Operation and Service Manual

Vector™ 8600MT

Mutli-Temp Trailer Refrigeration Units

62-11782 Rev E

Operation and Service Manual

for

VECTOR 8600MT

Multi-Temp Trailer Refrigeration Units

Manual Revision History 62-11782

Rev.	Date	Reason for Release
		Converted to FrameMaker started 10/14
B	05/10/17	
C	03/19/19	8.8 Corrected Step 17 - Torque mounting bolts to 66 ft-lbs (89 Nm); Spell check
D	5/7/2020	Updated covers and logo; updated diagnostic instructions for CSMV and EVXV
E	3/5/2021	Sections 1, 2, and 8: Updated with R-452A references, instructions, decals; Section 5.2.4: Added EVXV and CSMV to list under step 2; Section 5.3.3: Updated step 5 (download folder name), updated USB part number; Section 8.9.7.1, step 3: Updated verbiage to reference CSMV in Component Test mode; Replaced all coolant references and Notices (Use Organic Acid Technology (OAT), nitrite free (NF) extended life coolant) (per BM); Safety advisories updated (PM)

Change Pages

Date	Page	Changes
11/13/14	7-140	AL24301 updated per Vohn. Step 2 removed the “3” from Check the Compartment 3 EVOP.
12/10/14	8-12	If, after placing the system in Economized Mode for 180 seconds, engine speed is not low enough to calibrate the sensor (1700 – 1780 RPM), Changed “not high enough” to “not low enough” Same change for 8500 & X4
03/16/16	RPS Calibration procedures	Changed “ECU” to “ENCU” Added “Ensure the unit will not start automatically by placing the STOP/RUN-OFF switch in the OFF position and disabling the starter.” And “Re-enable the starter and start the unit.”
10/11/16	2-16	Changed Coolant Capacity from 2.9 gallons (11 liters) to 2.4 gallons (9 liters)
Updated 05/04/2017	multiple	Schematic is showing a Fuel Solenoid Actuator This should be called Fuel/speed actuator not fuel speed actuator or fuel solenoid.
05/04/17	Safety	Added new decal, 62-04222-00
06/05/17	Section 5, config table	Not completed Add “Setpoint Change Alarm” Config code to Section 5
10/26/2018	2-22	Heater Compartment 1, Heater 1 change 97.6 ohms to 196 ohms; Compartment 1, Heater 2 change 97.6 ohms to 196 ohms
02/11/19	10-7	Corrected SP-16 from Ground to Power

SECTION 1
Safety Precautions

1.1 Safety Precautions

WARNING

SAFETY CONSIDERATIONS: Installation and servicing of refrigeration equipment can be hazardous due to system pressures, rotating elements and electrical components. Only trained and qualified service personnel should install, repair or service refrigeration equipment. When working on refrigeration equipment, observe precautions in all literature including this manual, the equipment tags and labels attached to the unit, and other safety precautions that may apply. Follow safe work practices and utilize the appropriate protective equipment at all times.

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 START/RUN-OFF switch (SROS) is in the START/RUN position.

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 START/RUN-OFF switch (SROS) is in the START/RUN position. A buzzer will sound for 5 seconds before the unit is started. When performing any check of the refrigeration unit (e.g., checking the belt, checking the oil, checking the electrical connections), make certain that the START/RUN-OFF 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 coolant system. 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 Electric 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. Disconnect the high voltage source when performing service or maintenance procedures and lockout/tagout the receptacle in accordance with your company 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, Caution, and Notice 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

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

WARNING

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

CAUTION

CAUTION - warns against potential hazard or unsafe practices which could result in minor personal injury.

NOTICE

NOTICE - warns against potential 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

Unit may start automatically at any time even if the switch is in the OFF position. Use proper lockout/tagout procedures before inspection/servicing. All unit inspection/servicing by properly trained personnel only.

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 instruction, ensure the START/RUN-OFF switch is in 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

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

WARNING

Do not toggle the START/RUN - OFF switch out of the OFF position when in PC Mode or the unit will start.

WARNING

When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instruction, ensure the START/RUN-OFF switch is in OFF position and, whenever practical, disconnect the negative battery connection.

WARNING

Do not remove the cap from a hot coolant system; 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

Beware of moving belts and belt-driven components. When working with belts, beware of pinch points.

WARNING

Only a refrigerant cylinder that has previously been used with R-404A or R-452A should be connected to this refrigeration unit.

WARNING

Never use air or gases containing oxygen for leak testing or operating refrigerant compressors. Pressurized mixtures of air or gases containing oxygen can lead to explosion.

WARNING

Disconnect batteries before doing any electrical welding.

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.

WARNING

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

WARNING

Only a refrigerant cylinder containing R-404A or R-452A 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.

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.

WARNING

Before removal of the compressor, relieve the internal pressure by very carefully loosening the couplings to break the seal.

WARNING

A service/shipping sleeve (54-00656-23) must be installed before removal of the generator from the engine. The generator MUST be removed as an assembly, with the shim in place. DO NOT attempt to separate the rotor or stator.

WARNING

Never disassemble the generator rotor from the stator due to the high force required to do so and the high magnetic field that will result. The field present when the rotor is disassembled from the stator may interfere with cardiac implants such as pacemakers and defibrillators.

WARNING

R-452A is an A1 non-flammable refrigerant blend. However certain of its constituents are considered A2L mildly flammable. For this reason, it is imperative that the system of a Vector unit utilizing R-452A refrigerant be recovered to a sufficient vacuum to ensure all residual refrigerant is removed from the system. Follow the R-452A refrigerant recovery procedure before performing any "hot work," including but not limited to brazing or welding on a unit that has been charged with R-452A, to prevent flare up of residual A2L refrigerant constituents. Refrigerant must be recovered until equipment gauge indicates 20 inHG (-0.6bar) of vacuum.

CAUTION

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

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

Refer to Table 8–5 and Table 8–6 for Temperature Pressure Charts for R-452A and R-404A refrigerants. Note that the liquid state pressure value and the vapor state pressure value of the R-452A refrigerant are different and more variable than those of the R-404A refrigerant

CAUTION

Do not vapor charge R-404A or R-452A. Only liquid charging is acceptable.

CAUTION

The scroll compressor achieves low suction pressure very quickly. Do not use the compressor to evacuate the system below 0 psig. Never operate the compressor with the suction or discharge service valves closed (frontseated). Internal damage will result from operating the compressor in a deep vacuum.

NOTICE

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

NOTICE

Electronic modules MUST be handled with care to prevent accidental damage or degradation from electrostatic discharge (ESD), contamination or abuse. Before touching a module, touch your body and/or conductive tool being used to the frame to discharge ESD safely. All electronics should be handled carefully and only held by edges of any exposed board. Care should be taken when inserting/extracting connectors and components to avoid exerting excessive stress on the board which could fracture small components nearby, resulting in future failure of circuit.

NOTICE

Under no circumstances should a technician electrically probe the modules at any point, other than the connector terminals where the harness attaches. Module 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 module.

NOTICE

Technician mode should be canceled when work is complete. If Technician mode is not canceled, Technician Mode will be available for 60 minutes after the last key press without requiring a code, even after placing the SROS in the OFF and then back in the RUN/ STOP position.

NOTICE

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.

NOTICE

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

NOTICE

Unit uses either R-404A or R-452A refrigerant 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.

NOTICE

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

NOTICE

Torque fuel level sensor mounting screws to 15 to 18 inch/lbs (1.7 to 2.0 Nm). DO NOT over tighten, as little as 20 inch/pounds (2.3 Nm) will damage the sensor.

NOTICE

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.

NOTICE

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

NOTICE

Use only red Extended Life Coolant, Nitrite Free (ELC-NF) that is premixed to a 50/50 concentration of coolant/water. Coolant should meet ASTM specifications D3306 and D6210, and be labeled for at least five years, 12,000 hours service life. Do not add conventional or long life coolant (green, purple, or blue green) to a coolant system using ELC-NF (Red) coolant except in an emergency. If the ELC-NF coolant is diluted with conventional or long life coolant, the change reverts to two years, 6,000 hours.

NOTICE

The scroll compressor achieves low suction pressure very quickly. Do not use the compressor to evacuate the system below 0 psig. Never operate the compressor with the suction or discharge service valves closed (frontseated). Internal damage will result from operating the compressor in a deep vacuum.

NOTICE

When a module is replaced, software should be upgraded before switching the unit on. This will ensure software compatibility of all modules.

NOTICE

Do not bend tubing on the condenser coil when installing a new condenser. Bend the unit tubing if tubes do not align correctly.

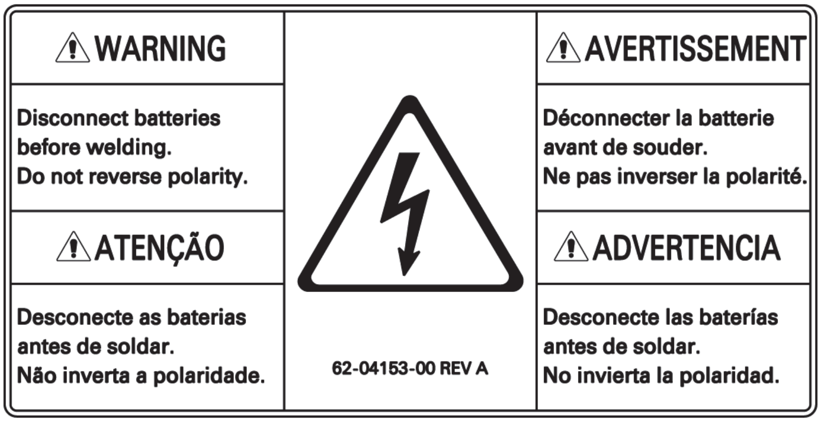
NOTICE

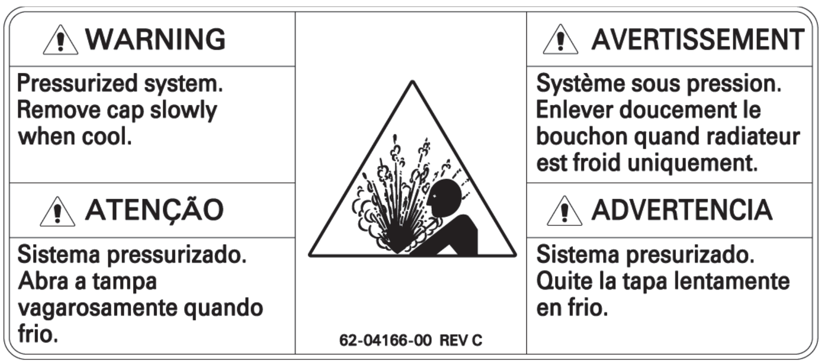
Under no circumstances should anyone attempt to repair sealed module internal components. Should a problem develop with these components, contact your nearest Carrier Transicold dealer for replacement.

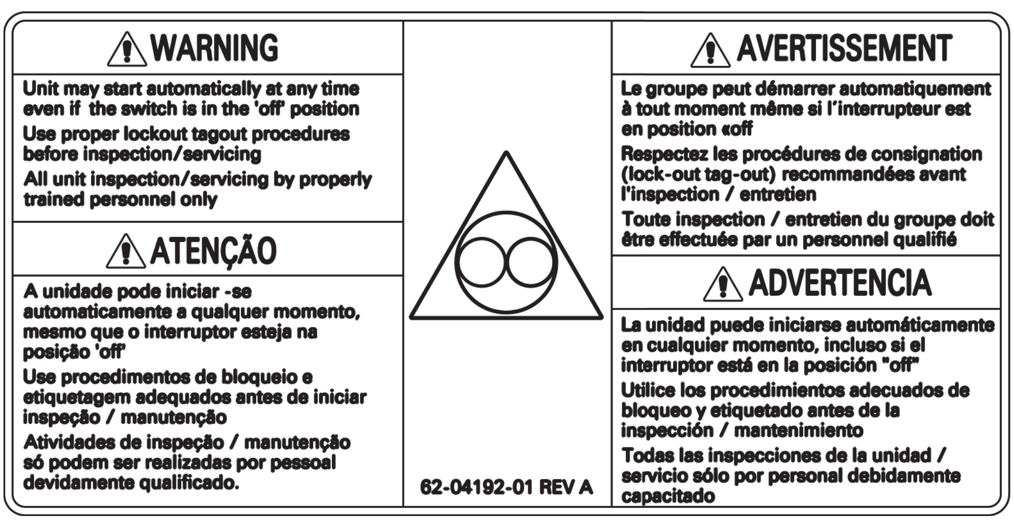
NOTICE

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

1.3 Safety Decals








62-04156-00 REV A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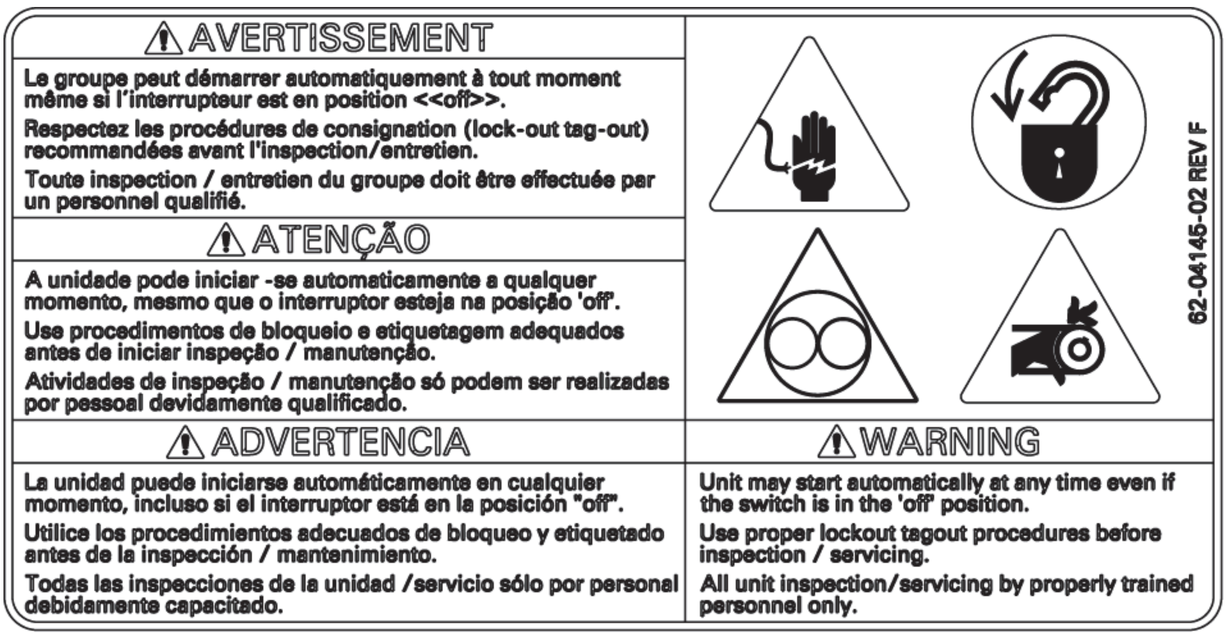
62-03958


AVERTISSEMENT
Le groupe peut démarrer automatiquement à tout moment même si l'interrupteur est en position <<off>>.
Respectez les procédures de consignation (lock-out tag-out) recommandées avant l'inspection/entretien.
Toute inspection / entretien du groupe doit être effectuée par un personnel qualifié.
ATENÇÃO
A unidade pode iniciar -se automaticamente a qualquer momento, mesmo que o interruptor esteja na posição 'off'.
Use procedimentos de bloqueio e etiquetagem adequados antes de iniciar inspeção / manutenção.
Atividades de inspeção / manutenção só podem ser realizadas por pessoal devidamente qualificado.
ADVERTENCIA
La unidad puede iniciarse automáticamente en cualquier momento, incluso si el interruptor está en la posición "off".
Utilice los procedimientos adecuados de bloqueo y etiquetado antes de la inspección / mantenimiento.
Todas las inspecciones de la unidad /servicio sólo por personal debidamente capacitado.
WARNING
Unit may start automatically at any time even if the switch is in the 'off' position.
Use proper lockout tagout procedures before inspection / servicing.
All unit inspection/servicing by properly trained personnel only.
62-04145-02 REV F


WARNING
Contains hot surfaces that will ignite flammable materials.
Inspect before use.
AVERTISSEMENT
Contient des surfaces chaudes qui pourraient enflammer des matériaux inflammables.
Inspecter avant utilisation
ATENÇÃO
Contem superfícies quentes que podem dar ignição em materiais inflamaveis.
Inspecione antes de usar.
ADVERTENCIA
Contiene superficies calientes que puede fuego con materiales flamables.
Inspeccione antes de usar.
62-04167-00 REV A

⚠ WARNING

Never use starting aids.
Hot surfaces may ignite flammable materials.

⚠ AVERTISSEMENT

Ne jamais utiliser un démarrage manuel.
Surfaces chaudes qui pourraient enflammer des matérieux inflammables.

62-04168-00 REV C

⚠ ATENÇÃO

Nunca use fluido de partida ou fluido para facilitar o arranque.
As superfícies quentes podem dar ignição em materiais inflamáveis.

⚠ ADVERTENCIA

Nunca use arrancadores.
o fluidos para ayudar al arranque.
Las superficies calientes pueden iniciar fuego en materiales flamables.

62-04159-00 REV C

⚠ AVERTISSEMENT

Utiliser le couvercle de protection pour éviter un court circuit batterie

⚠ ATENÇÃO

Use capa dos terminais da bateria para evitar curto-circuito

⚠ WARNING

Use terminal covers to avoid battery short circuit

⚠ ADVERTENCIA

Use las protecciones de las terminales para evitar corto circuito de la batería

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⚠ WARNING

Use terminal covers to avoid battery short circuit

⚠ AVERTISSEMENT

Utiliser le couvercle de protection pour éviter un court circuit batterie

62-04222-00 REV -

⚠ ATENÇÃO

Use capa dos terminais da bateria para evitar curto-circuito

⚠ ADVERTENCIA

Use las protecciones de las terminales para evitar corto circuito de la batería

62-04164-00 REV C

⚠ WARNING

Never use gas mixtures containing oxygen to leak test or operate this product.
Charge only with R-404A refrigerant compliant with AHRI Standard 700.

⚠ AVERTISSEMENT

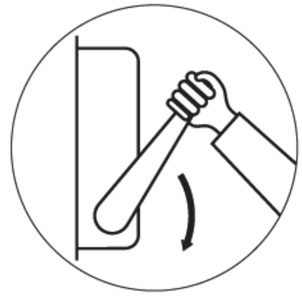
Ne jamais utiliser un mélange de gaz contenant de l'oxygène pour un test de fuite ou en fonctionnement.
Charger uniquement du réfrigérant R-404A conforme au standard AHRI 700.

⚠ ATENÇÃO

Nunca use misturas de gas que contenha oxigênio para teste de vazamento ou operação deste equipamento.
Carregue somente com refrigerante R-404A em conformidade com a norma AHRI 700.

⚠ ADVERTENCIA

Nunca use mezcla de gases que contenga oxigeno para prueba de fugas o para operar este producto.
Carge únicamente refrigerante R-404A que cumpla con el estándar 700 AHRI.



62-04169-00 REV A

⚠ WARNING

Turn off the unit and power supply before unplugging the unit

⚠ ADVERTISSEMENT

Arreter l'unité et couper l'alimentation avant de débrancher l'unité

⚠ ATENÇÃO

Deligue o equipamento ou a fonte de energia antes de desconectar o cabo de forç

⚠ ADVERTENCIA

Coloque la unidad en la posición de Off y desconecte la alimentación eléctrica

⚠ WARNING	⚠ AVERTISSEMENT
Charge only with **R-404A**	Charger uniquement avec du **R-404A**
⚠ ATENÇÃO	**⚠ ADVERTENCIA**
Carregue somente com **R-404A**	Carge unicamente **R-404A**

62-04160-01 REV B

62-04145-00 REV B

⚠ADVERTISSEMENT

L'entretien de la machine doit être assuré uniquement par du personnel formé et habilité.

Eteindre et consigne la machine avant entretien/dépannage ou utiliser des protecteurs temporaires avant dépannage pour protéger des contacts avec des pièces en mouvement ou d'une rupture de courroie.

Refermer les portes avant de mettre en marche la machine.

⚠ATENÇÃO

O Equipamento deve ser reparado apenas por pessoal treinado.

Use e coloque trava de segurança antes de reparar ou use proteções temporárias antes de diagnosticar e reparar para proteger contra o contato com peças móveis ou quebra de correias .

Feche as portas antes de funcionar o equipamento.

⚠ADVERTENCIA

Servicio a la unidad solo por personal entrenado.

Bloquee o coloque protecciones temporales antes de iniciar una reparación para protegerse de partes giratorias o bandas dañadas.

Cierre las puertas antes de iniciar la operación de la unidad.

⚠WARNING

Unit to be serviced by trained personnel only.

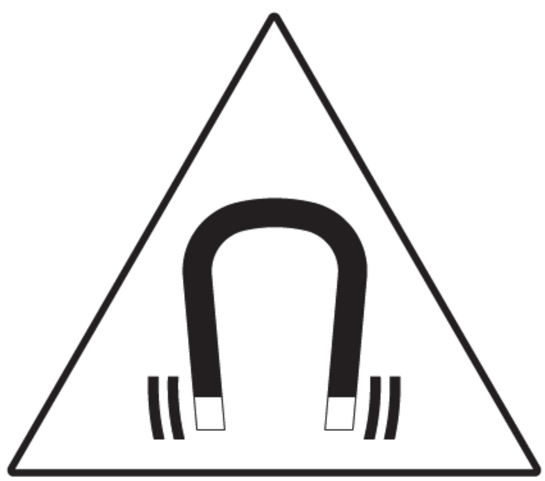
Lockout before servicing or use temporary guard before troubleshooting to protect against contact with rotating parts or belt breakage.

Close doors before operating unit.

⚠DANGER

Do not separate generator rotor and stator.

Separation will create a strong magnetic field that can interfere with cardiac and metal implants.



62-04165-00 REV B

⚠DANGER

Ne pas déassembler le rotor et le stator sur la génératrice.

Le déassemblage pourrait créer un fort champ magnétique qui pourrait interférer avec le fonctionnement d' un implant cardiaque ou d'un implant métallique.

⚠PERIGRO

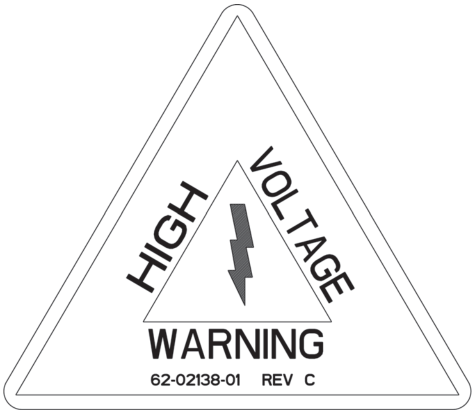
Não separe o rotor do estator do gerador.

A separação irá criar um forte campo magnético que poderá interferir em implantes cardíacos metálicos.

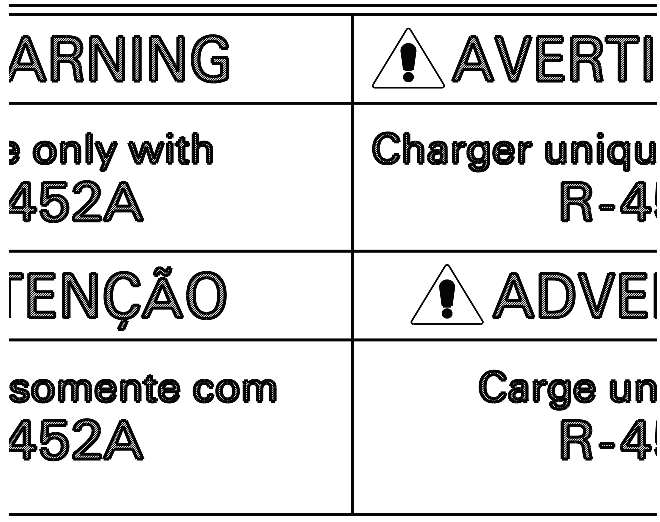
⚠PELIGRO

No separe el rotor y estator del generador.

Separarlos puede crear un campo magnético fuerte que puede interferir con implantes metálicos y cardiacos.


HIGH
VOLTAGE
WARNING
62-02138-01 REV C


62-11773-00 REV -


ARNING
AVERTI
e only with
452A
Charger uniqu
R-4
TENÇÃO
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somente com
452A
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R-4

SECTION 2
Unit Description

2.1 Introduction

⚠ WARNING

Unit may start automatically at any time even if the switch is in the OFF position. Use proper lockout/tagout procedures before inspection/servicing. All unit inspection/servicing by properly trained personnel only.

⚠ 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 instruction, ensure the START/ RUN-OFF switch is in 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 refrigeration unit listed in **Table 2–1**.

Additional support manuals are listed in **Table 2–3**.

The unit model/serial number plate is located inside the unit on the frame as shown in **Figure 2.1**.

2.2 General Description

Units described in this manual are hybrid/electric, fully charged, pre-wired, refrigeration/heating "nosemount" units. The units are used on insulated refrigerated compartments to maintain cargo temperatures within very close limits.

Electrical power is supplied to the unit from an external source, at the power supply receptacle (PSR), or by the AC generator which is driven by the engine. The generator provides nominal 480V/3ph/60Hz power when the engine is in high speed and nominal 350V/3ph/45Hz power in low speed.

The APX Control System includes a manual switch, control modules, fuses, and associated wiring. High voltage contactors, fuses and the contactor control boards are located in the control box while contactors for the optional standby electric power are located in the standby box (see **Figure 2.6**). The unit may be equipped with an optional remote light bar which mounts separately on the front outside corner of the refrigerated compartment.

Temperature control is provided by the Carrier Transicold APX control system (Refer to **Section 2.6**). Once the system is set at the desired temperature, the unit will operate automatically to maintain the desired temperature within very close limits. When in Engine Operation, 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 compartment.

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).

The unit is described as having three major sections:

- The condensing section (**Figure 2.1** and **Figure 2.2**), which includes the engine generator drive package.
- The evaporator section (**Figure 2.3**)
- The control system (**Figure 2.2**)

- The remote evaporators (**Figure 2.4** and **Figure 2.5**) are mounted in Compartments 2 and 3.

Table 2–1 Model Chart

Model	Refrigerant	Compressor	Engine	Engine Speed
NDK537*6LFP2 (2-Compartment) NDK537*6LFP3 (3-Compartment)	**R-404A** **LB** 18 **KG** 8.16	Scroll	V2203L-DI-EF01e	**High** 1800 **Low** 1350
NDK577*6LFP2 (2-Compartment) NDK577*6LFP3 (3-Compartment)	**R-452A** **LB** 18 **KG** 8.16	Scroll	V2203L-DI-EF01e	**High** 1800 **Low** 1350

Table 2–2 Remote Evaporator Configurations

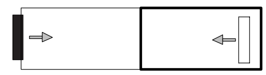
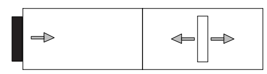
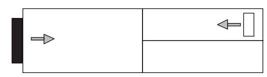
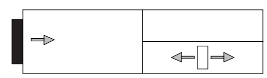
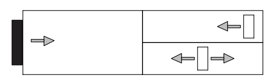
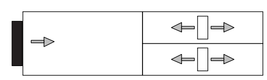
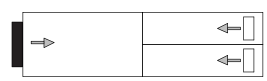
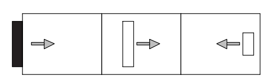
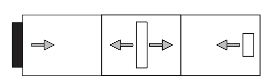
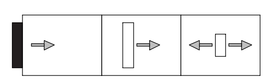
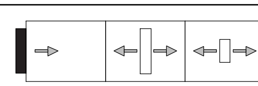
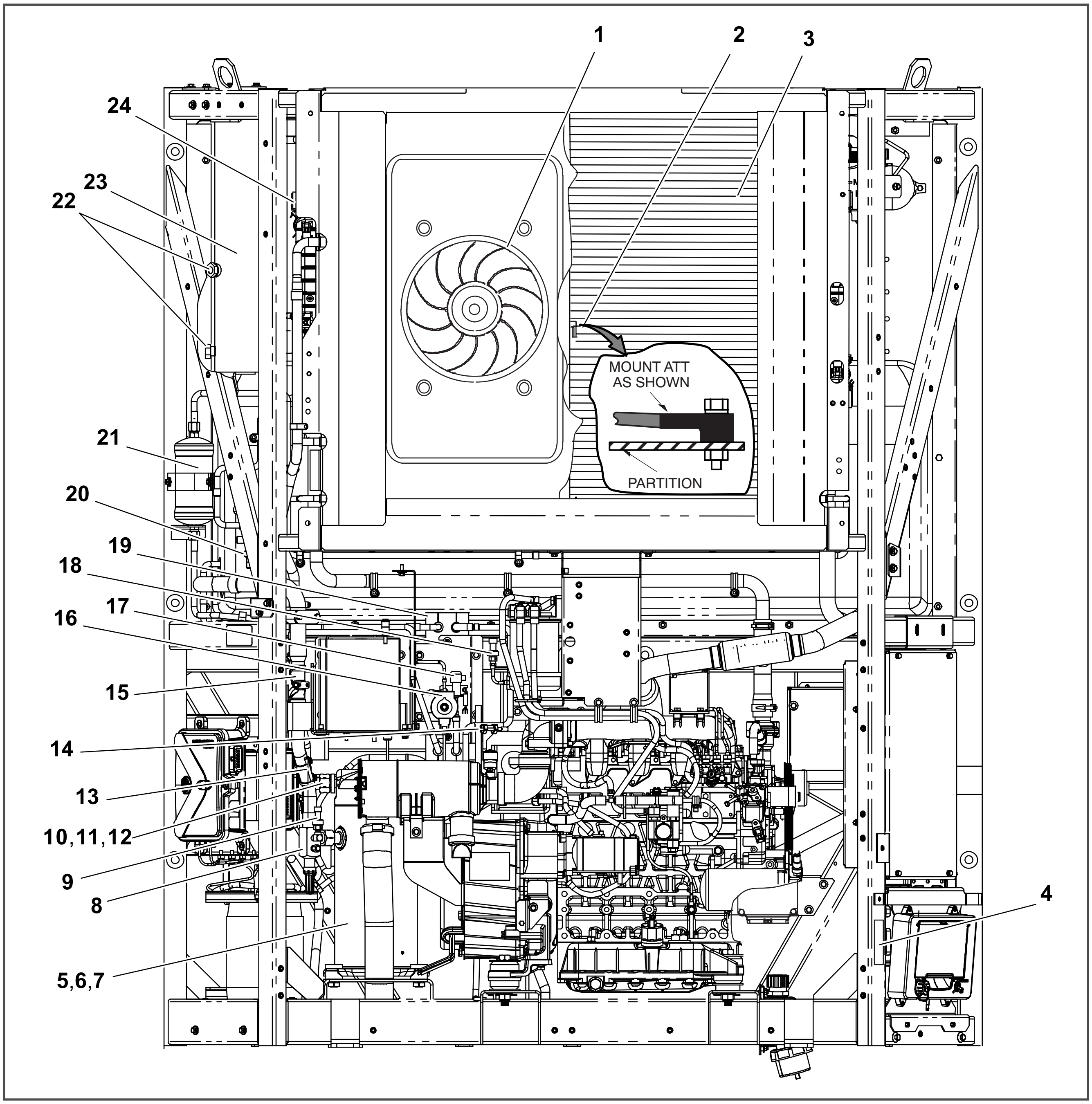
Configuration	Remote Evaporator	Location
1	MJS2200 Single Discharge Evaporator	
2	MJD2200 Dual Discharge Evaporator	
3	MJS1100 Single Discharge Evaporator	
4	MJD1100 Dual Discharge Evaporator	
5	MJS1100 Single Discharge Evaporator MJD1100 Dual Discharge Evaporator	
6	MJD1100 Dual Discharge Evaporator MJD1100 Dual Discharge Evaporator	
7	MJS1100 Single Discharge Evaporator MJS1100 Single Discharge Evaporator	
13	MJS2200 Single Discharge Evaporator MJS1100 Single Discharge Evaporator	
14	MJS1100 Single Discharge Evaporator MJD2200 Dual Discharge Evaporator	
15	MJS2200 Single Discharge Evaporator MJD1100 Dual Discharge Evaporator	
16	MJD2200 Dual Discharge Evaporator MJD1100 Dual Discharge Evaporator	

Table 2–3 Additional Support Manuals

Manual Number	Type of Manual		Manual Number	Type of Manual
	Parts Look Up System (PLUS)		62-11362	Engine Workshop Manual
62-11784	Operator’s Manual			

Figure 2.1 Front View - Refrigeration System Components



1. Condenser Fans and Motors (CDM1 and CDM2)
2. Ambient Air Temperature Sensor (AAT)
3. Condenser Coil
4. Model/Serial Number Nameplate
5. Compressor (C)
6. Compressor Junction Box (at rear of compressor)
7. Compressor Discharge Temperature Sensor (CDT -Located on compressor head)
8. Compressor Suction Service Valve
9. Compressor Suction Pressure Transducer (CSP)
10. Compressor Discharge Service Valve
11. High Pressure Switch (HPS - Located in service valve)
12. Compressor Discharge Pressure Transducer (CDP - located in discharge line)
13. Compressor Suction Temperature Sensor (CST)
14. Economizer Outlet Temperature Sensor (ECOT)
15. Compressor Suction Modulation Valve (CSMV)
16. Liquid Injection Valve (LIV)
17. Economizer Expansion Valve (ECXV)
18. Economizer Outlet Pressure Transducer (ECOP)
19. Economizer
20. Liquid Line Service Valve
21. Filter-Drier
22. Receiver Sight Glasses
23. Receiver
24. Defrost Air Switch (DAS)

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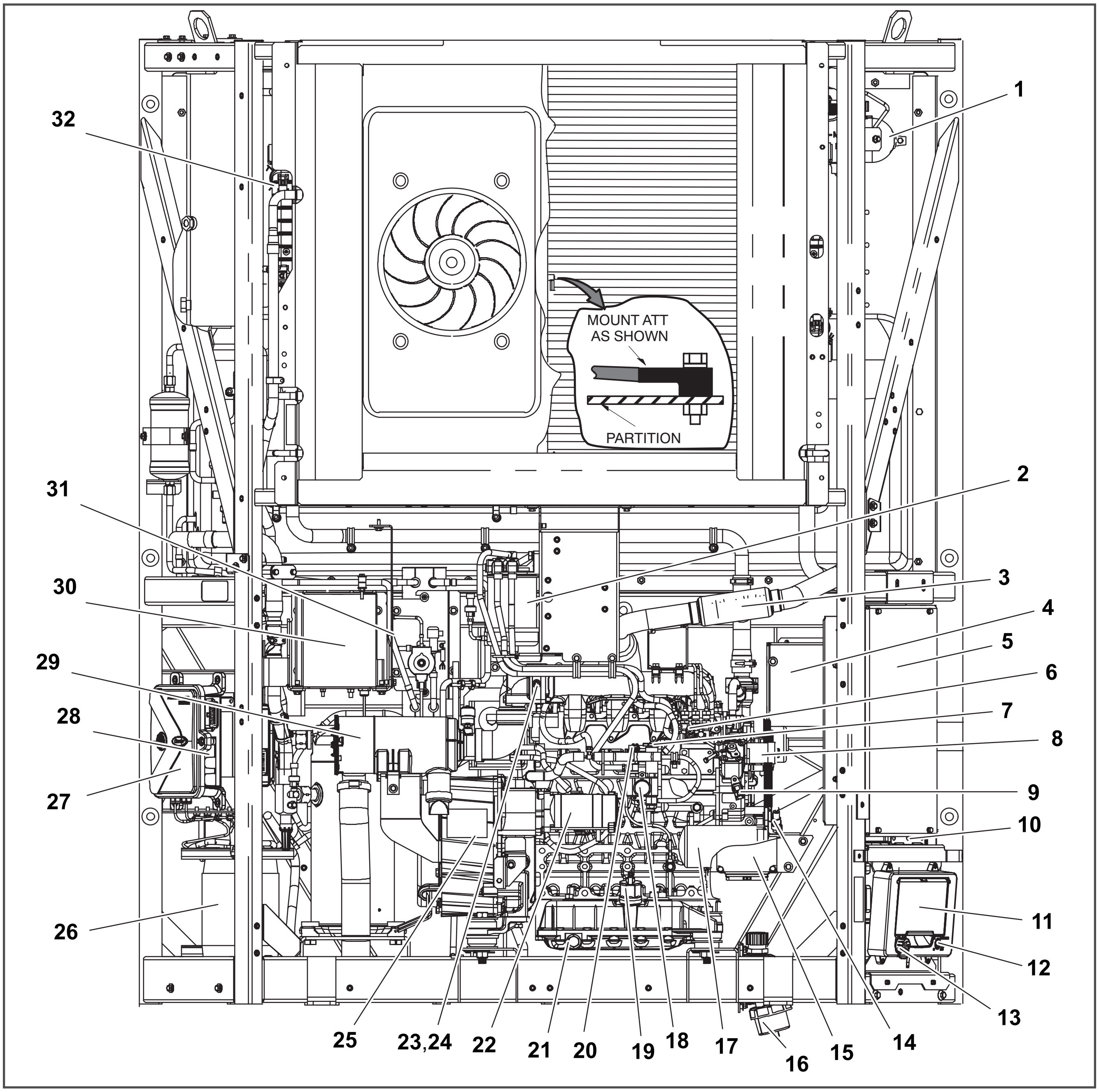
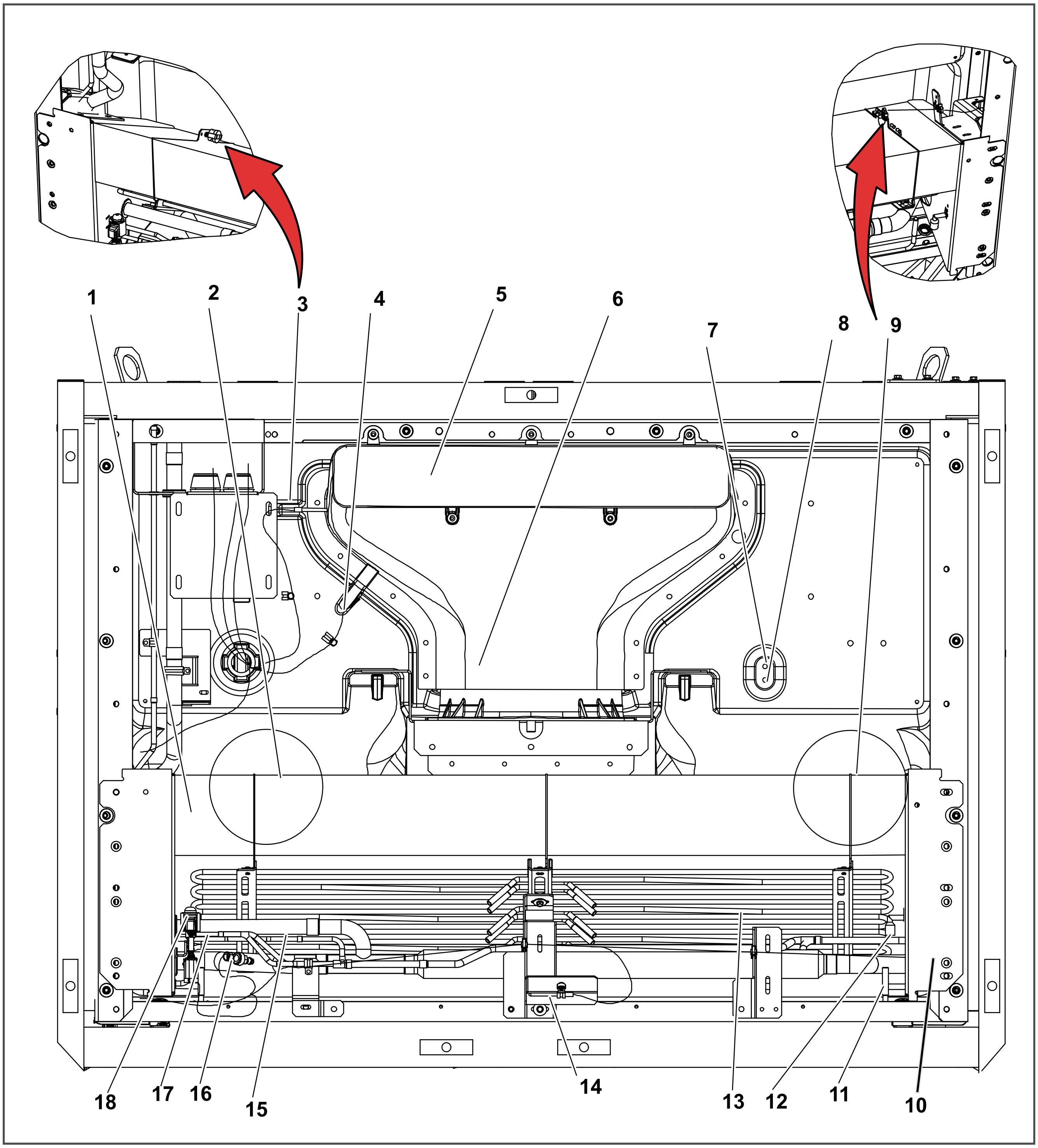
Figure 2.2 Front View - Engine, Control System



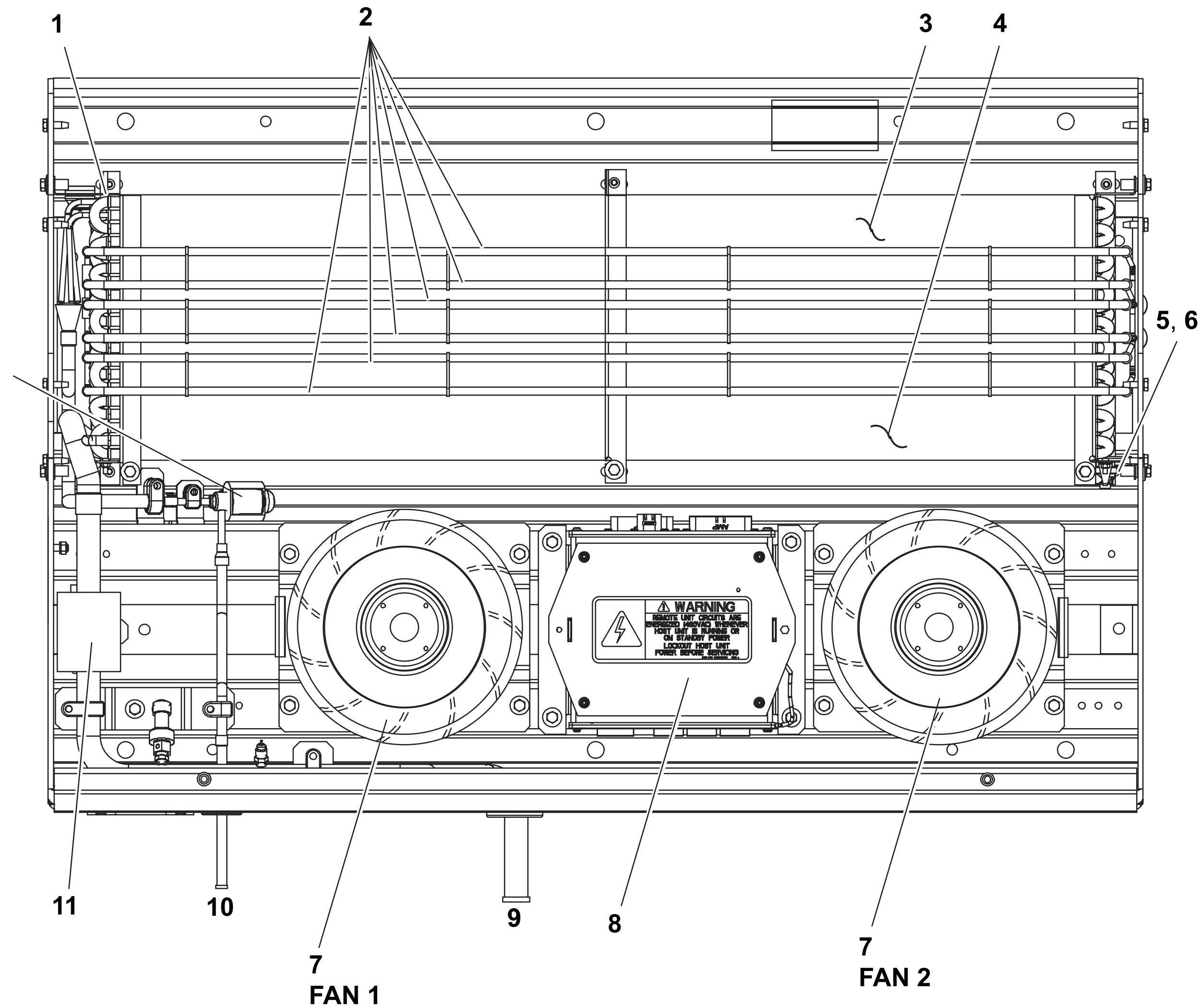
1. Coolant Bottle
2. Fuel Filter/Heater (FH)/Switch (FHTS) or Fuel Head Assembly
3. Exhaust
4. Standby Box (See **Figure 2.6**)
5. Control Box (See **Figure 2.6**)
6. Bleed Valve
7. Manual Plunger
8. Fuel/Speed Actuator (FSA)
9. Engine Speed Sensor (ENSSN)
10. Stepper Valve Module (SVM)
11. Display Module (DM)
12. START/RUN-OFF Switch (SROS)
13. USB Interface Port
14. Engine Oil Pressure Switch (ENOPS)
15. Engine Control Unit (ENCU)
16. Power Supply Receptacle (PSR)
17. Engine Oil Filter
18. Mechanical Fuel Pump
19. Engine Oil Fill and Dipstick
20. Rack Position Sensor (RPS)
21. Engine Oil Drain
22. Starter (SS, SSC, SM)
23. Engine Preheater (EPH)
24. Engine Coolant Temperature Sensor (ENCT) (Behind Engine Preheater)
25. Generator (GEN)
26. Battery (BTY)
27. Power Control Module (PCM - See **Figure 2.7**)
28. Main Microprocessor Module (MM)
29. Air Cleaner, Air Cleaner Service Indicator and Manifold Absolute Pressure Transducer (MAP - if equipped)
30. Battery Charger (BTYC, BTYC2)
31. Suction Side Fuel Filter/Heater (if equipped)
32. Radiator

Figure 2.3 Evaporator Section - Grille Removed



1. Evaporator Coil
2. Evaporator High Temperature Switch* (EVHTS)
3. Supply Air Temperature Sensor (1SAT)
4. Evaporator Fan Motor Wiring
5. Evaporator Air Nozzle
6. Evaporator Fan and Motor Assembly (EVM)
7. Low Pressure Defrost Air Switch Tubing (Clear)
8. High Pressure Defrost Air Switch Tubing (Red)
9. Defrost Termination Temperature Sensor* (1DTT)
10. Return Air Temperature Sensor 2 (RAT2) (located behind bracket, if equipped)
11. Drain Pan Heater (HTR1)
12. High Pressure Air Switch Fitting
13. Defrost Heaters (HTR1 and 2)
14. Return Air Temperature Sensor (1RAT)
15. Evaporator Outlet Temperature Sensor (EVOT)
16. Evaporator Outlet Pressure Transducer (EVOP)
17. EVXV Inlet Strainer Location
18. Evaporator Expansion Valve (EVXV)
*Located on tubesheet

Figure 2.4 Remote Evaporator, Single-Cover Removed



1. Coil
2. Heaters (RMT HTR1 and RMT HTR2)
3. Supply Air Temperature Sensor (RMT SAT) (option)
4. Return Air Temperature Sensor (RMT RAT - Located on return air grille)
5. Defrost Termination Temperature Sensor (RMT DTT)
6. Evaporator High Temperature Switch (HTA)
7. Fan and Motor Assembly
8. Remote Control Box
9. Suction Connection
10. Liquid Connection
11. Evaporator Outlet Temperature Sensor (RMT EVOT)
12. Electronic Expansion Valve (RMT EVXV1)

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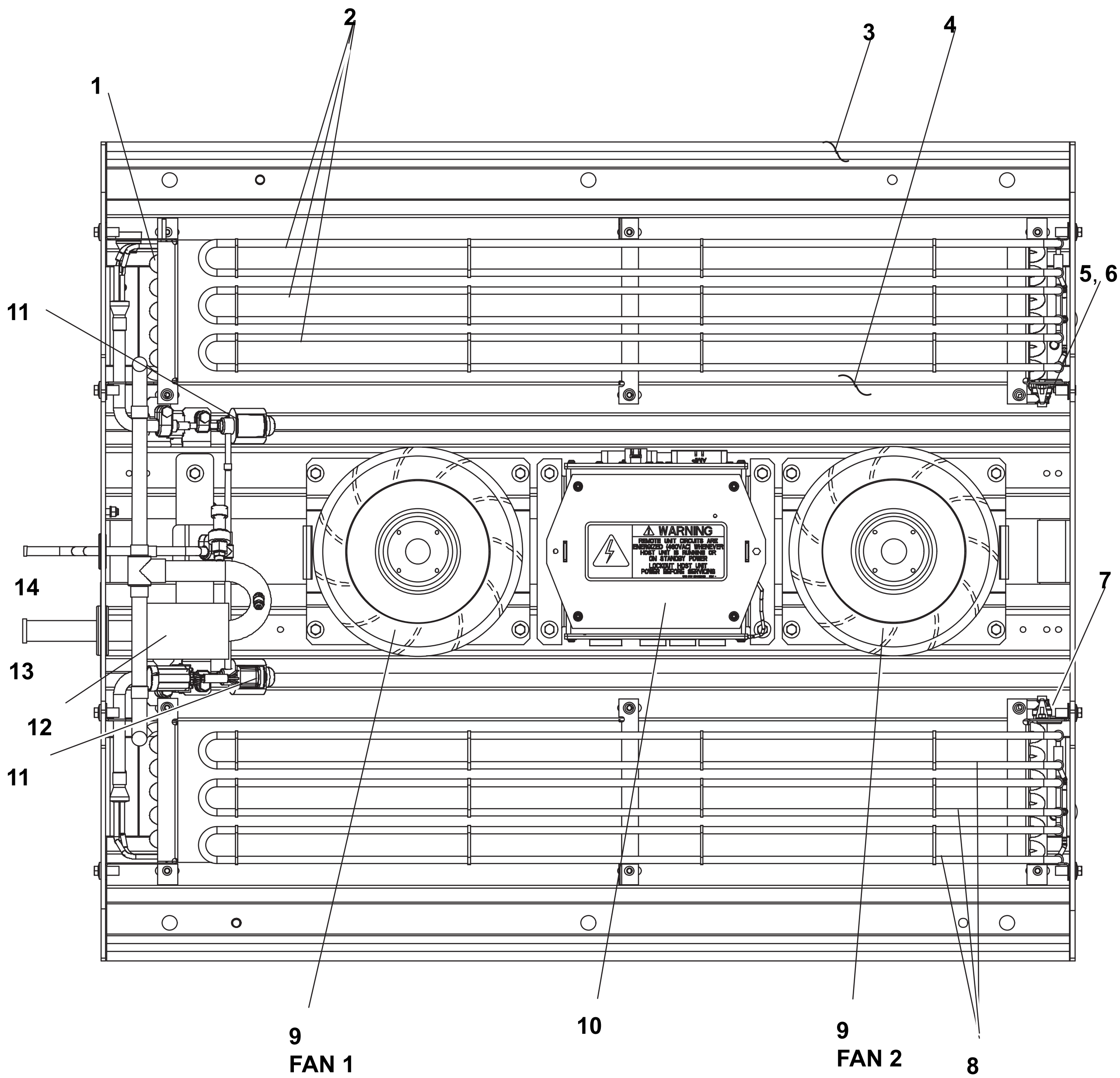
Figure 2.5 Remote Evaporator, Dual - Cover Removed



Configuration similar for all evaporators
Model MJD1100 shown

1. Coil
2. Heater, RMT HTR1
3. Supply Air Temperature Sensor (RMT SAT) (option)
4. Return Air Temperature Sensor (RMT RAT - Located on return air grille)
5. Defrost Termination Temperature Sensor (RMT DTT)
6. Evaporator High Temperature Switch (HTA)
7. Evaporator High Temperature Switch (HTB)
8. Heater, RMT HTR2
9. Fan and Motor Assembly
10. Remote Control Box
11. Electronic Expansion Valves #1 and #2 (EVXV1 and EVXV2)
12. Evaporator Outlet Temperature Sensor (RMT EVOT)
13. Suction Connection
14. Liquid Connection

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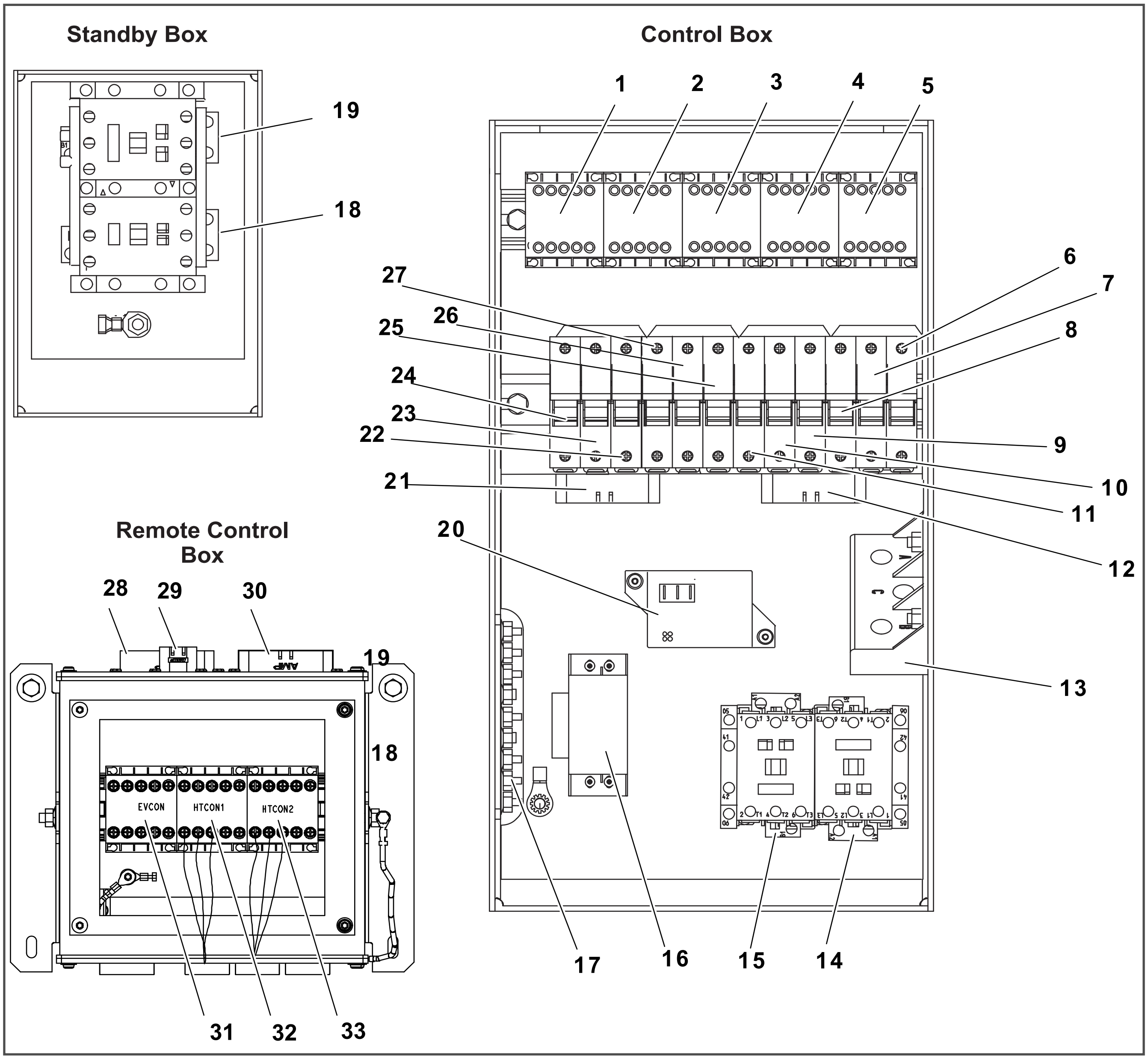
Figure 2.6 Control and Standby Boxes



1. Condenser Motor Contactor (CDCON1)
2. Condenser Motor Contactor (CDCON2)
3. Evaporator Motor Contactor (1EVCON)
4. Heat Contactor 1 (1HTCON1)
5. Heat Contactor 2 (1HTCON2)
6. Fuse (F41) - Heater Power = 12A
7. Fuse (F40) - Heater Power = 12A
8. Fuse (F39) - Heater Power = 12A
9. Fuse (F38) - Fan Motor Power = 12A
10. Fuse (F37) - Fan Motor Power = 12A
11. Fuse (F36) - Fan Motor Power = 12A
12. Contactor Control Board 2 (2CCB)
13. AC Current Sensor (CT 1, 2, 3)
14. Generator Contactor (GENCON)
15. Compressor Contactor (CCON)
16. High Voltage Transformer (HVT)
17. Ground Plate (PE)
18. Power Supply Contactor 2 (PSCON2)
19. Power Supply Contactor (PSCON)
20. Overload Ground Fault (OGF)
21. Contactor Control Board 1 (1CCB)
22. Fuse (F32) - Remote Evaporator Fan Motors = 15A (timed)
23. Fuse (F31) - Remote Evaporator Fan Motors = 15A (timed)
24. Fuse (F30) - Remote Evaporator Fan Motors = 15A (timed)
25. Fuse (F35) - Battery Charger Power = 5A
26. Fuse (F34) - Battery Charger Power = 5A
27. Fuse (F33) - Battery Charger Power = 5A
28. 1REC (To CAN Board)
29. 2REC (To Stepper Board)
30. 3REC (To Contactor Control Board)
31. Remote Evaporator Motor Contactor (RMT EVCON)
32. Remote Heat Contactor 1 (RMT HTCON1)
33. Remote Heat Contactor 2 (RMT HTCON2)

- - - - -

2.3 Condensing Section

The condensing section (see **Figure 2.1** and **Figure 2.2**) consists of an engine-generator drive package, compressor, condenser fans, condenser, radiator, economizer, refrigerant controls, defrost air switch, piping, wiring, and associated components.

The engine-generator drive package (see **Figure 2.2**) includes the engine, generator, air cleaner, muffler, coolant system, fuel system, engine oil filter system and engine sensors.

2.3.1 Engine

The engine is a four cylinder diesel which gives excellent fuel economy. The engine cooling system consists of the radiator (which is mounted with the condenser coil) and coolant overflow bottle. The engine is equipped with:

- an engine preheater (EPH), which provides easy starting characteristics.
- spin-on engine oil filter and a spin-on or suction side fuel filter for easier filter changes. The fuel filter may also be equipped with a thermostatically controlled fuel heater.
- an electronic battery charger which converts generator or standby alternating current to direct current for battery charging.

Refer to **Section 2.8** 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 air cleaner service indicator is connected at the outlet. Its function is to indicate when the air cleaner filter element requires replacement.

The system may be fitted with an intake air temperature sensor (IAT) and a manifold absolute pressure transducer (MAP). These sensors are installed when Carrier Transicold factory monitoring of the air system is required.

2.3.3 Engine Controls

a. 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 control system.

In order to ease the load on the system, speed transition (high to low and low to high) is ramped up or down over a 10 second period. The FSA is located on the front of the gear case cover.

b. Engine Speed Sensor (ENSSN)

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

c. Rack Position Sensor (RPS)

The RPS provides the control system with engine fuel rack (throttle) position information to be used to control the engine and refrigeration system. The sensor is located on the injection pump.

d. Engine Oil Pressure Switch (ENOPS)

The ENOPS is normally open and closes on pressure rise to signal to the control system 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 control system 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 is a thermistor type sensor that provides the control system with engine coolant temperature information to be displayed, recorded in the DataLink data recorder and used to control the engine and 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 345V/3Ø/45Hz power in low speed.

The generator may be fitted with a generator temperature sensor (GNT). This sensor is installed when Carrier Transicold factory monitoring of the system is required.

2.3.5 Compressor

The unit is fitted with a scroll compressor equipped with suction and discharge service valves and an economizer connection. 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 Compressor Switches, Transducers and Sensors

a. Compressor Discharge Pressure Transducer (CDP)

The CDP provides a signal to the control system 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 in the discharge line leaving the compressor.

b. Compressor Suction Pressure Transducer (CSP)

The CSP provides a signal to the control system equivalent to pressure entering the compressor. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located in the suction service valve.

c. High Pressure Switch (HPS)

The HPS is normally closed and opens on pressure rise to signal the control system to shutdown the refrigeration system if the discharge pressure rises above the switch setting. It is located in the discharge service valve.

d. Compressor Discharge Temperature Sensor (CDT)

The CDT is a thermistor type sensor that provides a signal to the control system 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 head.

e. Compressor Suction Temperature Sensor (CST)

The CST is a thermistor type sensor that provides a signal to the control system equivalent to the temperature of the gas entering the compressor suction service valve. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located on the line entering the service valve.

2.3.7 Liquid Injection Solenoid Valve (LIV)

The LIV is opened during periods of high compressor discharge temperature to inject refrigerant into the economizer connection to cool the compressor. It is located at the front of the economizer.

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, subcooler and radiator is provided by the condenser fans.

2.3.9 Economizer Circuit

The economizer circuit consists of a compact brazed plate heat exchanger (**Figure 2.1**) and the economizer expansion valve (ECXV). Both are located above the compressor.

In the economized mode, the frozen and pull down capacity of the unit is increased by subcooling the liquid refrigerant entering the evaporator expansion valve. Overall efficiency is increased because the gas leaving the economizer enters the compressor at a higher pressure, therefore requiring less energy to compress it to the required condensing conditions.

To place the unit in the economized mode, the control system energizes (opens) the ECXV. The ECXV controls the flow of liquid from the main liquid line through the economizer according to changes in superheat of the refrigerant leaving the economizer.

2.3.10 Economizer Transducer and Sensor

a. Economizer Outlet Pressure Transducer (ECOP)

The ECOP is located in the vapor injection line leaving the economizer. It provides the control system with economizer outlet pressure information to be displayed, recorded in DataLink data, and used to determine the required position of the economizer expansion valve.

b. Economizer Outlet Temperature Sensor (ECOT)

The ECOT is a thermistor type sensor located on the suction line leaving the economizer. It provides the control system with economizer outlet temperature information to be displayed, recorded in the DataLink data recorder and used to determine the required position of the economizer expansion valve.

2.3.11 Ambient Air Temperature Sensor (AAT)

The AAT is a thermistor type sensor that provides the control system with the temperature of the air entering the condenser. This temperature information is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. The sensor is located behind the front grill.

2.3.12 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 just above the compressor.

2.3.13 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.

2.3.14 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 bulls-eye sight glasses, for the observation of liquid level and moisture content, and a fusible plug.

2.4 Evaporator Section, COMPARTMENT 1

The evaporator (Figure 2.3) fits into a rectangular opening in the upper portion of the front wall of the refrigerated compartment. When the unit is 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, evaporator expansion valve, evaporator outlet pressure transducer, evaporator outlet temperature sensor, defrost termination temperature sensor, supply temperature sensor and return air temperature sensor.

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

2.4.1 Evaporator Coil

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. Air movement over the coil is provided by the evaporator fan and motor (EVM) assembly.

The electric heaters (HTR1 and HTR2) are mounted on the inlet side of the coil and in the drain pan.

Automatic evaporator coil defrosting is initiated by either a defrost air switch (DAS - which senses the pressure drop across the coil) or by the control system defrost timer. During defrost the refrigeration system is shut down and the evaporator fan and heaters operated as required by the defrost mode.

2.4.2 Evaporator Expansion Valve (EVXV)

The EVXV is an automatic 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 Evaporator Switches, Transducers and Sensors

a. Evaporator Outlet Pressure Transducer (EVOP)

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

b. Evaporator Outlet Temperature Sensor (EVOT)

The EVOT is a thermistor type sensor located on the suction line near the evaporator expansion valve. It provides the control system with evaporator outlet temperature information to be displayed, recorded in the DataLink data recorder and used to determine the required position of the evaporator expansion valve.

c. Evaporator High Temperature Switch (EVHTS)

EVHTS is a safety switch which opens on a temperature rise to de-energize the electric heaters if the temperature reaches the cutout point. It is located on the curbside tube sheet of the evaporator coil.

d. Defrost Termination Temperature Sensor (1DTT)

The defrost termination temperature sensor is located on the roadside tube sheet of the evaporator coil. It provides the control system 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 / RAT2)

1RAT and RAT2 (if equipped) are thermistor type temperature control probe which provides the control system 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 a bracket behind the center of the return air grille.

f. Supply Air Temperature Sensor (1SAT)

The 1SAT is a thermistor type temperature control probe which provides the control system 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 supply air outlet housing.

2.5 Remote Evaporator(s)

The remote evaporator(s) are mounted to the ceiling of compartment 2 and compartment 3. The evaporators used may be MJS (single discharge) or MJD (dual discharge). MJD units have two coils, each is fitted with an expansion valve.

The evaporator assembly consists of the evaporator coil(s), evaporator fan motors, evaporator expansion valve(s), coil heaters, defrost termination temperature sensor, high temperature switch(es), 12 V drain line heater(s), control box, return air sensor and an optional supply air sensor.

Heating and defrost is accomplished by electric heaters (RMT HTR1 and RMT HTR2) mounted on the coil(s).

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

To place a remote evaporator in the operation, the control system opens the evaporator expansion valve(s). Refrigerant flows from the main liquid line, through the evaporator expansion valve(s); (MJS - EVXV1), (MJD - EVXV1 and EVXV2). The EVXV controls the flow of liquid to the coil according to changes in superheat of the refrigerant leaving the evaporator.

a. Evaporator Coil(s)

Single discharge evaporators are fitted with one coil while dual discharge evaporators are fitted with two. The coils are tube in fin type. 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 (RMT HTR1 and RMT HTR2) are mounted on the under side of the coil(s).

b. Evaporator Expansion Valve (EVXV1 and EVXV2)

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

c. Remote Evaporator Outlet Pressure Transducer (RMT EVOP)

The RMT EVOP is located in the suction line (common line for dual evaporators) leaving the evaporator. It provides the control system with evaporator outlet pressure information to be displayed, recorded in the DataLink data recorder and used to determine the required position of the evaporator expansion valve(s).

d. Remote Evaporator Outlet Temperature Sensor (RMT EVOT)

The RMT EVOT is a thermistor type sensor located on the suction line (common line for dual evaporators) leaving the evaporator. It provides the control system with evaporator outlet temperature information to be displayed, recorded in the DataLink data recorder and used to determine the required position of the evaporator expansion valve(s).

e. Evaporator High Temperature Switch (HTA/HTB)

An HT is a safety switch which opens on a temperature rise to de-energize the electric heaters if the coil temperature reaches the cut-out point. They are located on the end tube sheet. Single Remote Evaporators have one High Temperature Switch, HTA. Dual Remote Evaporators have two High Temperature Switches, HTA and HTB; one located on each set of coils.

f. Remote Defrost Termination Temperature Sensor (RMT DTT)

The RMT 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.

g. Remote Return Air Temperature Sensor (RMT RAT)

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

h. Remote Supply Air Temperature Sensor (RMT SAT) (Option)

The RMT SAT is a temperature control probe which provides the microprocessor with information on the temperature of the air leaving the remote 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.

i. Remote Door Switch

The unit is provisioned to connect a door switch (RMT DS) directly to the control system near the #2 remote evaporator connector. This is a set of capped pigtails near the LV connector.

j. Drain Line Heater(s)

The unit is provisioned to connect a heater for each drain line directly to an auxiliary contact on the coil heater contactor. (MJS - CDWR1), (MJD - CDWR1 and CDWR2 and CDWR2).

k. Remote Evaporator Control Box

The heater and fan contactors, stepper board, contactor control board, and CAN board are located in the remote evaporator control box. The box is located inside the evaporator cover, between RMT EVM1 and RMT EVM2.

2.6 SYSTEM OPERATING CONTROLS AND COMPONENTS

Temperature control is provided by the Carrier Transicold APX™ Control System. Once the system is set at the desired temperature, the unit will operate automatically to maintain the desired temperature within very close limits.

2.6.1 Automatic Start-Stop

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

2.6.2 Special Features

The following additional special features are incorporated into the Carrier Transicold APX control system:

- An easy to read LCD display MessageCenter which clearly displays all required information
- Unit Data and Advanced User selectable Functional Parameters
- Programmable Maintenance Hour Meters
- Bright LED Alarm Light
- Fully Automated Pretrip
- Automated control system Self-test
- DataLink data recorder (uses System date and time)
- Trip Start to record date/time of trip in DataLink data recorder memory
- USB communication for downloading data, upgrading operational software, and Configuration set up
- Automatic Engine Starting
- Functional Parameter locks
- Alarms are stored in control system memory for future reference
- “ATM style” menu system (which reduces keystrokes)
- “Dashboard” display screens which display up to 5 data points simultaneously
- Backlit “Carrier Blue” silicone keypad makes operation easy for drivers

2.6.3 Component Description and Location

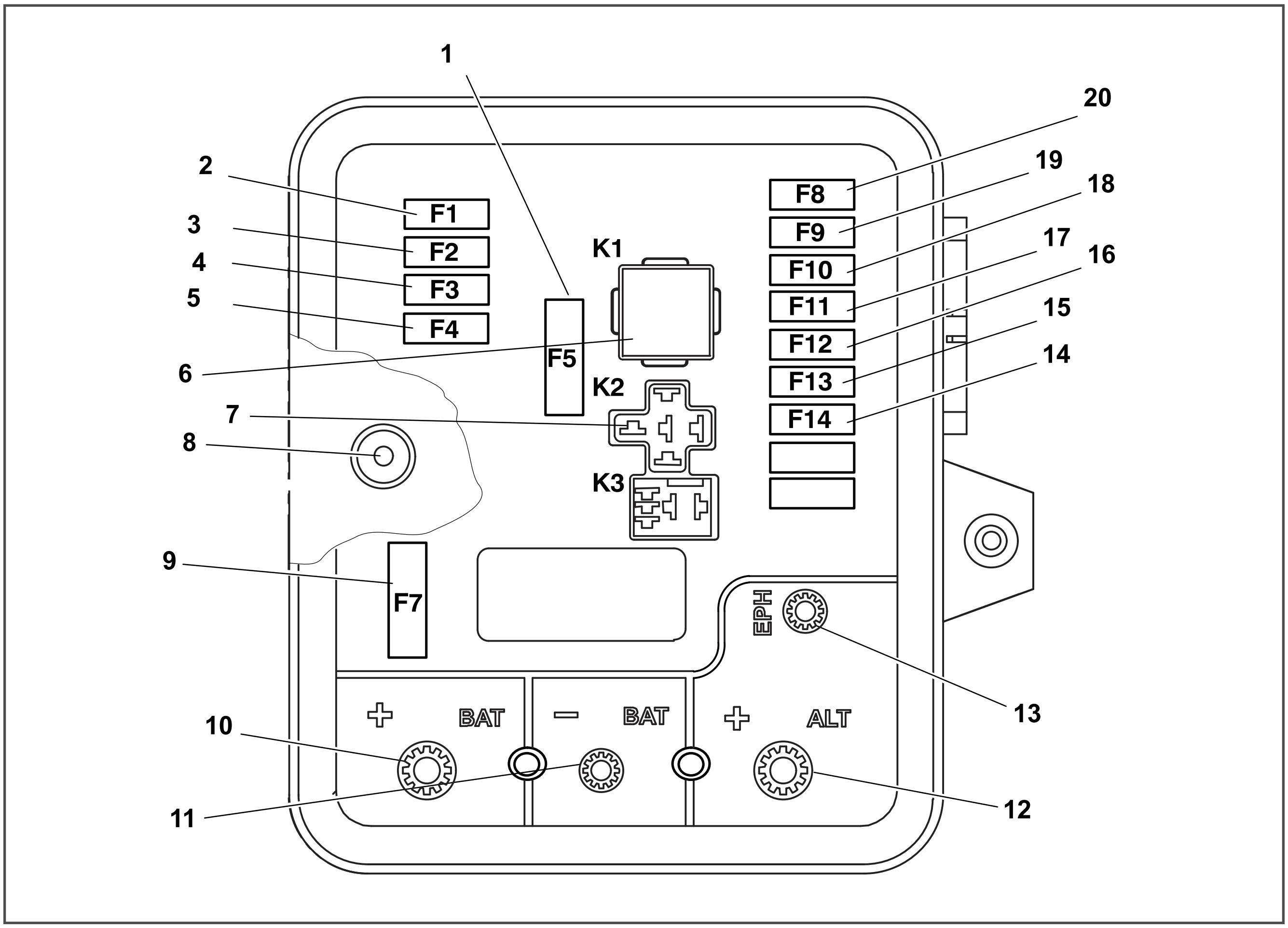
The APX control system is an automotive style, decentralized, modular system with CAN bus (Controlled Area Network) connectivity. Hardware associated with the system includes:

- power control module (PCM, **Figure 2.2**)
- main microprocessor module (MM)
- stepper valve module (SVM)
- engine control unit (ENCU)
- standby and control boxes (**Figure 2.6**)
- control-box-mounted overload ground fault module (OGF, **Figure 2.6**)
- control-box-mounted contactor control boards (CCB1 and CCB2, **Figure 2.6**)
- display module (DM, **Figure 2.2**)
- remote contactor control box - contains remote CAN board and connection (1REC), remote stepper board and connection (2REC), and remote contactor control board and connection (3REC), and 3 remote contactors (RMT HTCON1, RMT HTCON2, and RMT EVCON) (**Figure 2.6**).

NOTICE

Under no circumstances should anyone attempt to repair sealed module internal components. Should a problem develop with these components, contact your nearest Carrier Transicold dealer for replacement.

Figure 2.7 Power Control Module



1. Fuse (F5 = 30 amp), Power Enable Relay Contact Power
2. Fuse (F1 = 5 amp), Module Logic Circuit and Buzzer Power
3. Fuse (F2 = 5 amp), Remote Micro Power
4. Fuse (F3 = 5 amp), 2SVM and 3SVM Component Actuation Power and Engine Control Unit Power
5. Fuse (F4 = 5 amp), Remote Drain Heater
6. Relay, Power Enable (PER)
7. Relay, Fuel Heater (FHR)
8. Buzzer (B)
9. Fuse (F7 = 80 amp) Main Power
10. Battery Positive Connection (T1)
11. Battery Negative Connection (T2)
12. Battery Charger Output Connection (T3)
13. Engine Preheater Power Connection (T4)
14. Fuse (F14 = 15 amp), Fuel Heater Power
15. Fuse (F13 = 5 amp), Remote Output Power
16. Fuse (F12 = 5 amp), Satellite Communications Power
17. Fuse (F11 = 5 amp), Light Bar Power
18. Fuse (F10 = 20 amp), Main Microprocessor Module Component Actuation Power
19. Fuse (F9 = 5 amp), Contactor Control Board Component Actuation Power
20. Fuse (F8* = 5 amp), Fuel Level Sensor Power *With EES installed F8 = 10 amp for FLS and EES

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a. Power Control Module

The power control module (PCM - see **Figure 2.7**) is responsible for distribution of power from the battery to the system components, when starting, and then from the battery charger to the system components and to the battery (for charging) once power is available.

The module houses the system relays, low voltage fuses and the DC current transformer (CT1). The current transformer provides a reading of the total 12 VDC system current draw (amps) to the main microprocessor at terminal 2MM12 (see schematic diagram, Section 10).

b. Main Microprocessor Module

The main microprocessor module (MM) houses the main system microprocessor. The module does not contain any serviceable components.

c. SVM Module

The stepper valve module (SVM) houses the CSMV, EVXV and ECXV operating microprocessor. The module is totally self contained and does not contain any serviceable components.

d. Microprocessor Status LED

Microprocessor activity within the main microprocessor SVM Module or contractor control boards can be determined by observing the status LED's. Module LED's are located just to the right of the module bar code while contactor control board LED'S are visible through small openings in the bottom mounting bracket.

An LED will:

- blink, green in color, once per second to indicate that the microprocessor is operating correctly
- be off indicating no power to the module
- be on steadily green to indicate that microprocessor is not communicating (check CAN bus)
- be on steadily, red in color, to indicate an internal failure or loss of software.

e. Contactor Control Boards

The contactor control boards (1CCB and 2CCB - see **Figure 2.6**) are slave boards that contain the necessary software to control the contactors in accordance with the unit model programmed into the main microprocessor. The boards communicate with the control system through the CAN network.

f. AC Current Sensor

The current sensor (CT2, CT3 and CT4, **Figure 2.6**) provides a reading of each individual AC line current draw (amps) to the main microprocessor through the CAN bus from 1CCB at terminals 1CCB-12, -34, -10 and -31 (see schematic diagram Section 10).

g. High Voltage Transformer (HVT)

The high voltage transformer (**Figure 2.6**) provides a reading of line voltage to the main microprocessor through the CAN bus from 1CCB at terminals 1CCB-19 and -35 (see schematic diagram, Section 10).

h. Engine Control Unit (ENCU)

The ENCU (**Figure 2.2**) is a microprocessor based unit which controls the operation of the engine. The ENCU communicates with the control system through the CAN network and sends information on engine speed, oil pressure and coolant temperature to the control system to be displayed in the Advanced User Unit Data and recorded in the DataLink data recorder. The ENCU also communicates with the main microprocessor to control overall system balance. The ENCU is mounted on the frame near the fuel filter.

i. Overload Ground Fault Module (OGF)

The OGF, see **Figure 2.8**, is located in the control box (**Figure 2.6**). The module has two electrical safety features which are active in both Engine and Electric Operation:

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

In each case, the 00100 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.

Figure 2.8 OGF Module

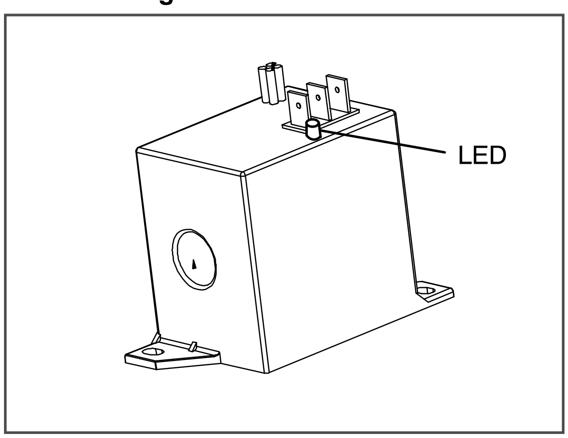
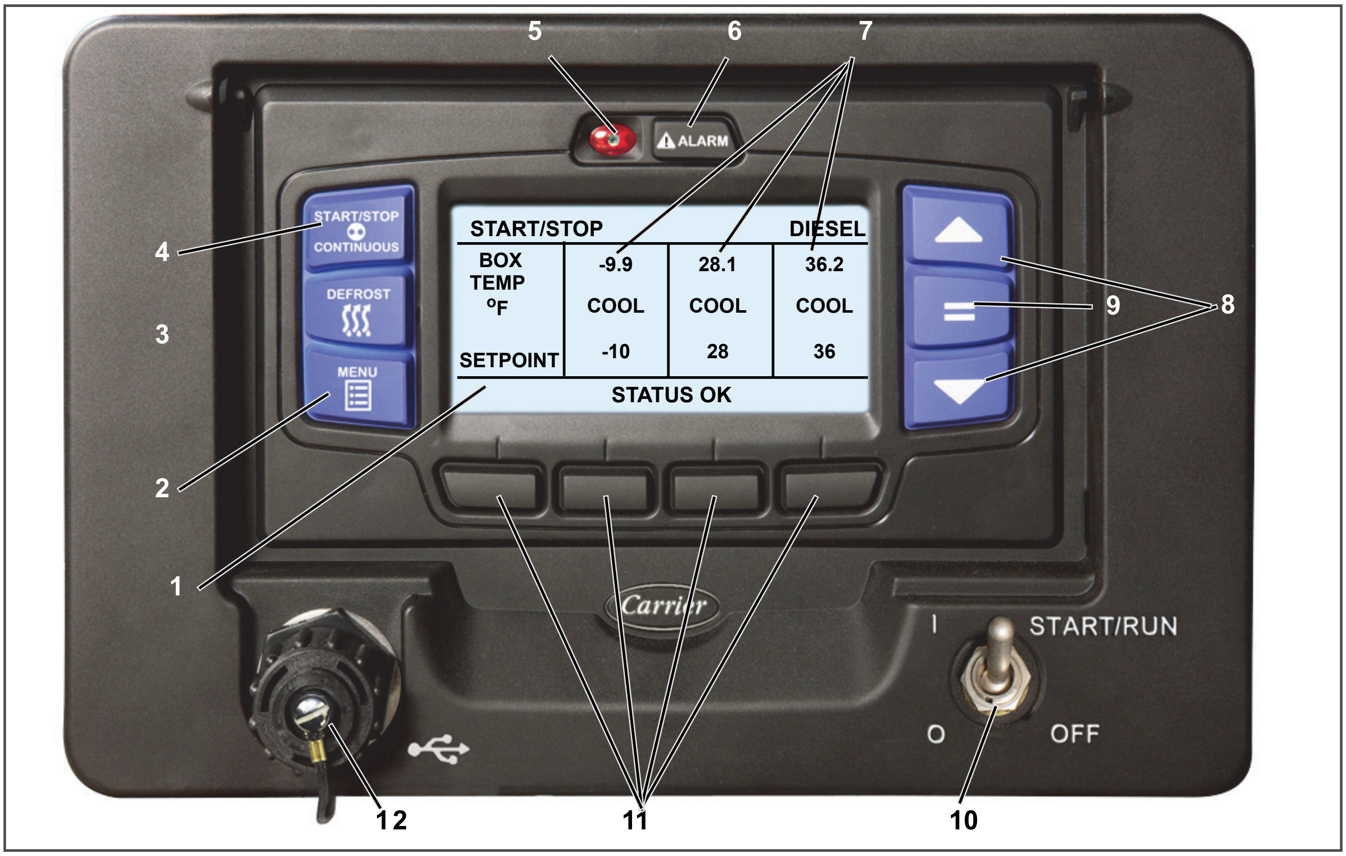


Figure 2.9 Display Module



1. Display Screen
2. MENU key
3. DEFROST key
4. START/STOP - CONTINUOUS Key
5. Alarm LED
6. Alarm Key
7. Compartment 1, 2, 3
8. Arrow Keys
9. “=” (Select) Key
10. START/RUN-OFF Switch
11. Soft Keys
12. USB Interface Port

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j. Display Module (DM)

Display

The APX Control System for multi-temp units will display one of two available options, Split Screen and Auto Scroll. Split Screen, shows each compartment Setpoint and Box Temperature in one view. Auto Scroll, which is similar to the standard APX Single Temp display, shows one compartment Setpoint and Box Temperature in each view; the screen automatically changes views to display each active compartment. Only compartments that are turned ON will be displayed. Refer to **Section 3.1** for Switching Display State.

