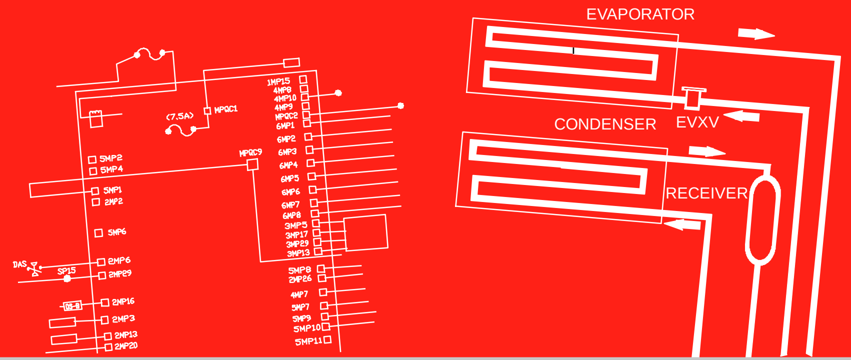
Trailer & Rail Refrigeration





# OPERATION & SERVICE MANUAL

for

# VECTOR 6600MT

## Multi–Temp Trailer Refrigeration Units

With Advance t Microprocessor

62–11524 Rev C

# OPERATION & SERVICE MANUAL

for

# VECTOR 6600MT

## Multi‑Temp Trailer

Refrigeration Units
With Advance t  Microprocessor

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# SECTION 1 – SAFETY PRECAUTIONS



1

# 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 Main Power switch is not in the OFF position.

**CAUTION**

**Under no circumstances should a technician electrically probe the microprocessor 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 microprocessor.**

**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 microprocessor.**

### Automatic Start-Stop

Your refrigeration unit is equipped with auto-start in both Start-Stop and Continuous Operation. The unit may start at any time the Main Power switch is not in the OFF 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 belt, checking the oil), make certain that the Main Power switch is in the OFF position.

### Engine Coolant

The engine is equipped with a pressurized cooling system including a pressurized coolant bottle. 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 or bottle. If the cap must be removed, cover it with a rag and remove very slowly in order to release the pressure without spray.

### Refrigerants

The refrigerant contained in the refrigeration system of this 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) we recommend that you contact your nearest Carrier Transicold authorized repair facility whenever service of the refrigerant system is required.

### Battery

This unit may be 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.

### Standby Power

Be aware of HIGH VOLTAGE supplied at the power plug. Even with the unit off, power is present from the plug to the inside of the control box. Whenever practical, disconnect the high voltage source when performing service or maintenance procedures and lockout/tagout the receptacle in accordance with your companies procedures. The recommended lockout device (Carrier part number 07-60129-00) is shown in Figure 1-1.

**Figure 1-1 Lockout/Tagout**

### 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 following statements 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**

**Advance microprocessor equipped units may start automatically at any time the Main Power switch is not in the OFF position. Also, the unit may be fitted with two way communication equipment that will allow starting of the unit from a remote location even though the switch is in the OFF position.**

**WARNING**

**Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instructions, ensure the Main Power switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection.**

**WARNING**

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

**WARNING**

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

**WARNING**

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

**WARNING**

**Always place the Main Power switch in the OFF position and turn off the high voltage power supply before disconnecting the high voltage power plug from the unit.**

**WARNING**

**If the unit is in Standby Operation and powered, 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 using Component Test Mode.**

**WARNING**

**Do not toggle the Main Power switch out of the OFF position when in PC Mode or the unit will start.**

**WARNING**

**Do not remove the cap from a hot radiator or bottle; if the cap must be removed, do so very slowly in order to release the pressure without spray.**

**WARNING**

**Caution and good electrical practices must be used when working around and with high voltage circuits.**

**WARNING**

**Use the required protective eye wear and clothing when working with solvents.**

**WARNING**

**Beware of moving poly V-belt and belt driven components.**

**WARNING**

**When working with belts, beware of pinch points.**

**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 8-30)**

**WARNING**

**Do not unscrew replacement compressor lifting eyelet/blankoff plate mounting capscrews all the way before breaking seal. Entrapped pressure could result in injury.**

**WARNING**

**Do not unscrew cylinder head mounting capscrews all the way before breaking seal. Entrapped pressure could result in injury.**

**WARNING**

**Do not unscrew enclosing tube nut all the way before breaking seal. Entrapped pressure could result in injury.**

**WARNING**

**Do not unscrew unloader valve body mounting bolts all the way before breaking seal. Entrapped pressure could result in injury.**

**WARNING**

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

**WARNING**

**NEVER dis-assemble the generator: HIGH MAGNETIC FIELD INSIDE! This field can interfere with cardiac implants such as pacemakers and defibrillators.**

**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.**

**CAUTION**

**Under no circumstances should anyone attempt to repair the keypad, display or internal control module components. Should a problem develop with these components, contact your nearest Carrier Transicold dealer for replacement.**

**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**

**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 microprocessor. DO NOT INTERRUPT THE SOFTWARE INSTALLATION PROCESS ONCE IT HAS STARTED. Also, do not place the Main Power switch in the OFF position during the initial power up following a software upgrade.**

**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.**

**CAUTION**

**Under no circumstances should a technician electrically probe the microprocessor 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 microprocessor.**

**CAUTION**

**Ensure 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 owners desired location time, enter that time. If you don't, enter the current time at your location.**

**CAUTION**

**DO NOT leave the circuit energized for the full 5 minutes if full amperage is shown, as the intake air heater element life will be greatly shortened.**

**CAUTION**

**Disconnect batteries before doing any electrical welding on unit or chassis to which unit is attached (trailer, container, rail car, metal building, etc).**

**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**

**Do not over torque display & keypad pan head screws. Torque all screws to 60 in lbs (6.8 Nm).**

**CAUTION**

**Running the engine for an extended period of time with the manual plunger up can cause a priming pump failure**

**CAUTION**

**Torque fuel level sensor mounting screws to 15 to 18 inch/pounds. DO NOT over tighten, as little as 20 inch/pounds will damage the sensor.**

**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**

**NEVER POUR COLD WATER INTO A HOT ENGINE, however hot water can always be added to a cold engine.**

**CAUTION**

**Only a refrigerant cylinder that has previously been used with R404A should be connected to this refrigeration unit.**

**CAUTION**

**Only a refrigerant cylinder containing R404A should be connected to this refrigeration unit in order to pressurize the system. However, dry nitrogen may be used to increase pressure. Any other gas or vapor will contaminate the system and require additional removal and evacuation.**

**CAUTION**

**Do not vapor charge R404A. Only liquid charging through the liquid line service valve is acceptable.**

**CAUTION**

**Ensure that thrust washer does not fall off dowel pins while installing oil pump.**

**CAUTION**

**An overcharge of oil will reduce system capacity and possibly cause internal compressor damage.**

**CAUTION**

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

**CAUTION**

**Extreme care must be taken to ensure the hose is immersed in the oil at all times. Otherwise air and moisture will be drawn into the compressor.**

**CAUTION**

**Ensure all parts are assembled into the solenoid valve enclosing tube in proper sequence to avoid premature coil burnout. Do not over tighten or damage the enclosing tube assembly.**

**CAUTION**

**Before connecting a megohmmeter, place the Main Power switch in the OFF position. Disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection. Isolate the microprocessor by disconnecting all connectors and wires going to it. Observe National Electric Manufacturer's Association (NEMA) rules and test equipment manufacturers instructions.**

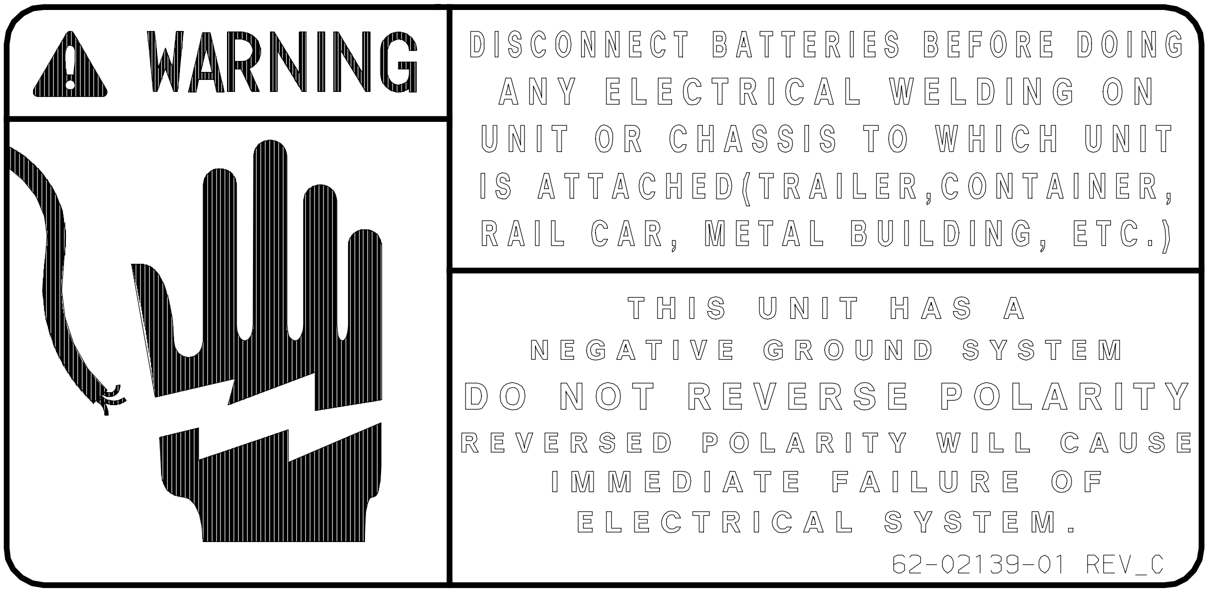
**CAUTION**

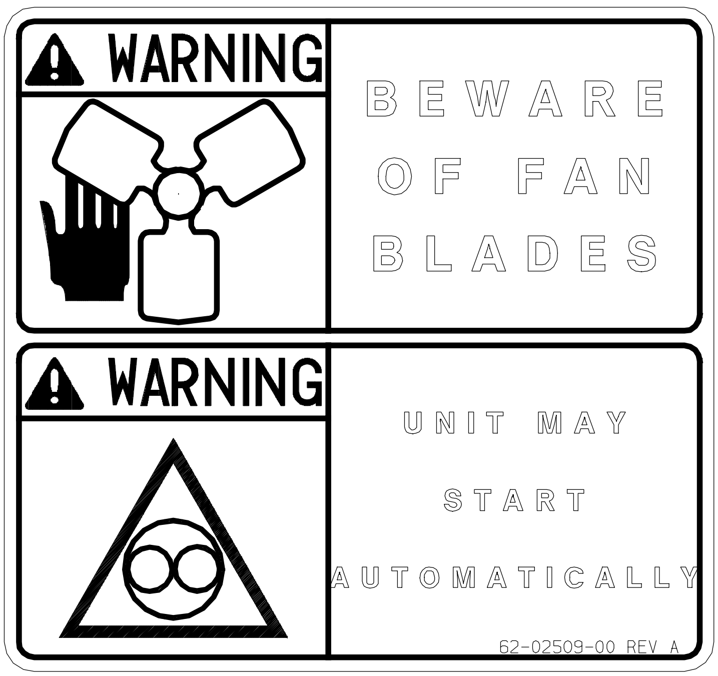
**A mica shim (Carrier Transicold part number 54–00630–25) must be installed before removal of the generator. The generator is to be removed as one piece, with the shim in place. DO NOT attempt to remove the rotor from the stator.**

**CAUTION**

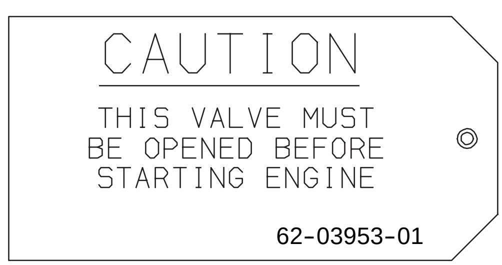
**Under no circumstances should anyone attempt to repair the keypad, display or internal control module components. Should a problem develop with these components, contact your nearest Carrier Transicold dealer for replacement.**

## 1.3 SAFETY DECALS

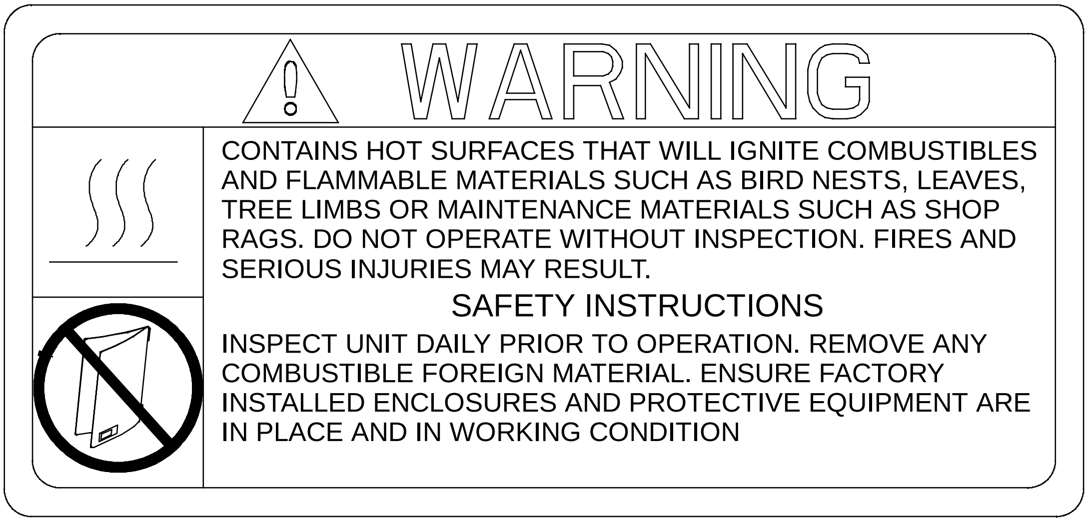


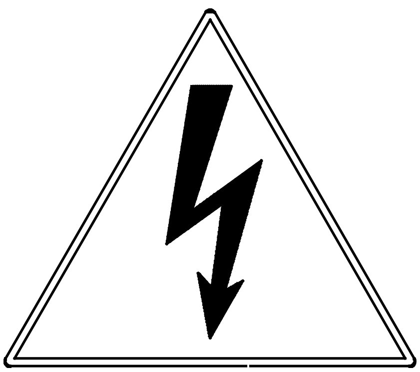




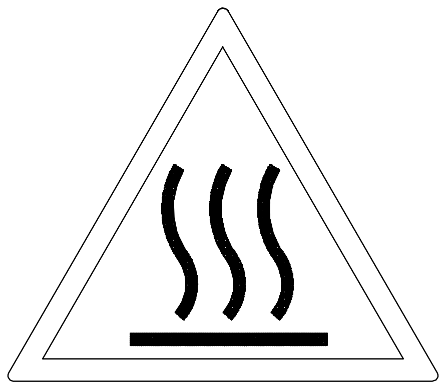

( NOTE: This tag is attached to the liquid line service valve and discharge service valve at assembly)



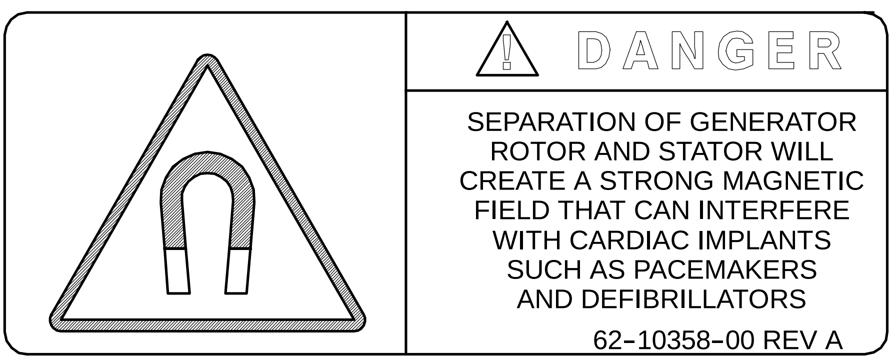

62–11282–00 REV – & 62–11283–00 REV B

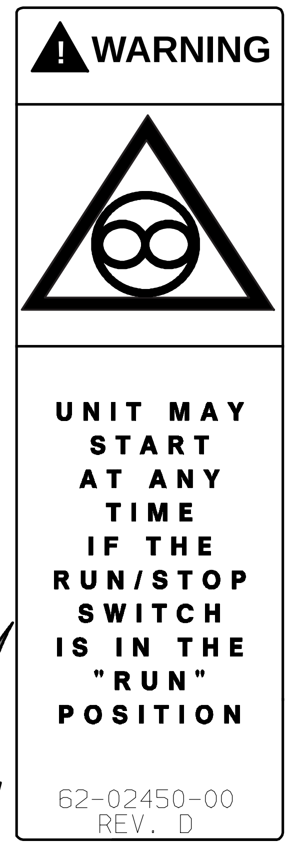


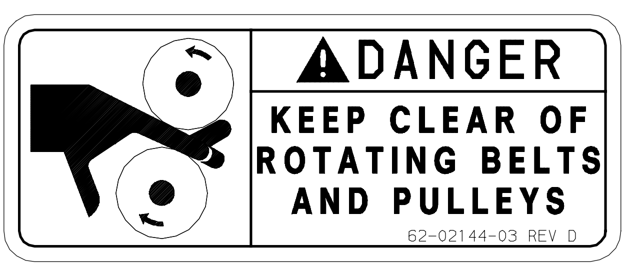
62–03957–00 & –01 High Voltage



62–03958–00 Heat Warning



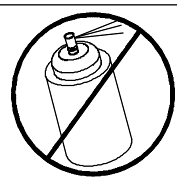



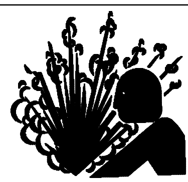

**NOTE:**
**The unit may be equipped with a Diesel/Off/Standby switch (DOES) or a START/RUN–OFF switch (SROS). The unit may start if the applicable switch is not in the OFF position.**

**CAUTION**

**THE ENGINE SPEED ON THIS UNIT MUST BE SET AT 1350 RPM ON LOW SPEED AND AT 1800 RPM ON HIGH SPEED. INCORRECT SPEED SETTINGS MAY CAUSE THE GENERATOR TO RUN AT THE WRONG VOLTAGE**

**62–11450–00**

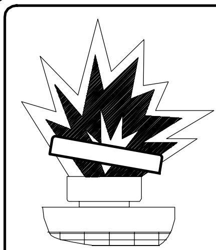




**WARNING**

**CONTAINS AIR HEATER THAT COULD IGNITE FLUIDS. NEVER USE STARTING AIDS, INCLUDING ETHER. FIRE AND SERIOUS INJURIES COULD RESULT**

62–11302 REV C



**CAUTION**

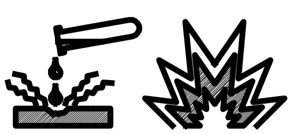
**REMOVE FILLER CAP SLOWLY**

62–02142 REV B

RADIATOR COOLANT INSTRUCTIONS

TOP–COOLANT INTO RECOVERY BOTTLE ONLY
FILL EMPTY RADIATOR THROUGH FILLER NECK SLOWLY TO AVOID AIR ENTRAPMENT

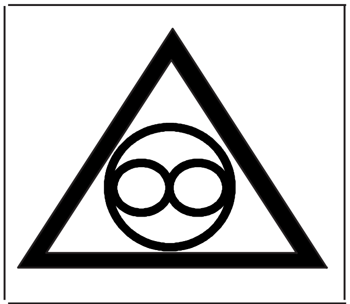
**CAUTION**



**REPLACE COVERS AFTER SERVICING BATTERY TO INSURE PROTECTION OF BATTERY AND TERMINALS**

62–02505 REV B

**WARNING**



**UNIT MAY START AUTOMATICALLY**

62-02146-00 REV_A

THIS UNIT CHARGED WITH

# R-404A

# CAUTION !

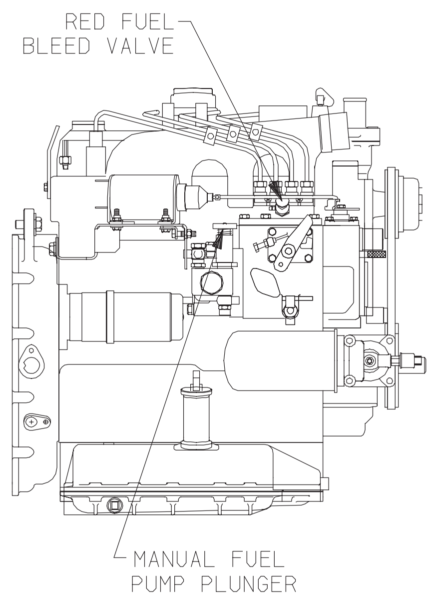
COMPRESSOR MUST BE CHARGED WITH
P.O.E. OIL ONLY: CTD P/N: 07-00317-00
MOBIL ARCTIC P.N: EAL63

CTD P.N: 62-03797-11

## INSTRUCTIONS FOR PRIMING THE FUEL SYSTEM

WHEN CHANGING THE FUEL FILTER, OPENING THE FUEL LINES FOR ANY REASON, OR IF THE SYSTEM HAS BEEN RUN OUT OF FUEL, FOLLOW THESE STEPS TO RE-PRIME THE ENGINE AFTER REFUELING THE TANK:

1. OPEN THE RED FUEL BLEED VALVE LOCATED JUST ABOVE THE ENGINE RUN LEVER.
2. THE MANUAL FUEL PUMP PLUNGER LOCATED APPROXIMATELY 3″ LEFT OF THE RED FUEL BLEED VALVE, HAS A HAND PUMP. TURN THE KNOB COUNTER-CLOCKWISE TO RELEASE THE PUMP PLUNGER AND IT WILL SPRING UP.
3. SLOWLY OPERATE THE MANUAL PUMP A MAXIMUM ONE STROKE PER SECOND WITH FULL EVEN STROKES. PUMP UNTIL FUEL CAN BE FELT FLOWING THROUGH THE PUMP. ONE HUNDRED OR MORE STROKES MAY BE REQUIRED TO FULLY PRIME THE ENGINE. IT MAY BE NECESSARY TO PUMP MORE THAN THIS IF THE FUEL FILTER IS EMPTY.
4. CRANK THE ENGINE TO START THE UNIT. IT MAY BE NECESSARY TO CONTINUE TO PUMP UNTIL THE ENGINE STARTS. TO PREVENT POSSIBLE FUEL SOLENOID FAILURE, DO NOT ATTEMPT MORE THAN 3 CONSECUTIVE STARTS WITHOUT A THIRTY SECOND DELAY BETWEEN EACH START ATTEMPT. IF THE UNIT DOES NOT START AFTER 3 ATTEMPTS, REPEAT STEP 3.
5. DEPRESS AND TURN THE TOP OF THE MANUAL FUEL PUMP PLUNGER CLOCKWISE TO LOCK IN PLACE.
6. AFTER THE UNIT IS RUNNING, CLOSE THE RED FUEL BLEED VALVE.




CAUTION RUNNING THE ENGINE FOR EXTENDED PERIODS OF TIME WITH THE MANUAL FUEL PUMP PLUNGER UP, CAN CAUSE A PRIMING PUMP FAILURE.

CTD P/N 62-11416-00 REV A

# SECTION 2 – UNIT DESCRIPTION



2

# SECTION 2

# UNIT DESCRIPTION

## 2.1 INTRODUCTION

**WARNING**

**Advance microprocessor equipped units may start automatically at any time the Main Power switch is not in the OFF position. Also, the unit may be fitted with two way communication equipment that will allow starting of the unit from a remote location even though the switch is in the OFF position.**

**WARNING**

**Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instructions, ensure the Main Power switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection.**

This manual contains operating data, electrical data and service instructions for the Vector 6600MT refrigeration system. The system consists of a host unit (see Figure 2-1) and one or two remote evaporators (see Figure 2-5), mounted in additional refrigerated compartments Refer to Table 2-1 for model information.

Additional support manuals are listed in Table 2-2.

The unit model/serial number plate is located inside the unit on the frame as shown in Figure 2-1.

## 2.2 GENERAL DESCRIPTION

The Vector 6600MT unit is a hybrid diesel/electric, fully charged, pre-wired, refrigeration/heating "nosemount" unit. The unit is used on insulated refrigerated compartments to maintain cargo temperatures within very close limits.

Electrical power is supplied to the unit from a power plug or by the 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 350V/3Ø/45Hz power in low speed.

The control box includes manual switches, microprocessor, fuses, and associated wiring. The unit can be equipped with an optional remote light bar which mounts separately on the front roadside corner of the trailer.

Temperature control is provided by the Carrier Transicold Advance microprocessor (Refer to Section 2.6). Once the microprocessor is set at the desired temperature, the unit will operate automatically to maintain the desired temperature within very close limits. The control system automatically selects high and low speed cooling or high and low speed heating as necessary to maintain the desired temperature within the refrigerated compartments.

The auto Start-Stop operation 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). The auto Start-Stop feature is standard equipment.

The unit can be described as having three major sections:

- the condensing section (Figure 2-1 & Figure 2-2), which includes the engine generator drive package (Figure 2-3).
- the evaporator section (Figure 2-4).
- the controls (Items 11 through 14, Figure 2-3: Figure 2-6 & Figure 2-10).

The remote evaporators (Figure 2-5) are mounted in Compartments 2 & 3.

**Table 2-1 Model Chart**

| Model | R-404A | | Compressor | Engine | Engine Speed | |
|---|---|---|---|---|---|---|
| | LB | KG | | | High | Low |
| NDP532*6JBP2<br>(Two Compartment)<br>NDP532*6JBP3<br>(Three Compartment) | 16 | 7.26 | 06D 41cfm | V2203–L–DI–E3B–CTD–5 | 1800 | 1350 |

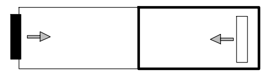
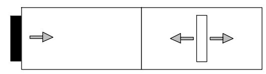
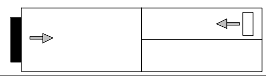
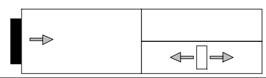
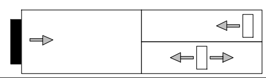
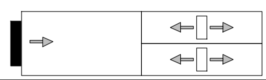
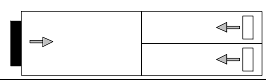
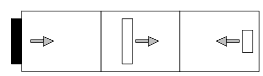
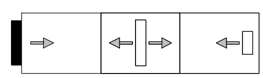
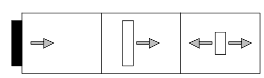
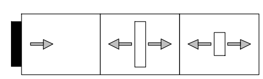
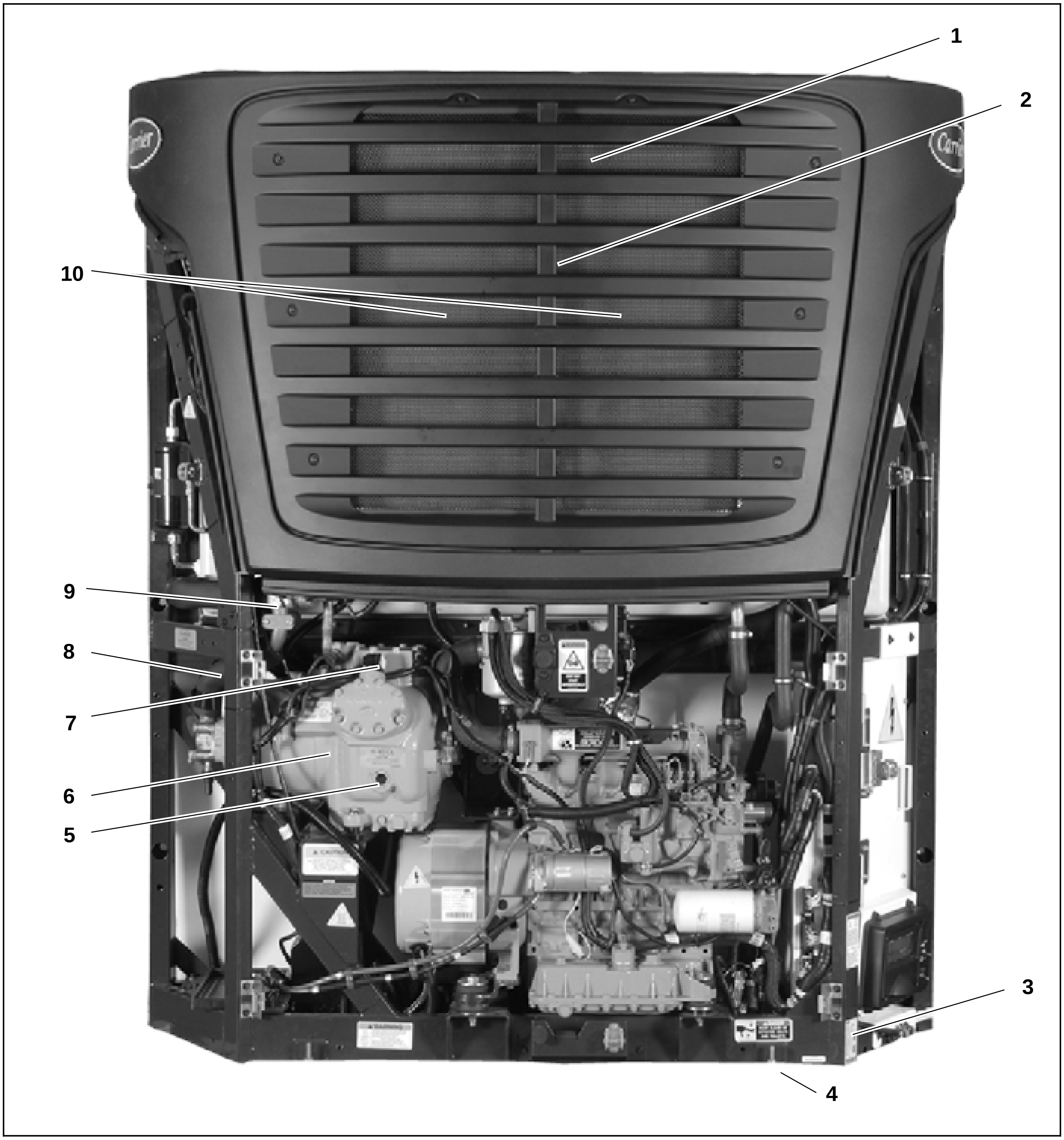
| Configuration | Remote Evaporator | Location |
|---|---|---|
| 1 | MHS22–445–3A4–Z |  |
| 2 | MHD22–445–3A4–Z |  |
| 3 | MHS11–245–3A4–Z |  |
| 4 | MHD11–245–3A4–Z |  |
| 5 | MHS11–245–3A4–Z<br>MHD11–245–3A4–Z |  |
| 6 | MHD11–245–3A4–Z<br>MHD11–245–3A4–Z |  |
| 7 | MHS11–245–3A4–Z<br>MHS11–245–3A4–Z |  |
| 13 | MHS22–245–3A4–Z<br>MHS11–245–3A4–Z |  |
| 14 | MHD22–245–3A4–Z<br>MHS11–245–3A4–Z |  |
| 15 | MHS22–245–3A4–Z<br>MHD11–245–3A4–Z |  |
| 16 | MHD22–245–3A4–Z<br>MHD11–245–3A4–Z |  |

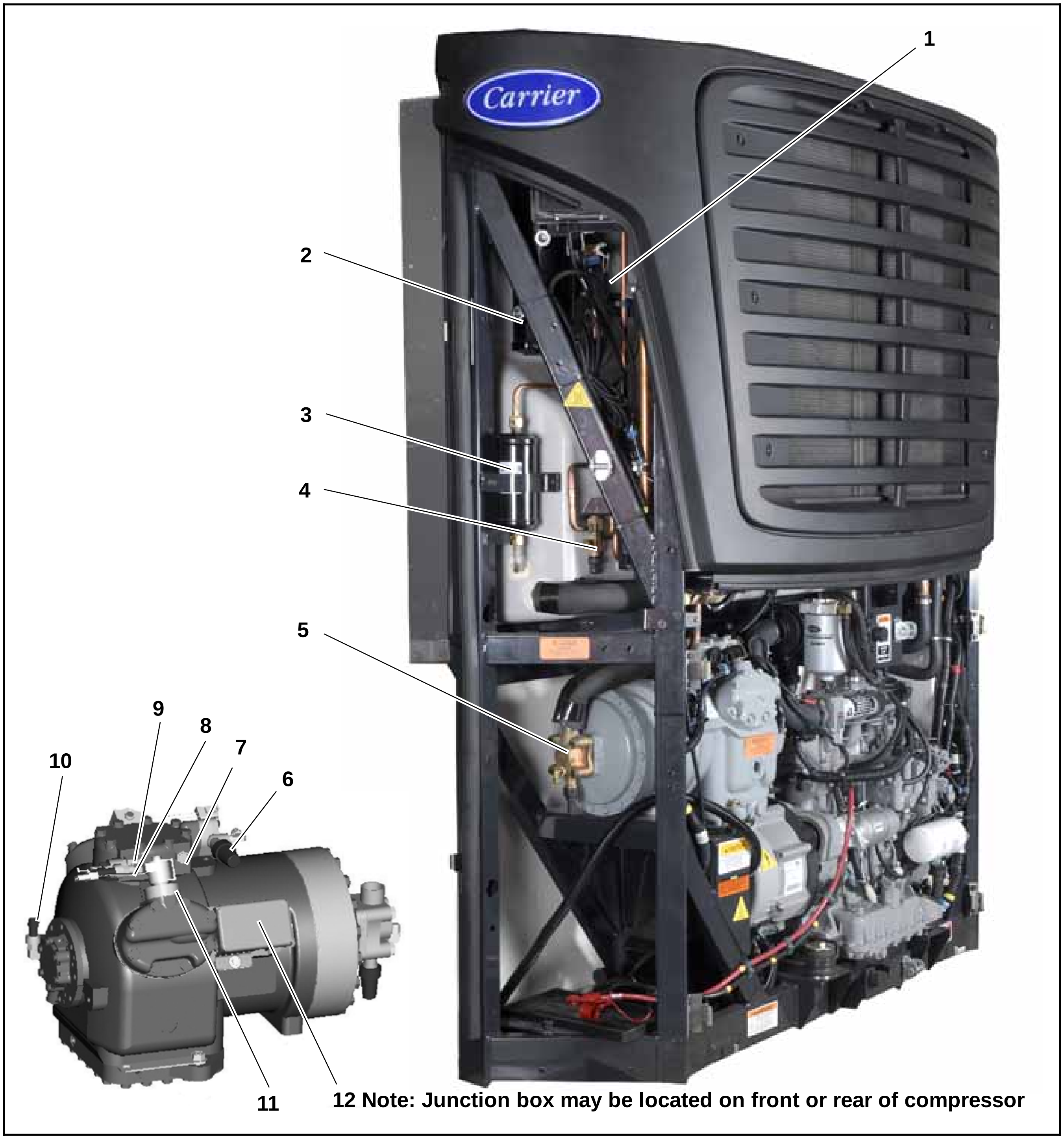
**Table 2-2 Additional Support Manuals**

| Manual Number | Type of Manual |
|---|---|
| 62–11369 | Parts Look Up System (PLUS disc) |
| 62–11503 | Operator’s Manual |
| 62–11525 | Easy To Run |



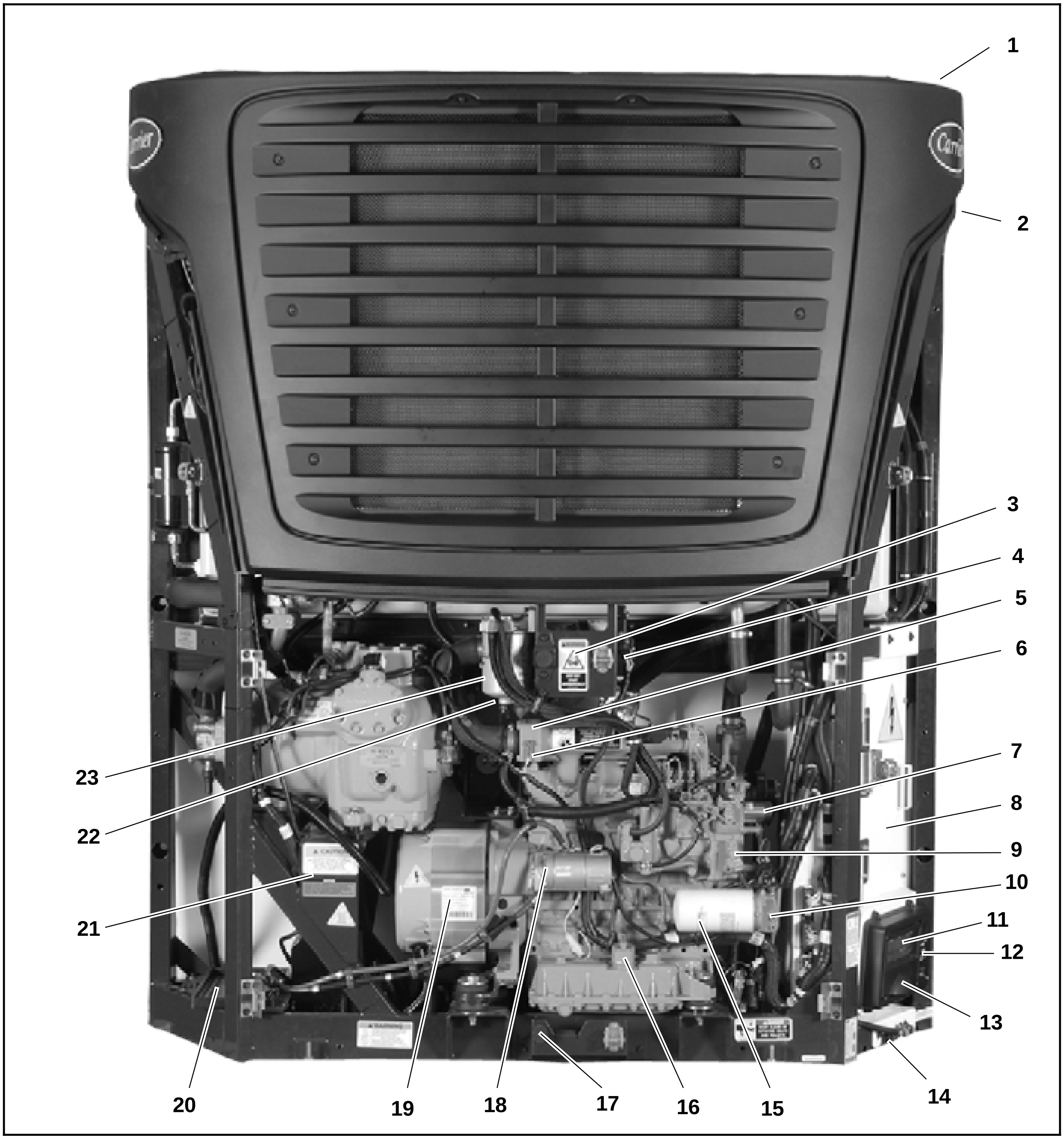

1. Condenser & Radiator
2. Ambient Air Temperature Sensor (ATT – behind grille)
3. Model/Serial Number Nameplate
4. Power Supply Receptacle (PSR – Under Unit)
5. Compressor Sight Glass
6. Compressor (C)
7. Front Unloader Valve (UL1)
8. Compressor Suction Temperature Sensor (CST)
9. Compressor Suction Modulation Valve (CSMV)
10. Condenser Fans and Motors (CDM1 & CDM2)

**Figure 2–1 Front View – Refrigeration System Components**



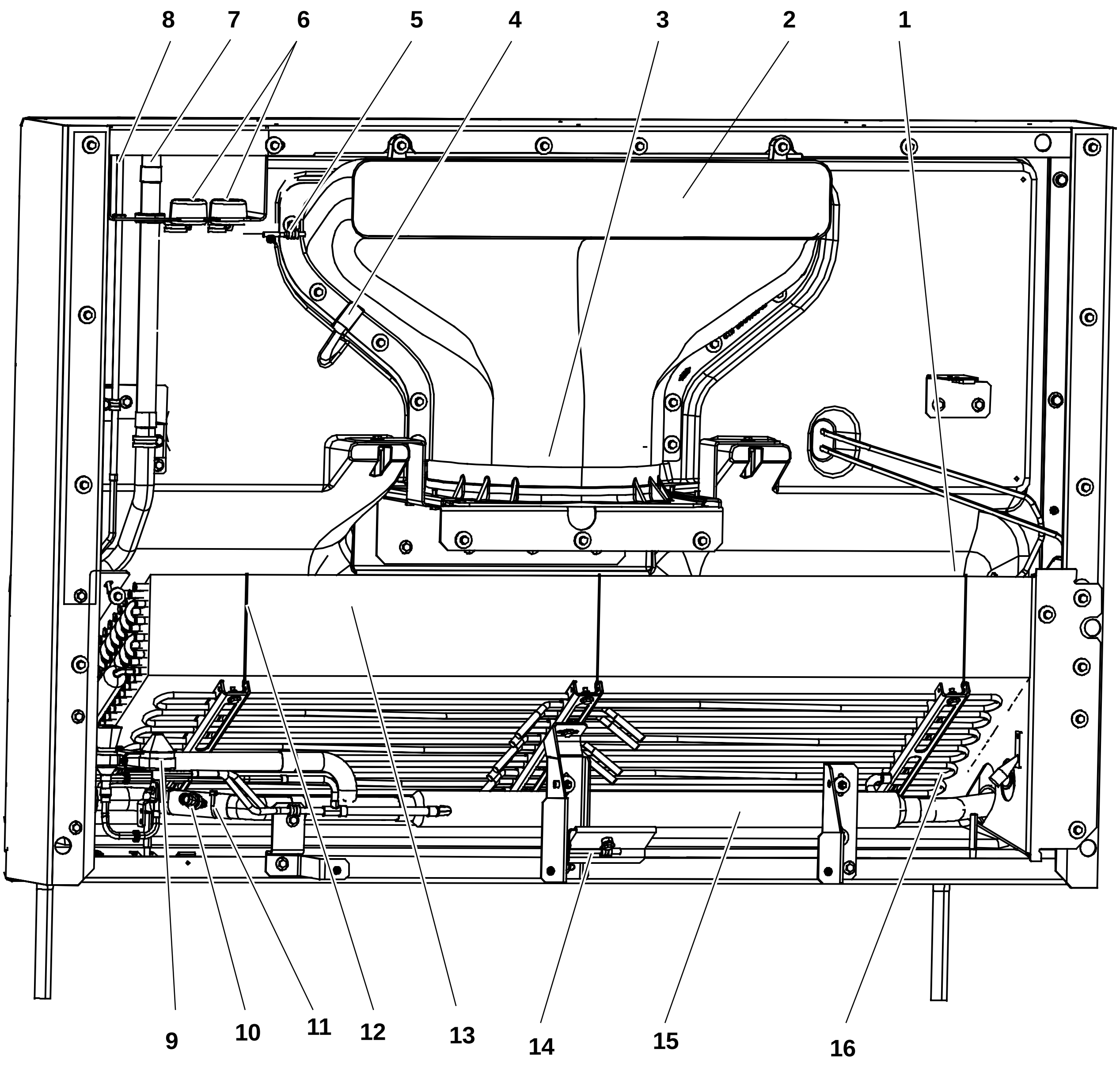

1. Defrost Air Switch (DAS)
2. Receiver & Sight Glasses
3. Filter-Drier
4. Liquid Line Service Valve
5. Compressor Suction Service Valve
6. Compressor Discharge Service Valve
7. Compressor Discharge Temperature Sensor (CDT)
8. Compressor Discharge Pressure Transducer (CDP)
9. High Pressure Switch (HP1)
10. Compressor Suction Pressure Transducer (CSP)
11. Rear Unloader Solenoid Valve (UL2)
12. Compressor Junction Box (IPC location)

**Figure 2-2 Road Side/Rear Compressor View - Refrigeration System Components**



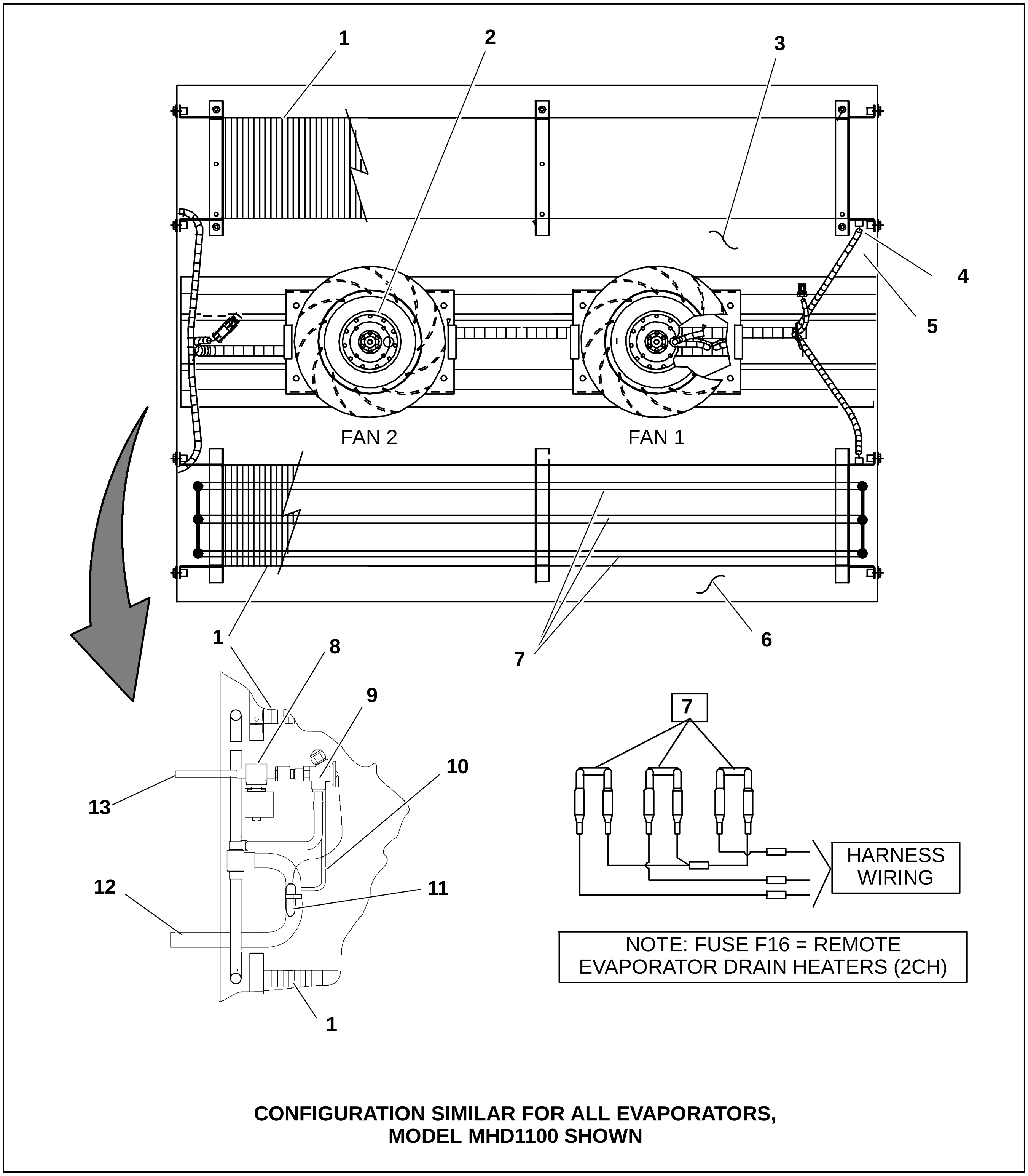

1. Exhaust (Location)
2. Coolant Bottle (Location)
3. Air Cleaner & Air Cleaner Service Indicator (Behind bracket)
4 Engine Speed Control Unit (ENSCU)
5. Engine Coolant Temperature Sensor (ENCT)
6. Intake Air Heater (IAH)
7. Fuel/Speed Actuator (FSA)
8. Control Box (Refer to Figure 2-6)
9. Engine Speed Sensor (ENSSN)
10. Engine Oil Pressure Switch (ENOPS)
11. Display
12. Switch Board
13. Keypad Door
14. Serial Download Port (SLP)
15. Lube Oil Filter
16. Lube Oil Fill & Dipstick
17. Lube Oil Drain
18. Starter Motor (SM)
19. Generator (GEN)
20. Battery Tray OR Lift Gate Charger Mounting
21. Battery Changer (BTYC)
22. Fuel Heater (FH - Location)
23. Fuel Filter

**Figure 2-3 Front View - Engine Components**



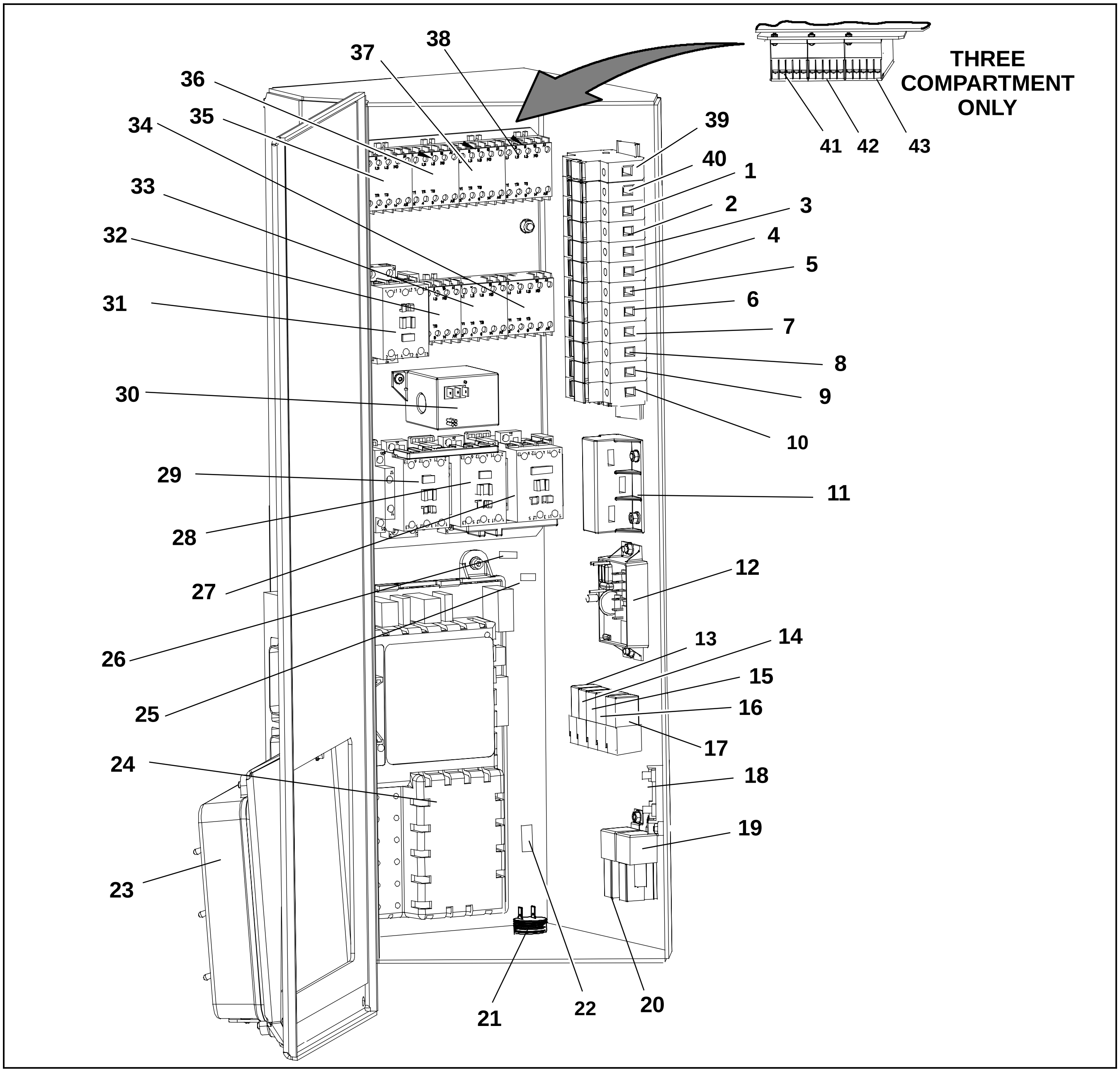

1. Defrost Termination Temperature Sensor (DTT – Located on curbside tube sheet)
2. Evaporator Air Nozzle
3. Evaporator Fan/Motor Assembly (EVM)
4. Evaporator Fan/Motor Wiring
5. Supply Air Temperature Sensor (1SAT)
6. Remote Evaporator Wiring
7. Remote Evaporator Suction Line
8. Remote Evaporator Liquid Line
9. Electronic Expansion Valve (EVXV)
10. Evaporator Outlet Pressure Transducer (EVOP)
11. Evaporator Outlet Temperature Sensor (EVOT – On suction line under insulation)
12. Evaporator High Temperature Switch (1EVHTS – Located on roadside tube sheet)
13. Evaporator Coil
14. Return Air Temperature Sensor (1RAT)
15. Heat Exchanger
16. Electric Heaters (HTR1, HTR2)

**Figure 2-4 Evaporator Section – Grille Removed**




1. Coil
2. Fan & Motor Assembly (2EVM1/2/3 or 4 & 2EVMIP1.2.3 or 4)
3. Return Air Temperature Sensor (2RAT – Located on return air grille)
4. Defrost Termination Temperature Sensor (2DTT)
5. Evaporator High Temperature Switch (2EVHTS)
6. Supply Air Temperature Sensor (2SAT –Optional)
7. Heaters (2HTR1 & 2HTR2)
8. Liquid Line Solenoid Valve (2LSV)
9. Thermal Expansion Valve
10. Equalizer Line
11. Thermal Expansion Valve Bulb
12. Suction Connection
13. Liquid Connection

**Figure 2–5 Remote Evaporator – Cover Removed**




1. Fuse (F13)
2. Fuse (F28)
3. Fuse (F27)
4. Fuse (F26)
5. Fuse (F12)
6. Fuse (F11)
7. Fuse (F10)
8. Fuse (F8)
9. Fuse (F7)
10. Fuse (F29)
11. AC Current Sensor (CT2,3,4)
12. Phase Reversal Module (PRM)
13. Fuel Heater Relay (FHR)
14. Run Control Relay (RCR) – Used with Remote Control Panel Only.
15. Power Source Contactor Relay (PSCONR)
16. Generator Contactor Relay (GENCONR)
17. Compressor Contactor Relay (CCONR)
18. Main Fuse (F5)
19. Intake Air Heater Relay (IAHR)
20. Starter Solenoid Relay (SSR)
21. Buzzer (B)
22. Fuse (F19)
23. Display, Keypad and Switch Board
24. Control Module (See Figure 2–10)
25. Fuse – Standby Contactor Power (F9)
26. Microprocessor Power Fuse (F6)
27. Power Source Contactor (PSCON)
28. Power Source Contactor (PSCON2)
29. Generator Contactor (GENCON)
30. Overload Ground Fault Module (OGF)
31. Compressor Contactor (CCON)
32. Heat Contactor (1HTCON2)
33. Evaporator Motor Contactor (1EVCON)
34. Condenser Motor Contactor (CDCON)
35. Evaporator Motor Contactor (2EVCON)
36. Heat Contactor (2HTCON1)
37. Heat Contactor (2HTCON2)
38. Heat Contactor (1HTCON1)
39. Fuse (F15)
40. Fuse (F14)
41. Evaporator Motor Contactor (3EVCON)
42. Heat Contactor (3HTCON1)
43. Heat Contactor (3HTCON2)

**Figure 2–6 Control Box**

## 2.3 CONDENSING SECTION

The condensing section (see Figure 2-1 & Figure 2-2) consists of an engine-generator drive package, compressor, condenser fans, condenser coil, radiator, refrigerant controls, defrost air switch, piping, wiring, and associated components.

The engine-generator drive package (see Figure 2-3) includes the engine, generator, air cleaner, muffler, coolant system, fuel system, oil filter system and engine sensors.

### 2.3.1 Engine

The engine is a four cylinder diesel which 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. The fuel filter may also be equipped with a thermostatically controlled fuel heater. The engine cooling system consists of the radiator (which is mounted with the condenser coil) and coolant overflow bottle. The system is also fitted with an electronic battery charger which converts generator or standby alternating current to direct current for battery charging. Refer to Section 2.9 for engine data.

### 2.3.2 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. An optional air cleaner service indicator may be connected to the intake manifold. Its function is to indicate when the air cleaner requires replacement. (Refer to section 8.5.9.)

### 2.3.3 Engine Controls:

**a. Engine Speed Control Unit (ENSCU)**

The ENSCU (see Figure 2-7) is a microprocessor based unit which controls the fuel supply to, and speed of, the engine in accordance with the position of the Main Power switch and speed relay.
The unit has an LED which may be used to diagnose failures within the electronic speed control system. Refer to Section 9.5 for information on diagnosing failures.
The ENSCU sends engine speed information to the microprocessor to be displayed in the Unit Data and recorded in the DataLink data recorder. The ENSCU is mounted on the air cleaner bracket.

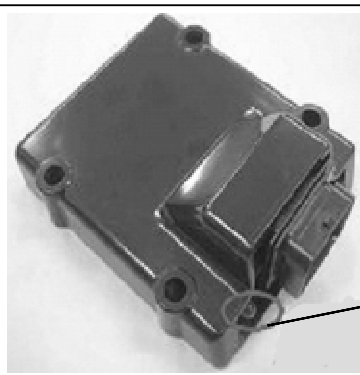



**Figure 2-7 Engine Speed Control Unit**

**b. Fuel/Speed Actuator (FSA)**

The FSA combines the fuel shutoff solenoid and speed control solenoid into one component. Fuel supply to the injectors and engine speed is controlled by varying rod position in accordance with the signal from the ENSCU. The FSA is located on the front of the injection pump.

**c. Engine Speed Sensor (ENSSN)**

The ENSSN provides the ENSCU with information on the speed at which the engine is running. The ENSSN is located in the gear case cover above the oil filter.

**d. Engine Oil Pressure Switch (ENOPS)**

The ENOPS is normally open and closes on pressure rise to signal to the microprocessor the engine has sufficient oil pressure for operation. 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 in the oil filter mounting assembly.

**e. Engine Coolant Temperature Sensor (ENCT)**

The ENCT provides the microprocessor with engine coolant temperature information to be displayed, recorded in the DataLink data recorder and used to control the refrigeration system. The sensor is located on the starter side of the engine near the #4 Injector.

### 2.3.4 Generator (GEN)

The generator is directly bolted to the engine and supplies nominal 460V/3Ø/60Hz power when the engine is in high speed and nominal 300V/3Ø/45Hz power in low speed.

### 2.3.5 Compressor

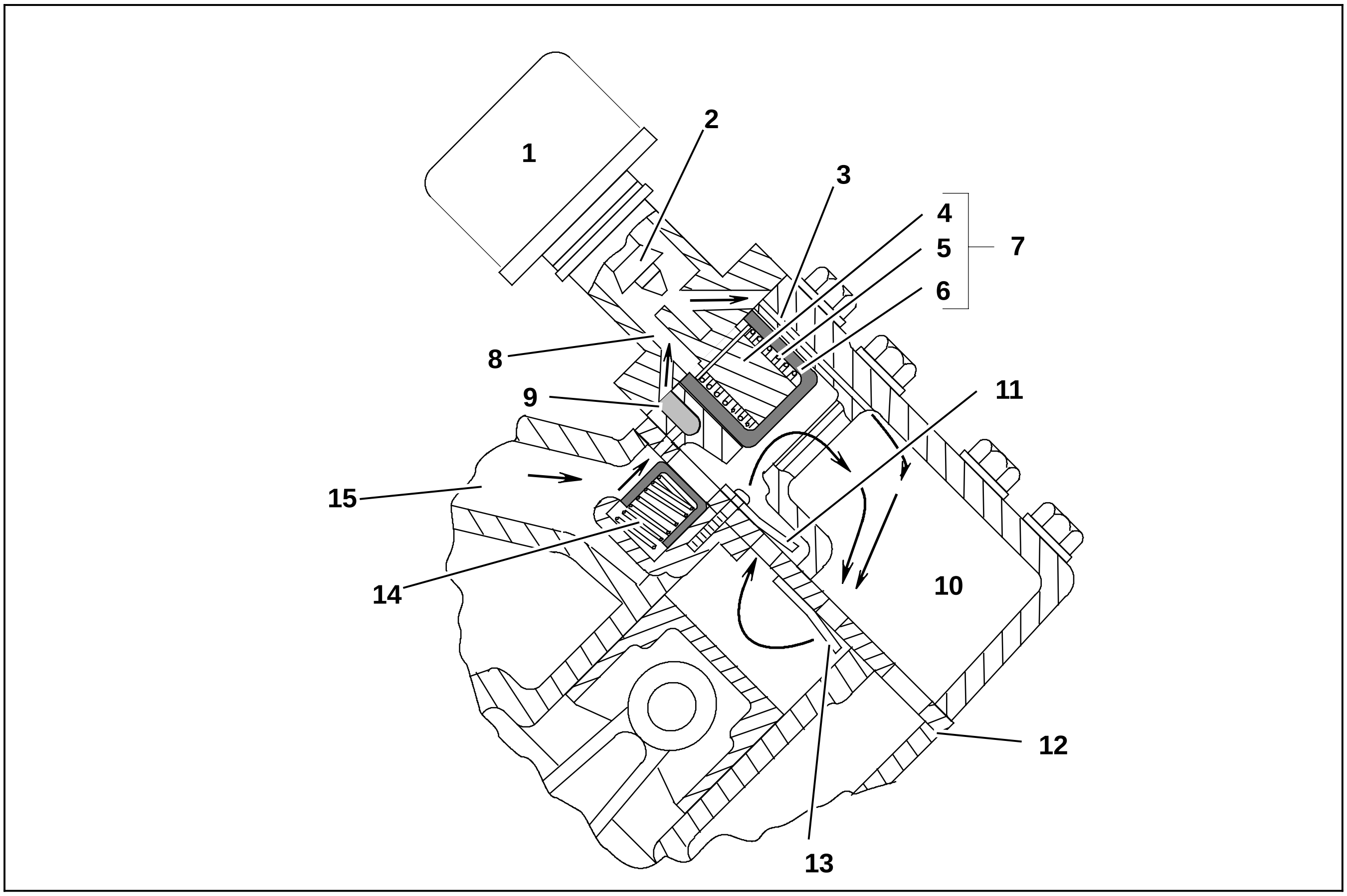
The compressor assembly includes the refrigerant compressor, suction and discharge service valves, high pressure switch, compressor discharge temperature sensor and the suction and discharge pressure transducers. The compressor draws refrigerant gas from the evaporator and delivers it to the condenser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

### 2.3.6 Unloaders

The compressor is equipped with unloaders as standard equipment. Unloaders are used as a compressor capacity control to unload the cylinder banks during periods of reduced cooling loads. This provides closer temperature control and reduces the power required to operate the compressor; thus reducing fuel consumption.

**a. Major Working Parts**

- Solenoid and valve system.
- Spring loaded piston type bypass valve.
- Spring loaded discharge check valve (located on the valve plate).




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

**Figure 2-8 Compressor Cylinder Head Unloaded**

**b. Unloaded Operation**

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

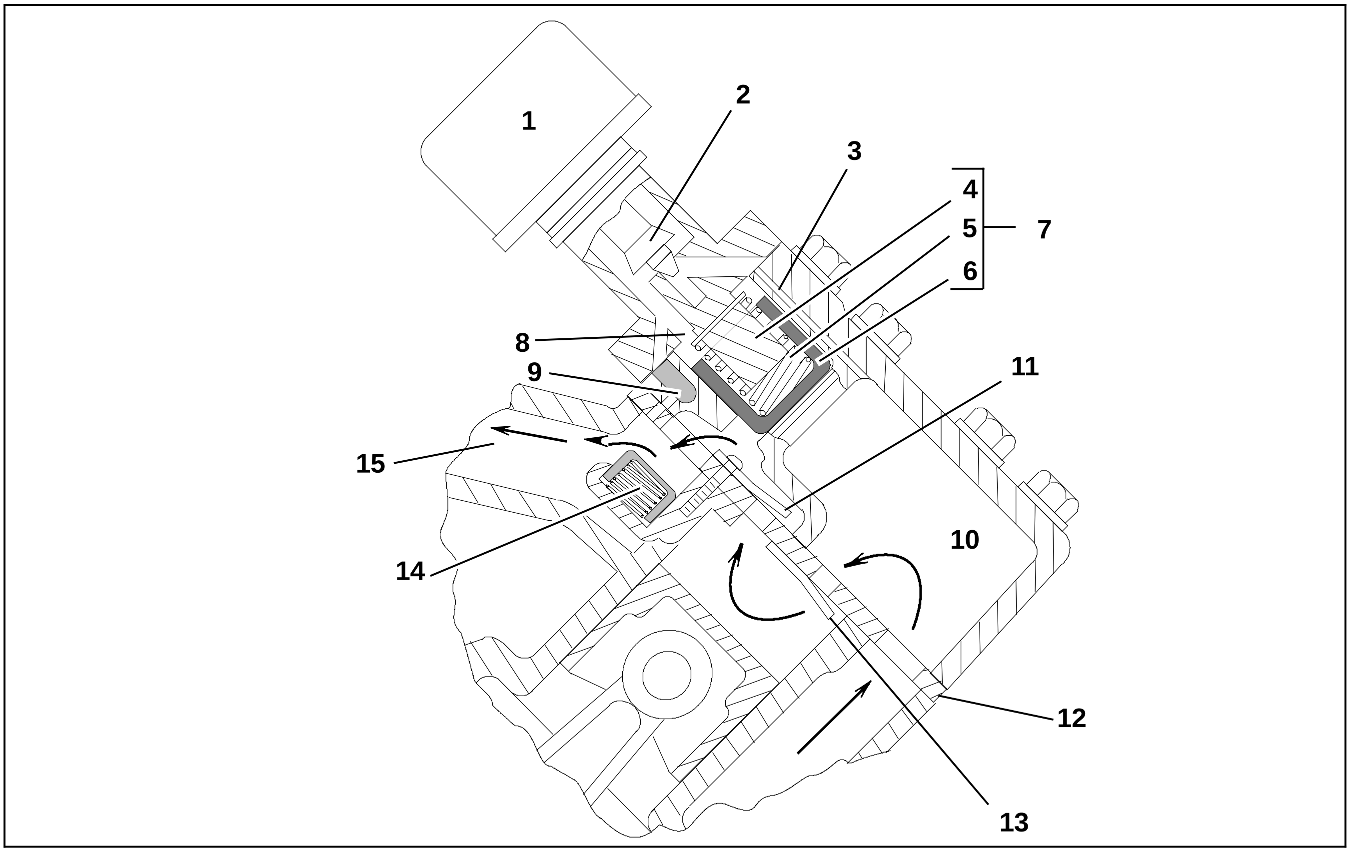
With the solenoid valve (1) energized the solenoid valve stem (2) will open the gas bypass port (3).

Discharge pressure will be bled to the suction manifold (10) through the opened gas bypass port . A reduction in pressure on the bypass piston 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 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 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. Bypass Valve
8. Bleed Orifice
9. Strainer
10. Suction Manifold
11. Cylinder Discharge Valve
12. Valve Plate
13. Cylinder Suction Valve
14. Discharge Check Valve Assembly
15. Discharge Manifold

**Figure 2-9 Compressor Cylinder Head Loaded**

**c. Loaded Operation**

With the solenoid valve (1, Figure 2-9) de-energized the solenoid valve stem will close the gas bypass port (3).

Pressure from the discharge manifold (item 15) through the strainer (9) and bleed orifice (8) will build behind the piston (6).

This increased 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 the discharge check valve assembly (14) open. Refrigerant gas will then flow into the compressor discharge manifold.

The loaded cylinder bank will continue to operate fully loaded until the solenoid valve is energized and the gas bypass port is opened.

### 2.3.7 Compressor Switches, Transducers and Sensors

**a. Compressor Discharge Pressure Transducer (CDP)**

The CDP provides a signal to the microprocessor equivalent to pressure leaving the compressor. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located on the compressor center head.

**b. Compressor Suction Pressure Transducer (CSP)**

The CSP provides a signal to the microprocessor equivalent to pressure entering the compressor cylinders. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located on the front of the compressor.

**c. Compressor Discharge Temperature Sensor (CDT)**

The CDT provides a signal to the microprocessor equivalent to the temperature of the gas leaving the compressor. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located on the compressor center head.

**d. Compressor Suction Temperature Sensor (CST)**

The CST provides a signal to the microprocessor equivalent to to the temperature of the gas entering the compressor suction service valve. It is located on the line entering the valve.

**e. High Pressure Switch (HP1)**

The HP1 is normally closed and opens on pressure rise to signal to the microprocessor to shutdown the engine, or shutdown the system if operating on standby power. It is located on the compressor center head.

### 2.3.8 Condenser Coil

The condenser coil is a microchannel type and acts as a heat exchanger in which the compressed refrigerant gas is lowered in temperature and condensed into a liquid. A portion of the condenser coil is occupied by the subcooler, which removes heat from the refrigerant liquid leaving the receiver. Air movement over the condenser is provided by two electric motor driven fans mounted in the condensing section.

### 2.3.9 Ambient Air Temperature Sensor (AAT)

The AAT provides microprocessor with information on the temperature of the ambient air entering the condenser to be displayed, recorded in the DataLink data recorder and used to control the refrigeration system. The sensor is located behind the front grill.

### 2.3.10 Filter-Drier

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

### 2.3.11 Receiver

Liquid refrigerant from the condenser flows 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 & moisture content, and a fusible plug.

## 2.4 COMPARTMENT 1 EVAPORATOR SECTION

The evaporator (See Figure 2-4) fits into a rectangular opening in the upper portion of the front wall of compartment 1. When installed, the evaporator section is located inside the compartment, and the condensing section is outside.

The evaporator assembly consists of an evaporator coil, evaporator fan motor, electronic expansion valve, coil heaters, heat exchanger, defrost termination temperature sensor the supply and return air sensors and a high temperature switch.

Heating and defrost is accomplished by electric heaters mounted on the coil.

Automatic evaporator coil defrosting is initiated by either a differential air switch (which senses the pressure drop across the coil) or by the defrost timer in the microprocessor.

### 2.4.1 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. The electric heaters (HTR1 & HTR2) are mounted on the inlet side of the coil.

### 2.4.2 Electronic Expansion Valve (EVXV)

The EVXV is an electronic device which controls the flow of liquid to the evaporator according to changes in superheat of 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.

### 2.4.3 Heat Exchanger

The heat exchanger is the tube in tube type and is installed in the main suction line and liquid line. The suction gas is used to cool the warm liquid refrigerant within the heat exchanger. This results in greater system efficiency.

### 2.4.4 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 assembly.

### 2.4.5 Compartment 1 Evaporator Switches, Transducers and Sensors

**a. Evaporator Outlet Pressure Transducer (EVOP)**

The EVOP provides the microprocessor with evaporator outlet pressure information to be displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located in the suction line near the electronic expansion valve.

**b. Evaporator High Temperature Switch (1EVHTS)**

1EVHTS is a safety switch which opens on a temperature rise to de-energize the electric heaters if the temperature in compartment 1 reaches the cut-out point. It is located on the roadside tube sheet of the evaporator coil

**c. Evaporator Outlet Temperature Sensor (EVOT)**

The EVOT provides the microprocessor with evaporator outlet temperature information to be displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located on the suction line near the electronic expansion valve.

**d. Defrost Termination Temperature Sensor (1DTT)**

The 1DTT is located on the curbside tube sheet of the evaporator coil. It provides the microprocessor with evaporator temperature information to be displayed, recorded in the DataLink data recorder and used to determine termination of defrost.

**e. Return Air Temperature Sensor (1RAT)**

The 1RAT is a temperature control probe which provides the microprocessor with information on the temperature of the air entering the evaporator section. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located on on a bracket behind the center of the return air grille.

**f. Supply Air Temperature Sensor (1SAT)**

The 1SAT is a temperature control probe which provides the microprocessor with information on the temperature of the air leaving the evaporator section. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located in the roadside of the supply air outlet housing.

## 2.5 REMOTE EVAPORATOR(S)

The remote evaporator(s) (See Figure 2-5) are mounted to the ceiling of compartment 2 and/or Compartment 3.

The evaporator assembly consists of one or more: evaporator coils, evaporator fan motors, liquid line solenoid valves, thermal expansion valves, coil heaters, defrost termination temperature sensors, high temperature switches, 12 V drain line heaters and a return air sensor. Compartment 1 is also be fitted with a supply air temperature sensor. For Compartment 2, the supply air temperature sensor is an option.

Heating and defrost is accomplished by electric heaters mounted on the coil.

Automatic evaporator coil defrosting may be initiated manually or by the microprocessor.

To place the unit in the operation, the microprocessor energizes (opens) the liquid line solenoid valve (2LSV/3LSV). Refrigerant flows from the main liquid line, through the LSV to the thermal expansion valve (TXV). The TXV controls the flow of liquid to the coil(s) according to changes in superheat of the refrigerant leaving the evaporator.

### 2.5.1 Evaporator Coil(s)

The 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. The electric heaters (2HTR1, 2HTR2, 3HTR1 & 3HTR2) are mounted on the inlet side of the coil(s).

### 2.5.2 Liquid Line Solenoid Valve (2LSV or 3LSV)

The LSV is energized (opened) by the microprocessor to allow flow of liquid refrigerant into the coil(s) when cooling is required

### 2.5.3 Thermal Expansion Valve (TXV)

The TXV is a mechanical device which controls the flow of liquid to the coil(s) according to changes in superheat of 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.

### 2.5.4 Remote Evaporator Switches, Transducers and Sensors

**a. Evaporator High Temperature Switch (2EVHTS or 3EVHTS)**

An EVHTS is a safety switch which opens on a temperature rise to de-energize the electric heaters if the temperature in a compartment reaches the cut-out point. It is located on the end tube sheet of an evaporator coil

**b. Defrost Termination Temperature Sensor (2DTT or 3DTT)**

The DTT is located on the end tube sheet of an evaporator coil. It provides the microprocessor with evaporator temperature information to be displayed, recorded in the DataLink data recorder and used to determine termination of defrost.

**c. Return Air Temperature Sensor (2RAT or 3RAT)**

The RATs are temperature control probes which provide the microprocessor with information on the temperature of the air entering the evaporator. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located on on the return air grille.

**d. Supply Air Temperature Sensor (2SAT)**

The 2SAT is an optional temperature control probe which provides the microprocessor with information on the temperature of the air leaving the evaporator. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located in a supply air outlet opening.

## 2.6 SYSTEM OPERATING CONTROLS AND COMPONENTS

Temperature control is provided by the Carrier Transicold Advance microprocessor. Once the microprocessor is set at the desired temperature, the unit will operate automatically to maintain the desired temperature within very close limits.

### 2.6.1 Multiple Languages

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

Press and hold the Select Key for 6 seconds to view or change the current language selection. Refer to Section 3.15 for more information on language selection.

### 2.6.2 Automatic Start-Stop

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).

### 2.6.3 Special Features

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

- An LCD display MessageCenter which clearly displays all information in dot matrix form.
- Unit Operation & Alarms are displayed in text (not in codes).
- Unit Data and Functional Parameters.
- Programmable Maintenance Hour Meters (resettable from the Keypad).
- Bright LED Alarm & Indicator Lights.
- Fully Automated Pretrip.
- Automated Microprocessor Self-test.
- DataLink data recorder (date & time can be set from the Keypad).
- Trip Start to record date/time of trip in DataLink data recorder memory.
- PC card functionality for downloading data, upgrading operational software, and Configuration set up.
- FET (Field Effect Transistor) indicating LEDs that are illuminated when a circuit is energized.
- Automatic Engine Starting.
- Functional Parameter locks.
- Alarms are stored in microprocessor memory for future reference.

### 2.6.4 Component Description And Location

The hardware associated with the Advance microprocessor includes the control module, display, keypad and switch board. The hardware is housed, for driver access, in the control box on the lower roadside corner of the unit.

**CAUTION**

**Under no circumstances should anyone attempt to repair the keypad, display or internal control module components. Should a problem develop with these components, contact your nearest Carrier Transicold dealer for replacement.**

#### a. Control Module

The control module (see Figure 2-10) consists of the microprocessor (with status LEDs), 3 fuses (F1, F2, & F3), a DC current sensor (CT1), 2 relays (RR & SR), 2 status LED's (LED30 & LED31), 6 input/output connectors (QC), 6 digital input/output connectors (MP), a programming card slot (with status LED's) and twenty three FET indicating LEDs.

The microprocessor is totally self contained and does not contain any serviceable components. Microprocessor activity can be determined by observing the LED's and FET's (see Figure 2-10 and Table 5-1). If the microprocessor is calling for a circuit to be energized, the indicator is illuminated.

The PC card slot allows programming of the microprocessor using Carrier Transicold PC Cards. The microprocessor 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 DataLink data recorder.
- Options PC Card for installing optional software programs.
- Configuration PC Card for setting the Microprocessor Functions, Configurations and DataLink 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 once per second when data is being transferred to, or from, the PC Card. Will be on steady when the operation is complete indicating the PC Card may be removed.
2. During Download, after Card is read and identified, card status LED blinks 2 seconds on and 2 seconds off until the = key is pressed to start the programming from the card to the micro. Once the data transfer to the micro begins, the Card Status LED and the Micro Status LED will blink together 1/2 second on and 1/2 second off until the data transfer is complete, then the Micro Status LED will continue at the 1/2 second rate and the Card Status LED will come on solid and remain on solid until the card is removed from the slot.

- 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.

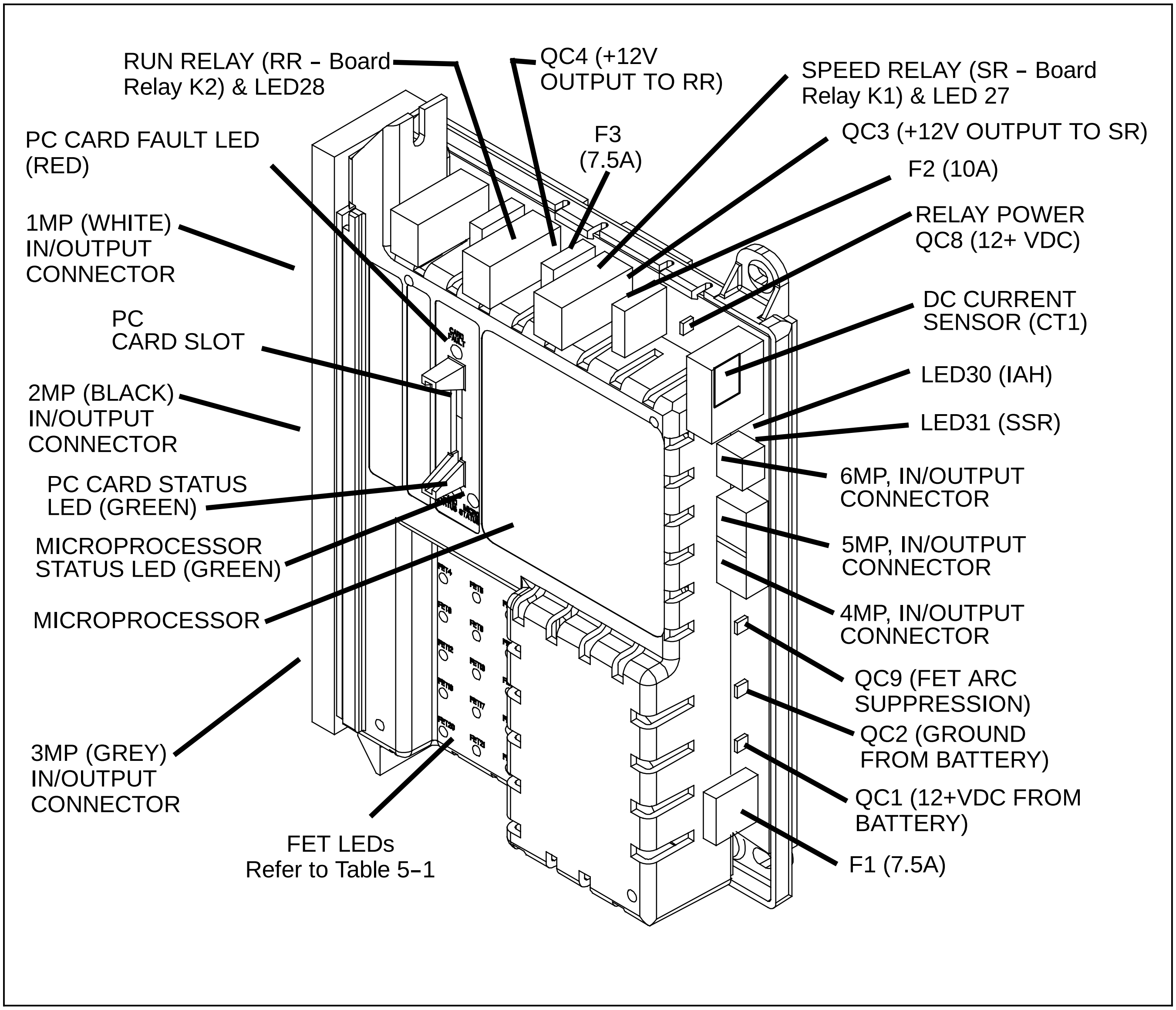
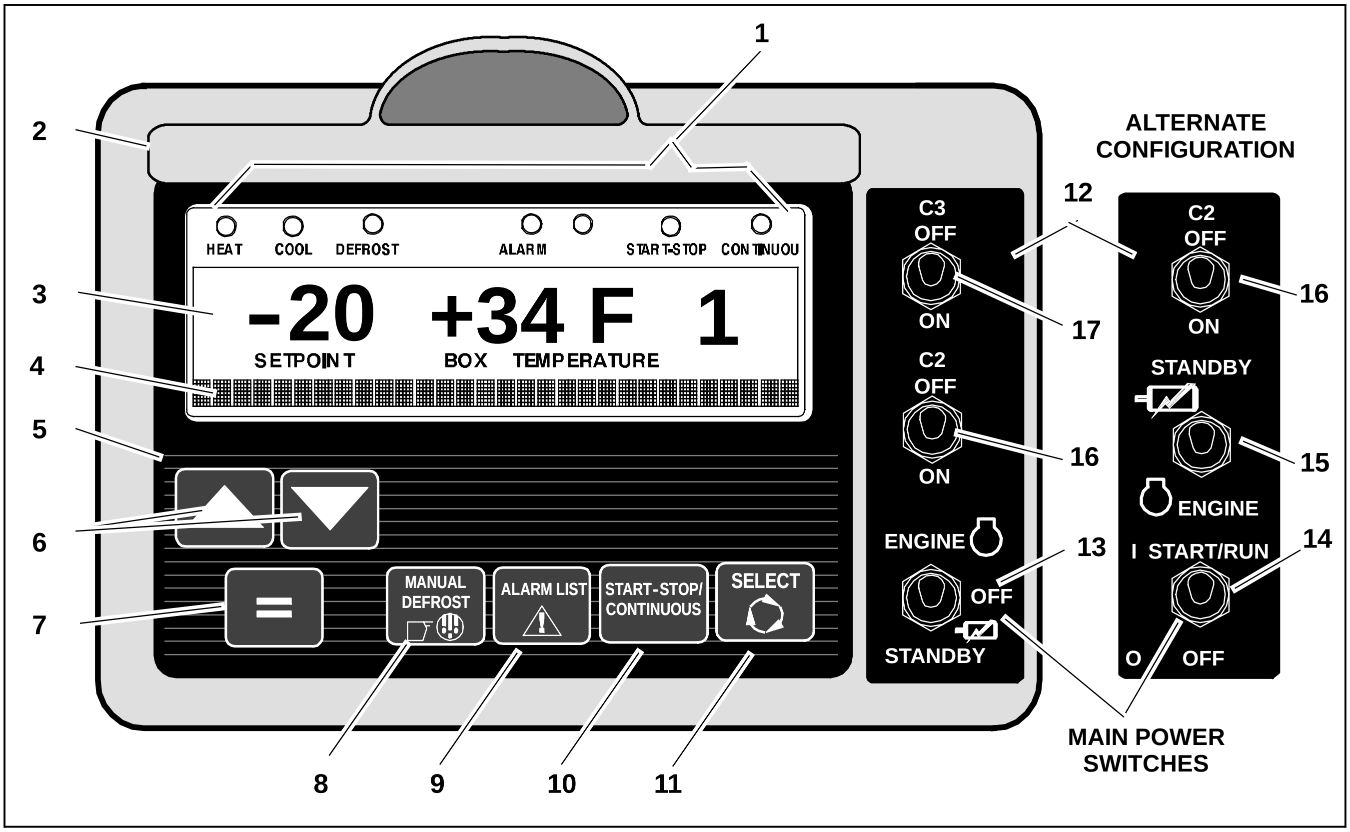



**Figure 2–10 Control Module**




1. Indicator lights
2. Keypad Door
3. Main Display
4. MessageCenter
5. Keypad
6. Up and Down Arrow Keys
7. Enter Key
8. Manual Defrost Key
9. Alarm List Key
10. Start/Stop-Continuous Key
11. Select Key
12. Switch Board

<u>MAIN POWER SWITCHES</u>

13. Diesel/Off/Engine Standby Switch (DOES) (Note: switch is labeled ENGINE/OFF/STANDBY)
14. START/RUN/OFF Switch (SROS)
15. Diesel Electric Switch (DES) (Note: switch is labeled STANDBY/ENGINE)
16. 2nd Compartment Run Switch (Note: switch is labeled C2)
17. 3rd Compartment Run Switch (Note: switch is labeled C3)

**Figure 2-11 Display And Keypad Assembly**

**b. Main Display, MessageCenter & Indicator Lights (see figure Figure 2-11)**

**Indicator Lights**

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

- Heat Indicator (Amber) - Illuminated when the unit is in Heat Mode.
- Cool Indicator (Green) - Illuminated when the unit is in Cool Mode.
- Defrost Indicator (Amber) - Illuminated when the unit is in Defrost Mode.
- Alarm Indicator (Red) - Off or Flashes at a rate of 0.5 seconds.
- Start-Stop Indicator (Green) - Illuminated when Start-Stop Operation has been selected.
- Continuous Indicator (Green) - Illuminated when Continuous Operation has been selected.

## 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.

**Main Display**

The microprocessor will display the refrigerated compartment setpoint to the left, compartment temperature in the center and the compartment number to the right. The display will alternate every 5 or 10 seconds, providing the information for compartment 1 and then the information for compartment 2 and then the information for compartment 3. Temperatures will be displayed as signed (+ or -) whole numbers. The compartment temperature will be followed by a letter indicating the information is in degrees Fahrenheit (F) or degrees Centigrade (C).

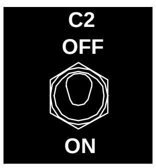
**Message Center**

Messages generated by the microprocessor are displayed in the MessageCenter. As the main display scrolls every 5 to 10 seconds from one active compartment to another, the applicable message for that particular compartment will also be displayed. Details of the messages are described in Section 6.1 MessageCenter.

**c. Switch Board**
**3rd Compartment Run Switch (3RS)**

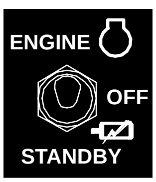

This switch is placed in the ON position to signal the microprocessor that the compartment 3 evaporator is to be in operation.

**2nd Compartment Run Switch (2RS)**




This switch is placed in the ON position to signal the microprocessor that the compartment 2 evaporator is to be in operation.

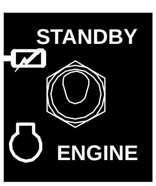
**Diesel/Off/Engine Standby Switch (DOES)**




When placed in the ENGINE or STANDBY position, this switch provides power to the microprocessor. The microprocessor performs a self-test (all segments of display are illuminated). Then setpoint and compartment temperatures are displayed and the unit is started in Engine Operation or Standby Operation .

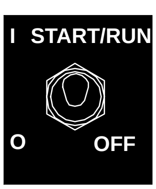
To stop the unit place the DOES switch in the OFF position.

**Diesel/Electric Switch (DES)**




This switch is used to select either Engine Operation or Standby Operation. When this switch is placed in standby position, the microprocessor will not energize the power source contactors until the engine oil pressure switch (ENOPS) opens.

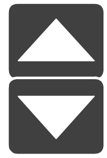
**START/RUN–OFF Switch (SROS)**




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

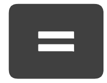
To stop the unit or remove power from the microprocessor, place the SROS in the OFF position.

**d. Keypad**



**UP ARROW and DOWN ARROW Keys**

These keys allow changing of the setpoints or other displayed data of the system. They also allow scrolling through the Unit Data, 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 may be used to initiate a defrost cycle when the required conditions are met.


**ALARM LIST Key**

The ALARM LIST key allows viewing of 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 advances through the list to the end. To view the inactive alarm list, Refer to Section 3.12.


**START–STOP/CONTINUOUS Key**

Pressing this key toggles between Start–Stop and Continuous Run operation.


**SELECT Key**

Press the SELECT key to scroll through the menu selections. One of the five standard menu selections will appear in the MessageCenter when the SELECT key is pressed. 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 selections are:

•**PRESS ↑↓ TO VIEW HOUR METERS**– Displays the hours for individual hour meters. Refer to Section 3.14.

•**PRESS ↑↓ TO START PRETRIP** – Used to initiate a pretrip. Refer to Section 3.4.

•**PRESS ↑↓ TO VIEW DATA** – Displays Unit Data. Refer to Section 3.13.

•**PRESS ↑↓ TO VIEW (AND CHANGE) SETTINGS** – Displays unit Functional Parameter settings. Refer to Section 3.15.

•**PRESS ↑↓ TO MARK TRIP START** – This menu selection is used to record a Trip Start event which is logged in the DataLink 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 3.10.

•**PRESS ↑↓ TO VIEW PRINT MENU** – Configures the microprocessor for use with the hand–held Strip Print II printer kit P/N 12–50150–10. Refer to manual 62–90476 (Strip Print) or 62–11338 (Strip Print II).

## 2.7 ELECTRONIC MODULES

### 2.7.1 Overload Ground Fault Module (OGF)

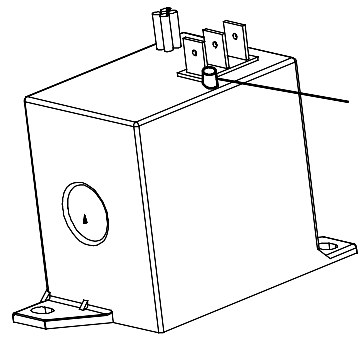



**Figure 2-12 OGF Module**

The OGF, see Figure 2-12, is located in the control box (see Figure 2-6). The module has two electrical safety features which are active in both Engine and Standby Operation:

1. Overload protection.
2. Ground Fault (Leakage).

In each case, the A100 - "OVERLOAD/GROUND FAULT" alarm is activated and the unit shuts down.

When ground leakage is detected, the red LED on the OGF module will be on continuously.

### 2.7.2 Phase Reversal Module (PRM)

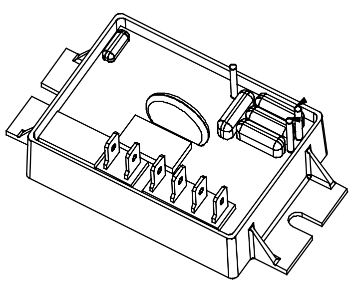


**Figure 2-13 PRM Module**

The PRM, Figure 2-13, is located in the control box (see Figure 2-6). In Standby Operation, 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 indicator light which can be seen in the driver's rear view mirror from the cab of the tractor. The green LED indicates "STATUS OK". The amber LED indicates "CHECK UNIT". The amber light is illuminated when the microprocessor illuminates the fault light. Alarms can be read on the microprocessor display.

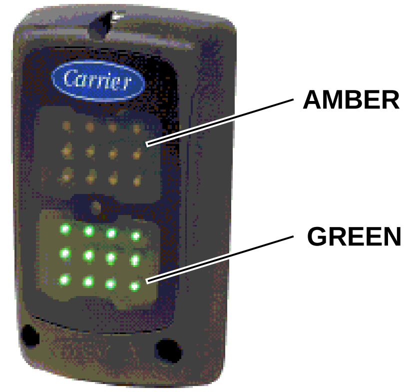



**Figure 2-14 Light Bar**

### 2.8.2 Remote Switch(es)

The unit is provisioned to connect remote switches (DS or REMS) directly to the microprocessor. These switches include:

REMS1 = Shut down/alarms for Compartment 1.
REMS2 = Shut down/alarms for Compartment 2.
DS = Provides "Door" alarms and
For 2 compartment units, shut the unit down.
For 3 Compartment units, shuts down Compartment 3 only.

- Two types of switches may be used:
  1. A switch with contacts that are open when the switch is activated.
  2. A switch with contacts that are closed when the switch is activated.
- Four Configurations are available for each switch.
  1. Activate an alarm only while the switch is activated.
  2. Activate an alarm and shut the unit down while the switch is activated. The unit will remain shut down for a minimum of 3 minutes under this setting.
  3. Activate the alarm and bring the engine into low speed while the switch is activated.
  4. Record the switch activation in the DataLink data recorder.
- If configured to shut the unit down or bring the engine to low speed an additional choice will be available. The additional choice allows the unit to be set so that the configured action will always take place OR the configured action will only take place when the ambient temperature is below a certain temperature. For example, if the shutdown/low speed temperature choice is set to 77°F (25°C) the unit will only shutdown/go to low speed if the ambient temperature is below 77°F (25°C).
- Additionally a Functional Parameter "override" setting will be available for each switch configured to shut the unit down. The Functional Parameter may be set to "YES" or "NO". If the Parameter is set to "NO" the configured action will not be overridden. If the Parameter is set to "YES", the alarm will be activated but the unit will not shutdown.

### 2.8.3 Remote Temperature Sensors

Two compartment units are provisioned to connect one or two remote temperature sensors directly to the microprocessor.

The microprocessor may be configured to display the sensor reading in the Unit Data and to record the sensor reading in the DataLink data recorder. A user specified name may be configured for each sensor. This name will be displayed, rather than the default Remote Sensor #1 or Remote Sensor #2 name, in the unit data list.

### 2.8.4 Remote Control Panel

The unit may be fitted with, and the remote switch/door switch configurations set for, an optional remote control panel. The panel displays refrigerated compartment setpoints, compartment temperatures and operating modes (heat, cool or defrost). The setpoint may be set and the unit may be started and stopped using the remote panel.

This compact panel can be mounted to suit the individual operator's preferences – for example, flush mounted inside the trailer near the rear door. Refer to Section 3.19.2 for more information on the remote control panel.

**NOTE**

The remote switch/door switch configurations may be set for use as individual switches or for use with a remote panel, not both.

## 2.9 ENGINE DATA

| | | |
|---|---|---|
| Engine Model | V2203L–DI–E3B–CTD–5 (26–00128–15) | |
| Displacement | 135 $in^3$ (2.2 liters) | |
| No. Cylinders | 4 | |
| Rated Power | 32 hp (24 KW) @1800 rpm | |
| **NOTE: Refer to Table 2-1 for engine speed settings** | | |
| Weight | 440 lbs (199.6 kg) | |
| Coolant Capacity | 2 U.S. gallons (7.6 liters) – 50/50 mix ethylene glycol antifreeze (with inhibitors) – never to exceed 60/40<br>**CAUTION**<br>**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.** | |
| Thermostat | Starts to open 177 to 182_F (81 to 83_C). Fully open at 203_F (95_C). | |
| **Fuel System** | | |
| Fuel | Winter: Diesel No. 1 Summer: Diesel No. 2(Maximum 5% Bio–Diesel is also allowed) | |
| Fuel Heater Temperature Switch | Close on a temperature fall @ 45_F (7.2°C)<br>Open on a temperature rise @ 75_F (24°C) | |
| Firing Order | 1–3–4–2 | |
| Intake Air Heater Amperage | 42 amps at 12 VDC | |
| **Lubrication System** | | |
| Oil Pressure | 40 to 62 psig (2.8 To 4.2 Bar) – Engine in high speed | |
| Oil Pressure Switch (ENOPS) | Closes, on pressure rise, at 18 psig (1.22 Bar)<br>Opens, on pressure fall, at 12 psig (0.82 Bar) | |
| Oil Capacity with Filter | 15 quarts (14.2 liters) | |
| Lube Oil Viscosity:<br>API CG or better<br>**OR**<br>Mobil Delvac 1 | Outdoor Temperature | Grade (SAE) |
| | Below 32_F (0°C) | 10W 30 or Mobil Delvac 1 (5W 40) |
| | Above 32_ (0_C) | 10W 30 or Mobil Delvac 1 (5W 40) or 15W 40 |
| Oil Change Intervals | Refer to Section 8.2 for information on service intervals. | |

## 2.10 COMPRESSOR DATA

| | |
|---|---|
| Compressor Model | 06D |
| Number of Cylinders | 6 |
| Type | Semi-hermetic Reciprocating |
| Weight | 325 lbs (1478 kg) |
| Oil Charge | 7.6 pints (3.6 liters) |
| Approved OIl | Mobil Arctic EAL 68 |

## 2.11 REFRIGERATION SYSTEM DATA

| | |
|---|---|
| Defrost Air Switch (DAS) | Initiates Defrost: 1.40 ¦ .07 inch (35 ¦ 1.8 mm) WG |
| Defrost Timer (micro controlled) | 1.5h, 3h, 6h, or 12 hours |
| Compartment 1 Evaporator High Temperature Switch (EVHTS) | Opens, on temperature rise, at: 130° ¦ 5°F (55° ¦ 2.8°C)<br>Closes, on temperature fall, at: 100° ¦ 7°F (37.8° ¦ 3.9°C) |
| Remote Evaporator High Temperature Switch (2EVHTS or 3EVHTS) | Opens, on temperature rise, at: 120° ¦ 5°F (38.5° ¦ 2.7°C)<br>Closes, on temperature fall, at: 80° ¦ 10°F (26.7° ¦ 5.5°C) |
| Remote Evaporator Thermal Expansion Valve Superheat Setting | 15 to 17°F @ 35°F Compartment Temperature<br>10 to 12°F @ -20°F Compartment Temperature |
| Fusible Plug Melting Point | 430_F (221_C) |
| High Pressure Switch (HP1) | Opens, on pressure rise, at : 465 ¦ 10 psig (34 ¦ 0.7 bar)<br>Closes, on pressure fall at: 350 ¦ 10 psig (24 ¦ 0.7 bar) |
| Host Unit Dry Weight, Less Battery | 2045 pounds (928 KG.) |
| Battery | 50 pounds (23 KG.) |
| Remote Evaporator Weight | MHS1100 = 106 lbs (48.1 kg): MHD1100 = 117 lbs (65.1 kg)<br>MHS2200 = 207 lbs (98.0 kg): MHD2200 = 225 lbs (102.1 kg) |

## 2.12 ELECTRICAL DATA

| | | |
|---|---|---|
| Compressor Motor | Full Load Amps (FLA) | 17.5 amps @ 460 VAC |
| | Locked Rotor Amps | 99.0 amps @ 460 VAC |
| | Winding Resistance | Approximately 2 ohms, phase to phase |
| Condenser Fan Motors (Each) | Full Load Amps (FLA) | 1.9 amps @ 460 vac, 60 hz |
| | Horsepower | 1.1 hp (820 watts) at 60 hz |
| | Speed | 1700 rpm @ 60 Hz |
| | Bearing lubrication | Factory lubricated, additional grease not required |
| | Rotation | Clockwise when viewed from shaft end |
| | Resistance | 20 to 21 ohms |
| Heaters | **Compartment 1 Heater 1** | |
| | Number of heaters | Three elements (1 assembly) |
| | Resistance | 196 ohms ±10 ohms per phase |
| | Current, Low Speed | 2.6 amps nominal |
| | Current, High Speed | 3.4 amps nominal |
| | **Compartment 1 Heater 2** | |
| | Number of heaters | Four elements (1 assembly) |
| | Resistance | 196 ohms ±10 ohms per phase |
| | Current, Low Speed | 2.6 amps nominal |
| | Current, High Speed | 3.4 amps nominal |
| | **Remote Evaporator Heaters** | |
| | Resistance | 100 ohms minimum per phase |
| | | 50 ohms minimum per heater |
| | Current (High Speed) | MHD1100/MHS1100 = 3.5 amps<br>MHD2200/MHS2200 = 5.1 amps |

## 2.12 ELECTRICAL DATA – Continued

| | | |
|---|---|---|
| Compartment 1 Evaporator Fan Motor | Full Load Amps (FLA) | 1.9 amps @ 460 vac, 60 hz |
| | Horsepower | 1.35 hp (1007 watts) @ 60hz |
| | Speed | 3500 rpm @ 60 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 | 7.4 to 7.6 ohms |
| Remote Evaporator Fan Motor (Each) | Full Load Amps (FLA) | 0.45 amps |
| | Horsepower | 0.25 hp (180 watts) @ 400VAC |
| | Speed | 2700 rpm @ 60 hz (Approx) |
| | Bearing Lubrication | Factory lubricated, additional grease not required |
| | Rotation | Clockwise (looking into grille) |
| Generator | Nominal voltage & frequency at High Speed | 460 vac, 60 hz, 3 phase |
| | Nominal voltage & frequency at Low Speed | 345 vac 45 hz, 3 phase |
| | Resistance | 0.72 to 0.88 phase to phase<br>0.36 to 0.44 ohms phase to ground |
| | Output | 20.7 KVA @ 0.84 p.f @ 1800 rpm |
| Battery Charger 20 Amp | Input | 360 – 460 VAC, Single Phase |
| | Output amps | 20A (Maximum) |
| | Output voltage | 14.8 VDC @ 77°F (25°C) |
| Battery Charger 40 Amp | Input | 360 – 460 VAC, Three Phase |
| | Output amps | 40A (Maximum) |
| | Output voltage | 14.8 VDC @ 77°F (25°C) |
| OGF Module | Trips – On High Current | 40 Amps |
| | Trips – on Ground Fault | 150mA |
| Battery | Voltage | 12 volt nominal – 90 amp hour capacity<br>Cold cranking amps = 425 DIN, 500 IEC, 725 BCI |
| Standby Power Requirements | Voltage<br>Current | 460/3/60 with a 30A Circuit Breaker required.<br>(Full Load Draw = 25A, Locked Rotor Draw = 99A) |
| Standby Power Cable | Gauge<br>Length | SOOW, 600V, 90°C, 10/4 (3ph + G)<br>50’ minimum length, 75’ Maximum length. |

## 2.13 COMPONENT RESISTANCE & CURRENT DRAW DATA

| Component | Ohms | Amps |
|---|---|---|
| Remote Liquid Line Solenoid Valve | 10.9 Ohms | 1.1 Amps |
| Unloader Solenoid Valve | 9.6 ±0.8 Ohms | 1.0 – 2.0 Amps |
| 12VDC Relay Coil (IAHR/GPR, SSR, FHR) | 72 Ohms ±10% | 0.14 – 0.18 Amps |
| 12VDC Relay Coil (PSCONR, GENCONR, CCONR, RCR) | 80 Ohms ±15% | 0.12 – 0.17 Amps |
| Contactor Coil (HTCON1, HTCON2, CDCON, 1EVCON, 2EVCON, 3EVCON, 2HTCON1, 2HTCON2, 3HTCON1, 3HTCON2) | 48 Ohms ±10% | 0.25 Amps ±10% |
| Contactor Coil (PSCON1, PSCON2, GENCON, CCON) | 0.6 Ohms ±10% Contacts Open<br>48 Ohms Contacts Held Closed | 0.25 Amps ±10% |
| Fuel/Speed Actuator (FSA) | 2.8 Ohms ±10% @ 68°F (20°C) | 4 Amps Max |
| Intake Air Heater Circuit | 0.3 to 0.5 Ohms | 38 – 46 Amps |
| Starter Motor | Less than 1 Ohm but more than 0 | 270 – 380 amps |
| Fuel Heater | 1.4 Ohms ±10% | 10.7 amps ±10% |

## 2.14 SAFETY DEVICES

The system is protected from high pressure conditions which may occur when exposed to very high temperatures (such as a fire) by a fusible plug mounted in the receiver. Under very high temperature conditions (refer to Section 2.11) the plug will melt, releasing the refrigerant pressure.

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 the following table.

| Unsafe Conditions | Safety Device | Device Setting |
|---|---|---|
| Excessive operating pressure | High Pressure Switch (HPS) | Refer to Section 2.11 |
| 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 - 20 amp chargers | Fuse (F7, F8) | Opens at 3 amps (single charger) **OR** opens at 6 amps (dual chargers) See note. |
| Excessive current draw by battery charger input - 40 amp charger | Fuse (F7, F8, F29) | Opens at 5 amps (timed) |
| Excessive current draw by generator/power supply contactors | Fuse (F9) | Opens at 10 amps |
| Excessive current draw by Compartment 1 evaporator heater | Fuse (F10/F11/12) | Opens at 12 amps |
| Excessive current draw by remote evaporator heater or fan motor | Fuse (F13/F14/15) | Opens at 12 amps |
| Excessive current draw by Compartment 2 remote drain heater | Fuse (F16) | Opens at 5 amps |
| Excessive current draw by Compartment 3 remote drain heater | Fuse (F17) | Opens at 5 amps |
| Excessive current draw by Fuel Heater Circuit | Fuse (F19) | Opens at 20 amps |
| Excessive current draw by Fuel Level Sensor Circuit | Fuse (FLS) | Opens at 3 amps |
| Excessive current draw by Compartment 1 evaporator or condenser fan motor | Fuse (F26/F27/F28) | Opens at 12 amps |
| 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 |

NOTE: When a second 20 amp charger is used to charge a lift gate battery, the higher rated fuse is installed.

## 2.15 REFRIGERANT CIRCUIT DURING COOLING

When cooling, (See Figure 2-15) 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) expansion valves, and (4) direct expansion evaporators.

