowing liquid refrigerant to flow through the valve to the evaporator.

If time permits, an easy method for checking C2 LSV and C3 LSV is to first run the unit through a defrost cycle. Then operate Compartment 1 only with Compartment(s) 2 (and 3) turned off. After 5 to 10 minutes, visually inspect the remote evaporators. The evaporator fan motors should not be running. Inspect the condition of the evaporator coils. There should be no frost on them. If possible, check the temperature of the suction line leaving the evaporator (without damaging the insulation on the line). Frost on either a remote compartment coil or a suction line that is colder than the compartment temperature indicates that the LSV for that compartment is leaking liquid refrigerant into the coil.

Another method of checking these components is to follow these steps:

a. Connect a manifold test set to the compressor discharge and suction service valves. Connect a PC Mode jumper to the download port, or a PC with the ReeferManager program running, in the Monitor and Override/ Microprocessor Monitor screen. It will be important to be able to watch the EVXV close in a later step.

b. Pump down the low side of the system per Section 8.11.1.

c. After the unit has been shut off, verify that the pressures do not equalize, and the suction pressure does not rise above 5 psig. If the suction pressure rises above 5 psig, repeat the Pumping Down the Low Side procedure.

d. When the EVXV reaches 0%, slowly open the king valve. The suction pressure should not rise. If the suction pressure rises the leakage possibilities are: the EVXV, or C2 LSV and C3 LSV (3 compartment units only). Go into each compartment and listen for any internal system leakage.

NOTE

When the suction pressure remains at 0 to 5 psig with the king valve open, C2 LSV, C3 LSV and EVXV have been tested for holding and passed.

e. To test C2 LSV for opening, use Component Test Mode (Refer to Section 5.2.2).

f. Monitor the suction pressure when the Microprocessor = key is pressed to energize C2 LSV. The suction pressure should rapidly rise indicating that the valve opened.

g. To check C3 LSV, repeat steps b. thru f..

h. If valve leakage is detected during the low side pump down, or if either valve fails to open, repairs to the valve(s) are required. (Refer to section 8.11.1)

i. Following this procedure, refill the system with the refrigerant that was removed in Step d. of Section 8.11.1

8.11 PUMPING UNIT DOWN OR REMOVING REFRIGERANT CHARGE

NOTE

To avoid damage to the earth's ozone layer, use a refrigerant recovery system whenever removing refrigerant. When working with refrigerants you must comply with all local government environmental laws, U.S.A. EPA section 608.

NOTE

The unit must be in Service Mode before pumping down and/or removing the refrigeration charge. Refer to Section 5.2.3.

8.11.1 Pumping Down The Low Side

Components on the low side of the refrigeration system (EVXV, SMV, filter drier, C2/3 LSVs, remote TXVs, and evaporators) may be tested, serviced or replaced without having to completely remove the refrigerant charge from the system by pumping down the low side, and temporarily storing the refrigerant in the condenser and receiver.

NOTE

If any leaks are suspected, do not pump the unit down below 1 psig in order to prevent contamination of the system.

a. Backseat suction and discharge service valves (turn counterclockwise) to close off gauge connection and attach manifold gauges to valves.

b. Open valves two turns (clockwise). Purge gauge line.

c. If the compressor is cold, start the unit and let it warm up for 5 to 10 minutes. If the compressor is already warmed up, skip ahead to step d..

d. Connect a clean refrigerant reclaim bottle to the receiver king valve, and remove 6 to 7 lbs of refrigerant from the system. This will prevent a high pressure shutdown in high ambient conditions during this procedure.

e. Front seat the king valve.

f. Watching the gauges, let the suction pressure drop to 10 to to 15" vacuum, then turn the compressor off.

g. Monitor the gauges. The suction pressure should not rise rapidly. If it does, leakage possibilities are compressor, EVXV, C2 LSV and C3 LSV (3 compartment units only). Check and repair as needed and continue with steps h. thru n. below. If there are no problems with system, continue with step i. of Section 8.10.

h. Frontseat (close by turning clockwise) suction service valve and the refrigerant will be trapped between the compressor suction service valve and the manual shut−off valve (king valve).

i. Before opening up any part of the system, a slight positive pressure should be indicated on the pressure gauge.

j. When opening up the refrigerant system, certain parts may frost. Allow the part to warm to ambient temperature before dismantling. This avoids internal condensation which puts moisture in the system.

k. After making necessary repairs, leak test and evacuate the low side of the refrigeration system. (Refer to Sections 8.12 and 8.13.)

l. Backseat manual shut−off valve (king valve) and midseat suction service valve.

m. Start the unit in cooling and check for noncondensibles.

n. Check the refrigerant charge. (Refer to Table 2-1.)

NOTE

Store the refrigerant charge in an evacuated container if the system must be opened between the compressor discharge valve and receiver. Whenever the system is opened, it must be evacuated and dehydrated. (Refer to Section 8.13)

8.11.2 Removing The Refrigerant Charge: Use Micro “EVAC MODE”

When entering Evacuation Mode, the micro will home the valves and then open the SMV and EVXV to 100% open and energize UL1. The message center will display “ENTERING SERVICE MODE” and log an Evacuation Mode Event in the Data Recorder.

Connect a refrigerant recovery system to the unit to remove refrigerant charge. Refer to instructions provided by the manufacture of the refrigerant recovery system.

HOLD = TO EXIT.

8.12 REFRIGERANT LEAK CHECKING: Use Micro “EVAC MODE”

a. If system was opened and repairs completed, leak check the unit.

b. The recommended procedure for finding leaks in a system is with an electronic leak detector. Testing joints with soapsuds is satisfactory only for locating large leaks, or pinpointing small leaks once a general area has been located.

c. If system is without refrigerant, charge system with refrigerant to build up pressure between 30 to 50 PSIG (2.0 to 3.4 Bar). Remove refrigerant drum and leak check all connections.

CAUTION

Only a refrigerant drum containing R404a should be connected to this refrigeration unit in order to pressurize the system. However, dry nitrogen may be used for leak checking. Any other gas or vapor will contaminate the system which will require additional purging and evacuation of the high side (discharge) of the system.

d. Remove refrigerant using a refrigerant recovery system and repair any leaks. Evacuate and dehydrate the unit. (Refer to Section 8.13) Charge unit with refrigerant. (Refer to Section 8.13.4)

e. Check for proper unit operation by running Pretrip (Refer to Section 3.5).

8.13 EVACUATION AND CHARGING: Use Micro “EVAC MODE”

8.13.1 General

Moisture is the deadly enemy of refrigerant systems. The presence of moisture in a refrigeration system can have many undesirable effects. The most common are copper plating, acid sludge formation, “freezing-up” of metering devices (EVXV or TXV) by free water, and formation of acids, resulting in metal corrosion.

8.13.2 Preparation

a. Evacuate and dehydrate only after pressure leak test. (Refer to Section 8.12)

b. Essential tools to properly evacuate and dehydrate any system include a good vacuum pump (5 cfm / 8m^{3}H volume displacement, P/N 07-00176-11) and a good vacuum indicator such as a thermocouple vacuum gauge (vacuum indicator). (07−00414−00)

NOTE

The use of a compound gauge is not recommended because of its inherent inaccuracy.

c. Keep the ambient temperature above 60°F (15.6°C) to speed evaporation of moisture. If ambient temperature is lower than 60°F (15.6°C), ice might form before moisture removal is complete. Heat lamps or alternate sources of heat may be used to raise system temperature.

8.13.3 Procedure For Evacuation

a. Remove refrigerant using a refrigerant recovery system.

b. The recommended method to evacuate and dehydrate the system is to connect three evacuation hoses (Do not use standard service hoses, as they are not suited for evacuation purposes.) as shown in Figure 8−21 to the vacuum pump and refrigeration unit. Also, as shown, connect an evacuation manifold, with evacuation hoses only, to the vacuum pump, electronic vacuum gauge, and refrigerant recovery system.

c. With the unit service valves closed (back seated) and the vacuum pump and electronic vacuum gauge valves open, start the pump and draw a deep vacuum. Shut off the pump and check to see if the vacuum holds. This operation is to test the evacuation setup for leaks, repair if necessary.

d. Midseat the refrigerant system service valves.

e. Then open the vacuum pump and electronic vacuum gauge valves, if they are not already open. Start the vacuum pump. Evacuate unit until the electronic vacuum gauge indicates 2000 microns. Close the electronic vacuum gauge and vacuum pump valves. Shut off the vacuum pump. Wait a few minutes to be sure the vacuum holds.

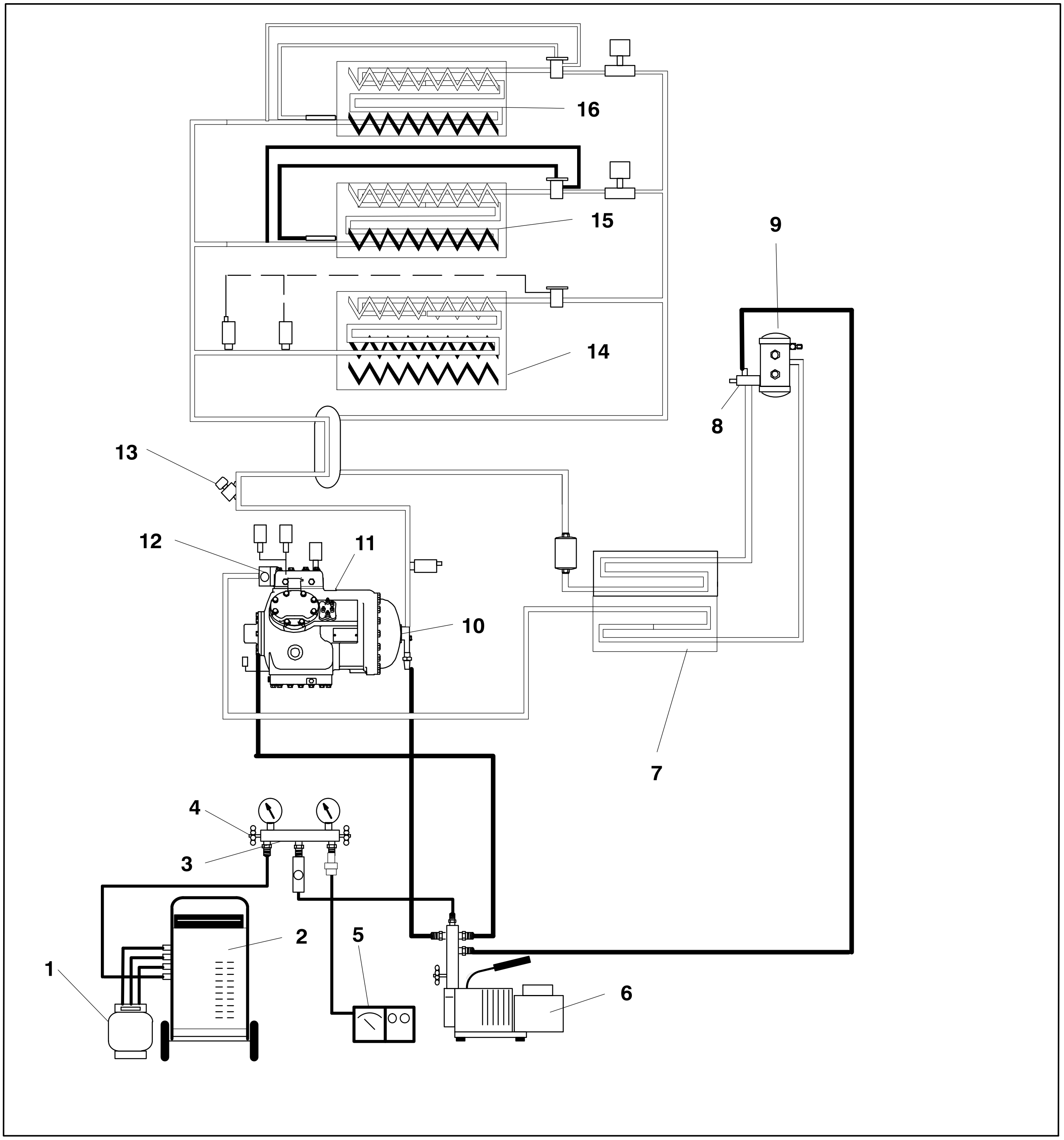
f. Break the vacuum with dry nitrogen. Raise system pressure to approximately 2 PSIG (0.1 Bar).

g. Purge nitrogen from system.

h. Repeat steps e through g one time.

i. Evacuate unit to 500 microns. Close off vacuum pump valve and stop pump. Wait five minutes to see if vacuum holds. This checks for residual moisture and/ or leaks.

j. With a vacuum still in the unit, the refrigerant charge may be drawn into the system from a refrigerant container on weight scales. The correct amount of refrigerant may be added by observing the scales. Correct charge will be found in Table 2-1.



1. Refrigerant Cylinder
2. Refrigerant Recovery Unit
3. Evacuation Manifold
4. Valve
5. Vacuum Gauge
6. Vacuum Pump
7. Condenser
8. King Valve
9. Receiver
10. Suction Service Valve
11. Compressor
12. Discharge Service Valve
13. Compressor Suction Modulation Valve (SMV)
14. Evaporator
15. Compartment 2 Evaporator
16. Compartment 3 Evaporator

Figure 8-21. Vacuum Pump Connection

8.13.4 Adding Refrigerant To System (Full Charge)

NOTE

Place unit in Service Mode before performing the following operations on the unit. Refer to Section 5.2.3.

CAUTION

Do not vapor charge R−404A. Only liquid charging through the receiver outlet (King) valve is acceptable.

a. Dehydrate unit and leave in deep vacuum. (Refer to section 8.11)

b. Place drum of refrigerant on scale and connect charging line from drum to king valve. Purge charging line at outlet valve.

c. Note weight of drum and refrigerant.

d. Open liquid valve on drum. Open king valve half way and allow the liquid refrigerant to flow into the unit until the correct weight of refrigerant has been added as indicated by scales. Correct charge will be found in Table 2-1.

NOTE

It is possible that all liquid may not be pulled into the receiver, as outlined in step d. In this case, frontseat the receiver outlet valve (king valve) and run the unit in cooling until the correct amount of refrigerant is added.

e. When drum weight (scale) indicates that the correct charge has been added, close liquid line valve on drum and backseat the king valve.

f. Start unit in cooling mode. Run approximately ten minutes. Partially block off air flow to condenser coil so discharge pressure rises to 15.8 bars (230 psig).

Refrigerant should appear at center line of lower receiver sight glass.

8.14 ADDING REFRIGERANT TO SYSTEM (PARTIAL CHARGE)

a. Start the unit in high speed diesel mode (ambient between 24°F (18°C) and 86°F (30°C) with a setpoint of 68°F (20°C) or lower.

b. When return air reaches 32°F (0°C), check the sight glasses.

c. If the bottom ball is floating at the top of the sightglass and the top ball is not floating, the charge is correct.

d. Liquid charge through the suction service valve.