The APX Control System may be configured to display the setpoint in either whole numbers or with tenths of a degree. The temperature description will be followed by a letter indicating the information is in degrees Fahrenheit (F) or degrees Centigrade (C).

Message Center

Messages generated by the control system are displayed in the MessageCenter. Details of the messages are described in Section 6.

START/RUN-OFF Switch (SROS) - When placed in the START/RUN position, this switch provides power to start the unit. The main microprocessor performs a self-test. Then setpoint and compartment temperatures are displayed. To stop the unit, place the SROS in the OFF position.

k. Display Module Keys

- **ALARM** - The ALARM key allows viewing of the alarms stored in the system.
- **UP ARROW and DOWN ARROW** - These keys allow scrolling through the selections presented.
- **EQUAL (ENTER)** - The EQUAL key is used to confirm a selection and lock it into memory.
- **START-STOP/CONTINUOUS** - Pressing this key toggles between Start-Stop and Continuous Operation.
- **DEFROST** - Used to manually initiate a defrost cycle when the required conditions are met.
- **MENU** - Pressing the MENU key displays the various soft keys in the MessageCenter. The selections offered are dependent on the operator's status: Driver, Advanced User or Technician. Refer to Section 3 for Driver and Advance User mode and Section 3 for Technician mode menu selection descriptions.
- **The USB Interface Port** - Used for installing software updates, options, configurations, functional parameters and downloading of data from the Data Link data recorder.

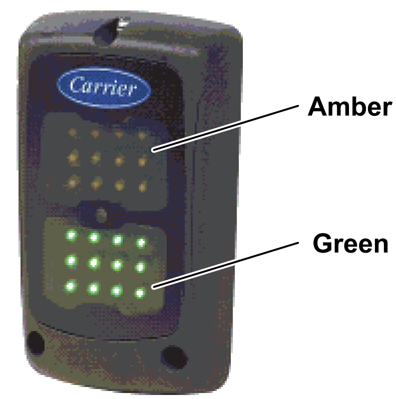
2.7 Options

2.7.1 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 APX Control System illuminates the alarm light. Alarms can be read on the display.

For units with EES installed, the amber light will also be illuminated when the EES System is in Service Mode. This does not affect unit operation.

Figure 2.10 Light Bar



2.7.2 Remote Switch(es)

The unit is provisioned to connect remote switches (DS/REMS1/REMS2) directly to the control system through the REM connector to the SVM.

- 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.

- Seven Configurations 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 three 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.
5. Compartment 1 Shutdown.
6. Compartment 2 Shutdown.
7. Compartment 3 Shutdown.

- 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.

2.7.3 Remote Temperature Sensor

The unit is provisioned to connect remote temperature sensors (REMSN1, REMSN2 and REMSN3) through the REM connector to the second contactor control board (2CCB).

The system 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, #2 or #3, name in the unit data list.

2.7.4 Fuel Level Sensor

An optional fuel level sensor (**Figure 8.9**) supplies an input signal to the control system as to the percentage of fuel remaining in the fuel tank. The control system will activate the **00001 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 alarm is automatically cleared when the level is brought above 25%. The fuel tank level is displayed in Unit Data.

2.7.5 Fuel Heater

The optional fuel heater (**Figure 2.2**) 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 lower, the control system will enable this circuit. Also, the heater is fitted with an internal temperature switch (FHTS) which will close on a temperature fall to energize the heater element, and open on a temperature rise to de-energize the heater element.

2.7.6 Electric Fuel Pump

The optional electric fuel pump (**Figure 8.7**) is mounted at the fuel tank location and assists the engine mounted mechanical pump in transferring fuel from the tank to the engine. The pump is activated by the control system whenever engine operation is required.

2.7.7 Remote Panel

The unit may be fitted with an optional remote control panel. The remote panel, which is very similar to the display module, displays compartment setpoints, compartment temperatures and operating modes (heat, cool or defrost).

The setpoint may be modified and the unit may be started and stopped using the remote panel.

This compact remote panel can be mounted to suit the individual operator's preferences - on the front bulkhead, or in the compartment (including in the wall itself). Remote Panel keys, soft keys and alarm indicators are in the same locations as the main APX display module.

2.8 Engine Data

Unit	Specification
Engine Model	V2203L-DI-EF01e (26-00135)
Rated Power	24.7 hp (18.5 KW) @1800 rpm
Displacement	135 in^3 (2.2 liters)
No. Cylinders	4
NOTE Refer to **Table 2–1** for engine speed settings	
Coolant Capacity	2.4 U.S. gallons (9 liters) - 50/50 mix - never to exceed 60/40. **NOTICE** **Recommended to use Extended Life Coolant, Nitrite Free (ELC-NF), which is red in color and labeled for at least five years, 12,000 hours service life.**
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 (Max 5% Bio-Diesel also allowed)
Fuel Heater Temperature Switch	Spin on filter = Close on a temperature fall @ 45°F (7.2°C) open on a temperature rise @ 75°F (24°C). Suction side filter = 53 ± 7°F (11.7 ± 3.8°C)
Firing Order	1-3-4-2
Engine Preheater (EPH)	42 amps at 12 VDC, resistance approximately 0.3 Ohms
Lubrication System	
Engine Oil Pressure	40 to 62 psig (2.8 To 4.2 Bar) - Engine in high speed
Engine Oil Pressure Safety Switch (ENOPS)	Closes, on pressure rise, at 18 psig (1.22 Bar) Opens, on pressure fall, at 12 psig (0.82 Bar)
Oil Capacity with Filter	15 quarts (14.2 liters)
Engine Oil Viscosity: API CG or better OR Mobil Delvac 1	If Outdoor Temp below 32°F (0°C), use 10W30 or Mobil Delvac 1 (5W 40) If Outdoor Temp above 32°F (0°C), use 10W30 or Mobil Delvac 1 (5W 40) or 15W 40.
Engine Oil Change Intervals	Refer to **Section 8.2** for information on service intervals.
Battery	12 volt nominal - 90 amp hour capacity cold cranking amps = 425 DIN, 500 IEC, 725 BCI

2.9 Compressor Data

Unit	Specification
Compressor Part Number	18-10151-00
Type	Hermetic Scroll
Displacement	8.81 Cubic Inches Per Revolution
Oil Charge	60 ounces (1.77 liters) (Service Replacement)
Approved Compressor Oil	Uniqema Emkarate RL-32-3MAF Carrier Part Number 46-00025-04

2.10 Refrigeration System Data

Unit	Specification
Defrost Air Switch (DAS)	Initiates Defrost: 1.40 +/- .07 inch (35 ± 1.8 mm)
Defrost Timer	1.5h, 3h, 6h, or 12 hours
Evaporator High Temperature Switch, Includes Remote Evaporators	Opens, on a temperature rise, at 130 +/- 5°F (55 ± 2.8°C) Closes, on a temperature fall, at 100 +/- 7°F (37.8 ± 3.9°C)
Liquid Injection Valve (LIV)	Energized (opened) at Compressor Discharge Temperature (CDT) Sensor readings above 275°F (135°C) May be pulsing (opened and closed) between Compressor Discharge Temperature (CDT) Sensor reading of 255°F and 275°F (124°C and 135°C) De-energized (closed) at (CDT reading below 124°C (255°F)
Fusible Plug Melting Point	430°F (221°C)
High Pressure Switch (HPS)	Opens, on pressure rise, at: 495 +/- 10 psig (34.1 +/- 3 bar) Closes, on pressure fall, at: 380 +/- 10 psig (26.2 +/- 3 bar)
Refrigerant Charge	Refer to **Table 2–1**
Remote Evaporator Weights	MJS-1100 - 113lbs (51.2kg) MJS-2200 - 204lbs (93.0kg) MJD-1100 - 130lbs (59.0kg) MJD-2200 - 239lbs (108kg)

2.11 Electrical Data

Unit	Specification	Detail
Compressor Motor	Rated Load Amps	14.2 amps @ 460 VAC
	Locked Rotor Amps	99.0 amps @ 460 VAC
	Winding Resistance	Approximately 1.63 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 stator end
	Resistance	20 to 22 ohms
OGF Module	Trips - On High Current	40 Amps
	Trips - On Ground Fault	150mA
Battery	Voltage	12 volt nominal - Group 31, side vent Cold cranking amps = 750 @ 0°F (-17.8°C), 454 @ -20°F or C
Standby Power Requirements	Voltage Current	460/3/60 with a 30A Circuit Breaker required. (Full Load Draw = 22A, Locked Rotor Draw = 90A)
Standby Extension Cord	Gauge Length	SOOW, 600V, 90°C, 10/4 (3ph + G) 50' minimum length, 75' Maximum length.

Unit	Specification	Detail
Heaters	**Compartment 1, Heater 1**	
	Number of heaters	Three elements (1 assembly)
	Resistance, cold (20°C)	196 ohms ± 10 ohms per phase
	Current, Low Speed	3.5 amps nominal
	Current, High Speed	4.7 amps nominal
	Compartment 1, Heater 2	
	Number of heaters	Four elements (1 assembly)
	Resistance, cold (20°C)	196 ohms ± 10 ohms per phase
	Current, Low Speed	3.5 amps nominal
	Current, High Speed	4.7 amps nominal
	Remote Evaporator Heaters	
	Number of heaters	Three elements (1 assembly)
	Resistance, cold (20°C)	108.5 ohms ± 5 ohms per phase
	Current, Low Speed	3.5 amps nominal
	Current, High Speed	4.7 amps nominal
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 to 8 ohms
Remote Evaporator Fan Motor (Each)	Full Load Amps (FLA)	.45 amps
	Horsepower	.25 hp (180 watts) @ 400VAC
	Speed	2700 rpm @ 60 hz (Approx)
	Bearing Lubrication	Factory lubricated, additional grease not required
	Rotation	Clockwise (looking into grille)
	Resistance	220 to 240 ohms
Generator	Nominal voltage and frequency at High Speed	460 vac, 60 hz, 3 phase
	Nominal voltage and frequency at Low Speed	345 vac 45 hz, 3 phase
	Resistance	0.235 to 0.27 ohms phase to ground 0.47 to 0.54 phase to phase *Precision meter required for testing
	Output	20.7 KVA @ 0.84 p.f @ 1800 rpm
Battery Charger	Input	360 - 460 VAC, Three Phase
	Output amps	40A (Maximum)
	Output voltage	14.8 VDC @ 77°F (25°C)

2.12 Component Resistance and Current Draw

Component	Ohms	Amps
Engine Preheater (EPH)	0.3 to 0.5 Ohms	38 - 46 Amps
Fuel Heater (FH)		
Standard	0.96 Ohms ±10%	12.5 amps ± 10%
Suction Side	1.3 Ohms ±10%	10.7 amps ± 10%
Fuel Heater Relay (FHR) and Power Enable Relay (PER)	90 Ohms between pins 85 and 86	
Fuel Pump (FP)	11.5 Ohms ± 10%	1.4 Amps @ 16 VDC
Fuel/Speed Actuator (FSA)	2.8 Ohms ± 10% @68°F (20°C)	4 Amps Max
Starter Motor (SM)	Less than 1 Ohm but more than 0	270 - 380 amps
Contactor Coil (HTCON1, HTCON2, CDCON, 1EVCON, 2EVCON, 3EVCON, 2HTCON1, 2HTCON2, 3HTCON1, 3HTCON2)	48 Ohms ± 10%	0.25 Amps ± 10%
Contactor Coil (PSCON, PSCON2, GENCON, CCON)	0.6 Ohms ± 10% Contacts Open 48 Ohms Contacts Held Closed	0.25 Amps ± 10%
Remote Contactor Coil (RMT HTCON1, RMT HTCON2, RMT EVCON)	48 Ohms +10%	0.25 Amps +10%
Liquid Injection Solenoid Valve (LIV)	7.2 Ohms ± 3%	1.65 Amps ± 3%

2.13 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 2.10**) 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 and the fuses shown in **Figure 2.6** and **Figure 2.7**.

.

Unsafe Conditions	Safety Device	Device Setting
Excessive operating pressure	High Pressure Switch (HPS)	**Section 2.10**

2.14 Refrigeration Circuit, Cooling

When cooling, the unit operates as a vapor compression refrigeration system. The main components of the system are:

- scroll compressor
- air-cooled condenser
- evaporator expansion valves
- direct expansion evaporators
- economizer circuit

The refrigeration system will operate in one of three modes; Standard, Economized or Null. In addition, the system may also operate in Liquid Injection mode. At start and during periods of high refrigeration system load, the system will operate in standard mode. This allows the system to place the unit in operation at reduced capacity and measure actual load. If the microprocessor calculates additional capacity is required and power is available (periods of high load or during pull-down), the system will transition to economized mode.

2.14.1 Standard Mode

In standard mode, (see **Figure 2.11**), 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 condenser. 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.

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 liquid then flows through the economizer (which is not active in standard mode) and into the evaporator expansion valve or valves (EVXV) in each operating compartment (Compartment 1, 2 and 3 - depending on unit configuration). Each EVXV 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 liquid that flows into the evaporator tubes is colder than the air that is circulated over the evaporator tubes by the evaporator fan. The evaporator tubes have aluminum fins to increase heat transfer; therefore heat is removed from the air circulated over the evaporator. This cold air is circulated throughout the 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 the evaporator outlet temperature and pressure sensors (EVOT and EVOP) which aid in calculation of superheat.

The vapor then returns to the compressor through the compressor suction modulation valve (CSMV). The CSMV controls the flow of refrigerant entering the suction line, thereby matching the load to the compressor capacity.

2.14.2 Economized Mode

In the economized mode the “main” refrigeration system operates the same as in the Standard mode except the control system operates (opens) the economizer expansion valve (ECXV). With the economizer expansion valve operating (see **Figure 2.12**), the capacity of the unit is increased by subcooling the liquid refrigerant entering the evaporator expansion valve.

Liquid refrigerant for use in the economizer circuit is taken from the main liquid line as it leaves the filter drier. This liquid refrigerant flows through the economizer expansion valve (ECXV) and the economizer heat exchanger internal passages absorbing heat from the liquid refrigerant flowing to the evaporator expansion valve. Overall efficiency is increased because the gas leaving the economizer enters the compressor at a higher pressure, therefore requiring less energy to compress it to the required condensing conditions.

There are two levels of economized mode, full economized mode and limited economized mode. Limited economized mode is entered when the control system requests higher capacity than standard mode but engine power or system current limit will not allow full economizer superheat control.

2.14.3 Null Mode

The system will enter null mode during periods where no cooling or heating is required and system is in continuous run. In null mode the compressor and heaters are shut down while evaporator fans continue to operate. The condenser fan will operate if engine cooling is required.

The system may also enter the null mode while in start stop if required time, coolant temperature or battery condition parameters have not been met.

2.14.4 Liquid Injection Mode

The control system monitors the signal provided by the compressor discharge temperature sensor. If compressor temperature rises to the limit (refer to **Section 2.10**), the system will enter Liquid Injection mode. In this mode, the normally closed liquid injection valve (LIV) will be pulsed or opened as required to allow flow of refrigerant into the economizer line, to cool the compressor.

2.15 Refrigeration Circuit, Heat/Defrost

In Heat and Defrost modes, the compressor is de-energized. In Heat mode, the coil mounted heaters and evaporator fans are energized. Air flowing over the warm coil is circulated throughout the refrigerated compartment to maintain cargo at desired temperature.

If the control system is Configured to allow Natural Defrost, and the compartment temperature is above freezing defrost may be accomplished using a combination of coil heaters and return air. If compartment temperature is below freezing or not sufficiently warm enough to defrost the coil, the evaporator fans are de-energized and the coil mounted heaters energized.

Figure 2.11 Refrigeration Circuit Standard Mode

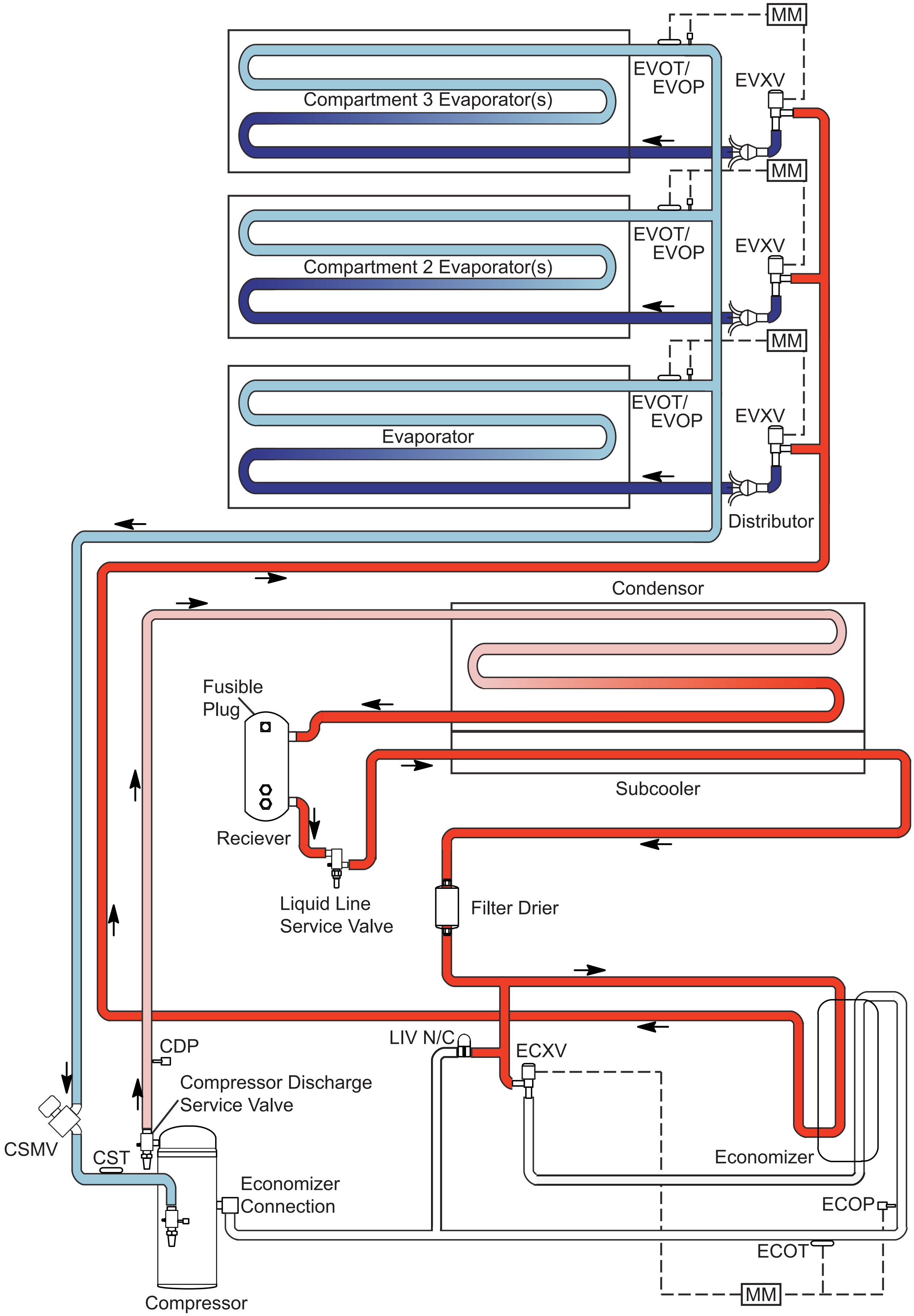
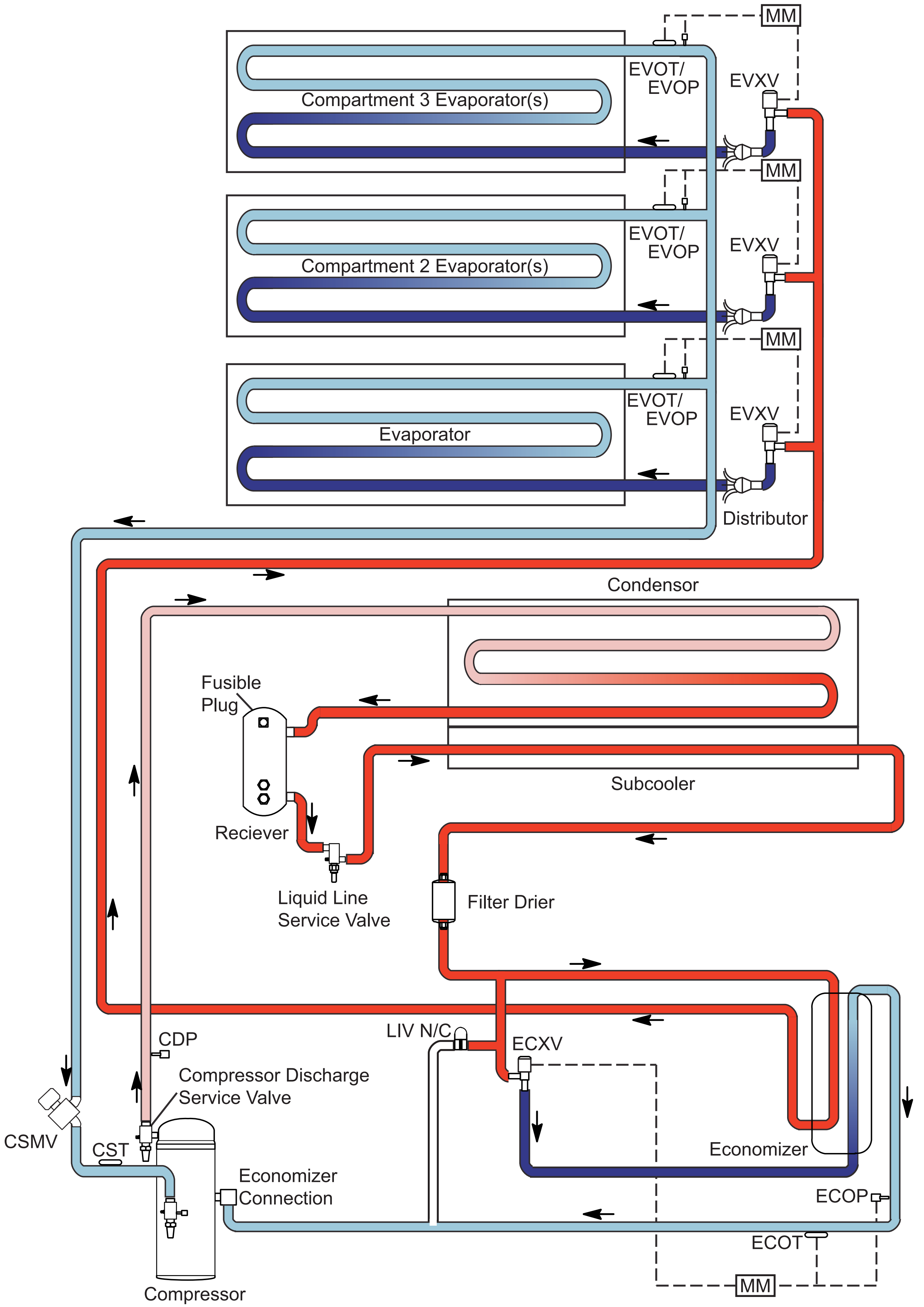


Figure 2.12 Refrigeration Circuit Economized Mode

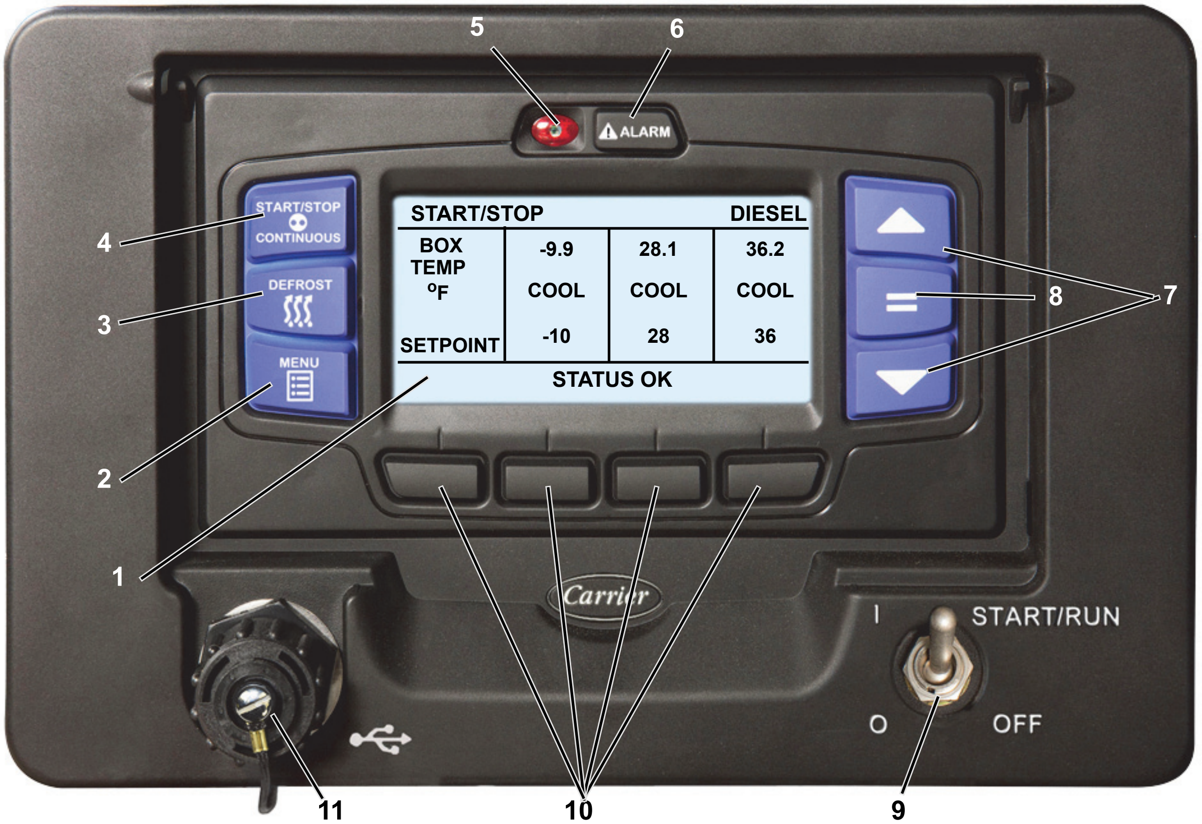


SECTION 3
Operation

⚠ WARNING

Unit may start automatically at any time even if the switch is in the OFF position. Use proper lockout/tagout procedures before inspection/servicing. All unit inspection/servicing by properly trained personnel only.

Figure 3.1 Display Module



1. Display Screen
2. MENU key
3. DEFROST key
4. START/STOP - CONTINUOUS Key
5. Alarm LED
6. Alarm Key
7. Arrow Keys
8. "=" (Select) Key
9. START/RUN-OFF Switch
10. Soft Keys
11. USB Interface Port

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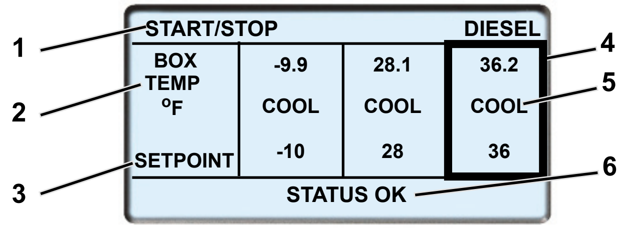
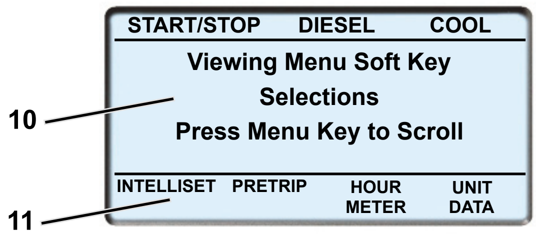
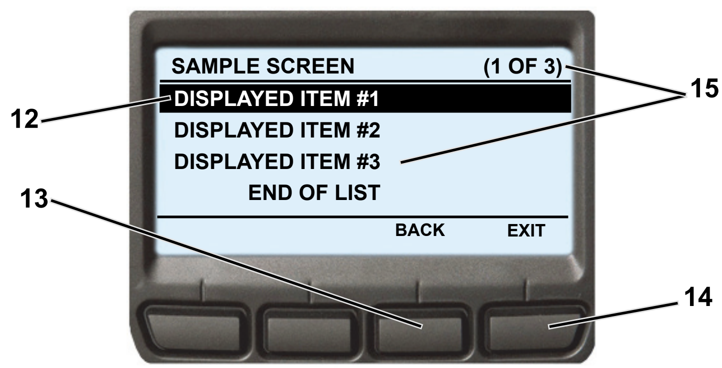
3.1 Display Screens

Split Screen

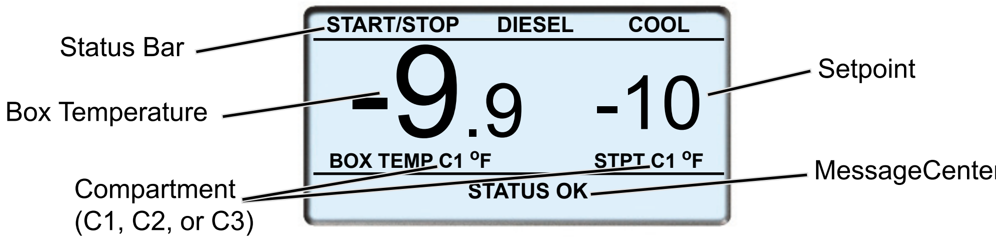


Typical Menu Screen





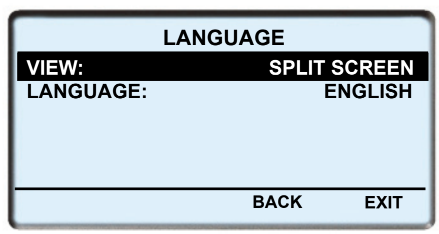
1. Status Bar
2. Box Temperature (row)
3. Setpoint (row)
4. Compartment Highlight Box
5. Operating Mode (row)
6. MessageCenter
7. Compartment #1
8. Compartment #2
9. Compartment #3
10. Operator Message Panel
11. Soft Key Descriptions (Order of presentation may not be as shown.)
12. Highlight -White letters on a black background.
13. BACK Key - Used to return to the previous screen.
14. EXIT Key - Used to return to the default screen.
15. The position of the highlighted item and total number of items in the list is displayed in the status bar. Up to 5 items may be displayed at a time. Press the ▼ key to view additional items, or the ▲ key to scroll back up the list. “END OF LIST” will be displayed after the last item in the list.



Auto Scroll

There are two available display options, Split Screen (see previous page) and Auto Scroll (above). Split Screen shows each compartment Setpoint and Box Temperature in one view. Auto Scroll, which is similar to the standard APX Single Temp display, shows one compartment Setpoint and Box Temperature in each view; the screen automatically changes views to display each active compartment. Only compartments that are turned ON will be displayed. To change between Split Screen and Auto Scroll:

1. Press and release the “MENU” key until the “LANGUAGE/VIEW” soft key is displayed.
2. Press the “LANGUAGE/VIEW” soft key to open the LANGUAGE/VIEW screen.



3. Press the ▲ or ▼ key to highlight “VIEW:”, and press the “=” key. The current view option will be highlighted.
4. Press the ▲ or ▼ key to toggle between AUTO SCROLL and SPLIT SCREEN, press the “=” key to select either display option.
5. Press the EXIT soft key to return to the selected display.

NOTE

Display screen examples in this manual use the default Split Screen view.

3.2 Starting Unit

WARNING

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

1. Place the START/RUN-OFF switch in the START/RUN position.

NOTE

The unit will automatically start in the operating state it was in (Engine or Electric) when stopped.

2. The system will display the Carrier Transicold logo, display the default screen, present language selection and the hour meter readings (if configured to do so) along with a test flash of the alarm light. The system will then perform a start sequence, energize the buzzer, and then start the unit automatically.

NOTE

If the unit attempts to start in Electric Operation, and power is not available, the **00073 NO POWER-CHECK POWER CORD** alarm will be activated. This alarm will clear if power is restored. If the alarm condition exists for five minutes and the Functions and Configurations are set to allow a switch, the unit will switch to Engine Operation.

3. If an alarm present, the alarm message will display in the MessageCenter and the alarm LED will flash for 5 seconds. If any shutdown alarms are present, the alarm(s) must be cleared before the unit will start.
4. If the unit is to be switched from Engine Operation to Electric or from Electric Operation to Engine refer to SWITCHING OPERATING STATE, **Section 3.4**. Once the unit is operating in the desired state, observe the MessageCenter. If the word “ACTIVE” or “MODIFIED” is displayed at the right, the unit is equipped with IntelliSet settings. Refer to **Section 3.5**.
5. If the LCD Display does not illuminate, check:
   - Battery voltage. A booster battery may be needed.
   - Check for blown fuse(s).
   - Verify the harness connector at the back of the display module and all other module connectors are securely attached.

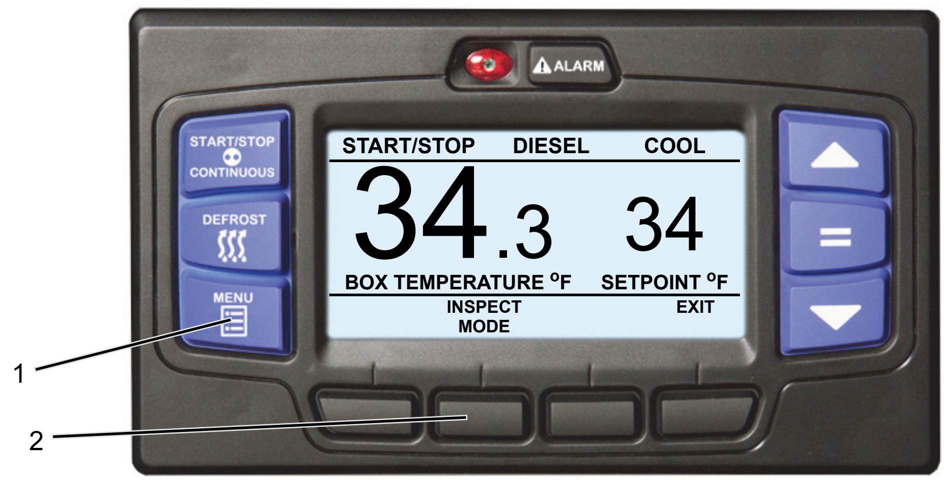
3.3 Inspect Mode

Inspect mode provides an additional layer of safety for operators and technicians. Inspect mode should be used during all pretrip inspections of the unit.

Inspect mode is a user activated feature that forces the unit to shutdown and remain in shutdown regardless of operating state.

After unit inspection, Inspect mode must be manually disabled, at which point the unit will resume standard operation.

Inspect mode is not a substitute for proper Lockout/Tagout procedures, which are always required when servicing the unit.



Enter Inspect Mode:

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) press the MENU key until INSPECT MODE is displayed.

2. Press the INSPECT MODE soft key, the unit will shut down.

While the unit is in Inspect mode the ALARM light will flash, and the display will indicate that unit operation, including temperature control, has been disabled.

Exit Inspect Mode:

3. While the unit is in Inspect mode, the EXIT soft key will be available, all other keys and functions will be locked out.

4. Press the EXIT soft key to disable Inspect mode, the unit will resume standard operation.

3.4 Switching Operating State

If DIESEL is displayed, the unit is in Engine Operation

⚠ 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

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

Standby Electric Guidelines

NOTE

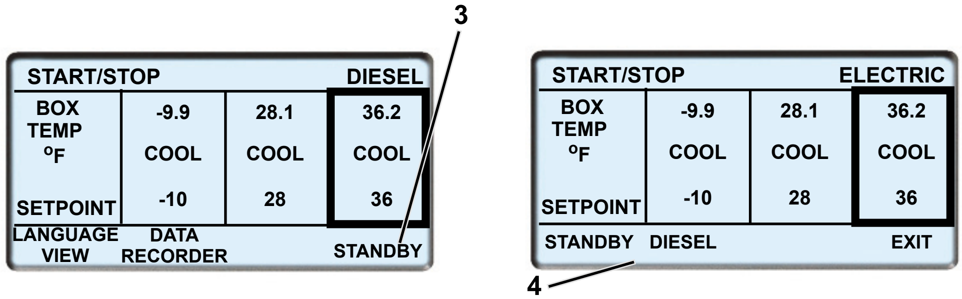
The unit is equipped with automatic phase reversal which ensures that the electric motors will run in the correct direction.

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

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

Engine to Electric

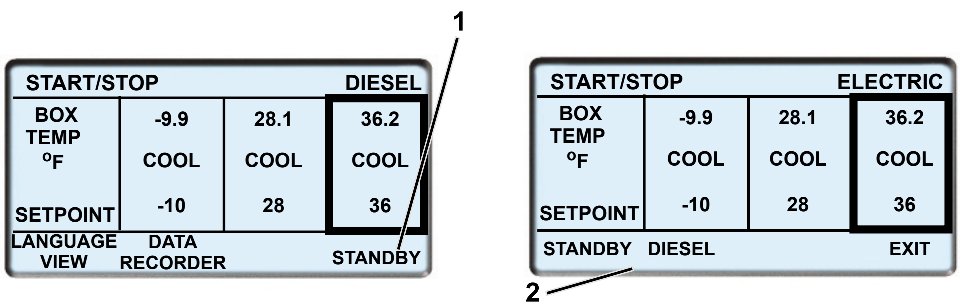
1. If the standby electric cable is not already in place, ensure the external power circuit breaker is OFF, and connect the cable to the unit receptacle.
2. Turn the external circuit breaker ON.
3. Press and release the “MENU” key until the “STANDBY” soft key is displayed.



4. Press the “STANDBY” soft key. The “STANDBY and DIESEL” soft keys will display.
5. Press the “STANDBY” soft key to place the unit in Electric Operation. The unit will stop, the status bar will change to ELECTRIC and the unit will restart in Electric Operation.

Electric to Engine

1. Press and release the “MENU” key until the “STANDBY” soft key is displayed.



2. Press the “STANDBY” soft key. The “STANDBY and DIESEL” soft keys will display.

⚠ WARNING

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

3. Press the “DIESEL” soft key to place the unit in Engine Operation. The unit will stop, the status bar will change to DIESEL and the unit will restart in Engine Operation.
4. If the standby electric cable is in place, and will not be needed, ensure the external power circuit breaker is OFF, disconnect the cable from the unit receptacle and hang up off the ground.

3.5 Intelliset

Products carried or stored in a refrigerated compartment require a multitude of refrigeration unit settings that must be checked and, if required, reset each time a new product is loaded. The APX control system offers the settings necessary to meet these requirements. IntelliSet is a feature that allows pre-selection and naming of the necessary settings for over 40 different products. The operator may then call up the settings by simply selecting the assigned IntelliSet name.

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

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

NOTES

- The above settings are examples of possible settings. Factory IntelliSets are available from your authorized Carrier Transicold Truck/Trailer dealer
- IntelliSet may be pre-programmed as “IntelliSleep” which allows Sleep mode to be entered by simply changing to that IntelliSet.
- Range Protect may be applied to as many IntelliSets as desired. Range Protect is designed to prevent freezing or overheating of non-sensitive cargo by locking the unit in Start-Stop Operation when the compartment temperature is in the preset range (default range is 35 to 70°F, 1.6 to 21.1°C). Range Protect offers increased fuel savings over normal Start-Stop Operation.

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) or in PC mode and the default screen displayed, press the “=” key. If the screen shown just above step 3 below is displayed, proceed to step 3. Otherwise, proceed to step 2.
2. Press the MENU key until INTELLISET is displayed. Then, press the INTELLISET soft key to display the IntelliSet screen.
3. The IntelliSet screen will display with a 10 second timeout and five of the available IntelliSets listed. The IntelliSet that is currently selected will have the word “Active” or “Modified” to the right. There may be more than five IntelliSets available, as displayed in parenthesis on the first line. For example, in the provided illustration there are seven IntelliSets available and the second IntelliSet is highlighted.
4. Press the ▲ or ▼ key to scroll through the list of available IntelliSets. To change to another IntelliSet, highlight the desired IntelliSet and press the “=” key. The highlighted IntelliSet will become active and an “INTELLISET CHANGED” message will display.
5. Press the EXIT soft key to return to the default display.

NOTES

- If setpoint change is allowed, refer to **Section 3.8** for setpoint change instruction.
- If it is desirable to have the unit go directly to the IntelliSet screen on a press of the “=” key, set the “ENABLE INTELLISET AT = KEY” Configuration to “YES”. Refer to **Section 5.2.3**.

3.6 Pretrip

Pretrip is a set of tests run by the control system to check unit operation. It is recommended that a Pretrip is run prior to loading the refrigerated compartment. It will indicate a failure if 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

If “CAN NOT START PRETRIP” is displayed in the MessageCenter, check to see if the unit is in PC mode (Refer to **Section 5.3.2**) or Defrost mode, or check the alarm list (**Section 3.16**) for active shut-down alarms.

NOTE

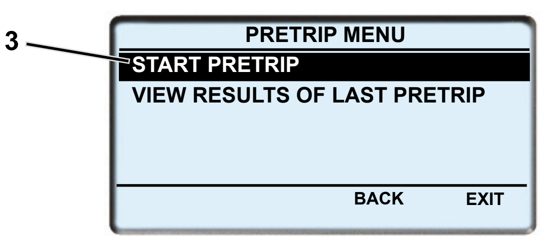
Pretrip will run until completed, unless an alarm occurs that causes Pretrip to be aborted. Only alarms that will result in other erroneous alarms or will affect future Pretrip tests will abort Pre trip.

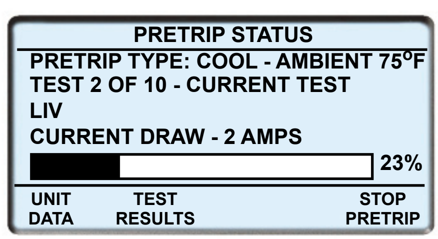
Once Pretrip is started: If the unit is running, the control system will shut the unit down for the initial tests, then start it again as it proceeds through the tests.

NOTE

Before completing Pretrip, the APX Control System looks at the status of alarms and if certain alarms are active (for example: Low Fuel Warning, Check Engine Oil 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.

1. With the system powered up (START/RUN-OFF switch in the START/RUN position), press the MENU key until PRETRIP is displayed.
2. Press the PRETRIP soft key to display the Pretrip Menu screen. The Pretrip Menu screen will display with a 15 second timeout. Press the ▲ or ▼ key to select “Start Pretrip” then press the “=” key.





3. If “Start Pretrip” is selected, Pretrip will begin and the Pretrip Status screen will be displayed.

NOTE

At any time during Pretrip, the UNIT DATA soft key may be pressed to allow the user to view the unit data screen (refer to **Section 3.15**). To return to Pretrip from the unit data screen, press the BACK soft key.

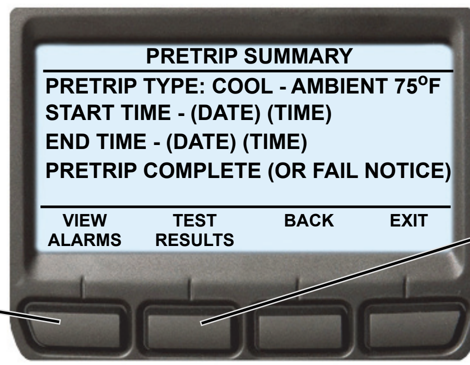
NOTE

During Pretrip the ALARM light will illuminate to indicate there is no temperature control. Immediately following Pretrip OR if “View Results of Last Pretrip” is selected the Pretrip Summary Screen will be displayed.

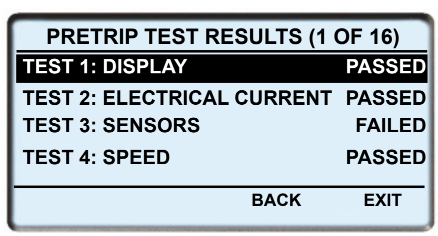
4. During Pretrip Test 1, verify that the buzzer is energized and the amber light on the light bar is illuminated (if equipped).
5. The remainder of the Pretrip tests will run automatically and take 7 to 25 minutes. The percent of Pretrip that has been completed is displayed in the status bar under the test description information.
6. “PRETRIP PASS”, “PRETRIP FAIL IN TEST ##” or “PRETRIP FAILED AND COMPLETE” will be displayed at the end of the testing. The “PASS” message will display until a key is pressed. The Pretrip test “FAIL” results message will display until the alarms are cleared.

TIP

To end Pretrip at any time, press the STOP PRETRIP soft key.



7. Press the VIEW ALARMS key to move to the Alarm Screen (refer to **Section 3.16**) and review any alarms activated during the test.
8. The TEST RESULTS soft key may be pressed at any time during Pretrip to view results of any test that has been completed. Press the ▲ or ▼ key to scroll through the results.



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Test 1 - Display Test

The control system activates the buzzer. Also, the amber light on the light bar is illuminated (if equipped). This test will last 5 seconds. This portion of the Pretrip re quires that the operator determines PASS or FAIL. 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.

Test 2 - 12VDC Electrical Component Amperage Check - Test 2 will check the amperage (current) draw of the fol lowing components:

- Battery Amp Draw (All Components Turned Off).
- Liquid Injection Valve
- Preheat Circuit (EPH)

- Condenser Fan Contactors #1 and #2
- Evaporator Fan Contactor
- Compressor Contactor
- Generator Contactor
- Standby Contactor
- Heater #1 Contactor, Main Compartment
- Heater #2 Contactor, Main Compartment
- Heater #1 Contactors, Compartment 2 and 3
- Heater #2 Contactors, Compartment 2 and 3
- Evaporator Fan Contactors, Compartment 2 and 3

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.

Test 3 - Temperature Sensor Check - Check the condition of all of the system temperature sensors in all compartments. Test 3 will last approximately 5 seconds. If a problem is detected with any of the sensors, the corresponding alarm will be activated. Refer to Alarm **Section 7.3.**

NOTE

Tests 4, 5 and 6 are only run when unit is in Engine Operation, in Electric Operation, test 7 is skipped.

Test 4 - Engine Low Speed - The control system verifies that engine is in the low speed range and the engine load is displayed. If the engine is not operating in the low speed range, the **P00174 CHECK LOW SPEED RPM** alarm will be activated.

Test 5 - Engine High Speed - The engine switches to high speed. The control system verifies that the engine is in the high speed range and the engine load is displayed. If the engine is not operating in the high speed range, the **P00175 CHECK HIGH SPEED RPM** alarm will be activated.

Test 6 - Engine Low Speed - The engine switches back to low speed and the engine load is displayed. The control system verifies that engine returns to the low speed range within 10 seconds. If not, the **P00174 CHECK LOW SPEED RPM** alarm will be activated.

Test 7 - 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. The process will be repeated for Compartment 2 and Compartment 3 (if applicable) heater outputs. Test 7 alarms:

P00187 CHECK HEATER 1 CIRCUIT

P00188 CHECK HEATER 2 CIRCUIT

P00146 C2 CHECK HEATER 1 CIRCUIT

P00147 C2 CHECK HEATER 2 CIRCUIT

P00163 C3 CHECK HEATER 1 CIRCUIT

P00167 C3 CHECK HEATER 2 CIRCUIT

Test 8 - Evaporator Fan Motor - The evaporator fan motor contactor will be energized and the motor checked for proper current draw. An alarm will be activated, **P00189 CHECK EVAPORATOR FAN MOTOR** if the evaporator fan motor is not drawing amperage in the expected range.

The process will be repeated for Compartment 2 and Compartment 3 (if applicable) evaporator fan motor outputs. If the remote evaporator fan motor(s) is not drawing amperage in the expected range alarm(s) **P00184 C2 CHECK EVAPORATOR FAN MOTOR** and/or **P00185 C3 CHECK EVAPORATOR FAN MOTOR** will be activated.

Test 9 - Condenser Fan Motors - The condenser fan motor contactors will be energized and the motors checked for proper current draw. An alarm will be activated, **P00190 CHECK CONDENSER FAN MOTOR** or **P11000 CHECK CONDENSER FAN MOTOR 2** if a condenser fan motor is not drawing amperage in the expected range.

Test 10 - Check Suction Modulation Valve (CSMV) - This test is run to ensure that the CSMV is opening and closing properly. If suction pressure doesn't change as expected with CSMV closed, then the **P00180 CHECK SUCTION MOD VALVE** alarm will be displayed.

Test 11 - Evaporator Expansion Valve (EVXV) - This test is an operational check of the EVXV. If evaporator outlet pressure doesn't change as expected with the EVXV closed then the **P00177 CHECK EXV (EVXV) SUPERHEAT** alarm will be displayed.

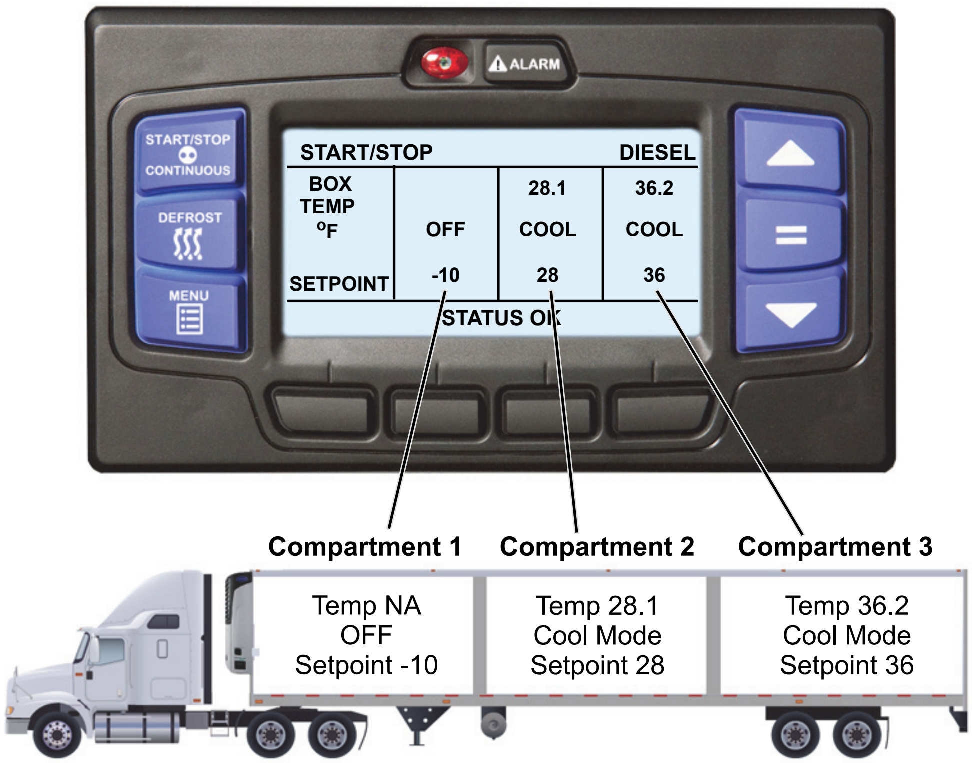
Test 12 - Economizer Expansion Valve (ECXV) - This test is an operational check of the ECXV. If economizer outlet pressure doesn't change as expected with the ECXV closed then the **P00173 CHECK ECONOMIZER** alarm will be displayed.

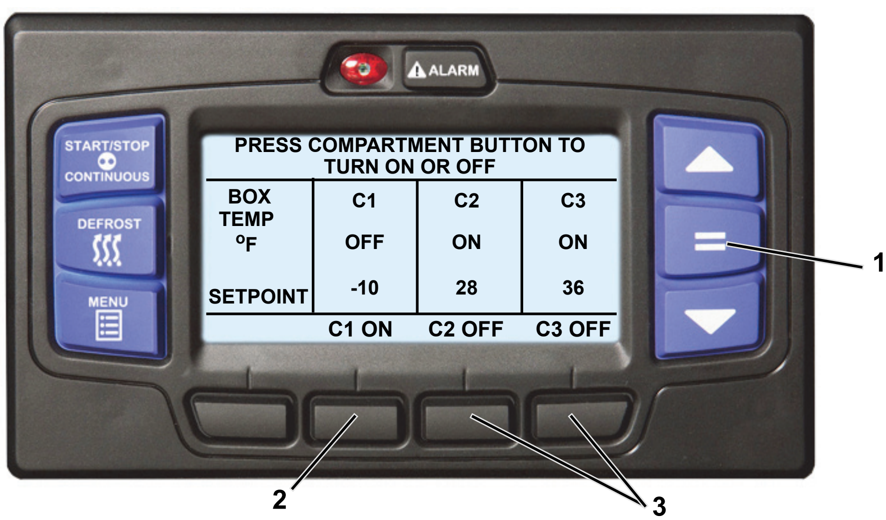
Test 13 - Liquid Injection Solenoid Valve (LIV) - This test checks the operation of the liquid injection solenoid valve. If compressor suction temperature does not change when LIV is energized, the **P00179 CHECK LIV** alarm will be displayed.

Test 14 - Remote Evaporator Expansion Valve (REVXVs) - This test checks the operation of the remote EVXV(s). If compressor suction pressure / evaporator superheat does not change when EVXV is energized, the corresponding Pretrip alarm will be displayed; **P14000 C2 CHECK EVAP1 SUPERHEAT**, **P14001 C2 CHECK EVAP2 SUPERHEAT**, **P14002 C3 CHECK EVAP1 SUPERHEAT**, **P14003 C3 CHECK EVAP2 SUPERHEAT**.

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 the EXIT key. In the event that the Pretrip test activates an alarm(s), either PRETRIP FAIL and 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.

3.7 Turning Compartments On/Off



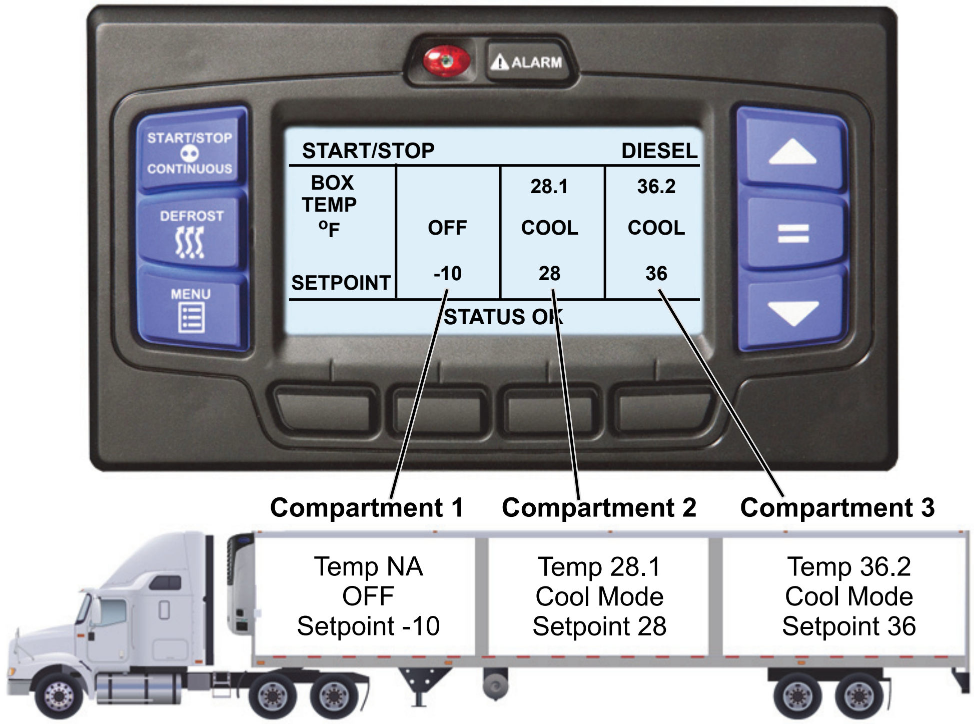


Individual compartment control status and temperature display boxes are configured left to right to match the compartments in the trailer, front to back. The left display box shows the status of the first compartment (C1), the middle display box shows the status of the second compartment (C2), and the right display box shows the status of the third compartment (C3); in a two compartment configuration, the right display box is blank.

The default display screen uses a highlight box to allow control of individual compartments. The highlight box will toggle between each of the compartments that are currently ON. If only one compartment is ON, the highlight box will remain on that compartment.

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) and the default screen displayed, press the “MENU” key to open the ON/OFF display.
   - If a compartment is currently OFF, the corresponding soft key will display ON.
   - If a compartment is currently ON, the corresponding soft key will display OFF.
2. To turn a compartment ON, press the ON soft key.
3. To turn a compartment OFF, press the OFF soft key.

3.8 Changing Setpoint



1. With the system powered up (START/RUN-OFF switch in the START/RUN position) and the default screen displayed (press the BACK or EXIT soft key if required), and the correct compartment highlighted
2. Press the ▲ or ▼ key to bring the displayed setpoint to the desired value.

TIP

The setpoint will change one degree (or 0.1 degree if configured to do so) with each press and release of an arrow key or the setpoint will scroll if the key is pressed and held.

3. Press the "=" key to save the new setpoint. The MessageCenter will display "SETPOINT CHANGED" for 10 seconds.
4. If the "=" key is not pressed the setpoint screen will flash, the MessageCenter will display "SETPOINT NOT CHANGED" and then return to original setpoint.

By default, setpoints of -22°F to +95°F (-30°C to +35°C) may be entered using the display mounted keys. The control system always retains the last entered setpoint in memory. The setpoint will change 1° (one full degree) OR 0.1° (one tenth of a degree - if configured to do so) for each press and release of release of the ▲ or ▼ key.

NOTE

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

Setpoint may be changed any time the START/RUN- OFF switch is in the START/RUN position, or when the unit is in PC mode EXCEPT when:

- Viewing the Alarm List, Data List or Functional Para meters **OR**
- When the unit is in Pretrip **OR**
- When the unit is in Sleep mode.

Pressing the = key will cause the new displayed setpoint to become active, SETPOINT CHANGED will be displayed. If the new value is not entered, after 10 seconds of no display mounted key activity, the entire display and Light Bar will flash (with SETPOINT NOT CHANGED displayed) and then revert back to the last entered setpoint. All other keys are active at this time and if a key is pressed while the display is flashing, the flashing will stop, and the requested function will be performed.

TIP

The setpoint may be changed quickly by pressing and holding the ▲ or ▼ key until the desired setpoint is reached. The longer the key is held, the faster the setting will change.

3.9 Start-Stop Operation

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) or in PC mode press the START-STOP/CONTINUOUS key until “START/STOP” is highlighted.
2. The message “START/STOP MODE SELECTED” will be displayed in the MessageCenter for 10 seconds.
3. The operation indication in the status bar will no longer be highlighted. 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 unit shut down and restart by monitoring refrigerated compartment temperature, battery charge condition and engine coolant temperature (Engine Operation only).

NOTE

In Electric Operation, if battery condition is the only reason the unit needs to operate, the compressor will stop but the battery charger will remain energized.

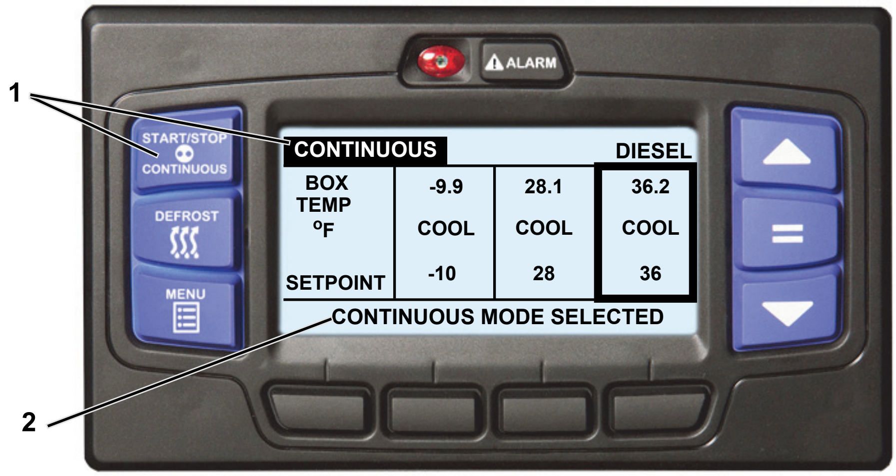
The main function of Start-Stop Operation is to turn off the refrigeration system near setpoint to provide an efficient temperature control system and to initiate a restart sequence after certain conditions are met.

The Start-Stop/Continuous key is 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 5.2.3** for Configuration information.

If the unit fails to start after three start attempts alarm **00031 FAILED TO START - AUTO MODE** 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 alarm **00030 FAILED TO RUN MINIMUM TIME** will be activated. The shutdown counter is cleared when the unit has run for 15 minutes.

Refer to **Section 4.5** for more detailed information on Start-Stop Operation.

3.10 Continuous Operation



1. With the system powered up (START/RUN-OFF switch in the START/RUN position) or in PC mode press the START-STOP/CONTINUOUS key until “CONTINUOUS” is displayed and highlighted.
2. The message “CONTINUOUS RUN MODE SELECTED” will be displayed in the MessageCenter for 10 seconds.
3. The operation indication in the status bar will no longer be highlighted. The unit is now in Continuous Operation.

In Continuous Operation, the unit will not shutdown except in response to a shutdown alarm. Refer to **Section 4.6** for more detailed information on Continuous Operation.

The control system may be configured with continuous operation tied to setpoint ranges for either frozen or perishable loads. The START-STOP/CONTINUOUS key is locked out if “CONTINUOUS LOCKED” displays in the MessageCenter when the key is pressed and the unit is in Continuous Operation or “START-STOP LOCKED” displays in the MessageCenter when the key is pressed and the unit is in Start-Stop Operation. Refer to **Section 5.2.3** for more information on Configurations.

If the unit fails to start after three start attempts alarm **00031 FAILED TO START - AUTO MODE** 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 alarm **00030 FAILED TO RUN MINIMUM TIME** will be activated. The shutdown counter is cleared when the unit has run for 15 minutes.

3.11 Data Recorder

The APX Control System contains a built-in DataLink data recorder with 3 megabytes of memory. The recorded data can be downloaded from the DataLink data recorder using either the TRU-Tech/TRU-View program or a Data Transfer USB memory device.

The DataLink data recorder reads the same input information as the control system (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 at selected intervals.

The following intervals are available for sensor recording:

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

3.11.1 APX Control System Information

The APX Control System information that may be recorded is as follows:

- DataLink data recorder time clock date / time
- Setpoint
- DataLink data recorder settings (Logging Intervals, Events and Sensors)
- Trailer (asset or car) ID
- Unit Serial Number
- Unit Model Number
- Controller (main microprocessor) Serial Number
- Controller (main microprocessor) Software Rev
- Pretrip Start/End
- Functional Parameters
- Control System Configurations
- Current System Operating Mode

3.11.2 Data Recording

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

1. APX Control System Information as described in the preceding **Section 3.11.1**.

2. Sensor Data

This information is recorded at pre-determined intervals as a snapshot of the sensor at the time of the recording, or an average of the sensor readings since the last recording based on 1 minute increments. The user can determine which sensor(s) will be recorded, whether snapshot or averaged readings are preferred and at what time intervals. (Snapshot readings are also taken at the beginning and end of defrost and 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 from 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/Defrost cycle end
- START/RUN - OFF switch on (START/RUN position)
- Pretrip start
- Pretrip end
- Unit Mode
- Control Mode
- Door and Remote switch activations
- Hour Meter readings (Hour meters are recorded at midnight or the first time of day the START/ RUN- OFF switch is toggled from the OFF position. There will be no hour meter readings when the switch is in the OFF position.

4. User Area Data

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

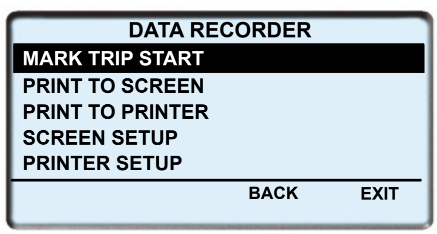
3.11.3 Data Downloading

The data within the DataLink data recorder can be downloaded using either the TRU-Tech/TRU-View program with a PC-USB service cable connected to the USB interface port or with a Data Transfer USB memory device (refer to **Section 5.3.3**).

3.11.4 DataLink Data Recorder Power-Up

The DataLink data recorder records data the entire time the START/RUN - OFF switch is in the START/RUN position. A Configuration exists which allows the user to select whether 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 record the additional 8 hours so the temperatures will be recorded during the unloading, fueling or other times when it may be necessary to turn the unit off. (Refer to **Section 5.2.3**.)

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) or in PC mode press the MENU key until DATA RECORDER is displayed.
2. Press the DATA RECORDER soft key to display the sub menus.



3. The Data Recorder screen will display with a 15 second timeout. Press the ▲ or ▼ key to scroll through the available sub menus. With the desired sub-menu highlighted, press the “=” key to enter the menu.

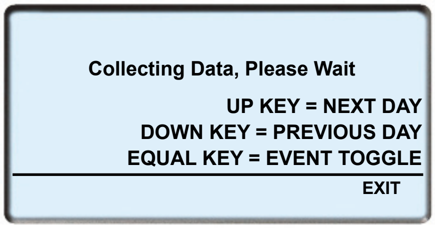
MARK TRIP START

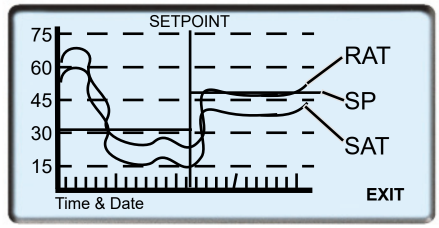
Trip Start places the present time and date as a stamp in the data recorder memory to allow easy review of the data from the last trip, and to allow downloading data from a specific trip. A trip begins at a Trip Start and ends at the next Trip Start.

To enter a Trip Start: with MARK TRIP START highlighted, press the “=” key. If trip start is acknowledged by the data recorder, “TRIP START ENTERED” will be displayed for 5 seconds and then the display will revert back to the normal display. In the unlikely situation that the data recorder is not functioning properly “CANNOT ENTER TRIP START” will flash and then the display will revert back to the Data Recorder menu.

PRINT TO SCREEN

PRINT TO SCREEN displays a graphical representation of the recorded data. To display the data: with PRINT TO SCREEN highlighted, press the "=" Key. **NOTE:** If Configured to do so, the System will prompt for entry of the data protect PIN code (refer to "PROTECT DATA WITH PIN", **Table 5–1**).





Once the graphical display is presented, press the ▲ or ▼ keys to move through the recorded data, day by day. The data is presented with the left horizontal axis as 00:00 (midnight) with 24 dividing lines representing the hours of the day.

Press the "=" key to toggle the event codes on or off. When viewing events with the event codes ON, the following acronyms will be displayed:

c = Door Close	o = Door Open
d = Defrost start	p = Power up
e = Defrost end	r = Real time clock range
f = Power down	t = Trip Start

3.12 Manual Defrost

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) and the default screen displayed (press the BACK or EXIT soft key if required), press the MANUAL DEFROST key.

NOTE

This procedure may be demonstrated in PC mode but the unit will not actually enter defrost.

2. If the conditions for defrost are met, the status bar and the Box Temperature display will change to the word “DEFROST”. The MessageCenter will display “DEFROST CYCLE STARTED” for 10 seconds. At the completion of any defrost cycle, the MessageCenter will return to the default display

3. If the conditions for defrost are not met, the MessageCenter will display “CANNOT START DEFROST CYCLE” for 5 seconds. This message will be activated when

   - The box temperature is too warm or the coil temperatures indicate a defrost is not needed. The host unit will only allow defrost when the defrost termination temperature sensor is below 40°F (4.4°C). The remote evaporators will allow defrost when the defrost termination temperature sensor is above 40°F (4.4°C), but only if other temperature readings on the coil indicate the coil may need a defrost. **OR**
   - The engine has not run at least 15 seconds after starting **OR**
   - The unit is in PC mode **OR**
   - The unit is in Pretrip **OR**
   - There is an active shutdown Alarm.

Defrost may also be initiated automatically at preset intervals by the system defrost timer or by the defrost air switch.

Defrost mode terminates when all defrost termination temperature sensors rise higher than 55°F (12.8°C). On remote evaporators, if the DTT is greater than 25°F (-3.9°C) at the beginning of the defrost, then termination will occur after the DTT rises 35°F (19.4°C) (Max 80°F) or if the EVOT rises above a maximum threshold indicating the coil is defrosted.

Should the defrost cycle not end after a maximum of 45 minutes, the defrost cycle is terminated automatically. “DEFROST NOT COMPLETE” will be displayed in the MessageCenter.

If defrost terminates on the 45 minute termination timer, the system will wait 1.5 hours of compressor running time before attempting another automatic defrost cycle. Pressing the manual defrost key will override this mode and start a defrost cycle.

TIP

The Manual Defrost Key can be used at any time to start a Defrost Cycle as long as the preceding conditions are met.

NOTE

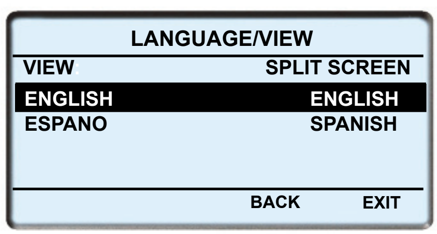
Refer to **Section 4.8** for more detailed information on DEFROST.

3.13 Language Selection

NOTE

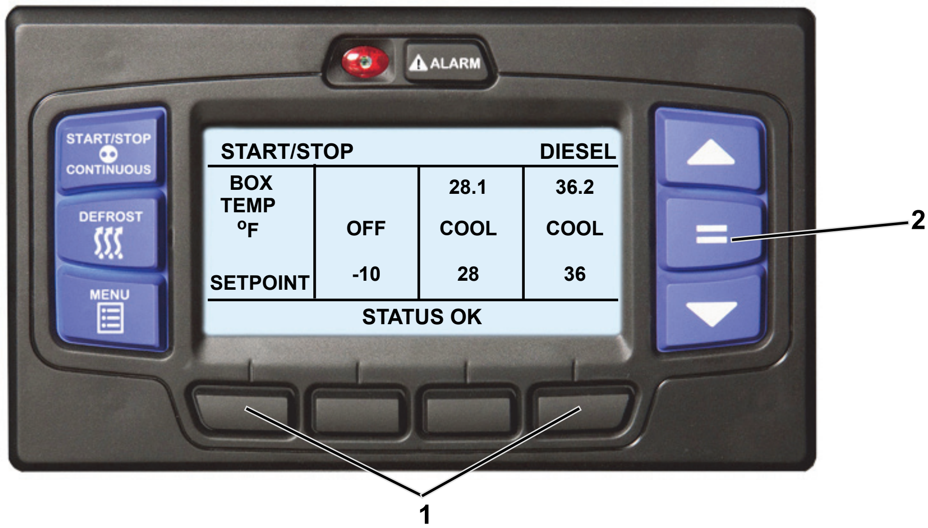
Language Selection may not be available on early software revisions.

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) or in PC mode press the MENU key until LANGUAGE is displayed.
2. Press the LANGUAGE soft key to display the language screen.



3. The language screen will display with a 10 second timeout. Press the ▲ or ▼ key to scroll through the available selections.
4. With the desired language highlighted, press the “=” key. The highlighted language will become active and “LANGUAGE CHANGED” will be displayed.

3.14 Advanced User

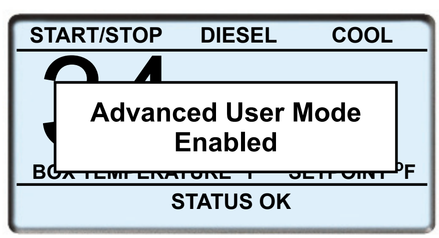


NOTES

- As shipped from the factory, the system will operate in the Driver mode. In the Driver mode, some data and menu items covered in this publication will not be available.
- The system may be configured to operate in the Advanced User mode. If configured to operate in the Advanced User mode, that additional data and those menu items will be available at all times.

  If the System is not configured to operate in the Advanced User mode, the mode may be entered as follows:

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) or in PC mode press and then release the two outside soft keys simultaneously. (NOTE: The system will not respond.)
2. Then, press the “=” key within 5 seconds. The operator message panel will display the acknowledgment message.



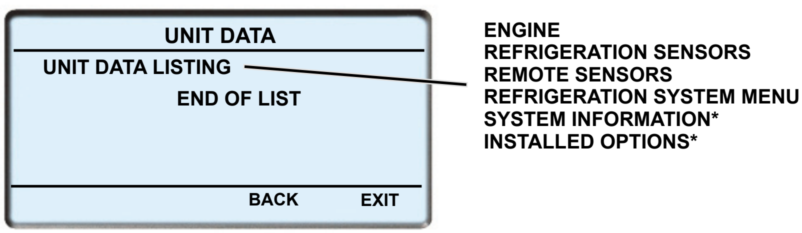
3. The Advanced User menus will be available for 60 minutes or until the START/RUN-OFF switch is placed in the OFF position.
4. The system can be toggled between Driver mode and Advanced User mode by pressing and then releasing the two outside soft keys simultaneously, and then pressing the “=” key.

   When toggling from Advance User mode to Driver mode, “DRIVERS MODE ENABLED” will display for 5 seconds.

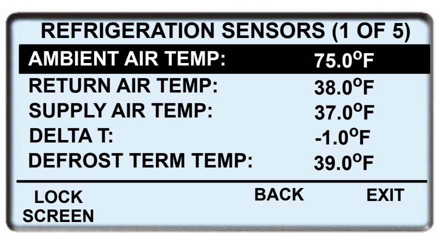
   When toggling from Driver mode to Advance User mode, “ADVANCE USER MODE ENABLED” will display for 5 seconds.

3.15 Unit Data

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) or in PC mode, press the MENU key until UNIT DATA is displayed.
2. Press the UNIT DATA soft key to display the unit data screen.



3. The Unit Data screen will display with a 15 second timeout. Press the ▲ or ▼ key to scroll through the available unit data sub menus. With the desired sub-menu highlighted, press the “=” key to view the data.
4. The selected sub-menu data will be displayed. For example, the Refrigeration Sensor display may include:



5. Press the ▲ or ▼ key to scroll through the sub-menu data list.
6. To lock the present LCD display press the LOCK SCREEN soft key. The screen will highlight (white lettering on a black background) to indicate it is locked and the soft key will change to UNLOCK SCREEN.
7. Press the UNLOCK SCREEN soft key to unlock the screen or press the ▲ or ▼ key to unlock the screen and scroll through the sub-menu data selections. Press the BACK key to return to the sub-menu selection screen or the EXIT key to return to the default screen.

UNIT DATA LIST

ENGINE
Fuel level
Battery: O.K.
Amp Draw (DC)
Engine Coolant Temperature
Unit AC Current #1
Unit AC Current #2*
Unit AC Current #3*
Unit AC Voltage*
Engine Speed*
Engine Load*

REFRIGERATION C1 SENSORS
Ambient Air Temp
Return Air Temp
Supply Air Temp
Delta-t
Defrost Term Temp

REFRIGERATION C2/C3 SENSORS
Ambient Air Temp
Return Air Temp
Defrost Term Temp
Supply Air Temp

REMOTE SENSORS (Optional)
Remote Sensor 1
Remote Sensor 2
Remote Sensor 3

C1 REFRFRIGERATION SYSTEM
Discharge Pressure*
Compressor Discharge Temp*
Suction Pressure
Suction Line Temp*
Evaporator Pressure*
Evaporator Outlet Temperature*
Econo Pressure*
Econo Temperature*
Suction Mod Valve*
Expansion Valve*
Econo Expansion Valve*

C2/C3 REFRFRIGERATION SYSTEM
Evaporator Pressure*
Evaporator Temperature*
Expansion Valve 1*
Expansion Valve 2*

SYSTEM INFORMATION*
Date*
Time*
Trailer/Asset/Car ID*
Unit Serial #*
Unit Model #*
Micro Software Revision*
Display Software Revision*
Remote Display Rev*
Main Micro Serial #*
C2 Evap*
C3 Evap*

INSTALLED OPTIONS*
Datatrack*
Datatrack Advanced*
Intelliset*

* Data marked with an asterisk will display in the Advanced User mode only.

Refer to **Table 3–1** for additional information on Unit Data readings.

Table 3–1 Unit Data

DATA	DEFINITION
ENGINE	
FUEL LEVEL	This is only displayed when the optional sensor is installed and configured YES. Displays % of fuel in tank.
BATTERY	Battery voltage
AMP DRAW	Battery charging or discharging amps
ENGINE COOLANT TEMP	Engine coolant temperature
UNIT AC CURRENT #1 (or 2 or 3)	High Voltage Current Draw on the numbered circuit
UNIT AC VOLTAGE	Voltage in the high voltage circuit.
ENGINE SPEED	Engine revolutions per minute
ENGINE LOAD	Engine Rack (Throttle) Position (% open)
REFRIGERATION SENSORS	
AMBIENT AIR TEMP	Ambient (air entering condenser) air temperature
RETURN AIR TEMP C1/C2/C3	Return (air entering evaporator) temperature
SUPPLY AIR TEMP C1/C2/C3	Supply (air leaving evaporator) temperature
DELTA-T	Supply air temperature minus return air temperature (A negative value indicates cooling and a positive value indicates heating.)
DEFROST TERM TEMP C1/C2/C3	Defrost termination temperature
REMOTE SENSORS	
REMOTE SENSOR (1-2-3)	This is the temperature at remote Temperature Sensor 1, 2 or 3. (These sensors are optional, and may not be applicable to this unit.)

Table 3–1 Unit Data

DATA	DEFINITION
REFRIGERATION SYSTEM	
DISCHARGE PRESSURE	Refrigerant pressure leaving the compressor
COMPRESSOR DISCHARGE TEMP	Refrigerant temperature leaving the compressor
SUCTION PRESSURE	Refrigerant pressure entering the compressor
SUCTION LINE TEMP	Refrigerant temperature entering the compressor
EVAPORATOR PRESSURE C1/C2/C3	Refrigerant pressure leaving the evaporator
EVAPORATOR OUTLET TEMP C1/C2/C3	Refrigerant temperature leaving the evaporator
ECONO PRESSURE	Refrigerant pressure leaving the economizer
ECONO TEMPERATURE	Refrigerant temperature leaving the economizer
SUCTION MOD VALVE	% open of CSMV
EXPANSION VALVE C1/C2/C3 *C2/C3 may have valve 1 and 2	% open of EVXV
ECONO EXPANSION VALVE	% open of ECXV
SYSTEM INFORMATION	
DATE / TIME	This is the current Date and Time that the system is using. This may be different than your actual time, depending on the time zone and daylight-saving time selections made by the owner of the unit. **NOTE:** The system uses a 24 hour clock. Hours 00 to 11 are AM and hours 12 to 23 are PM.
TRAILER ID #	Trailer ID (as entered by the user)
UNIT SERIAL #	Unit serial number
UNIT MODEL #	Unit model number (number entered in Configuration)
MICRO SOFTWARE REVISION	Software revision that is operating the main microprocessor module
DISPLAY SOFTWARE REVISION	Revision of the software that is operating the display module
REMOTE DISPLAY REVISION	Revision of the software that is operating the Remote display (If installed)
MAIN MICRO SERIAL #	Serial Number of the main microprocessor module
INSTALLED OPTIONS (will display if one or more options are installed)	
INTELLISET	If displayed, the IntelliSet option is installed.
DATATRAK ADVANCED	If displayed, the Advanced DataTrak option is installed.
DATATRAK	If displayed, the DataTrak option is installed.

3.16 View Active Alarms

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) or in PC mode press the ALARM key.
2. If there are active alarms, the alarm number will be displayed preceded by the letter "A" (active alarm). The last alarm that occurred will be the first alarm displayed.
   - If the alarm list is viewed when in the Driver mode, the alarm descriptions will only display if the System is configured to do so.
   - When viewing the alarm list in the Advanced User mode or Technician mode the alarm description will display, following the alarm number.
   - Next to the ACTIVE ALARMS screen name in the status bar, information on the total number of alarms and the position in the list of the highlighted alarm is provided. (In the preceding illustration there are 3 alarms and the second alarm is highlighted.)
3. Press the ▲ or ▼ key to scroll through the list of alarms.
4. To clear the alarms, press the CLEAR ALARMS soft key. The display will provide an "ACTIVE ALARMS CLEARED" message to confirm the alarms have cleared.
5. If there are no active alarms, the LCD Display will provide a "NO ACTIVE ALARMS" message and then return to the default display after 5 seconds.