The compressor raises the pressure and the temperature of the refrigerant and forces it into the condenser channels. The condenser fans circulate surrounding air over the outside of the channels. The channels have fins designed to improve the transfer of heat from the refrigerant gas to the air. This removal of heat causes the refrigerant to condense. 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 fusible plug which melts on occurrence of very high temperature to relieve the refrigerant pressure.

The refrigerant leaves the receiver and flows through the liquid line service 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 suction line 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 electronic expansion valve (compartment 1) and through a liquid line solenoid valve and thermal expansion valve (compartment s 2 and/or 3 - if active) 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 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 refrigerated compartments 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. The vapor then passes through the 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.

## 2.16 REFRIGERANT CIRCUIT - HEATING AND DEFROSTING

The compressor is turned off for all heating and defrost cycles. In heat, the coil mounted heaters and evaporator fan(s) are energized. Air flowing over the warm heater elements is circulated through the compartment to maintain the cargo at the desired temperature. Defrost may be accomplished using either electric heaters or return air (refer to Section 4.6).

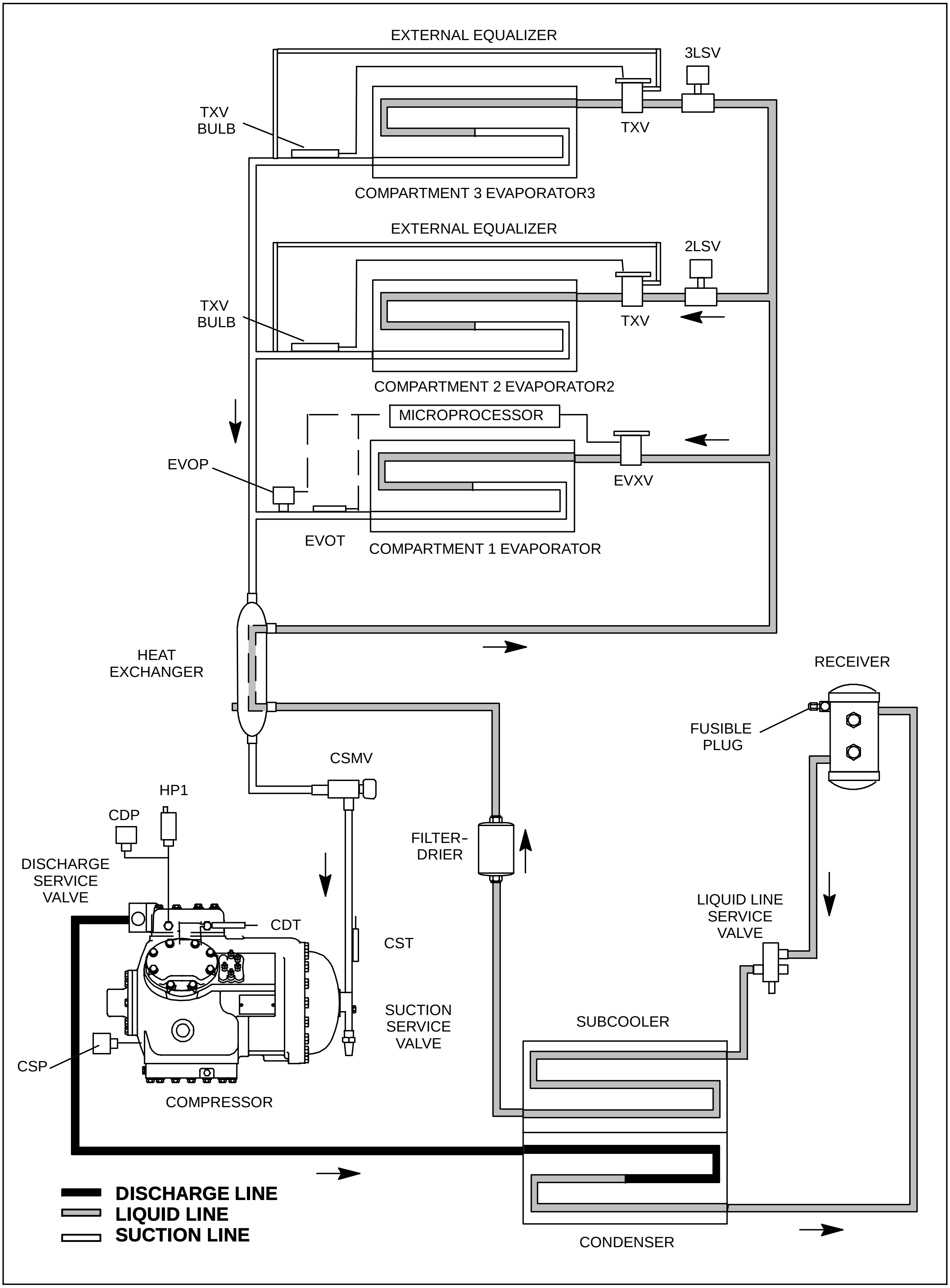



**Figure 2–15 Refrigerant Circuit**

# SECTION 3 – OPERATION

PARAGRAPH NUMBER — Page



3

# SECTION 3

# OPERATION

## 3.1 STARTING – ENGINE OPERATION

**⚠ WARNING**

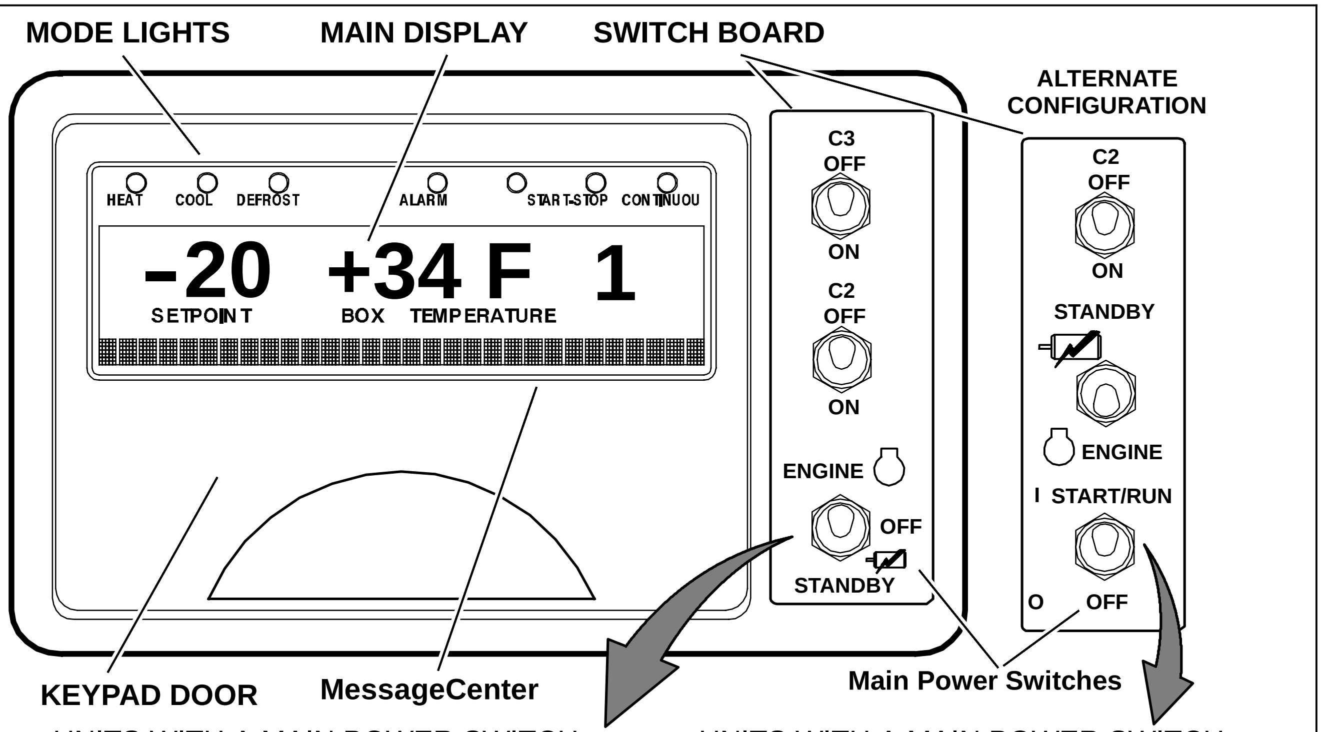
**Advance microprocessor equipped units may start automatically at any time the Main Power switch is not in the OFF position. Also, the unit may be fitted with two way communication equipment that will allow starting of the unit from a remote location even though the switch is in the OFF position.**

**⚠ WARNING**

**Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instructions, ensure the Main Power switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection.**

**⚠ WARNING**

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




<u>UNITS WITH A MAIN POWER SWITCH LABELED ENGINE/OFF–STANDBY</u>

1. Place the Main Power switch in the ENGINE position.
2. The microprocessor will perform a Self Test (refer to Section 3.3) and then start the unit automatically.
3. Ensure the 2nd Compartment Run (C2) and/or the 3rd Compartment Run (C3) switch is in the ON position if operation is desired.

<u>UNITS WITH A MAIN POWER SWITCH LABELED START/RUN–OFF</u>

1. Place the SWITCH LABELED standby/engine in the ENGINE position. Then place the Main Power switch in the START/RUN position.
2. The microprocessor will perform a Self Test (refer to Section 3.3) and then start the unit automatically.
3. Ensure the 2nd Compartment Run (C2) and/or the 3rd Compartment Run (C3) switch is in the ON position if operation is desired.

## 3.2 STARTING – STANDBY OPERATION

**⚠ WARNING**

**Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instructions, ensure the Main Power switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection. NEVER dis–assemble the generator: HIGH MAGNETIC FIELD INSIDE! This field can interfere with cardiac implants such as pacemakers and defibrillators.**

**⚠ WARNING**

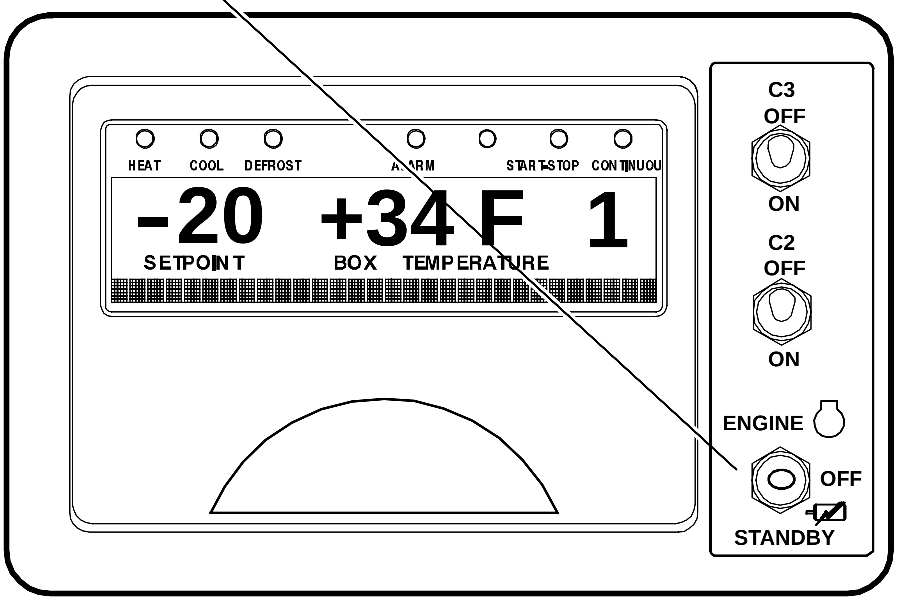
**Ensure the power plug is clean and dry before connecting to any electrical outlet / receptacle.**

**⚠ WARNING**

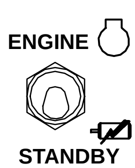
**Do not connect power plug to any electrical outlet without checking that it meets the 460/3/60 and 30 Amp electrical requirements of the unit.**

### Starting units with a Main Power switch labeled ENGINE/OFF/STANDBY

1. Ensure the switch labeled ENGINE/OFF/STANDBY is in the OFF position.
2. Ensure the external power circuit breaker is off, connect standby cable to unit and then turn the external power circuit breaker on.



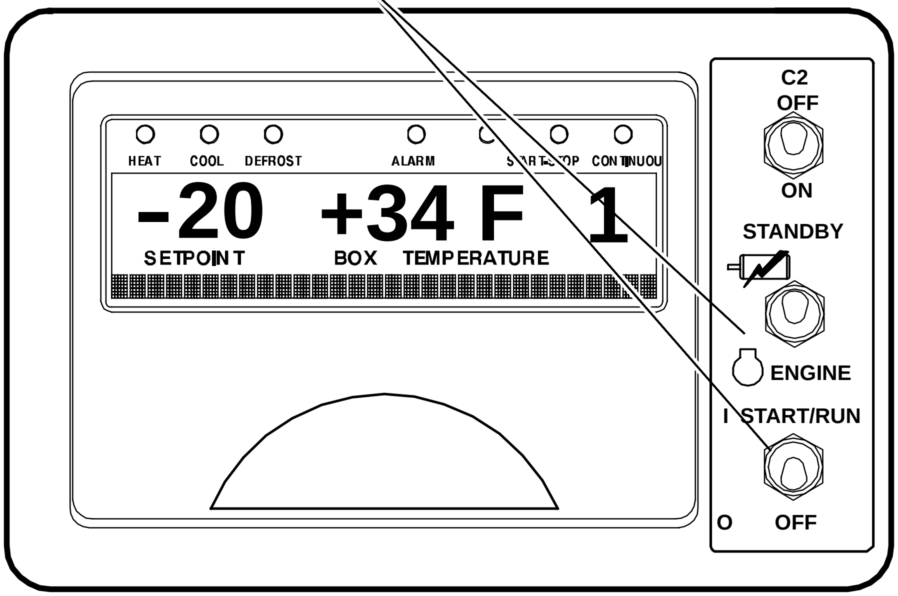

3. Place the switch labeled ENGINE/OFF/STANDBY in the STANDBY position.



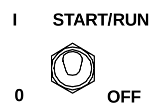

4. The microprocessor will then perform a Self Test (refer to section 3.3) and start the unit automatically.
5. Ensure the 2nd Compartment Run (C2) and/or the 3RD Compartment Run (C3) switch is in the ON position if operation is desired.

## Starting units with a Main Power switch labeled START/RUN-OFF

1. Ensure the switch labeled ENGINE/STANDBY is in the STANDBY position and the switch labeled START/RUN–OFF is in the OFF position
2. Ensure the external power circuit breaker is off, connect standby cable to unit and then turn the external power circuit breaker on.




3. Place the switch labeled START / RUN - OFF in the START/RUN position.




4. The microprocessor will then perform a Self Test (refer to section 3.3) and start the unit automatically.
5. Ensure the 2nd Compartment Run (C2) is in the ON position if operation is desired.

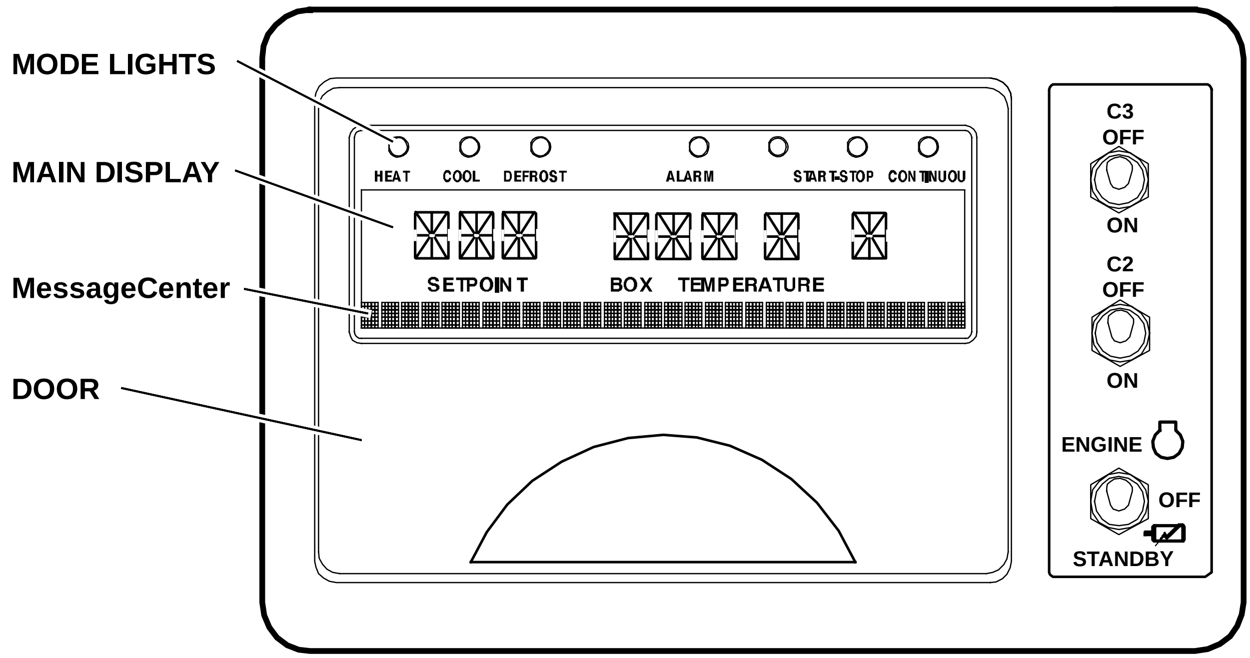
**NOTE**

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

**For safe, reliable operation in Standby Operation, it is important to consider the following guidelines:**

- **NEVER** connect the unit to a high voltage power source unless the Main Power switch is in the OFF position.
- The power supply cable and circuit breaker must comply with local electrical code and unit specifications. Refer to section 2.12.
- 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.

## 3.3 SELF TEST



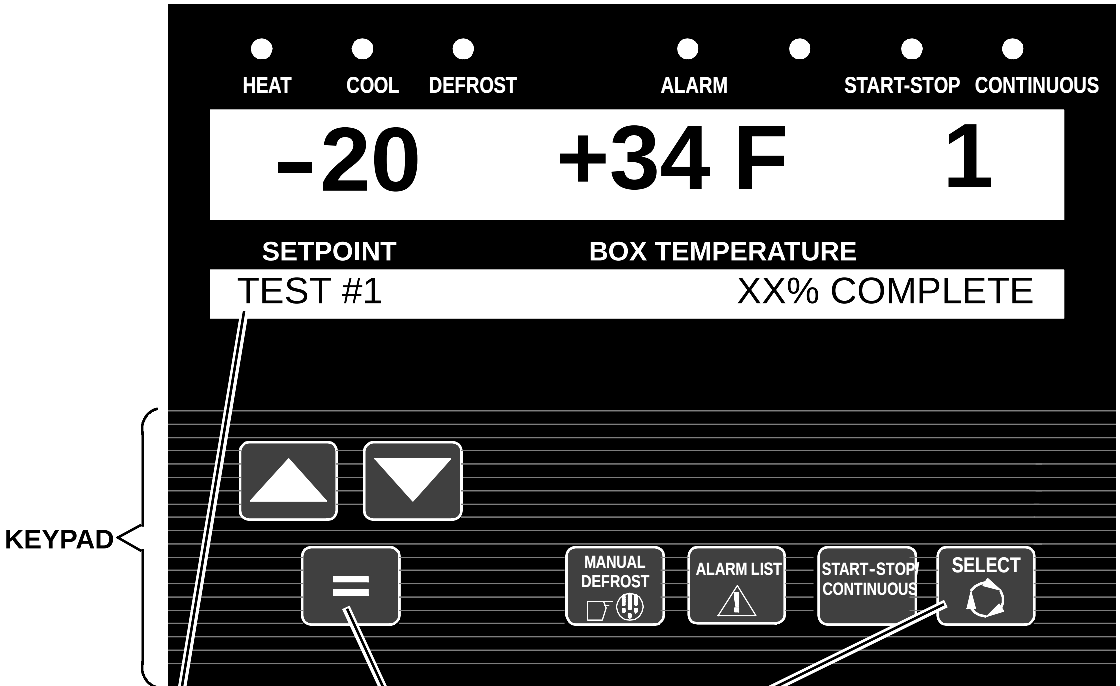

SELF TEST

When first powered up, the microprocessor will run a self test consisting of the following steps:

- All of the mode lights will illuminate.
- All of the segments on the main display will turn on.
- All of the liquid crystal diodes (LCDs) of the MessageCenter will turn on to verify their operation.
- The main display will then display the setpoint temperature in the left two characters and a compartment (BOX) temperature in the right two characters. The character just to the right of the box temperature indicates the temperature units as “C” Centigrade or “F” Fahrenheit. The last character indicates which compartment temperature is being displayed.
- The MessageCenter will then display “MICRO SELF TEST IN PROGRESS” for several seconds.
- If one or more Inactive alarms are stored, “INACTIVE ALARMS IN MEMORY” will be displayed and the Alarm LED will flash for 5 seconds, then turn off. Refer to Section 3.12 for information on viewing inactive alarms.
- If the microprocessor has been configured to display the hour meters, the Total Engine Hours, Standby Run Hours and/or Total Switch On Hours will be displayed.
- If there are one or more active alarms, the MessageCenter will display “UNIT SHUTDOWN – SEE ALARM LIST”. Any active alarms must be corrected and cleared before the unit can start. Refer to Section 3.11 for information on active alarms.
- The microprocessor will then display “SMV CLOSING” while the CSMV and the EVXV are brought to unit starting positions.
- **In engine operation**, the intake air heater will energize (as required), the buzzer will sound, and the engine will start.
- **In standby operation**, the buzzer will sound then the fans and compressor will start.

## 3.4 PRETRIP

1. Place the switch labeled ENGINE/OFF/STANDBY in the desired position OR place the switch labeled START/RUN–OFF in the 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 and that all lights on the Light Bar come on. Verify during Test #2 that the that the buzzer comes on for the first five seconds.
5. The remainder of Pretrip will take 7 to 15 minutes, and will run itself automatically.

Pretrip is a set of tests run by the microprocessor to check unit operation. It is recommended that a Pretrip be run prior to loading. It will indicate a failure when one is detected.

**TIP**

A Pretrip can be started at any box temperature. If Pretrip is started while the unit is in a Start–Stop off cycle the unit will start during the course of the test. If the unit is running when Pretrip is started, it will shutdown for the first three tests.

**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.

During the Pretrip test, the MessageCenter displays the current test number and description and the % of the test that has been completed. When Pretrip is complete the MessageCenter will display one of three different messages:

- “PRETRIP PASS” **OR**
- “PRETRIP FAIL IN TEST X” **OR**
- “PRETRIP FAILED & COMPLETE”. Alarm light will be on.

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

**TIP**

The Pretrip test “PASS” of “FAIL” results message will stay displayed until any key is pressed, or until the Main Power switch is placed in the OFF position.

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 5.3) or Defrost mode, or check the alarm list (Section 3.11) 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 abort Pretrip.

**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 display in the MessageCenter.

Once Pretrip is started: If the unit is running, the microprocessor will shut the unit down.

**NOTE**

Before completing Pretrip, the microprocessor 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 display “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 Test 1 by watching the microprocessor display. The microprocessor will illuminate all the Mode Lights and all segments of the Main Display. Following Test 1, the operator MUST verify that, during the first 5 seconds of Test 2, the buzzer is energized.

### Test 1 – Display Test

The microprocessor activates the display, and both lights on the Light Bar. This test will last 5 seconds. All segments of the display, all LEDs on the microprocessor, both lights of the Light Bar will be on during this test. This portion of the Pretrip requires that the operator determines PASS or FAIL. A defective display is indicated if: any LCD/LED segments are not visible or any LEDs or lights do not illuminate. 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 or light bar will not affect the operation of the unit, but will affect what is displayed during unit operation.

### Test 2 – Sound and 12VDC Electrical Component Amperage Check

At the beginning of this test the microprocessor activates the buzzer for 5 seconds, the operator is to determine if the sound test is PASS or FAIL. If the sound test fails it should be repaired at the conclusion of the Pretrip cycle. Pretrip will continue regardless of the outcome of the sound test. A faulty buzzer will not affect the operation of the unit, but will lead to operation without proper audible warning on start up.

Test 2 will continue with a check of the amperage (current) draw of the following components:

- Battery DC Current (All Components Turned Off).
- Front Unloader Solenoid (UL1).
- Rear Unloader Solenoid (UL2) .
- Intake Air Heater (IAH).
- Engine Speed Control Unit (ENSCU).
- Condenser Motor Contactor (CDCON).
- Compressor Motor Contactor (CCON).
- Generator Contactor (GENCON).
- Standby Contactor (PSCON).
- Heater Contactor (1HTCON1).
- Heater Contactor (1HTCON2).
- Remote Heater Contactor for Compartment 2 (2HTCON1).
- Remote Heater Contactor for Compartment 2 (2HTCON2).
- Remote Heater Contactor for Compartment 3 (3HTCON1).
- Remote Heater Contactor for Compartment 3 (3HTCON2).
- Evaporator Motor Contactor (1EVCON).
- Evaporator Motor Contactor (2EVCON).
- Evaporator Motor Contactor (3EVCON).
- Liquid Line Solenoid (2LSV).
- Liquid Line Solenoid (3LSV).

Each component will be individually checked for proper current draw. An alarm will be activated for any component not drawing amperage in the expected range.

## PRETRIP (Continued)

### 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.

### 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 activated.

**NOTE**

Tests 5, 6 an 7 are only performed when unit is in Engine Operation. When in Standby Operation, pretrip will skip to Test 8.

### Test 5 – Engine Low Speed

The engine starts up in low speed with condenser fans on. The microprocessor verifies that engine speed is in low speed range. If the engine is not operating within the low speed range, the P174 – “CHECK LOW SPEED RPM” alarm will be activated.

### Test 6 – Engine High Speed

The engine switches to high speed and energizes HTCON1 and HTCON2. The microprocessor verifies that engine speed is in high speed range. If the engine is not operating within the high speed range, the P175 – “CHECK HIGH SPEED RPM” alarm will be activated.

### Test 7 – Engine Low Speed 2

The engine switches back to low speed and heaters turn off. The microprocessor verifies that engine speed is in low speed range. If the engine is not operating within the low speed range, the P174 – “CHECK LOW SPEED RPM” alarm will be activated.

### Test 8 – Electric Heater Amperage Check

Each heater will be energized individually and checked for proper current draw. An alarm will be activated for any heater not drawing amperage in the expected range. Test 8 is repeated for Compartment 2 and (if applicable) Compartment 3.

### Test 9 – Evaporator Fan Motor Amperage Check

The evaporator motor contactor will be energized and checked for proper current draw. An alarm will be activated if the evaporator fan motor is not drawing amperage in the expected range. Test 9 is repeated for Compartment 2 and (if applicable) Compartment 3.

### Test 10 – Condenser Fan Motors Amperage Check

The condenser fan motor contactor will be energized and checked for proper current draw. An alarm will be activated if the condenser fan motors are not drawing amperage in the expected range.

### 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 the P180 – “CHECK SUCTION MOD VALVE” alarm will be activated. 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 the P177 – “CHECK EVAP SUPERHEAT” alarm will be activated.

### 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 P178 – “CHECK UL1” or P191 – “CHECK UL2” alarm will be activated.

### Test 14 – Liquid Line Solenoid Valve

This test checks the operation of LSV2 and then LSV3. If suction pressure does not change when a valve is energized and de–energized, the P168 – “C2 CHECK LSV VALVE” or P176 “C3 CHECK LSV VALVE” alarm will be activated.

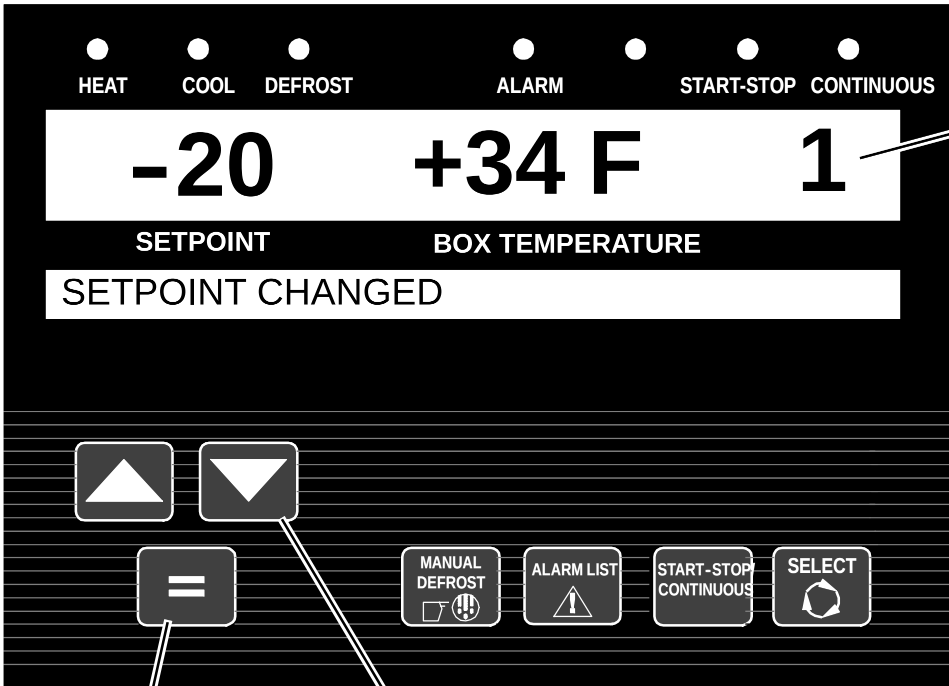
### Test 15 – Check For Other Alarms

The alarm list is checked for any non-pretrip alarms that may have occurred during the Pretrip test. If any operational alarms occurred, Pretrip will display FAIL, and the technician will need to review the Alarm List and take necessary and appropriate action to clear them. Test 15 will last about five seconds.

### Pretrip Termination

When the Pretrip cycle is completed, the unit will return to normal temperature control operation. “PRETRIP PASS” will be displayed until the operator presses any key. In the event that the Pretrip test triggered an alarm(s), 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) will be displayed.

### 3.5 CHANGING SETPOINT




1. Watch the display until the refrigerated compartment number for which the setpoint is being changed is displayed.

2. With the correct refrigerated compartment number displayed, press the UP ARROW or DOWN ARROW key to change the setpoint to the desired value. The MessageCenter will display "↑↓ TO SCROLL, THEN = TO SAVE".

3. Press the = key to save the new setpoint.

By default, setpoints of –22°F to +89°F (–30°C to +32°C) may be entered via the keypad. The microprocessor always retains the last entered setpoints in memory. The setpoints will change 1° (one full degree) for each press and release of the UP ARROW or DOWN ARROW key.

**NOTES**

1. Setpoint for Compartment 2 or Compartment 3 cannot be changed unless the switch for that compartment is in the ON position.

2. The microprocessor may be configured with a minimum and/or maximum setpoint other than the default values listed above. "MAX SETPOINT HAS BEEN REACHED" or "MIN SETPOINT HAS BEEN REACHED" will display in the MessageCenter when either of these conditions is reached.

Setpoint may be changed any time the Main Power switch is not in the OFF position, or when the unit is in PC Mode EXCEPT when:

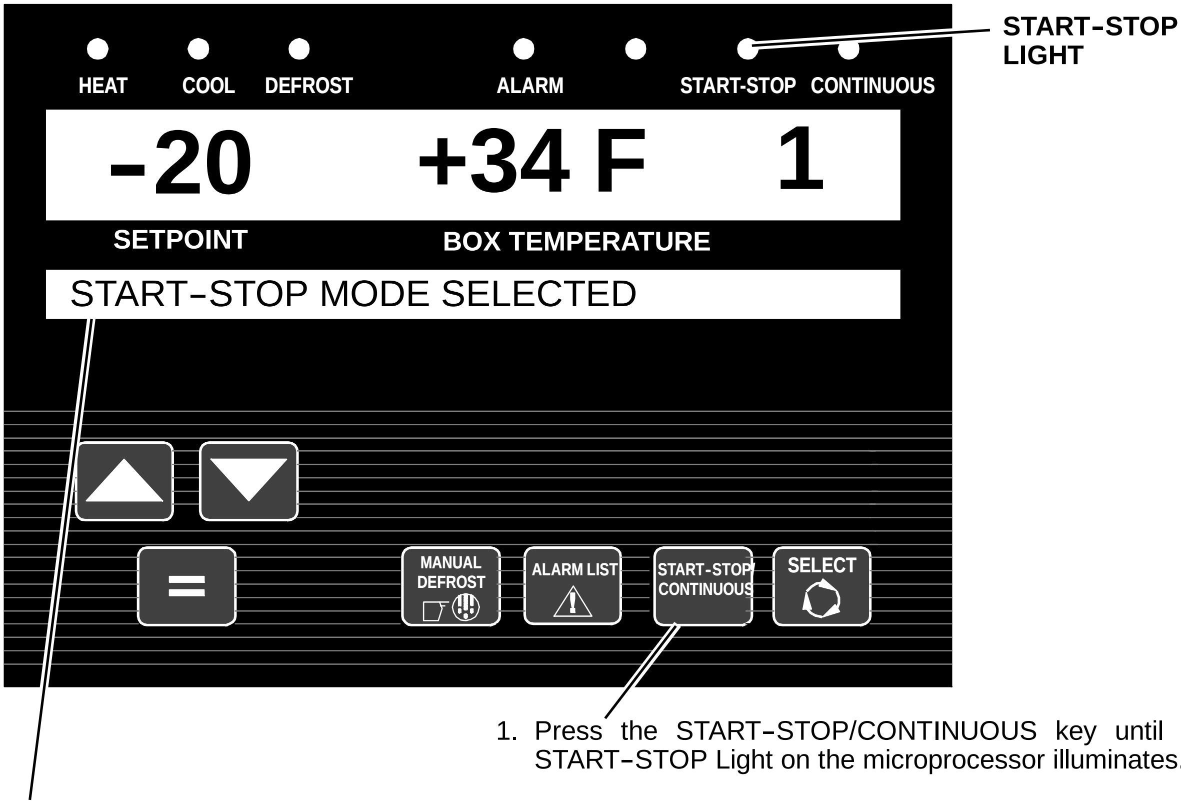
- Viewing the Alarm List, Data List or Functional Parameters **OR**
- When the unit is in Pretrip **OR**
- When the unit is in Sleep Mode.

Pressing the = key will cause the new displayed setpoint value to become active and "SETPOINT CHANGED" will be displayed. If the new value is not entered, after 5 seconds of no keypad activity, the entire display and Light Bar will flash and the buzzer will be energized for 15 seconds (with "SETPOINT NOT CHANGED" displayed) and then revert back to the last entered setpoint. 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**

The setpoint may be changed quickly by pressing and holding the UP ARROW or DOWN ARROW key. The longer the key is held, the faster the setting will change.

## 3.6 START-STOP OPERATION




1. Press the START-STOP/CONTINUOUS key until the START-STOP Light on the microprocessor 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.

Start-Stop is provided to reduce fuel or power consumption. This feature allows full automatic control of the unit shutdown and restart by monitoring refrigerated compartment temperatures, battery charging amps and engine coolant temperature (Engine Operation only). The main function of Start-Stop Operation is to turn off the refrigeration system near setpoint to provide an 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 Operation. The corresponding LED will be iluminated.

For refrigerated compartment 1, the microprocessor may be configured with Start-Stop operation tied to the setpoint ranges for frozen and perishable loads. The Start-Stop/Continuous key is locked out if “START-STOP LOCKED” displays in the MessageCenter when the key is pressed and the unit is in Start-Stop Operation or “CONTINUOUS LOCKED” displays in the MessageCenter when the key is pressed and the unit is in Continuous Run Operation. Refer to Section 5.2.1 for Configuration information.

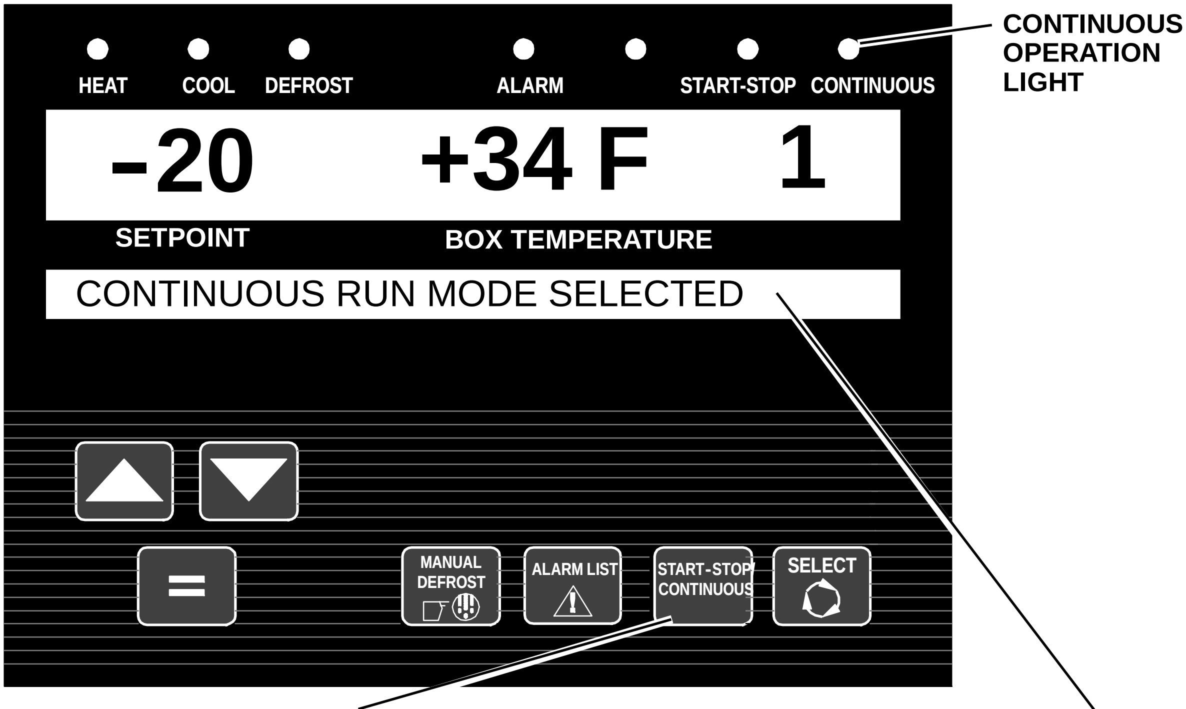
If the unit fails to start after three start attempts the A31 - “FAILED TO START-AUTO” alarm will be activated. While running, if the unit shuts down, an internal counter keeps track of the shutdowns. Should the unit shutdown three consecutive times without running a minimum of 15 minutes between shutdowns the A31 - “FAILED TO RUN MINIMUM TIME” alarm will be activated. The shutdown counter is cleared when the unit has run for 15 minutes.

**NOTE**

In Standby Operation, the unit will stop for a minimum of 5 minutes instead of 15 minutes.

Refer to Section 4.4 for more detailed information on Start-Stop Operation.

## 3.7 CONTINUOUS OPERATION



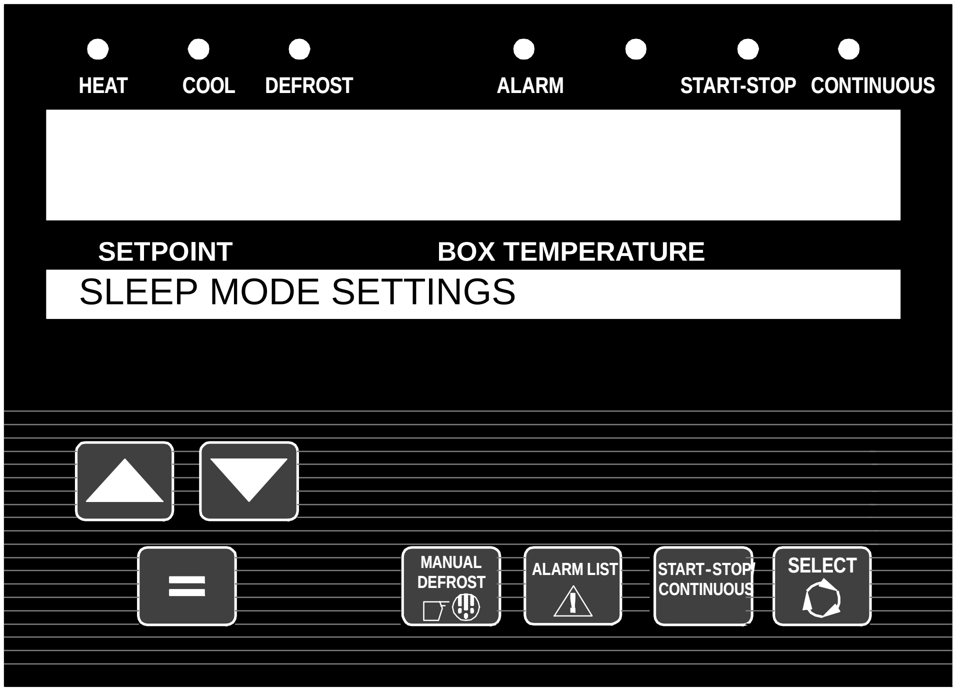

1. Press the START-STOP/CONTINUOUS key until the CONTINUOUS OPERATION Light on the microprocessor illuminates.
2. Verify that "CONTINUOUS RUN MODE SELECTED" is displayed on the MessageCenter and that the CONTINUOUS OPERATION light is illuminated. The unit is now in Continuous Operation.

In the Continuous Operation, the unit will not shutdown except in response to a shutdown alarm. Refer to Section 4.5 for more detailed information on Continuous Operation.

The microprocessor may be configured with Start–Stop operation tied to the setpoint ranges for frozen and perishable loads. The START-STOP/CONTINUOUS key is locked out if "START-STOP LOCKED" displays in the MessageCenter when the key is pressed and the unit is in Start-Stop Operation or "CONTINUOUS LOCKED" displays in the MessageCenter when the key is pressed and the unit is in Continuous Operation. Refer to Table 5–2 for more information on Configurations.

If the unit fails to start after three start attempts the A31 – "FAILED TO START–AUTO" alarm will be activated. While running, if the unit shuts down, an internal counter keeps track of the shutdowns. Should the unit shutdown three consecutive times without running a minimum of 15 minutes between shutdowns the A30 – "FAILED TO RUN MINIMUM TIME" alarm will be activated. The shutdown counter is cleared when the unit has run for 15 minutes.

## 3.8 SLEEP MODE




### TO ENTER SLEEP MODE

1. Press the SELECT key until the MessageCenter displays "PRESS ↑↓ TO VIEW SETTINGS".
2. Press the UP ARROW key until the Functional Parameter "SLEEP MODE SETTINGS" is displayed. Press the = key. The MessageCenter will then display "↑↓ TO SCROLL, THEN = TO SAVE".
3. Press either the UP or DOWN ARROW key until "SLEEP MODE: YES" is displayed. The MessageCenter will flash, indicating that this change has not been entered into memory. Press the = key to save the setting ti memory – the MessageCenter will stop flashing, the unit is now in sleep mode.
4. Additional Functional Parameter sub menu selections for "wake up time" and "run pretrip at wake" will now be available and may be saved to memory following the key stroke sequence in the preceding step. Refer to the following paragraphs for information on these settings.

### TO EXIT SLEEP MODE

Place the Main Power switch in the OFF position, then back to the desired position.

Sleep Mode is generally used in cold ambients when the unit will be off for an extended period of time with no product inside the refrigerated compartments. Many times units are difficult to start due to a discharged battery, thickened engine oil, etc. after time in cold ambient.

There is **NO TEMPERATURE CONTROL** in Sleep Mode and it should never be used if a compartment contains perishable or frozen products.

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

In Sleep and Standby Mode if the unit is connected to standby power, the battery charger is energized and will keep the battery charged. The engine will not run with the switch in the STANDBY position.

ADDITIONAL SUB MENUS

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 (refer to "TO EXIT SLEEP MODE" instruction above).

   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 date and 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 (1 to 12).
- Day (1 to 31).
- Year (1998 to 2037).
- Hour (0 to 23).
- Minute (0 to 59).

**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 with the switch in the ENGINE position, when the unit is not running during a 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 95°F (35°C), and the battery is fully charged (O.K. displays in the Data List voltage line, and charging amps are less than the configured setting). While the unit is running in Sleep Mode, “SLEEP WARNING: NO TEMP CONTROL” will flash in the MessageCenter, and the main display (setpoint and compartment temperatures) will be off.

If the unit is already running when Sleep Mode is selected, it will continue to run until the conditions described above are met.

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.

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 the configured restart temperature value or if the battery voltage drops below the configured battery restart value. (refer to Table 5–2)

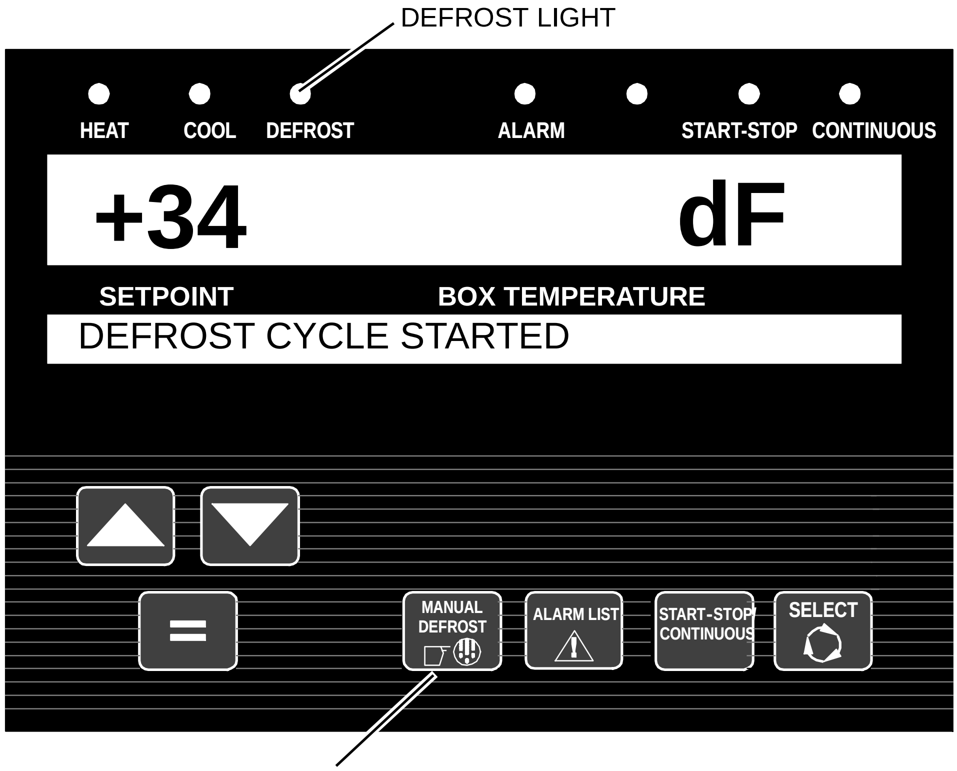
**NOTE (FOR ENGINE OPERATION ONLY)**

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.

## 3.9 MANUAL DEFROST




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 five seconds.

When defrost mode cannot be manually initiated “CANNOT START DEFROST CYCLE” is displayed in the MessageCenter. This will occur when:

- DTT, 2DTT and/or 3DTT are above 40°F (4°C). Defrost may be entered any time one of the DTT’s is below 40°F (4°C) **OR**
- The engine has not run 15 seconds after starting **OR**
- The unit is in PC Mode **OR**
- The unit is in Pretrip **OR**
- There is an active shutdown Alarm.

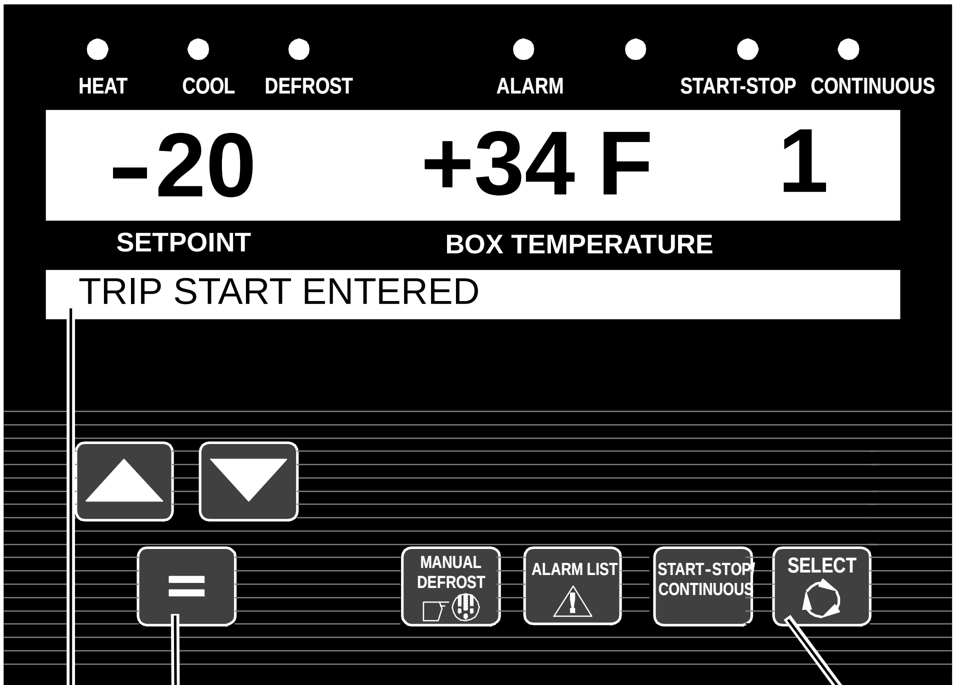
**TIP**

The Manual Defrost Key can be used at any time to start a Defrost Cycle as long as the preceding conditions are met. In Defrost Mode, all refrigerated compartments will enter defrost at the same time.

**NOTE**

Refer to Section 4.6 for more detailed information on DEFROST.

### 3.10 TRIP START



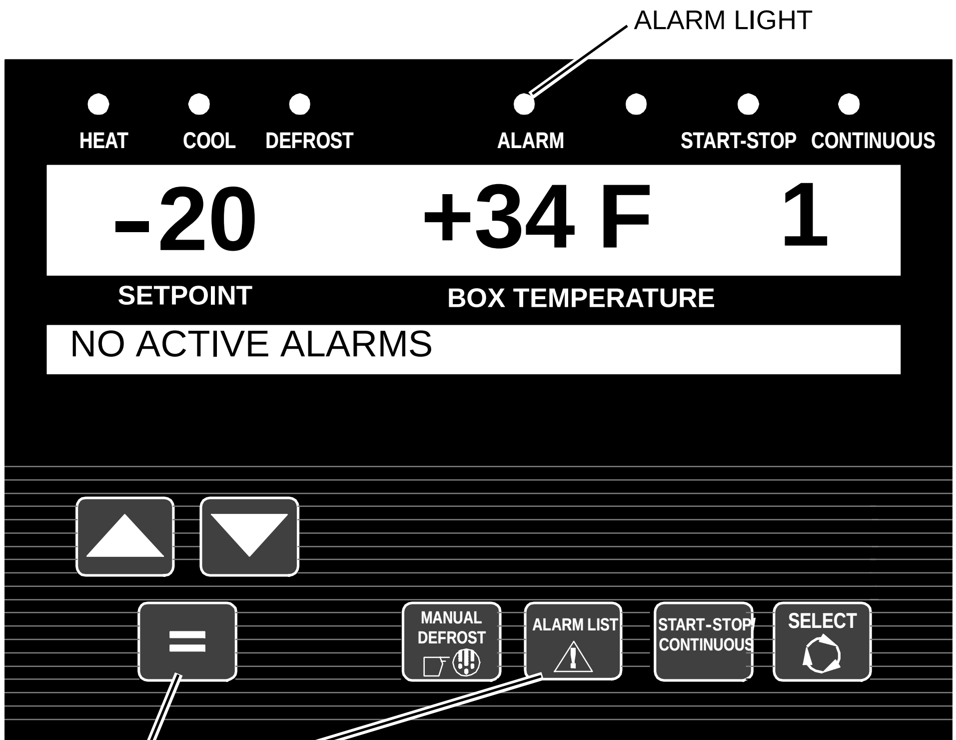

1. To mark the start of a trip in the DataLink data recorder, press the SELECT key until the MessageCenter displays “PRESS = TO MARK TRIP START”.

2. Press the = key.

3. If trip start is acknowledged by the DataLink data recorder, “TRIP START ENTERED” will be displayed for five 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 the present time and date as a stamp in the DataLink 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.

### 3.11 VIEW ACTIVE ALARMS




1. Press the ALARM LIST key. If there are no active alarms, “NO ACTIVE ALARMS” will display for 5 seconds.
2. If there are active alarms, the alarm number will be displayed with the letter “A” in front and the alarm message following. 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 five 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 are stored in the Alarm List in the microprocessor. Stored alarms may be viewed in the Message-Center.

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

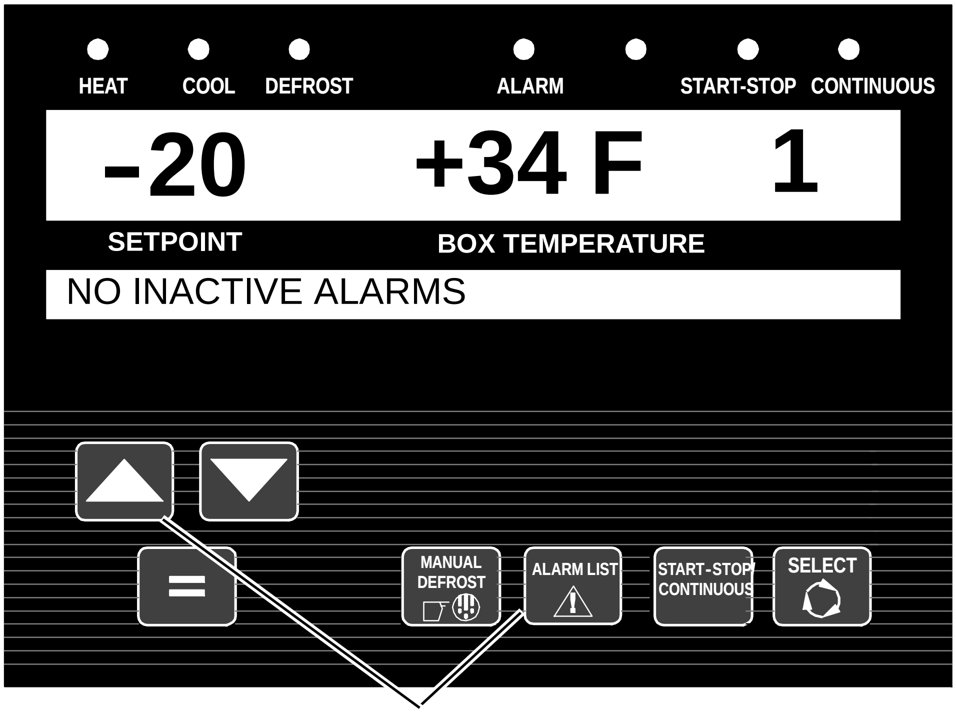
**TIP**

Another way to clear active alarms is to turn the microprocessor OFF and then back on using the Main Power switch

**TIP**

“CHK WIRES FROM MICRO TO KEYPAD” indicates there is a wiring problem between the microprocessor and the display module.

### 3.12 VIEW INACTIVE ALARMS




1. Press and hold both the ALARM LIST key and the UP ARROW key for six seconds. If there are no inactive alarms, the display will read "NO INACTIVE ALARMS" for five seconds.
2. If there are inactive alarms, the display will be 'I' in front of 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 in the combined Active and Inactive Alarm lists. The lists can be read via the MessageCenter or using the Reefer-Manager PC Program. There are two 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 inactivate, 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 to the Active Alarm list.

As additional alarms occur, they will be placed first in the Active Alarm list. Each alarm can only be present in either the Active or Inactive Alarm List at any given time. As conditions change, alarms may be moved from the Active Alarm list to the Inactive alarm list and back.

Alarms are also recorded in the DataLink 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**

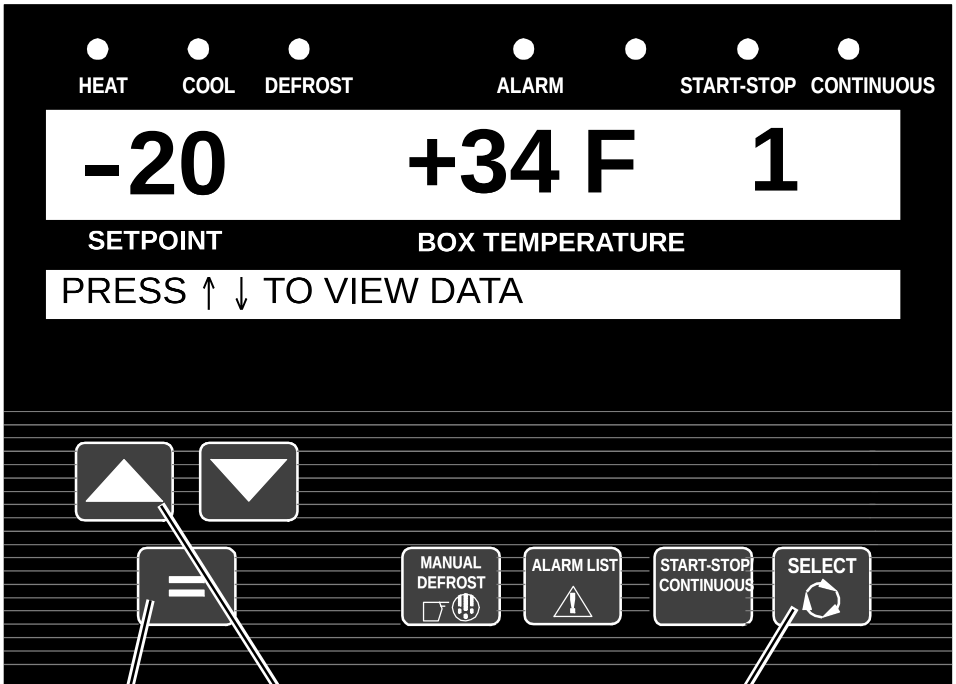
When alarms are cleared from the Inactive Alarm List, both active and inactive alarm lists are cleared.

If there is a safety shutdown "UNIT SHUTDOWN – SEE ALARM LIST" will be displayed. Pressing the Alarm List key will bring any Active Alarms into the MessageCenter. Refer to Section 7 for a complete list of Alarms and their descriptions.

**NOTE**

The Inactive Alarm List is also called the Technician's List. Only qualified refrigeration technicians should access the inactive list. It is not intended for the use of drivers or operators.

### 3.13 UNIT DATA




1. Press the SELECT key until the MessageCenter displays “PRESS ↑↓ TO VIEW DATA.”
2. Press the green UP ARROW key. The MessageCenter will display “PRESS ↑↓ TO VIEW DATA, THEN = TO LOCK” . Continue to press the green UP ARROW key to move down the Data List, or press the DOWN ARROW key to move up the Data List. (Refer to Table 3-1.)
3. The selected Data Item will remain in the MessageCenter for ten seconds, then the default message (“STATUS OK” or other customer specified message) will display.
4. To lock an item in the MessageCenter for continuous viewing, press the = key. The Data item will flash continuously for up to 30 minutes to indicate it is locked. If not unlocked in the 30 minute time, the display will return to the default message.
5. Pressing the UP or DOWN ARROW key will unlock that item and move to the next data item. Pressing the = key will unlock the item and, after ten seconds, the default message will be displayed.

**Table 3-1 Unit Data**

| | | |
|---|---|---|
| *** Displays information or setting entered in the microprocessor Configurations** | | |
| **+ May or may not be displayed depending on Parameter/Configuration settings** | | |
| Data readings are presented starting with “SUCTION PRESSURE” and progressing down the list using the green UP ARROW key. | | |
| | **DATA** | **DEFINITION** |
| | SUCTION PRESSURE | Compressor suction pressure |
| | DISCHARGE PRESSURE | Compressor discharge pressure |
| | EVAPORATOR PRESSURE | Leaving evaporator pressure |
| | ENGINE COOLANT TEMP | Engine coolant temperature |
| | RETURN AIR TEMP | Compartment 1 Return (air entering evaporator) temperature |

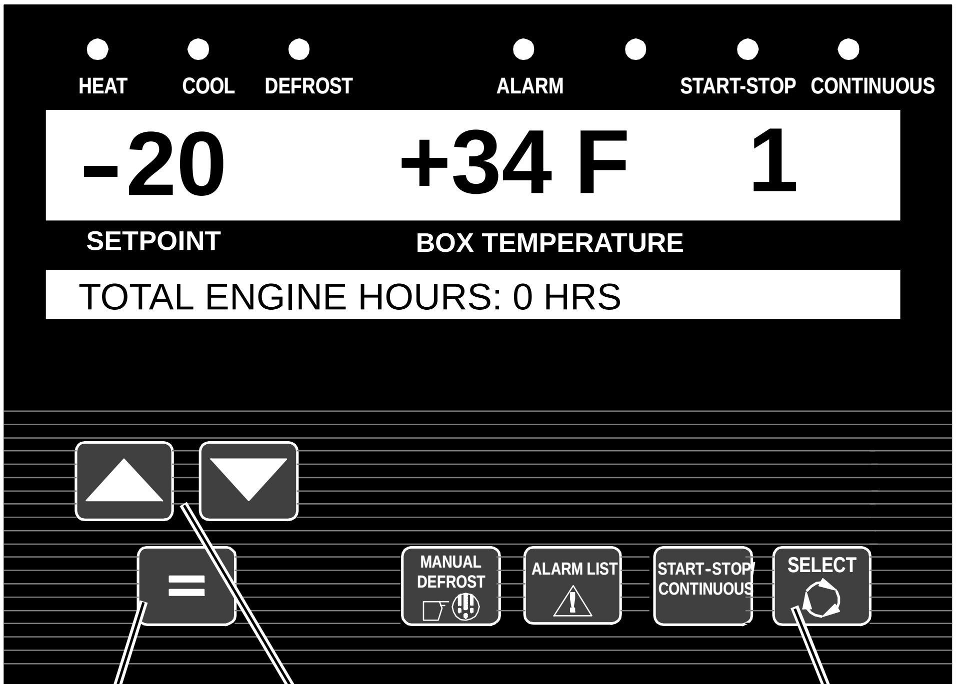
Table 3-1. Unit Data – Continued

| * Displays information or setting entered in the microprocessor Configurations | | |
|---|---|---|
| + May or may not be displayed depending on Parameter/Configuration settings | | |
| | C2 RETURN AIR TEMP | Compartment 2 Return (air entering evaporator) temperature |
| + | C3 RETURN AIR TEMP | Compartment 3 Return (air entering evaporator) temperature |
| | SUPPLY AIR TEMP | Compartment 1 Supply (air leaving evaporator) temperature |
| + | C2 SUPPLY AIR TEMP | Compartment 2 Supply (air leaving evaporator) temperature (If installed) |
| | DELTA–T | Supply air temperature minus return air temperature (a negative value indicates cooling and a positive value indicates heating) |
| | 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 leaving the compartment 1 evaporator outlet |
| | COMP DISCHARGE TEMP | Compressor discharge temperature |
| | BATTERY | Battery voltage |
| | CURRENT DRAW (DC) | Battery charging or discharging amps |
| | ENGINE RPM | Engine speed |
| | UNIT AC CURRENT #1 | High voltage current draw on circuit #1. |
| | UNIT AC CURRENT #2 | High voltage current draw on circuit #2. |
| | SUCTION MOD VALVE | % open of CSMV |
| + | FUEL LEVEL | This is only displayed when the sensor is configured ON. % of fuel in tank. |
| | EXPANSION VALVE | % open of EVXV |
| | START MODE | AUTO if the engine will start automatically<br>MANUAL if the engine must be started manually |
| + | INSTALLED OPTIONS | This is only displayed when one or more options is configured ON. Lists installed options. Press “=” to access the list. |
| | 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 configured by the user) |
| * | UNIT SERIAL # | Unit serial number |
| * | UNIT MODEL # | Unit model number |
| * | C2 EVAPORATOR # | Model number of the evaporator unit installed in Compartment 2 |
| * + | C3 EVAPORATOR # | Model number of the evaporator unit installed in Compartment 3 |
| + | HOURS TO ENGINE MAINTENANCE | This is only displayed when the meter is configured ON. Number of engine hours until the next programmed engine maintenance |
| + | HOURS TO S/B MOTOR MAINTENANCE | This is only displayed when the meter is configured ON.<br>Number of hours until the next programmed electric standby motor maintenance. |

Table 3-1. Unit Data – Continued

| | | |
|---|---|---|
| *** Displays information or setting entered in the microprocessor Configurations** | | |
| **+ May or may not be displayed depending on Parameter/Configuration settings** | | |
| + | HOURS TO UNIT MAINTENANCE | This is only displayed when the meter is configured ON. Number of switch-on hours until the next programmed general unit maintenance. |
| + | TIME LEFT TO PM (1-5) | This is only displayed when one or more of the meters is configured ON. Number of hours until the next programmed maintenance. (May display user programmed identification.) |
| * + | RANGE 1 LOCK | This is only displayed when Range Lock 1 is configured ON. Displays Range Lock 1 setting:<br>OFF = Temperature Range 1 Lock is turned off.<br>CONTINUOUS = When the setpoint is set between Range 1 Minimum & Maximum Temperatures, the unit is set to operate only in Continuous.<br>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 | Displays minimum temperature setting for Range 1. (Will only be displayed if Range Lock 1 is **ON**) |
| * + | RANGE 1 MAXIMUM TEMP | Displays maximum temperature setting for Range 1. (Will only be displayed if Range Lock 1 is **ON**) |
| * + | RANGE 2 LOCK | This is only displayed when Range Lock 1 is configured ON. Displays Range Lock 1 setting:<br>OFF = Temperature Range 2 Lock is turned off.<br>CONTINUOUS = When the setpoint is set between Range 2 Minimum & Maximum Temperatures, the unit is set to operate only in Continuous Run.<br>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 | Displays minimum temperature setting for Range 2. (Will only be displayed if Range Lock 2 is **ON**) |
| * + | RANGE 2 MAX. TEMP | Displays maximum temperature setting for Range 2. (Will only be displayed if Range Lock 2 is **ON**) |
| * + | TEMPERATURE (REMOTE) SENSOR (1 or 2) | Will only display when one or more of the optional sensors are configured ON. (2 Compartment units only)<br>Displays temperate reading of remote Temperature Sensor 1 (or 2). |
| * | DATALOGGER (DataLink data recorder) | Displays the current Date and Time that the DataLink data recorder is using. This may be different than local time, depending on the Time Zone and Daylight Savings. |

## 3.14 VIEW HOUR METERS

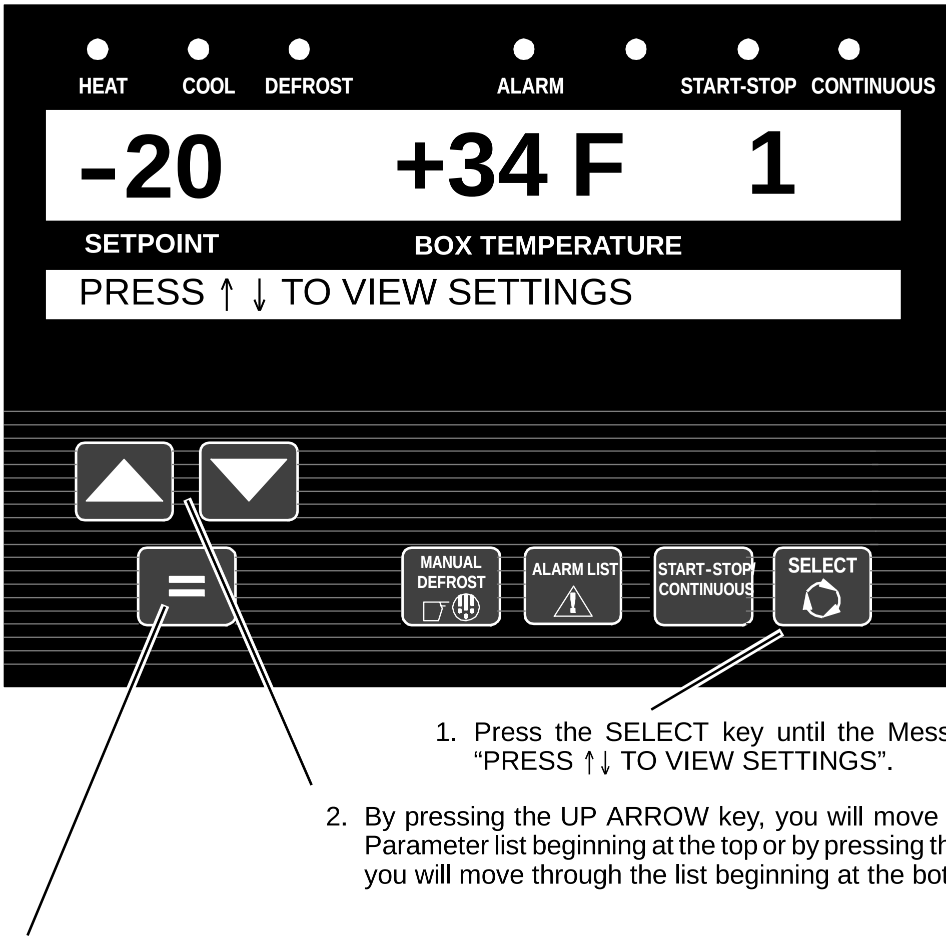



1. Press the SELECT key until the MessageCenter displays “PRESS ↑↓ TO VIEW HOURMETERS”.
2. Press the green UP ARROW key. The MessageCenter will display “PRESS ↑↓ TO SCROLL, THEN = TO LOCK” . Continue to press the green UP ARROW key to move down the hour meter list, or press the DOWN ARROW key to move up the list.
3. Displayed hour meters will depend on microprocessor configurations (refer to Table 5-2). 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. The selected hour meter will remain in the MessageCenter for 10 seconds, then the default message (“STATUS OK” or other customer specified message) will display.
6. To lock an hour meter in the MessageCenter for continuous viewing, 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 hour meter.

Hour meters available when “OTHER METERS AND COUNTERS” is chosen are:

- Meters listed in Step 3 above and, up to 5 User Configurable meters including:
- Switch On Standby Hours
- Engine Protect Hours.
- Switch On Protect Hours.
- Engine Sleep Hours.
- Switch On Sleep Hours.
- Compressor Run Hours
- High Speed Hours.
- Start cycles.

## 3.15 FUNCTIONAL 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 Functional Parameter list beginning at the top or by pressing the DOWN ARROW key, you will move through the list beginning at the bottom.

3. To change one of the Parameters, bring the Parameter you wish to change into the MessageCenter, and press = key. "↑ ↓ TO SCROLL, THEN = TO SAVE" will display in the MessageCenter. Pressing either UP or DOWN ARROW key will display the Parameter selections available for that Function. The MessageCenter will flash, indicating that a change to the displayed parameter selection has not been entered into memory.

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

**NOTE**

The microprocessor may be configured with all of the Parameters locked or some individual Parameters locked. Any Parameter that is displayed with a padlock symbol cannot be changed from the keypad.

**Table 3-2 Functional Parameters**

| FUNCTION | PARAMETER SELECTIONS | DESCRIPTION |
|---|---|---|
| NOTES: Selections in **BOLD** are the default settings. Also, Functional Parameter marked with an asterisk (*) may not display in the list for this unit, depending on how the microprocessor has been configured. | | |
| SILENT MODE | ON<br>**OFF** | OFF = Normal engine speed operation.<br>ON = Forced low engine speed operation. Used to disable high speed. |
| DEFROST INTERVAL TIMER SET FOR | 1.5HRS<br>3HRS<br>**6HRS**<br>12HRS | The defrost timer will automatically put the unit into the defrost cycle at the interval selected if a DTT is below 40°F (4.4°C).<br>Shorter times are generally used for warm, humid products like produce.<br>Longer times can be used for dry and frozen products.<br>**NOTE**: the the timer increments time toward the next defrost only when the DTT is below 40°F and the unit is running. |
| **Set Start–Stop Parameters**<br>Time and Temperature values that control Start–Stop Operation are set in this section.<br>The microprocessor may be configured so that: 1. the same settings apply to any setpoint = “Together”, or 2. the settings are different, depending on whether the setpoint is in the perishable range or in the frozen range = “Separate”.<br>SIf “together” is configured, there will be six settings with only the sixth applicable to just frozen range.<br>SIf “Separate” is configured there will be eleven settings five labeled perishable and six labeled frozen. | | |
| S 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 Start–Stop Operation. |
| S MIN OFF TIME: | 10MINS to 90MINS in 1 minute increments<br>**30MINS** | This determines the minimum length of time the unit will remain off whenever the unit cycles off in Auto Start–Stop Operation. |
| S RESTART TEMPERATURE | 0.5°F to 18°F (0.28 to10°C) in 1.0° F or C increments<br>**5.5°F (3°C)** | Following the Minimum Off Time, should a compartment temperature drift this far above or below setpoint in the Perishable Range or above setpoint in the Frozen Range, the unit will restart. |
| S OVERRIDE TEMP: | 3.6 to18°F (2 to 10°C) in 1.0° F or C increments<br>**12°F (6.7°C)** | This selects the override temperature for the Minimum Off Time portion of the Auto Start–Stop Off Cycle. During the Minimum Off Time, should the compartment temperature drift this far above or below setpoint in the Perishable Range, or above setpoint in the Frozen Range, the microprocessor will override the Minimum Off Time, and restart. |
| S MAX OFF TIME: | **OFF**<br>10MINS<br>to<br>255MINS<br>in 1 minute increments | OFF = There is no maximum off time.<br>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 compartment. |
| S FROZEN SHUTDOWN OFFSET | 0.0 to 1.0°F<br>(0.0 to 0.55°C)<br>in 0.5°F or C increments<br>**0.0°F (0.0°C)** | This only applies to Frozen setpoints in Start–Stop operation.<br>The system generally will allow an off cycle when the RAT is 0.5°F (0.3°C) above setpoint. This offset is the number of degrees below the 0.5°F (0.3°C) value that the unit will run before cycling off. This will allow for a lower average compartment temperature when considering temperature rises during off cycles. |

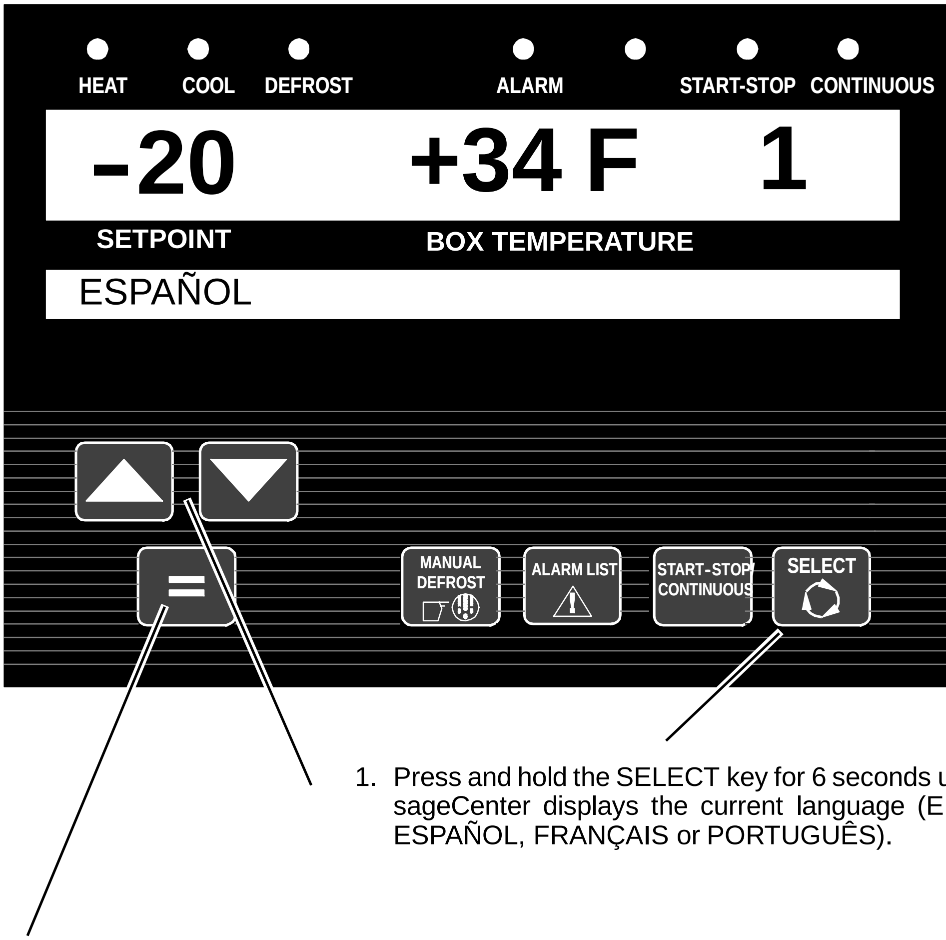
## Table 3-2 Functional Parameters – Continued

| FUNCTION | PARAMETER SELECTIONS | DESCRIPTION |
|---|---|---|
| PERISHABLE SENSITIVE PRODUCT | ON<br>**OFF** | OFF = Supply air temperature will be limited to the colder temperature of 32°F (0°C) or setpoint less the Supply Air Limit Configuration value.<br>ON = Supply air temperature will be limited to setpoint less the Supply Air Limit Configuration value.<br>Refer to Section 4.7.2 for complete information on Perishable Sensitive Product and Supply Air Configuration interaction. |
| TEMP CONTROL – Compartment 1 | **RETURN AIR**<br>SUPPLY AIR | The compartment 1 evaporator has both a Return Air Sensor and a Supply Air Sensor.<br>RETURN AIR = only the return air sensor reading will be used for calculating control actions. "Return Air" is generally selected for most products.<br>SUPPLY AIR = the microprocessor will switch to the supply air sensor when operating with a perishable setpoint (10.4°F [–12°C] or above). "Supply Air" will control within a narrower temperature band. |
| DISPLAY TEMPS IN ... | **FAHRENHEIT**<br>CELCIUS | The compartment temperature will display in either English (°F) using a decimal point to display tenths of a degree OR or Metric (°C ) using a comma to display tenths of a degree.<br>NOTE: Temperature setting values displayed in the MessageCenter will continue to use a decimal for both °F and °C. |
| DISPLAY PRESSURES IN ... | **PSIG**<br>BAR | Pressures will display in either English (psig) or Metric (bar). |
| ECO MODE | **NO**<br>YES | NO = When in Continuous Operation, control for maximum temperature protection.<br>YES = When in Continuous Operation, control for maximum fuel economy. |
| RESET PM HOUR-METERS | | This Functional Parameter allows resetting of the PM maintenance alarm when an hour meter has timed out, or when over 95% of the time out value has expired. If a maintenance interval has not been configured for the alarm, this parameter will not display.<br>Selecting RESET and pressing the = key will de-activate the alarm, and reset the hour meter for the next maintenance interval. The amount of time added back into the meter before the next alarm trigger is determined by the maintenance interval entered in the meter Configuration.<br>If there are active maintenance hour meters and none have expired and turned the alarm on, or none are within 95% of the time out value, the MessageCenter will display "NO METERS TO RESET."<br>**NOTE:** If a reset is required for a meter that has not timed out, the meter must be configured with a "0" reset value (to turn it off) and then reconfigured with the desired reset interval. Refer to Section 5 for Configuration instructions. |
| • STANDBY RUN HOURS | RESET | |
| • TOTAL ENGINE HOURS | RESET | |
| • TOTAL SWITCH ON HOURS | RESET | |
| • PM 1 Thru 5 | RESET | |
| OUT OF RANGE ALARM (Compartment 1)<br>**AND**<br>C2 OUT OF RANGE ALARM<br>**AND**<br>C3 OUT OF RANGE ALARM | English / Metric<br>OFF / OFF<br>4°F / 2°C<br>5°F / 3°C<br>**7°F** / **4°C** | The value entered here is the number of degrees away from setpoint the compartment temperature may drift before the Compartment is considered "Out Of Range" and the configured alarm or alarm and shutdown action will be activated.<br>Refer to Alarm A53 – "BOX TEMPERATURE OUT OF RANGE", A63 – "C2 BOX TEMPERATURE OUT OF RANGE" or A63 – "C3 BOX TEMPERATURE OUT OF RANGE" (Section 7) for more information. |

**Table 3-2 Functional Parameters – Continued**

| FUNCTION | PARAMETER SELECTIONS | DESCRIPTION |
|---|---|---|
| **Low Speed Startup Minutes**<br>Allows user to set the number of minutes the unit will run in low speed every time the engine starts.<br>Press “=” to access menu. | | |
| SCONTINUOUS | **OFF**<br>1 to 255MINS | Allows user to set the number of minutes the unit will run in low speed every time the engine starts in Continuous operation. |
| SSTART–STOP | OFF<br>1 to 255MINS<br>**10 MINUTES** | Allows user to set the number of minutes the unit will run in low speed every time the engine starts in Start–Stop Operation. |
| SLEEP MODE SETTINGS | For complete instructions on entering and setting parameters for Sleep Mode refer to Section 3.8. Press “=” to access menu. | |
| * NO S/B POWER | SWITCH TO DIESEL<br>**SHUT UNIT DOWN** | *If the NO AC POWER Configuration is set to “Alarm & Shutdown” this parameter will not display |
| | | SWITCH TO DIESEL = If the NO AC POWER Configuration is set to the “Switch To Engine” (on power loss), setting this parameter to “SWITCH TO DIESEL” will confirm the Configuration and the switch will be allowed. |
| | | SHUT UNIT DOWN = If the NO AC POWER Configuration is set to the “Switch To Engine”, setting this parameter to SHUT UNIT DOWN will override the Configuration setting and shut the unit down when power is lost. The purpose of this setting is to temporarily override the Configuration setting in situations where switching to engine power is not desired. |
| OVERRIDE REMOTE SWITCH 1 SHUTDOWN (REMS1)*<br>**AND**<br>OVERRIDE REMOTE SWITCH 2 SHUTDOWN (REMS2)*<br>**AND**<br>OVERRIDE DOOR SWITCH SHUTDOWN (DS)* | **NO**<br>YES | *If the Switch is configured “Switch Not Installed”, this parameter will not display |
| | | NO = the microprocessor will respond to the switch as configured |
| | | YES = the configured action on activation of the switch will be overridden and the action will be alarm only. The purpose of this setting is to temporarily override the Configuration setting in situations where shutdown or speed change is not desired. |
| LANGUAGE:<br>IDIOMAS:<br>LANGUE:<br>LINGUAGEM: | ENGLISH | **ENGLISH–** All information displayed in the MessageCenter will be displayed in English. |
| | ESPAÑOL | FRANÇAIS– All information displayed in the MessageCenter will be displayed in French. |
| | FRANÇAIS | ESPAÑOL– All information displayed in the MessageCenter will be displayed in Spanish. |
| | PORTUGUÊS | PORTUGUÊS – All information displayed in the MessageCenter will be displayed in Portuguese. |
| | **NOTE 1:** This parameter can be quickly accessed by pressing and holding the Select Key for 6 seconds.<br>**NOTE 2:** If the padlock is visible when accessing language from the Functional Parameter List, the language cannot be changed. However, when accessing the language by pressing and holding the Select Key for 6 seconds the language can be changed even if the padlock is displayed. | |

## 3.16 LANGUAGE SELECTION




1. Press and hold the SELECT key for 6 seconds until MessageCenter displays the 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.

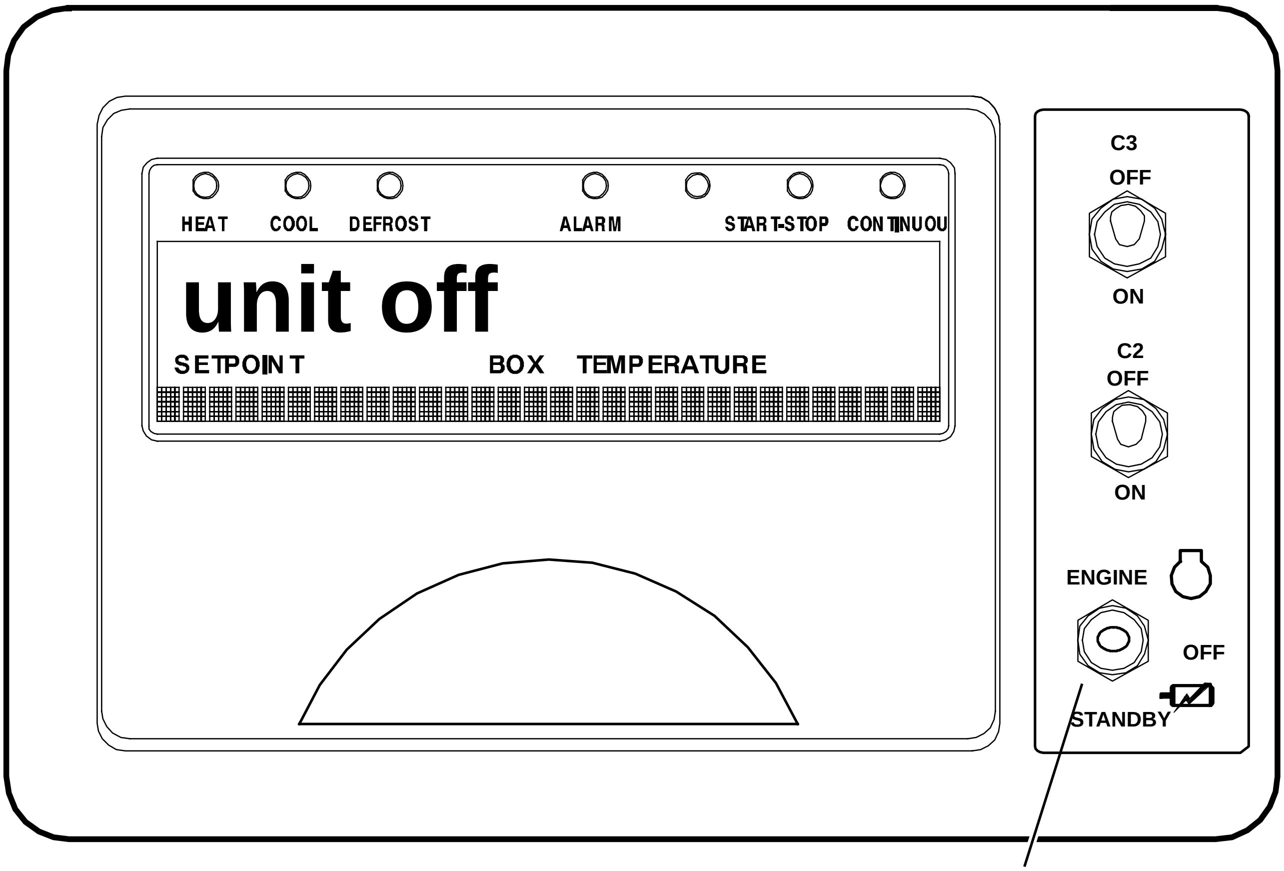
**TIP**

If the language is set to one that the user does not understand, press and hold the "SELECT" key for 6 seconds to bring up the Language Parameter so that it can be changed.

### 3.17 STOPPING UNIT

**WARNING**

**Always place the Main Power switch in the OFF position and turn off the high voltage power supply before disconnecting the high voltage power plug from the unit.**




To stop the unit, place the 2nd Compartment Run switch (C2) and/or 3rd Compartment Run switch (C3) in the OFF position, as required, and then place the Main Power switch in the OFF position.

The diesel engine or compressor will stop and the microprocessor will display "MICRO WILL STOP IN ## SECONDS". At the end of the countdown time the Microprocessor Main Display, MessageCenter, and all indicator LEDs will then turn off.

**NOTE**

Due to internal processing within the microprocessor, turning the Main Power switch off then back on 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 to 0% open before turning off.

### 3.18 DataLink DATA RECORDER

The Advance microprocessor contains a built-in DataLink data recorder with 512K of memory. The recorded data can be downloaded from the DataLink data recorder using either ReeferManager or a Download PC card.

The DataLink data recorder reads the same input information as the microprocessor (Functional Parameters, Configurations, and Unit Data) at all times. The DataLink data recorder records events as they occur, such as setpoint changes and defrost initiation and termination, and also records all data values including temperature sensors and pressure transducers in either averaged or snapshot format.

The following intervals are available for sensor recording:

| | |
|---|---|
| 2 Minutes | 30 Minutes |
| 5 Minutes | 1 Hour |
| 10 Minutes | 2 Hours |
| 15 Minutes | 4 Hours |

#### 3.18.1 Microprocessor Information

The microprocessor information that may be recorded is as follows:

- DataLink data recorder setup (Logging Intervals, Events and Sensors)
- DataLink data recorder time clock date / time
- Setpoints
- ID Number
- Unit Serial Number
- Unit Model Number
- Trailer ID
- Current System Mode
- Functional Parameters
- Microprocessor Configurations

#### 3.18.2 Data Recording

The DataLink data recorder data comes from four general categories of information:

a. Microprocessor Information as described in Section 3.18.1 above.

b. 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 intervals, and whether snapshot or averaged readings are preferred. (Snapshot readings of sensors are also taken at the time of a shutdown alarm.)

All of the sensors and transducers that may be read under Unit Data (refer to Table 3-1) may be included or excluded form the recordings.

c. 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 and may include:

- Setpoint change
- Defrost cycle start
- Main power on
- Pretrip start
- Pretrip end
- Unit mode (Start-Stop or Continuous Operation)
- Control mode (Heat, Cool, High/Low speed, etc)
- Door and Remote switch activations.
- Hour Meter readings (Hour meters are recorded at midnight or the first time of day the Main Power switch is toggled out of the OFF position.

d. User Area Data

The User or service technician may enter a Comment into the DataLink data recorder using the ReeferManager program.

#### 3.18.3 Data Downloading

The data within the DataLink data recorder can be downloaded using either the ReeferManager program with a download cable connected to the download port or with a Download PC card (refer to Section 5.3). If a PC card is used, the ReeferManager program is then used to extract the data from the PC card, and place it on the computer hard disk.

#### 3.18.4 DataLink Data Recorder Power-Up

The DataLink data recorder records data the entire time the Main Power switch is not in the OFF position. A Configuration exists which allows the user to select either an additional 8 hours of sensor data be recorded after the switch is placed in the OFF position, or to stop recording at the same time the switch is placed in the OFF position. The factory setting is to stop recording at the same time the switch is placed in the OFF position. (Refer to Section 5.2.1.)

## 3.19 OPTIONS

### 3.19.1 DataTrak

DataTrak allows remote communication with the Advance microprocessor (cellular, satellite, etc).

One way Communication providers can request data from the Advance microprocessor and transmit it via their equipment to another location. This is typically done via the Internet to any destination in the world.

**WARNING**

**Advance microprocessor equipped units may start automatically at any time the Main Power switch is not in the OFF position. Also, the unit may be fitted with two way communication equipment that will allow starting of the unit from a remote location even though the switch is in the OFF position.**

Two Way Communication providers can also send commands via their equipment to the Advance microprocessor to start or stop the unit, change settings and the way the microprocessor is operating the unit.

DataTrak is an optional feature. The DataTrak option is installed by inserting a DataTrak PC Card into the PC Card slot of the microprocessor and following the on-screen instructions on the keypad.

The DataTrak Option installation can be confirmed by scrolling through the Unit Data (refer to Section 3.13). DataTrak will be listed under the Installed Options heading if it is installed.

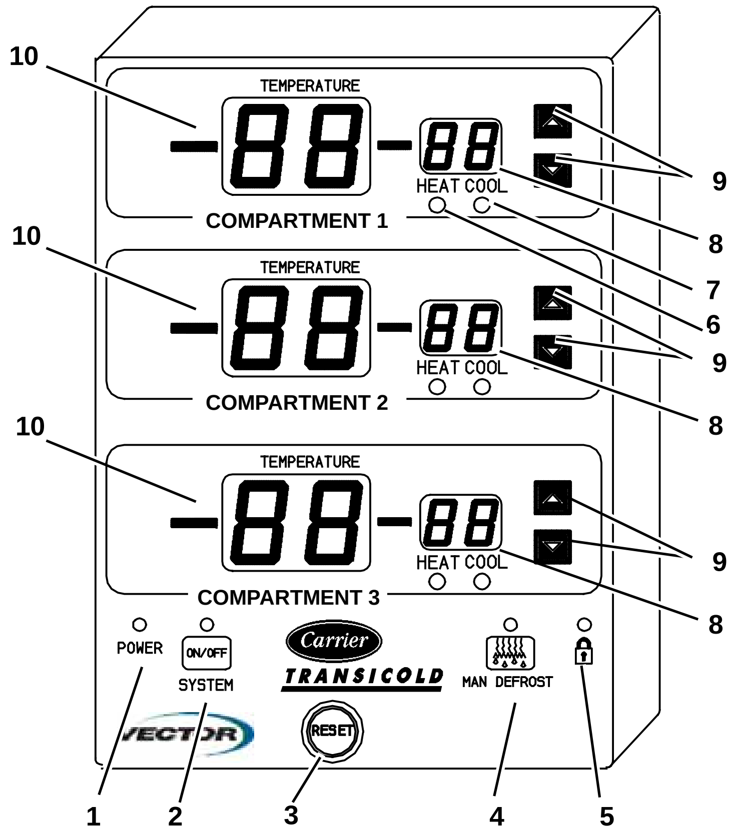
Once DataTrak is installed, the Advance Microprocessor must be properly configured for the provider that will be connecting to it. This is done in the configuration list (refer to section 5.2.1.) The Satellite Com configuration can be set for "Qualcomm" or "Other".

If the provider is Qualcomm T2 (Trailer Tracs 2) or any other provider then the "Other" setting is used. If the provider is Qualcomm Trailer Tracs then the "Qualcomm" setting is used.

Carrier Transicold has worked with approved communication providers with recommended installation locations, and wiring connections to Carrier units. Instructions for installing this equipment is supplied by each individual provider, and not by Carrier Transicold. Communications electrical harnesses and serial port splitters are available from Carrier Transicold Performance Parts Group (PPG).

Communication Providers will connect into the wiring harness at the SATCOM port. Testing the SATCOM port may be done using a serial port to PC cable (22-01690-00) and the ReeferManager program. If ReeferManager can communicate with the microprocessor the unit wiring and microprocessor are performing normally and any communication problem is with the provider's equipment.

### 3.19.2 Remote Control Panel




1 Control panel power on LED
2 System ON/OFF key
3 Reset Button
4 Manual defrost key
5 Control panel lock LED
6 HEAT mode LED
7 COOL mode LED
8 Setpoint display
9 Up and down arrow keys
10 Temperature display

| TEMP. DISPLAY | SETPOINT DISPLAY | |
|---|---|---|
| - - | | WAITING FOR COMMUNICATION WITH MICROPROCESSOR |
| | OF | UNIT WAS TURNED OFF VIA REMOTE CONTROL |
| dF | -20 | UNIT IN DEFROST MODE |
| - - | -20 | TEMPERATURE SENSOR MALFUNCTION |
| P1 | -20 | DISPLAYED WHEN SETTING PRE–SET SETPOINTS |

**NOTE:**
**TEMPERATURE DISPLAY (°C OR °F) IS DEPENDENT ON MICROPROCESSOR CONFIGURATION**

The unit may be fitted with an optional remote control panel. The panel displays compartment setpoints, compartment temperatures and operating modes (heat, cool or defrost). The setpoint may be set and the unit may be started and stopped using the remote panel.

This compact panels can be mounted to suit the individual operator's preferences – in the cab, on the front bulkhead, or in the compartment (including in the wall itself).

The remote control panel can be used to :
Turn the unit on or off:

- Check compartment temperatures
- Check and change setpoints
- Initiate manual defrost
- Check mode of operation

**a.Starting Unit with Remote Control Panel**

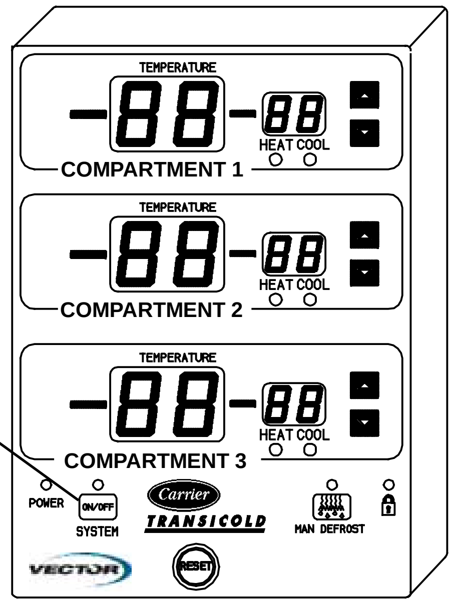
**NOTES**

1. The unit can be shutdown using either the remote panel or the unit switch panel mounted Main Power switch. The remote panel cannot operate if the unit switch panel mounted Main Power switch is in the OFF position. Also, the Compartment Run Switch (C2 and/or C3) must be in the ON position in order for that compartment to operate.

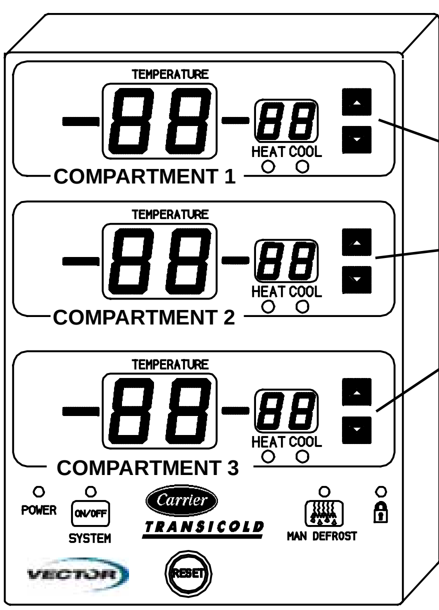
2. In order to prevent a constant drain on the battery, the remote panel will de-energize after two hours. If the panel is equipped with a RESET button, press the button to re-energize the panel. If the panel is not equipped with a RESET button, the panel may be re-energized by placing the unit switch panel mounted Main Power switch in the OFF position and then back in the desired position.

1. Place unit switch panel mounted Main Power switch in the desired position.

2. Press The SYSTEM ON/OFF Key. The POWER Light will illuminate. If a Compartment Run Switch (C2 and/or C3) is in the ON position, that compartment will also operate.

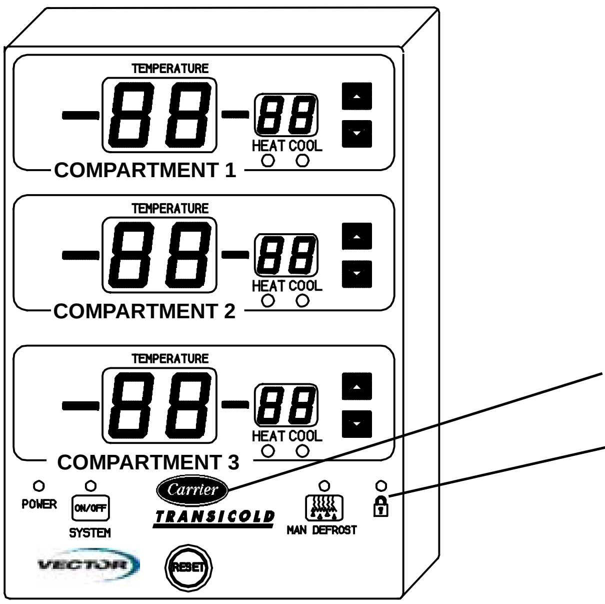



**b. Changing Setpoint With Remote Control Panel**




Press the UP or DOWN ARROW key for the desired compartment to increase or decrease setpoint.

**c.Lock / Unlock the Remote Control Panel**




**LOCKING THE PANEL:**
Press and hold the Carrier Logo for approximately one second and then release.
The lock indicator light will illuminate.

**UNLOCKING THE PANEL:**
Press the Carrier Logo for 10 seconds
The lock indicator light will de-energize.

**CARRIER LOGO**

**LOCK INDICATOR LIGHT**

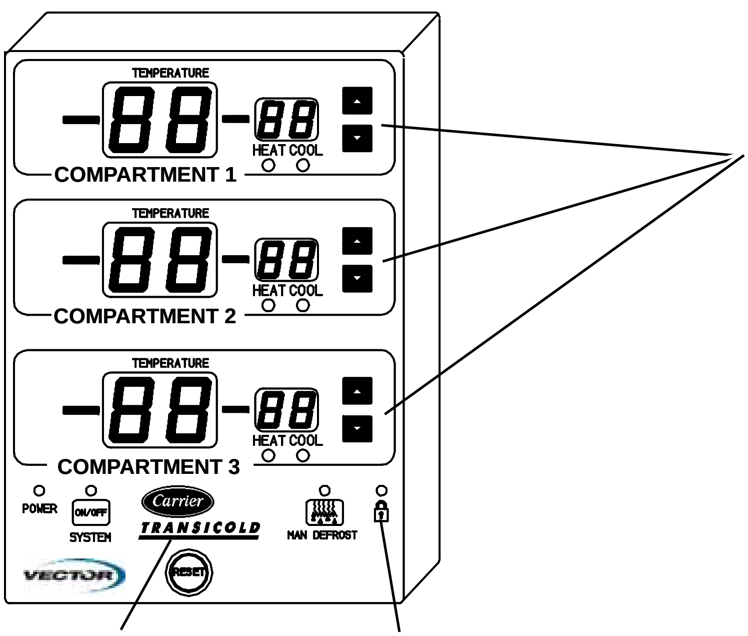
**d. Pre-setting Setpoint With Remote Control Panel**

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

**NOTE**

Once preset setpoints have been chosen, only those 5 designated setpoints can be used.

1. Place the unit switch panel mounted Main Power switch in the desired position and the Compartment Run Switches in the ON position.




3. Press UP ARROW for the desired compartment for 10 seconds. P1 will be displayed.

4. Set lowest setpoint required.

5. Press Carrier logo and P2 will be displayed. Set next highest temperature required.

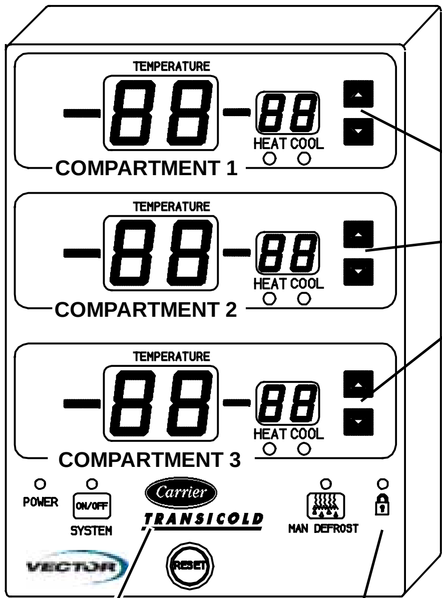
6. Follow same procedure for the next three temperatures.

7. Repeat steps 3 through 6 to pre-set the setpoints for the other compartments.

2. Press Carrier logo and the lock light will illuminate.

**e. Removing Pre-Set Setpoints With Remote Control Panel**

1. Place the unit switch panel mounted Main Power switch in the desired position and the Compartment Switches in the ON position.




3. Press UP ARROW for the desired compartment for 10 seconds. P1 will be displayed.

4. Set temperature to lowest pre-set setpoint and OFF will be displayed

5. Repeat steps 3 & 4 to remove the pre-set setpoints for the other compartments.

2. Press Carrier logo and the lock light will illuminate.

# SECTION 4 – ENGINE/STANDBY/TEMPERATURE CONTROL



4

# SECTION 4

# ENGINE/STANDBY/TEMPERATURE CONTROL

**NOTES**

1. If the unit is in an alarm condition, the microprocessor alarm response may override the operation described herein. If an alarm is displayed in the MessageCenter, refer to the specific alarm description in Section 7 for “Unit Control” descriptions.

2. With the complex control systems in use with the Advance microprocessor there are many user selected and preprogrammed software overrides which may change the operation of the unit. Refer to Sections 4.7 & 4.8 for complete descriptions of these features.

## 4.1 INTRODUCTION

This section describes operation of the unit when power is supplied from an external source – Standby Operation and when power is supplied by the internal generator – Engine Operation. The section also describes two additional sub–categories of operation; Start–Stop Operation (with standby or engine power) and Continuous Operation (with standby or engine power).

For descriptions of refrigerant system component interaction when cooling, with flow diagram, refer to section 2.15.

## 4.2 ENGINE/STANDBY OPERATION

Engine or Standby Operation is chosen by positioning of the switch labeled ENGINE/OFF/STANDBY (DOES) OR positioning of the switch labeled STANDBY/ENGINE (DES).

With the switch in the STANDBY position the power supply contactor relay (PSCONR – see wiring schematic, Section 10) is energized. Energizing PSCONR reverses its contacts to allow power from the power plug while the engine is shutdown and power from the generator is locked out.

With the switch in the ENGINE position the generator contactor relay (GENCONR) is energized. Energizing GENCONR reverses its contacts to allow the engine and generator to operate while power from the power plug is locked out.

Once the Main Power switch is toggled from the OFF position, the compressor suction modulating valve (CSMV) and electronic expansion valve (EVXV) will both open to a predetermined position, to equalize system pressure, and then close (0% open) before the unit starts.

**NOTE**

The unit will not restart for at least 30 seconds following a shutdown.

### 4.2.1 Standby Start–Up

On command to perform a Start–Up in Standby Operation the microprocessor will energize the buzzer for five seconds. The refrigeration system or heaters will then operate in the mode(s) required for temperature control.

### 4.2.2 Engine Start–Up

On command to perform a Start–up in Engine Operation the microprocessor will enter the engine start sequence to start the engine and direct connected generator. Following start, the refrigeration system or heaters will then operate in the mode(s) required for temperature control.

At the beginning of the start sequence the microprocessor will close the run relay (RR) contacts to signal the engine speed control unit (ENSCU) that engine operation is required and to provide power to the optional electric fuel pump (FP – if supplied). During the start sequence the engine speed control unit (ENSCU) will hold the engine in low speed.