8.15 COMPRESSOR – MODEL 06D

WARNING

When performing service and/or maintenance procedures, make certain the unit is disconnected from the power source and that the RS is in OFF position so that it is impossible for the unit to start up automatically during the maintenance operation.

a. The compressor should not operate in a vacuum greater than 19.6inHg (500 mm).

b. The service replacement compressor is shipped without shutoff valves (but with valve pads), and without terminal box and cover. Customer should retain all external compressor components including the original terminal box and cover for use on replacement compressor.

c. Check oil level in service replacement compressor. (Refer to section 8.15.4)

8.15.1 Removal and Replacement of Compressor

a. Frontseat suction service valve and run unit until suction pressure equals 1 PSIG (0.1 Bar)

b. Locate the compressor junction box. Remove wiring. Disconnect wiring from compressor terminals and remove compressor junction box.

c. Remove bolts from service valve flanges.

d. Remove compressor bolts.

e. Remove compressor. Refer to section 2.11 for weight of compressor.

f. Remove all external compressor components.

WARNING

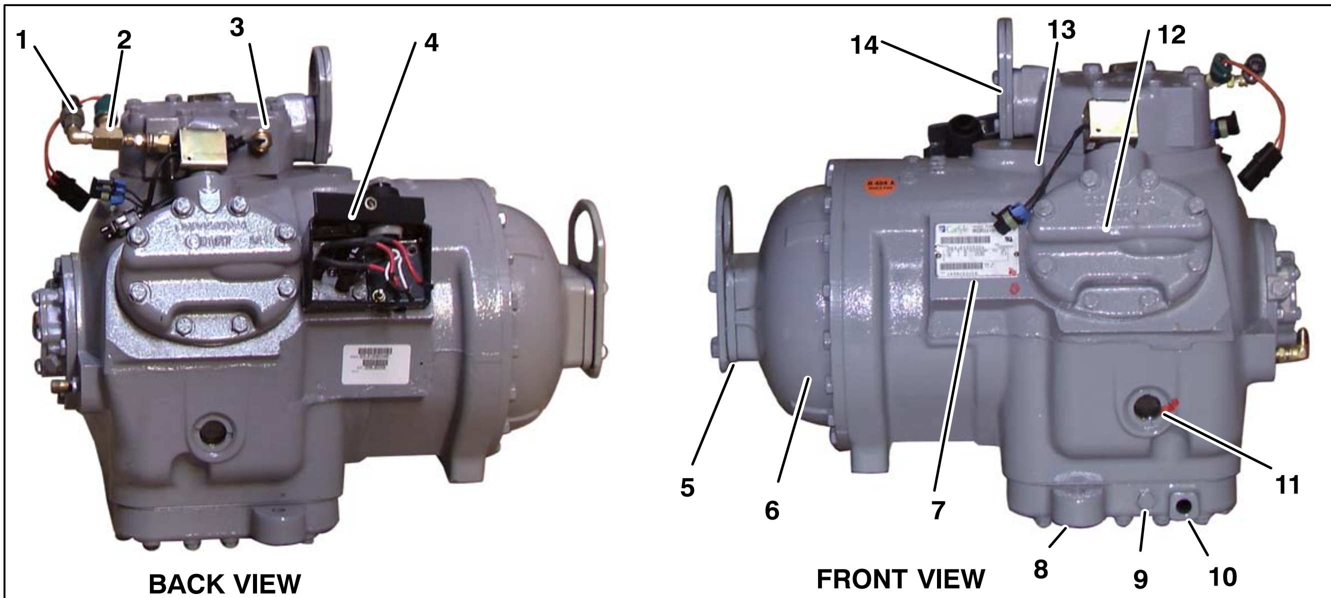
Relieve internal pressure of replacement compressor by slightly loosening the bolts of both service valve flanges/blank valve pads and then lightly tapping the center of the valve flanges/pads with a soft mallet to break the seal.

g. Reinstall components removed in step e.

h. Install compressor in unit.

i. Connect junction box to compressor and connect all wiring per wiring diagram. Install junction box cover.

j. Install new gaskets on service valves.



1. Compressor discharge pressure tranducer
2. High pressure switch
3. Compressor discharge temperature sensor
4. Electrical terminal box
5. Suction valve flange
6. Motor end cover
7. Serial / Model plate
8. Bottom plate
9. Oil drain location
10. Crankcase heater (option)
11. Sight glass
12. Cylinder head
13. Valve plate
14. Discharge valve flange

Figure 8–22 Compressor – model 06D

k. Install mounting bolts in service valves and torque according to values in Table 8-3.

l.Attach two hoses (with hand valves near vacuum pump) to the suction and discharge service valves. Dehydrate and evacuate compressor to 500 microns (29.90 inches Hg = 75.9 cm Hg vacuum). *Turn off valves on both hoses to pump.*

m.Fully backseat (open) both suction and discharge service valves.

n. Remove vacuum pump lines.

o. Start unit and check refrigerant charge. (Refer to section 8.11)

p. Change filter-drier if necessary. (Refer to section 8.17)

q. Check compressor oil level per section 8.15.4. Add oil if necessary.

8.15.2 Compressor Disassembly

a. Remove cylinder head capscrews. If the cylinder head is stuck, tap the center of the cylinder head with a wooden or lead mallet. DO NOT STRIKE THE SIDE OF THE CYLINDER HEAD! Be careful not to drop the head or damage the gasket sealing surface. (See Figure 8−22 and Figure 8−23) Remove cylinder head gasket.

b. Remove valve stops and valves. After they have been removed, free the valve plate from the cylinder deck by using the outside discharge valve hold-down capscrew as a jack screw through the tapped hole of the valve plate. Remove the valve plate gasket, see Figure 8−23, item 7

8.15.3 Compressor Reassembly

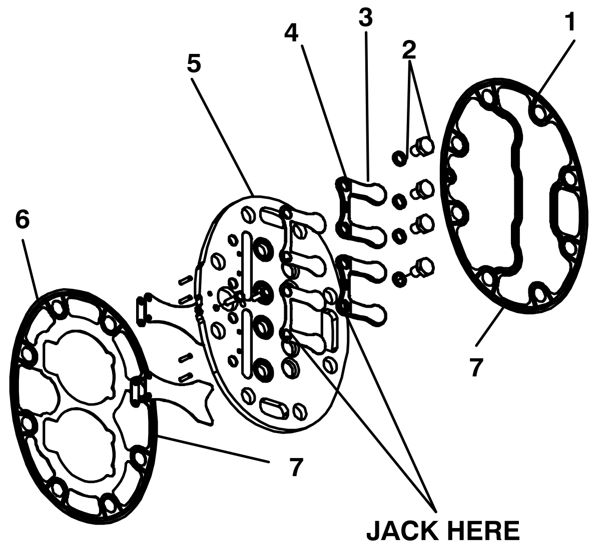
To clean compressor parts, use a suitable solvent with proper precautions. Coat all moving parts with the proper compressor oil before assembly. Refer to Table 8-3 for applicable compressor torque values.

a. Suction and discharge valves

If the valve seats look damaged or worn, replace valve plate assembly. Always use new valves because it is difficult to reinstall used discharge valves so that they will seat properly. Any valve wear will cause leakage for this reason.

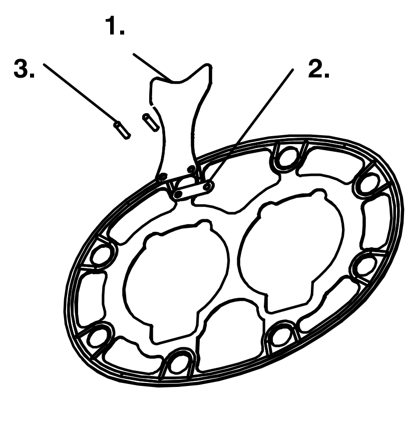
Suction valves are positioned by dowel pins (See Figure 8−24) and will assume their original position when reinstalled. No two valves are likely to wear in exactly the same way. Never interchange used valves.

Do not omit the suction valve positioning springs. (See Figure 8−24) Place the springs so that the ends bear against the cylinder deck (middle bowed away from cylinder deck). Use new gaskets when reinstalling valve plates and cylinder heads. Torque cylinder heads in a cross pattern in staged ten ft lb increments according to values in Table 8-3.



1. Cylinder Head Gasket
2. Discharge valve screw and lockwasher
3. Discharge valve stop
4. Discharge valve
5. Valve plate
6. Valve plate assembly
7. Valve plate gasket

Figure 8−23 Exploded view of valve plate



1. Suction valve
2. Suction valve positioning spring
3. Valve plate dowel pin

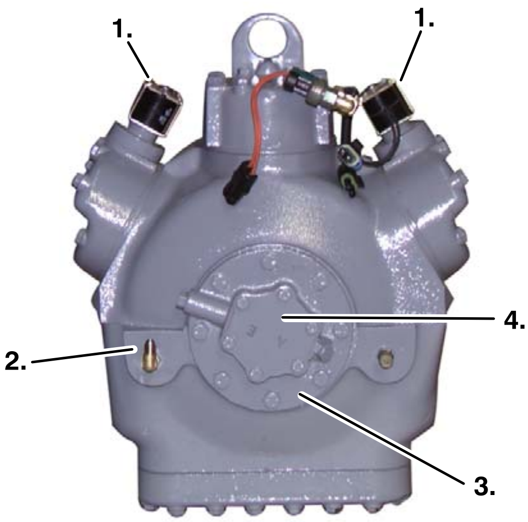
Figure 8−24 Suction valve & positioning springs

1. Push pistons from the inside of the crankcase through the cylinders, being careful not to break the rings. Place chamfered side of connecting rod against radius of crank pins. Install the crankshaft through the pump end of the compressor. Do not damage main bearings. Install matching connecting rod caps through bottom cover plate.

8.15.4 Compressor Oil Level

CAUTION

Use only Carrier Transicold approved Polyol Ester Oil (POE). Buy quantities of one quart or less. When using this hygroscopic oil, immediately reseal. Do not leave container of oil open or contamination will occur.



1. Unloaders
2. Oil fill and suction pressure transducer
3. Bearing head
4. Oil pump

Figure 8–25 Compressor oil pump end view

Checking the oil level in the compressor

a. Operate the unit in cooling mode for at least 20 minutes.

b. Check the front oil sight glass on the compressor to ensure that no foaming of the oil is present after 20 minutes of operation. If the oil is foaming excessively after 20 minutes of operation, check the refrigerant system for flood-back of liquid refrigerant. Correct this situation before performing step c.

c. Turn unit off to check the oil level. The correct oil level range should be between the bottom to one-eighth level of the sight glass. If the level is above one-eighth, oil must be removed from the compressor. To remove oil from the compressor, follow step d in this section. If the level is below the bottom of the sight glass, add oil to the compressor following step b below.

Adding Oil With Compressor In System

In an emergency where an oil pump is not available, oil may be drawn into the compressor through the suction service valve.

CAUTION

Extreme care must be taken to ensure the manifold common connection remains immersed in oil at all times; otherwise, air and moisture will be drawn into compressor.

Connect the suction connection of the gauge manifold to the compressor suction service valve port, and immerse the common connection of the gauge manifold in an open container of refrigeration oil. Crack the suction service valve and gauge valve to vent a small amount of refrigerant through the common connection and the oil to purge the lines of air. Close the gauge manifold valve.

With the unit running, frontseat the suction service valve and induce a vacuum in the compressor crankcase. SLOWLY crack the suction gauge manifold valve and oil will flow through the suction service valve into the compressor. Add oil as necessary.

Run unit for 20 minutes in cooling mode. Check oil level at the compressor sight glass.

Adding Oil To Service Replacement Compressor

NOTE

1. Service replacement compressors are shipped without oil.
2. When first adding oil to the compressor, add only 6.3 pints (3 liters) to the compressor. Run the unit for 20 minutes in cooling mode. Check the oil level in the compressor sight glass. Add oil as necessary. This procedure is designed to compensate for excess oil that may have migrated with refrigerant to other parts of the system during unit operation.

Removing oil from the compressor

a. If the oil level recorded is above one-eighth level of the capacity of the sight glass, oil must be removed from the compressor.

b. Close (frontseat) suction service valve and pump unit down to 2 to 4 psig (0.1 to 0.3 bar). Frontseat discharge service valve and slowly bleed remaining refrigerant.

c. Remove the oil drain plug on the bottom plate of the compressor and drain the proper amount of oil from the compressor to obtain the correct level (maximum is one-eight level of the sight glass). Replace the plug securely back into the compressor. *DO NOT FORGET TO OPEN SUCTION AND DISCHARGE SERVICE VALVES.*

d. Repeat Checking The Oil Level step c. to ensure proper oil level.

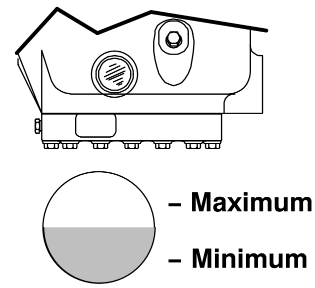


Figure 8–26. Oil Level in Sight Glass

Table 8-3 Compressor Torque Values

SIZE DIAMETER (INCHES)	THREADS PER INCH	TORQUE RANGE		USAGE
		FT-LB	MKG	
1/4	28	12 – 16	1.66 – 2.21	Unloader Valve
5/16	18	20 – 30	2.77 – 4.15	Discharge Valve
3/8	16	40 – 50	5.53 – 6.92	Cylinder Head
1/2	13	65–70	9.0–9.7	Suction Valve

8.16 COMPRESSOR UNLOADER VALVE

The compressor unloaders (located on the compressor cylinder heads) are controlled by the Advance Microprocessor. (Refer to Section 2.3.3)

Manual Checkout procedure

a. Initiate Pretrip.

b. Connect manifold gauges to the compressor suction and discharge service valves and start unit in cooling with the trailer temperature at least 5°F (2.8°C) above set point and the compressor will be fully loaded (both unloader coils are de-energized). Note suction pressure.

c. Unplug both unloader coils.

d. Using fused jumper wires energize front unloader. Note discharge and suction pressures. A rise of approximately 3 psig (0.2 Bar) will be noted on the suction pressure gauge. Discharge pressure should drop approximately 5 to 15 psig (0.4 to 1.0 Bar).

e. Disconnect UL1 and note pressures. Suction pressure should drop and discharge pressure should rise by same amount as in step d. above.

f. Repeat steps 3 & 4 for UL2 (rear unloader). At the end of the test, plug both unloaders back in.

NOTE

If either unloader coil energizes and the suction and discharge pressures do not change, the unloader assembly must be checked.

Replacing solenoid valve internal parts (see Figure 8–27)

a. Put gauges on the compressor.

b. Pump down the compressor to 0–5 psig (0 to 0.3 Bar). Frontseat both service valves to isolate compressor.

c. Equalize compressor high and low side pressures.

d. Recover refrigerant remaining in compressor.

e. Remove coil retainer and coil.

f. Remove enclosing tube collar (Item 4, Figure 8–27) using installation/removal tool supplied with repair kit (item 3).