   Alarms are stored in the Alarm List in the main microprocessor. Stored alarms may be viewed in the MessageCenter.

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

TIP

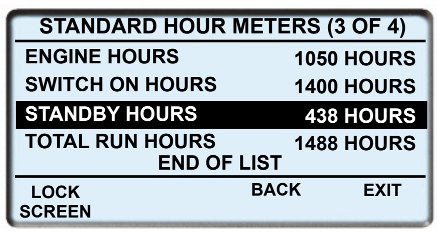
Another way to clear active alarms is to turn the control system OFF and then back on using the START/RUN - OFF switch.

TIP

The inactive alarm list may only be viewed while in Technician mode, refer to **Section 5.2.2**. Only qualified refrigeration technicians should access the inactive alarm list. It is not intended for the use of Drivers or Advanced Users.

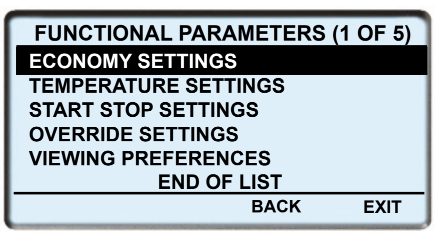
3.17 View Hour Meters

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) or in PC mode, press the MENU key until HOUR METERS is displayed.
2. Press the HOUR METER soft key to display the hour meters screen.
3. The hour meter screen will display with a 15 second timeout.

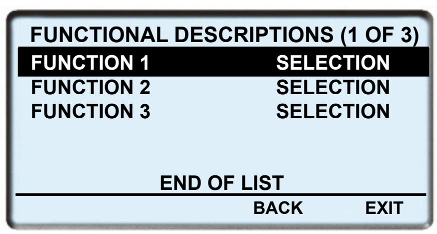


3.18 Functional Parameters

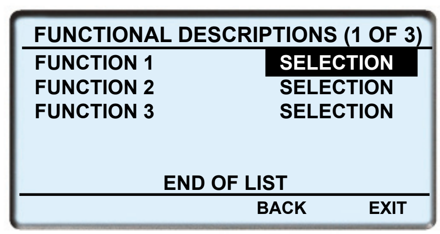
1. With the system powered up (START/RUN-OFF switch in the START/RUN position) or in PC mode, and in the Advanced User mode, press the MENU key until FUNCTIONS is displayed.
2. Press the FUNCTIONS soft key to display the sub-menus as in Sample Screen A. Press the DOWN ARROW key until the desired sub-menu is highlighted, as in Sample Screen B. Then press the “=” key to enter the sub-menu. The highlight will move to the present setting, as in Sample Screen C.



Sample Screen A



Sample Screen B



Sample Screen C

3. Press either the ▲ or ▼ key to scroll through the selections until the desired setting is highlighted. Press the “=” key to save the setting to memory.
4. Continue as above to set additional Functions as required.

Refer to **Table 3–2** for additional information on Functional Parameters.

Table 3–2 Functional Parameters

FUNCTION	PARAMETER SELECTIONS	DESCRIPTION
NOTES: 1. Selections in BOLD are the default settings. 2. Any Function displayed with an asterisk (*) has been locked using the TRU-Tech program and cannot be changed using the display mounted keys.		
ECONOMY SETTINGS		
FUEL SAVER (ECO) MODE	**NO** YES	NO = When in Continuous Operation, control for maximum temperature protection. YES = When in Continuous Operation, control for maximum fuel economy.
LOW SPEED DELAY S/S:	0 MINS TO 255MINS (in 1 minute increments) **10 MIN**	Select the length of time the unit is to remain in low speed after starting, before transitioning to high speed, when in Start-Stop Operation.

Table 3–2 Functional Parameters

FUNCTION	PARAMETER SELECTIONS	DESCRIPTION
LOW SPEED DELAY CONT:	0 MINS TO 255MINS (in 1 minute increments) **0 MIN**	Select the length of time the unit is to remain in low speed after starting, before transitioning to high speed, when in Continuous Operation.
TEMPERATURE SETTINGS		
DEFROST TIMER SET FOR	1.5HRS 3HRS **6HRS** 12HRS	The defrost timer will automatically put the unit into the defrost cycle at the interval selected if DTT is below 40°F (4.4°C) or the SAT is below 45°F (7.2°C). Shorter times are generally used for warm, humid products like produce. Longer times can be used for dry and frozen products. **NOTE:** The timer increments time toward the next defrost only when the DTT is below 40°F and the unit is running.
TEMP CONTROL	**RETURN AIR** SUPPLY AIR RETURN AIR 2	The evaporator has both a Return Air Sensor and a Supply Air Sensor. RETURN AIR = With this setting the unit will operate so that the return air (air entering the evaporator) will be controlled to setpoint. Return air temperature is generally considered to be a good sampling of the actual product temperature. SUPPLY AIR = The unit will operate so that the supply air (air leaving the evaporator) will be controlled to setpoint whenever the setpoint is in the perishable range (greater than 10.4°F (-12°C). When the setpoint is in the frozen range the unit will control the return air as described in the preceding Return Air choice. RETURN AIR 2 = For units equipped with RAT2, the unit will control temperature based on the return air entering the evaporator at the location of RAT2.
OUT OF RANGE ALARM OUT OF RANGE ALARM C2 OUT OF RANGE ALARM C3	Metric English OFF OFF 2°C 4°F 3°C 5°F **4°C 7°F**	The value entered here is the number of degrees away from setpoint the temperature may drift before it is considered "Out-Of-Range" and the configured alarm or alarm and shutdown action will be activated. Refer to alarm **00053 BOX TEMP OUT-OF-RANGE**, **00062 C2 BOX TEMP OUT-OF-RANGE**, or **00063 C3 BOX TEMP OUT-OF-RANGE** for more information.
PERISH SENSITIVE PRODUCT	ON **OFF**	OFF = Supply air temperature will be limited to the colder temperature of 32°F (0°C) or set point less the SUPPLY AIR LIMIT CONFIGURATION VALUE. ON = Supply air temperature will be limited to set point less the Supply air Limit Configuration value. Refer to **Section 4.9** for information on Perishable Sensitive Product and Supply Air Configuration interaction.

Table 3–2 Functional Parameters

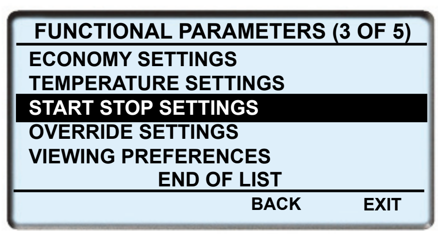
<table>
<tr><th>FUNCTION</th><th>PARAMETER SELECTIONS</th><th>DESCRIPTION</th></tr>
<tr><td colspan="3">START-STOP SETTINGS</td></tr>
<tr><td colspan="3">Time and Temperature values that control Start-Stop Operation are set in this section. The system may be configured so that:
1. the same settings apply 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”.
• If “together” is configured, there will be six settings with only the sixth applicable to just frozen range.
• If “Separate” is configured there will be eleven settings five labeled perishable and six labeled frozen.</td></tr>
<tr><td>MIN RUN TIME:</td><td>4MINS
TO
60MINS
(in 1 minute increments)</td><td>This determines the minimum run time for perishable/frozen setpoints in Start-Stop Operation.</td></tr>
<tr><td>MIN OFF TIME:</td><td>10 to 90MINS
(in 1 minute increments)
30 MINS</td><td>This determines the minimum off time for perishable/ frozen setpoints in Start-Stop Operation.</td></tr>
<tr><td>RESTART TEMP:</td><td>0.5 to 18°F (.28 to 10°C)
(in 0.5° increments)
5.4°F (3°C)</td><td>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.</td></tr>
<tr><td>OVERRIDE TEMP:</td><td>3.6 to 18°F (2 to 10°C)
(in 0.5 degree increments)
12.0°F (6.7°C)</td><td>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 refrigerated compartment temperature drift this far above or below setpoint in the Perishable Range, or above setpoint in the Frozen Range, the unit will override the Minimum Off Time, and restart.</td></tr>
<tr><td>MAX OFF TIME:</td><td>OFF
10MINS
TO
255MINS
(in 1 minute increments)</td><td>OFF - There is no maximum off time.
When a minute value is selected, this is the longest amount of time the unit will remain off during a (Perishable or Frozen or both) Auto Start/Stop Off Cycle. When this time expires, the unit will restart and run for the Minimum Run Time, regardless of any temperature change inside the compartment.</td></tr>
<tr><td>SWITCH TO DIESEL:</td><td>YES
NO</td><td>This will override the No A/C Power Configuration parameter when this functional parameter indicates No so that the system will shutdown.</td></tr>
<tr><td>FROZEN SHUTDOWN OFFSET:</td><td>0°F to 1.1°F
(0°C to 0.6°C)
(in 0.1°F or C increments)</td><td>This only applies to Frozen Setpoints in Start-Stop operation. This offset is the number of degrees below setpoint that the unit will run before cycling off. This will allow for a lower average compartment temperature when considering temperature rises during off cycles.</td></tr>
<tr><td>SLEEP MODE</td><td colspan="2">For complete instructions on entering and setting parameters for Sleep mode refer to Section 3.19.</td></tr>
<tr><td>WAKE UP TIME</td><td>OFF
ON</td><td>Set a time when Sleep mode will wake up, ranging from 1 hour to 8 days from current time.</td></tr>
</table>

Table 3–2 Functional Parameters

FUNCTION	PARAMETER SELECTIONS	DESCRIPTION
OVERRIDES		
OVERRIDE DOOR SWITCH SHUTDOWN (DS) AND OVERRIDE REMOTE SWITCH 1 SHUTDOWN (REMS1) AND OVERRIDE REMOTE SWITCH 2 SHUTDOWN (REMS2) AND OVERRIDE REMOTE SWITCH 3 SHUTDOWN (REMS3) AND OVERRIDE REMOTE SWITCH 4 SHUTDOWN (REMS4)	**NO** YES	If the switches are all configured “Switch Not Installed”, this parameter will not display. NO = the system 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.
NO S/B POWER	**SHUT DOWN UNIT** SWITCH TO DIESEL	Unit will switch to diesel when no voltage for 5 minutes if configured to do so.
VIEWING PREFERENCES		
DISPLAY TEMPERATURE IN	**°F** °C	Temperatures will display in either Fahrenheit (°F) or Celsius (°C). (for North American Units, this function may be locked)
DISPLAY PRESSURE IN	**PSIG** BAR	Pressure will display in either psig or (bar). (for North American Units, this function may be locked)
DATE FORMAT	**MM/DD/YYYY** DD/MM/YYYY	Date will display in either US (MM/DD/YYYY) or European (DD/MM/YYYY) format.
ALARM DESCRIPTIONS	**YES** NO	YES = In the Driver mode, the alarm code and alarm description will be displayed. NO = In the Driver mode, only the alarm code will be displayed.
CONTRAST	0 to 63 (In single digit increments) **35**	Higher numbers increase the contrast of the display screen.
COMPARTMENT SCROLL MODE	**YES** NO	The display screen will present compartment information in either Split Screen or Auto-Scroll. Refer to **Section 3.1**.

3.19 Sleep Mode

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) or in PC mode, and in the Advanced User mode, press the MENU key until FUNCTIONS is displayed.
2. Press the FUNCTIONS soft key to display the Functional Parameter Screen.
3. Press the ▼ key until the START-STOP SETTINGS sub-menu is highlighted and then press the “=” key to enter the menu.



4. Press the ▼ key until the Functional Parameter “SLEEP MODE SETTINGS” is highlighted. Press the “=” key.
5. Press either the ▲ or ▼ key until “ON” is highlighted. Press the “=” key to save the setting to memory, the unit is now in Sleep mode.
6. 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 for information on these settings.

TO EXIT SLEEP MODE

7. Place the START/RUN-OFF switch in the OFF position, then back to the START/RUN 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 compartment. 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 the compartment contains perishable or frozen products.

In Sleep mode the unit will “Wake Up” periodically and start the engine to keep the battery charged and the engine warm.

ADDITIONAL SUB MENUS:

1. “WAKE UP TIME” may be set to ON or OFF, the default setting is OFF.

a. When “WAKE UP TIME” is set to OFF the unit will remain in Sleep mode until it is taken out manually (refer to the preceding “TO EXIT SLEEP MODE” instruction).

b. When “WAKE UP TIME” is set to ON 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 (2009 to 2099)
- Hour (0 to 23)
- Minute (0 to 59)

NOTE

The system uses a 24 hour clock. Hours 00 to 11 are AM and hours 12 to 23 are PM.

2. “RUN PRETRIP TEST AT WAKE” may be set to YES or NO, the default setting is NO.

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 Message- Center until it is manually cleared by pressing any key.

If Sleep mode is selected, 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), the battery is charged (“OK” is displayed in the battery unit data reading) and charging amps are less than the configured setting. When the unit is running while in Sleep mode, “SLEEP WARNING: NO TEMP CONTROL” will flash in the MessageCenter.

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.

NOTE

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.

3.20 Stopping the Unit

To stop the unit, place the START/RUN-OFF switch in the OFF position. The unit will shutdown immediately while the system completes a shutdown sequence and then the LCD display will go blank.

The engine will stop and the display will turn off.

NOTE

The system will close the compressor suction modulation valve (CSMV) and evaporator expansion valve (EVXV) to 0% open before turning off.

NOTE

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

3.21 Option - DataTrak

DataTrak allows remote communication with the APX control system (cellular, satellite, etc).

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

WARNING

Unit may start automatically at any time even if the switch is in the OFF position. Use proper lockout/tagout procedures before inspection/servicing. All unit inspection/servicing by properly trained personnel only.

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

DataTrak is factory installed. DataTrak installation can be confirmed by scrolling through the Advanced User Unit Data (refer to **Section 3.15**). DataTrak will be listed under the Installed Options heading.

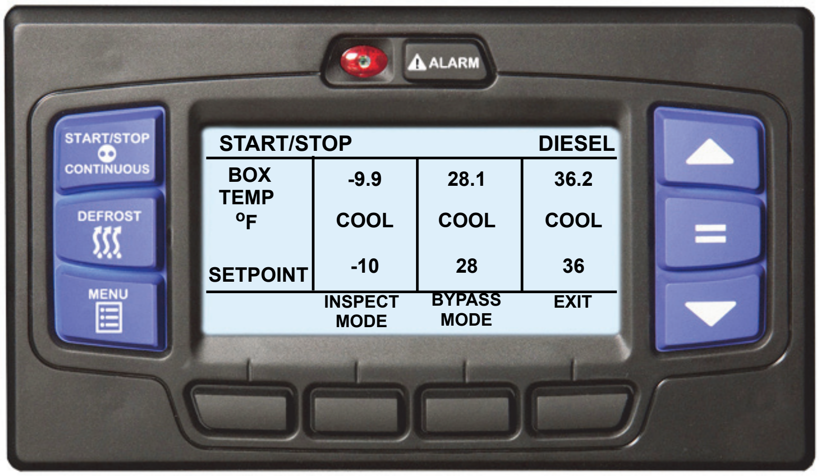
The control system must be configured for the provider that will be connecting to it (refer to **Section 5.2.3**). The Satellite Com Configuration can be set for “Qualcomm” or “Other”. If the provider is “Qualcomm” and the original Qualcomm TrailerTracs system is being used then the “Qualcomm” selection must be made. If the provider is Qualcomm and the newer TrailerTracs T2 system is being used or another communications provider is used, “Other” should be selected.

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 are available from Carrier Transicold Performance Parts Group (PPG).

3.22 Emergency Bypass Mode

In the event of an alarm caused by a failure of the display module, the unit will go into shutdown. In order to temporarily bypass this shutdown state, Emergency Bypass mode can be activated.

Once Emergency Bypass mode has been activated, the unit will operate normally for 24 hours, a countdown timer will be shown on the display. This 24 hour window of operation will keep the load safe, and provide enough time to contact the nearest Carrier Transicold Service Center for repair of the unit.



Enter Emergency Bypass Mode:

1. When the unit is in a shutdown state due to the display module alarm, press the MENU key until BYPASS MODE is displayed.
2. Press the BYPASS MODE soft key, the unit will resume operation until Emergency Bypass mode is disabled, or after 24 hours of unit operation in Emergency Bypass mode.

Exit Emergency Bypass Mode:

3. Press the MENU key until the EXIT BYPASS soft key is displayed.
4. Press the EXIT BYPASS soft key, the unit will shut down. Once Emergency Bypass mode is turned off, it cannot be restarted and the unit will remain in shutdown until it is repaired.

After repairs have been made and the display module alarm has been cleared, the unit will operate normally and Emergency Bypass mode will no longer be available.

3.23 Remote Panel

The unit may be fitted with an optional remote control panel. The remote panel, which is very similar to the display module, displays compartment setpoints, compartment temperatures and operating modes (heat, cool or defrost). The setpoint may be modified and the unit may be started and stopped using the remote panel. This compact remote panel can be mounted to suit the individual operator's preferences - on the front bulkhead, or in the compartment (even in the wall itself). Remote Panel keys, soft keys and alarm indicators are in the same locations as the main APX display module.

1. MENU key
2. DEFROST key
3. START/STOP - CONTINUOUS Key
4. Alarm LED
5. Alarm Key
6. "=" (Select) Key
7. Arrow Keys
8. Soft Keys
9. Display

- - - - -

The Remote Panel can be used to:

- Turn the unit On/Off
- Check compartment temperatures
- Check and change setpoints
- Initiate manual defrost
- Check mode of operation
- Initiate Pre-trip

The Remote Panel cannot be used to:

- Enter Advance User and Technician modes
- Access any USB Functions; USB menus, PC mode, Print

The Remote Panel does not have these features:

- There is no USB port on the remote panel
- There is no SROS (Start/Run/Off) switch at the remote panel. Remote Panel unit ON/Off is controlled by the "UNIT ON/OFF" soft key (replaces the Engine Hours soft key in the main display)

The following unit functions are controlled the same as the main display:

- Display compartment temperatures, **Section 3.1**

- Display the current mode of operation for each compartment, **Section 3.1**
- Intelliset selection, **Section 3.5**
- Initiate Pretrip, **Section 3.6**
- Initiate Manual Defrost/Defrost Indication, **Section 3.12**
- Control display indication lock, **Section 3.15**

Turning the Unit On/Off at the Remote Panel:

The unit can be shutdown using either the remote panel or the SROS switch on the Main Panel. The remote panel cannot operate if the SROS switch is in the OFF position.

In order to prevent a constant drain on the battery, the remote panel illuminates when the SROS switch is turned on, but the remote panel turns off after 30 minutes of inactivity. To turn the remote panel back on, simply press any button on the remote panel. The panel will turn off again after 30 minutes of inactivity.

1. On the remote panel press and release the “MENU” key until the “UNIT ON/OFF” soft key is displayed.

NOTE

The “UNIT ON/OFF” soft key on the remote panel takes the place of the “ENGINE HOURS” soft key in the main display.

2. To turn the unit ON, press the “UNIT ON/OFF” soft key. The remote display will read “UNIT ON”.
3. To turn the unit OFF, press the “UNIT ON/OFF” soft key. The remote display will read “UNIT SHUT DOWN BY REMOTE PANEL.”

SECTION 4

Engine and Temperature Control

NOTES

1. If the unit is in an alarm condition, the control system 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 interactions in use with the APX Control System there are many user selected and preprogrammed software overrides which may change the operation of the unit. Refer to **Section 4.9** and **Section 4.10** for complete descriptions of these features.

4.1 Introduction

This section describes operation of the unit when power is supplied from an external source - Electric 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 and Continuous Operation.

For a description and flow diagram of the refrigerant system component interaction while in cooling, refer to Section 2.14. For a description of the system component interaction in heating or defrost, refer to **Section 2.15**.

4.2 Sequence of Operation - Electrical

With the battery connected (see schematic diagram **Section 10.4**), power is available from the battery through fuse F7:

- and fuse F1 to the module logic circuit at main microprocessor module (MM) terminal 1MM-6, to the stepper valve module (from 1MM-8 and SP-16 to 1SMV-6), to the display module (from 1SVM-8 to DM-10), to the first contactor control board (1CCB) (from SP-16 through HVB7-B and HVB1-B and SP52 to 1CCB-04) and to the second contactor control board (2CCB) (from SP-52 to 2CCB-04).
- and fuse F3, PCM-34 and SP-18 to SVM at 2SVM-22 and 3SVM-22 (for operation of the valves), and ENCU-22 (for the ENCU logic circuit).
- and Remote MT fuse F2 for remote micro power to 3REC04 and 1REC06 (from PCM33 and MTLV E / RC1E to SP100).
- and Remote MT fuse F4 for remote drain heater power (from PCM12 to MTLV C / RC1C to RMT HTCON2- 13).

Potential power is also established for the starter solenoid contactor (SSC) normally open contacts, the battery charger logic circuit (BTYC TEMP/VOLTAGE), the engine preheat transistor (EPHT), fuel heater relay (FHR) normally open contacts, power enable relay (PER) normally open contacts (through fuse F5), and the buzzer (B + through fuse F1).

Once the module logic circuit is powered, the modules begin to communicate over the controlled area network (CAN).

The "HI" CAN connectivity is established from the main microprocessor (1MM-2, through connectors HVB7-C and HVB1-C) to the first contactor control board (at terminal 1CCB-05) and to the second contactor control board (from 1CCB-06 to terminal 2CCB-06). The connectivity continues (from 2CCB-05 and through terminals HVB1-H and HVB7-H) to SP-13. From SP-13 the connectivity continues to the ENCU (at terminal ENCU-23), to the stepper valve module (at 1SVM-5) and from 1SVM2 to ES-D, through ES-H to display module at DM-2.

Remote "HI" CAN 2 connectivity is established from the second contactor control board to remote contactor control board 3REC (from 2CCB16 to HVB2-E to HVB8-E to MTLV A / RC1A to 3REC05). And then from 3REC to 1REC (from 3REC06 to 1REC02). Additional remotes are connected from 3REC at 3REC16.

The "LO" CAN connectivity is established from the main microprocessor (1MM-4, through connectors HVB7-D and HVB1-D) to the first contactor control board (at terminal 1CCB-17) and to the second contactor control board (from 1CCB-29 to terminal 2CCB-29). The connectivity continues (from 2CCB-17 and through terminals HVB1-G and HVB7-G) to SP-14. From SP-14 the connectivity continues to the ENCU (at terminal ENCU-24), to the stepper valve module (at 1SVM-7) and from 1SVM-4 to ES-C, through ES-G to the display module, DM-6.

Remote "LO" CAN 2 connectivity is established from the second contactor control board to remote contactor control board 3REC (from 2CCB28 to HVB2-F to HVB8-F to MTLV B / RC1B to 3REC17). And then from 3REC to 1REC (from 3REC29 to 1REC04). Additional remotes are connected from 3REC at 3REC28.

To start the unit, SROS is placed in the START/RUN position. Power flows from SROS through terminal DM-7, the J1 jumper, the high pressure switch (HPS) and the overload ground fault (through terminal HVB1-K, OV-+12V OV-S+, SP-63, terminals HVB1-F and HVB7-F and PCM-15) to the power enable relay (PER) coil. Confirmation of power circuits are established from splice point SP-24 back to the main microprocessor at 2MM-35, SP-23 to 3MM-16 and from SP-63 to the second contactor control board at 2CCB-12. If any of these circuits is broken, the appropriate alarm will be activated.

If conditions are correct for operation, the main microprocessor will energize Power Enable Relay (PER) by providing ground through PCM16 from 3MM18. Energizing PER closes its normally open contacts to provide power:

- through fuse F10 to the main microprocessor at 3MM-34 and 3MM-23.
- through fuse F12 for satellite communication (SATPWR).
- through fuse F11 for the light bar (LB) green LED’s. through fuse F9, contacts HVB7-E and HVB1-E to SP-55. From SP-55 power is supplied to the contactor control boards (1CCB14+ and 2CCB-14+) for operation of the contactors.
- through remote MT fuse F13 for remote output power from PCM4 to MTLV F / RC1F to 3REC14.
- Potential power is also established through fuse F10 for the AFAR coil and FHR coil, and through fuse F8 for the fuel level sensor (FLS).

During operation the main microprocessor will complete the potential circuits, by supplying ground, energizing or de-energize the required components.

4.3 Engine/Electric Operation

Engine or Electric Operation is chosen at the display panel (Refer to **Section 3.4**).

With Electric Operation chosen, the Control System will energize the condenser fan motors in order to determine the phase sequence of the incoming power. If incoming power is not correct, the system will shutdown and restart, energizing the other power supply contactor (PSCON or PSCON2). If the phase sequence is not corrected by this action, the A00074 - “PHASE REVERSED” alarm will be activated and the unit will shutdown.

Energizing a power supply contactor reverses its contacts to allow power from the power plug while the engine is shutdown and power from the generator is locked out.

When Engine Operation is chosen the generator contactor (GENCON) is energized. Energizing GENCON reverses its contacts to allow the engine and generator to operate while power from the power plug is locked out.

Once the power selection is made:

- the stepper valve module will open the compressor suction modulating valve (CSMV), evaporator expansion valves (EVXV) and economizer expansion valve (ECXV), to equalize system pressure, and then bring the valves to a predetermined position before the unit starts.
- the contactor control boards will energize the compressor, condenser fan motors, evaporator fan motors and/or electric heaters as required.

4.3.1 Soft Start (Bump Start)

On command to start the compressor the control system will determine if there is a need to perform a Soft Start. Soft Start is performed to clear refrigerant from the compressor and/or return oil; Soft Start will be activated if:

- compressor has been off for more than twenty- four hours **or**
- compressor has been off for over two hours and suction and discharge pressure are within 10 psi (0.7 bar) **or**
- compressor has been off for more than two hours and suction pressure is above discharge pressure

During Soft Start the control system will de-energize the liquid injection valve (LIV), economizer expansion valve (ECSV) and energize the buzzer for five seconds. Then the compressor will operate for one second on, followed by nine seconds off. The on/off sequence may repeat up to five additional times.

Following Soft Start the compressor will transition to steady state operation, and the evaporator fans will start.

If Soft Start is not required, the buzzer will be energized for five seconds, the compressor will start and the evaporator fans will start.

NOTE

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

4.3.2 Loss of Standby Power

When the unit is running on standby power and power is lost, alarm **00073 NO POWER-CHECK POWER CORD** will be activated and the unit will shut down for 5 minutes. If standby power is restored the unit will restart in standby immediately.

If standby power has not been restored after 5 minutes, and the NO A/C POWER configuration is set to "SHUTDOWN", the unit will remain off. If the NO A/C POWER configuration is set to "SWITCH TO ENGINE", then the unit will switch to diesel and restart.

After 15 minutes of running in diesel the unit will "retry-to-standby" by shutting down and attempting to restart with standby power. If standby power is still not available (**00073 NO POWER-CHECK POWER CORD** is still active), the unit will restart in diesel and attempt "retry-to-standby" in 60 minute intervals.

4.3.3 Start-Up, Electric Operation

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

4.3.4 Start-Up, Engine Operation

On command to perform a Start-Up in Engine Operation the control system will perform the engine start-up procedure and set the required engine speed. The refrigeration system or heaters will then operate in the mode(s) required for temperature control.

4.3.5 Loss of Standby Power

When the unit is running on standby power and power is lost, alarm **00073 NO POWER-CHECK POWER CORD** will be activated and the unit will shut down for 5 minutes. If standby power is restored the unit will restart in standby immediately. If standby power has not been restored after 5 minutes, and the NO A/C POWER configuration is set to "SHUTDOWN", the unit will remain off. If the NO A/C POWER configuration is set to "SWITCH TO ENGINE", then the unit will switch to diesel and restart.

4.4 Engine Control

Engine control consists of engine start-up and speed control.

Figure 4.1 Auto Start Sequence

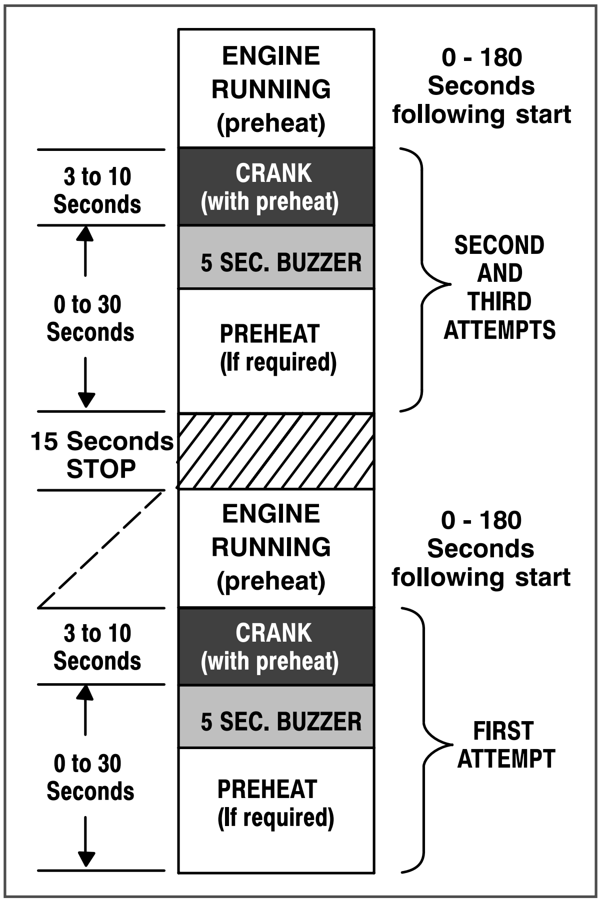


Table 4–1 Engine Preheat Time

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° to 11°C)	20	120
51°F to 78°F (11° to 26°C)	10	60
Greater than 78°F (26°C)	0	0

4.4.1 Engine Start-Up Sequence

On command to perform a Start-up the main microprocessor will supply power from 3MM-10 to the fuel pump (FP) and from 3MM-9 to ENCU-44. This signals the ENCU that engine operation is required. The control system will then enter the engine start sequence. During the start sequence the engine is operated in low speed. Following start, the refrigeration system will then operate in the mode(s) required for temperature control.

The engine start sequence consists of periods of time with the engine preheater (EPH - power from 3MM-14 through PCM-27 to EPHT) and starter (SM - power from 3MM-12 to SS, closing SSC contacts) energized and de-energized for up to three start attempts (see Figure 4.1), the pre-heat time will vary in duration based on engine coolant temperature (refer to Table 4–1).

If alarm **00129 CHECK ENG COOLANT SENSOR** is active, the ambient temperature sensor will be used. If both alarms **00129 CHECK ENG COOLANT SENSOR** and **00121 CHECK AMBIENT AIR SENSOR** are active the control system assumes a temperature of less than 32°F (0°C) for the preheat 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 contactor (SSC) will be energized for a maximum of ten seconds while the engine condition is checked 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 and the engine oil pressure switch (ENOPS) is closed.

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

- When engine speed reading is less than 1000 rpm, ambient temperature is above 32°F (0°C) and the ENOPS is closed - alarm **00130 CHECK ENGINE RPM SENSOR** will be activated and the engine will be considered running.
- 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 - alarm **00130 CHECK ENGINE RPM SENSOR** will be activated and the engine will be considered running.

Once the engine is considered running, the control system will keep the preheater 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 control system monitors engine speed while cranking. If engine speed drops below 50 rpm for three seconds the starter solenoid contactor will be de-energized and alarm **00035 CHECK STARTER CIRCUIT** will be activated.

If the unit fails to start after three start attempts, alarm **00031 FAILED TO START - AUTO MODE** will be activated.

If the unit is equipped with a fuel heater, the control system will monitor ambient temperature. If ambient is below 77°F (25°C) the fuel heater relay (FHR) will be energized. Energizing FHR closes its normally open contacts to supply power from fuse F14, through the fuel heater temperature switch (FHTS) to the heater. Refer to **Section 2.8** for FHTS settings.

4.4.2 Transition to High Speed

After a successful start, the control system may call for the engine to transition to high speed. When high speed is required, the main microprocessor will provide a signal through the CAN system to the ENCU, calling for the speed change. Three factors control this transition.

- Transition may be delayed if a time value is entered in the HIGH SPEED DELAY Configuration. The delay may be set to 0 to 10 minutes. The factory default setting is 1 minute.
- If the engine is started when the coolant temperature is 79°F (26°C) or below it will remain in low speed until the coolant temperature reaches 79°F (26°C) or it has operated for a minimum of 15 seconds. Once the coolant temperature reaches 79°F (26°C) the engine may transition to high speed.
- Transition will be based on the need for temperature control. Generally, the engine will operate in high speed when the unit is in Pulldown or Pull-Up Mode (full capacity required) and in low speed when less than full capacity is required.

4.5 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 temperature, 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 mode of operation will be indicated in the status bar.

NOTE

The control system 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 4.9.3**) for additional information.

4.5.1 Start-Stop Configuration

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 4.7.1**).
- 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 eleven Functional Parameters for Perishable and Frozen have been set and the Configuration is changed from SEPARATE to TOGETHER, the values from the Perishable settings will be the ones that will be used.

4.5.2 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. Unit has run for the selected Minimum Run Time

The MINIMUM RUN TIME is selected in the control system Functional Parameters. The purpose of this is to force the unit to run long enough to completely circulate the air inside the compartment, and to ensure that the product temperature is at setpoint. This 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. 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. Battery is fully charged - Voltage

A good battery is defined as having 13.1 VDC at 77°F (25°C). The control system 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

The status of the unit battery can be 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 Electric Operation and the compressor has cycled off a PSCON relay will energize (to supply power to the battery charger) until battery voltage is 13.1 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. Battery is fully charged - Amperage

The control system 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 control system 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 and all Start-Stop parameters required to enter a Start-Stop Off cycle have been met except this parameter, the unit will operate with compressor and heaters off and evaporator fan running until battery amperage draw is less than 7.0 amps.

If in Electric Operation and the compressor has cycled off, PSCON will remain energized (to supply power to the battery charger) until battery amperage is 7.0 amps.

5. 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 all compartment temperatures are within 0.5°F (0.3°C) of setpoint, for operation in Perishable Range. In Frozen Range, shutdown will be allowed when all compartment temperatures are calculated to be within 0.5°F (0.3°C) minus the FROZEN SHUTDOWN OFFSET

The FROZEN SHUTDOWN OFFSET Functional Parameter may be set from 0 to 1.1°F (0 to 0.6°C). 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.

4.5.3 Re-Start Parameters

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

NOTE

In Start-Stop Operation, when the setpoint is in the frozen range (refer to **Section 4.7.1**), the unit will not restart when temperature is below setpoint except as indicated in the following.

1. Engine coolant temperature drops below selected Configuration value

If in Engine Operation, the control system 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). The factory default setting is 10°F (-12.2°C).

If this is the only reason operation is required, the unit will operate as if it is in Continuous Operation until the requirement has been met.

2. Battery voltage falls below selected Configuration value

The control system will monitor battery voltage. If battery voltage is at or below the VOLTAGE FOR START-STOP RESTART Configuration value the engine will be started. The value may be set from 12.0 to 12.8 volts. The factory default setting is 12.2 volts.

TIP

The status of the unit battery can be 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 this is the only reason operation is required, the unit will operate as if it is in Continuous Operation until the requirement has been met.

3. 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 (if in Engine Operation, in low speed) with the evaporator fans running to circulate air. This will ensure there are no hot spots and the temperature sensor reading accurately reflects product temperature. The parameter value may be set to 0 minutes 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.

If this is the only reason operation is required, the unit will operate as if it is in Continuous Operation until the requirement has been met.

4. 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 TEMPERATURE value selected in the Functional Parameters away from setpoint. In the Frozen Range, restart is allowed when one of the compartments temperature is calculated to be greater than 0.5°F above setpoint. The MINIMUM 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 0.5 (F or C) increments. The factory default is 5.4°F (-14.7°C).

If this is the only reason operation is required, the unit will operate as if it is in Continuous Operation until the requirement has been met.

5. Compartment temperature has exceeded the Override Functional Parameter value

During MINIMUM OFF TIME the control system continually monitors the refrigerated compartment temperatures and the override functional parameter value. During the Minimum Off Time, if the one of the refrigerated compartment temperatures drifts this far above or below setpoint in the Perishable Range, or above setpoint in the Frozen Range, the unit will override the Minimum Off Time, and restart. The value may be set from 3.6 to 18°F (2 to 10°C) in 0.5° increments. The factory default setting is 12°F (6.7°C).

Whenever the unit restarts, temperature control will be in the Pulldown or Pull-Up Mode.

4.6 Continuous Operation

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 and 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 mode of operation will be indicated in the status bar.

NOTE

The control system 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 4.9.3**) for additional information.

4.7 Temperature Control

4.7.1 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 at or below +10.4°F (-12°C).

4.7.2 Pulse Cool

When any compartment is in frozen cooling and a perishable compartment is in low speed cooling, the perishable compartment is forced into a pulsed cooling mode.

If any compartment is in perishable high speed cooling, and a perishable compartment is in low speed cooling, the low speed perishable compartment is forced into a pulsed cooling mode.

Pulsed cooling opens the EVXV or REVXV, depending on compartment, for a period of time over a 30 second timer interval.

4.7.3 Temperature Determination

The control system monitors the temperature readings from the supply and return temperature sensors to determine the mode of operation required to maintain compartment temperatures in accordance with the setpoint.

The sensor used for temperature control is dependent on the selection made in the TEMP CONTROL Functional Parameter.

- If the selection is RETURN AIR the return air sensor (RAT) will be used for any setpoint.
- If the selection is SUPPLY AIR the control system will switch to the supply air sensor (SAT) when operating with a perishable setpoint (refer to **Section 4.7.1** 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.

4.7.4 Cool/Heat/Null Mode Switching Logic

When not in Pulldown and in Continuous Run Mode, operation in cool, heat and null modes is determined in accordance with the calculated Controlling Temperature value (CT), the difference between this value and Setpoint (SP) and the FUEL SAVER (ECO) MODE Functional Parameter setting in accordance with the following table:

Control Temperature with Fuel Saver OFF	
COOL MODE	
Switch On when CT-SP is greater than or equal to 0.36°F (0.2°C)	Switch Off when CT-SP is less than -0.36°F (-0.2°C)
NULL MODE	
Between Cool and Heat or Heat and Cool	
HEAT MODE	
Switch On when CT-SP is equal to or less than -0.54°F (0.3°C)	Switch Off when CT-SP is greater than 0.3°F (0.2°C)
Control Temperature with Fuel Saver ON	
COOL MODE	
Switch On when CT-SP is greater than or equal to the S/S OVERRIDE Functional parameter.	Switch Off when CT-SP is less than -0.32°F (-0.0°C)
NULL MODE	
Between Cool and Heat or Heat and Cool	
HEAT MODE	
Switch On when CT-SP is equal to or less than -1.44°F (-0.8°C)	Switch Off when CT-SP is greater than 1.26°F (0.7°C)

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

- Engine/Start-Stop Operation, the unit (engine, compressor, condenser fans and evaporator fans) will shut down if the remaining Stop Parameters have been satisfied.
- Engine/Continuous Operation, the compressor will shut down while the engine and evaporator fans continue to operate. The condenser fan will operate if engine cooling is required.
- Standby Continuous Operation, the compressor and condenser fans will shut down while the evaporator fan continues to operate.

NOTE

In Continuous Run, when difference between ambient and setpoint is < 10°C, the COMPRESSOR RESTART OFFSET configuration value will be used for the switch point to turn cool on (instead of 0.2°C). If the ambient and setpoint are more than 10°C then the switch point remains 0.2°C.

4.7.5 Cool Mode

When Cool Mode is required the system will operate in Pulldown or CSMV Control. Pulldown operation will include periods of time in Economized Mode and Standard Mode. CSMV control will occur in Standard Mode. For descriptions of operation when cooling, with flow diagrams, refer to **Section 2.14**.

Pulldown

Pulldown will be entered:

- following a Start-Up
- following a Setpoint change (requiring additional cooling)
- following an operational change (Start-Stop vs Continuous or Engine Operation vs Electric Operation)
- following a defrost termination
- or when all other Stop Parameters have been met except the refrigerated compartment Temperature Stop Parameter

Pulldown will end when one of the following occurs:

- when in Engine Operation and the control system is calling for low speed
- when in Start-Stop and the refrigerated compartment Temperature Stop Parameter has 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. This range is calculated when Supply Temperature (ST) is equal to or less than the Return Temperature (RT). The calculation is:

$$\text{Off Value} = (ST - RT) / 2$$

When the Control Temperature is within a range of +/- the Off Value of set point, Pulldown Mode ends.

- If in Continuous Operation - Perishable, and the High Speed Pulldown Configuration is ON: when the temperature is equal to setpoint.
- when active probe is within the control temperature which allows the unit to shut off.

CSMV Control

CSMV Control will be entered when additional cooling is required and Pulldown is not allowed. In CSMV Control the valve will be modulated so as to balance compressor capacity with the refrigeration load.

4.7.6 Heat Mode

When Heat Mode is required the system will operate with the evaporator fans energized. Operation of the heaters is determined in accordance with the calculated Controlling Temperature value (CT) and the difference between this value and Setpoint (SP) in accordance with the following table:

Control Temperature with Fuel Saver OFF	
HTCON1	
Switch On when CT-SP is less than -0.54°F (-0.3°C)	**Switch Off** when CT-SP is greater than -0.36°F (-0.2°C)
HTCON2	
Switch On when CT-SP is less than -3.6°F (-2.0°C)	**Switch Off** when CT-SP is greater than -3.24°F (-1.8°C)
Control Temperature with Fuel Saver ON	
HTCON1	
Switch On when CT-SP is less than -1.44°F (-0.8°C)	**Switch Off** when CT-SP is greater than -1.26°F (-0.7°C)
HTCON2	
Switch On when CT-SP is less than -3.6°F (-2.0°C)	**Switch Off** when CT-SP is greater than -3.24°F (-1.8°C)

HTCON1 may also be activated when the unit is in Continuous Operation Cooling to assist in balancing unit capacity with the load. In all other operating states and modes HTCON1 and HTCON2 will not be activated.

4.7.7 Null Mode

For descriptions of operation in the Null Mode, refer to **Section 2.14** and **Section 4.7.4**.

4.8 Defrost

Defrost is an independent cycle that overrides cooling and heating functions in order to de-ice the evaporator(s). When the unit enters defrost the MessageCenter will display DEFROST CYCLE STARTED for the first 10 seconds and then display the default message for the remainder of the cycle. DEFROST is displayed in the Operator Message Panel, along with the setpoint while the unit is in the defrost cycle.

When defrost is initiated, the microprocessor will attempt to initiate defrost in all compartments. However, defrost may not be allowed in any compartment where the DTT is above 40.0°F (4.4°C) and additional coil temperature sensors do not indicate a loss of heat transfer due to ice on the coil. Additionally, defrost may be staged based on the number of enabled compartments and the remote evaporator models installed.

On the host unit, defrost is only allowed when the DTT is less than 40.0°F (4.4°C). On remote evaporators, defrost may be allowed even when DDT is greater than 40.0°F (4.4°C) and coil conditions indicated a frosted coil.

OR

If DTT sensor alarm is active, the RAT is less than 45.0°F (7.2°C).

OR

If the alarms for both DTT and RAT alarms are active, then defrost can be initiated when the SAT is less than 45.0°F (7.2°C).

4.8.1 Defrost Initiation And Start

Defrost can be initiated by pressing the MANUAL DEFROST key or automatically by the control system. Control system 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) on the host unit.

OR

The control system has calculated there is a loss of heat transfer due to ice on the coil. This method of defrost initiation is called a saturation based demand defrost. This method is allowed when the unit has been in low speed or electric mode cool for five minutes, the evaporator fans have been in operation for seven minutes, and the evaporator expansion valve is operating at less than 90%.

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).

OR

The control system has calculated there is a loss of heat transfer due to ice on the remote evaporator coil. This method is allowed when the remote compartment has been in cool mode for at least two minutes and 30 minutes of run time has passed since the last defrost. This method of defrost initiation will only be used for 4 consecutive defrosts.

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 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.

4.8.2 Defrost Modes

There are two Defrost Modes available:

NOTE

When the unit is in either defrost mode 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 both heaters are de-energized.

Normal Defrost Mode will be entered if RAT is less than 32.0°F (0.0°C) and SAT is less than 45.0°F (7.2°C). Defrost will be accomplished by shutting down the refrigeration system 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.

Electric heaters will be used for all defrost with fans off when temperatures are less than 32°C (89.6°F) for RAT and less than 45°C (113°F) for SAT. For defrost requests at temperatures higher (RAT > 35°C, SAT > 45°C, heaters will not be energized.

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

Natural defrost is available when:

- Only the front compartment is enabled (all other compartments are off) **and**
- The Natural Defrost 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 **and**
- This initiation will not result in more than 3 natural defrosts between normal defrosts

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 and HTCON2 are de-energized.

4.8.3 Defrost Termination

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

On remote evaporators, if the DTT is greater than 25°F (-3.9°C) at the beginning of the defrost, then termination will occur after the DTT rises 35°F (19.4°C) (Max 80°F) or if the EVOT rises above a maximum threshold indicating that the coil is defrosted.

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.

During Defrost Termination, the heaters will de-energize, and the engine will go to low speed.

The EVXV / REVXV 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.

If there is a DTT sensor alarm present, defrost will terminate after 10 minutes.

NOTE

Defrost Mode 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 control system will end the defrost cycle, and show the alarm "DEFROST NOT COMPLETE". When this occurs, the Defrost Interval Timer is set for 1.5 hours, at which time the unit will go into defrost again.

4.9 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 sections.

4.9.1 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 4.7.1**). 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.

4.9.2 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 18.4°C), 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

4.9.3 Temperature Range Lock 1 and 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 its 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 4.2**), 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.

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 4.3**), 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.

Figure 4.2 Range Lock Settings - Non-Overlapping

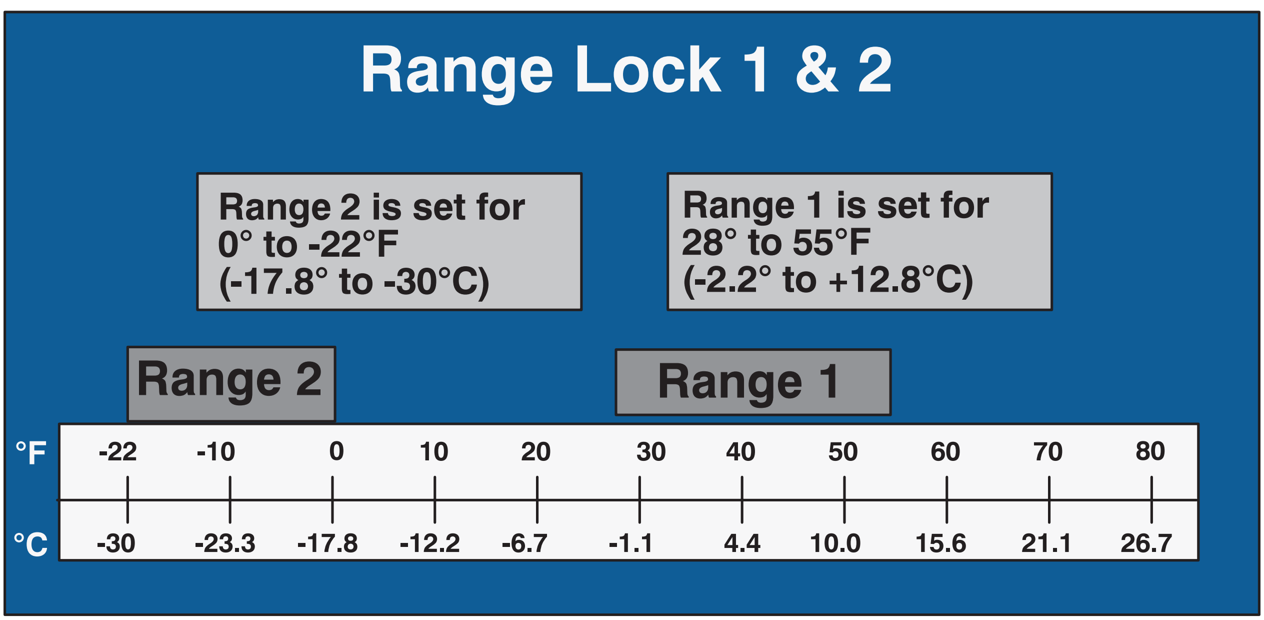
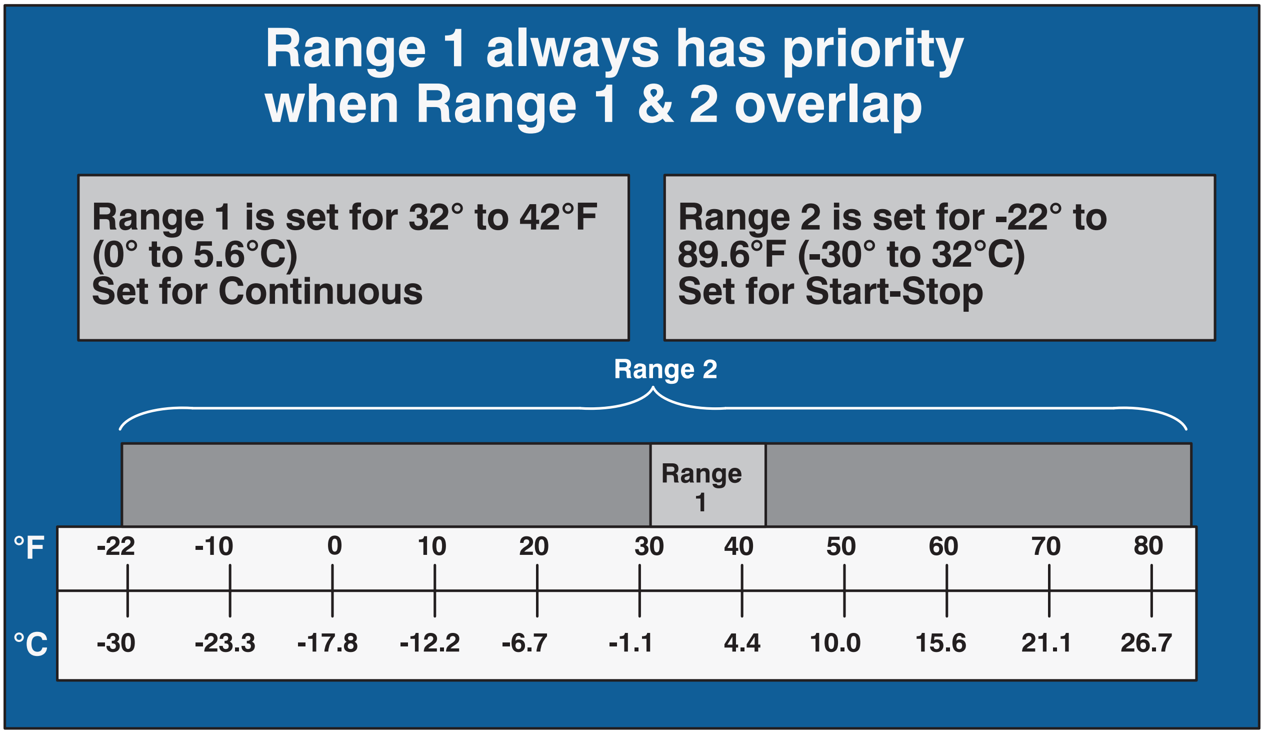


Figure 4.3 Range Lock Settings - Overlapping



4.9.4 ProductShield

ProductShield is a group of Configurations that work together to allow improved operating efficiency while providing customized product protection.

Each ProductShield setting allows the user to select an ambient temperature range in which to operate. The Minimum and Maximum range values can be set to OFF, or the allowed value range.

a. ProductShield Econo

ProductShield Econo allows the microprocessor to automatically switch from Start/Stop Operation to Continuous Operation or vice versa. This allows maximum product protection while providing for power savings when ambient temperature is in the preset range.

ProductShield Econo - Go to Start-Stop Operation

When set to Continuous Operation, ProductShield Econo allows the unit to run in Start/Stop Operation when:

- The ProductShield Econo Configuration is set to GO TO S/S **AND**
- The unit has run in Continuous Operation for a minimum of either 15 minutes or the Minimum Run Time Functional Parameter setting (whichever time is longer) **AND**
- The ambient temperature falls **within** the pre-programmed temperature range **AND**
- The unit is not already running in ProductShield Winter. (See Section c.)

The operator can also pre-program a maximum evaporator coil temperature differential (delta-t) between the return air and supply air temperatures as an additional criteria for switching to Start/Stop Operation. The unit must bring the delta-t below this setting before going to Start/Stop Operation if this option is chosen.

NOTE

In ProductShield Econo: Go to Start/Stop, the delta-t must be <u>lower</u> than the value selected in order to enter Start/Stop.

Once the microprocessor detects that the above criteria have been met, the unit will switch from Continuous Operation to a Start/Stop Off Cycle for the MINIMUM OFF TIME Functional Parameter setting. During the Minimum Off Time, the RESTART OVERRIDE TEMPERATURE Functional Parameter setting can cause the unit to restart to protect the load. After the Minimum Off Time has expired the unit will return to Continuous Operation when the return air temperature is more than the configured perishable restart temperature away from setpoint in the perishable range, or the configured frozen restart temperature above setpoint in the frozen range.

When the unit restarts, it will return to Continuous Operation for a minimum of 15 minutes or the Minimum Run Time Functional Parameter setting, whichever time is longer. The original activation conditions must then be met in order for the unit to return to ProductShield Econo: Start/Stop.

ProductShield Econo - Go To Start/Stop Examples:

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

Example 1 If the Minimum is set to 30°F (-1.1°C) and the Maximum is set to 40°F (4.4°C) and the ambient air temperature falls **between** these temperatures, the unit operation can change to Econo Start/Stop.

Example 2 If the Minimum is set to 30°F (-1.1°C) and the Maximum is set to OFF and the ambient air temperature is **above** 30°F (-1.1°C), the unit operation can change to Econo Start/Stop.

Example 3 If the Minimum is set to OFF and the Maximum is set to 40°F (4.4°C) and the ambient air temperature falls **below** 40°F (1.7°C), the unit operation can change to Econo Start/Stop.

Example 4 If both the Min and the Max are set to OFF, unit operation can change to Econo Start/Stop at any ambient temperature.

ProductShield Econo - Go to Continuous Operation

When the unit is set for Start/Stop, ProductShield Econo allows the unit to run in Continuous Operation when:

- ProductShield Econo configuration is set to GO TO CONTINUOUS **AND**
- The unit has run in Start/Stop Operation for a minimum of 15 minutes OR the Minimum Run Time, Functional Parameter setting (whichever time is longer) **AND**
- The ambient temperature falls outside the pre-programmed temperature range **AND**
- The unit is not already running in ProductShield Winter. (See Section c.)

Once the microprocessor detects that the above criteria have been met, the unit will switch from Start/Stop to Continuous Operation for a minimum of 30 minutes.

After 30 minutes the unit will return to Start/Stop if the ambient temperature enters the pre-programmed temperature range.

NOTE

Delta-t logic is not used or available when ProductShield Econo - Go To Continuous is active.

ProductShield Econo - Go To Continuous Examples

Example 1 If the Minimum is set to 0°F (-17.8°C) and the Maximum is set to 90°F (32.2°C) and the ambient air temperature falls **outside** these temperatures, the unit operation can change to Econo Continuous Operation.

Example 2 If the Minimum is set to 0°F (-17.8°C) and the Maximum is set to OFF and the ambient air temperature falls **below** 0°F (-17.8°C), the unit operation can change to Econo Continuous Operation.

Example 3 If the Minimum is set to OFF and the Maximum is set to 90°F (32.2°C) and the ambient air temperature falls **above** 90°F (32.2°C), the unit operation can change to Econo Continuous Operation.

Example 4 If both the Minimum and Maximum are set to OFF, ProductShield Econo: Go To Continuous can not operate as there is no range for the ambient to fall outside of.

b. ProductShield High Air

ProductShield High Air allows the microprocessor to automatically switch the engine from normal to forced high speed, and thereby provide high evaporator air flow. This allows maximum product protection when certain conditions are met while providing for power savings when High Air is not required.

Operation in High Air is controlled by four Configurations; ProductShield High Air, High air Minimum Temperature, High Air Maximum Temperature and High Air Delta-T.

- The Product Shield High Air Configuration may be set to OFF or ON. ProductShield High Air is only active when the Configuration is set to ON.
- The High Air ambient air temperature range is defined by the High Air Maximum Temperature Configuration setting and the High Air Minimum Temperature Configuration setting. When a value is entered for both of these configurations, the unit will enter High Air when ambient temperature is above the high setting or below the low setting.
- When the High Air Maximum Temperature Configuration is set for a value and High Air Minimum Temperature Configuration is set to OFF, the microprocessor will switch to high speed operation when the ambient temperature is above the setting.
- When the High Air Minimum Temperature Configuration is set for a value and High Air Maximum Temperature Configuration is set to OFF, the microprocessor will switch to high speed operation when the ambient temperature is below the setting.
- When both the High Air Minimum Temperature Configuration and the High Air Maximum Temperature Configuration are set to OFF, ProductShield High Air is not active.
- If a value is entered in the High Air Delta-T Configuration, the delta-t must be above the value before the microprocessor may switch to High Speed

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

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

ProductShield High Air Examples

Example 1 If the Minimum is set to 0°F (-17.8°C) and the Maximum is set to 90°F (32.2°C) and the ambient air temperature falls **outside** these temperatures, the unit operation can change to High Air Operation.

Example 2 If the Minimum is set to 0°F (-17.8°C) and the Maximum is set to OFF and the ambient air temperature falls **below** 0°F (-17.8°C), the unit operation can change to High Air Operation.

Example 3 If the Minimum is set to OFF and the Maximum is set to 90°F (32.2°C) and the ambient air temperature falls **above** 90°F (32.2°C), the unit operation can change to High Air Operation.

Example 4 If both the Minimum and Maximum are set to OFF, ProductShield High Air can not operate as there is no range for the ambient to fall outside of.

c. ProductShield Winter

When the unit is set for Start/Stop operation, ProductShield Winter allows it to switch to Continuous Operation when the ambient temperature falls below the pre-programmed temperature. This helps protect the unit from the possibility of cold weather issues.

Once the microprocessor detects that the ambient temperature has dropped below the pre-programmed temperature, the unit will switch into ProductShield Winter which will force the unit to operate in Continuous Operation. The unit will continue to operate in Continuous Operation for a minimum of 30 minutes. After 30 minutes, the unit will return to auto Start/Stop if the ambient temperature has risen above the pre-programmed ProductShield Winter temperature.

NOTE

All of the ProductShield settings may be viewed in the Data List (Refer to Section 3.15). For units with IntelliSets, the Data List will reflect the ProductShield settings for the IntelliSet that is currently active.

4.10 Preprogrammed Software Overrides

4.10.1 High Discharge Temperature

The control system monitors the signal provided by the compressor discharge temperature sensor. If compressor temperature rises to the limit, the system will enter Liquid Injection Mode. In this mode the normally closed liquid injection valve (LIV) will be opened to allow flow of refrigerant into the economizer connection to cool the compressor.

4.10.2 Cargo Protect Mode

The microprocessor will activate Cargo Protect Mode when: both the alarm **00122 CHECK RETURN AIR SENSOR**and **00123 CHECK SUPPLY AIR SENSOR** for Compartment 1, or alarm **00137 C2 CHECK RETURN AIR SENSOR** for Compartment 2, or **00138 C3 CHECK RETURN AIR SENSOR** 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 4.7.1**), the EVXV 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 and will go to low speed.

The MessageCenter will display “WARNING: NO TEMPERATURE CONTROL” when the unit is operating in Cargo Protect Mode.

4.10.3 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. High Voltage

   If the 20 second average voltage is greater than 585V or the instantaneous voltage is greater than 595V, force low speed for 10 minutes.

2. RAT and SAT Alarms

   When the **00122 CHECK RETURN AIR SENSOR** and **00123 CHECK SUPPLY AIR SENSOR** alarms are both active at the same time the control system will enter Cargo Protect Mode. Refer to **Section 4.10.2**.

3. Engine Coolant Warm-Up

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

4. Door/Remote Switch Configuration

   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.

5. Automatic Silent Mode

   If in diesel start/stop mode and engine restarts for any reason except S/S Perish Override Temp or S/S Frozen Override Temp (refer to **Table 3–2**), Diesel Engine Mode is forced to low speed for the minimum OFF time. If any time during the override the unit is no longer in Diesel start/stop mode, disable the override until the next restart. This Override does NOT apply for the first start of the engine.

6. Adjustable High Speed Delay

   Whenever the engine starts, the unit will remain in low speed according to the Continuous or Start-Stop High Speed Delay Functional Parameter setting.

7. High Speed Delay

   Whenever the engine is in low speed, transition to high speed will be delayed for the HIGH SPEED DELAY Configuration setting.

8. Start-Stop Frozen Range

   When in Start-Stop Operation with a setpoint in the frozen range after the minimum run time has expired, the engine will be forced to high speed if the refrigerated compartment temperature is not yet down to setpoint.

9. Frozen Setpoint Override

   If the setpoint is in the frozen range and the temperature is below setpoint, the engine will operate in low speed.

10.Low Suction Pressure Override

If suction pressure is below -4 psig (-.27 bar) for > 20 seconds, inhibit high speed operation. Remain in low speed for 5 minutes and until the suction pressure > -3 psig (-.2 bar).

11. Perishable S/S High Speed Override

With the system running in Start-Stop Run, Perishable Mode, the safety conditions and minimum on time are met, but the temperature condition is not met, run in high speed. Remain in high speed until the engine shuts off or the safety conditions are no longer met.

12.High Speed Pulldown

For perishable continuous run mode, if High Speed Pulldown is active, remain in high speed until termination conditions have been met.

13.Product Shield High Air

The engine is forced to high speed if the PRODUCT SHIELD HIGH AIR Configuration is active, refer to **Section 4.9.4**.

14 Range Protect

When the unit is operating in Range Protect and the compartment temperature is inside the protected range, while all other conditions to allow an off cycle are not met the engine will operate in low speed.

4.10.4 CSMV Control Overrides

1. Engine Rack (Throttle) Position Limit

The control system monitors the engine throttle position reading provided by the ENCU rack position sensor (RPS). If the position is greater than or equal to the maximum position (configuration parameter) the CSMV will move toward the closed position as required to lower the engine load, and thereby, the rack position.

2. Engine RPM

When the engine throttle position has been more than 90% for three seconds the control system will monitor actual engine RPM verses desired engine RPM (if the actual RPM is less than the desired RPM, this is defined as engine RPM droop.) If the droop is above 10 RPM, the CSMV will move toward the closed position as required to eliminate the droop by lowering the load on the engine.

3. High Generator Current

If the system is operating with high generator current the microprocessor will throttle the compressor suction modulating valve (CSMV) in an attempt to reduce the load. If additional current reduction is required the microprocessor will transition from Economized Mode to Standard Mode as required to prevent the engine from stalling. As current is reduced, the microprocessor will reverse these steps to provide maximum allowable capacity. This action is called “staging”.

4. Discharge Pressure Control

The control system monitors the discharge pressure. When the pressure is above the calculated maximum, the CSMV will move toward the closed position as required to reduce the pressure.

5. Low Suction Pressure Control

The control system monitors the suction pressure. When the pressure is below the calculated minimum (-2 psig) the CSMV will move toward the open position as required to raise the pressure.

6 Compression Ratio

The microprocessor monitors compressor operating pressures and calculates a compression ratio. The control system will open the CSMV to maintain the Maximum Compression Ratio.

4.10.5 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

Control System Interface

5.1 Interface Methods

There are four methods for interfacing with the APX Control System:

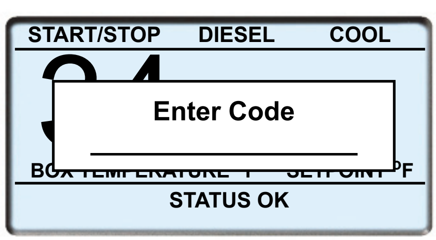
1. Driver/Advanced User Interface - Activities such as start, stop, Pretrip, reading alarms, reading data and changing Functional Parameters may all be performed using the display mounted keys (refer to **Section 3**).
2. Technician Mode - code based access. Technician Mode includes: technician hour meters, inactive alarms, configuration settings, Component Test Mode and Service Mode.
3. USB memory device - Activities using the USB memory device include, creation of the device, PC mode, downloading data files, installing software, and transferring configuration files.
4. TRU-Tech/TRU-View - Access using a computer and service cable.

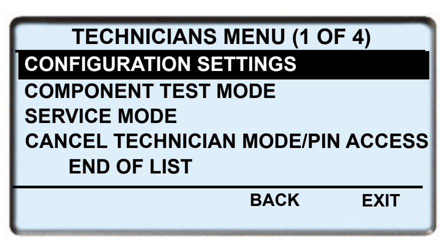
5.2 Technician Mode

Technician mode allows the technician to view inactive alarms and additional hour meters, work with Configurations, test the unit components and/or service the refrigeration system. Instructions for entering Technician mode are provided in **Figure 5.1**. Information on these operations is provided in the below sub-paragraphs.

Figure 5.1 Technician Mode

1. With the system powered up (START/RUN-OFF switch in the START/RUN position) or in PC mode press the MENU key until TECH MODE is displayed. If TECH MODE does not display, place the system in Advanced User mode (refer to **Section 3.14**).
2. Press the TECH MODE key. Enter the master technician PIN code. The factory installed master technician PIN code is 7435. Enter this code by pressing the 3 and 4 keys simultaneously, then pressing the 4 key, then the 3 key, then the 1&4 keys simultaneously. Once the code is entered, press the "=" key to enter the Technicians Menu.





3. Press the ▲ or ▼ key to scroll through the list of menu items. Press the "=" key to enter the settings or test modes.

NOTICE

Technician mode should be canceled when work is complete. If Technician mode is not canceled, Technician mode will be available for 60 minutes after the last key press without requiring a code, even after placing the SROS in the OFF and then back in the RUN/STOP position.

4. Once activity requiring use of Technician mode is complete, Technician Mode should be manually canceled.
    - To cancel from the TECHNICIANS MENU screen, highlight CANCEL TECHNICIAN MODE/PIN ACCESS and then press the "=" key. This will return the system to the Advance User mode.
    - To cancel from any screen, press and then release the two outside soft keys simultaneously (note: the system will not respond) and then press the "=" key. The system will return to Driver mode.

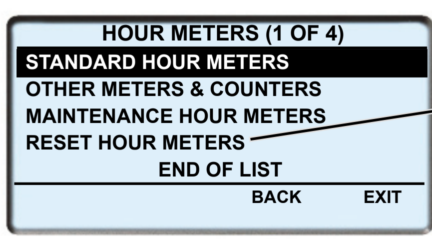
5.2.1 Technician Hour Meters

Hour meters, other than the standard hour meters, are available for viewing when in Technician mode. Instructions for viewing these hour meters are provided in **Figure 5.2**.

Figure 5.2 Technician Hour Meters

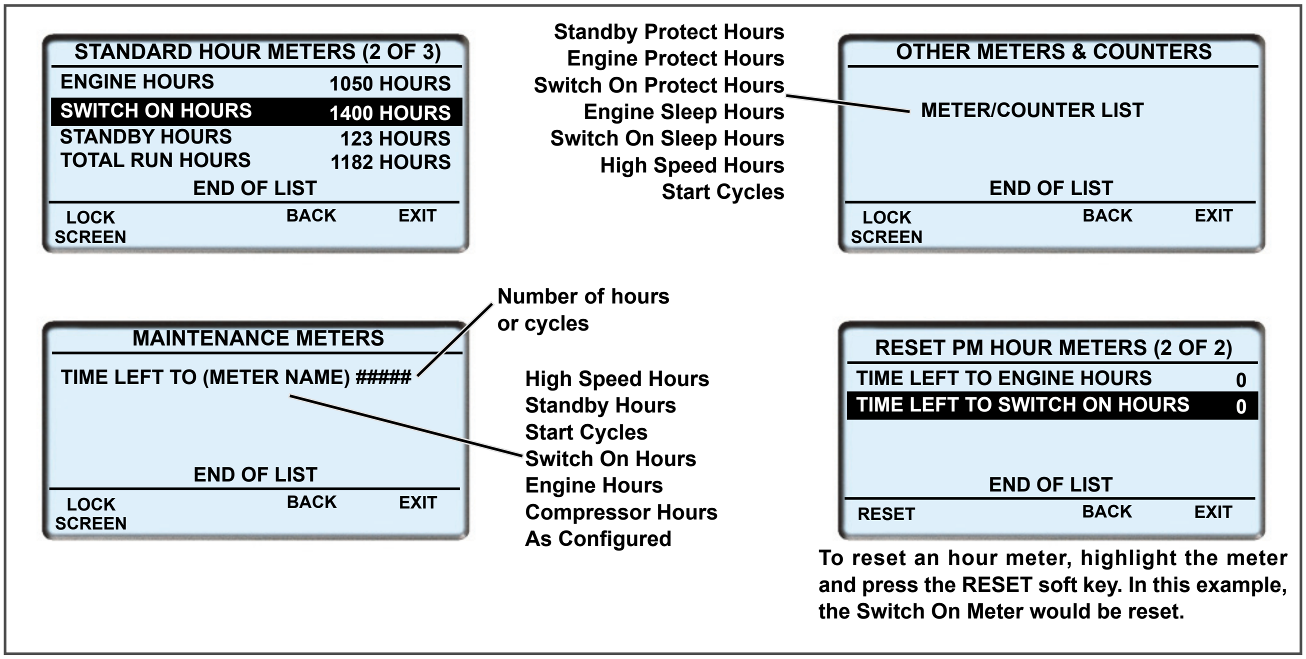
1. Enter the Technician mode, as described in **Figure 5.1**. While in the TECHNICIANS MENU screen, press the BACK or EXIT key and then press the MENU key until HOUR METERS is displayed.

2. Press the HOUR METER soft key to display the hour meter screen.



NOTE: This line will only display if one or more hour meters has timed out and is ready to be reset.

3. The hour meter screen will display with a 15 second timeout. Press the ▲ or ▼ key to scroll through the available selections. With the desired sub-menu highlighted, press the “=” key to view the data.



4. The number of meters displayed depends on the settings for this unit. Press the BACK key to return to the HOUR METERS screen or the EXIT key to return to the default screen. Once activity requiring use of Technician mode is complete, Technician mode should be manually canceled, refer to **Figure 5.1**.

5.2.2 Inactive Alarms

There are two sections in the Alarm list: an active alarm section and an inactive alarm section. The APX Control System can hold up to 16 alarms in the combined lists. The lists can be read via the display screen or using TRU-Tech. Alarms in these sections are in the order in which the alarms activate and inactivate, respectively. On startup, all alarms are moved to the inactive list. If an inactive alarm becomes active, the alarm is moved from the inactive list to the active list.

Each alarm can only be present in either the active or inactive list at any given time. As conditions change, alarms may be moved from the active list to the inactive list and back.

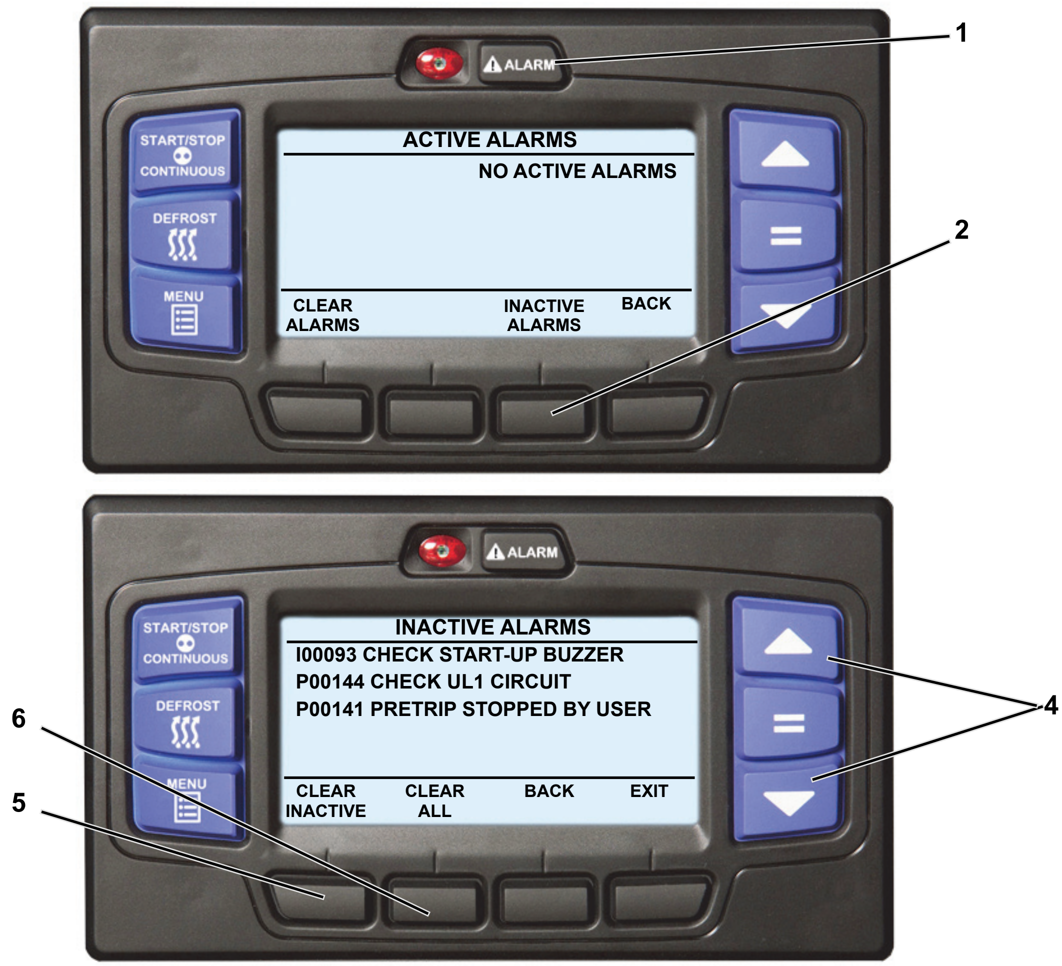
Alarms are also recorded in the DataLink data recorder. They are recorded at the time they occur (become active), and the time they become inactive.

Instructions for reading and clearing the Inactive Alarms are provided in **Figure 5.3**. For a complete list of Alarms and troubleshooting information Refer to Section 9.

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 Advanced Users.

Figure 5.3 Inactive Alarms



1. Enter the Technician Mode, as described in **Figure 5.1**, then press the ALARM key.
2. Press the INACTIVE ALARMS soft key.
3. If there are inactive alarms, the alarm number will be displayed preceded by the letter "I" (inactive alarm) or "P" (inactive Pretrip alarm). The last alarm that occurred will be the first alarm displayed and so on.
4. Press the ▲ or ▼ key to scroll through the list of alarms.
5. To clear only the inactive alarms and leave the active alarms, press the CLEAR INACTIVE soft key. The LCD Display will provide an "INACTIVE ALARMS CLEARED" message to confirm the alarms have cleared.
6. To clear both the active and inactive alarms, press the CLEAR ALL soft key. The operators message panel will provide an "ALL ALARMS CLEARED" message to confirm the alarms have cleared.
7. If there are no inactive alarms, the operators message panel will provide a "NO INACTIVE ALARMS" message and then return to the default display after five seconds.

NOTICE

Technician mode should be canceled when work is complete. If Technician mode is not canceled, Technician mode will be available for 60 minutes after the last key press without requiring a code, even after placing the SROS in the OFF and then back in the RUN/STOP position.

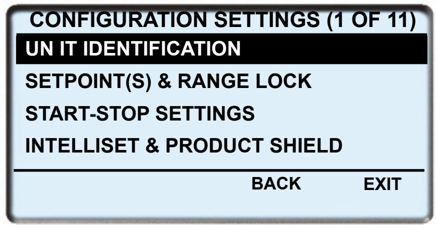
8. Once activity requiring use of Technician mode is complete, Technician mode should be manually canceled, refer to **Figure 5.1**.

5.2.3 Configuration Settings

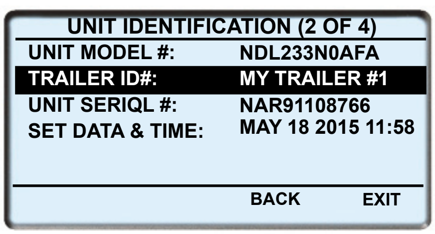
Configuration settings match the APX Control System to the unit and define APX Control System action under various operational conditions. Instructions for working with Configurations are provided in **Figure 5.4**.

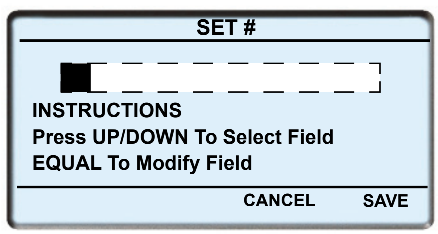
1. Enter the Technicians Menu, highlight CONFIGURATION SETTINGS and then press the “=” key as described in **Figure 5.1**.

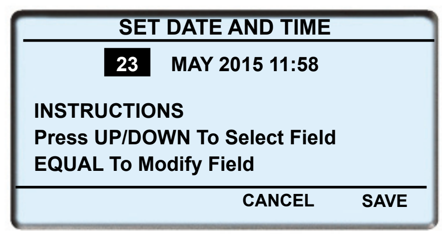
Figure 5.4 Setting Configurations



2. Eleven Configuration sub-menus will be available. To scroll through the Configuration sub-menu list, press the ▲ or ▼ key. The sub-menus will highlight as the list is scrolled. The available sub-menus are listed in **Table 5–1**.
3. With the desired sub-menu highlighted, press the “=” key. The individual Configurations within the sub-menu will display. There are two types of Configuration screens, data entry screens and value selection screens.
4. Data entry screens are displayed for the UNIT MODEL #, TRAILER ID #, UNIT SERIAL #, SET DATE & TIME and SET NEW HOURS (in a replacement main microprocessor) Configurations. To change a data entry screen press the “=” key with the configuration highlighted.

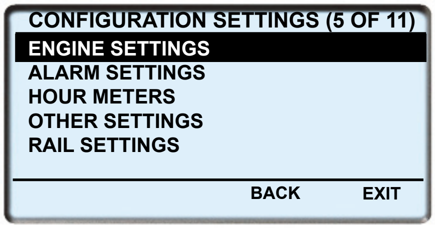




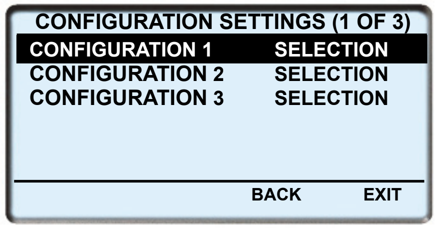


5. A data entry screen will be displayed with the entry points in a horizontal row of “fields”. The first selection “field” will be highlighted. Press the “=” key to enter the field then press the ▲ or ▼ key to scroll through the available selections.
    - When setting a number, the numbers 1 to 9 and the letters A to Z will be displayed.
    - When entering the date & time the day, month, year, hour or minute will be displayed. The system uses a 24 hour clock. Hours 00 to 11 are AM and hours 12 to 23 are PM.
    - With the desired selection in the field, press the “=” key to save the field entry.
6. Press the ▲ or ▼ key to move to the next field or to the desired field.
7. Press the “=” key to enter the field then press the ▲ or ▼ key to scroll through the available selections. With the desired selection in the field, press the “=” key to save the field entry.
8. Continue as above to enter additional field changes as required.
9. When all the fields are displayed as desired, press the SAVE soft key to save the setting into memory.
10. Continue as above to enter additional UNIT IDENTIFICATION changes as required.

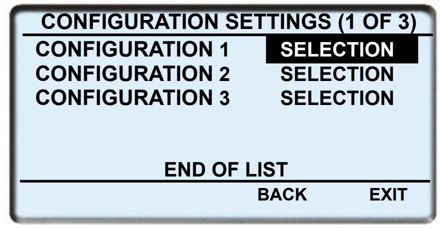
11. To change a value selection screen, press the “=” key with the desired Configuration sub-menu highlighted as in Sample Screen A. The individual Configurations within the sub-menu will display as in Sample Screen B. Press the ▲ or ▼ key to scroll through the individual Configurations. The individual Configurations will highlight as the list is scrolled.



Sample Screen A



Sample Screen B



Sample Screen C

12. With the desired individual Configuration highlighted, press the “=” key. The highlight will move to the present setting. As in Sample Screen C. Press the ▲ or ▼ key to scroll through the available settings. With the desired setting highlighted, press the “=” key to select. Refer to **Table 5–1** for information on the settings in each sub-menu and resultant System actions.

13. Continue as above to enter additional sub-menus and set additional individual Configurations as required.

NOTICE

Technician mode should be canceled when work is complete. If Technician mode is not canceled, Technician mode will be available for 60 minutes after the last key press without requiring a code, even after placing the SROS in the OFF and then back in the RUN/STOP position.

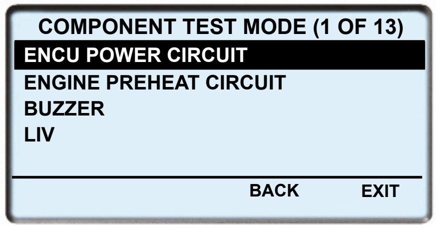
14. Once activity requiring use of Technician mode is complete, Technician mode should be manually canceled, refer to **Figure 5.1**.