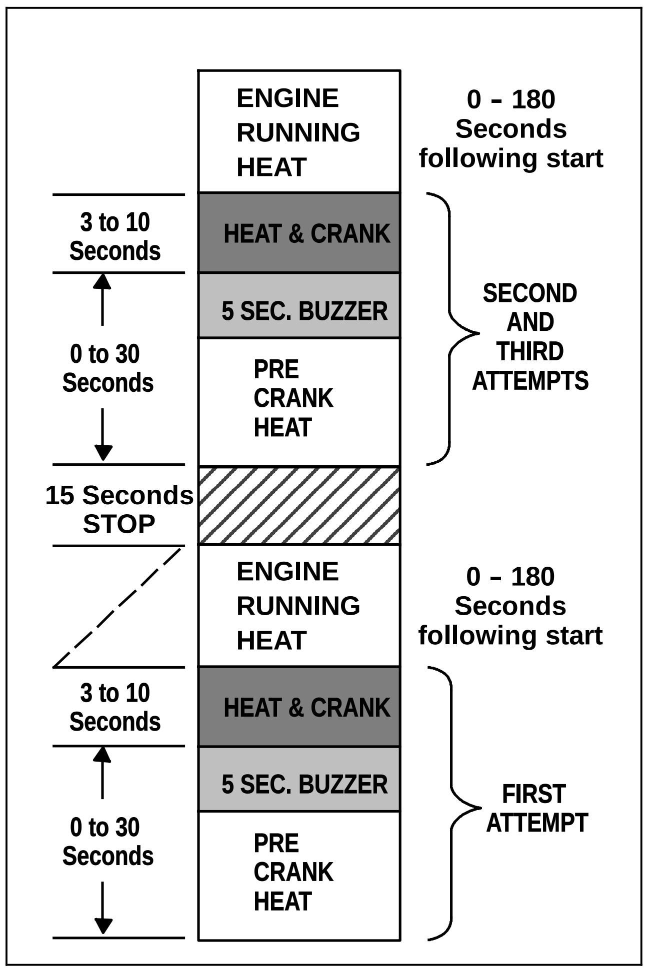



**Figure 4–1 Auto Start Sequence**

The engine start sequence consists of periods of time with the intake air heater relay (IAHR) and starter solenoid relay (SSR) energized and de-energized for up to three start attempts. See Figure 4-1.

Energizing GPR closes its contacts to energize the intake air heater (IAH), the heating time will vary in duration based on engine coolant temperature (refer to Table 4-1).

**Table 4-1 Intake Air Heat Time**

| Engine Coolant Temperature | Heat Time in Seconds | |
|---|---|---|
| | Preheat | Post Heat |
| Less than 33_F (1.0_C) | 30 | 180 |
| 33_F to 51_F (1.0_C to 11_C) | 20 | 120 |
| 51_F to 78_F (11_C to 26_C) | 10 | 60 |
| Greater than 78_F (26_C) | 0 | 0 |

If the A129 - "CHECK ENGINE COOLANT SENSOR" alarm is active, the microprocessor assumes a temperature of less than 32_F (0_C) for the heat timing.

During the last five seconds of Preheat **OR** for 5 seconds before a start attempt, if no Preheat is required, the buzzer (B) is energized; then the starter solenoid relay (SSR) will be energized for a maximum of ten seconds while the engine condition is checked each two seconds during the cranking period. The engine is considered to be running, and the start sequence will be stopped, when engine speed is greater than 1000 rpm.

During the second and third attempts, the microprocessor will monitor additional inputs.

S When engine speed reading is less that 1000 rpm, ambient temperature is above 32°F (0°C) and the ENOPS is closed - the A130 "CHECK ENGINE RPM SENSOR" alarm will be activated and the engine will be considered running.

S When engine speed reading is less that 1000 rpm, ambient temperature is below 32°F (0°C), the ENOPS is closed and DC current is more than 2 amps - the A130 - "CHECK ENGINE RPM" alarm will be activated and the engine will be considered running.

Once the engine is considered running, the microprocessor will keep the intake air heater energized for an additional 0 to 180 seconds of Post Heat, depending on engine coolant temperature (refer to Table 4-1).

During the start sequence the microprocessor monitors engine speed while cranking. If engine speed drops below 50 rpm for three seconds the starter solenoid contactor will be de-energized and the A35 - "CHECK STARTER CIRCUIT" alarm will be activated.

If the unit fails to start after three start attempts, the A31 - "FAILED TO START-AUTO" alarm will be activated.

If the unit is equipped with a fuel heater, the microprocessor will monitor ambient temperature. If ambient is below 77°F (25°C) power will be supplied to the fuel heater relay (FHR). Energizing FHR closes its normally open contacts to supply power through the fuel heater temperature switch (FHTS) to the heater. Refer to Section 2.9 for FHTS settings.

### 4.2.3 Transition To High Speed

After a successful start, the microprocessor may call for the engine to transition to high speed. Three factors control this transition.

- First, transition may be delayed if a time value is entered in either the START-STOP HIGH SPEED DELAY or CONTINUOUS HIGH SPEED DELAY Configuration. The delay may be set to OFF **or** from 0 to 255 minutes. The factory default setting for Start-Stop Operation is 10 minutes while the factory default setting for Continuous Operation is OFF. If the entered value for the present mode of operation is OFF, high speed operation is not allowed for two minutes following start.
- Second, the engine cannot transition if the SILENT MODE functional parameter is set to YES. The value may be set to YES or NO. The factory default setting is NO. (Refer to Table 3-2).
- Third, transition will be based on the need for temperature control. Generally, the engine will operate in high speed when a compartment is in Pulldown or Pull-Up Mode (full capacity required) and in low speed when less than full capacity is required.

## 4.3 TEMPERATURE CONTROL

### 4.3.1 Temperature Determination

The microprocessor monitors the temperature readings from the supply (if applicable) and return temperature sensors to determine the mode of operation required to maintain compartment temperature in accordance with the setpoints.

The sensor used for temperature control is dependent on the selection made in the "TEMP CONTROL" functional parameter.

S If the selection is "RETURN AIR" the return air sensor (RAT) will be used, for any setpoint.

S If the selection is "SUPPLY AIR" the microprocessor will switch to the supply air sensor (SAT) when operating with a perishable setpoint (refer to Section 4.3.2 for more information on frozen and perishable setpoints) and the return air sensor will continue to be used for frozen setpoints.

The modes of operation include Pulldown, Pull-Up, Cooling, Heating and Null.

**NOTES**

1. The compressor is always started with both unloaders energized (unloaded). After 10 seconds of operation (for UL1) or 1 minute of operation (for UL2) they are allowed to transition to the unloader state required for the present mode of operation.

2. The condenser fan will operate any time the engine or compressor is operating.

3. If suction pressure is below 100 psig (6.8 bar) the evaporator fan in compartment 1 will start 10 seconds after compressor start. If suction pressure is above 100 psig (6.8 bar) the fan start will be delayed until suction pressure is below 100 psig (6.8 bar) or until 20 seconds has elapsed.

4. If only one remote compartment is active, the evaporator fans will start 10 seconds after the Compartment 1 fan. If all three compartments are active, Compartment 2 will start ten seconds after Compartment 1 and Compartment 3 five seconds after Compartment 2.

### 4.3.2 Perishable And Frozen Setpoint Ranges.

There are two ranges defined for setpoint.

a. Perishable Range = setpoints above +10.4°F (-12°C).

b. Frozen Range = setpoints of or below +10.4°F (-12°C).

### 4.3.3 Pull Down/Pull-Up

When in Pulldown, the refrigeration system will operate with the compressor loaded (six cylinders), the EVXV and/or TXV controlling superheat to allow maximum flow, and (in Engine Operation) in high speed.

When in Pull-Up, and Engine Operation, the engine will operate in high speed.

If operating Compartment 1 only, both banks of heaters are operated. If operating Compartment 1 and additional compartment(s), only one bank of heaters will operate in Compartment 1.

Pulldown/Pull-Up will be entered:

- following a Start-Up.
- following a setpoint change.
- following an operational change (Start-Stop Operation vs Continuous Operation or Engine Operation vs Standby Operation).
- following a defrost termination.
- when in a Start-Stop ON Cycle and all other Stop Parameters have been met except the compartment temperature Stop Parameter.

Pulldown/Pull-Up will end when one of the following occurs:

- when in Engine Operation and the microprocessor is calling for low speed due to an override or Configuration Setting.
- when in Start-Stop Operation and the compartment temperature Stop Parameter for all compartments have been satisfied while one or more of the other Stop Parameters has not.
- If in Continuous Operation - perishable and the High Speed Pulldown Configuration is OFF and the temperature is in the required range Pulldown Mode ends.
- If in Continuous Operation - perishable and the High Speed Pulldown Configuration is ON: when the temperature is equal to or less than 0.36_F (0.2_C) above setpoint.

### 4.3.4. Pulse Cool

Pulse cool may be entered if one or more compartment(s) have a frozen setting and one or more a perishable setting. Whenever the compartment with the frozen setting is in cooling and the compartment(s) with a perishable setting is/are calling for low speed, pulse cooling begins in that compartment. During pulse cooling, the liquid control(EVXV in Compartment 1 or LSV in Compartments 2 & 3) will operate on a 30 second cycle. During the 30 second cycle, It will be opened for 4 seconds and closed for 26 seconds.

### 4.3.5. Defrost

Refer to Section 4.6 for a description of defrost.

### 4.3.6. Overrides

With the complex control systems in use with the Advance microprocessor there are many user selected and preprogrammed software overrides and Configuration settings which may change the operation of the unit. Refer to Sections 4.7 & 4.8 for complete descriptions of these features.

## 4.4 START-STOP OPERATION

Start-Stop is provided to reduce fuel or power consumption. This feature allows full automatic control of the unit by monitoring compartment temperatures, battery condition and (when in Engine Operation) engine coolant temperature.

The main function of Start-Stop Operation is to shutdown the engine or compressor after certain conditions are met (to provide an 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 and Start-Stop Operation. The corresponding LED will be illuminated.

**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 4.7.3) for additional information.

### 4.4.1 Start-Stop Configuration

Microprocessor control of Start-Stop Operation is dependent on both Configuration and Functional Parameter settings. The first setting to be considered is the START-STOP PARAMETERS Configuration. This setting determines control actions when in the Perishable Range or Frozen Range. The available settings are TOGETHER and SEPARATE.

- When SEPARATE is chosen the control action will be different, depending on whether the setpoint is in the Perishable Range or in the Frozen Range (refer to Section 4.3.2).
- When TOGETHER is chosen, the same settings apply to any setpoint.

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

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

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

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

**NOTE**

In the event that this Configuration was set to SEPARATE and the ten Functional Parameters for Perishable and Frozen have been set and then the Configuration is changed from SEPARATE to TOGETHER. The values from the Perishable settings will be the ones that will be used.

### 4.4.2 Stop Parameters

Whenever the unit starts in Start-Stop Operation, it will remain in the Start-Stop ON cycle until **all** five of the following criteria have been satisfied:

**1. It has run for the selected Minimum Run Time**

The MINIMUM RUN TIME is selected in the microprocessor Functional Parameters. The purpose of this is to force the unit to run long enough to completely circulate the air inside the compartments, and to ensure that the product temperature is at setpoint. This value may be set from 4 to 60 minutes in 1 minute intervals. The factory default setting is 4 minutes.

If only one compartment is operating and it is not in Pulldown or Pull-Up, that compartment will remain in operation with the compressor and heaters off and the evaporator fan(s) running. The compartment will remain in this condition until this stop parameter has been met OR cooling/heating is required in any compartment and the Minimum Off Time Functional Parameter has been met.

**2. The engine coolant temperature has warmed**

Each time the unit is started in Engine Operation it must continue to run until the coolant temperature rises to 95_F (35_C) to ensure it has fully warmed up before shutdown is allowed.

If only one compartment is operating and it is not in Pulldown or Pull-Up, that compartment will remain in operation with the compressor and heaters off and the evaporator fan(s) running. The compartment will remain in this condition until this stop parameter has been met OR cooling is required in any compartment and the Minimum Off Time Functional Parameter has been met OR any compartment requires heat.

**3. The battery is fully charged - Voltage**

A good battery is defined as having 13.4 VDC at 77_F (25_C). The microprocessor will calculate the equivalent voltage based on the ambient temperature and shutdown will be allowed when battery voltage is at or above the calculated value.

**TIP**

When the microprocessor is powered up, the status of the unit battery can be readily checked by reading the Battery Voltage in the Data List. If "OK." appears after the voltage reading, battery voltage is sufficient to allow the unit to cycle off.

If only one compartment is operating and it is not in Pulldown or Pull-Up, that compartment will remain in operation with the compressor and heaters off.
If in Engine Operation, the engine and the evaporator fan(s) will continue to operate.
If in Standby Operation and the compressor has cycled off a PSCON relay will energize (to supply power to the battery charger) until battery voltage is 13.4 volts or 20 minutes has elapsed.
The compartment will remain in this condition until this stop parameter has been met OR cooling/heating is required in any compartment and the Minimum Off Time Functional Parameter has been met.

**4. The battery is fully charged - Amperage**

The microprocessor will calculate the average current draw over a 20 second period. Once this average drops below the selected value, shutdown will be allowed. The CURRENT FOR START-STOP SHUTOFF is selected in the microprocessor Configurations The value may be set from 1 to 10 amps in 0.5 amp intervals. The factory default setting is 7 amps.

If only one compartment in operating and it is not in Pulldown or Pull-Up, that compartment will remain in operation with the compressor and heaters off.

If in Engine Operation, the engine and the evaporator fan(s) will continue to operate. The compartment will remain in this condition until this stop parameter has been met OR cooling/heating is required in any compartment and the Minimum Off Time Functional Parameter has been met.

If in Standby Operation and all Start-Stop parameters required to enter a Start-Stop Off cycle have been met except this parameter, the unit will enter the Off cycle. In the Off cycle, the PSCON relay remains energized, supplying power to the battery charger. The battery charger will continue to charge the battery if required.

**5. The compartment temperature requirement is satisfied**

In Start-Stop Operation the refrigeration system will operate in Pulldown or Pull-Up Mode in order to reach the shutdown condition as quickly as possible.

Shutdown will be allowed when the temperature in all compartments is within 0.5_F (0.3_C) of setpoint, for operation in the Perishable Range. In the Frozen Range, shutdown will be allowed when the temperature in all compartments is calculated to be within 0.5_F (0.3_C) minus the FROZEN shutdown OFFSET of setpoint.

The FROZEN shutdown OFFSET Functional Parameter may be set from 0 to 3.6_F (0 to 2_C) in 0.5_(C or F) increments. The factory default setting is 0_F (0_C).

If the temperature requirements for all compartments have been satisfied while one of the other shutdown requirements has not been met, the last compartment will remain in operation with the compressor and heaters off and the evaporator fan(s) running. The compartment will remain in this condition until this stop parameter has been met OR cooling/heating is required in any compartment and the Minimum Off Time Functional Parameter has been met.

### 4.4.3 Re-Start Parameters

While the unit is in a Start-Stop OFF Cycle, restart will be initiated when **one** of the following conditions occurs:

**1. Engine coolant temperature drops below selected microprocessor Configuration value**

If in Engine Operation, the microprocessor will monitor coolant temperature. If coolant temperature drops below the ENGINE TEMPERATURE FOR RESTART Configuration value the engine will be started. The Configuration value may be set from 10 to 32_F (-12.2 to 0_C) in 0.5_(C or F) increments. The factory default setting is 32_F (0_C).

**2. Battery voltage falls below selected microprocessor Configuration value**

The microprocessor will monitor battery voltage. If battery voltage is at or below the VOLTAGE FOR START-STOP RESTART Configuration value the engine will be started **or,** when in a Standby Operation OFF Cycle, a PSCON relay will be energized to supply power to the battery charger. The value may be set from 12.0 to 12.8 volts. The factory default setting is 12.2 volts.

**TIP**

When the microprocessor is powered up, the status of the unit battery can be readily checked by reading the Battery Voltage in the Data List. If “OK.” appears after the voltage reading, battery voltage is sufficient to allow the unit to cycle off.

**3. The Maximum Off Time has expired**

In some ambient conditions there are times when the unit may remain in a Start-Stop Off cycle for extended periods of time. To ensure that the entire load stays within the normal restart temperature range, the MAXIMUM OFF TIME Functional Parameter may be used to force the unit to restart - in low speed) with the evaporator fans operating to ensure there are no hot spots and the temperature sensor is accurately reflecting the temperature of the product. The parameter value may be set to OFF **or** from 10 to 225 minutes in 1 minute intervals.

If the MAXIMUM OFF TIME is OFF, there is no maximum off time for Start-Stop and the unit will remain off. The factory default setting is OFF.

**4. The Minimum Off Time has expired**

The MINIMUM OFF TIME Functional Parameter setting allows the unit to remain off for extended periods of time, maximizing fuel/power economy. The unit may not be restarted until the MINIMUM OFF TIME has expired **and** the temperature in one compartment is greater than the PERISHABLE RESTART value selected in the Functional Parameters away from setpoint. In the Frozen Range, restart is allowed when the temperature in one of the compartments is greater than the FROZEN RESTART value above setpoint.

The MINUMUM OFF TIME parameter value may be set from 10 to 90 minutes in 1 minute intervals. The factory default setting is 30 minutes. The RESTART TEMPERATURE value may be set from 0.5 to 18_F (0.28 to 10_C) in 1.0 (F or C) increments. The factory default is 5.5_F (3_C).

**5. Compartment temperature has exceeded the Override Functional Parameter value**

During MINIMUM OFF TIME the microprocessor continually monitors the refrigerated compartment temperatures. If the temperature in one of the compartments should drift outside the START-STOP OVERRIDE TEMPERATURE Functional Parameter value the unit will be restarted. The value may be set from 3.6 to 18_F (2 to 10_C) in 0.5° increments. The factory default setting is 11_F (6_C).

Whenever the unit restarts, temperature control will be in the PullDown or Pull-Up mode (refer to Section 4.3.3).

## 4.5 CONTINUOUS OPERATION

### 4.5.1. Introduction

In Continuous Operation, the unit will not shutdown except in response to a shutdown alarm. Temperature control in the compartments will operate under Pulldown, Pull-Up, Cooling, Heating or Null.

Continuous Operation is normally used for fresh produce and other sensitive product loads. The Start-Stop/Continuous key is pressed to switch between Continuous Operation and Start-Stop Operation. The corresponding LED will be illuminated.

**NOTE**

The microprocessor may be locked so that the unit will always operate in Start-Stop or in Continuous whenever the setpoint is within a specific range. Refer to Range Lock (Section 4.7.3) for additional information.

### 4.5.2. Continuous Operation

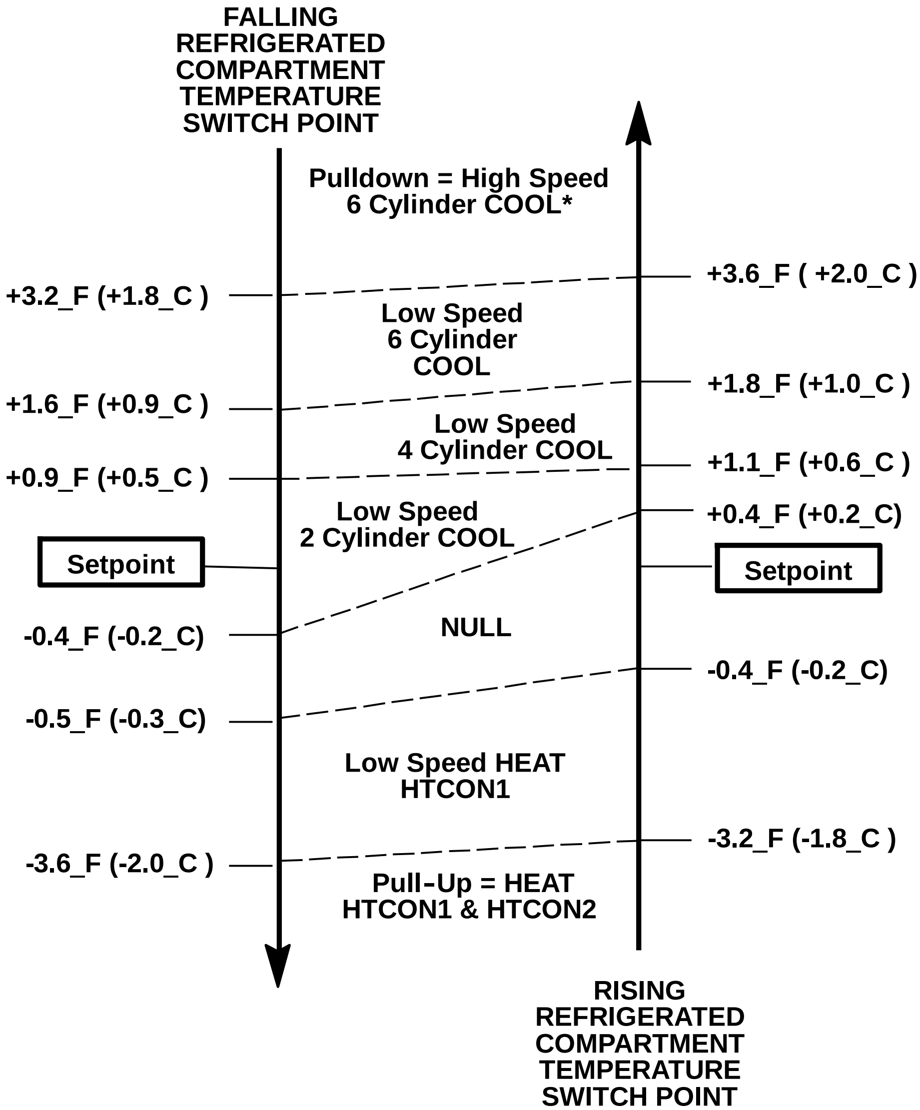
Refer to Figure 4-2 and Figure 4-3 for the Switch Point temperatures at which speed changes, unloading changes, heater operation and change to Null Mode occur while operating in Continuous Operation.

The switch points will differ depending on the setting of the microprocessor ECO MODE Functional Parameter. This value may be set to YES or NO. The factory default setting is NO. With ECO MODE set to NO, the microprocessor will control temperature closer to setpoint, yielding maximum product protection. With ECO MODE set to YES, the microprocessor uses the Start Stop Override Functional Parameter setting (even though the unit is in Continuous Operation) and will control temperature within a wider band, yielding improved fuel economy.

When neither heating or cooling is required in a compartment, the compartment will enter Null Mode. In Null Mode, the electronic expansion valve (EVXV) - for Compartment 1 is closed to 0% OR liquid line solenoid valve (LSV) for Compartment 2 & 3 is de-energized while the evaporator fan(s) continue to run.

When Null Mode is required in all compartments and the system is operating in:

- Engine Operation, the compressor will shutdown while the engine, condenser fan and evaporator fans will continue to operate.
- Standby Operation, the compressor will shutdown while the evaporator fans will continue to operate.

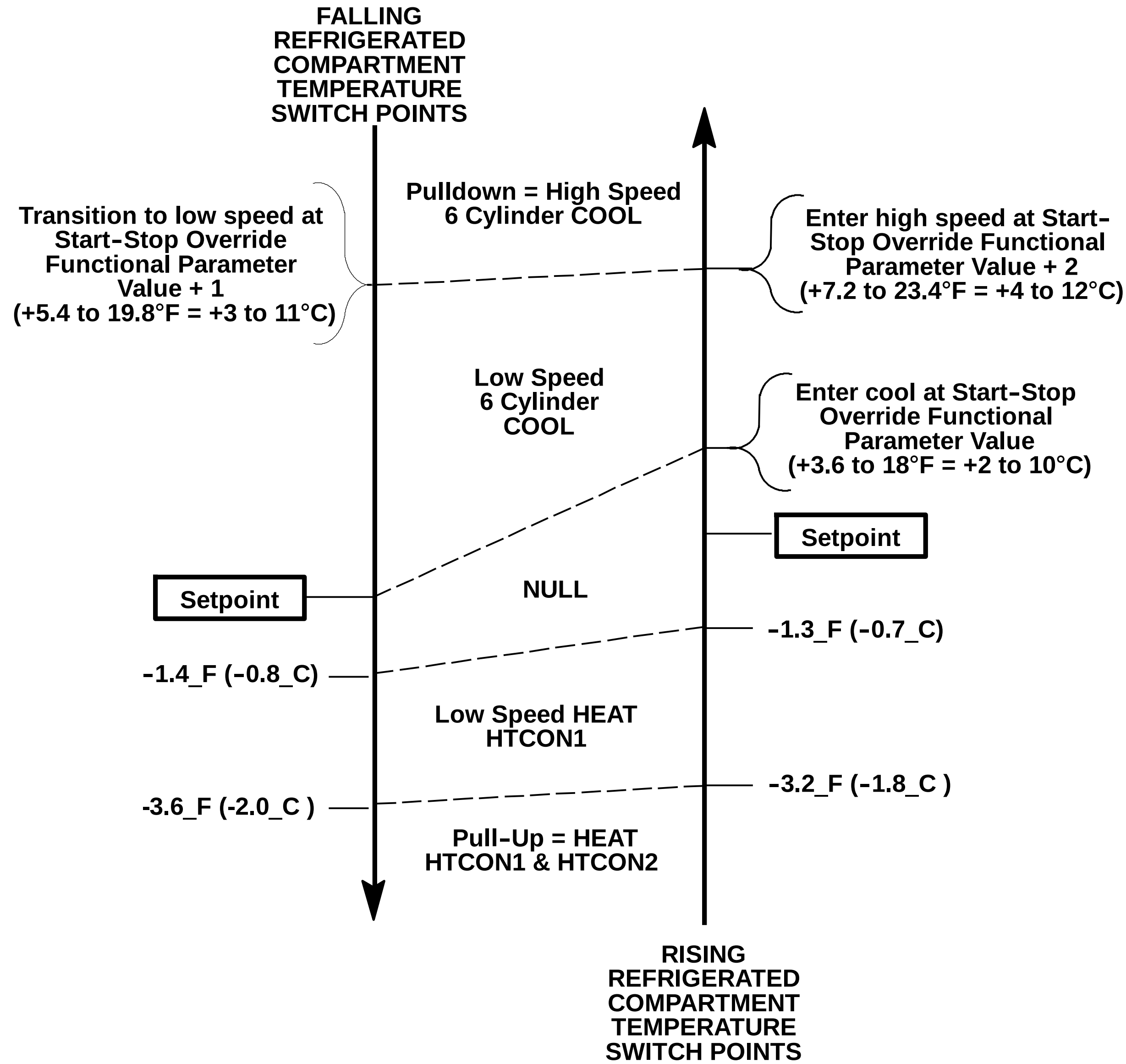



**Switch Point = Controlling Temperature – Setpoint**
**+ results are above setpoint, – results are below setpoint**

**Switch points are the same for Perishable Range and Frozen Range except in Frozen Range heating is not allowed.**

*** If the HIGH SPEED PULLDOWN Configuration is set to YES, transition from pulldown is delayed from the indicated +3.2_F (+1.8_C ) transition temperature until the temperature is +0.36 _F (+0.2_C) above setpoint.**

**Figure 4-2 Continuous Operation Switch Points with Eco Mode set to NO**




**Switch Point = Controlling Temperature – Setpoint**
**+ results are above setpoint, – results are below setpoint**

**Switch points are the same for Perishable Range and Frozen Range except in Frozen Range heating is not allowed.**

**Figure 4–3 Continuous Operation Switch Points with Eco Mode set to YES**

## 4.6 DEFROST

Defrost is an independent cycle overriding cooling and heating functions in order to de-ice the evaporators. 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”.

When defrost is initiated, the microprocessor will attempt to initiate defrost in all compartments. However, defrost will not be allowed in any compartment where the DDT is above 40.0_F (4.4_C) and defrost may be staged based on the number of enabled compartments and the remote evaporator models installed.

### 4.6.1 Defrost Initiation And Start

Defrost can be initiated by pressing the MANUAL DEFROST key or automatically by the microprocessor. Microprocessor initiation is based on coil condition or expiration of the defrost timer.

#### a. Defrost based on coil condition

Defrost based on coil condition will be initiated when:

- blockage is sufficient to cause an air pressure differential across the coil great enough to close the contacts of the defrost air switch (DAS).

**OR**

- when the compartment RAT – DTT temperature is greater than 36°F (20°C) in Compartment 1 or 18°F (10°C) in the remote compartments 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 only after a defrost cycle is initiated by another method (timer, air switch or manual).

**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.

#### b. Defrost based on time:

Time interval between defrosts is selected in the microprocessor Functional Parameters. The parameter value may be set to 1.5, 3, 6, or 12 hours. The factory default setting is 6 hours.

**NOTE**

1. The defrost timer will not count when the unit is in defrost, the unit is in a Start/Stop off cycle or all DTT’s are greater than 40.0_F (4.4_C).
2. There is a single defrost timer. When the timer expires initiation of defrost in the compartments may be staged depending on the number of compartments enabled and the models of remote evaporators installed.

### 4.6.2 Defrost Modes

There are two defrost modes available, Normal Defrost and Natural Defrost:

**NOTE**

When the unit is in defrost and in Engine operation:

- the condenser fan will operate to supply air for the radiator.
- the engine will operate in high speed when the heaters are energized (to supply power for the heaters).
- the engine will operate in low speed when the heaters are de–energized.
- if all three compartments are operating in defrost, only one bank of heaters may operate in each compartment.

#### a. Normal Defrost Mode

Normal Defrost Mode will be entered if RAT is less than 39.2_F (4.0_C) **and** SAT is less than 45.0_F (7.2_C). Defrost will be accomplished by shutting down the refrigeration system (including the evaporator fan motors) while the heaters are energized.

If three compartments are enabled, the two compartments with the coldest DTT readings will defrost first. When one of these compartments exits defrost, the final compartment will begin it’s defrost cycle.

#### b. Natural Defrost Mode

Natural Defrost Mode uses a combination of the heat from the product and the electric heaters to melt any ice.

Natural defrost is available when:

- only the front compartment is enabled (all other compartments are off) **and**
- the Natural Defrost microprocessor Configuration is set to YES **and**
- defrost is initiated by closing of the DAS contacts with RAT greater than or equal to 39.2_F (4.0_C) **and**
- at least one normal defrost has been performed since power up.

When a natural defrost is initiated, the unit will operate for the first five minutes with the evaporator fan and HTCON2 de–energized and only HTCON1 energized. After 5 minutes the evaporator fan is energized while both HTCON1 & HTCON2 are de–energized.

Only 3 consecutive natural defrosts cycles are allowed. After there have been 3 consecutive natural defrost cycles, the next defrost will be a normal deforst.

### 4.6.3 Defrost Termination

When in normal defrost mode, defrost will terminate in each compartment when the compartment DTT rises to 55_F (12.8_C).

When operating in natural defrost, defrost will continue in that compartment for a minimum of 5 minutes, a maximum of 10 minutes, or until the SAT is equal to or higher than the RAT.

When the last compartment exits defrost, the engine will go to low speed. “dF” will continue to be displayed in place of compartment temperature, and the COOL LED will come on when the compressor starts.

The EVXV or LSV will open, and the evaporator coil will begin to cool down. The evaporator fans will not come on right away, so that warm air is not blown into the refrigerated compartment, but will wait for the evaporator to cool down, up to a maximum of 8 minutes. Once the last evaporator fan has started, “dF” will no longer be displayed, and refrigerated compartment temperature will again be shown in the main display.

If a DTT sensor alarm has been activated, defrost will terminate after 10 minutes.

**NOTE**

Defrost uses a Defrost Duration Timer that allows for a maximum of 45 minutes in defrost. If defrost is not terminated during the 45 minutes, the microprocessor will end the defrost cycle, and activate the A54 – “DEFROST NOT COMPLETE” alarm. When this occurs, the Defrost Interval Timer is set for 1.5 hours, at which time the unit will go into defrost again.

## 4.7. USER SELECTED OVERRIDE OPERATION

Three optional software override programs are available to the user. These programs include: Priority Cooling, Supply Air Limit Control and Temperature Range Lock. Information on how the unit operates under these programs is provided in the following sub–paragraphs.

### 4.7.1 Priority Cooling

Priority cooling applies when the unit is operating with more than one compartment enabled and if one compartment has a frozen setpoint and the other(s) a perishable setpoint (refer to Section 4.3.2). In priority cooling, priority is assigned to the compartment with a frozen setpoint or the compartment with a perishable setpoint in accordance with four configuration settings. These settings include: Frozen Priority Cooling, Frozen Priority Time, Perishable Priority Time and Perishable Priority Temperature.

The Frozen Priority Cooling Configuration may be set to OFF, ON or HIGH CAPACITY. The factory default setting is OFF. The Frozen Priority Time Configuration and Perishable Priority Time Configuration may both be set from 5 to 60 minutes. The factory default is 15 minutes. The Perishable Priority Temperature Configuration may be set to OFF or from 3.6 to 27_F (2 to 15_C). The factory default setting is OFF.

With the Frozen Priority Cooling Configuration set to ON, once the temperature in a compartment with a frozen setting is less than 32_F (0_C) the compartment(s) with a perishable setting will be operated with the fan operating and the liquid control valve pulsing on a 20 second cycle, 8 seconds on and 12 seconds off, for the duration of the Frozen Priority Time setting. It will then operate with the fan on and the valve open for the duration of the Perishable Priority Time setting. This operation will continue to cycle on the timers as long as both compartments are calling for cooling.

With the Frozen Priority Cooling Configuration set to HIGH CAPACITY, once the temperature in a compartment with a frozen setting is less than 32_F (0_C) the compartment(s) with a perishable setting will be operated with the fan and liquid control valve off, for the duration of the Frozen Priority Time setting. It will then operate with the fan pulsing on a 20 second cycle, 8 seconds on and 12 seconds off, for the duration of the Perishable Priority Time setting. This operation will continue to cycle on the timers as long as all compartments are calling for cooling.

If the Perishable Priority Temperature is not set to OFF, the microprocessor will begin to monitor return air temperature in the perishable compartment(s) after 5 minutes of priority cooling operation. If the temperature within that compartment rises to setpoint + the Perishable Priority Temperature Setting, Priority Cooling will be suspended.

### 4.7.2 Supply Air Limit Control

Supply Air Limit Control is available for Compartment 1 when the setpoint is at or between 32 to 65_F (0 to 18.4_C), Compartment 1 is operating in cool, and no other compartment is operating in cool.

Supply Air Limit Control is available for Compartment 2 when: an optional supply air sensor is installed, the sensor is configured ON, the setpoint in Compartment 2 is at or between 32 to 65_F (0 to 18.4C), Compartment 2 is operating in cool and no other compartment is operating in the Cool Mode.

Supply Air Limit Control is not available for Compartment 3.

Supply Air Limit is NOT a positive temperature control, drift above and below the Supply Air Limit will be seen as the system balances out.

Control of the actual supply air temperature will be accomplished by varying the position of the CSMV for Compartment 1 or cycling of the liquid line solenoid valve for Compartment 2.

Supply Air Limit Configuration values can be set independently for Compartment 1 and Compartment 2, as well as allowing for a different limit for Start-Stop than used in Continuous Run.

Supply Air Limit Control is set using the Perishable Sensitive Product Functional Parameter (which can be set to OFF or ON), and the Supply Air Limit for Start–Stop Operation Configuration or Supply Air Limit for Continuous Operation Configuration for each compartment (which can be set from 0 to -21.6_F ([0 to -12_C]).

**NOTE**

These values are all negative (except for 0), therefore, when the value is added to the setpoint, the result will be a temperature that is less than the setpoint.

When the Perish Sensitive Product Functional Parameter is set to OFF, the supply air temperature for either or both compartments will be the coldest temperature of 32_F (0_C) OR the calculated value of setpoint minus the configured Supply Air Limit value.

When the Perishable Sensitive Product Functional Parameter is set to ON, the supply air temperature for either or both compartments will be the calculated value of setpoint minus the configured Supply Air Limit value.

Supply Air Limit controls the temperature of the supply air as it leaves the evaporator so that it does not go colder than the configured Supply Air Limit value below setpoint.

**NOTE**

The 9_F value used in the following examples is not necessarily a recommend setting, but is only used to show how the Supply Air Temperature Limit is calculated.

EXAMPLE 1: Perishable Sensitive Product Functional Parameter = **OFF**

Supply Air coldest temperature limit is the colder temperature of:

+32_F **OR**

Setpoint minus configuration value for Supply Air Limit

Sample Calculations:

| | | | | |
|---|---|---|---|---|
| Setpoint | 50_F | 45_F | 40_F | 33_F |
| Supply Air Limit Configuration Value | -9_F | -9_F | -9_F | -9_F |
| Setpoint minus Supply Air Limit | 41_F | 36_F | 31_F | 24_F |
| Coldest Supply Air Temperature allowed | 32_F | 32_F | 31_F | 24_F |

EXAMPLE 2: Perish Sensitive Product Functional Parameter = **ON**

Supply Air will be limited to Setpoint minus configuration value for Supply Air Limit.

Sample Calculations:

| | | | |
|---|---|---|---|
| Setpoint | 50_F | 40_F | 33_F |
| Supply Air Limit Configuration Value | -9_F | -9_F | -9_F |
| Setpoint minus Supply Air Limit | 41_F | 31_F | 24_F |
| Coldest Supply Air Temperature allowed | 41_F | 31_F | 24_F |

### 4.7.3 Temperature Range Lock 1 & 2

Range Lock is a group of Configurations which may be set to lock the unit into Start-Stop or Continuous Operation for various setpoint ranges.

**NOTE**

Range Lock is applicable to Compartment 1 only. When Compartment 1 is operating under Range Lock, all compartments will operate in Start/Stop Operation or Continuous Operation according to the setting for Compartment 1. For that reason, Range Lock is not recommended for use when another compartment(s) is enabled.

Two ranges are available for selection. Each Range can be independently set to lock it's setpoint temperatures into either Start-Stop or Continuous operation.

Each Range has it's own selectable minimum and maximum temperature, 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 (see Figure 4-4), if Continuous 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, with a Minimum Temperature of 28°F (-2.2°C) and a Maximum Temperature of 55°F (-12.8°C). Should Continuous Operation ALWAYS also be required with setpoints between -22 and 0°F (-30 and -17.8°C), then Range 2 will be set for Continuous, 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.

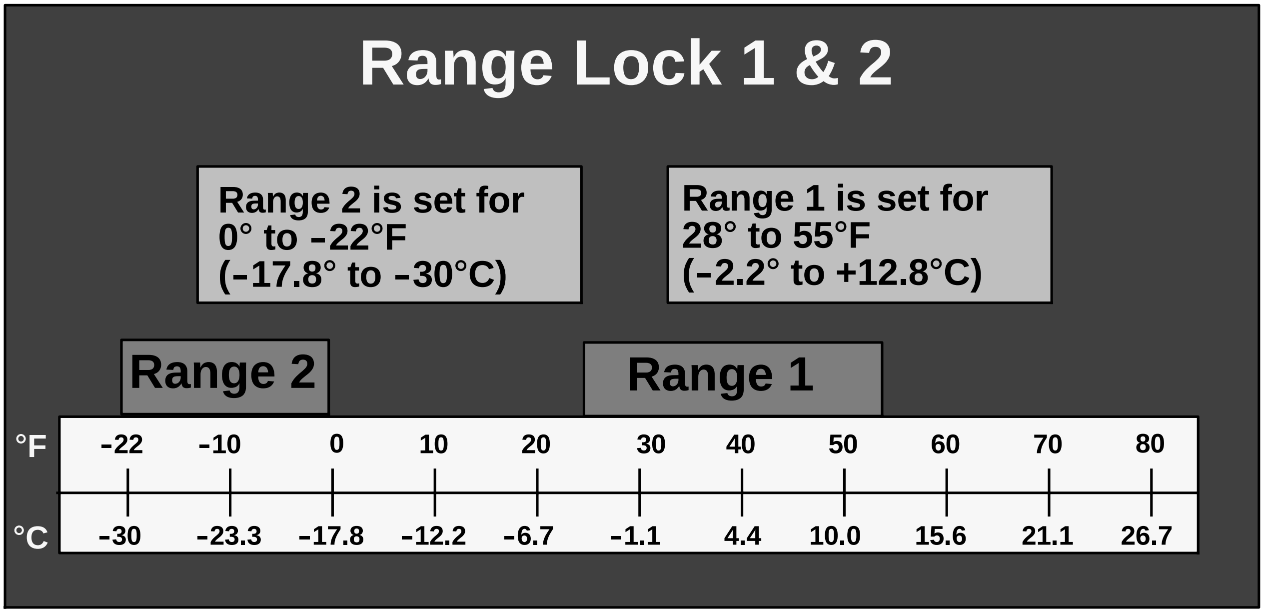



**Figure 4–4 Range Lock Settings – Non Overlapping**

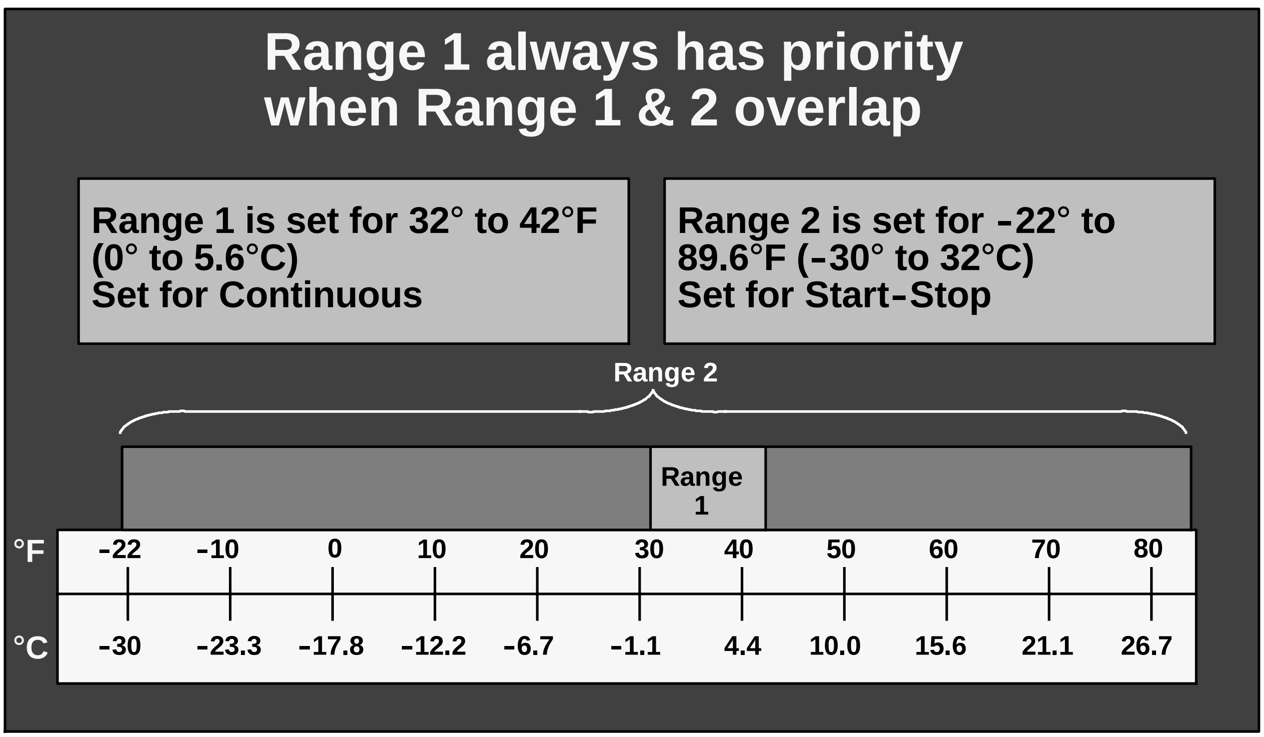



**Figure 4–5 Range Lock Settings – Overlapping**

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 (see Figure 4–5), the ranges have been set to lock all setpoints into Start–Stop, except for a small range between +32° and +42°F (0° and 5.6°C) where the unit will always operate in Continuous. Range 1 Minimum Temperature has been set for +32°F (0°C), and Maximum Temperature of +42°F (5.6°C). Range 2 has been set for a Minimum Temperature of –22°F (–30°C) and a Maximum Temperature of +89.6°F (32°C). The unit will switch to Continuous when the temperature is between +32° and +42°F (0° and 5.6°C) because, when the ranges overlap each other the Range 1 settings will take priority.

## 4.8. PREPROGRAMMED SOFTWARE OVERRIDES.

### 4.8.1 Cargo Protect Mode.

The microprocessor will activate Cargo Protect Mode when: both the A122 – "CHECK RETURN AIR SENSOR" and A123 CHECK SUPPLY AIR SENSOR" alarms for Compartment 1, or the A137 "CHECK RETRUN AIR SENSOR alarm for Compartment 2, or the A138 "CHECK RETURN AIR SENSOR" alarm for Compartment 3, are activated.

- If the setpoint in the compartment for which the alarm(s) have activated is in the perishable range (refer to Section 4.3.2), the EVXV or LSV for that compartment will shutdown.
- If the setpoint in the compartment for which the alarm(s) have activated is in the Frozen Range and the unit is in Engine Operation, the compressor will operate fully loaded and the engine will go to low speed.
- If the setpoint in the compartment for which the alarm(s) have activated is in the Frozen Range and the unit is in Standby Operation, the compressor will operate unloaded.

The MessageCenter will display "WARNING: NO TEMPERATURE CONTROL" when displaying information for the compartment(s) operating in Cargo Protect Mode.

### 4.8.2 Compressor Minimum Operating Time

Each time the compressor is started it must operate for a minimum of 3 minutes before it can be de–energized.

If, during the 3 minutes, a compartment is operating in the frozen range (refer to Section 4.3.2), that compartment will operate in cooling. If the only operating compartment is operating in the perishable range that compartment will continue to cool with the heaters energized as required to maintain setpoint.

### 4.8.3 Engine Speed Overrides

This section lists the different factors that determine engine speed (high or low) in addition to the speed controls used in temperature control.

Speed Control Overrides in priority order are:

1. <u>Forced Low Speed.</u>

The microprocessor will force the unit to run in low speed when:

- When the ambient temperature is less than 0° F (–17.7° C) AND the unit is running in low speed heat with the AC current less than 8 Amps for 10 minutes the unit will remain in low speed until the ambient temperature is above 0° F (–17.7° C) OR the AC current is more than 8 amps for 10 minutes.
- When the ambient temperature is less than 0.°F (–17.7°C) AND the unit is running in either cool, null, or defrost AND AC current is less than 12 Amps for10 seconds, the engine will be forced to low speed. The unit will remain in low speed until the ambient temperature is above 0.°F (–17.7°C) OR the AC current is more than 10 Amps for 10 minutes.
- When the ambient temperature is less than 77°F (25°C) AND the unit is running in defrost AND the engine has been running less than 30 minutes since the Main Power switch was toggled from the OFF position, the unit will remain in low speed until the ambient temperature is above 77°F (25°C) OR the engine has run for a minimum of 32 minutes since the switch was toggled.

When the engine is forced to low speed under these conditions, the Message Center will display "FORCED LOW ENGINE SPEED".

2. <u>RAT & SAT Alarms.</u>

When A122 – "CHECK RETURN AIR SENSOR" and A123 – "CHECK SUPPLY AIR SENSOR" alarms are activated microprocessor control may enter Cargo Protect Mode. Refer to Section 4.8.1.

3. <u>High Speed To Low Speed Delay.</u>

When the engine is operating in high speed, and the microprocessor calls for low speed, the engine will remain in high speed for 40 seconds OR until the actual AC current is less than the configured Diesel or Standby Maximum Generator Amps value less the Diesel or Standby Offset Maximum Amps value.

4. <u>Silent Mode.</u>

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

5. <u>Engine Coolant Warm–Up.</u>

The engine will run in low speed until the coolant is above 79°F (26°C).

6. <u>Defrost.</u>

When the unit is in defrost:

- the engine will operate in high speed when heaters are energized (to supply power for the heaters).
- the engine will operate in low speed when the heaters are de–energized.

7. <u>Door/Remote Switch Configuration.</u>

If the Door/Remote Switch Configuration is set for low speed, the engine will run in low speed when the door/remote switch is open/active.

8. <u>Start–Stop Restart.</u>

If the engine is restarted from a Start–Stop off cycle for any reason except a Start–Stop Parameter Override Temperature the engine will operate in low speed until all conditions are met for another off cycle OR for the Minimum Run Time Functional Parameter value.

9. <u>Low Speed To High Speed Delay.</u>

- The compressor must operate for 2 minutes before transition to high speed is allowed.
- The time value entered in the High Speed Delay Configuration must be expired before transition to high speed is allowed.

10. <u>Low Speed Startup</u>.

The time value entered in the Low Speed Startup Minutes Functional Parameter (for Start–Stop or Continuous) must be expired before transition to high speed is allowed.

11. Frozen Setpoint/Frozen Setpoint Override.

If the setpoint is a frozen setpoint (below +10.4°F [–12°C]) and the temperature is below setpoint, the engine will operate in low speed.

12. Low Suction Pressure.

The microprocessor monitors the signal provided by the Suction Pressure Transducer. If the suction pressure falls below –2psig (–0.14 bar) for more than 20 seconds, the engine will operate in low speed for a minimum of 5 minutes, then remain in low speed until the suction pressure is greater than –2psig (–0.14 bar).

13. Operation With A Perishable Setpoint.

- If in Start–Stop Operation with a setpoint in the perishable range (above +10.4°F [–12°C]) and all conditions for an OFF Cycle have been 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 shutdown 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 95°F (35°C), the engine may return to low speed operation until the shutdown condition is satisfied, then shutdown from low speed.

14. High Speed Pulldown.

If in Continuous Operation with a setpoint in the perishable range (above +10.4°F [–12°C]) and the High Speed Pulldown Configuration is set to YES, the engine will operate in high speed until the refrigerated compartment temperature is 0.36°F (0.2°C) above setpoint.

### 4.8.4 Unloader Control Overrides

This section lists the different factors that determine the operation (de–energizing / loading and energizing / unloading) of the unloaders in addition to the unloader control used in temperature control.

Unloaders operate in priority order for cooling ONLY (For example: Override a supersedes b and all lower overrides.):

The overrides will be allowed in Cargo Protect Mode only if the override does not use the return or supply temperature.

There is 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.

**NOTE**

In all of the following instances UL1 refers to the Front Unloader and UL2 refers to the Rear Unloader.

1. Low Generator Amp Draw.

When the A128 – "LOW AC AMPS" is activated the compressor will only operate on 2 or 4 cylinders.

2. High Discharge Pressure Or High Generator Amp Draw.

The microprocessor will not allow additional cylinders to load whenever the compressor discharge pressure is above 415 psig (28.3 bar) OR when the compressor amp draw is within 1 Amp of the maximum allowable generator current (Maximum Allowable Generator Current is a Configuration Setting – Refer to 5.2.1.)

However, if the CDT is above 284°F (140°C) for more than 30 seconds at the same conditions, loading of one cylinder bank is allowed.

3. Compressor Restart.

The microprocessor will force the compressor to run in 2 cylinders for 10 minutes when the compressor restarts unless the compressor is restarting following a defrost cycle. If the compressor discharge temperature (CDT) becomes greater than 284°F (140°C) or the system returns to Pulldown mode 10 minute will be overridden and the unloaders will de–energize (load) as required.

4. Fan Motor Delay.

Whenever any fan motor has been energized, there will be a 3 second delay before either unloader is allowed to de–energize (load).

5. Four Cylinder Delay.

When the compressor suction pressure (CSP) is greater than 22 psig (1.5 bar) AND the compressor is fully unloaded (operating on 2 cylinders), AND the conditions call for UL2 to be de–energized (loaded), there will be a 20 second delay while the CSMV closes down by 20% from the current setting. After UL2 loads the CSMV will go back to normal control.

6. Two–Minute Delay.

When an unloader is energized (unloaded) due to a refrigeration system pressure override (overrides #6, 7, 8 or 9), the unloader remains energized for a minimum of 2 minutes.

7. 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 the 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) after the compressor motor contactor is energized

8. High Evaporator Pressure.

UL2 will always be energized (unloaded) when the suction pressure is above the value shown Figure 4–6 for 1 minute, according to the current ambient temperature. For example, at an ambient temperature of 100°F (37.8 °C), UL2 will be energized when the suction pressure rises to approximately 75 psig (5 bar). UL2 can load as soon as the pressure is 5 psig (0.3 bar) less than the value in the chart.

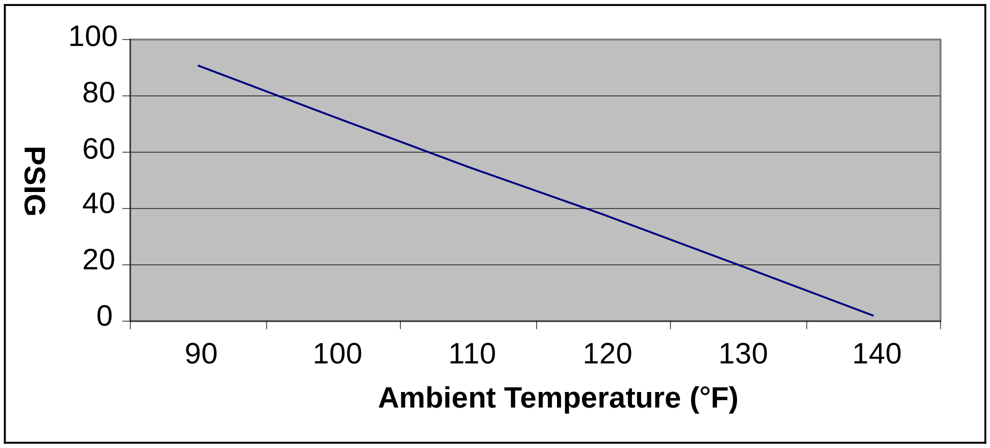



**Figure 4-6 Evaporator Pressure Chart**

9. High Discharge Pressure.

- If the compressor discharge pressure reaches 435 psig (29.6 bar) at some point soon after engine start up for more than 1 minute, UL2 will energize (unload) and remain energized until the compressor discharge pressure drops below 415 psig (29.6 bar).

- If both unloaders are energized (unloaded), and the discharge pressure drops below 430 psig (29.3 bar), UL1 will be de-energized (loaded)

10. Low Suction Pressure.

- If suction pressure falls below -2 psig or 4 in Hg (0.14 bar) for more than 20 seconds, UL2 will be energized (unloaded)

- After 20 seconds: if suction pressure is still less than -2 psig or 4 in Hg (0.14 bar), UL1 will be energized (unloaded), OR

- Once the suction pressure rises above 5 psig (0.3 bar), UL2 will be de-energized (loaded) (after the 2-Minute Delay mentioned above)

- If both unloaders are energized (unloaded), AND 20 seconds has elapsed since energizing (unloading) UL1 AND the suction pressure rises above 5 psig (0.3 bar), UL1 will be de-energized (loaded)

11. High CDT.

If the compressor is operating with both unloaders energized (unloaded), and the CDT rises to 284°F (140°C), UL1 will be de-energized (loaded), and will remain de-energized (loaded) until the CDT drops below 266°F (130°C) for at least 2 minutes.

12. Cargo Protect Mode.

Refer to Section 4.8.1

13. Start-Stop Operation.

If the Off Cycle conditions have been met in Start-Stop Mode (Refer to Section 4.4) and the minimum run time has expired, BUT a compartment temperature is not at setpoint, both unloaders will be de-energized (loaded) and the compressor will operate on 6-cylinders until the unit cycles off.

14. High Speed Pulldown.

When the Compartment 1 setpoint 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 loaded operation) until the refrigerated container temperature is 0.36°F (0.2°C) above setpoint.

15. Refrigeration System Stabilization.

When the Return Air Temperature is at or above 54°F (12°C) the compressor will operate on either 2 or 4 cylinders loaded. 6 cylinder operation will be allowed only after the return air temperature falls below 50°F (10°C) and then only when all criteria are met to allow 6 cylinder operation.

### 4.8.5 Defrost Safety Override

- When any compartment is in defrost and the return air temperature rises to 95°F (35°C) regardless of the temperature of the DTT, the unit will go into low speed and all electric heaters in all compartments will be de-energized. The unit will remain in defrost with the heaters de-energized until the return air temperature is less than 90°F (32°C).
- In addition, when Compartment 1 is in defrost and the supply air temperature rises above 135°F (45°C) regardless of the temperature of the DTT, the unit will go into low speed and all electric heaters in all compartments will be de-energized. The unit will remain in defrost with the heaters de-energized until the Compartment 1 supply air temperature is less than 108°F (42°C).

# SECTION 5 – MICROPROCESSOR INTERFACE



5

# SECTION 5

# MICROPROCESSOR INTERFACE

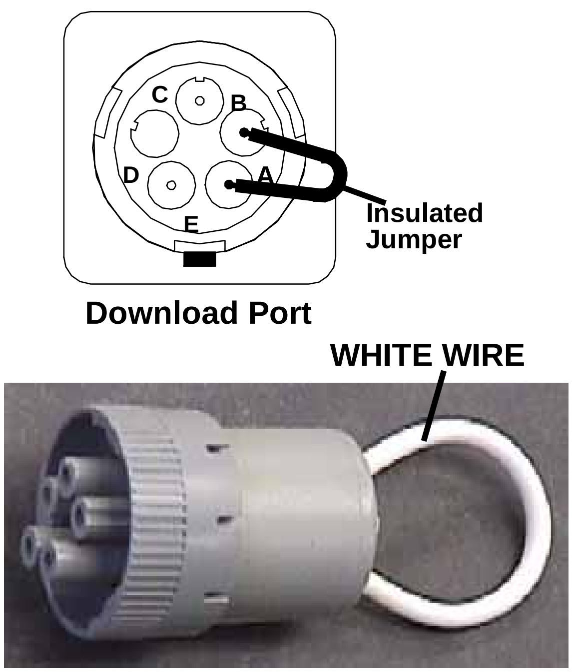
## 5.1 INTERFACE METHODS

There are five methods for interfacing with the Advance microprocessor;

1. Operator Interface – using the keypad.
2. Technician Interface – using the configuration jumper.
3. PC Mode – using the PC Mode jumper.
4. PC Card – Transferring data using a PC Card
5. ReeferManager & Reports – Access using a computer

Operator Interface such as start, stop, Pretrip, reading alarms, reading data and changing Functional Parameters may all be performed using the Keypad (refer to Section 3).

Technician Interface and PC Mode require the use of an additional connector before any actions may be performed and each allows increased interaction, including operations that may be performed with the microprocessor powered while the unit is shutdown.




**CONFIGURATION JUMPER**
**P/N 22-50180-00**

**Figure 5–1 Technicians Interface Connection**

## 5.2 TECHNICIAN INTERFACE (REMOVE JUMPER MODE)

The Technician Interface Mode allows the technician to change Configurations, test the unit components and/or service the refrigeration system. To place the microprocessor in the Technicians Interface Mode:

a. Place the Main Power switch in the OFF position.

b. Locate the serial download port (item 14, Figure 2–3) remove the protective plug to gain access to the wire terminals.

c. Plug in a Configuration Jumper or install an insulated jumper (see Figure 5–1).

**NOTE**

For units equipped with a switch labeled ENGINE/OFF/STANDBY (DOES):

The DOES may be placed in either the ENGINE or STANDBY position to enter the technician interface mode. If actual operation of the high voltage components (i. e. the evaporator fan motor) is desired, the power plug is to be connected and then the DOES is to be placed in the STANDBY position when entering the technician interface mode.

For units equipped with a switch labeled START/RUN–OFF (SROS):

The switch labeled STANDBY/ENGINE (DES) may be placed in either the ENGINE or STANDBY position to enter the technician interface mode. If actual operation of the high voltage components (i. e. the evaporator fan motor) is desired, the power plug is to be connected, the DES is to be placed in the STANDBY position and then the SROS is to be placed in the START/RUN position when entering the technician interface mode.

d. Place the Main Power switch in the desired position. The alarm LED will come on, the setpoint will display, but the refrigerated compartment temperature will not, and “REMOVE JUMPER” will display for 10 seconds. Remove the Configuration Jumper or insulated jumper at this time. The MessageCenter will then display “ ↑ ↓ TO SCROLL, THEN = TO SELECT” for 10 seconds.

e. Press the UP ARROW Key to scroll through the Menu beginning at the top.
Press the DOWN ARROW Key to scroll through the Menu beginning at the bottom.

f. Select the Mode you wish to access,

§**Configuration Mode**

§**Component Test Mode**

§**Service Mode**

and press the "=" key. Information on these test modes is provided in the following sub-paragraphs:

### 5.2.1 Configuration Mode

a. Enter the Technician Interface – Configuration Mode as described in Section 5.2.

b. To read through the Configuration list, 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. Refer to Table 5-2 for information on the settings and resultant microprocessor actions.

c. To change one of the Configurations, bring the desired Configuration into the MessageCenter, and press the "="key. The MessageCenter will then display "↑ ↓ TO SCROLL, THEN = TO SAVE" for 10 seconds. Then the selected Configuration will flash, displaying the current selection. Press the UP or DOWN ARROW Key to scroll through the list of available selections for this Configuration.

d. Once the desired selection is displaying in the MessageCenter, press the "=" Key to save the selection. The MessageCenter will stop flashing. The new selection is now in memory.

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

### 5.2.2 Component Test Mode

**WARNING**

**If the unit is in Standby Operation and powered, 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 using Component Test Mode.**

Component Test Mode allows the technician to energize individual circuits for 5 minutes at a time. The engine or compressor, when in Standby Operation, is not allowed to start when the microprocessor is in Component Test Mode. To enter the Component Test Mode:

a. Enter the Technician Interface – Component Test Mode as described in Section 5.2.

b. To read through the Component Test list, 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. Refer to Table 5-1 for a list of component tests available.

c. Once the desired test is displayed in the MessageCenter, press the "=" key to select that test. For example, if Buzzer is selected, the buzzer will come on, and "BUZZER OFF IN 5 MINUTES" will display in the MessageCenter. The minutes will count down to 0 at which time the buzzer circuit will be de-energized, and the MessageCenter will display the last component tested.

   Should you need more than 5 minutes, the timer may be reset for another 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 the "=" key. Press the UP or DOWN Arrow key to select another component.

To stop an individual component test, press and hold the "=" key for 6 seconds. The microprocessor will still be in Component Test Mode, and ready for another component to be selected. To stop component testing, and turn the microprocessor off, place the Main Power switch in the OFF position.

To go to Configuration Mode or Service Mode, select Main Menu and press the "=" key.

The only keys that operate during Component Test Mode are the ALARM and SELECT keys. The alarm list is available for review of any active or inactive alarms. The SELECT key will only allow access to the data list Amp Draw information for the component that is currently being tested.

**Table 5-1 Component Test**

| Component / Menu List | MessageCenter | FET | Board LED |
|---|---|---|---|
| Green Light | LIGHT OFF IN X MINS | 7 | |
| Amber Light | LIGHT OFF IN X MINS | 7 & 14 | |
| Defrost Light | LIGHT OFF X MINS | 16 | |
| Front Unloader (UL1) | UL1 OFF IN X MINS | 23 | |
| Rear Unloader (UL2) | UL2 OFF IN X MINS | 22 | |
| Speed Relay (SR) | SR OFF IN X MINS | | 27 |
| Buzzer (B) | BUZZER OFF IN X MINS | 18 | |
| Air Heater Relay (IAHR) | RELAY OFF IN X MINS | | 30 |
| Heater Contactor 1 (1HTCON1) | HEATER CONT 1 OFF IN 5 MINS | 10 | |
| Heater Contactor 2 (1HTCON2) | HEATER CONT 2 OFF IN 5 MINS | 21 | |
| C2 Heater Contactor 1 (2HTCON1) | C2 HEATER CONT 1 OFF IN 5 MINS | 9 | |
| C2 Heater Contactor 2 (2HTCON2) | C2 HEATER CONT 2 OFF IN 5 MINS | 11 | |
| C3 Heater Contactor 1 (3HTCON1) | C3 HEATER CONT 1 OFF IN 5 MINS | 8 | |
| C3 Heater Contactor 2 (3HTCON2) | C3 HEATER CONT 2 OFF IN 5 MINS | 13 | |
| Evaporator Motor Contactor (1EVCON) | EVAPORATOR CONT 1 OFF IN 5 MIN | 20 | |
| C2 Evap Contactor (2EVCON) | EVAPORATOR CONT 2 OFF IN 5 MIN | 5 | |
| C3 Evap Contactor (3EVCON) | EVAPORATOR CONT 3 OFF IN 5 MIN | 15 | |
| Power Supply Contactor Relay (PSCONR) | POWER SUPPLY CONT OFF IN X MIN | 19 | |
| Compressor Motor Contactor Relay (CCONR) | COMPRESSOR CONT OFF IN X MINS | 2 | |
| Condenser Motor Contactor (CDCON) | CONDENSER CONT OFF IN X MINS | 1 | |
| Generator Contactor Relay (GENCONR) | GENERATOR CONT OFF IN 5 MINS | 3 | |
| C2 LSV | C2 LSV OFF IN 5 MINS | 12 | |
| C3 LSV | C3 LSV OFF IN 5 MINS | 17 | |
| Main Menu ( Press the “=” key to go back to the the Configuration Mode or Service Mode selection menu. Press the down or up arrow to continue scrolling the component test list.) | | | |

### 5.2.3 Service Mode

**CAUTION**

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

**NOTE**

If the Main Power switch is toggled to the OFF position, the microprocessor will exit service Mode.

To enter Service Mode:

a. Enter the Technician Interface – Service Mode as described in Section 5.2.

b. “ENTERING SERVICE MODE” will display in the MessageCenter.

When entering Service Mode the microprocessor opens the CSMV and EXV to 100% open and energizes the remote liquid line solenoid valves (2LSV & 3 LSV).

c. Once the valves are 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.

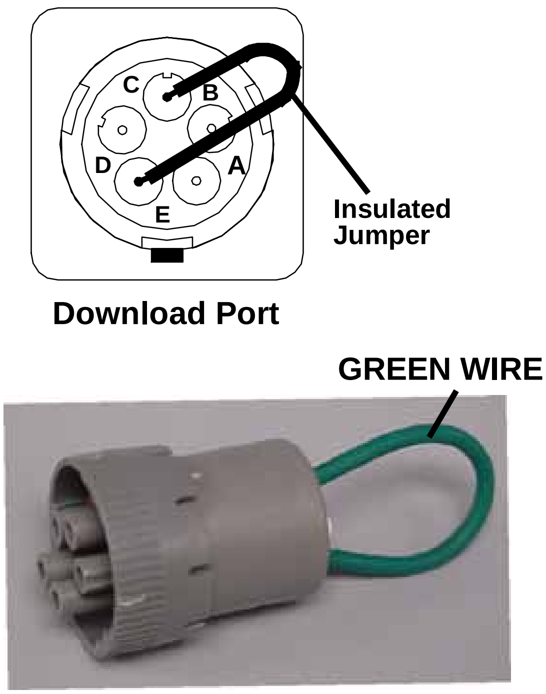
e. The unit should remain in the RECOVER / LEAK CHK / EVAC MODE as these service procedures are performed. If the unit shifts to Charge Mode and “CHARGE MODE – HOLD = TO EXIT” is displayed in the MessageCenter, DO NOT perform refrigerant recovery, leak checking, or evacuation. Exit Service Mode and then re-enter, making sure that “RECOVER / LEAK CHK / EVAC MODE” is displayed in the MessageCenter before continuing any of these service procedures.

f. The microprocessor will monitor the pressure transducer readings during evacuation. Once all pressure transducers (CDP, CSP and EVOP) have dropped below –20 in hg (0.68 Bar) and then 2 of the 3 pressure transducers rise above 5 PSIG (0.34 Bar ), the microprocessor will close CSMV and EXV to 0% open and de-energize the remote liquid line solenoid valves. When the valves are closed, “CHARGE MODE – HOLD = TO EXIT” is displayed in the MessageCenter. This action is taken to prevent refrigerant migration to the compressor during charging,

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

## 5.3 PC MODE

PC Mode allows the technician to access the microprocessor without the engine running and without the refrigeration system running. When in PC Mode the microprocessor is fully functional and all Operator Interfaces may be performed, the operation of the microprocessor may be demonstrated and all PC functions may be performed, again, without the unit actually operating.




**PC MODE CONNECTOR**
**P/N 22-50180-01**

**Figure 5–2 PC Mode Connection**

To place the microprocessor in PC Mode:

a. Place the Main Power switch in the OFF position.

b. Locate the serial download port (item 14, Figure 2–3) remove the protective plug to gain access to the wire terminals.

c. Plug in a PC mode connector or install an insulated jumper (see Figure 5–2).

**WARNING**

**Do not toggle the Main Power switch out of the OFF position when in PC Mode or the unit will start.**

d. The microprocessor will be energized but the engine and refrigeration system will not be started.

e. When work is complete, remove the PC Mode connector. The microprocessor will return to normal operation when the Main Power switch is toggled out of the OFF position.

## 5.4 PC CARDS

PC Cards that are available include Program Cards, Configuration Cards, Option Cards and Download Cards. General instructions for using the cards is provided in Figure 5–3. Specific information on use is provided in the following sub–paragraphs.

**NOTE**

For diagnoses of problems with the microprocessor, DataLink data recorder downloading, file analysis using Reports or use of PC cards, refer to Section 9.6

### 5.4.1 Handling PC Cards

While these cards are not constructed for a rugged environment, they are not intended to be stored in a technician's toolbox, back pocket or on the dashboard of a vehicle.

The label on each card clearly states that the card is to be handled with care – not to be bent, dropped or exposed to impact. Heat, moisture and direct sunlight should be avoided.

PC cards are designed to be used in a wide temperature range of –40 to +185°F (–40 to +85°C). When a PC card is connected to an Advance microprocessor or computer at temperatures outside this range, data transmission between the card and the other device may not be performed correctly.

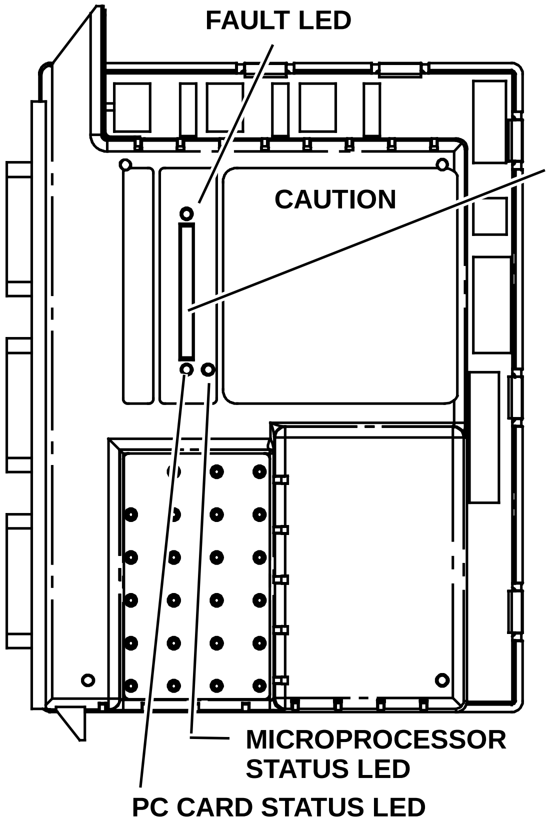
Retention of programmed data for extended periods of time requires a temperature range of –4 to +149°F (–20 to +65°C). When PC cards are exposed to temperatures outside of this range for several days data contained on the card may be damaged.

PC cards should never be:

- Dropped.
- Bent.
- Twisted.
- Squeezed.
- Submersed in any liquid.
- Exposed to electrostatic discharge.
- Exposed to intense ultraviolet light.
- Exposed to nearby magnetic or electromagnetic fields.

Low X–Ray exposure, i.e. that experienced while passing through a security screen, should not harm the card data. High X–Ray exposure, i.e. that experienced in a medical or dental environment may damage the card data. PC cards should not be exposed to magnets such as a pocket screwdriver with a magnetic end.

PC cards should be kept in a hard plastic jewel case when not in use. Replacement cases P/N 58–50109–00 are available from Carrier Transicold's Performance Parts Group.




1. Power the microprocessor by toggling the Main Power switch out of the OFF position or enter PC Mode (refer to section 5.3).
2. Insert the 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. Hold the card at the end opposite the plug end. DO NOT squeeze the card in the middle while inserting.
3. The MessageCenter will display messages while the required action is performed, the green PC CARD STATUS LED will flash. ***Do not remove the card until prompted to do so.***
4. When the required action is completed the PC Card Status LED will be on solid. The message center will display a "remove card message. The PC card may then be removed.
5. When the card is removed, the MessageCenter will return to the default message.
6. If any other messages display, 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.

**Figure 5-3 PC Card Interaction**

### 5.4.2 Program PC Card

A program card is used to load software into the microprocessor. The card may contain any software version however, only one version may be loaded to the card at a time.

For complete instructions on loading data to the card using ReeferManager, refer to manual 62-10889. Software may be downloaded by a Carrier Transicold dealer from the TransCentral site.

**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 microprocessor. DO NOT INTERRUPT THE SOFTWARE INSTALLATION PROCESS ONCE IT HAS STARTED. Also, do not place the Main Power switch in the OFF position during the initial power up following a software upgrade**.

To load software from the card into the microprocessor, insert the card in accordance with the instructions provided in Figure 5-3.

When loading new software, the MessageCenter will display one of 3 different messages:

SAME SW: "= TO LOAD, ↑ TO CANCEL"
(The software loaded on the card is the same as the software presently in the microprocessor)
OLD SW: "= TO LOAD, ↑ TO CANCEL"
(The software loaded on the card is older than the software presently in the microprocessor)
NEW SW: "= TO LOAD, ↑ TO CANCEL"
(The software loaded on the card is newer than the software presently in the microprocessor)

**NOTE**

All units should have the microprocessor software upgraded to the latest production software, provided for Carrier Transicold dealers on the TransCentral site, except for those units that are listed in the "Field Test Software" section. For units listed in the "Field Test Software" section, ensure the latest software for that unit is installed.

Press the "=" key to load the software. The MessageCenter will display "ENGINE AND MICRO WILL STOP NOW" and the unit will shutdown. After about 45 seconds the MessageCenter backlight will dim and the message "INSTALLING PROGRAM SOFTWARE" will be displayed.

The microprocessor will continue and complete the software loading in accordance with the instructions provided in Figure 5-3.

### 5.4.3 Configuration PC Card

A configuration card may be loaded with Configuration or maintenance files for download to the microprocessor. The card may contain either type of file however, only one may be loaded to the card at a time.

**NOTES**

1. When loading Configuration or Maintenance files to the card, ReeferManager will provide instruction for loading of IntelliSet files. Use of IntelliSets for the Vector 6600MT units is not recommended at this time.

2. There can be a single complete DataLink data recorder and microprocessor setup placed on the card for setting up reefers. This is simply called creating a "Configuration Card". Unit specific and time sensitive data cannot be loaded to a configuration card. This data includes: model number, serial number, hour meter readings, date and time. These configurations must be set using the keypad or ReeferManager.

3. There can be certain individual microprocessor settings placed on the card for maintenance purposes. This is called creating a "Maintenance Card".

To load a file from the card into the microprocessor, insert the card in accordance with the instructions provided in Figure 5-3.

Press the "=" key to load the file. The MessageCenter will display "LOADING INFO" while the FILE is being installed.

The microprocessor will continue and complete the loading in accordance with the instructions provided in Figure 5-3.

### 5.4.4 Option PC Card

Option PC Cards allow installation of optional programming into the microprocessor. Cards may be purchased with five or ten "clicks". Each "click" allows downloading to an individual microprocessor. To transfer data from the card to the microprocessor, insert the card in accordance with the instructions provided in Figure 5-3.

Press the "=" key to load the option. The MessageCenter will display "INSTALLING OPTION, PLEASE WAIT" while the option is being installed.

The microprocessor will continue and complete the software loading in accordance with the instructions provided in Figure 5-3. In the "INSTALLED, REMOVE CARD XX" message displayed at the end of the loading process, the "XX" is the number of installs left on the card. A "click" will not be removed from the card if it is inserted into a microprocessor that already has the option installed.

### 5.4.5 Download PC Card

Download PC cards allow coping of data from the microprocessor DataLink data recorder to the card for use with the Reports feature of ReeferManager. To copy data from the microprocessor to the card, insert the card in accordance with the instructions provided in Figure 5-3.

When copying data to the card the MessageCenter will display COPING DATA - PLEASE WAIT". When the copy is complete, the MessageCenter will display "COPY COMPLETE, REMOVE CARD X". The "X" is the number or empty spaces remaining on the card.

**NOTE**

Only a copy of the data will be written to the card. The actual data will remain inside the DataLink data recorder.

For complete instructions on working with the data using the Reports program, refer to manual 62-10889.

## 5.5 REEFERMANAGER & REPORTS

### 5.5.1 Introduction

The ReeferManager & Reports program allows the user to access and download data, using a computer, when the unit is not running and without starting the eight-hour DataLink data recorder timer. Using the computer will provide additional programming and configuring capabilities that will not be available through the keypad. The DataLink data recorder may also be configured and downloaded using the ReeferManager program.

For complete instructions on using ReeferManager & Reports, refer to manual 62-10889.

**NOTE**

For diagnoses of problems with the microprocessor, DataLink data recorder downloading, file analysis using Reports or use of PC cards, refer to Section 9.6

**a. ReeferManager**

ReeferManager enables the user to do the following:

- Monitor in real-time via the download port (an RS-232 connection) the current status of the microprocessor inputs, outputs, refrigeration, electrical, engine and temperature sensors and alarms.
- Record sensor data to a file for diagnostic purposes.
- Download microprocessor and DataLink data recorder data via serial port communications directly to the computer.
- Display, edit and send unit and remote evaporator model numbers, unit serial number and trailer ID to the microprocessor.
- Display, edit and send Functional Parameters and Configuration settings to the microprocessor and DataLink data recorder or to a PC Card.
- Write hour meter values to replacement microprocessors (during the first 25 hours).
- Initiate Pretrip and Defrost operations.
- Support Download, Configuration and Program PC Card operations.
- Provide a security log on system controlled by a System Administrator.

**b. Reports**

The Reports Program enables the user to do the following:

- Read .DCX download files from the Advance microprocessor
- Create various customized reports that include setpoint, sensors, and events
- Create various customized graphical reports
- Print numerical, graphical, and event reports
- View and print refrigeration system historical settings and changes
- Filter download data by date range and desired sensors and events
- Search for a sensor or event of interest
- Synchronize multiple graphical and numerical windows to better understand historical operation
- PC Setup enables the user to select how to display various parameters for use in the graph and text window.
- Easily adjust x and y axis and color scheme to accommodate various data
- Export data to a spreadsheet friendly format such as MS Excel.

**NOTE**

Beginning with ReeferManager version 03.08.00, USB to RS-232 adapter cables are supported for communication between the PC and the Download connector. The USB – RS232 program must be installed from the CD-ROM, and the instructions that are included with the CD-ROM must be followed to successfully assign the USB driver to the correct USB port on the PC that will be used for the serial connection. Refer to bulletin SER09-033 for further information.

**c. Connecting Computer and Microprocessor:**

To connect the microprocessor and computer:

a. Locate the serial download port (item 14, Figure 2-3) remove the protective plug to gain access to the wire terminals.

b. Plug a download cable into the download port and computer connection (see Figure 5-4). Once the cable is connected to the download port, the microprocessor will power up, and display “PC MODE”

c. Start the ReeferManager & Reports program by double clicking on the icon on your computer desktop. For complete instructions on using ReeferManager & Reports, refer to manual 62-10889.

d. When work is complete, remove the download cable. The microprocessor will return to normal operation.


**Figure 5-4 ReeferManager & Reports Connection**

## 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.

**NOTE**

For diagnoses of problems with the microprocessor, DataLink data recorder downloading, file analysis using Reports or use of PC cards, refer to Section 9.6

**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 2-10 – 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 5-5. If nominal 12 VDC is not present, the microprocessor has failed and must be replaced.

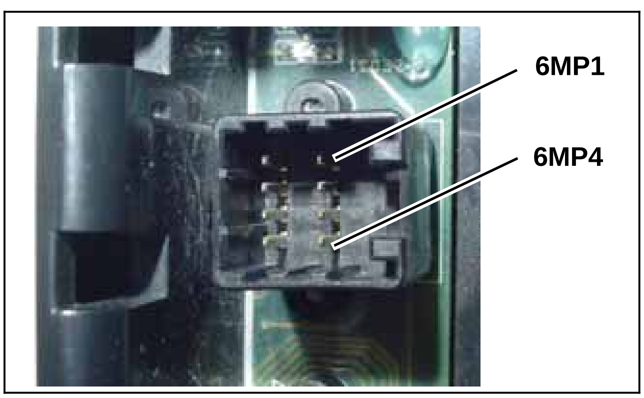



**Figure 5-5 Connector 6MP Connections**

e. With the negative meter lead on QC2 (without removing the spade connector), test voltage at the microprocessor 6MP4 terminal, see Figure 5-5. 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 8.4.4 for display disassembly.

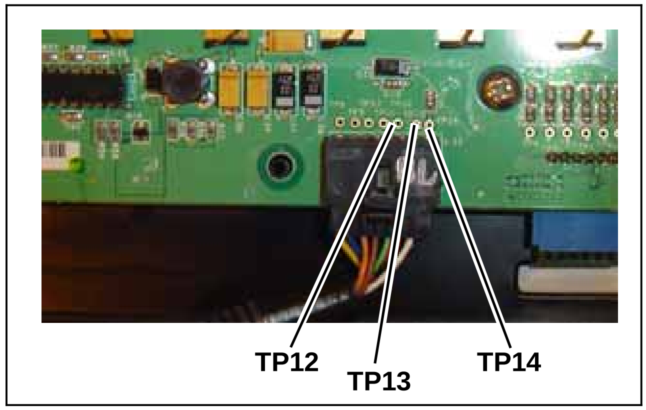



**Figure 5-6 Display Test Points**

h. With the negative meter lead on TP12, test voltage at TP14, see Figure 5-6. 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, see Figure 5-6. If nominal 5 VDC is not present, check wiring from microprocessor to display.

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

## 5.7 MICROPROCESSOR REPLACEMENT & SET-UP

**CAUTION**

**Under no circumstances should a technician electrically probe the microprocessor 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 microprocessor.**

Some microprocessor inputs operate at voltage levels other than the conventional 12 VDC. These inputs include but are not limited to the pressure transducers and temperature sensors. Under no circumstances should 12 VDC be applied at these connection points.

**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.**

Grounded wrist cuffs are available from Carrier (P/N 07-00304-00). These should be worn whenever handling a microprocessor.

Although there is less danger of electrical static discharge (ESD) damage in the outdoor environment or in a repair shop – where the processor is likely to be handled – proper board handling techniques should always be used. Advance Microprocessors should always be handled by the plastic cover and not the exposed printed circuit board. This not only precludes the possibility of ESD damage, but also lowers the possibility of physical damage to the electronic components.

When field diagnosis of a Carrier Transicold refrigeration unit determines that an Advance Microprocessor is not performing properly and must be replaced the replacement microprocessor must be setup for this unit and customer by entering the required Configurations, Functional Parameters and DataLink data recorder settings.

If the replacement microprocessor is not loaded with the most recent software, it should be updated. If software is loaded, it should be verified that it is the approved software for this model.

The preferred method for setup of the microprocessor is to use PC cards. All required changes, except unit specific and time sensitive data, may be performed using the cards. If cards are not available the microprocessor may be setup using ReeferManager. ReeferManager allows entry of all required data. If neither PC Cards or ReeferManager are available the microprocessor may be setup for immediate use using the keypad. Changes to the default DataLink data recorder settings may not be entered using the keypad, if the microprocessor is setup using the keypad, this feature will need to be loaded at a later date.

### 5.7.1 Pre–Replacement Steps

**NOTES**

1. 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.
2. For diagnoses of problems with the microprocessor, DataLink data recorder downloading, file analysis using Reports or use of PC cards, refer to Section 9.6

Before the unit can be started using the replacement microprocessor certain unit specific and time sensitive data must be known. That information includes:

- Unit Serial Number.
- Unit Model Number.
- Engine Protect Hours.
- Switch On Protect Hours.
- Engine Sleep Hours.
- Standby Hours.
- Switch On Sleep Hours.
- High Speed Hours.
- Start Cycles.
- Date and Time.
- ID Number.

a. If possible, power the original microprocessor up, by entering PC Mode, or by toggling the Main Power switch out of the OFF position.

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

c. Scroll through the data list and hour meter readings and make note of the unit specific data listed above. If the original microprocessor will not power up, gather the unit specific data from the model/serial number nameplate and estimate hour meter readings from the unit maintenance records. If PC Cards will be used to setup the replacement microprocessor, write the required data to the cards. Also, if the current configuration file is available for this customer from the TransCentral site, it should be downloaded and written onto the card prior to beginning work.

### 5.7.2 Microprocessor Replacement

a. Power down the microprocessor by removing the PC Mode connector and/or placing the Main Power switch in the OFF position.

b. Remove negative battery cable from battery.

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

d. Open the control box door.

e. Remove Connectors 4MP, 5MP & 6MP inside the Control Box. Remove all wires from the Microprocessor.

f. 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.

g. Remove the screws holding the sides of the microprocessor into the control box. Remove the single screw holding the top of the microprocessor in place.

h. Pull the microprocessor back, and twist it out of the control box.

i. Install the new microprocessor by reversing the preceding steps

**5.7.3 Microprocessor Setup**

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

b. Power up the microprocessor by toggling the Main Power switch out of the OFF position. The microprocessor will immediately go into the Configuration mode.

c. Select the correct model family (Vector) and then enter the correct model number by using the UP or DOWN ARROW keys, scroll through the list until the correct Model Number appears (verify by reading the Model/Serial Plate on the unit). Press the = key to enter the new model number.

d. 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. Using the UP or DOWN ARROW key, scroll through the Number/Letter list, until the first letter of the serial number 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. MAL12345678).

e. 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 key, scroll through the Number/Letter list, until the first letter / number of the ID 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 display.

f. Now, press the DOWN ARROW key until "SET TIME" appears. Press the = key then the UP ARROW key to enter that menu.

**⚠ CAUTION**

**Ensure 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 owners desired location time, enter that time. If you don't, enter the current time at your location.**

g. 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 key 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.

h. Press the UP ARROW key to go to Day.

i. Using the same key presses as in step g., continue to enter the correct numerical value for the Day, Year, Hour and Minute. Hours are displayed and entered as a 24 hour clock. 0 to 12 is AM. 13 to 24 is PM.

j. When you are finished, the MessageCenter will display "PRESS = TO SAVE TIME CHANGES".

**NOTE**

If you do not press the = key the time changes you just made will not be saved.

k. Press the UP ARROW key to go to "SET NEW HOURS". Press the = key then the Up Arrow key to enter that menu.

l. The first hour meter is Engine Protect Hours. Press the = key to select this meter. The cursor will be blinking on the ten-thousands place. Press the UP or DOWN ARROW key to select the correct value, then press the = key. If the correct number in any of the locations is 0 (zero), just press the = key to enter 0 as the value and move the cursor to the next place. For example, if you are entering 567 hours, you will press the = key twice to leave a 0 for the first two numbers, then use the UP and DOWN ARROW key to scroll through the numbers to enter the correct hours. When the correct hours for Engine Protect Hours has been entered, press the = key to advance to the next hour meter. If an invalid number is entered, a warning message will flash in the MessageCenter. For example, you can not enter a higher number of hours for Engine Protect than the number of Switch On Hours.

**NOTE**

None of the "Total" hour meters are listed. When the hours for all the hour meters are entered, the microprocessor will add the correct hours together and calculate the Total Engine Hours, Total Standby Run Hours and Total Switch On Hours. When the end of the list is reached "PRESS = TO SAVE HOURS" will be displayed. Pressing the = key will save the hours, and return you to the configuration list.

If you do not press the = key, none of the time hours or cycles you just entered will be saved.

Hour meters may be changed for 60 minutes following the initial hour entry. If an error has been made, be certain to correct it within the 60 minute time period. Following that time, the hour meters will count the appropriate hours because the unit switch is on and the unit is operating, and no further manual changes will be allowed.

**NOTES**

1. If a Configuration card will be used to setup the remainder of the microprocessor settings, proceed to Section 5.7.7 after the settings are entered.

2. After the unit specific and time sensitive configuration settings are complete use the UP or DOWN ARROW keys until “CONFIGS COMPLETE, = TO EXIT” is displayed in the MessageCenter. Press the = key to save.

3. If the Configurations, Functional Parameters and DataLink data recorder setup will be set from the keypad and /or ReeferManager, continue with following steps.

### 5.7.4 Configurations Via Keypad

a. Refer to Section 5.2 for a list of available microprocessor Configurations. Refer to Section 5.2.1 for instructions on how to access them.

### 5.7.5 Functional Parameters Via Keypad

a. Refer to Section 3.15 for list of available Microprocessor Functional Parameters and for directions on how to access them.

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

### 5.7.6 DataLink Data Recorder Via ReeferManager

**NOTE**

If the factory settings are used, you can skip this section.

a. Refer to Section 3.18 for list of DataLink data recorder setups.

b. Connect your computer to the download port of the unit and start the ReeferManager program (refer to Section 5.5 step c.). You will need ReeferManager version 03.08.00 or higher.

**NOTE**

ReeferManager 03.08.00 is REQUIRED in order to view, change and send new features to and from the microprocessor.

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

d. 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).

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

f. From the “Confirm Send Information” Pop Up, check the data you want to send and un-check the data you don’t want to send. Click the OK button.

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

**NOTE**

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

### 5.7.7 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 is now accurately 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.

## Table 5-2 Microprocessor Configurations

**NOTE**

Configurations are presented at the beginning of the list and progressing using the green UP arrow key

| Configuration | Selections | Description |
|---|---|---|
| UNIT MODEL NUMBER # | Unit Family types, and then a list of configurable model numbers | Indicates to the microprocessor the model number of the unit. There are several model numbers provided in the list. Scroll to the Vector Family entries and select the model number printed on the Model/Serial Number nameplate. |
| C2 EVAPORATOR | **MHD2200**<br>MHS2200<br>MHD1100<br>MHS1100 | The evaporator model installed in Compartment 2 is entered. |
| C3 EVAPORATOR | **MHD1100**<br>MHS1100<br>MHD2200<br>MHS2200 | The evaporator model installed in Compartment 3 is entered. |
| 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 | This Configuration will display when a replacement microprocessor is installed. It allows entry of the hours (from the existing microprocessor) into replacement microprocessor. This Configuration will only display until one of the hour meters reaches 25 hours. Changes to these values may be made for up to 60 minutes. | |
| AIR HEATER TIME | SHORT<br>LONG<br>**INTAKE HEATER** | Indicates to the microprocessor which engine is in the system<br>LONG = Glow Plug equipped and longer glow times are used (TV engines)<br>SHORT= Glow Plug equipped and shorter glow times are used (DI engines)<br>INTAKE HEATER = Intake Heater equipped (Tier 4 engines).<br>NOTE: Refer to Table 4-1 for glow times. |
| OUT OF RANGE SHUTDOWN | YES / **NO** | YES = When the refrigerated compartment temperature has been out-of-range for 45 minutes, the alarm light will come on, and the unit will shutdown.<br>NO = When the refrigerated compartment temperature has been out-of-range for 30 minutes, the alarm light will come on and the unit will continue to run.<br>Refer to Alarm A53 - "BOX TEMPERATURE OUT OF RANGE", A63 - "C2 BOX TEMPERATURE OUT OF RANGE" or A63 - "C3 BOX TEMPERATURE OUT OF RANGE" (Section 7) for more information. |
| PARAMETERS LOCKOUT: | YES / **NO** | YES = Functional Parameters cannot be changed using the keypad.<br>NO = Functional Parameters can be changed using the keypad, unless individually locked out by Reefer Manager. |
| RPM ALARM SHUTDOWN: | **YES** / NO | YES = When the A39 - "CHECK ENGINE RPM" alarm is active the alarm light will illuminate and the engine will shutdown.<br>NO = When the A39 - "CHECK ENGINE RPM" alarm is activated the alarm light will illuminate and the engine will continue to run. |

Table 5-2. Microprocessor Configurations – Continued

| Configuration | Selections | Description |
|---|---|---|
| LOW PRESSURE SHUTDOWN | **YES** / NO | YES = When the A18 – LOW REFRIGERANT PRESSURE” alarm is active the alarm light will illuminate and the unit will shutdown.<br>NO = When the A18 – LOW REFRIGERANT PRESSURE” alarm is activated alarm light will illuminate and the unit will continue to run. |
| SLP SHUTDOWN DELAY | (0 – 255 seconds in 1 second increments)<br>**255 SECS** | If the Low Pressure Shutdown Configuration is set to YES, shutdown is to be delayed for this amount of time after the Low Pressure Shutdown signal is received.<br>USE FACTORY DEFAULT SETTING ONLY, DO NOT OPERATE UNIT WITH DIFFERENT SETTING. |
| HIGH SUCT PRESS SHUTDOWN | **YES** / NO | YES = When the A27 – HIGH SUCTION PRESSURE alarm is activated the alarm light will illuminate and the unit will shutdown.<br>NO = When the A27 – HIGH SUCTION PRESURE alarm is activated the alarm light will illuminate and the unit will continue to run. |
| CHECK REFRIG SYS | **YES** / NO | YES = When the A28 – “CHECK REFRIG SYSTEM” alarm is activated the alarm light will illuminate and the unit will shutdown.<br>NO = When the A28 – “CHECK REFRIG SYSTEM” alarm is activated the alarm light will illuminate and the unit will continue to run. |
| SUCTION PRESSURE | **30 PSIG (2.0 BAR)**<br>0 – 50 psig (0 to 3.4 bar)<br>[in 1 psig (0.1 bar) increments] | Pressure to maintain if discharge pressure transducer is opened or shorted. |
| COMPRESSOR ALARM SHUTDOWN<br>(This Configuration is an option, it will not display if the option is not installed.) | **YES** / NO | If the “Compressor Alarm Shutdown” option has been installed (refer to Unit Data), this setting will be available.<br>YES = The unit will shutdown and not restart when alarm 13, 17, 18, 27, 28 or 56 occur 3 times within 2 hours of continuous engine operation.<br>NO = Normal shutdown rules for above alarms. |
| CURRENT FOR S/S SHUTOFF | **7.0A**<br>1A TO 10A<br>(in 0.5A increments) | In Start-Stop Operation the charging current must drop below this value before the unit is allowed to shutdown. |
| VOLTAGE FOR S/S RESTART | **12.2V**<br>12.0 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.<br>A lower selection may result in a longer off cycle (based on battery voltage) and possibly overall shorter battery life. A higher selection may result in a shorter off cycle (based on battery voltage) and possibly overall longer battery life. |
| ENG TEMP FOR S/S RESTART | **10°F (-12.2°C)**<br>10°F to 32°F (-12.2°C to 0°C) | The engine will restart from a Start-Stop Off cycle or a Sleep Mode Off cycle when the engine coolant temperature drops to this value. |

Table 5-2. Microprocessor Configurations – Continued

| Configuration | Selections | Description |
|---|---|---|
| ALTERNATOR CHECK SHUTDOWN: | YES / **NO** | YES = When the A51 – "ALTERNATOR NOT CHARGING" alarm is activated the alarm light will illuminate and the unit will shutdown.<br>NO = When the A51 – "ALTERNATOR NOT CHARGING" alarm is activated the alarm light will illuminate and the unit will continue to run. |
| BATT CHARGER (Applicable to unit – not lift gate – battery charger only.) | **NO TEMP SENSOR**<br>WITH TEMP SENSOR | NO TEMP SENSOR = Use this setting when the battery charger does not have the temperature sensor wire.<br>WITH TEMP SENSOR = Use this setting when the battery charger does have the temperature sensor wire (connected to the battery positive post). |
| ENGINE OIL LEVEL SWITCH | YES / **NO** | YES = An Engine Oil Level Switch is installed.<br>NO = An Engine Oil Level Switch is not installed. |
| ENGINE OIL LEVEL SHUTDOWN | YES / **NO** | YES = When the A2 – "LOW ENGINE OIL LEVEL" alarm is activated the alarm light will illuminate and the unit will shutdown.<br>NO = When the A2 – "LOW ENGINE OIL LEVEL" alarm is activated the alarm light will illuminate and the unit will continue to run. |
| LOW COOLANT LEVEL | YES / **NO** | YES = A Coolant Level Sensor is installed.<br>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.<br>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.<br>NO = A21 will not be activated. |
| FUEL SENSOR | **NO DEVICE**<br>SWITCH INSTALLED<br>0–5 VDC<br>0.25–4.75 VDC | NO DEVICE = There is no fuel level sensor installed in the fuel tank.<br>SWITCH INSTALLED = A low fuel level switch is installed in the fuel tank.<br>0–5 VDC = An older style low fuel level sensor (5 bolt mounting flange) with a 0 to 5 VDC signal range is installed in the fuel tank.<br>0.25–4.75 VDC = A low fuel level sensor with a 0.25–4.75 VDC signal range is installed in the fuel tank. (Sensor with 1/2" MPT mounting or newer ultrasonic sensor.)<br>If a low fuel level sensor (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%. |

**Table 5-2. Microprocessor Configurations – Continued**

| Configuration | Selections | Description |
|---|---|---|
| FUEL TANK SIZE | **OFF**<br>30 Gallons<br>50 Gallons<br>75 Gallons<br>100 Gallons<br>120 Gallons | OFF = No fuel sensor is installed in the tank.<br>30 to 120 GALLON = Size fo fuel tank installed.<br>(Refer to Fuel Sensor Configuration for additional information) |
| DIESEL MAX GEN AMPS | **25A**<br>10 TO 35<br>in 0.5A increments | Indicates to the microprocessor the maximum allowable amperage in Diesel operation.<br>USE FACTORY DEFAULT SETTING ONLY, DO NOT OPERATE UNIT WITH DIFFERENT SETTING. |
| STANDBY MAX GEN AMPS | **25A**<br>10 TO 35<br>in 0.5A increments | Indicates to the microprocessor the maximum allowable amperage in Standby operation.<br>USE FACTORY DEFAULT SETTING ONLY, DO NOT OPERATE UNIT WITH DIFFERENT SETTING. |
| STARTUP MAX GEN AMPS | **17A**<br>10 TO 35<br>in 0.5A increments | Indicates to the microprocessor the maximum allowable amperage during start up.<br>USE FACTORY DEFAULT SETTING ONLY, DO NOT OPERATE UNIT WITH DIFFERENT SETTING. |
| DIESEL OFFSET MAX AMPS | **4A**<br>0 TO 10<br>in 0.5A increments | The maximum allowable amperage in low speed operation will be the configured MAX GEN AMPS or MAX STANDBY AMPS less this value.<br>USE FACTORY DEFAULT SETTING ONLY, DO NOT OPERATE UNIT WITH DIFFERENT SETTING. |
| STANDBY STARTUP DELAY | **OFF**<br>5 Seconds<br>10 Seconds<br>15 Seconds<br>20 Seconds<br>RANDOM | Indicates to the microprocessor the delay for this unit when starting in standby.<br>This setting is used when multiple units are on the same line to stagger the occurrence of high inrush current in situations such as restart after a power loss.<br>If RANDOM is chosen a random time between 0 and 120 seconds will be used. “UNIT WILL START IN XX SECONDS” will display during the count down period. |
| DISPLAY TOTAL ENGINE HR | **YES** / NO | YES = This hour meter will be displayed during the startup messaging sequence and will be in hour meter menu.<br>NO = This hour meter will not be displayed during the startup messaging sequence. It will be displayed with the “other meters and counters”. |
| DISPLAY STANDBY RUN HR | **YES** / NO | YES = This hour meter will be displayed during the startup messaging sequence and will be in hour meter menu.<br>NO = This hour meter will not be displayed during the startup messaging sequence. It will be displayed with the “other meters and counters”. |
| DISPLAY TOTAL SWITCH ON HR | **YES** / NO | YES = This hour meter will be displayed during the startup messaging sequence and will be in hour meter menu.<br>NO = This hour meter will not be displayed during the startup messaging sequence. It will be displayed with the “other meters and counters”. |

**Table 5-2. Microprocessor Configurations – Continued**

| Configuration | Selections | Description |
|---|---|---|
| DIESEL RESET VALUE<br>(Refer to Table 8-1 for oil/filter change intervals.) | **0FF**<br>50 TO 30,000 hours in 50 hour increments | When the engine maintenance hour meter is reset, the value selected here will be added to the to the present meter reading to indicate to the microprocessor when the next service interval alarm will be activated. If the value entered is "0" the alarm feature is turned off. |
| STANDBY RESET VALUE | **0FF**<br>50 TO 30,000 hours in 50 hour increments | When the standby maintenance hour meter is reset, the value selected here will be added to the to the present meter reading to indicate to the microprocessor when the next service interval alarm will be activated. If the value entered is "0" the alarm feature is turned off. |
| SWITCH ON RESET VALUE | **0FF**<br>50 TO 30,000 hours in 50 hour increments | When the switch on maintenance hour meter is reset, the value selected here will be added to the to the present meter reading to indicate to the microprocessor when the next service interval alarm will be activated. If the value entered is "0" the alarm feature is turned off. |
| PM 1 – 5 (Preventative Maintenance Hour meters) | **OFF**<br>ENGINE PROTECT HOURS<br>SWITCH ON PROTECT HOURS<br>STANDBY HOURS<br>START CYCLES<br>HIGH SPEED HOURS<br>COMPRESSOR RUN HOURS<br>MAINTENANCE DAYS | OFF = This selection will turn this meter OFF (will not display).<br>ENGINE HOURS = this meter will count the engine hours until the next reset interval.<br>SWITCH ON HOURS = this meter will count the switch on hours until the next reset interval.<br>STANDBY HOURS = this meter will count the standby hours until the next reset interval.<br>START CYCLES = this meter will count how many times the engine has started until the next reset interval.<br>HIGH SPEED HOURS = this meter will count the number of hours the engine operated in high speed until the next reset interval.<br>COMPRESSOR RUN HOURS = this meter will count the number of hours the compressor has operated until the next reset interval.<br>MAINTENANCE DAYS = this meter will count the number of days until the next reset interval. |

Table 5-2. Microprocessor Configurations – Continued

| Configuration | Selections | Description |
|---|---|---|
| § PM 1 – 5 RESET INTERVAL<br>Note:<br>This Configuration will not display for those meters that are configured OFF. | **OFF**<br>ENGINE PROTECT HOURS<br>0 or 50 TO 30,000 hours in 50 hour increments<br>SWITCH ON PROTECT HOURS<br>0 or 50 TO 30,000 hours in 50 hour increments<br>STANDBY HOURS<br>0 or 50 TO 30,000 hours in 50 hour increments increments<br>START CYCLES 0 or 1,000 TO 90,000 CYCLES in 1,000 cycle increments<br>HIGH SPEED HOURS<br>0 or 50 TO 30,000 hours in 50 hour increments<br>COMPRESSOR RUN HOURS<br>0 OR 50 to 30,000 hours in 50 hour increments<br>MAINTENANCE DAYS<br>0 OR 10 to 990 days in 10 day increments | The value to be entered here is the desired number of hours, cycles or days between PM Maintenance Alarms for this meter.<br>When the meter is reset, the value selected here will be added to the to the present meter reading to indicate to the microprocessor when the next service interval alarm is to be activated.<br>When a PM hour meter is configured as a Maintenance Days meter, that meter will not count a specific instance such as hours of operation or number of cycles for a particular component. The meter is connected to the real time clock and will activate the alarm after the entered number of days has elapsed. |
| RANGE 1 LOCK<br>OR<br>RANGE 2 LOCK<br>(Applies to Compartment 1 setpoint only, however, all compartments will be affected by the lock.) | **OFF**<br>START-STOP<br>CONTINUOUS | OFF = If both Range Locks are OFF, the unit will operate normally.<br>If either Range 1 or Range 2 is not OFF, the unit will operate as selected whenever the setpoint is within that range<br>START-STOP = The unit will always operate in Start-Stop whenever the setpoint is between the minimum & maximum temperatures for that range (see the following sub-configurations).<br>CONTINUOUS = The unit will always operate in Continuous Run whenever the setpoint is between the minimum & maximum temperatures for that range (see the following sub-configurations). |
| • RANGE 1 (or 2) MINIMUM TEMPERATURE | -22°F TO **94.1**°F (-30°C to **34.5**°C) in 0.1°F or °C increments | Select the lowest temperature desired for this Range. |
| • RANGE 1 (or 2) MAXIMUM TEMPERATURE | -22°F TO **94.1**°F (-30°C to **34.5**°C) in 0.1°F or °C increments | Select the highest temperature desired for this range. |

**Table 5-2. Microprocessor Configurations – Continued**

| Configuration | Selections | Description |
|---|---|---|
| MIN SETPOINT<br>(Applies to Compartment 1) | **–22°F** TO 94.1°F (**–30°C** to 34.5°C) in 0.1°F or °C increments | Indicates to the microprocessor the desired minimum allowable set point . |
| MAX SETPOINT<br>(Applies to Compartment 1) | –22°F TO 94.1**°F** (–30°C to 34.5**°C**) in 0.1°F or °C increments | Indicates to the microprocessor the desired maximum allowable setpoint. |
| C2 MINIMUM SETPOINT<br>OR<br>C3 MINIMUM SETPOINT | **–22°F** TO 94.1°F (**–30°**C to 34.5°C) in 0.1°F or °C increments | Indicates to the microprocessor the desired minimum allowable set point . |
| C2 MAXIMUM SETPOINT<br>OR<br>C3 MAXIMUM SETPOINT | –22°F TO 94.1**°F** (**–30°C** to 34.5**°C**) in 0.1°F or °C increments | Indicates to the microprocessor the desired maximum allowable setpoint. |
| NO A/C POWER | **ALARM & SHUTDOWN**<br>SWITCH TO ENGINE | ALARM & SHUTDOWN = If standby power is lost unit is to shutdown<br>SWITCH TO ENGINE = If standby power is lost engine will be started. |
| S/S PARAMETERS | **TOGETHER**<br>SEPARATE | TOGETHER = When the Minimum Run Time, Minimum Off Time, Restart Temperature, 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.<br>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 (or 2)<br>(2 Compartment units only) | ON / **OFF** | ON = A remote sensor has been added to the unit, and connected into the wire harness.<br>OFF = There is no Remote Sensor (1or 2) in this unit. |