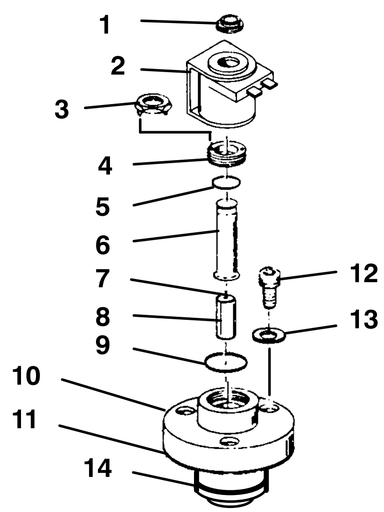
g. Check plunger for restriction due to: (a) Corroded or worn parts; (b) Foreign material lodged in valve; (c) Bent or dented enclosing tube.

h. Install new parts. Do not overtighten enclosing tube assembly. Torque to a value of 100 inch pounds (1.15 kmg).

i. Remove supplied installation/removal tool. Install coil, voltage plate, and retainer.

j. Evacuate and dehydrate the compressor.

k. Start unit and check unloader operation (Refer to section 8.16.



1. Retainer
2. Coil assembly
3. Installation/ Removal tool
4. Enclosing tube collar
5. O-ring
6. Enclosing tube
7. Plunger spring
8. Plunger assembly
9. Gasket
10. Valve body
11. Gasket
12. Bolt
13. Gasket, bolt
14. Piston ring

Figure 8−27 Unloader solenoid valve

Solenoid coil replacement

NOTE

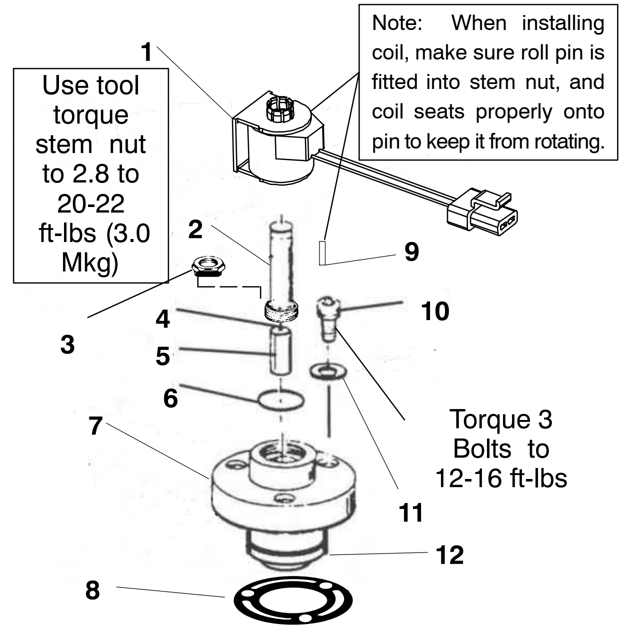
The coil may be removed without pumping down the unit.

a. Disconnect leads. Remove retainer. Lift off coil. (See Figure 8−28)

b. Verify coil type, voltage and frequency of old and new coil. This information appears on the coil housing.

c. Place new coil over enclosing tube, retainer and connect wiring.

d. Check unit operation by running Pretrip (Refer to Section 3.5).



1. Coil Assembly
2. Stem/Enclosing Tube Assy
3. Installation/Removal Tool
4. Spring, Plunger
5. Plunger Assembly
6. “O” Ring
7. Valve Body
8. Gasket, Valve Body
9. Pin, Anti-Rotation (fits into top of stem nut)
10. Bolts, Valve Body (3)
11. Washers (3)
12. Piston (use only with hot gas bypass unloaders)

Figure 8−28. Solenoid Coil Replacement

NOTE

Place unit in Service Mode before performing the following operations. Refer to Section 5.2.3

8.17 CHECKING AND REPLACING FILTER-DRIER

To Check Filter-Drier

Check for a restricted or plugged filter-drier by feeling the liquid line inlet and outlet connections of the drier cartridge. If the outlet side feels cooler than the inlet side, then the filter-drier should be changed.

To Replace Filter-Drier

a. Pump down the unit per section 8.11.1. Remove bracket, then replace drier. Tighten inlet side fitting.

b. Slowly open king valve and purge air through the drier. Tighten drier outlet side fitting.

c. Leak test drier connections.

d. Check refrigerant level.

e. Check unit operation by running Pretrip (Refer to Section 3.5).

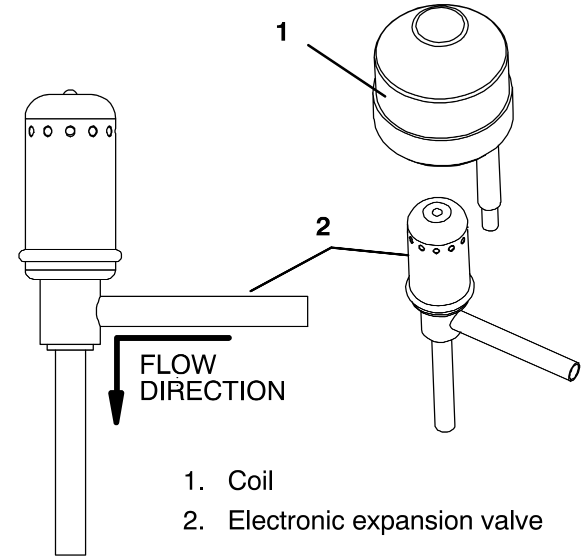
8.18 ELECTRONIC EXPANSION VALVE (SEE 8.19 FOR INFORMATION ON TXVs FOR REMOTE COMPARTMENTS)

NOTE

Place unit in Service Mode before performing the following operations on the unit. Refer to Section 5.2.3

The electronic expansion valve (EVXV) is an automatic device which maintains constant superheat of the refrigerant gas leaving the evaporator regardless of suction pressure. The valve functions are: (a) automatic response of refrigerant flow to match the evaporator load and (b) prevention of liquid refrigerant entering the compressor. Unless the valve is defective, it seldom requires any maintenance.

Make sure the EVXV coil is snapped down fully, and the coil retention tab is properly seated in one of the valve body dimples.



1. Coil
2. Electronic expansion valve

Figure 8–29 Electronic expansion valve

8.18.1 Replacing Expansion Valve & Screen

a. Pump down the unit by closing the manual shut off per Section 8.11.1.)

b. Remove coil.

c. Use a wet rag to keep valve cool whenever brazing. Heat inlet, outlet and equalizer connection to valve body and remove valve. Clean all tube stubs so new valve fits on easily.

d. Install new valve and screen, with cone of screen pointing into liquid line at inlet to the valve by reversing steps a.through c.

e. The thermal bulb is located below the center of the suction line (See Figure 8–31). This area must be clean to ensure positive bulb contact. Firmly tighten the straps around the thermal bulb and suction line and insulate both with Presstite.

f. Evacuate by placing vacuum pump on suction service valve.

g. Open king valve and then check refrigerant level.

h. Check superheat. (Refer to Section 2.12)

i. Check unit operation by running Pretrip (Refer to Section 3.5).

8.18.2 EVXV coil (Unipolar design)

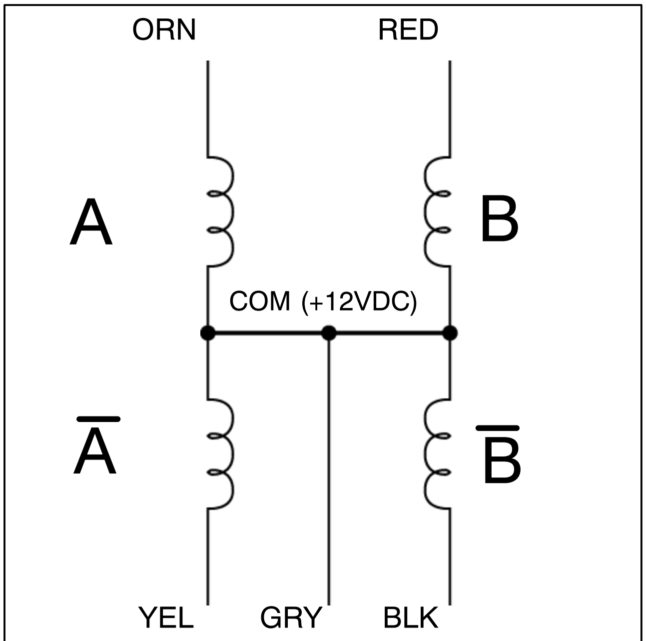


Figure 8−30 Electronic expansion valve

The EVXV (evaporator expansion valve) coil consists of four windings. See Figure 8−30 for labelling.

All of the windings are connected together at one end, sharing a common wire where +12V is applied from the micro.

The other end of each winding has its own wire connected back to the micro.

Looking at the 5−pin connector on the EVXV coil, the wiring is as follows:

Connector Pin	Wire Color	Winding
A	ORANGE	A
B	RED	B
C	YELLOW	$\overline{A}$
D	BLACK	$\overline{B}$
E	GREY	COM (+12V)

Each winding has a resistance of about 46 ohms. If the coil is good, this resistance ($\pm$ 10 %) will be measured between the gray common wire and each of the other four wires.

Also, since the coils are all connected together at a common point, the resistance of two windings in series can be measured between any two wires other than the gray wire. This resistance will be about 92 ohms ($\pm$10%).

To open the valve, the micro energizes each winding of the coil in a specific sequence. Energizing the windings in the correct sequence rotates the rotor and causes the valve to open one step.

The windings are energized in the reverse sequence to close the valve one step.

If the windings are not energized in the proper sequence, the valve will chatter, but the rotor will not rotate and the valve will not open (or close).

The sequence to energize each coil is shown below:

OPEN ↓	Sequence	CLOSED ↑
	A	
	A & B	
	B	
	$\overline{A}$ & B	
	$\overline{A}$	
	$\overline{A}$ & $\overline{B}$	
	$\overline{B}$	
	A & $\overline{B}$	
+12 VDC on GRAY		

8.19 THERMOSTATIC EXPANSION VALVES (REMOTE COMPARTMENTS)

NOTE

Place unit in Service Mode before performing the following operations on the unit. Refer to Section 5.2.3

The thermostatic expansion valve (TXV) is an automatic device which maintains constant superheat of the refrigerant gas leaving the evaporator regardless of suction pressure. The valve functions are: (a) automatic response of refrigerant flow to match the evaporator load and (b) prevention of liquid refrigerant entering the compressor. Unless the valve is defective, it seldom requires any maintenance.

8.19.1 Replacing Expansion Valve & Screen

a. Pump down the unit by closing the manual shut off valve (king valve). (Refer to Section 8.11.1.)

b. Remove insulation (Presstite) from expansion valve bulb and then remove bulb from suction line.

c. Remove Presstite from the expansion valve power head. Unscrew power head if only the element is being changed and replace by reversing steps a. through c.

d. Use a wet rag to keep valve cool whenever brazing. Heat inlet, outlet and equalizer connection to valve body and remove valve. Clean all tube stubs so new valve fits on easily.

e. Install new valve and screen, with cone of screen pointing into liquid line at inlet to the valve by reversing steps a.through c.

f. The thermal bulb is located below the center of the suction line (See Figure 8−31). This area must be clean to ensure positive bulb contact. Firmly tighten the straps around the thermal bulb and suction line and insulate both with Presstite.

g. Evacuate by placing vacuum pump on suction service valve.

h. Open king valve and then check refrigerant level.

i. Check superheat. (Refer to Section 2.12)

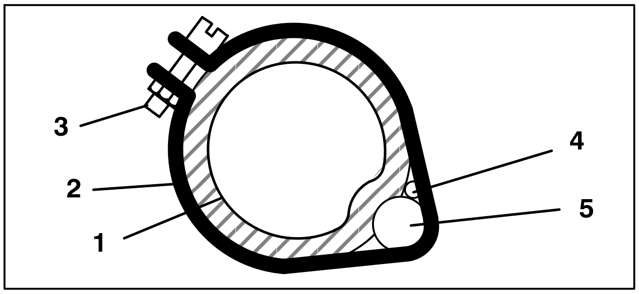
j. Check unit operation by running Pretrip (Refer to Section 3.5).

8.19.2 To Measure Superheat

NOTE

The expansion valve and bulb location are shown in Figure 8−31.

a. Pull loose the Presstite insulation from one end of the expansion valve bulb.
b. Loosen one TXV bulb clamp and make sure area under clamp (above TXV bulb) is clean.
c. Place thermocouple above (parallel) TXV bulb and then secure loosened clamp making sure both bulbs are firmly secured to suction line as shown in Figure 8−31. Use Presstite insulation to completely cover both bulbs.



1. Suction Line
2. TXV Bulb Clamp
3. Nut and Bolt (Clamp)
4. Thermocouple
5. TXV Bulb

Figure 8−31. Thermostatic Expansion Valve Bulb and Thermocouple

d. Connect an accurate gauge to the 1/4" port on the suction service valve.
e. Run unit until stabilized. Set controller 10°F (5.5°C) below box temperature.
f. From the temperature/pressure chart, determine the saturation temperature corresponding to the evaporator outlet pressure.
g. Note the temperature of the suction gas at the expansion valve bulb.
h. Subtract the saturation temperature determined in Step f. from the average temperature measured in Step g. The difference is the superheat of the suction gas.

8.20 CHECKING AND REPLACING HIGH PRESSURE CUTOUT SWITCH (HPS)

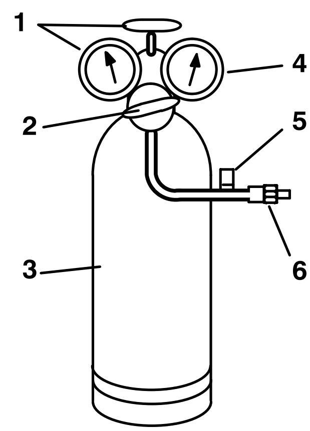
8.20.1 Replacing High Pressure Switch

a. Put gauges on the compressor.
b. Pump down compressor to 0−5 psig (0 to 0.3 Bar) suction pressure. (Refer to Section 8.11.1.) Frontseat both suction and discharge service valves to isolate compressor.
c. *Slowly* equalize compressor pressure through the service valve gauge ports.
d. Recover refrigerant remaining in compressor.
e. Disconnect wiring from defective switch, and remove old switch. The HPS is located on the top cylinder head (See Figure 8−22).
f. Install new cutout switch after verifying switch settings. (Refer to Section 8.20.2)
g. Evacuate and dehydrate the compressor. (Refer to Section 8.13)
h. Check unit operation by running Pretrip (Refer to Section 3.5).