5.2.4 Component Test Mode

Component Test mode allows the technician to energize individual circuits for five minutes at a time. The unit is not allowed to start when the System is in Component Test mode. Instructions for entering the Component Test mode are provided in **Figure 5.5**.

Figure 5.5 Component Test Mode

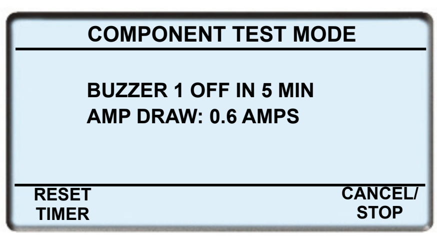
1. Enter the Technicians Menu, highlight COMPONENT TEST MODE and then press the “=” key as described in **Figure 5.1**.



2. The following tests are available. To scroll through the tests press the ▲ or ▼ key. The tests will highlight as the list is scrolled. The available tests include:

ENCU Power Circuit (MM output @ 3MM9)	Compressor Motor Contactor 1 (2CCB output @ 2CCB-02)
Engine Preheat Circuit (MM output @ 3MM14)	Condenser Motor Contactor 1 (1CCB output @ 1CCB-02)
Buzzer (MM ground @ 3MM-15)	Condenser Motor Contactor 2 (1CCB output @ 1CCB-03)
LIV (MM output @ 3MM-5)	Generator Contactor (1CCB output @ 1CCB-24)
Heater Contactor 1 (2CCB output @ 2CCB-24)	C2 Heater Contactor 1 (3REC output @3REC-24)
Heater Contactor 2 (2CCB output @ 2CCB-13)	C2 Heater Contactor 2 (3REC output @3REC-13)
Evaporator Motor Contactor1 (2CCB output @ 2CCB-01)	C3 Heater Contactor 2 (3REC output @3REC-13)
Power Supply Contactor (1CCB output @ 1CCB-13	C2 Evaporator Contactor (3REC output @3REC-01)
Power Supply Contactor 2 (1CCB output @ 1CCB-01	C3 Evaporator Contactor (3REC output @3REC-01)
EVXV (0% to 100% and 100% to 0%)	CSMV (0% to 100% and 100% to 0%)

3. With the desired test highlighted, press the “=” key. For example, if BUZZER is selected, the buzzer will come on, and “BUZZER OFF IN 5 MINUTES” will display. The minutes will count down to 0 at which time the circuit will be de-energized, and the operator message panel will return to the test selection screen.



4. When a component is energized in Component Test mode, the AMP DRAW display initially shows the current draw of the system, after a few seconds the display will change to reflect the current draw of the system plus the added component. For example, if CCON is energized in Component Test mode, the AMP DRAW display might initially show 0.75 Amps, then after a few seconds, the AMP DRAW display will change to 1.0 Amps. The difference between the two readings reflects the current draw of the component being tested; in this case CCON is drawing 0.25 Amps.
5. To extend the test time, press the RESET TIMER soft key. The time will reset to five minutes. To stop the test press the CANCEL/STOP soft key.
6. Continue as above to test additional components as required.

NOTICE

Technician mode should be canceled when work is complete. If Technician mode is not canceled, Technician mode will be available for 60 minutes after the last key press without requiring a code, even after placing the SROS in the OFF and then back in the RUN/STOP position.

7. Once activity requiring use of Technician mode is complete, Technician mode should be manually canceled, refer to **Figure 5.1**.

5.2.5 Service Mode

⚠ CAUTION

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

NOTE

If the START/RUN - OFF switch is toggled to the OFF position, the System will exit Service mode.

To enter Service mode:

1. Enter the Technicians Menu, highlight SERVICE MODE and then press the “=” key as described in **Figure 5.1**.
2. “TRANSITION TO SERVICE MODE” and then “ENTERING SERVICE MODE” will display in the operator message panel. When entering Service mode the APX Control System brings the CSMV, EVXV, REVXVs, and ECXV to 100% open and energizes LIV.
3. Once the modulating valves are 100% open, “RECOVER / LEAK CHK / EVAC MODE” is displayed in the operator message panel.
4. Refrigerant recovery, leak checking, or evacuation may be performed on the unit at this time. Refer to Service Procedures in **Section 8**.
5. The unit should remain in the RECOVER / LEAK CHK / EVAC MODE as refrigerant recovery or leak testing procedures are performed.
6. If the message in the operator message panel changes to “CHARGE MODE - HOLD = TO EXIT” do not continue refrigerant recovery, leak testing or evacuation procedures. Exit Service mode and then re-enter, ensuring that “RECOVER / LEAK CHK / EVAC mode” is displayed in the operator message panel before continuing refrigerant recovery or leak testing.

7. During evacuation, the APX Control System will monitor the pressure transducer readings.
   - The System will remain in “RECOVER / LEAK CHK / EVAC MODE” as evacuation is started.
   - As the refrigeration system is evacuated, the system pressure will go into a deep vacuum. Once the CSP is less than 20 in/hg and the CDP is less than +5 psig the operator message panel will change to “EVAC/ CHARGE MODE”. The position of the modulating valves and LIV do not change in this mode.
   - Following the evacuation, as the charging procedures are started the APX Control System will bring the modulating valves to 0% open and de-energize LIV when both of the transducers rise above +5psig (0.34 bar).
   - When the modulating valves are closed, “CHARGE MODE - HOLD = TO EXIT” is displayed in the operator message panel. This action is taken to prevent refrigerant migration to the compressor during charging.
8. To exit Service mode at any time, press the EXIT soft key. “EXITING SERVICE MODE” will then display in the operator message panel. When Service mode is exited, the APX Control System brings the modulating valves to 0% open and LIV will be de-energized.

NOTICE

Technician mode should be canceled when work is complete. If Technician mode is not canceled, Technician mode will be available for 60 minutes after the last key press without requiring a code, even after placing the SROS in the OFF and then back in the RUN/STOP position.

9. Once activity requiring use of Technician mode is complete, Technician mode should be manually canceled, refer to **Figure 5.1**.

5.3 USB Memory Devices

Instructions for using USB memory devices with the APX APX Control System are provided in the following subparagraphs.

5.3.1 Data Transfer USB Memory Device

Carrier Transicold APX USB Flash Drive, CTD P/N 12-00814-00 must be used:

- The device may be used to enter PC mode.
- Data files from the DataLink data recorder may be transferred from the APX Control System to the “DOWNLOAD’ folder.
- Software files may be transferred to the “PROGRAM” folder and then transferred to the APX Control System.
- IntelliSet/Configuration files may be transferred to the “CONFIG” folder and then transferred to the APX Control System.

5.3.2 PC Mode

PC mode allows the technician to access the APX Control System without the unit running. When in PC mode the System is fully functional, all Operator Interfaces may be performed and the operation of the System may be demonstrated, again, without the unit actually operating. Instructions for entering and using PC mode are provided below.

⚠ WARNING

Do not toggle the START/RUN - OFF switch out of the OFF position when in PC mode or the unit will start.

Figure 5.6 PC Mode

1. With the START/RUN - OFF switch in the OFF position, remove protective cover from the USB interface port and insert a Data Transfer USB. The USB activity LED will flash, the Carrier Transicold logo will display and then the MessageCenter will display one or more USB soft key descriptions.

NOTES:

a. A PC-USB service cable (Carrier Transicold P/N 22-04253-20) may be used.

b. If Configured to do so, the System will prompt for entry of the data protect PIN code (refer to “PROTECT DATA WITH PIN”, **Table 5–1**).

2. Press the “PC MODE’ soft key. DO NOT remove USB or cable at this time.

3. The MessageCenter will display “PC MODE”. The System is now in PC mode. The purpose of PC mode is to allow demonstration of the System features and allow changes to the System while the unit is not actually running. It is important to note that any changes saved to memory while in PC mode will remain after leaving PC mode.

NOTICE

Technician mode should be canceled when work is complete. If Technician mode is not canceled, Technician mode will be available for 60 minutes after the last key press without requiring a code, even after placing the SROS in the OFF and then back in the RUN/STOP position.

4. If Technician mode is entered while in PC mode, once the Technician mode activity is complete, re-enter the Technicians Menu, highlight “CANCEL TECHNICIAN MODE/PIN ACCESS” and then press the “=” key to take the system out of Technician mode before taking the System out of PC mode.

5. When use of PC mode is completed, remove the USB or cable. “SHUTTING DOWN - PLEASE WAIT” may be displayed or after a few seconds, the display will go blank. Replace the cover on the USB port.

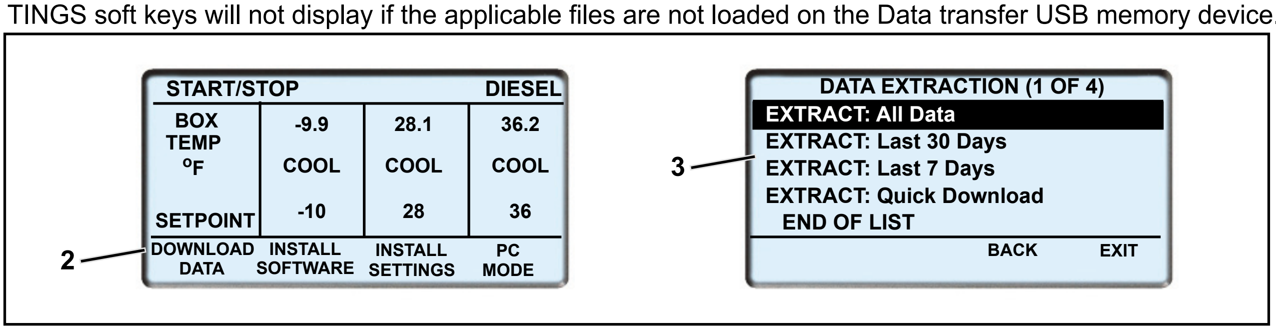
5.3.3 Downloading Data Files

Instructions for downloading data from the DataLink data recorder to a Data Transfer USB memory device are provided in **Figure 5.7**.

Figure 5.7 Downloading Data Files

1. Data may be downloaded with the system powered up or turned off. Remove protective cover from the USB interface port and insert a Data Transfer USB memory device. The MessageCenter will display READING USB. NOTE: If Configured to do so, the System will prompt for entry of the data protect PIN code (refer to "PROTECT DATA WITH PIN", **Table 5–1**).

2. The Message Center will then display the USB soft keys. (NOTE: The INSTALL SOFTWARE and INSTALL SETTINGS soft keys will not display if the applicable files are not loaded on the Data transfer USB memory device.)



3. Press the DOWNLOAD DATA soft key. Four extraction choices will be available as shown above. To scroll through the choices press the ▲ or ▼ key. The choices will highlight as the list is scrolled. With the desired choice highlighted, press the "=" key. The System will begin downloading data to the USB and the operator message panel will display COPYING DATA - PLEASE WAIT ##%. The percent downloaded will display as the data is copied and then the operator message panel will display COPY COMPLETE, PRESS ANY KEY. Press any key to return to the USB soft keys.

4. The MessageCenter will return to the USB soft key display and the USB may be removed.

5. The downloaded data will now be on the data transfer USB memory device in the “DOWNLOAD” folder. A folder will be created each day data is extracted to the USB. The folder naming convention will begin with the letters “DX” followed by the last two digits of the year, two digits representing the month and two digits representing the day. For example a folder named DX210120 would contain data extracted January 20, 2021.

6. Two files will be created inside the folder for each download. The file naming convention used is the last 8 characters of the Trailer ID followed by .zdx for the first file and a secondary file with the same name followed by .zax.

NOTE

If the same unit (with the same asset, trailer or car ID) is downloaded twice or more on the same day, the earlier files will be overwritten. If the earlier files will be required for later review, ensure they are transferred off the device before starting another download.

5.3.4 Installing Software

Instructions for installing software into the APX Control System from a Data Transfer USB memory device are provided in **Figure 5.8**. If power is lost or USB removed, this procedure should be repeated. The screen may be blank until the USB is reinserted.

TIP

Whenever installing new software, it is always a good idea to start the unit and give it a quick check over prior to performing the operation. All units should have the software upgraded to the latest version, provided for Carrier Transicold dealers on the TransCentral web site.

Figure 5.8 Installing Software

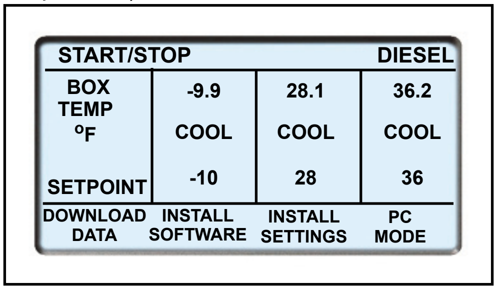
1. Ensure the desired software version folder is the only folder loaded in the “PROGRAM” folder on a Data Transfer USB memory device.

2. With the system powered or off, remove the protective cover from the USB port and insert USB. The MessageCenter will display READING USB.

NOTE

If Configured to do so, the System will prompt for entry of the data protect PIN code (refer to “PROTECT DATA WITH PIN”, **Table 5–1**).

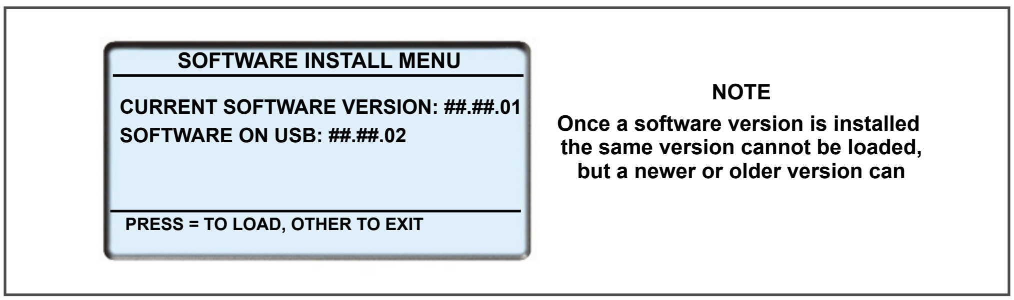
3. In less than two minutes time, the MessageCenter will display the USB soft keys. (NOTE: The INSTALL SETTINGS soft key will not display if files are not loaded in the CONFIG folder and DOWNLOAD DATA does not display if the DOWNLOAD folder is not present).



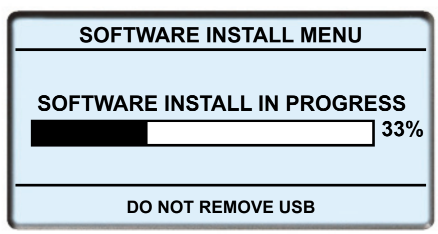
4. Press the INSTALL SOFTWARE soft key. The System will enter the software install menu and display the software version presently in the System, and the software version on the USB.

NOTE

Once a software version is installed the same version cannot be installed but a newer or older version can be.



5. Press the “=” key to start the installation. Press any other key to exit and return to the USB soft keys.



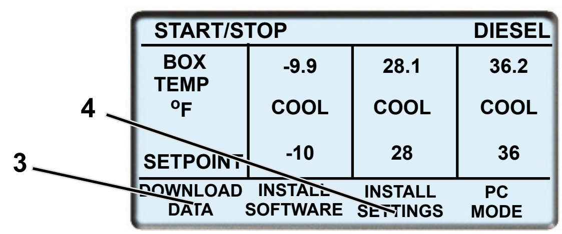
6. Once the “=” key is pressed, the operator message panel will display “UNIT AND MICRO WILL STOP NOW” and the unit will stop. The System will begin downloading software from the USB memory device and the operator message panel will display “SOFTWARE INSTALL IN PROGRESS”. The percent downloaded will display as the software is copied and then the operator message panel will display “SOFTWARE INSTALL COMPLETE - MICRO WILL RESTART NOW - REMOVE USB.
7. After install is complete, reinstall the USB, press the INSTALL SOFTWARE soft key and then the “=” key to verify the software matches that on the USB.
8. Remove the USB and reinstall USB the cover.

5.3.5 Transferring Configuration Files

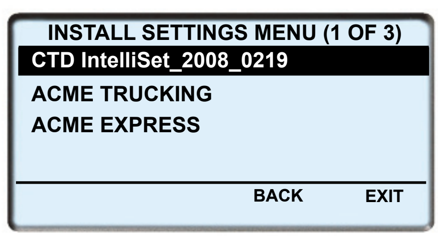
Instructions for installing configuration files into the APX Control System from a Data Transfer USB memory device are provided below. Configuration (*.set) files consist of one of the following types of files. A “Configuration” file contains a complete set of Configuration, Functional Parameter and Data Recorder settings for the system. An “IntelliSet” file contains multiple Configurations which are programmed using easily recognizable names that can then be selected using the display mounted keys by the operator. A “Maintenance” file contains one or more individual settings. For example: Remote Sensor Yes/No, Fuel Level Sensor: Yes/No. etc. Unit specific and time sensitive data cannot be loaded to a configuration file. This data includes: model number, serial number, trailer ID hour meter readings, date and time. These configurations must be set using the display mounted keys or TRU-Tech and a service cable.

1. Ensure the desired setting file(s) are loaded to the “CONFIG” folder on a Data Transfer USB memory device.
2. With the System powered or off, remove protective cover from the USB interface port and insert the device. The MessageCenter will display READING USB.NOTE: If Configured to do so, the System will prompt for entry of the data protect PIN code (refer to “PROTECT DATA WITH PIN”, Table 5–1).
3. The Message Center will then display the USB soft keys. (The INSTALL SOFTWARE soft key will not display if a file is not loaded in the PROGRAM folder.)
4. Press the INSTALL SETTINGS soft key. The System will enter the INSTALL SETTINGS menu.

Figure 5.9 Transferring Configuration Files

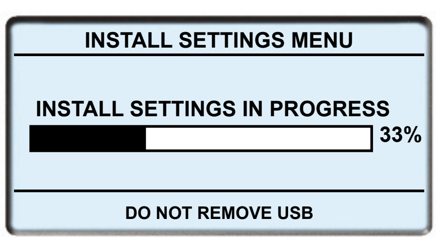


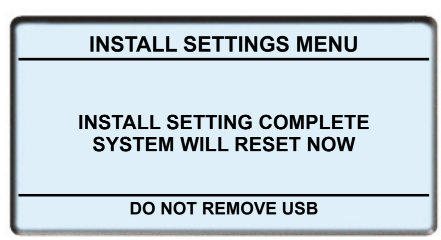
5. If one or more configuration file(s) are loaded on the Data Transfer USB memory device a listing of available files will be displayed. To scroll through the files press the ▲ or ▼ key. The files will highlight as the list is scrolled.



NOTE

Earlier software versions may have a display limit of 10 files. If the desired file is not displayed, reduce the USB CONFIG directory content to 10 files or less.





6. With the desired file highlighted, press the “=” key to start the installation. Press any other key to exit and return to the USB soft keys.
7. The unit will shutdown and the settings will be installed. If a single configuration is installed, the system will reset and the unit will restart. If IntelliSets are installed, following the system reset, the user will be prompted to select one of the new IntelliSets before the unit can be started.

8. Reinstall USB cover.

5.3.6 TRU-Tech & TRU-View

The TRU-Tech & TRU-View 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. The application interface will provide additional programming and configuring capabilities that will not be available using the display mounted keys. The DataLink data recorder may also be configured using the TRU-Tech program.

For complete instructions on using TRU-Tech & TRU-View, refer to the manual supplied with the TRU-Tech/TRU-View software.

5.3.7 TRU-Tech

TRU-Tech enables the user to do the following:

- Monitor in real-time via the USB interface port the current status of the APX Control System inputs, outputs, refrigeration, electrical, engine and temperature sensors and alarms.
- Record sensor data to a file for diagnostic purposes.
- Display, edit and send unit model number, unit serial number and trailer ID to the main microprocessor.
- Display, edit and send Functional Parameters and Configuration settings to the System (including the DataLink data recorder) or to a Data Transfer USB memory device.
- Write hour meter values to a replacement main microprocessors (during the first 25 hours).
- Initiate Pretrip and Defrost operations.
- Support Download, Configuration and Program USB operations.
- Provide a security log on a system controlled by a System Administrator.

5.3.8 TRU-View

TRU-View enables the user to do the following:

- Read download files from the System.
- Create various customized text 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 user friendly format such as PDF

5.3.9 Connecting Computer and Control System

To connect the APX Control System and computer:

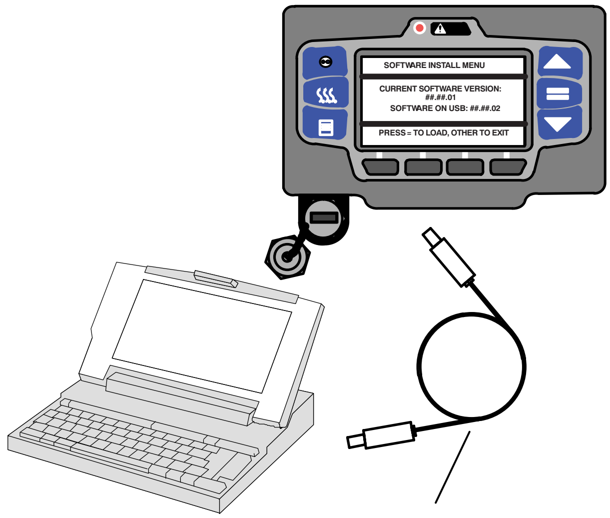
1. Locate the USB interface port and remove the protective cover to gain access (see Figure 5-10).
2. Plug a PC-USB service cable into the port and a USB port on the computer (see Figure 5-10).

   NOTE: If SROS is off, the System will power up, and display “PC MODE”.

3. Start the TRU-Tech & TRU-View program by double clicking on the icon on your computer desktop and entering the required password. Verify that the correct COM port is selected in the PC Setup. For complete instructions on using TRU-Tech & TRU-View, refer to the manual supplied with the TRU-tech/TRU-View software.

4. When work is complete, remove the interface cable and install the protective cover back onto the USB port. The APX Control System will return to normal operation.

Figure 5.10 TRU-Tech/TRU-View Connection



PC–USB Service Cable. Carrier Transicold Part number:

22–04253–01 = 20 foot/6.1 meter long)
22–04253–00 = 6 foot/1.8 meter long)

NOTE: An "off the shelf" USB to USB cable will not provide the required communication.

5.4 Main Microprocessor Replacement and Setup

NOTICE

Under no circumstances should a technician electrically probe the modules at any point, other than the connector terminals where the harness attaches. Module 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 module.

Some main 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.

NOTICE

Electronic modules MUST be handled with care to prevent accidental damage or degradation from electrical static discharge (ESD), contamination or abuse. Before touching a module, touch your body and/or conductive tool being used to the frame to discharge ESD safely. All electronics should be handled carefully and only held by edges of any exposed board. Care should be taken when inserting/extracting connectors and components to avoid exerting excessive stress on the board which could fracture small components nearby, resulting in future failure of circuit.

When field diagnosis of a Carrier Transicold refrigeration unit determines that an APX main 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 revision for this model.

NOTE

When a module is replaced, software should be upgraded before switching the unit on. This will ensure software compatibility of all modules.

The preferred method for setup of the main microprocessor is to use the display mounted keys or a Data Transfer USB memory device. All required changes, except unit specific and time sensitive data, may be performed using the USB memory device.

If a USB is not available the main microprocessor may be setup using TRU-Tech. TRU-Tech allows entry of all required data. If neither a USB memory device or TRU-Tech and service cable is available, the main microprocessor may be setup for immediate use using the display mounted keys. Changes to the default DataLink data recorder settings may not be entered using the display mounted keys. If the main microprocessor is setup using the display mounted keys and this feature is needed, it may be loaded at a later date.

5.4.1 Pre-Replacement Steps

Before the unit can be started using the replacement main microprocessor certain unit specific and time sensitive data must be known.

TIP

Print this page and fill out the following for use when entering the data.

That information includes:

- Unit Serial Number. ______________________________
- Unit Model Number. ______________________________
- Engine Protect Hours. ______________________________
- Standby 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. ______________________________

1. If possible, power the original system up by entering PC mode, or by placing the START/RUN - OFF switch in the START/RUN position.
2. Insert a Data Transfer USB memory device and download all data from the DataLink data recorder.
3. Scroll through the data list and hour meter readings and make note of the unit specific data listed above. If the original main 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 a Data Transfer USB memory device will be used to setup the replacement main microprocessor, write the required data to the device. Also, if the current configuration file is available for this customer from the TransCentral web site, it should be transferred to the device prior to beginning work.

5.4.2 Main Microprocessor Module Replacement

1. Ensure the unit will not start automatically by disabling any two way communication, placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable.
2. Release the tabs and remove the two 35 pin connectors and 8 pin connector from the front of the module.
3. Replace module. Tighten mounting hardware to 96 inch/lbs (10.8 Nm).
4. Reinstall connectors ensuring tabs are fully locked in place.

5.4.3 Main Microprocessor Setup

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

2. Make sure the latest software has been loaded to ensure all modules are compatible, refer to **Section 5.3.4**

NOTICE

When a module is replaced, software should be upgraded before switching the unit on. This will ensure software compatibility of all modules.

3. Power up the system by placing the START/RUN - OFF switch in the START/RUN position. The display will immediately go into the Unit Identification Configuration screen. The unit model information must be entered before the System can display the correct screens for this unit.

4. Select the correct model family and then enter the correct model number by using the ▲ and ▼ 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.

5. Press the ▲ key again, and the Unit Serial Number field will appear. Refer to **Section 5.2.3** for instructions on entering the unit serial number.

6. Press the ▲ key again, and the Trailer ID field will appear. Refer to **Section 5.2.3** for instructions on entering the Trailer ID.

NOTICE

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.

7. Now, press the ▼ key until “SET DATE & TIME” appears. Refer to **Section 5.2.3** for instructions on entering the date and time.

8. Press the ▲ key to go to “SET NEW HOURS”. Press the “=” key then the ▲ key to enter that menu.

9. The first hourmeter is Engine Protect Hours. Press the “=” key to select this meter. The cursor will be blinking on the ten-thousands place. Press the ▲ and ▼ 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 ▲ and ▼ 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 hourmeter. 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” hourmeters are listed. When the hours for all the hourmeters are entered, the system will add the correct hours together and calculate the Total Engine Hours, total Standby 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 hourmeters 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 Data Transfer USB memory device will be used to setup the remainder of the main microprocessor settings, proceed to **Section 5.4.7** after the settings are entered.
2. After the unit specific and time sensitive configuration settings are complete use the ▲ or ▼ key 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 using the display mounted keys and/or TRU-Tech, continue with following steps.

5.4.4 Configurations Via Display Mounted Keys

Refer to **Table 5–1** for a list of available Configurations. Refer to **Section 5.2.3** for instructions on how to access them.

5.4.5 Functional Parameters Via Display Mounted Keys

1. Refer to **Table 3–2** for a list of available Functional Parameters and **Section 3.18** for directions on how to access them.
2. Leave the system powered up as you continue with the next section.

5.4.6 DataLink Data Recorder Via TRU-Tech

NOTE

If the factory settings are used, this section can be skipped.

1. Refer to **Section 3.11** for list of DataLink data recorder setups.
2. Connect a computer to the USB interface port of the unit and start the TRU-Tech program (refer to **Section 5.3.6**).
3. In TRU-Tech, click on the REEFER SETUP LIVE/ Data Recorder Tab.
4. Select the Sensors to be recorded and then select averaged or snapshot recordings (averaged is recommended/ default for RAT, SAT, AAT and the remote sensors; snapshot is recommended/default for all others).
5. When the setup is correct, press the Send button to send the new settings to the system.
6. From the "Confirm Send Information" Pop Up, check the data that is to be sent and un-check the data that is not to be sent. Click the OK button.
7. 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 TRU-Tech

5.4.7 System Final Checkout

1. Start the unit and allow it to run for a few minutes.
2. While the unit is running, scroll through the Data List. Verify that all the data is now accurately displayed.
3. 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 5–1 Configuration Settings

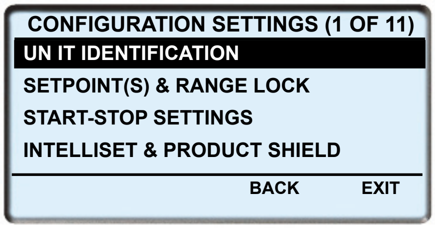
Configuration	Selections	Description
CONFIGURATION SETTINGS		
		Press the ▲ or ▼ keys to display configurations: UNIT IDENTIFICATION SETPOINT(S) & RANGE LOCK START-STOP SETTINGS INTELLISET & PRODUCT SHIELD ENGINE ALARMS ALARM SETTINGS HOUR METERS REMOTE SENSORS OTHER SETTINGS RAIL SETTINGS AUTO FRESH AIR SETTINGS
UNIT IDENTIFICATION		
UNIT MODEL NUMBER #	A list of configurable model numbers	Indicates to the main microprocessor the model number of the unit. There are several model numbers provided in the list. Select the model number printed on the Model/ Serial Number nameplate.
NOTE The unit model number selection may have an asterisk (*) in the place of the 7th character. If that is the case, then that number may be selected as long as all of the other numbers and letters match exactly.		
TRAILER ID #		A customer assigned ID # may be entered. This may be up to 10 characters long. Numbers, letters, and spaces may be entered by scrolling through the available list. Refer to **Section 5.2.3** for instructions on entering the Trailer ID.
NOTE The default display for this Configuration is “TRAILER ID #”. The display may be modified if the “UNIT OPERATION’” Configuration in the Rail Settings group is set to “RAIL”. If this Configuration is set to “RAIL” then “ASSET ID #” or “CAR ID #” may display rather than the “TRAILER ID #” default. Refer to the UNIT OPERATION Configuration later in this table.		
UNIT SERIAL NUMBER #		The unit S/N may be entered. Numbers, Letters, and a space are available by scrolling through the available list. Refer to **Section 5.2.3** for instructions on entering the unit serial number.
SET NEW HOURS	This Configuration will display when a replacement main microprocessor is installed. It allows entry of the hours (from the existing microprocessor) into the 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.	
SET DATE AND TIME	Indicates to the main microprocessor the current date and time. Refer to **Section 5.2.3** for instructions on entering the date and time. **NOTE** Date and Time may also be configured under “Other Settings”.	

Table 5–1 Configuration Settings (Continued)

Configuration	Selections	Description
SETPOINT(S) & RANGE LOCK		
DECIMAL	DISPLAYED	DISPLAYED = setpoint will be shown with a decimal and temperatures may be selected to a tenth of a degree.
	NOT DISPLAYED	NOT DISPLAYED = setpoint will not be shown with a decimal. All other temperatures will still be displayed with a decimal.
MIN SETPOINT - C1, C2, C3	**-22°F** - 95°F (**-30C** - 35°C) in 0.1°F or °C increments	Indicates to the main microprocessor the desired minimum allowable set point.
MAX SETPOINT - C1, C2, C3	-22°F TO **95°F** (-30C to **35°C**)	Indicates to the main microprocessor the desired maximum allowable setpoint.
RANGE 1 LOCK OR RANGE 2 LOCK	**OFF** START-STOP CONTINUOUS	OFF = If both Range Locks are OFF, the unit will operate normally. If either Range 1 or Range 2 is not OFF, the unit will operate as selected whenever the setpoint is within that range START-STOP = The unit will always operate in Start-Stop whenever the setpoint is between the minimum & maximum temperatures for that range (refer to the following sub-configurations). CONTINUOUS = The unit will always operate in Continuous Run whenever the setpoint is between the minimum & maximum temperatures for that range (refer to the following sub-configurations).
RANGE 1 (or 2) MINIMUM TEMPERATURE	-22°F - **95°F** (-30C - **35°C**)	Select the lowest temperature desired for this range.
RANGE 1 (or 2) MAXIMUM TEMPERATURE	-22°F - **95°F** (-30C - **35°C**)	Select the highest temperature desired for this range
START-STOP SETTINGS		
CURRENT FOR S/S SHUT-OFF	**7.0A** 1A TO 10A (in 0.5A increments)	In Start-Stop Operation the charging current must drop below this value before the unit is allowed to shut down.
VOLTAGE FOR S/S RE-START	**12.2V** 12.0 TO 12.8V	Engine restarts from a Start-Stop Off cycle or a Sleep mode Off cycle when the battery drops to this value. 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.
ENGINE TEMP FOR S/S RESTART	**10°F (-12.2°C)** 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 5–1 Configuration Settings (Continued)

Configuration	Selections	Description
S/S PARAMETERS	**TOGETHER** 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. SEPARATE = When the Minimum Run Time, Minimum Off Time, Restart Temperature, Maximum Off Time, and Override Temperatures are set in the Functional Parameter List, different values may be entered for Perishable and Frozen setpoints.
FROZEN PRIORITY COOLING	OFF **ON - NORMAL** HIGH CAPACITY	Alternate system control between perishable temperature control and frozen priority. ON/YES - perishable compartments will have the fan on, and the RMT EVXV will pulse when Frozen Priority is Active. During the Perishable Priority the fan will be on and the RMT EVXV will be open (dependent on temperature control). HIGH CAPACITY - perishable compartments will be off (both the fan and the RMT EVXV) when Frozen Priority is active. During the Perishable Priority the fan will be on and the RMT EVXV will pulse (8 out of 20 seconds).
FROZEN PRIORITY TIMER	**15 minutes** 5 - 60 minutes in 1 minute increments	Number of minutes spent in Frozen Priority Cooling when Frozen Priority Cooling is **not OFF**.
PERISHABLE PRIORITY TIMER	**5 minutes** 5 - 60 minutes in 1 minute increments	Number of minutes spent in Perishable Priority Cooling when Frozen Priority Cooling is **not OFF**.
FROZEN NULL MODE FANS	STAY ON **CYCLE OFF**	Controls evaporator fans in specified frozen range. See S/S Compartment mode.
S/S COMPARTMENT MODE STANDARD	STANDARD **ECONOMY**	Specifies control for Frozen Null mode Fans & Fresh Null mode Fans. ECONOMY - For start/stop operation, when any compartment goes to null, only restart that compartment (exit null to cool) on the off-time override temp instead of the standard temperature control. Continue to enter null on the standard temperature control. For heating, go to heat mode at -3.6°F (-2.0°C) away from setpoint. The start/stop parameter defaults should not be changed. STANDARD - Standard temperature control.
FRESH NULL MODE FANS (PERISHABLE FAN MODE)	STAY ON **CYCLE OFF**	Controls evaporator fans in specified perishable range. See S/S Compartment mode.
INTELLISET & PRODUCTSHIELD		
ENABLE INTELLISET AT = KEY	**NO** YES	YES = Allows access to the IntelliSet menu using the = key. NO = Allows access to the IntelliSet menu using the SELECT key.

Table 5–1 Configuration Settings (Continued)

Configuration	Selections	Description
PRODUCTSHIELD: ECONO	**OFF** GO TO S/S GO TO CONT	OFF = ProductShield Econo is OFF GO TO START/STOP = Allows unit to be set for and operate in Continuous Run until ambient temperature falls **within** a user-defined range when unit will go to START/ STOP. This allows energy savings while offering Continuous Run operation protection when ambient is outside range. Unit will return to Continuous Run when ambient goes beyond range. GO TO CONTINUOUS = Allows unit to be set for and operate in START/STOP until ambient temperature falls **outside** a user-defined range when unit will go to Continuous Run. This provides continuous air flow and good product protection for extreme ambient temperatures. Unit will return to START/ STOP when ambient comes back inside range.
ECONO MIN. TEMP	**OFF** or -20°F to +119.0°F (-28.9°C to +48.4°C) (in 0.5° increments) Default: **119.0°F (48.4°C**)	OFF = There is no lower limit for this parameter. Select the lowest ambient temperature desired to activate ProductShield Econo. If ProductShield Econo is Go To Continuous there is a minimum 10°F range. Therefore, this parameter's upper limit is ProductShield Econo Maximum Temperature minus 10°F (5.5°C).
ECONO MAX. TEMP	**OFF** or -20°F to +119.0°F (-28.9°C - +48.4°C) (in 0.5° increments) Default: **119.0°F (48.4°C**)	OFF = There is no upper limit for this parameter. Select the highest ambient temperature desired to activate ProductShield Econo. If ProductShield Econo Install is Go To Continuous there is a minimum 10°F range. Therefore, this parameter's lower limit is ProductShield Econo Min Temp plus 10°F (5.5°C).
ECONO DELTA-T NOTE: This is available for "Go to S/S only. It is not available for "Go to Continuous".	**OFF** +3.6°F to +27.0°F (+2°C - 15°C) in 0.5° increments	OFF = Delta-t is not used in determining when the unit will go into Econo: Go To Start/Stop mode. Select the desired delta-t value for activation of ProductShield Econo. When delta-t is below this setting and within the minimum/maximum range go to start/stop will be allowed.
PRODUCTSHIELD: HIGH AIR	**OFF** ON	OFF = The unit will operate normally in high and low speeds. ON = The unit will operate in high speed when the ambient air temperature is outside a user defined range. This provides increased air flow and good product protection for extreme ambient temperatures. Unit may return to low speed when ambient comes back within the range.
HIGH AIR MIN. TEMP	**OFF** -19°F to +119°F (-28.3°C - +48.3°C) in 0.5°F or °C increments	OFF = There is no lower limit for this parameter. Select the lower limit of the ambient range desired for this parameter. Refer to **Section 4.9.4** for more information on High Air Min. Temp.

Table 5–1 Configuration Settings (Continued)

Configuration	Selections	Description
HIGH AIR MAX. TEMP	**OFF** -19°F to +119°F (-28.3°C - +48.3°C) in 0.5°F - °C increments	OFF = There is no upper limit for this parameter. Select the upper limit of the ambient range desired for this parameter. Refer to **Section 4.9.4** for more information on High Air Max. Temp.
HIGH AIR DELTA-T	**OFF** +3.6°F - +27°F (+2°C - +15°C) in 0.5°C or °F increments	OFF = Delta-t is not used for determining the activation/ de-activation of High Air Delta-T Select the desired delta-t value for activation of ProductShield High Air. Refer to **Section 4.9.4** for more information on High Air Delta-T.
PRODUCTSHIELD: WINTER	**OFF** -20°F - +32°F (-28.9°C - +0°C) in 0.5°C or °F increments	Select the desired ambient temperature below which ProductShield Winter will operate (forced Continuous Run operation).
ENGINE SETTINGS		
GLOW TIME	SHORT LONG **INTAKE HEATER**	Indicates to the main microprocessor which engine is in the system. LONG = Glow Plug equipped and longer glow times are used (TV engines). SHORT= Glow Plug equipped and shorter glow times are used (DI engines). INTAKE HEATER = Engine preheat equipped (Tier 4 engines). NOTE: Refer to **Table 4–1** for glow times.
COOLANT SENSER SHUTDOWN	YES / **NO**	YES = When alarm **00012 HIGH COOLANT TEMPERATURE** has been activated three times in the last two hours of engine operation alarm **00021 TECHNICIAN RESET REQUIRED** will be activated. NO = When **00012 HIGH COOLANT TEMPERATURE** has been activated three times in the last two hours of engine operation alarm **00011 CHECK ENGINE OIL PRESSURE** will **not** be activated.
ENGINE OIL PRESS SHUTDOWN	YES / **NO**	YES = When alarm **00011 CHECK ENGINE OIL PRESSURE** has been activated three times in the last two hours of engine operation the A00021 - “Technician Reset Required” alarm will be activated. NO = When alarm **00011 CHECK ENGINE OIL PRESSURE**has been activated three times in the last two hours of engine operation alarm **00011 CHECK ENGINE OIL PRESSURE** will not be activated.
FUEL LEVEL SENSOR	YES / **NO**	YES = A Low Fuel Level Sensor is installed in the fuel tank. NO = There is no Fuel Level Sensor installed in the fuel tank.
LOW FUEL	**UNIT SHUTDOWN** ALARM ONLY	UNIT SHUTDOWN = The unit will be shutdown and alarm will be generated. ALARM ONLY = An alarm will be generated and the engine will continue to run.

Table 5–1 Configuration Settings (Continued)

Configuration	Selections	Description
FUEL HEATER	**NOT INSTALLED** INSTALLED	NOT INSTALLED = A Fuel Heater is not installed. INSTALLED = A Fuel Heater is installed.
MAX THROTTLE POSITION	80% - 125% **95%** default	IF THIS CONFIGURATION IS AVAILABLE, USE FACTORY DEFAULT ONLY, DO NOT OPERATE WITH A DIFFERENT SETTING.
EES SYSTEM INSTALLED (DPF Installed)	**Not Installed** Installed	Indicates if Diesel Particulate Filter is installed.
ALARM SETTINGS		
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 shut down. 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. Refer to alarm **00053 BOX TEMP OUT-OF-RANGE** for more information.
RPM ALARM SHUTDOWN	**YES** / NO	YES = When alarm **00039 CHECK ENGINE RPM** is activated the alarm light will illuminate and the engine will shut down. NO = When alarm **00039 CHECK ENGINE RPM** is activated the alarm light will illuminate and the engine will continue to run.
LOW PRESSURE SHUTDOWN	**YES** / NO	YES = When alarm **00018 LOW REFRIGERANT PRESSURE** is activated the alarm light will illuminate and the unit will shut down. NO = When alarm **00018 LOW REFRIGERANT PRESSURE** is activated the alarm light will illuminate and the unit will continue to run.
LP SHUTDOWN DELAY	(0 - 10 seconds) **10 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.
HIGH SUCT PRESS SHUTDOWN	**YES** / NO	YES = When alarm **00027 HIGH SUCTION PRESSURE** is activated the alarm light will illuminate and the unit will shut down. NO = When alarm **00027 HIGH SUCTION PRESSURE** is activated the alarm light will illuminate and the unit will continue to run.
REFRIGERATION SYS SHUTDOWN	**YES** / NO	YES = When alarm **00028 CHECK REFRIGERATION SYSTEM** is activated the alarm light will illuminate and the unit will shut down. NO = When alarm **00028 CHECK REFRIGERATION SYSTEM** is activated the alarm light will illuminate and the unit will continue to run.

Table 5–1 Configuration Settings (Continued)

Configuration	Selections	Description
COMPRESSOR ALARM SHUTDOWN	**YES** / NO	If the "Compressor Alarm Shutdown" option has been installed (refer to Unit Data), this setting will be available. YES = The unit will shutdown and not restart when alarm **00013 HIGH DISCHARGE PRESSURE**, **00017 HIGH COMP DISCHARGE TEMP**, **00018 LOW REFRIGERANT PRESSURE**, **00027 HIGH SUCTION PRESSURE**, or **00028 CHECK REFRIGERATION SYSTEM** occur 3 times within 2 hours of continuous engine operation. NO = Normal shutdown rules for above alarms.
ALTERNATOR (Battery Charger) CHECK SHUTDOWN	YES / **NO**	YES = When alarm **00051 ALTERNATOR (BATTERY CHARGER) NOT CHARGING** is activated the alarm light will illuminate and the unit will shut down. NO = When alarm **00051 ALTERNATOR (BATTERY CHARGER) NOT CHARGING** is activated the alarm light will illuminate and the unit will continue to run.
CONFIGURE HOUR METERS		
VIEWABLE STANDARD METERS		
DISPLAY TOTAL ENGINE HR	**YES** / NO	YES = This hour meter will be displayed during the start-up messaging sequence and will be in hour meter menu. 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 start-up messaging sequence and will be in hour meter menu. 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 start-up messaging sequence and will be in hour meter menu. NO = This hour meter will not be displayed during the startup messaging sequence. It will be displayed with the "other meters and counters".
SET PM CONFIGURATIONS		
DIESEL RESET VALUE (Refer to **Table 8–1** for oil/ filter change intervals.)	**OFF** 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 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	**OFF** 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	**OFF** 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 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.

Table 5–1 Configuration Settings (Continued)

Configuration	Selections	Description
PM (METER NUMBER) CONFIGS Meters available are PM-1 thorough PM-5.	**OFF** ENGINE HOURS SWITCH ON HOURS STANDBY RUN HOURS START CYCLES HIGH SPEED HOUIRS	OFF = This selection will turn this meter OFF (will not display). ENGINE HOURS = this meter will count the engine hours until the next reset interval. SWITCH ON HOURS = this meter will count the switch on hours until the next reset interval. STANDBY RUN HOURS = this meter will count the standby hours until the next reset interval. START CYCLES = this meter will count how many times the engine has started until the next reset interval. HIGH SPEED HOURS = this meter will count the number of hours the engine operated in high speed until the next reset interval. If a meter is configured, the following sub-configuration will be available.
PM 1-5 RESET INTERVAL **NOTE:** This Configuration will not display for those meters that are configured for zero hours.	ENGINE HOURS 0 or 50 TO 30,000 hours in 50 hour increments SWITCH ONHOURS 0 or 50 TO 30,000 hours in 50 hour increments S TANDBY RUN HOURS 0 or 50 TO 30,000 hours in 50 hour increments START CYCLES 0 or 1,000 TO 90,000 CYCLES in 1,000 cycle increments HIGH SPEED HOURS 0 or 50 TO 30,000 hours in 50 hour increments	The value to be entered here is the desired number of hours or cycles between PM Maintenance Alarms for this meter. When the meter is reset, the value selected here will be added to the to the present meter reading to indicate to the main microprocessor when the next service interval alarm is to be activated.
REMOTE SENSORS		
REMOTE TEMP SENSOR 1, 2 or 3	ON **OFF** RAT2	ON = A remote sensor has been added to the unit, and connected into the wire harness. OFF = There is no Remote Sensor (1, 2 or 3) in this unit. RAT2 = Indicates that RAT2 is installed and configured as a Return Air Temperature Sensor.
DOOR SWITCH	**NOT INSTALLED** OPEN SWITCH OPEN OPEN SWITCH CLOSED	NOT INSTALLED = There is no door switch. OPEN SWITCH CLOSED = A Door switch has been installed. The switch contacts will be CLOSED whenever the door is OPEN. OPEN SWITCH OPEN = A Door switch has been installed. The switch contacts will be OPEN whenever the door is OPEN.

Table 5–1 Configuration Settings (Continued)

Configuration	Selections	Description
DOOR SWITCH SHUTDOWN	**ALARM ONLY** UNIT SHUTDOWN LOW ENGINE SPEED DATA RECORDER ONLY COMPARTMENT SHUTDOWN (1, 2, or 3)	ALARM ONLY = When Door switch indicates that the door is open, a warning alarm will be displayed in the MessageCenter. UNIT SHUTDOWN = When Door switch indicates that the door is open, a warning alarm will be displayed in the MessageCenter, and the unit will shutdown. If this setting is chosen the following sub-setting will also be available. 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 sub-setting will also be available. 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. COMPARTMENT SHUTDOWN = Shutdown compartment 1, 2 or 3.
UNIT SHUTDOWN BELOW (ambient air temperature)	**OFF** 120 to -20°F (49 to -29°C)	If Door Switch = Unit Shutdown is selected: OFF = the unit will shutdown at any ambient temperature. Value = when ambient temperature is below the entered value, shut down will be allowed. (When ambient temperature is above the entered value, the unit will not shutdown.)
RUN LOW SPEED BELOW (ambient air temperature)	**OFF** 120 to -20°F (49 to -29°C)	If Door Switch = Low Engine Speed is selected: OFF = the unit will transition to low speed at any ambient temperature. Value = when ambient temperature is below the entered value, transition to low speed will be allowed. (When ambient temperature is above the entered value, the unit will not transition to low speed.)
REMOTE SWITCH 1, 2, 3, or 4	**NOT INSTALLED** ON CONTACTS CLOSED ON CONTACTS OPEN OPEN SWITCH CLOSED OPEN SWITCH OPEN	NOT INSTALLED = There is no remote 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 in the ON position. 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. OPEN SWITCH CLOSED = The remote switch will be used as a door switch. The switch contacts will be CLOSED whenever the door is OPEN. OPEN SWITCH OPEN = The remote switch will be used as a door switch. The switch contacts will be OPEN whenever the door is OPEN.

Table 5–1 Configuration Settings (Continued)

Configuration	Selections	Description
REMOTE SWITCH SHUT-DOWN 1, 2, 3, or 4	**ALARM ONLY** UNIT SHUTDOWN LOW ENGINE SPEED DATA RECORDER ONLY	ALARM ONLY = When the switch is activated, a warning alarm will be displayed in the Message- Center. UNIT SHUTDOWN = When the switch is activated, a warning alarm will be displayed in the Message- Center, and the unit will shutdown. LOW ENGINE SPEED = When the switch is activated, the engine will be forced to low speed. DATA RECORDER ONLY = The DataLink data recorder will record every time the switch is activated. There will be no alarms or messages displayed in the Mes-sageCenter.
OTHER SETTINGS		
ENABLE ADVANCED USER MODE:	YES / **NO**	YES = Advanced User mode is automatically enabled when the unit is powered on. NO = Driver mode is automatically enabled when the unit is powered on and Advanced User mode may be en-abled manually.
PROTECT DATA WITH PIN	YES / **NO**	NOTE: Master technician PIN code is described in **Sec-tion 5.2**. Using TRU-Tech, a data protect PIN code, which can override the master technician PIN code, may be en-tered into the APX Control System. YES = The data protect PIN code will override the master technician PIN code and data protect code must be en-tered to use the USB Interface port or data recorder print functions. NO = The data protect PIN code will not override the mas-ter technician PIN code when using the USB Interface port or data recorder print functions.
KEYPAD PARAMETERS LOCKOUT	YES / **NO**	YES = All Functional Parameters are locked and cannot be changed using the display mounted keys. NO = Functional Parameters can be changed using the display mounted keys, unless individually locked out by TRU-Tech.
8 HR ADDITIONAL DATA	**YES** / NO	YES = When the START/RUN-OFF switch is placed in the OFF position, the DataLink data recorder will contin-ue to record data for an additional 8 hours. NO = When the START/RUN-OFF switch is placed in the OFF position, the DataLink data recorder will stop re-cording data.
SATELLITE COMM (This Configuration is an op-tion, it will not display if the option is not installed.)	**OTHER** QUALCOMM	OTHER = The microprocessor is set for communication from Qualcomm T2 (Trailer Tracs 2) or any other supplier. QUALCOMM =- The microprocessor is set for communi-cation from Qualcomm Trailer Tracs.
HIGH SPEED DELAY	**1 Minute** 0 to 10 minutes in 0.5 min-ute increments	Select the length of time unit remains in low speed before transitioning to high speed.

Table 5–1 Configuration Settings (Continued)

Configuration	Selections	Description
LIGHT BAR	**NOT INSTALLED** 2 LIGHT	NOT INSTALLED = a remote light bar is not installed 2 light = a two light bar is installed.
NATURAL DEFROST	YES / **NO**	YES = Natural defrost will be allowed NO = Natural defrost will not be allowed Refer to Section 4.8 for more information on natural defrost)
BATT CHARGER (Applicable to unit - not lift gate - battery charger only.)	NO TEMP SENSOR **WITH TEMP SENSOR**	NO TEMP SENSOR = Use this setting when the battery charger does not have the temperature sensor wire. WITH TEMP SENSOR = Use this setting when the battery charger does have the temperature sensor wire (connected to the battery positive post).
SET DATE AND TIME	Indicates to the main microprocessor the current date and time. Refer to Section 5.2.3 for instructions on entering the date and time. **NOTE** Date and Time may also be configured under “Unit Identification”.	
NO AC POWER	**ALARM & SHUTDOWN** SWITCH TO ENGINE	ALARM & SHUTDOWN = If standby power is lost unit is to shut down SWITCH TO ENGINE = If standby power is lost diesel engine will be started.
STANDBY STARTUP DELAY	**OFF** 5 Seconds 10 Seconds 15 Seconds 20 Seconds	Indicates to the microprocessor the delay for this unit when starting in standby. 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.
STANDBY MAX GEN AMPS	**22A** 10 to 35 in 0.5A increments	Indicates to the microprocessor the maximum allowable amperage in Electric operation. USE FACTORY DEFAULT SETTING ONLY. DO NOT OPERATE UNIT WITH DIFFERENT SETTING.
SUPPLY AIR LIMIT FOR S/S (C2 available only if SAT2 is installed)	-21.6°F to -2.7° (-12°C to -1.5 °C) in 0.5°F or °C increments. **-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: 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.
SUPPLY AIR LIMIT FOR CONT (C2 available only if SAT2 is installed)	-21.6°F to 1.8°F (-12°C to -1°C) in 0.5°F or °C increments **-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.

Table 5–1 Configuration Settings (Continued)

Configuration	Selections	Description
HIGH SPEED PULLDOWN	YES / **NO**	When active, this logic indicates if temperature limits regulating the exit of pulldown mode are modified or not. YES = Unit will continue in High Speed until it reaches setpoint.
COMP RESTART OFFSET	**0.36°F** 0.36 - 1.8°F (0.2 - 1.0°C)	In Continuous Run and when difference between ambient and setpoint is < 105°C, use the COMP RESTART OFFSET configuration value for the switch point to turn cool on (instead of 0.25°C). If the ambient and setpoint are more than 105°C then the switch point remains 0.25°C.
SAT2 / SAT3	**Not Installed** Installed	Indicates if SAT2 / SAT 3 is installed.
C2 / C3 EVAPORATOR CONFIGURATION	**0 - NONE** 1 - MJD1100 2 - MJD2200 3 - MJS1100 4 - MJS2200	Remote evaporator configuration
NUMBER OF COMM MODULES	**0 - Not Installed** 1 - 1 Optional Comm Module Installed	If set to 1, this enables **27200 NO COMM FROM MICRO TO COMM MODULE**
NUMBER OF REMOTE PANELS	**0 - Not Installed** 1 - 1 Remote Panel Installed	If set to 1, this enables **20101 NO COMM FROM MICRO TO REMOTE DISPLAY** If set to 0 and a remote panel is connected, the remote panel will display a message indicating that the configuration must be changed and will not operate until then. **NOTE** If set to 1, and number of comm modules is set to 0, the number of comm modules is automatically increased to 1 on the main micro. A remote panel will not be operable without a comm module.

Table 5–1 Configuration Settings (Continued)

Configuration	Selections	Description
RAIL SETTINGS		
UNIT OPERATION	**STANDARD** RAIL	RAIL = The system is set to control Rail refrigeration operation. When this Configuration is set to “RAIL” the following “VEHICLE ID”, “RAIL SHUTDOWN OVERRIDE” and “RAIL OVERRIDE RESTARTS” Sub-Configurations will be available.
VEHICLE ID	ASSET **TRAILER** CAR	Modifies the prefix wording used for display of the customer assigned ID number entered in the “TRAILER ID” Configuration. For example, if the customer assigned ID number entered is 12345: ASSET = will display “ASSET # 12345” TRAILER = will display “TRAILER # 12345” CAR = will display “CAR # 12345”
RAIL SHUTDOWN OVERRIDE	NO **YES**	NO = When alarm **00030 FAILED TO RUN MINIMUM TIME** or **00031 FAILED TO START - AUTO MODE** is activated, the system will not override the alarm(s) and the unit will not restart until the alarms are cleared manually. YES = When alarm **00030 FAILED TO RUN MINIMUM TIME** or **00031 FAILED TO START - AUTO MODE** is activated, the unit will automatically override and clear the alarm(s) and attempt a restart after 4 hours. When this Configuration is set to “YES” the following “RAIL OVERRIDE RESTARTS” Sub-Configurations will be available.
RAIL OVERRIDE RESTARTS	1-20 **3**	With the default setting the system is allowed to override and clear alarm **00030 FAILED TO RUN MINIMUM TIME** or **00031 FAILED TO START - AUTO MODE** three consecutive times before the override is locked out and no further restart attempts will be allowed until the alarm(s) are cleared manually. The number of restart attempts allowed before the override is locked out may be changed by entering the desired number in this Sub-Configuration. Setting this number too high may result in a discharged or damaged battery if the unit never actually starts or fails to run long enough to charge the battery prior to shutting down again.

SECTION 6

MessageCenter Messages

6.1 MessageCenter Messages

The following table lists common messages which do not appear in other lists in this manual and a description of their meaning. Refer to **Section 9** for a list of Alarm messages. Refer to **Section 3.15** for a list of Unit Data messages. Refer to **Section 3.18** for a list of Functional Parameter messages. Refer to **Section 5.2.3** for a list of Configuration messages.

Table 6–1 MessageCenter Messages

Message	Description
ACTIVE	This message will appear in the MessageCenter along with the current IntelliSet indicating that the IntelliSet is active and none of its settings have been modified.
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.)
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.
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 **Section 3.12** and **Section 8.9.12**.
CANNOT START PRETRIP	Due to current unit conditions a Pretrip test cannot be started. Refer to Pretrip **Section 3.6**.
CHANGE INTELLISET TO EXIT	The IntelliSleep IntelliSet is active. Alternates with “INTELLI-SLEEP MODE” at five second interval whether unit is running or not.
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. There is currently an active non-shutdown alarm in the alarm list.
CHECK DOOR	The door switch indicates that a refrigerated compartment door is not closed.
CHECK FUEL LEVEL (Requires Optional Sensor)	The level in the fuel tank is very close to empty.
COMPONENT TEST MODE	Pressing the = key while this message is highlighted will allow user access to Component Test mode.
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.
DATA RECORDER FAILURE	The microprocessor has stopped recording Unit Data.
DEFROST CYCLE STARTED	The unit has gone into defrost.
DEFROST	The unit is in the defrost cycle.

Table 6–1 MessageCenter Messages

Message	Description
DOOR OPEN	A refrigerated compartment door is open.
DOOR OPEN - LOW SPEED	A refrigerated compartment door is open forcing the unit to run in low speed.
EES SERVICE REQUIRED	The EES requires service.
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	
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 5.2.5**.
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.
INACTIVE ALARMS IN MEMORY	There are inactive alarms in the microprocessor alarm list which have not yet been cleared.
INTELLI-SLEEP MODE	The IntelliSleep IntelliSet is active. This message alternates with “CHANGE INTELLISET TO EXIT” at 5 second interval whether unit is running or not.
KEYPAD (display mounted keys) LOCKED-BATTERY TOO LOW	Once the battery voltage goes below 7.0 Volts for 10 seconds, all of the keys on the display will be locked.
LOSS OF COMMUNICATIONS	There is a loss of communications between the display module or other module(s). If a specific module is involved, the name of the module will also be indicated.
MAX /MIN SETPOINT HAS BEEN REACHED	Maximum or minimum 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.
MIN SETPOINT HAS BEEN REACHED	Minimum setpoint allowed by configuration settings has been reached.
MODIFIED	This message will appear in the MessageCenter along with the current IntelliSet indicating that the IntelliSet is active and one or more of its settings have been modified.
NO ACTIVE ALARMS	There are no active alarms in the microprocessor Alarm List.
NO INACTIVE ALARMS	There are no inactive alarms in the Alarm List
PC MODE	The START/RUN-OFF switch is in the OFF position, the engine is not running in order to enter PC mode.
PM DUE	Preventative Maintenance is now due on the unit. Information on what meter(s) has timed out and the reset feature is provided under Technician Hour Meters. Refer to **Section 5.2.1**.
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.

Table 6–1 MessageCenter Messages

Message	Description
PRESTRIP STOPPED BY USER	Pretrip has been stopped by user.
PRODUCTSHIELD: ECONO ON	The unit is operating in ProductShield Econo which overrides normal unit Start-Stop or Continuous Run operation. Refer to Section 4.9.4.
PRODUCTSHIELD: HIGH AIR ON	The unit is operating in ProductShield High Air which overrides normal unit speed operation. Refer to Section 4.9.4.
PRODUCTSHIELD: WINTER ON	The unit is operating in ProductShield Winter which overrides normal unit operation. Refer to Section 4.9.4.
RECORDING DATA - PLEASE WAIT MICRO WILL RESTART WHEN COMPLETE	This message will be displayed when the unit is starting and the main microprocessor is completing communicating with another module.
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.
REMOTE SWITCH 1 (2, 3, or 4) OPEN	Remote switch is open. May be connected to a refrigerated compartment door or a remote control switch.
REMOTE SWITCH 1 (2, 3, or 4) 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.
SERVICE MODE	Selection which is used when servicing the refrigeration system. Refer to Section 5.2.5.
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 START/RUN-OFF 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 START/RUN-OFF switch in the OFF position, then back to the START/RUN 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 (COMPARTMENTS 1, 2, or 3)	The unit is operating correctly.

Table 6–1 MessageCenter Messages

Message	Description
TECHNICIAN RESET REQUIRED (AL00021)	Alarm AL00011 or AL00012 has been activated three times in the last two hours and the unit has been locked out. Refer to **Section 7** for further information.
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.
UNIT SHUTDOWN - DOOR OPEN	The unit has shutdown because the refrigerated compartment door is open.
UNIT SHUTDOWN - PRESS ALARM KEY	An active shutdown alarm has shut the unit down.
UNIT SHUTDOWN - REMOTE SWITCH 1 (2, 3, or 4)	The unit has shutdown because switch is open. May be connected to a door or a remote control switch.
USE UP/DOWN KEY TO SCROLL USE = KEY TO SELECT ITEM TO CHANGE	Items available are being displayed or additional items are available for selection. Use the up or down arrow key to highlight or display and highlight the desired selection and then use the “=” key to select it.
VIEWING MENU SOFTKEY SELECTIONS PRESS MENU KEY TO SCROLL	Additional soft key selections are available and the MENU key is to be used to scroll and view them.
WARNING: NO TEMP CONTROL	The temperature sensors have failed and the unit has entered Cargo Protect mode. Refer to **Section 4.10.2**.

SECTION 7

Alarm Troubleshooting

⚠ WARNING

APX Control System equipped units may start automatically at any time the START/ RUN-OFF switch is in the START/RUN 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

When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instruction, ensure the START/RUN-OFF switch is in OFF position and, whenever practical, disconnect the negative battery connection.

7.1 Introduction

This section provides guidance for troubleshooting alarms. The alarm light will be illuminated when there is at least one alarm stored in the system. Instructions for reviewing the active alarm list are provided in **Section 3.16** while instructions for reviewing the inactive alarm list are provided in **Section 5.2.2**.

When an alarm occurs, look through both active and inactive alarm lists 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. Alarms that are only activated during a Pretrip will begin with a capital "P".

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 to the use of a different order. For example, if the trailer is loaded, condensing section 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. (Refer to Note 1 in **Notes** Section)

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 inactive alarms in memory when the unit leaves the repair facility.

When working on the refrigeration system, an accurately calibrated manifold gauge set should always be installed, set up to read compressor suction and discharge pressure. Compressor suction pressure is displayed under Unit Data when in the Driver Mode. If in the Advance User Mode, compressor discharge pressure and temperature will also be displayed.

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

⚠ WARNING

The alarm related troubleshooting procedures in this section are to be performed by properly trained personnel only.

7.2 Notes

NOTE

Note 1: The active alarm list may be cleared when in the Driver Mode or Advanced User Mode by pressing the CLEAR ALARMS soft key. 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 may be cleared when in the Technician Mode in the same way. From the inactive alarm list the technician has the option to “Clear Inactive” alarms only or to “Clear All” alarms. Clearing the inactive alarm list removes the alarm from the system. However alarms that have been activated will remain in the data recorder.

NOTE

Note 2: The Virtual Tech system may provide a “signal” voltage when a circuit is not energized (nominal 3 to 5 volts). This signal voltage is used by the APX Control System to activate an alarm message if there is a problem in the circuit but should not be used for component testing. When instructed to test for voltage, energize the component using Component Test Mode to ensure the correct voltage is being read. Refer to **Section 5.2.4**, Also, testing may be performed without the unit starting. To do this, place the unit in PC Mode before using Component Test Mode. Refer to **Section 5.3.2**.

NOTE

Note 3: Sensors may be tested by taking a resistance measurement, at the sensor side of the harness connector, at the sensor location. To do this, being careful not to damage the connector pins, disconnect the sensor from the harness and measure resistance. Refer to **Table 8–1** for chart of resistances for different sensors. The interconnecting wiring may also be tested by checking for continuity between the harness side of the connector at the sensor location and the harness side of the connector at the module.

NOTE

Note 4: The switches, (door/remote, high pressure, engine oil pressure and defrost air) may be tested by checking continuity, at the switch side of the harness connector, at the switch location. To do this, being careful not to damage the connector pins, disconnect the switch from the harness and check continuity to determine if the switch is open or closed. The interconnecting wiring for the door/remote, engine oil pressure and defrost air switches may also be tested by checking for continuity between the harness side of the connector at the switch location and the harness side of the connector at the module. High pressure switch (HPS) interconnecting wiring may be tested by checking for continuity between the harness side of the connector at the high pressure switch location and the PCM or J-1 harness connector.

NOTE

Note 5: Some tests can only be conducted while the unit is operating. The unit may be started automatically by placing the SROS in the Start/Run position.

7.3 Alarms

00001 LOW FUEL LEVEL WARNING

NOTE
This is an optional alarm which will only occur when a fuel level sensor is present & configured “YES”.

- ACTIVATION: The ENCU circuit is energized (3MM-9) and fuel level is 15% or less for more than 30 seconds.
- UNIT CONTROL: Engine Operation: Alarm only.
  Electric Operation: This alarm will not activate in electric operation.
- RESET CONDITION: Auto Reset when the ENCU circuit is energized (3MM-9) and fuel level is above 17% for more than 30 seconds, or alarm may be manually reset using the display mounted keys or by turning the unit off, then back on again.

NOTE: Follow the Troubleshooting steps until a problem is found. Once a repair or correction is made, the active alarm should clear itself as described below. Operate the unit through the appropriate modes to see if any active alarm occurs.

CORRECTIVE ACTIONS:

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 **00126 CHECK FUEL SENSOR CIRCUIT**. Alarm condition must be corrected and the alarm cleared to continue.

00011 CHECK ENGINE OIL PRESSURE

NOTE
This alarm may be activated if too high a viscosity oil is used in cold ambient.

- ACTIVATION: The ENCU circuit is energized (3MM-9) and engine oil pressure is below 12 psig (0.82 bar) for longer than 5 seconds while the engine is running.
- UNIT CONTROL: Engine: Alarm only.
  Electric Operation: This alarm will not activate in Electric Operation.
- RESET CONDITION: Auto reset or alarm may be manually reset using the display mounted keys or by turning the unit off, then back on again.

NOTE: Follow the Troubleshooting steps until a problem is found. Once a repair or correction has been made, clear the active alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs.

CORRECTIVE ACTIONS:

1. **Check Engine Oil Level -** Check engine oil dipstick. Add engine oil as needed to fill.
2. **Check Engine Oil Pressure Switch (ENOPS) Power & Wiring**
   a. Inspect switch, connector pins & terminals. Verify that there is no physical damage to the switch. Check the connections for damage and corrosion.
   b. Using Component Test Mode, energize the ENCU Power Circuit. Check for power at the switch connector. Must have minimum 11 VDC. If not, check the connectors and wiring between terminals for damage, moisture or corrosion.
   c. Check for continuity from switch connector terminal A to ENCU-15. If good continuity is not present, check connectors and wiring between terminals for damage, moisture or corrosion.
   d. Check for continuity from switch connector terminal B to ENCU-18. If good continuity is not present, check connectors and wiring between terminals for damage, moisture or corrosion.
3. **Check ENOPS Switch -** Remove switch, connect to an external pressure source and test. Contacts close on a pressure rise at 15 psig (1.02 bar). Contacts open on a pressure fall at 12 psig (0.82 bar).
4. **Check Engine Oil Pressure -** Connect mechanical oil gauge. Oil pressure must be greater than 15 psig (1.02 bar.).

00012 HIGH COOLANT TEMPERATURE

- ACTIVATION:

  Condition 1: Ambient temperature is below 120°F (48.9°C) and engine coolant temperature is above 230°F (110°C).

  Condition 2: Ambient temperature is above 120°F (48.9°C) and, engine coolant temp is above 241°F (116°C).

  Condition 3: Ambient temperature is below 120°F (48.9°C) and the engine coolant temperature has remained between 230 and 241°F (110 and 116°C) for more than 5 minutes.

- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: This alarm will not activate in electric operation.

- RESET CONDITION: Auto reset after 15 minutes if the engine coolant temp falls below 212°F (100°C), or alarm may be manually reset using the display mounted keys or by turning the unit off and back on again.

NOTE: Follow the Troubleshooting steps until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs.

CORRECTIVE ACTIONS:

1. **Check Coolant Level**

   WARNING

   Do not remove the cap from a hot coolant system. If the cap must be removed, do so very slowly in order to release the pressure without spray.

   a. Check coolant level in overflow bottle. 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 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.

3. **Check Airflow Through Radiator & Condenser Coil**

   a. Inspect condenser & radiator. Ninety percent or more of the coil surface must be undamaged. Condenser/Radiator coil must be clean.

   b. Check airflow (with unit running). Verify even airflow through the entire coil and no “dead” spots.

   c. Check condenser fan rotation / operation. Fans should operate correctly. Air should be directed in through the grill, and into the engine compartment.

4. **Check Water Pump Belt -** Check belt condition. Verify no Glazing, no Cracking, no Slipping. Replace belt if required. Refer to **Section 8.6.15**.

Alarm continued on next page...

00012	HIGH COOLANT TEMPERATURE - CONTINUED

5. **Check Engine Coolant Temperature Sensor Wiring**

   a. Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**). Verify no physical damage to harness and 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.

6. **Check Engine Cooling System**

   a. Compare actual engine temperature to the Unit Data reading. Refer to **Section 3.15**. Temperature must be within ± 20°F (± 11.1°C).

   b. Test operation of thermostat. Must operate correctly.

   c. Check water pump operation. Verify no seepage at weep hole, bearings tight and quiet, and Impeller firmly attached to shaft.

   d. Check cooling system for scale, sludge, rust, etc. Coolant must be clean & clear with 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.

00013 HIGH DISCHARGE PRESSURE

- ACTIVATION: Compressor discharge pressure switch (HPS) contacts are open. HPS contacts open when the discharge pressure rises. Refer to **Section 2.10**.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm with PSCON still energized. CSMV at 50% and EVXV controls superheat.
- RESET CONDITION: Auto reset after 15 minutes if the compressor discharge pressure falls below limit, or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check System Pressures -** Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown in Unit Data. Refer to **Section 8.9.11** for instruction on comparison. If discharge pressure is in normal range, proceed to step 5.
2. **Check Airflow Through Radiator & Condenser Coil**
   a. Inspect condenser & radiator. Ninety percent or more of the coil surface must be undamaged. Condenser/Radiator coil must be clean.
   b. Check airflow (with unit running). Verify even airflow through the entire coil, and no "dead" spots.
   c. Check condenser fan rotation / operation. Fans should operate correctly. Air should be directed in through the grill, and into the engine compartment.
3. **Perform Pre-trip -** Check CSMV & ECXV tests. Refer to **Section 3.6**. Pass Test.
4. **Check Refrigerant Charge -** Refer to **Section 8.7.2**. Charge must be correct.
5. **Check HPS Power And Wiring**
   a. Inspect switch, connector pins & terminals. Verify that there is no physical damage to the switch. Check the connections for damage and corrosion.
   b. Check for power at the 2MM35 or J1A. If a minimum of 11 VDC is not present, check connectors and wiring between terminals for damage, moisture or corrosion.
   c. Check continuity from the switch connector B position to 3MM16 2MM35. Inspect SP-23 and SP-24 connections. If they are OK replace HPS. If good continuity is not present, check connectors and wiring between terminals for damage, moisture or corrosion.
6. **Check HPS**
   a. With discharge pressure below the switch closing pressure (refer to **Section 2.10**). Check continuity from the switch connector B position to 2MM35. Switch closed.
   b. Check switch operation. Test switch. Refer to **Section 8.9.10** step b.
7. **Refer to Refrigeration Troubleshooting -** Refer to **Section 9.4**. Discharge must be in range for the current ambient and refrigerated compartment conditions.

00014	HIGH A/C AMPS

- ACTIVATION: AC Current Sensor 1, 2, or 3 is greater than 28.5A for 3 seconds.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Auto reset after 14 minutes if AC Current Sensor 1, 2, and 3 reading is less than 27 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **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.
2. **Check Current Draw**
   a. Use a clamp around A/C ammeter to check amps at power wires. Must be 1.0 Amp of reading in Unit Data.
   b. Check A/C amps with compressor running. Must be greater than 5 Amps.
   c. Compare A/C Amp readings between L1-L2-L3. Maximum allowable difference is 10 Amps.
3. **Check Wiring**
   a. Inspect wiring from CT to 1CCB. Check related Splice Points. (See wiring schematic **Section 10.4**)
   b. Verify there is no physical damage to harness, no damage, moisture, or corrosion in connectors.

00015 BATTERY VOLTAGE TOO HIGH

- ACTIVATION: Voltage at the main microprocessor is greater than 17 VDC.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Auto reset after 15 minutes when the voltage at the main microprocessor is between 11 and 14 VDC, or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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, above unit off reading (battery charger charging).

   NOTE

   Voltage with unit running should always be higher than voltage with unit off due to battery charging.

2. **Check Battery Charger Voltage**

   a. Test voltage at PCM-T3 with unit off. Must be between 11-16 VDC.

   b. Test voltage at PCM-T3 with unit running. Must be between 12-16 VDC.

3. **Check Voltage At Main Microprocessor**

   a. Check voltage reading at 3MM-23 & 3MM-34. Must be between 11-16 VDC.

   b. Check Unit Data voltage reading. Must be within 0.5 VDC of reading obtained at 3MM-23 & 3MM-34. If voltages are out with unit running, check Battery Charger. Refer to **Section 8.10.13**.

00016 BATTERY VOLTAGE TOO LOW

- ACTIVATION: Voltage at the main microprocessor is less than 10 VDC (except when the engine starter is engaged).
- UNIT CONTROL: Engine and Electric Operation: Shutdown and alarm. Alarm only if activated while starting unit.
- RESET CONDITION: Auto reset after 15 minutes when the voltage at the main microprocessor is between 11 and 14 VDC, or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check For Alarm 00051**
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 between 11-16 VDC.

   c. Test voltage at battery with unit running. Must be between 12-16 VDC, above unit off reading (battery charger charging).

   NOTE

   Voltage with unit running should always be higher than voltage with unit off due to battery charging.

   d. Perform load test on battery. Follow battery manufacturer's procedure.
3. **Check Connections to Main Microprocessor**

   a. Check connections at PCM-T1, T2 & T3. Verify that connections are not damaged or corroded.

   b. Check voltage reading at 3MM-23 & 3MM-34. Must be above 11 VDC.

   c. Check Unit Data voltage reading. Must be within 0.5 VDC of reading obtained at 3MM-23 & 3MM-34.

   d. Check ground at 3MM-28 & 1MM-1. If ground is not good, check connectors and wiring between terminals for damage, moisture or corrosion.

00017 HIGH COMP DISCHARGE TEMP

- ACTIVATION: “Check Compressor Discharge Sensor” alarm not active (if alarm is active, refer to **00125 CHECK COMP DISCHARGE SENSOR** first) and: discharge temp rises above 285.1°F (140.6°C) for 30 seconds, or discharge temp rises above 295.0°F (146.1°C).
- UNIT CONTROL: Engine Operation: Shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Auto Reset after 15 minutes when discharge temp falls below 266°F (130.0°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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Airflow Through Radiator / Condenser Coil**
   a. Inspect condenser / radiator fins. Fins must be straight. 90% or more of the coil surface must be undamaged. There can be no “dead” air spaces. Condenser / Radiator coil must be clean (refer to **Section 8.6.14**).
   b. Check condenser airflow. Even airflow through the entire coil, with no “dead” spots.
   c. Check condenser fan rotation / operation. Fans should operate correctly. Air should be drawn in through the grill, and directed into the engine compartment.
2. **Check LIV, CSMV, EVXV and ECXV** - Clear the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.
3. **Check For Low Refrigerant Charge** - Check refrigerant level in the receiver. Refer to **Section 8.7.2**. Generally, level should be between upper & lower sight glasses with a refrigerated compartment temperature of 35°F (1.0°C) or lower.
4. **Check System Pressures** - Install Manifold Test 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. Pressures must be in the normal range for ambient & refrigerated compartment temperature conditions.
5. **Check Compressor** - Check compressor for excessive vibration or noise. Replace compressor. Refer to **Section 8.8**.
6. **Check System For Noncondensible** - Check refrigeration system for noncondensable gas(es). No noncondensable gas(es) may be present. Refer to **Section 8.7.2**.

00018 LOW REFRIGERANT PRESSURE

- ACTIVATION: Suction Pressure has been less than -6.3 psig (-0.43 bar) for the Low Suction Pressure Configuration time or 10 seconds (whichever is less).
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.

  Electric Operation: Alarm only or (if configured for shutdown) refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Auto Reset when suction pressure rises above 0.0 (bar or psig). Alarm may be manually reset via keypad or by turning the unit OFF, then ON again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Visually Inspect Unit** - Visually inspect unit for damage to liquid line causing restriction or signs of temperature drop at the filter drier. All tubing from the receiver to the evaporator section must be in good condition. Verify that there is no temperature drop at the drier or anywhere on the liquid line.
2. **Perform Pretrip Check** - Clear the Active Alarm list, then run a Pretrip and check for alarms. Any active alarms must be corrected and cleared before proceeding.
3. **Check For Low Refrigerant Charge** - Check refrigerant level in the receiver. Refer to **Section 8.7.2**. Generally, the level should be between the upper & lower sight glasses with a refrigerated compartment temperature of 35°F (1.0°C) or lower.
4. **Manually Defrost Unit** - Defrost unit and terminate automatically. Typical defrost cycle time is 5-20 minutes. Suction pressure should rise gradually during cycle.
5. **Check Evaporator Section** - Check evaporator section, return air bulkhead, air chute, and evaporator coil for cleanliness and airflow. Refer to **Section 9.4.10**
6. **Check System Pressures** - Install Manifold Test Set and check and compare compressor discharge & suction pressures with those shown on the microprocessor. Suction pressure must be above 0.0 (psig or bar) Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display.
7. **Check Transducer Wiring. Refer to Section 8.9.11**

   a. Inspect transducer & connector pins & terminals. (See wiring schematic **Section 10**.) Verify that there is no physical damage to sensor, and the pins in plug are not damaged or corroded.

   b. Check for voltage at the transducer plug between pins A (+) and B (ground). Voltage should be approximately 12VDC.

   c. Reconnect the transducer plug. Check for voltage between 1MP-29 and ground. Voltage should be greater than 0.24 VDC and less than 5 VDC.
8. **Check Compressor Suction Modulation Valve (CSMV) -** Check CSMV. Refer to **Section 8.9.7**.
9. **Check Expansion Valve (EVXV) -** Refer to **Section 8.9.8**.

00019 LOW FUEL SHUTDOWN

NOTE

This is an optional alarm. This alarm will only occur if the Fuel Level Sensor Configuration is YES.

- ACTIVATION: The fuel level is 10% or less for more than 60 seconds AND Alarm 000126 - “Check Fuel Sensor Circuit” is not active.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Alarm only.
- RESET CONDITION: Auto reset when fuel level is above 12% for more than 1 minute, or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check For Low Fuel Level** - Check level in the tank. Add fuel as needed.
2. **Check Low Fuel Level Sensor** - Refer to procedure for alarm **00126 CHECK FUEL SENSOR CIRCUIT**. Alarm condition must be corrected and the alarm cleared to continue.

00020 MAXIMUM COMPRESSOR ALARMS

- ACTIVATION: This option must be installed and alarm must be enabled by configuring the Compressor Alarm Shutdown to YES. Alarms **00013 HIGH DISCHARGE PRESSURE**, **00017 HIGH COMP DISCHARGE TEMP**, **00018 LOW REFRIGERANT PRESSURE**, **00027 HIGH SUCTION PRESSURE**, or **00028 CHECK REFRIGERATION SYSTEM** individually occur 3 times within the last 2 hours.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Clear the alarm from inactive alarm list. This alarm and the alarm(s) that caused it 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Determine Which Alarm Activated This Alarm**
   a. Check active alarm list for Alarm **00013 HIGH DISCHARGE PRESSURE**, **00017 HIGH COMP DISCHARGE TEMP**, **00018 LOW REFRIGERANT PRESSURE**, **00027 HIGH SUCTION PRESSURE**, or **00028 CHECK REFRIGERATION SYSTEM**. One or more of these alarms will be present.
   b. Follow the troubleshooting steps for the alarm(s) found, and correct the alarm condition. All alarm conditions must be corrected.
2. **Reset Alarm** - Clear all inactive alarms. Refer to **Section 5.2.2**. All alarms must be cleared to start unit.

00021 TECHNICIAN RESET REQUIRED
• ACTIVATION: The High Engine Temp Shutdown Configuration and/or Engine Oil Pressure Shutdown Configuration is/are set to YES, and either Alarm 00011 - Low Engine Oil Pressure, **or** Alarm 00012 - High Coolant Temperature has become active and shut the unit down three times within the past 2 hours. • UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm. Electric Operation: This alarm will not activate in Electric Operation • RESET CONDITION: Clear the alarm from the inactive alarm list. This alarm and the alarm(s) that caused it 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary. **CORRECTIVE ACTIONS:** 1. **Determine Which Alarm Activated This Alarm**. a. Check active alarm list for Alarm **00011 CHECK ENGINE OIL PRESSURE** or **00012 HIGH COOLANT TEMPERATURE**. One of these alarms will be present. b. Follow the troubleshooting steps for the alarm(s) found, and correct the alarm condition. All alarm conditions must be corrected. 2. **Reset Alarm** - Clear all inactive alarms. Refer to **Section 5.2.2**. All alarms must be cleared to start unit.

00022 LOW SUCTION SUPERHEAT

- ACTIVATION: "Check Suction Temperature Sensor" and/or "Check Evaporator Temperature Sensor" alarms are not active (refer to Alarm 000127 and/or 000131 first) and:

  Compressor suction superheat (Compressor Suction Temperature (CST) minus saturated temperature for Compressor Suction Pressure (CSP) is less than 8°F (4.4°C) for more than 3-4 minutes.

- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm with PSCON still energized.

- RESET CONDITION: Auto reset after 15 minutes, or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check System Pressures**

   a. Check Suction and Evaporator Pressure reading at the compressor. While the compressor is running and the SMV is greater than 70% open, verify evaporator and suction pressure readings within 3 psi of each other, with evaporator pressure slightly higher than suction pressure. If not, check the Pressure Transducers. Refer to **Section 8.9.11**.

   b. Install manifold gage set and check and compare compressor discharge, suction and evaporator outlet pressure to the Unit Data readings. Refer to **Section 8.9.11** for instruction on comparison.

2. **Check Evaporator Section** - Check evaporator section, return air bulkhead, air chute, and the evaporator coil (for cleanliness and airflow). Refer to **Section 9.4.10**

3. **Check Suction and Evaporator Temperature Sensors**

   a. Check Evaporator and Suction temperature sensor insulation integrity, and make sure insulation is properly installed. Repair or replace any insulation if required. Loose or missing insulation will cause inaccurate refrigerant temperature readings.

   b. Inspect sensor & connector. Verify there is no damage to sensor. Verify there is no damage, moisture, or corrosion in connector.

   c. Check sensor resistance (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C.) See **Table 8–3** for complete table of temperatures and resistance values.

4. **Check Expansion Valve (EVXV)**

   a. Visually inspect valve. Check that the coil is seated properly.

   b. Check operation of valve. Refer to **Section 8.9.8**.

5. **Perform Pretrip Check** - Clear the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.

00023 A/C CURRENT OVER LIMIT

- ACTIVATION: The high voltage amp draw is over the limit shown in the following table for more than 10 seconds.

CONDITION	DRAW
Engine High / Low Speed, Standby Cool or Pretrip / Engine Off	30A
Any 2 compartments or 3 compartments enabled: Engine Off	10A
Engine High Speed Heat	18A
Engine Low Speed or Standby Heat	14A
Engine High Speed Defrost (With heaters energized)	16A
Engine Low Speed or Standby Heat Defrost	12A
Engine High/Low Speed or Null	8A
Engine Low Speed or Standby Null	8A
Engine or Standby Natural Defrost (when heaters are de-energized)	10A

- UNIT CONTROL: Engine Operation: Refrigeration system shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Auto reset after 15 minutes or alarm may be manually reset via keypad or by turning the unit OFF, then back ON.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Perform Pretrip** - Clear the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.
2. **Check Configurations for Correct Maximum Amps Settings**, **refer to Table 5–1**
   a. Check STANDBY MAX GEN AMPS configuration setting. Setting should be 22 - 25 Amps. Maximum recommended setting is 25 Amps. Minimum recommended setting is 22 Amps.
3. **Check For Electrical Failure In System**
   a. Check electrical motors. Visually inspect condenser fans and evaporator fan 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.
   b. Check for defective wiring. Check for discolored wiring at contactors and loose connections.
   c. Check for defective contactor. Remove and replace any suspected contactor(s).

Alarm continued on next page...

00023 A/C CURRENT OVER LIMIT - CONTINUED

4. **Check High Voltage Components Amp Draw (with the unit operating)**

   a. Check condenser fan amp draw on all legs. (CDCON)

   b. Check evaporator fan motor amp draw on all 3 legs (1EVCON, RMT EVCON)

   c. Check compressor amp draw on all 3 legs. (CCON)

   d. Check heater amp draw. (1HTCON1, 1HTCON2, 2HTCON1, 2HTCON2, 3HTCON1 & 3HTCON2)

   WARNING

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

   Verify that all three actual amperage readings for each component are within 10% of each other, and are within the values shown in **Section 2.11**.

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 2.11**.

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 2.11**.

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 2.11**.

   b. Check voltage at CCON with compressor operating. T1-T2, T1-T3, T2-T3. Must be within voltage limits shown in **Section 2.11**.

8. **Verify Accuracy of AC Current Sensor (CT1, CT2 & CT3)**

   a. Put microprocessor in PC Mode. Refer to **Section 5.3.2**. Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.

   b. Use a clamp on ammeter to measure current draw of all 3 legs of the T side of GENCON. Meter reading should be the same as Unit Data: Compare meter reading to Unit Data in PC Mode. Compare meter reading to Unit Data with unit under load.

9. **Defective Overload Ground Fault (OGF) Detector** - Opens prematurely. Remove and replace.

00024 COMPRESSION RATIO EXCEEDED

- ACTIVATION: If the compressor compression ratio is greater than 21 for 20 seconds.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Auto reset when compression ratio is less than 21 for 3 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for Refrigerant Overcharge** - Refer to **Section 8.7.2**. Must be correct.
2. **Check Airflow through Radiator / Condenser Coil**
   a. Inspect condenser / radiator fins. Fins must be straight. 90% or more of the coil surface must be undamaged. There can be no dead air spaces. Condenser / Radiator coil must be clean (refer to **Section 8.6.14**).
   b. Check condenser airflow. Make sure there is even airflow through the entire coil and no “dead” spots.
   c. Check condenser fan rotation / operation. Fans should operate correctly. Air should be drawn in through the grill, and directed into the engine compartment.
3. **Check Evaporator Section** - Check evaporator section, return air bulkhead, air chute, cleanliness of evaporator coil and airflow. Refer to **Section 9.4.10**
4. **Check System for Non-Condensables** - Check refrigeration system for noncondensable gas(es). No noncondensable gas(es) may be present. Refer to **Section 8.7.2**.
5. **Look for High Discharge or Low Suction Pressure Causes** - Refer to Alarm **00013 HIGH DISCHARGE PRESSURE** and **00018 LOW REFRIGERANT PRESSURE**. Discharge and suction pressures must be in normal range for the current ambient and refrigerated compartment temperature conditions. Refer to Abnormal Pressure Trouble Shooting **Section 9.4.8**.

00027 HIGH SUCTION PRESSURE

- ACTIVATION: The refrigeration system is running and the suction pressure has been greater than 98 psig (6.7 bar) for more than 10 minutes.
- UNIT CONTROL: Engine Operation: Alarm only or (if configured for shutdown) engine and unit shutdown and alarm.
  Electric Operation: Alarm only or (if configured for shutdown) refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Auto reset when suction pressure is less than 75 psig (5.1 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Refrigerant Charge** - Refer to **Section 8.7.2**. Charge must be correct.
2. **Perform Pretrip Check** - Clear the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.
3. **Check System Pressures** - Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown in Unit Data. Suction pressure must be above 3 psig (0.2 bar) and should be in the normal range for ambient & refrigerated compartment conditions. Refer to **Section 8.9.11**.
4. **Check Compressor**

   a. Check compressor for excessive vibration or noise. Replace compressor

   b. Cover condenser and build-up discharge pressure. Must be able to raise pressure to 400 psig (27.2 bar).
5. **Check Transducer Wiring. Refer to Section 8.9.11**.

   a. Inspect transducer & connector pins & terminals. (See wiring schematic **Section 10.3**.) Verify there is no physical damage to sensor. Verify there is no damaged or corroded pins in plug.

   b. Check for voltage at the transducer plug between pins A (+) and B (ground). Voltage should be approximately 12VDC. If OK, go to next step. If not, continue with this step.

   c. Reconnect the transducer plug. Check for voltage between 1MP-29 and ground. Voltage should be greater than 0.24 VDC and less than 5 VDC.
6. **Check Expansion Valve (EVXV)**

   a. Visually inspect valve. Check coil is seated properly.

   b. Check valve. Refer to **Section 8.9.8**.

00028 CHECK REFRIGERATION SYSTEM

- ACTIVATION: The refrigeration system is running and the discharge pressure is less than 5 psig (0.34 bar) higher than suction pressure for more than 30 seconds.
- UNIT CONTROL: Engine Operation: Alarm only or (if configured for shutdown) engine and unit shutdown and alarm.
  Electric Operation: Alarm only or (if configured for shutdown) refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Auto reset when discharge pressure is more than 20 psig (1.36 bar) above the suction pressure when in alarm only, or auto reset after 30 minutes when shutdown is configured or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Verify Compressor is Running** - Check Compressor Amp draw - CCON T1-T2, T1-T3, T2-T3. Check all three voltage legs. Must be within voltage limits shown in **Section 2.11**.
2. **Perform Pretrip Check** - Clear the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.
3. **Check System Pressures** - Install Manifold Test 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) Discharge pressure must be more than 5 psig (0.3 bar) higher than the suction pressure. Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display.
4. **Check Compressor** - Check compressor for excessive vibration or noise. Replace compressor. Refer to **Section 8.8**.

00030 FAILED TO RUN MINIMUM TIME

- ACTIVATION: If Configured STANDARD: The unit has shutdown on an alarm 3 times without having run for at least 15 minutes between each shutdown (not including door switch shutdowns).
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Alarm may be manually reset using the display mounted keys or by turning the unit off, then back on again. If the Configuration is set to Rail Mode, this alarm will reset after 4 hours and a rail alarm reset will be recorded in the data recorded.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Check For Alarms - Check for shutdown alarms. Alarm conditions must be corrected and the alarm(s) cleared to continue.

00031 FAILED TO START - AUTO MODE

- ACTIVATION: Engine has tried to start three times unsuccessfully in the auto start mode.
- UNIT CONTROL: Engine Operation: Shutdown and alarm.
  Electric Operation: Alarm condition only.
- RESET CONDITION: Alarm may be manually reset using the display mounted keys or by turning the unit off, then back on again. If the Configuration is set to Rail Mode, this alarm will reset after 4 hours. Rail alarm reset will be recorded in the data recorder.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check For Low Fuel Level** - Check fuel level in the fuel tank. Add fuel as needed to the fuel tank.
2. **Check For Additional Alarms** -
   a. If this alarm is activated in conjunction with other alarms (00041 & 05012) check F5 & F10. Fuses must be good. Replace fuse(s) as required. Clear alarms, restart and check for repeat alarm(s).
   b. Check for the following alarms: **00040 CHECK ENGINE PREHEAT CIRCUIT** and **00035 CHECK STARTER CIRCUIT**. Alarm conditions must be corrected and the alarm cleared to continue.
3. **Check Engine Control Unit (ENCU) and Fuel/Speed Actuator (FSA)**
   a. Check voltage from fuse F3 through PCM-34 and SP-18 to ENCU-22. Verify correct fuse, see **Figure 2.7**. Must have minimum 11 VDC with the battery connected and SROS in the OFF position.
   b. Check voltage from 3MM-9 to ENCU-44. Must have minimum 11 VDC with SROS in the START/RUN position. If not, energize the run relay output using component test mode (refer to **Section 5.2.4**) and retest.
   c. Check for ground at ENCU-19 and ENCUGND-A (at the battery negative cable connection). If ground not good, check connectors and wiring between terminals for damage, moisture or corrosion.
   d. Inspect fuel/speed actuator (FSA), engine speed sensor (ENSSN) and engine speed control unit (ENCU) connector pins & terminals. Verify no physical damage to components, and no damage or corrosion in connectors.
   e. Check resistance & amp draw of FSA. Refer to **Section 2.12** for specifications.
   f. Check FSA plunger. Must move in and out freely. Refer to engine manual.
4. **Check Engine Air-intake System**
   a. Check air cleaner indicator. Flag must not be visible.
   b. Inspect air intake system. Verify hoses & tubes in good condition, with no kinks or restrictions.
5. **Check For Correct Engine Oil** - Check that viscosity is correct for ambient conditions. Refer to **Section 2.8**.
6. **Check Engine Exhaust System** - Inspect the exhaust system. Must be clear and unobstructed.
7. **Check Generator** - Check for proper preventative maintenance and operating precautions. Refer to **Section 8.10.14**
8. **Check Engine** - Check engine compression. Refer to Engine Workshop manual.

00034 ENGINE FAILED TO STOP

- ACTIVATION: 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.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: This alarm will not activate in Electric Operation.
- RESET CONDITION: Alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check To Ensure Engine Is Running** - Verify that engine is still running. Engine should not be running.
2. **Check Start/Run-Off Switch & Circuit**
   a. Check SROS. It must be in the OFF position.
   b. Check two way communication equipment. It must not be wired so unit can start with SROS in the OFF position. Correct wiring as needed.
   c. Check voltage to 2MM-35. Verify 0 VDC at 2MM-35 (including SP-24) and 3MM-16.
3. **Check For Alarm 00130 (Engine Speed Sensor)** - Refer to Alarm **00130 CHECK ENGINE RPM SENSOR**.
4. **Check ENOPS** - Check ENCU-15 to ENCU-18. It should be an open circuit when engine is not running
5. **Check Engine Control Unit (ENCU) and Fuel/Speed Actuator (FSA)**
   a. Check voltage from fuse F3 through PCM-34 and SP-18 to ENCU-22. Verify correct fuse, see **Figure 2.7**. Must have minimum 11 VDC with the battery connected and SROS in the OFF position.
   b. Check voltage from 3MM-9 to ENCU-44. Must have minimum 11 VDC with SROS in START/ RUN. If not, energize the run relay output using component test mode (refer to **Section 5.2.4**) and retest.
   c. Check for ground at ENCU-19 and ENCUGND-A (at the battery negative cable connection). If ground is not good, check connectors and wiring between terminals for damage, moisture or corrosion.
   d. Inspect fuel/speed actuator (FSA), engine speed sensor (ENSSN) and engine speed control unit (ENCU) connector pins & terminals. Verify there is no physical damage to components, and no damage or corrosion in connectors.
   e. Check resistance & amp draw of FSA. Refer to **Section 2.12** for specifications.
   f. Check FSA plunger. Must move in and out freely. Refer to engine manual.

00035 CHECK STARTER CIRCUIT

- ACTIVATION: Engine speed fails to reach 50 rpm during 2 start attempts.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: This alarm will not activate in Electric Operation.
- RESET CONDITION: Alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Starting Sequence** - Check to see if engine starts, runs for a few seconds then shuts off. If NO, continue with Step 2. If YES, check engine speed sensor. Refer to procedure for alarm **00130 CHECK ENGINE RPM SENSOR**.
2. **Check Fuses** - Check Fuses F5 & F10. Verify correct fuse and check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).
3. **Check Starter Solenoid Circuit**
   a. Place SROS in START/RUN position. After buzzer sounds, check for power at starter solenoid & 3MM-12. If there is not a minimum of 11 VDC, check connectors and wiring between terminals for damage, moisture or corrosion.
   b. Inspect wiring to starter motor. (See wiring schematic **Section 10.3**.) Verify there is no physical damage to wiring or battery cable end, and no damage or corrosion in connections.
4. **Check Starter**
   a. Inspect starter and wiring. (See wiring schematic **Section 10.3**.) Verify there is no damage or corrosion. Wiring and battery cable must be clean and tight.
   b. Check voltage to starter motor. Must be above 10 VDC while cranking.
   c. Check resistance of starter motor. Refer to **Section 2.12** for specifications.
   d. Check amperage draw of starter. Refer to **Section 2.12** for specifications.
5. **Check Battery Voltage**
   a. Inspect cable ends and posts. Must be clean and tight, with no corrosion.
   b. Test voltage at battery with unit off. Must have minimum 11 VDC.
   c. Perform load test on battery. Follow battery manufacturer's procedure.
6. **Check Engine Control Unit (ENCU) and Fuel/Speed Actuator (FSA)**
   a. Check voltage from fuse F3 through PCM-34 and SP-18 to ENCU-22. Verify correct fuse, see **Figure 2.7**. Must have minimum 11 VDC with the battery connected and SROS in the OFF position.
   b. Check voltage from 3MM-9 to ENCU-44. Must have minimum 11 VDC with SROS in START/ RUN. If not, energize the run relay output using component test mode (refer to **Section 5.2.4**) and retest.
   c. Check for ground at ENCU-19 and ENCUGND-A (at the battery negative cable connection). If ground not good, check connectors and wiring between terminals for damage, moisture or corrosion.
   d. Inspect fuel/speed actuator (FSA), engine speed sensor (ENSSN) and engine speed control unit (ENCU) connector pins & terminals. Verify there is no physical damage to components, and no damage or corrosion in connectors.
   e. Check resistance & amp draw of FSA. Refer to **Section 2.12** for specifications.
   f. Check FSA plunger. Must move in and out freely. Refer to engine manual.
7. **Check For Correct Engine Oil** - Check viscosity is correct for ambient conditions. Refer to **Section 2.8**.

00036 CHECK COOLANT TEMPERATURE

- ACTIVATION: Coolant temperature is below 32°F (0°C) after the engine has been running for 5 minutes.
- UNIT CONTROL: Engine Operation: Alarm only.
  Electric Operation: This alarm will not activate in Electric Operation.
- RESET CONDITION: Auto reset when coolant temperature is higher than 36°F (2.2°C) or alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Coolant Temperature** - Check temperature of coolant or upper radiator hose. Must be above 32°F (0°C).
2. **Check Engine Coolant Sensor** - Refer to the procedure for Alarm **00129 CHECK ENG COOLANT SENSOR.**

00037 CHECK LOW SPEED RPM

- ACTIVATION: The APX Control System is calling 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 APX Control System calls for a change from high to low speed, or when unit first starts).
- UNIT CONTROL: Engine Operation: Alarm only.
  Electric Operation: This alarm will not activate in Electric Operation.
- RESET CONDITION: Auto reset if APX Control System is calling for low engine speed operation and signal is: within 1220 and 1480 rpm for 60 seconds or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Fuel Supply** - Check for proper fuel and fuel level in the fuel tank. Add fuel as needed to the fuel tank.
2. **Perform Pretrip** - Run Pretrip and check for alarms. Any active alarms must be corrected and cleared before proceeding.
3. **Check Engine Speed**
   a. Check actual engine speed using hand held tachometer. Speed must be within range shown above.
   b. Compare actual speed with that shown in Unit Data. Readings within ± 50 rpm.
4. **Check Fuel/Speed Actuator (FSA)** - Check FSA plunger. Must move in and out freely. Refer to engine manual.
5. **Check Engine Air-Intake System**
   a. Check air cleaner indicator. Flag must not be visible.
   b. Inspect air intake system. Verify hoses & tubes in good condition, with no kinks or restrictions.
6. **Check Engine Exhaust System** - Inspect the exhaust system. Must be clear and unobstructed.

00038 CHECK HIGH SPEED RPM

- ACTIVATION: The APX Control System is calling for high speed operation, and engine speed is less than 1650 rpm, or greater than 2075 rpm for more than 60 seconds (120 seconds when the APX Control System calls for a change from low to high speed, or when unit first starts).
- UNIT CONTROL: Engine Operation: Alarm only.
  Electric Operation: This alarm will not activate in Electric Operation.
- RESET CONDITION: Auto reset if APX Control System is calling for high speed operation and the speed is within 1670 and 2050 rpm for 60 seconds or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Fuel Supply** - Check for proper fuel and fuel level in the fuel tank. Add fuel as needed to the fuel tank.
2. **Perform Pretrip** - Run Pretrip and check for alarms. Any active alarms must be corrected and cleared before proceeding.
3. **Check Engine Speed**

   a. Check actual engine speed using hand held tachometer. Refer to **Table 2–1**. Speed must be within range shown above.

   b. Compare actual speed with that shown in Unit Data. Readings within ± 50 rpm.
4. **Check Fuel/Speed Actuator (FSA)** - Check FSA plunger. Must move in and out freely. Refer to engine manual.
5. **Check Engine Air-Intake System**

   a. Check air cleaner indicator. Flag must not be visible.

   b. Inspect air intake system. Verify hoses & tubes in good condition, with no kinks or restrictions.
6. **Check Engine Exhaust System** - Inspect the exhaust system. Must be clear and unobstructed.

00039 CHECK ENGINE RPM

- ACTIVATION: In Engine Operation and Alarm 00130 is not active **and** Engine speed is greater than 1300 rpm for 3 seconds **and**:

  Engine speed is greater than 2100 rpm for 5 minutes **or**

  Engine speed is less than 1250 rpm for 5 minutes **or**

  Engine speed is less than 1200 rpm for 10 seconds
- UNIT CONTROL: Engine Operation: Alarm only or (if configured for shutdown) engine and unit shutdown and alarm.

  Electric Operation: This alarm will not activate in Electric Operation
- RESET CONDITION: Engine rpm > 1250 **and** < 2000 for 5 minutes. Auto reset if engine speed is within the specified range for 5 minutes or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Run Pre-trip** - Pre-trip will test low speed and high speed operation.
2. **Force Low Speed Operation** - Set the High Speed Delay Functional Parameter to 10 minutes and restart unit. (Reset following testing) System should run in low speed. If not, check speed overrides, **Section 4.10.3**. Ensure System is calling for low speed when performing step 3.
3. **Check Low Speed Engine RPM**

   a. Check actual engine speed using hand held tachometer. Refer to **Table 2–1**. Speed must be within range provided above.

   b. Compare actual speed with that shown in Unit Data. Readings within ± 50 rpm.
4. **Check High Speed Engine RPM**

   a. Check actual engine speed using hand held tachometer. Refer to **Table 2–1**.

   b. Compare actual speed with that shown in Unit Data. Both readings must be within ± 50 rpm.
5. **Check Engine Air-Intake System**

   a. Check air cleaner indicator. Flag must not be visible.

   b. Inspect air intake system. Verify hoses & tubes in good condition, with no kinks or restrictions.
6. **Check Engine Control Unit (ENCU) and Fuel/Speed Actuator (FSA)**

   a. Check voltage from fuse F3 through PCM-34 and SP-18 to ENCU-22. Verify correct fuse, see **Figure 2.7**. Must have minimum 11 VDC with the battery connected and SROS in the OFF position.

   b. Check voltage from 3MM-9 to ENCU-44. Must have minimum 11 VDC with SROS in the START/RUN position. If no, energize the run relay output using component test mode (refer to **Section 5.2.4**) and retest.

   c. Check for ground at ENCU-19 and ENCUGND-A (at the battery negative cable connection). If ground not good, check connectors and wiring between terminals for damage, moisture or corrosion.

   d. Inspect fuel/speed actuator (FSA), engine speed sensor (ENSSN) and engine speed control unit (ENCU) connector pins & terminals. Verify no physical damage to components, and no damage or corrosion in connectors.

   e. Check resistance & amp draw of FSA. Refer to **Section 2.12** for specifications.

   f. Check FSA plunger. Must move in and out freely. Refer to engine manual.

00040 CHECK ENGINE PREHEAT CIRCUIT

- ACTIVATION: 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 pre-heat time allowed.

  Refer to **Table 4–1** for pre-heat times.

  Electric Operation: This alarm will not activate in Electric Operation.
- UNIT CONTROL: Alarm Only
- 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check For Alarm 05017 CHECK ENG PREHEAT ENABLE CIRCUIT**. Alarm conditions must be corrected and the alarm cleared to continue.
2. **Check Engine Preheater Circuit**

   a. Using Component Test Mode, refer to **Section 5.2.4**, energize engine preheat circuit. Check displayed amp draw, must be greater than 70 amps.

   NOTICE

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

   b. Check for power at PCM-T4 and EPH +. Must have minimum 11 VDC. If not, check connectors and wiring between terminals for damage, moisture or corrosion.

   c. Replace PCM with known good component.
3. **Check Engine Preheater Circuit** - Check resistance of EPH. Refer to **Section 2.8** for specifications.

00041 ENGINE STALLED

- ACTIVATION: The APX Control System is calling for the engine to run, Engine speed sensor is good, and engine speed is less than 10 rpm; **or** the A00130 (Check Engine RPM Sensor) alarm is ON, and the Oil Pressure switch contacts are open, **and** AL00013 (High Discharge Pressure) is not active.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: This alarm will not activate in Electric Operation.
- RESET CONDITION: Auto Restart after 15 minutes, or Alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check For Additional Alarms**

   a. If this alarm is activated in conjunction with other alarms (00031, or 05012) check F5 & F10. Verify correct fuse, check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

   b. Check for alarm 00130. When alarms 00130 and 00041 occur at the same time, generally the engine has run out or is running out of fuel. This causes the engine speed to surge and drop. Check fuel tank and add fuel as necessary. Check fuel lines between the fuel tank and the fuel pump inlet for air leakage.

2. **Check Start/Run-Off Switch & Circuit**

   a. Check SROS. Must be in the START/RUN position.

   b. Check two way communication equipment. Must be set to allow operation and calling for operation.

3. **Check Fuel System**

   a. Check for Alarm 00001 (Low Fuel Level Warning). Fill tank as needed.

   b. Check fuel flow. Check for unrestricted fuel flow through the system. Pump screen(s) clean. Verify that fuel not gelled.

   c. Check fuel system prime. Verify no air in fuel system.

4. **Check Engine Control Unit (ENCU) and Fuel/Speed Actuator (FSA)**

   a. Check voltage from fuse F3 through PCM-34 and SP-18 to ENCU-22. Verify correct fuse, see **Figure 2.7**. Must have minimum 11 VDC with the battery connected and SROS in the OFF position.

   b. Check voltage from 3MM-9 to ENCU-44. Must have minimum 11 VDC with SROS in the START/RUN position. If not, energize the run relay output using component test mode (refer to **Section 5.2.4**) and retest.

   c. Check for ground at ENCU-19 and ENCUGND-A (at the battery negative cable connection). If ground not good, check connectors and wiring between terminals for damage, moisture or corrosion.

   d. Inspect fuel/speed actuator (FSA), engine speed sensor (ENSSN) and engine speed control unit (ENCU) connector pins & terminals. Verify no physical damage to components, and no damage or corrosion in connectors.

   e. Check resistance & amp draw of FSA. Refer to **Section 2.12** for specifications.

   f. Check FSA plunger. Must move in and out freely. Refer to engine manual.

Alarm continued on next page...

00041 ENGINE STALLED - CONTINUED

5. **Check Engine Speed Sensor (ENSSN)** - Inspect harness, connector pins & terminals. (See wiring schematic **Section 10**.) Verify no physical damage to harness, and no damage, moisture, or corrosion in connectors.
6. **Check Engine Air-Intake System**

   a. Check air cleaner indicator. Flag must not be visible.

   b. Inspect air intake system. Verify hoses & tubes in good condition, with no kinks or restrictions.
7. **Check Engine Exhaust System** - Inspect the exhaust system. Must be clear and unobstructed.
8. **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).
9. **Check Refrigeration System** - Check discharge & suction pressures. Must be within normal operating range for conditions.

00051 ALTERNATOR (BATTERY CHARGER) NOT CHARGING

- ACTIVATION: Unit is running and the current flow is less than -1.0 amps between the alternator and the battery for 3 continuous minutes.
- UNIT CONTROL: Engine Operation: Alarm only or (if Alternator Check Shutdown configuration is set to YES (configured for shutdown) engine and unit shutdown & alarm.
  Electric Operation: Alarm only regardless of configuration setting.
- RESET CONDITION: Auto reset (if not shutdown) when battery charger is charging or alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Current Transformer (CT)**

   a. Check current value. Power up APX Control System in PC Mode. (Refer to **Section 5.3.2**.) Check Unit Data. Must be -2.0 to 1.5A with no load.

   b. Check CT power from main microprocessor. Must have +5 VDC from terminal 2MM-29 to PCM-31.

   c. Check CT ground to main microprocessor. Check wiring from terminal 2MM-23 to PCM-30.

   d. Check CT signal to main microprocessor. Check wiring from terminal 2MM-12 to PCM-29.

2. **Check Battery Charger Wiring**

   a. Check output & ground wire (unit OFF.) Negative lead on Ground terminal Positive lead on Output terminal = same as battery voltage.

   b. Check battery charger input. Must be within voltage limits shown in **Section 2.11**. Must be between the two red Wires.

   c. Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**.) Verify there is no physical damage to harness, and no damaged or corroded pins.

   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.

   NOTE

   Do not test for voltage at output connector of battery charger without connector being connected to the battery. Without the battery connected any reading will be very inaccurate. (Refer to **Section 8** for more information on checking battery charger.)

   e. Check output (with the unit running). When the unit is started, voltage at the battery will begin near 12.0 VDC, and slowly rise toward 13.5 VDC as the battery charges.

3. **Check High Voltage Fuses, Wiring from Fuses to Batter Charger** - Check fuses F33, F34, F35. Verify correct fuse, and check fuse holder for damage, see **Figure 2.6**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

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 alternator rating.

5. **Perform Pretrip Check** - Clear the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.

00053 BOX TEMP OUT-OF-RANGE

NOTE: Corresponding alarm for Compartment 2 is AL00062, for Compartment 3 AL00063.

- ACTIVATION:

  Condition One: If the unit is running in Pulldown and the SAT is not greater than 1°F (0.56°C) below the RAT or if the unit is running in Pull-Up 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 Electric Operation:

  Shutdown for all compartments if this compartment is in perishable, below setpoint, and out of range shutdown is configured YES.

  Shutdown for this compartment ONLY if this compartment is NOT (perishable and below setpoint) and out of range shutdown is configured YES.

  Alarm condition only if out of range shutdown is configured NO..

- RESET CONDITION:

  Condition 1: Auto reset; If the unit is running in Pulldown and the SAT is greater than 1°F (0.56°C) below the RAT or if the unit is running in Pull-Up 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 Any Condition: Alarm may be manually reset using the display mounted keys 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.

Alarm continued on next page...

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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary. **CORRECTIVE ACTIONS:** 1. **Check Compartment Doors** - Inspect all compartment doors. Must be closed, and not allowing any air leakage. 2. **Defrost Evaporator** - Initiate manual defrost cycle. Must terminate automatically. Verify all ice cleared from evaporator coil. 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 Alarm 00018 (Low Refrigerant Pressure Alarm)** - Check for Alarm **00018 LOW REFRIGERANT PRESSURE**. Alarm conditions must be corrected and the alarm cleared to continue. 5. **Check Refrigerant Charge** - Refer to **Section 8.7.2**. Charge must be correct. 6. **Check System Pressures** - Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown in Unit Data. Refer to **Section 8.9.11** for instruction on comparison. 7. **Perform Pretrip Check** - Clear the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding. 8. **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). In Heat the delta-t must be greater than 0 (SAT must be higher than RAT).

00054 DEFROST NOT COMPLETE

- ACTIVATION: Defrost cycle did not complete within 45 minutes
- UNIT CONTROL: Engine and Electric Operation: Alarm only. While this alarm is active, the Defrost Timer will be set to initiate a defrost cycle 90 minutes (1.5 hours) of unit running time after the alarm comes on.
- RESET CONDITION: Auto Reset when defrost cycle is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Perform Pretrip Check** - Clear the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.
2. **Check For Defective Defrost Sensor Location/Correct Installation** - Has sensor fallen from location? Must be corrected to continue.
3. **Check Evaporator Fan Contactors** - Check that contactors are not energized and that the contacts are not stuck closed in defrost. Must de-energize evaporator fan during defrost.
4. **Check Evaporator Heater Current Draw** - Check Heater amp draw at 1HTCON1 & 1HTCON2. These checks must be made with the unit operating. Verify that all three actual amperage readings for each component are within 10% of each other, and are within the values shown in **Section 2.11**.

00055	CHECK DEFROST AIR SWITCH

- ACTIVATION: 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.)
- UNIT CONTROL: Engine and Electric Operation: Alarm only. While this alarm is active, the defrost air switch will NOT be used to initiate a defrost cycle; however the Defrost Timer will initiate a defrost cycle 90 minutes after the alarm comes on, and the manual defrost switch will remain operative.
- RESET CONDITION: Auto reset when defrost cycle terminates correctly, and the air switch does not call for a defrost cycle within the 8 minutes following defrost termination, or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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. 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 DAS Power And Wiring**
   a. Inspect switch, connector pins & terminals. Verify the switch has not been physically damaged. Verify no damage or corrosion in connections.
   b. If required, power switch by placing the unit in PC Mode. Check for power at switch connector. Must have minimum 11 VDC. If not, check connectors and wiring between terminals for damage, moisture or corrosion.
   c. Check for continuity from switch connector plus terminal to 3MM-19. If good continuity is not present, check connectors and wiring between terminals for damage, moisture or corrosion.
   d. Check for continuity from switch connector minus terminal to 3MM-29. If good continuity is not present, check connectors and wiring between terminals for damage, moisture or corrosion.
3. **Check Defrost Air Switch and Tubing** - Check tubing and perform testing as required. Refer to **Section 8.9.12**.

00057 CHECK REMOTE SWITCH 1 (REMS1)

- ACTIVATION: REMS1 is set to trigger an alarm if the switch is activated (opened or closed, depending on switch type) for more than five seconds.
- UNIT CONTROL: Engine and Electric Operation: May be configured as alarm only, alarm and force low engine speed, or alarm and shutdown.
- RESET CONDITION: Alarm Only: Auto reset after the switch has de-activated for more than five seconds. Shutdown: Auto reset after three minutes (minimum off time for switch activated 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

IF A SWITCH IS INSTALLED:

1. **Determine What REMS1 Is Activated By** - REMS1 may be connected to a compartment door or some other device. 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 Configuration for REMS1** - 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 **Section 5.2.3**.
4. **Check Wiring**

   a. Visually inspect wiring to REMS1. Wiring must be connected.

   b. Visually inspect condition of switch. Must not be damaged, wet, corroded, etc.

   c. Check circuit. (See wiring schematic **Section 10.3**.) With the switch contacts closed, check for minimum 11 VDC from 2SVM-14 through the wiring and switch back to 2SVM-25.
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 or low speed, this action may be temporarily overridden by setting the correct Functional Parameter. Set the OVERRIDE REMS1 SHUTDOWN Functional Parameter to YES.

<u>IF A SWITCH IS NOT INSTALLED</u>:

1. **Check Configurations** - Any switch/sensor not present in the unit should not be Configured “ON”. Verify correct configurations.
2. **Check REM Connector** - Locate and inspect 10 position connector for optional sensors and switches (see wiring schematic **Section 10.3**). Connector must have cap on. No corrosion or moisture inside connector. 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.

00058 CHECK REMOTE SWITCH 2 (REMS2)

- ACTIVATION: 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.
- UNIT CONTROL: Engine and Electric Operation: May be configured as alarm only, alarm and force low engine speed, or alarm and shutdown.
- RESET CONDITION: Alarm Only: Auto Reset after the switch has de-activated for more than five seconds. 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.

CORRECTIVE ACTIONS:

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 **Section 5.2.3**.
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 10.3**.) With the switch contacts closed, check for minimum 11 VDC from 2SVM-15 through the wiring and switch back to 2SVM-26.
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 (REMSN, see wiring schematic **Section 10.3**). Connector must have cap on. No corrosion or moisture inside connector. 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.

00059 DATALOGGER (DataLink data recorder) NOT RECORDING

- ACTIVATION: No data is being recorded by the DataLink data recorder.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Alarm may be manually reset using the display mounted keys.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Clear Alarm**

   a. Clear Active Alarm(s).

   b. Check for Active Alarm re-occurrence. If Inactive, download all data & retain. If Active, go to next step.

2. **Main Microprocessor Defective**

   a. Download previous data using a Data Transfer USB memory device, or TRU-Tech. Verify data retrieval OK.

   b. Replace and setup main microprocessor. Refer to **Section 5.4**.

NOTE

Specific Configurations may be found on the TransCentral Website (Authorized Carrier Transicold Dealers only).

00060 DATALOGGER (DataLink data recorder) TIME WRONG

- ACTIVATION: The real time clock in the DataLink data recorder does not contain a valid date.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- 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 (refer to 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 TRU-Tech. Must show correct date and time. Change as needed. Refer to **Section 5.2.3**.

2. **Reset Microprocessor**

   a. Place the SROS in the OFF position for 30 seconds and then return it to the START/RUN position. Microprocessor powers up OK.

   b. Check for valid real time clock reading in Unit Data. Valid date and time in memory. Alarm is cleared automatically.

   c. Real Time Clock can not be changed. Proceed to step 3.

3. **Main Microprocessor Defective**

   a. Download previous data using a Data Transfer USB memory device, or TRU-Tech. Data retrieval OK.

   b. Replace and setup main microprocessor. Refer to **Section 5.4**.

00061	DOOR OPEN (DS1)

- ACTIVATION: DS1 is set to trigger an alarm if the switch is activated (opened or closed, depending on switch type) for more than five seconds.
- UNIT CONTROL: Engine and Electric Operation: May be configured as alarm only, alarm and force low engine speed, or alarm and shutdown.
- RESET CONDITION: Alarm Only: Auto reset after the switch has de-activated for more than five seconds. 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

IF A SWITCH IS INSTALLED

1. **Determine What DS1 Is Activated By** - DS1 may be connected to a compartment door or some other device. 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 Configuration for DS1** - 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 **Section 5.2.3**.
4. **Check Wiring**

   a. Visually inspect wiring to DS1 to make sure it is connected.

   b. Visually inspect condition of switch. It must not be damaged, wet, corroded, etc.

   c. Check circuit. (See wiring schematic **Section 10.3**.) With the switch contacts closed, check for minimum 11 VDC from 2SVM-13, through the wiring and switch back to 2SVM-24.
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 or low speed, this action may be temporarily overridden by setting the correct Functional Parameter. Set the Override Door Switch Shutdown Functional Parameter to YES.

IF A SWITCH IS NOT INSTALLED

1. **Check Configurations** - Any switch/sensor not present in the unit should not be Configured “ON”. Correct Configurations.
2. **Check Connector** - Locate and inspect the DS or REM 10 position connector for optional sensors and switches (see wiring schematic **Section 10.3**). Connector must have cap on. No corrosion or moisture inside connector.

   If there is a problem with the DS connector and no switch is installed, the connector may be removed and both wires separated, terminated and insulated with heat shrink.

   If there is no DS connector, there is a problem with the REM 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.

00062	C2 BOX TEMP OUT-OF-RANGE
Refer to procedure for alarm **00053 BOX TEMP OUT-OF-RANGE**.	

00063	C3 BOX TEMP OUT-OF-RANGE
Refer to procedure for alarm **00053 BOX TEMP OUT-OF-RANGE**.	

00066 CHECK EVAP SENSOR GROUP

- ACTIVATION: The unit has been shut off for at least 48 hours. During wake up, a temperature comparison of the Evaporator Temperature Sensors (RAT, SAT, DTT) is performed. If the highest and the lowest temperature readings are more than 3.6°F (2.0°C) apart this alarm will be activated.

  The Evaporator Temperature Sensors test for this alarm is only run when main power is off and the unit is not running. When this alarm is in the inactive alarm list, the MessageCenter will display “Check at Next Service Interval” instead of “Status OK”
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: The system will continue to monitor the Evaporator Temperature Sensors during each wake up. If the temperature sensors read within 2.7°F (1.5°C) the alarm will clear. If the alarm doesn't clear, the alarm will be displayed as a non-shutdown alarm when the unit is powered up to alert the operator.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

1. Check Unit Data, or take a download to determine which sensor is out of range.
2. Check Temperature Sensors - Refer to **Section 8.10.16**.

00073 NO POWER-CHECK POWER CORD

- ACTIVATION: The unit is set to operate in electric AND no AC power; incoming voltage at the High Voltage Transformer (HVT) is less than 300VAC.
- UNIT CONTROL: Engine Operation: System will remain in Engine Operation.

  Electric Operation:

  If 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.

  If 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 electric power has been restored continually for 5 minutes.
- RESET CONDITION: Auto Reset when AC power is restored (HVT shows above 340VAC) 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 Electric Operation.

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.

CORRECTIVE ACTIONS:

1. **Check Circuit Breaker On The Main External Power Supply**

   a. Check that the 30A supply circuit breaker is on.

   b. Check the voltage in the plug. 460V / 3 / 60Hz.
2. **Check Power Cord**

   a. Inspect connections in the socket and the plug. Connections must be tight.

   b. Inspect the cable. Cable must not be frayed, cut or damaged.
3. **Check For Power In The Control Box**

   a. Check for voltage at PSCON L1-L2, L2-L3, L1-L3. All three readings must be 460V $\pm$ 10%.

   b. Check for voltage at PSCON2 L1-L2, L2-L3, L1-L3. All three readings must be 460V $\pm$ 10%.
4. **Check Connections** - Check for bad connections in the control box. Connections and wire crimps must be tight.
5. **Check CCB1** - Check for voltage between 1CCB35 & 1CCB19. Voltage should be 0.766 V $\pm$ 10%.
6. **Check CCON** - Check for continuity between L1 or L2 to HVT. Check for open or shorted.

00074 PHASE REVERSED

- ACTIVATION: If the system is in electric mode and the START/RUNSTART/RUN Switch is ON and the system cannot properly detect the phase.
- UNIT CONTROL: Engine Operation: Alarm only.
  Electric Operation: Required Shutdown.
- RESET CONDITION: Auto reset when and the phase reversed switch = phase reverse okay for 2 seconds, or switch to diesel mode. Alarm may be manually reset using the display mounted keys 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.

CORRECTIVE ACTIONS:

1. **Check Circuit Breaker On The Main External Power Supply**

   a. Check the 30A supply circuit breaker to make sure it is on.

   b. Check the voltage in the plug. Verify 460V / 3 / 60Hz.

2. **Check For Power In The Control Box, PSCON or PSCON2**

   a. Check PSCON and PSCON2. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for amp values. View current draw in Component Test Mode screen.

   b. Check for voltage at PSCON L1-L2, L2-L3, L1-L3. All three readings must be 460V ± 10%.

   c. Check for voltage at PSCON2 L1-L2, L2-L3, L1-L3. All three readings must be 460V ± 10%.

3. **Check PSCON, and PSCON2** - Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for amp values. View current draw in Component Test Mode screen.

4. **Check Current Transformer (CT)**

   a. Check current value. Power up APX Control System in PC Mode. (Refer to **Section 5.3.2**.) Check Unit Data. Must be -2.0 to 1.5A with no load.

   b. Check CT power from main microprocessor. +5 VDC from terminal 2MM-29 to PCM-31

   c. Check CT ground to main microprocessor. Check wiring from terminal 2MM-23 to PCM-30

   d. Check CT signal to main microprocessor. Check wiring from terminal 2MM-12 to PCM-29

00075 COMP MOTOR OVERLOAD

- ACTIVATION: If alarm **00022 LOW SUCTION SUPERHEAT**, **00027 HIGH SUCTION PRESSURE** and/or **00028 CHECK REFRIGERATION SYSTEM** was triggered with current below 5.5 amps, this alarm will also trigger or on restart from alarm 00022, 00027 and/or 00028 trigger on if compressor current does not rise above 1 amp, **and** alarm **00013 HIGH DISCHARGE PRESSURE** (High Discharge Pressure) is not active.
- UNIT CONTROL: Engine: Engine and unit shutdown and alarm.
  Electric: Refrigeration system shutdown and alarm with PSCON still energized.

NOTE

The compressor motor is fitted with an internal line break that may have caused this alarm. The line break is an auto reset device. Additional time may be required to reduce winding temperature to the reset temperature of this device.

- RESET CONDITION: Auto reset after 30 minutes. 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check For Alarms 00022, 00027 and/or 00028 (Check Download)** - Alarms 00022, 00027 and/or 00028 will always cause this alarm to activate. Review steps for triggered alarms and correct if necessary.
2. **Check Compressor Power Supply** - Start unit and check voltage. Normal low speed voltage at contactor should be greater than 360 and less than 460V. Check current on each phase. Current must be greater than 0 and less than 18 amps. (Compressor is operating.) If voltage is present and current is 0, motor is overheated. Wait for compressor to cool for 30 minutes and check again. If voltage and current are not present at load side of contact check compressor contactor operation.
3. **Check Compressor Motor Contactor** - Check condition and wiring. Repair/replace as required.
4. **Check Airflow Through Radiator / Condenser Coil**
   a. Inspect condenser / radiator fins. Fins must be straight. 90% or more of the coil surface must be undamaged. No “dead” air spaces. Coil must be clean (refer to **Section 8.6.14**).
   b. Check condenser airflow. Verify even airflow through the entire coil, and no “dead” spots.
   c. Check condenser fan rotation / operation. Fans should operate correctly. Air drawn in through the grill, and directed into the engine compartment.
5. **Check System For Non-Condensables, Low Charge** - Check refrigeration system for noncondensable gas(es). No non-condensable gas(es) may be present. Refer to **Section 8.7.2**.
6. **Perform Pretrip, Verify SMV and ECXV Functionality** - Clear the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.
7. **Verify Accuracy of AC Current Sensor**
   a. Put microprocessor in PC Mode. Refer to **Section 5.3.2**. Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.
   b. Use a clamp on ammeter to measure current draw of all 3 legs of the T side of GENCON. Meter reading should be the same as Unit Data: Compare meter reading to Unit Data in PC Mode. Compare meter reading to Unit Data with unit under load.
8. **Check Compressor** - Check compressor for excessive vibration or noise. Replace compressor. Refer to **Section 8.8**

00076 CONDENSER MOTOR OVERHEATED

- ACTIVATION: The condenser fan motor Internal Protectors (IP-CDM1) circuit is open and alarm **00013 HIGH DISCHARGE PRESSURE** is not active.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Auto Reset when motor overload input is within limits, or change to engine Operation, or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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, with no sticks or other material obstructing its movement. Check for ice build-up preventing blade rotation.
2. **Determine if the IP is open**

   a. Check for Continuity between 1CCB33 and 1CCB02. It should be 0 Ohms. If condenser fan motor is extremely warm, allow it to cool off, then recheck IP continuity.

   b. If open, continue with step 6 below.
3. **Check Fuses** - Check fuses F9, F36, F37 and F38. Verify correct fuse, and check fuse holder for damage, see **Figure 2.4**, **Figure 2.6**. Replace fuse(s) as required. Clear alarms, restart and check for repeat alarm(s).
4. **Check Condenser Fan Motor Contactor**

   a. Inspect the wire connections to the contactor. (See wiring schematic **Section 10.3**.) Check for signs of overheating of the contactor. And verify 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 the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.
6. **Check Condenser Fan Motors** - Disconnect power plug at motor. Test IP circuit for continuity using ohmmeter. If IP remains open after a 30 minute cool down period, and motor feels cool to the touch, remove and replace motor. Refer to **Section 8.10.12**.

   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 2.11** for correct electrical values.

   If motor tests good, check the DC IP circuit to microprocessor.

Alarm continued on next page...

00076	CONDENSER MOTOR OVERHEATED - CONTINUED

7. **Check IPC circuit**

   a. Use Component Test Mode to energize CDCON1 circuit. (Refer to **Section 5.2.4**.) Output will come on.

   b. Verify 12 VDC at CDCON1 A1 and A2. Inspect wiring between condenser and CCB.

   c. Verify 12 VDC between CDCON1 A1 and 1CCB33. If there is no voltage, and wiring is okay, then it's likely that CCB is bad.

   d. Unplug the connector to condenser fan motor 1 (CDM1) and check voltage on pins 4-5 in the engine harness connector to ground.

      Check voltage at pin 5, should read 3 VDC. No voltage indicates open from pin 5 to 1CCB33.

      Check voltage at pin 4, should read 12VDC. No voltage indicates open from pin 4 to 1CCB02.

   e. 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.

8. **Check Motor Operation** - Turn the unit ON. Check current on each phase (must be less than shown on **Section 2.11**.) Check voltage on each phase (must be within voltage limits shown in **Section 2.11**.)

00077 EVAP MOTOR OVERHEATED

- ACTIVATION: The evaporator fan motor Internal Protector (IP-EVM) is open and alarm **00013 HIGH DISCHARGE PRESSURE** is not active.
- UNIT CONTROL: Engine and Electric Operation: Shutdown (Main compartment outputs only) and alarm.
- RESET CONDITION: Alarm **00109 CHECK 1EVCON COIL** is active. Auto Reset after a 5 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.

CORRECTIVE ACTIONS:

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, with no sticks or other material obstructing its movement. Check for ice build-up preventing blade rotation.
2. **Check For 12 VDC between 2CCB01 and 2CCB34**

   a. If 12VDC, then alarm should have cleared itself.

   b. If no power (0VDC), then continue with steps below.
3. **Check IPC Circuit**

   a. Use Component Test Mode to energize Evaporator Motor Contactor circuit. (Refer to **Section 5.2.4**.) Output will come on.

   b. Unplug the connector to the evaporator fan motor and check voltage on IP-EVM (white) wire.

   Check voltage at pin 5, should read 3 VDC. No voltage indicates open from pin 5 to 2CCB34.

   Check voltage at pin 4, should read 12VDC. No voltage indicates open from pin 4 to 2CCB01.

   c. 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.
4. **Check Evaporator Fan Motor Contactor**

   a. Inspect the wire connections to the contactor. (See wiring schematic **Section 10.3**.) Check for signs of overheating of the contactor. Verify 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 the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.
6. **Check Evaporator Fan Motor** - Disconnect power plug at motor Test IP circuit for continuity using ohmmeter. If IP remains open after a 30 minute cool down period, and motor feels cool to the touch, remove and replace motor. Refer to **Section 8.10.11**.

   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 2.11** for correct electrical values.

   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 2.11**). Check voltage on each phase (must be at within limits shown in **Section 2.11**.)

00084 CHECK REMOTE ALARM LIGHT

This alarm may be activated with earlier software revisions, follow procedure for alarm **06001 CHECK LIGHT BAR**.

00093	CHECK STARTUP BUZZER

- ACTIVATION: The Buzzer (B) circuit is shorted or open. (The Buzzer output from the microprocessor [PCM-23 to 3MM15] is negative, so the circuit will not be shorted to ground, but is shorted either within the Buzzer itself, or to a positive wire.)
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto reset when Buzzer amp draw is normal, or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Buzzer**

   a. Inspect Buzzer & wire connections. Verify no damage to the buzzer. Verify no damage or corrosion to the connections.

   b. Check resistance of buzzer. Cannot be opened (infinite ohms) or shorted (Zero Ohms).

2. **Check Buzzer Wiring** - Inspect PCM sub-harness connector pins & terminals. (See wiring schematic **Section 10.3**.) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

3. **Check Buzzer** - Use Component Test Mode (Refer to **Section 5.2.4**) to test actual current draw of the circuit. Buzzer provides audible signal. View current draw in Component Test Mode screen. Verify current.

00094	CHECK COMP CONTACTOR 1

- ACTIVATION: Compressor motor contactor (CCON) circuit is shorted or open.
- UNIT CONTROL: Engine and Electric Operation: Shutdown and alarm.
- 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.

CORRECTIVE ACTIONS:

1. **Check CCON**

   a. Inspect compressor contactor coil and connector. Verify there is no damage to coil, and no damage, moisture, or corrosion in connector.

   b. Check contactor coil resistance. Refer to **Section 2.12** for contactor coil resistance values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.

2. **Check CCON Using Component Test Mode**

   a. Use Component Test Mode to energize CCON. (Refer to **Section 5.2.4**). Verify Current Draw on Component Test Mode Screen. Refer to **Section 2.12** for correct electrical values.

   b. Check coil voltage between A1 and A2. Verify 12 VDC between A1 & A2.

   c. Check resistance at contacts. Verify contacts are closed at L1-T1, L2-T2, L3-T3.

3. **Check CCON Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**). Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

00095 CHECK CDCON1 COIL

- ACTIVATION: Condenser fan motor contactor (CDCON) circuit is shorted or open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check CDCON**

   a. Inspect contactor coil and connector. Verify there is no damage to coil, and no damage, moisture, or corrosion in connector.

   b. Check contactor coil resistance. Refer to **Section 2.12** for contactor coil resistance values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.

2. **Check CDCON Using Component Test Mode**

   a. Use Component Test Mode to energize CDCON. (Refer to **Section 5.2.4**) Verify Current Draw on Component Test Mode Screen. Refer to **Section 2.12** for correct electrical values.

   b. Check coil voltage between A1 and A2. Verify 12 VDC between A1 and A2.

   c. Check resistance at contacts. Verify contacts are closed at L1-T1, L2-T2, L3-T3.

3. **Check CDCON Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

00096 CHECK GENCOIL COIL

- ACTIVATION: Generator contactor (GENCON) circuit is shorted or open.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check GENCON**

   a. Inspect contactor coil and connector. Verify there is no damage to coil, and no damage or corrosion to connector.

   b. Check contactor coil resistance. Refer to **Section 2.12** for contactor coil resistance values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.

2. **Check GENCON Using Component Test Mode**

   a. Use Component Test Mode to energize GENCON. (Refer to **Section 5.2.4**) Verify Current Draw on Component Test Mode Screen. Refer to **Section 2.12** for correct electrical values.

   b. Check coil voltage between A1 and A2. Verify 12 VDC between A1 and A2.

   c. Check resistance at contacts. Verify contacts are closed at L1-T1, L2-T2, L3-T3.

3. **Check GENCON Wiring**

   a. Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**.) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

   b. Check PSCON1 and PSCON2 for loose wires or open contact. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

00098 CHECK HIGH TEMP THERMOSTAT

- ACTIVATION: With the Main Power switch toggled out of the OFF position, the EVHTS circuit is open.
- UNIT CONTROL: Engine and Electric Operation: Alarm AND no heat allowed.
- RESET CONDITION: Auto Reset when the EVHTS 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.

CORRECTIVE ACTIONS:

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 2.10**). (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 10.3**) Check for damage to the thermostat. Verify 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. If HTT is open below temperature, (Refer to **Section 2.10**) replace HTT.

   b. Check ground at 2CCB35. If ground not good, check connectors and wiring between terminals for damage, moisture or corrosion.

   c. Check SP-71, SP-72, SP-50. If ground not good, check connectors and wiring between terminals for damage, moisture or corrosion.

00100 OVERLOAD/GROUND FAULT

- ACTIVATION: Engine or Electric 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 Milli-amps.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm.
- 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.

CORRECTIVE ACTIONS:

1. **Check Overload Ground Fault Detector (OGF) LED**

   Check status LED.

   If LED is On - Ground Fault is detected. Start with Step 3 below.

   If LED is Off - Circuit Overload is detected. Start with Step 2 below. Refer to **Section 8.10.8**

2. **Check For Electrical Overload** - Check high voltage amp draw from GENCON if running in Engine Operation, or PSCON2 if running in Electric Operation. Must be less than 40 Amps.

3. **Check For High Voltage Short To Ground**

   a. Check resistance between T1, T2 and T3 for **ALL** High voltage contactors to ground. Reading must be greater than 25,000 Ohms.

   b. Perform Meg-ohmmeter test on all high voltage circuits. See **Section 8.10**.

4. **Perform Pretrip Check**

   a. Clear the Active Alarm list, then run a Pretrip and check for any new alarms. Note during which test Alarm 00100 occurs.

   b. Further test circuit from Step 3b above. Use a meg-ohmmeter 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 2CCB12. Refer to **Section 8.10.3** for checking OGF.

00101 C2 EVAP MOTOR OVERHEATED

- ACTIVATION: The 2nd compartment evaporator fan motor Internal Protector (IP-EVM) is open.
- UNIT CONTROL: Engine and Electric Operation: Shutdown compartment 2 only.
- RESET CONDITION: Alarm **00110 CHECK 2EVCON COIL** is not active. Auto Reset after a 5 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.

CORRECTIVE ACTIONS:

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, with no sticks or other material obstructing its movement. Check for ice build-up preventing blade rotation.
2. **Check Motor IP** - Disconnect power plug at motor, Test continuity through IPC. Test IP circuit for continuity using ohmmeter. Should be 0 Ohms. If the evaporator fan motor is extremely warm, allow it to cool off, then recheck IPC continuity.

   NOTE

   If Motor IP shows 0 ohms, it indicates that this motor may not be the problem, check the next Remote Evaporator Motor IP. If none of the motors show an open IP, continue with the next step.
3. **Check For Voltage**

   a. Use Component Test Mode to energize the C2 Evaporator Motor Contactor. (Refer to **Section 5.2.4**.) Verify 12 VDC between A1 & A2.

   b. Unplug the connector to the evaporator fan motor and check voltage on IP-EVM (white) wire. Check voltage at pin 5, should read 3 VDC. No voltage indicates an open from pin 5 to 3REC02. Check voltage at pin 4, should read 12VDC. No voltage indicates open from pin 4 to 3REC01.
4. **Check Evaporator Fan Motor Contactor**

   a. Inspect the wire connections to the contactor. (See wiring schematic **Section 10**.) Verify no signs of overheating of the contactor. Check that 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 the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.
6. **Check Evaporator Fan Motor** - Disconnect power plug at motor Test IP circuit for continuity using ohmmeter. If IP remains open after a 30 minute cool down period, and motor feels cool to the touch, remove and replace motor, refer to **Section 8.10.11**. 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 2.11** for correct electrical values. 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 2.11**). Check voltage on each phase (must be at within limits shown in **Section 2.11**.)

00102 C3 EVAP MOTOR OVERHEATED

- ACTIVATION: The 3rd compartment evaporator fan motor Internal Protector (IP-EVM) is open.
- UNIT CONTROL: Engine and Electric Operation: Shutdown compartment 3 only.
- RESET CONDITION: Alarm **00111 CHECK 3EVCON COIL** is not active. Auto Reset after a 5 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.

CORRECTIVE ACTIONS:

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, with no sticks or other material obstructing its movement. Check for ice build-up preventing blade rotation.

2. **Check Motor IP** - Disconnect power plug at motor, Test continuity through IPC. Test IP circuit for continuity using ohmmeter. Should be 0 Ohms. If the evaporator fan motor is extremely warm, allow it to cool off, then recheck IPC continuity.

   NOTE

   If Motor IP shows 0 ohms, it indicates that this motor may not be the problem, check the next Remote Evaporator Motor IP. If none of the motors show an open IP, continue with the next step.

3. **Check For Voltage**

   a. Use Component Test Mode to energize the C3 Evaporator Motor Contactor. (Refer to **Section 5.2.4**.) Verify 12 VDC between A1 & A2.

   b. Unplug the connector to the evaporator fan motor and check voltage on IP-EVM (white) wire. Check voltage at pin 5, should read 3 VDC. No voltage indicates an open from pin 5 to 3REC02. Check voltage at pin 4, should read 12VDC. No voltage indicates open from pin 4 to 3REC01.

4. **Check Evaporator Fan Motor Contactor**

   a. Inspect the wire connections to the contactor. (See wiring schematic **Section 10**.) Verify no signs of overheating of the contactor. Check that 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 the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.

6. **Check Evaporator Fan Motor** - Disconnect power plug at motor Test IP circuit for continuity using ohmmeter. If IP remains open after a 30 minute cool down period, and motor feels cool to the touch, remove and replace motor, refer to **Section 8.10.11**. 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 2.11** for correct electrical values. 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 2.11**). Check voltage on each phase (must be at within limits shown in **Section 2.11**.)

00103	CHECK 2HTCON1 COIL

- ACTIVATION: Heater Contactor 1 in Compartment 2 (2HTCON1) circuit is shorted or open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check 2HTCON1**

   a. Inspect heater contactor coil and connector. Verify no damage to coil. Verify no damage, moisture, or corrosion in connector.

   b. Check contactor coil resistance. Refer to **Section 2.12** for contactor coil resistance values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.

2. **Check 2HTCON1 Using Component Test Mode**

   a. Use Component Test Mode to energize 2HTCON1. (Refer to **Section 5.2.4**.) Verify Current Draw on Component Test Mode Screen. Refer to **Section 2.12** for correct electrical values.

   b. Check coil voltage between A1 and A2. Verify 12 VDC between A1 & A2.

   c. Check resistance at contacts. Verify contacts are closed at L1-T1, L2-T2, L3-T3.

3. **Check 2HTCON1 Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10**.) Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.

4. **Check CCB status indicator** - Refer to **Section 2.6.3**.

00104 CHECK 2HTCON2 COIL

- ACTIVATION: Heater Contactor 2 in Compartment 2 (2HTCON2) circuit is shorted or open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check 2HTCON2**

   a. Inspect heater contactor coil and connector. Verify no damage to coil. Verify no damage, moisture, or corrosion in connector.

   b. Check contactor coil resistance. Refer to **Section 2.12** for contactor coil resistance values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.

2. **Check 2HTCON2 Using Component Test Mode**

   a. Use Component Test Mode to energize 2HTCON2. (Refer to **Section 5.2.4**.) Verify Current Draw on Component Test Mode Screen. Refer to **Section 2.12** for correct electrical values.

   b. Check coil voltage between A1 and A2. Verify 12 VDC between A1 & A2.

   c. Check resistance at contacts. Verify contacts are closed at L1-T1, L2-T2, L3-T3.

3. **Check 2HTCON2 Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10**.) Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.

4. Check CCB status indicator - a. Refer to **Section 2.6.3**.

00105	CHECK 3HTCON1 COIL

- ACTIVATION: Heater Contactor 1 in Compartment 3 (3HTCON1) circuit is shorted or open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check 3HTCON1**

   a. Inspect heater contactor coil and connector. Verify no damage to coil. Verify no damage, moisture, or corrosion in connector.

   b. Check contactor coil resistance. Refer to **Section 2.12** for contactor coil resistance values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.

2. **Check 3HTCON1 Using Component Test Mode**

   a. Use Component Test Mode to energize 3HTCON1. (Refer to **Section 5.2.4**.) Verify Current Draw on Component Test Mode Screen. Refer to **Section 2.12** for correct electrical values.

   b. Check coil voltage between A1 and A2. Verify 12 VDC between A1 & A2.

   c. Check resistance at contacts. Verify contacts are closed at L1-T1, L2-T2, L3-T3.

3. **Check 3HTCON1 Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10**.) Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.

4. **Check CCB status indicator** - Refer to **Section 2.6.3**.

00106 CHECK 3HTCON2 COIL

- ACTIVATION: Heater Contactor 2 in Compartment 3 (3HTCON2) circuit is shorted or open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check 3HTCON2**

   a. Inspect heater contactor coil and connector. Verify no damage to coil. Verify no damage, moisture, or corrosion in connector.

   b. Check contactor coil resistance. Refer to **Section 2.12** for contactor coil resistance values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.

2. **Check 3HTCON2 Using Component Test Mode**

   a. Use Component Test Mode to energize 3HTCON1. (Refer to **Section 5.2.4**.) Verify Current Draw on Component Test Mode Screen. Refer to **Section 2.12** for correct electrical values.

   b. Check coil voltage between A1 and A2. Verify 12 VDC between A1 & A2.

   c. Check resistance at contacts. Verify contacts are closed at L1-T1, L2-T2, L3-T3.

3. **Check 3HTCON2 Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10**.) Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.

4. **Check CCB status indicator** - Refer to **Section 2.6.3**.

00109	CHECK 1EVCON COIL

- ACTIVATION: Evaporator fan motor contactor (1EVCON) circuit is shorted or open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check 1EVCON**

   a. Inspect contactor coil and terminals. Verify there is no damage to coil, and no damage or corrosion to terminals.

   b. Check contactor coil resistance. Refer to **Section 2.12** for contactor coil resistance values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.

2. **Check 1EVCON Using Component Test Mode**

   a. Use Component Test Mode to energize 1EVCON. (Refer to **Section 5.2.4**.) Verify Current Draw on Component Test Mode Screen. Refer to **Section 2.12** for correct electrical values.

   b. Check coil voltage between A1 and A2. Verify 12 VDC between A1 & A2.

   c. Check resistance at contacts. Verify contacts are closed at L1-T1, L2-T2, L3-T3.

3. **Check 1EVCON Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness. Verify there is no damage, moisture, or corrosion in connectors.

00110	CHECK 2EVCON COIL

- ACTIVATION: Evaporator fan motor contactor (2EVCON) circuit in compartment 1 is shorted or open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Follow Alarm **00109 CHECK 1EVCON COIL** procedure for 2EVCON.

00111	CHECK 3EVCON COIL

- ACTIVATION: Evaporator fan motor contactor (3EVCON) circuit in compartment 1 is shorted or open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Follow Alarm **00109 CHECK 1EVCON COIL** procedure for 3EVCON.

00114	CHECK LIV CIRCUIT

- ACTIVATION: A problem has been detected in the LIV coil circuit. If this alarm is activated while the control system is calling for LIV to be energized, the circuit is detected shorted. If this alarm is activated at any other time, the circuit is detected open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset when the LIV coil current 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Coil Wiring** - Inspect coil & connector pins & terminals. (See wiring schematic **Section 10.3**.) Verify there is no physical damage to the coil. Verify there is no damage, moisture or corroded pins in plug.
2. **Check Current Draw**

   a. Use Component Test Mode to test actual current draw of the circuit. (Refer to **Section 5.2.4**.) View current draw in Component Test Mode screen. Refer to **Section 2.12** for normal current values.

   b. Check for voltage at the coil plug between pins A (+) and B (ground). Voltage should be approximately12VDC.
3. **Check Coil** - Check coil resistance. View current draw in Data List. Refer to **Section 2.12** for normal current values.
4. **Check Circuits With Another Coil** - Substitute known good coil and clear alarm. Start unit, run for 30 seconds. If alarm does not reoccur, replace failed coil.

00121	CHECK AMBIENT AIR SENSOR

- ACTIVATION: Ambient Air Temperature Sensor (AAT) is not within range of -53 to +158°F (-47° to +70° C).
- UNIT CONTROL: Engine and Electric Operation: A value of 122°F (50°C) will be used for any calculations.
- RESET CONDITION: Auto reset when sensor is in range or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Sensor**

   a. Inspect sensor & connector. Verify no damage to sensor. Verify no damage, moisture, or corrosion in connector.

   b. Check sensor resistance. (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–3** for chart of resistances for different sensors.
2. **Check Sensor Wiring**

   a. Inspect connector pins & terminals at sensor and connector 2MM. (See wiring schematic **Section 10.3**.) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

   b. Place the system in PC Mode. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC at harness plug between pins. Voltage should be 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor.

00122 CHECK RETURN AIR SENSOR

- ACTIVATION: Return Air Temperature Sensor (RAT) is not within range of -53 to +158°F (-47 to +70° C).
- UNIT CONTROL: Engine and Electric Operation:

  If Alarm **00123 CHECK SUPPLY AIR SENSOR** is not active: Alarm and switch to supply air control.
  If Alarm **00123 CHECK SUPPLY AIR SENSOR** is active: Alarm and the System will enter Cargo Protect Mode. Refer to **Section 4.10.2**.
- RESET CONDITION: Auto reset when sensor is in range or, alarm may be manually reset using the display mounted keys 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 (refer to 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. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connectors.

   b. Check sensor resistance. (Refer to Note 3 in **Notes** Section) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–3** for chart of resistances for different sensors.

2. **Check Sensor Wiring**

   a. Inspect connector pins & terminals at sensor connector 2MM. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

   b. Place the system in PC Mode. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC at harness plug between pins. Voltage should be 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor.

00123 CHECK SUPPLY AIR SENSOR

- ACTIVATION: Supply Air Temperature Sensor (SAT) is not within range of -53 to +158°F (-47 to +70° C).
- UNIT CONTROL: Engine and Electric Operation:

  If Alarm **00022 LOW SUCTION SUPERHEAT** is not active: Functional Parameter Temperature Control is set for Supply Air and the setpoint is in the perishable range: Alarm and switch to return air control.
  If Alarm **00022 LOW SUCTION SUPERHEAT** is active: alarm and the System will enter Cargo Protect Mode. Refer to **Section 4.10.2**.
- RESET CONDITION: Auto reset when sensor is in range or, alarm may be manually reset using the display mounted keys or by turning the unit off and 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Sensor**

   a. Inspect sensor & connectors. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connectors.

   b. Check sensor resistance. (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–1** for chart of resistances for different sensors.

2. **Check Sensor Wiring**

   a. Inspect connector pins & terminals at sensor connector 2MM. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

   b. Place the system in PC Mode. Refer to Note 2 in **Notes** Section,. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

00124 CHECK DEFROST TERM 1 SENSOR

- ACTIVATION: Defrost Termination Temperature Sensor (1DTT) is not within the range of -53° to +158°F (-47° to +70° C.)
- UNIT CONTROL: Engine and Electric Operation:
  If Alarm **00022 LOW SUCTION SUPERHEAT** is not active: Alarm and initiate defrost if 1RAT is below 45°F (7.2°C).
  If Alarm **00022 LOW SUCTION SUPERHEAT** is also active: Alarm and initiate defrost if 1SAT is below 45°F (7.2°C). Under both of the above conditions, defrost will end after 10 minutes.
  If Alarms **00022 LOW SUCTION SUPERHEAT** and **00123 CHECK SUPPLY AIR SENSOR** are also both active: alarm and defrost will not be allowed.
- 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.

CORRECTIVE ACTIONS:

1. **Check Sensor**
   a. Inspect sensor & connectors. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connectors.
   b. Check sensor resistance. (Refer to Note 3 in **Notes** Section) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–1** for chart of resistances for different sensors.
2. **Check Sensor Wiring**
   a. Inspect harness & control box connector pins & terminals (See wiring schematic **Section 10.3**) (2MM3 & 2MM11) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.
   b. Power up the microprocessor (Refer to Note 2 in **Notes** Section). Disconnect sensor from harness. Check for Voltage 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

00125 CHECK COMP DISCHARGE SENSOR

- ACTIVATION: Compressor Discharge Temperature Sensor (CDT) is not within the range of -40° to +392°F (-40° to +200°C).
- UNIT CONTROL: Engine and Electric Operation: Alarm Only.
- RESET CONDITION: Auto reset when sensor is in range or, alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Sensor**
   a. Inspect sensor & connector. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connector.
   b. Check sensor resistance. (Refer to Note 3 in **Notes** Section.) 90,000 Ohms @ 77°F (25°C). Refer to **Table 8–4** for chart of resistances for different sensors.
2. **Check Sensor Wiring**
   a. Inspect connector pins & terminals 2MM. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.
   b. Place the system in PC Mode. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

00126 CHECK FUEL SENSOR CIRCUIT

- ACTIVATION: The fuel level sensor is configured “YES” and the reading (in the Unit Data) is less than 2% for 30 seconds.
- UNIT CONTROL: Engine Operation: Alarm Only.
  Electric Operation: This alarm does not activate in electric operation.
- RESET CONDITION: Auto reset when fuel level is sensed above 4% for 30 seconds or, alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check For Low Fuel Level** - Check fuel level in tank. Add fuel as needed.
2. **Check Sensor Fuse & Wiring**

   a. Check Fuse F8 Verify correct fuse, and check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

   b. Inspect wiring from at PCM22, and 2MM24. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

   c. Perform sensor check procedure. Refer to **Section 8.6.7**.

NOTE

If new sensor is not available, the sensor may be configured OFF temporarily. Refer to Configurations **Section 5.2.3**.

00127 CHECK SUCTION TEMP SENSOR

- ACTIVATION: Compressor Suction Temperature Sensor (CST) is not within the range of -53 to +158°F (-47 to +70° C.)
- UNIT CONTROL: Engine and Electric Operation: Alarm only. Control of Superheat will switch to supply air temperature sensor.
- RESET CONDITION: Auto reset or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Sensor**

   a. Inspect sensor & connector. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connector.

   b. Check sensor resistance (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C.) See **Table 8–1** for complete table of temperatures and resistance values.

2. **Check Sensor Wiring**

   a. Inspect connector pins & terminals at sensor and connector 2MM. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

   b. Place the system in PC Mode. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

00128 LOW/UNBALANCED A/C AMPS

- ACTIVATION: The compressor is on and AC Current Sensor 1, 2 or 3 is less than 5 amps for 10 seconds. OR, if the difference between AC Current 1 and AC Current 2, 2-3 and 1-3 is greater than 10 amps for 10 seconds.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Change unit to Electric Operation when AC Current Sensor 1 and 2 is greater than 7 amps for 5 minutes AND difference between AC Current 1 and AC Current 2 is less than 7 amps for 5 minutes OR alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Perform Pretrip Check** - Clear the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.
2. **Check Current Draw**
   a. Use a clamp around A/C ammeter to check amps at power wires. Must be 1.0 Amp of reading in Unit Data.
   b. Check A/C amps with compressor running. Must be greater than 5 Amps.
   c. Compare A/C Amp readings between L1-L2-L3. Maximum allowable difference is 10 Amps.
3. **Check Wiring** - Inspect wiring from CT to 1CCB. Check related Splice Points. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

00129 CHECK ENG COOLANT SENSOR

- ACTIVATION: Engine Coolant Temperature Sensor (ENCT) is not within the range of -58 to +266°F (-50 to +130°C).
- UNIT CONTROL: Engine Operation: Alarm Only.
  Electric Operation: This alarm does not activate in electric operation.
- RESET CONDITION: Auto reset when sensor is in range or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Sensor**
   a. Inspect sensor & connector. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connector.
   b. Check sensor resistance. (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–3** for chart of sensor resistances.
2. **Check Sensor Wiring**
   a. Inspect connector pins & terminals at ENCU. (See wiring schematic **Section 10.3**). Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.
   b. Place the system in PC Mode. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor.

00130 CHECK ENGINE RPM SENSOR

- ACTIVATION: 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 speed 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 speed is sensed at less than 1000.
- UNIT CONTROL: Engine Operation: Alarm Only and engine will be considered running.
  Electric Operation: This alarm does not activate in electric operation.
- RESET CONDITION: Auto reset when engine speed is greater than 1,000 rpm or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check For Alarm 00041 ENGINE STALLED** - When alarms 00041 and 00130 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.

   Check fuel lines between the fuel tank and the fuel pump inlet to ensure air is not being drawn in.

2. **Check Engine Speed Sensor (ENSSN)**

   a. Check actual engine speed using a hand held tachometer and compare with speed shown in unit data. Must be ± 20 rpm. Must be a steady reading.

   b. Inspect sensor, connector pins & terminals. Verify there is no physical damage to sensor, and no damage or corrosion in connections.

   c. Check power from ENCU. Should read approximately +12 VDC from terminal ENCU-43 to ENSSN-3.

   d. Check ground to ENCU. Check wiring from terminal ENCU-20 to ENSSN-1.

   e. Check signal to ENCU. Check wiring from terminal ENCU-2 to ENSSN-2.

3. **Check Circuits With Test Sensor** - Substitute known good sensor and check unit data reading (Refer to **Section 3.15**). Must be within ± 50 rpm of reading on tachometer.

00131 CHECK EVAP TEMP SENSOR

- ACTIVATION: Evaporator Outlet Temperature Sensor (EVOT) is not within the range of -53 to +158°F (-47 to +70°C)
- UNIT CONTROL: Engine and Electric Operation: Alarm only and superheat for EVXV will be calculated using SAT or DTT if alarm 00123 (Check Supply Air Sensor) is active.
- RESET CONDITION: Auto reset when Evaporator Temp Sensor is in range or, alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Sensor**

   a. Inspect sensor & connector. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connector.

   b. Check Evaporator Temp Sensor resistance. (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C.) See **Table 8–1** for complete table of temperatures and resistance values.

2. **Check Sensor Wiring**

   a. Inspect connector pins & terminals at sensor and connector 2MM. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

   b. Place the system in PC Mode. Refer to Note 2 in **Notes** Section Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor.

3. **Check Airflow Through Evaporator Coil/Section**

   a. Inspect coil. Ninety percent or more of the coil surface must be undamaged. Coil must be clean.

   b. Check coil airflow (with unit running). Verify even airflow through the entire coil, and no “dead” spots.

   c. Check return air bulkhead, air chute. Verify good air flow and make sure return air not restricted. Air chute should be in good condition.

00133 CHECK REMOTE TEMP SENSOR 1

00134 CHECK REMOTE TEMP SENSOR 2

00135 CHECK REMOTE TEMP SENSOR 3

- ACTIVATION: Remote Temperature Sensor (REMSN1, REMSN2 or REMSN3) is not within the range of -53 to +158°F (-47 to +70°C.)
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

IF A SENSOR IS INSTALLED

1. **Check Sensor**

   a. Inspect sensor & connector. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connector.

   b. Check sensor resistance (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–1** for chart of resistances for different sensors.

2. **Check Sensor Wiring**

   a. Inspect connector pins & terminals at sensor, REM connector and 2CCB. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

   b. Place the system in PC Mode. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor.

IF A SENSOR IS NOT INSTALLED

1. **Check Configurations** - Any switch/sensor that is not present in the unit should not be Configured “ON”. Correct Configurations.

2. **Check REM Connector** - Locate and inspect 10 position connector for optional sensors and switches. (See wiring schematic **Section 10.3**). Connector must have cap on, no corrosion or moisture inside connector.

   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.

00136 C2 CHECK SUPPLY AIR SENSOR

- ACTIVATION: Compartment 2 Supply Air Temperature Sensor (SAT) is not within the range of -53 to +158°F (-47 to +70° C). (NOTE: Compartment 2 Supply Air Temperature Sensor (SAT) is optional and may not be present. If the configuration is set to INSTALLED and the sensor is not connected, this alarm will be active.)
- UNIT CONTROL: Engine and Electric Operation: Alarm Only.
- RESET CONDITION: Auto reset when sensor is in range or, alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Make sure the Configuration Setting (Installed / Not Installed) for SAT2 is correct** - Refer to **Table 5–1** for Configuration Settings.
2. **Check Sensor**
   a. Inspect sensors and connectors. Verify no damage to sensors, and no damage, moisture, or corrosion in connectors.
   b. Check sensor resistance. (Refer to Note 3 in **Notes** Section.)
3. **Check Sensor Wiring**
   a. Inspect connector pins & terminals at sensor connector 3REC10 and 3REC21. Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.
   b. Place the system in PC Mode, refer to **Section 5.3.2**. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC at harness plug between pins. Voltage should be 3.0 ± 0.1 VDC at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

00137 C2 CHECK RETURN AIR SENSOR

- ACTIVATION: Compartment 2 Return Temperature Sensor (RAT) is not within the range of -53 to +158°F (-47 to +70° C).
- UNIT CONTROL: Engine and Electric Operation: 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.
- RESET CONDITION: Auto reset when sensor is in range or, alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Sensor**
   a. Inspect sensors and connectors. Verify no damage to sensors, and no damage, moisture, or corrosion in connectors.
   b. Check sensor resistance. (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–3** for chart of resistances for different sensors.
2. **Check Sensor Wiring**
   a. Inspect connector pins & terminals at sensor connector 3REC32 & 3REC33. Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.
   b. Place the system in PC Mode, refer to **Section 5.3.2**. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC at harness plug between pins. Voltage should be 3.0 ± 0.1 VDC at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

00138	C3 CHECK RETURN AIR SENSOR

- ACTIVATION: Compartment 3 Return Temperature Sensor (RAT) is not within the range of -53 to +158°F (-47 to +70° C).
- UNIT CONTROL: Engine and Electric Operation: 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.
- RESET CONDITION: Auto reset when sensor is in range or, alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Sensor**
   a. Inspect sensors and connectors. Verify no damage to sensors, and no damage, moisture, or corrosion in connectors.
   b. Check sensor resistance. (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–3** for chart of resistances for different sensors.
2. **Check Sensor Wiring**
   a. Inspect connector pins & terminals at sensor connector 3REC32 & 3REC33. Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.
   b. Place the system in PC Mode, refer to **Section 5.3.2**. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC at harness plug between pins. Voltage should be 3.0 ± 0.1 VDC at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

00139	C2 CHECK DEFROST TERM 1 SENSOR

- ACTIVATION: Defrost Termination Temperature Sensor for Compartment 2, (2DTT) is not within the range of -53° to +158°F (-47° to +70° C.)
- UNIT CONTROL: Engine and Electric Operation:

  If Alarm **00137 C2 CHECK RETURN AIR SENSOR** C2 CHECK RETURN AIR SENSOR is not active: alarm and initiate defrost if 1RAT is below 455F (7.25C).

  If Alarm **00137 C2 CHECK RETURN AIR SENSOR** is also active: alarm and initiate defrost if 1SAT is below 455F (7.25C).

  Under both of the above conditions, defrost will end after 10 minutes.

  If Alarms **00137 C2 CHECK RETURN AIR SENSOR** and **00136 C2 CHECK SUPPLY AIR SENSOR** are also both active: alarm and defrost will not be allowed.
- RESET CONDITION: Auto Reset when 2DTT 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Sensor**

   a. Inspect sensors and connectors. Verify no damage to sensors, and no damage, moisture, or corrosion in connectors.

   b. Check sensor resistance. (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–3** for chart of resistances for different sensors.

2. **Check Sensor Wiring**

   a. Inspect connector pins & terminals at sensor connector 3REC32 & 3REC33. Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.

   b. Place the system in PC Mode, refer to **Section 5.3.2**. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC at harness plug between pins. Voltage should be 3.0 ± 0.1 VDC at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

00140	C3 CHECK DEFROST TERM 1 SENSOR

- ACTIVATION: Defrost Termination Temperature Sensor for Compartment 3, (3DTT) is not within the range of -53° to +158°F (-47° to +70° C.)
- UNIT CONTROL: Engine and Electric Operation:

  If Alarm 138 C3 CHECK RETURN AIR SENSOR is not active: alarm and initiate defrost if 1RAT is below 455F (7.25C).

  If Alarm 138 is also active: alarm and initiate defrost if 1SAT is below 455F (7.25C).

  Under both of the above conditions, defrost will end after 10 minutes.

  If Alarms 138 and 12000 are also both active: alarm and defrost will not be allowed.
- RESET CONDITION: Auto Reset when 3DTT 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Follow procedure for 3DTT - Refer to alarm **00139 C2 CHECK DEFROST TERM 1 SENSOR**.

P00141	PRETRIP STOPPED BY USER

- ACTIVATION: Pretrip cycle was stopped by user before the Pretrip cycle ended automatically.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only.
- RESET CONDITION: Alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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.

P00146 C2 CHECK HEATER 1 CIRCUIT

This device is checked twice in Pretrip - once in Test 2 and again in Test 7.

- ACTIVATION TEST 2: (unit not running): Normal draw for the 2HTCON1 coil is 0.05 to 1.0 Amps (12 VDC). The circuit tests outside this range.
- ACTIVATION TEST 7: (unit running): Normal draw for the 2HTCON1 heaters is 1.0 to 3.5 Amps (460 VAC). The circuit tests outside this range.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again or alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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 187. If alarm is present, follow step 2. If alarm is not present, follow steps 3 - 7.