**Table 5-2. Microprocessor Configurations - Continued**

| Configuration | Selections | Description |
|---|---|---|
| **DOOR SWITCH - FOR TWO COMPARTMENT UNITS ONLY** | | |
| DOOR SWITCH | **SWITCH NOT INSTALLED**<br>DOOR OPEN SWITCH OPEN<br>DOOR OPEN SWITCH CLOSED | SWITCH NOT INSTALLED = There is no door switch.<br>DOOR OPEN SWITCH OPEN = A Door Switch has been installed. The switch contacts will be OPEN whenever the door is OPEN.<br>DOOR OPEN SWITCH CLOSED = A Door Switch has been installed. The switch contacts will be CLOSED whenever the door is OPEN. |
| • DOOR SWITCH<br>NOTE: door switch alarms are not moved to inactive memory when the door is closed, this prevents "Inactive Alarm In Memory" messages caused by door openings. | **ALARM ONLY**<br>UNIT SHUTDOWN<br>LOW ENGINE SPEED<br>DATA RECORDER ONLY | ALARM ONLY = When Door Switch indicates that the door is open, a warning alarm will be displayed in the MessageCenter.<br>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. If this setting is chosen the following "unit shutdown below" setting will also be available.<br>LOW ENGINE SPEED = When Door Switch indicates that the door is open, the engine will be forced to low speed. If this setting is chosen the following "run low speed below" setting will also be available.<br>NOTE<br>The DataLink data recorder will record every time the door is opened or closed when using any of the preceding alarm/shutdown/speed change settings.<br>DATA RECORDER ONLY = The DataLink data recorder will record every time the door is opened or closed. There will be no alarms or messages displayed in the MessageCenter. |
| • • UNIT SHUTDOWN BELOW<br>(temperature) | **OFF**<br>120 to -20°F (49 to -29°C) | If Door Switch= Unit Shutdown is selected:<br>OFF = the unit will shutdown at any ambient temperature.<br>Value = when ambient temperature is below the entered value, shutdown will be allowed. (When ambient temperature is above the entered value, the unit will not shutdown.) |
| • • RUN LOW SPEED BELOW<br>(temperature) | **OFF**<br>120 to -20°F (49 to -29°C) | If Door Switch= Low Engine Speed is selected:<br>OFF = the unit will transition to low speed at any ambient temperature.<br>Value = when ambient temperature is below the entered value, the engine will be forced to low speed will be allowed. (When ambient temperature is above the entered value, the engine will not be forced to low speed.) |

**Table 5-2. Microprocessor Configurations - Continued**

| Configuration | Selections | Description |
|---|---|---|
| **DOOR SWITCH - FOR THREE COMPARTMENT UNITS ONLY** | | |
| DOOR SWITCH<br>NOTE<br>On a three compartment unit, the door switch controls Compartment 3. If the configuration is set for a switch, not for a panel, the following sub configuration will also be available. | **SWITCH NOT INSTALLED**<br>DOOR OPEN SWITCH OPEN<br>DOOR OPEN SWITCH CLOSED<br>REMOTE PANEL (C3) | SWITCH NOT INSTALLED = There is no door switch.<br>DOOR OPEN SWITCH OPEN = A Door Switch has been installed. The switch contacts will be OPEN whenever the door is OPEN.<br>DOOR OPEN SWITCH CLOSED = A Door Switch has been installed. The switch contacts will be CLOSED whenever the door is OPEN.<br>REMOTE PANEL = If set to this value, the remote panel SYSTEM ON/OFF key will be enabled. The switch panel mounted Main Power switch must be toggled out of the OFF position and the remote panel SYSTEM ON/OFF key must be pressed for the compartment to operate. |
| • DOOR SWITCH SHUTDOWN | **ALARM ONLY**<br>COMPARTMENT SHUTDOWN<br>LOW ENGINE SPEED<br>DATA RECORDER ONLY | ALARM ONLY = When Door Switch indicates that the door is open, a warning alarm will be displayed in the MessageCenter.<br>COMPARTMENT SHUTDOWN = When Door Switch indicates that the door is open, a warning alarm will be displayed in the MessageCenter, and the compartment will shutdown. |
| REMS1 (Remote Switch 1)<br>OR<br>REMS2 (Remote Switch 2)<br>NOTE<br>REMS1 controls Compartment 1 while REMS2 controls Compartment 2. If the configuration is set for a switch, not for a panel, the following sub configuration will also be available. | **NOT INSTALLED**<br>DOOR OPEN SWITCH OPEN<br>DOOR OPEN SWITCH CLOSED<br>SWITCH ON CONTACTS OPEN<br>SWITCH ON CONTACTS CLOSED<br>REMOTE PANEL (C1 or C2) | Switch not installed = There is no remote switch or panel.<br>DOOR OPEN SWITCH OPEN = The remote switch will be used as a door switch. The switch contacts will be OPEN whenever the door is OPEN.<br>DOOR OPEN SWITCH CLOSED = The remote switch will be used as a door switch. The switch contacts will be CLOSED whenever the door is OPEN.<br>SWITCH ON CONTACTS OPEN = The remote switch will be used as a remote control switch. The switch contacts will be OPEN whenever the switch is in the ON position.<br>SWITCH ON CONTACTS CLOSED = The remote switch will be used as a remote control switch. The switch contacts will be CLOSED whenever the switch is ON.<br>REMOTE PANEL (C1 or C2) = If set to this value, the remote panel SYSTEM ON/OFF key will be enabled. The switch panel mounted Main Power switch must be toggled out of the OFF position and the remote panel SYSTEM ON/OFF key must be pressed for the compartment to operate. However, if the Override Remote Switch 1 or 2 Functional Parameter is set to YES, the remote panel is disabled. |

**Table 5-2. Microprocessor Configurations - Continued**

| Configuration | Selections | Description |
|---|---|---|
| • REMS1<br>OR<br>• REMS2 | **ALARM ONLY**<br>UNIT SHUTDOWN<br>LOW ENGINE SPEED<br>DATA RECORDER ONLY | ALARM ONLY = When the switch is activated, a warning alarm will be displayed in the MessageCenter.<br>UNIT SHUTDOWN = When the switch is activated, a warning alarm will be displayed in the MessageCenter, and the compartment (REMS1 = Compartment 1: REMS2 = Compartment 2) will shutdown.<br>LOW ENGINE SPEED = When the switch is activated, the engine will be forced to low speed.<br>DATA RECORDER ONLY = The DataLink data recorder will record every time the the switch is activated. There will be no alarms or messages displayed in the MessageCenter. |
| SET TIME | Indicates to the microprocessor the time and date for the DataLink data recorder Real Time Clock . | |
| • 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. |
| S/S COMPARTMENT MODE | **STANDARD**<br>ECONOMY | STANDARD = When individual compartments reach setpoint and cycle off, and the unit continues to run due to another compartment not yet in range, or another stop parameter has not been reached, the off compartment will cycle back on when the temperature in that compartment moves above setpoint more than 3.6°F (2.0°C) or below setpoint 5.5°F (3.0°C), when the setpoint is in the perishable range, or 1.8°F (1.0°C), when in the the frozen range.<br>ECONOMY = When individual compartments reach setpoint and cycle off, and the unit continues to run due to another compartment not yet in range, or another stop parameter has not been reached, the off compartment will cycle back on when the temperature in that compartment moves above or below setpoint by the Off Time Override Temperature Functional Parameter setting. |
| FRESH NULL MODE FANS | STAY ON/ **CYCLE OFF** | STAY ON = The evaporator fan will operate<br>CYCLE OFF = The evaporator fan will cycle off unless the setpoint is between 14 to 41°F (-10 to-5°C) in which case they will remain on. |
| FROZEN NULL MODE FANS | STAY ON/ **CYCLE OFF** | STAY ON = The evaporator fan will operate<br>CYCLE OFF = The evaporator fan will not operate |

Table 5–2. Microprocessor Configurations – Continued

| Configuration | Selections | Description |
|---|---|---|
| FROZEN COMPARTMENT PRIORITY | **OFF**<br>ON<br>HIGH CAPACITY | OFF = Frozen priority cooling is not active.<br>ON = Frozen priority cooling is active<br>HIGH CAPACITY = Frozen priority is active and compartments will be operated with the compartment having a frozen setpoint given additional capacity. |
| • FROZEN PRIORITY TIME | 5 to 60 minutes in 1 minute increments<br>**Default = 5 minutes** | When Frozen Priority Cooling is active, this is the amount of time priority will be given to the compartment with a frozen setpoint. |
| • NON–PRIORITY TIME | 5 to 60 minutes in 1 minute increments<br>**Default = 5 minutes** | When Frozen Priority Cooling is active, this is the amount of time priority will be given to the compartment with a perishable setpoint. |
| • PERISHABLE OVERRIDE TEMPERATURE | **OFF**<br>3.6 to 27_F (2 to 15_C). | When temperature in the compartment rises above setpoint by this setting, Priority Cooling shall be suspended. |
| NATURAL DEFROST | YES **/ NO** | YES = Natural defrost will be allowed<br>NO = Natural defrost will not be allowed<br>Refer to Section 4.6 for more information on natural defrost) |
| 8 HOURS ADDITIONAL DATA: | **YES** / NO | YES = When the Main Power switch is placed in the OFF position, the DataLink data recorder will continue to record data for an additional 8 hours.<br>NO = When the Main Power switch is placed in the OFF position, the DataLink data recorder will stop recording data. |
| HIGH SPEED DELAY | **1 Minute**<br>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<br>(This Configuration is an option, it will not display if the option is not installed.) | **OTHER**<br>QUALCOMM | OTHER = The microprocessor is set for communication from Qualcomm T2 (Trailer Tracs 2) or any other supplier.<br>QUALCOMM =– The microprocessor is set for communication from Qualcomm Trailer Tracs. |
| UNIT OPERATION | **STANDARD**<br>RAIL | STANDARD = The microprocessor is set to control trailer refrigeration operation.<br>RAIL = Not recommended for Vector MT |
| SUPPLY AIR LIMIT FOR S/S (Applies to Compartment 1) | –2.7° to –21.6° F (–1° to –12°C) in 0.5°F or °C increments.<br>**DEFAULT: –21.6°F (–12°C)** | Value to be used to calculate the lowest allowable supply air temperature, when in Start–Stop Operation, in accordance with the formula “Setpoint + this value = coldest allowable supply air temperature“. For example:<br><br>Fahrenheit: if the setpoint is 35°F and the Configuration value is set at –10°F the calculation is 35 + (–10) = 25°F lowest allowed supply air temperature.<br><br>Celsius: if the setpoint is 2°C and the Configuration value is set at –6°C the calculation is 2 + (–6) = –4°C lowest allowed supply air temperature. |

### Table 5–2. Microprocessor Configurations – Continued

| Configuration | Selections | Description |
|---|---|---|
| SUPPLY AIR LIMIT FOR CONT (Applies to Compartment 1) | –2.7° to –21.6° F (–1° to –12°C) in 0.5°F or °C increments. **DEFAULT: –4.5°F (–2.5°C)** | Value to be used to calculate the lowest allowable supply air temperature, when in Continuous Operation, in accordance with the formula "Setpoint + this value = coldest allowable supply air temperature". For example: Fahrenheit: if the setpoint is 35°F and the Configuration value is set at –10°F the calculation is 35 + (–10) = 25°F lowest allowed supply air temperature. Celsius: if the setpoint is 2°C and the Configuration value is set at –6°C the calculation is 2 + (–6) = –4°C lowest allowed supply air temperature. |
| SAT2 | **NOT INSTALLED** INSTALLED | NOT INSTALLED = A supply air sensor (SAT2) is not installed in the remote evaporator. INSTALLED = A supply air sensor (SAT2) is installed in the remote evaporator. If this setting is chosen the following sub–settings will also be available. |
| C2 SUPPLY AIR LIMIT FOR S/S (Applies to Compartment 2) | –2.7° to –21.6° F (–1° to –12°C) in 0.5°F or °C increments. **DEFAULT: –21.5°F (–12°C)** | Value to be used to calculate the lowest allowable supply air temperature, when in Start–Stop Operation, in accordance with the formula "Setpoint + this value = coldest allowable supply air temperature". For example: Fahrenheit: if the setpoint is 35°F and the Configuration value is set at –10°F the calculation is 35 + (–10) = 25°F lowest allowed supply air temperature. Celsius: if the setpoint is 2°C and the Configuration value is set at –6°C the calculation is 2 + (–6) = –4°C lowest allowed supply air temperature. |
| C2 SUPPLY AIR LIMIT FOR CONT (Applies to Compartment 2) | –2.7° to –21.6° F (–1° to –12°C) in 0.5°F or °C increments. **DEFAULT: –5°F (–2.7°C)** | Value to be used to calculate the lowest allowable supply air temperature, when in Continuous Operation, in accordance with the formula "Setpoint + this value = coldest allowable supply air temperature". For example: Fahrenheit: if the setpoint is 35°F and the Configuration value is set at –10°F the calculation is 35 + (–10) = 25°F lowest allowed supply air temperature. Celsius: if the setpoint is 2°C and the Configuration value is set at –6°C the calculation is 2 + (–6) = –4°C lowest allowed supply air temperature. |
| HIGH SPEED PULLDOWN (Applies to operation with only Compartment 1 enabled.) | YES / **NO** | YES = The unit will remain in high speed 6 cylinder cooling until the compartment temperature has dropped to less than 0.36°F (0.2°C) above setpoint. NO = Normal unit operation. |
| CONFIG COMPLETE | Press the "=" key to exit configurations | |

# SECTION 6 – MESSAGECENTER

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6

# 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 3.13 for a list of Unit Data messages. Refer to Section 3.15 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 and 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 key 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 key 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 Option PC Card has been inserted into the PC Card slot. Press the = key to install the option into the microprocessor. The number of installs remaining on the PC Card will be shown. |
| ACTIVE ALARM LIST CLEARED | The list of active alarms in the microprocessor has been erased. (This does *not* remove alarms from the DataLink data recorder.) |
| ALL ALARMS CLEARED | The list of active and inactive alarms in the microprocessor alarm lists have been erased. (This does *not* remove alarms from the DataLink data recorder.) |
| ALL INFO LOADED – REMOVE CARD | All data has been loaded into the microprocessor from the PC Card. The card may be safely removed from the microprocessor. |
| BACK TO CONFIGS | Pressing the = key with this message showing will return the user to the main microprocessor Configuration list. |
| BACK TO FUNC PARAMS | Pressing the = key with this message showing will return the user to the main Functional Parameter list. |
| BAD PC CARD OR CARD SLOT | The microprocessor has detected a problem with either the PC card or the PC card slot. |
| BUZZER OFF IN X MINS | The Buzzer circuit has been energized in Component Test Mode. The Buzzer circuit will continue to be energized for the number of minutes shown. |
| CALIBRATION UNSUCCESSFUL | An attempt to calibrate the discharge transducer failed. |
| CANNOT ENTER TRIP START | Cannot enter Trip Start. A problem has been detected within the DataLink data recorder. |
| CANNOT START DEFROST CYCLE | Due to current unit conditions, the defrost cycle cannot be started. Refer to Defrost Sections 3.9 and 8.8.9. |
| CANNOT START PRETRIP | Due to current unit conditions a Pretrip test cannot be started. Refer to Pretrip Section 3.4. |
| CANNOT DOWNLOAD – BATTERY TOO LOW | Data cannot be downloaded and software upgrades are prohibited when battery voltage is below 7.0 volts. This message will be displayed until the serial cable is removed. |
| CARD FULL, REMOVE CARD | The PC Download Card is full. There is no additional room to download information from the microprocessor. You may safely remove the PC Card from the slot. |

| MessageCenter MESSAGES – Continued | |
|---|---|
| **Message** | **Description** |
| 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 the = key to load configurations into microprocessor. |
| CHARGE MODE–HOLD=TO EXIT | Service Mode has the refrigeration system set so that it can be charged with refrigerant through the liquid line service valve. Press the = key to manually exit, or wait until the charging is complete. |
| CHECK AT NEXT SERVICE INTERVAL | The unit needs to be checked at next service interval.<br>There is currently an active non–shutdown alarm in the alarm list. |
| CHECK DOOR | Door switch indicates that a refrigerated compartment door is not closed. |
| CHECK FUEL LEVEL<br>(Requires Optional Sensor) | The level in the fuel tank is very close to empty. |
| CHK WIRES FROM MICRO TO KEYPAD | There is a communication signal lost between the keypad, display and control module. Check and test the wiring to the keypad/display |
| COMPONENT TEST MODE | Pressing the = key while this message is being displayed will allow user access to Component Test Mode. |
| CONFIG ERROR, REMOVE CARD | There was an error configuring the microprocessor 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 UP or DOWN ARROW key will start list over. Press the = key to exit Configuration List. |
| CONFIGURATION MODE | Press the = key to enter Configuration Mode. |
| CONFIGURATION NOT CHANGED | New configuration selection was not entered (saved) within the 5 second time limit. |
| 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 | The unit operating mode has been changed from Start-Stop to Continuous Run. |
| COPY COMPLETE, REMOVE CARD XX | A DownLoad PC Card has been inserted into the PC Card slot, and all data from the DataLink 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.<br>XX indicates the 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 DataLink data recorder is being copied onto the PC Card. DO NOT REMOVE THE CARD WHILE THIS MESSAGE IS BEING DISPLAYED. |
| DATA RECORDER FAILURE | The microprocessor has stopped recording Unit Data. |
| DEFROST CYCLE STARTED | The unit has gone into defrost. |
| DOOR OPEN | A refrigerated compartment door is open. |

**MessageCenter MESSAGES – Continued**

| Message | Description |
|---|---|
| DOOR OPEN – LOW SPEED | A refrigerated compartment door is open forcing the unit to run in low speed. |
| ENTERING SERVICE MODE | The initial message for Service Mode. |
| ERROR: ENG HRS > SWITCH ON HRS | When setting up a replacement microprocessor, incorrect hours have been entered |
| ERROR: HI SP HRS > TOTAL ENG HRS | |
| ERROR: SBY HRS > SWITCH ON SBY HRS | |
| EVAC / CHARGE MODE | The unit is in Service Mode, and the refrigeration system is ready to be evacuated then charged with refrigerant. Refer to Section 5.2.3. |
| EXITING PRETRIP MODE | Pretrip has been aborted either by user or by a pretrip alarm. |
| EXITING SERVICE MODE | Service Mode has been turned off and unit is returning to normal operation. |
| FORCED LOW ENGINE SPEED | Due to current ambient conditions and power requirements, the engine is being set to operate in Low Speed. (See Section 4.8.3, step 1 for more information.) |
| 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 hour meters in either the configuration or functional parameter lists. |
| INACTIVE ALARMS IN MEMORY | There are inactive alarms in the microprocessor alarm list which have not yet been cleared. |
| INSTALLED, REMOVE CARD XX | An Option PC Card has been inserted into the PC Card slot, and the option has been installed in the microprocessor. The PC Card may safely be removed from the slot. XX indicates the 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 microprocessor. 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. |
| KEYPAD LOCKED–BATTERY TOO LOW | Once the battery voltage goes below 7.0 Volts for 10 seconds, all of the keys on the keypad will be locked. |
| LIST END, = TO CLEAR ALARMS | The end of the Alarm list has been reached. Pressing the = key will clear the Alarm list. |
| LOADING INFO | A Configuration PC Card has been inserted into the PC Card slot, and information from the card is being loaded into the microprocessor. 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 RESET & RESTART NOW | The microprocessor Program software has just been changed, or a new configuration has been programmed into the microprocessor. The microprocessor will turn itself off then on again (similar to a computer reboot) in order for the changes to be effective. |
| MICRO WILL STOP IN XXX SECONDS | The Main Power switch has been placed in the OFF position and the system valves are closing. The display will turn off when the count down reaches zero. |

| MessageCenter MESSAGES – Continued | |
|---|---|
| **Message** | **Description** |
| MIN SETPOINT HAS BEEN REACHED | Minimum setpoint allowed by configuration settings has been reached. |
| MODEL # ERASED – PRESS = TO SELECT | If software has been installed that does not support the model selected, the model selection will be erased. The operator will be prompted to select from the model family & model number list contained in the new software. |
| 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 microprocessor. Press the = key 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 microprocessor. The PC Card may be safely removed from the slot. |
| NO ACTIVE ALARMS | There are no active alarms in the microprocessor 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 DataLink 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 SW:CANNOT LOAD–REMOVE CARD | A Program PC Card has been inserted into the PC Card slot, and the major version of the program on the PC Card is an older version than what is already loaded in the microprocessor. Software with older major versions can not be loaded into the microprocessor. Remove the PC Card. |
| OLD SW, = TO LOAD, ↑ TO CANCEL | A Program PC Card has been inserted into the PC Card slot, and the minor version of the program on the PC Card is an older version than what is already loaded in the microprocessor. Press the = key to load the older program. |
| PC MODE | The Main Power switch is in the OFF position, the PC Mode Jumper is connected and engine is not running in order to enter PC Mode. |
| 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. |
| PRESS = TO MARK TRIP START | Press the = key to mark the start of the trip in the DataLink data recorder. |
| PRESS = TO START PRETRIP | Press the = key to begin pretrip tests. |
| PRETRIP FAIL & COMPLETED | The Pretrip test is completed, and some of the pretrip tests did not pass. Check the Alarm List for pretrip alarms. |
| PRETRIP FAIL IN TEST XX | Some of the pretrip tests did not pass and the pretrip was not completed. Check the Alarm List for pretrip alarms. |
| PRETRIP PASS | All of the pretrip tests were ok. |
| PRETRIP STOPPED BY USER | Pretrip has been stopped by user. |
| READY TO INSTALL SOFTWARE | The microprocessor has been forced into Program Install Mode. If this message does not clear after loading the current version of software, check for a shorted circuit between 5MP5 and 5MP6. |

| MessageCenter MESSAGES – Continued | |
|---|---|
| **Message** | **Description** |
| 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 CARD – BATTERY TOO LOW | If a PC card is inserted when battery is below 7.0 volts this message will be displayed until card is removed. |
| REMOTE SWITCH 1 (2) OPEN | Remote switch is open. May be connected to a refrigerated compartment door or a remote control switch. |
| REMOTE SWITCH 1 (2) OPEN – LOW SPEED | Shows that the remote switch is open and that the unit is running in low speed. Switch may be connected to a refrigerated compartment door or a remote control switch. |
| 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 microprocessor. Press the = key to reload the same program or press the UP ARROW key to cancel and remove card. |
| SERVICE MODE | Selection in Configuration and Technician Test Modes which is used when servicing the refrigeration system. Refer to Section 5.2.3. |
| SETPOINT CHANGED | The new setpoint has been entered (saved into microprocessor memory), the new setpoint will be used. |
| SETPOINT NOT CHANGED | The new setpoint has NOT been entered (NOT saved into microprocessor memory), the old setpoint will be used. |
| SETTING SMV: XXX % | The Main Power switch has been toggled out of the OFF position and the CSMV is opening. |
| SLEEP MODE, OFF / ON TO WAKE | The unit is cycled off in Sleep Mode. Place the Main Power switch in the OFF position, then back to the desired position to wake the microprocessor up. |
| SLEEP WARNING: DOOR OPEN | The unit is configured for Rail Mode and the unit is in Sleep Mode and a refrigerated compartment door is open. The unit will start as needed for Sleep Mode. |
| SLEEP WARNING: NO TEMP CONTROL | The unit is running in Sleep Mode to charge the battery and (in Engine Operation) warm the engine coolant. It is not running to provide temperature control. |
| SLEEP WARNING: REMS1(2) OPEN | The unit is configured for Rail Mode and the unit is in Sleep Mode and a remote switch is open. The switch may be connected to a refrigerated compartment door or to a remote control switch. The unit will start as needed for Sleep Mode. |
| SMV CLOSING: WAIT XXX SECONDS | Power Up and the CSMV is closing. XX indicates the number of seconds remaining until valve is fully closed. |
| START STOP LOCKED | The setpoint has been locked into Start–Stop Operation. Continuous Run can not be selected. |
| START–STOP MODE SELECTED | Start–Stop Operation has been selected. |
| STATUS OK – COMPARTMENT X | The compartment (“X” = 1 OR 2) is operating correctly. |
| 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) XX% COMPLETE | Pretrip is currently running this test and is XX% complete. |
| TIME SELECTION NOT CHANGED | A time change was started but not entered (saved) in Configuration List. |
| TRIP START ENTERED | The Trip Start marker has been placed in the DataLink data recorder. |
| UNIT BATTERY TOO LOW | The unit battery has dropped below 7 volts for more than 10 seconds. |

| MessageCenter MESSAGES – Continued | |
|---|---|
| **Message** | **Description** |
| UNIT SHUTDOWN – DOOR OPEN | The unit has shutdown because the refrigerated compartment door is open. |
| UNIT SHUTDOWN – SEE ALARM LIST | An active shutdown alarm has shut the unit down. |
| UNIT SHUTDOWN – RMS1(2) | The unit has shutdown because switch is open. May be connected to a door or a remote control switch. |
| UNIT WILL START IN XX SECONDS | The unit has been shutdown on a loss of power with the Standby Startup Delay set to random and the seconds remaining before start up are counting down. |
| UNKNOWN CARD – REMOVE CARD | A defective or different type of PC Card has been inserted into the PC Card slot. The microprocessor can not recognize any data on the card. The card may be safely removed from the microprocessor. |
| WARNING: DIESEL RESTART ON | When electric power is not available while the unit is operating in Standby Operation, the unit will switch to Engine Operation. |
| WARNING: NO TEMP CONTROL | The temperature sensor(s) have failed in one or more compartments and the compartment has entered Cargo Protect Mode. Refer to Section 4.8.1. |
| WRONG SW FOR MODEL = TO LOAD | If the software on the program PC card does not support the currently selected unit model number this message will be displayed. This will not prevent installation of the software but cautions the operator that the currently selected model number is not supported or available with this software version. |
| WRONG UNIT TYPE, REMOVE CARD | A configuration 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 microprocessor. The card may be safely removed from the microprocessor. |

# SECTION 7 – ALARM TROUBLESHOOTING



7

# SECTION 7

# ALARM TROUBLESHOOTING

**WARNING**

**Advance microprocessor equipped units may start automatically at any time the Main Power switch is not in the OFF position. Also, the unit may be fitted with two way communication equipment that will allow starting of the unit from a remote location even though the switch is in the OFF position.**

**WARNING**

**Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instructions, ensure the Main Power switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection.**

## 7.1 INTRODUCTION

This section provides guidance for troubleshooting alarms. The alarm light will be illuminated when there is one (or more) alarm(s) stored in the microprocessor. Instructions for reviewing the alarm lists are provided in sections 3.11 & 3.12.

When an alarm occurs, look through both Active and Inactive alarm lists in the microprocessor and make note of all alarms. Each alarm begins with an A (active) or I (inactive) followed by an alarm number and description. Alarms are listed in this guide by alarm number in ascending order.

Before beginning to actually troubleshoot an alarm, 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.

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

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 lead a to the use of a different order. For example, if the trailer is loaded, condensing unit checks should be done first, even though some evaporator section checks may be listed before them.

When the cause of the problem is corrected, it is not necessary to continue through the remainder of the steps. Some active alarms will inactivate themselves automatically once the cause has been corrected. Alarms that do not inactivate themselves automatically must be cleared manually. (See Note 1 page 7-2.)

When repairs are completed, run the unit through a Pretrip cycle and verify that no further active alarms occur. Also, the inactive alarm list should be cleared so that there are no 'old' alarms in memory when the unit leaves the repair facility.

If the message **CHECK 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 to check), and at connector 6MP 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 gauge set should always be installed. It is not necessary to connect an additional high pressure gauge at the liquid line service valve. The compressor suction pressure, compressor discharge pressure and evaporator outlet pressure can be read in the Unit Data.

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

## 7.2 NOTES

Note 1 The active alarm list may be cleared by scrolling to the end of the list. “LIST END, = TO CLEAR ALARMS” will appear in the MessageCenter. Pressing = will inactivate the alarms. That is: the alarm is “cleared” from the active alarm list and moved to the inactive alarm list for later review **if** the condition that caused the alarm has been corrected. When Shutdown Alarms are cleared, the unit will attempt to restart. When non-Shutdown Alarms are cleared, there will be no noticeable change in the unit’s operation.

The Inactive Alarm list is cleared in the same way. When the inactive alarm list is cleared both the inactive and active lists are cleared. Clearing the inactive alarm list removes the alarm from the microprocessor.

Note 2 Many electrical circuits may be tested by powering the microprocessor without starting the unit. Two methods are available to do this.

METHOD ONE:
Place the microprocessor in PC Mode. Refer to Section 5.3.

METHOD TWO:
Set the NO A/C POWER Configuration to ALARM & SHUTDOWN and ensure the unit is disconnected from standby power. Start the unit in standby:

For units equipped with a Main Power switch switch labeled ENGINE/OFF/STANDBY (DOES), place the DOES in the STANDBY position.

For units equipped with a Main Power switch labeled START/RUN–OFF (SROS), place the switch labeled STANDBY/ENGINE (DES) in the STANDBY position and then place the SROS in the START/RUN position.

Note 3 Sensors may be tested at the component plug. The sensor and interconnecting wiring may also be tested at the 1MP plug. Remove plug and, using an ohmmeter, measure resistance. Be careful not to damage the connector pins. (Refer to Section 8.9.10 for chart of resistances for different sensors.)

Note 4 The switches, (Remote 1 & 2, Door, High Pressure, Engine Oil Pressure, Defrost Air and Evaporator High Temperature 1, 2 or 3) may be tested at the component plug. The switch and interconnecting wiring may also be tested at the 1MP, 2MP, OC or EVC plug. Remove plug and, referring to the wiring schematic, check for voltage from the microprocessor through the switch to ground or from the voltage source through the switch to the microprocessor as applicable.

Note 5 Some tests can only be conducted while the unit is operating. The unit may be started automatically in either Engine Operation or Standby Operation.

For units equipped with a Main Power switch labeled ENGINE/OFF/STANDBY (DOES), place the DOES in the ENGINE or STANDBY position as desired.

For units equipped with a Main Power switch labeled START/RUN–OFF (SROS), place the switch labeled STANDBY/ENGINE (DES) in the ENGINE or STANDBY position as desired and then place the SROS in the START/RUN position.

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **7.3 DRIVER / OPERATOR ALARMS** | | | |
| **00001** | **LOW FUEL LEVEL WARNING** | | |
| **Note:** This is an optional alarm which will not occur unless a fuel level sensor is present and configured ON.<br>• TRIGGER ON: Fuel level is 15% or less for more than 30 seconds.<br>• UNIT CONTROL: Engine Operation: Alarm only.<br>Standby Operation: this alarm will not activate in standby Operation.<br>• 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** | |
| | | Check fuel level in the fuel tank. | Add fuel as needed to the fuel tank. |
| | 2 | **Check Fuel Level Sensor. Refer to procedure for Alarm 126** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **7.4 SHUTDOWN ALARMS** | | | |
| **00011** | **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.<br>• UNIT CONTROL: Engine Operation: Shutdown and alarm.<br>Standby Operation: Will not activate in standby.<br>• 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 page 7–2.) Operate the unit through the appropriate modes to see if any active active alarm occurs. Continue with the steps below as necessary. | | | |
| | 1 | **Check Engine Oil Level** | |
| | | Check engine oil dipstick. | Add engine oil as needed. |
| | 2 | **Check Engine Oil Pressure Switch Wiring** | |
| | | a. Inspect switch & connector pins & terminals. | No physical damage to switch.<br>No damage or corrosion in connector. |
| | | b. Check switch circuit<br>Check for voltage at switch plug between pins A (+) and B (ground) | Energize circuit. (See Note 2 page 7–2.)<br>Voltage should be approximately 12 VDC. If OK skip to step 4, if not continue with step 3. |
| | 3 | **Check Engine Oil Switch Harness** | |
| | | a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Check for shorted circuit in harness, and continuity through the harness. | Check for voltage from 2MP17 to plug terminal A<br>Check for ground at plug terminal B. |
| | 4 | **Check Switch** | |
| | | Remove switch, connect to an external pressure source and test. | Contacts closes on a pressure rise at 15 psig (1.02 bar.)<br>Contacts open on a pressure fall at 12 psig (0.82 bar.) |
| | 5 | **Check Engine Oil Pressure** | |
| | | Connect mechanical oil gauge. | Oil pressure must be greater than 15 psig (1.02 bar.) |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00012** | **HIGH COOLANT TEMPERATURE** | | |
| | • TRIGGER–ON: When in Engine Operation: 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 and 241°F (110 and 116°C) for more than 5 minutes.<br>• UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm. Standby Operation: Will not activate in standby.<br>• 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.<br>**WARNING**<br>**Do not remove the cap from a hot radiator or bottle; if the cap must be removed, do so very slowly in order to release the pressure without spray.** | Level must be in the normal range. |
| | | b. 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** | |
| | | Check for Alarm 129. | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 3 | **Check Freeze Point Of Coolant** | |
| | | 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. | Ninety percent 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** | |
| | | Check engine water pump belt. | No Glazing, no cracking, no slipping. |
| | 6 | **Check Engine Coolant Temperature Sensor** | |
| | | a. Inspect sensor & connector pins & terminals. | No damage to sensor.<br>No damage, moisture, or corrosion in connector. |
| | | b. Check sensor resistance. (See Note 3 page 7–2.) | 10,000 Ohms @ 77°F (25°C.) Refer to Table 8–5 for complete table of temperatures and resistance values. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00012** | **HIGH COOLANT TEMPERATURE – Continued** | | |
| | 7. | **Check Engine Coolant Temperature Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage or corrosion in connectors. |
| | | b Check voltage at the sensor connector with the microprocessor powered up. | Voltage reading should be 2.5 ± 0.1 VDC. This verifies microprocessor output and wiring connections to sensor. |
| | 8. | **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 cooling system for scale, sludge, rust, etc. | Coolant must be clean & clear. No foreign particles or substances in it. Flush & clean the coolant system as necessary. |
| | | e. Check water pump bypass hose to thermostat housing for internal blockage. | Must be clear and open. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00013** | **HIGH DISCHARGE PRESSURE (ALARM 75 WILL ALSO ACTIVATE)** | | |
| | • TRIGGER–ON: Compressor discharge pressure switch (HP1) contacts are open. HP1 contacts open when the discharge pressure rises to 465 psig (31.6 bar.)<br>• UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm. Standby Operation: Refrigeration system shutdown and alarm with PSCON still energized.<br>• RESET CONDITION: Auto Reset after 15 minutes if the compressor discharge pressure falls below 350 psig (23.8 bar), 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** | |
| | | Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor. | Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display.<br>Pressures must be in the normal range for ambient & refrigerated compartment temperature conditions. If discharge pressure is in normal range, proceed to step 4.<br>NOTE: Microprocessor suction (CSP) and evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar) The actual suction pressure must be lower than 100 psig in order to perform this test. |
| | 2 | **Check Airflow Through Condenser Coil** | |
| | | a. Inspect condenser & radiator. | Ninety percent or more of the coil surface must be undamaged. Condenser coil and radiator must be clean. |
| | | b. Check airflow (with unit running.) | Even airflow through the entire coil.<br>No “dead” spots. |
| | | c. Check condenser fans. | Both fans should operate correctly. Check rotation, air should be pulled in through the grill, and discharge into the engine compartment. |
| | 3 | **Check For Refrigerant Overcharge** | |
| | | Check refrigerant charge. | Refer to Section 8.6.2. |
| | 4 | **Check HP1 Switch** | |
| | | Inspect switch & connector pins & terminals. | No physical damage to switch.<br>No damage, moisture, or corrosion in connector. |
| | 5 | **Check HP1 Switch Harness** | |
| | | a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Check for shorted circuit in harness, and continuity through the harness. | Energize Circuit. (See Note 2, page 7–2.) Check for voltage from SP5, through switch and SP15 to microprocessor terminal 2MP29. |
| | 6 | **Check HP1 Switch** | |
| | | Check switch operation. | Test switch, refer to Section 8.8.7 step b. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00014** | **HIGH A/C AMPS** | | |
| | • TRIGGER–ON: AC Current Sensor 1 is greater than 40A or AC Current Sensor 2 is greater than 40A for 3 seconds.<br>• UNIT CONTROL: Engine Operation: Alarm will not activate.<br>Standby Operation: Refrigeration system shutdown and alarm with PSCON still energized.<br>• RESET CONDITION: Auto reset after 15 minutes if the AC current sensor reading is 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)** | |
| | | Check voltage at GENCON L1–L2, L1–L3, L2–L3. | Must be nominal 460 VAC |
| | 2 | **Check Power Source Voltage (If Used When Alarm Occurred)** | |
| | | Check voltage at PSCON L1–L2, L1–L3, L2–L3. | Must be nominal 460 VAC |
| | 3 | **Check Voltage Output From Contactors** | |
| | | a. Check voltage at GENCON T1–T2, T1–T3, T2–T3. | Must be nominal 460 VAC |
| | | b. Check voltage at CCON with compressor operating. T1–T2, T1–T3, T2–T3. | Must be nominal 460 VAC |
| | 4 | **Verify AC Current Sensor Accuracy** | |
| | | Power the microprocessor. Refer to Note 2, page 7–2 | Unit AC Current #1 and #2 reading in Unit Data must be 0.0 $\pm$ 1.0 amp. |
| | 5 | **Perform Pretrip Check** | |
| | | Clear Active Alarm list, then run Pre-trip & check for any new alarms. | Any active alarms must be corrected and cleared before proceeding. |
| | 6 | **Check High Voltage Components Amp Draw** | |
| | | a. Check condenser fan amp draw at CDCON on all 3 legs. | The unit must be running for these tests to be performed. Refer to Section 2.12 for correct electrical values. |
| | | b. Check evaporator fan motor amp draw at 1EVCON, 2EVCON & 3EVCON (if applicable) on all 3 legs. | |
| | | c. Check compressor amp draw at CCON on all 3 legs. | |
| | | d. Check evaporator heater amp draw at 1HTCON1, 1HTCON2, 2HTCON1, 2HTCON2, 3HTCON1 AND 3HTCON2 (if applicable) on all 3 legs. | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00015** | **BATTERY VOLTAGE TOO HIGH** | | |
| | • TRIGGER–ON: Voltage at the microprocessor is greater than 17 VDC.<br>• UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized.<br>• 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 11–16 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 11–16 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 page 7–2.)<br>Must be between 11–16 VDC. |
| | | b. Check voltage reading on microprocessor display. | Must be within 0.5 VDC of reading obtained at QC–1. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00016** | **BATTERY VOLTAGE TOO LOW** | | |
| | • TRIGGER–ON: Voltage at the microprocessor is less than 10 VDC (except when the engine starter is engaged.)<br>• UNIT CONTROL: Unit Shutdown & Alarm. Alarm condition only if activated while starting unit.<br>• 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** | |
| | | Check for “Alternator Not Charging Alarm”. (**Note**: The A51 name is carried over from unit models with alternators. For the Vector Model, Alarm 51 indicates that the solid state battery charger is not performing correctly.) | 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–). | Must be above 11 VDC. |
| | | b. Check voltage reading on microprocessor display. | Must be within 0.5 VDC of reading obtained at QC–1. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00017** | **HIGH COMP DISCHARGE TEMP** | | |
| | | • TRIGGER–ON: Discharge sensor alarm not active AND:<br>Ambient temp below 120°F (48.9°C) and discharge temp is greater than 310°F (154.4°C) for 3 minutes, or<br>Ambient temp above 120°F (48.9°C) and discharge temp is greater than 340°F (171.1°C) for 3 minutes, or<br>Discharge temp ever reaches 350.1°F (176.7°C.)<br>• UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm.<br>Standby Operation: refrigeration system shutdown and alarm with PSCON still energized.<br>• RESET CONDITION: Auto Reset after 15 minutes if the discharge temp falls below 300°F (148.9°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** | |
| | | Check for Alarm 125. | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 2 | **Check Refrigerant Charge** | |
| | | Check for undercharged system. | Refer to Section 8.6.2. |
| | 3 | **Check Airflow Through Condenser Coil** | |
| | | a. Inspect condenser & radiator. | Ninety percent or more of the coil surface must be undamaged. No “dead” air spaces. Condenser coil and radiator must be clean. |
| | | b. Check airflow (with unit running). | Even airflow through the entire coil<br>No “dead” spots |
| | 4 | **Check CSMV** | |
| | | Check compressor suction modulation valve. | Refer to Section 8.8.5. |
| | 5 | **Check System Pressures** | |
| | | Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display. | Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display.<br>NOTE: Microprocessor suction (CSP) and evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar) The actual suction pressure must be lower than 100 psig in order to perform this test. |
| | 6 | **Perform Pretrip Check** | |
| | | Clear Active Alarm list, then run Pretrip & check for any new alarms. | Any active alarms must be corrected and cleared before proceeding. |
| | 7 | **Check Compressor Reed Valves & Gaskets** | |
| | | Remove compressor heads & inspect condition of all reeds & gaskets. | Must be in good condition. Install new parts and gaskets as required. |
| | 8 | **Check Expansion Valve (EVXV)** | |
| | | Check operation of valve. | Refer to Section 8.8.6 |
| | 9 | **Check System For Non-Condensables** | |
| | | Check refrigeration system for non-condensable gas(es). | No non–condensable gas(es) may be present. (Refer to Section 8.6.2.) |

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>Alarm/Cause</th><th>Corrective Action</th></tr>
<tr><td colspan="4">00018 LOW REFRIGERANT PRESSURE<br>• TRIGGER–ON:<br>The compressor is operating with the suction pressure less than –10 in Hg (–0.3 BAR), with both the Front (UL1) and the Rear (UL2) unloaders energized, and the time that is selected for the LP Shutdown Delay Configuration has expired since UL1 was energized (Note: The MessageCenter does not display in.Hg. This alarm triggers on when the display shows less than –4.7 psig.<br>• UNIT CONTROL: Engine Operation: alarm only or (if configured for shutdown) engine and unit shutdown and alarm.<br>Standby Operation: alarm only or (if configured for shutdown) refrigeration system shutdown and alarm with PSCON still energized.<br>• RESET CONDITION: If alarm only, auto reset when either UL1 or UL2 is de–energized. If unit and system shutdown and alarm, auto reset after 15 minutes. Alarm may be manually reset via keypad or by turning the unit OFF, then 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 Refrigerant Charge</td></tr>
<tr><td></td><td></td><td>Check for undercharged system.</td><td>Refer to Section 8.6.2.</td></tr>
<tr><td></td><td>2</td><td colspan="2">Check System Pressures</td></tr>
<tr><td></td><td></td><td>Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display.</td><td>Suction pressure must be above 3 psig (0.2 bar.)<br>Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display.<br>NOTE: Microprocessor suction (CSP) and evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar) The actual suction pressure must be lower than 100 psig in order to perform this test.</td></tr>
<tr><td></td><td>3</td><td colspan="2">Manually Defrost Unit</td></tr>
<tr><td></td><td></td><td>Defrost unit and terminate automatically.</td><td>Typical defrost cycle time is 5–20 minutes.<br>Visually verify that all ice is cleared from evaporator coils in all compartments.</td></tr>
<tr><td></td><td>4</td><td colspan="2">Perform Pretrip Check</td></tr>
<tr><td></td><td></td><td>Clear Active Alarm list, then run Pretrip & check for any new alarms.</td><td>Any active alarms must be corrected and cleared before proceeding.</td></tr>
<tr><td></td><td>5</td><td colspan="2">Check Unloader Operation</td></tr>
<tr><td></td><td></td><td>Check Front (UL1) and Rear (UL2) Unloaders.</td><td>Refer to Alarms 85 and 86.</td></tr>
<tr><td></td><td>6</td><td colspan="2">Check CSMV</td></tr>
<tr><td></td><td></td><td>a. Check compressor suction modulation valve.</td><td>Refer to Section 8.8.5 .</td></tr>
<tr><td></td><td></td><td>b. Check airflow (with unit running.)</td><td>Even airflow through the entire coil.<br>No “dead” spots.</td></tr>
<tr><td colspan="2"></td><td colspan="2">Additional steps on the next page.</td></tr>
</table>

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00018** | **LOW REFRIGERANT PRESSURE – Continued** | | |
| | 7 | **Check Evaporator Sections** | |
| | | a. Check evaporator section in all compartments, return air bulk-head, air chute, cleanliness of evap. coils. | Good Air Flow.<br>Return air not restricted.<br>Air chute in good condition.<br>No damage to evaporator fan motor assemblies.<br>Evap. coil clean.<br>Evap. fan rotation ok. |
| | | b. Check airflow (with unit running.) | Even airflow through the entire coil.<br>No “dead” spots. |
| | 8 | **Visually Inspect Unit** | |
| | | Visually inspect unit for damage to the liquid line causing a restriction or any signs of temperature drop at the filter–drier. | All tubing from the receiver to the evaporator section is in good condition<br>There is no temperature drop at the filter–drier or anywhere on the liquid line |
| | 9 | **Check Electronic Expansion Valve (EVXV)** | |
| | | Check operation of EVXV. | Refer to Section 8.8.6. |
| | 10 | **Check Thermal Expansion Valve(s) (TXV)** | |
| | | Check operation and superheat adjustment of TXV(s). | Refer to Section 8.8.11. |
| | 11 | **Check Liquid Line Solenoid Valve(s) (2LSV)** | |
| | | Check operation of 2LSV(s). | Refer to Section 8.8.10. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00019** | **LOW FUEL SHUTDOWN** | | |
| | | **Note:** This is an optional alarm. This alarm will not occur in Standby Operation or if the Fuel Level Sensor Configuration is NO DEVICE or if the Fuel Tank Size Configuration is OFF. | |
| | | • TRIGGER ON: The unit is operating in Engine Operation and the fuel level is 10% or less for more than 1 minute AND Alarm 126 – “Check Fuel Sensor Circuit” is not active.<br>• UNIT CONTROL: Alarm only or (if configured for shutdown) engine and unit shutdown and alarm.<br>• 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** | |
| | | Check for alarm 1. | Must be cleared. |
| | 2 | **Check For Low Fuel Level** | |
| | | Check fuel level in tank. | Add fuel as needed to the fuel tank. |
| | 3. | **Check Low Fuel Level Sensor** | |
| | | a. Inspect sensor & connector pins & terminals. | No damage to sensor.<br>No damage, moisture, or corrosion in connector. |
| | | b. Check Low Fuel Level Sensor. | Refer to Section 8.9.10 for sensor check out procedure. |
| | 4. | **Check Low Fuel Level Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b Check voltage at the Low Fuel Level Sensor connector with the microprocessor powered up. | Voltage reading should be 12 – 13 VDC between terminals FLSA and FLSB.<br>Voltage reading should be between 0 – 5 VDC between FLSC and ground wire from unit with sensor disconnected. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00020** | **MAXIMUM COMPRESSOR ALARMS** | | |
| • TRIGGER ON: This option must be installed and alarm must be enabled by configuring the Compressor Alarm Shutdown to YES. Alarms 13, 17, 18, 27 or 28 individually occur 3 times within the last 2 hours.<br>• UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized.<br>• 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,or 29. | 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** | |
| | | Reset all alarms from the inactive alarm list. | All alarms must be cleared to start unit. |
| | | | |
| **00021** | **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<br>• UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: This alarm will not activate in Standby Operation<br>• 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. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00022** | **LOW SUCTION SUPERHEAT** | | |
| | • TRIGGER ON: Compressor suction superheat (Compressor Suction Temperature [CST] minus saturated temperature for Compressor Suction Pressure [ CSP] refer to Table 8–7) is less than 9°F (5°C) for more than 2 minutes.<br>• UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized.<br>• 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** | |
| | | Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display. | Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display.<br>NOTE: Microprocessor suction (CSP) reading has a maximum value of 100 psig (7.5 bar). The actual suction pressure must be lower than 100 psig in order to perform this test. |
| | 2 | **Check Refrigerant Charge** | |
| | | Check for undercharged system. | Refer to Section 8.6.2. |
| | 3 | **Check For Restricted Evaporator Airflow** | |
| | | Check for restricted evaporator airflow in all compartments. | Check for proper Evaporator Fan operation (Refer to Section 8.9.6.)<br>Check for correct Evaporator Fan rotation.<br>Check defrost air switch setting and hoses. Refer to Section 8.8.9.<br>Check for restricted bulkhead or air chute installation. |
| | 4 | **Perform Pretrip Check** | |
| | | Clear Active Alarm list, then run Pretrip & check for any new alarms. | Any active alarms must be corrected and cleared before proceeding. |
| | 5 | **Check Compressor Suction Temperature (CST) sensor. Refer to the procedure for Alarm 127** | |
| | 6 | **Check Compressor Suction Pressure Transducer (CSP).** | |
| | | a. Check operation of transducer | Refer to Section 8.8.8. |
| | | b. Check Schrader valve fitting under transducer | Must not be physically damaged, depressor must fully open valve to allow pressure to transducer |
| | 7 | **Check EVXV** | |
| | | Check operation of EVXV | Refer to Section 8.8.6. |
| | 8 | **Check heat exchanger** | |
| | | With the unit running in high speed cool, check temperature of suction line inlet and outlet at the heat exchanger. | Inlet line (toward evaporator coil) must be colder than outline (toward compressor). |

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>Alarm/Cause</th><th>Corrective Action</th></tr>
<tr><td colspan="4">00023 A/C CURRENT OVER LIMIT<br>• TRIGGER ON: The high voltage amp draw is over the limit shown in the following table for more than 10 seconds.</td></tr>
</table>

| CONDITION | Compartment 1 Enabled | Compartments 1 & 2 Enabled |
|---|---|---|
| Engine High / Low Speed, Standby Cool or Pretrip | 30A | 30A |
| Engine High Speed Heat | 18A | 24A |
| Engine Low Speed or Standby Heat | 14A | 20A |
| Engine High Speed Defrost (With heaters energized) | 16A | 22A |
| Engine Low Speed or Standby Heat Defrost | 12A | 18A |
| Engine High/Low Speed or Null | 8A | 10A |
| Engine High/Low Speed, Standby or Natural Defrost (when heaters are de-energized) | 8A | N/A |

<table>
<tr><td colspan="4">• UNIT CONTROL: Engine Operation: refrigeration system shutdown and alarm.<br>Standby Operation: refrigeration system shutdown and alarm with PSCON still energized.<br>• RESET CONDITION: Auto reset after 15 minutes or alarm may be manually reset via keypad or by turning the unit OFF, then back ON.</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">Perform Pretrip.</td></tr>
<tr><td></td><td></td><td>Clear Active Alarm list, then run Pretrip & check for any new alarms.</td><td>Any active alarms must be corrected and cleared before proceeding.</td></tr>
<tr><td></td><td>2</td><td colspan="2">Check Configurations for Correct Maximum Amps Settings</td></tr>
<tr><td></td><td></td><td>a. Check DIESEL MAX GEN AMPS configuration setting.</td><td>Setting should be 24 – 25 Amps. Maximum recommended setting is 25 Amps. Minimum recommended setting is 22 Amps.</td></tr>
<tr><td></td><td></td><td>b. Check STANDBY MAX GEN AMPS configuration setting.</td><td>Setting should be 22 – 25 Amps. Maximum recommended setting is 25 Amps. Minimum recommended setting is 22 Amps.</td></tr>
<tr><td></td><td></td><td>c. Check STARTUP MAX AMPS configuration setting.</td><td>Setting should be 15 – 19 Amps. Maximum recommended setting is 19 Amps.</td></tr>
<tr><td></td><td></td><td>d. Check DIESEL OFFSET MAX AMPS configuration setting.</td><td>Setting should be 4 – 6 Amps. Maximum recommended setting is 6 Amps.</td></tr>
<tr><td></td><td>3</td><td colspan="2">Check For Electrical Failure In System</td></tr>
<tr><td></td><td></td><td>a. Check electrical motors.</td><td>Visually inspect condenser fans and evaporator fans in all compartments for damage to motor or fan blade, or for foreign material obstructing the movement of the fan. Listen for noise caused by failed bearing or motor obstruction.</td></tr>
<tr><td></td><td></td><td>b. Check for defective wiring.</td><td>Check for discolored wiring at contactors and loose connections.</td></tr>
<tr><td></td><td></td><td>c. Check for defective contactor.</td><td>Remove and replace any suspected contactor(s).</td></tr>
<tr><td colspan="2"></td><td colspan="2">Additional steps on the next page.</td></tr>
</table>

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00023** | **A/C CURRENT OVER LIMIT – Continued** | | |
| | 4 | **Check High Voltage Components Amp Draw** | |
| | | a. Check condenser fan amp draw on all legs. (CDCON) | These checks must be made with the unit operating.<br><br>**WARNING**<br>**Caution and good electrical practices must be used when working around and with high voltage circuits.**<br><br>Verify that all three actual amperage readings for each component are within 10% of each other, and are within the values shown in Section 2.12. |
| | | b. Check evaporator fan motor amp draw for all compartments. (1EVCON, 2EVCON & 3EVCON – if applicable) | |
| | | c. Check compressor amp draw on all 3 legs. (CCON) | |
| | | d. Check heater amp draw. (1HTCON1, 1HTCON2, 2HTCON1, 2HTCON2, 3HTCON1 & 3HTCON2 – if applicable) | |
| | 5 | **Check Generator Voltage (If Used When Alarm Occurred)** | |
| | | Check voltage at GENCON L1–L2, L1–L3, L2–L3. | Must be within voltage limits shown in Section 2.12. |
| | 6 | **Check Power Source Voltage (If Used When Alarm Occurred)** | |
| | | Check voltage at PSCON L1–L2, L1–L3, L2–L3. | Must be within voltage limits shown in Section 2.12. |
| | 7 | **Check Voltage Output From Contactors** | |
| | | a. Check voltage at GENCON T1–T2, T1–T3, T2–T3. | Must be within voltage limits shown in Section 2.12. |
| | | b. Check voltage at CCON with compressor operating. T1–T2, T1–T3, T2–T3. | Must be within voltage limits shown in Section 2.12. |
| | 8 | **Verify AC Current Sensor Accuracy (CT2 & CT3)** | |
| | | Power the microprocessor by toggling the Main Power switch out of the OFF position. | Unit AC Current #1 and #2 reading in Unit Data must be 0.0 $\pm$ 1.0 amp. |
| | 9 | **Defective Overload Ground Fault (OGF) Detector** | |
| | | Opens prematurely. | Remove and replace. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00027** | **HIGH SUCTION PRESSURE** | | |
| | • TRIGGER ON: The refrigeration system is running and the suction pressure has been greater than 98 psig (6.7 bar) for more than 10 minutes.<br>• 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.<br>• RESET CONDITION: Auto reset when suction pressure is less than 75 psig (5.1 bar) 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** | |
| | | Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display. | Suction pressure must be above 3 psig (0.2 bar.)<br>Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display.<br>**NOTE: Microprocessor suction (CSP) and evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar) The actual suction pressure must be lower than 100 psig in order to perform this test.** |
| | 2 | **Check For Refrigerant Overcharge** | |
| | | Check refrigerant level in the receiver. | Refer to Section 8.6.2. |
| | 3 | **Perform Pretrip Check** | |
| | | Clear Active Alarm list, then run Pretrip & check for any new 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 corrosion in connectors. Connector tight on valve. |
| | | b. Check operation of EVXV. | Refer to Section 8.8.6. |
| | 5 | **Check Compressor.** | |
| | | a. Perform Pump–Down Test. Refer to Section 8.7.1 | Must hold a vacuum and not equalize in a short period of time |
| | | b. Cover condenser and build–up discharge pressure. | Must be able to pump up to 400 psig (27.2 bar.) |
| | | 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 |
|---|---|---|---|
| **00028** | **CHECK REFRIGERATION SYSTEM** | | |
| | • TRIGGER ON: The compressor is running and the discharge pressure is less than 5 psig (0.34 bar) higher than suction pressure for more than 10 minutes.<br>• UNIT CONTROL: Engine Operation: alarm only or (if configured for shutdown) engine and unit shutdown and alarm.<br>Standby Operation: alarm only or (if configured for shutdown) refrigeration system shutdown and alarm with PSCON still energized.<br>• RESET CONDITION: Auto reset when discharge pressure is more than 20 psig (1.36 bar) above the suction pressure when in alarm only (for either trigger), or auto reset after Minimum Off Time Functional Parameter setting 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.** | |
| | | Check compressor amp draw on all three legs. | Readings must be in the range as shown in Section 2.12. |
| | 2 | **Check System Pressures** | |
| | | Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display. | Suction pressure must be above 3 psig (0.2 bar)<br>Discharge pressure must be more than 5 psig (0.3 bar) higher than the suction pressure.<br>Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display.<br>**NOTE: Microprocessor suction (CSP) and evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar) The actual suction pressure must be lower than 100 psig in order to perform this test.** |
| | 3 | **Perform Pretrip Check** | |
| | | Clear Active Alarm list, then run Pretrip & check for any new alarms. | Any active alarms must be corrected and cleared before proceeding. |
| | 4 | **Check Compressor.** | |
| | | a. Perform Pump−Down Test. Refer to Section 8.7.1 | Must hold a vacuum and not equalize in a short period of time |
| | | b. Cover condenser and build−up discharge pressure. | Must be able to pump up to 400 psig (27.2 bar.) |
| | | 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** | | | |
| **00030** | **FAILED TO RUN MINIMUM TIME** | | |
| | • TRIGGER–ON: The unit has shutdown on an alarm 3 times without having run for at least 15 minutes between each shutdown (not including Door shutdowns.)<br>• TRIGGER–ON: The unit has shutdown on alarm 00041(Engine Stalled) and when restarting alarm 00128(Low/Unbalanced A/C Amps) becomes active. NOTE: 00041 may have been caused by a problem in the A/C circuits, and this new trigger will prevent the unit from continuing to run.<br>• UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized.<br>• RESET CONDITION: Alarm may be manually reset via keypad or by turning the unit off, then back on again. If the Unit Operation configuration is set to Rail Mode, this alarm will reset after 4 hours. | | |
| 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 page 7-2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary. | | | |
| | | **Check For Alarms** | |
| | | Check for shutdown alarms. | Alarm conditions must be corrected and the alarm(s) cleared to continue. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00031** | **FAILED TO START – AUTO MODE** | | |
| | • TRIGGER–ON: Engine has tried to start three times unsuccessfully in the auto start mode.<br>• UNIT CONTROL: Unit Shutdown & Alarm<br>• RESET CONDITION: Alarm may be manually reset via keypad or by turning the unit off, then back on again. If the Unit Operation configuration is set to Rail Mode, this alarm will reset after 4 hours. | | |
| **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 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary. | | | |
| | 1 | **Check For Flash Code on Engine Speed Control Unit (ENSCU).** | |
| | | Check for flash codes on the ENSCU. | Refer to ENSCU LED Fault Chart, Section 9.5, must be no LED alarm codes occurring to continue. |
| | 2 | **Check Fuel Level in Tank.** | |
| | | Check fuel gauge on tank. | Fill tank as needed. |
| | 3 | **Check For Alarms** | |
| | | Check for the following alarms:<br>71 Check for Bad F2 or F3 Fuse alarm.<br>40 Check Air Heater alarm.<br>35 Check Starter Circuit alarm. | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 4 | **Check ENSCU Power** | |
| | | a. Check run relay. | Using Component Test Mode, refer to Section 5.2.2, energize run relay. |
| | | b. Check Run Relay LED. | Must be ON. |
| | | c. Check voltage to ENSCU. | Must have +12 VDC between ENSCU13 and ENSCU19 and between ENSCU24 and ENSCU19 with Run Relay energized |
| | | d. Inspect Fuel Solenoid Actuator (FSA) & connector pins & terminals. | No damage to FSA.<br>No damage, moisture, or corrosion in connector. |
| | | e. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | f. Check Splice Pack 6 (SP6) (See wiring schematic Section 10.) | No corrosion or oxidation.<br>12 VDC reading to + battery cable. |
| | 5 | **Check Fuel System** | |
| | | a. Check fuel system prime. | No air in fuel system. |
| | | b. Check fuel flow. | Unrestricted fuel flow through system. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00031** | **FAILED TO START – AUTO MODE – Continued** | | |
| | 6 | **Check Engine Air–intake Heater System** (This step only applies when the engine coolant temperature is less than 77°F (25°C.) | |
| | | a. Check voltage to heater. | Must be 11 VDC or higher |
| | | b. Check operation of intake air heater relay. | **CAUTION**<br>**DO NOT leave the circuit energized for the full 5 minutes if full amperage is shown, as the intake air heater element life will be greatly shortened.**<br>Using Component Test Mode, refer to Section 5.2.2, energize the intake air heater relay.<br>LED 30 must be illuminated.<br>Amperage must be correct, refer to Section 2.9 for correct electrical values. |
| | 7 | **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.<br>No kinks or restrictions. |
| | 8 | **Check For Correct Engine Oil** | |
| | | Check for correct oil viscosity (weight) for conditions. | Refer to Section 2.9.<br>Must be correct for ambient conditions. |
| | 9 | **Check Engine Exhaust System** | |
| | | Inspect the exhaust system. | Must be clear and unobstructed. |
| | 10 | **Check Generator** | |
| | | Check for proper preventative maintenance and operating precautions. | Refer to Section 8.9.9 |
| | 11 | **Check Engine** | |
| | | Check engine compression. | Refer to Engine Workshop manual |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00034** | **ENGINE FAILED TO STOP** | | |
| | • TRIGGER–ON: When in Engine Operation, engine is turning more than 500 RPM for 20 seconds after unit shutdown or cycled off or Oil Pressure Switch is closed longer than 20 seconds after unit shutdown or cycle off.<br>• UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: this alarm will not activate in standby Operation.<br>• 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 page 7-2.) 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** | |
| | | Verify that engine is still running. | Engine should not be running. |
| | 2 | **Check For Bad Engine RPM Sensor Alarm** | |
| | | Check for Alarm 130. | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 3 | **Check Engine Oil Pressure Switch** | |
| | | a. Inspect switch & connector pins & terminals. | No physical damage to switch.<br>No damage or corrosion in connector. |
| | | b. Check engine oil switch operation. | Contacts close on a pressure rise at 15 psig (1.02 bar.)<br>Contacts open on a pressure fall at 12 psig (0.82 bar.) |
| | 4 | **Check Engine Oil Switch Harness** | |
| | | a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Check for shorted circuit in harness, and continuity through the harness. | Energize circuit. (See Note 2 page 7-2.)<br>Battery voltage reading (12-13 VDC) between wires in plug. |
| | 5 | **Check Fuel/Speed Actuator (FSA) & Circuit** | |
| | | a. Check Run Relay LED. | LED 28 must be OFF. |
| | | b. Check voltage at harness to ENSCU. | 0 VDC between<br>ENSCU13 and ENSCU19 and between<br>ENSCU24 and ENSCU19 |
| | | c. Check FSA plunger. | Must be free to move to the stop position (extended out of the solenoid.) |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00035** | **CHECK STARTER CIRCUIT** | | |
| | • TRIGGER–ON: <br>Condition 1: Engine speed fails to reach 50 RPM during 2 start attempts.<br>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.<br>• UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm.<br>Standby Operation: this alarm will not activate in standby Operation.<br>• 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. If the Unit Operation configuration is set to Rail Mode, this alarm will reset after 4 hours. | | |
| 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 page 7-2.) 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.<br>If YES, continue with stepc., then step 2. |
| | | b. Does the engine actually start, run for a few seconds and then shut off? | If NO, continue with Step 3.<br>If YES, check wiring to RPM sensor for a broken wire. |
| | | c. Check for correct engine oil. | Engine oil must be correct for ambient conditions. Refer to Section 2.9. |
| | 2 | **Check Oil Pressure Stitch & Circuit** | |
| | | a. Check oil pressure switch. | Contacts must be open when there is no pressure on the switch. |
| | | b. Check oil pressure switch circuit. | Must be no continuity between the wires. |
| | 3 | **Check If Unit Has Electronic Speed Control Fault LED Flash Code** | |
| | | a. Check for flash codes on the engine speed control unit (ENSCU). | Refer to ENCU diagnostic tables, Section 9.5. |
| | | b. Check for voltage at ENSCU terminal 13. | Must be above 11.5 VDC. |
| | | c. Check for ground at ENSCU terminal 19. | No damage or high resistance. Good connection to ground. |
| | 4 | **Check Starter Relay Circuit** | |
| | | a. Check operation of starter solenoid relay. | Energize circuit. (5MP disconnected from micropro-cessor. Pull SSR relay partially out of socket to ex-pose pins.) Relay contacts closed when SSR85 is grounded. |
| | | b. Check relay socket and terminals. | No signs of discoloration from overheating.<br>No corrosion. |
| | | c. Check voltage to starter solenoid relay. | Negative lead on 85, Positive lead on 86 = 12 VDC.<br>Negative lead on Gnd, Positive lead on 87 & 30 = 12 VDC. |
| | | d. Inspect wiring to starter solenoid and starter motor. (See wiring schematic Section 10.) | No physical damage to wiring or battery cable end.<br>No damage or corrosion in connections. |
| | | 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. |
| **Additional steps on the next page.** | | | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00035** | **CHECK STARTER CIRCUIT – continued** | | |
| | 5 | **Check Fuel/Speed Actuator (FSA) & circuit** | |
| | | a. Check Run Relay LED | LED 28 must be ON. |
| | | b. Check for 12 VDC on the Run Relay circuit (MPQC4) | Must be 12 VDC |
| | | c. Check ENSCU terminals 13 & 15 for voltage | Must be 12 VDC |
| | | d. Check FSA plunger | Must be free to move |
| | 6 | **Check Starter** | |
| | | a. Inspect starter and wiring. (See wiring schematic Section 10.) | No damage or corrosion.<br>Wiring and battery cable must be clean and tight |
| | | b. Check resistance of solenoid. | Refer to Section 2.13 for correct electrical values. |
| | | c. Check resistance of starter motor. | Refer to Section 2.13 for correct electrical values. |
| | | d. Check amperage draw of starter. | Refer to Section 2.13 for correct electrical values. |
| | 7 | **Check Battery Voltage** | |
| | | a. Inspect battery cable ends and posts. | Must be clean and tight.<br>No corrosion. |
| | | b. Test voltage at battery with unit off. | Must be above 11 VDC. |
| | | c. Test specific gravity of battery. | Must be 1.225 or higher. |
| | | d. Perform load test on battery. | (Follow battery manufacturer's procedure and guidelines.) |
| **00036** | **CHECK COOLANT TEMPERATURE**<br>• TRIGGER–ON: Coolant temperature is below 32°F (0°C) after the engine has been running for 5 minutes.<br>• UNIT CONTROL: Engine Operation: alarm only. Standby Operation: this alarm will not activate in standby Operation.<br>• RESET CONDITION: Auto reset when coolant temperature is higher than 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 page 7–2.) 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** | |
| | | 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 3 page 7–2.) | Refer to Section 8.9.10 |
| | | b. Check harness and control box connector pins and terminals. (See wiring schematic Section 10.) | No physical damage to harness<br>No damage, moisture, or corrosion in connectors. |
| | | c. Check voltage at harness connection to ENCT. | Must be 2.5 ± 0.5 VDC. This verifies microprocessor output and wiring to sensor. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00037** | **CHECK LOW SPEED RPM** | | |
| | • TRIGGER–ON: The microprocessor is set for low engine speed operation, and engine speed is: less than 1200 rpm, or greater than 1500 rpm for more than 60 seconds (120 seconds when the microprocessor calls for a change from high to low speed, or when unit first starts).<br>• UNIT CONTROL: Alarm Only<br>• RESET CONDITION: Auto Reset if microprocessor is set for low engine speed operation and signal is: Between 1220 to 1480 RPM for 60 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 Model Number** | |
| | | Verify that the model number on the nameplate matches the model number shown in the microprocessor Unit Data. | Enter the correct number in Configurations. (Refer to Section 5.2.1.) |
| | 2 | **Check For Proper Voltage To The Engine Speed Control Unit (ENSCU) Pin 16. Check For Proper Voltage With Unit Running.** | |
| | | Check ENSCU 16. | 0 VDC between ENSCU 16 and ENSCU 19 (GND.) |
| | 3 | **Check Fuel/Speed Actuator (FSA)** | |
| | | Check fuel/speed actuator. | Plunger must move in and out freely. Refer to Engine Manual. |
| | 4 | **Force Low Speed operation** | |
| | | a. Using Functional Parameters, set the Low Speed Start Up Delay to 10 minutes. | Unit will run in low speed. RPM must be within range shown above for each specific model. Refer to Speed Control System Diagnotics, Section 9.5. Clear all fault codes before continuing. |
| | | b. Check operation of Speed Relay LED. | LED 27 must be OFF. |
| | | c.Check voltage at engine speed control unit (ENSCU) pin 16. | Must be 0 VDC. |
| | 5 | **Check Engine RPM** | |
| | | a. Check actual engine RPM using hand held tachometer. | Refer to Table 2-1. |
| | | 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.<br>No kinks or restrictions. |
| | 7 | **Check Engine Fuel System** | |
| | | a. Check fuel tank level. | Must have enough fuel to run engine. |
| | | b Check fuel lines. | Connections are tight and not leaking.<br>No kinks or sharp bends in the lines. |
| | | c Check fuel screen. | Fuel screen is located in the inlet fitting to the lift pump. Screen must be clean. |
| | | d Check fuel filters. | Fuel filters must be clean and allow full flow of fuel through them. |
| | 8 | **Check Engine Exhaust System** | |
| | | Inspect the exhaust system. | Must be clear and unobstructed. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00038** | **CHECK HIGH SPEED RPM** | | |
| | • TRIGGER–ON: The microprocessor is set for high engine speed operation, and engine speed is: less than 1650 rpm, or greater than 1950 rpm for more than 60 seconds (120 seconds when the microprocessor calls for a change from low to high speed, or when unit first starts).<br>• UNIT CONTROL: Engine Operation: alarm only. Standby Operation: this alarm will not activate in standby Operation.<br>• RESET CONDITION: Auto Reset if microprocessor is set for high speed operation and the signal 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 | **Check Model Number** | |
| | | Verify that the model number on the nameplate matches the model number shown in the microprocessor Unit Data. | Enter the correct number in Configurations. (Refer to Section 5.2.1.) |
| | 2 | **Check for proper voltage to the Engine Speed Control Unit (ENSCU) pin 16. Check for proper voltage with unit running.** | |
| | | a. Check ENSCU 16. | 12 VDC between ENSCU 16 and ENSCU19. |
| | | b. Check circuit from ENSCU 16 to microprocessor connection MPQC3. | Must be 12 VDC at MPQC3 and ENSCU16. |
| | 3 | **Check Fuel/Speed Actuator (FSA) plunger** | |
| | | Check plunger on fuel/speed actuator. | Must move in and out freely.<br>Spring tension must hold rod firmly extended and in place. |
| | 4 | **Check FSA Harness** | |
| | | a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Check resistance of fuel/speed actuator. | Refer to Section 2.13 for correct electrical values. |
| | 5 | **Force High Speed Operation** | |
| | | a. Adjust setpoint (for all compartments) to at least 20 degrees away from compartment temperature. If the unit does not immediately go into High Speed, ensure the Silent Mode Functional Parameter is set to OFF and/or the applicable High Speed Delay Configuration is set to OFF. (Reset following testing.) | The microprocessor will call for High Speed operation. |
| | | b. Check operation of Speed Relay LED. | LED 27 must be ON. (If LED 27 is not on, the microprocessor is not calling for High Speed operation. Check Speed Overrides in Section 4.8.3 for more information.) |
| | | c. Check voltage on the engine speed control unit (ENSCU, pin 16.) | Must be 12-14 VDC |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00038** | **CHECK HIGH SPEED RPM – Continued** | | |
| | 6 | **Check Engine RPM** | |
| | | a. Check actual engine RPM using hand held tachometer. | Refer to Table 2-1. |
| | | b. Compare actual RPM with those shown on display. | Both readings within ± 50 RPM. |
| | 7 | **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.<br>No kinks or restrictions. |
| | 8 | **Check Engine Exhaust System** | |
| | | Inspect the exhaust system. | Must be clear and unobstructed. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00039** | **CHECK ENGINE RPM** | | |
| | • TRIGGER–ON: In Engine Operation and Alarm 130 is not active and engine speed is less than 1250 rpm for 2 seconds or greater than 2100 rpm for 5 minutes or engine speed drops to less than 1200 rpm for 3 seconds after the engine speed has been greater than 1250 rpm.<br>• 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.<br>• RESET CONDITION: Auto Reset if engine rpm is greater than 1150 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 Model Number** | |
| | | Verify that the model number on the nameplate matches the model number shown in the microprocessor Unit Data. | Enter the correct number in Configurations. (Refer to Section 5.2.1.) |
| | 2 | **Check For Flash Code On Engine Speed Control Unit (ENSCU)** | |
| | | Check for flash codes on the ENSCU. | Refer to ENSCU LED Fault Chart, Section 9.5, must be no LED alarm codes occurring to continue. |
| | 3 | **Check Fuel/Speed Actuator** | |
| | | Check plunger on fuel/speed actuator. | Must move in and out freely.<br>Spring tension must hold rod firmly extended and in place. |
| | 4 | **Check Fuel System** | |
| | | a. Check for Alarm 1. | Fill tank as needed. |
| | | b. Check fuel flow. | Unrestricted fuel flow through system.<br>Fuel not gelled. |
| | | c. Check fuel system prime. | No air in fuel system. |
| | 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.<br>No kinks or restrictions. |
| | 6 | **Force Low Speed Operation** | |
| | | a. Using Functional Parameters, set the High Speed Delay for at least 10 minutes so the unit starts in low speed. | Unit will run in low speed. RPM must be within range shown above for each specific model. Refer to ENSCU LED Fault Chart, Section 9.5, must be no LED alarm codes occurring to continue. |
| | | b. Check operation of Speed Relay LED. | LED 27 must be OFF when the microprocessor is calling for Low Speed. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00039** | **CHECK ENGINE RPM – Continued** | | |
| | 7 | **Check Low Speed Engine RPM** | |
| | | a. Check actual engine RPM using hand held tachometer. | Refer to Table 2-1. |
| | | b. Compare actual RPM with those shown on display. | Both readings within ± 50 RPM. |
| | 8 | **Force High Speed Operation** | |
| | | a. Place unit in continuous run and adjust setpoint to at least 15 degrees away from refrigerated compartment temperature, and a temperature greater than 20°F (5.6°C) If the unit does not immediately go into High Speed, set the AIRFLOW Functional Parameter to HIGH. | The microprocessor will call for High Speed operation. |
| | | b. Check operation of Speed Relay LED. | LED 27 must be ON. (If LED 27 is not on, the microprocessor is not calling for high speed operation. Check Speed Overrides in Section 4.8.3 for more information.) |
| | 9 | **Check high speed engine RPM** | |
| | | a. Check actual engine RPM using hand held tachometer. | Refer to Table 2-1. |
| | | b. Compare actual RPM with those shown on display. | Both readings within ± 50 RPM. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00040** | **CHECK AIR HEATER** | | |
| | • TRIGGER–ON: Engine Operation: Intake Air Heater amperage is less than 25 Amps, **or** greater than 70 Amps after 14 seconds of glow time (NOTE: This can only occur when the Engine Coolant Temperature is below 50°F (11°C) due to the glow time allowed. Refer to Table 4–1 for glow times. Standby Operation: This alarm will not activate in standby Operation.<br>• UNIT CONTROL: Alarm Only<br>• RESET CONDITION: Auto Reset if amperage is between 4 to 55 amps for at least 14 seconds during the glow cycle, 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 Model Number** | |
| | | Verify that the model number on the nameplate matches the model number shown in the microprocessor Unit Data. | Enter the correct number in Configurations. (Refer to Section 5.2.1.) |
| | 2 | **Check Air Heater Configuration** | |
| | | Verify that the configuration is set to INTAKE HEATER. | INTAKE HEATER must be the selection (Refer to Section 5.2.1 for configuration settings.) |
| | 3 | **Check Air Intake Heater circuit** | |
| | | a. Inspect relay & socket. | No signs of discoloration from overheating.<br>No damage, moisture, or corrosion in socket. |
| | | b. Check operation of intake air heater relay. | **CAUTION**<br>**DO NOT leave the circuit energized for the full 5 minutes if full amperage is shown, as the intake air heater element life will be greatly shortened.**<br>Using Component Test Mode, refer to Section 5.2.2, energize the intake air heater relay.<br>LED 30 must be illuminated.<br>Amperage must be correct, refer to Section 2.9 for correct electrical values. |
| | | c. Check voltage to Air Intake Heater. | Must be 11 VDC or higher. |
| | 4 | **Check Air Intake Heater circuit wiring** | |
| | | a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Check connection at Intake Air Heater. | Ring terminal is tight on terminal.<br>No signs of overheating. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00041** | **ENGINE STALLED** | | |
| | • TRIGGER–ON: 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.<br>• UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm. Standby Operation: This alarm will not activate in standby Operation.<br>• RESET CONDITION: Auto Restart 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 page 7-2.) 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 130 – Check RPM Sensor** | |
| | | Check for alarm 130. | When Alarms 130 and 41 occur at the same time, generally the engine has run out or is running out of fuel. This causes the engine RPM to surge and drop.<br>Check fuel tank and add fuel as necessary.<br>Check fuel lines between the fuel tank and the fuel pump inlet for drawing air in. |
| | 2 | **Check For Flash Code On Engine Speed Control Unit (ENSCU)** | |
| | | Check for flash codes on the ENSCU. | Refer to ENSCU LED Fault Chart, Section 9.5, must be no LED alarm codes occurring to continue. |
| | 3 | **Was Engine Shut Off Manually?** | |
| | | Check for external cause. | Correct problem. |
| | 4 | **Check For Bad F2 Or F3 Fuse Alarm** | |
| | | 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 flow. | Unrestricted fuel flow through system.<br>Fuel not gelled. |
| | | c. Check fuel system prime. | No air in fuel system. |
| | | d. Check fuel system check valve from filter to injection pump. | Check valve must hold fuel and not leak back. |
| | 6 | **Check Fuel/Speed Actuator (FSA)** | |
| | | a. Check Run Relay LED. | LED 28 must be ON. |
| | | b. Check voltage to ENSCU. | Use Component Test Mode to energize Run Relay. (Refer to Section 5.2.2.)<br>Must have 12.0 VDC or higher reading between ENSCU 13 and 19. |
| | | c. Inspect ENSCU connector pins & terminals. | No damage, moisture, or corrosion in connector. |
| | | d. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | e. Check resistance of FSA. | Refer to Section 2.13 for correct electrical values. |
| | | f. Check operation of FSA. | Plunger must move in when energized. |
| | | g. Check connections at splice points SP3, SP5 ans SP6. | Connections must be good condition. No loose or broken wires. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00041** | **ENGINE STALLED – Continued** | | |
| | 7 | **Check Engine Speed Sensor (ENSSN)** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | 8 | **Check Electrical System Amperage** | |
| | | a. Check the configuration setting for Diesel Max Gen Amps. | Must be set for 22 – 25 Amps |
| | | b. Check the configuration setting for Diesel Offset Max Amps. | Must be set for 4 Amps |
| | | c. With the unit operating, check all 3 high voltage circuits for amperage. | Must be no more than 26 Amps. |
| | 9 | **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.<br>No kinks or restrictions. |
| | 10 | **Check engine exhaust system** | |
| | | Inspect the exhaust system. | Must be clear and unobstructed. |
| | 11 | **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.) |
| | 12 | **Check refrigeration system** | |
| | | Check discharge & suction pressures. | Must be within normal operating range for conditions. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **7.6 WARNING / STATUS ALARMS** | | | |
| **00051** | **ALTERNATOR NOT CHARGING (This alarm applies to the Battery Charger)** | | |
| | • TRIGGER–ON: Unit is running in either Engine or Standby Operation and the current flow is more than −1.0 amps (discharge) between the battery charger and the battery for 3 continuous minutes.<br>• UNIT CONTROL: Engine Operation: alarm only or (if Alternator Check Shutdown configuration is set to YES (configured for shutdown) engine and unit shutdown and alarm.<br>Standby Operation: alarm only regardless of configuration setting.<br>• RESET CONDITION: Auto Reset (if not shutdown) 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.<br>• OPERATING RANGE: Operating range is 293 VAC / 47HZ to 640 VAC / 65.8 HZ. See Section 8.9.8. | | |
| 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 page 7–2.) 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** | |
| | | Check microprocessor current value. | Power up microprocessor in PC Mode. (Refer to Section 5.3.) Must be −2.0 to 1.5A with no load. |
| | 2 | **Check Wire Direction Through Current Sensor** | |
| | | Visually inspect wire at current sensor. | Must go through current sensor in the direction of the arrow on the sensor:<br>**away** from the F-5 fuse for units with a Main Power switch labeled Engine-Off-Standby<br>**toward** the F-5 fuse for units with a Main Power switch labeled Start/Run-Off. |
| | 3 | **Check Battery Charger Wiring** | |
| | | a. Check output & ground wire (unit OFF.) | Negative lead on Ground terminal<br>Positive lead on Output terminal = same as battery voltage. |
| | | b. Check battery charger input. | Check for AC voltage between SPZ, SPX & (for 40 amp 3 phase chargers) SPX. Check fuses F7, F8 and (for 40 amp 3 phase chargers) F29. |
| | | c. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | d. Check output and ground wire voltages (unit running.) | When the unit is started, battery voltage at the battery will begin near 12.0 VDC, and slowly rise toward 13.5 VDC as the battery charges.<br>**NOTE:** Do not test for voltage at the output connector of the battery charger without the connector being connected to the battery. Without the battery connected any reading will be very inaccurate. (Refer to Section 8.9.8 for more information on checking battery charger.) |
| | 4 | **Check For Add–on Equipment Drawing Too Much Current** | |
| | | Check amperage of added–on components & accessories. | Total current draw including the actual unit current draw and all add–on components & accessories must be less than battery charger rating. |
| | 5 | **Perform Pretrip Check** | |
| | | Clear Active Alarm list, then run Pretrip & check for any new alarms. | Any active alarms must be corrected and cleared before proceeding. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|

**00053 BOX TEMP OUT OF RANGE (Compartment 1)**

- TRIGGER–ON:

  **Condition One:** If the unit is running in Pulldown Mode and the SAT is not greater than 1°F (0.56°C) below the RAT **or** if the unit is running in Pull–Up Mode and the SAT is not above the RAT, the configured action (Alarm only after 30 minutes or Alarm and Shutdown after 45 minutes) will be activated.

  **NOTE:** If the Out–Of–Range Alarm Functional Parameter is set to OFF, the following conditions will not trigger an alarm or shutdown.

  **Condition Two:** If the refrigerated compartment temperature has been within ±2.7°F (±1.5°C) for perishable setpoints or +2.7°F (±1.5°C) for frozen of setpoint at least once since the unit was started and is now further away from setpoint than the limit set in the Out–Of–Range Alarm Functional Parameter [ 4°, 5°, or 7°F (2°, 3°, or 4°C)], the configured action (Alarm only after 30 minutes or Alarm and Shutdown after 45 minutes) will be activated.

  **Condition Three:** If a shutdown alarm occurs and the RAT is further away from setpoint than the limit set in the Out–Of–Range Alarm Functional Parameter [ 4°, 5°, or 7°F (2°, 3°, or 4°C)], the configured action (Alarm only after 30 minutes or Alarm and Shutdown after 45 minutes) will be activated regardless if the refrigerated compartment temperature has been in–range or not.

- UNIT CONTROL: Engine and standby Operation:
  If the microprocessor is not configured for shutdown, alarm only.
  If the microprocessor is configured for shutdown the unit will shutdown and alarm.

- RESET CONDITION:

  **Condition 1**: Auto Reset; If the unit is running in Pulldown Mode and the SAT is greater than 1°F (0.56°C) below the RAT **or** if the unit is running in Pull–Up Mode and the SAT is greater than the RAT.

  **Condition 2 & 3**: Auto Reset when the temperature is within ±2.7°F (±1.5°C) for perishable setpoints or +2.7°F (±1.5°C) for frozen setpoint.

  **For either Condition**: alarm may be manually reset via Keypad OR by turning the unit off, then back on again.

NOTE: The 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 activated in Sleep Mode.

NOTE: For Condition Two, the temperature criteria for this alarm is reset, and the refrigerated compartment temperature must again go In Range before this alarm can be activated if any of the following occur:

- Pretrip is started.
- Setpoint is changed.
- A door switch or remote switch is installed and configured as a door switch, and the switch is opened indicating that the compartment door has been opened.

**Troubleshooting steps begin on the next page.**

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00053** | **BOX TEMP OUT-OF-RANGE - Continued** | | |
| 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 page 7-2.) 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** | |
| | | Inspect all trailer compartment doors. | Must be closed, no air leakage. |
| | 2 | **Defrost Evaporator** | |
| | | Initiate Manual Defrost Cycle. | Must terminate automatically.<br>All ice cleared from all evaporator coils. |
| | 3 | **Check For Any Shutdown Alarm(s)** | |
| | | Check the Alarm List for any Shutdown Alarms. | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 4 | **Check For Low Refrigerant Pressure Alarm** | |
| | | Check for alarm 18. | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 5 | **Check Refrigerant Level** | |
| | | Visually check refrigerant level in receiver. | Must be at correct level. Refer to Section 8.6.2. |
| | 6 | **Check System Pressures** | |
| | | Install manifold gauge 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. |
| | 7 | **Check Evaporator Motor or Contactor Alarm** | |
| | | Check for alarm 77,101,102,109,110 or 111. | Must be corrected and cleared to continue. |
| | 8 | **Verify accuracy of RAT & SAT sensors** | |
| | | Verify accuracy of RAT & SAT using infrared or other accurate temperature testing tool. | RAT & SAT readings must be within ±3°F (1.7°C) of test temperature tool reading. |
| | 9 | **Perform Pretrip Check** | |
| | | Clear Active Alarm list, then run Pretrip & check for any new alarms. | Any active alarms must be corrected and cleared before proceeding. |
| | 10 | **Check For Low Delta-T** | |
| | | Read Delta-T from Unit Data. | In Cool, the Delta-T must be greater than(cooling more than) -1°F (-0.56°C.)<br>In Heat the Delta-T must be greater than 0 (1SAT must be higher than 1RAT.) |

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>Alarm/Cause</th><th>Corrective Action</th></tr>
<tr><td colspan="4">00054 DEFROST NOT COMPLETE<br>• TRIGGER–ON: Defrost cycle did not complete within 45 minutes<br>• 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.<br>• 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.</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 rowspan="2"></td><td>1</td><td colspan="2">Perform Pretrip Check</td></tr>
<tr><td></td><td>Clear Active Alarm list, then run Pretrip & check for any new alarms.</td><td>Any active alarms must be corrected and cleared before proceeding.</td></tr>
<tr><td rowspan="2"></td><td>2</td><td colspan="2">Check For Defective Defrost Sensor Location/Correct Installation</td></tr>
<tr><td></td><td>Has sensor fallen from location?</td><td>Must be corrected to continue.</td></tr>
<tr><td rowspan="2"></td><td>3</td><td colspan="2">Check Evaporator Fan Contactors</td></tr>
<tr><td></td><td>Check that contactors are not energized and that the contacts are not stuck closed in defrost.</td><td>Must de-energize evaporator fan in each enabled compartment during defrost.</td></tr>
<tr><td rowspan="4"></td><td rowspan="4">4</td><td colspan="2">Check Evaporator Heater Current Draw</td></tr>
<tr><td>a. Check Compartment 1 Heater amp draw for 1HTCON1 & 1HTCON2</td><td rowspan="3">These checks must be made with the unit operating.<br>Verify that all three actual amperage readings for each component are within 10% of each other, and are within the values shown in section 2.12.</td></tr>
<tr><td>b. Check Compartment 2 Heater amp draw for 2HTCON1 & 2HTCON2</td></tr>
<tr><td>c. Check Compartment 3 Heater amp draw for 3HTCON1 & 3HTCON2</td></tr>
</table>

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00055** | **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 contacts were closed continuously for 15 seconds before the defrost cycle was started.)<br>• 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.<br>• 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 Condition Of Refrigerated Compartment & Load** | |
| | | a. Check condition of refrigerated compartment doors & seals. | Doors must be closed, and door seals must seal and prevent entrance of outside air. |
| | | b. Check condition of evaporator. | Check for blockage sufficient to cause an air pressure differential across the coil great enough to close the contacts of the defrost air switch.<br>Coil must be free of ice following defrost. |
| | | c. Check condition of product. | If product is warm and moist, frequent defrost cycles can be expected. |
| | 2 | **Check Switch Wiring** | |
| | | a. Inspect switch & connector pins & terminals. | No physical damage to switch.<br>No damage or corrosion in connector. |
| | | b. Check switch circuit. (See wiring schematic Section 10.) | Check wiring from switch to microprocessor terminal 2MP6 is not shorted to a power source, providing a false signal. |
| | 3 | **Check Defrost Air Switch, Defrost Circuit and Tubing** | |
| | | a. Perform testing and reset switch if required. | Refer to Section 8.8.9 page 8–31. |

| Alarm NO. | Steps | ALARM / CAUSE | CORRECTIVE ACTION |
|---|---|---|---|
| **00057** | **CHECK REMOTE SWITCH 1 (REMS1)** | | |
| | • TRIGGER–ON: Remote Switch 1 is set to activate an alarm if the switch is activated (opened or closed, depending on switch type) for more than five seconds.<br>• UNIT CONTROL: May be configured as alarm only, alarm and force low engine speed or alarm and shutdown Compartment 1.<br>• RESET CONDITION:<br>Alarm Only: Auto Reset after the switch has de-activated for more than five seconds.<br>Shutdown: Auto Reset after three minutes (minimum off time for door open condition) and the switch has de-activated for more than five seconds. | | |
| 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. | | | |
| | | **IF A SWITCH IS INSTALLED** | |
| | 1 | **Determine what REMS1 is controlled by.** | |
| | | REMS1 may be connected to a compartment door or some other device and used to remotely control the compartment. | Locate the device used as REMS1. |
| | 2 | **Check To See If REMS1 Has Activated** | |
| | | Inspect device used to activate REMS1. | For example, Compartment door must be closed, and switch must be de-activated. |
| | 3 | **Check "REMS1 (Remote Switch 1)" Configuration** | |
| | | Verify that Configuration is set for the type of switch being used (i.e. when switch is activated, switch contacts are closed; etc.) | Configuration must agree with switch type. Refer to "REMS1 (Remote Switch 1)" Configuration, Table 5-2. |
| | 4 | **Check Wiring** | |
| | | a. Visually inspect wiring to Remote Switch #1. | Wiring must be connected. |
| | | b. Visually inspect condition of switch | Must not be damaged, wet, corroded, etc. |
| | | c. Check circuit. (See wiring schematic Section 10.) | With the switch contacts closed, check for 12 VDC through the wiring and switch to the correct microprocessor terminal (refer to applicable wiring schematic - Section 10). |
| | 5 | **Temporary Solution Tip** | |
| | | In the event of a defective switch that can not be repaired or replaced, and the switch is forcing the unit into a Shutdown, this alarm may be temporarily overridden by setting the correct Functional Parameter. | In the Functional Parameter list set OVERRIDE REMS1 SHUTDOWN to YES. |
| | | **IF A SWITCH IS NOT INSTALLED** | |
| | | Locate and inspect 10 position connector for optional sensors and switches (see wiring schematic Section 10). | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

| Alarm NO. | Steps | ALARM / CAUSE | CORRECTIVE ACTION |
|---|---|---|---|
| **00058** | **CHECK REMOTE SWITCH 2 (REMS2)** | | |
| | • TRIGGER–ON: Remote Switch 2 is set to activate an alarm if the switch is activated (opened or closed, depending on switch type) for more than five seconds.<br>• UNIT CONTROL: May be configured as alarm only, alarm and force low engine speed or alarm and shutdown Compartment 2.<br>• RESET CONDITION:<br>Alarm Only: Auto Reset after the switch has de-activated for more than five seconds.<br>Shutdown: Auto Reset after three minutes (minimum off time for door open condition) and the switch has de-activated for more than five seconds. | | |
| 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. | | | |
| **IF A SWITCH IS INSTALLED** | | | |
| | 1 | **Determine what REMS2 is controlled by.** | |
| | | REMS2 may be connected to a compartment door or some other device and used to remotely control the compartment. | Locate the device used as REMS2. |
| | 2 | **Check To See If REMS2 Has Activated** | |
| | | Inspect device used to activate REMS2. | For example, Compartment door must be closed, and switch must be de-activated. |
| | 3 | **Check "REMS2 (Remote Switch 2)" Configuration** | |
| | | Verify that Configuration is set for the type of switch being used (i.e. when switch is activated, switch contacts are closed; etc.) | Configuration must agree with switch type. Refer to "REMS2 (Remote Switch 2) Configuration, Table 5-2. |
| | 4 | **Check Wiring** | |
| | | a. Visually inspect wiring to Remote Switch #2. | Wiring must be connected. |
| | | b. Visually inspect condition of switch | Must not be damaged, wet, corroded, etc. |
| | | c. Check circuit. (See wiring schematic Section 10.) | With the switch contacts closed, check for voltage from microprocessor terminal 2MP13, through the 10 position connector (OC), through the 2EVC connector and through the switch to ground at SP6. |
| | 5 | **Temporary Solution Tip** | |
| | | In the event of a defective switch that can not be repaired or replaced, and the switch is forcing the unit into a Shutdown, this alarm may be temporarily overridden by setting the correct Functional Parameter. | In the Functional Parameter list set OVERRIDE REMS2 SHUTDOWN to YES. |
| **IF A SWITCH IS NOT INSTALLED** | | | |
| | | Locate and inspect 10 position connector for optional sensors and switches (see wiring schematic Section 10). | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00059** | **DATALOGGER (DataLink data recorder) NOT RECORDING** | | |
| | • TRIGGER–ON: No data is being recorded by the DataLink data recorder.<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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 page 7-2.) 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 re-occurrence. | If Inactive, download all data & retain.<br>If Active, go to next step. |
| | 2 | **Microprocessor Defective** | |
| | | a. Download previous data using Download PC Card, or ReeferManager Program. | Data retrieval OK. |
| | | b. Replace microprocessor & set Configurations, Functional Parameters, Enter hours from removed microprocessor, set Maintenance Hour Meters, and DataLink data recorder Setup. | New microprocessor in place. |
| NOTE: Specific configurations may be found on the TransCentral Website (Authorized Carrier Transicold Dealers only.) | | | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00060** | **DATALOGGER (DataLink data recorder) TIME WRONG**<br>• TRIGGER–ON: The real time clock in the Data Recorder does not contain a valid date.<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• RESET CONDITION: Auto Reset when the DataLink 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** | |
| | | Check Real Time Clock in the Unit Data, or using ReeferManager. | Must show correct date and time. Change as needed (Configuration List). |
| | 2 | **Reset Microprocessor** | |
| | | a. Place the Main Power switch in the OFF position for 30 seconds and then return it to the desired position. | Microprocessor powers up OK. |
| | | b. Check for valid Real Time Clock reading in Unit Data. | Valid date and time in memory.<br>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 ReeferManager Program. | Data retrieval OK. |
| | | b. Replace microprocessor & set Configurations, Functional Parameters, Enter hours from removed microprocessor, set Maintenance Hour Meters, and DataLink data recorder Setup. | New microprocessor in place. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00061** | **DOOR OPEN (DS1)**<br>• TRIGGER–ON: DS1 is set to activate an alarm if the switch is activated (opened or closed, depending on switch type) for more than five seconds.<br>• UNIT CONTROL: May be configured as alarm only, alarm and force low engine speed or alarm and shutdown.<br>• RESET CONDITION:<br>Alarm Only: Auto Reset after the switch has de-activated for more than five seconds.<br>Shutdown: Auto Reset after three minutes (minimum off time for door open condition) and the switch has de-activated for more than five seconds. | | |
| 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. | | | |
| | | **IF A SWITCH IS INSTALLED** | |
| | 1 | **Determine what DS1 is controlled by.** | |
| | | DS1 may be connected to a compartment door or some other device and used to remotely control the unit. | Locate the device used as DS1. |
| | 2 | **Check To See If DS1 Has Activated** | |
| | | Inspect device used to activate DS1. | For example, Compartment door must be closed, and switch must be de-activated. |
| | 3 | **Check “DOOR SWITCH” Configuration** | |
| | | Verify that Configuration is set for the type of switch being used (i.e. when switch is activated, switch contacts are closed; etc.) | Configuration must agree with switch type. Refer to “DOOR SWITCH” Configuration, Table 5-2. |
| | 4 | **Check Wiring** | |
| | | a. Visually inspect wiring to DS1 | Wiring must be connected. |
| | | b. Visually inspect condition of switch | Must not be damaged, wet, corroded, etc. |
| | | c. Check circuit. (See wiring schematic Section 10.) | With the switch contacts closed, check for 12 VDC through the wiring and switch to the correct microprocessor terminal (refer to applicable wiring schematic - Section 10). |
| | 5 | **Temporary Solution Tip** | |
| | | In the event of a defective switch that can not be repaired or replaced, and the switch is forcing the unit into a Shutdown, this alarm may be temporarily overridden by setting the correct Functional Parameter. | In the Functional Parameter list set OVERRIDE REMS1 SHUTDOWN to YES. |
| | | **IF A SWITCH IS NOT INSTALLED** | |
| | | Locate and inspect 10 position connector for optional sensors and switches (REMSN, see wiring schematic Section 10). | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|

**00062 C2 BOX TEMP OUT OF RANGE (Compartment 2)**

- TRIGGER–ON:

  **Condition One:** If the unit is running in Pulldown Mode and the SAT is not greater than 1°F (0.56°C) below the RAT **or** if the unit is running in Pull–Up Mode and the SAT is not above the RAT, the configured action (Alarm only after 30 minutes or Alarm and Shutdown after 45 minutes) will be activated.

  **NOTE:** If the Out–Of–Range Alarm Functional Parameter is set to OFF, the following conditions will not trigger an alarm or shutdown.

  **Condition Two:** If the refrigerated compartment temperature has been within ±2.7°F (±1.5°C) for perishable setpoints or +2.7°F (±1.5°C) for frozen of setpoint at least once since the unit was started and is now further away from setpoint than the limit set in the Out–Of–Range Alarm Functional Parameter [ 4°, 5°, or 7°F (2°, 3°, or 4°C)], the configured action (Alarm only after 30 minutes or Alarm and Shutdown after 45 minutes) will be activated.

  **Condition Three:** If a shutdown alarm occurs and the RAT is further away from setpoint than the limit set in the Out–Of–Range Alarm Functional Parameter [ 4°, 5°, or 7°F (2°, 3°, or 4°C)], the configured action (Alarm only after 30 minutes or Alarm and Shutdown after 45 minutes) will be activated regardless if the refrigerated compartment temperature has been in–range or not.

- UNIT CONTROL: Engine and standby Operation:

  If the microprocessor is not configured for shutdown, alarm only.
  If the microprocessor is configured for shutdown the unit will shutdown and alarm.

- RESET CONDITION:

  **Condition 1**: Auto Reset; If the unit is running in Pulldown Mode and the SAT is greater than 1°F (0.56°C) below the RAT **or** if the unit is running in Pull–Up Mode and the SAT is greater than the RAT.

  **Condition 2 & 3**: Auto Reset when the temperature is within ±2.7°F (±1.5°C) for perishable setpoints or +2.7°F (±1.5°C) for frozen setpoint.

  **For either Condition**: alarm may be manually reset via Keypad OR by turning the unit off, then back on again.

NOTE: The 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 activated in Sleep Mode.

NOTE: For Condition Two, the temperature criteria for this alarm is reset, and the refrigerated compartment temperature must again go In Range before this alarm can be activated if any of the following occur:

- Pretrip is started.
- Setpoint is changed.
- A door switch or remote switch is installed and configured as a door switch, and the switch is opened indicating that the compartment door has been opened.

**Troubleshooting steps begin on the next page.**

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00062** | **C2 BOX TEMP OUT-OF-RANGE - Continued** | | |
| 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 page 7-2.) 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** | |
| | | Inspect all trailer compartment doors. | Must be closed, no air leakage. |
| | 2 | **Defrost Evaporator** | |
| | | Initiate Manual Defrost Cycle. | Must terminate automatically.<br>All ice cleared from all evaporator coils. |
| | 3 | **Check For Any Shutdown Alarm(s)** | |
| | | Check the Alarm List for any Shutdown Alarms. | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 4 | **Check For Low Refrigerant Pressure Alarm** | |
| | | Check for alarm 18. | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 5 | **Check Refrigerant Level** | |
| | | Visually check refrigerant level in receiver. | Must be at correct level. Refer to Section 8.6.2. |
| | 6 | **Check System Pressures** | |
| | | Install manifold gauge 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. |
| | 7 | **Check Evaporator Airflow Alarm** | |
| | | Check for alarm 56. | Must be corrected and cleared to continue. |
| | 8 | **Perform Pretrip Check** | |
| | | Clear Active Alarm list, then run Pretrip & check for any new alarms. | Any active alarms must be corrected and cleared before proceeding. |
| | 9 | **Check For Low Delta-T** | |
| | | Read Delta-T from Unit Data. | In Cool, the Delta-T must be greater than(cooling more than) -1°F (-0.56°C.)<br>In Heat the Delta-T must be greater than 0 (1SAT must be higher than 1RAT.) |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|

**00063 C3 BOX TEMP OUT OF RANGE (Compartment 3)**

- TRIGGER–ON:

  **Condition One:** If the unit is running in Pulldown Mode and the SAT is not greater than 1°F (0.56°C) below the RAT **or** if the unit is running in Pull-Up Mode and the SAT is not above the RAT, the configured action (Alarm only after 30 minutes or Alarm and Shutdown after 45 minutes) will be activated.

  **NOTE:** If the Out-Of-Range Alarm Functional Parameter is set to OFF, the following conditions will not trigger an alarm or shutdown.

  **Condition Two:** If the refrigerated compartment temperature has been within ±2.7°F (±1.5°C) for perishable setpoints or +2.7°F (±1.5°C) for frozen of setpoint at least once since the unit was started and is now further away from setpoint than the limit set in the Out-Of-Range Alarm Functional Parameter [ 4°, 5°, or 7°F (2°, 3°, or 4°C)], the configured action (Alarm only after 30 minutes or Alarm and Shutdown after 45 minutes) will be activated.

  **Condition Three:** If a shutdown alarm occurs and the RAT is further away from setpoint than the limit set in the Out-Of-Range Alarm Functional Parameter [ 4°, 5°, or 7°F (2°, 3°, or 4°C)], the configured action (Alarm only after 30 minutes or Alarm and Shutdown after 45 minutes) will be activated regardless if the refrigerated compartment temperature has been in-range or not.

- UNIT CONTROL: Engine and standby Operation:

  If the microprocessor is not configured for shutdown, alarm only.
  If the microprocessor is configured for shutdown the unit will shutdown and alarm.

- RESET CONDITION:

  **Condition 1**: Auto Reset; If the unit is running in Pulldown Mode and the SAT is greater than 1°F (0.56°C) below the RAT **or** if the unit is running in Pull-Up Mode and the SAT is greater than the RAT.

  **Condition 2 & 3**: Auto Reset when the temperature is within ±2.7°F (±1.5°C) for perishable setpoints or +2.7°F (±1.5°C) for frozen setpoint.

  **For either Condition**: alarm may be manually reset via Keypad OR by turning the unit off, then back on again.

NOTE: The 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 activated in Sleep Mode.

NOTE: For Condition Two, the temperature criteria for this alarm is reset, and the refrigerated compartment temperature must again go In Range before this alarm can be activated if any of the following occur:

- Pretrip is started.
- Setpoint is changed.
- A door switch or remote switch is installed and configured as a door switch, and the switch is opened indicating that the compartment door has been opened.