8.20.2 Checking High Pressure Switch

WARNING

Do not use a nitrogen cylinder without a pressure regulator. Cylinder pressure is approximately 2350 PSIG (159.9 Bar). Do not use oxygen in or near a refrigerant system as an explosion may occur. (See Figure 8–32)



1. Cylinder Valve and Gauge
2. Pressure Regulator
3. Nitrogen Cylinder
4. Pressure Gauge [0 to 400 PSIG (0 to 27.2 Bar)]
5. Bleed-Off Valve
6. 1/4 inch Connection

Figure 8–32. Typical Setup for Testing High Pressure Switch

a. Remove switch as outlined in Section 8.20.1

b. Connect ohmmeter or continuity light across switch terminals. Ohmmeter will indicate resistance and continuity light will be lighted if switch closed after relieving pressure.

c. Connect switch to a cylinder of dry nitrogen. (See Figure 8–32)

d. Set nitrogen pressure regulator higher than cutout point on switch being tested. Pressure switch cutout and cut-in points are shown in Section 2.12.

e. Close valve on cylinder and open bleed-off valve.

f. Open cylinder valve. Slowly close bleed-off valve and increase pressure until the switch opens. If light is used, light will go out and if an ohmmeter is used, the meter will indicate open. Open pressure on gauge. Slowly open bleed-off valve (to decrease pressure) until switch closes (light will light or ohmmeter will move).

8.21 DISCHARGE PRESSURE TRANSDUCER (CDP)

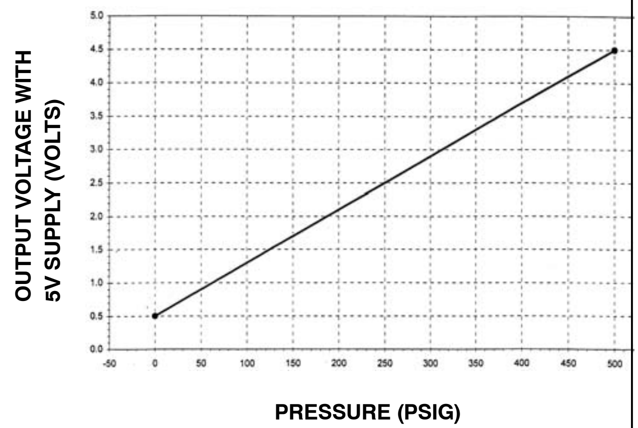


Figure 8–33. Pressure Transducer Values

Table 8-4 Suction and discharge Pressure Transducer Voltages

Psig	Bar	Suction voltage	Discharge voltage
–14.5	- 1.0	0.50	0.38
–8.7	- 0.6	0.66	0.42
0	0	1.01	0.50
5	0.3	1.19	0.54
10	0.6	1.36	0.58
15	1.0	1.54	0.62
20	1.3	1.71	0.66
25	1.7	1.88	0.70
30	2.0	2.06	0.74
35	2.4	2.23	0.78
40	2.7	2.41	0.82
45	3.0	2.58	0.86
50	3.4	2.76	0.90
55	3.7	2.93	0.94
60	4.1	3.10	0.98
65	4.4	3.28	1.02
70	4.8	3.45	1.06
75	5.1	3.63	1.10
80	5.4	3.80	1.14
85	5.8	3.98	1.18
90	6.1	4.15	1.22
95	6.5	4.32	1.26
100	6.8	4.50	1.30

8.21.1 Calibrating Compressor Discharge Pressure Transducer

The Compressor Discharge Pressure Transducer (CDP) has a range of 0 to 500 PSIG (0 to 34.0 Bar). With this large of a pressure range, some transducers will not read exactly the same as the next. To allow for variations in transducers and still display an accurate pressure reading in the Data List, there is a calibration feature for the CDP built into the microprocessor.

To calibrate the CDP, it *must* be removed from the compressor, and be exposed to 0 PSIG/Bar. During the calibration process, the microprocessor measures the difference between what the transducer is sending and what the microprocessor was expecting for a zero reading. The difference between these two is called an offset. This offset is then stored in the microprocessor's memory, and is used in all future calculations for displaying compressor discharge pressure.

NOTE

The Compressor Discharge Pressure on the microprocessor Data List will never read less than 0 PSIG/Bar, even if it is exposed to a vacuum (such as when evacuating the system.) Consequently, a transducer reading of 0 does not indicate accurate calibration. Every Discharge Transducer must be calibrated before being installed into a compressor.

a. Power up the transducer circuit. Place unit into PC Mode (Refer to Section 5.1), or place unit in Manual Start Mode.

b. Press the Select Key until "PRESS ↑↓ TO VIEW DATA" appears in the MessageCenter.

c. Press the Up Arrow until "**DISCHARGE PRESSURE:**" is showing in the MessageCenter.

d. Press and hold the Equal Key for 6 seconds. The MessageCenter will blink 5 times. When it stops blinking, the display will either show "DISCHARGE PRESSURE: 0.0 Bar/PSIG", or the message "**CALIBRATION UNSUCCESSFUL**".

e. When "DISCHARGE PRESSURE: 0.0 Bar/PSIG" appears, the offset has been saved into the microprocessor memory, and the calibration is complete.

f. If the calibration was unsuccessful, either there is more than 0 Bar/PSIG on the transducer, or the transducer is further away from 0 than an offset will allow. The transducer must be replaced.

8.21.2 Testing Compressor Discharge Pressure Transducer

a. Verify that the wiring to the transducer is correct. (See wiring diagram, Section 10.)

b. Power up the transducer circuit. Place unit into PC Mode (Refer to Section 5.1), or place unit in Manual Start Mode.

c. Check Voltage to transducer connector. Voltage reading between A (negative) and B (positive) should be 5.0 VDC.

d. Check wire resistance between C (output to microprocessor) and 1MP5.

e. Place +5.0 VDC on transducer terminal B and −5.0 VDC on transducer terminal A. Disconnect C from the microprocessor. Test voltage between B and C. The reading should be as shown in table below.

Table 8-5. Compressor Discharge Pressure Transducer

PSIG	Bar	Voltage	PSIG	Bar	Voltage	PSIG	Bar	Voltage
0	0	0.5	80	5.4	1.1	250	17.0	2.5
10	0.7	0.6	90	6.1	1.2	275	18.7	2.7
20	1.4	0.7	100	6.8	1.3	300	20.4	2.9
30	2.0	0.7	125	8.5	1.5	325	22.1	3.1
40	2.7	0.8	150	10.2	1.7	350	23.8	3.3
50	3.4	0.9	175	11.9	1.9	375	25.5	3.5
60	4.1	1.0	200	13.6	2.1	400	27.2	3.7
70	4.8	1.1	225	15.3	2.3	450	30.6	4.1

CAUTION

The +5.0 VDC (terminal B) is common between the Compressor Discharge Pressure Transducer, the Compressor Suction Pressure Transducer, and the RPM sensor. If this circuit is shorted to ground (due to one of the mentioned components being defective, or a worn wire) the MessageCenter will show:

Suction Pressure: −14.7 psig (−1 Bar)
Discharge Pressure: 0 Bar/PSIG
Engine RPM: 0.

8.21.3 Replacing Compressor Discharge Pressure Transducer

a. Pump down the compressor. (Refer to Section 8.11.1.) Frontseat both suction and discharge service valves to isolate compressor.

b. Equalize compressor discharge and suction pressures through the service valve gauge set.

c. Disconnect wiring from defective transducer and remove. The CDP is located at the side of the center compressor cylinder head. (See Figure 2-2)

⚠ WARNING

The Compressor Discharge Pressure Transducer does not have a Schrader valve in the connecting fitting. Any discharge pressure remaining in the compressor will be released when removing the CDP.

d. Calibrate new discharge transducer before installing in compressor. (Refer to Section 8.21.1)

e. Install new discharge transducer, being careful to obtain the correct transducer for your unit. R-404A CDPs have a red dot on the side.

NOTE

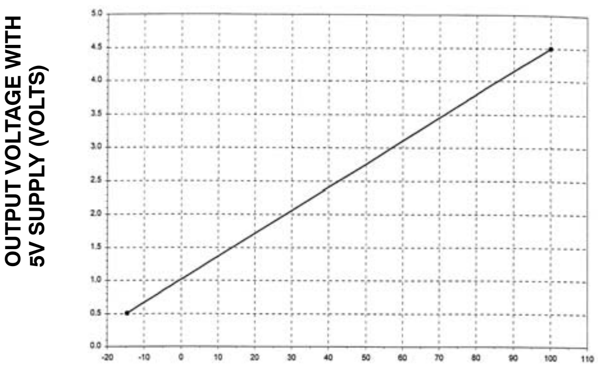
Place unit in Service Mode before performing the following operations on the unit. Refer to Section 5.2

f. Evacuate and dehydrate the compressor. (Refer to Section 8.13.**)**

g. Check unit operation by running Pretrip (Refer to Section 3.5).

8.22 COMPRESSOR SUCTION PRESSURE TRANSDUCER (CSP AND EVOP)

LOW RANGE PRESSURE TRANSDUCER – CSP/EVOP



PRESSURE (PSIG)

8.22.1 Calibrating Compressor Suction Pressure Transducer

The Compressor Suction Pressure Transducer (CSP) has a range of −14.7 to100 PSIG (−1 to 6.8 Bar). Because of this much smaller range, calibration of the CSP is not required.

8.22.2 Testing Compressor Suction Pressure Transducer

a. Verify that the wiring to the transducer is correct. (See wiring diagram, Section 10).

b. Power up the transducer circuit. Place unit into PC Mode (Refer to Section 5.1), or place unit in Manual Start Mode.

c. Check Voltage to transducer. Voltage reading between A (negative) and B (positive) should be 5.0 VDC.

d. Check wire resistance between C (output to microprocessor) and 1MP6.

e. Place +5.0 VDC on transducer terminal B and −5.0 VDC on transducer terminal A. Test voltage between B and C. The reading should be as shown in table below.

Table 8-6. Compressor Suction Pressure Transducer

PSIG	Bar	Voltage	PSIG	Bar	Voltage	PSIG	Bar	Voltage
−10	−0.7	0.7	30	2.0	2.1	70	4.8	3.5
−5.0	−0.3	0.8	35	2.4	2.2	75	5.1	3.6
0.0	0.0	1.0	40	2.7	2.4	80	5.4	3.8
5.0	0.3	1.2	45	3.1	2.6	85	5.8	4.0
10.0	0.7	1.4	50	3.4	2.8	90	6.1	4.1
15.0	1.0	1.5	55	3.7	2.9	95	6.5	4.3
20.0	1.4	1.7	60	4.1	3.1	100	6.8	4.5
25.0	1.7	1.9	65	4.4	3.3			

⚠ CAUTION

The +5.0 VDC (terminal B) is common between the Compressor Discharge Pressure Transducer, the Compressor Suction Pressure Transducer, and the RPM sensor. If this circuit is shorted to ground (due to one of the mentioned components being defective or a worn wire) the MessageCenter will show:

Suction Pressure: −14.7 psig (−1 Bar)
Discharge Pressure: 0 PSIG/Bar
Engine RPM: 0.

8.22.3 Replacing Compressor Suction Pressure Transducer

a. Pump down compressor until the suction pressure is approximately 0−5 PSIG (0−.4 Bar). (Refer to Section 8.11.1.)

b. Disconnect wiring from defective transducer. Slowly remove the transducer. The pressure remaining in the suction line will be held in place by a Schrader valve located inside the fitting. The CSP is located on the suction line just above the Suction Service Valve. (See Figure 2-2).

c. Install new suction transducer, being careful to obtain the correct transducer for your unit. R-404A CSPs have a blue dot on the side. Check for leaks.

d. Open the king valve and check operation.

e. Evacuate and dehydrate the compressor. (Refer to Section 8.13.)

f. Check unit operation by running pretrip (Refer to Section 3.5).

8.23 REPLACING RECEIVER SIGHT GLASS ASSEMBLY

NOTE

Place unit in Service Mode before performing the following operations. Refer to Section 5.2.3.

a. Store the refrigerant in an evacuated container. (Refer to Section 8.11.1.)

b. Unscrew the sight glass assembly. Wrap threads with teflon tape or spread some sealing compound on pipe threads of new sight glass assembly or plug and install. The torque value for the sight glass assembly is 37−44 ft−lbs (5.1 to 6.1 Mkg)

c. Leak check receiver sight glass Section 8.12.

d. After leak checking unit, evacuate and dehydrate as outlined in Section 8.12.

e. Add refrigerant charge. (Refer to Section 8.13.4)

f. Check unit operation by running Pretrip.

8.24 COMPRESSOR SUCTION MODULATION VALVE (CSMV)

The purpose of the SMV is to control suction pressure, maintain the compressor within its operating envelope, and maximize unit capacity and fuel economy.

At initial startup, the microprocessor will go through a self test. When the test is complete, the MessageCenter will display “SMV CLOSING”. The process of fully closing the SMV on startup is known as “homing” the SMV. When homing is complete, the MessageCenter will display “SETTING SMV XX%”. The XX% will count up to a predetermined percentage depending on ambient temperature and box temperature. The unit will then go through its normal start procedure.

Figure 8−34 Suction modulation valve (CSMV)

8.24.1 Function

The SMV coil consists of two windings labeled 1 and 2. Each winding has two poles, labeled A and B.

Both poles of both windings have a wire connected back to the micro.

Looking at the 4−pin connector on the SMV coil, the wiring is as follow :

Table 8-7. CSMV Connections

Connector Pin	Wire Color	Winding/Pole
A	BLACK	1A
B	WHITE	1B
C	RED	2B
D	GREEN	2A

OPEN		Winding #1		Winding #2		
		1A	1B	2A	2B	
	1	+12V	GRD	+12V	GRD	
	2	GRD	+12V	+12V	GRD	
	3	GRD	+12V	GRD	+12V	
	4	+12V	GRD	GRD	+12V	CLOSE

Each winding has a resistance of about 75 Ω.

There is no common connection point between the two windings.

The reason this coil design is bipolar is that the microprocessor causes the valve to open by energizing the windings in a particular sequence *and* by reversing the polarity of the current through the windings in a specific sequence.

Energizing the windings with the correct polarity, in the correct sequence, rotates the rotor and causes the valve to open one step.

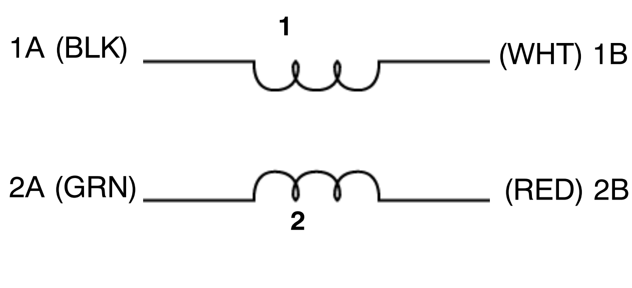


Figure 8–35 CSMV Coil (Bi–Polar Design)

8.24.2 CSMV Diagnostics

If the SMV is suspected to be faulty, the first thing the operator should do is perform a unit Pretrip (Refer to Section 3.5). Some symptoms that could indicate a faulty SMV are:

- Unusually high suction pressure in COOL mode.

  A27 – High Suction Pressure Alarm may be generated.