<u>12 VDC CIRCUIT</u>:

2. **Check 2HTCON1**

   Refer to Alarm **00103 CHECK 2HTCON1 COIL**.

3. **Check Evaporator High Temperature Switch(es) (HTA/HTB)**

   Refer to **Section 2.5** & Alarm **05022 C2 CHECK HIGH TEMP THERMOSTAT**

460 VAC CIRCUIT:

4. **Check Amp Draw of 2HTCON1 Heater Circuit**

   a. Check fuses F30, F31, F32. Verify correct fuse, check fuse holder for damage, see **Figure 2.6**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

   b. With the unit running and calling for Heat, use a clamp-on ammeter to check the current draw of all 3 legs. Must be within range shown in **Section 2.11** for all three legs.

   c. Check voltage at 2HTCON1 contacts. Must be within range shown in **Section 2.11** for L1-L2, L1-L3, and L2-L3. Must be within range shown in **Section 2.11** for T1-T2, T1-T3, and T2-T3.

   d. Shut down Unit. Verify continuity from 2HTCON1 to host.

5. **Check Heater Elements**

   a. Check heater elements with the unit Off. Verify no visual physical damage. Remove and replace if damaged.

   b. Check heater element resistance. Check from “T” terminals on 2HTCON1 contactor. See **Section 2.11** for correct resistance.

Alarm continued on next page...

P00146 C2 CHECK HEATER 1 CIRCUIT - CONTINUED

6. **Check Heater Element Connections**

   a. Inspect high voltage heater connections at evaporator. Check for corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.

   b. Disconnect heater element plug. Heater resistance per **Section 2.11**. Remove and replace heaters if required.

   c. Inspect plugs, plug seal and connectors. Check for corrosion, water damage or burning / discoloration. Remove and replace if required.

7. **Verify Accuracy of AC Current Sensor**

   a. Put microprocessor in PC Mode. Refer to **Section 5.3.2**. Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.

   b. Use a clamp on ammeter to measure current draw of all 3 legs of the T side of GENCON. Meter reading should be the same as Unit Data: Compare meter reading to Unit Data in PC Mode. Compare meter reading to Unit Data with unit under load.

P00147 C2 CHECK HEATER 2 CIRCUIT

This device is checked twice in Pretrip - once in Test 2 and again in Test 7.

- ACTIVATION TEST 2: (unit not running): Normal draw for the 2HTCON2 coil is 0.05 to 1.0 Amps (12 VDC). The circuit tests outside this range
- ACTIVATION TEST 7: (unit running): Normal draw for the 2HTCON2 heaters is 1.0 to 3.5 Amps (460 VAC). The circuit tests outside this range.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again or alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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 187. If alarm is present, follow step 2. If alarm is not present, follow steps 3 through 7.

<u>12 VDC CIRCUIT</u>:

2. **Check 2HTCON2**

   Refer to Alarm **00104 CHECK 2HTCON2 COIL**.

3. **Check Evaporator High Temperature Switch(es) (HTA/HTB)**

   Refer to **Section 2.5** & Alarm **05022 C2 CHECK HIGH TEMP THERMOSTAT**.

Alarm continued on next page...

P00147 C2 CHECK HEATER 2 CIRCUIT - CONTINUED

460 VAC CIRCUIT:

4. **Check Amp Draw of 2HTCON2 Heater Circuit**

   a. With the unit running and calling for Heat, use a clamp on ammeter to check the current draw of all 3 legs. Must be within range shown in **Section 2.11** for all three legs.

   b. Check fuses F30, F31, F32. Verify correct fuse, check fuse holder for damage, see **Figure 2.6**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

   c. Check voltage at 2HTCON2 contacts. Must be within range shown in **Section 2.11** for L1-L2, L1-L3, and L2-L3. Must be within range shown in **Section 2.11** for T1-T2, T1-T3, and T2-T3.

   d. Shut down Unit. Verify SP-A, B, C by checking continuity from 2HTCON2 to GENCON.

5. **Check Heater Elements**

   a. Check heater elements with the unit Off. Verify no visual physical damage. Remove and replace if damaged.

   b. Check heater element resistance. Check from "T" terminals on 2HTCON2 contactor. See **Section 2.11** for correct resistance.

6. **Check Heater Element Connections**

   a. Inspect high voltage heater connections at evaporator. Check for corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.

   b. Disconnect heater element plug. Heater resistance per **Section 2.11**. Remove and replace heaters if required.

   c. Inspect plugs, plug seal and connectors. Check for corrosion, water damage or burning / discoloration. Remove and replace if required.

7. **Verify Accuracy of AC Current Sensor**

   a. Put microprocessor in PC Mode. Refer to **Section 5.3.2**. Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.

   b. Use a clamp on ammeter to measure current draw of all 3 legs of the T side of GENCON. Meter reading should be the same as Unit Data: Compare meter reading to Unit Data in PC Mode. Compare meter reading to Unit Data with unit under load.

P00151 CHECK GLOW CIRCUIT (This applies to the engine preheater = EPH)

- ACTIVATION: The circuit current draw is outside the normal range.
- UNIT CONTROL: Engine and Electric 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 using the display mounted keys or by turning the unit off then back on again.

CORRECTIVE ACTIONS:

Check EPH operation - Refer to procedure for alarm **00040 CHECK ENGINE PREHEAT CIRCUIT**. Alarm condition must be corrected and the alarm cleared to continue.

P00152 CHECK FUEL/SPEED ACTUATOR CIRCUIT

- ACTIVATION: The circuit current draw is outside the normal range.
- UNIT CONTROL: Engine and Electric 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 using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Check ENCU operation - Refer to procedure for alarm **05012 CHECK ENCU POWER CIRCUIT**. Alarm condition must be corrected and the alarm cleared to continue.

P00153 CHECK RETURN AIR SENSOR

- ACTIVATION: Return Air Temperature Sensor (RAT) is not within the range of -53 to +158°F (-47 to +70°C).
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again, or alarm may be manually reset using the display mounted keys or by turning the unit off, then back on again.

CORRECTIVE ACTIONS:

Check sensor operation - Refer to procedure for alarm **00122 CHECK RETURN AIR SENSOR**. Alarm condition must be corrected and the alarm cleared to continue.

P00154 CHECK SUPPLY AIR SENSOR

- ACTIVATION: Supply Air Temperature Sensor (SAT) is not within the range of -53 to +158°F (-47 to +70°C).
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again, or alarm may be manually reset using the display mounted keys or by turning the unit off, then back on again.

CORRECTIVE ACTIONS:

Check sensor operation - Refer to procedure for alarm **00123 CHECK SUPPLY AIR SENSOR**. Alarm condition must be corrected and the alarm cleared to continue.

P00155 CHECK COOLANT TEMP SENSOR

- ACTIVATION: Engine Coolant Temperature Sensor (ENCT) is not within the range of -58 to +266°F (-50 to +130°C).
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again, or alarm may be manually reset using the display mounted keys or by turning the unit off, then back on again.

CORRECTIVE ACTIONS:

Check sensor operation - Refer to procedure for alarm **00129 CHECK ENG COOLANT SENSOR**. Alarm condition must be corrected and the alarm cleared to continue.

P00157 CHECK BATTERY CURRENT

- ACTIVATION: With all circuits off, current flow of more than +1.5 to -2.0 amps is detected in the 12 VDC electrical circuits.

  NOTE: If this alarm occurs, Pretrip Test #2 will be skipped and Pretrip Test #3 will start.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again, or alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check DC Current Draw and Sensor**

   a. Observe current draw reading in unit data. Reading must be between +1.5 to -2.0 Amps.

   b. Check power between 2MM-29 and 2MM-23 and between PCM-31 and PCM-30. Verify 5 VDC. If not, check connectors and wiring between terminals for damage, moisture or corrosion.

   c. Check for continuity from 2MM-12 to PCM-29. If good continuity not present, check connectors and wiring between terminals for damage, moisture or corrosion.
2. **Check Individual Circuits** - Isolate individual circuits and test amp draw. Must be in range. (Refer to **Section 2.12** for correct electrical values.)
3. **Check For Parasitic Loads** - Check for electrical loads that are drawing current with all circuits OFF. 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.

P00158 CHECK AMBIENT AIR SENSOR

- ACTIVATION: Ambient Air Temperature Sensor (AAT) is not within the range of -53 to +158°F (-47 to +70°C).
- UNIT CONTROL: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again, or alarm may be manually reset using the display mounted keys or by turning the unit off, then back on again.

CORRECTIVE ACTIONS:

Check sensor operation - Refer to procedure for alarm **00121 CHECK AMBIENT AIR SENSOR**. Alarm condition must be corrected and the alarm cleared to continue.

P00159	CHECK DEFROST TERM 1 SENSOR

- ACTIVATION: Defrost Termination Temperature Sensor (1DTT) is not within the range of -53 to +158°F (-47 to +70°0 C.)
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

CORRECTIVE ACTIONS:

Check sensor operation - Refer to procedure for alarm **00124 CHECK DEFROST TERM 1 SENSOR**. Alarm condition must be corrected and the alarm cleared to continue.

P00160	CHECK DISCHARGE TEMP SENSOR

- ACTIVATION: Compressor Discharge Temperature Sensor (CDT) is not within the range of -40 to +392°F (-40 to +200°C.)
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again or alarm may be manually reset using the display mounted keys or by turning the unit off then back on again.

CORRECTIVE ACTIONS:

Check sensor operation - Refer to procedure for alarm **00125 CHECK COMP DISCHARGE SENSOR**. Alarm condition must be corrected and the alarm cleared to continue.

P00161	CHECK SUCTION TEMP SENSOR

- ACTIVATION: Compressor Suction Temperature Sensor (CST) is not within the range of -40 to +392°F (-40 to +200°C.)
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again or alarm may be manually reset using the display mounted keys or by turning the unit off then back on again.

CORRECTIVE ACTIONS:

Check sensor operation - Refer to procedure for alarm **00127 CHECK SUCTION TEMP SENSOR**. Alarm condition must be corrected and the alarm cleared to continue.

P00163 C3 CHECK HEATER 1 CIRCUIT

This device is checked twice in Pretrip - once in Test 2 and again in Test 7.

- ACTIVATION TEST 2: (unit not running): Normal draw for the 3HTCON1 coil is 0.05 to 1.0 Amps (12 VDC). The circuit tests outside this range.
- ACTIVATION TEST 7: (unit running): Normal draw for the 3HTCON1 heaters is 1.0 to 3.5 Amps (460 VAC). The circuit tests outside this range.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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 187. If alarm is present, follow steps 2 through 5. If alarm is not present, follow steps 6 through 9.

<u>12 VDC CIRCUIT</u>:

2. **Check 3HTCON1**

   a. Inspect heater contactor coil and wire connections. Verify no damage to coil. Verify wire connections to contactor coil are tight. Verify no damaged or corroded wires to contactor coil.

   b. Check contactor coil resistance. Refer to **Section 2.12** for correct electrical values.

3. **Check 3HTCON1 Amp Draw** - Check 3HTCON1 amp draw. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for correct amp values. View current draw in Component Test Mode screen.

4. **Check 3HTCON1 Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10**.) Verify no physical damage to harness. Verify 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.

Alarm continued on next page...

P00163 C3 CHECK HEATER 1 CIRCUIT - CONTINUED

460 VAC CIRCUIT:

6. **Check Amp Draw of 3HTCON1 Heater Circuit**
   a. With the unit running and calling for Heat, use a clamp on ammeter to check the current draw of all 3 legs. Must be within range shown in **Section 2.11** for all three legs.
   b. Check fuses F30, F31, F32. Verify correct fuse, check fuse holder for damage, see **Figure 2.6**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).
   c. Check voltage at 3HTCON1 contacts. Must be within range shown in **Section 2.11** for L1-L2, L1-L3, and L2-L3. Must be within range shown in **Section 2.11** for T1-T2, T1-T3, and T2-T3. If not in range, verify SP-A, B, C by checking continuity from HTCON1 to GENCON.
   d. Shut down Unit. Verify SP-A, B, C by checking continuity from HTCON1 to GENCON.
7. **Check Heater Elements**
   a. Check heater elements with the unit Off. No visual physical damage. Remove and replace if damaged.
   b. Check heater element resistance. Check from “T” terminals on 3HTCON1 contactor. See **Section 2.11** for correct resistance.
8. **Check Heater Element Connections**
   a. Inspect high voltage heater connections at evaporator. Check for corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.
   b. Disconnect heater element plug. Heater resistance per **Section 2.11**. Remove and replace heaters if required.
   c. Inspect plugs, plug seal and connectors. Check for corrosion, water damage or burning / discoloration. Remove and replace if required.
9. **Verify Accuracy of AC Current Sensor**
   a. Put microprocessor in PC Mode. Refer to **Section 5.3.2**. Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.
   b. Use a clamp on ammeter to measure current draw of all 3 legs of the T side of GENCON. Meter reading should be the same as Unit Data: Compare meter reading to Unit Data in PC Mode. Compare meter reading to Unit Data with unit under load.

P00166 C2 CHECK SUPPLY AIR SENSOR

- ACTIVATION: Compartment 2 Supply Air Temperature Sensor (SAT) is not within the range of -53 to +158°F (-47 to +70°C).
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again, or alarm may be manually reset using the display mounted keys or by turning the unit off, then back on again.

CORRECTIVE ACTIONS:

Check Sensor Operation - Refer to procedure for alarm **00136 C2 CHECK SUPPLY AIR SENSOR.** Alarm condition must be corrected and the alarm cleared to continue.

P00167 C3 CHECK HEATER 2 CIRCUIT

This device is checked twice in Pretrip - once in Test 2 and again in Test 7.

- ACTIVATION TEST 2: (unit not running): Normal draw for the 3HTCON2 contactor coil is 0.05 to 2.0 Amps (12 VDC). The circuit tests outside this range.
- ACTIVATION TEST 7: (unit running): Normal draw for the 3HTCON2 heaters is 1.0 to 3.5 Amps (460 VAC). The circuit tests outside this range.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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 through 4 If alarm is not present, follow steps 5 through 10.

<u>12 VDC CIRCUIT</u>:

2. **Check 3HTCON2**

   a. Inspect heater contactor coil and wire connections. Verify no damage to coil. Verify no damage, moisture, or corrosion in connections.

   b. Check contactor coil resistance. Refer to **Section 2.12**.

3. **Check 3HTCON2 Amp Draw** - Check 3HTCON2 amp draw. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for correct amp values. View current draw in Component Test Mode screen.

4. **Check 3HTCON2 Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10**.) Verify no physical damage to harness. Verify 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.

Alarm continued on next page...

P00167 C3 CHECK HEATER 2 CIRCUIT - CONTINUED

460 VAC CIRCUIT:

6. **Check Amp Draw of 3HTCON2 Heater Circuit**
   a. With the unit running and calling for pull up in, use a clamp on ammeter to check the current draw of all 3 legs. Must be within range shown in **Section 2.11** for all three legs.

   b. Check fuses F30, F31, F32. Verify correct fuse, check fuse holder for damage, see **Figure 2.6**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

   c. Check voltage at 3HTCON2 contacts. Must be within range shown in **Section 2.11** for L1-L2, L1-L3, and L2-L3. Must be within range shown in **Section 2.11** for T1-T2, T1-T3, and T2-T3.

   d. Shut down Unit. Verify SP-A, B, C by checking continuity from HTCON2 to GENCON

7. **Check Heater Elements**
   a. Check heater elements with the unit Off. Check for visual physical damage. Remove and replace if damaged.

   b. Check heater element resistance. Check from “T” terminals on 3HTCON2 contactor. See **Section 2.11** for correct resistance.

8. **Check Heater Element Connections**
   a. Inspect high voltage heater connections at evaporator. Check for corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.

   b. Disconnect heater element plug. Heater resistance per **Section 2.11**. Remove and replace heaters if required.

   c. Inspect plugs, plug seal and connectors. Check for corrosion, water damage or burning / discoloration. Remove and replace if required.

9. **Verify Accuracy of AC Current Sensor**
   a. Put microprocessor in PC Mode. Refer to **Section 5.3.2**. Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.

   b. Use a clamp on ammeter to measure current draw of all 3 legs of the T side of GENCON. Meter reading should be the same as Unit Data. Compare meter reading to Unit Data in PC Mode. Compare meter reading to Unit Data with unit under load.

P00170 CHECK LIV CIRCUIT

- ACTIVATION: During Test #2 the LIV current draw is not in range.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- 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.

CORRECTIVE ACTIONS:

Check LIV Circuit - Refer to procedure for alarm **00114 CHECK LIV CIRCUIT**.

P00173 CHECK ECONOMIZER

- ACTIVATION: Test #12, Check Economizer Expansion Valve fails.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only.
- RESET CONDITION: Auto reset if Pretrip is started again or alarm may be manually reset using the display mounted keys or by turning the unit off then back on again.

CORRECTIVE ACTIONS:

Check Economizer - Refer to procedure for alarm **07000 ECONOMIZER TEMP SENSOR** & alarm **07001 ECONOMIZER PRESS SENSOR**.

P00174 CHECK LOW SPEED RPM

- ACTIVATION:
  Test #4: With the CAN calling for low speed, engine speed is NOT between: 1300 and 1400 rpm.
  Test #6: 15 seconds after the High Speed Pretrip Test #5, engine speed has NOT dropped back to the low speed range (within 15 seconds). This test will be skipped if alarm **00130 CHECK ENGINE RPM SENSOR** is active.
- UNIT CONTROL: Engine Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED".
  Electric Operation: This test is not made.
- RESET CONDITION: Auto reset if Pretrip is started again or alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Check low speed operation - Refer to procedure for alarm **00037 CHECK LOW SPEED RPM**. Alarm condition must be corrected and the alarm cleared to continue.

P00175 CHECK HIGH SPEED RPM

- ACTIVATION: In Test #5 with the CAN calling for high speed, engine speed is NOT between: 1750 and 1850 rpm.
- UNIT CONTROL: Engine Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED".
  Electric Operation: This test is not made.
- RESET CONDITION: Auto reset if Pretrip is started again, or Alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Check high speed operation - Refer to procedure for alarm **00038 CHECK HIGH SPEED RPM**. Alarm condition must be corrected and the alarm cleared to continue.

P00177 CHECK EXV (EVXV) SUPERHEAT

- ACTIVATION: With the unit running in Test 11, after the control system 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.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again or alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Refrigerant Level** - Check refrigerant charge. Refer to **Section 8.7.2**.
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.) Refer to **Section 8.9.11** for instruction on comparison.
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. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

   c. Check EVXV operation. See **Section 8.9.8**.

   d. Check basic refrigeration system. Verify pressures normal and Compressor operation normal.

   e. Check the EVXV electrical system for good continuity in all circuits from microprocessor to EVXV.

   f. Inspect component and wire connections. Verify no physical damage to harness.

   g. Inspect harness connector pins. Verify there is no damage, moisture, or corrosion in connectors. (See wiring schematic **Section 10.3**.)
4. **Check EVOT** - Check the sensor. Refer to procedure for alarm **00131 CHECK EVAP TEMP SENSOR**.

P00179 CHECK LIV

- ACTIVATION: With unit running at the end of Test 13 (ECXV closed, LIV de-energized, SMV set to maximum position and EVXV controlling normally), the LIV is energized. If the Compressor Discharge Temperature Delta (Initial Compressor Discharge Temperature - the Current Compressor Discharge Temperature) does not reach 95°F (35°C) within 70 seconds, it indicates that the LIV is not opening properly and this alarm is activated.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

CORRECTIVE ACTIONS:

Check LIV Circuit - Refer to procedure for alarm **00114 CHECK LIV CIRCUIT**.

P00180 CHECK SUCTION MOD VALVE

- ACTIVATION: With the unit running in Pretrip Test #10, after the microprocessor attempts to close CSMV, the suction pressure fails to drop below 0 psig (0 bar).
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL IN TEST 10”.
- RESET CONDITION: Auto reset if Pretrip is started again or alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check wiring to CDP & CSP**

   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. The CDP connector is identified with a red tape band while the CSP connector is identified with a blue band.

   b. Verify that correct transducer is being used in each position. Mechanical connections to transducers are the same. The Discharge Transducer should have a RED marking dot on it. The Suction Transducer should have a BLUE marking dot on it.

2. **Check SVM Module** - Check indicator light on SVM Module. If light is red, it indicates that the SVM Module should be replaced.

3. **Check Compressor Operation** - Check compressor operation. If compressor is defective, replace compressor. Refer to **Section 8.8**

4. **Check Suction Modulating Valve**

   a. Visually inspect CSMV. Check for damage to the valve.

   b. Inspect CSMV coil and wire connections. Refer to **Section 8.9.7**. Verify there is no damage to coil, and no damage, moisture, or corrosion in connector.

   c. Check CSMV operation. Refer to **Section 8.9.7**. Must perform correctly.

   d. Check wires from CSMV to SVM Module. Verify there is no visual damage to wires. Continuity test verifies that each wire is good.

P00184 C2 CHECK EVAPORATOR FAN MOTOR

This device is checked twice in Pretrip - once in Test 2 and again in Test 8.

- ACTIVATION TEST 2: (unit not running): Normal draw for the 2EVCON contactor coil is 0.05 to 2.0 Amps (12 VDC). The circuit tests outside this range.
- ACTIVATION 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.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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 through 4 If alarm is not present, follow steps 5 through 8.

<u>12 VDC CIRCUIT</u>:

2. **Check 2EVCON**

   a. Inspect Evaporator Fan Motor contactor coil and wire connections. Verify no damage to coil. Verify no damage, moisture, or corrosion in connections.

   b. Check contactor coil resistance. Refer to **Section 2.12**.

3. **Check 2EVCON Amp Draw** - Check 2EVCON amp draw. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for correct amp values. View current draw in Component Test Mode screen.

4. **Check 2EVCON Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10**.) Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.

Alarm continued on next page...

P00184 C2 CHECK EVAPORATOR FAN MOTOR - CONTINUED

460 VAC CIRCUIT:

5. **Check Amp Draw of 2EVCON Evaporator 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 2.11** for all three legs.

   b. Check fuses F30, F31, F32 Verify correct fuse, check fuse holder for damage, see **Figure 2.6**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

   c. Check voltage at 2EVCON contacts. Must be within range shown in **Section 2.11** for L1-L2, L1-L3, and L2-L3. Must be within range shown in **Section 2.11** for T1-T2, T1-T3, and T2-T3.

6. **Check Evaporator Fan Motor**

   a. With the unit off, visually check fan motor and blower wheel. Check for physical damage. Check for blockage to blower wheels and verify the blower wheels spin freely. Remove and replace if required.

   b. With the unit off, check the resistance of the evaporator fan motor windings. See **Section 2.11** for correct resistance. Resistance (Ohms) must be in range. No continuity from any high voltage lead to ground.

7. **Check Evaporator Fan Motor Connections** - Inspect high voltage fan motor connections at evaporator. Check for corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.

8. **Verify Accuracy of AC Current Sensor**

   a. Put microprocessor in PC Mode. Refer to **Section 5.3.2**. Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.

   b. Use a clamp on ammeter to measure current draw of all 3 legs of the T side of GENCON. Meter reading should be the same as Unit Data: Compare meter reading to Unit Data in PC Mode. Compare meter reading to Unit Data with unit under load.

P00185 C3 CHECK EVAPORATOR FAN MOTOR

This device is checked twice in Pretrip - once in Test 2 and again in Test 8.

- ACTIVATION TEST 2: (unit not running): Normal draw for the 2EVCON contactor coil is 0.05 to 2.0 Amps (12 VDC). The circuit tests outside this range.
- ACTIVATION 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.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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 **P00189 CHECK EVAPORATOR FAN MOTOR**. If alarm is present, follow steps 2 through 4. If alarm is not present, follow steps 5 through 8.

<u>12 VDC CIRCUIT</u>:

2. **Check 3EVCON**

   a. Inspect Evaporator Fan Motor contactor coil and wire connections. Verify no damage to coil. Verify no damage, moisture, or corrosion in connections.

   b. Check contactor coil resistance. Refer to **Section 2.12**.

3. **Check 3EVCON Amp Draw** - Check 3EVCON amp draw. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for correct amp values. View current draw in Component Test Mode screen.

4. **Check 3EVCON Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10**.) Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.

Alarm continued on next page...

P00185 C3 CHECK EVAPORATOR FAN MOTOR - CONTINUED

460 VAC CIRCUIT:

5. **Check Amp Draw of 3EVCON Evaporator 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 2.11** for all three legs.

   b. Check fuses F30, F31, F32 Verify correct fuse, check fuse holder for damage, see **Figure 2.6**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

   c. Check voltage at 3EVCON contacts. Must be within range shown in **Section 2.11** for L1-L2, L1-L3, and L2-L3. Must be within range shown in **Section 2.11** for T1-T2, T1-T3, and T2-T3.

6. **Check Evaporator Fan Motor**
   a. With the unit off, visually check fan motor and blower wheel. Check for physical damage. Check for blockage to blower wheels and verify the blower wheels spin freely. Remove and replace if required.

   b. With the unit off, check the resistance of the evaporator fan motor windings. See **Section 2.11** for correct resistance. Resistance (Ohms) must be in range. No continuity from any high voltage lead to ground.

7. **Check Evaporator Fan Motor Connections** - Inspect high voltage fan motor connections at evaporator. No corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.

8. **Verify Accuracy of AC Current Sensor**
   a. Put microprocessor in PC Mode. Refer to **Section 5.3.2**. Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.

   b. Use a clamp on ammeter to measure current draw of all 3 legs of the T side of GENCON. Meter reading should be the same as Unit Data: Compare meter reading to Unit Data in PC Mode. Compare meter reading to Unit Data with unit under load.

P00186 CHECK EVAP OUTLET TEMP

- ACTIVATION: Evaporator Outlet Temperature Sensor (EVOT) is not within the range of -53 to +158°F (-47 to +70°C.)
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

CORRECTIVE ACTIONS:

Check Sensor - Refer to procedure for alarm **00131 CHECK EVAP TEMP SENSOR**.

P00187 CHECK HEATER 1 CIRCUIT
This device is checked twice in Pretrip - once in Test 2 and again in Test 7.

- ACTIVATION TEST 2: (unit not running): Normal draw for the 1HTCON1 coil is 0.05 to 1.0 Amps (12 VDC). The circuit tests outside this range.
- ACTIVATION TEST 7: (unit running): Normal draw for the 1HTCON1 heaters is 1.0 to 3.5 Amps (460 VAC). The circuit tests outside this range.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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 **P00187 CHECK HEATER 1 CIRCUIT**. If alarm is present, follow steps 2 through 5 If alarm is not present, follow steps 6 through 9.

12 VDC CIRCUIT

2. **Check 1HTCON1**
   a. Inspect heater contactor coil and wire connections.Verify no damage to coil. Verify wire connections to contactor coil are tight. Verify no damaged or corroded wires to contactor coil.
   b. Check contactor coil resistance. Refer to **Section 2.12** for correct electrical values.
3. **Check 1HTCON1 Amp Draw** - Check 1HTCON1 amp draw. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for correct electrical values. View current draw in Component Test Mode screen.
4. **Check 1HTCON1 Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**.) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.
5. **Check Evaporator High Temperature Switch (EVHTS)** - Inspect for open EVHTS per wiring schematic **Section 10.3**. If open, replace switch as required.

Alarm continued on next page...

P00187 CHECK HEATER 1 CIRCUIT - CONTINUED

460 VAC CIRCUIT

6. **Check Amp Draw of 1HTCON1 Heater Circuit**
   a. With the unit running and calling for Heat, use a clamp on ammeter to check the current draw of all 3 legs. Must be within range shown in **Section 2.11** for all three legs.
   b. Check fuses F39, F40, and F41 for heater elements. Verify correct fuse, check fuse holder for damage, see **Figure 2.6**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).
   c. Check voltage at 1HTCON1 contacts. Must be within range shown in **Section 2.11** for L1-L2, L1-L3, and L2-L3. Must be within range shown in **Section 2.11** for T1-T2, T1-T3, and T2-T3. If not in range, verify SP-A, B, C by checking continuity from HTCON1 to GENCON
   d. Shut down Unit. Verify SP-A, B, C by checking continuity from HTCON1 to GENCON
7. **Check Heater Elements**
   a. Check heater elements with the unit Off. Verify there is no visual physical damage. Remove and replace if damaged.
   b. Check heater element resistance. Check from “T” terminals on 1HTCON1 contactor. See **Section 2.11** for correct resistance.
8. **Check Heater Element Connections**
   a. Inspect high voltage heater connections at evaporator. Check for corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.
   b. Disconnect heater element plug. Heater resistance per **Section 2.11**. Remove and replace heaters if required.
   c. Inspect plugs, plug seal and connectors. Check for corrosion, water damage or burning / discoloration. Remove and replace if required.
9. **Verify Accuracy of AC Current Sensor**
   a. Put microprocessor in PC Mode. Refer to **Section 5.3.2**. Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.
   b. Use a clamp on ammeter to measure current draw of all 3 legs of the T side of GENCON. Meter reading should be the same as Unit Data: Compare meter reading to Unit Data in PC Mode. Compare meter reading to Unit Data with unit under load.

P00188 CHECK HEATER 2 CIRCUIT

This device is checked twice in Pretrip - once in Test 2 and again in Test 8.

- ACTIVATION 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.
- ACTIVATION 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.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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 **P00188 CHECK HEATER 2 CIRCUIT**. If alarm is present, follow steps 2 through 4. If alarm is not present, follow steps 5 through 10.

12 VDC CIRCUIT

2. **Check 1HTCON2**

   a. Inspect heater contactor coil and wire connections. Verify there is no damage to coil. Check that wire connections to contactor coil are tight. Check for damaged or corroded wires to contactor coil.

   b. Check contactor coil resistance. Refer to **Section 2.12**.

3. **Check 1HTCON2 Amp Draw** - Check 1HTCON2 amp draw. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for correct electrical values. View current draw in Component Test Mode screen.

4. **Check 1HTCON2 Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

5. **Check Evaporator High Temperature Switch (EVHTS)** - Inspect for open EVHTS per wiring schematic, **Section 10.3**. If open, replace switch as required.

Alarm continued on next page...

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 Heat, use a clamp on ammeter to check the current draw of all 3 legs. Must be within range shown in **Section 2.11** for all three legs.
   b. Check fuses F39, F40, and F41 for heater elements. Verify correct fuse, and check fuse holder for damage, see **Figure 2.6**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).
   c. Check voltage at 1HTCON2 contacts. Must be within range shown in **Section 2.11** for L1-L2, L1-L3, and L2-L3. Must be within range shown in **Section 2.11** for T1-T2, T1-T3, and T2-T3. If not in range, verify SP-A, B, C by checking continuity from HTCON2 to GENCON
   d. Shut down Unit. Verify SP-A, B, C by checking continuity from HTCON1 to GENCON
7. **Check Heater Elements**
   a. Check heater elements with the unit Off. Verify there is no visual physical damage. Remove and replace if damaged.
   b. Check heater element resistance. Check from “T” terminals on 1HTCON1 contactor. See **Section 2.11** for correct resistance.
8. **Check Heater Element Connections**
   a. Inspect high voltage heater connections at evaporator. Check for corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.
   b. Disconnect heater element plug. Check heater resistance per **Section 2.11**. Remove and replace heaters if required.
   c. Inspect plugs, plug seal and connectors. Check for corrosion, water damage or burning / discoloration. Remove and replace if required.
9. **Verify Accuracy of AC Current Sensor**
   a. Put microprocessor in PC Mode. Refer to **Section 5.3.2**. Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.
   b. Use a clamp on ammeter to measure current draw of all 3 legs of the T side of GENCON. Meter reading should be the same as Unit Data: Compare meter reading to Unit Data in PC Mode. Compare meter reading to Unit Data with unit under load.

P00189 CHECK EVAPORATOR FAN MOTOR

This device is checked twice in Pretrip - once in Test 2 and again in Test 9.

- ACTIVATION 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.
- ACTIVATION 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.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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 **P00189 CHECK EVAPORATOR FAN MOTOR**. If alarm is present, follow steps 2 through 4. If alarm is not present, follow steps 5 through 8.

12 VDC CIRCUIT

2. **Check 1EVCON**

   a. Inspect Evaporator Fan Motor contactor coil and wire connections. Verify there is no damage to coil. Check that wire connections to contactor coil are tight. Check for damaged or corroded wires to contactor coil.

   b. Check contactor coil resistance. Refer to **Section 2.12**.

3. **Check 1EVCON Amp Draw** - Check 1EVCON amp draw. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for correct electrical values. View current draw in Component Test Mode screen.

4. **Check 1EVCON Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

Alarm continued on next page...

P00189 CHECK EVAPORATOR FAN MOTOR - CONTINUED
460 VAC CIRCUIT 5. **Check Amp Draw of 1EVCON Evaporator 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 2.11** for all three legs. b. Check fuses F36, F37, and F38 for heater elements. Verify correct fuse, check fuse holder for damage, see **Figure 2.6**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s). c. Check voltage at 1EVCON contacts. Must be within range shown in **Section 2.11** for L1-L2, L1-L3, and L2-L3. Must be within range shown in **Section 2.11** for T1-T2, T1-T3, and T2-T3. 6. Check Evaporator Fan Motor a. With the unit off, visually check fan motor and blower wheel. Check for physical damage. Check for blockage to the blower wheels and that blower wheels spin freely. Remove and replace if required. b. With the unit off, check the resistance of the evaporator fan motor windings. See **Section 2.11** for correct resistance. Resistance (Ohms) must be in range. Verify no continuity from any high voltage lead to ground. 7. **Check Evaporator Fan Motor Connections** - Inspect high voltage fan motor connections at evaporator. Check for corrosion, water damage or burning / discoloration. Remove, repair, or replace if required. 8. **Verify Accuracy of AC Current Sensor** a. Put microprocessor in PC Mode. Refer to **Section 5.3.2**. Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data. b. Use a clamp on ammeter to measure current draw of all 3 legs of the T side of GENCON. Meter reading should be the same as Unit Data. Compare meter reading to Unit Data in PC Mode. Compare meter reading to Unit Data with unit under load.

P00190 CHECK CONDENSER FAN MOTOR

- ACTIVATION: Normal draw for the condenser fan motors is 0.8 to 3.5 Amps (460 VAC). The circuit tests outside this range.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary. 460 VAC CIRCUIT

CORRECTIVE ACTIONS:

460 VAC CIRCUIT

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 2.11** for all three legs. 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, F36, F37, and F38. Verify correct fuse, check fuse holder for damage, see **Figure 2.6**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

   c. Check voltage at CDCON contacts. Must be within range shown in **Section 2.11** for L1-L2, L1-L3, and L2-L3. Must be within range shown in **Section 2.11** for T1-T2, T1-T3, and T2-T3.

2. **Check Condenser Fan Motors**

   a. Check condenser fan motors. Verify there is no visual physical damage, and no blockage due to debris. Remove and replace if required.

   b. With the unit off, visually check fan motors and fan blades. Verify there is no visual physical damage, and no blockage to fan blades. Make sure the fan blades spin freely. Remove and replace if required.

   c. With the unit off, check the resistance of the condenser fan motor windings. See **Section 2.11** for correct resistance. Resistance (Ohms) must be in range. Verify no continuity from any high voltage lead to ground.

3. **Check Condenser Fan Motor Connections** - Inspect high voltage connections at the condenser fan motors. Check for corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.

4. **Verify Accuracy of AC Current Sensor**

   a. Put microprocessor in PC Mode. Refer to **Section 5.3.2**. Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.

   b. Use a clamp on ammeter to measure current draw of all 3 legs of the T side of GENCON. Meter reading should be the same as Unit Data: Compare meter reading to Unit Data in PC Mode. Compare meter reading to Unit Data with unit under load.

P00199 C2 CHECK RETURN AIR SENSOR

- ACTIVATION: Compartment 2 Return Air Temperature Sensor (RAT) is not within the range of -53 to +158°F (-47 to +70°C).
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again, or alarm may be manually reset using the display mounted keys or by turning the unit off, then back on again.

CORRECTIVE ACTIONS:

Check sensor operation - Refer to procedure for alarm **00122 CHECK RETURN AIR SENSOR**. Alarm condition must be corrected and the alarm cleared to continue.

P00206 CHECK CONDENSER FAN CIRCUIT

- ACTIVATION: Normal draw for the CDCON contactor coil is 0.05 to 2.0 Amps (12 VDC). The circuit tests outside this range.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check CDCON**

   a. Inspect CDCON contactor coil and wire connections. Verify there is no damage to coil, and no damage, moisture, or corrosion in connections.

   b. Check contactor coil resistance. Refer to **Section 2.12**.

2. **Check CDCON Amp Draw** - Check CDCON contactor coil amp draw. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for amp values. View current draw in Component Test Mode screen.

3. **Check CDCON Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

P00207 CHECK COMPRESSOR CONTACT CIRC

- ACTIVATION: Normal draw for the CCON contactor coil is 0.0 to 1.0 Amps (12 VDC). The circuit tests outside this range.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check CCON**

   a. Inspect CCON contactor coils and wire connections. Verify there is no damage to coil, and no damage, moisture, or corrosion in connections.

   b. Check contactor coil resistance Refer to **Section 2.12**.

2. **Check CCON Amp Draw**

   a. Check CCON contactor coil amp draw. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for correct electrical values. View current draw in Component Test Mode screen.

   b. Listen for CCON to pull in. If CCON contactor pulls in, CCON is OK. If CCON contactor does not pull in, check for 12 VDC at CCON coil. 12 VDC indicates defective CCON coil.

3. **Check CCON Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

P00208 CHECK GENERATOR CONT CIRC

- ACTIVATION: Normal draw for the GENCON coil is 0.0 to 1.0 Amps (12 VDC). The circuit tests outside this range.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check GENCON**

   a. Inspect GENCON contactor coils and wire connections. Verify there is no damage to coil, and no damage, moisture, or corrosion in connections.

   b. Check contactor coil resistance. Refer to **Section 2.12**.

2. **Check GENCON Amp Draw**

   a. Check GENCON contactor coils amp draw. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for amp values. View current draw in Component Test Mode screen.

   b. Listen for GENCON to pull in.

   If GENCON contactor pulls in, GENCON is OK.

   If GENCON contactor does not pull in, check for 12 VDC at GENCON coil. 12 VDC across A1 - A2 indicates defective GENCON coil.

   If no voltage, check GENCON wiring through PSCON & PSCON2 aux, and CCB. Check fuse F9.

   c. Check 12 VDC across A1 - A2. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for correct electrical values.

3. **Check GENCON Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

P00209	CHECK STANDBY CONT CIRCUIT

- ACTIVATION: Normal amps for the PSCON **or** 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.)
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) 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.

CORRECTIVE ACTIONS:

1. **Check PSCON and PSCON2**
   a. Inspect PSCON and PSCON2 contactor coils and wire connections. Verify there is no damage to coils, and no damage, moisture, or corrosion in connections.
   b. Check contactor coil resistance. Refer to **Section 2.12** for resistance values.
2. **Check PSCON and PSCON2 Amp Draw**
   a. Check PSCON and PSCON2 contactor coils amp draw. Use Component Test Mode (**Section 5.2.4**) to test. Refer to **Section 2.12** for amp values. View current draw in Component Test Mode screen.
   b. Listen for PSCON or PSCON2 to pull in.

   WARNING

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

   If PSCON or PSCON2 contactor pulls in, PSCON / PSCON2 are OK. If PSCON or PSCON2 contactor does not pull in, check for 12 VDC across the coil. If 12 VDC across A-1 & A-2, check wiring from A-1 to B-1, if wiring is OK, replace contactor. No voltage - check F9.
3. **Check PSCON, and PSCON2 Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

00210	C3 CHECK RETURN AIR SENSOR

- ACTIVATION: Compartment 3 Return Air Temperature Sensor is not within the range of -53 to +158°F (-47 to +70°C).
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail and display “PRETRIP FAIL AND COMPLETED”.
- RESET CONDITION: Auto reset if Pretrip is started again, or alarm may be manually reset using the display mounted keys or by turning the unit off, then back on again.

CORRECTIVE ACTIONS:

Check sensor operation - Refer to procedure for alarm **00122 CHECK RETURN AIR SENSOR**. Alarm condition must be corrected and the alarm cleared to continue.

00211	C2 CHECK DEFRFOST SENSOR

- ACTIVATION: Compartment 2 Defrost Termination Temperature Sensor is not within the range of -53 to +158°F (-47 to +70°0 C.)
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

CORRECTIVE ACTIONS:

Check sensor operation - Refer to procedure for alarm **00124 CHECK DEFROST TERM 1 SENSOR**. Alarm condition must be corrected and the alarm cleared to continue.

00212	C3 CHECK DEFROST SENSOR

- ACTIVATION: Compartment 3 Defrost Termination Temperature Sensor is not within the range of -53 to +158°F (-47 to +70°0 C.)
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

CORRECTIVE ACTIONS:

Check sensor operation - Refer to procedure for alarm **00124 CHECK DEFROST TERM 1 SENSOR**. Alarm condition must be corrected and the alarm cleared to continue.

00223	ENGINE MAINTENANCE DUE

- ACTIVATION: The Engine Maintenance Hour Meter time has expired.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only. Alarm Light will NOT be turned on.
- RESET CONDITION: Alarm may be manually reset using the display mounted keys.

CORRECTIVE ACTIONS:

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.

00224	STANDBY MAINTENANCE DUE

- ACTIVATION: The Standby Hour Meter time has expired.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only. Alarm Light will NOT be turned on.
- RESET CONDITION: Alarm may be manually reset via keypad.

CORRECTIVE ACTIONS:

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.

00225	GENERAL MAINTENANCE DUE

- ACTIVATION: The General Maintenance Hour Meter time has expired.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only. Alarm Light will NOT be turned on.
- RESET CONDITION: Alarm may be manually reset via keypad.

CORRECTIVE ACTIONS:

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.

00226 SERVICE SOON-PM #1 DUE

- ACTIVATION: The Maintenance Hour Meter #1 time has expired.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only. Alarm Light will NOT be turned on.
- RESET CONDITION: Alarm may be manually reset via keypad.

CORRECTIVE ACTIONS:

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 the 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.

00227 SERVICE SOON-PM #2 DUE

- ACTIVATION: The Maintenance Hour Meter #2 time has expired.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only. Alarm Light will NOT be turned on.
- RESET CONDITION: Alarm may be manually reset via keypad.

CORRECTIVE ACTIONS:

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 the 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.

00228 SERVICE SOON-PM #3 DUE

- ACTIVATION: The Maintenance Hour Meter #3 time has expired.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only. Alarm Light will NOT be turned on.
- RESET CONDITION: Alarm may be manually reset via keypad.

CORRECTIVE ACTIONS:

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 the 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.

00229 SERVICE SOON-PM #4 DUE

- ACTIVATION: The Maintenance Hour Meter #4 time has expired.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only. Alarm Light will NOT be turned on.
- RESET CONDITION: Alarm may be manually reset via keypad.

CORRECTIVE ACTIONS:

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 the 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.

00230 SERVICE SOON-PM #5 DUE

- ACTIVATION: The Maintenance Hour Meter #4 time has expired.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only. Alarm Light will NOT be turned on.
- RESET CONDITION: Alarm may be manually reset via keypad.

CORRECTIVE ACTIONS:

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 the 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.

00232 SETPOINT ERROR

- ACTIVATION: There is an error in the setpoint that is stored in the main microprocessor memory.
- UNIT CONTROL: Engine and Electric Operation: Shutdown and alarm.
- RESET CONDITION: Auto reset when a valid setpoint is entered, or alarm may be manually reset by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Setpoint**

   a. Check setpoint setting. Must be between -22 and +90° F (-30° and +32°C).

   b. Enter new setpoint.

2. **Reset Microprocessor**

   a. Place the START/RUN-OFF switch in the OFF position. Disconnect positive battery cable, remove the F7 fuse or unplug 1MM connector, wait 20 seconds and reinstall. Then place the START/RUN-OFF back in the START/RUN position. The microprocessor powers up OK and the latest setpoint appears in the display.

   b. Valid setpoint can not be entered and alarm 00232 remains active. Download data and replace the main microprocessor module (MM). Refer to Section 5.4.

00233 MODEL # ERROR

- ACTIVATION: There is an error in the Model Number that is stored in the main microprocessor memory
- UNIT CONTROL: Engine and Electric Operation: Shutdown and alarm.
- RESET CONDITION: Auto reset only when a valid Model number is entered.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Model Number**

   a. Check Model # in microprocessor. Check Model Number on Nameplate.

   b. Enter correct Model Number. 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 START/RUN-OFF switch in the OFF position. Disconnect positive battery cable, remove F7 fuse or unplug 1MM connector, wait 20 seconds and reinstall. Then place the START/RUN-OFF back in the START/RUN position. The microprocessor powers up OK and the latest setpoint appears in the display.

   b. Check for valid Model number in Unit Data. Valid number is present. Alarm is cleared.

   c. Valid model number can not be entered and alarm remains active. Download data and replace the main microprocessor module (MM). Refer to **Section 5.4**.

00237	FUNCTION PARAMETERS ERROR

- ACTIVATION: There is an error in one or more of the Functional Parameters that are stored in the main microprocessor memory.
- UNIT CONTROL: Engine and Electric Operation: Incorrect Functional Parameter(s) will be automatically set for default value.
- RESET CONDITION: Auto reset when valid Functional Parameters are entered, or alarm may be manually reset by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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 5.3.4**.
3. **Reset Microprocessor**

   a. Place the START/RUN-OFF switch in the OFF position. Disconnect positive battery cable, remove F7 fuse or unplug 1MM connector, wait 20 seconds and reinstall. Then place the START/RUN-OFF back in the START/RUN position. The microprocessor powers up OK and the latest setpoint appears in the display.

   b. Check for valid Functional Parameters in Functional Parameters List. Valid number is set for all parameters. Alarm is cleared.

   c. Valid Functional Parameter(s) can not be entered and alarm remains active. Download data and replace the main microprocessor module (MM). Refer to **Section 5.4**.

00238 CONFIGURATIONS ERROR

- ACTIVATION: There is an error in the Configuration settings that are stored in the main microprocessor memory.
- UNIT CONTROL: Engine and Electric Operation: Incorrect Configuration(s) will be automatically set for default value.
- RESET CONDITION: Auto reset when valid Configuration(s) are entered, or alarm may be manually reset by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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. If changes were made using a newer version of TRU-Tech, that version may contain Configurations that were not present in older versions of control system software.
3. **Reconfigure Microprocessor** - Send settings to microprocessor. Using the latest version of TRU-Tech and a Data Transfer USB Memory Device, write the desired Configuration file to the device, then load the file into the microprocessor. Allow the microprocessor to reboot itself.
4. **Reset Microprocessor**

   a. Place the START/RUN-OFF switch in the OFF position. Disconnect positive battery cable, remove F7 fuse or unplug 1MM connector, wait 20 seconds and reinstall. Then place the START/RUN-OFF back in the START/RUN position. The microprocessor powers up OK and the latest setpoint appears in the display.

   b. Check for valid Configuration settings in Configuration List. Values are set correctly for all parameters. Alarm is cleared.

   c. Disconnect positive battery cable from the battery, wait 30 seconds, then reconnect and place the START/RUN-OFF switch in the START/RUN The microprocessor powers up OK and the latest setpoint appears in the display.

   d. Check for valid Configuration settings in Configuration List. Values are set correctly for all parameters. Alarm is cleared.

   e. Valid Configurations can not be entered and alarm remains active. Download data and replace the main microprocessor module (MM). Refer to **Section 5.4**.

00245 CANNOT SAVE SETTING

- ACTIVATION: There is an error in sending and saving new settings in the main microprocessor memory.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Microprocessor Software Revision** - Check microprocessor software. The unit should have the software upgraded to the latest version, provided for Carrier Transicold dealers on the TransCentral site.
2. **Reset Microprocessor**

   a. Place the START/RUN-OFF switch in the OFF position. Disconnect positive battery cable, remove F7 fuse or unplug 1MM connector, wait 20 seconds and reinstall. Then place the START/RUN-OFF back in the START/RUN position. The microprocessor powers up OK and the latest setpoint appears in the display.

   b. Check Active Alarm List. Verify alarm is cleared - microprocessor is OK.

   c. Alarm **00245 CANNOT SAVE SETTING** remains active. Unit will operate, but changes to the settings will not be retained in the microprocessor memory. Download data and replace the main microprocessor module (MM). Refer to **Section 5.4**.

00246 EEPROM WRITE FAILURE

- ACTIVATION: There is an error in the ability to write information to be stored in the main microprocessor memory.
- UNIT CONTROL: Engine and Electric Operation: Alarm only
- RESET CONDITION: Alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Microprocessor**

   a. Check setpoint setting. Must be between -22 and +90°F (-30 and +32°C).

   b. Enter new setpoint. Must be between -22 and +90°F (-30 and +32°C).
2. **Reset Microprocessor**

   a. Place the START/RUN-OFF switch in the OFF position. Disconnect positive battery cable, remove F7 fuse or unplug 1MM connector, wait 20 seconds and reinstall. Then place the START/RUN-OFF back in the START/RUN position. The microprocessor powers up OK and the latest setpoint appears in the display.

   b. Alarm 00246 remains active. Download data and replace the main microprocessor module (MM). Refer to **Section 5.4**.

00248 CONFIG MODE / HP2 ERROR

- ACTIVATION: EEPROM Configuration is out of range.
- UNIT CONTROL: Engine and Electric Operation: Shutdown and alarm.
- RESET CONDITION: Auto reset only when valid info is entered.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check microprocessor**

   a. Check setpoint setting. Must be between -22 and +90°F (-30 and +32°C).

   b. 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 TRU-Tech a USB data transfer device. (Do NOT use the display mounted keys.)

   c. Check Configurations. All settings must be valid. Send desired settings to microprocessor using the latest version of TRU-Tech a USB data transfer device. (Do NOT use the display mounted keys.)

3. **Reset microprocessor**

   a. Place the START/RUN-OFF switch in the OFF position. Disconnect positive battery cable, remove F7 fuse or unplug 1MM connector, wait 20 seconds and reinstall. Then place the START/RUN-OFF back in the START/RUN position. The microprocessor powers up OK and the latest setpoint appears in the display.

   b. Alarm 00248 remains active. Download data and replace the main microprocessor module (MM). Refer to **Section 5.4**.

00255	MICROPROCESSOR ERROR

- ACTIVATION: If alarm 21100 “NO COMM FROM MICRO TO DISPLAY“ is not active and main microprocessor input and/or output board configuration is incorrect.
- UNIT CONTROL: Engine and Electric Operation: Shutdown and alarm.
- RESET CONDITION: Auto reset when board communications are valid, 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Software Revision** - Check microprocessor software. The unit should have the software upgraded to the latest version, provided for Carrier Transicold dealers on the TransCentral site.
2. **Reset Microprocessor**

   a. Place the START/RUN-OFF switch in the OFF position. Disconnect positive battery cable, remove F7 fuse or unplug 1MM connector, wait 20 seconds and reinstall. Then place the START/RUN-OFF back in the START/RUN position. The microprocessor powers up OK and the latest setpoint appears in the display.

   b. Alarm 00255 remains active. Download data and replace the main microprocessor module (MM). Refer to **Section 5.4**.

02000	UPDATE SOFTWARE

- ACTIVATION: The software version in one or more of the modules is not compatible with the remainder of the control system.
- UNIT CONTROL: Engine and Electric Operation: Shutdown and alarm.
- RESET CONDITION: Auto reset when all module software versions are compatible. Or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Reload Software - The unit should have the software upgraded to the latest version, provided for Carrier Transicold dealers on the TransCentral site.

02001	REAR PANEL SHUTDOWN

- ACTIVATION: 'UNIT OFF' soft key is pressed from Remote Panel.
- UNIT CONTROL: Engine and Electric Operation: Shutdown and alarm.
- RESET CONDITION: Auto reset when all module software versions are compatible. Or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Verify Unit should be shut down.

02002 LOW DISCHARGE SUPERHEAT

- ACTIVATION: Compressor discharge superheat is less than 68°F (20°C) after 3 minutes of engaging the Econ SH offset logic, the compressor is on, and Evaporator Flood back control hasn't been active in the last 3 minutes and suction superheat is greater than 40°F (4.4°C)

NOTE

This alarm can be caused by a stuck open ECXV or LIV, causing too much liquid to be sent into the compressor at the economizer connection. An inaccurate pressure transducer or temperature sensor reading (discharge or economizer) can also cause this alarm.

- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Discharge superheat is more than 72°F (22°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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check System Pressures** - Install manifold gauge set and check and compare compressor discharge, suction and economizer pressures with those shown in Unit Data. The ECOP should read between the CSP and the CDT, if not it indicated the ECOP has failed. Refer to **Section 8.9.11** for instruction on comparison. If discharge pressure is in normal range, proceed to step 5.
2. **Check Suction, Discharge and Economizer Temperature Sensors**
   a. Check economizer temperature sensor insulation integrity, make sure insulation is properly installed. Repair or replace any insulation if required. Loose or missing insulation will cause inaccurate refrigerant temperature readings.
   b. Inspect sensor & connectors. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connectors.
   c. Check sensor resistance. (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–3** for chart of resistances for different sensors.
3. **Check Economizer Pressure Transducer** - Inspect sensor & connectors. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connectors.
4. **Perform Pretrip** - Clear the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.
5. **Check Expansion Valves, EVXV, ECXV**
   a. Visually inspect valve. Verify there is no damage to valve, and no damage, moisture, or corrosion in coil. Check coil is seated properly.
   b. Check operation of valve. Refer to **Section 8.9.8**.
6. **Check Liquid Injection Valve (LIV)** - Inspect valve & coil. Verify there is no damage to valve, and no damage, moisture, or corrosion in coil. Refer **Section 8.9.9**

02003	DISPLAY MODULE ERROR

- ACTIVATION: The APX Control system has detected 50 or more On/Off transitions of the SROS within a 4 minute period.
- UNIT CONTROL: Shutdown and Alarm.
- RESET CONDITION: The system can be temporarily reset by enabling Emergency Bypass Mode. The system will be permanently reset after replacing the Display Module.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Enable Emergency Bypass Mode** - This is a temporary solution that will only allow the system to function for 24 hours.
   a. In the event of an alarm caused by a failure of the display module, the unit will go into shutdown. In order to temporarily bypass this shutdown state, Emergency Bypass Mode can be activated, refer to **Section 3.22**.
   b. Once Emergency Bypass Mode has been activated, the unit will operate normally for 24 hours, a countdown timer will be shown on the display. This 24 hour window of operation will keep the load safe, and provide enough time to contact the nearest Carrier Transicold Service Center for repair of the unit.
2. **Remove and replace the Display Module, refer to Section 8.10.4**.

03001	ENGINE LOAD CALIBRATION

- ACTIVATION: Activate alarm if:

  Condition 1 = At engine start if the engine throttle sensor (Rack Position Sensor) value is less than 90%.

  Condition 2 = After start if the sensor value does not drop below 90% within 5 seconds.

  Condition 3 = At engine shutoff if the sensor value does not drop below 10% within 5 seconds.
- UNIT CONTROL: Alarm only. Control system will modulate CSMV and activate Economizer Control as required.
- RESET CONDITION: Alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Rack Position Sensor (RPS) Power And Wiring**
   a. Inspect sensor, connector pins & terminals. Verify no physical damage to sensor. Check for damage or corrosion in connections.
   b. If required, power sensor by placing the unit in PC Mode. Check for power. Voltage reading between connector position 1 (positive) and position 2 (negative) should be 5 volts DC. Check connectors and wiring between terminals for damage, moisture or corrosion.
   c. Check for continuity from connector terminal 3 to ENCU-7. If good continuity is not present, check connectors and wiring between terminals for damage, moisture or corrosion.
2. **Perform the Engine Load Calibration** - Refer to **Section 8.6.13**.
3. **Replace Rack Position Sensor** - Replace sensor with known good component. Calibrate sensor and ENCU. Refer to **Section 8.6.13**.

04000 CHECK REMOTE SWITCH 3 (REMS3)

- ACTIVATION: REMS3 is set to trigger an alarm if the switch is activated (opened or closed, depending on switch type) for more than five seconds.
- UNIT CONTROL: Engine and Electric Operation: May be configured as alarm only, alarm and force low engine speed or alarm and shutdown.
- RESET CONDITION: Alarm Only: Auto reset after the switch has de-activated for more than five seconds. Shutdown: Auto reset after three minutes (minimum off time for switch activated 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

<u>IF A SWITCH IS INSTALLED</u>:

1. **Determine What REMS3 Is Activated By** - REMS3 may be connected to a compartment door or some other device. Locate the device used as REMS3.
2. **Check To See If REMS3 Has Activated** - Inspect device used to activate REMS3. For example, Compartment door must be closed, and switch must be de-activated.
3. **Check Configuration for REMS3** - 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 **Section 5.2.3**.
4. **Check Wiring**

   a. Visually inspect wiring to REMS3. 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 minimum 11 VDC from 2SVM-14 through the wiring and switch back to 2SVM-25.
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 or low speed, this action may be temporarily overridden by setting the correct Functional Parameter. Set the OVERRIDE REMS3 SHUTDOWN Functional Parameter to YES.

<u>IF A SWITCH IS NOT INSTALLED</u>:

1. **Check Configurations** - Any switch/sensor not present in the unit should not be Configured “ON”. Correct Configurations.
2. **Check REM Connector** - Locate and inspect 10 position connector for optional sensors and switches (see wiring schematic **Section 10**). Connector must have cap on, no corrosion or moisture inside connector. 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.

04001	CHECK REMOTE SWITCH 4 (REMS4)

- ACTIVATION: REMS4 is set to trigger an alarm if the switch is activated (opened or closed, depending on switch type) for more than five seconds.
- UNIT CONTROL: Engine and Electric Operation: May be configured as alarm only, alarm and force low engine speed or alarm and shutdown.
- RESET CONDITION: Alarm Only: Auto reset after the switch has de-activated for more than five seconds. Shutdown: Auto reset after three minutes (minimum off time for switch activated 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

<u>IS A SWITCH IS INSTALLED</u>:

1. **Determine What REMS4 Is Activated By** - REMS4 may be connected to a compartment door or some other device. Locate the device used as REMS4.
2. **Check To See If REMS4 Has Activated** - Inspect device used to activate REMS4. For example, Compartment door must be closed, and switch must be de-activated.
3. **Check Configuration for REMS4** - 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 **Section 5.2.3**.
4. **Check Wiring**

   a. Visually inspect wiring to REMS4. 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 minimum 11 VDC from 2SVM-14 through the wiring and switch back to 2SVM-25.
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 or low speed, this action may be temporarily overridden by setting the correct Functional Parameter. Set the OVERRIDE REMS4 SHUTDOWN Functional Parameter to YES.

<u>IF A SWITCH IS NOT INSTALLED</u>:

1. **Check Configurations** - Any switch/sensor not present in the unit should not be Configured “ON”. Correct Configurations.
2. **Check REM Connector** - Locate and inspect 10 position connector for optional sensors and switches (see wiring schematic **Section 10**). Connector must have cap on, and no corrosion or moisture inside connector. 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.

04002 HIGH ECONOMIZER SUPERHEAT

- ACTIVATION: With unit running in economized mode for 15 minutes, ECXV open greater than 99% for 5 minutes, and a box temperature less than 14°F (-10°C); economizer superheat is above 74°F (23°C) for 5 minutes.

NOTE

This alarm can be caused by a stuck ECXV, not letting enough liquid into the economizer circuit. An inaccurate economizer pressure transducer or economizer temperature sensor can also cause this alarm.

- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Calculated economizer superheat reaches the desired range, or < 60°F (15°C) for 2 minutes. Unit Changes from Economized Mode to standard mode or Compressor shuts off, 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check For Low Refrigerant** - Charge Check refrigerant level in the receiver. Generally, level should be between upper & lower sight glasses with a refrigerated compartment temperature of 35°F (1.0°C) or lower. Refer to **Section 8.7.2**.
2. **Check Economizer Temperature Sensor** - Inspect sensor & connectors. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connectors.
3. **Check Economizer Pressure Transducer** - Inspect sensor & connectors. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connectors.
4. **Perform Pretrip** - Run Pretrip and check for alarms. Any active alarms must be corrected and cleared before proceeding.
5. **Check Economizer Expansion Valve (ECXV)**

   a. Visually inspect valve. Verify there is no damage to valve, and no damage, moisture, or corrosion in coil. Check coil is seated properly.

   b. Check operation of valve. Refer to **Section 8.9.8**.
6. **Check Expansion Valve (EVXV)**

   a. Visually inspect valve. Verify there is no damage to valve, and no damage, moisture, or corrosion in coil. Check coil is seated properly.

   b. Check operation of valve. Refer to **Section 8.9.8**.

04004	NO SETPOINT CHANGE
04005	NO SETPOINT CHANGE C2
04006	NO SETPOINT CHANGE C3

- ACTIVATION: Operator failed to press '=' key after entering a setpoint change
- UNIT CONTROL: Alarm only.
- RESET CONDITION: Setpoint change entered correctly.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Enter setpoint change, and then press the “=” key. Refer to **Section 3.8.**

04007	CHECK C2 CONFUIGURATION
04008	CHECK C3 CONFUIGURATION

- ACTIVATION: Incorrect configuration setting for Remote Compartment
- UNIT CONTROL: Alarm only.
- RESET CONDITION: Select an Evaporator Configuration other than NONE.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Make sure the C2 / C3 EVAPORATOR CONFIGURATION is correct - Refer to **Table 5–1** for Configuration Settings.

04016	CHECK EES CONFIGURATION

- ACTIVATION: EES specific CAN messages or alarms are present and the EES is configured off
- UNIT CONTROL: Alarm only.
- RESET CONDITION: Select an EES Configuration other than NONE

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Make sure the EES SYSTEM INSTALLED configuration is correct - Refer to **Table 5–1** for Configuration Settings.

05004 BAD F13 FUSE

- ACTIVATION: Fuse Alarm; Feedback from Output Board indicates fuse is missing or blown. Signal must be present for at least 3 seconds.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Replace or fix fuse issue.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Fuse F13**

   a. Visually check fuse. Verify correct fuse, check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

   b. Check voltage. Check voltage through the fuse. If fuse is blown, replace it.

   c. Check wiring from PCM4 through MTLV connector to the remotes. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

2. **Check Remote 1 and Remote 2 Control Boxes**

   a. Visually check. Verify no physical damage to the harness. Verify there is no damage, moisture, or corrosion in connectors.

   b. Check for high amp draw. Refer to **Section 2.12** for correct electrical values. Use ammeter.

05005 BAD F9 FUSE

- ACTIVATION: CCB Fuse Alarm; Feedback from CCB indicates fuse is missing or blown. Signal must be present for at least 3 seconds.
- UNIT CONTROL: Engine and Electric Operation: Shutdown and Alarm.
- RESET CONDITION: Replace or fix fuse issue.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Check Fuse F9

a. Visually check fuse. Verify correct fuse, check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

b. Check voltage. Check voltage through the fuse. If fuse is blown, replace it.

c. Check wiring. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

05006 POWER ENABLE RELAY FUSE ALARM

- ACTIVATION: Fuses 9, 10 and 13 (multi-temp only) must be in a failed state in order to trigger the Power Enable Relay (PER) Fuse Alarm.
- UNIT CONTROL: Engine and Electric Operation: Shutdown and Alarm.
- RESET CONDITION: Fuses are not in a failed state.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Fuse F5**
   a. Visually check fuse. Verify correct fuse, and check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).
   b. Check voltage. Check voltage through the fuse, if fuse is blown, replace it.
   c. Check wiring. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.
2. **Check Fuse F9 and F10**
   a. Visually check fuses. Verify correct fuse, and check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).
   b. Check voltage. Check voltage through the fuse, if fuse is blown, replace it.
   c. Check wiring. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

05007 BAD F3 FUSE

- ACTIVATION: Stepper Board Fuse Alarm; Feedback from Stepper Board indicates fuse is missing or blown. Signal must be present for at least 3 seconds.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Replace or fix fuse issue.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Check Fuse F3

a. Visually check fuse. Verify correct fuse, and check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).
b. Check voltage. Check voltage through the fuse, if fuse is blown, replace it.
c. Check wiring from PCM34 - SP-18 - ENCU - 2SVM22. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

05008 BAD F10 FUSE

- ACTIVATION: Output Board Fuse Alarm; Feedback from Output Board indicates fuse is missing or blown. Signal must be present for at least 3 seconds.
- UNIT CONTROL: Engine and Electric Operation: Shutdown and Alarm.
- RESET CONDITION: Replace or fix fuse issue.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Fuse F10**

   a. Visually check fuse. Verify correct fuse, and check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

   b. Check voltage. Check voltage through the fuse, if fuse is blown, replace it.

   c. Check wiring from PCM8 - 3MM34 - PCM9 - 3MM23. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

2. **Check LIV, FP, FS, ENCU**

   a. Visually check for physical damage to harness, and verify no damage, moisture, or corrosion in connectors.

   b. Check for high amp draw. Refer to **Section 2.12** for correct electrical values. Use ammeter.

05009 CHECK STANDBY CONTACTOR ONE (PSCON)

- ACTIVATION: Standby contactor one (PSCON) circuit is shorted or open.
- UNIT CONTROL: Engine Operation: Alarm condition only.
  Electric Operation: Required Shutdown
- RESET CONDITION: 15 Minutes have elapsed since activation 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.

CORRECTIVE ACTIONS:

1. **Check PSCON**

   a. Inspect generator contactor coil and terminals. Verify there is no damage to coil, and no damage or corrosion at terminals.

   b. Check contactor coil resistance. Refer to **Section 2.12** 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 2.12** for correct electrical values. Use ammeter.

2. **Check PSCON Current Draw**

   Use Component Test Mode to test actual current draw of the circuit. (Refer to **Section 5.2.4**.) Refer to **Section 2.12** for correct electrical values. View current draw in Component Test Mode screen.

3. **Check PSCON Wiring**

   a. Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness.

   b. Check PSCON loose wires or open. Verify there is no damage, moisture, or corrosion in connectors.

05010	CHECK STANDBY CONTACTOR TWO (PSCON2)

- ACTIVATION: Standby contactor one (PSCON2) circuit is shorted or open.
- UNIT CONTROL: Engine Operation: Alarm condition only.
  Electric Operation: Required Shutdown
- RESET CONDITION: 15 Minutes have elapsed since activation 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.

CORRECTIVE ACTIONS:

1. **Check PSCON2**

   a. Inspect generator contactor coil and terminals. Verify there is no damage to coil, and no damage or corrosion at terminals.

   b. Check contactor coil resistance. Refer to **Section 2.12** 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 2.12** for correct electrical values. Use ammeter.

2. **Check PSCON2 Current Draw** - Use Component Test Mode to test actual current draw of the circuit. (Refer to **Section 5.2.4**.) Refer to **Section 2.12** for correct electrical values. View current draw in Component Test Mode screen.

3. **Check PSCON2 Wiring**

   a. Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness.

   b. Check PSCON2 loose wires or open. Verify there is no damage, moisture, or corrosion in connectors.

05012 CHECK ENCU POWER CIRCUIT

NOTE

When operation of the engine is required the main microprocessor will provide a signal from terminal 3MM-9. This signal has been referred to as the “run relay”, based on pre-APX control systems that had an actual relay in place. Whenever the term “run relay” is used in APX control system discussion, it is referring to the engine run output from 3MM-9 to the ENCU at terminal ENCU-44.

- ACTIVATION: A problem has been detected in the ENCU-44 terminal circuit. If this alarm is activated while the circuit is energized, the circuit is detected shorted. If this alarm is activated at any other time, the circuit is detected open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto reset when the circuit is normal, or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Wiring**

   a. Inspect main microprocessor 3MM & ENCU connectors. Verify there is no damage to module, and no damage, moisture, or corrosion in connector.

   b. Use Component Test Mode (Refer to **Section 5.2.4**) to energize the circuit. Must have minimum 11 VDC at 3MM-9. If no voltage at 3MM-9, download data and replace main microprocessor. Refer to **Section 5.4**.

   c. With circuit still in Component Test Mode check voltage at ENCU-44. Must have minimum 11 VDC at ENCU-44. If no voltage at ENCU- 44, check connectors and wiring between terminals for damage, moisture or corrosion.

   d. Place the SROS in the OFF position and check continuity of the wiring from ENCU-19 to the “ENCUGND” connector extending from the battery negative cable connection. Check connectors and wiring between terminals for damage, moisture or corrosion.

2. **Check ENCU** - Replace ENCU with a known good component. Calibrate sensor and ENCU. Refer to **Section 8.6.13**

05014 CHECK STARTER SOLENOID CIRCUIT

- ACTIVATION: A problem has been detected in the starter solenoid coil (SS) circuit. If this alarm is activated while the control system is calling for SS to be energized, the circuit is detected shorted. If this alarm occurs at any other time, the circuit is detected open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto reset when the control system calls for SS to energize and the coil circuit is normal, or when the control system calls for SS to be de-energized and the circuit is not shorted or Alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Starter Solenoid Coil**

   a. Inspect coil & connector terminal. Verify there is no damage to coil. Special connector at starter is tight and locked. Harness connector is not damaged or corroded.

   b. Check resistance of coil. Verify coil not open or shorted.

2. **Check Power And Wiring**

   a. Place Start/Run - Off switch in the OFF position and then back into the Start/Run position. Following buzzer, check for power at SS terminal and 3MM-12. Must have minimum 11 VDC. If not, check connectors and wiring between terminals for damage, moisture or corrosion.

   b. Check starter. Refer to engine workshop manual.

05016 CHECK REMOTE AMBER LIGHT

- ACTIVATION: A problem has been detected in the alarm (amber) light circuit (LB). If this alarm is activated while the circuit is energized, the circuit is detected shorted. If this alarm is activated at any other time, the circuit is detected open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto reset when the circuit is normal, or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Light Bar Wiring** - Inspect light bar & connector. No damage to light bar. No damage, moisture, or corrosion in connector. Place the SROS in the OFF position and check:
   - Fuses F5 & F11 in the PCM.
   - Continuity of the wiring from PCM-7 to LB-B.
   - Continuity of the wiring from LB-G -including SP10 to ground.
   - Continuity of the wiring from LB-H to 3MM-7.
   - Verify correct fuse, see **Figure 2.7**. Check connectors and wiring between terminals for damage, moisture or corrosion.
2. **Check Light Bar** - Check operation of 2-Light Bar. Refer to **Section 8.10.8** for information on testing the light bar.

05017	CHECK ENG PREHEAT ENABLE CIRCUIT

- ACTIVATION: A problem has been detected in the engine preheat enable circuit (EPHT). If this alarm is activated when the circuit is energized, the circuit is detected shorted. If this alarm is activated at any other time, the circuit is detected open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto reset when circuit is normal, or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check EPHT Wiring** - Inspect 3MM and PCM connectors. Verify there is no damage to modules, and no damage, moisture, or corrosion in connector.
2. **Check Engine Preheat Enable Circuit**

   a. Using Component Test Mode, refer to **Section 5.2.4**, energize engine preheat circuit. The circuit is energized and amp draw is displayed.

   NOTICE

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

   b. Check for power at 3MM-14 Must have minimum 11 VDC. If not, download data and replace main microprocessor. For complete Main Microprocessor Module replacement instructions refer to **Section 5.4.2**

   c. Check for power at PCM-27. Must have minimum 11 VDC. If not, check wiring and connectors between 3MM-14 and PCM-27. Good continuity, no damage, moisture, or corrosion in connectors.

   d. Replace PCM. Refer to **Section 8.10.2**.

05018	CHECK POWER ENABLE CONTROL

- ACTIVATION: The Power Enable Control Circuit Feedback is sensed out of range.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto reset when circuit is normal, or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Check PER Relay on the Power Control Module - Refer to Figure 2.7

a. Check resistance of PER coil. Refer to **Section 2.12**.

b. Check wiring. Verify no damage, moisture, or corrosion.

05019 CHECK CDCON2 COIL

- ACTIVATION: Condenser fan motor contactor (CDCON2) circuit is shorted or open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check CDCON2**
   a. Inspect condenser fan contactor coil and terminals. Verify there is no damage to coil, and no damage or corrosion at terminals.
   b. Check contactor coil resistance. Refer to **Section 2.12** 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 2.12** for correct electrical values. Use ammeter.
2. **Check CDCON2 Current Draw**
   a. Use Component Test Mode to energize CDCON2. (Refer to **Section 5.2.4**.) Verify Current Draw on Component Test Mode Screen. Refer to **Section 2.12** for correct electrical values.
   b. Check coil voltage between A1 and A2. Verify 12 VDC between A1 & A2.
   c. Check resistance at contacts. Verify contacts are closed at L1-T1, L2-T2, L3-T3.
   d. Use Component Test Mode to test actual current draw of the circuit. (Refer to **Section 5.2.4**.) Refer to **Section 2.12** for values. View current draw in Component Test Mode screen.
   e. Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.
3. **Check PSCON1 and PSCON2** - Check for loose wires or open contact. Verify there is no physical damage, and no damage, moisture, or corrosion in connectors.

05020	CHECK HTR CNTR ONE

- ACTIVATION: Heater Contactor 1 (1HTCON1) circuit is shorted or open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check 1HTCON1**

   a. Inspect contactor coil and connectors. Verify there is no damage to coil, and no damage, moisture, or corrosion in connector.

   b. Check contactor coil resistance. Refer to **Section 2.12** for contactor coil resistance values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.

2. **Check 1HTCON1 Using Component Test Mode**

   a. Use Component Test Mode to energize 1HTCON1. (Refer to **Section 5.2.4**.) Verify Current Draw on Component Test Mode Screen. Refer to **Section 2.12** for correct electrical values.

   b. Check coil voltage between A1 and A2. Verify 12 VDC between A1 & A2.

   c. Check resistance at contacts. Verify contacts are closed at L1-T1, L2-T2, L3-T3.

3. **Check 1HTCON1 Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

4. **Check CCB status indicator** - Refer to **Section 2.6.3**.

05021 CHECK HTR CNTR TWO

- ACTIVATION: Heater Contactor 2 (1HTCON2) circuit is shorted or open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check 1HTCON2**

   a. Inspect contactor coil and connectors. Verify there is no damage to coil, and no damage, moisture, or corrosion in connector.

   b. Check contactor coil resistance. Refer to **Section 2.12** for contactor coil resistance values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.

2. **Check 1HTCON2 Using Component Test Mode**

   a. Use Component Test Mode to energize 1HTCON2. (Refer to **Section 5.2.4**.) Verify Current Draw on Component Test Mode Screen. Refer to **Section 2.12** for correct electrical values.

   b. Check coil voltage between A1 and A2. Verify 12 VDC between A1 & A2.

   c. Check resistance at contacts. Verify contacts are closed at L1-T1, L2-T2, L3-T3.

3. **Check 1HTCON2 Wiring** - Inspect harness & control box connector pins & terminals. (See wiring schematic **Section 10.3**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

4. **Check CCB status indicator** - Refer to **Section 2.6.3**.

05022 C2 CHECK HIGH TEMP THERMOSTAT

- ACTIVATION: With the Main Power switch toggled out of the OFF position, the EVHTS circuit is open.
- UNIT CONTROL: Engine and Electric Operation: Alarm AND no heat allowed.
- RESET CONDITION: Auto Reset when the EVHTS 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.

CORRECTIVE ACTIONS:

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 2.10**). (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**.) Verify no damage to thermostat. Verify 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. If HTT is open below temperature, (Refer to **Section 2.10**) replace HTT.
   b. Check ground at 3REC03. Good ground. If not, check connectors and wiring between terminals. Verify no damage, moisture or corrosion.
   c. Check SP-102, SP-108. Good ground. If not, check connectors and wiring between terminals. Verify no damage, moisture or corrosion.

05023 C3 CHECK HIGH TEMP THERMOSTAT

- ACTIVATION: With the Main Power switch toggled out of the OFF position, the EVHTS circuit is open.
- UNIT CONTROL: Engine and Electric Operation: Alarm AND no heat allowed.
- RESET CONDITION: Auto Reset when the EVHTS 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.

CORRECTIVE ACTIONS:

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 2.10**). 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**.) Verify no damage to thermostat. Verify 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. If HTT is open below temperature, (Refer to **Section 2.10**) replace HTT.
   b. Check ground at 3REC03. Good ground. If not, check connectors and wiring between terminals. Verify no damage, moisture or corrosion.
   c. Check SP-102, SP-108. Good ground. If not, check connectors and wiring between terminals. Verify no damage, moisture or corrosion.

06000 CONDENSER MOTOR2 OVERHEATED

- ACTIVATION: The condenser fan motor Internal Protectors (IP-CDM2) circuit is open.
- UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm.
  Electric Operation: Refrigeration system shutdown and alarm with PSCON still energized.
- RESET CONDITION: Auto Reset when motor overload input is within limits, or change to engine Operation, or alarm may be manually reset via keypad or by turning the unit off, then back on again.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

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, with no sticks or other material obstructing its movement. Check for ice build-up preventing blade rotation.

2. **Determine if the IP is open**

   a. Check for Continuity between 1CCB3 and 1CCB20 Should be 0 Ohms. If condenser fan motor is extremely warm, allow it to cool off, then recheck IP continuity.

   b. If open, continue with step 7 below.

3. **Check Fuses** - Check fuses F9, F36, F37 and F38. Verify correct fuse and check fuse holder for damage, see **Figure 2.6**, **Figure 2.7**. Replace fuse(s) as required. Clear alarms, restart and check for repeat alarm(s).

4. **Check Condenser Fan Motor Contactor**

   a. Inspect the wire connections to the contactor. (See wiring schematic **Section 10.3**) 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 the Active Alarm list, then run a Pretrip and check for any new alarms. Any active alarms must be corrected and cleared before proceeding.

6. **Check Condenser Fan Motors** - Disconnect power plug at motor. Test IP circuit for continuity using ohmmeter. If IP remains open after a 30 minute cool down period, and motor feels cool to the touch, remove and replace motor. If closed, then an intermittent IP circuit is suspect. Check phase to phase and phase to ground for short or open circuits. Refer to **Section 2.11** for correct electrical values. If motor tests good, check the DC IP circuit to microprocessor.

7. **Check IPC circuit**

   a. Use Component Test Mode to energize CDCON2 circuit. (Refer to **Section 5.2.4**.) Output will come on.

   b. Verify 12 VDC at Pin A of CDCON2. 12 VDC indicates that the IP is closed.

   c. Unplug the connector to condenser fan motor (CDM2) and check voltage on pins 4-5 in the engine harness connector to ground.

   Check voltage at pin 5, should read 3 VDC. No voltage indicates an open from pin 5 to 1CCB20

   Check voltage at pin 4, should read 12VDC. No voltage indicates open from pin 4 to 1CCB03.

   d. Test continuity through CDM2 IP at pins 4-5 in the fan motor harness connector. Should be 0 Ohms. If condenser fan motor is extremely warm, allow it to cool off, then recheck IP continuity.

8. **Check Motor Operation** - Turn the unit ON. Check current on each phase (must be less than shown on **Section 2.11**.) Check voltage on each phase (must be within voltage limits shown in **Section 2.11**.)

06001	CHECK LIGHT BAR

- ACTIVATION: A problem has been detected in the light circuit (LB). If this alarm is activated while the circuit is energized, the circuit is detected shorted. If this alarm is activated at any other time, the circuit is detected open.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto reset when the circuit is normal, or alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Light Bar Wiring** - Inspect light bar & connector. Verify there is no damage to light bar, and no damage, moisture, or corrosion in connector. Place the SROS in the OFF position and check:
   - Fuses F5 & F11 in the PCM, Continuity of the wiring from PCM-7 to LB-B, Continuity of the wiring from LB-G -including SP10 to ground, Continuity of the wiring from LB-H to 3MM-7

   Verify correct fuse, see **Figure 2.7**. Check connectors and wiring between terminals for damage, moisture or corrosion.
2. **Check Light Bar** - Check operation of 2-Light Bar Refer to **Section 8.10.8** for information on testing the light bar.

07000	ECONOMIZER TEMP SENSOR

- ACTIVATION: Economizer temp sensor is out of range
- UNIT CONTROL: Engine and Electric Operation: Alarm only. Economizer forced to STANDARD mode when alarm is active.
- RESET CONDITION: Auto reset or alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Sensor**

   a. Inspect sensor & connector. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connector.

   b. Check sensor resistance (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C.) See **Table 8–3** for complete table of temperatures and resistance values.
2. **Check Sensor Wiring**

   a. Inspect connector pins & terminals at sensor and connector 2MM. (See wiring schematic **Section 10**.) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

   b. Place the system in PC Mode. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

07001 ECONOMIZER PRESS SENSOR

- ACTIVATION: Economizer Pressure (ECOP) sensor is out of range.
- UNIT CONTROL: Engine and Electric: Alarm only. Economizer forced to STANDARD mode when alarm is active.
- RESET CONDITION: Economizer Pressure sensor is in range or alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check System Pressures** - Check Unit Data. Refer to **Section 3.15**. Compare the pressure readings for the ECOP, the CSP and the CDP. The ECOP should read between the CSP and the CDP. If not it indicates the ECOP has failed. Refer to **Section 8.9.11** for instruction on comparison. If discharge pressure is in normal range, proceed to next step.

   Place the Unit in Service Mode. Refer to **Section 5.2.5**. After the unit has equalized, compare the pressure readings for the ECOP, the CSP and the CDP. The ECOP the CSP and the CDP should all read within 5 PSI, if not it indicates the ECOP has failed. Refer to **Section 8.9.11** for instruction on comparison.

2. **Check Economizer Pressure Sensor** - Inspect sensor & connectors. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connectors.