**Troubleshooting steps begin on the next page.**

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00063** | **C3 BOX TEMP OUT-OF-RANGE - Continued** | | |
| 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 page 7-2.) 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** | |
| | | Inspect all trailer compartment doors. | Must be closed, no air leakage. |
| | 2 | **Defrost Evaporator** | |
| | | Initiate Manual Defrost Cycle. | Must terminate automatically.<br>All ice cleared from all evaporator coils. |
| | 3 | **Check For Any Shutdown Alarm(s)** | |
| | | Check the Alarm List for any Shutdown Alarms. | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 4 | **Check For Low Refrigerant Pressure Alarm** | |
| | | Check for alarm 18. | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 5 | **Check Refrigerant Level** | |
| | | Visually check refrigerant level in receiver. | Must be at correct level. Refer to Section 8.6.2. |
| | 6 | **Check System Pressures** | |
| | | Install manifold gauge 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. |
| | 7 | **Check Evaporator Airflow Alarm** | |
| | | Check for alarm 56. | Must be corrected and cleared to continue. |
| | 8 | **Perform Pretrip Check** | |
| | | Clear Active Alarm list, then run Pretrip & check for any new alarms. | Any active alarms must be corrected and cleared before proceeding. |
| | 9 | **Check For Low Delta-T** | |
| | | Read Delta-T from Unit Data. | In Cool, the Delta-T must be greater than(cooling more than) -1°F (-0.56°C.)<br>In Heat the Delta-T must be greater than 0 (1SAT must be higher than 1RAT.) |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **7.7 ELECTRICAL ALARMS** | | | |
| **00071** | **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<br>• UNIT CONTROL: Engine Operation: Alarm Only. If the engine shut off, see troubleshooting steps below to correct.<br>Standby Operation: Additional verification required if the “NO A/C POWER” configuration is set for “Installed and shutdown”, the refrigeration system will shutdown with the alarm on and PSCON still energized.<br>• 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 page 7-2. 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** | |
| | | Did engine shutdown? | Yes Check F3.<br>No Check F2. |
| | 2 | **Check Fuses** | |
| | | a. Locate blown fuse(s). | Will have open circuit. |
| | | b. Verify fuse size. | Refer to Section 2.14 for correct electrical values. Must be correct rating for circuit. (See wiring schematic. Section 10.) |
| | | 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 for correct electrical values. |
| | | b. Check amperage draw on Run Relay circuit. | Refer to Section 2.14 for correct electrical values. |

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>Alarm/Cause</th><th>Corrective Action</th></tr>
<tr><td colspan="4">00073 NO A/C POWER-CHECK POWER CORD<br>• TRIGGER–ON: The unit is set to operate in standby AND no AC power<br>• UNIT CONTROL: Engine Operation: this alarm will not activate in Engine Operation.<br>Standby Operation:<br>If the “NO POWER SWITCH TO DIESEL” Functional Parameter is set to “No” or the “NO POWER SWITCH TO DIESEL” Functional Parameter is set to “Yes” and the “NO A/C POWER” Configuration is set for “Alarm and shutdown” the refrigeration system will shutdown (because of the loss of power) with the alarm on and PSCON still energized.<br>If the “NO POWER SWITCH TO DIESEL” Functional parameter is set to “Yes” and the “NO A/C POWER” Configuration is set to “Switch To Diesel” the unit will remain off for 5 minutes, then start the engine. The unit will remain in Engine Operation until the minimum run time has expired (regardless if the unit is set for Start Stop or Continuous) and until standby power has been restored continually for 5 minutes.<br>• RESET CONDITION: Auto Reset when AC power is restored or the alarm may be manually reset via keypad or by turning the unit off, then back on. If the unit is running in Engine Backup when the A/C power has been restored for 5 continuous minutes and the above conditions have been met, the engine will stop and the unit will restart in Standby Operation.</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 Circuit Breaker On The Main External Power Supply</td></tr>
<tr><td></td><td></td><td>a. Check circuit breaker.</td><td>30A supply circuit breaker – Must be on.</td></tr>
<tr><td></td><td></td><td>b. Check the voltage in the plug.</td><td>460V / 3 / 60Hz.</td></tr>
<tr><td></td><td>2</td><td colspan="2">Check Power Cord</td></tr>
<tr><td></td><td></td><td>a. Inspect connections in the socket and the plug.</td><td>Connections must be tight.</td></tr>
<tr><td></td><td></td><td>b. Inspect the cable.</td><td>Cable must not be frayed, cut or damaged.</td></tr>
<tr><td></td><td>3</td><td colspan="2">Check For Power In The Control Box</td></tr>
<tr><td></td><td></td><td>a. Check for voltage at PSCON L1–L2, L2–L3, L1–L3.</td><td>All three readings must be 460V ± 10% .</td></tr>
<tr><td></td><td></td><td>b. Check for voltage at PSCON2 L1–L2, L2–L3, L1–L3.</td><td>All three readings must be 460V ± 10%.</td></tr>
<tr><td></td><td>4</td><td colspan="2">Check Connections</td></tr>
<tr><td></td><td></td><td>Check for bad connections in the control box.</td><td>Connections and wire crimps must be tight.</td></tr>
<tr><td></td><td>5</td><td colspan="2">Check Phase Reversal Module (PRM)</td></tr>
<tr><td></td><td></td><td>a. Check for voltage at 5MP04.</td><td>Must be +12 VDC.</td></tr>
<tr><td></td><td></td><td>b. Check Phase Reversal Module for correct operation.</td><td>See Section 8.9.2. Replace PRM if defective.</td></tr>
</table>

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00075** | **COMP MOTOR OVERLOAD** | | |
| | • TRIGGER–ON: Compressor Motor Internal Protector (IPC) circuit is open.<br>• UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized.<br>• 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 Alarm13 (A13 or I13 = High Pressure)** | |
| | | Alarm 13 will always cause this alarm to activate, even when there are no problems with this circuit. | Review steps for Alarm 13 and correct if necessary. |
| | 2 | **Check For 12 VDC At 4MP1** | |
| | | a. If 12VDC. | Alarm should have cleared itself. |
| | | b. If no power (0VDC.) | Continue with step 3. |
| | 3 | **Check IPC circuit** | |
| | | a. Use Component Test Mode to energize CCON circuit (Refer to Section 5.2.2.) | FET 2 will be on. |
| | | b. Check IPC harness to microprocessor. | 12 VDC on terminals 8 & 9 at the compressor (white wires.) |
| | | c. Check SP15. | There should be 12 VDC from HP1 to SP15 to IPC. |
| | | d. Test continuity through IPC. | Should be 0 Ohms. If compressor body is extremely warm, allow it to cool off, then recheck IPC continuity. |
| | | e. Test IP circuit from compressor motor to microprocessor. | 12 VDC at 4MP1. |
| | 4 | **Check Compressor Motor Contactor** | |
| | | a. Inspect the wire connections to the contactor. (See wiring schematic Section 10.) | No signs of overheating of the contactor. Wiring is routed correctly to the contactor. |
| | | b. Check tightness of the contactor wire connections. | Tighten with screwdriver and check for discoloration of wires. |
| | 5 | **Perform Pretrip** | |
| | | Clear Active Alarm list, then run Pretrip & check for any new alarms. | Any active alarms must be corrected and cleared before proceeding. |
| | 6 | **Check Compressor Motor Operation** | |
| | | Turn the unit ON in Engine or Standby Operation. | Check voltage and current on each phase (voltage and amperage must be within allowable range (Refer to Section 2.12 for correct electrical values.) |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00076** | **CONDENSER MOTOR OVERHEATED** | | |
| | • TRIGGER–ON: One or both of the condenser fan motor Internal Protectors (IP–CDM1 AND 2) circuit is open.<br>• UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm.<br>Standby Operation: refrigeration system shutdown and alarm with PSCON still energized.<br>• 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 Blades for Free Operation** | |
| | | Visually inspect condenser fan blades for any foreign material or damage or anything that will prevent the blade and motor from turning freely | Fan blade must be in good condition.<br>No sticks or other material obstructing it's movement<br>No ice build–up preventing blade rotation. |
| | 2 | **Check For 12 VDC At 4MP2** | |
| | | a. If 12VDC. | Alarm should have cleared itself. |
| | | b. If no power (0VDC.) | Continue with step 2 below. |
| | 3 | **Check IPC circuit** | |
| | | a. Check MPQC9. | There should be 12 VDC from MPQC9 to Ground. |
| | | b. Use Component Test Mode to energize CDCON circuit. (Refer to Section 5.2.2.) | FET 1 will be on. |
| | | c. Unplug the connector to condenser fan motor 1 (CDM1) and check voltage on pins 4–5 in the engine harness connector. | 12 VDC between pin 4 and pin 5 indicates the open circuit is in the IP for CDM1. |
| | | d. Test continuity through CDM1 IP at pins 4–5 in the fan motor harness connector. | Should be 0 Ohms. If condenser fan motor 1 is extremely warm, allow it to cool off, then recheck IP continuity. |
| | | e. Test continuity through IPC. | Should be 0 Ohms. If either condenser fan motor is extremely warm, allow it to cool off, then recheck IPC continuity. |
| | | f. Test IP circuit from condenser fan motor wires to microprocessor. | 12 VDC at 4MP2. |
| | 4 | **Check Condenser Fan Motor Contactor** | |
| | | a. Inspect the wire connections to the contactor. (See wiring schematic Section 10.) | No signs of overheating of the contactor. Wiring is routed correctly to the contactor. |
| | | b. Check tightness of the contactor wire connections. | Tighten with screwdriver and check for discoloration of wires. |
| | 5 | **Perform Pretrip** | |
| | | Clear Active Alarm list, then run Pretrip & check for any new alarms. | Any active alarms must be corrected and cleared before proceeding. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00076** | **CONDENSER MOTOR OVERHEATED – Continued** | | |
| | 6 | **Check Condenser Fan Motors** | |
| | | Disconnect power plug at motor. | Test IP circuit for continuity using ohmmeter.<br>If open, remove and replace motor.<br>If closed, then an intermittent IP circuit is suspect. Check phase to phase and phase to ground for short or open circuits. Refer to Section 2.12 for correct electrical values.<br>If motor tests good, check the DC IP circuit to microprocessor. |
| | 7 | **Check Motor Operation** | |
| | | Turn the unit ON. | Check current on each phase (must be less than shown on Section 2.12.)<br>Check voltage on each phase (must be within voltage limits shown in Section 2.12.) |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00077** | **EVAP MOTOR OVERHEATED** | | |
| | • TRIGGER–ON: The evaporator fan motor Internal Protector (IP–EVM) is open.<br>• UNIT CONTROL: Engine and Standby Operation: Shutdown and alarm<br>• RESET CONDITION: Auto Reset after a 15 minute off time when motor overload input is within limits 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 Blades for Free Operation** | |
| | | Visually inspect evaporator fan for any foreign material or damage or anything that will prevent the blade and motor from turning freely | Blower wheel must be in good condition.<br>No sticks or other material obstructing its movement<br>No ice build–up preventing blade rotation. |
| | 2 | **Check For 12 VDC At 4MP3** | |
| | | a. If 12VDC | Alarm should have cleared itself. |
| | | b. If no power (0VDC) | Continue with step 2 below. |
| | 3 | **Check IPC Circuit** | |
| | | a. Use Component Test Mode to energize Evaporator Motor Contactor circuit. (Refer to Section 5.2.2.) | FET 20 will be on. |
| | | b. Unplug the connector to the evaporator fan motor and check voltage on IP–EVM (white) wire. | 12 VDC between pin 4 in the engine harness connector and Ground. |
| | | c. Check MPQC9. | There should be 12 VDC from MPQC9 to Ground. |
| | | d. Test continuity through IPC. | Should be 0 Ohms. If the evaporator fan motor is extremely warm, allow it to cool off, then recheck IPC continuity. |
| | | e. Test IP circuit from evaporator fan motor junction box to microprocessor. | 12 VDC at 4MP3 |
| | 4 | **Check Evaporator Fan Motor Contactor** | |
| | | a. Inspect the wire connections to the contactor. (See wiring schematic Section 10.) | No signs of overheating of the contactor. Wiring is routed correctly to the contactor. |
| | | b. Check tightness of the contactor wire connections | Tighten with screwdriver and check for discoloration of wires. |
| | 5 | **Perform Pretrip** | |
| | | Clear Active Alarm list, then run Pretrip & check for any new alarms. | Any active alarms must be corrected and cleared before proceeding. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00077** | **EVAP MOTOR OVERHEATED – Continued** | | |
| | 6 | **Check Evaporator Fan Motor** | |
| | | Disconnect power plug at motor | Test IP circuit for continuity using ohmmeter<br>If open, remove and replace motor<br>If closed, then an intermittent IP circuit is suspect. Check phase to phase and phase to ground for short or open circuits. Refer to Section 2.12 for correct electrical values.<br>If motor tests good, check the DC IP circuit to microprocessor. |
| | 7 | **Check Motor Operation** | |
| | | Turn the unit ON | Check current on each phase (must be less than shown on Section 2.12).<br>Check voltage on each phase (must be at within limits shown in Section 2.12.) |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00081** | **CHECK FHR CIRCUIT** | | |
| | • TRIGGER–ON: Fuel Heater Relay circuit is shorted. (The Fuel Heater Relay output from the micro is negative, so the circuit will not be shorted to ground, but is shorted either within the Fuel Heater Relay coil itself, or to a positive wire.)<br>• UNIT CONTROL: Alarm Only<br>• RESET CONDITION: Auto Reset when Fuel Heater Relay 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 fuel heater relay** | |
| | | a. Inspect fuel heater relay & socket | No damage to relay<br>No damaged or corroded pins |
| | | b.Check resistance of relay coil | Refer to Section 2.13. |
| | 2 | **Check fuel heater relay wiring** | |
| | | a. Inspect harness & control box connector pins & terminals (See wiring schematic, Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | 3 | **Check fuel heater relay current draw** | |
| | | a. Use Component Test mode (Refer to Section 5.2.2) to test actual current draw of the circuit. | Refer to Section 2.13 for normal current values. View current draw in the Unit Data list. (Refer to Section 3.13). |
| | | | |
| **00084** | **CHECK REMOTE ALARM LIGHT** | | |
| | • TRIGGER–ON: The fault output circuit (amber “check unit” LED’s) to the light bar is shorted. (This output [3MP19] from the microprocessor is negative, so the circuit will not be shorted to ground, but is shorted either within the remote alarm light itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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 2–Light Bar Wiring** | |
| | | a. Inspect light bar & connector. | No damage to light bar.<br>No damage, moisture, or corrosion in connector. |
| | | b. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | 2 | **Check 2–Light Bar** | |
| | | Check operation of 2–Light Bar | Refer to Section 8.9.3 for information on testing the 2–Light Bar. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00085** | **CHECK UL1 CIRCUIT** | | |
| | • TRIGGER–ON: Front Unloader (UL1) circuit is shorted. (The UL1 output from the microprocessor (3MP12) is negative, so the circuit will not be shorted to ground, but is shorted either within UL1 itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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 Front Unloader (UL1) Coil** | |
| | | a. Inspect Front Unloader (UL1) coil & connector. | No damage to coil<br>No damage, moisture, or corrosion in connector. |
| | | b. Check resistance of coil | Refer to Section 2.13 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground. |
| | | c. Check amp draw of coil. | Refer to Section 2.13 for correct electrical values. Use ammeter. |
| | 2 | **Check Front Unloader (UL1) Current Draw** | |
| | | Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.) | Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 3 | **Check Front Unloader (UL1) Coil Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00086** | **CHECK UL2 CIRCUIT** | | |
| | • TRIGGER–ON: Rear Unloader (UL2) circuit is shorted. (The UL2 output from the microprocessor (3MP23) is negative, so the circuit will not be shorted to ground, but is shorted either within UL2 itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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 Rear Unloader (UL2) Coil** | |
| | | a. Inspect Rear Unloader (UL2) coil & connector. | No damage to coil.<br>No damage, moisture, or corrosion in connector. |
| | | b. Check resistance of coil. | Refer to Section 2.13 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground. |
| | | c. Check amp draw of coil. | Refer to Section 2.13. Use ammeter. |
| | 2 | **Check Rear Unloader (UL2) Current Draw** | |
| | | Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.) | Refer to Section 2.13 for correct electrical values.<br>View current draw in Unit Data. |
| | 3 | **Check Rear Unloader (UL2) Coil Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00089** | **CHECK REMOTE AUTO LIGHT (Light Bar)** | | |
| | • TRIGGER–ON: The normal operation output circuit (green “Status OK” LED’s) to the light bar is shorted. (The light bar output from the microprocessor [3MP32] is negative, so the circuit will not be shorted to ground, but is shorted either within the light bar itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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 2-Light Bar Wiring** | |
| | | a. Inspect light bar & connector. | No damaged to light bar<br>No damage, moisture, or corrosion in connector. |
| | | b. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | 2 | **Check 2-Light Bar** | |
| | | Check operation of 2-Light Bar | Refer to Section 8.9.3 for information on testing the 2-Light Bar. |
| | | | |
| **00091** | **CHECK 1HTCON1 RELAY COIL** | | |
| | • TRIGGER–ON: Heater Contactor 1 (1HTCON1) circuit is shorted. (The contactor output from the microprocessor (4MP13) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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 1HTCON1** | |
| | | a. Inspect heater contactor relay coil and connector. | No damage to coil.<br>No damage, moisture, or corrosion in connector. |
| | | b. Check contactor coil resistance. | Refer to Section 2.13 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground. |
| | | c. Check amp draw of coil. | Refer to Section 2.13 for correct electrical values. Use ammeter. |
| | 2 | **Check 1HTCON1 Current Draw** | |
| | | Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.) | Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 3 | **Check 1HTCON1 Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00092** | **CHECK 1HTCON2 RELAY COIL** | | |
| | • TRIGGER–ON: Heater contactor 2 (1HTCON2) circuit is shorted. (The contactor output from the microprocessor (4MP14) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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 1HTCON2** | |
| | | a. Inspect heater contactor coil and terminals | No damage to coil<br>No damage or corrosion. |
| | | b. Check contactor coil resistance | Refer to Section 2.13 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground. |
| | | c. Check amp draw of coil. | Refer to Section 2.13 for correct electrical values. Use ammeter. |
| | 2 | **Check 1HTCON2 Current Draw** | |
| | | Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.) | Refer to Section 2.13 for correct electrical values<br>View current draw in Unit Data. |
| | 3 | **Check 1HTCON2 Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00093** | **CHECK START UP BUZZER** | | |
| | • TRIGGER–ON: The Buzzer (B) circuit is shorted. (The Buzzer output from the microprocessor [5MP08] is negative, so the circuit will not be shorted to ground, but is shorted either within the Buzzer itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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.<br>No damage or corrosion. |
| | | b. Check resistance of buzzer. | Refer to Section 2.13 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground. |
| | 2 | **Check Buzzer Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | 3 | **Check Buzzer Current Draw** | |
| | | Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.) | Refer to Section 2.13 for correct electrical values.<br>View current draw in Unit Data. |
| | | | |
| **00094** | **CHECK COMP CONTACTOR 1** | | |
| | • TRIGGER–ON: Compressor motor contactor relay (CCONR) circuit is shorted. (The relay output from the microprocessor (4MP5) is negative, so the circuit will not be shorted to ground, but is shorted either within the relay coil itself, or to a positive wire.).<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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.<br>No damage or corrosion. |
| | | b. Check contactor coil resistance. | Refer to Section 2.13 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground. |
| | | c. Check amp draw of coil. | Refer to Section 2.13 for correct electrical values.<br>Use ammeter. |
| | 2 | **Check CCONR Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | 3 | **Check CCONR Current Draw** | |
| | | Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.) | Refer to Section 2.13 for correct electrical values.<br>View current draw in Unit Data. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00095** | **CHECK CDCON RELAY COIL** | | |
| | • TRIGGER–ON: Condenser fan motor contactor (CDCON) circuit is shorted. (The contactor output from the microprocessor (4MP6) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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.<br>No damage or corrosion. |
| | | b. Check contactor coil resistance. | Refer to Section 2.13 for correct electrical values.<br>Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground. |
| | | c. Check amp draw of coil. | Refer to Section 2.13 for correct electrical values.<br>Use ammeter. |
| | 2 | **Check CDCON Current Draw** | |
| | | Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.) | Refer to Section 2.13 for correct electrical values.<br>View current draw in Unit Data. |
| | 3 | **Check CDCON** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00096** | **CHECK GENCONR RELAY COIL** | | |
| | • TRIGGER–ON: Generator contactor relay (GENCONR) circuit is shorted. (The relay output from the microprocessor (4MP7) is negative, so the circuit will not be shorted to ground, but is shorted either within the relay coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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.<br>No damage or corrosion. |
| | | b. Check contactor coil resistance. | Refer to Section 2.13 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground. |
| | | c. Check amp draw of coil. | Refer to Section 2.13 for correct electrical values. Use ammeter. |
| | 2 | **Check GENCONR Current Draw** | |
| | | Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.) | Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 3 | **Check GENCONR Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00098** | **CHECK HIGH TEMP THERMOSTAT** | | |
| | • TRIGGER–ON: With the Main Power switch toggled out of the OFF position, the 1EVHTS circuit is open.<br>• UNIT CONTROL: Alarm AND no heat allowed in any compartment.<br>• RESET CONDITION: Auto Reset when the 1EVHTS circuit 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 Evaporator Area For High Temperature** | |
| | | Check Evaporator temperature using a test thermometer. | EVHTS opens when the temperature of the evaporator becomes very high (Refer to Section 2.11). (For example, if the heaters are on when the fan is not running.) If the temperature of the evaporator section is very warm (hot), it will have to cool down before the EVHTS closes. |
| | 2 | **Check High Temperature Thermostat (EVHTS)** | |
| | | Inspect thermostat and connector. (See wiring schematic Section 10.) | No damage to thermostat.<br>No damage or corrosion in connector. |
| | 3 | **Check High Temperature Contacts** | |
| | | a. Contacts must be closed when temperature is normal. Unplug EVHTS and check for continuity. | Must be 0 (zero) Ohms. Cannot be opened (infinite ohms) or shorted to ground. |
| | | b. Check for 12VDC on MPQC9. | 12 VDC at MPQC9<br>Unplug EVHTS and check for 12 VDC at EVHTS pin A harness connector.<br>Visually inspect and repair wiring as needed. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00099** | **CHECK STANDBY CONTACTOR** | | |
| | • TRIGGER–ON: Standby motor contactor relay (PSCONR) circuit is shorted. (The relay output from the microprocessor (5MP7) is negative, so the circuit will not be shorted to ground, but is shorted either within the relay coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only. In engine Operation, the unit will continue to operate. In Standby the refrigeration system will not operate.<br>• 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.<br>No damage or corrosion. |
| | | b. Check contactor coil resistance. | Refer to Section 2.13 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground. |
| | | c. Check amp draw of coil. | Refer to Section 2.13 for correct electrical values. Use ammeter. |
| | 2 | **Check PSCONR Current Draw** | |
| | | Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.) | Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 3 | **Check PSCONR Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00100** | **OVERLOAD/GROUND FAULT** | | |
| | • TRIGGER–ON: Engine or Standby Operation is being called for and the overload ground fault module 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 miliamps.<br>• UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm.<br>• RESET CONDITION: Auto Reset in Engine Operation. 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 (Overload Ground Fault Detector (OGF) LED** | |
| | | Check status LED | LED is On – Ground Fault is detected. Start with Step 3 below.<br>LED is Off – Circuit Overload is detected. Start with Step 2 below. |
| | 2 | **Check For Electrical Overload** | |
| | | Check high voltage amp draw from GENCON if running in Engine Operation or PSCON2 if running in standby Operation. | Must be less than 40 Amps. |
| | 3 | **Check For High Voltage Short To Ground** | |
| | | a. Check resistance between T1, T2 and T3 for **<u>ALL</u>** High voltage contactors to ground. | Reading must be greater than 25,000 Ohms. |
| | | b. Perform Megohmmeter test on all high voltage circuits. | See Section 8.9. |
| | 4 | **Perform Pretrip Check** | |
| | | a. Clear Active Alarm list, then run Pretrip & check for any new alarms. | Note during which test Alarm 100 occurs. |
| | | b. Further test circuit from Step a. above. | Use a megohmmeter to test. |
| | 5 | **Check Overload / Ground Fault Device** | |
| | | With the engine OFF and standby power disconnected, start the unit in Engine Operation. | Must have 12 VDC at HC19 and 2MP26.<br>Refer to Section 8.9.4 for checking OGF. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00101** | **C2 EVAP MOTOR OVERHEATED**<br>• TRIGGER–ON: One or more of the 2EVM1, 2, 3 4 Internal Motor Protectors (IP) is open.<br>• UNIT CONTROL: Engine and Standby Operation: Compartment 2 shutdown only<br>• 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 (2EVCON)** | |
| | | 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 and check for discoloration of wires. |
| | 2 | **Check Motor Operation** | |
| | | Turn the unit ON | Check current on each phase. Refer to Section 2.12 for correct electrical values<br>Check voltage on each phase (must be at least 440VAC). |
| | 3 | **Check Compartment 2 Evaporator Motors** | |
| | | Disconnect power plug at motor | Test IP circuit for continuity using ohmmeter<br>If open, remove and replace motor<br>If closed, then an intermittent IP circuit is suspect. Check phase to phase and phase to ground for short or open circuits.<br>If motor tests good, check the DC IP circuit to microprocessor. |
| | 4 | **Perform Pretrip Check** | |
| | | Run Pretrip & check for alarms | Any active alarms must be corrected and cleared before proceeding. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00102** | **C3 EVAP MOTOR OVERHEATED** | | |
| | • TRIGGER–ON: One or more of the 3EVM1, 2, 3 4 Internal Motor Protectors (IP) is open.<br>• UNIT CONTROL: Engine and Standby Operation: Compartment 3 shutdown only<br>• 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 (3EVCON)** | |
| | | 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 and check for discoloration of wires. |
| | 2 | **Check Motor Operation** | |
| | | Turn the unit ON | Check current on each phase. Refer to Section 2.12 for correct electrical values<br>Check voltage on each phase (must be at least 440VAC). |
| | 3 | **Check Compartment 3 Evaporator Motors** | |
| | | Disconnect power plug at motor | Test IP circuit for continuity using ohmmeter<br>If open, remove and replace motor<br>If closed, then an intermittent IP circuit is suspect. Check phase to phase and phase to ground for short or open circuits.<br><br>If motor tests good, check the DC IP circuit to microprocessor. |
| | 4 | **Perform Pretrip Check** | |
| | | Run Pretrip & check for alarms | Any active alarms must be corrected and cleared before proceeding. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00103** | **CHECK 2HTCON1 RELAY COIL**<br>• TRIGGER–ON: Remote heater contactor 1 (2HTCON1) circuit is shorted. (The contactor output from the microprocessor (3MP34) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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<br>No damage or corrosion. |
| | | 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 2.13 for correct electrical values. Use ammeter. |
| | 2 | **Check 2HTCON1 Current Draw** | |
| | | Use Component Test Mode (Refer to Section 5.2.2) to test actual current draw of the circuit. | Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 3 | **Check 2HTCON1 Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | | |
| **00104** | **CHECK 2HTCON2 RELAY COIL**<br>• TRIGGER–ON: Remote heater contactor 2 (2HTCON2) circuit is shorted. (The contactor output from the microprocessor (3MP06) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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<br>No damage or corrosion. |
| | | 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 2.13 for correct electrical values. Use ammeter. |
| | 2 | **Check 2HTCON2 Current Draw** | |
| | | Use Component Test Mode (Refer to Section 5.2.2) to test actual current draw of the circuit. | Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 3 | **Check 2HTCON2 Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00105** | **CHECK 3HTCON1 RELAY COIL** | | |
| | • TRIGGER–ON: Remote heater contactor 1 (3HTCON1) circuit is shorted. (The contactor output from the microprocessor (3MP33) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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<br>No damage or corrosion. |
| | | 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 2.13 for correct electrical values.<br>Use ammeter. |
| | 2 | **Check 3HTCON1 Current Draw** | |
| | | Use Component Test Mode (Refer to Section 5.2.2) to test actual current draw of the circuit. | Refer to Section 2.13 for correct electrical values.<br>View current draw in Unit Data. |
| | 3 | **Check 3HTCON1 Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | | |
| **00106** | **CHECK 3HTCON2 RELAY COIL** | | |
| | • TRIGGER–ON: Remote heater contactor 2 (3HTCON2) circuit is shorted. (The contactor output from the microprocessor (3MP07) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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<br>No damage or corrosion. |
| | | 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 2.13 for correct electrical values.<br>Use ammeter. |
| | 2 | **Check 2HTCON2 Current Draw** | |
| | | Use Component Test Mode (Refer to Section 5.2.2) to test actual current draw of the circuit. | Refer to Section 2.13 for correct electrical values.<br>View current draw in Unit Data. |
| | 3 | **Check 2HTCON2 Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00107** | **CHECK 2LSV CIRCUIT** | | |
| | • TRIGGER–ON: Compartment 2 Liquid Solenoid Valve (2LSV) circuit is shorted. (The 2LSV output from the microprocessor (3MP18) is negative, so the circuit will not be shorted to ground, but is shorted either within the valve coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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 coil and connector. | No damage to coil<br>No damage, moisture, or corrosion in connector. |
| | | 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 2.13 for correct electrical values. Use ammeter. |
| | 2 | **Check LSV2 Current Draw** | |
| | | Use Component Test Mode (Refer to Section 5.2.2) to test actual current draw of the circuit. | Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 3 | **Check LSV2 Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | | |
| **00108** | **CHECK 3LSV CIRCUIT** | | |
| | • TRIGGER–ON: Compartment 3 Liquid Solenoid Valve (3LSV) circuit is shorted. (The 3LSV output from the microprocessor (3MP09) is negative, so the circuit will not be shorted to ground, but is shorted either within the valve coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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 coil and connector. | No damage to coil<br>No damage, moisture, or corrosion in connector. |
| | | 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 2.13 for correct electrical values. Use ammeter. |
| | 2 | **Check LSV3 Current Draw** | |
| | | Use Component Test Mode (Refer to Section 5.2.2) to test actual current draw of the circuit. | Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 3 | **Check LSV3 Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>Alarm/Cause</th><th>Corrective Action</th></tr>
<tr><td colspan="4">00109 CHECK 1EVCON RELAY COIL<br>• TRIGGER–ON: Evaporator fan motor contactor (1EVCON) circuit is shorted. (The contactor output from the microprocessor (4MP15) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.)<br>• UNIT CONTROL: Alarm only<br>• RESET CONDITION: Auto Reset 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 1EVCON</td></tr>
<tr><td></td><td></td><td>a. Inspect evaporator fan contactor coil and terminals</td><td>No damage to coil<br>No damage or corrosion.</td></tr>
<tr><td></td><td></td><td>b. Check coil resistance</td><td>Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground</td></tr>
<tr><td></td><td></td><td>c. Check amp draw of coil</td><td>Use ammeter.</td></tr>
<tr><td></td><td>2</td><td colspan="2">Check 1EVCON Current Draw</td></tr>
<tr><td></td><td></td><td>Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.)</td><td>Refer to Section 2.13 for correct electrical values.<br>View current draw in Unit Data.</td></tr>
<tr><td></td><td>3</td><td colspan="2">Check 1EVCON Wiring</td></tr>
<tr><td></td><td></td><td>Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.)</td><td>No physical damage to harness.<br>No damage, moisture, or corrosion in connectors.</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">00110 CHECK 2EVCON RELAY COIL<br>• TRIGGER–ON: Evaporator fan motor contactor (2EVCON) circuit is shorted. (The contactor output from the microprocessor (3MP30) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• RESET CONDITION: Auto Reset 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 2EVCON</td></tr>
<tr><td></td><td></td><td>a. Inspect compartment 2 evaporator fan contactor coil and terminals</td><td>No damage to coil<br>No damage or corrosion.</td></tr>
<tr><td></td><td></td><td>b. Check coil resistance</td><td>Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground</td></tr>
<tr><td></td><td></td><td>c. Check amp draw of coil.</td><td>Refer to Section 2.13 for correct electrical values.<br>Use ammeter.</td></tr>
<tr><td></td><td>2</td><td colspan="2">Check 2EVCON Current Draw</td></tr>
<tr><td></td><td></td><td>Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.)</td><td>Refer to Section 2.13 for correct electrical values.<br>View current draw in Unit Data.</td></tr>
<tr><td></td><td>3</td><td colspan="2">Check 2EVCON Wiring</td></tr>
<tr><td></td><td></td><td>Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.)</td><td>No physical damage to harness.<br>No damage, moisture, or corrosion in connectors.</td></tr>
</table>

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00111** | **CHECK 3EVCON RELAY COIL** | | |
| | • TRIGGER–ON: Evaporator fan motor contactor (3EVCON) circuit is shorted. (The contactor output from the microprocessor (3MP08) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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<br>No damage or corrosion. |
| | | 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 2.13 for correct electrical values. Use ammeter. |
| | 2 | **Check 3EVCON Current Draw** | |
| | | Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.) | Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 3 | **Check 3EVCON Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **7.8 SENSOR ALARMS** | | | |

**00121 CHECK AMBIENT AIR SENSOR**

- TRIGGER–ON: Ambient Air Temperature Sensor (AAT) is not within the range of –53 to +158°F (–47° to +70° C.)
- UNIT CONTROL: Engine and Standby Operation: 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 resetvia 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.

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| | 1 | **Check Sensor** | |
| | | a. Inspect sensor & connector. | No damage to sensor.<br>No damage, moisture, or corrosion in connector. |
| | | b. Check sensor resistance. (See Note 3 page 7–2.) | 10,000 Ohms @ 77°F (25°C.) See Table 8–5 for complete table of temperatures and resistance values. |
| | 2 | **Check Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals. (1MP, See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Power up the microprocessor. See Note 2 page 7–2. Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins. | Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor. |
| | 3 | **Check remote sensor/switch connector** | |
| | | c. Locate and inspect 10 position connector (OC) for optional sensors and switches. | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>Alarm/Cause</th><th>Corrective Action</th></tr>
<tr><td>00122</td><td colspan="3">CHECK RETURN AIR SENSOR<br>• TRIGGER–ON: Return Air Temperature Sensor (1RAT) is not within the range of –53 to +158°F (–47 to +70° C.)<br>• UNIT CONTROL:Engine and Standby Operation:<br>If Alarm 123 – Check Supply Air Sensor – is not active: alarm only and switch to supply air control.<br>If Alarm 123 is also active (Cargo Protect Mode, refer to section 4.8.1) and the functional parameter Temperature Control is set for Return Air and the setpoint is in the perishable range: alarm and shutdown.<br>If Alarm 123 is also active (Cargo Protect Mode, refer to section 4.8.1) and setpoint is frozen: alarm and unit will operate in reduced capacity COOL mode. (Refer to Section 4.8.1.)<br>• 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.</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 rowspan="3"></td><td>1</td><td colspan="2">Check Sensor</td></tr>
<tr><td rowspan="2"></td><td>a. Inspect sensor & connectors.</td><td>No damage to sensor<br>No damage, moisture, or corrosion in connectors.</td></tr>
<tr><td>b. Check sensor resistance (See Note 3, page 7–2.)</td><td>10,000 Ohms @ 77°F (25°C.) Refer to Table 8–5 for complete table of temperatures and resistance values.</td></tr>
<tr><td rowspan="3"></td><td>2</td><td colspan="2">Check Sensor Wiring</td></tr>
<tr><td rowspan="2"></td><td>a. Inspect harness & control box connector pins & terminals. (1MP & DP16, see wiring schematic Section 10.)</td><td>No physical damage to harness.<br>No damage, moisture, or corrosion in connectors.</td></tr>
<tr><td>b. Power up the microprocessor (see Note 2, page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins.</td><td>Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.</td></tr>
<tr><td rowspan="2"></td><td>3</td><td colspan="2">Check remote sensor/switch connector</td></tr>
<tr><td></td><td>c. Locate and inspect 10 position connector (OC) for optional sensors and switches.</td><td>Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink.</td></tr>
</table>

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00123** | **CHECK SUPPLY AIR SENSOR** | | |
| | • TRIGGER–ON: Supply Air Temperature Sensor (1SAT) is not within the range of −53 to +158°F (−47 to +70° C.)<br>• UNIT CONTROL: Engine and standby:<br>If Alarm 122 is not active and functional parameter Temperature Control is set for Supply Air and the setpoint for Compartment 1 is in the perishable range: alarm only and switch to return air control.<br>If Alarm 122 is active: set unit control as described in Alarm 122.<br>• 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 Sensor** | |
| | | a. Inspect sensor & connectors. | No damage to sensor.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Check sensor resistance. (See Note 3, page 7−2.) | 10,000 Ohms @ 77°F (25°C.) See Table 8−5 for complete table of temperatures and resistance values. |
| | 2 | **Check Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals. (1MP & DP16, see wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Power up the microprocessor (see Note 2, page 7−2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins. | Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor. |
| | 3 | **Check remote sensor/switch connector** | |
| | | c. Locate and inspect 10 position connector (OC) for optional sensors and switches. | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00124** | **CHECK DEFROST TERM 1 SENSOR** | | |
| | • TRIGGER–ON: Defrost Termination Temperature Sensor (1DTT) is not within the range of –53° to +158°F (–47° to +70° C.)<br>• UNIT CONTROL: Engine and standby:<br>If Alarm 122 is not active: alarm and initiate defrost if 1RAT is below 45°F (7.2°C).<br>If Alarm 122 is also active: alarm and initiate defrost if 1SAT is below 45°F (7.2°C).<br>Under both of the above conditions, defrost will end after 10 minutes.<br>If Alarms 122 and 123 are also both active: alarm and defrost will not be allowed in Compartment 1.<br>• RESET CONDITION: Auto Reset when 1DTT 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 Sensor** | |
| | | a. Inspect sensor & connectors. | No damage to sensor.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Check sensor resistance. (See Note 3, page 7–2.) | 10,000 Ohms @ 77°F (25°C.) See Table 8–5 for complete table of temperatures and resistance values. |
| | 2 | **Check Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals. (1MP & DP16, see wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins. | Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor. |
| | 3 | **Check remote sensor/switch connector** | |
| | | c. Locate and inspect 10 position connector (OC) for optional sensors and switches. | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00125** | **CHECK COMP DISCHARGE SENSOR** | | |
| | • TRIGGER–ON: Compressor Discharge Temperature Sensor (CDT) is not within the range of –40° to +392°F (–40° to +200°C.)<br>• UNIT CONTROL: Engine and Standby Operation: Alarm Only.<br>• 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 Sensor** | |
| | | a. Inspect sensor & connector. | No damage to sensor.<br>No damage, moisture, or corrosion in connector. |
| | | b. Check sensor resistance. (See Note 3, page 7–2.) | 100,000 Ohms @ 77°F (25°C) See Table 8–6 for complete resistance chart.) |
| | 2 | **Check Compressor Discharge Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals. (1MP, see wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins. | Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor. |
| | 3 | **Check remote sensor/switch connector** | |
| | | c. Locate and inspect 10 position connector (OC) for optional sensors and switches. | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |
| | | | |
| **00126** | **CHECK FUEL SENSOR CIRCUIT** | | |
| | • TRIGGER–ON: The fuel level sensor is configured as a 0–5VDC or 0.25–4.75VDC sensor and the reading (in the Unit Data) is less than 2% for 30 seconds.<br>• UNIT CONTROL: Engine Operation: Alarm Only. Standby Operation: This alarm does not activate in standby.<br>• 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** | |
| | | Check fuel level in tank. | Add fuel as needed. |
| | 2 | **Check Sensor Fuse & Wiring** | |
| | | Perform sensor check procedure, refer to Section 8.5.6 | NOTE: If new sensor is not available, the sensor may be configured OFF temporarily. Refer to Section 5.2.1 – Configurations. |

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>Alarm/Cause</th><th>Corrective Action</th></tr>
<tr><td colspan="4">00127 CHECK SUCTION TEMP SENSOR<br>• TRIGGER–ON: Compressor Suction Temperature Sensor (CST) is not within the range of –53 to +158°F (–47 to +70° C.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• RESET CONDITION: Auto Reset 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 Sensor</td></tr>
<tr><td></td><td></td><td>a. Inspect sensor & connector</td><td>No damage to sensor<br>No damage, moisture, or corrosion in connector</td></tr>
<tr><td></td><td></td><td>b. Check sensor resistance (See Note 3, page 7–2.)</td><td>10,000 Ohms @ 77°F (25°C.) See Table 8–5 for complete table of temperatures and resistance values.</td></tr>
<tr><td></td><td>2</td><td colspan="2">Check Sensor Wiring</td></tr>
<tr><td></td><td></td><td>a. Inspect harness & control box connector pins & terminals. (1MP, see wiring schematic Section 10.)</td><td>No physical damage to harness.<br>No damage, moisture, or corrosion in connectors.</td></tr>
<tr><td></td><td></td><td>b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins.</td><td>Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor.</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">00128 LOW/UNBALANCED A/C AMPS<br>• TRIGGER–ON: 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.<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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.</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">Perform Pretrip Check</td></tr>
<tr><td></td><td></td><td>Clear Active Alarm list, then run Pretrip & check for any new alarms.</td><td>Any active alarms must be corrected and cleared before proceeding.</td></tr>
<tr><td></td><td>2</td><td colspan="2">Check Current Draw</td></tr>
<tr><td></td><td></td><td>a. Use a clamp around A/C ammeter to check amps at power wires.</td><td>Must be ±1.0 Amp of reading in Unit Data.</td></tr>
<tr><td></td><td></td><td>b. Check A/C amps with compressor running.</td><td>Must be greater than 5 Amps.</td></tr>
<tr><td></td><td></td><td>c. Compare A/C Amp readings between L1–L2–L3.</td><td>Maximum allowable difference is 10 Amps.</td></tr>
</table>

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00129** | **CHECK ENG COOLANT SENSOR** | | |
| | • TRIGGER–ON: Engine Coolant Temperature Sensor (ENCT) is not within the range of –58 to +266°F (–50 to +130°C).<br>• UNIT CONTROL: Engine Operation: Alarm Only. Standby Operation: This alarm does not activate in standby.<br>• 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 Sensor** | |
| | | a. Inspect sensor & connector. | No damage to sensor.<br>No damage, moisture, or corrosion in connector. |
| | | b. Check sensor resistance. (See Note 3, page 7–2.) | 10,000 Ohms @ 77°F (25°C.) See Table 8–5 for complete table of temperatures and resistance values. |
| | 2 | **Check Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals. (1MP, see wiring schematic Section 10). | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins. | Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor. |
| | 3 | **Check remote sensor/switch connector** | |
| | | c. Locate and inspect 10 position connector (OC) for optional sensors and switches. | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00130** | **CHECK ENGINE RPM SENSOR** | | |
| | • TRIGGER–ON: When in Engine Operation only. If ambient temperature is above 32°F (0°C), and this is the second or third start attempt, and the engine oil pressure switch is closed (oil pressure good), and engine RPM is sensed at less than 1000; **OR**, if ambient is below 32°F (0°C) and the DC amp draw is more than 2 amps, and this is the second or third start attempt, and engine RPM is sensed at less than 1000.<br>• UNIT CONTROL: Alarm Only and engine will be considered running.<br>• RESET CONDITION: Auto Reset in Auto Start when engine speed is greater than 1,000 RPM 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** | |
| | | Check for Alarm 41. | When alarms 41 and 130 occur at the same time, generally, the engine has run out or is running out of fuel. This causes the engine to surge. Check fuel in tank and add fuel as necessary.<br>Check fuel lines between the fuel tank and the fuel pump inlet to endure air is not being drawn in. |
| | 2 | **Check Engine Speed Sensor (ENSSN)** | |
| | | a. Inspect circuit from ENSCU terminal 3 to microprocessor connection 2MP18 & connector. | No damage to sensor or wiring.<br>No damage, moisture, or corrosion in connector. |
| | | b. Compare actual engine speed with that shown on the display using hand held tachometer. | Must be ± 20 RPM.<br>Must be a steady reading. |
| | | c. Check for 12 VDC between ENSSN 12V terminal & ENSSN ground. | Must be 12 VDC. |
| | | d. Check for 12 VDC at ENSSU terminal 25 to ground | Must be 12 VDC. |
| | 3 | **Check Circuits With Test Sensor** | |
| | | Substitute known good sensor and check Unit Data reading (Refer to Section 3.13). | Must be within ± 20 RPM of reading on tachometer. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00131** | **CHECK EVAP TEMP SENSOR** | | |
| | • TRIGGER–ON: Evaporator Outlet Temperature Sensor (EVOT) is not within the range of −53 to +158°F (−47 to +70°C.)<br>• UNIT CONTROL: Engine and standby: alarm only and superheat for EVXV will be calculated using SAT.<br>• 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 Sensor** | |
| | | a. Inspect sensor & connector. | No damage to sensor.<br>No damage, moisture, or corrosion in connector. |
| | | b. Check Evap Temp Sensor resistance. (See Note 3, page 7−2.) | 10,000 Ohms @ 77°F (25°C.) See Table 8−5 for complete table of temperatures and resistance values. |
| | 2 | **Check Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals. (1MP & DP16, see wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Power up the microprocessor (see Note 2 page 7−2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins. | Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00133** | **CHECK REMOTE TEMP SENSOR 1** | | |
| **00134** | **CHECK REMOTE TEMP SENSOR 2** | | |
| | • Note: Remote sensors are available on 2 Compartment units only.<br>• TRIGGER–ON: Remote Temperature Sensor (REMSN1 or REMSN2) is not within the range of –53 to +158°F (–47 to +70°C.)<br>• UNIT CONTROL: Engine and Standby Operation: Alarm only.<br>• RESET CONDITION: Auto Reset when Remote 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. | | | |
| **IF A SENSOR IS INSTALLED** | | | |
| | 1 | **Check Sensor** | |
| | | a. Inspect sensor & connector. | No damage to sensor.<br>No damage, moisture, or corrosion in connector. |
| | | b. Check Remote Temp Sensor resistance (See Note 3, page 7–2.) | 10,000 Ohms @ 77°F (25°C.) See Table 8–5 for complete table of temperatures and resistance values. |
| | 2 | **Check Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals. (1MP & REM, see wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins. | Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor. |
| **IF A SENSOR IS NOT INSTALLED** | | | |
| | | **Check remote sensor/switch connector** | |
| | | Locate and inspect 10 position connector for optional sensors and switches (see wiring schematic Section 10). | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00136** | **C2 CHECK SUPPLY AIR SENSOR** | | |
| | • TRIGGER–ON: Supply Air Temp Sensor 2 (2SAT) is not within the range of –53° to +158°F (–47° to +70°C). (NOTE: 2SAT is an optional sensor that may not be present. If the configuration is set to INSTALLED and the sensor is not connected, this alarm will be active.)<br>• UNIT CONTROL: Engine and Standby Operation: alarm only.<br>• 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 Sensor** | |
| | | a. Inspect sensor & connector | No damage to sensor<br>No damage, moisture, or corrosion in connector |
| | | b. Check sensor resistance (See Note 3, page 7–2.) | 10,000 Ohms @ 77°F (25°C)<br>(Refer to Table 8–5 for complete resistance chart) |
| | 2 | **Check Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals (1MP, see wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins. | Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor. |
| | 3 | **Check remote sensor/switch connector** | |
| | | c. Locate and inspect 10 position connector for optional sensors and switches. | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00137** | **C2 CHECK RETURN AIR SENSOR** | | |
| | • TRIGGER–ON: Return Air Sensor 2 (2RAT) is not within the range of –53° to +158°F (–47° to +70°C)<br>• UNIT CONTROL: Engine and standby: If setpoint is in the perishable range, compartment 2 will shutdown. If setpoint is in the frozen range, compartment 2 will run in reduced capacity cool.<br>• 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 Sensor** | |
| | | a. Inspect sensor & connector | No damage to sensor<br>No damage, moisture, or corrosion in connector |
| | | b. Check Return Air Sensor resistance (See Note 3, page 7–2.) | 10,000 Ohms @ 77°F (25°C)<br>(Refer to Table 8–5 for complete resistance chart) |
| | 2 | **Check Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals (1MP & 2EVC, see wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins. | Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor. |
| | 3 | **Check remote sensor/switch connector** | |
| | | c. Locate and inspect 10 position connector (OC) for optional sensors and switches. | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00138** | **C3 CHECK RETURN AIR SENSOR** | | |
| | • TRIGGER–ON: Return Air Sensor 3 (3RAT) is not within the range of –53° to +158°F (–47° to +70°C)<br>• UNIT CONTROL: Engine and standby: If setpoint is in the perishable range, compartment 3 will shutdown. If setpoint is in the frozen range, compartment 3 will run in reduced capacity cool.<br>• 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 Sensor** | |
| | | a. Inspect sensor & connector | No damage to sensor<br>No damage, moisture, or corrosion in connector |
| | | b. Check sensor resistance. (See Note 3, page 7–2.) | 10,000 Ohms @ 77°F (25°C)<br>(Refer to Table 8–5 for complete resistance chart) |
| | 2 | **Check Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals (1MP & 3EVC, see wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins. | Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor. |
| | 3 | **Check remote sensor/switch connector** | |
| | | c. Locate and inspect 10 position connector (OC) for optional sensors and switches. | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00139** | **C2 CHECK DEFROST SENSOR** | | |
| | • TRIGGER–ON: Defrost Termination Temperature Sensor for Compartment 2 (2DTT) is not within the range of –53° to +158°F (–47° to +70°C)<br>• UNIT CONTROL: Engine and Standby Operation:<br>If Alarm 137 is not active: alarm and initiate defrost if 2RAT is below 45°F (7.2°C.) and defrost will end after 10 minutes. **OR**<br>If Alarm 137 is active and 2SAT is installed and Alarm 136 is not active: alarm and and initiate defrost if 2SAT is below 45°F (7.2°C.) and defrost will end after 10 minutes.<br>If Alarm 137 is active and there is no 2SAT OR if both Alarm 137 and 136 are active: alarm and defrost is not allowed for compartment 2.<br>• 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 Sensor** | |
| | | a. Inspect sensor & connector | No damage to sensor<br>No damage, moisture, or corrosion in connector |
| | | b. Check sensor resistance (see Note 3, page 7–2.) | 10,000 Ohms @ 77°F (25°C)<br>(Refer to Table 8–5 for complete resistance chart) |
| | 2 | **Check Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals (1MP & 2EVC, see wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins. | Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor. |
| | 3 | **Check remote sensor/switch connector** | |
| | | c. Locate and inspect 10 position connector (OC) for optional sensors and switches. | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00140** | **C3 CHECK DEFROST SENSOR** | | |
| | • TRIGGER–ON: Defrost Termination Temperature Sensor for Compartment 3 (3DTT) is not within the range of −53° to +158°F (−47° to +70°C)<br>• UNIT CONTROL: Engine and Standby Operation:<br>If Alarm 138 is not active: alarm and initiate defrost if 3RAT is below 45°F (7.2°C) and defrost will end after 10 minutes.<br>If both alarm 140 and 138 are active: alarm and defrost is not allowed for compartment 3.<br>• 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 Sensor** | |
| | | a. Inspect sensor & connector | No damage to sensor<br>No damage, moisture, or corrosion in connector |
| | | b. Check sensor resistance (see Note 3, page 7−2.) | 10,000 Ohms @ 77°F (25°C)<br>(Refer to Table 8−5 for complete resistance chart) |
| | 2 | **Check Sensor Wiring** | |
| | | a. Inspect harness & control box connector pins & terminals (1MP & 3EVC, see wiring schematic Section 10). | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Power up the microprocessor (see Note 2 page 7−2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins. | Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor. |
| | 3 | **Check remote sensor/switch connector** | |
| | | c. Locate and inspect 10 position connector (OC) for optional sensors and switches. | Connector must have cap on,<br>No corrosion or moisture inside connector.<br>If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **7.9 PRETRIP ALARMS** | | | |
| **P00141** | **PRETRIP STOPPED BY USER** | | |
| | • TRIGGER–ON: Pretrip cycle was stopped by user before the Pretrip cycle ended automatically.<br>• UNIT CONTROL: Engine and Standby Operation: Alarm Only.<br>• 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 page 7-2.) 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 Pretrip Alarms** | |
| | | Scroll the alarm list for any Active Pretrip alarms. | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 2 | **Rerun Pretrip Check (If Desired)** | |
| | | a. Clear Active Alarm List, then run Pretrip & check for any new alarms. | Unit is in Pretrip. Check for any new alarms. |
| | | b. Allow to terminate automatically. | Pretrip cycle operates normally. |
| | | | |
| **P00144** | **CHECK UL1 CIRCUIT** | | |
| | • TRIGGER–ON: Normal Amps for the Front Unloader (UL1) Circuit is 0.75 to 2.0 Amps. The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail in test 2 and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again. | | |
| | | **Check UL1 circuit – refer to procedure for alarm 85** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00145** | **CHECK SPEED SOL CIRCUIT** | | |
| | • TRIGGER–ON: Normal Amps for the Speed Solenoid Circuit is 0 to 1.0 Amps. The circuit tests outsidethis range.<br>• UNIT CONTROL: Alarm Only<br>• RESET CONDITION: Auto Reset if Pretrip is started again or alarm may be manually reset via keypad or by turning the unit off then back on again. | | |
| | 1 | **Check For Bad F2 Or F3 Fuse Alarm** | |
| | | Check for Alarm 71. | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 2 | **Check Speed Circuit To ENSCU And FSA** | |
| | | a. Check voltage to ENSCU and amp draw of engine speed control circuit (ENSCU) pin 16 and MPQC3 on the microprocessor. | Use Component Test mode to energize the Speed Relay. (Section 5.2.2)<br>Refer to Section 2.13 for amp values.<br>View current draw in the Unit Data. (Refer to Section 3.13).<br>Check voltage at ENSCU16 and ground. Must be 11 VDC or higher. |
| | | b. Check operation of Speed Relay LED | LED 27 must be ON when the Speed Relay is ON in component Test Mode. |
| | 3 | **Check Engine Speed Control Unit (ENSCU)** | |
| | | a.Check resistance of FSA | Refer to Section 2.13. With FSA unplugged, ohm spec is 3 to 4 ohms, ± 10%. |
| | | b. Inspect ENSCU and wiring | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors.<br>No damage to ENSCU |
| | 4 | **Check ENSCU Circuit Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00146** | **C2 CHECK HEATER 1 CIRCUIT** | | |
| | This device is checked twice in Pretrip – once in Test 2 and again in Test 8.<br>• TRIGGER–ON TEST 2: Normal current draw for the 2HTCON1 contactor coil is .05 to 2.0 D/C Amps (12 VDC). The circuit tests outside this range.<br>• TRIGGER–ON TEST 8: Normal current draw for the 2HTCON1 heaters is 1.0 to 7.0 A/C Amps (460 VAC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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 Pretrip | Stop Pretrip 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 CIRCUIT** | 2 | **Check 2HTCON1** | |
| | | a. Inspect heater contactor coil and wire connections | No damage to coil<br>No damage or corrosion. |
| | | b. Check contactor coil resistance | Refer to Section 2.13 for correct electrical values |
| | 3 | **Check 2HTCON1 Amp Draw** | |
| | | Check 2HTCON1 amp draw | Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 4 | **Check 2HTCON1 Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00146** | **C2 CHECK HEATER 1 CIRCUIT (Continued)** | | |
| **460 VAC CIRCUIT** | 5 | **Check Evaporator High Temperature Switch (2EVHTS)** | |
| | | Inspect for open 2EVHTS per wiring schematic. | If open, replace switch as required |
| | 6 | **Check Amp Draw of 2HTCON1 Heater Circuit** | |
| | | Use a clamp on ammeter to check the current draw of all 3 legs. | Must be within range shown in Section 2.12 for all three legs. |
| | 7 | **Check Heater Elements** | |
| | | Check heater elements | No visual physical damage<br>No blockage due to debris<br>Remove and replace if required |
| | 8 | **Check Heater Element Plugs And Connections** | |
| | | Disconnect heater element plug. Inspect plugs, plug seal and connectors. | No corrosion, water damage or burning/discoloration<br>Remove and replace if required |
| | 9 | **Verify Accuracy of AC Current Sensor** | |
| | | With microprocessor in PC Mode (refer to Section 5.3) check amperage in the Unit Data (refer to Section 3.13) | Reading for AC1 amps and AC2 amps must both be 0. |
| | 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 |
|---|---|---|---|
| **P00147** | **C2 CHECK HEATER 2 CIRCUIT** | | |
| | This device is checked twice in Pretrip – once in Test 2 and again in Test 8.<br>• TRIGGER–ON TEST 2: Normal draw for the 2HTCON2 contactor coil is .05 to 5.0 D/C Amps (12 VDC). The circuit tests outside this range.<br>• TRIGGER–ON TEST 8: Normal draw for the 2HTCON2 heaters is 1.0 to 7.0 A/C Amps (460 VAC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7-2.) 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 Pretrip | Stop Pretrip 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<br>No damage or corrosion. |
| | | b. Check contactor coil resistance | Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground |
| | 3 | **Check 2HTCON2 Amp Draw** | |
| | | Check 2HTCON2 amp draw | Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 4 | **Check 2HTCON2 Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00147** | **C2 CHECK HEATER 2 CIRCUIT (Continued)** | | |
| **460 VAC CIRCUIT** | 5 | **Check Evaporator High Temperature Switch (2EVHTS)** | |
| | | Inspect for open 2EVHTS per wiring schematic. | If open, replace switch as required |
| | 6 | **Check Amp Draw of 2HTCON2 Heater Circuit** | |
| | | Use a clamp on ammeter to check the current draw of all 3 legs. | Must be within range shown in Section 2.12 for all three legs. |
| | 7 | **Check Heater Elements** | |
| | | Check heater elements | No visual physical damage<br>No blockage due to debris<br>Remove and replace if required |
| | 8 | **Check Heater Element Plugs And Connections** | |
| | | Disconnect heater element plug. Inspect plugs, plug seal and connectors. | No corrosion, water damage or burning/discoloration<br>Remove and replace if required |
| | 9 | **Verify Accuracy of AC Current Sensor** | |
| | | With microprocessor in PC Mode (refer to Section 5.3) check amperage in the Unit Data (refer to Section 3.13) | Reading for AC1 amps and AC2 amps must both be 0. |
| | 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 |
| | | | |
| **P00151** | **CHECK AIR HEATER CIRCUIT** | | |
| | | • TRIGGER–ON: Normal Amps for the Intake Air Heater Circuit is 23 to 75 Amps after 15 seconds. The circuit tests outside this range.<br>• UNIT CONTROL: Alarm Only<br>• RESET CONDITION: Auto Reset if Pretrip is started again or alarm may be manually reset via keypad or by turning the unit off then back on again. | |
| | | **Check air heater circuit – refer to procedure for alarm 40** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00152** | **CHECK FUEL SOLENOID CIRC** | | |
| | • TRIGGER–ON: Normal Amps for the Fuel Solenoid Hold Circuit is 0.2 to 4.5 Amps (including possible electric fuel pump). The circuit tests outside this range.<br>• UNIT CONTROL: Alarm Only<br>• RESET CONDITION: Auto Reset if Pretrip mode is started again, or Alarm may be manually reset via<br>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** | |
| | | Check for alarm 71 | Alarm conditions must be corrected and the alarm cleared to continue. |
| | 2 | **Check fuel and speed actuator (FSA)** | |
| | | a. Check resistance of FSA | Refer to Section 2.13. |
| | | b. Check amp draw between MPQC4 & terminal 13 of the ENSCU. | Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.13 for amp values. |
| | 3 | **Check FSA & circuits** | |
| | | a. Inspect FSA and wiring | No physical damage to harness.<br>No damaged or corroded pins<br>No damage to component |
| | | b. Check operation of Run Relay | With microprocessor powered, see Note 2. LED 28 must be ON. |
| | | c. Check voltage to FSA | With microprocessor powered, see Note 2. OR component test mode, 12 VDC between engine speed control unit (ENSCU) pins 13 and 19.<br>With Main Power switch not in the OFF position, 12 VDC between ENSCU pins 24 and 19. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00153** | **CHECK RETURN AIR SENSOR** | | |
| | • TRIGGER–ON: Return Air Temperature Sensor (1RAT) is not within the range of –53 to +158°F (–47 to +70°C.)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again. | | |
| | | **Check Sensor – refer to procedure for alarm 122** | |
| | | | |
| **P00154** | **CHECK SUPPLY AIR SENSOR** | | |
| | • TRIGGER–ON: Supply Air Temperature Sensor (1SAT) is not within the range of –53 to +158°F (–47 to +70°C.)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again. | | |
| | | **Check Sensor – refer to procedure for alarm 123** | |
| | | | |
| **P00155** | **CHECK COOLANT TEMP SENSOR** | | |
| | • TRIGGER–ON: Engine Coolant Temperature Sensor (ENCT) is not within the range of –58 to +266°F (–50 to +130°C.)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again. | | |
| | | **Check Sensor – refer to procedure for alarm 129** | |
| | | | |
| **P00156** | **CHECK BATTERY VOLTS** | | |
| | • TRIGGER–ON: Battery voltage is less than 11 VDC or greater than 17 VDC.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary. | | | |
| | | **Refer to procedure for alarm 15 for high voltage condition or procedure for alarm 16 for low voltage condition** | |

<table>
<tr><th>Alarm NO.</th><th>Steps</th><th>Alarm/Cause</th><th>Corrective Action</th></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">P00157 CHECK BATTERY CURRENT<br>• TRIGGER–ON: With all circuits off, current flow of more than 1.5 amps is detected in the 12 VDC electrical circuits.<br>NOTE: If this alarm occurs, Pretrip Test #2 will not be performed. You will need to run pretrip again.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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 No Load Current Draw</td></tr>
<tr><td></td><td></td><td>a. Energize circuit (refer to Note 2 page 7–2). Observe current draw on microprocessor display.</td><td>Reading is less than 1.5 Amps.</td></tr>
<tr><td></td><td></td><td>b. Disconnect F5 wire and remove from inside DC current sensor (see Figure 2–10, page 2–15). Reconnect at F5 and power the microprocessor by toggling the Main Power switch out of the OFF position.</td><td>Without wire in sensor, reading should be 0 +/– 1 amp.<br>NOTE: Ensure wire is rerouted through sensor prior to returning unit to service.</td></tr>
<tr><td></td><td>2</td><td colspan="2">Check Individual Circuits</td></tr>
<tr><td></td><td></td><td>Isolate individual circuits and test amp draw.</td><td>Must be in range. (Refer to Section 2.13 for correct electrical values.)</td></tr>
<tr><td></td><td>3</td><td colspan="2">Check for parasitic loads.</td></tr>
<tr><td></td><td></td><td>Check for electrical loads that are drawing current with all circuits OFF</td><td>Check for non–factory installed devices such as lift gates, inside lights, satellite systems, etc. These devices must be wired so as to not draw current during Pretrip testing.</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">P00158 CHECK AMBIENT AIR SENSOR<br>• TRIGGER–ON: Ambient Air Temperature Sensor (AAT) is not within the range of –53 to +158°F (–47 to +70°C.)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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="2"></td><td colspan="2">Check Sensor – refer to procedure for alarm 121</td></tr>
</table>

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00159** | **CHECK DEFROST TERM 1 SENSOR** | | |
| | | • TRIGGER–ON: Defrost Termination Temperature Sensor (1DTT – Compartment 1) is not within the range of –53 to +158°F (–47 to +70°0 C.)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again. | |
| | | **Check Sensor – refer to procedure for alarm 124** | |
| | | | |
| **P00160** | **CHECK DISCHARGE TEMP SENSOR** | | |
| | | • TRIGGER–ON: Compressor Discharge Temperature Sensor (CDT) is not within the range of –40 to +392°F (–40 to +200°C. )<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip is started again or alarm may be manually reset via keypad or by turning the unit off then back on again. | |
| | | **Check Sensor – refer to procedure for alarm 125** | |
| | | | |
| **P00161** | **CHECK SUCTION TEMP SENSOR (CST)** | | |
| | | • TRIGGER–ON: Suction Temp Sensor (CST) is not within the range of –53° to +158°F (–47° to +70°C.)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• 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. | |
| | | **Check Sensor – refer to procedure for alarm 127** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00163** | **C3 CHECK HEATER 1 CIRCUIT** | | |
| | This device is checked twice in Pretrip – once in Test 2 and again in Test 8.<br>• TRIGGER–ON TEST 2: Normal current draw for the 3HTCON1 contactor coil is .05 to 2.0 D/C Amps (12 VDC). The circuit tests outside this range.<br>• TRIGGER–ON TEST 8: Normal current draw for the 3HTCON1 heaters is 1.0 to 7.0 A/C Amps (460 VAC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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 Pretrip | Stop Pretrip during Test #3 by holding = Key for 6 seconds |
| | | d. Review active alarm list for Alarm 163 | If alarm is present, follow steps 2 thru 4. If alarm is not present, follow steps 5 thru 10. |
| **12 VDC CIRCUIT** | 2 | **Check 3HTCON1** | |
| | | a. Inspect heater contactor coil and wire connections | No damage to coil<br>No damage or corrosion. |
| | | b. Check contactor coil resistance | Refer to Section 2.13 for correct electrical values |
| | 3 | **Check 3HTCON1 Amp Draw** | |
| | | Check 3HTCON1 amp draw | Use Component Test Mode (Section 5.2.2) to test.<br>Refer to Section 2.13 for correct electrical values.<br>View current draw in Unit Data. |
| | 4 | **Check 3HTCON1 Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00163** | | **C3 CHECK HEATER 1 CIRCUIT (Continued)** | |
| | 5 | **Check Evaporator High Temperature Switch (3EVHTS)** | |
| | | Inspect for open 3EVHTS per wiring schematic. | If open, replace switch as required. |
| | 6 | **Check Amp Draw of 3HTCON1 Heater Circuit** | |
| | | Use a clamp on ammeter to check the current draw of all 3 legs. | Must be within range shown in Section 2.12 for all three legs. |
| | 7 | **Check Heater Elements** | |
| | | Check heater elements | No visual physical damage<br>No blockage due to debris<br>Remove and replace if required |
| **460 VAC CIRCUIT** | 8 | **Check Heater Element Plugs And Connections** | |
| | | Disconnect heater element plug. Inspect plugs, plug seal and connectors. | No corrosion, water damage or burning/discoloration<br>Remove and replace if required |
| | 9 | **Verify Accuracy of AC Current Sensor** | |
| | | With microprocessor in PC Mode (refer to Section 5.3) check amperage in the Unit Data (refer to Section 3.13) | Reading for AC1 amps and AC2 amps must both be 0. |
| | 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 |

**P00164 CHECK UL2 CIRCUIT**

- TRIGGER–ON: Normal Amps for the Rear Unloader (UL2) Circuit is 0.75 to 2.0 Amps. The circuit tests outside this range.
- UNIT CONTROL: Engine and Standby Operation: Pretrip will fail in test 2 and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.

**Check UL2 circuit – refer to procedure for alarm 86**

**P00166 C2 CHECK SUPPLY AIR SENSOR**

- TRIGGER–ON: Supply Air Sensor is not within the range of –53° to +158°F (–47° to +70°C)
- UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto Reset if Pretrip mode is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.

**Check Sensor – refer to procedure for alarm 136**

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00167** | **C3 CHECK HEATER 2 CIRCUIT** | | |
| | This device is checked twice in Pretrip – once in Test 2 and again in Test 8.<br>• TRIGGER–ON TEST 2: Normal draw for the 3HTCON2 contactor coil is .05 to 5.0 D/C Amps (12 VDC). The circuit tests outside this range.<br>• TRIGGER–ON TEST 8: Normal draw for the 3HTCON2 heaters is 1.0 to 7.0 A/C Amps (460 VAC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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 Pretrip | Stop Pretrip during Test #3 by holding = Key for 6 seconds |
| | | d. Review active alarm list for Alarm 167 | If alarm is present, follow steps 2 thru 4. If alarm is not present, follow steps 5 thru 10. |
| | 2 | **Check 3HTCON2** | |
| | | a. Inspect heater contactor coil and wire connections | No damage to coil<br>No damage or corrosion. |
| | | b. Check contactor coil resistance | Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground |
| **12 VDC CIR-CUIT** | 3 | **Check 3HTCON2 Amp Draw** | |
| | | Check 2HTCON1 amp draw | Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 4 | **Check 3HTCON2 Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00167** | **C3 CHECK HEATER 2 CIRCUIT (Continued)** | | |
| **460 VAC CIRCUIT** | 5 | **Check Evaporator High Temperature Switch (3EVHTS)** | |
| | | Inspect for open 3EVHTS per wiring schematic. | If open, replace switch as required. |
| | 6 | **Check Amp Draw of 3HTCON2 Heater Circuit** | |
| | | Use a clamp on ammeter to check the current draw of all 3 legs. | Must be within range shown in Section 2.12 for all three legs. |
| | 7 | **Check Heater Elements** | |
| | | Check heater elements | No visual physical damage<br>No blockage due to debris<br>Remove and replace if required |
| | 8 | **Check Heater Element Plugs And Connections** | |
| | | Disconnect heater element plug. Inspect plugs, plug seal and connectors. | No corrosion, water damage or burning/discoloration<br>Remove and replace if required |
| | 9 | **Verify Accuracy of AC Current Sensor** | |
| | | With microprocessor in PC Mode (refer to Section 5.3) check amperage in the Unit Data (refer to Section 3.13) | Reading for AC1 amps and AC2 amps must both be 0. |
| | 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 |
|---|---|---|---|
| **P00168** | **C2 CHECK LSV VALVE** | | |
| | • TRIGGER–ON: In Test 2: Compartment 2 Liquid Solenoid Valve (2LSV) current is outside the range of 0.75A to 2.0A; **OR**<br>In Test 14: The suction pressure did not rise as expected when the 2LSV was energized (opened).<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset when Pretrip 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 page 7–2.) 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 Pretrip | Stop Pretrip during Test #3 by holding = Key for 6 seconds |
| | | d. Review active alarm list for Alarm 168 | If alarm is present, follow steps 2 & 3. If alarm is not present, follow step 4. |
| | 2 | **Test 2 alarm:Check Compartment 2 LSV Coil** | |
| | | a. Inspect coil and connector. | No damage to coil<br>No damage, moisture, or corrosion in connector.<br>Use component test mode to check circuit |
| | | b. Check resistance of coil | Refer to Section 2.13 for correct electrical values |
| | 3 | **Test 2 alarm:Check Compartment 2 LSV Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | 4 | **Test 14 alarm: Check Compartment 2 LSV Valve** | |
| | | Check operation of Compartment 2 LSV valve for proper opening and closing. | Refer to section 8.8.10.<br>Compartment 2 LSV must open and close correctly. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00174** | **CHECK LOW SPEED RPM** | | |
| | • TRIGGER–ON in Test #5: With Speed Relay turned off, engine speed is <u>NOT</u> between 1250 and 1450 rpm.<br>• TRIGGER–ON in Test #7: 15 seconds after the High Speed Pretrip Test #6, engine speed has <u>NOT</u> dropped back to the low speed range (within 15 seconds) as shown above.<br>Note: This test will be skipped if the RPM sensor alarm (A130) is active.<br>• UNIT CONTROL: Engine Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”. Standby Operation: This test is not made.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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** | |
| | | Verify that the model number on the nameplate matches the model number shown in the microprocessor Unit Data. | Enter the correct number in Configurations. Refer to Section 5.2.1 |
| | 2 | **Check the fuel/speed actuator** | |
| | | Check FSA plunger. | Must move in and out freely. |
| | 3 | **Verify low speed operation (See Note 5 page 7–2)** | |
| | | a. Set Functional Parameter “LOW SPEED START” for a high number (30 to 90) then start the unit. **Set Functional Parameter back to original setting after completing repairs.** | LED 27 must be OFF. |
| | | b. Check operation of Speed Relay LED. | LED 27 must be OFF. |
| | | c. Check voltage to FSA. | Must be 0 VDC. |
| | | d. Check for 12 VDC on engine speed control unit (ENSCU) pin 22. | Must be 12 VDC. |
| | 4 | **Check for proper voltage to the Engine Speed Control Unit (ENSCU) Pin 16 Based On Requested Speed From The Microprocessor** | |
| | | Check voltage at pin 16 with unit running. | Must be 0 VDC. |
| | 5 | **Check engine RPM** | |
| | | a. Check actual engine RPM using hand held tachometer. | Check Speed Control System, refer to Section 9.5 |
| | | b. Compare actual RPM with those shown on display. | Both readings within ± 50 RPM. |
| | 6 | **Check engine intake air system** | |
| | | a. Check air filter indicator. | Flag must not be visible. |
| | | b. Inspect air intake system. | Hoses & tubes in good condition.<br>No kinks or restrictions. |
| | 7 | **Check engine exhaust system** | |
| | | Inspect the exhaust system. | Must be clear and unobstructed. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00175** | **CHECK HIGH SPEED RPM** | | |
| | • TRIGGER–ON: With Speed Relay energized (voltage at the Engine Speed Control Unit for high speed operation), engine RPM is NOT between 1700 and 1900.<br>• UNIT CONTROL: Engine Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". Standby Operation: This test is not made.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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** | |
| | | Verify that the model number on the nameplate matches the model number shown in the microprocessor Unit Data. | Enter the correct number in the Unit Data. (Refer to Section 3.13.) |
| | 2 | **Check the fuel/speed actuator** | |
| | | Check FSA plunger. | Must move in and out freely. |
| | 3 | **Force high speed operation (See Note 5 page 7–2)** | |
| | | a. Set Functional Parameter "LOW SPEED START" to zero and adjust setpoint at least 10°F (5.6°C) above or below refrigerated compartment temperature then start the unit. **Set Functional Parameter back to original setting after completing repairs.** | LED 27 must be ON. |
| | | b. Check operation of Speed Relay. | LED 27 must be ON. |
| | | c. Check voltage to FSA. | Must be 12–14 VDC. |
| | | d. Check resistance of FSA. | Refer to Section 2.13 for correct electrical values. |
| | | e. Check amp draw of FSA. | Use Component Test Mode to energize the Speed Relay circuit. (Section 5.2.2.)<br>Refer to Section 2.13 for correct electrical values.<br>View current draw in the Unit Data. (Refer to Section 3.13. |
| | | f. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | 4 | **Check for proper voltage to the Engine Speed Control Unit (ENSCU) Pin 16 Based On Requested Speed From The Microprocessor** | |
| | | Check 12 VDC at pin 16 with unit running. | Must be 12 VDC when the microprocessor is calling for high speed. |
| | 5 | **Check engine RPM** | |
| | | a. Check actual engine RPM using hand held tachometer. | Check Speed Control System, refer to Section 9.5 |
| | | b. Compare actual RPM with those shown on display. | Both readings within ± 50 RPM. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00175** | **CHECK HIGH SPEED RPM – Continued** | | |
| | 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.<br>No kinks or restrictions. |
| | 7 | **Check engine exhaust system** | |
| | | Inspect the exhaust system. | Must be clear and unobstructed. |
| | | | |
| **P00176** | **C3 CHECK LSV VALVE**<br>• TRIGGER–ON: In Test 2: Compartment 3 Liquid Solenoid Valve (3LSV) current is outside the range of 0.75A to 2.0A; **OR**<br>In Test 14: The suction pressure did not rise as expected when the 3LSV was energized (opened).<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED".<br>• RESET CONDITION: Auto Reset when Pretrip 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 page 7-2.) 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 Pretrip | Stop Pretrip during Test #3 by holding = Key for 6 seconds |
| | | d. Review active alarm list for Alarm 176 | If alarm is present, follow steps 2 & 3. If alarm is not present, follow step 4. |
| | 2 | **Test 2 alarm:Check Compartment 3 LSV Coil** | |
| | | a. Inspect coil and connector. | No damage to coil<br>No damage, moisture, or corrosion in connector.<br>Use component test mode to check circuit |
| | | b. Check resistance of coil | Refer to Section 2.13 for correct electrical values |
| | 3 | **Test 2 alarm:Check Compartment 3 LSV Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | 4 | **Test 14 alarm: Check Compartment 3 LSV Valve** | |
| | | Check operation of Compartment 3 LSV valve for proper opening and closing. | Refer to section 8.8.10.<br>Compartment 3 LSV must open and close correctly. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00177** | **CHECK EVAP SUPERHEAT** | | |
| | • TRIGGER–ON: With the unit running in Test 12, after the microprocessor closes the EVXV to 0%, evaporator pressure fails to drop by 20 psig (1.36 bar) or fails to go below 0 psig / bar **OR** the EVXV appears not to be opening to the full capacity position.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7-2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary. | | | |
| | 1 | **Check Refrigerant Level** | |
| | | Check refrigerant charge. | Refer to Section 8.6.2. |
| | 2 | **Check System Pressures** | |
| | | Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display. | Suction and Evaporator Outlet pressures must be above 3 psig (0.2 bar.)<br><br>Suction, Evaporator Outlet & Discharge Pressures must have the same reading on gauges & on microprocessor display.<br><br>NOTE: Microprocessor Suction (CSP) and Evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar.) The actual pressure must be lower than 100 psig in order to perform this test. |
| | 3 | **Check EVXV** | |
| | | a. Visually inspect EVXV for damage. | Check to see if coil is seated on valve properly. |
| | | b. Inspect EVXV coil and wire connections. | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | c. Check coil resistance. | See Section 8.8.6. |
| | | d. Check EVXV operation. | See Section 8.8.6. |
| | | e. Check basic refrigeration system. | Pressures normal. Compressor operation normal. |
| | | f. Check the EVXV electrical system. | Check for good continuity in all circuits from micro to EVXV. |
| | | g. Inspect component and wire connections. | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | h. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00178** | **CHECK UL1** | | |
| | • TRIGGER–ON: The pressure differential between suction and discharge pressures did not change as expected when the Front Unloader (UL1) 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.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail in teat 13 and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip is started again or alarm may be manually reset viakey-pad 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 page 7–2.) 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. |
| | | b. Verify that correct transducer is being used in each position. | Mechanical connections to transducers are the same.<br>The Discharge Transducer should have a RED marking dot on it.<br>The Suction Transducer should have a BLUE marking dot on it. |
| | 2 | **Check for Check UL1 Alarm** | |
| | | 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 transducer operation | Refer to Section 8.8.8 |
| | | b. Check Schrader valve fitting under each transducer | Must not be physically damaged, depressor must fully open valve to allow pressure to transducer |
| | | a. Verify the correct Transducer is in place. | Verify by part number or colored dot that the correct Transducer is installed for the SPT. |
| | 4 | **Check System Pressures** | |
| | | Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display. | Suction and Evaporator Outlet pressures must be above 3 psig (0.2 bar.)<br><br>Suction, Evaporator Outlet & Discharge Pressures must have the same reading on gauges & on microprocessor display.<br><br>**NOTE: Microprocessor Suction (CSP and Evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar.) The actual pressure must be lower than 100 psig in order to perform this test.** |
| | 5 | **Check Front Unloader (UL1) Operation – Unit must be running (See Note 5 page 7–2)** | |
| | | Check operation of Front Unloader (UL1). | See Section 8.7.6<br><br>Unloader must load and unload properly. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00180** | **CHECK SUCTION MOD VALVE** | | |
| | • TRIGGER–ON: With the unit running in Pretrip Test #11, after the microprocessor attempts to close CSMV, the suction pressure fails to drop below 4in. Hg (–0.14 bar.)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL IN TEST 11".<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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** | |
| | | Upgrade software. | Install (or have Carrier Transicold dealer install) latest revision. |
| | 2 | **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. |
| | | b. Verify that correct transducer is being used in each position. | Mechanical connections to transducers are the same.<br>The Discharge Transducer should have a RED marking dot on it.<br>The Suction Transducer should have a BLUE marking dot on it. |
| | 3 | **Check Compressor Operation** | |
| | | Check compressor operation. | Refer to Section 8.7.1.<br>If compressor does not pass all tests, repair or replace compressor. |
| | 4 | **Check Suction Modulating Valve** | |
| | | a. Visually inspect CSMV. | No damage to valve. |
| | | b. Inspect CSMV coil and wire connections. Refer to Section 8.8.5. | No damage to coil.<br>No damage, moisture, or corrosion in connector. |
| | | c. Check CSMV operation. Refer to Section 8.8.5. | Must perform correctly. |
| | | d. Check wires from CSMV to microprocessor. | No visual damage to wires<br>Continuity test verifies that each wire is good. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00184** | **C2 CHECK EVAP FAN MOTOR** | | |
| | This device is checked twice in Pretrip – once in Test 2 and again in Test 8.<br>• TRIGGER–ON TEST 2: Normal draw for the 2EVCON contactor coil is .05 to 2.0 D/C Amps (12 VDC). The circuit tests outside this range.<br>• TRIGGER–ON TEST 8: Normal draw for the Compartment 2 Evap Fan motors is 0.1 to 2.0 A/C Amps (460 VAC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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 Pretrip | Stop Pretrip during Test #3 by holding = Key for 6 seconds |
| | | d. Review active alarm list for Alarm 184 | 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<br>No damage, moisture, or corrosion in connections. |
| | | b. Check contactor coil resistance | Refer to Section 2.13 for correct electrical values |
| | 3 | **Check 2EVCON Amp Draw** | |
| | | Check 2EVCON amp draw | Use Component Test Mode (refer to Section 5.2) to test.<br>Refer to Section 2.13 for amp values. View current draw in Unit Data. |
| | 4 | **Check 2EVCON Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00184** | **C2 CHECK EVAP FAN MOTOR (Continued)** | | |
| **460 VAC CIRCUIT** | 5 | **Check Amp Draw of Compartment 2 evaporator fan motor (2EVCON) circuit** | |
| | | Use a clamp on ammeter to check the current draw of all 3 legs. | Must be within range shown in Section 2.12 for all three legs. |
| | 6 | **Check Compartment 2 evaporator fan motors** | |
| | | a. With the unit off, visually check fan motors and blower wheels | No visual physical damage.<br>No blockage due to debris.<br>Blower wheels spin freely.<br>Remove and replace if required. |
| | | b. With the unit off, check resistance of the evaporator fan motor windings | No open windings, phase to phase.<br>No continuity from any high voltage lead to ground. |
| | 7 | **Check Compartment 2 evaporator fan motor connections** | |
| | | Inspect high voltage fan motor connections at evaporator. | No corrosion, water damage or burning/discoloration.<br>Remove and replace if required. |
| | 8 | **Verify Accuracy of AC Current Sensor** | |
| | | With microprocessor in PC Mode (refer to Section 5.3 page 5-4) check amperage in the Unit Data (refer to Section 3.13) | Reading for AC1 amps and AC2 amps must both be 0. |
| | 9 | **Check Compartment 2 evaporator fan motor 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 |
|---|---|---|---|
| **P00185** | **C3 CHECK EVAP FAN MOTOR** | | |
| This device is checked twice in Pretrip – once in Test 2 and again in Test 8.<br>• TRIGGER–ON TEST 2: Normal draw for the 3EVCON contactor coil is .05 to 2.0 D/C Amps (12 VDC). The circuit tests outside this range.<br>• TRIGGER–ON TEST 8: Normal draw for the Compartment 3 Evap Fan motors is 0.1 to 2.0 A/C Amps (460 VAC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED".<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7-2.) 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 Pretrip | Stop Pretrip during Test #3 by holding = Key for 6 seconds |
| | | d. Review active alarm list for Alarm 183 | If alarm is present, follow steps 2 thru 4. If alarm is not present, follow steps 5 thru 10. |
| **12 VDC CIRCUIT** | 2 | **Check 3EVCON** | |
| | | a. Inspect heater contactor coil and wire connections | No damage to coil<br>No damage, moisture, or corrosion in connections. |
| | | b. Check contactor coil resistance | Refer to Section 2.13 for correct electrical values |
| | 3 | **Check 3EVCON Amp Draw** | |
| | | Check 3EVCON amp draw | Use Component Test Mode (refer to Section 5.2) to test.<br>Refer to Section 2.13 for amp values. View current draw in Unit Data. |
| | 4 | **Check 3EVCON Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00185** | **C3 CHECK EVAP FAN MOTOR (Continued)** | | |
| **460 VAC CIR-CUIT** | 5 | **Check Amp Draw of Compartment 3 evaporator fan motor (3EVCON) circuit** | |
| | | Use a clamp on ammeter to check the current draw of all 3 legs. | Must be within range shown in Section 2.12 for all three legs. |
| | 6 | **Check Compartment 3 evaporator fan motors** | |
| | | a. With the unit off, visually check fan motors and blower wheels | No visual physical damage.<br>No blockage due to debris.<br>Blower wheels spin freely.<br>Remove and replace if required. |
| | | b. With the unit off, check resistance of the evaporator fan motor windings | No open windings, phase to phase.<br>No continuity from any high voltage lead to ground. |
| | 7 | **Check Compartment 3 evaporator fan motor connections** | |
| | | Inspect high voltage fan motor con-nections at evaporator. | No corrosion, water damage or burning/discoloration.<br>Remove and replace if required. |
| | 8 | **Verify Accuracy of AC Current Sensor** | |
| | | With microprocessor in PC Mode (refer to Section 5.3 page 5-4) check amperage in the Unit Data (refer to Section 3.13) | Reading for AC1 amps and AC2 amps must both be 0. |
| | 9 | **Check Compartment 3 evaporator fan motor 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">P00186 CHECK EVAP OUTLET TEMP<br>• TRIGGER–ON: Evaporator Outlet Temperature Sensor (EVOT) is not within the range of –53 to +158°F (–47 to +70°C.)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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="2"></td><td colspan="2">Check Sensor – refer to procedure for alarm 131</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">P00187 CHECK HEATER 1 CIRCUIT<br>This device is checked twice in Pretrip – once in Test 2 and again in Test 8.<br>• TRIGGER–ON TEST 2 (unit not running): Normal draw for the 1HTCON1 relay coil is 0.05 to 1.0 Amps (12 VDC). The circuit tests outside this range.<br>• TRIGGER–ON TEST 8 (unit running): Normal draw for the 1HTCON1 heaters is 1.0 to 3.5 Amps (460 VAC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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 Pretrip.</td><td>Stop Pretrip during Test #3 by holding = Key for 6 seconds.</td></tr>
<tr><td>d. Review active alarm list for Alarm 187.</td><td>If alarm is present, follow steps 2 thru 5 If alarm is not present, follow steps 6 thru 9.</td></tr>
<tr><td rowspan="11">12 VDC CIR-CUIT</td><td>2</td><td colspan="2">Check 1HTCON1</td></tr>
<tr><td rowspan="2"></td><td>a. Inspect heater contactor coil and wire connections.</td><td>No damage to coil.<br>Wire connections to contactor coil are tight.<br>No damaged or corroded wires to contactor coil.</td></tr>
<tr><td>b. Check contactor coil resistance.</td><td>Refer to Section 2.13 for correct electrical values.</td></tr>
<tr><td>3</td><td colspan="2">Check 1HTCON1 Amp Draw</td></tr>
<tr><td></td><td>Check 1HTCON1 amp draw.</td><td>Use Component Test Mode (Section 5.2.2) to test.<br>Refer to Section 2.13 for correct electrical values.<br>View current draw in Unit Data.</td></tr>
<tr><td>4</td><td colspan="2">Check 1HTCON1 Wiring</td></tr>
<tr><td></td><td>Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)</td><td>No physical damage to harness.<br>No damage, moisture, or corrosion in connectors.</td></tr>
<tr><td>5</td><td colspan="2">Check Evaporator High Temperature Switch (EVHTS)</td></tr>
<tr><td></td><td>Inspect for open EVHTS per wiring schematic Section 10.</td><td>If open, replace switch as required.</td></tr>
<tr><td colspan="2"></td><td colspan="2">Additional steps on the next page.</td></tr>
</table>

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00187** | **CHECK HEATER 1 CIRCUIT – Continued** | | |
| | 6 | **Check Amp Draw of 1HTCON1 Heater Circuit** | |
| | | a. With the unit running and calling for Heat in Compartment 1, use a clamp on ammeter to check the current draw of all 3 legs. | Must be within range shown in Section 2.12 for all three legs. |
| | | b. Check fuses for heater elements. | F10, F11, and F12 must not be blown. |
| | | c. Check voltage at 1HTCON1 contacts. | Must be within range shown in Section 2.12 for L1–L2, L1–L3, and L2–L3.<br><br>Must be within range shown in Section 2.12 for T1–T2, T1–T3, and T2–T3. |
| **460 VAC CIRCUIT** | 7 | **Check Heater Elements** | |
| | | a. Check heater elements with the unit Off. | No visual physical damage.<br>Remove and replace if damaged. |
| | | b. Check heater element resistance. | Check from “T” terminals on 1HTCON1 contactor.<br>See section 2.12 for correct resistance. |
| | 8 | **Check Heater Element Connections** | |
| | | a. Inspect high voltage heater connections at evaporator. | No corrosion, water damage or burning / discoloration.<br>Remove, repair, or replace if required. |
| | | b. Disconnect heater element plug. | Heater resistance per Section 2.12.<br>Remove and replace heaters if required. |
| | | a. Inspect plugs, plug seal and connectors. | No corrosion, water damage or burning / discoloration.<br>Remove and replace if required. |
| | 9 | **Verify Accuracy of AC Current Sensor** | |
| | | Put microprocessor in PC Mode. Refer to section 5.3 page 5–4. | Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00188** | **CHECK HEATER 2 CIRCUIT** | | |
| | This device is checked twice in Pretrip – once in Test 2 and again in Test 8.<br>• TRIGGER–ON TEST 2 (unit not running): Normal draw for the 1HTCON2 contactor coil is 0.05 to 2.0 Amps (12 VDC). The circuit tests outside this range.<br>• TRIGGER–ON TEST 8 (unit running): Normal draw for the 1HTCON2 heaters is 1.0 to 3.5 Amps (460 VAC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7-2.) 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 Pretrip. | Stop Pretrip during Test #3 by holding = Key for 6 seconds. |
| | | d. Review active alarm list for Alarm 188. | 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 1HTCON2** | |
| | | a. Inspect heater contactor coil and wire connections. | No damage to coil.<br>No damage, moisture, or corrosion in connections. |
| | | b. Check contactor coil resistance. | Refer to Section 2.13. |
| | 3 | **Check 1HTCON2 Amp Draw** | |
| | | Check 1HTCON2 amp draw. | Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. |
| | 4 | **Check 1HTCON2 Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | 5 | **Check Evaporator High Temperature Switch (EVHTS)** | |
| | | Inspect for open EVHTS per wiring schematic Section 10. | If open, replace switch as required. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00188** | **CHECK HEATER 2 CIRCUIT – Continued** | | |
| **460 VAC CIRCUIT** | 6 | **Check Amp Draw of 1HTCON2 Heater Circuit** | |
| | | a. With the unit running and calling for pull up in Compartment 1, use a clamp on ammeter to check the current draw of all 3 legs. | Must be within range shown in Section 2.12 for all three legs. |
| | | b. Check fuses for heater elements | F10, F11, and F12 must not be blown. |
| | | c. Check voltage at 1HTCON2 contacts. | Must be within range shown in Section2.12for L1–L2, L1–L3, and L2–L3.<br><br>Must be within range shown in Section 2.12 for T1–T2, T1–T3, and T2–T3. |
| | 7 | **Check Heater Elements** | |
| | | a. Check heater elements with the unit Off. | No visual physical damage<br>Remove and replace if damaged |
| | | b. Check heater element resistance. | Check from “T” terminals on HTCON2 contactor. See section 2.12 for correct resistance. |
| | 8 | **Check Heater Element Connections** | |
| | | Inspect high voltage heater connections at evaporator. | No corrosion, water damage or burning / discoloration.<br>Remove, repair, or replace if required. |
| | 9 | **Verify Accuracy of AC Current Sensor** | |
| | | Put microprocessor in PC Mode. Refer to Section 5.3 page 5–4. | Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00189** | **CHECK EVAPORATOR FAN MOTOR** | | |
| | This device is checked twice in Pretrip – once in Test 2 and again in Test 8.<br>• TRIGGER–ON TEST 2 (unit not running): Normal draw for the 1EVCON contactor coil is 0.05 to 2.0 Amps (12 VDC). The circuit tests outside this range.<br>• TRIGGER–ON TEST 9 (unit running): Normal draw for the Evaporator Fan motor is 0.7 to 3.5 Amps (460 VAC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED".<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7-2.) 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 Pretrip. | Stop Pretrip during Test #3 by holding = Key for 6 seconds. |
| | | d. Review active alarm list for Alarm 189. | If alarm is present, follow steps 2thru 4 If alarm is not present, follow Steps 5 thru 8 |
| **12 VDC CIR-CUIT** | 2 | **Check 1EVCON** | |
| | | a. Inspect Evaporator Fan Motor contactor coil and wire connections. | No damage to coil.<br>No damage, moisture, or corrosion in connections. |
| | | b. Check contactor coil resistance. | Refer to Section 2.13. |
| | 3 | **Check 1EVCON Amp Draw** | |
| | | Check 1EVCON amp draw. | Use Component Test Mode (Section 5.2.2) to test.<br>Refer to Section 2.13 for correct electrical values.<br>View current draw in Unit Data. |
| | 4 | **Check 1EVCON Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | **Additional steps on the next page.** | |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00189** | **CHECK EVAPORATOR FAN MOTOR – Continued** | | |
| **460 VAC CIRCUIT** | 5 | **Check Amp Draw of 1EVCON Evap Fan Motor Circuit** | |
| | | a. With the unit running in either HEAT or COOL use a clamp on ammeter to check the current draw of all 3 legs. | Must be within range shown in Section 2.12 for all three legs. |
| | | b. Check fuses for evaporator fan motor. | F26, F27, and F28 must not be blown. |
| | | c. Check voltage at 1EVCON contacts. | Must be within range shown in Section 2.12 for L1–L2, L1–L3, and L2–L3.<br>Must be within range shown in Section 2.12 for T1–T2, T1–T3, and T2–T3. |
| | 6 | **Check Compartment 1 Evaporator Fan Motor** | |
| | | a. With the unit off, visually check fan motor and blower wheel. | No visual physical damage.<br>No blockage to blower wheels.<br>Blower wheels spin freely.<br>Remove and replace if required. |
| | | b. With the unit off, check the resistance of the evaporator fan motor windings. | See Section 2.12 for correct resistance.<br>Resistance (Ohms) must be in range.<br>No continuity from any high voltage lead to ground. |
| | 7 | **Check Compartment 1 Evaporator Fan Motor Connections** | |
| | | Inspect high voltage fan motor connections at evaporator. | No corrosion, water damage or burning / discoloration.<br>Remove, repair, or replace if required. |
| | 8 | **Verify Accuracy of AC Current Sensor** | |
| | | Put microprocessor in PC Mode. Refer to Section 5.3 page 5–4. | Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00190** | **CHECK CONDENSER FAN MOTOR** | | |
| • TRIGGER–ON Normal draw for the condenser fan motors is 0.8 to 3.5 Amps (460 VAC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED".<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7-2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary. | | | |
| **460 VAC CIR-CUIT** | 1 | **Check Amp Draw of Condenser Fan Motor Circuit** | |
| | | a. With the unit running use a clamp on ammeter to check the current draw at CDCON on all 3 legs. | Must be within range shown in Section 2.12 for all three legs.<br>If higher than normal draw is read, the wiring for the motors must be separated, and each motor tested individually. |
| | | b. Check fuses for condenser fan motors. | F26, F27, and F28 must not be blown. |
| | | c. Check voltage at CDCON contacts. | Must be within range shown in Section 2.12 for L1-L2, L1-L3, and L2-L3.<br>Must be within range shown in Section 2.12 for T1-T2, T1-T3, and T2-T3. |
| | 2 | **Check Condenser Fan Motors** | |
| | | a. Check condenser fan motors. | No visual physical damage.<br>No blockage due to debris.<br>Remove and replace if required. |
| | | b. With the unit off, visually check fan motors and fan blades. | No visual physical damage.<br>No blockage to fan blades.<br>Fan blades spin freely.<br>Remove and replace if required. |
| | | c. With the unit off, check the resistance of the condenser fan motor windings. | See Section 2.12 for correct resistance.<br>Resistance (Ohms) must be in range.<br>No continuity from any high voltage lead to ground. |
| | 3 | **Check Condenser Fan Motor Connections** | |
| | | Inspect high voltage connections at the condenser fan motors. | No corrosion, water damage or burning / discoloration.<br>Remove, repair, or replace if required. |
| | 4 | **Verify Accuracy of AC Current Sensor** | |
| | | Put microprocessor in PC Mode. Refer to Section 5.3 page 5-4. | Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00191** | **CHECK UL2** | | |
| | • TRIGGER–ON: The pressure differential between suction and discharge pressures did not change as expected when the Rear Unloader (UL2) 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.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail in test 13and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) **.** 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. |
| | | b. Verify that correct transducer is being used in each position. | Mechanical connections to transducers are the same.<br>The Discharge Transducer should have a RED marking dot on it.<br>The Suction Transducer should have a BLUE marking dot on it. |
| | 2 | **Check for Check UL2 Alarm** | |
| | | Check for alarm 86 or P164 | Alarm conditions must be corrected and the alarm cleared to continue |
| | 3 | **Check System Pressures** | |
| | | Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display. | Suction and Evaporator Outlet pressures must be above 3 psig (0.2 bar.)<br>Suction, Evaporator Outlet & Discharge Pressures must have the same reading on gauges & on microprocessor display.<br>**NOTE: Microprocessor Suction (CSP and Evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar.) The actual pressure must be lower than 100 psig in order to perform this test.** |
| | 4 | **Check Rear Unloader (UL2) Operation – Unit must be running. (See Note 5 page 7–2)** | |
| | | Check operation of Rear Unloader (UL2) | See Section 8.7.6.<br>Unloader must load and unload properly. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00199** | **C2 CHECK RETURN AIR SENSOR** | | |
| | • TRIGGER–ON: Compartment 2 Return Air Sensor is not within the range of –53° to +158°F (–47° to +70°C)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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 sensor & connector | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Check Return Air Sensor resistance (See Note 3, page 7–2.) | 10,000 Ohms @ 77°F (25°C)<br>(Refer to Table 8–5 for complete resistance chart) |
| | 2 | **Check Return Air Sensor Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10). | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00206** | **CHECK CONDENSER FAN CIRCUIT** | | |
| | • TRIGGER–ON : Normal draw for the CDCON contactor coil is 0.05 to 2.0 Amps (12 VDC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7-2.) 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 CDCON contactor coil and wire connections. | No damage to coil.<br>No damage, moisture, or corrosion in connections. |
| | | b. Check contactor coil resistance. | Refer to Section 2.13. |
| | 2 | **Check CDCON Amp Draw** | |
| | | Check CDCON contactor coil amp draw. | Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.13 for amp values. View current draw in Unit Data. |
| | 3 | **Check CDCON Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | | |
| **P00207** | **CHECK COMPRESSOR CONTACT CIRC** | | |
| | • TRIGGER–ON: Normal draw for the CCONR and CCON relay coils is 0.0 to 1.0 Amps (12 VDC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset viakeypad 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 page 7-2.) 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 CCONR and CCON contactor coils and wire connections. | No damage to coil.<br>No damage, moisture, or corrosion in connections. |
| | | b. Check contactor coil resistance | Refer to Section 2.13. |
| | 2 | **Check CCONR Amp Draw** | |
| | | a. Check CCONR and CCON contactor coil amp draw. | Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.13 for correct electrical values. View current draw in Unit Data. FET 2 On. |
| | | b. Listen for CCON to pull in. | If CCON contactor pulls in, CCONR and CCON are OK.<br>If CCON contactor does not pull in, check for 12 VDC at CCON coil. 12 VDC indicates defective CCON coil. No voltage - check CCONR. |
| | 3 | **Check CCONR Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00208** | **CHECK GENERATOR CONT CIRC** | | |
| | • TRIGGER–ON: Normal draw for the GENCONR and GENCON coils is 0.0 to 1.0 Amps (12 VDC). The circuit tests outside this range.<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED".<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7-2.) 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 GENCONR and GENCON contactor coils and wire connections. | No damage to coil.<br>No damage, moisture, or corrosion in connections. |
| | | b. Check contactor coil resistance. | Refer to Section 2.13. |
| | 2 | **Check GENCONR and GENCON Amp Draw** | |
| | | a. Check GENCONR and GENCON contactor coils amp draw. | Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.13 for amp values. View current draw in Unit Data. FET 3 On. |
| | | b. Listen for GENCON to pull in. | If GENCON contactor pulls in, GENCONR and GENCON are OK.<br>If GENCON contactor does not pull in, check for 12 VDC at GENCON coil. 12 VDC indicates defective GENCON coil. No voltage – check GENCONR. |
| | 3 | **Check GENCONR Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00209** | **CHECK STANDBY CONT CIRCUIT** | | |
| • TRIGGER–ON: Normal amps for the PSCONR relay coil and PSCON <u>or</u> PSCON2 contactor coils 0.0 to 1.0 Amps (12 VDC). The circuit(s) test outside this range. (During this test either PSCON or PSCON2 will be tested depending on the phase reversal module.)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7-2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary. | | | |
| NOTE: **IF PRETRIP IS DONE IN STANDBY MODE, THIS PRETRIP ALARM WILL GENERATE MANY OTHER PRETRIP ALARMS. THEREFORE, IT SHOULD BE ADDRESSED FIRST** | | | |
| | 1 | **Check PSCONR** | |
| | | a. Inspect PSCONR, PSCON and PSCON2 contactor coils and wire connections. | No damage to coils.<br>No damage, moisture, or corrosion in connections. |
| | | b. Check contactor coil resistance. | Refer to Section 2.13 for resistance values |
| | 2 | **Check PSCONR, PSCON, and PSCON2 Amp Draw** | |
| | | a. Check PSCONR, PSCON and PSCON2 contactor coils amp draw. | Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.13 for amp values. View current draw in Unit Data. FET 19 On. |
| | | b. Listen for PSCON or PSCON2 to pull in. | If PSCON or PSCON2 contactor pulls in, PSCONR and PSCON or PSCON2 are OK.<br>If PSCON or PSCON2 contactor does not pull in, check for 12 VDC at Phase Reversal Module (PRM) “N” terminal. 12 VDC indicates defective PSCON or PSCON2 coil. No voltage – check PSCONR and PRM. |
| | 3 | **Check PSCONR, PSCON, PSCON2 and PRM Wiring** | |
| | | Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.) | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00210** | **C3 CHECK RETURN AIR SENSOR** | | |
| • TRIGGER–ON: Compartment 3 Return Air Sensor is not within the range of –53° to +158°F (–47° to +70°C)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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 sensor & connector | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Check Return Air Sensor resistance (See Note 3, page 7–2.) | 10,000 Ohms @ 77°F (25°C)<br>(Refer to Table 8–5 for complete resistance chart) |
| | 2 | **Check Return Air Sensor Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10). | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | | |
| **P00211** | **CHECK DEFROST SENSOR (2DTT)** | | |
| • TRIGGER–ON: Defrost Sensor for Compartment 2 is not within the range of –53° to +158°F (–47° to +70°C)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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 sensor & connector | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Check Return Air Sensor resistance (See Note 3, page 7–2.) | 10,000 Ohms @ 77°F (25°C)<br>(Refer to Table 8–5 for complete resistance chart) |
| | 2 | **Check Compartment 2 Defrost Sensor Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10). | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | 3 | **Check Remote Sensor Connector (2 Compartment Units Only)** | |
| | | Locate and inspect remote sensor connector | Cap is in place.<br>No physical damage.<br>No moisture or corrosion. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **P00212** | **CHECK DEFROST SENSOR (3DTT)** | | |
| | • TRIGGER–ON: Defrost Sensor for Compartment 3 is not within the range of –53° to +158°F (–47° to +70°C)<br>• UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED".<br>• RESET CONDITION: Auto Reset if Pretrip 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 page 7–2.) 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 sensor & connector | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | | b. Check Return Air Sensor resistance (See Note 3, page 7–2.) | 10,000 Ohms @ 77°F (25°C)<br>(Refer to Table 8–5 for complete resistance chart) |
| | 2 | **Check Compartment 3 Defrost Sensor Wiring** | |
| | | Inspect harness & control box connector pins & terminals (See wiring schematic Section 10). | No physical damage to harness.<br>No damage, moisture, or corrosion in connectors. |
| | 3 | **Check Remote Sensor Connector** | |
| | | Locate and inspect remote sensor connector | Cap is in place.<br>No physical damage.<br>No moisture or corrosion. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **7.10 MAINTENANCE ALARMS** | | | |
| **00223** | **ENGINE MAINTENANCE DUE** | | |
| | • TRIGGER–ON: The Engine Maintenance Hour Meter time has expired.<br>• UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on.<br>• RESET CONDITION: Alarm may be manually reset via keypad. | | |
| | 1 | **Check Unit Maintenance Records** | |
| | | Schedule unit into service facility for maintenance. | Must be done soon! |
| | 2 | **Perform Maintenance** | |
| | | 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 configured Interval if required. |
| | | b. Reset Engine Maintenance Hour Meter for the next service interval. | Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2. |
| | | | |
| **00224** | **STANDBY MAINTENANCE DUE** | | |
| | • TRIGGER–ON: The Standby Hour Meter time has expired.<br>• UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on.<br>• RESET CONDITION: Alarm may be manually reset via keypad. | | |
| | 1 | **Check Unit Maintenance Records** | |
| | | Schedule unit into service facility for maintenance. | Must be done soon! |
| | 2 | **Perform Maintenance** | |
| | | Perform appropriate engine & unit maintenance. | Follow instructions on proper maintenance form. |
| | 3 | **Reset Standby Hour Meter** | |
| | | a. Check that the Standby Maintenance Hour Meter interval is set for your requirements. | Reset configured Interval if required. |
| | | b. Reset Standby Maintenance Hour Meter for the next service interval. | Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00225** | **GENERAL MAINTENANCE DUE** | | |
| | • TRIGGER–ON: The General Maintenance Hour Meter time has expired.<br>• UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on.<br>• RESET CONDITION: Alarm may be manually reset via keypad. | | |
| | 1 | **Check Unit Maintenance Records** | |
| | | Schedule unit into service facility for maintenance. | Must be done soon! |
| | 2 | **Perform Maintenance** | |
| | | 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 configured Interval if required. |
| | | b. Reset General Maintenance Hour Meter for the next service interval. | Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2. |
| | | | |
| **00226** | **SERVICE SOON–PM #1 DUE** | | |
| | • TRIGGER–ON: The Maintenance Hour Meter #1 time has expired.<br>• UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on.<br>• RESET CONDITION: Alarm may be manually reset via keypad. | | |
| | 1 | **Check Unit Maintenance Records** | |
| | | Schedule unit into service facility for maintenance. | Must be done soon! |
| | 2 | **Perform Maintenance** | |
| | | 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 configured Interval if required. |
| | | b. Reset Maintenance Hour Meter #1 for the next service interval. | Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00227** | **SERVICE SOON–PM #2 DUE** | | |
| | • TRIGGER–ON: The Maintenance Hour Meter #2 time has expired.<br>• UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on.<br>• RESET CONDITION: Alarm may be manually reset via keypad. | | |
| | 1 | **Check Unit Maintenance Records** | |
| | | Schedule unit into service facility for maintenance. | Must be done soon! |
| | 2 | **Perform Maintenance** | |
| | | 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 configured Interval if required. |
| | | b. Reset Maintenance Hour Meter #2 for the next service interval. | Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2. |
| | | | |
| **00228** | **SERVICE SOON–PM #3 DUE** | | |
| | • TRIGGER–ON: The Maintenance Hour Meter #3 time has expired.<br>• UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on.<br>• RESET CONDITION: Alarm may be manually reset via keypad. | | |
| | 1 | **Check Unit Maintenance Records** | |
| | | Schedule unit into service facility for maintenance. | Must be done soon! |
| | 2 | **Perform Maintenance** | |
| | | 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 configured Interval if required. |
| | | b. Reset Maintenance Hour Meter #3 for the next service interval. | Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00229** | **SERVICE SOON–PM #4 DUE** | | |
| | • TRIGGER–ON: The Maintenance Hour Meter #4 time has expired.<br>• UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on.<br>• RESET CONDITION: Alarm may be manually reset via keypad. | | |
| | 1 | **Check Unit Maintenance Records** | |
| | | Schedule unit into service facility for maintenance | Must be done soon! |
| | 2 | **Perform Maintenance** | |
| | | 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 configured Interval if required. |
| | | b. Reset Maintenance Hour Meter #4 for the next service interval. | Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2. |
| | | | |
| **00230** | **SERVICE SOON–PM #5 DUE** | | |
| | • TRIGGER–ON: The Maintenance Hour Meter #5 time has expired.<br>• UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on.<br>• RESET CONDITION: Alarm may be manually reset via keypad. | | |
| | 1 | **Check Unit Maintenance Records** | |
| | | Schedule unit into service facility for maintenance. | Must be done soon! |
| | 2 | **Perform Maintenance** | |
| | | 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 configured Interval if required. |
| | | b. Reset Maintenance Hour Meter #5 for the next service interval. | Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **7.11 MICROPROCESSOR ALARMS** | | | |
| **00232** | **SETPOINT ERROR** | | |
| | • TRIGGER–ON: There is an error in the setpoint that is stored in the microprocessor memory.<br>• UNIT CONTROL: Unit Shutdown & Alarm.<br>• 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.<br>b. Enter new setpoint. | Must be between –22 and +89.6° F (–30° and +32°C) |
| | 2 | **Reset Microprocessor** | |
| | | a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position. | The microprocessor powers up OK and the latest setpoint appears in the display. |
| | | b. Valid setpoint can not be entered and alarm 232 remains active. | Download and replace microprocessor. Refer to Section 5.7. |
| | | | |
| **00233** | **MODEL # ERROR** | | |
| | • TRIGGER–ON: There is an error in the Model Number that is stored in the microprocessor memory<br>• UNIT CONTROL: Unit Shutdown & Alarm<br>• 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.<br>b. Enter correct Model Number. | Check Model Number on Nameplate.<br>Select the correct model number in the “MODEL NUMBER” Configuration. If correct model number is not found, Install (or have Carrier Transicold dealer install) latest software revision. |
| | 2 | **Reset Microprocessor** | |
| | | a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position. | Microprocessor powers up OK. |
| | | b. Check for valid Model number in Unit Data. | Valid number is present.<br>Alarm is cleared. |
| | | c. Valid model number can not be entered and alarm remains active. | Download and replace microprocessor. Refer to Section 5.7. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00237** | **FUNCTION PARAMETERS ERROR** | | |
| | • TRIGGER–ON: There is an error in one or more of the Functional Parameters that are stored in the microprocessor memory.<br>• UNIT CONTROL: Incorrect Functional Parameter(s) will be automatically set for default value.<br>• 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** | |
| | | Check Functional Parameters. | All must be set for selectable values. |
| | 2 | **Check Software Version** | |
| | | Check microprocessor Software version. | Upgrade to the latest version of software. Newer versions may contain functional parameters that were not present in older versions of microprocessor software. Refer to Section 5.4.2. |
| | 3 | **Reset Microprocessor** | |
| | | a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position. | Microprocessor powers up OK. |
| | | b. Check for valid Functional Parameters in Functional Parameters List. | Valid number is set for all parameters.<br>Alarm is cleared. |
| | | c. Valid Functional Parameter(s) can not be entered and alarm remains active. | Download and replace microprocessor. Refer to Section 5.7. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00238** | **CONFIGURATIONS 1 ERROR** | | |
| | • TRIGGER–ON: There is an error in the Configuration settings that are stored in the microprocessor memory.<br>• UNIT CONTROL: Incorrect Configuration(s) will be automatically set for default value.<br>• 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** | |
| | | Check Configurations. | All must be set for selectable values. |
| | 2 | **Check Software Version** | |
| | | Check microprocessor software version. | Upgrade to the latest version of software. Newer versions of ReeferManager may contain configurations that were not present in older versions of microprocessor software. |
| | 3 | **Reconfigure Microprocessor** | |
| | | Send settings to microprocessor. | Using the latest version of ReeferManager and a Configuration PC Card, write the desired configuration file to the PC Card, then load the file into the microprocessor. Allow the microprocessor to reboot itself. |
| | 4 | **Reset Microprocessor** | |
| | | a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position. | Microprocessor powers up OK. |
| | | b. Check for valid Configuration settings in Configuration List. | Values are set correctly for all parameters.<br>Alarm is cleared. |
| | | c Disconnect positive battery cable from the battery, wait 30 seconds, then reconnect and place the Main Power switch in the desired position. | Microprocessor powers up OK. |
| | | d Check for valid Configuration settings in Configuration List. | Values are set correctly for all parameters.<br>Alarm is cleared. |
| | | c. Valid Configurations can not be entered and alarm remains active. | Download and replace microprocessor. Refer to Section 5.7. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00242** | **DIS PRESS CALIBRATE ERROR** | | |
| | • TRIGGER–ON: There is an error in the Compressor Discharge Pressure Sensor Calibration value stored in memory.<br>• UNIT CONTROL: Alarm Only.<br>• 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** | |
| | | Check Discharge Pressure Reading. | Must read valid data. |
| | 2 | **Calibrate Discharge Pressure Sensor** | |
| | | a. Calibrate Discharge Pressure Sensor. | Calibration successful. |
| | | b. Discharge Pressure Sensor can not be successfully calibrated and alarm remains active. | Download and replace microprocessor. Refer to Section 5.7. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00243** | **SUCTION/EVAP CALIBRATE ERROR** | | |
| | • TRIGGER–ON: There is an error in either or both of the Suction Pressure (CSP) or Evaporator Pressure (EVOP) Sensor Calibration values stored in the microprocessor memory. Note that neither of these transducers can be calibrated manually. This is an error in the microprocessor.<br>• UNIT CONTROL: Alarm only.<br>• RESET CONDITION: Auto Reset when both Suction and Evaporator Pressure transducers are reading correctly 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 Pressure (CSP) and Evaporator Pressure (EVOP) Readings** | |
| | | a. Check Suction and Evaporator Pressure Readings in the Unit Data. | Must read valid data. |
| | | b. Install manifold gauge set and check and compare compressor suction & evaporator pressures with those shown on the microprocessor display. | Suction and Evaporator Outlet Pressures must have the same reading on gauges & on microprocessor display.<br>**NOTE: Microprocessor Suction (CSP) and Evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar.) The actual pressure must be lower than 100 psig in order to perform this test.** |
| | 2 | **Reset Microprocessor** | |
| | | a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position. | Microprocessor powers up OK |
| | | b. Wait 2–3 minutes, then check to see if A–243 becomes active again. | Suction and Evaporator pressure values are reading OK when compared to test gauges.<br>Alarm is cleared. |
| | | c. Disconnect positive battery cable from the battery, wait 30 seconds, then reconnect and place the Main Power switch in the desired position. | Microprocessor powers up OK |
| | | d. Wait 2–3 minutes, then check to see if A–243 becomes active again. | Suction and Evaporator pressure values are reading OK when compared to test gauges.<br>Alarm is cleared. |
| | | e. Valid readings are not appearing for either or both the Suction and Evaporator Pressures in the Unit Data. | Download and replace microprocessor. Refer to Section 5.7. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00245** | **CANNOT SAVE SETTING** | | |
| | • TRIGGER–ON: There is an error in sending and saving new settings in the Microprocessor memory.<br>• UNIT CONTROL: Alarm only.<br>• 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** | |
| | | Check microprocessor software revision. | Will be a 6 digit number, upgrade if required. Refer to Section 5.4.2. |
| | 2 | **Reset Microprocessor** | |
| | | a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position. | |
| | | b. Check Active Alarm List. | Alarm is cleared – microprocessor is OK. |
| | | c. Alarm 245 remains active. | Unit will operate, but changes to the settings will not be retained in the microprocessor memory. Download and replace microprocessor. Refer to Section 5.7. |
| | | | |
| **00246** | **EEPROM WRITE FAILURE** | | |
| | • TRIGGER–ON: here is an error in the ability to write information to be stored in the memory.<br>• UNIT CONTROL: Alarm only<br>• 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. | Must be between −22 and +89.6°F (−30 and +32°C.) |
| | | b.Enter new setpoint. | Must be between −22 and +89.6°F (−30 and +32°C.) |
| | 2 | **Reset Microprocessor** | |
| | | a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position. | Microprocessor powers up OK. |
| | | b. Alarm 246 remains active. | Download and replace microprocessor. Download and replace microprocessor. Refer to Section 5.7. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00248** | **CONFIGURATION MODE / HP2 ERROR** | | |
| | • TRIGGER–ON: EEPROM configuration is out of range.<br>• UNIT CONTROL: Shutdown and alarm.<br>• 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 page 7–2.) 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. | Must be between –22 and +89.6°F (–30 and +32°C.) |
| | | b. Enter new setpoint. | Must be between –22 and +89.6°F (–30 and +32°C.) |
| | | c. Check Functional Parameters. | All settings must be valid. |
| | 2 | **Check Software Revision** | |
| | | a. Check microprocessor software revision. | Upgrade to the latest revision of software. The latest revision may contain configurations that were not present in older revisions. |
| | | b. Check Functional Parameters | All settings must be valid. Send desired settings to microprocessor using the latest version of ReeferManager or a PC Card (Do NOT use the keypad.) |
| | | c. Check Configurations | All settings must be valid. Send desired settings to microprocessor using the latest version of ReeferManager or a PC Card (Do NOT use the keypad.) |
| | 3 | **Reset microprocessor** | |
| | | a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position. | Microprocessor powers up OK. |
| | | b. Alarm 248 remains active. | Download and replace microprocessor. Refer to Section 5.7. |

| Alarm NO. | Steps | Alarm/Cause | Corrective Action |
|---|---|---|---|
| **00249** | **MICROPROCESSOR ERROR** | | |
| | • TRIGGER–ON: Microprocessor Input Conversion Error.<br>• UNIT CONTROL: Shutdown and alarm.<br>• 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 page 7–2.) 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** | |
| | | Check microprocessor software revision. | Upgrade to the latest revision of software. |
| | 2 | **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. |
| | 3 | **Check Microprocessor & Unit Wiring** | |
| | | 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. |
| | 4 | **Reset Microprocessor** | |
| | | a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position. | Microprocessor powers up OK |
| | | b. Alarm 249 remains active. | Download (if possible) and replace microprocessor. Refer to Section 5.7. |

# SECTION 8 – SERVICE



8

# SECTION 8

# SERVICE

## ⚠ WARNING

**Advance microprocessor equipped units may start automatically at any time the Main Power Switch is not in the OFF position. Also, the unit may be fitted with two way communication equipment that will allow starting of the unit from a remote location even though the switch is in the OFF position.**

## ⚠ WARNING

**Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instructions, ensure the Main Power switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection.**

## ⚠ CAUTION

**Disconnect batteries before doing any electrical welding on unit or chassis to which unit is attached (trailer, container, rail car, metal building, etc).**

## ⚠ 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.**

### 8.1 SECTION LAYOUT

Service procedures are presented herein under the following major sections:

- Scheduled Maintenance – Section 8.2
- Pretrip Inspection – Section 8.3
- External Surface Service (grille, surround, doors and display & keypad assembly) – Section 8.4, beginning on page 8–5
- Engine And Engine Related Systems Service– Section 8.5, beginning on page 8–7
- Refrigerant System Service – Section 8.6, beginning on page 8–14
- Compressor and Unloader Service – Section 8.7, beginning on page 8–20
- Refrigerant System Component Service – Section 8.8, beginning on page 8–26
- Electrical System Component Service – Section 8.9, beginning on page 8–34.