- Unusually low suction pressure

  A18 – Low Refrigerant Alarm may be generated

- Poor temperature control

  Box temperature deviates from setpoint.

If the unit fails Test 10 during pretrip,
(P180 CHECK SUCTION MOD VALVE) the SMV could be faulty. The SMV could have become mechanically jammed, or it could have failed electrically in the power head, or it may not be receiving the proper signal from the micro. There are several steps the operator should make in addition to the unit Pretrip to further diagnose the valve.

a. The SMV may be stuck in some position other than completely closed and the stepper motor cannot move the piston. To check if the valve is stuck, first start the unit and run in cool mode with manifold gauges attached to the compressor

b. Allow the suction pressure to pull down to 0 PSIG/Bar.

WARNING

Carrier Transicold does not recommend allowing the compressor to pull less than 0 PSIG/Bar at any time.

c. Once the unit has reached suction pressure of 0 PSIG/BAR, switch the unit to OFF using the SROS. After the engine shuts down, the microprocessor will fully close the SMV.

NOTE

Carefully listen to the valve. When the unit is off and the valve is closing, the valve will make a ratcheting noise that may be heard or felt as it is closing. If this can be heard or felt, it indicates that the microprocessor is **attempting** to close the valve, and may serve as a quick indication that the drive module is in working order. It is not, however, an indication that the valve piston is actually working.

d. Wait about 2 minutes after the engine stops to ensure the valve is fully shut.

e. If the SMV is fully shut, the suction pressure should still read 0 PSIG/Bar. If the valve is stuck at some position other than fully closed, or it cannot fully close for any reason, the suction pressure during this test will rise.

   a. If the suction pressure holds to 0, go to Step c.

   b. If the suction pressure rises, go to Step d.

c. Use the Stepper Motor Tester (CTD special tool P/N 07–00375–00) to manually open the valve. The suction pressure on the manifold gauge should go up. If the suction pressure does not go up, the SMV is stuck closed (go to Step d.) or there is something obstructing the refrigerant.

NOTE

Opening the valve can also be accomplished by using the microprocessor. Place the SROS in the Start/Run position. The microprocessor will go through its self test and the display will show "SMV CLOSING". *The valve is obviously closed at this point, but the microprocessor still has to "home" the SMV valve every time the microprocessor is powered up.* The display will then show "SETTING SMV XX%" . Refer to 8.24 above. If the suction pressure does not go up, the SMV is stuck closed (go to Step d.) or there is something obstructing the refrigerant.

NOTE

If the valve passes steps a. through c., the valve is operating properly.

d. If the suction pressure rises during Step e., or if the valve is determined to be stuck closed in Step c., turn the unit Off by placing the SROS in the OFF position and unplug the 4 pin connector to the SMV. With a reliable digital ohmmeter, check the winding resistance between 1A (Black) wire and the 1B (White) wire AND between the 2A (Green) wire and the 2B (Red) wire. In normal ambient, each winding should have 72 to 84 ohms. If this resistance is confirmed, proceed to Step 8. If an infinite or zero ohm reading occurs, first check the wires at the connector for good contact. If the connector is in good condition and the resistance is still bad, one (or both) of the coils could be faulty. Replace the SMV power head assembly P/N 14−00263−20. Refer to Section 8.24.3.

e. Locate the wires on the engine harness side of the SMV connector. Locate the wires labeled CSMVA, CSMVB, CSMVC and CSMVD. These will correlate to the connector pins labeled A, B, C and D. See Table 8-7.

f. Place the SROS in the Start/Run position. DO NOT ALLOW THE UNIT TO START. When the MessageCenter displays “SMV CLOSING”, measure the AC voltage between pins A and B and then between C and D. A reading of 10 to 16 VAC should be read by the digital voltmeter for each pair of wires. If this test passes, there is a good signal coming from the microprocessor.

g. If the reading of 10 to 16 VAC is not present on one or both of the wire pairs, check the wiring between the microprocessor and the SMV connector, or check the microprocessor for proper model number configuration.

h. If all the above tests pass, the SMV is operating properly and the abnormal unit operation can be contributed to something other than the SMV.

8.24.3 Replacing The SMV Power Head (14−00263−20)

a. Pump the unit down at the manual shut off valve (king valve) (Refer to Section 8.11.1).

b. Unplug the SMV connector from the engine harness.

c. Loosen the 2 1/8” nut on the SMV and remove the power head assembly. (See Figure 8−34).

d. Install the new SMV power head.

e. The power head should be set to 100% (Open) when received from the warehouse. This is to ensure the Teflon valve seal is not damaged when it is installed. Ensure the valve is fully open by using Stepper Motor Tester (CTD special tool P/N 07−00375−00) to manually open the valve to 100% before it is installed.

f. Torque the 2 1/8” nut to 35 to 40 ft−lbs (4.8 to 5.5 Mkg)

g. Reconnect the SMV connector to the engine harness.

NOTE

Place unit in Service Mode before pumping down and/or removing the refrigeration charge. Refer to Section 5.2.3.

h. Evacuate the low side of the refrigeration system. (Refer to Section 8.13)

i. Open the king valve, run the unit for approximately 10 minutes and initiate a pretrip.

Emergency repair procedures :

In the event that the SMV system has a failure, and replacement components are not readily available in an emergency. A **LIMP-HOME** procedure can be done as follows :

a. Attach a manifold gauge set.

b. Perform a low side pump down. When the unit has reached 0 to 5 psig close the suction service valve and turn the unit OFF.

c. Remove SMV powerhead by loosening the 2-1/8 inch diameter nut (see Figure 8−34), and sliding the powerhead out.

d. Remove the piston by loosening the Allen screw and removing the piston and screw.

e. Install the powerhead assembly (without the piston), torque to 35 to 40 foot-lbs (4.8 to 5.5 Mkg).

f. Open all valves.

g. Start the unit.

3. Adjust the suction service valve so that the approximate temperature OR current limit is maintained. For perishable loads, it is recommended that the adjustment be made so that the available capacity is slightly larger than the load, the unit will cycle OFF and ON.

h. Once repair parts become available, repair as required.

8.25 CHECKING DEFROST OR HEATING CYCLE

NOTE

The DTT temperature for any enabled compartment must be 40°F (4.4°C) or cooler, before any checks can be made.

8.25.1 Defrost Air Switch

a. To check the Defrost Air Switch, run unit in high speed cooling and jump across the air switch terminals. This will start the defrost cycle as it simulates the action of the defrost air switch. Bypassing the switch in this manner operates all components involved in defrost.

NOTE

If none of the DTTs are below 40°F (4.4°C), the MessageCenter will show “CANNOT START DEFROST CYCLE”.

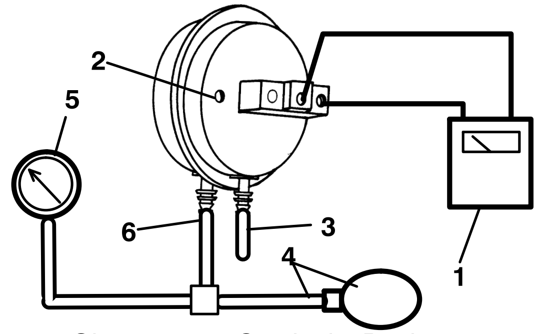
b. Unit should remain in defrost until all DTTs reach 55°F (12.8°C). At this point the defrost cycle will terminate, and the unit will resume automatic operation.

c. If the above test indicates satisfactory operation, test DAS settings using a Dwyer Magnehelic gauge (P/N 07-00177) or similar instrument. (Refer to Section 8.26)

8.25.2 Electronic Defrost Timer

Refer to Section 2.12 for description.

8.26 CHECKING CALIBRATION OF DEFROST AIR SWITCH



1. Ohmmeter or Continuity Device
2. Adjustment Screw (0.050” socket head size)
3. Low Side Connection
4. Pressure Line or Aspirator Bulb (P/N 07-00177-01)
5. Magnehelic Gauge (P/N 07-00177-00)
6. High Side Connection

Figure 8−36 Defrost Air Switch Test Setup

a. Make sure magnehelic gauge is in proper calibration.

NOTE

The Magnehelic Gauge may be used in any position, but must be re-zeroed if position of gauge is changed from vertical to horizontal or vice versa. USE ONLY IN POSITION FOR WHICH IT IS ZEROED. The Defrost Air Switch MUST be in the same orientation as it will be in when installed in the unit.

b. With air switch in vertical position, connect high pressure side of magnehelic gauge to high side connection of air switch. (See Figure 8−36)

c. Install tee in pressure line to high side connection. Tee should be approximately half-way between gauge and air switch or an improper reading may result.

d. Attach an ohmmeter to the air switch electrical contacts to check switch action.

NOTE

Use a hand aspirator (P/N 07-00177-01), since blowing into tube by mouth may cause an incorrect reading.

e. With the gauge reading at zero, apply air pressure very slowly to the air switch. An ohmmeter will indicate continuity when switch actuates. The switch contacts should close and the ohmmeter needle move rapidly to 0. Any hesitation in the ohmmeter indicates a possible problem with the switch, and it should be replaced.

f. Refer to Section 2.12 for switch settings. If switch fails to actuate at correct gauge reading, adjust switch by turning adjusting screw clockwise to increase setting or counterclockwise to decrease setting.

g. Repeat checkout procedure until switch actuates at correct gauge reading.

h. After switch is adjusted, place a small amount of paint or fingernail polish on the adjusting screw so that vibration will not change switch setting.

8.27 EVAPORATOR COIL

8.27.1 Cleaning

The use of recycled cardboard cartons is increasing across the country. The recycled cardboard cartons create much more fiber dust during transport than “new” cartons. The fiber dust and particles are drawn into the evaporator where they lodge between the evaporator fins. If the coil is not cleaned on a regular basis, sometimes as often as after each trip, the accumulation can be great enough to restrict air flow, cause coil icing, repetitive defrosts and loss of unit capacity. Due to the “washing” action of normal defrost the fiber dust and particles may not be visible on the face of the coil but may accumulate deep within.

It is recommended to clean the evaporator coil on a regular basis, not only to remove cardboard dust, but to remove any grease or oil film which sometimes coats the fins and prevents water from draining into the drain pan.

Cardboard fiber particles after being wetted and dried several times can be very hard to remove. Therefore, several washings may be necessary.

a. Remove rubber check valves (Kazoo) from drain lines (front of trailer or rail car).

b. Spray coil with a mild detergent solution such as Oakite 164 or 202) or any good commercial grade automatic dish washer detergent such as Electrosol or Cascade and let the solution stand for a few minutes and reverse flush (opposite normal air flow) with clean water at mild pressure. A garden hose with spray nozzle is usually sufficient. Make sure drain lines are clean.

c. Run unit until defrost mode can be initiated to check for proper draining from drain pan.

8.27.2 Coil Replacement − Compartment 1

a. Pump unit down. (Refer to section 8.11)

b. With power OFF and power plug removed, remove the screws securing the panel covering the evaporator section.

c. Disconnect all heater wiring.

d. Disconnect the RAT, DTT, and SAT sensors from the coil.

e. Remove the mounting hardware from the coil.

f. Unsolder the two coil connections, one at the distributor and the other at the coil header.

g. After defective coil is removed from unit, remove heaters and install on replacement coil.

h. Install coil assembly by reversing above steps.

i. Leak check connections per section 8.12. Evacuate the unit per section 8.13 and add refrigerant charge per Section 8.13.4.

8.28 CONDENSER COIL

8.28.1 Coil Cleaning

Remove all foreign material from the condenser coil by reversing the normal air flow. (Air is pulled in through the front and discharges over the engine.) Compressed air or water may be used as a cleaning agent. It may be necessary to use warm water mixed with any good commercial dishwasher detergent. Rinse coil with fresh water if a detergent is used.

8.28.2 Coil Replacement

a. Remove the refrigerant charge per section 8.11.

b. Drain engine coolant.

c. Remove the condenser grille.

d. Unsolder discharge line and remove the line to the receiver.

e. Remove coil mounting hardware and remove the coil.

f. Install replacement coil and solder connections.

g. Leak-check the coil per section 8.12. Evacuate the unit per section 8.13, then charge the unit with refrigerant per section 8.13.4.

h. Refill engine coolant.

8.29 CONTROLLER SENSOR CHECKOUT

An accurate ohmmeter must be used to check resistance values shown in Table 8-8.

Due to variations and inaccuracies in ohmmeters, thermometers or other test equipment, a reading within 2% of the chart value would indicate a good sensor. If a sensor is bad, the resistance reading will usually be much higher or lower than the resistance values given in Table 8-8.

Two preferred methods of determining the actual test temperature at the sensor, is an ice bath at 32°F (0°C) or a calibrated temperature tester.

Table 8-8. Sensor Resistance (ATT, 1RAT, 2RAT, 3RAT, 1SAT, ENCT, EVOT, CST, 1DTT, 2DTT)

°F	°C	Ohms	°F	°C	Ohms	°F	°C	Ohms	°F	°C	Ohms
–40	–40	336,500	18	–7.8	49,060	76	24.4	10,250	134	56.7	2,809
–38	–38.9	312,600	20	–6.7	46,230	78	25.6	9,760	136	57.8	2,697
–36	–37.8	290,600	22	–5.6	43,580	80	26.7	9,299	138	58.9	2,590
–34	–36.7	270,300	24	–4.4	41,100	82	27.8	8,862	140	60.0	2,488
–32	–35.6	251,500	26	–3.3	38,780	84	28.9	8,449	142	61.1	2,390
–30	–34.4	234,200	28	–2.2	36,600	86	30.0	8,057	144	62.2	2,297
–28	–33.3	218,200	30	–1.1	34,560	88	31.1	7,686	146	63.3	2,208
–26	–32.2	203,400	32	0	32,650	90	32.2	7,334	148	64.4	2,124
–24	–31.1	189,700	34	1.1	30,850	92	33.3	7,000	150	65.6	2,042
–22	–30	177,000	36	2.2	29,170	94	34.4	6,684	155	68.3	1,855
–20	–28.9	165,200	38	3.3	27,590	96	35.6	6,384	160	71.1	1,687
–18	–27.8	154,300	40	4.4	26,100	98	36.7	6,099	165	73.9	1,537
–16	–26.7	144,200	42	5.5	24,700	100	37.8	5,828	170	76.7	1,402
–14	–25.6	134,800	44	6.6	23,390	102	38.9	5,571	175	79.4	1,281
–12	–24.4	126,100	46	7.7	22,160	104	40.0	5,327	180	82.2	1,171
–10	–23.3	118,100	48	8.9	20,990	106	41.1	5,095	185	85.0	1,072
–8	–22.2	110,500	50	10	19,900	108	42.2	4,874	190	87.8	983
–6	–21.1	103,600	52	11.1	18,870	110	43.3	4,665	195	90.6	902
–4	–20	97,070	54	12.2	17,900	112	44.4	4,465	200	93.3	829
–2	–18.9	91,030	56	13.3	16,980	114	45.5	4,275	205	96.1	762
0	–17.8	85,400	58	14.4	16,120	116	46.7	4,095	210	98.9	702
2	–16.7	80,160	60	15.5	15,310	118	47.8	3,923	215	101.7	647
4	–15.6	75,270	62	16.6	14,540	120	48.9	3,759	220	104.4	598
6	–14.4	70,720	64	17.7	13,820	122	50.0	3,603	225	107.2	553
8	–13.3	66,460	66	18.9	13,130	124	51.1	3,454	230	110.0	511
10	–12.2	62,500	68	20.0	12,490	126	52.2	3,313	235	112.8	473
12	–11.1	58,790	70	21.1	11,880	128	53.3	3,177	240	115.6	438
14	–10.0	55,330	72	22.2	11,310	130	54.4	3,049	245	118.3	406
16	–8.9	52,090	74	23.3	10,760	132	55.6	2,926	250	121.1	378