07002 C3 CHECK SUPPLY AIR SENSOR

- ACTIVATION: Supply Air Temperature Sensor (SAT) is not within the range of -53 to +158°F (-47 to +70° C).
- UNIT CONTROL: Engine and Electric:
  If Alarm 00122 is not active: functional Parameter Temperature Control is set for Supply Air and the setpoint is in the perishable range: alarm and switch to return air control.
  If Alarm 00122 is active: alarm and the System will enter Cargo Protect Mode, refer to **Section 4.10.2**.
- RESET CONDITION: Auto reset when sensor is in range or, alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Make sure the Configuration Setting (Installed / Not Installed) for SAT2 is correct** - Refer to **Table 5–1** for Configuration Settings.
2. **Check Sensor**
   a. Inspect sensor & connectors. Verify no damage to sensor. Verify no damage, moisture, or corrosion in connectors.
   b. Check sensor resistance. (Refer to Note 3.) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–3** for chart of resistances for different sensors.
3. **Check Sensor Wiring**
   a. Inspect connector pins & terminals at sensor connector 3REC10 and 3REC21. Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.
   b. Place the system in PC Mode, refer to **Section 5.3.2**. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC at harness plug between pins. Voltage should be 3.0 ± 0.1 VDC at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

07003	C2 CHECK EVAC TEMP SENSOR

- ACTIVATION: Evaporator Outlet Temperature Sensor (EVOT) in compartment 2 is not within the range of -53 to +158°F (-47 to +70°C)
- UNIT CONTROL: Engine and Electric: Alarm only and superheat for EVXV will be calculated using SAT or DTT if alarm 00123 (Check Supply Air Sensor) is active.
- RESET CONDITION: Auto reset when Evaporator Temp Sensor is in range or, alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Sensor**
   a. Inspect sensor & connector. Verify no damage to sensor. Verify no damage, moisture, or corrosion in connector.

   b. Check Evaporator Temp Sensor resistance. (See Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C.) See **Table 8–3** for complete table of temperatures and resistance values.
2. Check Sensor Wiring
   a. Inspect connector pins & terminals at sensor connector 3REC11 and 3REC12. No physical damage to harness. No damage, moisture, or corrosion in connectors.

   b. Place the system in PC Mode. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC at harness plug between pins. Voltage should be 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor.
3. Check Airflow Through Evaporator Coil/Section
   a. Inspect coil Ninety percent or more of the coil surface must be undamaged. Coil must be clean.

   b. Check coil airflow (with unit running). Even airflow through the entire coil. No “dead” spots

   c. Check return air bulkhead, air chute. Verify that air flow is good flow, Return air is not restricted. Verify the Air chute in good condition.

07004	C3 CHECK EVAC TEMP SENSOR

- ACTIVATION: Evaporator Outlet Temperature Sensor (EVOT) in compartment 3 is not within the range of -53 to +158°F (-47 to +70°C)
- UNIT CONTROL: Engine and Electric: Alarm only and superheat for EVXV will be calculated using SAT or DTT if alarm 00123 (Check Supply Air Sensor) is active.
- RESET CONDITION: Auto reset when Evaporator Temp Sensor is in range or, alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Sensor**
   a. Inspect sensor & connector. Verify no damage to sensor. Verify no damage, moisture, or corrosion in connector.
   b. Check Evaporator Temp Sensor resistance. (See Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C.) See **Table 8–3** for complete table of temperatures and resistance values.
2. Check Sensor Wiring
   a. Inspect connector pins & terminals at sensor connector 3REC11 and 3REC12. No physical damage to harness. No damage, moisture, or corrosion in connectors.
   b. Place the system in PC Mode. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC at harness plug between pins. Voltage should be 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor.
3. Check Airflow Through Evaporator Coil/Section
   a. Inspect coil Ninety percent or more of the coil surface must be undamaged. Coil must be clean.
   b. Check coil airflow (with unit running). Verify even airflow through the entire coil, with no “dead” spots.
   c. Check return air bulkhead, air chute. Verify good air flow, with Return air not restricted. Check that the Air chute in good condition.

07006	SUCTION PRESSURE SENSOR

- ACTIVATION: Suction pressure sensor is out of range. If Economizer pressure < or = (Suction pressure - 10) for 10 seconds and suction pressure is > than 40 psig and < than 60 psig with the compressor running.
- UNIT CONTROL: Engine and Electric: Alarm only. Economizer forced to STANDARD mode when alarm is active.
- RESET CONDITION: Auto reset when Suction Pressure Sensor is in range or, alarm may be manually reset using the display mounted keys 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 (refer to reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check System Pressures** - Check Unit Data. Refer to **Section 3.15**. Compare the pressure readings for the ECOP, the CSP and the CDP. The ECOP should read between the CSP and the CDP. Refer to **Section 8.9.11** for instruction on comparison. If pressures are in normal range, proceed to next step.

   Place the Unit in Service Mode. Refer to **Section 5.2.5**. After the unit has equalized, compare the pressure readings for the ECOP, the CSP and the CDP. The ECOP the CSP and the CDP should all read within 5 PSI, if not it indicates a failed sensor. Refer to **Section 8.9.11** for instruction on comparison.

2. **Check Pressure Sensor** - Inspect sensor & connectors. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connectors.

07009	RETURN AIR SENSORS OUT OF RANGE (RAT & RAT2)

- ACTIVATION: A Redundant Return Air Temperature Sensor (RAT2) is installed, configured, and is not reading with (2° C).
- UNIT CONTROL: Engine and Electric Operation: If RAT2 is selected as the active probe, switch active probe to RAT probe.
- RESET CONDITION: Auto reset when sensor is in range or, alarm may be manually reset using the display mounted keys 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 (refer to 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. Verify there is no damage to sensor, and no damage, moisture, or corrosion in connectors.

   b. Check sensor resistance. (Refer to Note 3 in **Notes** Section) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–3** for chart of resistances for different sensors.

2. **Check Sensor Wiring**

   a. Inspect connector pins & terminals at sensor connector 2MM. (See wiring schematic **Section 10.2**) Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

   b. Place the system in PC Mode. Refer to Note 2 in **Notes** Section Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC at harness plug between pins. Voltage should be 3.0 ± 0.1 VDC volts at harness plug between pins. This verifies microprocessor.

P11000 CHECK CONDENSER FAN MOTOR 2

- ACTIVATION: Normal draw for the condenser fan motors is 0.8 to 3.5 Amps (460 VAC). The circuit tests outside this range.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

CORRECTIVE ACTIONS:

Check Motor - refer to procedure for Alarm **P00190 CHECK CONDENSER FAN MOTOR**.

P12000 C3 CHECK AIR SUPPLY SENSOR

- ACTIVATION: Supply Air Temperature Sensor (SAT) in compartment 3 is not within the range of -53 to +158°F (-47 to +70° C).
- UNIT CONTROL: Engine and Electric:
  If Alarm 00122 is not active: functional Parameter Temperature Control is set for Supply Air and the setpoint is in the perishable range: alarm and switch to return air control.
  If Alarm 00122 is active: alarm and the System will enter Cargo Protect Mode, refer to **Section 4.10.2**.
- RESET CONDITION: Auto reset when sensor is in range or, alarm may be manually reset using the display mounted keys 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). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Make sure the Configuration Setting (Installed / Not Installed) for SAT3 is correct** - Refer to **Table 5–1** for Configuration Settings.
2. **Check Sensor**
   a. Inspect sensor & connectors. Verify no damage to sensor. Verify no damage, moisture, or corrosion in connectors.
   b. Check sensor resistance. (Refer to Note 3 in **Notes** Section.) 10,000 Ohms @ 77°F (25°C). Refer to **Table 8–3** for chart of resistances for different sensors.
3. **Check Sensor Wiring**
   a. Inspect connector pins & terminals at sensor connector 3REC10 and 3REC21. Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.
   b. Place the system in PC Mode, refer to **Section 5.3.2**. Refer to Note 2 in **Notes** Section. Disconnect sensor from harness. Check for 3.0 ± 0.1 VDC at harness plug between pins. Voltage should be 3.0 ± 0.1 VDC at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

P12001 C2 CHECK EVAP OUTLET TEMP

- ACTIVATION: Evaporator Outlet Temperature Sensor (EVOT) is not within the range of -53 to +158°F (-47 to +70°C.)
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

CORRECTIVE ACTIONS:

Check Sensor - Refer to procedure for Alarm **07003 C2 CHECK EVAC TEMP SENSOR**.

P12002 C3 CHECK EVAP OUTLET TEMP

- ACTIVATION: Evaporator Outlet Temperature Sensor (EVOT) is not within the range of -53 to +158°F (-47 to +70°C.)
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

CORRECTIVE ACTIONS:

Check Sensor - Refer to procedure for Alarm **07004 C3 CHECK EVAC TEMP SENSOR**.

P13000 CHECK CONDENSER FAN 2 CIRCUIT

- ACTIVATION: Normal draw for the CDCON2 contactor coil is 0.05 to 2.0 Amps (12 VDC). The circuit tests outside this range.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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.

CORRECTIVE ACTIONS:

Refer to procedure for Alarm **P00206 CHECK CONDENSER FAN CIRCUIT**.

P14000 C2 CHECK EVAP1 SUPERHEAT
P14001 C2 CHECK EVAP2 SUPERHEAT

- ACTIVATION: Compartment 2 evaporator (1 or 2) superheat and/or Compartment 2 evaporator pressure out of range activates this alarm.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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

CORRECTIVE ACTIONS:

Refer to procedure for Alarm **P00177 CHECK EXV (EVXV) SUPERHEAT**.

P14002 C3 CHECK EVAP1 SUPERHEAT

P14003 C3 CHECK EVAP2 SUPERHEAT

- ACTIVATION: Compartment 3 evaporator (1 or 2) superheat and/or Compartment 3 evaporator pressure out of range activates this alarm.
- UNIT CONTROL: Engine and Electric Operation: Pretrip will fail 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

CORRECTIVE ACTIONS:

Refer to procedure for Alarm **P00177 CHECK EXV (EVXV) SUPERHEAT**.

20100 NO COMM FROM MICRO TO DISPLAY

NOTE

This alarm will be available in the inactive alarm list and download only. It is an indication that an intermittent failure is occurring, causing a break in the circuit sufficient to activate the alarm.

- ACTIVATION: If alarm 21100 “NO COMM FROM ANY BOARD TO MAIN MICRO“ is not active and main microprocessor cannot communicate with the display module over the CAN bus.
- UNIT CONTROL: Engine and Electric Operation: Required Shutdown. If alarm remains active for 2 minutes issue a shutdown command to all modules except the display.
- RESET CONDITION: Auto reset when CAN communication is restored, 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check CAN bus**

   a. Inspect connector pins & terminals on 1MM, 1SVM and DM. Verify no damage or corrosion in connections.

   b. Check display LOSS OF COMMUNICATIONS message is displayed.

   c. Check for CAN circuit continuity:

   CAN Hi; Refer to **Section 4.2**

   CAN Lo; Refer to **Section 4.2**.

   If good continuity is not present, check connectors and wiring between terminals for damage, moisture or corrosion.

20101 NO COMM FROM MICRO TO REMOTE DISPLAY

- ACTIVATION: If alarm 21100 “NO COMM FROM ANY BOARD TO MAIN MICRO“ is not active, and Number of Remote Panels installed configuration is 1, and no sync responses have been received from the Remote Panel Module for 10 seconds.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto reset when communication is restored, 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Does the Remote Panel Work?** - If panel is working, this may be an intermittent alarm caused by a bad connection. Check connection from Comm Module to Remote Panel. Verify no damage or corrosion in connections.
2. **Check for other CAN bus alarms** - This alarm may accompany other alarms, complete troubleshooting steps for alarms found. If repairs have been made and the other alarms have cleared, further troubleshooting may not be required.
3. **Check for Power into Remote Panel** - Check for battery power at pins C & D. Verify power.
4. **Check CAN Circuit to Remote Panel** - At the Remote Panel connector, check resistance between pin A & pin B. Verify 120 ohms.
5. **Replace Remote Panel with a Known Good Panel**

   a. If problem re-occurs replace the Comm Module.

   b. If problem goes away replace the Remote Panel.

21100 NO COMM FROM ANY BOARD TO MAIN MICRO

NOTE

This alarm will be available in the inactive alarm list and download only. It is an indication that an intermittent problem has occurred and a careful diagnosis is required.

- ACTIVATION: Main microprocessor cannot communicate with any modules over the CAN bus.
- UNIT CONTROL: Engine and Electric Operation: Required Shutdown. If alarm remains active for 2 minutes issue a shutdown command to all modules except the display.
- RESET CONDITION: Auto reset when CAN communication is restored, 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check CAN bus**

   a. Inspect connector pins & terminals on 1MM, 1SVM, DM and ENCU. Verify no damage or corrosion in connections.

   b. Check for CAN circuit continuity:

   CAN Hi; Refer to **Section 4.2**

   CAN Lo; Refer to **Section 4.2**.

   If good continuity not present, check connectors and wiring between terminals for damage, moisture or corrosion.

2. **Check for other CAN bus alarms** - This alarm may accompany by other alarms, complete troubleshooting steps for alarms found. If repairs have been made and the other alarms have cleared, further troubleshooting may not be required. If this alarm reoccurs, check CAN bus as described in the proceeding step.

3. **Perform and analyze a data download**

22100 NO COMM FROM MICRO TO INPBD1

- ACTIVATION: Alarm **21100 NO COMM FROM ANY BOARD TO MAIN MICRO** is not active and the main microprocessor cannot communicate internally.
- UNIT CONTROL: Engine and Electric Operation: Shutdown all modules except the display and alarm. (The alarm will only display if the display module is communicating.) Main microprocessor status LED will illuminate steady green (not pulsing).
- RESET CONDITION: Auto reset when internal communication is restored, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Replace Main Microprocessor - Download data and replace main microprocessor. For complete Main Microprocessor Module replacement instructions refer to **Section 5.4.2**.

22101 SENSOR INPUT VOLTAGE LOW INP1

NOTE

This alarm is an indication that there is a short in the transducer or DC current transformer wiring and the voltage supply in the main microprocessor is overloaded.

- ACTIVATION: Voltage from main microprocessor to the components is less than 4.5 VDC
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto reset when voltage is correct, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check System Pressures** - Install manifold gauge set and check and compare compressor discharge, evaporator outlet & suction pressures with those shown in Unit Data. Refer to **Section 8.9.11** for instruction on comparison.
2. **Check Wiring** - If a transducer reading is not within a reasonable range of gauge reading, check wires to sensors for short:
   - For CSP, check wiring from 2MM-20, 2MM-30 and 2MM-9.
   - For EVOP, check wiring from 2MM-25, SP-20 and 2MM-17.
   - For CDP, check wiring from 2MM-21, SP-20 and 2MM-10.
   - For ECOP, check wiring from 2MM-28, SP-20 and 2MM-14.
3. **Check CT Wiring** - Check wires to sensor for short. Check wiring from 2MM-29, 2MM-12 and 2MM-23 to PCM.
4. **Replace Main Microprocessor** - Download data and replace main microprocessor. For complete Main Microprocessor Module replacement instructions refer to **Section 5.4.2**.

22102 SENSOR INPUT VOLTAGE HIGH INP1

NOTE

This alarm is an indication that there is a short in the DC current transformer wiring from another (nominal 12 VDC) circuit into the transducer or CT sensor circuit.

- ACTIVATION: Voltage from main microprocessor to the sensors is greater than 5.5 VDC
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Auto reset when sensor voltage is correct, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Wiring** - If a transducer reading is not within a reasonable range of gauge reading, check wires to sensors for short.
   - For CSP, check wiring from 2MM-20, 2MM-30 and 2MM-9.
   - For EVOP, check wiring from 2MM-25, SP-20 and 2MM-17.
   - For CDP, check wiring from 2MM-21, SP-20 and 2MM-10.
   - For ECOP, check wiring from 2MM-28, SP-20 and 2MM-14.
2. **Check CT Wiring** - Check wires to sensor for short from another circuit. Check wiring from 2MM-29, 2MM-12 and 2MM-23 to PCM.
3. **Replace Main Microprocessor**

   Download data and replace main microprocessor. For complete Main Microprocessor Module replacement instructions refer to **Section 5.4.2**.

22103 INPUT LOST CONFIGURATION

- ACTIVATION: Input Board reports an invalid configuration
- UNIT CONTROL: Engine and Electric Operation: Required Shutdown.
- RESET CONDITION: Auto reset when communication is restored, or alarm may be manually reset by turning the unit off, then back on again.

CORRECTIVE ACTIONS:

1. **Check Wiring** - Check logic power connections. Check wiring at 1MM6 & 1MM1.
2. **Replace Main Microprocessor** - Download data and replace main microprocessor. For complete Main Microprocessor Module replacement instructions refer to **Section 5.4.2**.

23100	NO COMM FROM MICRO TO OUTPBD1

- ACTIVATION: Main microprocessor cannot communicate internally.
- UNIT CONTROL: Engine and Electric Operation: Shutdown all modules except the display and alarm. (The alarm will only display if the display module is communicating.) Main microprocessor status LED will illuminate steady green (not pulsing).
- RESET CONDITION: Auto reset when internal communication is restored, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Replace Main Microprocessor - Download data and replace main microprocessor. For complete Main Microprocessor Module replacement instructions refer to **Section 5.4.2**.

23101	OUTPUT LOST CONFIGURATION

- ACTIVATION: Output Board reports an invalid configuration.
- UNIT CONTROL: Engine and Electric Operation: Required Shutdown.
- RESET CONDITION: Auto reset when communication is restored, 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Wiring** - Check logic power connections. Check wiring at 1MM6 & 1MM1.
2. **Replace Main Microprocessor** - Download data and replace main microprocessor. For complete Main Microprocessor Module replacement instructions refer to **Section 5.4.2**.

24100	NO COMM FROM MICRO TO CCB1

- ACTIVATION: Alarm 21100 is not active, and Unit is not starting in diesel. No communication from the CCB1 Module for 10 seconds.
- UNIT CONTROL: Engine and Electric Operation: Required Shutdown. If alarm remains active for 2 minutes issue a shutdown command to all modules except the display.
- RESET CONDITION: Communication received from the CCB1 Module in the past 10 seconds 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check CCB1 status indicator** - Refer to **Section 2.6.3.**
2. **Check Fuse F9**
   a. Visually check fuse. Verify correct fuse, check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).
   b. Check voltage. Check voltage through the fuse. If fuse is blown, replace it.
   c. Check wiring. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.
3. **Check for power at CCB1** - Check power at pins 14 and 26. Verify battery power.

24101	SENSOR INPUT VOLTAGE LOW CCB1

- ACTIVATION: The Voltage Supply for the Sensors on the CCB1 is below the low voltage limit 4.5V
- UNIT CONTROL: Engine and Electric Operation: Alarm Only.
- RESET CONDITION: The Voltage Supply for Sensors on CCB1 is above the low voltage limit 4.5V

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check CCB1 status indicator** - Refer to **Section 2.6.3**.
2. **Check Fuse F9**
   a. Visually check fuse. Verify correct fuse, check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).
   b. Check voltage. Check voltage through the fuse, if fuse is blown, replace it.
   c. Check wiring. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.
3. **Check for power at CCB1** - Check power at pins 14 and 26. Verify battery power.

24102 SENSOR INPUT VOLTAGE HIGH CCB1

- ACTIVATION: The Voltage Supply for the Sensors on the CCB1 is above High voltage limit 5.5V
- UNIT CONTROL: Engine and Electric Operation: Alarm Only.
- RESET CONDITION: The Voltage Supply for Sensors on CCB1 is below the High voltage limit 5.5V

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Check for power at CCB1 - Check power at pins 14 and 26. Verify battery power.

24200 NO COMM FROM MICRO TO CCB2

- ACTIVATION: If Alarm 21100 is not active, and Unit is not starting in diesel. No sync responses have been received from the CCB2 Module for 10 seconds.
- UNIT CONTROL: Engine and Electric Operation: Required Shutdown. If alarm remains active for 2 minutes issue a shutdown command to all modules except the display.
- RESET CONDITION: Sync response received from the CCB2 Module in the past 10 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check CCB2 status indicator** - Refer to **Section 2.6.3**.
2. **Check Fuse F9**
   a. Visually check fuse. Verify correct fuse, check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).
   b. Check voltage. Check voltage through fuse, if fuse is blown, replace it.
   c. Check wiring. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.
3. **Check wires from CCB1** - Check wiring from pins 6 and 29. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

24201 SENSOR INPUT VOLTAGE LOW CCB2

- ACTIVATION: The Voltage Supply for the Sensors on the CCB2 is below the low voltage limit 4.5V
- UNIT CONTROL: Engine and Electric Operation: Alarm Only.
- RESET CONDITION: The Voltage Supply for Sensors on the CCB2 is above low voltage limit 4.5V

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check CCB2 status indicator** - Refer to **Section 2.6.3**.
2. **Check Fuse F9**
   a. Visually check fuse Verify correct fuse, check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).
   b. Check voltage. Check voltage through the fuse, if fuse is blown, replace it.
   c. Check wiring. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.
3. **Check wires from CCB1** - Check power at pins 14 and 26. Verify battery power.

24202 SENSOR INPUT VOLTAGE HIGH CCB2

- ACTIVATION: The Voltage Supply for Sensors on the CCB2 is above the High voltage limit 5.5V
- UNIT CONTROL: Engine and Electric Operation: Alarm Only.
- RESET CONDITION: The Voltage Supply for Sensors on the CCB2 is below High voltage limit 5.5V

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Check wires from CCB1 - Check power at pins 14 and 26. Verify battery power.

24300 NO COMM FROM MICRO TO CCB3

- ACTIVATION: Alarm 21100 is not active, and Unit is not starting in diesel. No communication from the CCB3 Module for 10 seconds.
- UNIT CONTROL: Engine and Electric Operation: Required Shutdown. If alarm remains active for 2 minutes issue a shutdown command to all modules except the display.
- RESET CONDITION: Communication received from the CCB3 Module in the past 10 seconds 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for additional CCB3 / CCB4 & STP3 / STP4 alarms**

   Alarms for CCB3 *and* CCB4 indicate a problem before CCB3 or at CCB3.

   Alarms isolated to CCB3 indicate a problem before CCB3 or at CCB3.

   Alarms isolated to CCB4 indicate a problem between CCB3 and CCB4, or at CCB4.

   Stepper Alarms isolated to STP3 or STP4 indicate a problem with the associated CCB

2. **Check wiring to CCB3**

   a. Check wiring. Verify no physical damage to harness. Verify no damage, moisture, or corrosion in connectors.

   b. Check voltage. Verify power at 3REC04 and 3REC15

   c. Check CAN connectivity. Verify CAN connectivity at 3REC05 and 3REC17

24301 SENSOR INPUT VOLTAGE LOW CCB3

- ACTIVATION: The Voltage Supply for the Sensors on the CCB3 is below the low voltage limit 4.5V.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only.
- RESET CONDITION: The Voltage Supply for Sensors on CCB3 is above the low voltage limit 4.5V

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for additional CCB3 / CCB4 & STP3 / STP4 alarms**

   Alarms for CCB3 and CCB4 indicate a problem before CCB3 or at CCB3.

   Alarms isolated to CCB3 indicate a problem before CCB3 or at CCB3.

   Alarms isolated to CCB4 indicate a problem between CCB3 and CCB4, or at CCB4.

   Stepper Alarms isolated to STP3 or STP4 indicate a problem with the associated CCB.

2. Check the Compartment EVOP

   Pull the EVOP connector. Clear alarms, then check for repeat alarm(s). If alarm is not repeated, it indicates the EVOP is faulted.

   Check voltage. Check for 5V at EVOP between pins 1 - 2. If 5V is present, it indicates a faulted CCB.

   Check wiring between 3REC and EVOP. No physical damage to harness. No damage, moisture, or corrosion in connectors.

24302	SENSOR INPUT VOLTAGE HIGH CCB3

- ACTIVATION: The Voltage Supply for the Sensors on the CCB3 is above the high voltage limit 5.5V.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only.
- RESET CONDITION: The Voltage Supply for Sensors on CCB3 is below the High voltage limit 5.5V.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Check CCB3 - This alarm indicates a faulted CCB. Replace the CCB. Refer to **Section 8.10.6**.

24400	NO COMM FROM MICRO TO CCB4

- ACTIVATION: If Alarm 21100 is not active, and Unit is not starting in diesel. No sync responses have been received from the CCB4 Module for 10 seconds.
- UNIT CONTROL: Engine and Electric Operation: Required Shutdown. If alarm remains active for 2 minutes issue a shutdown command to all modules except the display.
- RESET CONDITION: Sync response received from the CCB4 Module in the past 10 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for additional CCB3 / CCB4 & STP3 / STP4 alarms**

   Alarms for CCB3 and CCB4 indicate a problem before CCB3 or at CCB3.

   Alarms isolated to CCB3 indicate a problem before CCB3 or at CCB3.

   Alarms isolated to CCB4 indicate a problem between CCB3 and CCB4, or at CCB4.

   Stepper Alarms isolated to STP3 or STP4 indicate a problem with the associated CCB.

2. Check wiring to CCB4

   a. Check wiring. Check for physical damage to harness. Verify no damage, moisture, or corrosion in connectors.

   b. Check voltage. Verify power at 3REC04 and 3REC15

   c. Check CAN connectivity. Verify CAN connectivity at 3REC05 and 3REC17

24401	SENSOR INPUT VOLTAGE LOW CCB4

- ACTIVATION: The Voltage Supply for the Sensors on the CCB4 is below the low voltage limit 4.5V.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only.
- RESET CONDITION: The Voltage Supply for Sensors on CCB4 is above the low voltage limit 4.5V

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for additional CCB3 / CCB4 & STP3 / STP4 alarms**

   Alarms for CCB3 and CCB4 indicate a problem before CCB3 or at CCB3.

   Alarms isolated to CCB3 indicate a problem before CCB3 or at CCB3.

   Alarms isolated to CCB4 indicate a problem between CCB3 and CCB4, or at CCB4.

   Stepper Alarms isolated to STP3 or STP4 indicate a problem with the associated CCB.

2. **Check the Compartment EVOP**

   a. Pull the EVOP connector. Clear alarms, then check for repeat alarm(s). If alarm is not repeated, it indicates the EVOP is faulted.

   b. Check voltage. Check for 5V at EVOP between pins 1 - 2. If 5V is present, it indicates a faulted CCB.

   c. Check wiring between 3REC and EVOP. Check for physical damage to harness. Verify no damage, moisture, or corrosion in connectors.

24402	SENSOR INPUT VOLTAGE HIGH CCB4

- ACTIVATION: The Voltage Supply for the Sensors on the CCB4 is above the high voltage limit 5.5V.
- UNIT CONTROL: Engine and Electric Operation: Alarm Only.
- RESET CONDITION: The Voltage Supply for Sensors on CCB4 is below the High voltage limit 5.5V.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Check CCB3 - This alarm indicates a faulted CCB. Replace the CCB. Refer to **Section 8.10.6**.

25100 NO COMM FROM MICRO TO STP1

- ACTIVATION: Main microprocessor cannot communicate with stepper valve module over the CAN bus.
- UNIT CONTROL: Engine and Electric Operation: Shut down and alarm. The stepper valve module status LED may be on steady green (not pulsing) or red.
- RESET CONDITION: Auto reset when CAN communication is restored, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check both active and inactive alarms for other " NO COMM" alarms.**

   a. If more than one alarm, record all and proceed to step 3.

   b. If this is the only "NO COMM" alarm, replace module.

2. **Check status indicator** - Refer to **Section 2.6.3** for Component Descriptions.

3. **Check CAN bus**

   a. Inspect connector pins & terminals on 1MM and1SVM. Verify no damage or corrosion in connections.

   b. Check for CAN circuit continuity.

   CAN Hi: Refer to **Section 4.2**;

   CAN Lo: Refer to **Section 4.2**;

   If good continuity is not present, check connectors and wiring between terminals for damage, moisture or corrosion. Repair if required.

4. **Check system** - Clear active and inactive alarms. Start unit and monitor for additional "NO COMM" alarms.

25101 OVER CURRENT STP1

- ACTIVATION: The stepper current is reported to be too high by stepper board 1 (Indicated by Stepper Output Voltage < 5V) for 3 Seconds as timed at stepper board.
- UNIT CONTROL: Engine and Electric Operation: Alarm only. Steppers on board with problem disabled (Powered OFF) until good power reported from Stepper Board at which point they are re-enabled.
- RESET CONDITION: 10 Seconds of good current range reported from all steppers.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check wires** - Check wiring to Stepper Valves to SVM. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

2. **Check power** - Check power at 2SVM11 and 2SVM22. Verify battery power.

25102	CHECK INPUT VOLTAGE STP1

- ACTIVATION: The stepper input voltage is reported out of valid range (9V to 17V) by stepper board 1 for 3 seconds as times at stepper board.
- UNIT CONTROL: Engine and Electric Operation: Alarm only. Steppers on board with problem disabled (Powered OFF) until good power reported from Stepper Board at which point they are re-enabled.
- RESET CONDITION: 10 Seconds of good voltage reported from all steppers.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check voltages** - Check input voltage at SVM1.
2. **Check Fuse F3**

   a. Visually check fuse. Verify correct fuse, and check fuse holder for damage, see **Figure 2.7**. Replace fuse as required. Clear alarms, restart and check for repeat alarm(s).

   b. Check voltage through the fuse. If fuse is blown, replace it.

   c. Check wiring from PCM34 - SP-18 - ENCU - 2SVM22. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.
3. **Disconnect Stepper Valve(s), if alarm goes away -** Check operation of suspected valve. Refer to **Section 8.9.7**.

25200	NO COMM FROM MICRO TO STP2

- ACTIVATION: Alarm 21100 is not active and No sync responses have been received from the Stepper 2 Module for 10 seconds.
- UNIT CONTROL: Engine and Electric Operation: Required Shutdown. If alarm remains active for 2 minutes issue a shutdown command to all modules except the display.
- RESET CONDITION: Sync response received from the Stepper 2 Module in the past 10 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Check for Alarm 25100 - If **25100 NO COMM FROM MICRO TO STP1** is not present, it indicates the SVM Board is bad. Replace the SVM Board.

25201	OVER CURRENT STP2

- ACTIVATION: The stepper current is reported to be too high by stepper board 2 (Indicated by Stepper Output Voltage < 5V) for 3 Seconds as timed at stepper board.
- UNIT CONTROL: Engine and Electric Operation: Alarm only. Steppers on board with problem disabled (Powered OFF) until good power reported from Stepper Board at which point they are re-enabled.
- RESET CONDITION: 10 Seconds of good current range reported from all steppers.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check power** - Verify power at 3SVM11 and 3SVM22.
2. **Check wiring** - Check wiring to ECXV to SVM2. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

25202	CHECK INPUT VOLTAGE STP2

- ACTIVATION: The stepper input voltage is reported out of valid range (9V to 17V) by stepper board 2 for 3 seconds as times at stepper board.
- UNIT CONTROL: Engine and Electric Operation: Alarm only. Steppers on board with problem disabled (Powered OFF) until good power reported from Stepper Board at which point they are re-enabled.
- RESET CONDITION: 10 Seconds of good voltage reported from all steppers.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check power** - Verify power at 3SVM11 and 3SVM22.
2. **Check wiring** - Check wiring to ECXV to SVM2. Verify there is no physical damage to harness, and no damage, moisture, or corrosion in connectors.

25300 NO COMM FROM MICRO TO STP3

- ACTIVATION: Alarm 21100 is not active and No sync responses have been received from the Stepper 3 Module for 10 seconds.
- UNIT CONTROL: Engine and Electric Operation: Required Shutdown. If alarm remains active for 2 minutes issue a shutdown command to all modules except the display.
- RESET CONDITION: Auto reset when Sync response received from the Stepper 3 Module in the past 10 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for additional CCB3 / CCB4 & STP3 / STP4 alarms**
   - Alarms for CCB3 and CCB4 indicate a problem before CCB3 or at CCB3.
   - Alarms isolated to CCB3 indicate a problem before CCB3 or at CCB3.
   - Alarms isolated to CCB4 indicate a problem between CCB3 and CCB4, or at CCB4.
   - Stepper Alarms isolated to STP3 or STP4 indicate a problem with the associated CCB.
2. **Check wiring to CCB3**
   a. Check wiring No physical damage to harness. Verify no damage, moisture, or corrosion in connectors.
   b. Check voltage. Check voltage at 3REC04 and 3REC15. Check voltage at 1REC01 and 1REC06.
   c. Check CAN connectivity. Verify CAN connectivity at 3REC05 and 3REC17. Verify CAN connectivity at 1REC02 and 1REC4.

25301 OVER CURRENT STP3

- ACTIVATION: The stepper current is reported to be too high by stepper board 3 (Indicated by Stepper Output Voltage < 5V) for 3 Seconds as timed at stepper board.
- UNIT CONTROL: Engine and Electric Operation: Alarm only. Steppers on board with problem disabled (Powered OFF) until good power reported from Stepper Board at which point they are re-enabled.
- RESET CONDITION: 10 Seconds of good current range reported from all steppers.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for additional CCB3 / CCB4 & STP3 / STP4 alarms**
   - Alarms for CCB3 and CCB4 indicate a problem before CCB3 or at CCB3.
   - Alarms isolated to CCB3 indicate a problem before CCB3 or at CCB3.
   - Alarms isolated to CCB4 indicate a problem between CCB3 and CCB4, or at CCB4.
   - Stepper Alarms isolated to STP3 or STP4 indicate a problem with the associated CCB.
2. **Check wiring to CCB3**
   a. Check wiring. Check for physical damage to harness. Verify no damage, moisture, or corrosion in connectors.
   b. Check voltage. Check voltage at 3REC04 and 3REC15. Check voltage at 1REC01 and 1REC06.
   c. Check CAN connectivity. Verify CAN connectivity at 3REC05 and 3REC17. Verify CAN connectivity at 1REC02 and 1REC4.

25302 CHECK INPUT VOLTAGE STP3

- ACTIVATION: The stepper input voltage is reported out of valid range (9V to 17V) by stepper board 3 for 3 seconds.
- UNIT CONTROL: Engine and Electric Operation: Alarm only. Steppers on board with problem disabled (Powered OFF) until good power reported from Stepper Board at which point they are re-enabled.
- RESET CONDITION: 10 Seconds of good voltage reported from all steppers.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for additional CCB3 / CCB4 & STP3 / STP4 alarms**
   - Alarms for CCB3 and CCB4 indicate a problem before CCB3 or at CCB3.
   - Alarms isolated to CCB3 indicate a problem before CCB3 or at CCB3.
   - Alarms isolated to CCB4 indicate a problem between CCB3 and CCB4, or at CCB4.
   - Stepper Alarms isolated to STP3 or STP4 indicate a problem with the associated CCB.
2. **Check wiring to CCB3**
   a. Check wiring. Check for physical damage to harness. Verify no damage, moisture, or corrosion in connectors.
   b. Check voltage. Check voltage at 3REC04 and 3REC15. Check voltage at 1REC01 and 1REC06.
   c. Check CAN connectivity. Verify CAN connectivity at 3REC05 and 3REC17. Verify CAN connectivity at 1REC02 and 1REC4.

25400 NO COMM FROM MICRO TO STP4

- ACTIVATION: Alarm 21100 is not active and No sync responses have been received from the Stepper 4 Module for 10 seconds.
- UNIT CONTROL: Engine and Electric Operation: Required Shutdown. If alarm remains active for 2 minutes issue a shutdown command to all modules except the display.
- RESET CONDITION: Auto reset when Sync response received from the Stepper 4 Module in the past 10 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for additional CCB3 / CCB4 & STP3 / STP4 alarms**
   - Alarms for CCB3 and CCB4 indicate a problem before CCB3 or at CCB3.
   - Alarms isolated to CCB3 indicate a problem before CCB3 or at CCB3.
   - Alarms isolated to CCB4 indicate a problem between CCB3 and CCB4, or at CCB4.
   - Stepper Alarms isolated to STP3 or STP4 indicate a problem with the associated CCB.
2. **Check wiring to CCB3**
   a. Check wiring. Check for physical damage to harness. Verify no damage, moisture, or corrosion in connectors.
   b. Check voltage. Check voltage at 3REC04 and 3REC15. Check voltage at 1REC01 and 1REC06.
   c. Check CAN connectivity. Verify CAN connectivity at 3REC05 and 3REC17. Verify CAN connectivity at 1REC02 and 1REC4.

25401	OVER CURRENT STP4

- ACTIVATION: The stepper current is reported to be too high by stepper board 4 (Indicated by Stepper Output Voltage < 5V) for 3 Seconds.
- UNIT CONTROL: Engine and Electric Operation: Alarm only. Steppers on board with problem disabled (Powered OFF) until good power reported from Stepper Board at which point they are re-enabled.
- RESET CONDITION: 10 Seconds of good current range reported from all steppers.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for additional CCB3 / CCB4 & STP3 / STP4 alarms**
   - Alarms for CCB3 and CCB4 indicate a problem before CCB3 or at CCB3.
   - Alarms isolated to CCB3 indicate a problem before CCB3 or at CCB3.
   - Alarms isolated to CCB4 indicate a problem between CCB3 and CCB4, or at CCB4.
   - Stepper Alarms isolated to STP3 or STP4 indicate a problem with the associated CCB.
2. **Check wiring to CCB3**

   a. Check wiring. Check for physical damage to harness. Verify no damage, moisture, or corrosion in connectors.

   b. Check voltage. Check voltage at 3REC04 and 3REC15. Check voltage at 1REC01 and 1REC06.

   c. Check CAN connectivity. Verify CAN connectivity at 3REC05 and 3REC17. Verify CAN connectivity at 1REC02 and 1REC4.

25402	CHECK INPUT VOLTAGE STP4

- ACTIVATION: The stepper input voltage is reported out of valid range (9V to 17V) by stepper board 4 for 3 seconds.
- UNIT CONTROL: Engine and Electric Operation: Alarm only. Steppers on board with problem disabled (Powered OFF) until good power reported from Stepper Board at which point they are re-enabled.
- RESET CONDITION: 10 Seconds of good voltage reported from all steppers.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for additional CCB3 / CCB4 & STP3 / STP4 alarms**
   - Alarms for CCB3 and CCB4 indicate a problem before CCB3 or at CCB3.
   - Alarms isolated to CCB3 indicate a problem before CCB3 or at CCB3.
   - Alarms isolated to CCB4 indicate a problem between CCB3 and CCB4, or at CCB4.
   - Stepper Alarms isolated to STP3 or STP4 indicate a problem with the associated CCB.
2. **Check wiring to CCB3**

   a. Check wiring. Check for physical damage to harness. Verify no damage, moisture, or corrosion in connectors.

   b. Check voltage. Check voltage at 3REC04 and 3REC15. Check voltage at 1REC01 and 1REC06.

   c. Check CAN connectivity. Verify CAN connectivity at 3REC05 and 3REC17. Verify CAN connectivity at 1REC02 and 1REC4.

26100 NO COMM FROM MICRO TO ENCU

- ACTIVATION: Main microprocessor cannot communicate with the engine control unit over the CAN bus and AL00013 (High Discharge Pressure) is not active.
- UNIT CONTROL: Engine Operation: Shutdown and alarm.
  Electric Operation: This alarm will not activate in Electric Operation.
- RESET CONDITION: Auto reset when CAN communication is restored, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check both active and inactive alarms for other "NO COMM" alarms**.
   a. If more than one alarm, record all and proceed to step 2.
   b. If this is the only alarm, check for continuity:
      CAN Hi - Refer to **Section 4.2**
      CAN Lo - Refer to **Section 4.2**
      If good continuity is not present, check connectors and wiring between terminals for damage, moisture or corrosion. Repair if required.
   c. Replace ENCU. Refer to **Section 8.6.12**
2. **Check CAN bus**
   a. Inspect connector pins & terminals on 1MM and 1SVM. Verify no damage or corrosion in connections.
   b. Check for CAN continuity:
      CAN Hi - Refer to **Section 4.2**
      CAN Lo - Refer to **Section 4.2**
      If good continuity is not present, check connectors and wiring between terminals for damage, moisture or corrosion.
3. **Check system** - Clear active and inactive alarms. Start unit and monitor for additional "NO COMM" alarms.

26101 ENGINE OVER HEAT ENCU

- ACTIVATION: Engine water temperature > or = 262°F (128° C)
- UNIT CONTROL: Engine Operation: Alarm only.
  Electric Operation: This alarm will not activate in electric operation.
- RESET CONDITION: If trigger on message not received for 5 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Refer to **00012 HIGH COOLANT TEMPERATURE**.

26102	WATER TEMP LOW ENCU

- ACTIVATION: Voltage of water temperature sensor is 0.1 V or less
- UNIT CONTROL: Engine Operation: Alarm only.
  Electric Operation: This alarm will not activate in electric operation.
- RESET CONDITION: If trigger on message not received for 5 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Refer to:
00129 CHECK ENG COOLANT SENSOR
P00155 CHECK COOLANT TEMP SENSOR.

26103	WATER TEMP HIGH ENCU

- ACTIVATION: Voltage of water temperature sensor is 4.9 V or above
- UNIT CONTROL: Engine Operation: Alarm only. Electric Operation: This alarm will not activate in electric operation.
- RESET CONDITION: If trigger on message not received for 5 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Refer to:
00129 CHECK ENG COOLANT SENSOR
P00155 CHECK COOLANT TEMP SENSOR.

26104	BATTERY VOLTAGE HIGH ENCU

- ACTIVATION: ECU recognition of battery voltage is above 18 V.
- UNIT CONTROL: Engine Operation: Required Shutdown.
  Electric Operation: This alarm will not activate in electric operation.
- RESET CONDITION: If trigger on message not received for 5 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Refer to **00015 BATTERY VOLTAGE TOO HIGH**.

26105 ENGINE OVERRUN ENCU

- ACTIVATION: Engine speed > 2070 min-1 (rpm)
- UNIT CONTROL: Engine Operation: Required Shutdown.
  Electric Operation: This alarm will not activate in electric operation.
- RESET CONDITION: If trigger on message not received for 5 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Refer to:
00038 CHECK HIGH SPEED RPM
00039 CHECK ENGINE RPM

26106 SENSOR SUPPLY VOLTAGE 1 LOW

- ACTIVATION: Voltage to sensor is below 4.00 V
- UNIT CONTROL: Engine Operation: Required Shutdown.
  Electric Operation: This alarm will not activate in electric operation.
- RESET CONDITION: If trigger on message not received for 5 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Engine Speed Sensor (ENSSN)**
   a. Check actual engine speed using a hand held tachometer and compare with speed shown in unit data. Must be ± 20 rpm. Must be a steady reading.
   b. Inspect sensor, connector pins & terminals. (See wiring schematic **Section 10**.) Verify there is no physical damage to sensor, and no damage or corrosion in connections.
   c. Check power from ENCU. Should read approximately +12 VDC from terminal ENCU-43 to ENSSN-3.
   d. Check power from ENCU. +5 VDC from terminal ENCU-29 to RPS-1
   e. Check ground to ENCU. Check wiring from terminal ENCU-20 to ENSSN-1
   f. Check signal to ENCU. Check wiring from terminal ENCU-2 to ENSSN-2
2. **Check Rack Position Sensor (RPS)** - Refer to **Section 8.6.12**.

26108 RACK POSITION SENSOR ABNORMAL

- ACTIVATION: Sensor voltage > 4.9 V or < 0.3V
- UNIT CONTROL: Engine Operation: Alarm only.
  Electric Operation: This alarm will not activate in electric operation.
- RESET CONDITION: If trigger on message not received for 5 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check Rack Position Sensor (RPS)** - Inspect sensor, connector pins & terminals. (See wiring schematic **Section 10**.) Check for physical damage to sensor. Verify no damage or corrosion in connections.
2. **Check Rack Position Sensor (RPS). Refer to Section 8.6.12**
3. **Refer to 26106 SENSOR SUPPLY VOLTAGE 1 LOW.**

26109 ACTUATOR ABNORMAL ENCU

- ACTIVATION: Actuator current >3.0A or < 80mA
- UNIT CONTROL: Engine Operation: Required Shutdown.
  Electric Operation: This alarm will not activate in electric operation.
- RESET CONDITION: If trigger on message not received for 5 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Refer to 05012 CHECK ENCU POWER CIRCUIT**.
2. **Check Engine Control Unit (ENCU) and Fuel/Speed Actuator (FSA)**
   a. Check voltage from fuse F3 through PCM-34 and SP-18 to ENCU-22. Verify correct fuse, see **Figure 2.7**. Must have minimum 11 VDC with the battery connected and SROS in the OFF position.
   b. Check voltage from 3MM-9 to ENCU-44. Must have minimum 11 VDC with SROS in the START/RUN position. If no, energize the run relay output using component test mode (refer to **Component Test Mode**) and retest.
   c. Check for ground at ENCU-19 and ENCUGND-A (at the battery negative cable connection). If ground not good, check connectors and wiring between terminals for damage, moisture or corrosion.
   d. Inspect fuel/speed actuator (FSA), engine speed sensor (ENSSN) and engine speed control unit (ENCU) connector pins & terminals. Verify no physical damage to components, and no damage or corrosion in connectors.
   e. Check resistance & amp draw of FSA. Refer to **Section 2.12** for specifications.
   f. Check FSA plunger. Must move in and out freely. Refer to engine manual.

26110	ENGINE SPEED SENSOR ABNORMAL

- ACTIVATION: Engine speed = 0 min-1 (rpm)
- UNIT CONTROL: Engine Operation: Required Shutdown.
  Electric Operation: This alarm will not activate in electric operation.
- RESET CONDITION: If trigger on message not received for 5 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

Refer to Alarm 00130 CHECK ENGINE RPM SENSOR.

27200	NO COMM FROM MICRO TO COMM MODULE

- ACTIVATION: Alarm 21100 “NO COMM FROM ANY BOARD TO MAIN MICRO“ is not active, and Number Of Comm Modules Configuration is set to 1, and no sync responses have been received from the Comm Module for 10 seconds.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Sync response received from the Comm Module in the past 10 seconds, alarm 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, clear the alarm(s). (Refer to Note 1 in **Notes** Section.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for other CAN bus alarms** - This alarm may accompany other alarms, complete the troubleshooting steps for alarms found. If repairs have been made and the other alarms have cleared, further troubleshooting may not be required.
2. **Replace Comm Module**

28001	NO COMM FROM FUEL SENSOR

- ACTIVATION: The fuel sensor is configured as 3rd party and no communications have been received from the sensor for at least 15 minutes
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Communications have been received from the fuel sensor.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for proper APX Control System Configuration** - Refer to **Section 5.2.3** & **Table 5–1**.
2. **Make sure that all third party configurations are correct and software is current**.
3. **Check Fuel Sensor and Wiring** - Inspect sensor, connector pins & terminals. No physical damage to sensor. No damaged or corrosion in connections.

28002	NO COMM FROM DOOR SWITCH

- ACTIVATION: The door switch configuration is configured as 3rd Party and no communications have been received for 15 minutes
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Communications have been received from the door switch.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for proper APX Control System Configuration -** Refer to **Section 5.2.3** & **Table 5–1**.
2. **Make sure that all third party configurations are correct and software is current.**

   Check Switch and Wiring - Inspect switch, connector pins & terminals. No physical damage to sensor. No damaged or corrosion in connections.

28003	INVALID DOOR SWITCH

- ACTIVATION: The Door Switch configuration is configured as 3rd Party and data received from the switch is invalid.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Valid data received from door switch.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for proper APX Control System Configuration -** Refer to **Section 5.2.3** & **Table 5–1**.
2. **Make sure that all third party configurations are correct and software is current.**

   Check Switch and Wiring - Inspect switch, connector pins & terminals. No physical damage to sensor. No damaged or corrosion in connections.

28004 28005	INVALID REMS1 INVALID REMS2

- ACTIVATION: The Remote Switch configuration is configured as 3rd Party and data received from the switch is invalid.
- UNIT CONTROL: Engine and Electric Operation: Alarm only.
- RESET CONDITION: Valid data received from remote switch.

NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (Refer to Note 1 in **Notes** Section) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.

CORRECTIVE ACTIONS:

1. **Check for proper APX Control System Configuration -** Refer to **Section 5.2.3** & **Table 5–1**.
2. **Make sure that all third party configurations are correct and software is current.**

   Check Switch and Wiring - Inspect switch, connector pins & terminals. No physical damage to sensor. No damaged or corrosion in connections.

SECTION 8
Service

⚠ WARNING

Unit may start automatically at any time even if the switch is in the OFF position. Use proper lockout/tagout procedures before inspection/servicing. All unit inspection/servicing by properly trained personnel only.

⚠ WARNING

Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure the START/RUN-OFF switch is in the OFF position, lockout/tagout the high voltage receptacle, and lockout/tagout the negative battery connection.

⚠ WARNING

Beware of moving belts and belt-driven components. When working with belts, beware of pinch points.

⚠ WARNING

Never use air or gases containing oxygen for leak testing or operating refrigerant compressors. Pressurized mixtures of air or gases containing oxygen can lead to explosion.

⚠ WARNING

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

⚠ 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.

⚠ CAUTION

Disconnect batteries before doing any electrical welding.

NOTICE

Unit uses either R-404A or R-452A refrigerant, 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. 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 module) - **Section 8.5**
- Engine And Engine Related Systems Service - **Section 8.6**
- Refrigerant System Service - **Section 8.7**
- Compressor Service - **Section 8.8**
- Refrigerant System Component Service - **Section 8.9**,
- Electrical System Component Service - **Section 8.10**,

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 cleaner replacement, coolant replacement and pre-trip inspections. Maintenance is to be performed in accordance with the procedures provided in Table 8–1.

8.3 Pretrip Inspection

Pretrip inspection should be performed before every trip and at regular maintenance intervals. Pretrip procedures are provided the Trailer Refrigeration Pretrip Inspection document 62-90490.

Table 8–1 Maintenance Schedule

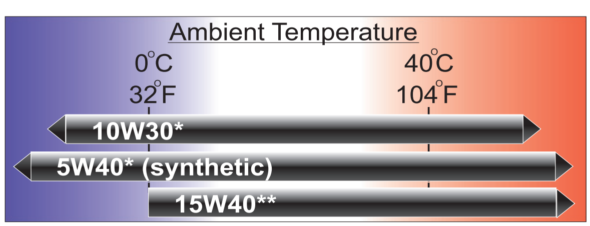
System	Operation	Reference Section
a. Pretrip Inspections		
1. Pretrip Inspection - before starting		Section 8.3
2. Pretrip Inspection - after starting		Section 8.3
3. Run Microprocessor Pretrip - Before loading		Section 3.6
4. Check Engine Hours		Section 3.17
b. Every Service Interval or Yearly		
Engine	1. Check engine oil and filter change interval (refer to Section d. of this table)	Section d.
	2. Check low oil pressure switch	Engine Manual
	3. Clean crankcase breather	Section 8.6.16
	4. Check fuel injectors every 1,500 hours*	Engine Manual
	5. Check injection pump every 3,000 hours*	Engine Manual
	6. Check and adjust engine valves every 4,000 hours	Engine Manual
Fuel System	1. Clean mechanical and electric (if equipped) fuel pump screens	Section 8.6.3 & Section 8.6.4
	2. Change fuel filter	Section 8.6.5
	3. Check fuel heater (if equipped)	Section 8.6.8
Cooling System	1. Check coolant change interval (refer to Section c. of this table). If replacement is not required, check antifreeze concentration using a refractometer (Carrier Transicold P/N 07-00435-00)	Section 8.6.14
	2. Clean condenser/radiator surfaces	Section 8.6.14
	3. Check water pump	Check
	4. Check water temperature sensor	Check
Exhaust System	1. Check mounting hardware	Check
	2. Check muffler and exhaust pipes	Check
Air Intake System	1. Change air cleaner element	Section 8.6.10
	2. Check and reset air cleaner indicator	Section 8.6.10
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

Table 8–1 Maintenance Schedule

System	Operation	Reference Section
Charging Circuit	1. Check battery charger output voltage	**Section 8.10.13**
	2. Check battery charger amperage	**Section 8.10.13**
*Based upon EPA 40 CFR Part 89		
Unit	1. Check unit and remote evaporator mounting bolts	Check
	2. Check engine and compressor mounting bolts	Check
	3. Check door latches & hinges	**Section 8.5.3**
	4. Check condition of water pump belt	Check
Refrigeration System	1. Check defrost air switch and calibrate as necessary	**Section 8.9.12**
	2. Check & clean C1/C2/C3 evaporator coil and all defrost drain hoses	**Section 8.9.12**
	3. Install manifold gauge set and check refrigerant pressure	**Section 8.9.1**
	4. Run APX Control System Pretrip	**Section 3.6**
	5. Check calibration of suction pressure transducer	**Section 8.7.1**
	6. Check C1, C2, & C3 manual defrost operation	**Section 3.12**
Electrical System	1. Check unit & remote evaporator switches & electrical connections	Check
	2. Check all ground connections for corrosion & tightness	Check
	3. Check stand-by plug for signs of wear or damage	Check
	4. Check condenser fan amperage	Section 2.11
	5. Check C1, C2, C3 evaporator fan amperage	Section 2.11
	6. Check compressor amperage	Section 2.11
	7. Check C1, C2, C3 heater amperage	Section 2.11
c. 5 year or 12,000 Hour Maintenance		
Coolant System	1. Drain and flush cooling system	**Section 8.6.14**
	2. Refill with an Organic Acid Technology (OAT), nitrite free (NF) extended life coolant (ELC-NF).	**Section 8.6.14**
d. Oil Change Intervals		
Oil Type	**Oil Change / ESI Filter Change**	
Petroleum	3000 hours or 2 years (Maximum oil drain interval is 2 years)	
Mobil Delvac 1*	4000 hours or 2 years (Maximum oil drain interval is 2 years)	
*Mobil Delvac1 is the only approved synthetic oil		

These maintenance schedules are based on the use of approved oils and regular Pretrip inspections of the unit. Failure to follow the recommended maintenance schedule may affect the life and reliability of the refrigeration unit.

8.4 Oil Viscosity



*10W30 & 5W40 (synthetic) are recommended for ALL climates
**15W40 is NOT recommended for climates < 32°F (0°C)

8.5 External Surface Service

Procedures for servicing or maintaining the grille, surround, doors, door latches and display module are provided below.

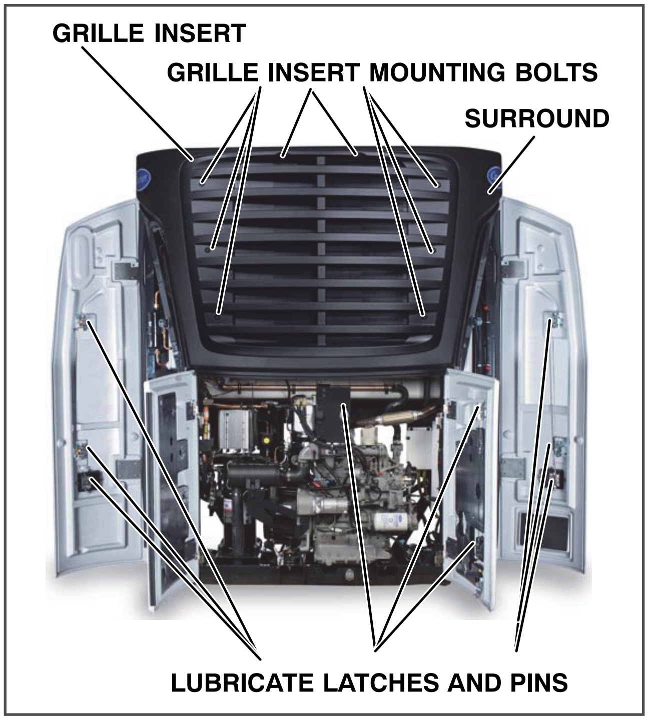
8.5.1 Remove Grille Insert

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 8.5.2**.)

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Remove the 3 grille insert mounting bolts on each side of the grille insert, See **Figure 8.1**.
3. Remove the 2 grille insert mounting bolts on top of the grille insert.
4. The grille is fitted with locating tabs along the bottom. To remove, swing insert down and lift out of locating slots.
5. Reverse above steps to install grille insert.
6. Re-enable the starter, start unit and run Pretrip to check operation.

Figure 8.1 Grille Insert Removal and Door Latch Maintenance



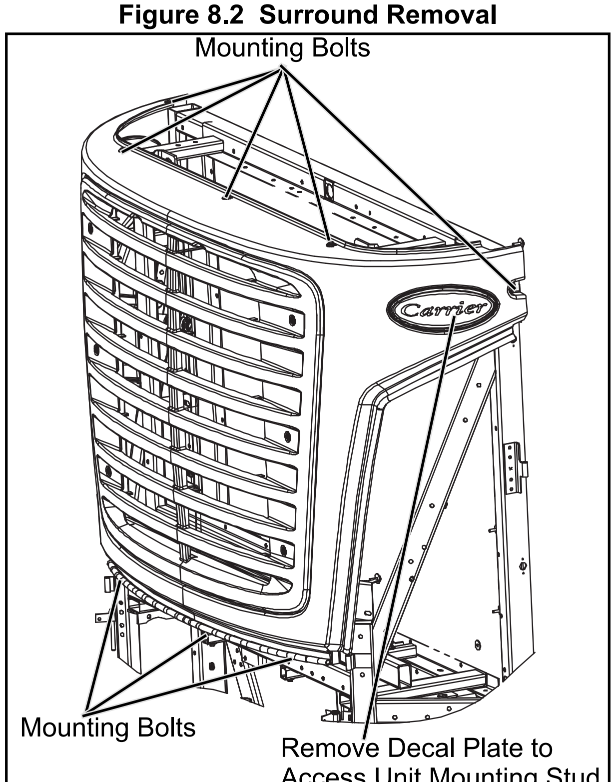
8.5.2 Surround Removal

NOTE

It is not necessary to remove the grille before removing the surround.

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Open both side and front doors.
3. Remove the bolts that secure the surround to the unit, see **Figure 8.2**.
4. Reverse above steps to install surround.
5. Re-enable the starter, start unit and run Pretrip to check operation.

Figure 8.2 Surround Removal



8.5.3 Door Latch Maintenance and Cable Replacement

8.5.3.1 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.

8.5.3.2 Cable Replacement

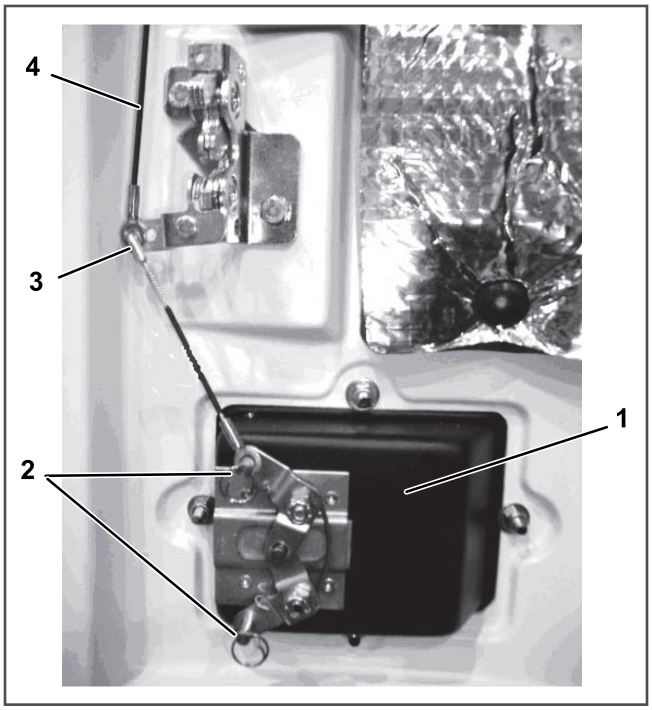
1. Remove circular clip that secures the cable to the paddle assembly. See **Figure 8.3**.
2. Slide cable from paddle and rotate other end out of latch assembly.

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.

Figure 8.3 Door Latch Cable Removal

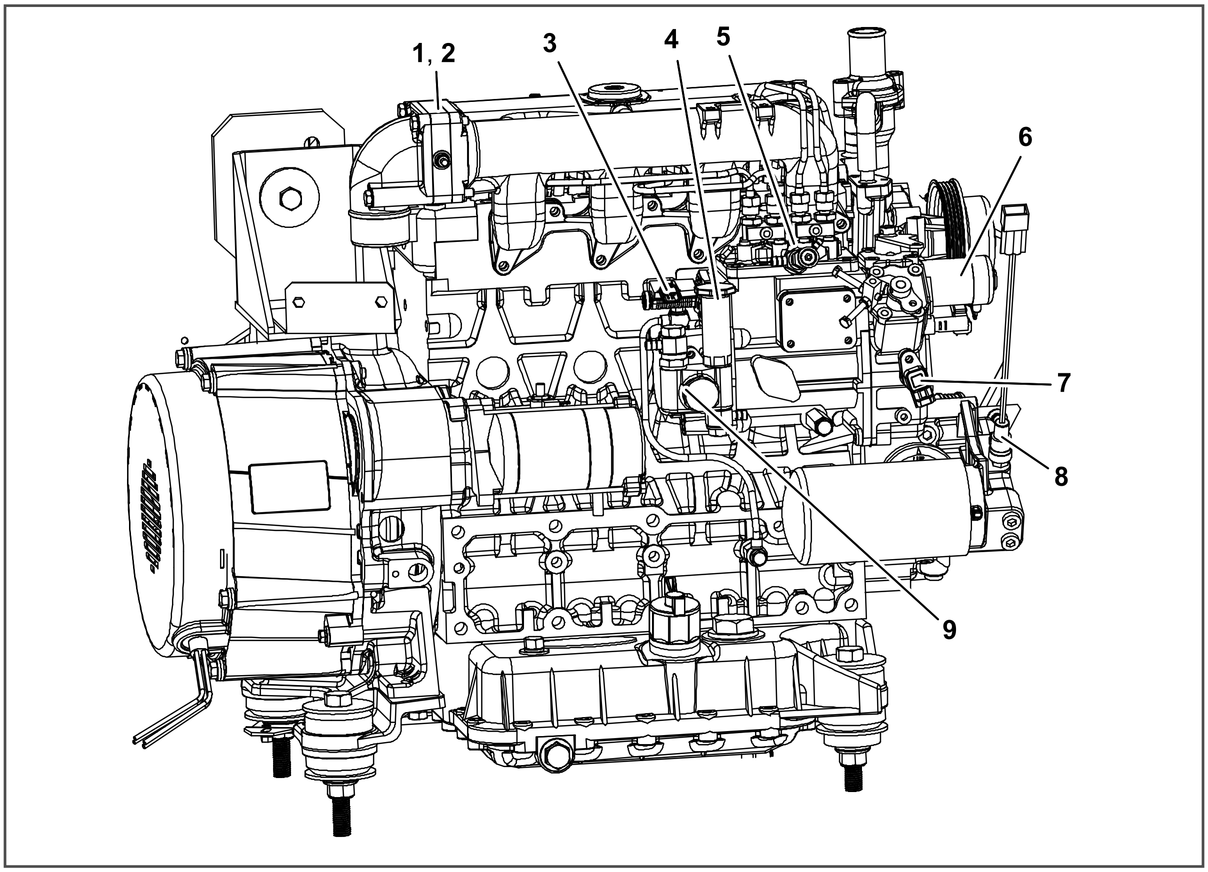


1.Paddle Assembly (Typical, Front & Side Doors)
2.Circular Clips (Typical, Front & Side Doors)
3.Lower Cable Upper Connection (Side Doors Only)
4.Upper Cable (Side Doors Only)

8.6 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.

Figure 8.4 Engine Components



1. Engine Preheater (EPH)
2. Engine Coolant Temperature Sensor (ENCT) (Behind Engine Preheater)
3. Rack Position Sensor (RPS)
4. Manual Plunger
5. Injection Pump
6. Fuel/Speed Actuator (FSA)
7. Engine Speed Sensor (ENSSN)
8. Engine Oil Pressure Switch (ENOPS)
9. Mechanical Fuel Pump

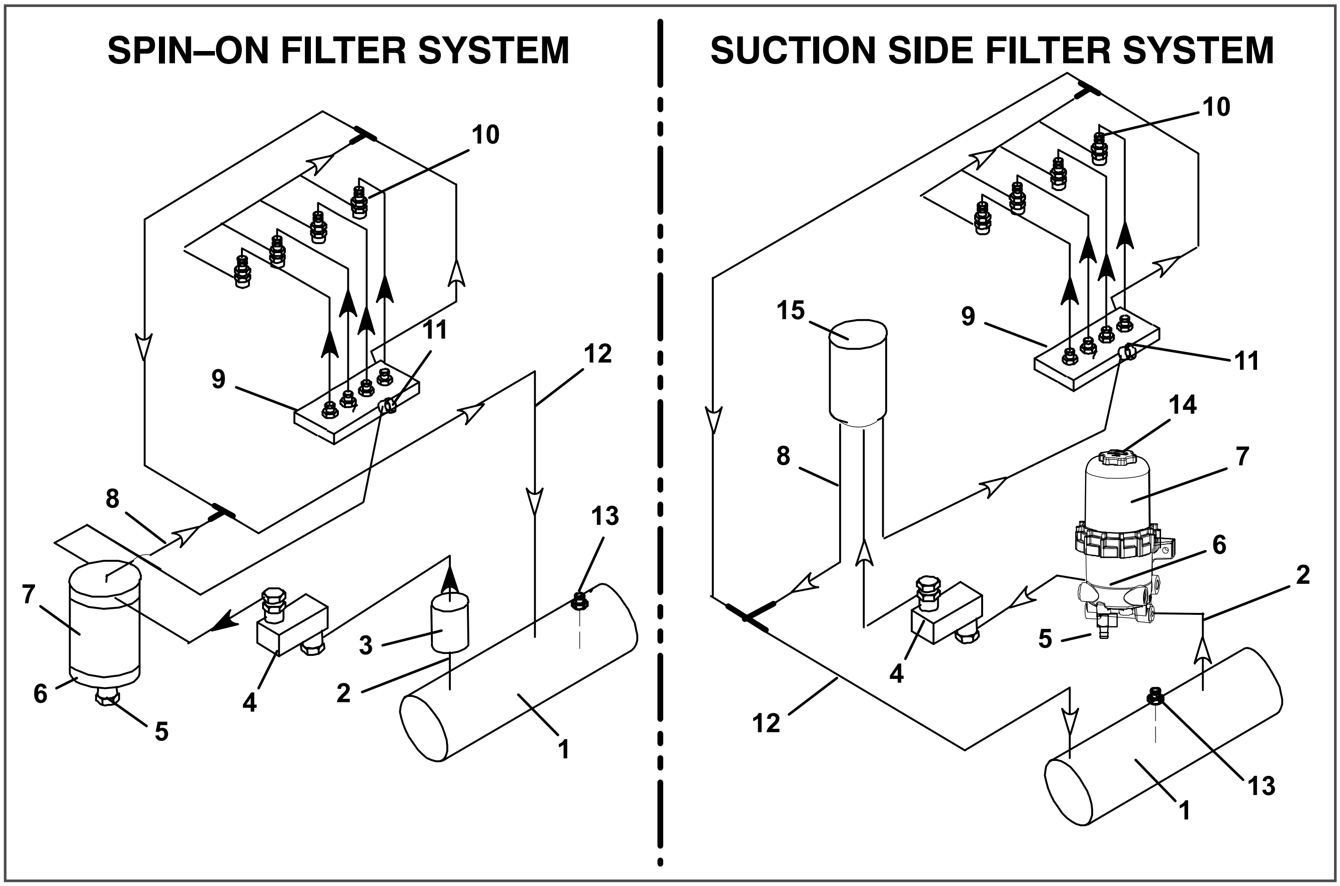
* Engine Control Unit (ENCU), not on engine, for location, see Figure 2.2.

8.6.1 Fuel System

The fuel system consists of the fuel tank, mechanical fuel 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 are available, the standard extended life spin-on filter system and the extra heavy-duty suction side filter system (see **Figure 8.5**).

Figure 8.5 Fuel System Diagram



1. Fuel Tank
2. Supply Line
3. Electric Pump
4. Mechanical Pump
5. Water Drain Valve
6. Heater
7. Filter
8. Filter or Fuel Head Leak-Off Line
9. Injection Pump
10. Injector Nozzles
11. Bleed Screw
12. Return Line
13. Level Sensor
14. Vent Cap
15. Fuel Head Assembly

8.6.2 Priming the Fuel Pump System

The mechanical fuel pump (See **Figure 8.6**) is mounted on the engine next to the injection pump (See **Figure 8.4**). This pump has a manual plunger for priming the fuel system when the fuel tank has been run dry.

1. If bleeding a spin-on system, considerable effort may be saved by changing the filter and filling the new element with clean diesel fuel before priming the remainder of the system. Refer to **Section 8.6.5**. If bleeding a suction side filter system remove the vent cap from the filter bowl and add fuel until level is about even with the top of the filter element, reinstall cap. Do not allow fuel level to fall below the visible level in the bowl as the bleeding procedure is accomplished, add more fuel if required.

2. Turn the bleed valve (red) counter-clockwise until fully opened.

3. 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.

4. 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.

5. Start engine. It may be necessary to continue to pump until the engine starts.

NOTICE

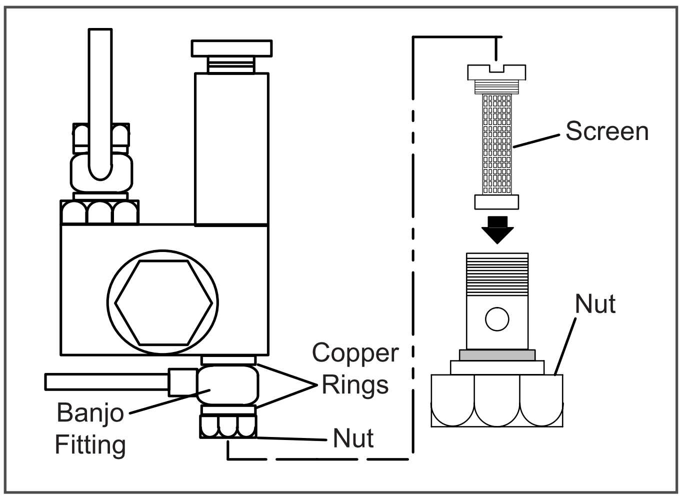
Running the engine for an extended period of time with the manual plunger up can cause a priming pump failure

6. Depress and turn the top of the manual plunger clockwise to lock in place.
7. When engine is running smoothly, turn bleed valve clockwise until fully closed. If bleeding a suction side filter system, loosen the vent on the cover until fuel level lowers to the collar clamp then hand tighten vent.

8.6.3 Mechanical Fuel Pump Screen

The fuel screen (See **Figure 8.6**) 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 pretrip or when the oil and fuel filters are changed.

Figure 8.6 Mechanical Fuel Pump



1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Turn nut (**Figure 8.6**) counter-clockwise to loosen and remove it.
3. Remove banjo fitting (Item 4) and let it hang loose. Discard copper rings (Item 3) and replace with new ones.
4. Turn screen (Item 1) counter-clockwise and remove. Check and clean or replace as required.
5. To install reverse above steps.
6. Re-enable the starter, start unit and check for leaks.

8.6.4 Electric Fuel Pump Screen

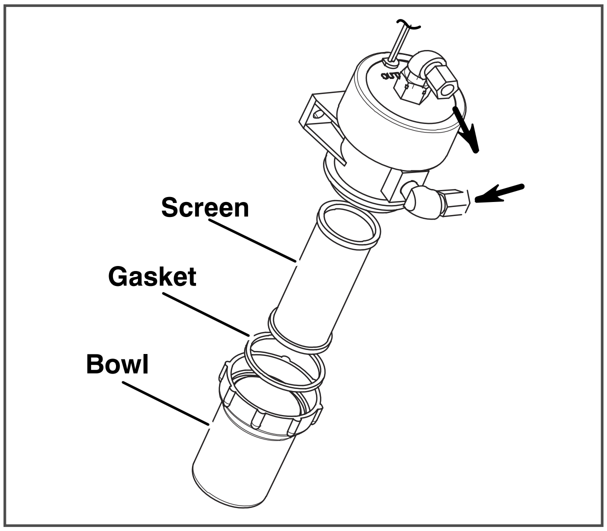
1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Remove bowl, (Figure 8.7).
3. Remove gasket and screen.

⚠ WARNING

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

4. Wash screen in cleaning solvent and blow out with air pressure. Clean bowl.
5. To install reverse above steps.
6. Re-enable the starter, start unit and check for leaks.

Figure 8.7 Electric Fuel Pump



8.6.5 Spin-On Fuel Filter Replacement

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Place a shallow pan under filter (item 7, Figure 8.5) and open the drain valve (5) to drain contents.
3. Remove water separator and O-ring or heater bowl and then remove element.
4. Install water separator on new element using new O-ring or heater bowl on new element using new gasket.
5. Fill new element with clean diesel fuel, lubricate the seal and install. Tighten firmly by hand.
6. Re-enable the starter, start unit and check for leaks.

8.6.6 Suction Side Fuel Filter Replacement

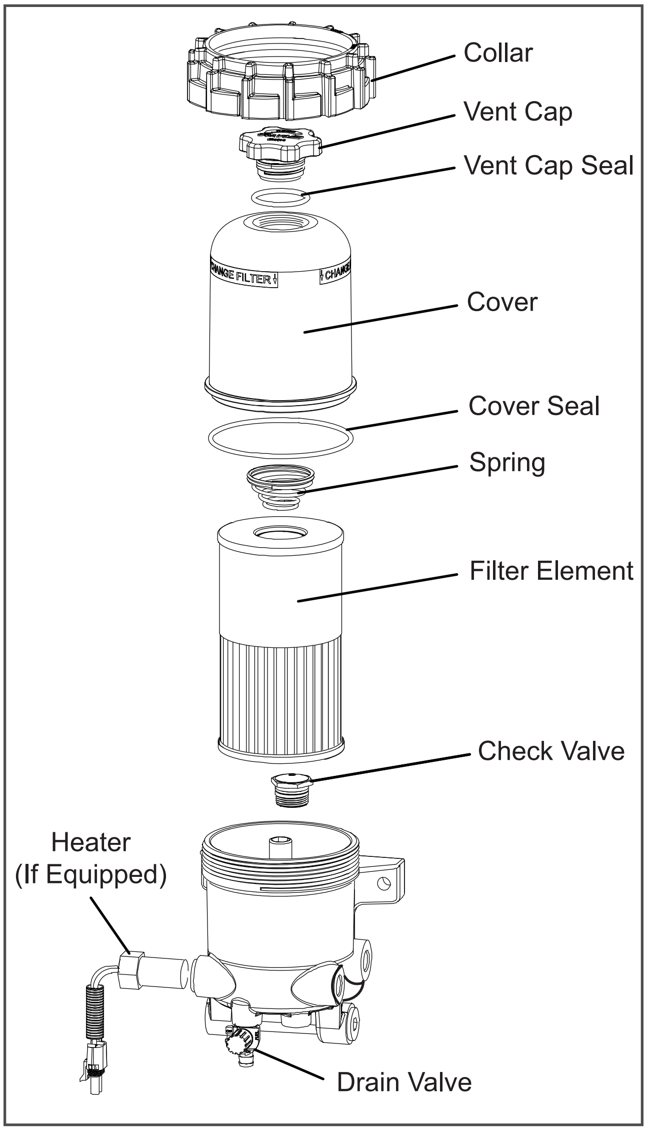
1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.

NOTE

If required, use a lock collar wrench (Carrier Transicold part Number 07-00423-00) to loosen the collar or vent cap. Do not use the wrench to install the vent cap or collar, hand tighten only.

2. Place a shallow pan under filter (**Figure 8.8**). Remove the vent cap and open the drain valve (9) to drain the fuel below the collar level.
3. Remove the collar then remove the clear cover.
4. Remove filter element, spring, cover seal, and vent cap seal. Dispose of the filter element and seals properly.
5. Using a clean shop rag, clean the cover, collar and threads on the filter body.
6. Install new filter element, cover seal and vent cap seal. Install filter with spring at top and hand tighten collar.
7. Prime the system by removing the vent cap from the filter bowl and add fuel until level is about even with the top of the filter element Reinstall cap and hand tighten.
8. Re-enable the starter, start the engine and run for one minute. Slowly open the vent cap and allow the fuel level to drop to about one inch above the collar.
9. Hand tighten the vent cap.

Figure 8.8 Suction Side Fuel Filter Replacement



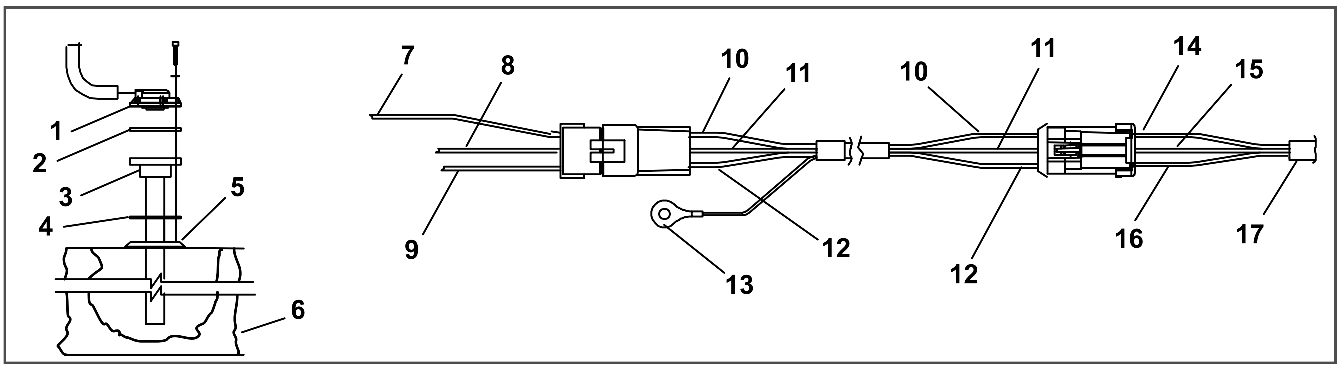
8.6.7 Fuel Level Sensor (FLS)

An optional fuel level sensor (item1, Figure 8.9) supplies an input signal to the control system as to the percent of fuel remaining in the fuel tank. The control system will activate alarm A00001 - “LOW FUEL LEVEL WARNING” 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:

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Verify that the PCM fuse (F8, **Figure 2.7**) is not open.
3. Verify that the wiring is correct, cable shield is properly grounded and the condition of connectors. No damage to sensor; no damage, moisture or corrosion in connectors.
4. Energize sensor circuit, (MM calling for engine operation). Check power (approximately 12 VDC) from PCM-22 (9, **Figure 8.9**) through to connector (12). Check ground from 2MM-24 (8) through connector (11). Check signal (greater than 0.24 VDC and less than 5VDC) at 2MM-13.
5. 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.

Figure 8.9 Fuel Level Sensor



1. Fuel Level Sensor
2. Gasket
3. Focus Tube
4. Sensor Flange
5. Fuel Level Sensor Flange
6. Fuel Tank
7. Wire FLSC to 2MM-13 (Connection C)
8. Wire FLSB to 2MM-24 (Connection B)
9. Wire PCM-22 to FLSA (Connection A)
10. White Wire (Connection C)
11. Black Wire (Connection B)
12. Red Wire (Connection A)
13. Ground (Shield)
14. Yellow Wire (Connection C)
15. Black Wire (Connection B)
16. Red Wire (Connection A)
17. Wires From Sensor

- - - - -

NOTICE

Torque fuel level sensor mounting screws to 15 to 18 inch/lbs (1.7 to 2.0 Nm). DO NOT over tighten, as little as 20 inch/pounds (2.3 Nm) will damage the sensor.

6. Using new gaskets, reinstall fuel level sensor components. Mounting holes are not symmetrical, an alignment hole is 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 finger tight. Tighten in accordance with the instructions provided in the preceding CAUTION.
7. With the fuel tank empty the output reading should be approximately 0.25 VDC.
8. With the fuel tank full, the output reading should be approximately 4.75 VDC.
9. Re-enable the starter, start unit and check for leaks.

8.6.8 Fuel Heater

The optional fuel heater (**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 control system will not enable this circuit.

Also, the heater is fitted with an internal temperature switch (FHTS - see schematic diagram, **Section 10**). The heater used in spin on type filter systems closes on a temperature fall to energize the heater element at temperatures below 45°F (7.2°C), and opens on a temperature rise to de-energize the heater element at 75°F (23.9°C). The heater used in suction side filter systems closes at temperatures below 53+/-7°F (11.7+/-3.9°C).

Test the Fuel Heater:

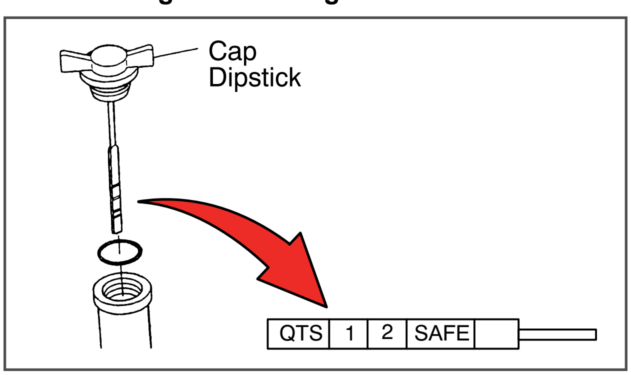
1. Using Unit Data (refer to **Section 3.15**), check to ensure the Ambient Air Temperature reading is below 77°F (25°C), if the reading is below this temperature the fuel heater relay (FHR) should be energized. If the relay does not energize, check for power from PCM fuse F10 to the relay coil + terminal and ground from the coil negative connection through PCM-17 to 3MM-17.
2. With the relay contacts closed, check for power from F7, through the relay contacts, fuse F14, through PCM-14 & 3 through SP25 to the fuel heater connector at terminal A. Also check for ground from the fuel heater connector terminal B through SP10 to GND1RING1.
3. If the wiring is good and the fuel heater temperature is below the cut in temperature replace the fuel heater. If the wiring is good but the fuel heater temperature is above the cut out temperature, the internal temperature switch may be open. Retest at a temperature below the switch close point as soon as conditions allow.
4. Start unit and check for leaks.