Refer to the Table Of Contents to locate specific topics.

### 8.2 SCHEDULED MAINTENANCE

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 is to be performed in accordance with the procedures provided in Table 8–1.

### 8.3 PRE TRIP INSPECTION

Pre trip inspection should be performed before every trip and at regular maintenance intervals. Pre trip procedures are provided in Table 8–2.

Table 8–1 Maintenance Schedule

| System | Operation | Reference Section |
|---|---|---|
| **a. Pre Trip Inspections** | | |
| | 1 Pre Trip Inspection – before starting | 8.3 |
| | 2 Pre Trip Inspection – after starting | 8.3 |
| | 3 Run Microprocessor Pretrip – Before loading | 3.4 |
| | 4 Check Engine Hours | 3.14 |
| **b. Every Service Interval or Yearly** | | |
| **Engine** | 1 Check engine oil and filter change interval (refer to Section **e.** of this table) | Section **e.** |
| | 2 Check engine hour meter, adjust engine valves every 4,000 hours. | Engine Manual |
| | 3 Check low oil pressure switch | Check |
| | 4 Clean crankcase breather | 8.5.14 |
| | 5 Check engine speeds | Table 2-1 |
| | 6 Check water pump belt | Check |
| **Fuel System** | 1 Clean mechanical and electric (if equipped) fuel pump screens | 8.5.3 & 8.5.4 |
| | 2 Change fuel filter | 8.5.5 |
| | 3 Check fuel heater (if equipped) | 8.5.7 |
| **Cooling System** | 1 Check coolant change interval (refer to Section **f.** of this table). | 8.5.12 |
| | If replacement is not required, check antifreeze concentration using a refractometer (Carrier Transicold part number 07–00435–00) | 8.5.12 |
| | 2 Clean condenser & radiator surfaces | Check |
| | 3 Check water pump | Check |
| | 4 Check water temperature sensor | |
| **Exhaust System** | 1 Check mounting hardware | Check |
| | 2 Check muffler and exhaust pipes | Check |
| **Air Intake System** | 1 Change air cleaner filter element | 8.5.9 |
| | 2 Check and reset air filter indicator (if equipped) | Check |
| **Starting Circuit** | 1 Clean battery connections and cable ends | Check/Replace |
| | 2 Check battery hold down clamps | Check/Replace |
| | 3 Check battery condition | Check |
| | 4 Check starter operation | Check |
| **Charging Circuit** | 1 Check battery charger output voltage | 2.12 |
| | 2 Check battery charger amperage | 2.12 |
| **A.C. Generator** | 1 Check voltage output | 2.12 |
| | 2 Check amperage output | 2.12 |
| **Unit & Remote Evaporators** | 1 Check unit and remote evaporator mounting bolts | Check |
| | 2 Check engine and compressor mounting bolts | Check |
| | 3 Check door latches & hinges | 8.4.3 |
| | 4 Check unit and remote evaporator switches and electrical connections | Check |
| | 5 Check all electrical ground connections | Check |
| | 6 Check control box condition | Check |

**Table 8–1 Maintenance Schedule – Continued**

| System | Operation | Reference Section |
|---|---|---|
| **b. Every Service Interval or Yearly – Continued** | | |
| **Refrigeration System** | 1 Check air switch and calibrate<br>2 Check & clean Compartment 1. Compartment 2 and Compartment 3 evaporator coils and all defrost drain hoses<br>3 Install manifold gauge set and check refrigerant pressure<br>4 Check Compartment 1, Compartment 2 and Compartment 3 manual defrost operation<br>5 Perform Microprocessor Pretrip | 8.8.9<br>8.8.1<br><br>Check<br>3.9<br><br>3.4 |
| **Electrical System** | 1 Check all ground connections for corrosion & tightness<br>2 Check Stand–by plug for signs of wear or damage<br>3 Check condenser fan amperage<br>4 Check Compartment 1, Compartment 2 and Compartment 2 evaporator fan amperages<br>5 Check compressor amperage<br>6 Check Compartment 1, Compartment 2 and Compartment 3 heater amperages<br>7 Perform insulation resistance verification for high voltage wiring, refer to Section 8.9.1. | Check<br>Check<br>2.12<br>2.12<br><br>2.12<br>2.12<br>– – |
| **c. Every Second Service Interval or 2 years** | | |
| **Cooling System** | Drain and flush cooling system | 8.5.12 |
| **d. Every 10,000 Hour Maintenance** | | |
| Perform complete annual Preventive Maintenance and the following: | | |
| **Fuel System** | Clean and adjust injector nozzles. | Engine Service Guide |

| **e. Oil Change Intervals** | |
|---|---|
| **Oil Type** | **Oil Change / ESI Filter Change** |
| Petroleum | 3000 hours or 2 yrs. (Maximum oil drain interval is 2 years.) |
| Mobile Delvac 1* | 4000 hours or 2 yr (Maximum oil drain interval is 2 years.) |
| * Mobil Delvac1 is the only approved synthetic oil. | |

| **f. Coolant Change Intervals** | |
|---|---|
| **Coolant Type** | **Service Interval** |
| Standard | 6000 hours or 2 yr |
| Extended Life | 12000 hours or 5 yr |

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.

**Table 8-2 Pre Trip Inspection**

| 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** | **OK** | **ADJUST** |
| Drain water from bottom of fuel tank | j | j |
| Drain water from water separator on fuel filter (if applicable) | j | j |
| Check radiator coolant level | j | j |
| Check condenser & radiator for cleanliness | j | j |
| Check air cleaner and hoses | j | j |
| Check engine oil level | j | j |
| Check condition of water pump belt | j | j |
| Check battery fluid level (if applicable) | j | j |
| Check battery cables and terminals | j | j |
| Check evaporator coils for cleanliness | j | j |
| Check bulkheads and return air screens | j | j |
| Check all defrost water drains | j | j |
| Place in continuous run and start unit | j | j |
| **IMMEDIATELY AFTER STARTING ENGINE** | **OK** | **ADJUST** |
| Check fuel lines and filter for leaks | j | j |
| Check oil lines and filter for leaks | j | j |
| Check coolant hoses for leaks | j | j |
| Check exhaust system for leaks | j | j |
| Check condenser fan for proper airflow. | j | j |
| Check evaporator fans for proper airflow. | j | j |
| Check for unusual noises | j | j |
| **MICROPROCESSOR PRETRIP** | **PASS** | **FAIL** |
| Initiate Pretrip | j | j |
| List Alarms occurring during Pretrip | | |
| **AFTER OPERATING UNIT FOR 15 MINUTES OR MORE** | **OK** | **ADJUST** |
| Check refrigerant level | j | j |
| Check compressor oil level | j | j |
| Check for proper temperature control | j | j |
| Check Start-Stop Operation | j | j |
| Initiate defrost and allow to terminate | j | j |
| Check engine speeds | j | j |

**Table 8-2 Pre Trip Inspection - Continued**

| **OPERATE UNIT IN HIGH SPEED COOL AND RECORD** (From Microprocessor Unit Data) | | | | | |
|---|---|---|---|---|---|
| Suction Pressure | | Suction line Temp | | Unit Serial # | |
| Discharge Pressure | | Evap Outlet Temp | | Unit Model # | |
| Evaporator Pressure | | Compr Disch Temp | | C2 Evaporator | |
| Engine Coolant Temp | | Battery Voltage | | C3 Evaporator* | |
| Return Air Temp | | Current Draw (DC) | | Fuel Level* | |
| C2 Return Air Temp | | Engine RPM | | Hrs to Engine Maint | |
| C3 Return Air Temp* | | Unit AC Current #1 | | Hrs to S/B Motor Maint | |
| Supply Air Temp | | Unit AC Current #2 | | Hrs to Unit Maint | |
| C2 Supply Air Temp* | | CSMV % | | Time Left to PM1* | |
| Delta-T | | EVXV % | | Time Left to PM2* | |
| Ambient Air Temp | | Software Rev | | Time Left to PM3* | |
| Defrost Term Temp | | Display Software Rev | | Time Left to PM4* | |
| C2 Defrost Term Temp | | Controller Serial # | | Time Left to PM5* | |
| C3 Defrost Term Temp* | | Trailer/Vehicle/Car ID # | | Datalogger (DataLink data recorder) Date/ Time | |

* Display is optional, record if displayed.

| FINAL | OK | ADJUST |
|---|---|---|
| Review Functional Parameters | j | j |
| Download DataLink data recorder (if required) | j | j |
| Enter Trip Start In Microprocessor | j | j |

## 8.4 EXTERNAL SURFACE SERVICE

Procedures for servicing or maintaining the grille, surround, doors, door latches and display & keypad assembly are provided in the following sub-paragraphs.

### 8.4.1 Grille Insert Removal

To remove the grille insert, do the following.

**NOTE**

If difficulty is experienced when attempting to remove the grille mounting bolts, the grille may be removed with the surround attached to allow access to the mounting clips. (Refer to Section 8.4.2.)

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Remove the 3 grille insert mounting bolts on each side of the grille insert, See Figure 8-1

c. Remove the 2 grille insert mounting bolts on top of the grille insert.

d. The grille is fitted with locating tabs along the bottom. To remove, swing insert down and lift out of locating slots.

e. Reverse above steps to install grille insert.

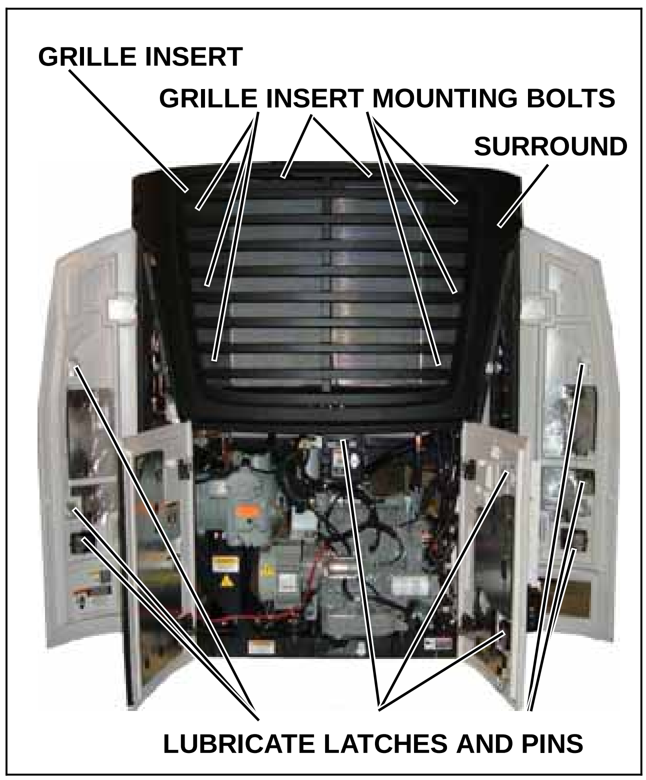



**Figure 8-1 Grille Insert Removal And Door Latch Maintenance**

### 8.4.2 Surround Removal

**NOTE**

It is not necessary to remove the grille before removing the surround.

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Open both side and front doors.

c. Remove the bolts that secure the surround to the unit, see Figure 8-2.

d. Reverse above steps to install surround.

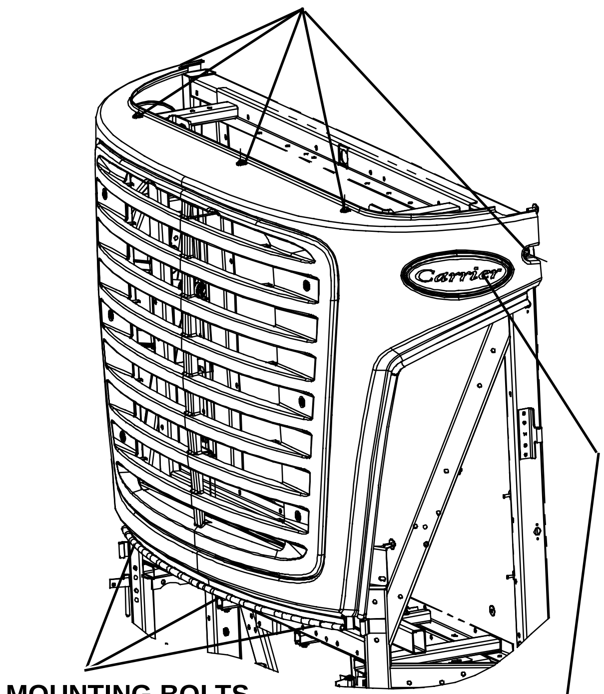



**Figure 8-2 Surround Removal**

### 8.4.3 Door Latch Maintenance And Replacement

**a. Door Latch Maintenance**

Proper maintenance is important for smooth operation of the latch assemblies and the latch pins that are mounted on the unit's frame (See Figure 8-1). In order to keep the movable parts clean and lubricated, CTD recommends the use of a de-greasing cleaner and LPS 2 lubricant. This lubricant should be available at any local automobile and truck parts suppliers.

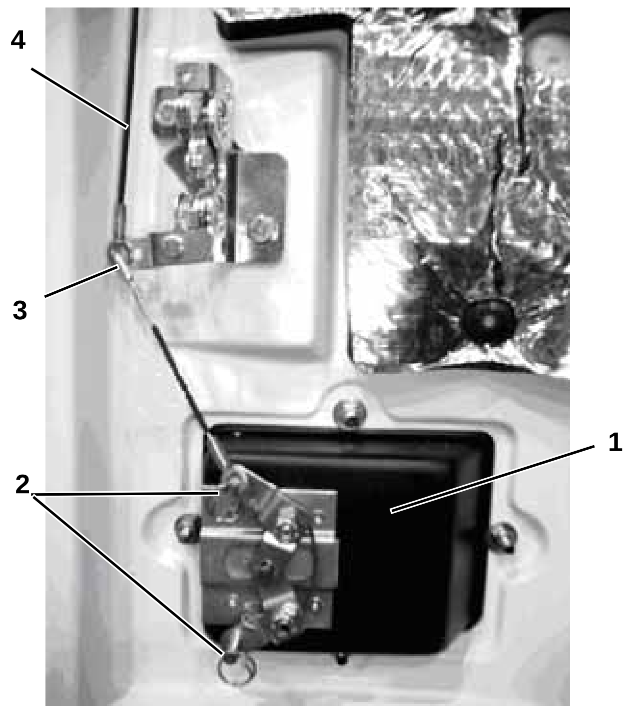
**b. Cable Replacement**

1. Remove circular clip that secures the cable to the paddle assembly. See Figure 8-3
2. Slide cable from paddle and rotate other end out of latch assembly.

**NOTE**

The side door lower cable is inserted through the upper cable eyelet. The lower cable is to be removed to gain access to the upper cable.

3. Reverse above steps to install new cable.




1. Paddle Assembly (Typical, Front & Side Doors)
2. Circular Clips (Typical, Front & Side Doors)
3. Lower Cable Upper Connection (Side Doors Only)
4. Upper Cable (Side Doors Only)

**Figure 8-3 Door Latch Cable Removal**

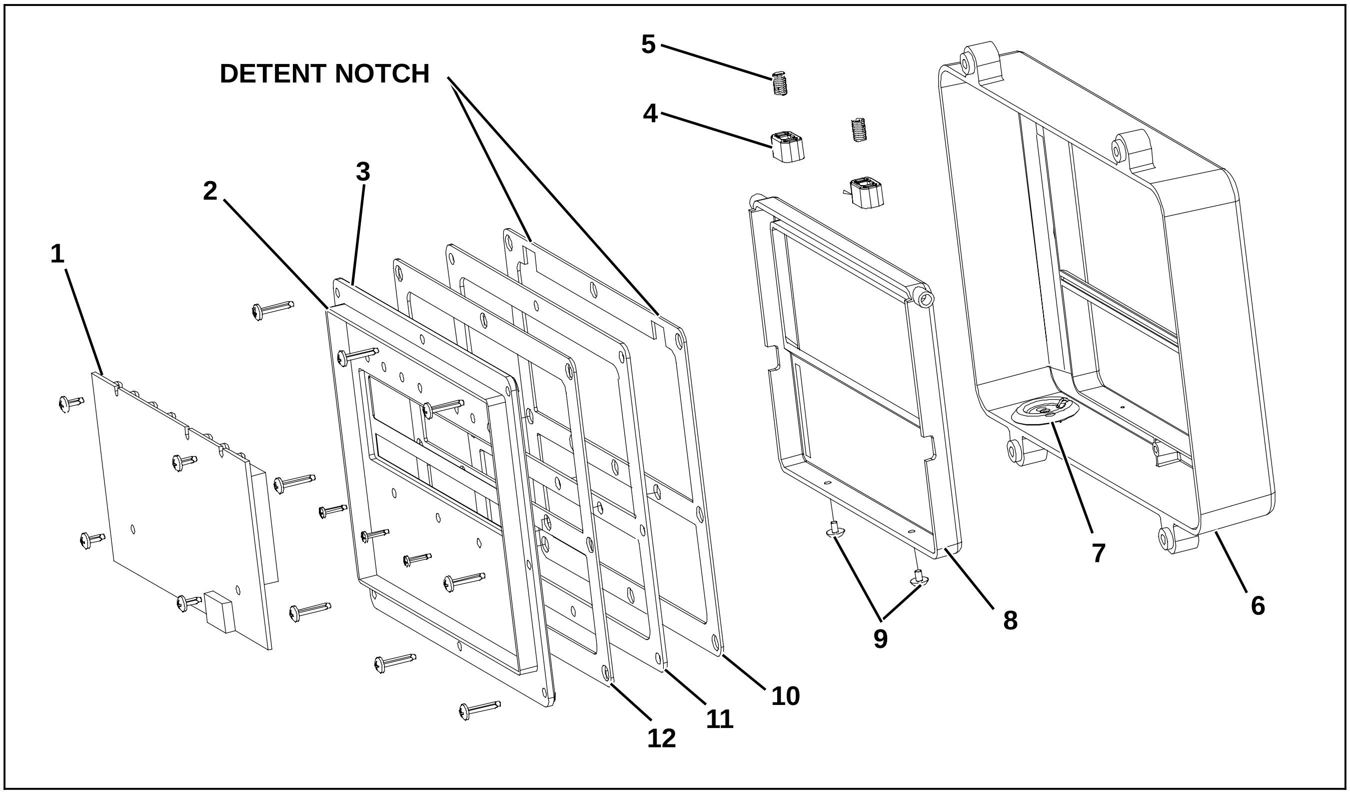
### 8.4.4 Display & Keypad Assembly

**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.

**a. Disassembly**

1. Place the Main Power switch in the OFF position. Disconnect the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle. Attach a grounded wrist strap (Carrier Transicold part number 07-00304-00) and ground it to a good unit frame ground.
2. Disconnect wiring between the keypad & display assembly and harness.
3. Loosen and remove the (4) hex head 1/4-20 bolts holding the assembly to the unit, see Figure 8-4, and lay the assembly on a clean work surface. Re-ground wrist strap at new work surface.
4. Loosen and remove the (4) pan head screws holding the display board to the keypad support. Carefully separate the display board from the keypad support.




1. Display Board
2. Keypad Support
3. Keypad
4. Latch
5. Spring
6. Bezel
7. Condensate Drain
8. Door
9. Plug
10. Gasket (Window to Bezel)
11. Window
12 Gasket (Keypad to Window)

**Figure 8-4 Display and Keypad Assembly**

5. If additional disassembly is required, remove the eleven pan head screws (eight screws around the perimeter and three in the center) used to retain the keypad support, keypad, gaskets and window to the bezel.

**b. Reassembly**

**CAUTION**

**Do not over torque display & keypad pan head screws. Torque all screws to 60 in lbs (6.8 Nm).**

**NOTE**

All gaskets must be replaced any time the keypad support is removed from the bezel. All replacement display bezel assembly kits are packaged with replacement gaskets.

1. Clean all gasket surfaces and install keypad support, keypad, gaskets and window to the bezel in the correct order, see Figure 8-4 Install the 11 mounting screws.
2. Install the display board. and reconnect wiring between the keypad & display assembly and harness.
3. Reconnect negative battery cable and standby plug as required and run Pretrip to check unit operation.

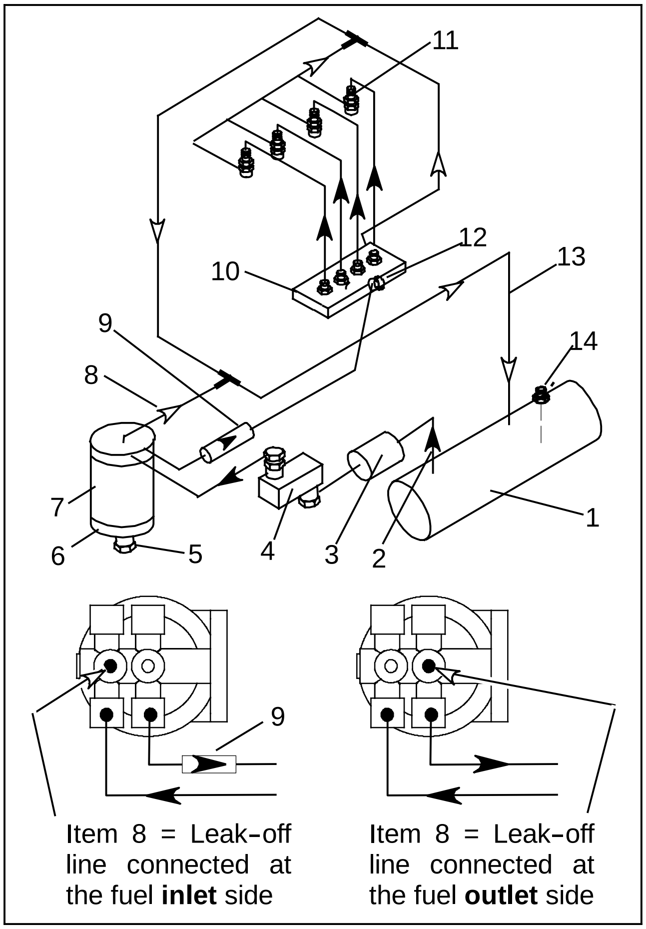
### 8.5 ENGINE AND ENGINE RELATED SYSTEMS SERVICE

Procedures for servicing the engine, fuel system, engine cooling system and air cleaner are provided in the following sub-paragraphs.

#### 8.5.1 Fuel System

The fuel system (see Figure 8-5) consists of the fuel tank, mechanical lift pump, fuel filter, fuel injection pump, the injectors and interconnecting tubing. The fuel system may also be equipped with an optional electric pump and/or optional electric fuel heater.

Two fuel system configurations have been used. The first has the leak-off line at the inlet side of the filter (with an outlet line check valve) and the second has the leak-off line at the outlet side of the filter (without an outlet line check valve).




1. Fuel Tank
2. Supply Line
3. Electric Pump
4. Mechanical Pump
5. Water Separator
6 Heater
7. Filter
8. Filter Leak–Off Line
9. Check Valve*
10. Injection Pump
11. Injector Nozzles
12. Bleed Screw
13. Return Line
14. Level Sensor

* CHECK VALVE USED WHEN LEAK–OFF LINE IS INSTALLED AT THE INLET CONNECTION ONLY

**Figure 8–5 Fuel System Diagram**

### 8.5.2 Priming The Fuel System

The mechanical fuel lift pump (See Figure 8–6) 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.

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 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.

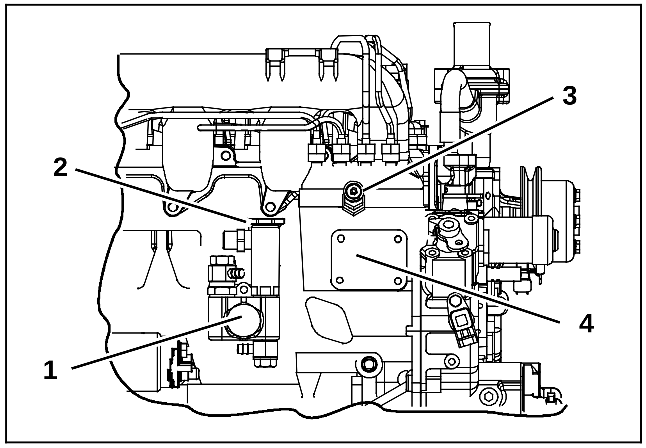
d. Start engine. It may be necessary to continue to pump until the engine starts.

**⚠ CAUTION**

**Running the engine for an extended period of time with the manual plunger up can cause a priming pump failure**

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.

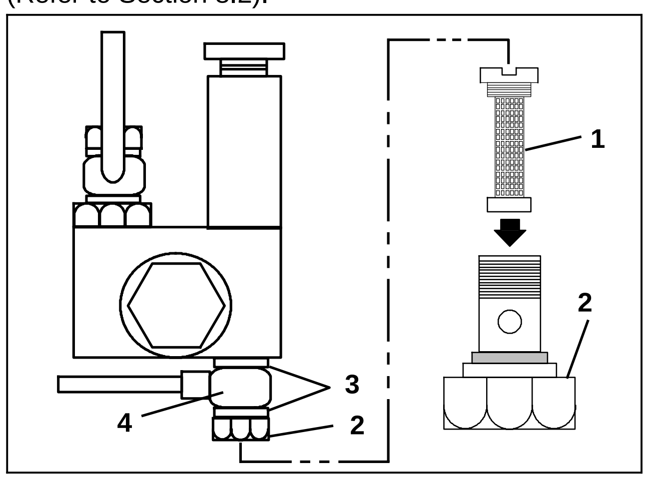



1. Mechanical Fuel Lift Pump
2. Manual Plunger
3. Bleed Screw
4. Injection Pump

**Figure 8–6 Fuel Bleed Components**

### 8.5.3 Mechanical Fuel Pump Screen

The fuel screen (See Figure 8–7) may become plugged or restricted with foreign particles or wax as a result of using the wrong grade of fuel or untreated fuel in cold weather. This will cause the engine to lose power. The screen must be cleaned on a regular schedule such as unit pre-trip or when the oil and fuel filters are changed. (Refer to Section 8.2).




1. Screen
2. Nut
3. Copper Rings
4. Banjo Fitting

**Figure 8–7 Mechanical Fuel Pump**

To check or replace Screen

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Turn nut counter-clockwise to loosen and remove it (Item 2, Figure 8–7).

c. Remove banjo fitting (Item 4) and let it hang loose. Discard copper rings (Item 3) and replace with new ones.

d. Turn screen (Item 1) counter-clockwise and remove. Check and clean.

e. To install reverse above steps.

f. Start unit and check for leaks.

### 8.5.4 Electric Fuel Pump Screen

To check or replace Screen

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Remove 3 screws from cover (See Figure 8–8).

c. Remove cover, gasket and screen.

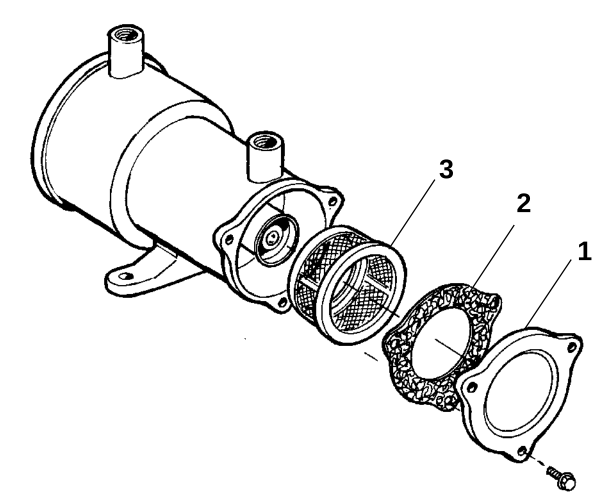
**WARNING**

**Use the required protective eye wear and clothing when working with solvents.**

d. Wash screen in cleaning solvent and blow out with air pressure. Clean cover.

e. To Install reverse above steps.

f. Start unit and check for leaks.




1. Cover 2. Gasket 3. Screen

**Figure 8–8 Electric Fuel Pump**

### 8.5.5 Fuel Filter

To replace filter:

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Place a shallow pan under filter (item 7, Figure 8–5) and open the water separator (5) to drain contents.

c. Remove water separator and O–ring and then remove element.

d. Install water separator on new element using new O–ring.

e. Fill new element with clean diesel fuel, lubricate the seal and install. Tighten firmly by hand.

f. Start unit and check for leaks.

### 8.5.6 Fuel Level Sensor (FLS)

An optional fuel level sensor (item1, Figure 8–9) supplies an input signal to the microprocessor as to the % of fuel remaining in the fuel tank. The microprocessor will activate the A1 – "LOW FUEL LEVEL WARNING" alarm when the level reaches 15%, and (if configured to do so) shuts the engine down when the level reaches 10%. The fuel tank level is displayed in Unit Data.

To Check The Fuel Level Sensor, do the following

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Verify that the fuse (FLS) is not open. See Figure 8–9.

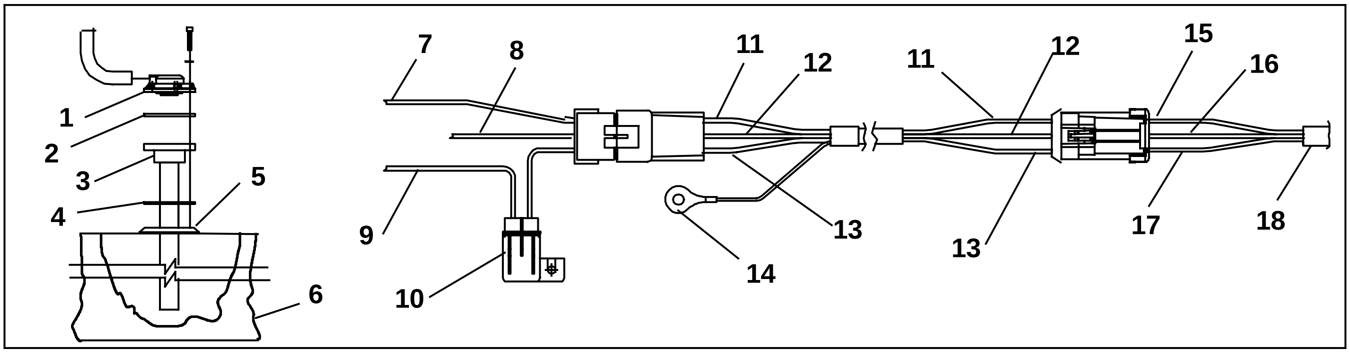
c. Verify that the wiring is correct, cable shield is properly grounded and condition of connectors. No damage to sensor; no damage, moisture or corrosion in connectors.

d. Energize sensor circuit, refer to Note 2, page 7–2. Check power (approximately 12 VDC) from SP5 (9, Figure 8–9) through to connector (13). Check ground from SP6 (8) through connector (12). Check signal (greater than 0.24 VDC and less than 5VDC) at microprocessor (1MP–26).

e. If checks in the preceding step are OK, remove the fuel level sensor, focus tube and gaskets. With the trailer level, verify that the fuel level sensor flange is within one–half bubble of level using a 24 inch level. Adjust tank mounting as required.

**CAUTION**

**Torque fuel level sensor mounting screws to 15 to 18 inch/pounds. DO NOT over tighten, as little as 20 inch/pounds will damage the sensor.**




1. Fuel Level Sensor
2. Gasket
3. Focus Tube
4. Sensor Flange
5. Fuel Level Sensor Flange
6. Fuel Tank
7. Wire 1MP26 – FLSC (Connection C)
8. Wire SP6 – FLSB (Connection B)
9. Wire SP5 – FLSA (Connection A)
10. Fuse (FLS = 3A)
11. White Wire (Connection C)
12. Black Wire (Connection B)
13. Red Wire (Connection A)
14. Ground (Shield)
15. Yellow Wire (Connection C)
16. Black Wire (Connection B)
17. Red Wire (Connection A)
18. Wires From Sensor

**Figure 8-9 Fuel Level Sensor**

f. Using new gaskets, reinstall fuel level sensor components. The mounting holes are not symmetrical, there is an alignment hole in the sensor, alignment holes and index dimples in the gaskets and an alignment notch in the focus tube flange to assist in aligning the components. Install mounting screws and washers in all mounting holes and bring to finger tight. Tighten in accordance with the instructions provided in the preceding CAUTION

g. With the fuel tank empty the output reading should be approximately 0.25 VDC.

h. With the fuel tank full, the output reading should be approximately 4.75 VDC.

i. Start unit and check for leaks.

### 8.5.7 Fuel Heater

The optional fuel heater (itemNO TAG, Figure 8-5) applies heat to fuel in the fuel filter. Heating the fuel dissolves / prevents paraffin wax crystals (and ice) that form when diesel fuel is chilled thus enabling the water separator to work more efficiently and to prevent the filter from plugging with wax and/or ice crystals. When the ambient air sensor is reading 77_F (25_C) or higher, the microprocessor will not enable this circuit. Also, the heater is fitted with an internal temperature switch (FHTS – see schematic diagrams, Section 10) which will close, on a temperature fall, to energize the heater element at temperatures below 45_F (7.2_C) and open, on a temperature rise, to de-energize the heater element at 75_F (23.9_C).

To test the fuel heater, do the following:

a. Using Unit Data (refer to Section 3.13), check to ensure the Ambient Air Temperature reading is below 77_F (25_C), if the reading is below this temperature the fuel heater relay (FHR) should be energized. If the relay does not energize, check for power from microprocessor terminal 4MP16 to the relay coil and ground from the coil connector.

b. Check for power from SP50, through fuse F19, the relay contacts and HC16 to the fuel heater connector. Check also for ground from the fuel heater connector to SP 6.

c. If the fuel heater temperature is below 45_F (7.2_C) replace the fuel heater. If the fuel heater temperature is above 45_F (7.2_C), the internal temperature switch may be open. Retest at a temperature below the switch close point as soon as conditions allow.

### 8.5.8 Engine Oil And Oil Filter

**a. To Check The Engine Oil Level:**

1 Warm up the engine and then stop it by placing the Main Power switch in the OFF position. Ensure the unit will not start automatically by disabling any two way communication. Disconnect the high voltage source and lockout/tagout the receptacle.

2 Unscrew the cap/dipstick see Figure 8-10. Wipe the dipstick clean and insert the cap into the oil fill tube <u>without</u> threading into tube.

3 Remove the dipstick again and check oil level. DO NOT add oil if the level is in the “safe” range. If needed, add oil as indicated by markings on dipstick until level is in the “safe” range.

4 After checking or adding oil as necessary, ensure cap is threaded back onto oil fill tube.

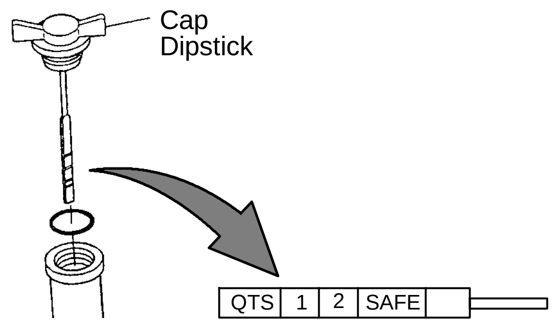
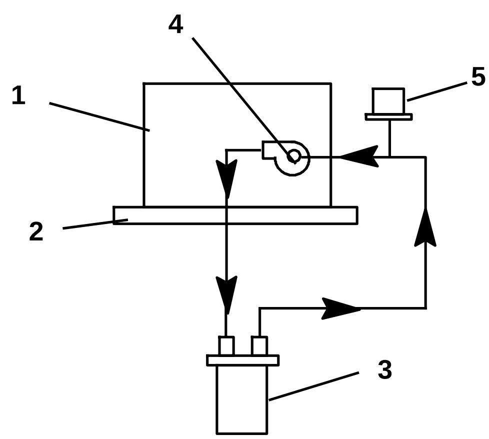



**Figure 8-10 Engine Oil Level**




1. Engine Block
2. Oil Pan
3. Oil Filter
4. Engine Oil Connection
5. Oil Pressure Switch

**Figure 8-11 Engine Oil Flow Diagram**

**b. To Change Engine Oil:**

1 Warm up the engine and then stop it by placing the Main Power switch in the OFF position. Ensure the unit will not start automatically by disabling any two way communication. Disconnect the high voltage source and lockout/tagout the receptacle.

2 If available, install oil drain tool (CTD P/N 68-15763-00). See Figure 8-12. The Oil Drain Tool not only directs the oil over the door latch pin bracket and bottom panel, on units so equipped, but also holds a typical drain bucket in place while the oil is draining from the engine.

3 Remove drain plug drain engine oil. Replace plug and refill engine with oil. Continue with step c. and change oil filter.

**Figure 8-12 Oil Drain Tool**

**c. To Change Engine Oil Filter:**

1 If not continuing from preceding step b., warm up the engine and then stop it by placing the Main Power switch in the OFF position. Ensure the unit will not start automatically by disabling any two way communication. Disconnect the high voltage source and lockout/tagout the receptacle.

2 Remove oil filter. Ensure filter mounting is clean.

**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.**

3 Lightly oil gasket on new filter before installing. Tighten 3/4 to 1 turn after the seal makes contact.

4. Start unit and check for leaks.

### 8.5.9 Air Cleaner

The 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 must be set up and followed.

An air cleaner service indicator is connected to the intake manifold. Its function is to indicate when the air cleaner requires replacement. During operation: when a plugged air cleaner causes the intake manifold pressure to drop to 20” (500 mm) WG, the indicator will move to the red line. The air cleaner should then be replaced and the indicator reset by pressing the reset button.

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Check all connections for mechanical tightness. Be sure filter outlet pipe is not fractured.

c. Release 2 clips on air cleaner housing and remove the cover.

d. Remove filter element, wipe inside of air cleaner housing clean inspect element and replace if required.

e. Wipe inside of the cover and re-install.

f. Re-secure 2 clips on air cleaner housing.

g. Reset air cleaner service indicator.

### 8.5.10 Intake Air Heater

The circuit amp draw for the air heater circuit is checked during a Pretrip cycle. Refer to Section 2.13 for amperage and resistance values.

**a. Troubleshooting The Intake Air Heater (IAH)**

1 Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

2 Disconnect the lead.

3 Measure the resistance between the + terminal and the heater body.

4 If the resistance is infinite or zero, the intake air heater is faulty and must be replaced.

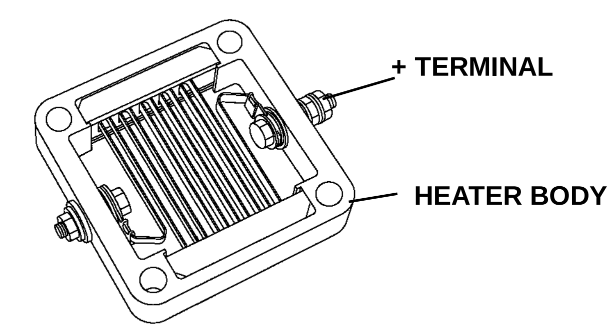



**Figure 8-13 Intake Air Heater**

**b. Replacing The Intake Air Heater**

1 Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

2 Remove the inlet hose.

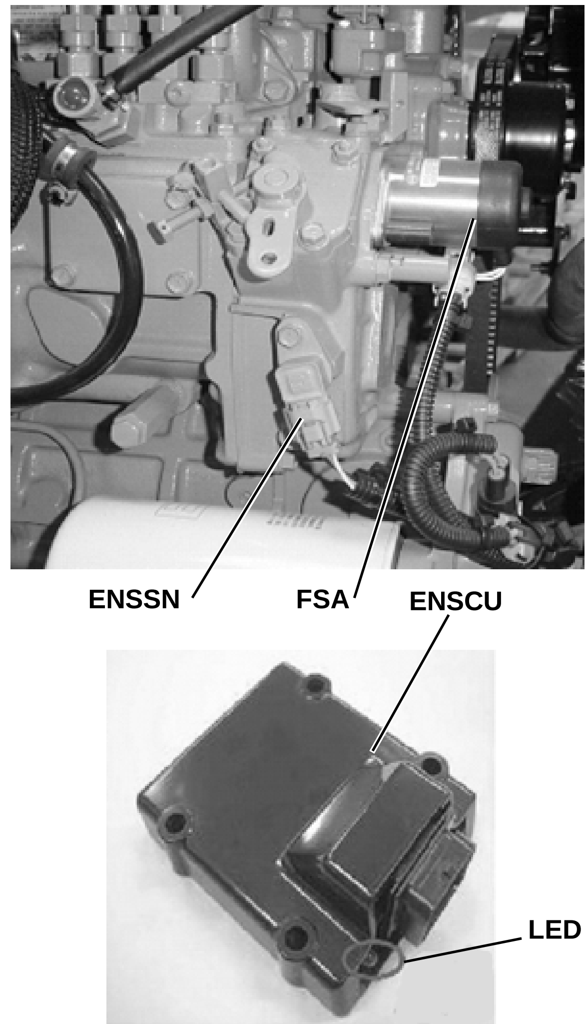
3 Disconnect the lead.

4 Remove the flange, intake air heater and gaskets.

**NOTE**

To avoid short-circuiting the heater, ensure that the heater and the heater elements are vertical when assembling to the intake manifold. The plus terminal is to be mounted towards the front of the unit.

5 Clean gasket surfaces and reinstall intake air heater and flange using new gaskets. Torque flange bolts to 11 to 18 ft/lbs (15 to 24 nm).




**The ENSCU is located on the air cleaner bracket - see item 4,Figure 2-3)**

**Figure 8-14 Electronic Speed Control Components**

### 8.5.11 Speed Control System

Engine speed is controlled by three components: the engine speed control unit (ENSCU), the fuel/speed actuator (FSA) and the engine speed sensor (ENSSN).

The ENSSN provides the speed signal to the ENSCU.

The ENSCU starts, stops and controls the speed of the engine by varying the position of the FSA rod. It also provides a speed signal to the microprocessor.

The FSA combines the fuel shutoff solenoid and speed control solenoid into one component.

The ENSCU is fitted with an alarm LED which may be used to diagnose failures within the system. Refer to Section 10 for wiring schematic and to Section 9.5 for Speed Control System Diagnostics.

### 8.5.12 Cooling System

**a. Cleaning and Flushing**

Air flows through the condenser and then the radiator. The cooling surfaces of both must be clean and the interior of the radiator must be clean for adequate cooling.

**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 specification 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.**

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Remove all foreign material from the condenser coil and radiator 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.

**WARNING**

**Do not remove the cap from a hot radiator or bottle; if the cap must be removed, do so very slowly in order to release the pressure without spray.**

**NOTE**

Draining the coolant from the engine petcock will leave approximately 1 quart (.9 liters) of coolant in the block.

3. Drain coolant completely by removing radiator cap and then the lower radiator hose.

**CAUTION**

**NEVER POUR COLD WATER INTO A HOT ENGINE, however hot water can always be added to a cold engine.**

4. Install hose and fill system with clean, untreated water.

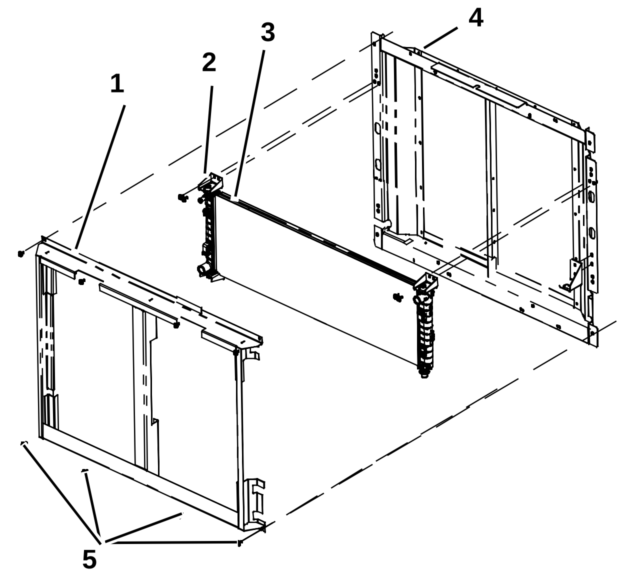
**NOTE**

Only clean water should be used to flush the cooling system. Do not use any radiator flush or detergents to clean the radiator.

5. Start the engine and drain system while warm. Rinse system three times after it has cooled down. Refill system with water.
6. Run engine to operating temperature. Drain system again and fill with 50/50 water/anti-freeze mixture. (see Caution Note at the beginning of this section.)

**b. Radiator Replacement**

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Drain coolant completely by removing radiator cap and then the lower radiator hose.
3. Remove condenser fans, refer to Section 8.9.7. When removing the road side fan assembly, remove the condenser to subcooler line support bracket completely, to allow clearance for coil removal.
4. Remove the radiator frame assembly mounting bolts (see Figure 8-15) and and remove the radiator frame assembly.
5. Remove top radiator mounting brackets and remove the radiator through the top of the unit.
6. Re-assemble in reverse order of removal.
7. Flush and fill radiator with coolant. (Refer to section 8.5.12.)




Condenser coil not shown, for clarity

1. Radiator Frame Assembly
2. Radiator Mounting Bracket
3. Radiator
4. Condenser Frame Assembly
5. Radiator Frame Mounting Bolts

**Figure 8-15 Condenser And Radiator Assemblies**

### 8.5.13 Water Pump V-Belt

**WARNING**

**Beware of moving poly V-belt and belt driven components.**

**WARNING**

**When working with belts, beware of pinch points.**


**Figure 8-16 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 requires no tension adjustment.

To replace the poly V-belt, perform the following steps:

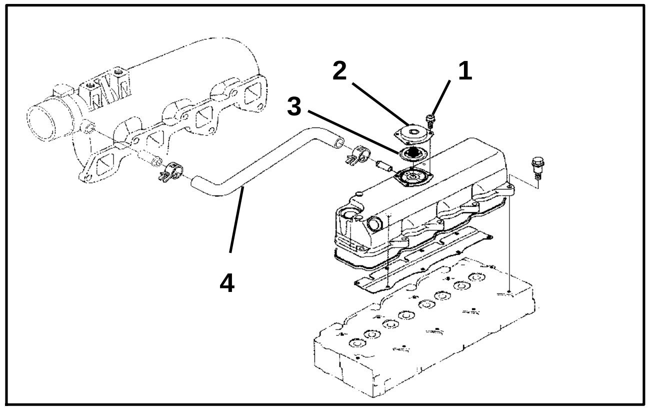
a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Using the proper size socket, slowly rotate the crank by turning the crank pulley nut. At the same time, use a flat, blunt object to guide the belt off the crank pulley. Be careful not to damage grooves on the pulley.

c.. Replace the poly V-Belt by positioning the belt on the water pump pulley, and while rotating the engine (as in step 1), use a flat, blunt object to guide the belt onto the crank pulley. Be careful not to damage grooves on the pulley or belt.

### 8.5.14 Crankcase Breather

The engine uses a closed type breather with the breather line attached to the cylinder head cover. (See Figure 8-17)
The breather assembly should be cleaned once a year or at every 2000 hours maintenance interval (whichever comes first). See Table 8-1




1. Screw
2. Breather Cover
3. Breather Valve
4. Breather Tube

**Figure 8-17 Engine Crankcase Breather**

## 8.6 REFRIGERANT SYSTEM SERVICE

Service of the refrigerant system includes: connection of refrigerant system equipment, servicing the refrigerant charge, leak checking and evacuation. Procedures for refrigerant system service are provided in the following sub paragraphs.

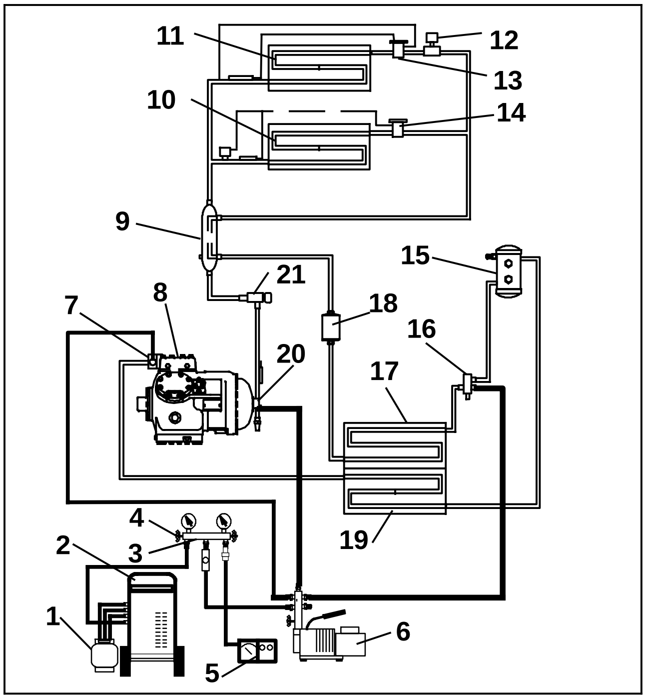
### 8.6.1 Refrigerant System Service Connections

To service the refrigerant system, service equipment is connected to the system at the compressor discharge service valve, compressor suction service valve and/or the liquid line service valve.

When connecting to a valve, backseat the valve (turn counterclockwise) to close off gauge connection and attach service line to the valve. Open valve 1/4 to 1/2 turn (clockwise) and then purge the service line. See Figure 8-18 for an example of a full service connection setup.

**NOTE**

To avoid damage to the earth's ozone layer, use a refrigerant recovery system whenever removing refrigerant from a refrigeration system. When working with refrigerants you must comply with all local government environmental laws, U.S.A. EPA section 608.




1. Refrigerant Cylinder
2. Refrigerant Recovery Unit
3. Manifold Gauge Set
4. Valve
5. Vacuum Indicator
6. Vacuum Pump
7. Discharge Service Valve
8. Compressor
9. Heat Exchanger
10. Compartment 1 Evaporator
11. Compartment 2 Evaporator
12. Liquid Line Solenoid Valve
13. Thermal Expansion Valve
14. Electronic Expansion Valve
15. Receiver
16. Liquid Line Service Valve
17. Subcooler
18. Filter–Drier
19 Condenser
20 Suction Service Valve
21 Compressor Suction Modulation Valve (CSMV)

**Figure 8–18 Refrigerant System Service Equipment**

### 8.6.2 Servicing The Refrigerant Charge

Servicing of the refrigerant charge includes: checking the charge level, checking for noncondensibles, removing the charge, pumping down the low side, pumping down the compressor, adjusting the charge level and adding a complete charge. Procedures for charge service are provided in the following sub paragraphs.

**a. Checking Charge Level**

Check the refrigerant charge before adding any refrigerant to the system. Only add refrigerant if charge is low. If charge is low, leak checking must be performed (Refer to Section 8.6.3) and all leaks repaired before adding refrigerant.

1. Install a manifold gauge set to allow reading of discharge pressure. See Figure 8–18.
2. Start unit in Continuous Run Operation. Adjust setpoints so that unit is running in high speed, fully loaded and all compartments are operating in cooling. Run approximately ten minutes – until the refrigeration system is warmed up and the refrigerated compartment temperatures are approaching setpoint.
3. Partially block off air flow to condenser coil so discharge pressure rises to 230 psig (15.7 bar).
4. Check the receiver sight glasses to determine charge. The system is correctly charged when the lower sight glass is not empty and the upper sight glass is not full.
5. If the system appears to be overcharged or under charged, adjust charge. Refer to following step f.

**b. Checking For Noncondensibles**

To check for noncondensibles, proceed as follows:

1. Install a manifold gauge set to allow reading of suction and discharge pressure. See Figure 8–18.
2. Stabilize system to equalize pressure between the suction and discharge side of the system. The refrigerant system needs to be off for several hours.
3. Measure temperature at the copper tubing leaving the condenser (not the subcooler).
4. Record compressor discharge pressure.
5. Determine saturation pressure as it corresponds to the condenser temperature using the temperature pressure chart, Table 8–7.
6. If gauge reading is not close to the calculated saturation pressure in step 5, noncondensibles or mixed refrigerants are present.
7. Remove refrigerant. Refer to following step c.
8. Leak check, evacuate and recharge the system.

**c. Removing Charge**

To remove the refrigerant charge, proceed as follows:

1. If the system is in operating condition, it will be quicker to remove the charge by continuing with step 2. If the system is not in operating condition, skip steps 2 through 5 and continue with step 6.
2 Install a manifold gauge set to allow reading of suction and discharge pressure. See Figure 8–18.

**CAUTION**

**Only a refrigerant cylinder that has previously been used with R404A should be connected to this refrigeration unit.**

3. Connect a clean, evacuated refrigerant cylinder to the liquid line service valve connection. Place the cylinder on a weight scale so the refrigerant going into the cylinder can be monitored.
4. Start the unit and run in high speed cool. Cover the condenser to raise the discharge pressure to as high

as 375 psig (25.5 bar). Do not let the discharge pressure exceed 400 psig (27.2 bar). Open the refrigerant cylinder valve, and allow the refrigerant to flow into the cylinder. The amount of refrigerant going into the cylinder can be monitored by watching the weight of the cylinder.

5. Shut down the unit when the suction pressure drops to 2 psig (0.2 bar). There should be very little refrigerant remaining in the system at this point.

6. Place the unit in Service Mode (Refer to Section 5.2.3). Ensure that the microprocessor MessageCenter displays “RECOVER/LEAK CHK/EVAC MODE” during the refrigerant removal procedures. If the microprocessor switches to charge mode during the process, switch it back to the “RECOVER/LEAK CHK/EVAC MODE”.

7. Connect a refrigerant recovery device and a clean refrigerant recovery cylinder (or continue to use the same cylinder used in step 3) as shown in Figure 8-18 and remove any remaining refrigerant from the system.

8. Refer to instructions provided by the manufacturer of the refrigerant recovery unit.

9. After making necessary repairs, leak check, evacuate and recharge the system.

**d. Pumping Down The Low Side**

Components on the low side of the refrigeration system (the filter-drier, EVXV, evaporator coil, evaporator outlet pressure transducer, CSMV, heat exchanger, suction line, remote evaporators, TXV’s, liquid line solenoids etc.) may be 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.

1. Install a manifold gauge set to allow reading of suction and discharge pressure. See Figure 8-18.

2. Start the unit.

3. Frontseat the liquid line service valve.

4. Shut down the unit when the suction pressure drops to 2 psig (0.2 bar). There should be very little refrigerant remaining in the low side of the system at this point.

5. Monitor the gauges. The suction pressure should not rise rapidly. If the suction pressure continues to rise, the liquid line service valve may not be closed properly. In this case, the low side cannot be pumped down and the entire refrigerant charge must be removed from the system. (Refer to preceding step c.)

6. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

7. Frontseat (close by turning clockwise) the discharge service valve and the refrigerant will be trapped between the compressor discharge service valve and the liquid line service valve.

8. Before opening up any part of the low side of the system, a slight positive pressure should be indicated on the pressure gauge. If the pressure is below 0 psig/bar slowly open the liquid line service valve slightly and then frontseat the valve again. Repeat as necessary in order to raise the pressure above 0.

9. Connect a refrigerant recovery device and a clean refrigerant recovery cylinder to the suction and discharge service valves and remove any remaining refrigerant from the low side. DO NOT bring the low side pressure below 0 psig/bar.

10. After making necessary repairs, leak check and evacuate the low side of the refrigeration system. (Refer to Sections 8.6.3 and 8.6.4.)

**e. Pumping Down The Compressor**

The compressor or any of the components attached to it (unloaders, high pressure switch, discharge and suction pressure transducers, discharge temperature sensor, compressor heads and oil, etc.) may be serviced or replaced by pumping the compressor down, and isolating the compressor from the rest of the system.

1 Install a manifold gauge set to allow reading of suction and discharge pressure. See Figure 8-18.

2 **If the compressor is operational,** start the unit and slowly frontseat the suction service valve. Shut down the unit when the suction pressure drops to 2 psig (0.2 bar). Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle. Frontseat the discharge service valve to isolate compressor. There should be very little refrigerant remaining in the compressor at this point.

3 **If the compressor is not operational,** ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source, lockout/tagout the receptacle. and then frontseat both the discharge and suction service valve to isolate the compressor.

4 Connect a refrigerant recovery device and a clean refrigerant recovery cylinder to the suction and discharge service valves and remove any remaining refrigerant from the compressor. DO NOT bring the compressor pressure below 0 psig/bar.

5. After making necessary repairs, leak check and evacuate the compressor. (Refer to Sections 8.6.3 and 8.6.4.)

**f. Adjusting The Charge Level**

Adjustment of the charge level may be required when there has been a leak or the system was not correctly charged during a previous service.

1 Check charge level by performing the procedures of the preceding step a.

2 If charge removal is required: connect a clean evacuated refrigerant recovery cylinder to the liquid line service valve. Open liquid valve on cylinder. Midseat liquid line service valve and monitor the liquid

refrigerant flow into the cylinder. If the unit is operating, close the cylinder valve and backseat the liquid line service valve when the ball in the upper sight glass drops to the bottom of the glass. It the unit is not operating, when approximately 5 lbs. (2.3 kg) have been removed close the cylinder valve and backseat the liquid line service valve. Proceed to step 7

3 If charge is to be added: place cylinder of refrigerant on a scale and connect a charging line and gauge from cylinder to liquid line service valve. Start unit in Continuous Run Operation with all compartments operating with setpoints lower than refrigerated compartment temperatures. Wait until unit switches to high speed operation. Run approximately ten minutes.

4 Note weight of cylinder and refrigerant.

5 Frontseat the liquid line service valve (turn clockwise) and watch the pressure on the manifold gauge. When the pressure falls below the pressure in the refrigerant cylinder [or to 50 psig (3.4 bar)], open the cylinder valve and monitor the liquid refrigerant to flow into the unit.

6 When approximately 5 lbs. (2.3 kg) have been added, close the cylinder valve, and backseat the liquid line service valve.

7 Recheck for the correct refrigerant charge. (Refer to preceding step a.) Repeat preceding steps as required. When charge level adjustment is complete, remove refrigerant service equipment.

**g. Adding a Complete Charge**

1 Evacuate unit and leave in deep vacuum. (Refer to Section 8.6.4.)

2 Determine charge required for this unit (refer to the model/serial number nameplate or Table 2-1) and procure a refrigerant cylinder with sufficient weight of refrigerant. Place cylinder on scale and connect charging line from cylinder to liquid line service valve.

3 Note weight of cylinder and refrigerant.

4 Open liquid valve on cylinder. Midseat liquid line service valve and allow the liquid refrigerant to flow into the unit until the correct weight of refrigerant has been added.

**NOTE**

It is possible that all liquid may not be pulled into the receiver, as outlined in step 4. In this case, add the additional refrigerant in accordance with the charge adjustment procedures, refer to preceding step f.

5 When scale indicates that the correct charge has been added, close liquid line valve on cylinder and backseat the liquid line service valve. Remove charging hose.

### 8.6.3 Leak Checking

The condition that the system may be in when leak checking is required include; when the system is charged, when the system is without charge, when the low side has been pumped down and when only the compressor is to be leak checked. Procedures for each condition are provided in the following subsections.

**a. Leak Checking a Charged System**

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

**NOTE**

Service Mode is not required for this procedure.

2. Verify that the suspected leak area (high or low side) has sufficient pressure [minimum 20 psig (1.4 bar)] to detect the leak. The larger the leak the less pressure is required. The smaller the leak, the greater the pressure required.
3. The recommended procedure for finding leaks from a system is with an electronic leak detector. Checking joints with soapsuds is satisfactory only for locating large leaks, or pinpointing small leaks once a general area has been located.
4. Some leaks may be repaired by simply tightening a connection. Others may require removal of the charge, refer to Section 8.6.2.
5. Check for proper unit operation by running Pretrip (Refer to Section 3.4).

**b. Leak Checking a System Without Charge**

The refrigeration system must be leak checked once it is closed and all repairs complete.

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Connect refrigerant system equipment if not already connected. Refer to Figure 8–18

**CAUTION**

**Only a refrigerant cylinder containing R404A should be connected to this refrigeration unit in order to pressurize the system. However, dry nitrogen may be used to increase pressure. Any other gas or vapor will contaminate the system and require additional removal and evacuation.**

**CAUTION**

**Do not vapor charge R404A. Only liquid charging through the liquid line service valve is acceptable.**

3. Ensure that the microprocessor MessageCenter displays “RECOVER/LEAK CHK/EVAC MODE” during the pressurizing and leak checking procedures. (Refer to Section 5.2.3.) If the microprocessor switches to charge mode during the process, switch it back to the “RECOVER/LEAK CHK/EVAC MODE”.

4 Pressurize the system to 5 to 10 psig (0.3 to 0.7 bar) with refrigerant at the liquid line service valve.

## ⚠ 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 8-30)**

5 Connect a cylinder of dry nitrogen. Use the dry nitrogen to increase the pressure as necessary to 20 to 150 psig (1.4 to 10.2 bar) to detect the leak. The larger the leak the less pressure is required. The smaller the leak, the greater pressure is required

6 The recommended procedure for finding leaks from a system is with an electronic leak detector. Checking joints with soapsuds is satisfactory only for locating large leaks, or pinpointing small leaks once a general area has been located.

7. Once leak checking is complete, remove the refrigerant/nitrogen vapor out of the system.

8. If no leaks are found the system is ready for evacuation. (Skip to Step 11)

9. If any leaks are found they must be repaired before proceeding.

10 Repeat steps 4 thru 9 as necessary.

11. Evacuate the system after all leaks are repaired. (Refer to Section 8.6.4.)

**c. Leak Checking With Low Side Pumped Down**

The low side of the system must be leak checked once it is closed and all repairs complete.

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

## ⚠ CAUTION

**Only a refrigerant cylinder containing R404A should be connected to this refrigeration unit in order to pressurize the system. However, dry nitrogen may be used to increase pressure. Any other gas or vapor will contaminate the system and require additional removal and evacuation.**

2. Connect refrigerant system equipment if not already connected. Refer to Figure 8-18

## ⚠ CAUTION

**Do not vapor charge R404A. Only liquid charging through the liquid line service valve is acceptable.**

3. Ensure that the microprocessor MessageCenter displays “RECOVER/LEAK CHK/EVAC MODE” during the pressurizing and leak checking procedures. (Refer to Section 5.2.3.) If the microprocessor switches to charge mode during the process, switch it back to the “RECOVER/LEAK CHK/EVAC MODE”.

4. Pressurize the low side of the system to 5 to 10 psig (0.3 to 0.7 bar) with refrigerant from the high side by turning the liquid line service valve off frontseat for a few seconds and then returning to frontseat.

## ⚠ 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 8-30)**

5. Connect a cylinder of dry nitrogen. Use the nitrogen to increase the low side pressure to 20 to 150 psig (1.4 to 10.2 bar) to detect the leak. The larger the leak the less pressure is required. The smaller the leak, the greater the pressure required

6. The recommended procedure for finding leaks from a system is with an electronic leak detector. Checking joints with soapsuds is satisfactory only for locating large leaks, or pinpointing small leaks once a general area has been located.

7. Once leak checking is complete, remove the refrigerant/nitrogen vapor from the low side of the system.

8. If no leaks are found the low side of the system is ready for evacuation. (Skip to Step 11)

9. If any leaks are found they must be repaired before proceeding.

10. Repeat steps 4 thru 9 as necessary.

11. Disconnect the nitrogen cylinder. Evacuate the low side of the system after all leaks are repaired. (Refer to Section 8.6.4.)

**d. Leak Checking Compressor**

The compressor and its associated switches, transducers, etc. must be leak checked once the compressor is closed and all repairs complete.

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

2. Connect refrigerant system service equipment to the suction and discharge service valves, if not already connected. Refer to Figure 8-18.

**CAUTION**

**Only a refrigerant cylinder containing R404A should be connected to this refrigeration unit in order to pressurize the system. However, dry nitrogen may be used to increase pressure. Any other gas or vapor will contaminate the system and require additional removal and evacuation.**

**CAUTION**

**Do not vapor charge R404A. Only liquid charging through the liquid line service valve is acceptable.**

3. Pressurize the compressor to 5 to 10 psig (0.3 to 0.7 bar) by opening the suction service valve for a few seconds, then closing (frontseating) it again.

**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 8-30.)**

4. Connect a cylinder of dry nitrogen. Use the nitrogen to increase the compressor pressure to 20 to 150 psig (1.4 to 10.2 bar) to detect the leak. The larger the leak the less pressure is required. The smaller the leak, the greater pressure required

5 The recommended procedure for finding leaks from a compressor is with an electronic leak detector. Checking joints with soapsuds is satisfactory only for locating large leaks, or pinpointing small leaks once a general area has been located.

6 Once leak checking is complete, remove the refrigerant/nitrogen vapor from the compressor.

7 If no leaks are found the compressor is ready for evacuation. (Skip to Step 10)

8 If any leaks are found they must be repaired before proceeding.

9 Repeat steps 4 thru 9 as necessary.

10 Disconnect the nitrogen cylinder. Evacuate the compressor after all leaks are repaired. (Refer to Section 8.6.4.)

### 8.6.4 Evacuation And Dehydration

Moisture is detrimental to refrigerant systems. The presence of moisture in a refrigeration system can have many undesirable effects such as: copper plating, acid sludge formation, "freeze-up" of the expansion valves, and formation of acids, resulting in metal corrosion. Proper evacuation of the system will remove any moisture from inside the system.

**NOTES**

1. Essential tools to properly evacuate any system include a good vacuum pump (5 cfm/8m#H volume displacement, Carrier Transicold part number 07-00176-11) and a good vacuum indicator such as a thermocouple vacuum gauge (micrometer). (Carrier Transicold part number 07-00414-00)

2. The use of a compound gauge is not recommended for use in determining when the evacuation process is completed because of its inherent inaccuracy.

3. Standard service hoses are not recommended for evacuation purposes. Evacuation hoses are recommended for this procedure.

#### a. Evacuation of the Complete System

1. Evacuate only after pressure leak check. (Refer to Section 8.6.3.)
2. If possible keep the temperature of the major components (condenser, evaporator, compressor, receiver and remote evaporator) above 60_F (15.6_C) to speed evaporation of moisture. If the temperature is lower than 60_F (15.6_C), ice might form before moisture removal is complete. Heat lamps, heat guns or alternate sources of heat may be used to raise system temperature.
3. The recommended method to evacuate the system is to connect three evacuation hoses with vacuum pump and vacuum indicator (see Figure 8-18).
4. Ensure that the microprocessor MessageCenter displays "RECOVER/LEAK CHK/EVAC MODE" during the evacuation and dehydration procedures. (Refer to Section 5.2.3.) If the microprocessor switches to charge mode during the process, switch it back to the "RECOVER/LEAK CHK/EVAC MODE".
5. Backseat (turn counter-clockwise) the liquid line service valve, suction service and discharge service valves.
6. With the unit service valves closed (back seated) and the vacuum pump and vacuum indicator 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.
7. Midseat the refrigerant system service valves. Ensure that the MessageCenter displays "RECOVER/ LEAK CHK/EVAC MODE".
8. Start the vacuum pump. Evacuate unit until the vacuum indicator indicates 2000 microns. Close the vacuum pump valve and shut off the pump. Wait a few minutes to ensure the vacuum holds.

9. Break the vacuum with dry nitrogen through the discharge service valve. Raise system pressure to approximately 2 psig (0.1 bar). Ensure that the microprocessor does not switch to the charge mode. If this occurs, switch it back to the “RECOVER/LEAK CHK/EVAC MODE” (Refer to Section 5.2.3)

10. Purge nitrogen from system at the suction service valve.

11. Open the vacuum pump valve and start the pump. Evacuate unit to 500 microns. Close the vacuum pump valve and shut off the pump. Wait a few minutes to be sure the vacuum holds below 2000 microns.

12. If vacuum holds below 2000 microns continue to step 14. If vacuum rises above 2000 microns continue to step 13.

13. Repeat steps 8 through 11 until the vacuum stays below 2000 microns.

14. Once the system holds a good vacuum, it is ready to be charged with refrigerant. Refer to Section 8.6.2.

**b. Evacuation of the Low Side**

1. Evacuate only after a low side pressure leak check. (Refer to Section 8.6.3)

2. If possible keep the temperature of the major components (condenser, evaporator, compressor, receiver and remote evaporator) above 60_F (15.6_C) to speed evaporation of moisture. If the temperature is lower than 60_F (15.6_C), ice might form before moisture removal is complete. Heat lamps, heat guns or alternate sources of heat may be used to raise system temperature.

3. The recommended method to evacuate the system is to connect three evacuation hoses with vacuum pump and vacuum indicator (see Figure 8-18).

4. Ensure that the microprocessor MessageCenter displays “RECOVER/LEAK CHK/EVAC MODE” during the evacuation and dehydration procedures. (Refer to Section 5.2.3.) If the microprocessor switches to charge mode during the process, switch it back to the “RECOVER/LEAK CHK/EVAC MODE”.

5. Leave the liquid line service valve and the discharge service valve frontseated and then midseat the suction service valve.

6. Start the vacuum pump. Evacuate unit until the electronic vacuum gauge indicates 2000 microns. Close the vacuum pump valve and shut off the pump. Wait a few minutes to be sure the vacuum holds.

7. Break the vacuum with dry nitrogen through the liquid line service valve. Raise system pressure to approximately 2 psig (0.1 bar). Ensure that the microprocessor does not switch to the Charge Mode. If this occurs, switch it back to the “RECOVER/LEAK CHK/EVAC MODE” (Refer to Section 5.2.3

8. Purge nitrogen from the low side of the system at the suction service valve.

9. Open the vacuum pump valve and start the pump. Evacuate unit to 500 microns. Close the vacuum pump valve and shut off the pump. Wait a few minutes to be sure the vacuum holds below 2000 microns.

10. If vacuum holds below 2000 microns continue to step 12. If vacuum rises above 2000 microns continue to step 11.

11. Repeat steps 6 through 9 until the vacuum stays below 2000 microns.

12. Once the system holds a good vacuum, open the compressor discharge service valve and the liquid line service valve.

13. Start unit and check the refrigerant charge. Refer to Section 8.6.2.

**c. Evacuation of the Compressor**

1. Evacuate only after a compressor pressure leak check. (Refer to Section 8.6.3.)

2 Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

3. If possible keep the temperature of the compressor above 60_F (15.6_C) to speed evaporation of moisture. If the temperature is lower than 60_F (15.6_C), ice might form before moisture removal is complete. Heat lamps, heat guns or alternate sources of heat may be used to raise compressor temperature.

4. Connect evacuation equipment to the compressor suction and discharge service valves. See Figure 8-18.

5. Start the vacuum pump. Evacuate compressor to 500 microns. Close the vacuum pump valve and shut off the pump. Wait a few minutes to be sure the vacuum holds. This checks for residual moisture and/or leaks.

6. Once the compressor holds a good vacuum, open the compressor suction and discharge service valve to allow refrigerant to enter the compressor.

7. Start unit and check the refrigerant charge. Refer to Section 8.6.2.

## 8.7 COMPRESSOR AND UNLOADER SERVICE

### 8.7.1 Repair or Replacement Determination

Certain operating conditions or refrigeration system components may be misdiagnosed and subsequently lead to the determination that the compressor requires replacement. These conditions or components should be checked prior to replacing a compressor and after a replacement compressor is installed to prevent replacement compressor damage. To determine if compressor replacement or repair is required, do the following:

a. If the compressor is operational, check the refrigerant charge, refer to Section 8.6.2.

b. If the compressor is operational, check operation of the unloaders, refer to Section 8.7.6.

c. If the compressor is operational, check the system components as follows:

1. Install gauges to allow reading of receiver, suction and discharge pressure. See Figure 8-18.

2. Start the unit with at least one compartment in cooling so that compressor operates.

3. Frontseat the liquid line service valve. Shut down the unit when the suction pressure drops to 2 psig (0.2 bar).

4. Monitor the gauges. If the receiver pressure drops rapidly and the suction and discharge pressures rise rapidly the liquid line service valve requires replacement before the compressor can be further tested.

5. Backseat the liquid line service valve and restart the unit. Slowly frontseat the suction service valve. Shut down the unit when the suction pressure drops to 2 psig (0.2 bar).

6. Monitor the gauges. If the suction and discharge pressures do not equalize rapidly, the compressor is not at fault.

d. Check condition of and repair cylinder heads and valve plates. Refer to Section 8.7.3.

e. If the compressor is not operational, check the compressor motor as follows:

1. Remove the compressor power leads form the compressor contactor (See Figure 2-6, Item 34).

2. Perform a megaohm test (refer to section 8.9.1) to determine the condition of the compressor motor and wiring harness.

3. If the test fails, remove the four bolts holding the compressor terminal block in place, inspect the wiring attached to the terminal block.

4. With the terminal block suspended in midair (not grounded), perform the megaohm test again.

5. If the compressor passes this test, replace the terminal block with kit 17-40093-06 and wire repair kit, 76-50192-00.

### 8.7.2 Removal and Replacement of Compressor

a. Pumpdown the compressor. (Refer to Section 8.6.2.)

b. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

**⚠ WARNING**

**Do not unscrew service valve mounting capscrews all the way before breaking seal. Entrapped pressure could result in injury.**

c. Loosen the suction and discharge service valve mounting bolts. Tap the valve bodies to break the seal and then remove bolts.

d. Locate the compressor junction box, item 5, Figure 8-19. Note location if the power wires on the terminal plate then remove wiring and compressor junction box. Disconnect all low voltage connectors.

e. Remove compressor mounting bolts.

f. Remove compressor. Refer to Section 2.10 for weight of compressor.

g. Draw a small sample of compressor oil and test for acidity If acid is present a system cleanup may be necessary.

h. Remove all external compressor components such as: the unloader coils; discharge strainer; switches, transducers, temperature sensors & fittings.

**⚠ WARNING**

**Do not unscrew replacement compressor lifting eyelet/blankoff plate mounting capscrews all the way before breaking seal. Entrapped pressure could result in injury.**

i. Loosen the suction and discharge lifting eyelet/ blankoff plate mounting bolts. Tap the center of the blankoff plates to break the seal and then remove bolts, plates and gaskets.

j. If required add oil to the replacement compressor. Add only 7.0 pints (3.3 liters) of oil when first adding oil to the compressor. This procedure is designed to compensate for excess oil that may have migrated with refrigerant to other parts of the system during unit operation.

k. Install components removed in step h. Install blankoff plates and plugs in original compressor for shipment.

l. Remove any remaining old gasket material from the discharge and suction service valve sealing surfaces.

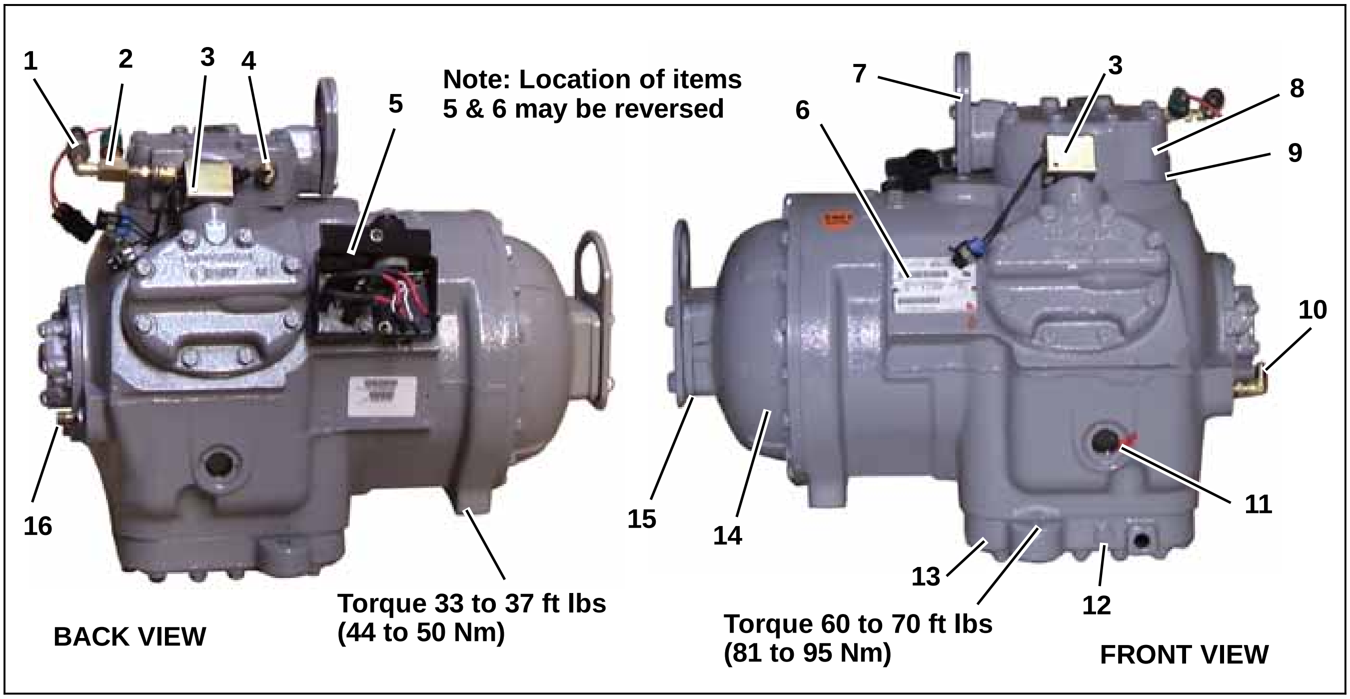
m. Secure junction box to compressor.

n. Install compressor in unit. See Figure 8-19 for mounting bolt torque information.

o. Connect all wiring per wiring schematic. Install junction box cover.

p. Install new gaskets and mounting bolts in service valves. Torque discharge service valve mounting bolts 20 to 30 ft lbs (27 to 40.7 Nm). Torque suction service valve mounting bolts 55 to 80 ft lbs (74 to 108 Nm).

q. Leak check and evacuate the compressor. Refer to Section 8.6.3 and Section 8.6.4.




1. Compressor Discharge Pressure Transducer
2. High Pressure Switch
3. Unloader Coil
4. Compressor Discharge Temperature Sensor
5. Junction Box
6. Serial/Model Plate
7. Discharge Service Valve Flange
8. Cylinder Head
9. Valve Plate
10. Suction Pressure Transducer (Location)
11. Oil Level Sight Glass
12. Oil Drain Location
13. Oil Pan
14. Motor End Cover
15. Suction Service Valve Flange
16. Oil Fill Port

**Figure 8-19 Compressor - model 06D**

### 8.7.3 Cylinder Head and Valve Plate Service

a. Pumpdown the compressor. (Refer to Section 8.6.2.)

b. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

**WARNING**

**Do not unscrew cylinder head mounting capscrews all the way before breaking seal. Entrapped pressure could result in injury.**

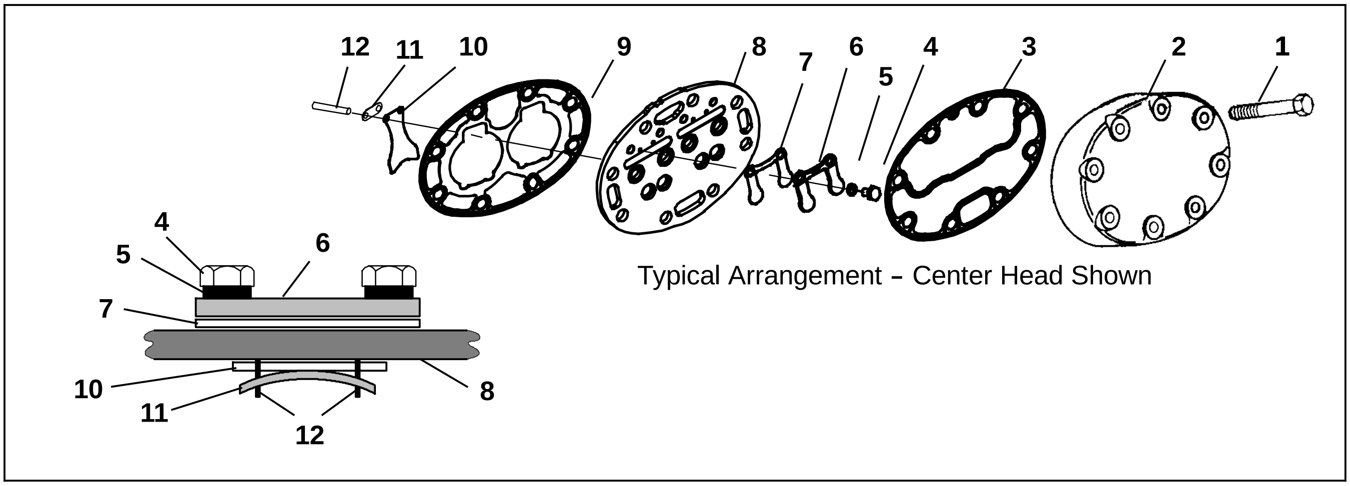
c. Loosen cylinder head capscrews. Tap the head lightly with a wooden or lead mallet to break the seal and relieve any remaining pressure. Be careful not to drop the head or damage the gasket sealing surface. Remove cylinder head capscrews and gasket. (See Figure 8-20)

d. If removing the center head, remove the discharge valve mounting hardware.

e. If required, free the valve plates from the cylinder deck by using the discharge valve capscrews, without washers, as jackscrews through the outermost tapped holes in the valve plate after the valve stops and valves have been removed. Remove the valve plate gasket.

f. Inspect the parts of the cylinder head and/or the valve plate.

1. Inspect cylinder head gaskets for proper alignment and center web blow-out.
2. Inspect the discharge valves for loose or damaged valve stops, or any debris that may affect the proper operation of the valves.
3. Inspect for broken, cracked, or chipped discharge valves.
4. Inspect the side valve plate discharge check valves to ensure the pistons move and contact the plates.
5. Inspect for broken, cracked, or chipped suction valves.
6. Inspect the valve plate and the cylinder head for cracks.
7. Inspect valve plate gaskets for damage and wear.
8. Remove any oil on top of the pistons. Inspect the top of the piston for damage. Check for debris, burned and carbonized oil sludge, or mechanical failure.
9. Inspect cylinder bores for excessive wear. Excessive wear for cylinder bores is defined as heavy and uneven scratches, gouges, or chipping of the internal wall of the cylinder, with a depth greater than 0.025 inch, which are caused by foreign objects, other than a normal reciprocating movement of the pistons and piston rings. If cylinder(s) are damaged, compressor replacement is required.




1. Capscrew
2. Cylinder Head
3. Cylinder Head Gasket
4. Capscrew
5. Lockwasher
6. Discharge Valve Backer
7. Discharge Valve
8. Valve Plate
9. Valve Plate Gasket
10. Suction Valve
11. Suction Valve Spring
12. Dowel Pin

**Figure 8-20 Cylinder Head & Valve Plate**

g. Discard valves and gaskets. Use only new valves and gaskets when assembling cylinder head and valve plate assemblies.

h. If required, install the discharge valves and discharge valve stops with capscrews and lock washers onto the valve plates. Torque the capscrews to 12 to 16 ft lbs (16.3 to 21.7 Nm).

i. Turn the valve plate over.

j. Install the suction valve spring on the dowel pins with the spring ends bearing away from the cylinder head. (See Figure 8-20)

k. Place suction valve on dowel pins.

l. Place the valve plate and new valve plate gasket (with flat side toward cylinder deck) on cylinder deck, ensuring that the valve plate is properly positioned on the four dowel pins.

m. Using a small screwdriver, operate the suction valves to ensure that the valve tips are not being held by the valve plate gasket. (See Figure 8-21)

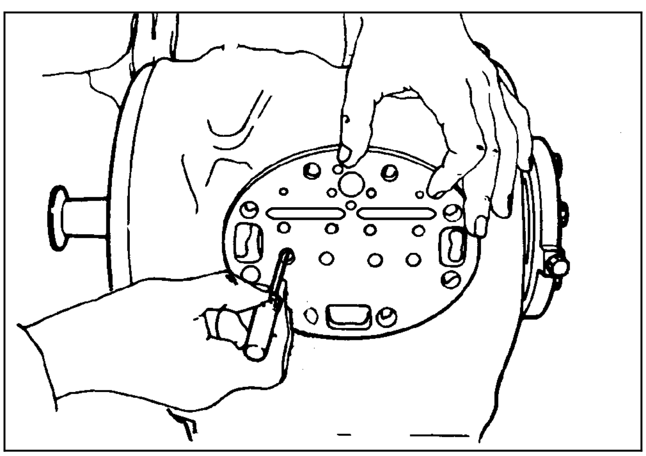


**Figure 8-21 Checking Suction Valve**

n. Install capscrews, cylinder head and new cylinder head gasket (with flat side toward valve plate), ensuring that the gasket and cylinder head are properly positioned on the valve plate. Torque the capscrews, in a diagonal pattern, 42 to 55 ft-lbs (57 to 74 Nm)

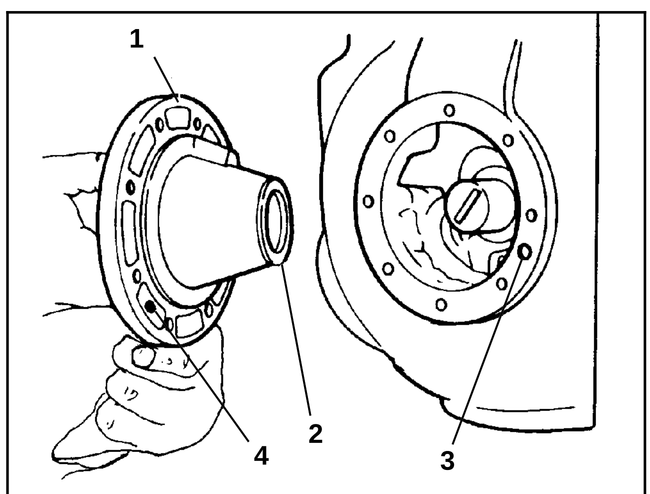
o. Leak check and evacuate the compressor. Refer to Section 8.6.3 and Section 8.6.4.

### 8.7.4 Oil Pump And Bearing Head

a. Pumpdown the compressor. (Refer to Section 8.6.2.)

b. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

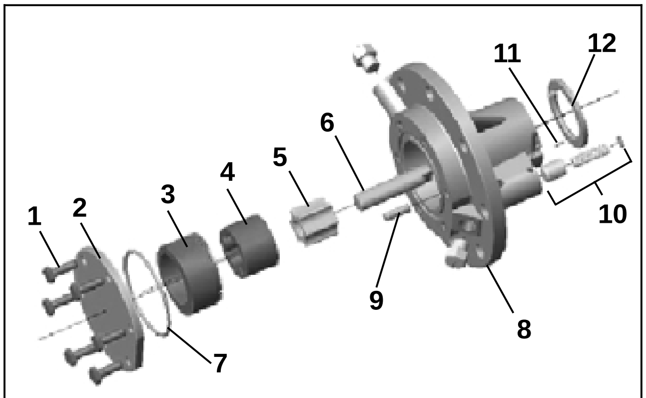
c. Loosen the eight capscrews, tap the pump to relieve any remaining pressure and then remove the oil pump bearing head assembly, gasket and thrust washer. (See Figure 8-22.)



1. Oil Pump & Bearing Head
2. Thrust Washer
3. Oil Pickup Tube
4. Oil Inlet Port

**Figure 8-22 Oil Pump and Bearing Head Assembly**

d. If it is determined that the oil pump is not operating properly, the entire oil pump and bearing head assembly must be replaced. Replacement parts for the pump are not available except for the cover plate O-ring. However, in the event the pump requires inspection or cleaning, refer to Figure 8-23 for disassembly and reassembly. Clean all parts; coat all moving parts with compressor oil before proceeding with reassembly.




| | | | |
|---|---|---|---|
| 1 | Capscrews | 7 | O-Ring |
| 2 | Cover | 8 | Oil Pump & Bearing |
| 3 | Eccentric Ring | 9 | Dowel Pin |
| 4 | Rotor | 10 | Relief Valve Assembly |
| 5 | Idler | 11 | Pins (2) |
| 6 | Shaft (Drive) | 12 | Thrust Washer |

**Figure 8-23 Oil Pump**

e. Install the pump end thrust washer on the two dowel pins located on the bearing head. (See Figure 8-22.)

**CAUTION**

**Ensure that thrust washer does not fall off dowel pins while installing oil pump.**

f. Install the bearing head assembly with a new gasket on the compressor crankshaft. Carefully push oil pump on by hand ensuring that the thrust washer remains on the dowel pins, the tang on the end of the drive engages the slot in the crankshaft, and the oil inlet port on the pump is aligned with the oil pickup tube in the crankcase. The oil pump should mount flush with the crankcase with the word **"TOP"** stamp on the pump oriented straight up.

g. Align the gasket and install the eight capscrews in the mounting flange. Torque capscrews, in a diagonal pattern, 30 to 50 ft-lbs (40.7 to 87 Nm).

h. Leak check and evacuate the compressor. Refer to Sections 8.6.3 and 8.6.4.

### 8.7.5 Compressor Oil Level

**a. Checking Compressor Oil Level**

**CAUTION**

**An overcharge of oil will reduce system capacity and possibly cause internal compressor damage.**

1 Operate the unit in Cool Mode for at least 20 minutes.

2 Check the oil sight glass 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 3

3 Turn unit off to check the oil level. The correct oil level range should be 1/8 to 1/2 glass. If level is above 1/2 glass or below 1/8 glass, continue with the following steps as required.

**b. Adding Oil With Compressor In System**

**CAUTION**

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

Two methods for adding oil are the oil pump method and closed system method.

**Oil Pump Method**

One compressor oil pump that may be purchased is a Robinair, part no. 14388. This oil pump adapts to a one U.S. gallon (3.785 liters) metal refrigeration oil container and pumps 2-1/2 ounces (0.0725 liters) per stroke when connected to the oil fill (Item 12, Figure 8-19). There is no need to remove pump from can after each use.

When the compressor is in operation, the pump check valve prevents the loss of refrigerant, while allowing the technician to develop sufficient pressure to overcome the operating suction pressure to add oil as necessary.

Backseat suction service valve and connect oil charging hose to oil fill. Purge the oil hose at oil pump. Add oil as necessary.

**Closed System Method**

**CAUTION**

**Extreme care must be taken to ensure the hose is immersed in the oil at all times. Otherwise air and moisture will be drawn into the compressor.**

In an emergency where an oil pump is not available, oil may be drawn into the compressor through the suction service valve.

1. Pump down the compressor. Refer to Section 8.6.2.
2. With both manifold gauge set valves frontseated, leave the suction connection connected to the com-

pressor suction service valve port and connect the common connection to a vacuum pump. Remove the discharge hose from the manifold gauge set; connect the end with the Schrader depressor to the compressor oil fill port (Item 12, Figure 8-19), and immerse the other end in a container of refrigeration oil. Start the vacuum pump throttle the manifold gauge set suction valve and pull a vacuum on the compressor while watching the the oil level in the glass. Fill to 1/4 glass. Shut down pump and remove oil fill line from the oil fill port.

3. Break any remaining vacuum (raise to 0 psig/bar) with refrigerant remaining in the system (crack open the suction service valve), or from a fresh cylinder of refrigerant. Evacuate the compressor crankcase to 500 microns. Remove service equipment, backseat suction and discharge service valves and recheck oil level.

**c. Removing Oil From The Compressor**

1. Check compressor oil level, refer to preceding step a. If the oil level is above the middle of the sight glass (item 11, Figure 8-19), oil must be removed from the compressor.
2. Pump down the compressor. Refer to Section 8.6.2.
3. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.
4. Loosen the oil drain plug (item 10, Figure 8-19) and allow oil to seep out and bring the level to 1/8 glass. Tighten the plug securely back into the compressor.
5. Leak check the oil drain plug, refer to Section 8.6.3. Start compressor and recheck oil level

### 8.7.6 Unloaders

**a. Unloader Checkout procedure**

1 Install a manifold gauge set on the compressor suction and discharge service valves and start unit in cooling with compartment temperatures at least 5_F (2.8_C) below setpoint. The compressor will be fully loaded (both unloader coils de-energized). Note suction pressure.

2 Unplug both unloader coils.

3 Using a 12 VDC source, energize the front unloader (UL1). 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).

4 De-energize UL1 and note pressures. Suction pressure should drop and discharge pressure should rise by same amount as in step 3 above.

5 Repeat steps 3 & 4 for the rear unloader (UL2). At the end of the test, reconnect both unloaders.

**NOTE**

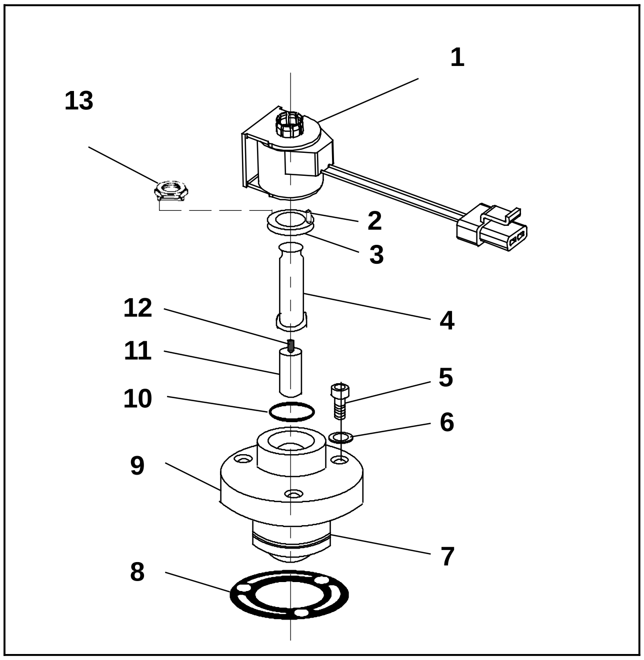
If pressures do not change as indicated, check the unloader coil resistance (refer to Section 2.13). Replace if coil is open or shorted. If either unloader coil energizes and the suction and discharge pressures do not change, the unloader assembly must be checked.

**b. Unloader Coil Replacement**

**NOTE**

The coil may be removed while the compressor is under pressure.

1. Disconnect leads and lift coil (see Figure 8-24) off enclosing tube.
2. Verify replacement coil is the correct type, voltage and frequency.
3. Place new coil over enclosing tube. With wiring facing in the desired direction, ensure roll pin is fitted in one of the detents in the bottom of the coil mounting. Coll is to snap into place with bottom in contact with the enclosing tube nut. Connect wiring.
4. Check operation, refer to preceding step a.




1. Coil Assembly
2. Pin, Roll
3. Enclosing Tube Nut
4. Enclosing Tube
5. Bolts, Valve Body (3)
6. Washers (3)
7. Piston
8. Gasket
9. Valve Body
10. “O” Ring
11. Plunger
12. Plunger Spring
13 Installation/Removal Tool

**Figure 8-24 Unloader Coil**

**c. Replacing Unloader Valve Internal Parts**

1. Pump down the compressor. Refer to Section 8.6.2 step e.

2 Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

3. Disconnect and remove coil.

**WARNING**

**Do not unscrew enclosing tube nut all the way before breaking seal. Entrapped pressure could result in injury.**

4 Loosen the enclosing tube nut (see Figure 8-24) using installation/removal tool supplied with repair kit. Ensure tube is loose and seal is broken then remove tool, enclosing tube nut, enclosing tube, plunger with plunger spring and o-ring

5. Check plunger for restriction due to: (a) corroded or worn parts; (b) foreign material lodged in valve; (c) bent or dented enclosing tube.