Table 8-9. Sensor Resistance (CDT)

°F	°C	Ohms	°F	°C	Ohms
–40	–40	3,360,000	18	–7.8	189,690
–38	–38.9	3,121,020	20	–6.7	461,170
–36	–37.8	2,900,710	22	–5.6	434,790
–34	–36.7	2,697,500	24	–4.4	410,080
–32	–35.6	2,509,940	26	–3.3	386,940
–30	–34.4	2,336,720	28	–2.2	365,260
–28	–33.3	2,186,670	3	–1.1	344,930
–26	–32.2	2,028,680	32	0	325,860
–24	–31.1	1,891,780	34	1.1	307,970
–22	–30	1,765,060	36	2.2	291,180
–20	–28.9	1,647,700	38	3.3	275,410
–18	–27.8	1,538,950	40	4.4	260,590
–16	–26.7	1,438,120	42	5.5	246,670
–14	–25.6	1,344,580	44	6.6	233,570
–12	–24.4	1,257,770	46	7.7	221,260
–10	–23.3	1,177,150	48	8.9	209,670
–8	–22.2	1,102,240	50	10	198,760
–6	–21.1	1,032,600	52	11.1	188,490
–4	–20	967,830	54	12.2	178,820
–2	–18.9	907,560	56	13.3	169,700
0	–17.8	851,450	58	14.4	161,100
2	–16.7	799,180	60	15.5	152,990
4	–15.6	750,470	62	16.6	145,340
6	–14.4	705,060	64	17.7	138,120
8	–13.3	662,690	66	18.9	131,310
10	–12.2	623,150	68	20.0	124,870
12	–11.1	586,230	70	21.1	118,790
14	–10.0	551,740	72	22.2	113,040
16	–8.9	519,500	74	23.3	107,600

Sensor Resistance (CDT) Continued										
°F	°C	Ohms		°F	°C	Ohms		°F	°C	Ohms
76	24.4	102,460		134	56.7	28,160		260	126.7	3,290
78	25.6	97,600		136	57.8	27,040		270	132.2	2,850
80	26.7	92,990		138	58.9	25,970		280	137.8	2,490
82	27.8	88,630		140	60.0	24,960		290	143.3	2,170
84	28.9	84,510		142	61.1	23,980		300	148.9	1,910
86	30.0	80,600		144	62.2	23,050		310	154.4	1,680
88	31.1	76,890		146	63.3	22,160		320	160.0	1,480
90	32.2	73,380		148	64.4	21,310		330	165.5	1,310
92	33.3	70,040		150	65.6	20,500		340	171.1	1,160
94	34.4	66,880		155	68.3	18,980		350	176.7	1,040
96	35.6	63,880		160	71.1	16,940		360	182.2	920
98	36.7	61,040		165	73.9	15,450		370	187.8	830
100	37.8	58,330		170	76.7	14,070		380	193.3	740
102	38.9	55,770		175	79.4	12,870		390	198.9	670
104	40.0	53,330		180	82.2	11,750		400	204.4	600
106	41.1	51,010		185	85.0	10,750		410	210.0	540
108	42.2	48,800		190	87.8	9,870		420	215.6	490
110	43.3	46,710		195	90.6	9,050		430	221.1	450
112	44.4	44,710		200	93.3	8,320		440	226.7	410
114	45.5	42,820		205	96.1	7,650		450	232.2	370
116	46.7	41,010		210	98.9	7,050		460	237.8	340
118	47.8	39,290		215	101.7	6,510		470	243.3	310
120	48.9	37,660		220	104.4	6,000		480	248.9	280
122	50.0	36,100		225	107.2	5,540		490	254.4	260
124	51.1	34,610		230	110.0	5,130		500	260.0	240
126	52.2	33,200		235	112.8	4,760				
128	53.3	31,850		240	115.6	4,410				
130	54.4	30,560		245	118.3	4,090				
132	55.6	29,330		250	121.1	3,800				

Temperature		Pressure			Temperature		Pressure	
°C	°F	Bar	PSIG		°C	°F	Bar	PSIG
–40	–40	0.3	4.5		0	32	5.0	72.5
–37	–35	0.5	7.1		1	34	5.2	75.6
–34	–30	0.7	9.9		2	36	5.4	78.8
–32	–25	0.9	12.9		3	38	5.7	82.1
–29	–20	1.1	16.3		4	40	5.9	85.5
–28	–18	1.2	17.7		6	42	6.1	89.0
–27	–16	1.3	19.2		7	44	6.4	92.5
–26	–14	1.4	20.7		8	46	6.6	96.2
–24	–12	1.5	22.3		9	48	6.9	99.9
–23	–10	1.7	23.9		10	50	7.2	103.7
–22	–8	1.8	25.6		13	55	8.0	115.4
–21	–6	1.88	27.3		16	60	8.7	126.1
–20	–4	2.0	29.1		18	65	9.5	137.4
–19	–2	2.1	30.9		21	70	10.3	149.4
–18	0	2.3	32.8		24	75	11.2	162.1
–17	2	2.4	34.8		27	80	12.1	175.5
–16	4	2.5	36.8		29	85	13.1	189.6
–14	6	2.7	38.9		32	90	14.1	204.5
–13	8	2.8	41.1		35	95	15.2	220.2
–12	10	3.0	43.3		38	100	16.3	236.8
–11	12	3.1	45.6		41	105	17.5	254.2
–10	14	3.3	48.0		43	110	18.8	272.4
–9	16	3.5	50.4		46	115	20.1	291.6
–8	18	3.7	52.9		49	120	21.5	311.8
–7	20	3.8	55.5		52	125	23.0	332.9
–6	22	4.0	58.1		54	130	24.5	355.0
–4	24	4.2	60.9		57	135	26.1	378.1
–3	26	4.4	63.7		60	140	27.7	402.3
–2	28	4.6	66.5		63	145	29.5	427.6
–1	30	4.8	69.5		66	150	31.3	454.0

Table 8-10. Temperature Pressure Chart

SECTION 9

MICROPROCESSOR AND UNIT TROUBLESHOOTING

9.1 MICROPROCESSOR TROUBLESHOOTING

CAUTION

Under no circumstances should anyone attempt to service the Advance Microprocessor. Should a problem develop with the Advance Microprocessor, contact your nearest Carrier Transicold dealer for replacement.

INDICATION/ TROUBLE	POSSIBLE CAUSES	REFERENCE SECTION
DIESEL ENGINE		
9.1.1 Engine Will Not Start		
Starter motor will not crank or low cranking speed	Battery insufficiently charged	Check
	Battery terminal post dirty or defective	Check
	Bad electrical connections at starter	Check
	Starter motor malfunctions	9.1.4
	Starter motor solenoid defective	Engine Manual
	Open starting circuit	9.1.5
	Incorrect grade of lubricating oil	2.9
	Worn generator bearings	replace
Starter motor cranks but engine fails to start	No fuel in tank	Check
	Air in fuel system	8.3
	Water in fuel system	Drain Sump
	Plugged fuel filter(s)	Replace
	Plugged fuel lines to injector(s)	Check
	Fuel control operation erratic	Engine Manual
	Glow plug(s) defective	8.6.8
	Fuel solenoid defective	Engine Manual
	Optional fuel pump (FP) malfunction	8.3
Starter cranks, engages, but dies after a few seconds	Engine lube oil too heavy	2.9
	Voltage drop in battery cable(s)	Check

INDICATION/ TROUBLE	POSSIBLE CAUSES	REFERENCE SECTION
9.1.2 Engine Starts Then Stops		
Engine stops after several rotations	Fuel supply restricted	Check
	No fuel in tank	Check
	Leak in fuel system	Check
	Faulty fuel control operation	Engine
	Fuel filter restricted	Replace
	Injector nozzle(s) defective	Engine Manual
	Injection pump defective	Engine Manual
	Air cleaner or hose restricted	8.6.6
	Safety device open	2.15
	Fuel solenoid defective	Engine Manual
	Optional fuel pump (FP) malfunction	8.3
	Open wiring to fuel solenoid	Check
	Mechanical lift fuel pump malfunction	Engine Manual
	Oil pressure switch defective	Replace
9.1.3 Engine Will Not Shut Off		
Engine will not shut off	Loose ground connection	Clean & Tighten
	Improperly seated fuel solenoid	Correct
9.1.4 Starter Motor Malfunction		
Starter motor will not crank or turns slowly	Battery insufficiently charged	Check
	Battery cable connections loose or oxidized	Check
	Battery cables defective	Replace
	Starter brushes shorted out	Engine Manual
	Starter brushes hang up or have no contact	Engine Manual
	Starter solenoid damaged	Engine Manual
	Glow/Crank switch defective	Replace
	Engine lube oil too heavy	2.9
Starter motor turns but pinion does not engage	Pinion or ring gear obstructed or worn	Clean both, remove burrs, or replace; apply grease
Starter motor does not disengage after switch has been released	Glow/Crank switch defective	Replace
	Starter motor solenoid defective	Engine Manual
Pinion does not disengage after switch is released	Defective starter	Engine Manual
9.1.5 Malfunction In The Engine Starting Circuit		
No power to starter solenoid (SS)	Battery defective	Check
	Loose electrical connections	Tighten
Fuel solenoid does not energize or does not remain energized	Battery defective	Check
	Loose electrical connections	Tighten
	Oil pressure safety switch (ENOPS) defective	Replace
	Run relay (RR) defective	Replace
	Engine coolant temp. (ENCT) defective	Replace
	Fuel solenoid defective	Engine Manual

INDICATION/ TROUBLE	POSSIBLE CAUSES	REFERENCE SECTION
9.1.6 Miscellaneous Engine Troubleshooting		
Loss of power	Restriction in air cleaner	8.6.6
	Air in fuel system	8.3.1
	Air vent restricted	Clean
	Restricted fuel lines	Engine Manual
	Defective fuel injection pump	Engine Manuall
	Defective injector(s) or incorrect type	Engine Manual
	Incorrect fuel injection pump timing	Engine Manuall
	Incorrect valve timing	Engine Manual
	Poor compression	Engine Manual
Vibration	Engine shockmounts defective	Replace
	Poor compression	Engine Manual
Overheating	Restriction in air cleaner	8.6.6
	Exhaust pipe restriction	Removel
	Restriction in water jacket	Engine Manual
	Restriction in radiator	8.6.2
	Coolant level too low	8.5.1l
	Loose water pump	replace
	Defective thermostat	Engine Manual
	Defective water pump	Engine Manual
Excessive crankcase pressure	Plugged crankcase breather line	8.6.7

INDICATION/ TROUBLE	POSSIBLE CAUSES	REFERENCE SECTION
9.2 BATTERY CHARGER		
Input fuse blows when charger is turned on	Short in 12 volt wiring causing overload of charger	Locate and remove short
Input fuse blows repeatedly, even when not connected	Internal short	Replace
Charger does not taper back after charging for a few minutes	Bad cell in battery	Test battery for defect according to battery manufacturer's instructions
	Defective charger	Replace
Charger does not charge	Open input fuse Charger is not receiving AC input	Replace. Using a voltmeter, confirm charger is receiving correct (460v) AC voltage. If not check input connections.
	Charger output is not connected to 12 volt battery	Check output wiring connections to battery.
	Defective charger	Replace
Low output voltage measured across charger output	Battery not connected to charger. It is normal to measure 12 volts or less across charger output with no battery connected	Check charging leads from charger to battery
Reverse polarity connection to battery has caused charger to stop charging	Internal DC fuse blown and possible damage to current carrying components	Replace

INDICATION/ TROUBLE	POSSIBLE CAUSES	REFERENCE SECTION
9.3 ALTERNATING CURRENT GENERATOR		
No voltage	Loss of residual magnetism in exciter field	8.9
	Circuit breaker tripped	Check
	Open or short in stator windings	Check
	Short circuited	Repair
Low voltage	Low engine speed	Correct
	Excessive load	Check
	High resistance connections – connections warm or hot	Clean and Tighten
Fluctuating voltage	Fluctuating speed	Correct
	Irregular speed of engine	Engine Manual
	Loose terminal or load connections	Tighten
High voltage	Excessive engine speed	Correct
Overheating	Generator overloaded	Check
	Clogged ventilation openings	Clean
	Insufficient circulation	Check Fan
	Unbalanced load	Balance
Mechanical Noise	Loose laminations	8.9.2
Generator frame produces shock when touched	Static charge	Check ground to frame

INDICATION/ TROUBLE	POSSIBLE CAUSES	REFERENCE SECTION
9.4 REFRIGERATION		
9.4.1 Unit Will Not Cool		
Compressor malfunction	Compressor contactor defective	check
	Compressor defective	8.15
Refrigeration system	A defrost cycle did not terminate	8.25
	Abnormal pressure	9.4.7
	Liquid line solenoid valve (LSV2/3) malfunction	9.4.12
9.4.2 Unit Runs But Has Insufficient Cooling		
Compressor	Compressor valves defective	8.15
	Unloader malfunction	8.16
Refrigeration system	Abnormal pressure	9.4.7
	Unloader malfunction	8.16
	Expansion valve malfunction	9.4.11
	No or restricted evaporator airflow	9.4.10
	Suction Modulation Valve malfunction	8.24
9.4.3 Unit Operates Long Or Continuously In Cooling		
Trailer	Hot Load	Allow time to pull down
	Defective box insulation or air leak	Correct
Refrigeration system	Abnormal pressure	9.4.7
	Temperature controller malfunction	9.4.9
Compressor	Defective	8.15
9.4.4 Unit Will Not Heat Or Has Insufficient Heating		
Unit will not heat or has insufficient heat	Evaporator fan internal motor protector open	8.7.3
	Heat relay defective	Check
	Heater(s) defective	8.7
	Heater contactor or coil defective	Replace
	Evaporator fan motor(s) defective or rotating backwards	8.7.3
	Evaporator fan motor contactor defective	Replace
	Controller malfunction	9.4.9
	Defective wiring	Replace
	Loose terminal connections	Tighten
	Low voltage	9.3