6. Install new parts. Do not over tighten enclosing tube assembly. Torque to a 100 inch pounds (11.3 Nm).

7. Remove tool and install coil, refer to preceding step b.

8 Leak check and evacuate the compressor. Refer to Sections 8.6.3 and 8.6.4.

9. Check operation, refer to preceding step a.

**d. Unloader Valve Replacement**

1. Pump down the compressor. Refer to Section 8.6.2.

2. Disconnect and remove coil.

**WARNING**

**Do not unscrew unloader valve body mounting bolts all the way before breaking seal. Entrapped pressure could result in injury.**

3 Loosen the valve body mounting bolts. Tap the valve body to break the seal and then remove bolts and gasket.

4. Remove small screen from inside the compressor head and ensure it is not obstructed. Clean or replace as required.

5. Place new gasket onto replacement unloader valve body (with flat side toward the head) and, using unloader ring pliers (Carrier Transicold part number 07-00223-00) compress the unloader ring while inserting the unloader into the compressor head.

6. One valve body mounting hole is offset to assist in correctly aligning the valve body and gasket. Insert mounting bolts, align with gasket holes and mounting holes in head. Start bolts by hand and then toque mounting bolts 12 to16 ft-lbs (1.3 to 1.8 Nm).

7 Leak check and evacuate the compressor. Refer to Sections 8.6.3 and 8.6.4.

8. Check operation, refer to preceding step a.

## 8.8 REFRIGERANT SYSTEM COMPONENT SERVICE

### 8.8.1 Evaporator Coils

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 evaporators where they lodge between the coil 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.

Clean the evaporator coils 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.

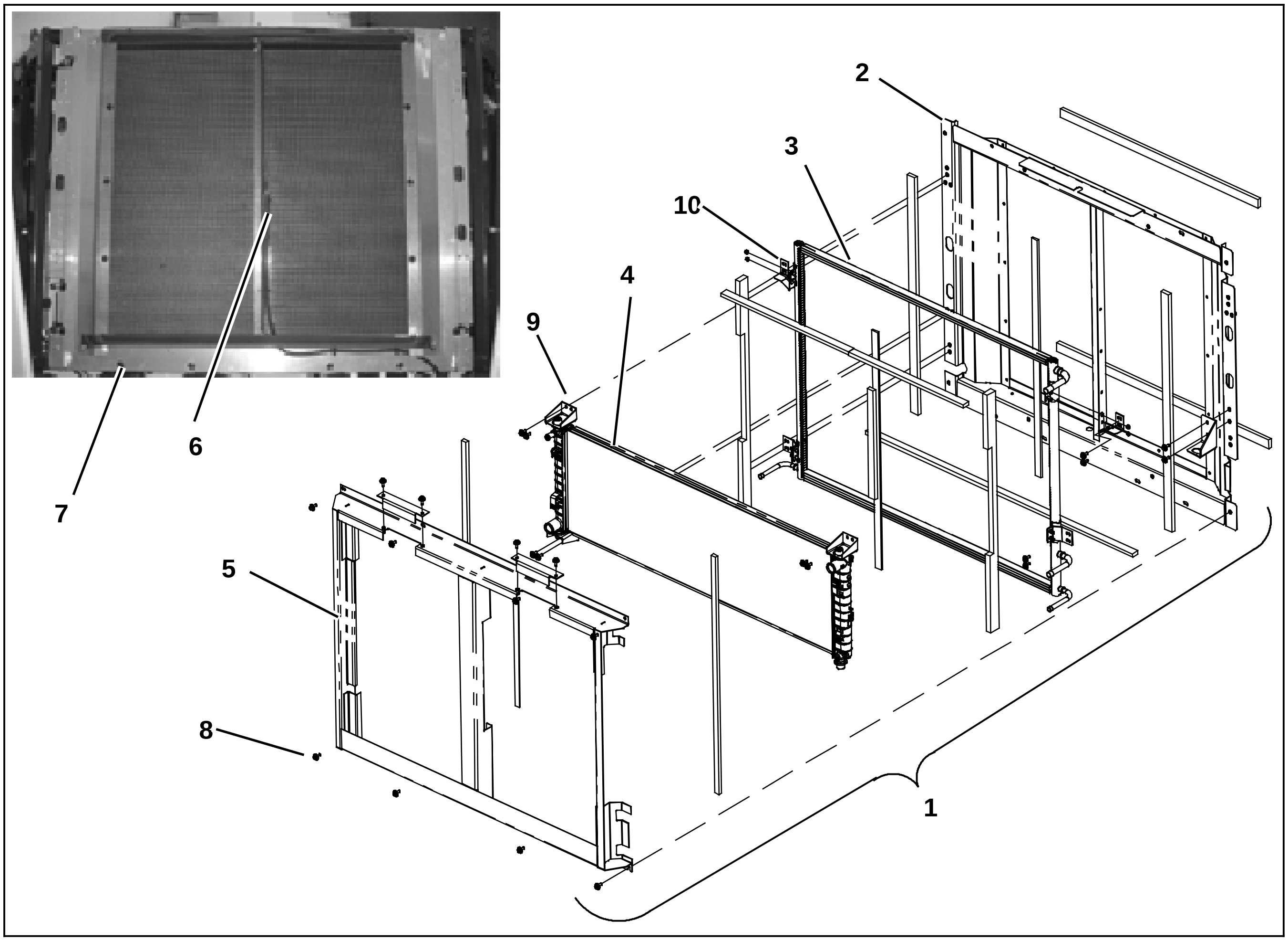
Cardboard fiber particles after being wetted and dried several times can be very hard to remove. Therefore, several washings may be necessary.

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Remove rubber check valves (Kazoo) from drain lines of the evaporator(s) to be cleaned.

c. Spray coil(s) 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.

d. Re-install check valves and run unit until defrost mode can be initiated to check for proper draining from drain pan.




1. Condenser/Radiator Assembly
2. Condenser Frame
3. Condenser Coil
4. Radiator
5. Radiator Frame
6. Ambient Air Temperature Sensor (ATT)
7. Condenser/Radiator Assembly Mounting Bolts
8. Radiator Frame Mounting Bolts
9. Radiator Mounting Brackets
10. Condenser Coil Mounting Brackets

**Figure 8-25 Condenser/Radiator Assembly**

### 8.8.2 Condenser Coil

#### a. Cleaning

**Note**

Only Clean Water Should Be Used To Wash The Condenser. Do Not Use Any Detergents To Clean The Condenser.

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. Take care so that the fins aren't bent during this procedure.

#### b. Condenser Coil Replacement

**Note**

This assembly has undergone two design changes: beginning with S/N HAG the condenser inlet was moved further down on the tube sheet & beginning with S/N NAZ91305902 the mounting brackets were modified to allow for greater distance between the coils.

1. Remove the refrigerant charge. Refer to Section 8.6.2.

**Note**

If the condenser coil (Item 3, Figure 8-25) requires replacement, the entire condenser/radiator assembly (1) must be removed from the unit and disassembled/reassembled on the bench.

2. Drain coolant completely by removing radiator cap and then the lower radiator hose.
3. Remove the surround with the grille attached. Refer to Section 8.4.2.
4. Remove hoses from radiator.
5. Unsolder refrigerant lines from condenser coil.
6. Disconnect the hail and bug screen sufficient to reach the ambient sensor (6) and wiring. Remove sensor and wiring from radiator frame (5).
7. Remove the eight bolts (7) securing the condenser/radiator assembly to the unit.

8. Remove the condenser/radiator assembly from the unit.

9. Remove the eight bolts (8) securing the radiator frame to the condenser frame (2) and set radiator frame aside.

10. Separate the radiator (4) from the condenser/radiator assembly by removing the top and bottom radiator mounting brackets (9). Set radiator aside.

11. Remove condenser coil by removing the condenser coil mounting brackets (10).

12. Reassemble condenser/radiator assembly in reverse order using new coil.

**CAUTION**

**Do not bend the copper tubing on the condenser coil when installing the new condenser. Bend the unit tubing if tubes do not align correctly.**

**Note**

Before applying heat to the new condenser apply a wet rag to the entire copper to aluminum transition area to avoid melting the protective heat shrink or damaging the joint.

13. Reassemble condenser/radiator assembly into unit.

14. Leak check, evacuate and charge the system. Refer to Sections 8.6.3, 8.6.4 & 8.6.2.

15. Refill engine coolant. Refer to Section 8.5.12.

### 8.8.3 Filter-Drier

**a. Check Filter-Drier**

The unit must be running in cool for this test. 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 replaced.

**b. Replace Filter-Drier**

1. Pump down the low side, refer to Section 8.6.2.

2. Remove bracket, loosen the inlet connection to relieve any remaining pressure then remove drier.

3. Procure new O-rings. Lubricate the O-rings, back side of sleeves and coupling nuts. Using a backup wrench at each connection torque 30 to 38 ft-lbs (41 to 51 Nm).

4. Leak check and evacuate the low side of the system. Refer to Sections 8.6.3 & 8.6.4.

### 8.8.4 Replacing Receiver Sight Glass Or Fusible Plug

a. Remove the refrigerant charge. Refer to Section 8.6.2.

b. Loosen the sight glass or fusible plug to relieve any remaining pressure. Remove and discard glass or plug.

c. Wrap threads of new sight glass or plug with Teflon tape or spread sealing compound on pipe threads and install. Torque the sight glass to 15 to 25 ft lbs (20 to 34 Nm). Torque the fusible plug to 4 to 8 ft lbs (5 to 11 Nm).

d. Leak check, evacuate and charge the system. Refer to Sections 8.6.3, 8.6.4 & 8.6.2.

### 8.8.5 Compressor Suction Modulation Valve (CSMV)

The purpose of the SMV is to 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”. Then the MessageCenter will display “SETTING SMV XX%” with actual percentage depending on ambient temperature and refrigerated compartment temperatures. The unit will then go through its normal start procedure.

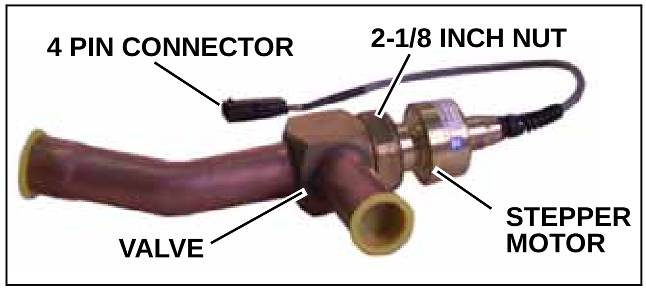



**Figure 8-26 Suction modulation valve (CSMV)**

If it is suspected that the SMV is malfunctioning, the most efficient method of diagnosing the valve is to run a pretrip (refer to Section 3.4). The pretrip steps will check the remainder of the system and the #11 test will check the SMV. The valve will be brought to a preset position, the unit started and then the valve will be opened while the microprocessor monitors suction pressure. If there is a problem with the valve, stepper motor or microprocessor wiring to the valve the test will fail.

**a. Diagnostics - Microprocessor or Wiring**

1. Locate the wires, on the engine harness side of the SMV connector labeled CSMVA, CSMVB, CSMVC and CSMVD. These will correlate to the connector pins labeled A, B, C and D. Refer to Table 8-3.

**Table 8-3 CSMV Connections**

| Connector Pin | Wire Color | Winding/Pole |
|---|---|---|
| A | BLACK | 1A |
| B | WHITE | 1B |
| C | RED | 2B |
| D | GREEN | 2A |

2. Power the microprocessor by toggling the Main Power switch out of the OFF position DO NOT ALLOW THE UNIT TO START. When the MessageCenter displays “SMV CLOSING”, measure the AC voltage between pins A & B and then between C & D. A voltage (10 to 16 VDC) should be read by the digital voltmeter for each pair of wires. If the reading is present on the wire pairs there is a good signal coming from the microprocessor.

3. If the reading is not present on one or more of the wire pairs, check the wiring between the microprocessor and the SMV connector, or check the microprocessor for proper model number Configuration.

**b. Diagnostics – Stepper Motor**

The valve stepper motor may be tested using a stepper motor drive tester or ohmmeter.

1. To test with a stepper motor drive tester (Carrier Transicold part number 07–00375–00), connect the 4 pin test cable to the valve connector, refer to Table 8–3, and the cable wires to the tester in accordance with wire and terminal color.

2. Set the step rate to 200 steps per second and either open or close the valve. Each red LED should light sequentially until all four are illuminated. Any LED failing to illuminate indicates an open on that leg and a need to replace the piston and drive motor assembly .

3. To test with an ohmmeter, check the winding resistance between connector pin 1A & 1B and then between 2A & 2B, see Figure 8–27. In normal ambient, the resistance between the pins should be 72 to 84 ohms. Also check each terminal to the coil casing (ground). If an out of tolerance or zero reading is observed, the piston and drive motor assembly is to be replaced.

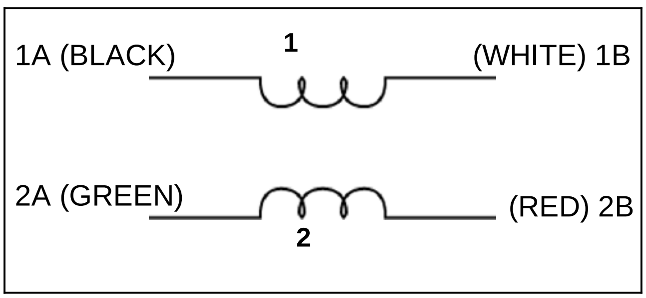



**Figure 8–27 CSMV Coil**

**c. Diagnostics – Valve**

**NOTE**

If the valve failed pretest and passed the preceding diagnostic testing, this is an indication that the valve internal mechanism is damaged and the piston and motor assembly is to be replaced.

1. To test the valve internal mechanism, install a manifold gauge set on the suction service valve and a stepper motor drive tester.

2. Start the unit, set the step rate to 200 steps per second and close the valve while watching the suction pressure. Within one minute the suction pressure should begin to fall. Place the Main Power switch in the OFF position before the reading enters a vacuum.

3. If the suction pressure does not change, this is an indication the valve is stuck and the piston and drive motor assembly is to be replaced.

**d. Replacing the Drive and Motor Assembly**

1. Pump down the low side. (Refer to section 8.6.2).

2. Remove valve piston and motor assembly and replace with a new assembly and gasket. 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 the stepper motor tester to manually open the valve to 100% before it is installed. Torque nut to 47.4 Nm (35 ft–lb).

3. Leak check, evacuate the low side. Refer to Sections 8.6.3 and 8.6.4.

**e. 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 :

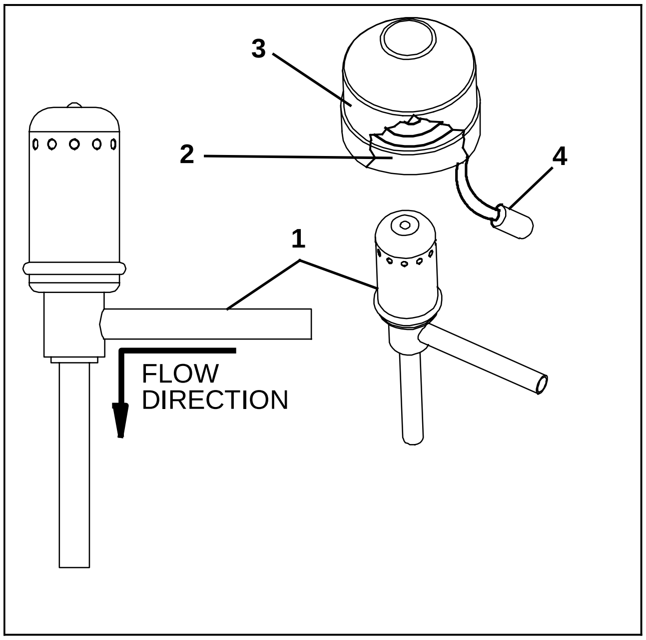
1. Install a manifold gauge set.
2. Pump down the low side. (Refer to section 8.6.2).
3. Remove SMV power head by loosening the 2-1/8 inch diameter nut (see Figure 8–26), and sliding the power head out.
4. Remove the piston by loosening the Allen screw and removing the piston and screw.
5. Install the power head assembly (without piston), torque to 47 to 54 Nm (35 to 40 ft–lb).
6. Leak check and evacuate the low side. Refer to Sections 8.6.3 & 8.6.4.
7. Start the unit.
8. 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.
9. Once repair parts become available, repair as required.

### 8.8.6 Electronic Expansion Valve

The electronic expansion valve (EVXV – see Figure 8–28) is a microprocessor driven device which meters the flow of refrigerant into the coil. The flow control provides: (a) response to match the evaporator load and (b) prevention of liquid refrigerant return to the compressor. Unless the valve is defective, it seldom requires any maintenance.

**NOTE**

As a preliminary check, ensure the EVXV coil is snapped down fully, and the coil retention tab is properly seated in one of the valve body dimples.




1. Electronic Expansion Valve
2. Coil Boot
3. Coil
4. Five Pin Connector

**Figure 8-28 Electronic expansion valve**

**a. Diagnostics - Microprocessor or Wiring**

1. Locate the wires, on the engine harness side of the EVXV connector labeled EXVA, EXVB, EXVC, EXVD and EXVE. These will correlate to the connector pins labeled A, B, C, D and E. Refer to Table 8-4.

**Table 8-4 EVXV Connections**

| Connector Pin | Wire Color | Winding |
|---|---|---|
| A | ORANGE | A |
| B | RED | B |
| C | YELLOW | $\overline{A}$ |
| D | BLACK | $\overline{B}$ |
| E | GREY | COM (+12V) |

2. Set the voltmeter to the DCV scale. Ensure the unit is disconnected from standby power and start the unit in Standby Operation. Wait for the MessageCenter to display "UNIT SHUTDOWN - SEE ALARM LIST".
3. Perform the following test on the wiring coming from the microprocessor:
   Place the positive (+) voltmeter lead on pin E, the negative (-) voltmeter lead on pin A and observe the meter for several seconds. The voltage reading will be very low, then rise to battery voltage (approximately 12.3VDC with a good battery) for a few seconds, then drop back to a lower reading
4. Repeat for pins B,C and D.
5. If there is no voltage reading or if the voltage never rises to battery voltage level, there is a problem in the wiring or the microprocessor. Test all wiring from the EVXV connector to the microprocessor and verify good continuity before replacing the microprocessor.

**b. Diagnostics - Stepper Motor**

The valve stepper motor may be tested using a stepper motor drive tester or ohmmeter.

1. To test with a stepper motor drive tester (Carrier Transicold part number 07-00375-00), connect the 5 pin test cable to the valve connector, and the cable wires to the tester in accordance with wire and terminal color. (if a 5 pin tester cable is required, order Carrier Transicold part number 07-00375-11.)
2. Set the step rate to 50 steps per second and either open or close the valve. Each red LED should light sequentially until all four are illuminated. Any LED failing to illuminate indicates an open on that leg and a need to replace the drive.
3. To test with an ohmmeter, check the winding resistance between connector pin A & E, B & E, C & E and then between D & E. In normal ambient, the resistance between the pins should be 46 ohms. If an infinite or zero reading is observed, the piston and drive motor assembly is to be replaced.

**c. Diagnostics - Valve**

**NOTE**

If the valve failed Pretrip and passed the preceding diagnostic testing, this is an indication that the valve internal mechanism is damaged and the piston and motor assembly is to be replaced.

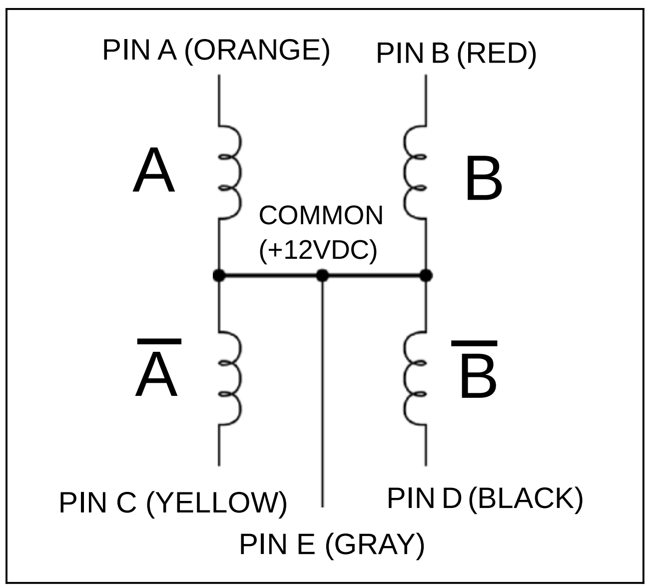



**Figure 8-29 Electronic Expansion Valve**

1. To test the valve internal mechanism, install a manifold gauge set on the suction service valve and a stepper motor drive tester. Refer to Section 8.8.6b.
2. Start the unit, set the step rate to 200 steps per second (refer to Section 8.8.6 step b.) and close the valve while watching the suction pressure. Within one minute the suction pressure should begin to fall.

3. If the suction pressure does not change, this is an indication the valve is stuck and the piston and drive motor assembly is to be replaced.

**d. Replacing Expansion Valve & Screen**

1. Pump down the low side. (Refer to section 8.6.2).
2. Remove coil and unbraze valve. Clean all tube stubs so new valve fits on easily.
3. Use a wet rag to keep the replacement valve cool and braze in place.
4. Leak check and evacuate the low side. Refer to Sections 8.6.3 and 8.6.4.

### 8.8.7 High Pressure Switch

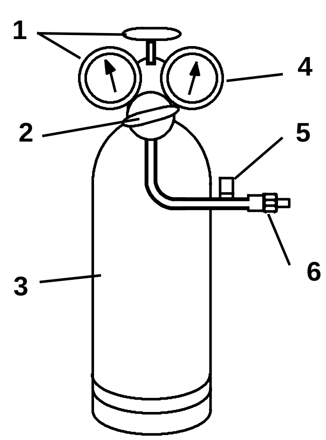
**a. Replacing High Pressure Switch**

1. Pump down the compressor (Refer to section 8.6.2).
2. Disconnect wiring from switch, and remove switch.
3. Install switch after verifying switch settings. (Refer to following step b.)
4. Leak check and evacuate the compressor. Refer to Sections 8.6.3 and 8.6.4.

**b. Checking High Pressure Switch**

**WARNING**

**Do not use a nitrogen cylinder without a pressure regulator. Cylinder pressure is approximately 2350 PSIG (160 bar). Do not use oxygen in or near a refrigerant system as an explosion may occur. (See Figure 8-30.)**




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. Switch

**Figure 8-30 Typical Setup for Testing High Pressure Switch**

1. Remove switch as outlined in preceding section
2. Connect ohmmeter or continuity light across switch terminals. Ohmmeter will indicate resistance and continuity light will be illuminated if switch closed after relieving pressure.
3. Connect switch to a cylinder of dry nitrogen. (See Figure 8-30)
4. Set nitrogen pressure regulator higher than open setting for switch being tested. For pressure switch settings refer to Section 2.11.
5. Close valve on cylinder and open bleed-off valve.
6. 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. Close cylinder valve. Slowly open bleed-off valve (to decrease pressure) until switch closes (light will illuminate or ohmmeter will indicate open).

### 8.8.8 Pressure Transducers

The Compressor Discharge Pressure Transducer (CDP) has a range of 0 to 500 PSIG (0 to 34.0 bar) while the Compressor Suction Pressure Transducer (CSP) and Evaporator Pressure Transducer (EVOP) have a range of -14.7 to100 PSIG (-1 to 6.8 bar). To test the transducers, do the following:

**NOTE**

The Compressor Discharge Pressure on the microprocessor Data List will never read less than 0 bar/psig, even if it is exposed to a vacuum (such as when evacuating the system.) Also, the compressor suction pressure and evaporator pressure transducers will never read higher than 100 psig, even if the actual pressure is higher.

a. Verify that the wiring to the transducer is correct.

b. Power up the transducer circuit. Place the unit in PC mode, refer to Section 5.3. Check Voltage to transducer connector. Voltage reading between B (positive) and A (negative) should be 5.0 VDC.

c. To check the signal wiring, check continuity between the transducer connector C terminal and the following microprocessor connector:

CDP = 1MP05, CSP = 1MP29, EVOP = 1MP06

d. If voltage and signal wire are good, replace the transducer. The transducer may be removed by disconnecting the connector and quickly backing it off the Schrader valve fitting.

### 8.8.9 Defrost Air Switch

**NOTE**

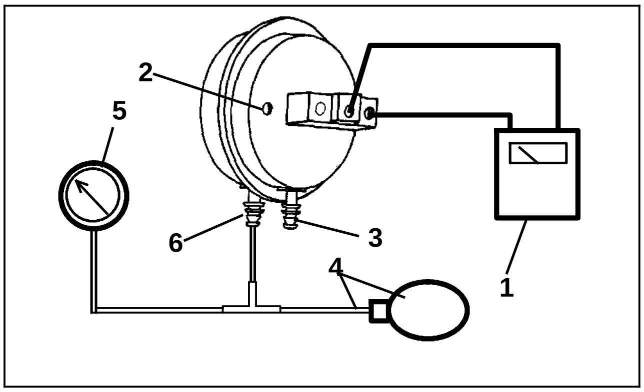
If the DTT temperature is above 40°F (4.4°C) defrost cannot be initiated and the MessageCenter will display “CANNOT START DEFROST CYCLE”.

a. Check air switch tubing. Red tube is to be connected to the high connection and routed below the coil. Clear tube is to be connected to the low connection and routed above coil. Check condition and mounting of air sensing fittings on the coil end of both tubes.

b. To check the defrost air switch, run unit in cooling and jumper 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.

c. Unit should remain in defrost until DTT in all compartments reach 55_F (12.8_C ), for normal defrost, or for 5 to 10 minutes in each compartment for natural defrost (refer to Section 4.6 for more information on defrost). At this point the defrost cycle will terminate, and the unit will resume automatic operation.

d. If the above test indicates satisfactory operation, test DAS settings using a Magnehelic gauge (Carrier Transicold part number 07-00177) or similar instrument as follows.




1. Ohmmeter or Continuity Device
2. Adjustment Screw (0.050" socket head size)
3. Low Side Connection
4. Pressure Line or Aspirator Bulb (Carrier Transicold part number 07-00177-01)
5. Magnehelic Gauge (Carrier Transicold part number 07-00177-00)
6. High Side Connection

**Figure 8-31 Defrost Air Switch Test Setup**

e. Ensure 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.

f. With air switch in vertical position, connect high pressure side of magnehelic gauge, a tee and and aspirator to high side connection of air switch. Tee is to be placed approximately half-way between gauge and air switch or an improper reading may result. (See Figure 8-31.)

g. Attach an ohmmeter to the air switch electrical contacts to check switch action.

**NOTE**

Use a hand aspirator (Carrier Transicold part number 07-00177-01), since blowing into tube by mouth may cause an incorrect reading.

h. 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.

i. Refer to Section 2.11 for switch setting. If switch fails to actuate at correct gauge reading, adjust switch by turning adjusting screw clockwise to increase setting or counterclockwise to decrease setting.

j. Repeat checkout procedure until switch actuates at correct gauge reading.

k. 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.

### 8.8.10 Liquid Line Solenoid Valve (2LSV/3LSV)

**a. Checking Operation**

the LSV is used to control the flow of refrigerant to the compartment. Generally, when a compartment is enabled, and the box temperature is above setpoint, the microprocessor will be calling for that compartment to operate in Cool. When the compartment is calling for Cool, the LSV will be energized, allowing liquid refrigerant to flow through the valve to the evaporator.

If time permits, an easy method for checking an LSV is to first run the unit through a defrost cycle. Then operate Compartment 1 only with the remote compartments 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 coil. There should be no frost. 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:

1. Install a manifold gauge set on the compressor discharge and suction service valves.
2. Pump down the low side of the system, refer to Section 8.6.2.
3. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.
4. 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 pump down procedure.

5. Using Unit Data (refer to Section 3.13), check to ensure the EVXV is 0% open, slowly open the liquid line service valve. The suction pressure should not rise. If the suction pressure rises the leakage possibilities are: the EVXV, 2LSV or 3LSV. Go into each compartment and listen for any internal system leakage.

**NOTE**

When the suction pressure remains at 0 to 5 psig with the liquid line service valve open, 2LSV and EVXV have been tested for holding and passed.

6. Open the compartment LSV in question using Component Test Mode (Refer to Section 5.2.2).
7. Monitor the suction pressure when the Microprocessor "= " key is pressed to energize the LSV. The suction pressure should rapidly rise indicating that the valve opened. If pressure does not rise, check FET, voltage at plug and coil resistance. If required, replace coil. Refer to following step b.
8. If valve leakage is detected during the low side pump down, or the valve fails to open, valve repair is required. Refer to following step c.

**b. Replacing the Coil**

**CAUTION**

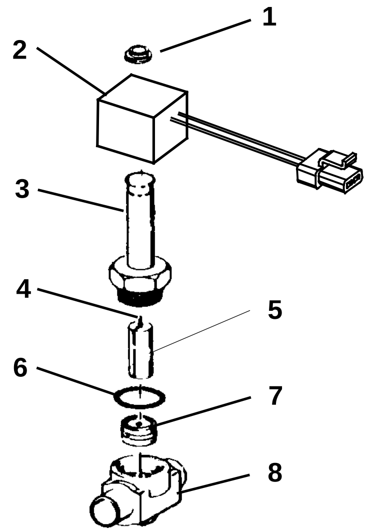
**Ensure all parts are assembled into the solenoid valve enclosing tube in proper sequence to avoid premature coil burnout. Do not over tighten or damage the enclosing tube assembly.**

**NOTE**

The coil may be replaced without removing the refrigerant or pumping the unit down.

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Note direction of coil wiring. Unplug coil from wiring harness, remove coil retainer (see Figure 8-32) and coil assembly.
3. Verify coil type, voltage and frequency.
4. Place new coil over enclosing tube. With wiring facing in the direction noted in the preceding step, ensure roll pin is fitted in one of the detents in the bottom of the coil mounting. Ensure bottom of coil housing is in contact with the enclosing tube nut. Install snap clip and connect wiring.

**c. Replacing internal parts**




| | |
|---|---|
| 1 Coil Retainer | 5 Plunger |
| 2 Coil | 6 Gasket |
| 3 Enclosing Tube | 7 Piston |
| 4 Plunger Spring | 8 Body |

**Figure 8-32 Liquid line Solenoid Valve**

1. Pump down the low side of the system, refer to Section 8.6.2.
2. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.
3. Remove coil retainer and coil assembly from valve, refer to preceding step b.
4. Remove enclosing tube assembly and related items.
5. Check for foreign material in valve body.
6. Install new parts.
7. Tighten enclosing tube assembly to 250 in-lbs (28 Nm)
8. Install coil assembly and retainer, refer to preceding step b.
9. Leak check and evacuate the low side. Refer to Sections 8.6.3 and 8.6.4.

### 8.8.11 Thermal Expansion Valve

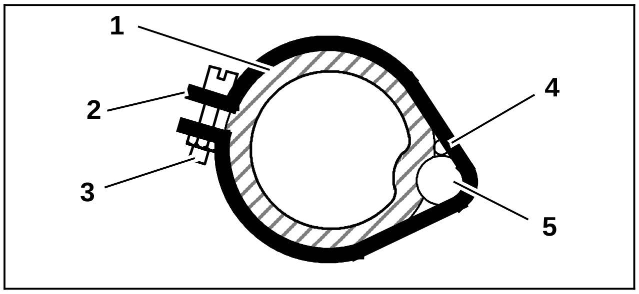
**a. Check Superheat**

**NOTE**

For evaporators with two thermal expansion valves, thermocouple is only required on one valve. However, when making adjustments, make an equal adjustment to <u>both</u> valves for each required change.

1. Loosen the insulation at one end of the expansion valve bulb.
2. Loosen one TXV bulb clamp and make sure the area where the bulb contacts the line is clean.

3. Place a thermocouple parallel to the TXV bulb and then secure loosened clamp making sure the thermocouple and bulb are both firmly secured to suction line as shown in Figure 8-33. Use insulation to completely cover both.




1. Suction Line
2. TXV Bulb Clamp
3. Nut and Bolt (Clamp)
4. Thermocouple
5. TXV Bulb

**Figure 8-33 Thermal Expansion Valve Bulb and Thermocouple**

6. Connect an accurate gauge to the 1/4” port on the suction line.
7. If the valve(s) have not been adjusted previously, a preliminary adjustment may be made by turning the adjustment fully clockwise to bring the valve to the closed position and then turning the adjustment screw counter clockwise three complete turns of 360°.
8. Set Compartment 2 at 0°F (-18°C) to keep the unit running in high speed. Adjust the bulkhead or open the compartment door slightly to maintain Compartment 2 temperature as close to 32°F (0°C) as possible. Keep in mind that running the unit with the door open will frost the evaporator coil, making the superheat measurements unstable.
9. Take at least ten readings of pressure and temperature 10 seconds apart and average readings.
10. From the temperature/pressure chart (refer to Table 8-7), determine the saturation temperature corresponding to the average suction pressure.
11. Subtract the average saturation temperature from the average bulb temperature. The difference is the evaporator superheat. Evaporator superheat should be 15 to 17°F (8.3 to 9.4°C). If required adjust valve. One complete turn will change the reading by about 7°F (3.8°C). Turn clockwise to increase or counter clockwise to decrease superheat. Repeat adjustment as required to bring superheat in the required range.
12. Once the valve(s) are adjusted, read compressor suction temperature and pressure from the microprocessor. Convert the suction pressure using the P/T chart. Subtract the converted suction temperature from the actual suction pressure to obtain the suction superheat. The suction superheat should be between 70 to 90°F (38 to 50°C).
13. For final verification, allow Compartment 2 temperature to pull down to -20°F (-30°C). Repeat the above procedure. Evaporator superheat should be 10 to 12°F (5.5 to 6.6°C) while the suction superheat should be between 35 to 40°F (19 to 22°C).
14. If superheat cannot be brought within the required ranges, the valve(s) must be replaced.

**b. Replacing Expansion Valve**

1. Pump down the low side of the system, refer to Section 8.6.2.
2. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.
3. Note location of bulb on the suction line and then remove the valve bulb and the insulation from the expansion valve power head.

c. Heat inlet, outlet and equalizer connections to valve body and remove valve. Clean all tube stubs so new valve fits on easily.

d. Install new valve.

e. Clean the suction line where the bulb will make contact. Install bulb and firmly tighten the straps around the bulb and suction line.

f. Leak check and evacuate the low side. Refer to Sections 8.6.3 and 8.6.4. Install bulb and power head insulation.

g. Check and adjust superheat in accordance with the preceding step a.

## 8.9 ELECTRICAL SYSTEM COMPONENT SERVICE

Procedures for servicing or maintaining the high voltage electrical system components are provided in the following sub-paragraphs.

### 8.9.1 Megohmmeter Test Procedure

This instruction will aid in the check of the electrical insulation integrity and connections using a resistance tester (commonly known as a megohmmeter or Megger), such as Carrier Transicold part number 07-00481-00, that can be set to 1000V.

**CAUTION**

**Before connecting a megohmmeter, place the Main Power switch in the OFF position. Disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection. Isolate the microprocessor by disconnecting all connectors and wires going to it. Observe National Electric Manufacturer’s Association (NEMA) rules and test equipment manufacturers instructions.**

a. Disconnect the generator ground wire (GEN-GRD = green wire marked with red tape) from the unit ground plate (PE plate) inside the control box. See Figure 8-34. Fully insulate the ground wire terminal with electrical tape.

b. Connect a tester lead to the ground plate.

Figure 8-34 Megohmmeter Connection to Ground Plate

c. Begin by testing the generator and interconnecting wiring. To do this, connect the remaining tester lead to the GENCON contactor at terminal L1. See Figure 8-35

d. Set the tester to 1000V.

e. Press the tester TEST button and record reading. It should be greater than 200 MΩ. If not, follow the procedure outlined in Step h.

f. Continue testing the generator by testing at the GENCON L2 and then the GENCON L3 terminals. Both should measure greater than 200 MΩ. If not, follow the procedure outlined in Step h.

g. To complete the high voltage circuit testing, test the T1, T2 and T3 terminals on all high voltage contactors listed in Figure 8-35. The fuses and the Overload Ground Fault Module (OGF) do not need to be tested. All readings should be greater than 200 MΩ. If not, follow the procedure outlined in Step h. If all readings are 200 MΩ or greater, proceed to step i.

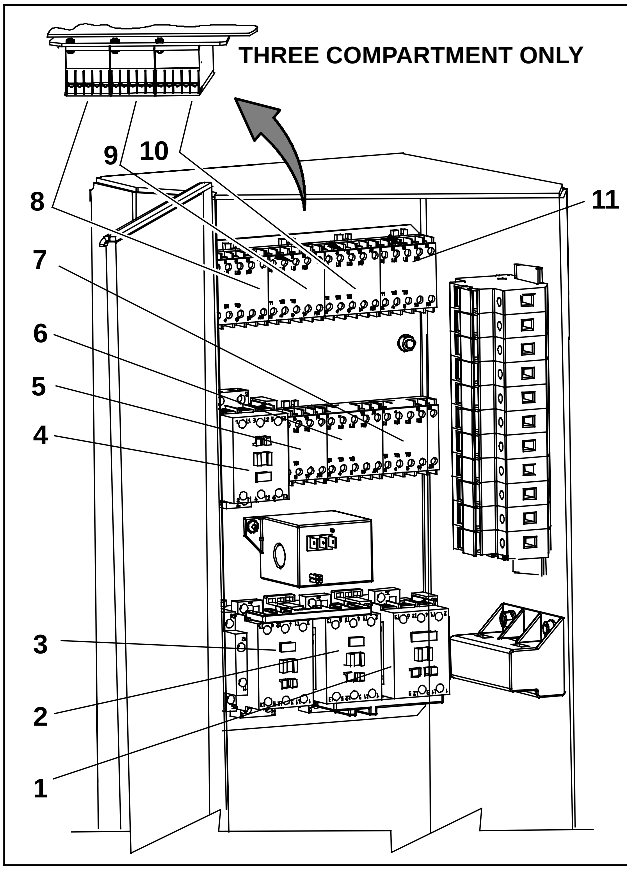
h. If a reading is less than 200 MΩ, reconnect the generator ground wire, run the unit for 15 minutes to dry out the windings, remove and re-insulate the generator ground wire and and test again. If the reading does not improve to above 200 MΩ after running 15 minutes, check for a short to ground by:

NOTE:

It is not necessary to remove the trough covers unless it is determined that a problem exists within the trough. Isolate and test harness within the trough by disconnecting the connector at in the remote evaporator.

- Visually inspecting the tested component for any poor connections or chafed wires
- Isolating the component and wire harness.
- Retesting the harness and component (i.e. the motor windings) with the megohmmeter to determine where the short to ground is located

i. Following the completion of all testing, reconnect the generator ground wire at the unit ground plate.




1. Power supply contactor 1 (PSCON)
2. Power supply contactor 2 (PSCON2)
3. Generator contactor (GENCON)
4. Compressor contactor (CCON)
5. Compartment 1 evaporator heater contactor 2 (1HTCON2)
6. Compartment 1 evaporator motor contactor (1EVCON)
7. Condenser motor contactor (CDCON)
8. Compartment 2/3 evaporator motor contactor (2EVCON/3EVCON)
9. Compartment 2/3 evaporator heater contactor 1 (2HTCON1/3HTCON1)
10. Compartment 2/3 evaporator heater contactor 2 (2HTCON2/3HTCON2)
11. Compartment 1 evaporator heater contactor 1 (1HTCON1)

Figure 8-35 High Voltage Contactors

### 8.9.2 Phase Reversal Module (PRM)

One principle of three phase motors is that the direction of rotation will be reversed if any two wires going to the motor are reversed. When operating on the generator, the wiring is not changed and therefore the PRM is not active. However, when operating on standby power, the incoming power may be reversed. The function of the phase reversal module is to monitor the incoming standby power and reverse the power to the motors if that incoming power will result in incorrect rotation.

When the unit is started in standby, power is supplied to the PRM +12V terminal to activate the PRM. Refer to wiring schematic, Section 10. Once the PRM is activated, it will provide a 12VDC power signal to the microprocessor at terminal 5MP04 to signal the microprocessor that Standby Operation has been selected and high voltage has been detected at the power plug. The PRM has two output contacts PRM IN S1 and PRM IN S2. If incoming power is correct, the PRM IN S1 contact is closed, energizing PSCON to supply power to the motors. If any two incoming power wires are reversed, the PRM IN S2 contact are closed, energizing PSCON2 to supply power to the motors. Both PSCON and PSCON2 have a set of normally closed auxiliary contacts wired in series with the "other" contactor to prevent energizing of both contactors at the same time.

To test the PRM:

a. Check for 460 VAC power from the power plug to the PRM. If required, correct wiring or power source.

b. Check for 12 VDC to the +12V from the switch. If required, correct wiring.

c. Check for ground at the PRM OV terminal. If required, correct wiring.

d. Check for a 12 VDC signal from the PRM to microprocessor terminal 5MP04. If required, correct wiring from PRM to the microprocessor.

e. If all wiring and voltage readings are correct, replace PRM.

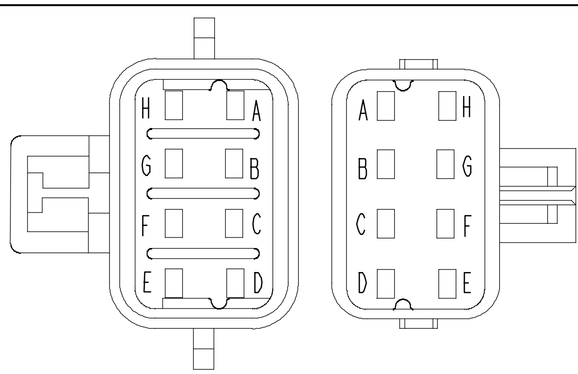



**Figure 8–36 Light Bar Connections**

### 8.9.3 Light Bar

The light bar may be tested using a 12 VDC source. To test the light bar:

a. Connect the ground (–) from the power source to pin B on the light bar side of the connector.

b. The green LEDs will illuminate when the 12 VDC side (+) of the power source is connected to pin G.

c. With the connection as in the preceding steps (+ on pin G, and – on pin B), the amber LEDs will illuminate when the ground (–) from the power source is also connected to pin G.

### 8.9.4 Overload Ground Fault (OGF)

**a. Operation**

The OGF is designed to detect current overload and fault to ground in the AC voltage circuits. The function of the OGF is to shut down the power supply (generator or standby) when current is over 40 amp for 2 seconds, or leakage to ground is more than 150mA.

Power, from SP52, energizes the OGF at terminal +12 V. The module is grounded by the microprocessor at the OV terminal through microprocessor terminal 1MP15.

This power also flows through the OGF normally closed contacts and the S+ terminal to the GENCONR relay, PSCONR relay and microprocessor terminal 2MP26. If an overload or excessive leakage to ground condition exists, the OGF contacts open to de–energize the relays and stop the flow of power to microprocessor terminal 2MP26. Loss of power at 2MP26 activates the A100 – "OVERLOAD/GROUND FAULT" alarm and illuminates the OGF mounted fault LED.

**b. OGF Checkout Procedure**

1. Check the FAULT LED on the module. If the LED is illuminated the module has activated and 12 VDC power supply is correct. Perform a megohm test (refer to Section 8.9.1) to determine if a fault to ground exists. This test will also help determine if an excessive current condition exists due to leakage to ground. Repair wiring or components as required.
2. If a problem with the module is suspected, check for 12VDC power to the module at the +12V terminal and ground at the OV terminal. Correct wiring as required. Reset module by placing the Main Power switch in the OFF position and then back in the desired position. Check for 12 VDC at the S+ terminal. If LED is off and the module normally closed connection is open, replace module.
3. If module is OK, check for 12 VDC at SP61 and wiring through to microprocessor terminals 2MP26, 4MP7 & 5MP7 as required.
4. If a problem with the current sensors is suspected, check sensor output. Current sensor inputs to the module are rated at 16.7mV per Amp. For every Amp that is read at the wires coming from the GENCON T1, T2 and T3 terminals with an amp meter, there should be a corresponding voltage reading on the blue, brown & orange wires to the black wire. For example: 20Amps = 0.33VAC.

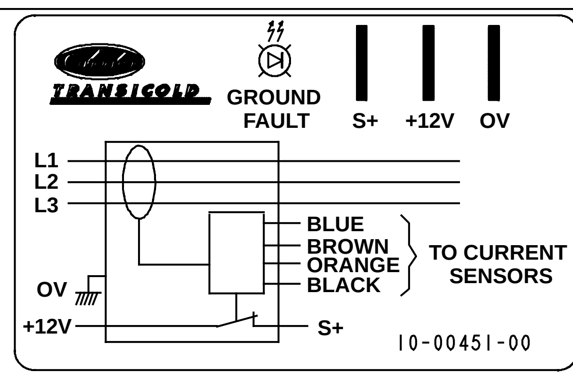



**Figure 8–37 Overload Ground Fault Connections**

### 8.9.5 Evaporator Heaters

**NOTE**

A good preliminary test of the heaters is to run a Pretrip and check for heater alarms

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Remove the lower back panel or coil cover as applicable.

c. To determine which heater assembly needs to be replaced , disconnect the suspect heater assembly and check pin to pin resistance. For heater resistance refer to Section 2.12.

d. Remove the Compartment 1 heater mounting brackets or, note location of and remove remote unit heater mounting clips.

e. Remove and replace faulty heater. If removing a drain pan heater, carefully remove heater from the clips on the drain pan.

f. When reinstalling Compartment 1 brackets torque to 6 to 7 ft/lbs (8.1 to 9.5 Nm). Rods should move freely from side to side when installed.

g. Route and secure electrical cables. For Compartment 1, route along the lower side of the heat exchanger at the 5 o'clock position (on the side closest to the evaporator coil). Ensure that all wires are clear of heaters.

### 8.9.6 Compartment 1 Evaporator Blower & Motor

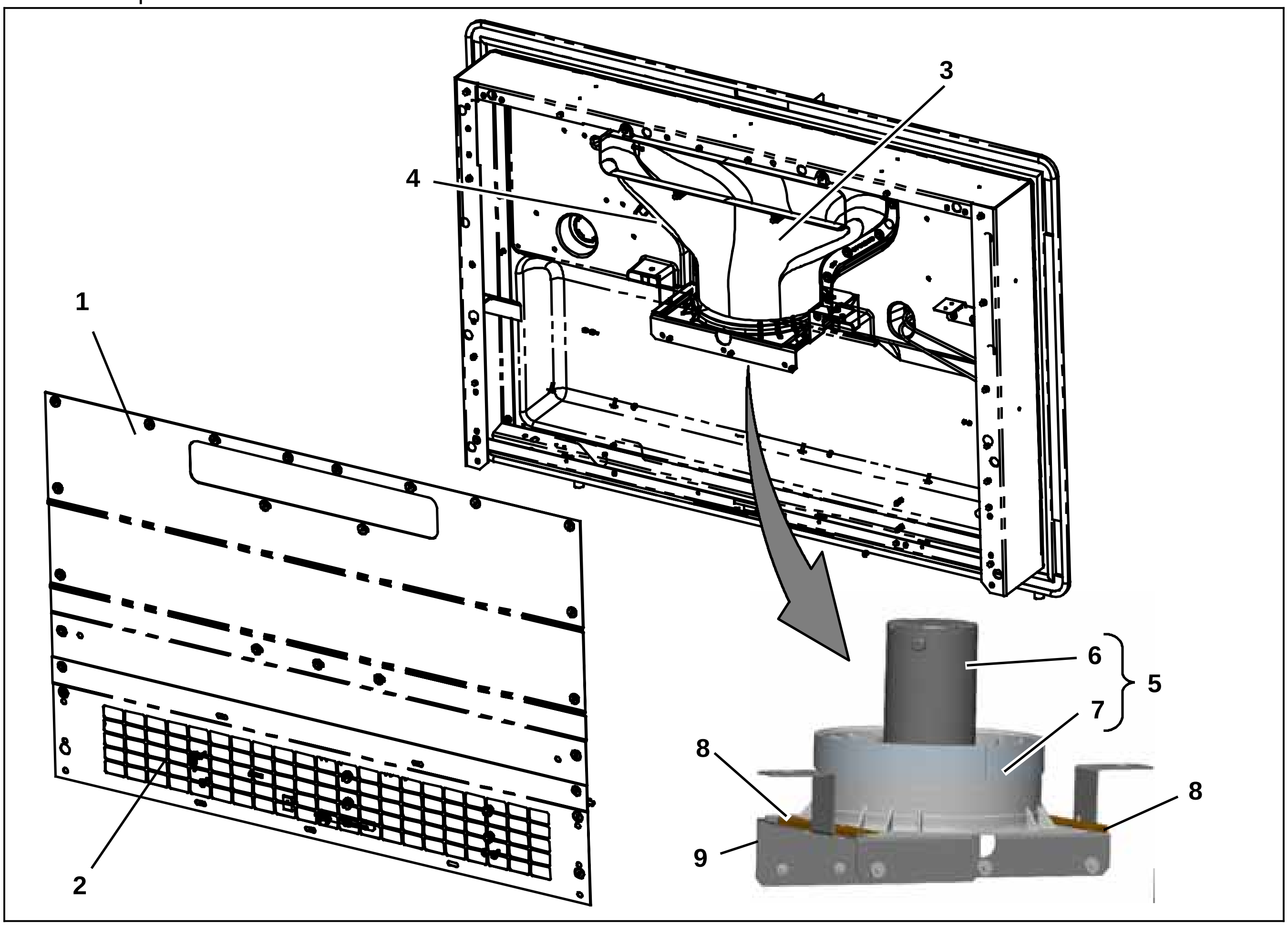
NOTE:

The blower motor bearings are factory sealed and do not require additional grease.

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. From inside of trailer, remove back panel and grille (see Figure 8-38).

c. Disconnect the motor electrical connector.




1. Access panel
2. grille
3. Nozzle
4. Supply Air Sensor
5. Blower Assembly
6. Motor
7. Stator
8. Mounting Brackets
9. Support Bracket

**Figure 8-38 Evaporator Blower Assembly**

d. Remove the supply air sensor and then remove the nozzle.

e. Loosen the four bolts on the underside of the support bracket that fasten the two mounting brackets.

f. Slide the blower assembly off the support bracket and out of the unit.

g. To remove the fan, loosen the nut holding the blade to the motor shaft using impact gun.

h. To remove motor remove four bolts that hold motor to the stator.

i. Complete the assembly in reverse order of removal. Coat motor shaft with never-seize before assembly. Torque:

| | |
|---|---|
| Fan Nut | 37 to 43 ft/lbs (50 to 58 Nm) |
| Motor Mounting Bolts | 5.5 to 7.5 ft/lbs (7.5 to 10 Nm) |
| Mounting Bracket Bolts | 5 to 7 ft/lbs (6.8 to 9.5 Nm) |

### 8.9.7 Condenser Fan Assemblies

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

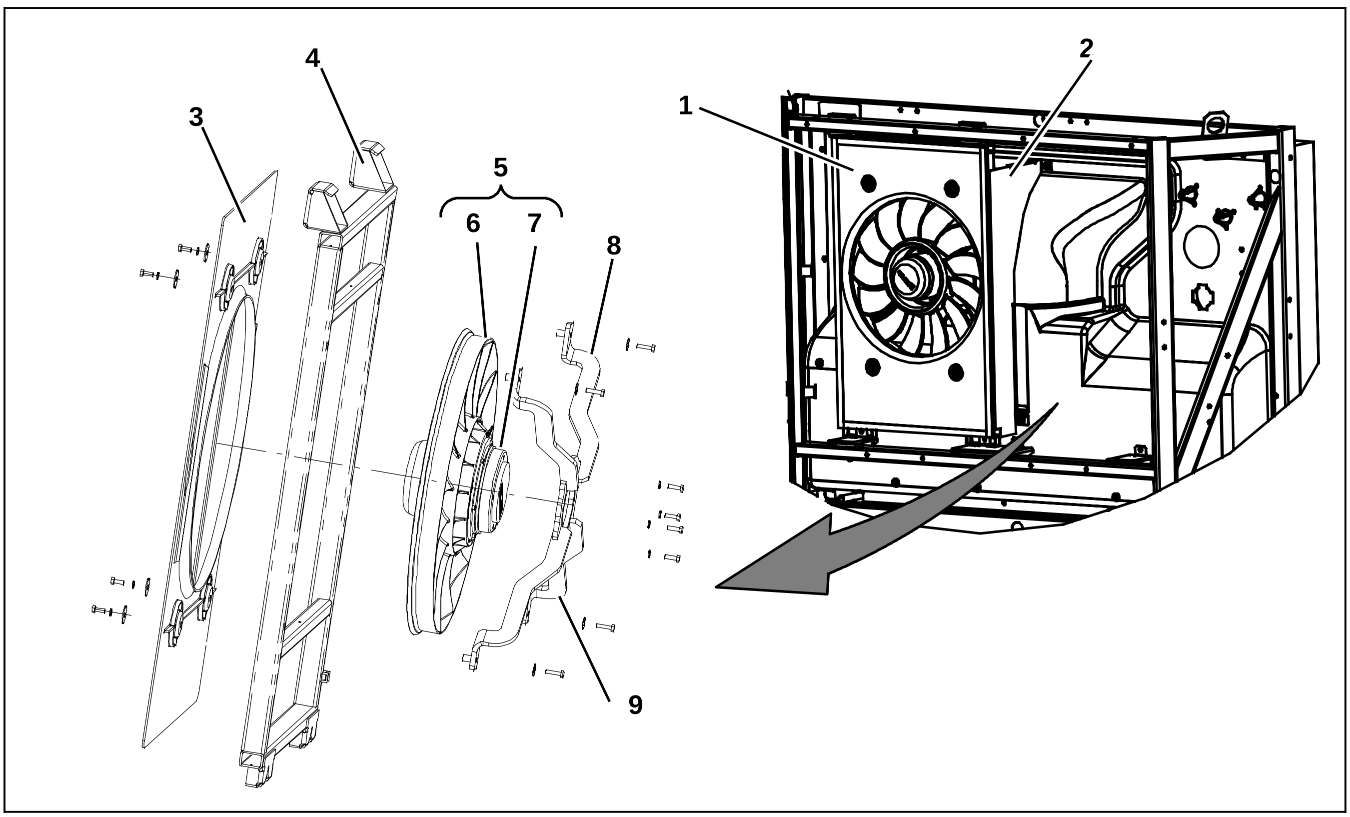
b. Disconnect the motor electrical connector. Note motor is assembled to allow routing of the wiring down the lower right hand leg of the welded support. See Figure 8-39

c. Remove the condenser fan assembly mounting bolts and slide the assembly out of unit. If required, the divider may be removed by removing the upper and lower mounting bolts.

d. Disassemble the fan and motor assembly from the mounting and then disassemble the fan from the motor as required.

e. Complete the assembly in reverse order of removal. When mounting fan & motor assembly, assemble so wire connector is in line with lower right welded support leg, see in Figure 8-39. Torque:

| | |
|---|---|
| Fan to motor bolts | 4 to 6 ft/lbs (5.5 to 6.8 Nm) |
| Fan & motor assembly to welded support bolts | 5 to 6 ft/lbs (6.8 to 8.1 Nm) |
| Welded support to frame bolts | 7 to 8 ft/lbs (9.5 to 10.8 Nm) |
| Shroud to frame and frame to unit bolts | 6 to 7 ft/lbs (8.1 to 9.5 Nm) |




1. Condenser Fan Assembly
2. Divider
3. Shroud
4. Frame
5. Fan & Motor Assembly
6. Fan
7. Motor
8. Welded Support
9. Wire Routing

**Figure 8-39 Condenser Fan Assembly**

### 8.9.8 Battery Charger (BTYC)

**NOTE**

A battery of known good condition must be connected to the charger before doing the following test.

The charger operates only when the input voltage is between 275 VAC and 640VAC. If either limit is exceeded it will not function. It should resume charging when the input voltage rises above 275–293 VAC or falls below 620–630 VAC.

a. Run the unit with the battery charger connected to the battery as usual.

b. Using a clamp–on ammeter, take a reading of the amperage on both output wires of the battery charger. If charging current is between 3 and 20 Amps, for 20 amp (single phase) chargers, or 3 and 40 amps, for 40 amp (three phase) chargers, the battery charger is functioning correctly.

c. If charging Amps = 0 check the AC input voltage to the charger. The AC input voltage range should be between 350 and 600 VAC.

d. If there is no AC voltage, ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

e. Check battery charger fuses and inspect fuse holder wire connections. Inspect plugs, pins and wires at charger connections.

f. If input voltage, wiring connections and the fuses are good, replace the battery charger.

### 8.9.9 Generator (GEN)

**a. Preventive Maintenance and Operating Precautions**

**WARNING**

**Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instructions, ensure the Main Power switch is in the OFF position and, whenever practical, disconnect the high voltage source and disconnect the negative battery connection.**

**WARNING**

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

**NOTE**

Always test suspect generators with a megohmmeter. (Refer to Section 8.9.1.)

**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.**

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.

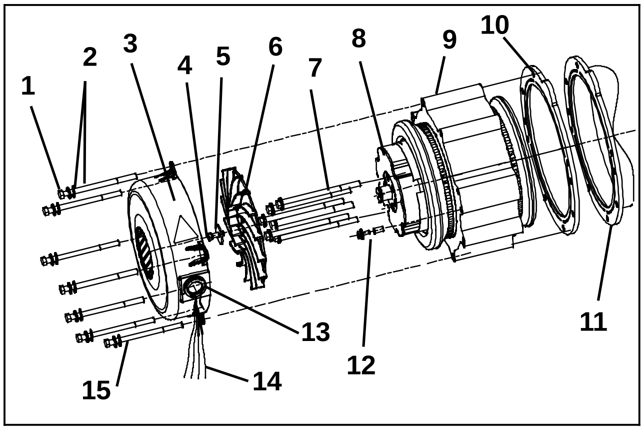
- **Drying the Generator Windings**

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.

Always test suspect motors, or generators described above, with a megohmmeter (Refer to Section 8.9.1). Do not set voltage higher than rating on wiring insulation in order not to prevent insulation breakdown during testing. Test each winding to ground, looking for very high megohmmeter readings. Also test each phase to phase winding looking for a low ohm reading but with equal reading across all phases.

**b. Generator Replacement**

Service procedures for replacement of the generator (see Figure 8–40) involve removal of components as required to swing the unidrive assembly out, from the generator end, sufficient to allow removal of the generator from the back of the engine. The procedures that follow cover the general steps required. Minor modifications of the procedures may be required depending on the routing of wires within the unit being serviced.




1. Bolt, Fan Cover/Stator
2. Washer, Cover/Stator (Two per bolt)
3. Fan Cover
4. Fan Mount Bolt
5. Fan Mount Washer
6. Fan
7. Bolt, Rotor
8. Rotor
9. Stator
10. Spacer
11. Engine
12. Harness Ground
13. Grommet
14. Generator Leads
15. Ground Strap Location

**Figure 8-40 Generator Assembly**

**c. Generator Removal**

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle, refer to Section NO TAG, SAFETY PROCEDURES - STANDBY POWER.

2. Remove the two center unit doors.

3. Working from the battery, disconnect the negative cable from the battery. If fitted, disconnect the microprocessor connectors at the positive and negative cable ends and remove the battery charger terminals at the positive cable end. Disconnect the positive battery cable from the battery. Remove any brackets securing the positive and negative cables to the unit (the brackets may remain clamped to the cables) and remove the positive connection at the starter. The cables may then be moved, out of the way.

4. Remove the tie wraps holding the generator connections to the frame mount.

5. Remove the hardware attaching the generator ground strap (Item 15, Figure 8-40) at the frame and the harness ground wire (12) at the back of the generator. The battery may then be removed.

6. If the bolts holding the upper unidrive snubber bracket to the back of the engine were not removed with the positive cable, remove the four bolts. Remove the snubber bolt and then remove the bracket from the unit.

7. If required, remove the bolts holding the battery charger(s) to the frame and slide the battery charger(s) out of the way.

8. Remove the two engine mounts at the generator end of the unidrive.

9. Remove the tie wraps holding the connectors to the intake hose at the intake manifold connection. Disconnect the the air intake hose from the intake manifold.

**Figure 8-41 Exhaust Connection Disassembly**

10. Remove the heat shield from the exhaust connection at the manifold (see Figure 8-41) and then remove the hardware holding the exhaust to the manifold.

11. Remove the engine end unidrive mount at the rear, (toward the trailer) and then loosen the remaining unidrive mount sufficient to allow the unidrive to rotate.


**Figure 8-42 Support Assembly Installation**

12. Install the support tool (Carrier Part Number 86-04751-00) under the back of the unidrive (see Figure 8-42). Secure the tool in place, so it will not

pull out as the unidrive is rotated, by installing a ½–13 bolt in the threaded hole provided.


**Figure 8–43 Locking Tool Installation**

13. To prepare for removal of the rotor bolts, install the flywheel locking tool (Carrier Part Number 07–60083–00). See Figure 8–43.

14. Swing the unidrive assembly out sufficient to remove the generator.

15. Remove the tape from the generator splice connections.

**TIP**

When cutting the generator splices, cut on the harness side, leaving just enough harness wire so that the wiring remaining on the old generator may be viewed later to determine color combinations required for reassembly.

16. Cut the generator splices from the harness.

**Figure 8–44 Fan Cover Disassembly**

17. Remove the hardware attaching the fan cover (see Figure 8–44) DO NOT remove the hardware attaching the stator to the engine at this time. Slide the generator wires out of the grommet while removing the cover.

**Figure 8–45 Fan Disassembly**

18. Remove the center mounting bolt and washer and then, remove the fan, see Figure 8–45.

**CAUTION**

**A mica shim (Carrier Transicold part number 54–00630–25) must be installed before removal of the generator. The generator is to be removed as one piece, with the shim in place. DO NOT attempt to remove the rotor from the stator.**

**NOTE**

Do not remove and use the shim from a replacement generator, the replacement generator shim must remain in place until the generator is installed.

**Figure 8–46 Generator Shim Installation**

19. Install the shim (Carrier Part Number 54–00630–25) between the rotor and stator. See Figure 8–46.

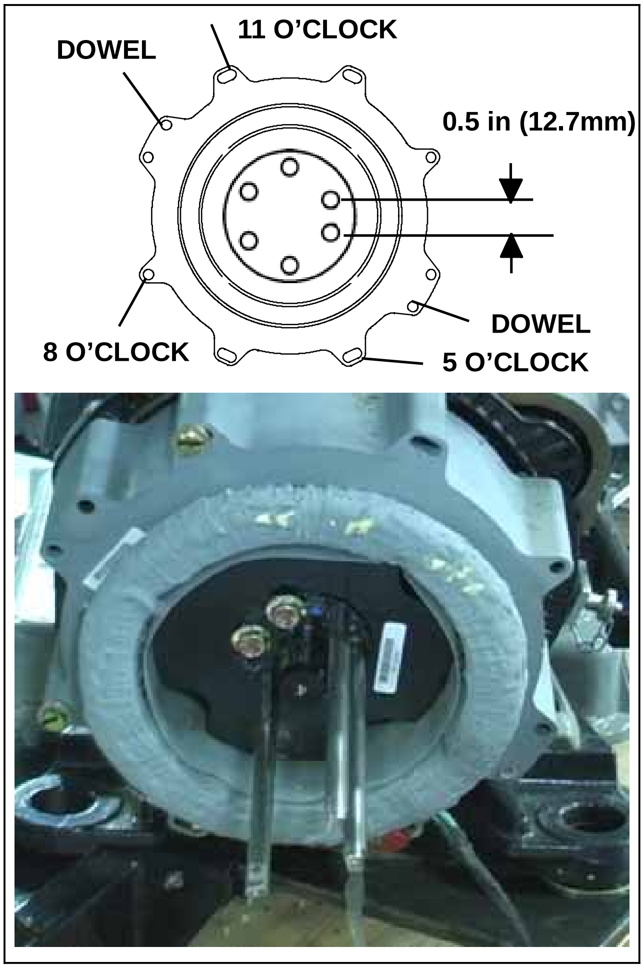



**Figure 8-47 Guide Rod Installation**

20. Note (see Figure 8-47) that two of the rotor bolts are indexed approximately 0.5 inch (12.7mm) apart while the remainder are approximately 0.75 inch apart. Remove the two indexed bolts and one bolt opposite their location and install the guide rods (Carrier Part Number SKM-5671). Snug the rods in position and then remove the three remaining rotor bolts.

**⚠ WARNING**

**NEVER dis-assemble the generator: HIGH MAGNETIC FIELD INSIDE! This field can interfere with cardiac implants such as pacemakers and defibrillators.**

21. Remove the stator bolt at the 11:00 o'clock position and install the lift tool (see Figure 8-48 = Carrier Part Number 07-60085-010). Remove the remaining stator bolts. Attach a lifting mechanism to the lifting tool. Take the weight off the generator and slide it back away from the engine sufficient to rotate the lifting tool lock (see Figure 8-48) in position. Once the lock is in position, remove the generator from the unit.

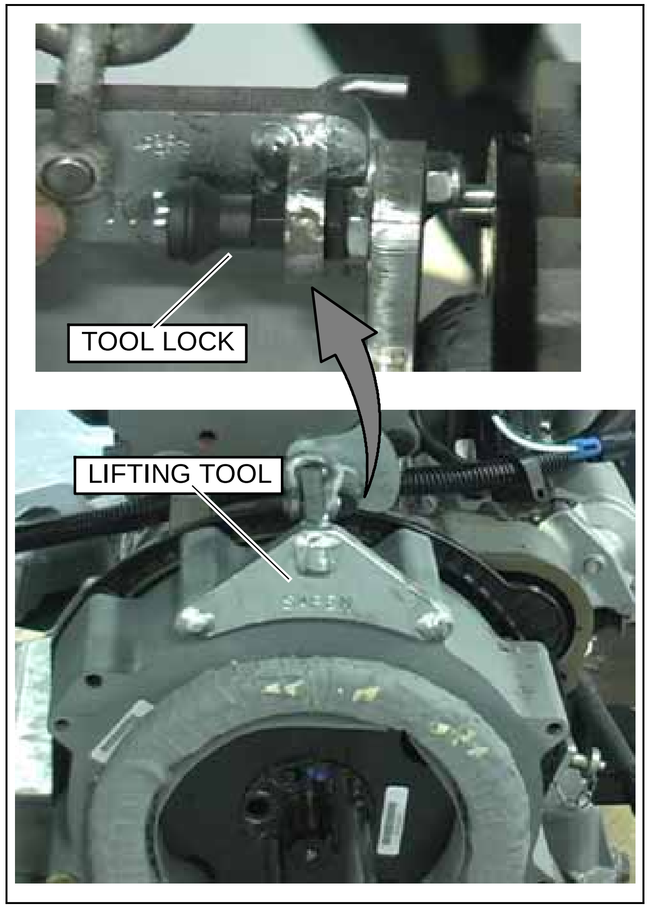



**Figure 8-48 Generator Lifting Tool Installation**

**d. Generator Assembly Procedure**

1. Verify the existence and condition of the two original dowel pins in the bell housing. (See Figure 8-47, CTD P/N 34-06210-00 - not included in the kit). If replacement is required, the pins are to be installed with the chamfer facing out.

**⚠ WARNING**

**NEVER dis-assemble the generator: HIGH MAGNETIC FIELD INSIDE! This field can interfere with cardiac implants such as pacemakers and defibrillators.**

2. Note the position of the indexed guide rods in relation to the indexed mounting holes in the replacement rotor.
   If the stator is not in correct alignment, back out the flywheel locking tool sufficient to allow the flywheel to rotate. Using a wrench on the front pulley bolt, turn the engine sufficient to allow aligning of the stator holes with the dowel pins.
   Slide the replacement generator on the guide rods and move towards the engine, aligning the stator on the dowel pins
   Rotate the lifting tool lock out of the way as the stator is brought onto the pins.
   Using new bolts (DO NOT reuse original bolts) install and snug three rotor bolts.
3. Using two flat washers on each, install the stator bolts at the 5 o'clock (ensure ground strap is in posi-

tion on this bolt) and 8 o'clock positions. Snug the bolts sufficient to hold the generator in place on the engine. Remove the lifting tool and then, using two flat washers install and snug the stator mounting bolt at the 11 o'clock position.

**Figure 8-49 Generator Rotor Bolt Installation**

4. If required, re-lock the flywheel. Using new bolts (DO NOT reuse original bolts), remove the guide rods and install the remaining three rotor bolts. Torque the six rotor bolts (see Figure 8-49), using an alternating pattern, to 45 ft/lbs (61 Nm) and then, final torque the bolts to 90 to 110 ft/lbs (122 to 149 Nm).

5. Remove the shim, install the fan (with the blades facing away from the engine - see Figure 8-44) and torque the fan bolt 10 to 12 ft/lbs(13.6 to 16.3 Nm). Remove the flywheel locking device.


Note: Green wire not shown

**Figure 8-50 Generator Wires**

6. Prepare the replacement generator power wires by installing four crimp splices (see Figure 8-50), one on each wire, and then route the wires through the cover grommet. Bring the cover in place, using two flat washers on each, install the remaining cover/stator bolts and torque all cover/stator and stator blots 33 to 37 ft/lbs (44.7 to 50.2 Nm).

7. Slide the unidrive assembly back in place,and then remove the engine support tool. Align, install and torque all four mounting bolts 90 to 120 ft/lbs (122 to 163 Nm).

8. Reinstall the snubber bracket in place and snug the mounting bolt.

| HARNESS | GENERATOR |
|---|---|
| GENCON L1/GEN VB (black) | GREY (VB) |
| GENCON L2/GEN UA (white) | BLACK (UA) |
| GENCON L3/GEN WC (red) | BROWN (WC) |
| GREEN (W/Red Tape) | GREEN |

**Figure 8-51 Generator/Harness Wire Connections**

9. Procure four pieces each ¼ inch and ½ inch heat shrink (Carrier Part Number 66U1-3803-01 and 66U1-3803). Slide one piece of each size onto the four generator wires. Install the harness wires into the prepared crimps on the generator wires and crimp in accordance with the color coded crimps saved from dis-assembly or Figure 8-51. Bring a ¼" heat shrink over the splice and heat until a small amount of glue seeps out from each end (sealing the connection), complete the connection by doing the same with the ½" heat shrink. Repeat to cover and seal all four splice connections.

**Figure 8-52 Generator Wire Tape Installation**

10. Complete wire installation by gathering the four wires (see Figure 8-52) and covering with tape (Carrier Part Number 02-00137-00). Refasten wiring in place to the frame mount.

11. Reconnect the air intake hose at the intake manifold connection. Refasten the connectors to the intake manifold connection.

12. Using new hardware, reinstall the exhaust to the manifold and torque hardware 22 to 24 ft/lbs (29.8 to 32.5 Nm). Reinstall the heat shield.

**Figure 8-53 Positive Starter Wire Installation**

13. Reinstall the positive & negative battery wires. When reinstalling the positive battery wire bracket at the snubber location, install the four bracket bolts and torque 24 to 30 ft/lbs (32.5 to 40.7 Nm). Then, torque the snubber bolt to 90 ft/lbs (122 Nm). When reinstalling the positive wire to the starter (see Figure 8-53), torque to 108 in/lbs (12.2 Nm).
14. Reinstall the hardware attaching the generator ground strap (Item 15, Figure 8-40) at the frame and the harness ground wire (12) at the back of the generator
15. Reinstall the battery charger(s).
16. If required, reconnect the microprocessor connectors at the positive and negative cable ends and reinstall the battery charger terminals at the positive cable end.
17. Reinstall the battery and battery cable connections.
18. Reinstall the doors
19. Remove the lockout/tagout equipment, start unit and run Pretrip

### 8.9.10 Sensor Checkout

An accurate ohmmeter must be used to check resistance values shown in Table 8-5 or Table 8-6.

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 the tables.

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 8–5 Sensor Resistance**

| Sensors AAT, 1RAT, 1SAT, ENCT, EVOT, CST, DTT, REMSN 1 & 2, 2DTT, 2RAT, 2SAT | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| °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 8–6 Sensor Resistance (CDT)

| °C | °F | Ohms | °C | °F | Ohms | °C | °F | Ohms | °C | °F | Ohms |
|---|---|---|---|---|---|---|---|---|---|---|---|
| –40 | –40 | 3,360,000 | 0 | 32 | 325,860 | 40.0 | 104 | 53,330 | 101.7 | 215 | 6,510 |
| –38.9 | –38 | 3,121,020 | 1.1 | 34 | 307,970 | 41.1 | 106 | 51,010 | 104.4 | 220 | 6,000 |
| –37.8 | –36 | 2,900,710 | 2.2 | 36 | 291,180 | 42.2 | 108 | 48,800 | 107.2 | 225 | 5,540 |
| –36.7 | –34 | 2,697,500 | 3.3 | 38 | 275,410 | 43.3 | 110 | 46,710 | 110.0 | 230 | 5,130 |
| –35.6 | –32 | 2,509,940 | 4.4 | 40 | 260,590 | 44.4 | 112 | 44,710 | 112.8 | 235 | 4,760 |
| –34.4 | –30 | 2,336,720 | 5.5 | 42 | 246,670 | 45.5 | 114 | 42,820 | 115.6 | 240 | 4,410 |
| –33.3 | –28 | 2,186,670 | 6.6 | 44 | 233,570 | 46.7 | 116 | 41,010 | 118.3 | 245 | 4,090 |
| –32.2 | –26 | 2,028,680 | 7.7 | 46 | 221,260 | 47.8 | 118 | 39,290 | 121.1 | 250 | 3,800 |
| –31.1 | –24 | 1,891,780 | 8.9 | 48 | 209,670 | 48.9 | 120 | 37,660 | 126.7 | 260 | 3,290 |
| –30 | –22 | 1,765,060 | 10 | 50 | 198,760 | 50.0 | 122 | 36,100 | 132.2 | 270 | 2,850 |
| –28.9 | –20 | 1,647,700 | 11.1 | 52 | 188,490 | 51.1 | 124 | 34,610 | 137.8 | 280 | 2,490 |
| –27.8 | –18 | 1,538,950 | 12.2 | 54 | 178,820 | 52.2 | 126 | 33,200 | 143.3 | 290 | 2,170 |
| –26.7 | –16 | 1,438,120 | 13.3 | 56 | 169,700 | 53.3 | 128 | 31,850 | 148.9 | 300 | 1,910 |
| –25.6 | –14 | 1,344,580 | 14.4 | 58 | 161,100 | 54.4 | 130 | 30,560 | 154.4 | 310 | 1,680 |
| –24.4 | –12 | 1,257,770 | 15.5 | 60 | 152,990 | 55.6 | 132 | 29,330 | 160.0 | 320 | 1,480 |
| –23.3 | –10 | 1,177,150 | 16.6 | 62 | 145,340 | 56.7 | 134 | 28,160 | 165.5 | 330 | 1,310 |
| –22.2 | –8 | 1,102,240 | 17.7 | 64 | 138,120 | 57.8 | 136 | 27,040 | 171.1 | 340 | 1,160 |
| –21.1 | –6 | 1,032,600 | 18.9 | 66 | 131,310 | 58.9 | 138 | 25,970 | 176.7 | 350 | 1,040 |
| –20 | –4 | 967,830 | 20.0 | 68 | 124,870 | 60.0 | 140 | 24,960 | 182.2 | 360 | 920 |
| –18.9 | –2 | 907,560 | 21.1 | 70 | 118,790 | 61.1 | 142 | 23,980 | 187.8 | 370 | 830 |
| –17.8 | 0 | 851,450 | 22.2 | 72 | 113,040 | 62.2 | 144 | 23,050 | 193.3 | 380 | 740 |
| –16.7 | 2 | 799,180 | 23.3 | 74 | 107,600 | 63.3 | 146 | 22,160 | 198.9 | 390 | 670 |
| –15.6 | 4 | 750,470 | 24.4 | 76 | 102,460 | 64.4 | 148 | 21,310 | 204.4 | 400 | 600 |
| –14.4 | 6 | 705,060 | 25.6 | 78 | 97,600 | 65.6 | 150 | 20,500 | 210.0 | 410 | 540 |
| –13.3 | 8 | 662,690 | 26.7 | 80 | 92,990 | 68.3 | 155 | 18,980 | 215.6 | 420 | 490 |
| –12.2 | 10 | 623,150 | 27.8 | 82 | 88,630 | 71.1 | 160 | 16,940 | 221.1 | 430 | 450 |
| –11.1 | 12 | 586,230 | 28.9 | 84 | 84,510 | 73.9 | 165 | 15,450 | 226.7 | 440 | 410 |
| –10.0 | 14 | 551,740 | 30.0 | 86 | 80,600 | 76.7 | 170 | 14,070 | 232.2 | 450 | 370 |
| –8.9 | 16 | 519,500 | 31.1 | 88 | 76,890 | 79.4 | 175 | 12,870 | 237.8 | 460 | 340 |
| –7.8 | 18 | 189,690 | 32.2 | 90 | 73,380 | 82.2 | 180 | 11,750 | 243.3 | 470 | 310 |
| –6.7 | 20 | 461,170 | 33.3 | 92 | 70,040 | 85.0 | 185 | 10,750 | 248.9 | 480 | 280 |
| –5.6 | 22 | 434,790 | 34.4 | 94 | 66,880 | 87.8 | 190 | 9,870 | 254.4 | 490 | 260 |
| –4.4 | 24 | 410,080 | 35.6 | 96 | 63,880 | 90.6 | 195 | 9,050 | 260.0 | 500 | 240 |
| –3.3 | 26 | 386,940 | 36.7 | 98 | 61,040 | 93.3 | 200 | 8,320 | | | |
| –2.2 | 28 | 365,260 | 37.8 | 100 | 58,330 | 96.1 | 205 | 7,650 | | | |
| –1.1 | 30 | 344,930 | 38.9 | 102 | 55,770 | 98.9 | 210 | 7,050 | | | |

Table 8-7 Temperature Pressure Chart

| 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 |

# SECTION 9 – UNIT TROUBLESHOOTING

# SECTION 9

# UNIT TROUBLESHOOTING

**CAUTION**

**Under no circumstances should anyone attempt to repair the keypad, display or internal control module components. Should a problem develop with these components, contact your nearest Carrier Transicold dealer for replacement.**

**NOTE**

Run a Pretrip and check all active alarms before continuing with troubleshooting.

## 9.1 ENGINE

| Indication/Trouble | Possible Causes | Action/Reference Section |
|---|---|---|
| **NOTE: Refer to section 9.5 for electronic speed control system diagnoses** | | |
| **9.1.1 Engine Will Not Start** | | |
| Starter motor will not crank or low cranking speed | Battery insufficiently charged | 9.2 |
| | 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 |
| | Internal generator damage | 8.9.9 |
| Starter motor cranks but engine fails to start | No fuel in tank | Check |
| | Air in fuel system | 8.5.2 |
| | Water in fuel system | Drain Sump & 8.5.5 |
| | Plugged fuel filter | 8.5.5 |
| | Plugged inlet screen to mechanical pump. | 8.5.3 |
| | Plugged inlet screen to electric pump. | 8.5.4 |
| | Plugged fuel lines to injector(s) | Check |
| | ESC defective | 9.5 |
| | Intake air heater defective | 8.5.10 |
| Starter cranks, engages, but dies after a few seconds | Incorrect grade of lubricating oil | 2.9 |
| | Voltage drop in battery cable(s) | Check |
| | ESC defective | 9.5 |

| Indication/Trouble | Possible Causes | Action/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 Manual |
| | Plugged fuel filter | 8.5.5 |
| | Plugged inlet screen to mechanical pump. | 8.5.3 |
| | Plugged inlet screen to electric pump. | 8.5.4 |
| | Injector nozzle(s) defective | Engine Manual |
| | Injection pump defective | Engine Manual |
| | Air cleaner or hose restricted | 8.5.9 |
| | Safety device open | 2.14 |
| | ESC defective | 9.5 |
| | Electric fuel pump malfunction | 8.5.4 |
| | Mechanical fuel pump malfunction | Engine Manual |
| | Oil pressure switch defective | Replace |
| **9.1.3 Engine Will Not Shut Off** | | |
| Engine will not shut off | ESC operation defective | 9.5 |
| **9.1.4 Starter Motor Malfunction** | | |
| Starter motor will not crank or turns slowly | Battery insufficiently charged | 9.2 |
| | 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 |
| | Incorrect grade of lubricating oil | 2.9 |
| Starter motor turns but pinion does not engage | Pinion or ring gear obstructed or worn | Clean both, remove burrs, or replace |
| Starter motor does not disengage after engine starts | Starter motor solenoid defective | Engine Manual |
| | 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 |
| | ESC defective | 9.5 |
| | No power to Starter Solenoid connector | 9.5 |

| Indication/Trouble | Possible Causes | Action/Reference Section |
|---|---|---|
| **9.1.6 Miscellaneous Engine Troubleshooting** | | |
| Loss of power | Air cleaner or hose restricted | 8.5.9 |
| | Air in fuel system | 8.5.2 |
| | Air vent restricted in fuel tank cap | 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 | Air cleaner or hose restricted | 8.5.9 |
| | Exhaust pipe restriction | Remove |
| | Restriction in water jacket | Engine Manual |
| | Restriction in radiator | 8.5.12 |
| | Coolant level too low | 8.5.12 |
| | Loose water pump | Engine Manual |
| | Defective thermostat | Engine Manual |
| | Defective water pump / belt | Engine Manual |
| Excessive crankcase pressure | Plugged crankcase breather | 8.5.14 |

## 9.2 BATTERY CHARGER

| Indication/Trouble | Possible Causes | Action/Reference Section |
|---|---|---|
| F7 or F8 or F29 (if applicable) fuse blows | Short in 12 volt wiring causing overload of charger | 8.9.8 |
| | Internal short | 8.9.8 |
| Charging rate does not taper back after charging for a few minutes of engine crank | Bad cell in battery | Test battery for defect according to battery manufacturer's instructions |
| | Defective charger | Replace |
| Charger does not charge | Open F7 or F8or F29 (if applicable) | Replace. |
| | Charger is not receiving AC input | 8.9.8 |
| | 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 |

## 9.3 GENERATOR

| Indication/Trouble | Possible Causes | Action/Reference Section |
|---|---|---|
| No voltage with engine running | Damaged harness | Check |
| | GENCON damaged | Check |
| | Open or short in stator windings | Check |
| Low voltage | Low engine speed | Correct |
| | Excessive load | Check |
| | High resistance connections – connections warm or hot | Clean and Tighten |
| Fluctuating voltage | Fluctuating speed | 9.5 |
| | Irregular speed of engine | 9.5 |
| | Loose terminal or load connections | Tighten |
| High voltage | Excessive engine speed | 9.5 |
| Overheating | Generator overloaded | Check |
| | Clogged ventilation openings | Clean |
| | Insufficient circulation | Check Fan |
| | Unbalanced load | Balance |
| Mechanical Noise | Loose laminations | 8.9.9 |

## 9.4 REFRIGERATION / TEMPERATURE CONTROL

| Indication/Trouble | Possible Causes | Action/Reference Section |
|---|---|---|
| **9.4.1 Unit Will Not Cool** | | |
| Compressor malfunction | Compressor contactor or relay defective | Check |
| | Compressor defective | 8.7.1 |
| Refrigeration system | A defrost cycle did not terminate. Check Compartment DTT | 8.9.10 |
| | Abnormal pressure | 9.4.8 |
| | Check system for noncondensibles | 8.6.2 |
| **9.4.2 Unit Runs But Has Insufficient Cooling** | | |
| Compressor | Compressor internal damage | 8.7.1 |
| | Unloader malfunction | 8.7.6 |
| Refrigeration system | Abnormal pressure | 9.4.8 |
| | Unloader malfunction | 8.7.6 |
| | Expansion valve malfunction | 9.4.11/9.4.12 |
| | No or restricted evaporator airflow | 9.4.10 |
| | Suction Modulation Valve malfunction | 8.8.5 |
| | Check system for noncondensibles | 8.6.2 |
| **9.4.3 Unit Operates Long Or Continuously In Cooling** | | |
| Refrigerated Compartment | Hot Load | Allow time to pull down |
| | Defective or insufficient refrigerated compartment insulation or air leak | Correct |
| Refrigeration system | Abnormal pressure | 9.4.8 |
| | Temperature sensor malfunction | 8.9.10 |
| | Check system for noncondensibles | 8.6.2 |
| Compressor | Defective | 8.7.1 |

| Indication/Trouble | Possible Causes | Action/Reference Section |
|---|---|---|
| **9.4.4 Unit Will Not Terminate Cooling** | | |
| Unit fails to stop cooling | Temperature sensor malfunction | 8.9.10 |
| | Contactor (CCON) stuck closed | Check |
| | Microprocessor improperly set | Check setpoint Check whether microprocessor is set at °C or °F |
| **9.4.5 Unit Will Not Heat Or Has Insufficient Heating** | | |
| Unit will not heat or has insufficient heat | Heater(s) defective | 8.9.5 |
| | Heater contactors or coil defective | Replace |
| | Defective wiring / connectors | Replace |
| | Loose terminal connections | Tighten |
| | Low voltage | 9.3 |
| | No or restricted air flow | 9.4.10 |
| | Temperature sensor malfunction | 8.9.10 |
| | Compressor contactor stuck closed | Check |
| **9.4.6 Unit Will Not Terminate Heating** | | |
| Unit fails to stop heating | Microprocessor temperature improperly set | Reset |
| | Microprocessor malfunction | 9.6 |
| | Temperature sensor malfunction | 8.9.10 |
| **9.4.7 Defrost Cycle Malfunction** | | |
| Will not initiate defrost automatically | Defrost timer has not expired | Check/Reset |
| | Defrost air switch (DAS) malfunction | 8.8.9 |
| | A Compartment DTT is above 40_F (4.4_C) | Cool Down |
| | Loose terminal connections (DAS) | Tighten |
| Will not initiate defrost manually | Keypad defective | 8.4.4 |
| | Loose terminal connections between keypad and microprocessor | Tighten |
| | A compartment DTT is above 40_F (4.4_C) | Cool 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 | 8.9.5 |
| | Evaporator fan contactor stuck closed | Check |
| Frequent defrost | Defrost air switch (DAS) out of adjustment | 8.8.9 |
| | Wet load | Normal |
| Does not terminate or cycles on defrost. | Defrost air switch (DAS) out of adjustment | 8.8.9 |
| | DTT malfunction | 8.9.10 |
| Refrigerated Compartment | Hot Load | Allow time to pull down |
| | Defective or insufficient refrigerated compartment insulation or air leak | Correct |

| INDICATION/ TROUBLE | Possible Causes | Action/Reference Section |
|---|---|---|
| **9.4.8 Abnormal Pressure** | | |
| High discharge pressure | Condenser coil dirty | 8.8.2 |
| | Condenser fans rotating backwards | Check Wiring |
| | Condenser fan inoperative | Check |
| | Refrigerant overcharge or noncondensibles | 8.6.2 |
| | Discharge service valve partially closed | Open |
| Low discharge pressure | Compressor valves(s) worn or broken | 8.7.1 |
| | Low refrigerant charge | 8.6.2 |
| | Suction modulation valve malfunction | 8.8.5 |
| Low suction pressure | Filter-drier partially plugged | 8.8.3 |
| | Low refrigerant charge | 8.6.2 |
| | Expansion valve malfunction | 9.4.11/9.4.12 |
| | Liquid line solenoid valve malfunction | 8.8.10 |
| | No evaporator air flow or restricted air flow | 9.4.10 |
| | Excessive frost on evaporator coil | 9.4.7 |
| | Evaporator fan rotating backwards | Check Wiring |
| | Suction modulation valve malfunction | 8.8.5 |
| | Liquid or suction line service valve partially closed | Open |
| High suction pressure | Compressor valves(s) worn or broken | 8.7.1 |
| | Compressor gasket(s) defective | 8.7.1 |
| | Heater contactor stuck closed | Check |
| Suction and discharge pressures tend to equalize when unit is operating | Compressor valves defective | 8.7.1 |
| | Compressor gasket(s) defective | 8.7.1 |
| **9.4.9 Abnormal Noise** | | |
| Compressor | Loose mounting bolts | Tighten |
| | Worn bearings | 8.7.1 |
| | Worn or broken valves | 8.7.1 |
| | Liquid slugging | 9.4.11/9.4.12 |
| | Insufficient oil | 8.7.5 |
| Condenser or evaporator fan | Loose or striking shroud | Check |
| | Bearings defective | 8.9.6/8.9.7 |
| | Bent shaft | 8.9.6/8.9.7 |
| Water pump belt | Cracked or worn | Replace |
| **9.4.10 No Evaporator Air Flow Or Restricted Air Flow** | | |
| Evaporator coil blocked | Frost on coil | 8.8.9 |
| | Dirty coil | 8.8.1 |
| No or partial evaporator air flow | Evaporator fan loose or defective | 8.9.6 |
| | Evaporator fan rotating backwards | 8.9.6 |
| | Evaporator air flow blocked in refrigerated compartment | Check |

| Indication/Trouble | Possible Causes | Action/Reference Section |
|---|---|---|
| **9.4.11 Electronic Expansion Valve (EVXV) Malfunction** | | |
| EVXV not controlling correctly (Compartment 1 only) | Low refrigerant charge | 8.6.2 |
| | EVOT defective | 8.9.10 |
| | EVOP defective | 8.8.8 |
| | Coil not seated properly on valve | Check |
| | EVXV inlet screen plugged | Check and Replace |
| | Loose connector | Check and Tighten |
| **9.4.12 Thermal Expansion Valve (TXV) Malfunction** | | |
| TXV not controlling correctly (Compartment 2 or 3) | Low refrigerant charge | 8.6.2 |
| | External equalizer line plugged | Clean |
| | Ice formation at valve seat | 8.6.4 |
| | Wax or dirt plugging the valve or orifice | 8.8.11 |
| | Broken capillary/Loss of bulb charge | 8.8.11 |
| | Superheat setting too high | 8.8.11 |
| **9.4.13 Compressor Suction Modulation Valve (CSMV) Malfunction** | | |
| CSMV not controlling correctly | Coil not seated properly | Check |
| | Coil defective | 8.8.5 |
| | Loose connector | Check and Tighten |
| | CST defective | 8.9.10 |
| | CSP defective | 8.8.8 |
| | CDT defective | 8.9.10 |
| | CDP defective | 8.8.8 |

## 9.5 Speed Control System Diagnostics

**Table 9–1 ENSCU LED Fault Chart**

| | Fault | LED flash code | Diagnostic tree |
|---|---|---|---|
| 1 | Engine Over Speed: more than 2,530 RPM | One Long–One Short | Figure 9–1 |
| 2 | No signal from ENSSN for 2 seconds after RPM is greater than 1,000 RPM for 10 seconds, **OR** for 5 seconds while engine cranking (no voltage at ENSCU pin 18). | Two Long–One Short | Figure 9–2 |
| 3 | Fuel/speed actuator (FSA) wiring disconnected or open circuit. Coil Resistance Spec: 2.8 ohm +/- 10%. | Two Long–Three Short | Figure 9–3 |
| 4 | ENSCU supply voltage is greater than 26V. | Two Long–Seven Short | Figure 9–4 |

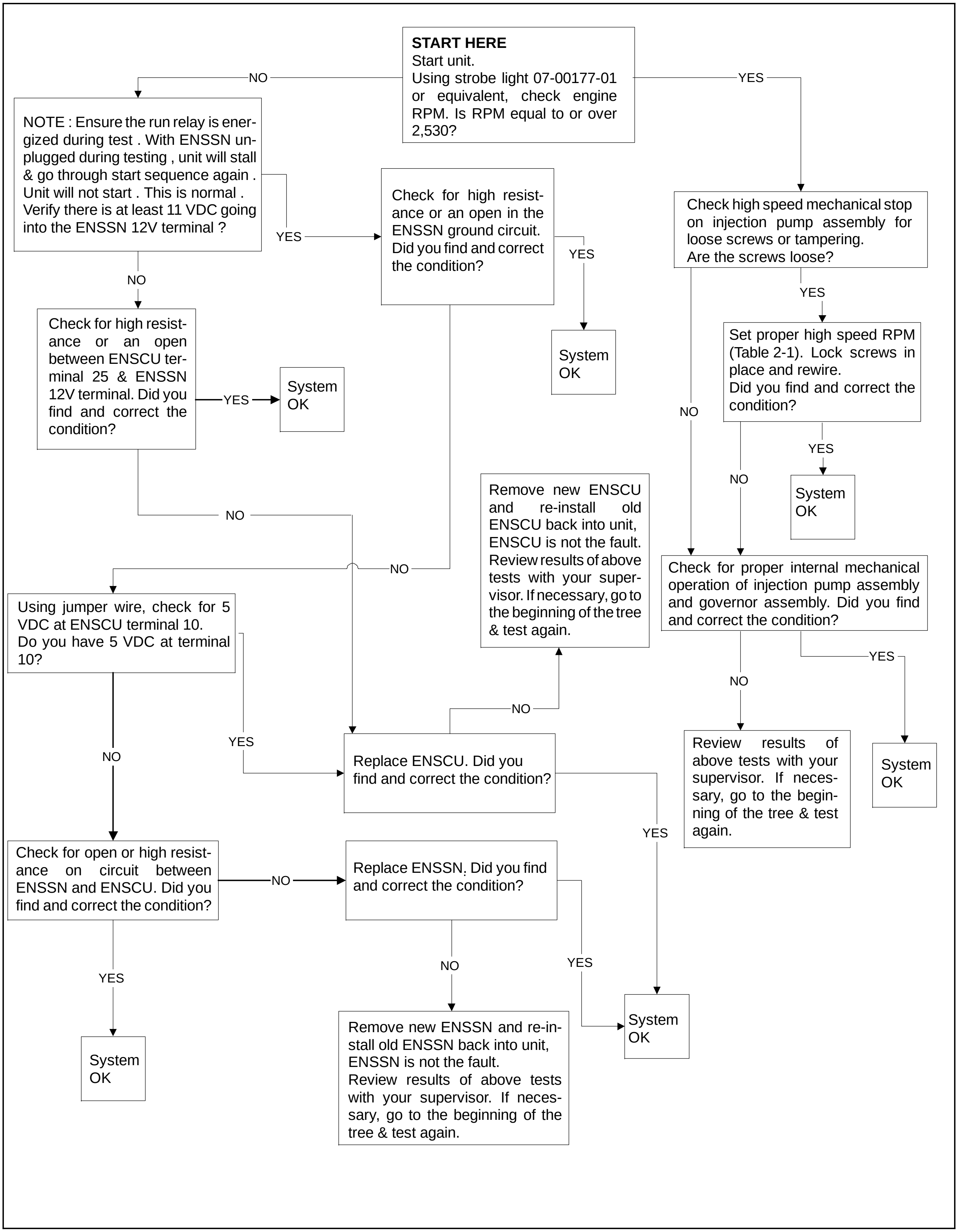



**Figure 9-1 ENSCU Diagnostic Tree - 1 Long, 1 Short LED Code**

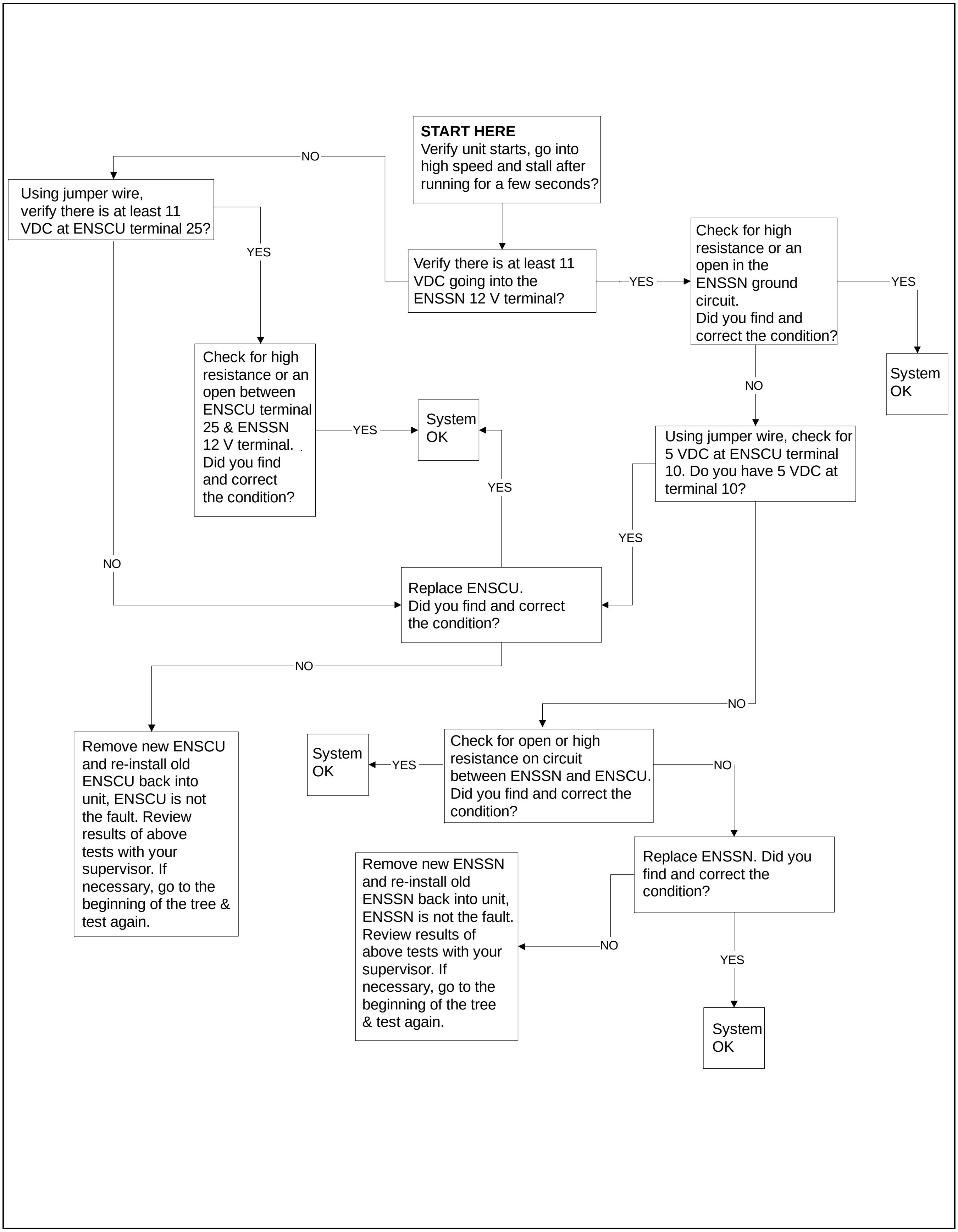



**Figure 9-2 ENSCU Diagnostic Tree – 2 Long, 1 Short LED Code**

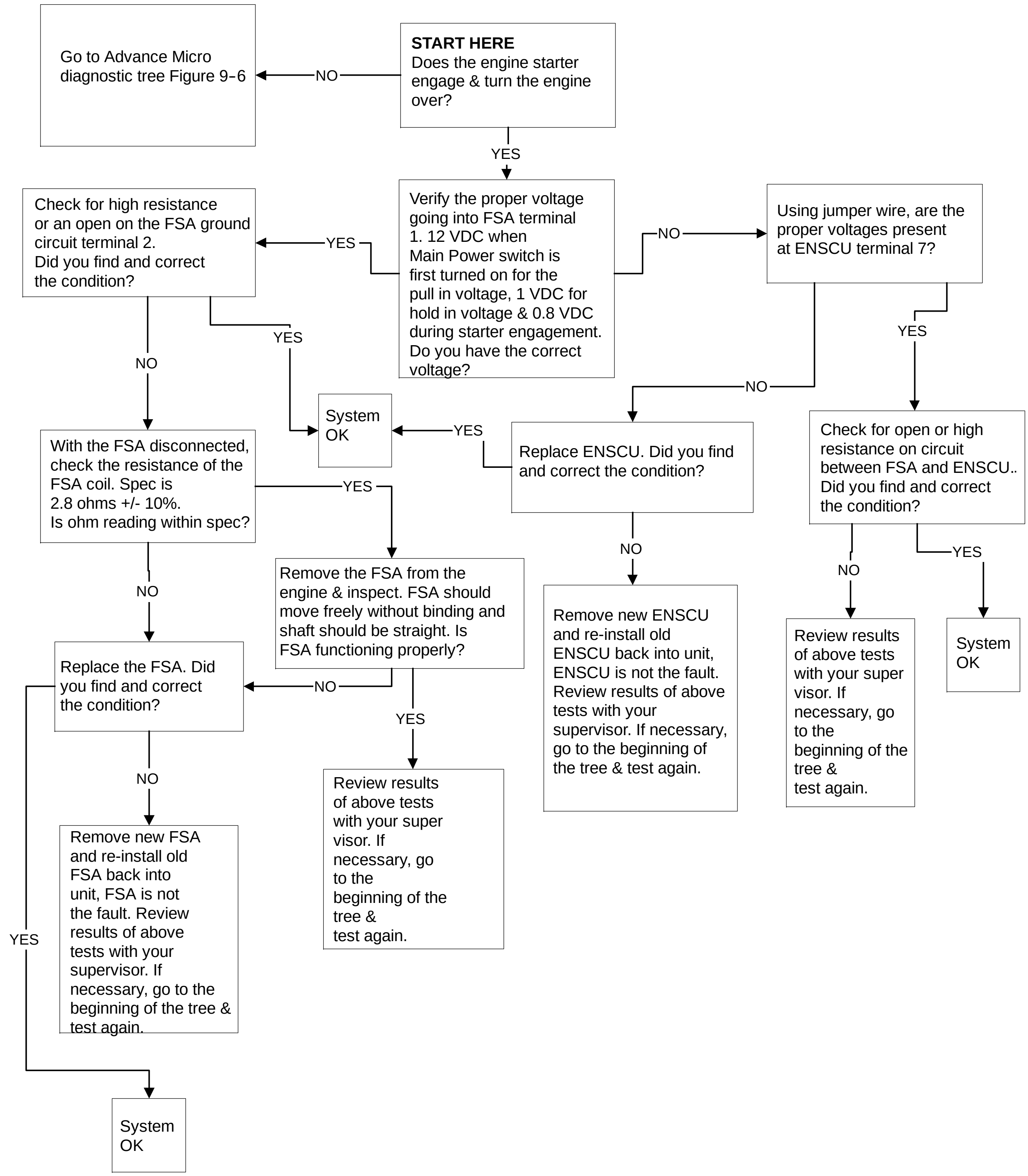



**Figure 9-3 ENSCU Diagnostic Tree – 2 Long, 3 Short LED Code**

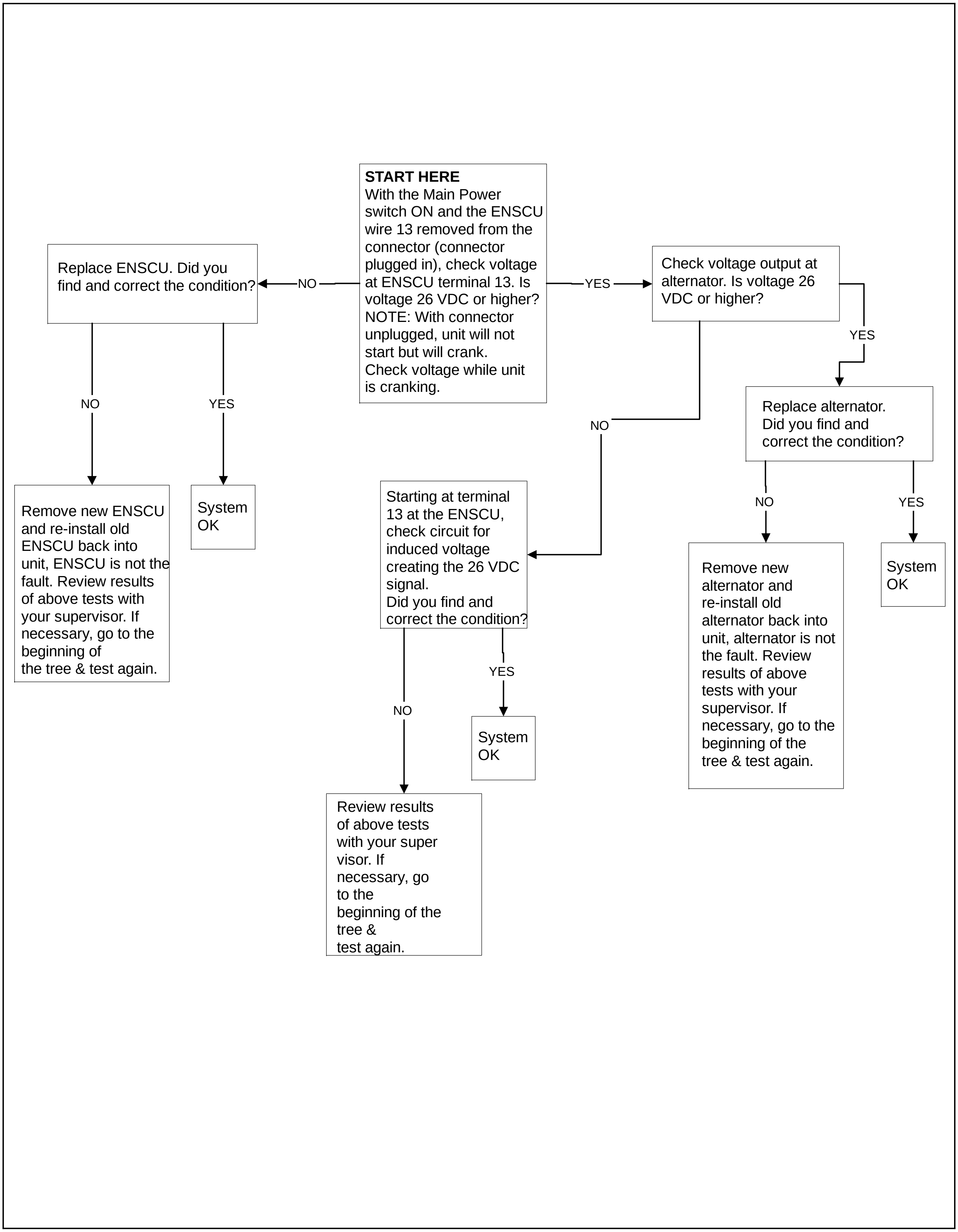



**Figure 9–4 ENSCU Diagnostic Tree – 2 Long, 7 Short LED Code**

## 9.6 Microprocessor Diagnostics

The purpose of the following procedure is to provide a logical and straightforward guide to be used when diagnosing operational or other problems occurring with the microprocessor. Often users and technicians have mistakenly worked to correct a problem that has ended up being normal operation. The microprocessor has several different conditions contributing to operating parameters. These conditions are called out in the various diagnostic charts to aid the technician in pinpointing the problem, or in realizing that the unit is performing normally.

When using these trees, it is important to verify the reported symptom or problem and then correctly identify the appropriate tree for that particular condition. Using the incorrect tree will lead to an incorrect diagnosis.

When using these diagnostic trees, it is very important not to skip any steps. Follow the flow of the trees in the order that they are laid out. These trees are formatted into a logical diagnostic sequence. Skipping around the trees will most likely lead to errors in diagnosis.

Throughout the trees, the steps will point the technician to areas to look at or check for a problem. Most of the steps will lead the technician to a circuit or other area of the unit to check, test, and possibly repair other than the microprocessor. Some steps will point to a possible problem with the microprocessor. Whenever reaching one of these steps, it is a very good practice to install the new microprocessor, then verify unit operation PRIOR TO writing hours, Trailer ID, Unit Serial Number, etc., into the new microprocessor. Once the technician is satisfied that a new microprocessor is required, the hours, trailer ID, unit serial number, customer configurations, etc., should be entered. Should the problem remain even with the new microprocessor in place, once all repairs are made, the original microprocessor is to be reinstalled into the unit, to avoid unnecessary costs to the customer or having the Warranty Request rejected if there is no problem found with the returned microprocessor.

All steps leading to replacement of the microprocessor have a number associated with them. When filling out the MPR tag that will be attached to the returned part, write the step number on the upper half of the tag in the Failure Description Field. Include the same information in the Failure Description Field when entering the warranty claim information on line. This will show which diagnostic tree was used and the path that was followed to determine the micro was at fault.

Refer to the following table to identify the correct tree to use.

**Table 9-2 Microprocessor Diagnostics**

| Condition | Description | Diagnostic tree |
|---|---|---|
| 1 | Main Power switch On - Unit Does Not Operate | Figure 9-5 |
| 2 | Main Power switch On - Unit Operates But Not Properly | Figure 9-6 |
| 3 | Main Power switch Off - Unit Fails To Stop | Figure 9-7 |
| 4 | Unit Will Not Run In High Speed | Figure 9-8 |
| 5 | Unit Will Not Run In Low Speed | Figure 9-9 |
| 6 | DataLink Data Recorder Data Download Problems When Using ReeferManager and a Download Cable. Data File Analysis Problems Using Reports | Figure 9-10 |
| 7 | PC Card Problems | Figure 9-11 |
| 8 | Programming Problems With PC Cards | Figure 9-12 |

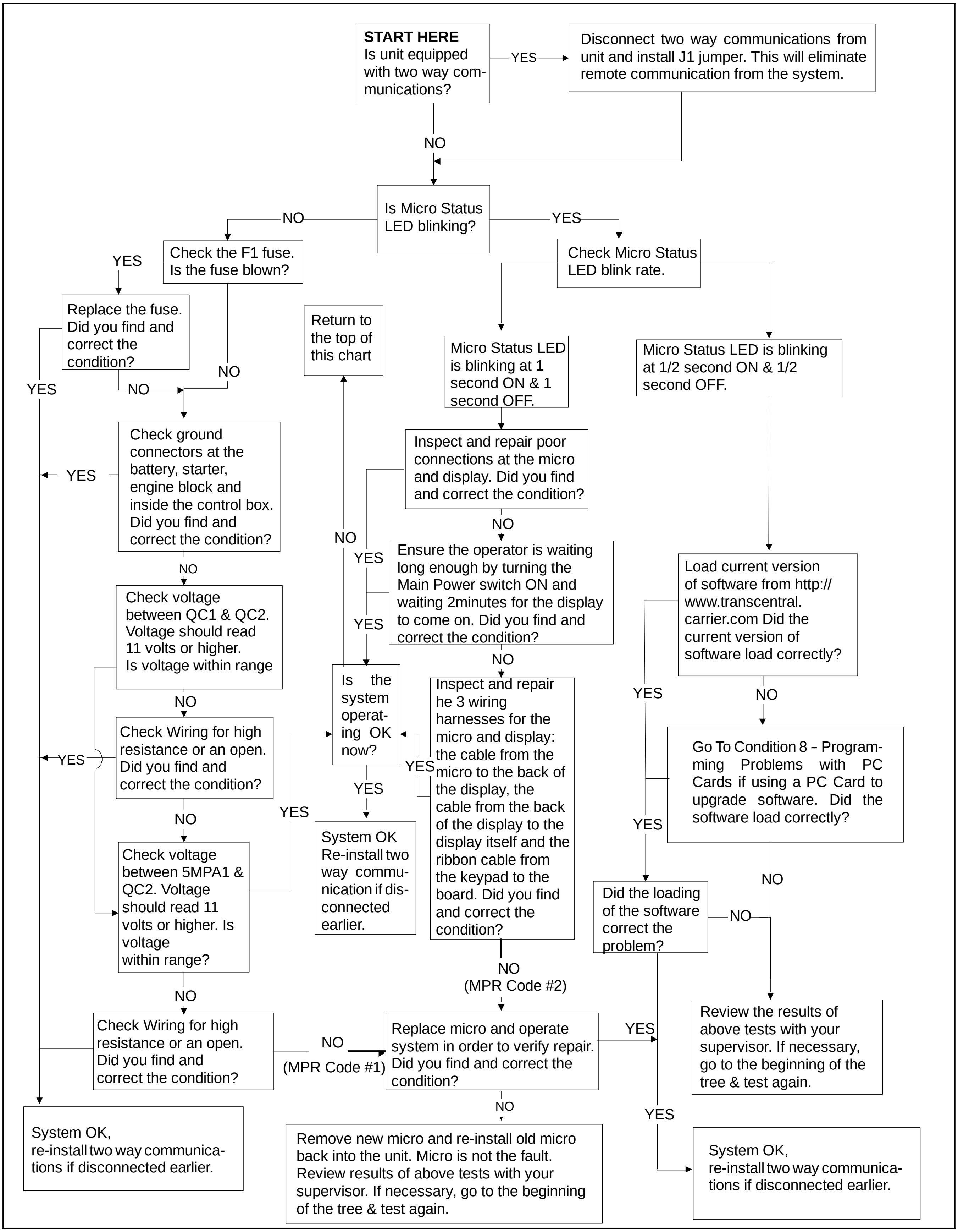



**Figure 9–5 Micro Diagnostic Tree – Cond. 1 – Main Power Switch On – Unit Does Not Operate**

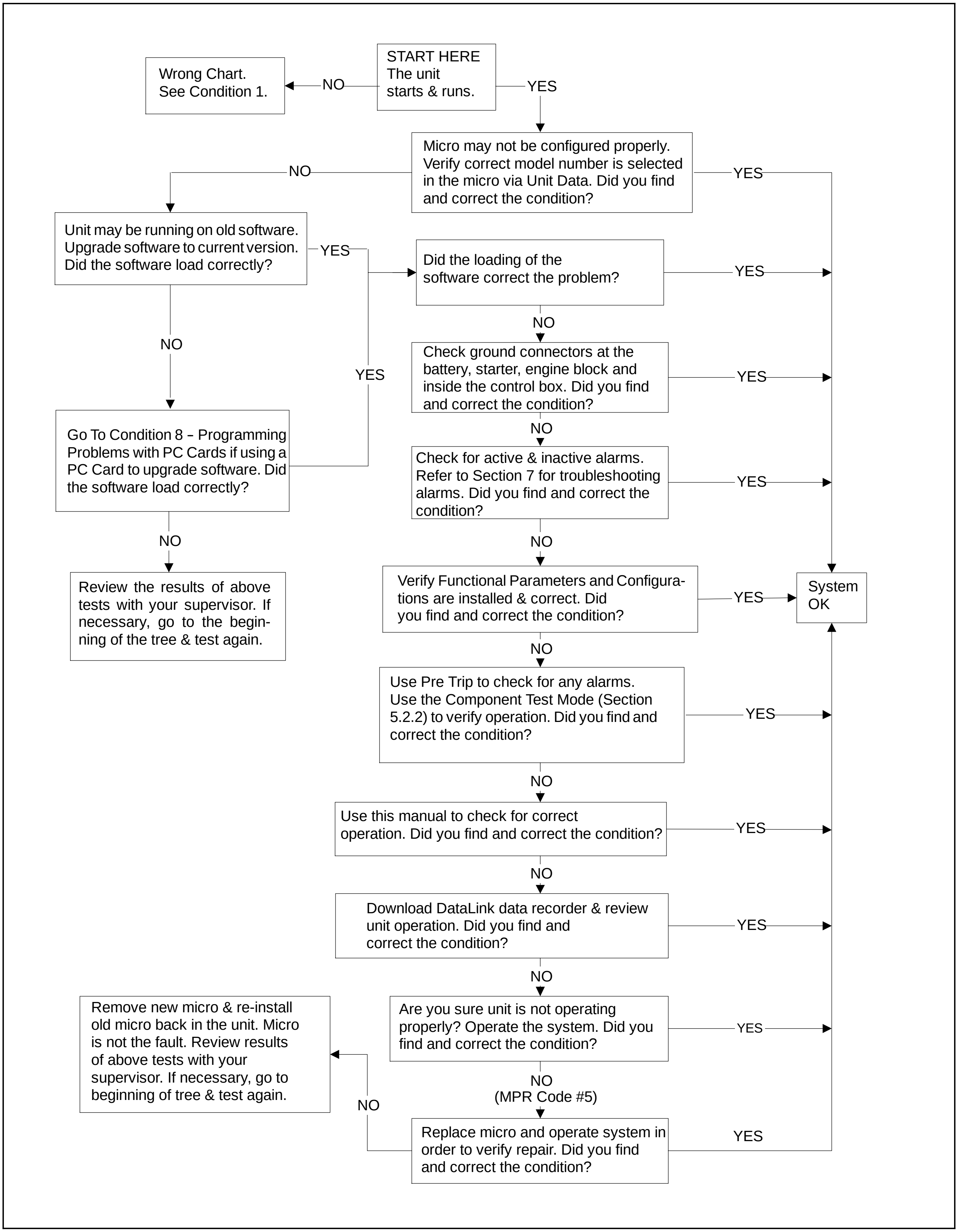



**Figure 9-6 Micro Diagnostic Tree – Cond. 2 – Main Power Switch On – Unit Operates But Not Properly**

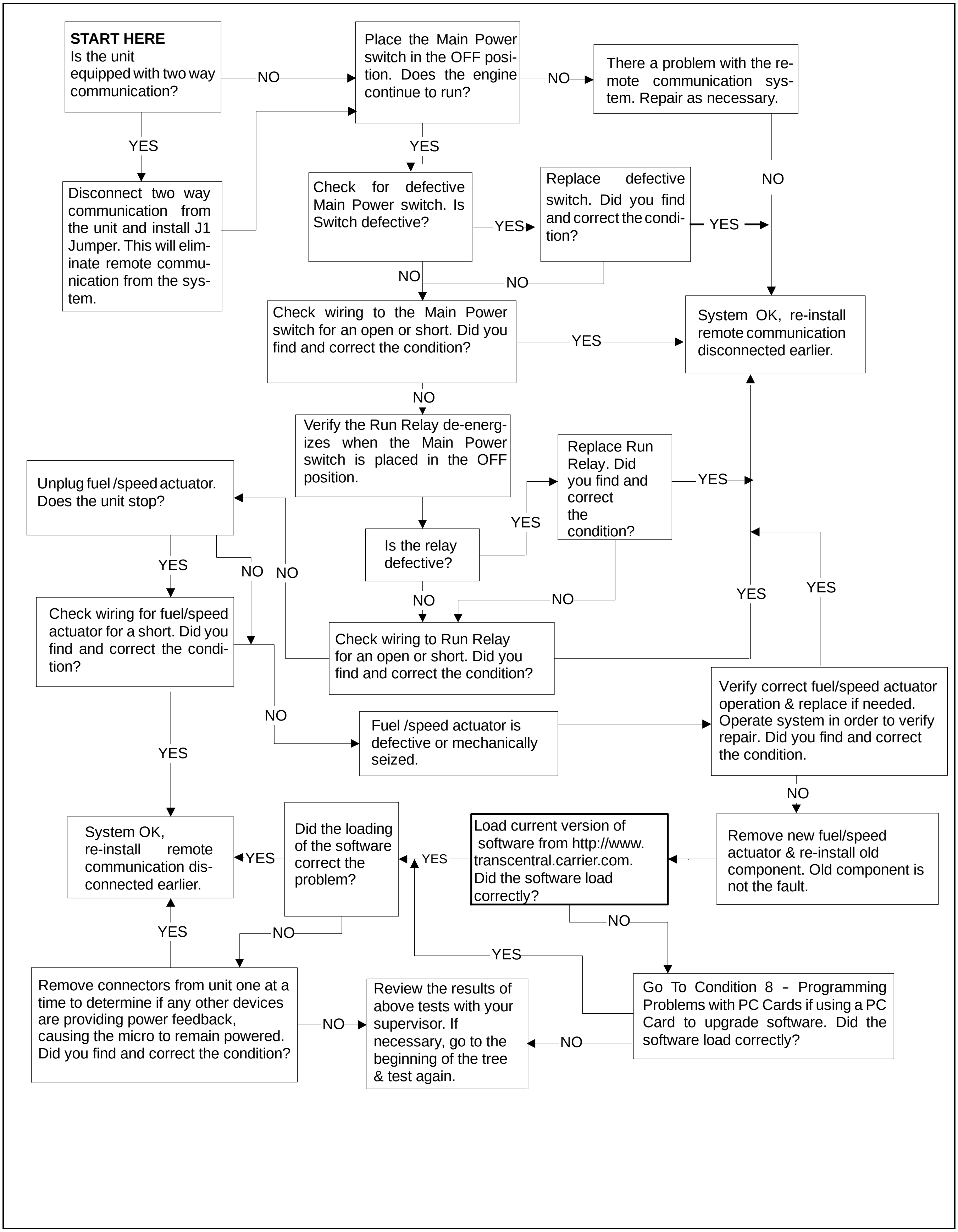



**Figure 9–7 Micro Diagnostic Tree – Cond. 3 – Main Power Switch Off – Unit Fails To Stop**

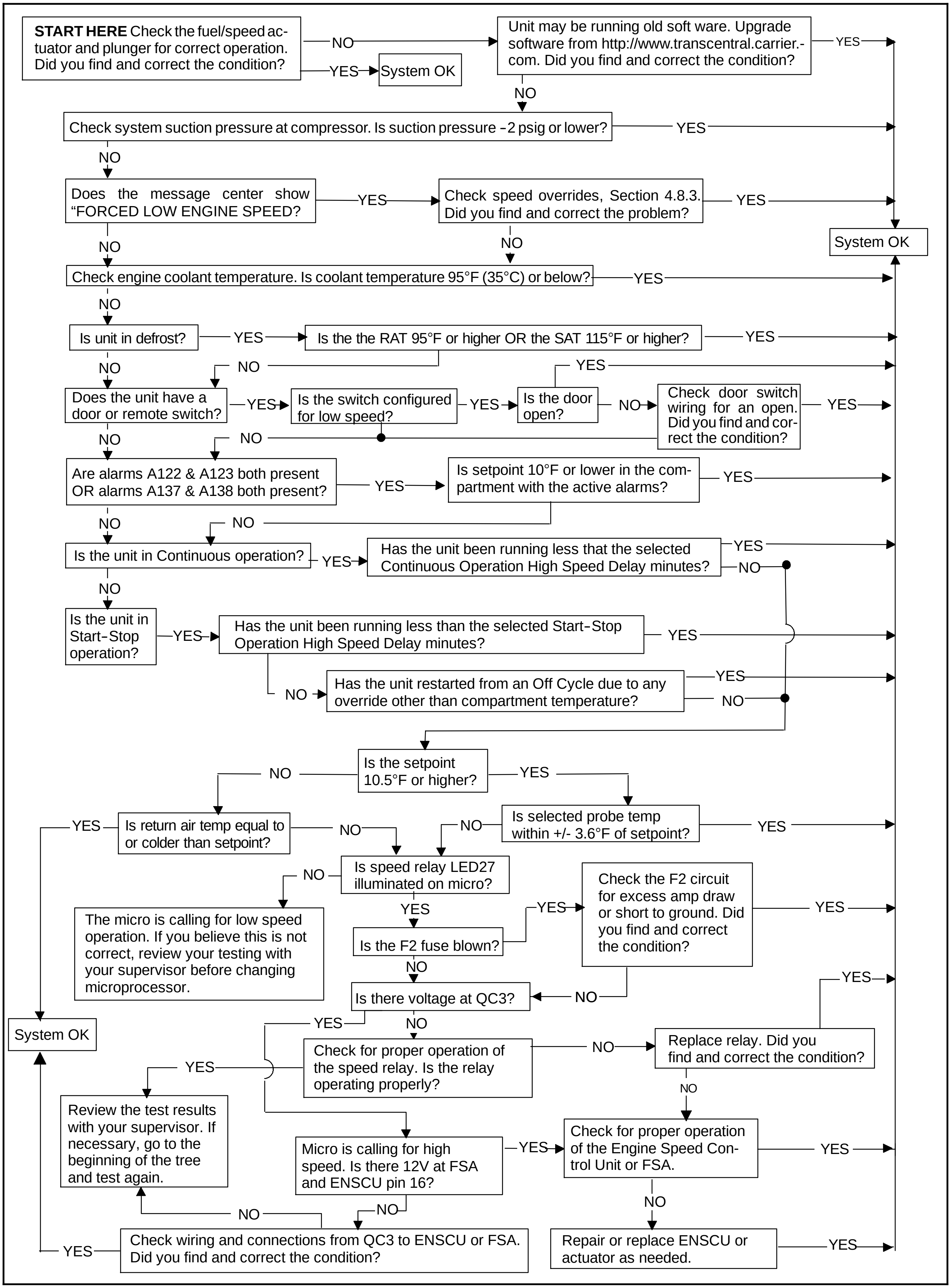



**Figure 9-8 Micro Diagnostic Tree - Cond. 4 - Unit Will Not Run In High Speed**

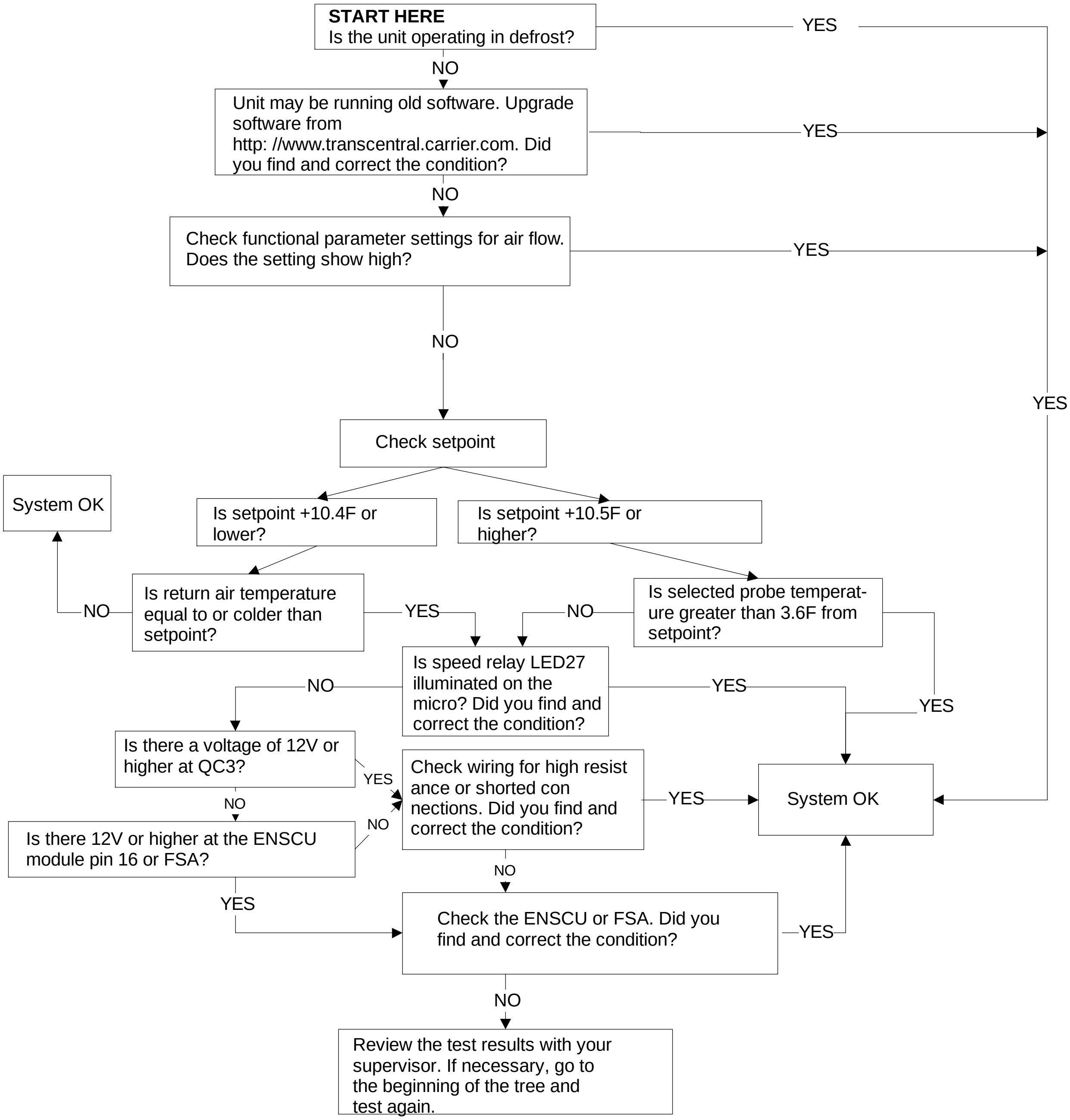



**Figure 9-9 Micro Diagnostic Tree – Cond. 5 – Unit Will Not Run In Low Speed**

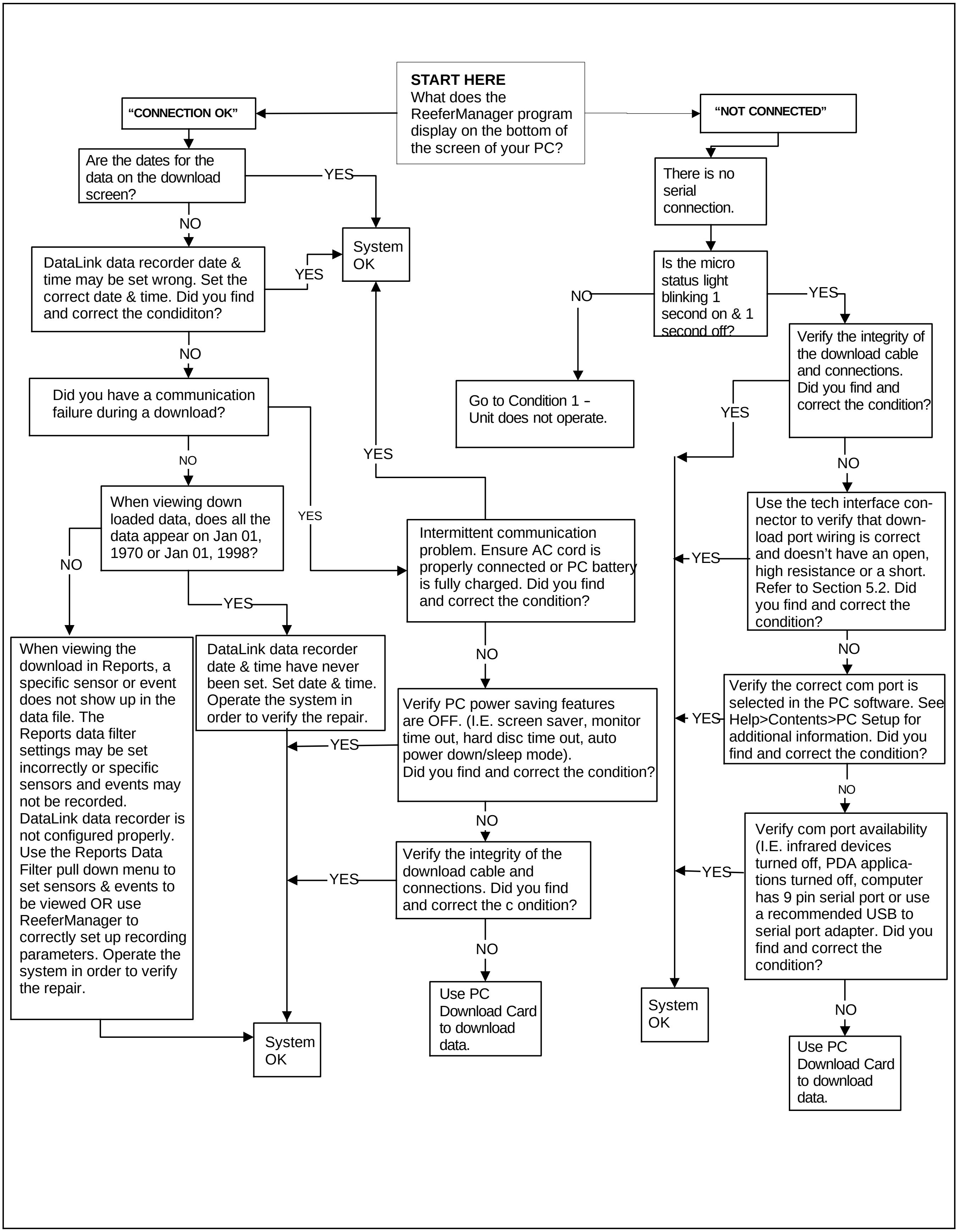



**Figure 9–10 Micro Diagnostic Tree – Cond. 6 – DataLink Data Recorder Data Download Problems When Using ReeferManager and a Download Cable. Data File Analysis Problems Using Reports**

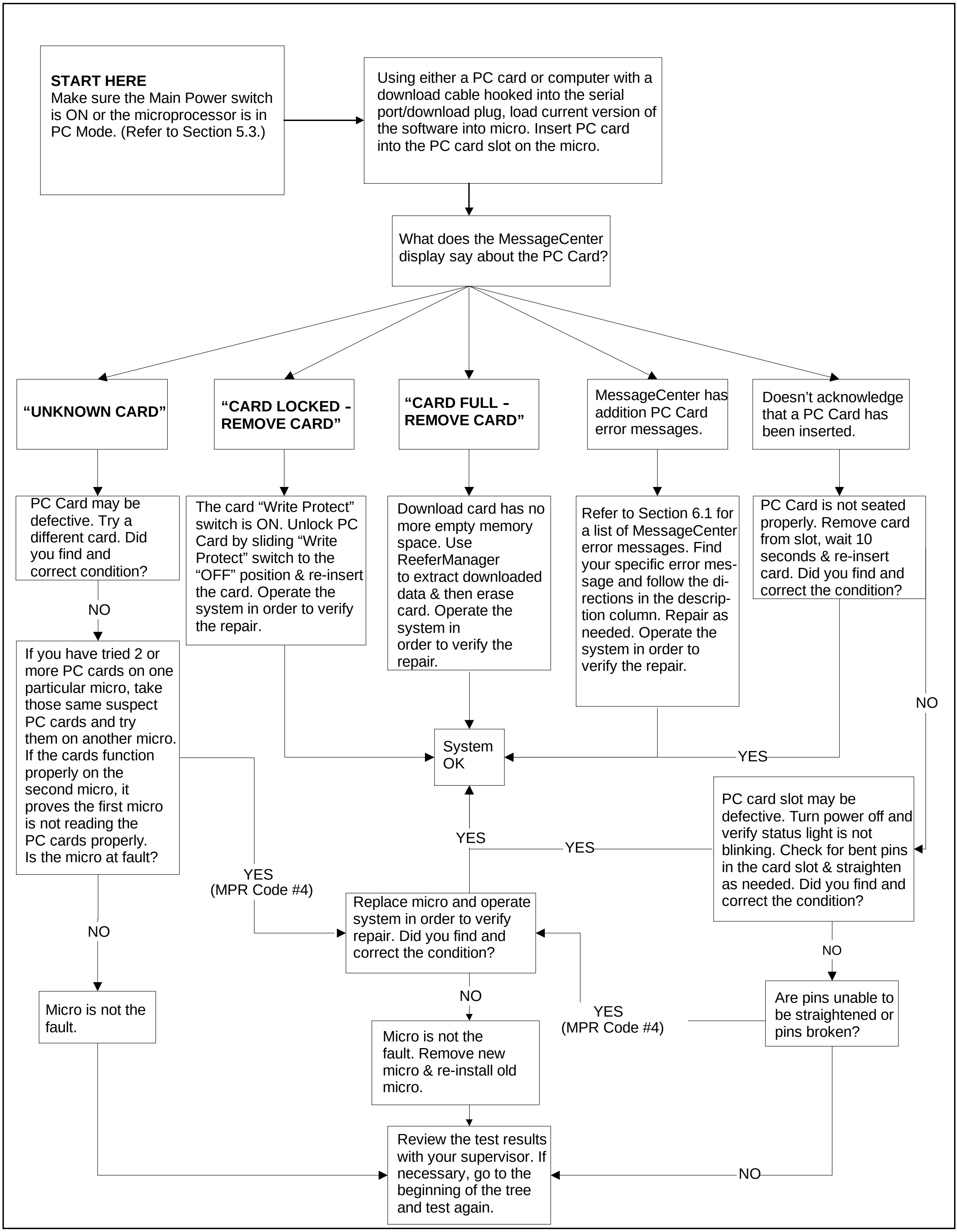



**Figure 9-11 Microprocessor Diagnostic Tree - Cond. 7 - PC Card Problems**

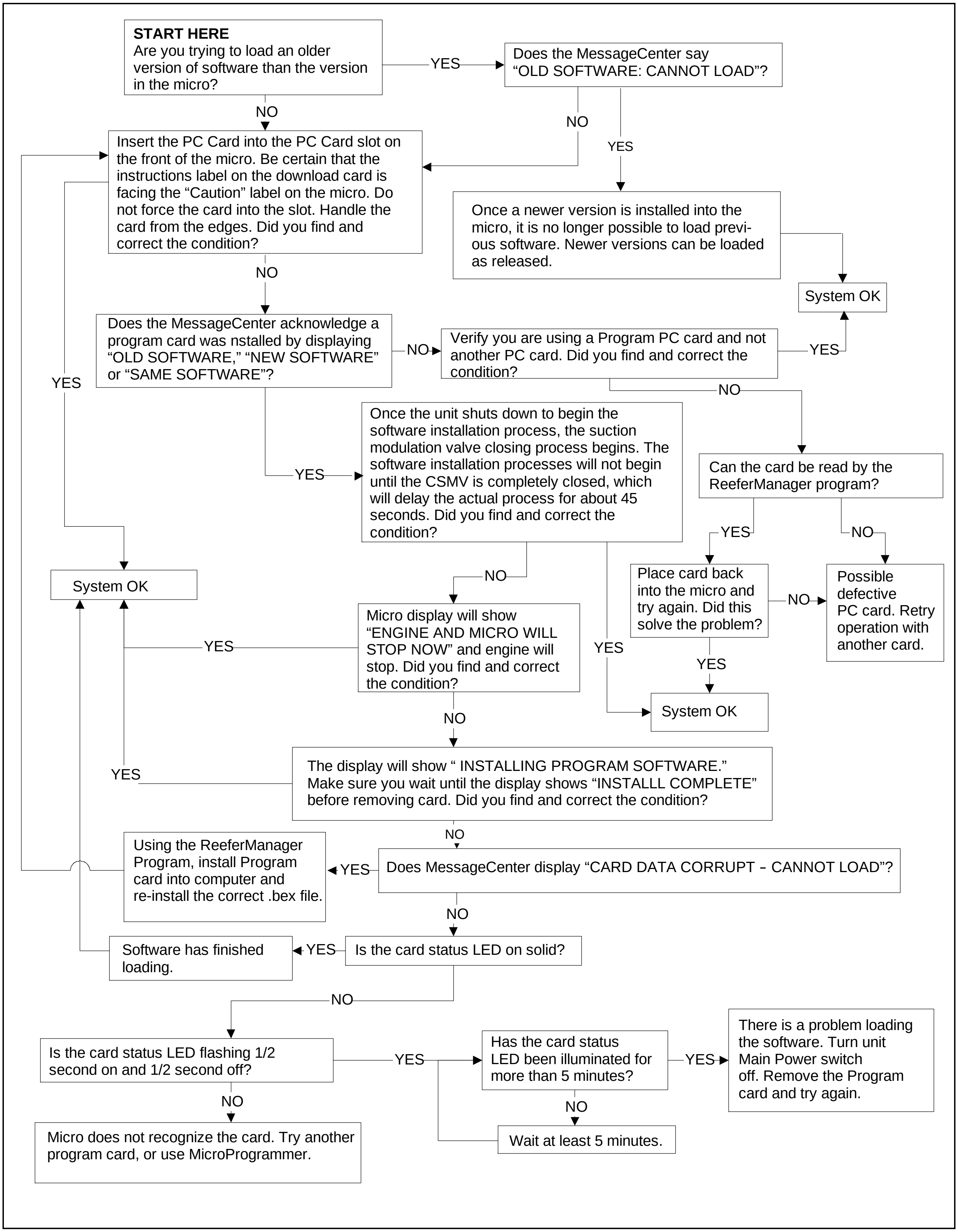



**Figure 9–12 Micro Diagnostic Tree – Cond. 8 – Programming Problems With PC Cards**

# SECTION 10 – WIRING

**PARAGRAPH NUMBER** **Page**

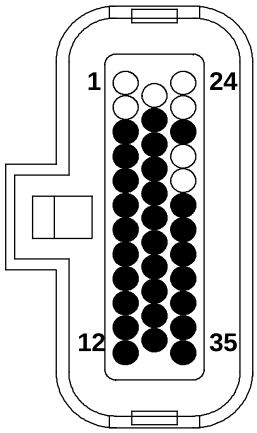


10

# SECTION 10
# WIRING

## 10.1 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED ENGINE/OFF/ STANDBY

### 1MP - NATURAL



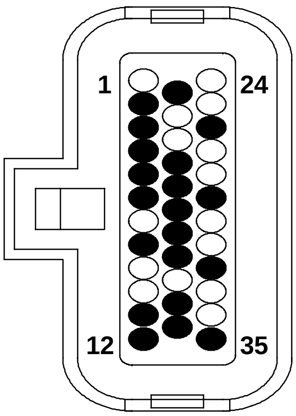

| Component | Terminal |
|---|---|
| REM1 (REM–E) (2 compartment only) | 3 (14) |
| 3DTT (3EVC–K) | 3 (21) |
| REMSN2 (REMSN–H) (2 compartment only) | 4 (14) |
| 3RAT (3EVC–J) | 4 (23) |
| CDP–3 | 5 (16) (30) |
| EVOP–3 (DP16–S) | 6 (17) (30) |
| ENCT | 7 (18) |
| 2DTT (2EVC–K) | 8 (21) |
| CDT | 9 (20) |
| CST | 10 (19) |
| AAT | 11 (22) |
| 1RAT (DP16–H) | 12 (23) |
| REM1 (REM–F) (SP1) (2 compartment only) | 14 (3) |
| REM2 (REM–G) (SP1) (2 compartment only) | 14 (4) |

### 1MP - NATURAL (Continued)

| Component | Terminal |
|---|---|
| CSP–1 (SP16) | 15 (29) (30) |
| OGF–OV (HC–1) (SP16) | 15 |
| CDP–1 | 16 (5) (30) |
| EVOP–1 (DP16–P) | 17 (6) (30) |
| ENCT (SP2) | 18 (7) |
| CST (SP14) | 19 (10) |
| EVOT (DP16–F) (SP14) | 19 (32) |
| CDT | 20 (9) |
| 1DTT (DP16–B) (SP42) | 21 (34) |
| 2DTT (2EVC–L) (SP42) | 21 (8) |
| 2SAT (2SAT–B) (SP42) | 21 (31) |
| 3DTT (3ECV–L) (SP42) | 21 (3) |
| AAT | 22 (11) |
| 1SAT (DP16–D) (SP12) | 23 (35) |
| 1RAT (DP16–G) (SP12) | 23 (12) |
| 2RAT (2EVC–H) (SP12) | 23 (12) |
| 3RAT (3EVC–H) (SP12) | 23 (4) |
| FLS–C | 26 |
| CSP–3 | 29 (15) (30) |
| CSP–2 (SP7) | 30 (15) (29) |
| CDP–2 (SP7) | 30 (5) (16) |
| EVOP–2 (SP7) (DP16–R) | 30 (6) (17) |
| 2SAT–A (SAT–A) | 31 (21) |
| EVOT (DP16–E) | 32 (19) |
| 2RAT (2EVC–J) | 33 (23) |
| 1DTT (DP16–A) | 34 (21) |
| 1SAT (DP16–C) | 35 (23) |
| Unused terminals: 1, 2,13, 24, 25, 27,28 | |

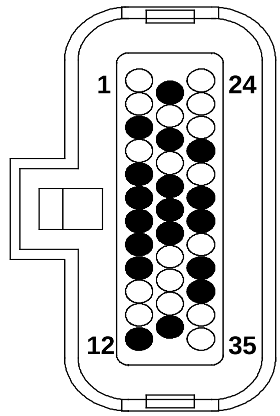
## 10.1 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED ENGINE/OFF/ STANDBY (Continued)

### 2 MP – Black




| Component | Terminal |
|---|---|
| 3RS–B (HC9) | 2 |
| REMOTE SWITCH (OC–C) | 3 |
| SP46 (3 compartment only) | 4 |
| SP45 | 5 |
| DAS | 6 |
| CSMV–D | 8 (19) (20) (32) |
| EVXV–B (DP16–K) | 11 (12) (22) (23) (35) |
| EVXV–E (DP16–N) | 12 (11) (22) (23) (35) |
| REMOTE SWITCH (OC–D) | 13 |
| DOOR SWITCH (DS–B = 2 compartment only) | 16 |
| DOOR SWITCH (OC–E = 3 compartment only) | 16 |
| ENOPS | 17 |
| ENSCU–3 | 18 |
| CSMV–C | 19 (8) (20) (32) |
| CSMV–A | 20 (8) (19) (32) |
| EVXV–D (DP16–M) | 22 (11) (12) (23) (35) |
| EVXV–A (DP16–J) | 23 (11) (12) (22) (35) |
| HC19 (SP61) | 26 |
| SP15 | 29 |
| CSMV–B | 32 (8) (19) (20) |
| EVXV–C (DP16–L) | 35 (11) (12) (22) (23) |
| Unused terminals: 1,7,9,10,14,15,21, 24, 25, 27, 28,30, 31, 33, 34 | |

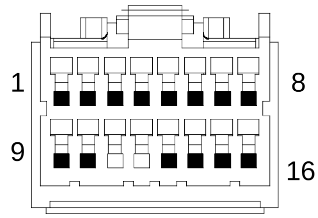
### 3 MP – Grey




| Component | Terminal |
|---|---|
| SATCOM–C (GND) | 3 (15) (27) |
| SLP–C (GND) | 5 (13)(17) (29) |
| 2HTCON2–A1 (2CA–F) | 6 |
| 3HTCON2–A1 (3CA–A) | 7 |
| 3EVCON–A1 (3CA–C) | 8 |
| 3LSV (3EVC–A) | 9 |
| UL1 | 12 |
| SLP–E | 13 (5) (17) (29) |
| SATCOM–B (RX) | 15 (3) (27) |
| SLP–A (RX) | 17 (5) (13) (29) |
| 2LSV (2EVC–A) | 18 |
| LB–H (AMBER) | 19 (32) |
| UL2 | 23 |
| SATCOM–A (TX) | 27 (3) (15) |
| SLP–B (TX) | 29 (5) (13) (17) |
| 2EVCON–A1 (2CA–G) | 30 |
| LB–B (GREEN) | 32 (19) |
| 3HTCON1–A1 (3CA–B) | 33 |
| 2HTCON1–A1 (2CA–E) | 34 |
| Unused terminals: 1, 2, 4, 10, 11, 14, 16, 20,21, 22, 24, 25, 26, 28, 31, 35 | |

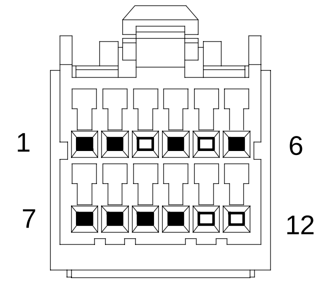
### 10.1 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED ENGINE/OFF/ STANDBY (Continued)

## 4 MP



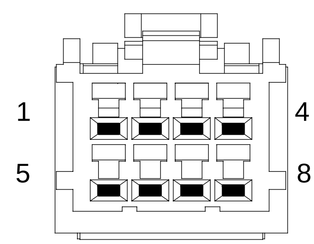

| Component | Terminal |
|---|---|
| CCONR–1 (SP60) | 1 |
| CDCON–A2 | 2 |
| 1EVCON–A2 | 3 |
| SP55 | 4 |
| CCONR–2 | 5 |
| CDCON–A1 | 6 |
| GENCONR–2 | 7 |
| CT BROWN/OGF BROWN (SP54) | 8 |
| CT BLACK | 9 |
| CT BLUE/OGF BLUE (SP53) | 10 |
| 1HTCON1–A1 | 13 |
| 1HTCON2–A1 | 14 |
| 1EVCON–A1 | 15 |
| FHR–2 | 16 |
| Unused terminals: 11, 12. | |

## 5 MP




| Component | Terminal |
|---|---|
| SP52 | 1 |
| SP56 | 2 |
| PRM–OUT+ | 4 |
| 2RS–B | 6 |
| PSCONR–2 | 7 |
| BUZZER – | 8 |
| IAHR–85 | 9 |
| SSR–85 | 10 |
| Unused terminals: 3, 5, 11, 12 | |

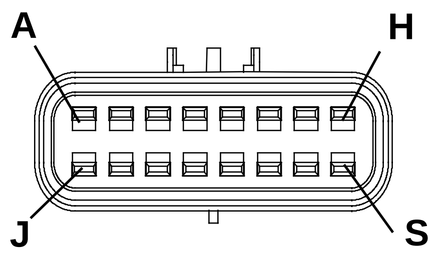
## 6 MP




| Component | Connector | Terminal |
|---|---|---|
| DISP–1 (BLK) | A | 1 |
| DISP–2 (WHT) | B | 2 |
| DISP–3 (RED) | C | 3 |
| DISP–4 (GRN) | D | 4 |
| DISP–5 (BRN) | E | 5 |
| DISP–7 (BLU) | F | 6 |
| DISP–6 (ORN) | G | 7 |
| DISP–8 (YEL) | H | 8 |
| Unused terminals: None | | |

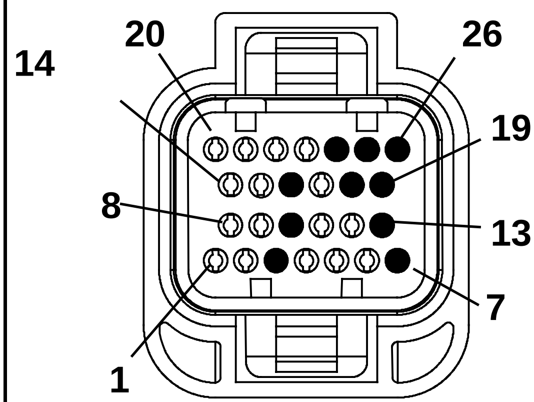
## 10.1 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED ENGINE/OFF/ STANDBY (Continued)

**DP16**




| Component | Terminal |
|---|---|
| 1DTT | A |
| 1DTT | B |
| 1SAT | C |
| 1SAT | D |
| EVOT | E |
| EVOT | F |
| 1RAT | G |
| 1RAT | H |
| EVXV–A | J |
| EVXV–B | K |
| EVXV–C | L |
| EVXV–D | M |
| EVXV–E | N |
| EVOP–1 | P |
| EVOP–2 | R |
| EVOP–3 | S |
| Unused terminals: None | |

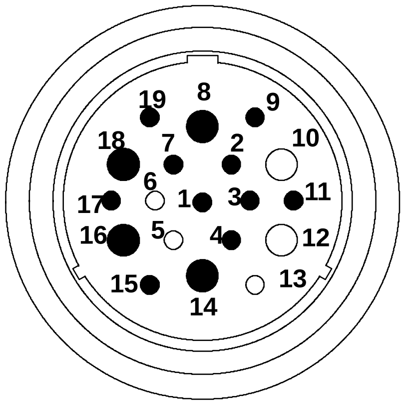
**ENSCU**




| Component | Terminal |
|---|---|
| 2MP–18 | 3 |
| FSA–1 | 7 |
| ESSN–S | 10 |
| SP3 | 13 |
| MPQC3 (HC–2) | 16 |
| STARTER MOTOR | 18 |
| SP6 (GND) | 19 |
| SP5 | 24 |
| ENSSN–3 | 25 |
| FSA–2 | 26 |
| Unused Terminals: 1, 2, 4, 5, 6, 8, 9, 11, 12, 14, 15, 17, 20,21, 22, 23 | |

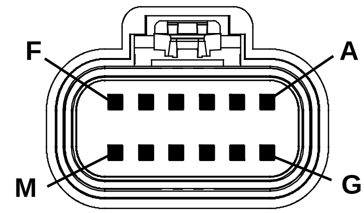
### 10.1 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED ENGINE/OFF/ STANDBY (Continued)

## HC Plug
**(Control Box Side)**



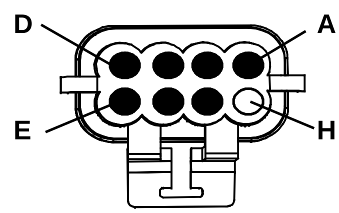

| Component | Terminal |
|---|---|
| OGF–OV/1MP15 | 1 |
| MPQC–3/ENSCU–16 | 2 |
| MPQC–1/BTY+ | 3 |
| MPQC4/SP3 | 4 |
| RCR–2/OC–B | 7 |
| SSR–87/SS | 8 |
| 3RS–B/2MP2 | 9 |
| SP60/CCON–IPC | 11 |
| IAHR–87/IAH | 14 |
| SP57/GND–1 | 15 |
| FHR–5/FHTS | 16 |
| RCR–3/DOES–3 (SP4) | 17 |
| SP52/SP5 | 18 |
| SP61/2MP26 | 19 |
| Unused terminals: 5, 6, 10,12 & 13 | |

## 2EVC
**(22–04191–10)**




| Component | Terminal |
|---|---|
| 3MP18/2LSV | A |
| SP5/Compartment 2 Remote Evap Power | B |
| EVHTS/2CA–B | C |
| 2CA–C/2CH | D |
| Compartment 2 Remote Evap Ground/GROUND (GND–2) | E |
| 2EVM1–2–3–4 IP/SP45 | F |
| OC–G/REMS2 | G |
| 1MP23 (SP12)/2RAT | H |
| 1MP33/2RAT | J |
| 1MP8/2DTT | K |
| IMP21 (SP42)/2DTT | L |
| REMS2/SP–6 | M |
| Unused terminals: None | |

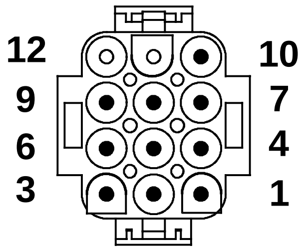
## 2CA
**(22–50078–03)**




| Component | Terminal |
|---|---|
| 2HTCON1–A2/2HTCON2–A2/ 2EVC–C | B |
| 2HTCON2–14/2EVC–D | C |
| 2EVCON–A2/SP45 | D |
| 3MP34/2HTCON1–A1 | E |
| 3MP6/2HTCON2–A1 | F |
| 3MP30/2EVCON–A1 | G |
| Unused terminals: A,H | |

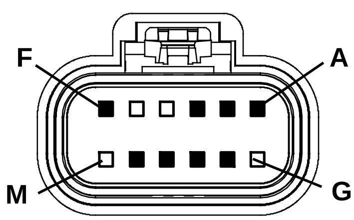
## 10.1 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED ENGINE/OFF/ STANDBY (Continued)

### 2C10
### (22–01997–20)



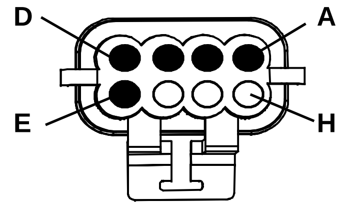

| Component | Terminal |
|---|---|
| 2HTCON1–T1 | 1 |
| 2HTCON1–T2 | 2 |
| 2HTCON1–T3 | 3 |
| 2HTCON2–T1 | 4 |
| 2HTCON2–T2 | 5 |
| 2HTCON2–T3 | 6 |
| 2EVCON–T1 | 7 |
| 2EVCON–T2 | 8 |
| 2EVCON–T3 | 9 |
| PE Plate | 10 |
| Unused terminals: 11,12 | |

### 3EVC
### (22–04191–10)



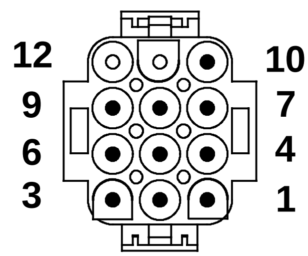

| Component | Terminal |
|---|---|
| 3MP09/3LSV | A |
| SP5/Compartment 3 Remote Evap Power | B |
| 3EVHTS/3CA–D | C |
| 3CA–F/3CH | D |
| Compartment 3 Remote Evap Ground/GROUND (GND–2) | E |
| 3EVM1–2–3–4 IP/SP46 | F |
| OCF/Compartment 3 Door Switch | G |
| 1MP23 (SP12)/3RAT | H |
| 1MP04/3RAT | J |
| 1MP03/3DTT | K |
| 1MP21(SP43)/3DTT | L |
| Compartment 3 Door Switch/SP5 | D |
| Unused terminals: D,E,G & M | |

### 3CA
### (22–50078–03)




| Component | Terminal |
|---|---|
| 3MP07/3HTCON2–A1 | A |
| 3MP33/3HTCON1–A1 | B |
| 3MP08/3EVCON–A1 | C |
| 3HTCON1–A2/3HTCON2–A2/ 3EVC–C | D |
| 3EVCON–A2/SP46 | E |
| 3HTCON2–14/3EVC–D | F |
| Unused terminals: G & H | |

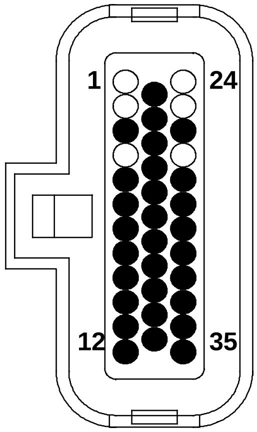
### 3C10
### (22–01997–20)




| Component | Terminal |
|---|---|
| 3HTCON1–T1 | 1 |
| 3HTCON1–T2 | 2 |
| 3HTCON1–T3 | 3 |
| 3HTCON2–T1 | 4 |
| 3HTCON2–T2 | 5 |
| 3HTCON2–T3 | 6 |
| 3EVCON–T1 | 7 |
| 3EVCON–T2 | 8 |
| 3EVCON–T3 | 9 |
| PE Plate | 10 |
| Unused terminals: 11,12 | |

## 10.2 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED START/RUN-OFF

### 1MP - NATURAL

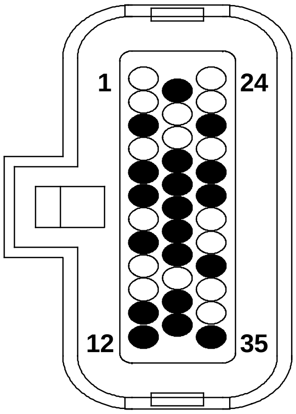



| Component | Terminal |
|---|---|
| REMSN1 (REMSN–E) | 3 (14) |
| CDP–C | 5 (16) (30) |
| EVOP–C (DP16–S) | 6 (17) (30) |
| ENCT | 7 (18) |
| 2DTT (2EVC–K) | 8 |
| CDT | 9 (20) |
| CST | 10 (19) |
| AAT | 11 (22) |
| 1RAT (DP16–G) | 12 (23) |
| MAP–A | 13 (28) (30) |
| REMSN1 (REMSN–F) (SP1) | 14 (3) |
| REMSN2 (REMSN–G) (SP1) | 14 (33) |

### 1MP - NATURAL (Continued)

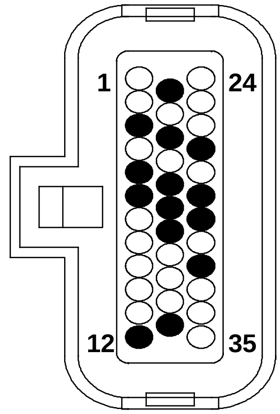
| Component | Terminal |
|---|---|
| CSP–A (SP16) | 15 (29) (30) |
| OGF–OV (HC–1) (SP16) | 15 |
| CDP–A | 16 (5) (30) |
| EVOP–A (DP16–P) | 17 (6) (30) |
| ENCT (SP2) | 18 (7) |
| CST (SP14) | 19 (10) |
| EVOT (DP16–F) (SP14) | 19 (32) |
| CDT | 20 (9) |
| 1DTT (DP16–B) (SP42) | 21 (34) |
| 2DTT (2EVC–L) (SP42) | 21 (8) |
| 2SAT (2SAT–B) (SP42) | 21 (31) |
| AAT | 22 (11) |
| 1SAT (DP16–D) (SP12) | 23 (35) |
| 1RAT (DP16–H) (SP12) | 23 |
| 2RAT (2EVC–H) (SP12) | 23 |
| FLS–C | 26 |
| MAP–C | 28 (13) (30) |
| CSP–C | 29 (15) (30) |
| CSP–B (SP7) | 30 (15) (29) |
| CDP–B (SP7) | 30 (5) (16) |
| EVOP–B (SP7) (DP16–R) | 30 (6) (17) |
| MAP–B (SP7) | 30 (13) (28) |
| 2SAT–A | 31 (21) |
| EVOT (DP16–E) | 32 (19) |
| REMSN2 (REMSN–H | 33 (14) |
| 2RAT (2EVC–J) | 33 (23) |
| 1DTT (DP16–A) | 34 (21) |
| 1SAT (DP16–C) | 35 (23) |
| Unused terminals: 1, 2,4, 24, 25, 27 | |

## 2 MP – Black




| Component | Terminal |
|---|---|
| OC–C | 3 |
| 2EVC–F (SP45) | 5 |
| 2CA–D (SP45) | 5 |
| DAS | 6 |
| CSMV–D | 8 (19) (20) (32) |
| EVXV–B (DP16–K) | 11 (12) (22) (23) (35) |
| EVXV–E (DP16–N) | 12 (11) (22) (23) (35) |
| OC–D | 13 |
| OC–E | 16 |
| ENOPS | 17 |
| ENSCU–3 | 18 |
| CSMV–C | 19 (8) (20) (32) |
| CSMV–A | 20 (8) (19) (32) |
| EVXV–D (DP16–M) | 22 (11) (12) (23) (35) |
| EVXV–A (DP16–J) | 23 (11) (12) (22) (35) |
| HC19 (SP61) | 26 |
| SP5 | 28 |
| SP15 | 29 |
| CSMV–B | 32 (8) (19) (20) |
| EVXV–C (DP16–L) | 35 (11) (12) (22) (23) |
| Unused terminals: 1,2,4,7,9,10,14,15,21,24, 25, 27, 30, 31, 33, 34 | |

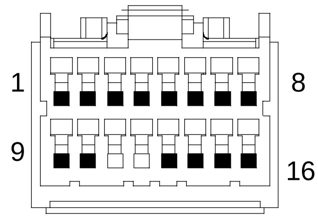
## 3 MP – Grey




| Component | Terminal |
|---|---|
| SATCOM–C (GND) | 3 (15) (27) |
| SLP–C (GND) | 5 (13)(17) (29) |
| 2CA–F | 6 |
| UL1 | 12 |
| SLP–E | 13 (5) (17) (29) |
| SATCOM–B (RX) | 15 (3) (27) |
| SLP–A (RX) | 17 (5) (13) (29) |
| 2EVC–A | 18 |
| LB–H (AMBER) | 19 (32) |
| UL2 | 23 |
| SATCOM–A (TX) | 27 (3) (15) |
| SLP–B (TX) | 29 (5) (13) (17) |
| 2CA–G | 30 |
| LB–B (GREEN) | 32 (19) |
| 2CA–E | 34 |
| Unused terminals: 1, 2, 4, 7, 8, 9, 10, 11, 14, 16, 20,21, 22, 24, 25, 26, 28, 31, 33, 35 | |

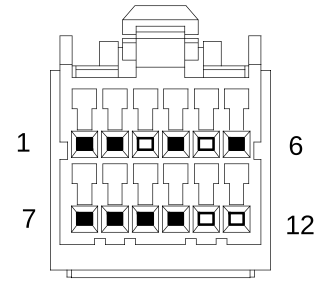
## 10.2 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED START/RUN–OFF (Continued)

### 4 MP



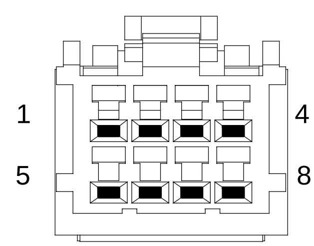

| Component | Terminal |
|---|---|
| CCONR–1 (SP60) | 1 |
| CDCON–A2 | 2 |
| 1EVCON–A2 | 3 |
| SP55 | 4 |
| CCONR–2 | 5 |
| CDCON–A1 | 6 |
| GENCONR–2 | 7 |
| CT2/OGF (SP54) | 8 |
| CT2,3 & 4 BLACK | 9 |
| CT3/OGF (SP53) | 10 |
| 1HTCON1–A1 | 13 |
| 1HTCON2–A1 | 14 |
| 1EVCON–A1 | 15 |
| FHR–2 | 16 |
| Unused terminals: 11, 12 | |

### 5 MP




| Component | Terminal |
|---|---|
| MPQCC9/SP52 | 1 |
| SP56 | 2 |
| PRM–OUT+ | 4 |
| 2RS–B | 6 |
| PSCONR–2 | 7 |
| BUZZER – | 8 |
| GPR–85 | 9 |
| SSR–85 | 10 |
| Unused terminals: 3, 5, 11, 12 | |

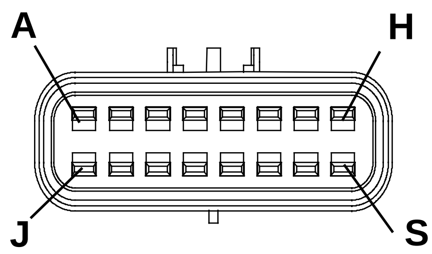
### 6 MP




| Component | Connector | Terminal |
|---|---|---|
| DISP–1 (BLK) | A | 1 |
| DISP–2 (WHT) | B | 2 |
| DISP–3 (RED) | C | 3 |
| DISP–4 (GRN) | D | 4 |
| DISP–5 (BRN) | E | 5 |
| DISP–7 (BLU) | F | 6 |
| DISP–6 (ORN) | G | 7 |
| DISP–8 (YEL) | H | 8 |
| Unused terminals: None | | |

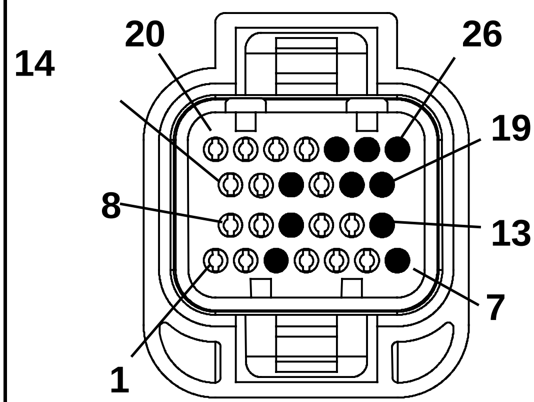
## 10.2 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED START/RUN-OFF (Continued)

### DP16




| Component | Terminal |
|---|---|
| 1DTT–B | A |
| 1DTT–A | B |
| 1SAT–A | C |
| 1SAT–B | D |
| EVOT–A | E |
| EVOT–B | F |
| 1RAT–A | G |
| 1RAT–B | H |
| EVXV–A | J |
| EVXV–B | K |
| EVXV–C | L |
| EVXV–D | M |
| EVXV–E | N |
| EVOP–A | P |
| EVOP–B | R |
| EVOP–C | S |
| Unused terminals: None | |

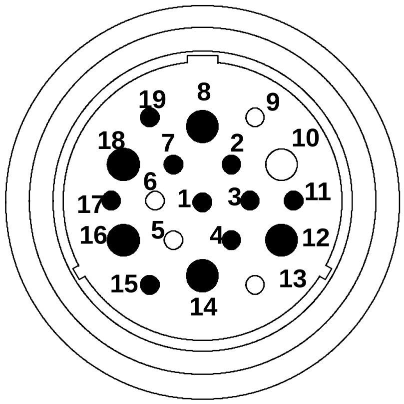
### ENSCU




| Component | Terminal |
|---|---|
| 2MP–18 | 3 |
| FSA–1 | 7 |
| ESSN–S | 10 |
| SP3 | 13 |
| HC–2 | 16 |
| STARTER MOTOR | 18 |
| SP6 (GND) | 19 |
| SP5 | 24 |
| ENSSN–12V | 25 |
| FSA–2 | 26 |
| Unused Terminals: 1, 2, 4, 5, 6, 8, 9, 11, 12, 14, 15, 17, 20,21, 22, 23 | |

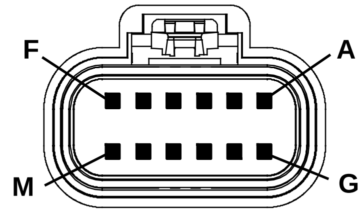
## 10.2 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED START/RUN–OFF (Continued)

### HC Plug
(Control Box Side)



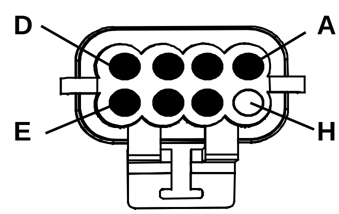

| Component | Terminal |
|---|---|
| OGF–OV/HC–1 | 1 |
| MPQC–3 | 2 |
| MPQC–1 | 3 |
| MPQC4 | 4 |
| RCR–2 | 7 |
| SSR–87 | 8 |
| SP60 | 11 |
| F5–B | 12 |
| GPR–87 | 14 |
| SP57 | 15 |
| SP50 | 16 |
| RCR–3 | 17 |
| SP52 | 18 |
| SP61 | 19 |
| Unused terminals: 5, 6,9, 10 & 13 | |

### 2EVC
(22–04191–10)




| Component | Terminal |
|---|---|
| 3MP18 | A |
| SP5 | B |
| 2CA–B | C |
| 2CA–C | D |
| GND–2 | E |
| SP45 | F |
| OC–G | G |
| SP12 | H |
| 1MP33 | J |
| 1MP8 | K |
| SP42 | L |
| C6–D | M |
| Unused terminals: None | |

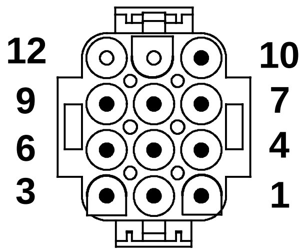
### 2CA
(22–50078–03)




| Component | Terminal |
|---|---|
| SP64 | A |
| 2HTCON1–A2 | B |
| 2HTCON2–14 | C |
| 2EVCON–A2 | D |
| 2HTCON1–A1 | E |
| 2HTCON2–A1 | F |
| 2EVCON–A1 | G |
| Unused terminals: H | |

## 10.2 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED START/RUN-OFF (Continued)

**2C10**
**(22-01997-20)**




| Component | Terminal |
|---|---|
| 2HTCON1-T1 | 1 |
| 2HTCON1-T2 | 2 |
| 2HTCON1-T3 | 3 |
| 2HTCON2-T1 | 4 |
| 2HTCON2-T2 | 5 |
| 2HTCON2-T3 | 6 |
| 2EVCON-T1 | 7 |
| 2EVCON-T2 | 8 |
| 2EVCON-T3 | 9 |
| PE Plate | 10 |
| Unused terminals: 11,12 | |

### 10.3 CONTROL BOX INTERIOR SPLICE POINTS FOR UNITS WITH A MAIN POWER SWITCH LABELED ENGINE/OFF/STANDBY

| Splice Point No. | Component |
|---|---|
| 50 | F5–A |
| | F19–A |
| | IAHR–30 |
| | F6–A |
| | SSR–30 |
| | F9–A |
| 52 | BUZZER + |
| | 5MP–1 |
| | OGF – +12V |
| | SSR–86 |
| | HC–18 |
| | MPQC–9 |
| | MPQC–8 |
| | SP59 |
| | RCR–5 |
| | SP62 |
| 53 | CT–BLUE |
| | 4MP–10 |
| | OGF–BLUE |
| 54 | CT–BROWN |
| | 4MP–8 |
| | OGF–BROWN |
| 55 | 4MP–4 |
| | 1HTCON1–A2 |
| | 1HTCON2–A2 |
| | SP63 |
| 56 | 5MP–2 |
| | PRM – +12V |
| | DOES–6 |

| Splice Point No. | Component |
|---|---|
| 57 | RCR–1 |
| | FHR–1 |
| | HC–15 |
| | MPQC–2 |
| | PRM–OV |
| | CCON–A2 |
| | GENCONR–3 |
| | LOW VOLT GND |
| | 3RSA (3 compartment only) |
| 58 | F9–B |
| | CCONR–3 |
| | PSCONR–3 |
| 59 | EVM–4 |
| | EVHTS–A |
| | SP52 |
| 60 | 4MP–1 |
| | CCONR–1 |
| | HC–11 |
| 61 | HC–19 |
| | OGF–S+ |
| | GENCONR–1 |
| | PSCONR–1 |
| 62 | SP52 |
| | SP59 |
| | CDM2–4 |
| 63 | SP55 |
| | EVHTS–B |
| 64 | F–16A |
| | 2CA–A |
| | F–17A (3 compartment only) |

### 10.4 CONTROL BOX INTERIOR SPLICE POINTS FOR UNITS WITH A MAIN POWER SWITCH LABELED START/RUN–OFF

| Splice Point No. | Component |
|---|---|
| 50 | F5–A |
| | HC–16 |
| | GPR–30 |
| | F6–A |
| | SSR–30 |
| | F9–A |
| 52 | BUZZER + |
| | 5MP–1 |
| | OGF – +12V |
| | SSR–86 |
| | HC–18 |
| | MPQC–9 |
| | MPQC–8 |
| | SP59 |
| | DES–A |
| | RCR–5 |
| | SP62 |
| 53 | CT–BLUE |
| | 4MP–10 |
| | OGF–BLUE |
| 54 | CT–BROWN |
| | 4MP–8 |
| | OGF–BROWN |
| 55 | 4MP–4 |
| | 1HTCON1–A2 |
| | 1HTCON2–A2 |
| | SP63 |
| 56 | 5MP–2 |
| | PRM – +12V |
| | DES–B |

| Splice Point No. | Component |
|---|---|
| 57 | HC–15 |
| | MPQC–2 |
| | PRM–OV |
| | CCON–A2 |
| | GENCONR–3 |
| | LOW VOLT GND |
| 58 | F9–B |
| | CCONR–3 |
| | PSCONR–3 |
| 59 | EVM–4 |
| | EVHTS–A |
| | SP52 |
| 60 | 4MP–1 |
| | CCONR–1 |
| | HC–11 |
| 61 | HC–19 |
| | OGF–S+ |
| | GENCONR–1 |
| | PSCONR–1 |
| 62 | SP52 |
| | SP59 |
| | CDM2–4 |
| 63 | SP55 |
| | EVHTS–B |
| 64 | F–16A |
| | 2CA–A |
| | |

## 10.5 DISPLAY TEST POINTS

**NOTE**
Refer to Section 5.6 for microprocessor and display diagnostic procedures

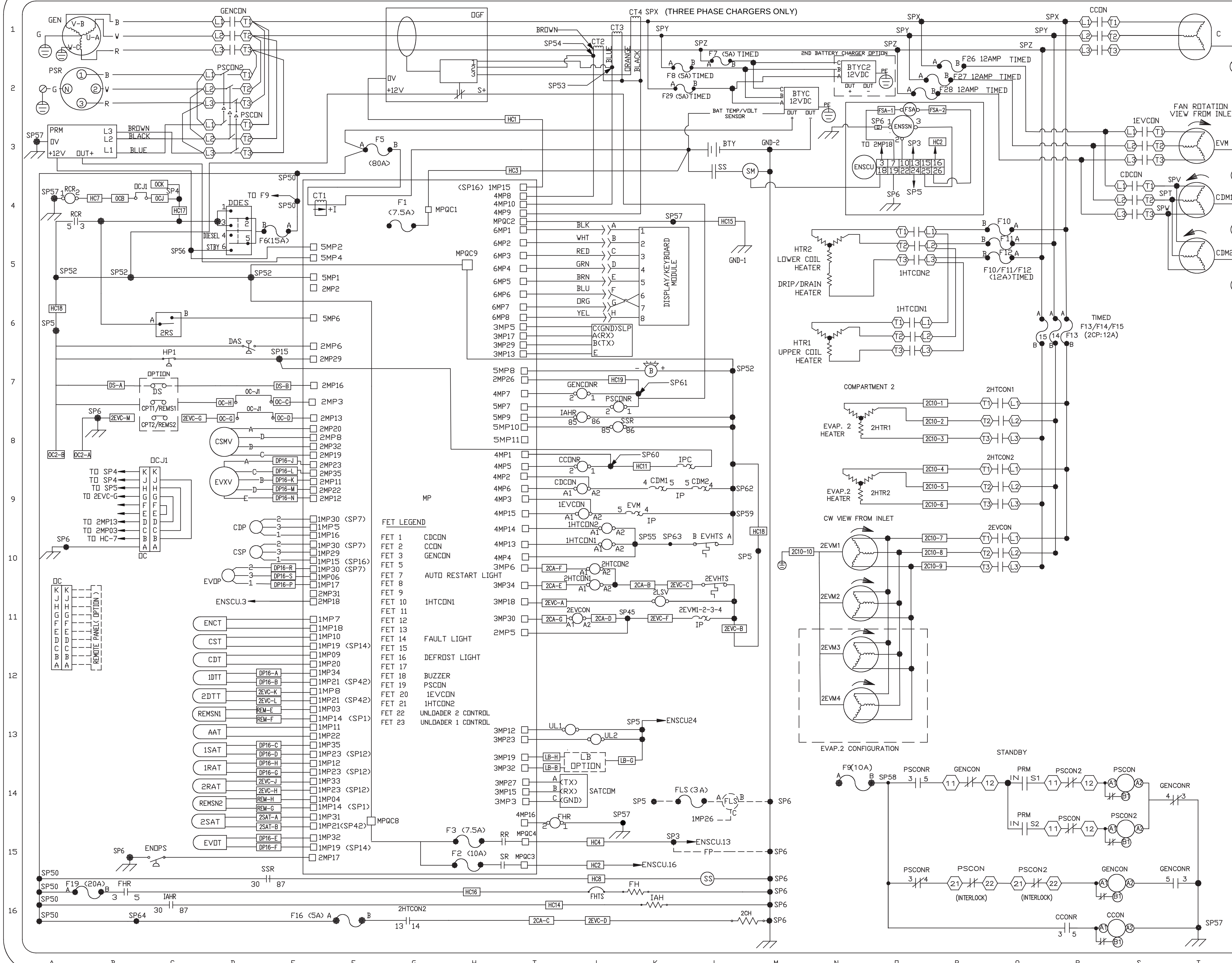
| Test Point | Pin | Color | Description |
|---|---|---|---|
| TP14 | Pin 1 | Black | +12 VDC for Display backlighting and indicator LED s |
| TP13 | Pin 2 | White | Ground for backlighting and indicator LEDs |
| TP13 | Pin 3 | Red | Ground for backlighting and indicator LEDs |
| TP12 | Pin 4 | Green | +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 |

## 10.6 WIRING SCHEMATIC

The wiring schematics are provided on the following pages.



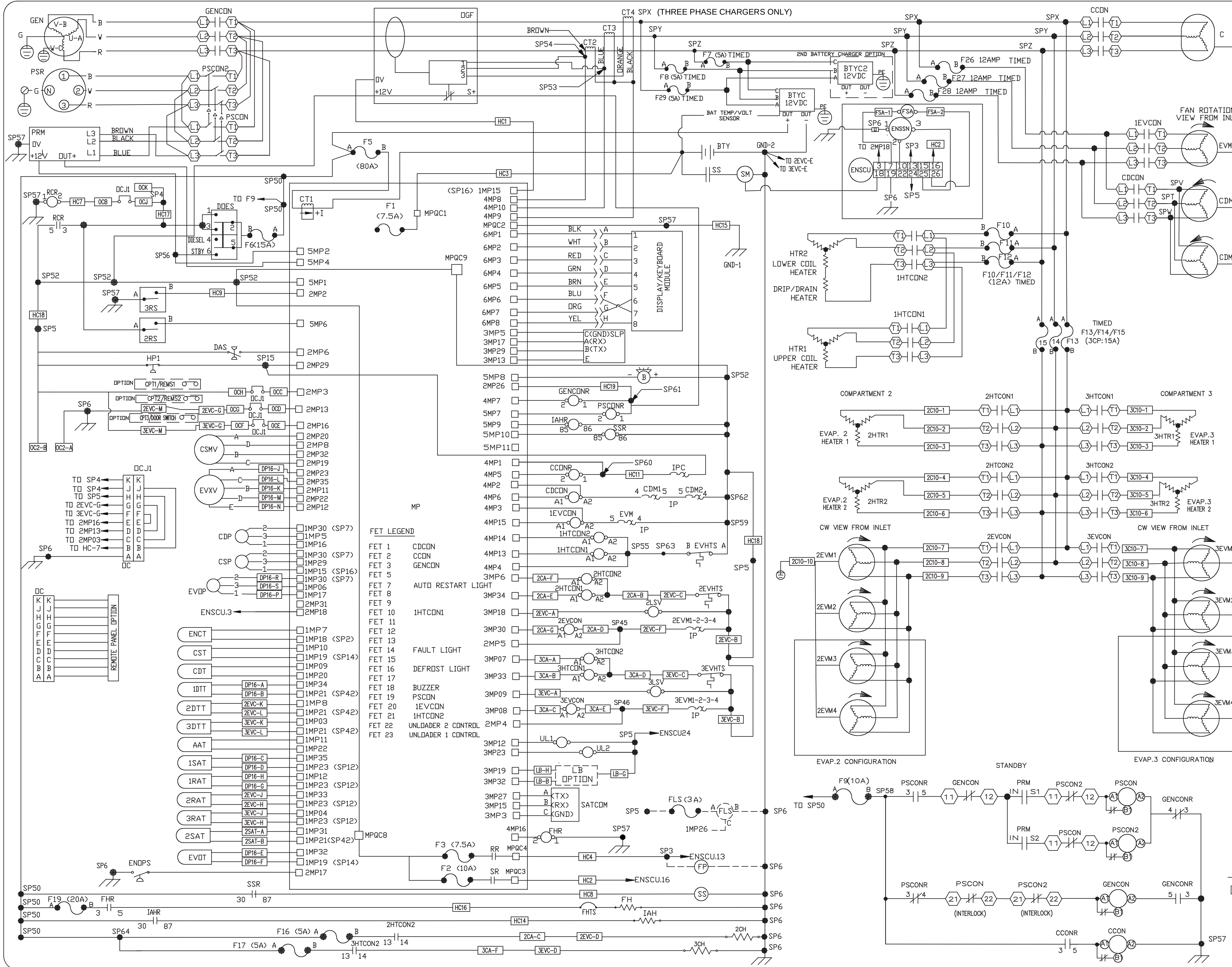
| ZONE | ACRONYM | DESCRIPTION |
|---|---|---|
| C6 | 2RS | 2ND COMPARTMENT RUN SWITCH |
| C6 | 3RS | 3RD COMPARTMENT RUN SWITCH |
| C14 | 2RAT | 2ND COMPARTMENT RETURN AIR SENSOR |
| C14 | 2SAT | 2ND COMPARTMENT SUPPLY AIR SENSOR (OPTIONAL) |
| C13 | AAT | AMBIENT AIR TEMP SENSOR |
| K7 | B | BUZZER |
| L3 | BTY | BATTERY |
| M2 | BTYC | BATTERY CHARGER |
| N2 | BTYC2 | BATTERY CHARGER2 (OPTION) |
| T1 | C | COMPRESSOR |
| R1,R16 | CCON | COMPRESSOR CONTACTOR |
| I8,R16 | CCONR | COMPRESSOR CONTACTOR RELAY |
| D10 | CDP | COMPRESSOR DISCHARGE PRESSURE TRANSDUCER |
| C12 | CDT | COMPRESSOR DISCHARGE TEMPERATURE SENSOR |
| J9,S4 | CDCON | CONDENSER MOTOR CONTACTOR |
| T4 | CDM1 | CONDENSER MOTOR 1 |
| T5 | CDM2 | CONDENSER MOTOR 2 |
| L16 | 2CH | CONDENSATE HEATER (EVAP 2) |
| C7 | CPT1,2 | COMPARTMENT REMOTE SWITCH 1,2 |
| D8 | CSMV | COMPRESSOR SUCTION MODULATION VALVE |
| D10 | CSP | COMPRESSOR SUCTION PRESSURE TRANSDUCER |
| C11 | CST | COMPRESSOR SUCTION TEMPERATURE SENSOR |
| E4 | CT1 | DC CURRENT SENSOR |
| J2 | CT2,3,4 | AC CURRENT SENSOR |
| D6 | DAS | DEFROST AIR SWITCH |
| D7 | DS | DOOR SWITCH |
| D12 | 1,2DTT | DEFROST TEMPERATURE SENSOR EVAPS 1,2 |
| D4 | DOES | DIESEL OFF ENGINE STANDBY SWITCH |
| D11 | ENCT | ENGINE COOLANT TEMPERATURE |
| B15 | ENOPS | ENGINE OIL PRESSURE SWITCH |
| O3 | ENSCU | ENGINE SPEED CONTROL UNIT |
| O3 | ENSSN | ENGINE SPEED SENSOR |
| J9,S3 | 1EVCON | 1 EVAPORATOR FAN CONTACTOR |
| J11,Q10 | 2EVCON | 2 EVAPORATOR FAN CONTACTOR |
| T3 | EVM | EVAPORATOR FAN MOTOR |
| O10-13 | 2EVM1-4 | 2ND COMPARTMENT EVAPORATOR FAN MOTORS |
| L10 | EVHTS | EVAP HIGH TEMPERATURE SWITCH |
| L11 | 2EVHTS | 2 EVAP HIGH TEMPERATURE SWITCH |
| D10 | EVOP | EVAPORATOR OUTLET PRESSURE TRANSDUCER |
| C15 | EVOT | EVAPORATOR OUTLET TEMPERATURE SENSOR |
| D9 | EVXV | ELECTRONIC EXPANSION VALVE |
| G4 | F1 | FUSE POWER-7.5 AMP |
| H15 | F2 | FUSE - SPEED RELAY 10 AMP |
| H15 | F3 | FUSE - RUN RELAY 7.5 AMP |
| F3 | F5 | FUSE - MAIN 80 AMP |
| D4 | F6 | FUSE - MICRO POWER 15 AMP |
| L2 | F7/8/29 | FUSE BATTERY CHARGER 5 AMP TIME DELAY |
| O13 | F9 | FUSE - CONTACTORS 10 AMP |
| Q5 | F10/11/12 | FUSE - HEATERS 12 AMP TIME DELAY |
| R7 | F13/14/15 | FUSE - REMOTE COMPARTMENT 12 AMP TIME DELAY |
| C16 | F16 | FUSE - 2CPT REMOTE DRAIN HTR 5 AMP |
| B16 | F19 | FUSE - FUEL HEATER 20 AMP |
| P2 | F26/27/28 | FUSE - FANS 12AMP TIME DELAY |
| K16 | FH | FUEL HEATER |
| I15,C15 | FHR | FUEL HEATER RELAY |
| J16 | FHTS | FUEL HEATER THERMOSTATIC SWITCH |
| L14 | FLS | FUEL LEVEL SENSOR (OPTIONAL) |
| L15 | FP | FUEL PUMP ( OPTIONAL) |
| O2 | FSA | FUEL SOLENOID ACTUATOR |
| D1,R15 P14 | GENCON | GENERATOR CONTACTOR |
| J7,S14 | GENCONR | GENERATOR CONTACTOR RELAY |
| A1 | GEN | GENERATOR |
| C7 | HP1 | HIGH DISCHARGE PRESSURE SWITCH |
| J10,O6 | 1HTCON1 | 1 HEATER1 CONTACTOR |
| J9,O5 | 1HTCON2 | 1 HEATER2 CONTACTOR |
| N6 | HTR1 | HEATER 1 |
| N5 | HTR2 | HEATER 2 |
| J10,Q7 | 2HTCON1 | 2ND COMPARTMENT HEATER1 CONTACTOR |
| J10,R8, D16 | 2HTCON2 | 2ND COMPARTMENT HEATER2 CONTACTOR |
| N8 | 2HTR1 | 2ND COMPARTMENT HEATER 1 |
| N9 | 2HTR2 | 2ND COMPARTMENT HEATER 2 |
| K16 | IAH | INTAKE AIR HEATER |
| J7,D16 | IAHR | INTAKE AIR HEATER RELAY |
| K8 | IPC | INTERNAL PROTECTOR COMPRESSOR |
| K9 | IPCDM1,2 | INTERNAL PROTECTORS CONDENSER FAN MOTORS |
| K9 | IPEVM | INTERNAL PROTECTOR EVAPORATOR FAN MOTOR |
| L11 | 2IPEVM | INTERNAL PROTECTORS 2 COMPARTMENT EVAP MOTORS |
| J14 | LB | LIGHT BAR ( OPTIONAL) |
| K11 | 2LSV | 2ND COMPARTMENT LIQUID SOLENOID VALVE |
| D10 | MAP | MANIFOLD ATMOSPHERIC PRESSURE SENSOR (OPTIONAL) |
| E3-15 | MP | MICROPROCESSOR |
| A11 | OC | OPTIONAL CONTROL PANEL CONNECTOR |
| C4,C9 | OCJ1 | OPTIONAL CONTROL PANEL CONNECTOR JUMPER |
| A8 | OC2 | OPTION CONNECTOR 2 |
| G2 | OGF | OVERLOAD/GROUND FAULT MODULE |
| E4 | PWR | MICRO POWER |
| A3,Q14 | PRM | PHASE REVERSAL MODULE |
| D3,R14 | PSCON | POWER SOURCE CONTACTOR |
| D2,S14 | PSCON2 | POWER SOURCE CONTACTOR 2 |
| O15 | PSCONR | POWER SOURCE CONTACTOR RELAY |
| C7 | REMS1,2 | REMOTE SWITCH |
| D13,D14 | REMSN1,2 | REMOTE SENSOR |
| H15 | RR | RUN RELAY |
| A4 | RCR | RUN CONTROL RELAY |
| A2 | PSR | STANDBY POWER PLUG |
| C13 | 1RAT | RETURN AIR TEMPERATURE |
| D13 | 1SAT | SUPPLY AIR TEMPERATURE |
| J14 | SATCOM | SATELLITE COMMUNICATIONS CONNECTOR |
| J6 | SLP | SERIAL COMMUNICATIONS PORT |
| L3 | SM | STARTER MOTOR |
| H15 | SR | SPEED RELAY |
| L16 | SS | STARTER SOLENOID |
| L3 | SSC | STARTER SOLENOID CONTACTOR |
| J8,D15 | SSR | STARTER SOLENOID RELAY |
| J13 | UL1,2 | UNLOADER1,2 |

NOTE:-
SP-NUMERIC LOW VOLT
SP-ALPHA HIGH VOLT

- SPLICE POINT
- STANDARD OPTIONS
- PLUG CONNECTION
- PIN CONNECTION
- COMPONENT CONNECTION
- N/C CONTACTS
- N/O CONTACTS
- WIRE GROUND (PE)
- CHASSIS GROUND

VECTOR 6600MT
With Main Power Switch Labeled ENGINE/OFF/STANDBY
2 COMPARTMENT

Based on 62-11580_ART6_S6_RF



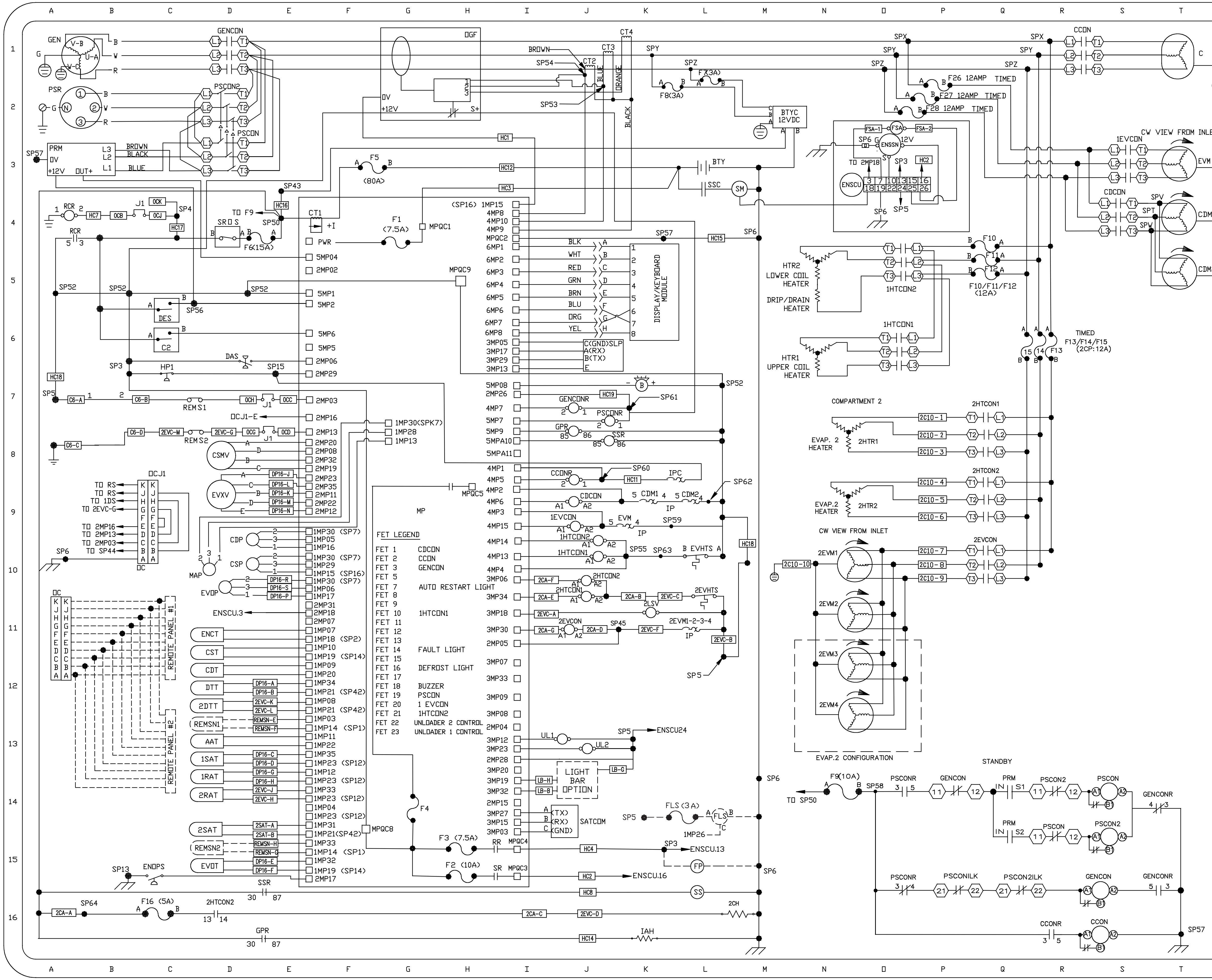

| ZONE | ACRONYM | DESCRIPTION |
|---|---|---|
| C6 | 2RS | 2ND COMPARTMENT RUN SWITCH |
| C6 | 3RS | 3RD COMPARTMENT RUN SWITCH |
| C14 | 2RAT | 2ND COMPARTMENT RETURN AIR SENSOR |
| C14 | 3RAT | 3RD COMPARTMENT RETURN AIR SENSOR |
| C14 | 2SAT | 2ND COMPARTMENT SUPPLY AIR SENSOR (OPTIONAL) |
| C13 | AAT | AMBIENT AIR TEMP SENSOR |
| K7 | B | BUZZER |
| L3 | BTY | BATTERY |
| M2 | BTYC | BATTERY CHARGER |
| N2 | BTYC2 | BATTERY CHARGER2 (OPTION) |
| T1 | C | COMPRESSOR |
| R1,R16 | CCON | COMPRESSOR CONTACTOR |
| I8,R16 | CCONR | COMPRESSOR CONTACTOR RELAY |
| D10 | CDP | COMPRESSOR DISCHARGE PRESSURE TRANSDUCER |
| C12 | CDT | COMPRESSOR DISCHARGE TEMPERATURE SENSOR |
| J9,S4 | CDCON | CONDENSER MOTOR CONTACTOR |
| T4 | CDM1 | CONDENSER MOTOR 1 |
| T5 | CDM2 | CONDENSER MOTOR 2 |
| L16 | 2,3CH | CONDENSATE HEATER (EVAP 2,3) |
| C7 | CPT1,2,3 | COMPARTMENT SWITCH 1,2,3 |
| D8 | CSMV | COMPRESSOR SUCTION MODULATION VALVE |
| D10 | CSP | COMPRESSOR SUCTION PRESSURE TRANSDUCER |
| C11 | CST | COMPRESSOR SUCTION TEMPERATURE SENSOR |
| E4 | CT1 | DC CURRENT SENSOR |
| J2 | CT2,3,4 | AC CURRENT SENSOR |
| D6 | DAS | DEFROST AIR SWITCH |
| D5 | DOES | DIESEL OFF ENGINE STANDBY SWITCH |
| D12 | 1,2,3DTT | DEFROST TEMPERATURE SENSOR EVAPS 1,2,3 |
| D11 | ENCT | ENGINE COOLANT TEMPERATURE |
| B15 | ENOPS | ENGINE OIL PRESSURE SWITCH |
| O3 | ENSCU | ENGINE SPEED CONTROL UNIT |
| O3 | ENSSN | ENGINE SPEED SENSOR |
| J9,S3 | 1EVCON | 1 EVAPORATOR FAN CONTACTOR |
| J11,Q10 | 2EVCON | 2 EVAPORATOR FAN CONTACTOR |
| J13,R10 | 3EVCON | 3 EVAPORATOR FAN CONTACTOR |
| T3 | EVM | EVAPORATOR FAN MOTOR |
| O10-13 | 2EVM1-4 | 2ND COMPARTMENT EVAPORATOR FAN MOTORS |
| T10-13 | 3EVM1-4 | 3RD COMPARTMENT EVAPORATOR FAN MOTORS |
| L10 | EVHTS | EVAP HIGH TEMPERATURE SWITCH |
| L11 | 2EVHTS | 2 EVAP HIGH TEMPERATURE SWITCH |
| L12 | 3EVHTS | 3 EVAP HIGH TEMPERATURE SWITCH |
| D10 | EVOP | EVAPORATOR OUTLET PRESSURE TRANSDUCER |
| C15 | EVOT | EVAPORATOR OUTLET TEMPERATURE SENSOR |
| D9 | EVXV | ELECTRONIC EXPANSION VALVE |
| K16 | FH | FUEL HEATER |
| I15,B15 | FHR | FUEL HEATER RELAY |
| G4 | F1 | FUSE POWER-7.5 AMP |
| H15 | F2 | FUSE - SPEED RELAY 10 AMP |
| H15 | F3 | FUSE - RUN RELAY 7.5 AMP |
| F3 | F5 | FUSE - MAIN 80 AMP |
| D4 | F6 | FUSE - MICRO POWER 15 AMP |
| L2 | F7/8/29 | FUSE BATTERY CHARGER 5 AMP TIME DELAY |
| O13 | F9 | FUSE - CONTACTORS 10 AMP |
| Q5 | F10/11/12 | FUSE - HEATERS 12 AMP TIME DELAY |
| R7 | F13/14/15 | FUSE - REMOTE COMPARTMENTS 15 AMP TIME DELAY |
| C16 | F16 | FUSE - 2CPT REMOTE DRAIN HTR 5 AMP |
| B16 | F17 | FUSE - 3CPT REMOTE DRAIN HTR 5 AMP |
| B16 | F19 | FUSE - FUEL HEATER 20 AMP |
| P2 | F26/27/28 | FUSE - FANS 12AMP TIME DELAY |
| K16 | FH | FUEL HEATER |
| I15,C15 | FHR | FUEL HEATER RELAY |
| J16 | FHTS | FUEL HEATER THERMOSTATIC SWITCH |
| L14 | FLS | FUEL LEVEL SENSOR (OPTIONAL) |
| L15 | FP | FUEL PUMP ( OPTIONAL) |
| O2 | FSA | FUEL SOLENOID ACTUATOR |
| P14,S15 D1 | GENCON | GENERATOR CONTACTOR |
| J7,S14 | GENCONR | GENERATOR CONTACTOR RELAY |
| A1 | GEN | GENERATOR |
| C7 | HP1 | HIGH DISCHARGE PRESSURE SWITCH |
| J10,O6 | 1HTCON1 | 1 HEATER1 CONTACTOR |
| J9,O5 | 1HTCON2 | 1 HEATER2 CONTACTOR |
| N6 | HTR1 | HEATER 1 |
| N5 | HTR2 | HEATER 2 |
| J10,Q7 | 2HTCON1 | 2ND COMPARTMENT HEATER1 CONTACTOR |
| J10,Q8, D16 | 2HTCON2 | 2ND COMPARTMENT HEATER2 CONTACTOR |
| N8 | 2HTR1 | 2ND COMPARTMENT HEATER 1 |
| N9 | 2HTR2 | 2ND COMPARTMENT HEATER 2 |
| J12,R7 | 3HTCON1 | 3RD COMPARTMENT HEATER1 CONTACTOR |
| J12,R8, C16 | 3HTCON2 | 3RD COMPARTMENT HEATER2 CONTACTOR |
| S8 | 3HTR1 | 3RD COMPARTMENT HEATER 1 |
| S9 | 3HTR2 | 3RD COMPARTMENT HEATER 2 |
| K16 | IAH | INTAKE AIR HEATER |
| D16,J7 | IAHR | INTAKE AIR HEATER RELAY |
| K8 | IPC | INTERNAL PROTECTOR COMPRESSOR |
| K9 | IPCDM1,2 | INTERNAL PROTECTORS CONDENSER FAN MOTORS |
| K9 | IPEVM | INTERNAL PROTECTOR EVAPORATOR FAN MOTOR |
| L11 | 2IPEVM | INTERNAL PROTECTORS 2 COMPARTMENT EVAP MOTORS |
| L12 | 3IPEVM | INTERNAL PROTECTORS 3 COMPARTMENT EVAP MOTORS |
| J14 | LB | LIGHT BAR ( OPTIONAL) |
| K11 | 2LSV | 2ND COMPARTMENT LIQUID SOLENOID VALVE |
| K12 | 3LSV | 3RD COMPARTMENT LIQUID SOLENOID VALVE |
| E3-15 | MP | MICROPROCESSOR |
| A11 | OC | OPTIONAL CONTROL PANEL CONNECTOR |
| C4,C9 | OCJ1 | OPTIONAL CONTROL PANEL CONNECTOR JUMPER |
| A8 | OC2 | OPTION CONNECTOR 2 |
| G2 | OGF | OVERLOAD/GROUND FAULT MODULE |
| E4 | PWR | MICRO POWER |
| A3,Q14 | PRM | PHASE REVERSAL MODULE |
| D3,R14 P15 | PSCON | POWER SOURCE CONTACTOR |
| D2,S14 | PSCON2 | POWER SOURCE CONTACTOR 2 |
| O14,O15 | PSCONR | POWER SOURCE CONTACTOR RELAY |
| C7 | REMS1,2 | REMOTE SWITCH |
| H15 | RR | RUN RELAY |
| A4 | RCR | RUN CONTROL RELAY |
| A2 | PSR | STANDBY POWER PLUG |
| C13 | 1RAT | RETURN AIR TEMPERATURE |
| H15 | RR | RUN RELAY |
| D13 | 1SAT | SUPPLY AIR TEMPERATURE |
| J14 | SATCOM | SATELLITE COMMUNICATIONS CONNECTOR |
| J6 | SLP | SERIAL COMMUNICATIONS PORT |
| L3 | SM | STARTER MOTOR |
| H15 | SR | SPEED RELAY |
| L16 | SS | STARTER SOLENOID |
| L3 | SSC | STARTER SOLENOID CONTACTOR |
| J8,D15 | SSR | STARTER SOLENOID RELAY |
| J13 | UL1,2 | UNLOADER1,2 |

-SPLICE POINT
-STANDARD OPTIONS
HC# -PLUG CONNECTION
-PIN CONNECTION
-COMPONENT CONNECTION
-N/C CONTACTS
-N/O CONTACTS
-WIRE GROUND (PE)
-CHASSIS GROUND

NOTE:-
SP-NUMERIC LOW VOLT
SP-ALPHA HIGH VOLT

VECTOR 6600MT
3 COMPARTMENT

Based on 62-11580_ART8-S8-RF



| ZONE | ACRONYM | DESCRIPTION |
|---|---|---|
| C13 | AAT | AMBIENT AIR TEMP SENSOR |
| K7 | B | BUZZER |
| L3 | BTY | BATTERY |
| M2 | BTYC | BATTERY CHARGER |
| C6 | C2 | 2CPT RUN/STOP SWITCH |
| T1 | C | COMPRESSOR |
| R16 | CCON | COMPRESSOR CONTACTOR |
| I8,R16 | CCONR | COMPRESSOR CONTACTOR RELAY |
| D10 | CDP | COMPRESSOR DISCHARGE PRESSURE SENSOR |
| C12 | CDT | COMPRESSOR DISCHARGE TEMPERATURE SENSOR |
| J9,S4 | CDCON | CONDENSOR MOTOR CONTACTOR |
| S4 | CDM1 | CONDENSOR MOTOR 1 |
| S5 | CDM2 | CONDENSOR MOTOR 2 |
| L16 | 2CH | CONDENSATE HEATER (EVAP 2) |
| D8 | CSMV | COMPRESSOR SUCTION MODULATION VALVE |
| D10 | CSP | COMPRESSOR SUCTION PRESSURE SENSOR |
| C11 | CST | COMPRESSOR SUCTION TEMPERATIURE SENSOR |
| E4 | CT1 | DC CURRENT SENSOR |
| J2 | CT2,3,4 | AC CURRENT SENSOR |
| D6 | DAS | DEFROST AIR SWITCH |
| C5 | DES | DIESEL ELECTRIC SWITCH |
| D12 | DTT | DEFROST TEMPERATURE SENSOR |
| D12 | 2DTT | DEFROST TEMPERATURE SENSOR COMPARTMENT 2 |
| D11 | ENCT | ENGINE COOLANT TEMPERATURE |
| B15 | ENOPS | ENGINE OIL PRESSURE SWITCH |
| O3 | ENSCU | ENGINE SPEED CONTROL UNIT |
| O3 | ESSN | ENGINE SPEED SENSOR |
| J9,S3 | 1EVCON | 1 EVAPORATOR FAN CONTACTOR |
| T3 | EVM | EVAPORATOR FAN MOTOR |
| O10-13 | 2EVM1-4 | 2ND COMPARTMENT EVAPORATOR FAN MOTORS |
| J11,Q10 | 2EVCON | 2ND COMPARTMENT EVAPORATOR FAN CONTACTOR |
| L10 | 1EVHTS | 1 EVAP HIGH TEMPERATURE SWITCH |
| D10 | EVOP | EVAPERATOR OUTLET PRESSURE SENSOR |
| C15 | EVOT | EVAPORATOR OUTLET TEMPERATURE SENSOR |
| D9 | EVXV | ELECTRONIC EXPANSION VALVE |
| F4 | F1 | FUSE POWER-7.5 AMP |
| G15 | F2 | FUSE - SPEED RELAY 10 AMP |
| G15 | F3 | FUSE - RUN RELAY 7.5 AMP |
| F3 | F5 | FUSE - MAIN 80 AMP |
| D4 | F6 | FUSE - MICRO POWER 15 AMP |
| L2 | F7/8 | FUSE BATTERY CHARGER 3 AMP TIME DELAY |
| N14 | F9 | FUSE - CONTACTORS 10 AMP |
| Q5 | F10/11/12 | FUSE - HEATERS 12 AMP QUICK BLOW |
| R7 | F13/14/15 | FUSE - REMOTE COMPARTMENTS 12 AMP TIME DELAY |
| C16 | F16 | FUSE - 2CPT REMOTE DRAIN HTR |
| P2 | F26/27/28 | FUSE - FANS 12AMP TIME DELAY |
| L14 | FLS | FUEL LEVEL SENSOR (OPTIONAL) |
| L15 | FP | FUEL PUMP ( OPTIONAL) |
| O2 | FSA | FUEL/SPEED ACTUATOR |
| P14,S15 | GENCON | GENERATOR CONTACTOR |
| J7,S14, S15 | GENCONR | GENERATOR CONTACTOR RELAY |
| A1 | GEN | GENERATOR |
| D16,J8 | GPR | GLOW PLUG RELAY |
| C7 | HP1 | HIGH DISCHARGE PRESSURE SWITCH |
| J9,O4 | 1HTCON1 | 1 HEATER1 CONTACTOR |
| J9,O6 | 1HTCON2 | 1 HEATER2 CONTACTOR |
| N5 | HTR1 | HEATER 1 |
| N6 | HTR2 | HEATER 2 |
| J10,Q9 | 2HTCON1 | 2ND COMPARTMENT HEATER 1 CONTACTOR |
| J10,Q8 | 2HTCON2 | 2ND COMPARTMENT HEATER 2 CONTACTOR |
| N9 | 2HTR1 | 2ND COMPARTMENT HEATER 1 |
| N8 | 2HTR2 | 2ND COMPARTMENT HEATER 2 |
| K16 | IAH | INTAKE AIR HEATER |
| K8 | IPC | INTERNAL PROTECTOR COMPRESSOR |
| K9 | IPCDM1,2 | INTERNAL PROTECTORS CONDENSOR FAN MOTORS |
| K9 | IPEVM | INTERNAL PROTECTOR EVAPORATOR FAN MOTORS |
| L11 | 2IPEVM | INTERNAL PROTECTORS 2 COMPARTMENT EVAP MOTOR |
| J13 | LB | LIGHT BAR ( OPTIONAL) |
| K11 | 2LSV | 2ND COMPARTMENT LIQUID SOLENOID VALVE |
| D10 | MAP | MANIFOLD ABSOLUTE PRESSURE SENSOR |
| E3-15 | MP | MICROPROCESSOR |
| A11 | OC | OPTIONAL CONTROL PANEL CONNECTOR |
| D7 | OCJ1 | OPTIONAL CONTROL PANEL CONNECTOR JUMPER |
| G2 | OGF | OVERLOAD/GROUND FAULT MODULE |
| E4 | PWR | MICRO POWER |
| A3,Q14 | PRM | PHASE REVERSAL MODULE |
| D3,R14 | PSCON | POWER SOURCE CONTACTOR |
| D2,S14 | PSCON2 | POWER SOURCE CONTACTOR 2 |
| P15 | ILK | PSCON INTERLOCK |
| O15 | PSCONR | POWER SOURCE CONTACTOR RELAY |
| A2 | PSR | STANDBY POWER PLUG |
| C13 | 1RAT | RETURN AIR TEMPERATURE |
| D7 | REMS1 | REMOTE SWITCH 1 |
| D8 | REMS2 | REMOTE SWITCH 2 |
| D13 | REMSN1 | REMOTE TEMPERATURE 1 |
| D15 | REMSN2 | REMOTE TEMPERATURE 2 |
| H15 | RR | RUN RELAY |
| D13 | 1SAT | SUPPLY AIR TEMPERATURE |
| J14 | SATCOM | SATELLITE COMMUNICATIONS CONNECTOR |
| J6 | SLP | SERIAL COMMUNICATIONS PORT |
| L3 | SM | STARTER MOTOR |
| H15 | SR | SPEED RELAY |
| D4 | SROS | START/RUN - OFF SWITCH |
| L16 | SS | STARTER SOLENOID |
| L3 | SSC | STARTER SOLENOID CONTACTOR |
| J8 | SSR | STARTER SOLENOID RELAY |
| J13 | UL1/2 | UNLOADER1/2 |

NOTE:-
SP-NUMERIC LOW VOLT
SP-ALPHA HIGH VOLT

●-SPLICE POINT
----STANDARD OPTIONS
HC#-PLUG CONNECTION
□-PIN CONNECTION
○-COMPONENT CONNECTION

N/C CONTACTS
N/O CONTACTS
-WIRE GROUND (PE)
-CHASSIS GROUND

VECTOR 6600MT
With Main Power Switch Labeled START/RUN-OFF
2 COMPARTMENT

Based on 62-11451_ART6_S6_RE

# INDEX

## R



## S

## T



## U



## V



## W

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