INDICATION/ TROUBLE	POSSIBLE CAUSES	REFERENCE SECTION
REFRIGERATION (Continued)		
9.4.5 Unit Will Not Terminate Heating		
Unit fails to stop heating	Controller improperly set	Reset
	Controller malfunction	9.4.9
	Heater termination thermostat remains closed along with the heat relay	Repair
9.4.6 Defrost Cycle Malfunction		
Will not initiate defrost automatically	Defrost air switch (DAS) out of calibration	8.26
	A DTT is above 40°F (4.4°C)	Cool Box Down
	Defrost air switch (DAS) defective	8.25 & 8.26
	Loose terminal connections	Tighten
	Air sensing tubes defective or disconnected	Check
Will not initiate defrost manually	Microprocessor defective	Replace
	Loose terminal connections	Tighten
	DTT2 is above 40°F (4.4°C)	Cool Box Down
	Unit has been running less than 15 seconds	Try again
Initiates but does not defrost	Heater contactor or coil defective	Replace
	Heater(s) burned out	8.7
Frequent defrost	Defrost air switch (DAS) out of adjustment	8.25 & 8.26
	Wet load	Normal

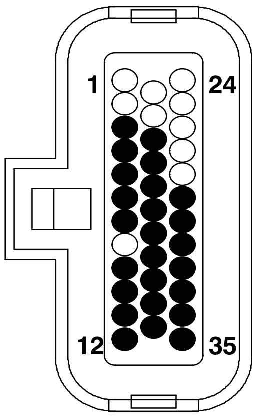
INDICATION/ TROUBLE	POSSIBLE CAUSES	REFERENCE SECTION
9.4.7 Abnormal Pressure		
High discharge pressure	Condenser coil dirty	8.28
	Condenser fan rotating backwards	Check Wiring
	Condenser fan inoperative	Check
	Refrigerant overcharge or noncondensibles	8.11
	Discharge service valve partially closed	Open
	Suction modulation valve malfunction	8.24
Low discharge pressure	Compressor valves(s) worn or broken	8.15
Low suction pressure	Suction service valve partially closed	Open
	Filter-drier partially plugged	8.17
	Low refrigerant charge	8.13
	Expansion valve defective	9.4.11
	No evaporator air flow or restricted air flow	9.4.10
	Excessive frost on evaporator coil	9.4.6
	Evaporator fan(s) rotating backwards	8.7.3
	Discharge pressure regulator valve defective	Replace
	Suction modulation valve malfunction	8.24
	King valve partially closed	Open
High suction pressure	Compressor valves(s) worn or broken	8.15
	Compressor gasket(s) defective	8.15
Suction and discharge pressures tend to equalize when unit is operating	Compressor valves defective	8.15
	Compressor gasket(s) defective	8.15
9.4.8 Abnormal Noise		
Compressor	Loose mounting bolts	Tighten
	Worn bearings	8.15
	Worn or broken valves	8.15
	Liquid slugging	9.4.11
	Insufficient oil	8.15.4
Condenser or evaporator fan	Loose or striking shroud	Check
	Bearings defective	8.7.3
	Bent shaft	8.7.3
V-belt	Cracked or worn	replace
9.4.9 Control System Malfunction		
Will not control	Sensor defective	8.29
	Relay(s) defective	Check
	Microprocessor controller malfunction	Check

INDICATION/ TROUBLE	POSSIBLE CAUSES	REFERENCE SECTION
9.4.10 No Evaporator Air Flow Or Restricted Air Flow		
Evaporator coil blocked	Frost on coil	8.25
	Dirty coil	8.27
No or partial evaporator air flow	Evaporator fan loose or defective	8.7.3
	Evaporator fan rotating backwards	8.7.3
	Evaporator air flow blocked in trailer (box)	Check
9.4.11 Expansion Valve Malfunction		
Low suction pressure with high superheat	Low refrigerant charge	8.12/8.13.4
	External equalizer line plugged	Clean
	Ice formation at valve seat	8.13
	Wax, oil or dirt plugging valve or orifice	8.18
	Broken capillary	8.18
	Power assembly failure or partial Loss of element/bulb charge	Replace
	Superheat setting too high	8.18
Low superheat and liquid slugging in compressor	Superheat setting too low	8.18
	External equalizer line plugged	Open
	Ice holding valve open	8.13
	Foreign material in valve	Clean
	Pin and seat of expansion valve eroded or held open by foreign material	8.18
Fluctuating suction pressure	Improper bulb location or installation	8.18
	Low superheat setting	8.18
High superheat	Broken capillary	8.18
9.4.12 Solenoid Valve Malfunction		
Solenoid valve does not function properly	No power to valve	Check
	Improper wiring or loose connections	Check
	Coil defective	8.16
	Valve improperly assembled	8.15
	Coil or coil sleeve improperly assembled	8.15
	Movement of plunger restricted due to: a. Corroded or worn parts b. Foreign material lodged in valve c. Bent or dented enclosing tub	8.15
Solenoid valve closes but refrigerant continues to flow	Foreign material lodged under seat	Clean
	Defective seat	Replace

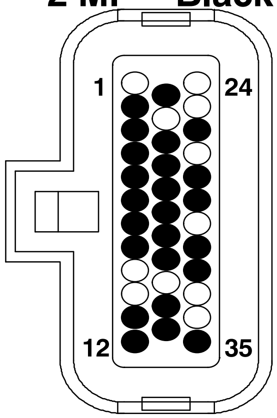
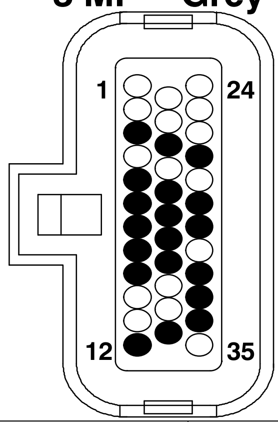
SECTION 10
WIRING

Plugs used with Schematic 62−60926−07 Rev H

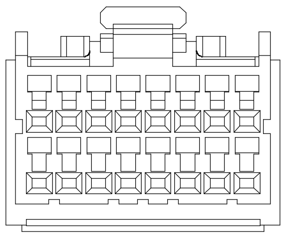
1MP − NATURAL



Component	Terminal
3DTT	3 (21)
3RAT	4 (23)
CDP (C)	5 (16) (30)
EVOP (C)	6 (17) (30)
ENCT	7 (18)
CDT	9 (20)
CST	10 (19)
AAT	11 (22)
1RAT	12 (23)
CSP (A)	15 (29) (30)
HC1	15 (SP16)
CDP (A)	16 (5) (30)
EVOP (A)	17 (6) (30)
ENCT	18 (7) (SP2)
CST	19 (10)
EVOT	19 (32) (SP14)
CDT	20 (9)
1DTT	21 (34)
2DTT	21 (8)
3DTT	21 (3)
2SAT	21 (31)
AAT	22 (11)
1SAT	23 (35)
1RAT	23 (12)
2RAT	23 (33)
3RAT	23 (4)
CSP (C)	29 (15 (30)
CSP (B)	30 (25) (29)
CDP (B)	30 (5) (16)
EVOP (B)	30 (6) (17)
2SAT	31 (21)
EVOT	32 (19)
2RAT	33 (23)
1DTT	34 (21)
1SAT	35 (23)
Unused terminals: 1, 2, 13, 14, 24, 25, 26, 27 & 28	

<table>
<tr><th colspan="2">2 MP – Black</th><th colspan="2">3 MP – Grey</th></tr>
<tr><td colspan="2">
</td><td colspan="2">
</td></tr>
<tr><th>Component</th><th>Terminal</th><th>Component</th><th>Terminal</th></tr>
<tr><td>HC9</td><td>2</td><td>SLP2–C</td><td>3 (15) (27)</td></tr>
<tr><td>OCC</td><td>3</td><td rowspan="3">SLP (C)</td><td rowspan="3">5 (17) (29)</td></tr>
<tr><td>SP46</td><td>4</td></tr>
<tr><td>SP45</td><td>5</td></tr>
<tr><td rowspan="2">DAS</td><td rowspan="2">6</td><td>2HTCON2</td><td>6</td></tr>
<tr><td>3HTCON2</td><td>7</td></tr>
<tr><td>ENRPM–C</td><td>7 (18) (31)</td><td>3EVCON</td><td>8</td></tr>
<tr><td>CSMV–D</td><td>8 (19) (20) (32)</td><td>3LSV</td><td>9</td></tr>
<tr><td>EVXV–B</td><td>11 (12) (22) (23) (35)</td><td>UL1</td><td>12</td></tr>
<tr><td>EVXV–E</td><td>12 (11) (22) (23) (35)</td><td>SLP2–B</td><td>15 (3) (27)</td></tr>
<tr><td>OCD</td><td>13</td><td rowspan="2">SLP –B</td><td rowspan="2">17 (5) (29)</td></tr>
<tr><td>ENCLS–C</td><td>15</td></tr>
<tr><td>OCE</td><td>16</td><td>2LSV</td><td>18</td></tr>
<tr><td>ENOPS</td><td>17</td><td>FL</td><td>19</td></tr>
<tr><td>ENRPM–B</td><td>18 (7) (31)</td><td>DL</td><td>20</td></tr>
<tr><td>CSMV–C</td><td>19 (8) (20) (32)</td><td>UL2</td><td>23</td></tr>
<tr><td rowspan="2">CSMV–A</td><td rowspan="2">20 (8) (19) (32)</td><td>SLP2–A</td><td>27 (3) (15)</td></tr>
<tr><td>SLP–A</td><td>29 (5) (17)</td></tr>
<tr><td>EVXV–D</td><td>22 (11) (12) (23) (35)</td><td>2EVCON</td><td>30</td></tr>
<tr><td>EVXV–A</td><td>23 (11) (12) (22) (35)</td><td>ARL</td><td>32</td></tr>
<tr><td>HC19</td><td>26</td><td>3HTCON1</td><td>33</td></tr>
<tr><td>ENOLS–B</td><td>28</td><td>2HTCON1</td><td>34</td></tr>
<tr><td>SP15</td><td>29</td><td rowspan="4"></td><td rowspan="4"></td></tr>
<tr><td>ENRPM–A</td><td>31 (7) (18)</td></tr>
<tr><td>CSMV–B</td><td>32 (8) (19) (20)</td></tr>
<tr><td>EVXV–C</td><td>35 (11) (12) (22) (23)</td></tr>
<tr><td colspan="2">Unused terminals: 1, 9, 10, 14, 21, 24, 25, 27, 30, 33 & 34</td><td colspan="2">Unused terminals: 1, 2, 4, 10, 11, 13, 14, 16, 21, 22, 24, 25, 26, 28, 31 & 35</td></tr>
</table>

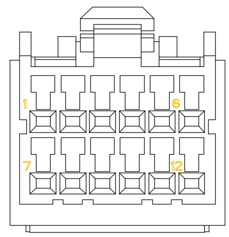
4 MP



Component	Terminal
CCONR−2	1 (5)
CDCON−A2	2 (6)
1EVCON−A2	3 (15)
HTCON1R−2	4 (13) (14) (SP14)
CCONR−2	5 (1)
CDCON−A1	6 (2)
GENCONR−2	7
CT2/OGF	8
CT3/CT4/OGF	9
CT3/OGF	10
HTCON1R−2	13 (4) (14)
HTCON2−A1	14 (4) (13)
1EVCON−A1	15 (3)

Unused terminals: 11 & 12.

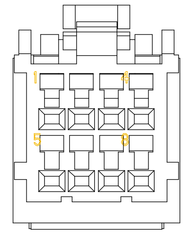
5 MP



Component	Terminal
MPQCC9/SPK2	1
SP20/DES	2
PRM−OUT+	4
GCS−2	5 (6)
GCS−3	6 (5)
PSCONR2	7
SPK2	8
GPR	9
SSR	10

Unused terminals: 3, 11 & 12

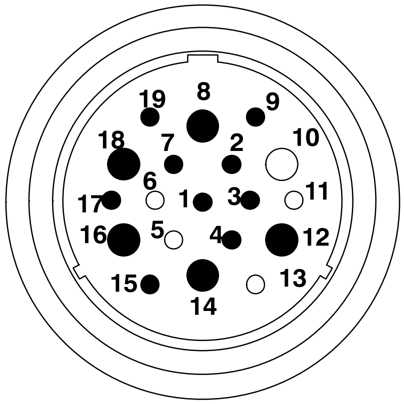
6 MP



Component	Terminal
DISP/KEY1 − BLK	1
DISP/KEY1 − WHT	2
DISP/KEY1 − RED	3
DISP/KEY1 − GRN	4
DISP/KEY1 − BRN	5
DISP/KEY1 − BLU	6
DISP/KEY1 − ORG	7
DISP/KEY1 − YEL	8

Unused terminals: None

HC Plug



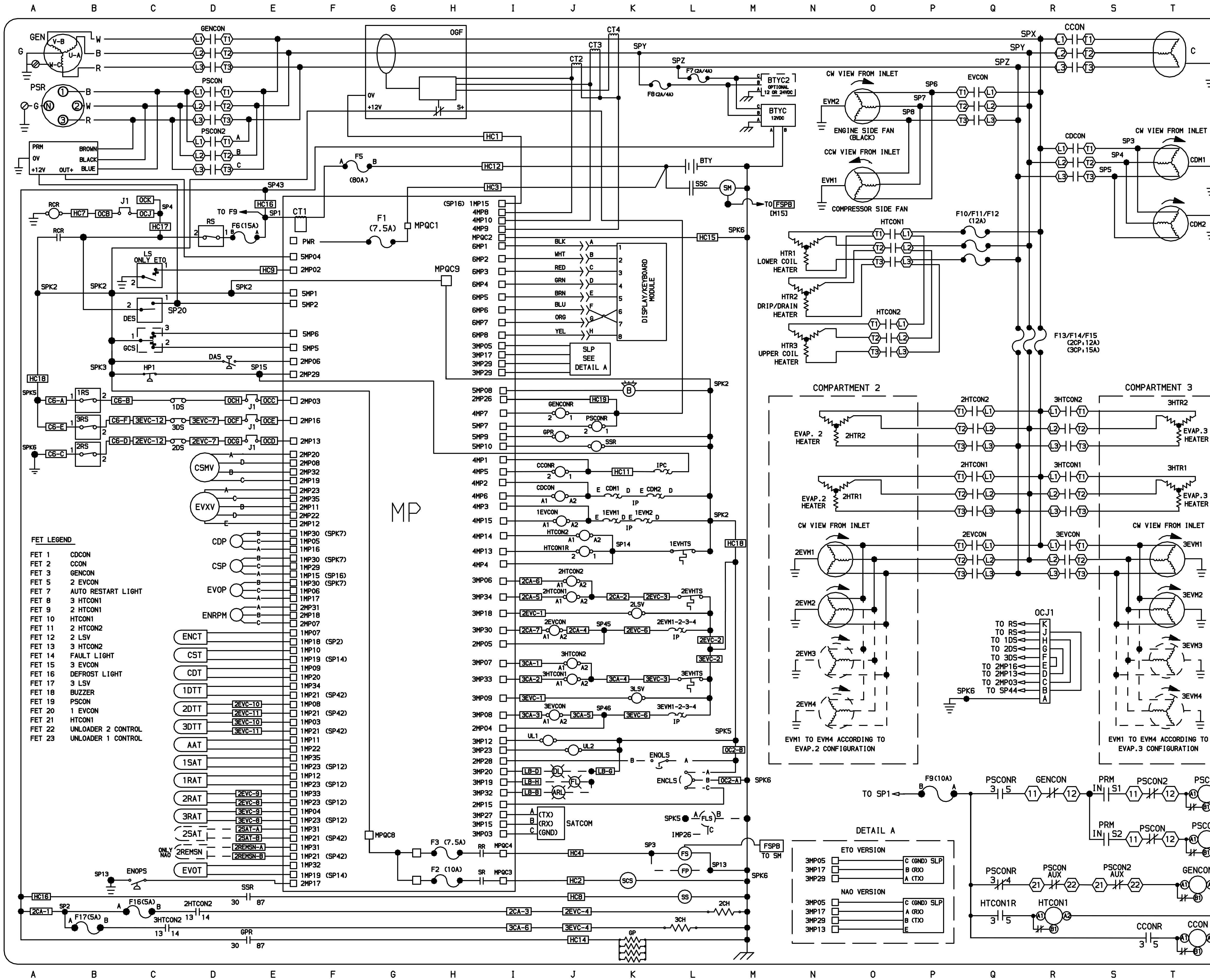
Component	Terminal
OGF−OV/HC−1	1
HC−2/MPQC−3	2
MPQC−1/HC−3	3
MPQC−1/HC−4	4
RCR−2/HC−7	7
HC−8/SSR−87	8
HC−9/C2−1	9
HC−12/F5−B	12
GPR−87/HC−14	14
GRD/HC−15	15
SP1/HC−16	16
RCR−3/HC17	17
SPK2/HC−18	18
GENCONR−1/HC−19	19
Unused terminals: 5, 6, 10, 11 & 13	

ADVANCE MICRO DISPLAY HARNESS CONNECTIONS

Test Point	Pin	Color	Description
TP14	Pin 1	Black	+12 Vdc for Display backlighting and indicator LED¿s
TP13	Pin 2	White	Ground for Backlighting and indicator LEDs
TP13	Pin 3	Red	Ground for Backlighting and indicator LEDs
TP12	Pin 4	Green	+5 Vdc for Display processor and LCD
TP11	Pin 5	Brown	Display ground
TP10	Pin 6	Orange	TX the serial communications from the control to the display
TP9	Pin 7	Blue	RX the serial communications from the display to the control
TP8	Pin 8	Yellow	Display ground

VOLTAGE TESTS:

Negative Test Lead	Positive Test Lead	Voltage Reading
TP13	TP14	12
TP13	TP12	5
TP13	TP11	0
TP13	TP8	0
TP11	TP14	12
TP11	TP8	0
TP8	TP14	12



ZONE		LEGEND
C13	AAT	AMBIENT AIR TEMPERATURE SENSOR
I14	ARL	AUTO RESTART LIGHT (OPTIONAL)
K7	B	BUZZER
J3	BTY	BATTERY
M2	BTYC	BATTERY CHARGER (SOLID STATE)
M2	BTYC2	BATTERY CHARGER 2 (OPTION)
T1	C	COMPRESSOR
V15,R1	CCON	COMPRESSOR CONTACTOR
I8,U15	CCONR	COMPRESSOR CONTACTOR RELAY
D10	CDP	COMP'R DISCH. PRESS
C12	CDT	COMP'R DISCH. TEMP. SENSOR
J9,R2	CDCON	CONDENSER MOTOR CONTACTOR
T2,T3	CDM 1,2	CONDENSER MOTORS 1 & 2
L16	2,3CH	CONDENSATE HEATER (EVAP. 2,3)
D8	CSMV	COMPRESSOR SUCTION MODULATION VALVE
D10	CSP	COMP'R SUCT. PRESS.
C12	CST	COMP'R SUCT. TEMP.
E4	CT1	DC CURRENT SENSOR
M1	CT2,3,4	AC CURRENT SENSOR
D8	DAS	DEFROST AIR SWITCH
C5	DES	DIESEL ELECTRIC SWITCH
I14	DL	DEFROST LIGHT (OPTIONAL)
C6	1DS	DOOR SWITCH EVAP.1(OPTIONS CONNECTOR)
C6,C7	2,3DS	DOOR SWITCH EVAP.2,3
C12	1,2,3DTT	DEFROST TEMP. SENSOR EVAP.1,2,3
K14	ENCLS	ENG.COOLANT LOW LEVEL SENSOR(OPT.CONNECT.)
C11	ENCT	ENG.COOLANT TEMPERATURE
K13	ENOLS	ENG.OIL LOW LEVEL SENSOR (OPT. CONNECTOR)
B15	ENOPS	ENG. OIL PRESSURE SWITCH
D11	ENRPM	ENG. RPM SENSOR
J9,P2	1EVCON	MOTOR CONTACTOR EVAP.1
J11,P10	2EVCON	MOTOR CONTACTOR EVAP.2
J13,R10	3EVCON	MOTOR CONTACTOR EVAP.3
L10	1EVHTS	EVAP.1 HIGH TEMP. SWITCH
L11	2EVHTS	EVAP.2 HIGH TEMP. SWITCH
L12	3EVHTS	EVAP.3 HIGH TEMP. SWITCH
O2,N10,T10	1,2,3EVM	EVAP.1,2,3 MOTORS
D10	EVOP	EVAP.1 OUTLET PRESSURE
C15	EVOT	EVAP.1 OUTLET TEMPERATURE
D9	EVXV	EVAP.1 EXPANSION VALVE
F4	F1	FUSE- PWR 7.5 AMP
G15	F2	FUSE- SPEED RELAY 10.0 AMP
G15	F3	FUSE- RUN RELAY 7.5 AMP
F3	F5	FUSE- MIDI FUSE 80.0 AMP
D4	F6	FUSE- MICRO PWR 15.0 AMP
L2	F7/F8	FUSE- BATTERY CHARGER 2 OR 4 AMP T. DELAY
P13	F9	FUSE- CONTACTORS 10.0 AMP
P4	F10/11/12	FUSE- HEATERS 12AMP QUICK BLOW
Q6	F13/14/15	FUSE- REMOTE EVAP 12/15AMP TIME DELAY
B16	F16/F17	FUSE- CONDENSATE HEATER EVAP.2/3 (5.0 AMP)
B16	FL	FAULT LIGHT
L14	FLS	FAULT LEVEL SENSOR (OPTION)
L15	FP	FUEL PUMP (OPTION)
L15	FS	FUEL SOLENOID
C6	GCS	GLOW CRANK SWITCH (OPTION)
U16,D1	GENCON	GENERATOR CONTACTOR
J7,R16	GENCONR	GENERATOR CONTACTOR RELAY
A1	GEN	GENERATOR
K16	GP	GLOW PLUG
J8,D16	GPR	GLOW PLUG RELAY
-	GRD	GROUND
-	GRN	FRAME GROUND
C8	HP1	HIGH PRESSURE CUT-OUT SWITCH
M5,M6,T6	HTR1,2,3	ELECTRIC HEATER 1,2,3 EVAP.1
N8,N9	2HTR1,2	ELECTRIC HEATER 1,2 EVAP.2
T8,T9	3HTR1,2	ELECTRIC HEATER 1,2 EVAP.3
U15,J9,P4,R5	HTCON1,2	HEAT CONTACTOR 1,2 EVAP.1
J10,P7,P8,C16	2HTCON1,2	HEAT CONTACTOR 1,2 EVAP.2
J12,S7,S8,C16	3HTCON1,2	HEAT CONTACTOR 1,2 EVAP.3
J10,U15	HTCON1R	HEAT CONTACTOR 1 RELAY EVAP.1
K8	IPC	INTERNAL PROTECTOR COMPRESSOR
J12	IPCDM1,2	INTERNAL PROTECTOR COND. MTR 1,2
J13	IPEVM1,2	INTERNAL PROTECTOR EVAP. MTR 1,2
K14	IP2,3EVM	INTERNAL PROTECTOR EVAP.2,3 MTR
C5	LS	LANGUAGE SWITCH (ETO ONLY)
J10,J12	2,3LSV	LIQUID SOLENOID VALVE EVAP.2,3
E3-E15	MP	MICROPROCESSOR BOARD
-	OC	OPTIONAL CONTROL PANEL CONNECTOR
Q11	OCJ1	OPTIONAL CONTROL PANEL CONNECTOR JUMPER
G2	OGF	OVERLOAD GROUND FAULT
E4	PWR	POWER (MICRO)
B3,T14	PRM	PHASE REVERSAL MODULE
V14,D2,U15	PSCON	POWER SUPPLY CONTACTOR
J7,R14	PSCONR	POWER SUPPLY CONTACTOR RELAY
A2	PSR	POWER PLUG
C14	1,2,3RAT	RETURN AIR TEMPERATURE EVAP.1,2,3
A4	RCR	RUN CONTROL RELAY
C15	2REMSN	REMOTE SENSOR CPT.2 (NAO OPTION)
H15	RR	RUN RELAY
D4	RS	RUN STOP SWITCH
A6,A7	1,2,3RS	COMPARTMENT RUN STOP SWITCHES, CP1,CP2,CP3
C13,C15	1,2 SAT	SUPPLY AIR TEMPERATURE EVAP.1,2
L14	SATCOM	SATELLITE COMMUNICATION (OPT. CONNECTOR)
K15	SCS	SPEED CONTROL SOLENOID
J6	SLP	SERIAL PORT
L3	SM	STARTER MOTOR
H15	SR	SPEED RELAY
L16	SS	STARTER SOLENOID
K3	SSC	STARTER SOLENOID CONTACTOR
J8	SSR	STARTER SOLENOID RELAY
J13	UL1,2	UNLOADER FRONT,REAR

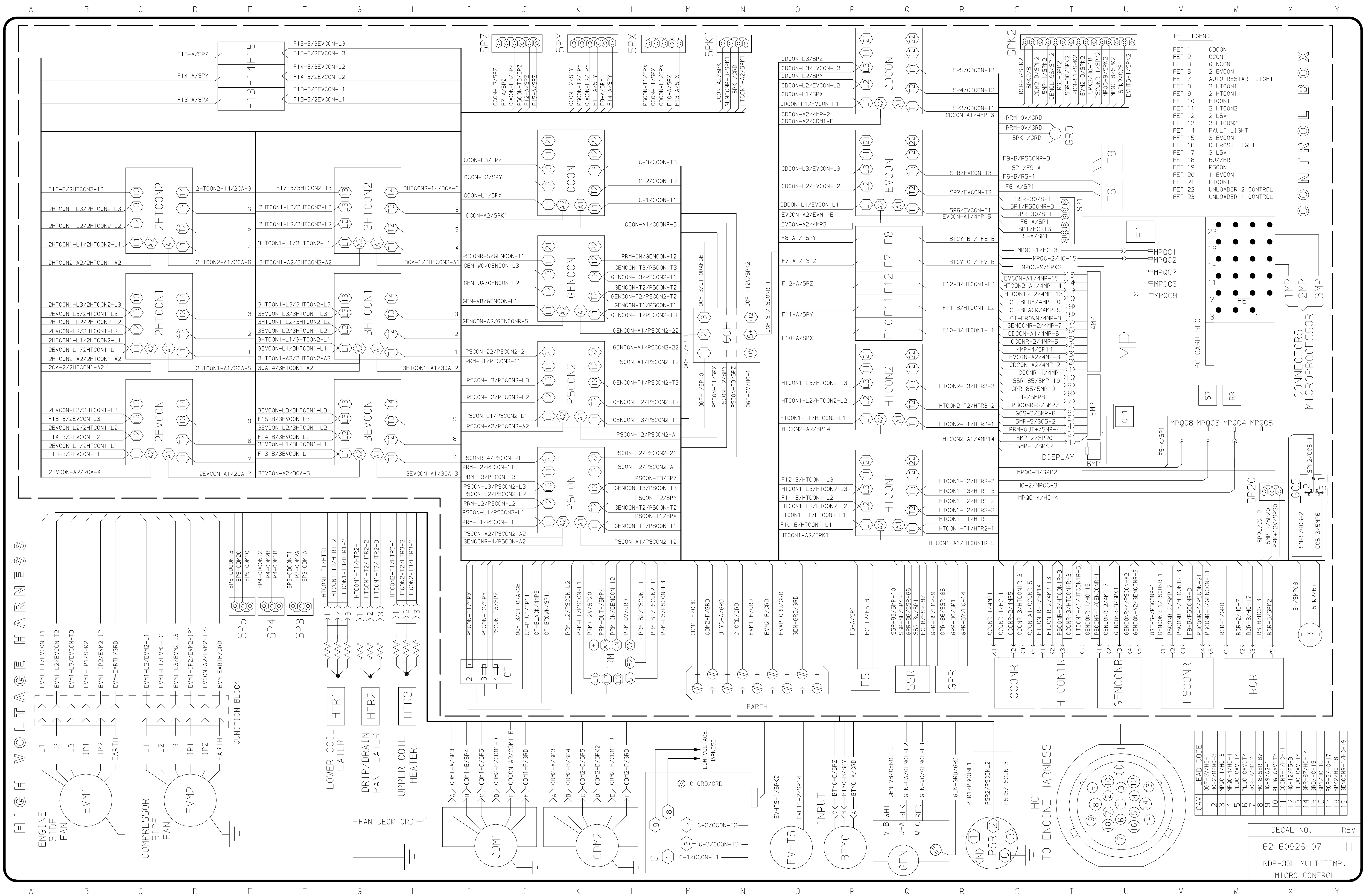
●-SPLICE POINT
--STANDARD OPTIONS
HC#-PLUG CONNECTION
□-PIN CONNECTION
○-COMPONENT CONNECTION
N/C CONTACTS
N/O CONTACTS
-WIRE GROUND
-CHASSIS GROUND

DECAL NO.	REV
62-60926-07	H

VECTOR MULTI-TEMP 2,3 CP 12V (PHASE REVERSAL)

PHASE 3
MICRO CONTROL

62-60926-ART4-S4-RH



62-60926-ART5-S5-RH

INDEX

A

B

C

D

E

North America
Carrier Transicold
700 Olympic Drive
Athens, GA 30601 USA
Tel: 1–706–357–7223
Fax: 1–706–355–5435

Central America and Mexico
Ejercito Nacional 253–A Piso 5
Colonia Anahuac
11320 Mexico, D.F.
Tel: 55315010
Fax: 55315010 ext. 1005

United Technologies

Building & Industrial Systems

Carrier Transicold Division,
Carrier Corporation
P.O. Box 4805
Syracuse, N.Y. 13221 U.S A

www.carrier.transicold.com

A member of the United Technologies Corporation family.
Stock symbol UTX