8.6.9 Engine Oil and Oil Filter

8.6.9.1 Check The Engine Oil Level:

1. Warm up the engine and then stop it by placing the START/RUN-OFF switch in the OFF position. 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 without 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



8.6.9.2 Change Engine Oil

1. Warm up the engine and then stop it by placing the START/RUN-OFF switch in the OFF position. Ensure the unit will not start automatically by disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.
2. If available, install oil drain tool (CTD P/N 68-15763-01). See **Figure 8.11**. 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 8.11 Oil Drain Tool

8.6.9.3 Change Engine Oil Filter

1. If not continuing from preceding step b., warm up the engine and then stop it by placing the START/ RUN-OFF switch in the OFF position. Ensure the unit will not start automatically by disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Remove oil filter. Ensure filter mounting is clean.

NOTICE

When changing oil filter, the new filter should be primed (partially filled) with clean oil if possible. If the filter is 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. Re-enable the starter, start unit and check for leaks.

8.6.10 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 filter element requires replacement. During operation: when a plugged filter element causes the intake manifold pressure to drop to 20” (500 mm) WG, the indicator will move to the red line. The filter element should then be replaced and the indicator reset by pressing the reset button.

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Check all connections for mechanical tightness. Be sure filter outlet pipe is not fractured.
3. Release 2 clips on air cleaner housing and remove the cover.
4. Remove filter element, wipe inside of air cleaner housing clean, inspect filter element, and replace if required.
5. Wipe inside of the cover and re-install.
6. Re-secure two clips on air cleaner housing.
7. Re-enable the starter, start unit and check for leaks.
8. Reset air cleaner service indicator.

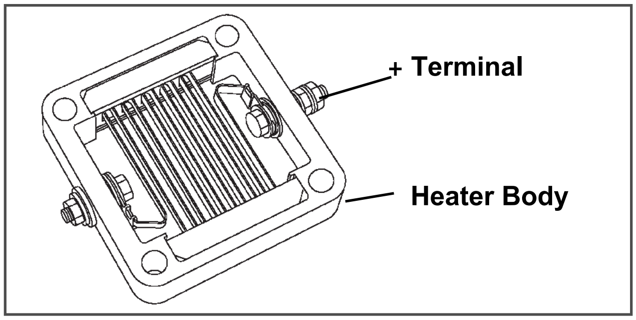
8.6.11 Engine Preheater

The current draw for the preheat circuit is checked during a Pretrip cycle. Refer to **Section 2.12** for amperage and resistance values.

8.6.11.1 Troubleshooting The Engine Preheater (EPH):

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. 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. Refer to **Section 2.8** for correct resistance value.
4. If the resistance is infinite (open) or zero, the engine preheat element is faulty and must be replaced.

Figure 8.12 Engine Preheater



8.6.11.2 Replacing the Engine Preheater

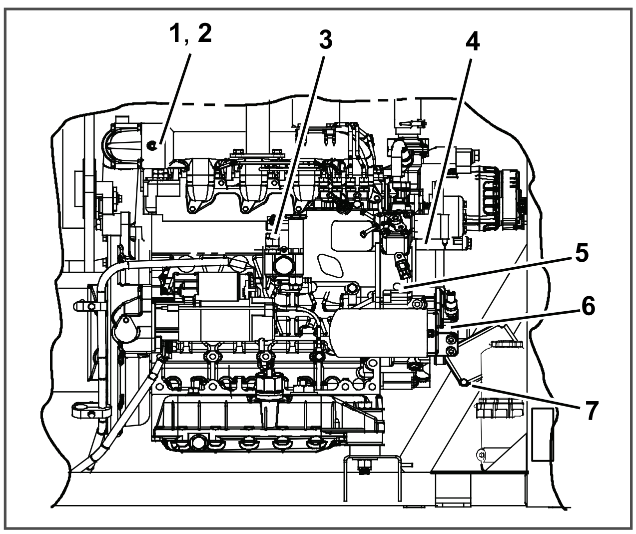
1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Remove the inlet hose.
3. Disconnect the lead.
4. Remove the flange, engine preheater, and gaskets.

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 engine preheater and flange using new gaskets. Torque flange bolts 15 to 20 ft/lbs (20.3 to 27.1 nm).
6. Reconnect the lead.
7. Re-enable the starter, start unit and run Pretrip to check operation.

Figure 8.13 Engine Control System



1. Engine Preheater (EPH)
2. Engine Coolant Temperature Sensor (ENCT) (Behind Engine Preheater)
3. Rack Position Sensor (RPS)
4. Fuel/Speed Actuator (FSA)
5. Engine Speed Sensor (ENSSN)
6. Engine Oil Pressure Switch (ENOPS)
7. Engine Control Unit (ENCU)

8.6.12 Engine Control System

Then engine is controlled by six components (see **Figure 8.4**): the engine control unit (ENCU), the Fuel/Speed Actuator (FSA) the engine speed sensor (ENSSN), the rack position sensor (RPS), the engine oil pressure switch (ENOPS) and the Engine Coolant Temperature Sensor (ENCT).

- The ENCU starts, stops and controls the speed of the engine by varying the position of the FSA rod. It also provides oil pressure, coolant temperature, engine load and speed signals to the control system via the CAN.
- The FSA combines the fuel shutoff solenoid and speed control solenoid into one component. Opening and closing the fuel rack (throttle) in accordance with signals from the ENCU.
- The ENSSN provides the speed signal to the ENCU.
- The ENOPS is connected to the engine oil pump outlet. It provides an open or closed signal to the ENCU.
- The RPS provides the position of the rack to the ENCU.
- The ENCT provides the engine coolant temperature signal to the ENCU.
- If any of these components is not functioning correctly, the corresponding alarm will be activated.

8.6.13 Rack Position Sensor (RPS) Calibration

The RPS calibration procedure is a software function initiated in Technician mode. This procedure should be performed after engine, ENCU, or rack position sensor replacement.

Start the Rack Position Sensor Calibration Procedure:

1. Put the system into Technician mode, refer to **Section 5.2**.
2. Select the Component Calibration mode soft key.
3. Press “=” to start Rack Position Sensor calibration.

During calibration the display will show engine load (%), RPM, current calibration offset, and calibration status. RPS calibration starts at 1700 - 1780 RPM, to reach this engine speed, the system will incrementally increase engine load in the following order:

Low Speed -> Compressor Start -> High Speed -> Heater 1 On -> Heater 2 On -> (3 minutes) -> Economized Mode

Manually Increase Engine Load:

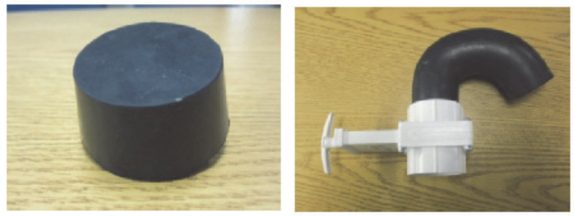
If after placing the system in Economized mode for 180 seconds the system is unable to reach calibration RPM (1700 - 1780), the display will indicate that the load is too low for calibration. In this case engine load can be manually increased by slowly blocking the condenser coil until the engine reaches calibration RPM and the calibration procedure can be completed.

If engine speed still does not reach calibration RPM, a plug & gate valve assembly can be used to restrict engine air intake.

Restrict Air Intake Using Plug and Gate Valve Assembly (if necessary):

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter.
2. Disconnect the air intake hose (if applicable) from the air cleaner inlet and install the gate valve assembly to the air cleaner inlet. Make sure the gate valve is fully open.
3. Remove the kazoo from the air cleaner and install the plug in its place.
4. Re-enable the starter and start the unit.
5. Slowly close the gate valve to reduce flow and bring engine speed between 1700 and 1780 RPM. Once proper RPM is achieved, the calibration process will begin.

Figure 8.14 Plug & Gate Valve Assembly



Calibration Completed:

After the calibration process is completed, the system will indicate that the calibration was successful, and the engine will shut down.

8.6.14 Cooling System

8.6.14.1 Cleaning and Flushing:

Air flows through the condenser and then the radiator. The cooling surfaces must be clean and the interior of the radiator must be clean for adequate cooling.

NOTICE

Use only red Extended Life Coolant, Nitrite Free (ELC-NF) that is premixed to a 50/50 concentration of coolant/water. Coolant should meet ASTM specifications D3306 and D6210 and be labeled for at least five years, 12,000 hours service life. Do not add conventional or long life coolant (green, purple, or blue-green) to a cooling system using ELC-NF (Red) coolant except in an emergency. If the ELC-NF coolant is diluted with conventional or long life coolant the change interval reverts to two years, 6,000 hours.

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Remove all foreign material from the condenser & 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 for cleaning.

⚠ WARNING

Do not remove the cap from a hot coolant system. 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 into a suitable container by removing coolant bottle cap and then the engine drain plug.

NOTICE

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

4. Install hose or drain plug 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.

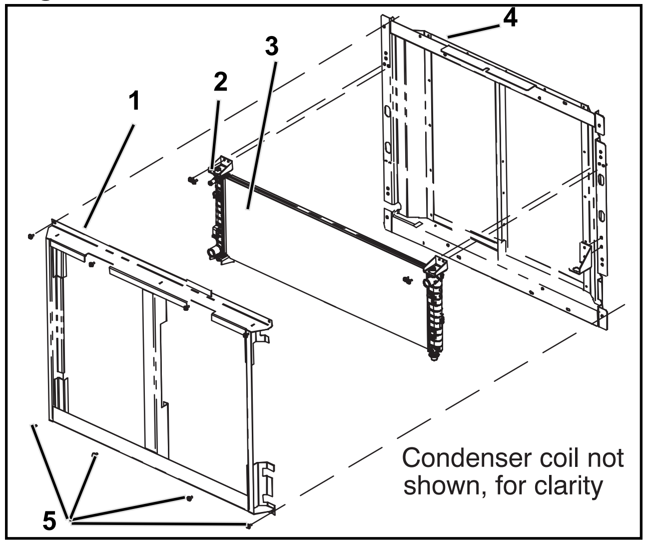
5. Start the engine and drain system while warm. Rinse system three times after it has cooled down. Refill system with water.
6. Run engine to operating temperature. Drain system again and fill with 50/50 water/anti-freeze mixture. (refer to the Caution Note at the beginning of this section.)

7. Reinstall the negative battery cable, start unit and check for leaks.

8.6.14.2 Radiator Replacement:

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Drain coolant into a suitable container by removing coolant bottle cap and the engine drain plug.
3. Remove condenser fans, refer to **Section 8.10.12**. 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 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 8.6.14**.)
8. Reinstall the negative battery cable, start unit and check for leaks.

Figure 8.15 Condenser and Radiator Assemblies



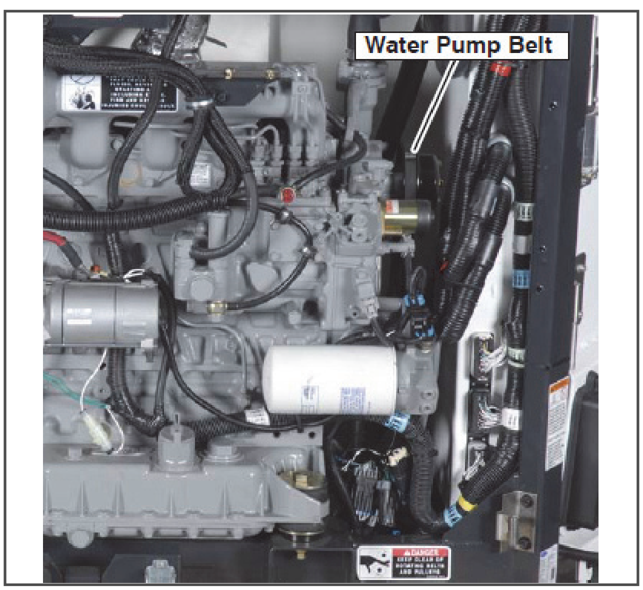
1. Radiator Frame Assembly
2. Radiator Mounting Bracket
3. Radiator
4. Condenser Frame Assembly
5. Radiator Frame Mounting Bolts

8.6.15 Replace Water Pump V-Belt

⚠ WARNING

Beware of moving belts and belt-driven components. 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 requires no tension adjustment.

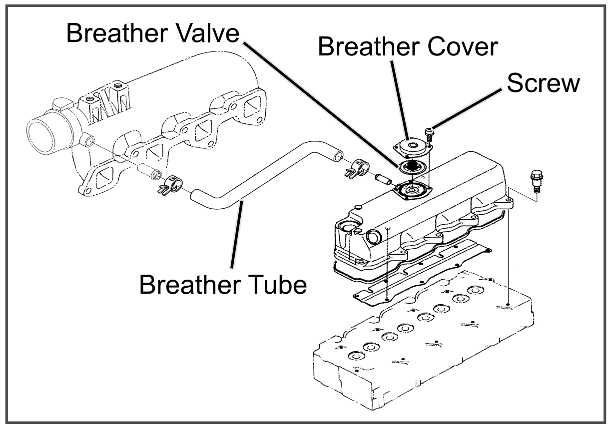
1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Using the proper size socket, slowly rotate the crank by turning the crank pulley nut. 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.
3. 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.

8.6.16 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 oil change interval (whichever comes first). See **Table 8–1**.

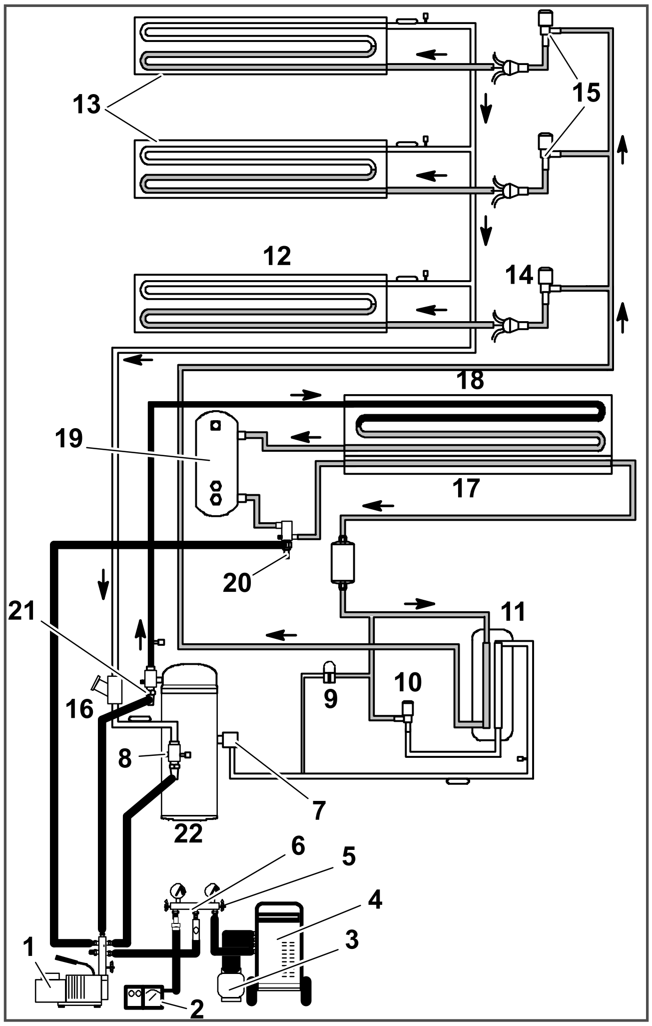
Figure 8.17 Engine Crankcase Breather



8.7 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.

Figure 8.18 Refrigerant System Service



1. Vacuum Pump
2. Vacuum Indicator
3. Refrigerant Cylinder
4. Refrigerant Recovery Unit
5. Valve
6. Manifold Gauge Set
7. Economizer Connection
8. Suction Service Valve
9. Liquid Injection Valve
10. Economizer Expansion Valve
11. Economizer
12. Evaporator
13. Remote Evaporators
14. EVXV, Evaporator Expansion Valve
15. Remote EVXV
16. Compressor Suction Modulation Valve (CSMV)
17. Subcooler
18. Condenser
19. Receiver
20. Liquid Line Service Valve
21. Discharge Service Valve
22. Compressor

8.7.1 Refrigerant System Service Connections

To service the refrigerant system, service equipment is connected 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 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.

8.7.2 Servicing the Refrigerant Charge

Servicing of the refrigerant charge includes: checking 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.

8.7.2.1 Checking Charge Level

Check refrigerant charge before adding refrigerant to the system. Only add refrigerant if charge is low. If charge is low, leak checking must be performed (Refer to **Section 8.7.3**) 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 Operation. Adjust setpoint so that unit is running in high speed, fully loaded, and operating in economized mode. Use Technician Mode to verify that the ECXV is open.
3. Run approximately ten minutes - until the refrigeration system is warmed up and the refrigerated compartment temperature is approaching setpoint.
4. Partially block off air flow to condenser coil so discharge pressure rises to 230 psig (15.7 bar).
5. 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.
6. If the system appears to be overcharged or under charged, adjust charge, refer to step **Adjusting the Charge Level**.

8.7.2.2 Checking for Noncondensibles

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 8–5**.
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 **Removing Charge (R-404A)**.
8. Leak check, evacuate, and recharge the system.

8.7.2.3 Removing Charge (R-404A)

1. Install a manifold gauge set to allow reading of suction and discharge pressure, **Figure 8.18**.

⚠ WARNING

Only a refrigerant cylinder containing R-404A or R-452A 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. Place the unit in Service Mode (Refer to **Section 5.2.5**). Ensure that the operator message panel displays “RECOVER/LEAK CHK/EVAC MODE” during the refrigerant removal procedures. If the control system switches to charge mode during the process, switch it back to the “RECOVER/LEAK CHK/EVAC MODE”.
3. 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.
4. Refer to instructions provided by the manufacturer of the refrigerant recovery unit.
5. After making necessary repairs, leak check, evacuate and recharge the system.

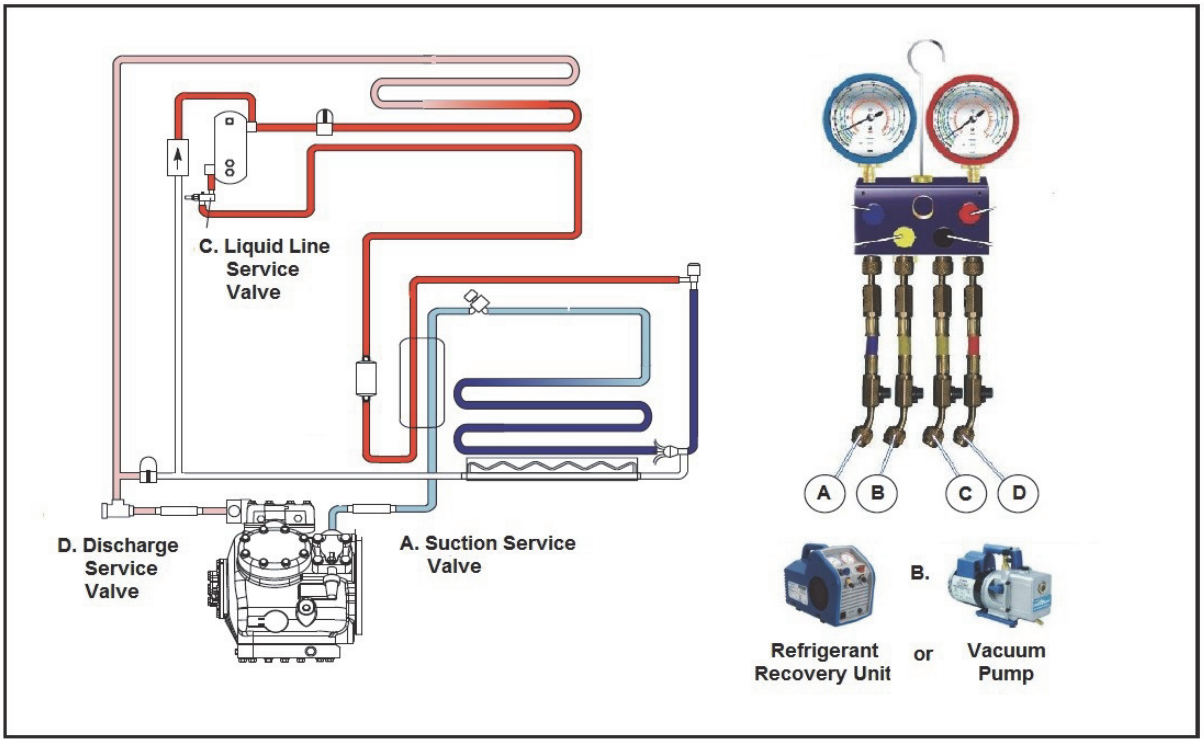
8.7.2.4 Removing Charge (R-452A)

⚠ WARNING

R-452A refrigerant is an A1 non-flammable refrigerant blend which includes some mildly flammable constituents. As such, please follow all proper service and maintenance procedures. Ensure that proper evacuation procedure is strictly followed before performing any "hot work," including, but not limited to brazing or welding, on these units to prevent flare-up of residual refrigerant.

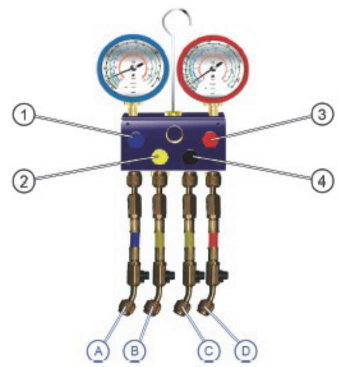
- Refrigerant must be reclaimed until manifold gauge set indicates -20 inHG (-0.67bar/ -9,82 Psia) of vacuum.
- Before performing any service work, make sure the Start-Stop switch is off.
- When repairing a leak on the refrigeration circuit, ensure the minimum pressure is reached per the recovery machine and ensure a nitrogen purge procedure is used during the unbrazing operation.
- In the event of brazing on the low side, store the refrigerant in the receiver and follow the reclaim procedure on the low side of the system.

Figure 8.19 Four Port Manifold Gauge Option



8.7.2.4.1 Unit Connections

Figure 8.20 Unit Connections



- Connect the manifold gauge set to the unit (refer to **Figure 8.20**)
- Hose A to low-pressure compressor service valve
- Hose B to vacuum pump
- Hose C to high-pressure compressor service valve
- Hose D to high-pressure receiver king valve

6. Start the vacuum pump.
7. Open the manifold gauge valves (1,2,3,4).
8. Open the hose B service valve and wait for one minute.
9. Check the manifold gauge values. Readings must be at the lowest and most stable.
10. Close hose B service valve.
11. Stop the vacuum pump.
12. Disconnect the vacuum pump.

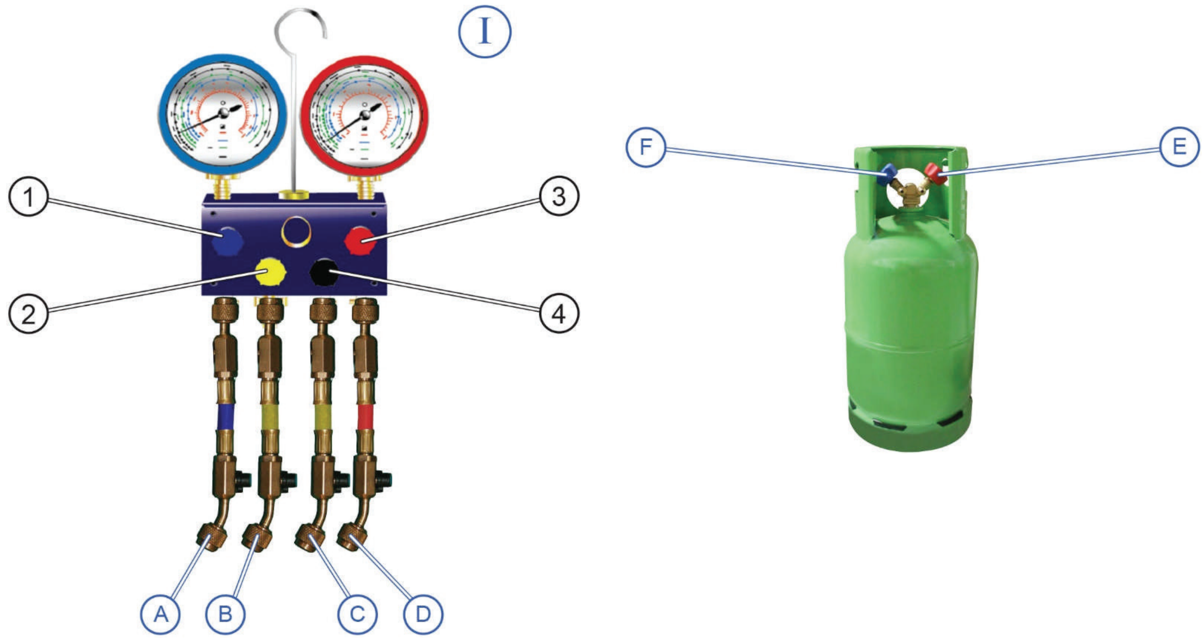
The manifold gauge (I) is installed

Before continuing with the next steps:

- Ensure the manifold installation procedure is completed correctly.
- Ensure all unit valves are opened
- Ensure there are no refrigerant traps
- Place the unit in service mode (Refer to Section 5.25).
- Ensure the microprocessor display reads: **“RECOVER/LEAK CHK/EVAC MODE”**

8.7.2.4.2 Recovery System Installation

Figure 8.21 Recovery System



1. Connect recovery machine to hose (B).
2. Place the R-452A recovery bottle onto the scale and note the weight.
3. Check the admissible charge indicated in the R-452A recovery bottle information.
4. Connect the liquid valve (E) of the R-452A recovery bottle to the recovery machine.
5. Adjust high- and low-pressure compressor service valves to the mid-seat position.
6. Adjust receiver king valve (liquid line service valve) to the mid-seat position.
7. Open hoses A,B,C,D service valves.

The system is ready for recovery.

8.7.2.4.3 R-452A Liquid Recovery

1. Open liquid valve (E) and start the recovery machine.
2. Open hose B service valve.
3. Open the manifold gauge valve (2,3). The R-452A liquid will be transferred from the unit receiver to the R-452A recovery bottle.
4. Check weight on the scale. The R-452A recovery bottle weight must be stable.
5. Close hose B service valve.
6. Stop the recovery machine.Close liquid valve (E).

The R-452A liquid is recovered

1. Disconnect the R-452A recovery bottle from the recovery machine.
2. Connect the vapor valve (F) of the R-452A recovery bottle to the recovery machine.

The system is ready for vapor recovery

8.7.2.5 R-452A Vapor Recovery

1. Open vapor valve (F).
2. Start the recovery machine.
3. Open hose B service valve.
4. Open the manifold gauge valve (1,4)

The R-452A vapor will be transferred from the compressor to the R-452A recovery bottle.

5. Check the pressure values indicated on the two manifold gauges.
   - Wait until the dials from the two manifold gauges indicate -0,67 bar (-20 inHg)
   - In order to prevent flare-up or residual refrigerant, do not move to the next step before reaching -0,67 bar (-20 inHg). This specific effect must be taken into consideration especially in cases of working in heights where there may be a fall risk.

The R-452A is recovered

6. Close hose B service valve.
7. Close the two manifold gauge service valves.
8. Stop the recovery machine.
9. Wait for 15 minutes.
   - If after 15 minutes the pressure has risen, repeat the recovery procedure starting with step 1.
   - If -0,67 bar (-20 inHg) is maintained, proceed to step 10.
10. Disconnect the recovery machine and dispose of the R-452A recovery bottle according to local regulation.

End of recovery procedure

11. Purge with Nitrogen.

For more information about nitrogen instruction, refer to Carrier Transicold document #98-60068-00 (Brazing Instructions).

8.7.2.6 Pumping Down the Low Side

Components on the low side of the refrigeration system (the filter drier, EVXV, ECXV, evaporator coil, CSMV, heat exchanger, suction line 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.

NOTICE

The scroll compressor achieves low suction pressure very quickly. Do not use the compressor to evacuate the system below 0 psig. Never operate the compressor with the suction or discharge service valves closed (frontseated). Internal damage will result from operating the compressor in a deep vacuum.

1. Install a manifold gauge set to allow reading of suction and discharge pressure, **Figure 8.18**.
2. Start the unit.
3. Frontseat the liquid line service valve.
4. Shutdown 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 properly closed. In this case, the low side cannot be pumped down and the entire refrigerant charge must be removed from the system. Refer to step **Removing Charge (R-404A)**
6. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. 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 zero.
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 **Section 8.7.3** and **Section 8.7.4**.)

8.7.2.7 Pumping Down the Compressor

The compressor or any of the components attached to it (high pressure switch, 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. shutdown the unit when the suction pressure drops to 2 psig (0.2 bar). Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. 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 placing the START/RUN-OFF switch in the OFF position and disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle. 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 **Section 8.7.3** and **Section 8.7.4**.)

8.7.2.8 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 Operation with a setpoint lower than refrigerated compartment temperature. 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.

8.7.2.9 Adding a Complete Charge

1. Evacuate unit and leave in deep vacuum. (Refer to **Section 8.7.4**.)
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 the liquid valve on cylinder. Midseat liquid line service valve and allow liquid refrigerant to flow into the unit until the correct weight of refrigerant has been added.

NOTE

It is possible that all the required 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 the correct charge has been added, close liquid valve on cylinder and backseat the liquid line service valve. Remove charging hose.
6. Start unit and run Pretrip to check operation.

8.7.3 Leak Checking

WARNING

Never use air or gases containing oxygen for leak testing or operating refrigerant compressors. Pressurized mixtures of air or gases containing oxygen can lead to explosion.

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.

8.7.3.1 Leak Checking a Charged System

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. 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 side 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 8.7.2**.

5. Start unit and run Pretrip to check operation.

8.7.3.2 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 placing the START/RUN-OFF switch in the OFF position and disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.

2. Connect refrigerant system equipment if not already connected. Refer to **Figure 8.18**.

WARNING

Only a refrigerant cylinder containing R-404A or R-452A 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.

NOTICE

Do not vapor charge R-404A or R-452A. Only liquid charging through the liquid line service valve is acceptable.

3. Ensure that the operator message panel displays “RECOVER/LEAK CHK/EVAC MODE” during the pressurizing and leak checking procedures. (Refer to **Section 5.2.5**.) If the control system switches to Charge Mode during the process, switch it back to the “RECOVER/LEAK CHK/EVAC MODE”.

4. Pressurize the system 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 8.32).

5. Connect a cylinder of dry nitrogen. Use the dry nitrogen to increase the pressure as necessary 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 through 9 as necessary.

11. Evacuate the system after all leaks are repaired. Refer to **Section 8.7.4**.

8.7.3.3 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 placing the START/RUN-OFF switch in the OFF position and disabling the starter. Disconnect the high voltage source and lockout/tagout the receptacle.

WARNING

Only a refrigerant cylinder containing R-404A or R-452A 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**.

NOTICE

Do not vapor charge R-404A or R-452A. Only liquid charging through the liquid line service valve is acceptable.

3. Ensure that the operator message panel displays “RECOVER/LEAK CHK/EVAC MODE” during the pressurizing and leak checking procedures. (Refer to **Section 5.2.5**.) If the control system 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 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 8.18)

5. Connect a cylinder of dry nitrogen. Use the nitrogen to increase the low side pressure 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 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 - 9 as necessary.
11. Disconnect the nitrogen cylinder. Evacuate the low side of the system after all leaks are repaired. (Refer to **Section 8.7.4**.)

8.7.3.4 Leak Checking Compressor

The compressor connections, suction, discharge, and economizer, must be leak checked once the compressor is closed and all repairs complete.

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. 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**.

⚠ WARNING

Only a refrigerant cylinder containing R-404A or R-452A 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.

NOTICE

Do not vapor charge R-404A or R-452A. Only liquid charging through the liquid line service valve is acceptable.

3. Pressurize the compressor 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 8.18)

4. Connect a cylinder of dry nitrogen. Use the nitrogen to increase the compressor pressure 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 connection 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 - 9 as necessary.

10. Disconnect the nitrogen cylinder. Evacuate the compressor after all leaks are repaired. (Refer to **Section 8.7.4**.)

8.7.4 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 valve, and formation of acids, resulting in metal corrosion. Proper evacuation of the system will remove any moisture from inside the system.

NOTES

- Essential tools to properly evacuate any system include a good vacuum pump (5 cfm/8m^{3}H volume displacement, Carrier Transicold part number 07-00176-11) and a good vacuum indicator such as a digital vacuum gauge, Carrier Transicold part number 07-00414-00.
- The use of a compound gauge is not recommended for use in determining when the evacuation process is completed because of its inherent inaccuracy.
- Standard service hoses are not recommended for evacuation purposes. Evacuation hoses are recommended for this procedure.

8.7.4.1 Evacuation of the Complete System

1. Evacuate only after leak check. (Refer to **Section 8.7.3**.)
2. If possible keep the temperature of the major components (condenser, evaporator, compressor and receiver) 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 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 operator message panel displays “RECOVER/LEAK CHK/EVAC MODE” during the evacuation and dehydration procedures. (Refer to **Section 5.2.5**.) If the control system 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 and install the service valve caps. Ensure that the operator message panel displays “RECOVER/LEAK CHK/ EVAC MODE”.

   NOTE

   The service valve caps help minimize leakage through valve stems during midseat operation.

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 control system does not switch to the Charge Mode. If this occurs, switch it back to the “RECOVER/LEAK CHK/EVAC MODE” (Refer to **Section 5.2.5**)
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 8.7.2**.

8.7.4.2 Evacuation of the Low Side

1. Evacuate only after a low side leak check. (Refer to **Section 8.7.3**)
2. If possible keep the temperature of the major components (condenser, evaporator, compressor and receiver) 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 operator message panel displays “RECOVER/LEAK CHK/EVAC MODE” during the evacuation and dehydration procedures. (Refer to **Section 5.2.5**.) If the control system 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 control system does not switch to the Charge Mode. If this occurs, switch it back to the “RECOVER/LEAK CHK/EVAC MODE” (Refer to **Section 5.2.5**.)
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 8.7.2**.

8.7.4.3 Evacuation of the Compressor

1. Evacuate only after a compressor leak check. Refer to **Section 8.7.3**.
2. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and disabling the starter. 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. Re-enable the starter, start unit and check the refrigerant charge. Refer to **Section 8.7.2**.

8.8 Compressor Service

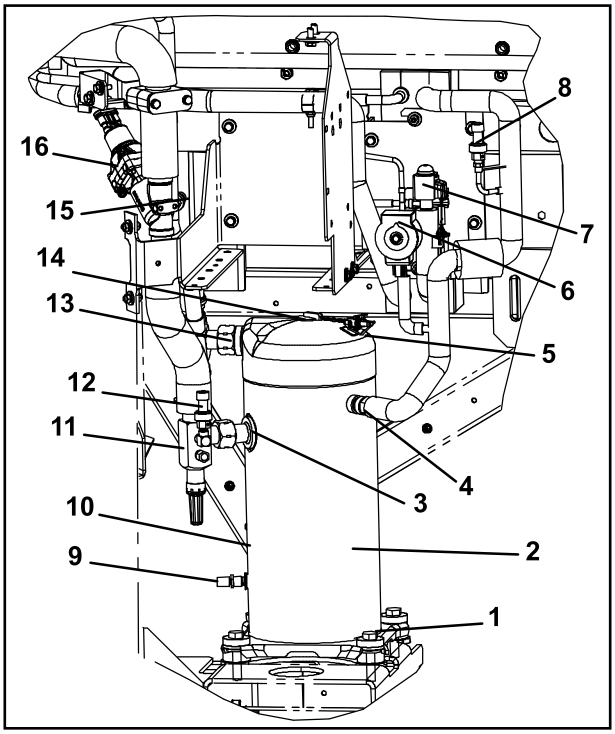
WARNING

Before removal of the compressor, relieve the internal pressure by very carefully loosening the couplings to break the seal.

NOTICE

The scroll compressor achieves low suction pressure very quickly. Do not use the compressor to evacuate the system below 0 psig. Never operate the compressor with the suction or discharge service valves closed (frontseated). Internal damage will result from operating the compressor in a deep vacuum.

Figure 8.22 Compressor Kit



1. Mounting Hardware
2. Compressor
3. Suction Connection
4. Economizer Connection
5. Lifting Lug
6. LIV
7. ECXV
8. ECOP
9. Oil Level Adj. Port (service comp. only)
10. Power Plug (rear)
11. SSP
12. SPT
13. Discharge Connection
14. Discharge Temperature Sensor
15. CDP
16. CSMV

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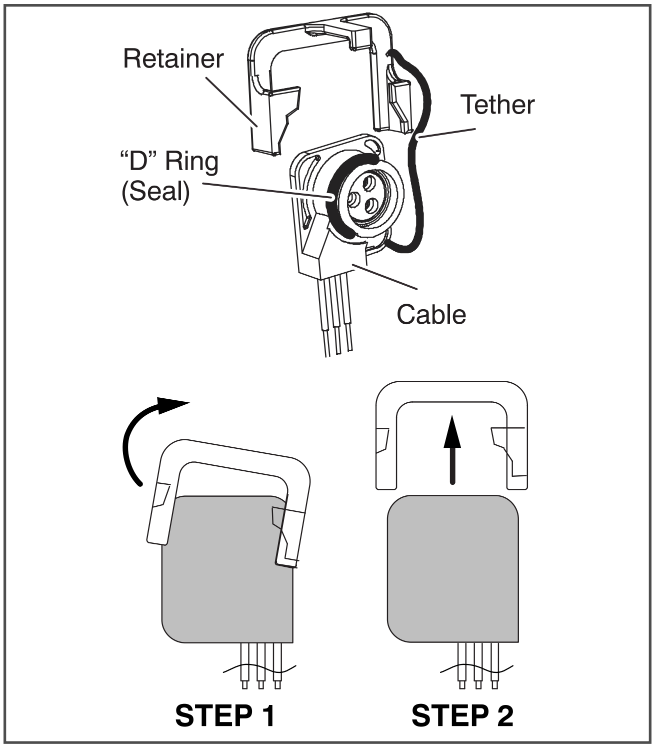
8.8.1 Remove and Replace the Compressor

1. Remove refrigerant charge. Refer to Section 8.7.2.
2. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
3. Frontseat the discharge and suction service valves to help protect the remainder of the system.
4. If necessary, remove all remaining refrigerant from compressor using refrigerant recovery system. Refrigerant out gassing from compressor oil can build pressure when the service valves are closed. Additional reclamation may be needed to insure no refrigerant exists in the compressor.
5. Remove the Rotalock fittings from the suction and discharge service connections, and uncouple the economizer line from the compressor.
6. Disconnect the compressor discharge temperature sensor (CDT) connector. The replacement compressor comes with the compressor discharge temperature sensor already assembled.
7. Remove and save the compressor base-mounting bolts and spacers.

Figure 8.23 Compressor Plug Retaining Clip



8. Rotate the compressor to gain access to the power plug. Remove the power plug retaining clip (see Figure 8.23) by pulling out gently on the left side (to clear the shorter left locking tab and rotate the right locking tab) and then slide up and off the plug. Pull the plug out and away from the compressor to remove. Disconnect the ground lead/ terminal from the compressor circle fence.

NOTE

Inspect the power plug terminals to ensure they are not deformed or have any signs of heat or arcing. If any damage is noted, replace the power cable.

9. Remove (slide out) the old compressor from the unit and slide the new compressor into the unit.

NOTE

DO NOT add any oil to the replacement compressor. Replacement compressor is shipped with full oil charge of 60 oz.

10. Install the "D" ring into the square groove of the power plug.
11. Inject a small amount of lubricant (shipped with the compressor) into each pin connection in the power plug. For ease of installation and to prevent the "D" ring from rolling, use a small amount of lubricant to lubricate the outside radius of the "D" ring.
12. Align the power plug with the cutout in the terminal fence. Insert the power plug at a slight angle allowing the "D" ring to start at the lower portion of the terminal fence. Apply even pressure on the back of the power plug until the flat surface of the plug seats against the outer face of the terminal fence. Insertion force of the power plug to the compressor socket may be difficult, use of a blunt hard object to pound compressor plug into the compressor socket is not recommended. Compressor pin damage may occur if plugs are hammered into place. Use light tapping from the palm of hand to aid in seating the plug. If the plug is tight fitting, remove plug and inspect the o-ring for proper seating in groove, add more oil and retry.
13. Reinstall the plug retaining bracket or molded plug retainer as required. Inspect that molded plug retainer is fully engaged in the circle fence, if not engaged correctly, insert the compressor plug deeper into socket and verify the compressor plug is inserted squarely to the socket.
14. Attach compressor grounding terminal to the compressor circle fence using new ground screw provided. Grounding screw is a thread cutting type screw.

NOTE

Due to thread cutting nature of the ground screw, higher initial torque is required to "cut" threads into the base metal. This high initial torque can mislead one to believe the screw is tight. Visually verify that screw is actually providing a clamping pressure to the grounding terminal and ring terminal is tight.

15. Install the four base-mounting bolts loosely.
16. Place new Teflon seals at the compressor suction and discharge ports. Apply a slight amount of mineral oil (alkylated benzine oil CTD P/N 07-00274) to the economizer port O-ring, back side of sleeves, and coupling nut and put in place at the economizer line connection port. Hand tighten all three connections.
17. Torque mounting bolts to 66 ft-lbs (89 Nm).

18. Using a backup wrench, torque the compressor connections as follows:

Service Valve / Connection	Torque Value
Suction and Discharge Rotalocks	80 - 100 ft-lbs (109 - 136 Nm)
Economizer Connection	38 - 42 ft-lbs (51 - 57 Nm)

19. Connect the new compressor discharge temperature sensor (CDT) connector. Wire-tie any loose wiring as appropriate.

20. Backseat the suction and discharge service valves.

21. Reconnect the battery. With starter wire disconnected, place the unit back into “Service Mode”. Leak check and evacuate the unit and charge, refer to **Section 8.7**.

NOTICE

The scroll compressor achieves low suction pressure very quickly. Do not use the compressor to evacuate the system below 0 psig. Never operate the compressor with the suction or discharge service valves closed (frontseated). Internal damage will result from operating the compressor in a deep vacuum.

22. Following installation of a replacement compressor, the oil level in the unit may be above the required level. Adjust the oil level in accordance with the instructions packaged with the replacement compressor.

8.9 Refrigerant System Component Service

8.9.1 Evaporator Coil

The use of recycled cardboard cartons is increasing across the country. The recycled cardboard cartons create much more fiber dust during transport than “new” cartons. The fiber dust and particles are drawn into the evaporator where they lodge between the 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 coil on a regular basis, not only to remove cardboard dust, but to remove any grease or oil film which sometimes coats the fins and prevents water from draining into the drain pan.

Cardboard fiber particles after being wetted and dried several times can be very hard to remove. Therefore, several washings may be necessary.

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.

2. Remove rubber check valves (Kazoo) from drain lines of the evaporator to be cleaned.

3. Spray coil with a mild detergent solution such as Oakite 164 or 202) or any good commercial grade automatic dishwasher detergent 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.

4. Re-install check valves and run unit until Defrost Mode can be initiated to check for proper draining from drain pan.

8.9.2 Condenser Coil

8.9.2.1 Cleaning

NOTE

Only clean water should be used to wash the condenser coil. 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.

8.9.2.2 Condenser Coil Replacement

1. Remove the refrigerant charge. Refer to **Section 8.7.2**.

NOTE

If the condenser coil (Item 3, **Figure 8.24**) requires replacement, the entire condenser/radiator assembly (1) must be removed from the unit and disassembled/reassembled on the bench.

2. Drain coolant into a suitable container by removing coolant bottle cap and then the engine drain plug.
3. Remove the surround with the grille attached. Refer to **Section 8.5.2**.
4. Remove hoses from radiator.

NOTICE

Unit uses either R-404A or R-452A refrigerant 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.

5. Unbraze 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.

NOTICE

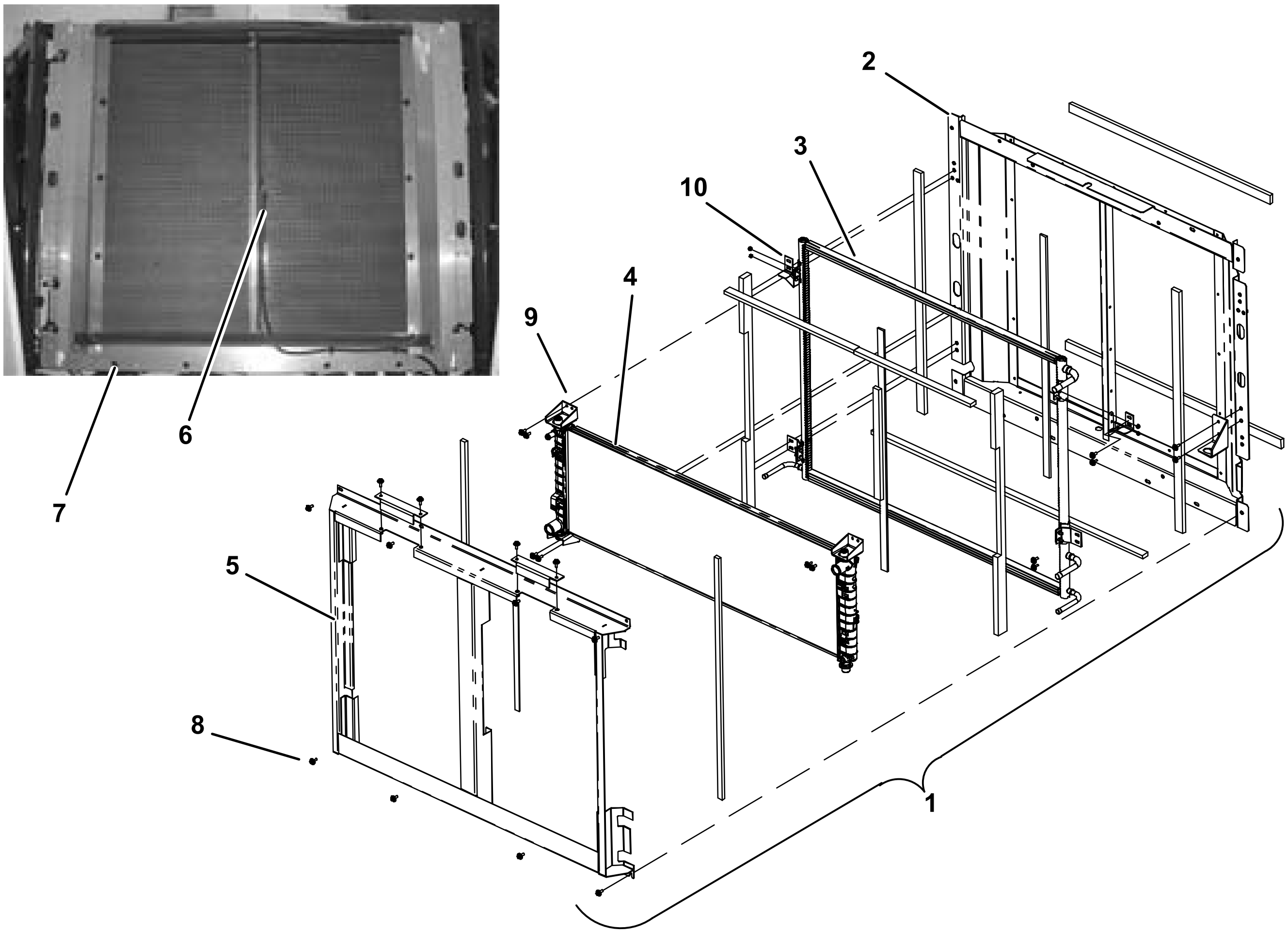
Do not bend the copper tubing on the condenser coil when installing the new condenser. Bend the unit tubing if tubes do not align correctly.

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 **Section 8.7.3**, **Section 8.7.4** and **Section 8.7.2**.
15. Refill engine coolant. Refer to **Section 8.6.14**.

Figure 8.24 Condenser/Radiator Assembly



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

8.9.3 Filter-Drier

8.9.3.1 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.

8.9.3.2 Replace Filter-Drier

1. Pump down the low side. Refer to **Section 8.7.2**.
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 (40.7 to 51.5 Nm).
4. Leak check, evacuate & dehydrate, and charge system as required. Refer to **Section 8.7.2**, **Section 8.7.3** and **Section 8.7.4**.

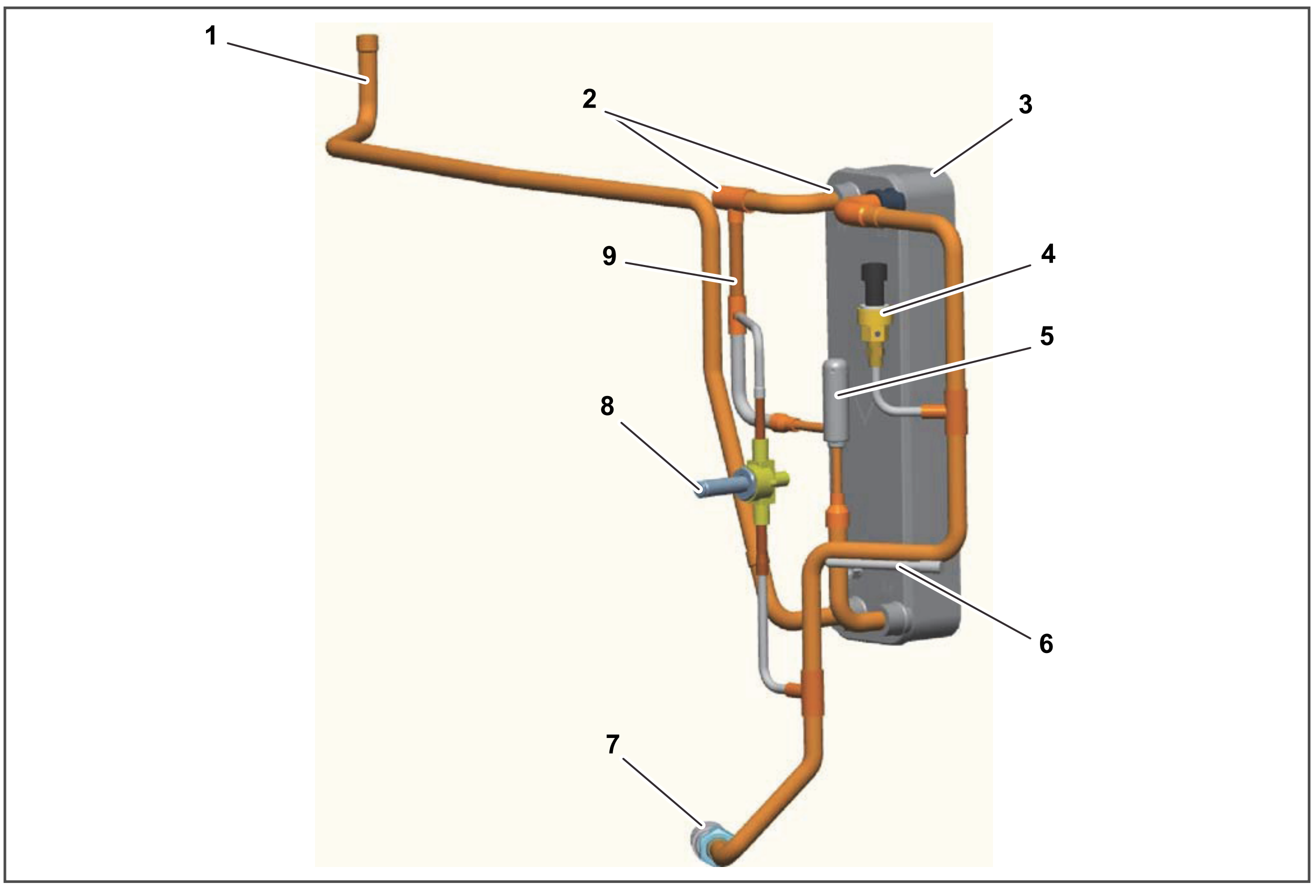
8.9.4 Replacing Receiver Sight Glass Or Fusible Plug

1. Remove the refrigerant charge. Refer to **Section 8.7.2**.
2. Loosen the sight glass or fusible plug to relieve any remaining pressure. Remove and discard glass or plug.
3. Using new o-ring, install component. Torque the sight glass to 15 to 25 ft/lbs (20.3 to 33.9 Nm). Torque the fusible plug to 48 to 96 inch/lbs (5.4 to 10.8 Nm).
4. Leak check, evacuate & dehydrate, and charge system as required. Refer to **Section 8.7.2**, **Section 8.7.3** and **Section 8.7.4**.

8.9.5 Economizer Heat Exchanger

1. Pump down the low side. Refer to **Section 8.7.2**.
2. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
3. Remove insulation, brackets and clamps from economizer line assemblies as required (refer to **Figure 8.25**).
4. Remove the economizer expansion valve and liquid injection solenoid valve coils.
5. Remove the economizer outlet pressure transducer and economizer outlet temperature sensor.
6. Unbraze four lines at the economizer connections.
7. Note orientation of economizer (mounted with connection markings upside-down). Remove economizer heat exchanger, bolt replacement economizer heat exchanger in place and rebraze lines by reversing the previous steps.
8. Leak check, evacuate the unit and charge.
9. Reinstall the economizer outlet pressure transducer, economizer outlet temperature sensor, valve coils and insulation.
10. Place unit back in service and run Pretrip to check operation.

Figure 8.25 Economizer Section



1. Liquid Outlet Line (To EVXV)
2. Liquid Inlet Line (From Drier)
3. Economizer Heat Exchanger
4. Economizer Outlet Pressure Transducer (ECOP)
5. Economizer Expansion Valve (ECXV)
6. Economizer Outlet Temperature Sensor (ECOT)
7. Compressor Economizer Connection
8. Liquid Injection Solenoid Valve (LIV)
9. Strainer (Location)

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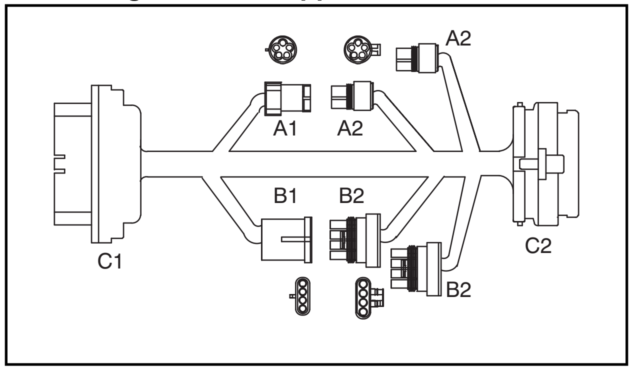
8.9.6 Stepper Test Harness

A stepper test harness (Carrier Transicold P/N 07-00515) is available for testing the compressor suction modulation valve (CSMV) and evaporator expansion valve (EVXV).

The test harness is installed by disconnecting the 2SVM connector at the SVM module and plugging the C1 connector, see **Figure 8.26**, into the module and C2 connector into the unit harness. With the test harness in place, the A1/A2 test harness connectors may be used to perform EVXV testing while the B1/B2 connectors may be used to perform CSMV testing.

Figure 8.26 Stepper Test Harness



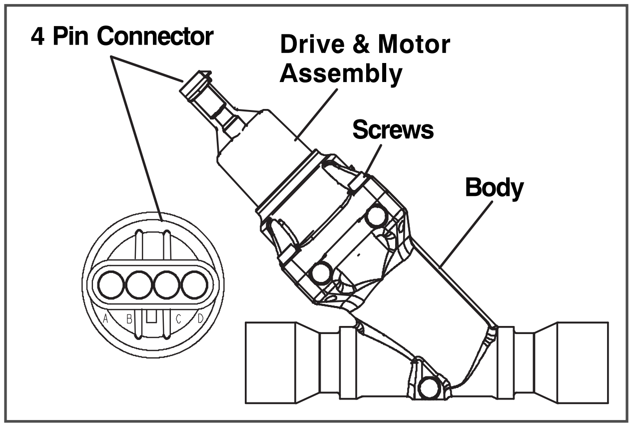
8.9.7 Compressor Suction Modulation Valve (CSMV)

The purpose of the CSMV (see **Figure 8.27**) is to maintain the compressor within its operating envelope, maximize unit capacity and fuel economy, maintain temperature control and engine power.

If it is suspected that the CSMV is malfunctioning, the most efficient method of diagnosing the valve is to run a Pretrip (refer to **Section 3.6**). The Pretrip steps will check the remainder of the system and the CSMV specific test will check the valve. During the CSMV specific test the valve will be brought to a preset position, the unit started and then the valve will be opened while the control system monitors suction pressure.

If there is a problem with the valve internal motor/piston assembly or control system wiring to the valve the test will fail.

Figure 8.27 Suction Modulation Valve (CSMV)



8.9.7.1 Diagnostics - Control System or Wiring

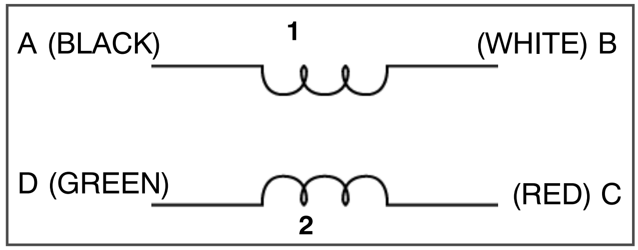
1. Place the START/RUN-OFF switch in the OFF position and disconnect the starter motor wire at the weather tight connector.
2. Disconnect the CSMV connector. The Stepper Test harness can also be used, refer to **Section 8.9.6**
3. Place unit in Component Test mode and select CSMV. This will open and close the CSMV for 10 minutes. Measure the AC voltage on the harness side of the connector between pins A and B and then between C and D. A consistent voltage (10 to 16 VAC) should be read by the digital voltmeter for each pair of wires. If the reading is present on all pairs there is a good signal coming from the SVM.
4. If the reading is not present on one or more of the wire pairs, check the wiring between the SVM and the CSMV connector, or check the APX Control System for proper model number configuration.

8.9.7.2 Diagnostics - Stepper Motor (SMV) or Wiring

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 07-00375-00SV), connect the 4-pin test cable supplied with the tester to the valve connector, and the cable wires to the tester in accordance with wire and terminal color.
2. Set the step rate to 150 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 A & B and then between C & D, see **Figure 8.28**. In normal ambient, the resistance between the pins should be 65 to 84 ohms. If an out of tolerance or zero reading is observed, the piston and drive motor assembly is to be replaced.
4. With component installed on the unit, check each pin to chassis ground If any of the pins on the valve give an ohm reading to chassis ground OL (over limit), the valve is shorted internally and should be replaced.

Figure 8.28 CSMV Coil



8.9.7.3 Diagnostics - Valve (SMV)

NOTE

If the valve failed pretest and passed the preceding diagnostic testing, this is an indication that the valve mechanism is damaged and the internal motor/piston 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 150 steps per second and close the valve while watching the suction pressure. Within one minute the suction pressure should begin to fall. Place the START/RUN-OFF 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 internal motor/piston assembly is to be replaced.

8.9.7.4 Replacing the Internal Motor/Piston Assembly

1. Pump down the low side. Refer to **Section 8.7.2**.
2. Remove internal motor/piston assembly and replace with a new assembly and gaskets. The motor/piston assembly should be set to 100% open when received from the warehouse. This is to ensure the 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. Ensure the gasket is installed in the body groove, and torque the body screws 80 to 97 inch/lbs (9 to 11 Nm).
3. Leak check, evacuate & dehydrate, and charge system as required. Refer to **Section 8.7.2**, **8.7.3** & **8.7.4**.

8.9.7.5 Emergency Repair Procedures

In the event that the CSMV 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 8.7.2**.
3. Remove the internal motor/piston assembly.
4. Loosen the Allen screw and remove the piston and screw.
5. Install the motor/piston assembly (without the piston). Torque the nut 35 to 40 ft/lb (47.5 to 54.2 Nm) or body screws 80 to 97 inch/lbs (9 to 11 Nm) as applicable.
6. Leak check, evacuate & dehydrate, and charge system as required. Refer to **Section 8.7.2**, **8.7.3** & **8.7.4**.
7. Start the unit.

8. Adjust the suction service valve so that the approximate temperature is maintained. For perishable loads, it is recommended that the adjustment be made so 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.

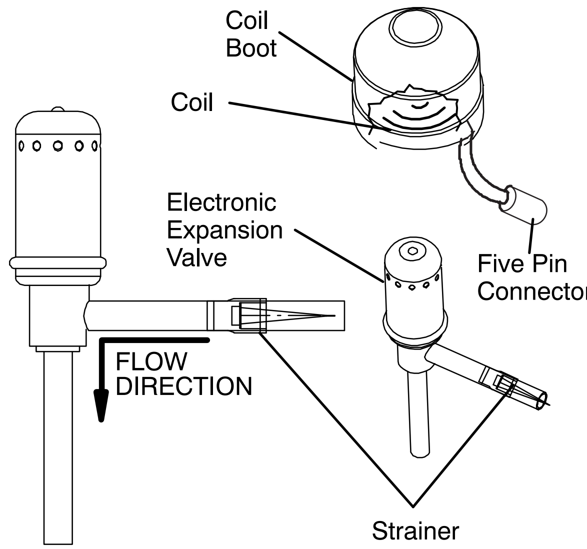
8.9.8 Expansion Valves, EVXV, RMT EVXV(s) & ECXV

The electronic expansion valves (EVXV = evaporator expansion valve & ECXV = economizer expansion valve see **Figure 8.29**) are automatic devices which maintain constant superheat of the refrigerant gas leaving the evaporator/economizer regardless of suction pressure. The valve functions are: (a) automatic response of refrigerant flow to match the evaporator load and (b) prevention of liquid refrigerant return to the compressor. Unless a valve is defective, it seldom requires any maintenance.

NOTE

As a preliminary valve check, ensure the coil is snapped down fully, and the internal coil retention tab is properly seated in one of the valve body dimples. Also, check for a temperature drop at the valve inlet strainer location, indicating the strainer is restricted or plugged.

Figure 8.29 Evaporator Expansion Valve



8.9.8.1 Diagnostics - Microprocessor or Wiring

At startup, the APX Control System moves the EVXV and ECXV to known positions. During this time (about 6 seconds after the PER is energized) the voltage sent to the valves can be measured.

1. Locate the wires on the harness side labeled:

   EXVA, EXVB, EXVC, EXVD and EXVE

   or

   ECVA, ECVB, ECVC, ECVD and ECVE

   These will correlate to the connector pins labeled A, B, C, D and E. Refer to **Table 8–2**.

Table 8–2 Expansion Valve Connections

Connector Pin	Wire Color	Winding
A	ORANGE	A
B	RED	B
C	YELLOW	$\overline{A}$
D	BLACK	$\overline{B}$
E	GREY	COM (+12V)

NOTE

The stepper test harness, **Section 8.9.6**, (Carrier Transicold P/N 07-00515) (can also be used to test the EVXV. If the test harness is used, voltages will be different when measured direct or in-line. The stepper test harness cannot be used to test the ECXV.

2. Set the voltmeter to the ACV scale. Place the START/RUN−OFF switch in the OFF position and disconnect the starter motor wire at the weather tight connector. Place the START/RUN−OFF switch back in the START/RUN position.
3. Perform the following test on the wiring coming from the SVM: 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 approximately 5 to 9 VAC depending on valve position.
4. Leave the positive (+) voltmeter lead on pin E and repeat for pins B, C and D. This procedure may have to be repeated several times to ensure consistent readings due to the 6 second “home” time.
5. To test the ECXV, start the unit and measure the voltage between pins E & A and then between E & B, E & C and E & D. A voltage should be read by the digital voltmeter for each pair of wires. If voltage is measured on all of the wire pairs there is a good signal.

6. If there is no voltage reading, or if the voltage never rises to the 5 to 9 VAC level, it indicates a problem in the wiring or the SVM. Place the START/RUN−OFF switch in the OFF position and reconnect the starter wire. Test all wiring from the EVXV/ECXV connector to the SVM and verify good continuity, and check the APX Control System for proper model number configuration before replacing the SVM.b. Diagnostics - Stepper Motor

8.9.8.2 Testing Valve Stepper Motor

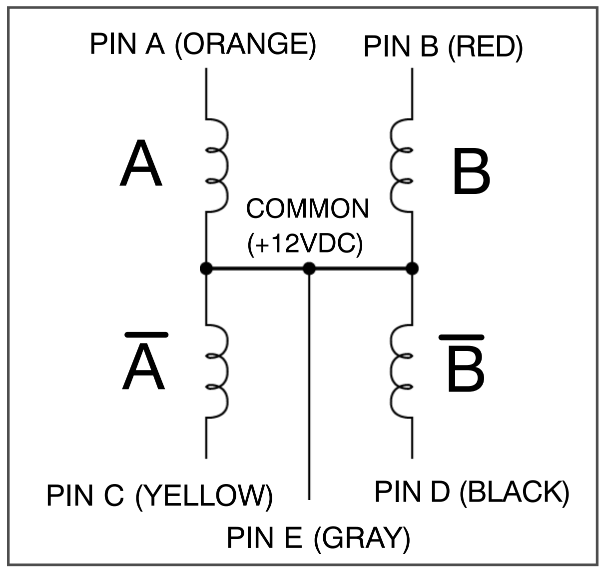
Using Stepper Motor Drive Tester

1. To test with a stepper motor drive tester (Carrier Transicold P/N 07-00375-00SV), connect the 5 pin test cable to the valve connector (see **Figure 8.30**), 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 P/N 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.

Using Stepper Motor Drive Tester

1. 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.
2. With component installed on the unit, check each pin to chassis ground. If any of the pins on the valve give an oh reading to chassis ground other than OL (over limit) the valve is shorted internally and should be replaced.

Figure 8.30 Evaporator Expansion Valve Pins



8.9.8.3 Diagnostics - Valve

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.

Testing the EVXV valve internal mechanism

1. Install a manifold gauge set on the suction service valve and a stepper motor drive tester. Refer to **Section 8.7.1**.

NOTICE

The scroll compressor achieves low suction pressure very quickly. Do not use the compressor to evacuate the system below 0 psig. Never operate the compressor with the suction or discharge service valves closed (frontseated). Internal damage will result from operating the compressor in a deep vacuum.

2. Start the unit, set the step rate to 150 steps per second, open 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.

Testing the ECXV valve internal mechanism

1. To test the ECXV, install a stepper motor drive tester to the valve, refer to **Section 8.7.1**.
2. Use the stepper motor drive tester to close the ECXV completely, and run the unit for five minutes.
3. Check for a temperature change through the valve.

   If there is a temperature change, it indicates that the ECXV is stuck open and needs to be replaced.

   If there is not a temperature change, record the CDT and AC current from Unit Data.
4. Use the stepper motor drive tester to open the ECXV, and run the unit for five minutes.
5. Check for a temperature change through the valve, if there is a temperature change, it indicates that the ECXV opened correctly.
6. From Unit Data, make sure the CDT temperature reading went down, and that the AC current draw went up.

8.9.8.4 . Replacing Expansion Valve & Strainer (Host Unit)

1. Pump down the low side. Refer to **Section 8.7.2**.
2. Remove coil and unbraze valve. Clean all tube stubs so new valve fits on easily.
3. Verify the strainer is in place.
4. Use a wet rag to keep the replacement valve cool and braze in place.
5. Leak check and evacuate the low side. Refer to **Section 8.7.3** and **Section 8.7.4**.

NOTE

The strainer for the ECXV is located in the tube above the LIV connection, refer to **Figure 8.25**.

8.9.9 Liquid Injection Solenoid Valve

8.9.9.1 Replacing the Coil

NOTE

The coil may be replaced without removing the refrigerant.

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Disconnect coil connector.
3. Remove locking nut, upper O-ring, threaded collar coil and lower O-ring (See **Figure 8.31**).
4. Verify coil type, voltage and frequency of old and new coil. This information appears on the coil housing.
5. Ensure upper and lower O-rings are installed on top and bottom of coil and tighten locking nut to 1.2 to 1.4 Nm (10 to 18 inch-pounds).

8.9.9.2 Repairing the Valve:

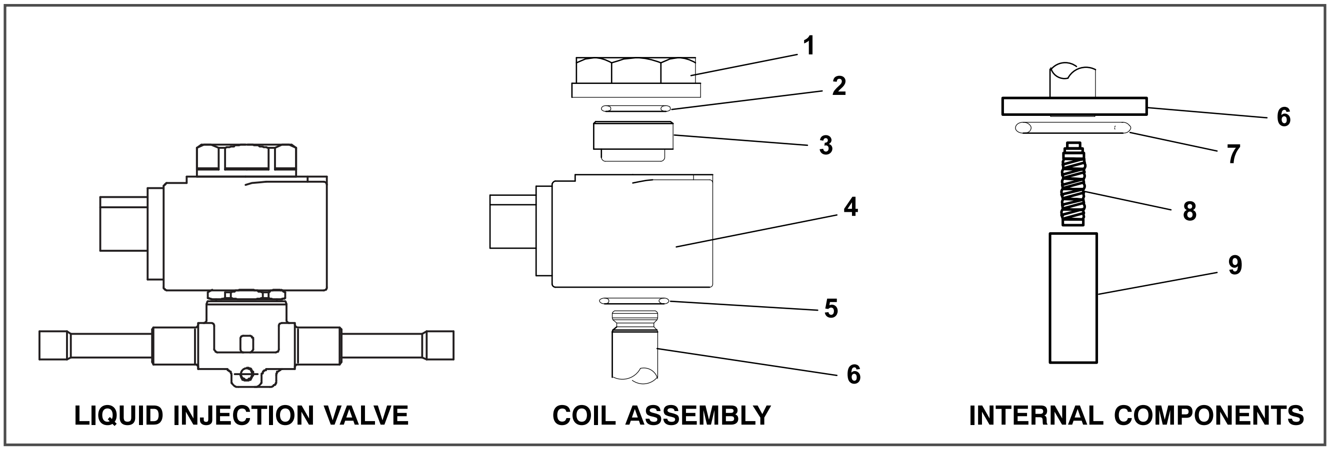
1. Pump down the low side. Refer to **Section 8.7.2**.
2. Remove the armature tube, taking care the armature and spring do not drop out.
3. Ensure the spring is properly seated in the armature and install into the armature tube.
4. Install a new internal O-ring into the valve body and then reinstall the enclosing tube with armature and spring.

8.9.9.3 Replacing the Valve:

1. To replace a valve, pump down the low side. Refer to **Section 8.7.2**.
2. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.

3. Remove coil, refer to “Replacing the Coil” above.
4. Unbraze valve from unit and braze new valve in place. Wrap valve in wet rag and point flame away from valve during brazing operation.
5. Install coil, refer to “Replacing the Coil” above. Leak check, evacuate the unit and charge in accordance with **Section 8.7**.

Figure 8.31 Solenoid Valve (LIV)



1.Locking Nut
2.Upper O-Ring
3.Threaded Collar
4.Coil
5.Lower O-Ring
6.Armature Tube
7.Internal O-Ring
8.Spring
9.Armature

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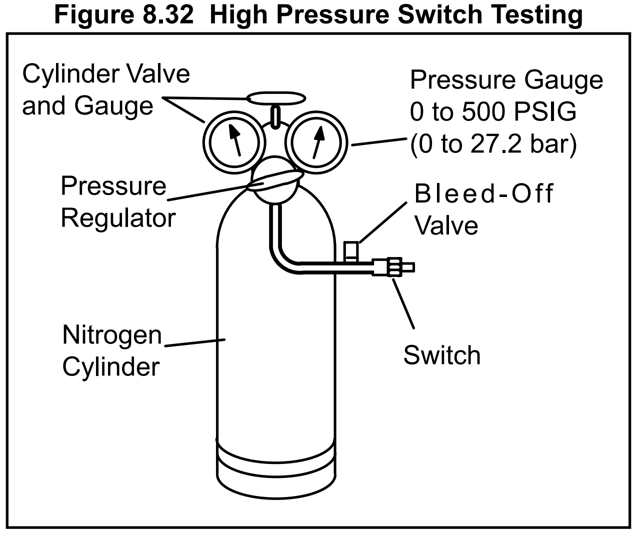
8.9.10 High Pressure Switch

8.9.10.1 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 8.32)

Figure 8.32 High Pressure Switch Testing



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 8.32**
4. Set nitrogen pressure regulator higher than open setting for switch being tested. For pressure switch settings refer to **Section 2.10**.
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)

8.9.10.2 Replacing High Pressure Switch

1. Pump down the compressor. Refer to **Section 8.7.2**.
2. Disconnect wiring from switch, and remove switch.
3. Install switch after verifying switch settings. (Refer to following step b.)
4. Leak check, evacuate & dehydrate, and charge system as required. Refer to **Section 8.7.2**, **8.7.3** & **8.7.4**

8.9.11 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), evaporator outlet pressure transducer (EVOP), and economizer pressure transducer (ECOP) have a range of -14.7 to 100 PSIG (-1 to 6.8 bar). When comparing the transducer reading in Unit Data to the reading on a manifold gauge, keep in mind the following:

- The compressor discharge pressure reading in Unit Data will never read less than 0 bar/psig, even if it is exposed to a vacuum (such as when evacuating the system).
- If the compressor discharge pressure transducer has lost power or the signal is not returning to the module the reading in Unit Data will default to 305 to 315 psig (20.75 to 21.43 bar). Comparisons in this pressure range are not conclusive.
- The compressor suction pressure and evaporator pressure transducers will never read higher than 100 psig, even if the actual pressure is higher.
- If the compressor suction pressure or evaporator pressure transducer has lost power or the signal is not returning to the module the reading in Unit Data will default to 55 to 60 psig (3.74 to 4.08 bar). Comparisons in this pressure range are not conclusive.

8.9.11.1 Testing Transducer Wiring

1. Verify that the wiring to the transducer is correct.

NOTE

CDP connector is identified with a red tape band. The CSP connector is identified with a blue band.

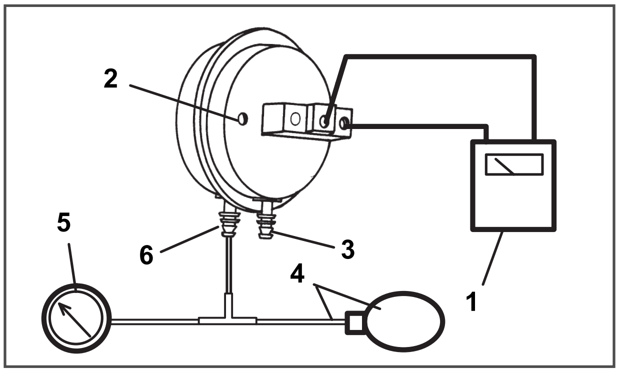
2. If required, power the transducer circuit by placing the unit in PC mode, refer to **Section 5.3.2.** Check Voltage to transducer connector. Voltage reading between connector position 2 (positive) and position 1 (negative) should be 5.0 VDC.
3. To check the signal wiring, check continuity between the transducer connector position 3 and the following connector:

   CDP = 2MM-10, CSP = 2MM-9, EVOP = 2MM-17

4. 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. Torque replacement transducer 13 to 15 ft/lb (17.6 to 20.3 Nm).

8.9.12 Defrost Air Switch

Figure 8.33 Defrost Air Switch Test Setup



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 P/N 07-00177-01)
5. Magnehelic Gauge (Carrier Transicold P/N 07-00177-00)
6. High Side Connection

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”.

1. 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. See **Figure 2.3**.
2. 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.
3. Unit should remain in defrost until the DTT and SAT both reach 55°F (12.8°C). At this point the defrost cycle will terminate, and the unit will resume automatic operation.
4. If the above test indicates satisfactory operation, test DAS settings using a Magnehelic gauge (Carrier Transicold P/N 07-00177) or similar instrument as follows.
5. 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.

6. With air switch in vertical position, connect high pressure side of magnehelic gauge, a tee 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 8.33**)
7. Attach an ohmmeter to the air switch electrical contacts to check switch action.

NOTE

Use a hand aspirator (Carrier Transicold P/N 07-00177-01), since blowing into tube by mouth may cause an incorrect reading.

8. 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.
9. Refer to **Section 2.10** 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.
10. Repeat checkout procedure until switch actuates at correct gauge reading.
11. 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.

8.10 Electrical System Component Service

Procedures for servicing or maintaining the electrical system components are provided in the following sub-paragraphs.

8.10.1 Main Microprocessor Module (MM)

For complete Main Microprocessor Module replacement instructions refer to **Section 5.5.2**.

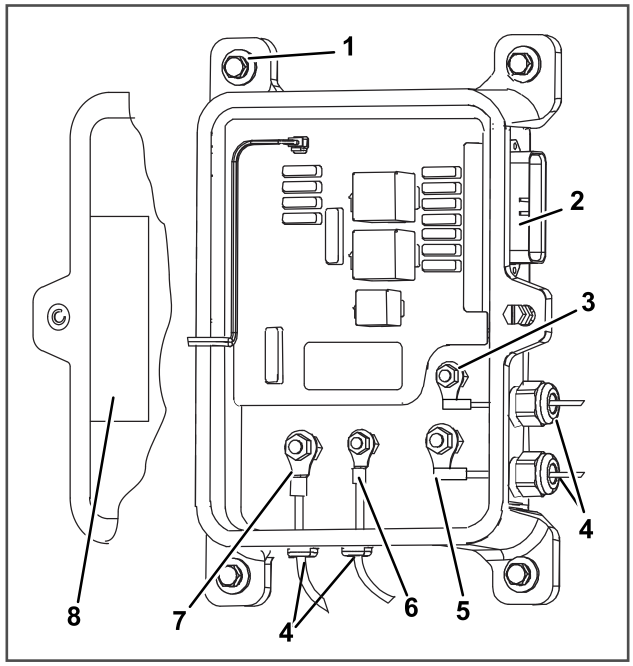
8.10.2 Power Control Module (PCM)

NOTE

The buzzer, buzzer harness, fuses, door, door seal, hinge pin, door screw (with retainer) and relays may be purchased separately and do not require complete module replacement.

1. Disconnect main power leads at battery.
2. Open Power Control module door. Loosen & remove stud-post terminal nuts (brass) at terminals BAT+ (6, **Figure 8.34**); BAT- (7); ALT+ (5) & EPH (3).
3. Remove nuts holding plastic bushings (4) & leave hanging on wire.
4. Lift the 4 cable terminals up & off stud-posts. Remove loose nuts, slide plastic bushings & cables/terminals out of mounting hole in box.
5. Unlock tab on 35 pin connector (2) & remove connector.
6. Remove the four fasteners (1) mounting Power Control module to unit frame & remove module from unit
7. Follow steps above in reverse order to install new Power Control Module. Torque:
   - fasteners mounting module to frame (1) to 38 to 58 inch/lbs (4.3 to 6.6 Nm)
   - M6 terminal nuts (3 & 7) to 30 to 40 inch/lbs (3.4 to 4.5 Nm)
   - M8 terminal nuts (5 & 6) to 60 to 80 inch/lbs (6.8 to 9.0 Nm). See **Figure 2.7**

Figure 8.34 Power Control Module



1. Mounting Fasteners
2. 35 Pin Connector
3. Engine Preheat Terminal (EPH)
4. Plastic Bushings
5. Alternator Positive Terminal (ALT +)
6. Battery Negative Terminal (BAT-)
7. Battery Positive Terminal (BAT +)
8. Door Mounted Legend Sticker

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8. Note a component legend sticker is to be located inside the PCM door. Install the correct sticker (packaged with the replacement PCM) for this unit inside the replacement PCM. The replacement PCM is populated at the factory with the standard fuses and relays. Additional fuses and relays may be required for this application (refer to **Figure 2.7**) transfer the required fuses and relays from the original PCM to the replacement PCM as required.
9. Make sure the latest software has been loaded to ensure all modules are compatible, refer to **Section 5.3.4**.

NOTICE

When a module is replaced, software should be upgraded before switching the unit on. This will ensure software compatibility of all modules.

10. Reinstall the battery cables, start unit and run Pretrip to check operation.

8.10.3 Stepper Valve Module (SVM)

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Unlock the tabs on and remove the two 35 pin connectors and 8 pin connector from the front of the module.
3. Replace module. Tighten mounting hardware to 96 inch/lbs (10.8 Nm).
4. Reinstall connectors ensuring tabs are fully locked in place.
5. Reinstall the negative battery cable, start unit and run Pretrip to check operation.

8.10.4 Display Module (DM)

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Unlock the tabs on, and then remove the 14 pin connector from the back of the module.
3. Remove hardware at rear of module. Replace module. Tighten mounting hardware to 84 to 120 inch/lbs (9.5 to 13.6 Nm).
4. Reinstall connector ensuring tabs are fully locked in place.
5. Make sure the latest software has been loaded to ensure all modules are compatible, refer to **Section 5.3.4**.

NOTICE

When a module is replaced, software should be upgraded before switching the unit on. This will ensure software compatibility of all modules.

6. Reinstall the battery cables, start unit and run Pretrip to check operation.

8.10.5 Contactor Control Board (CCB)

The two Contactor Control Boards, CCB1 & CCB2 are located behind the control box. To service a CCB do the following:

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.

NOTICE

Electronic modules MUST be handled with care to prevent accidental damage or degradation from electrical static discharge (ESD), contamination or abuse. Before touching a module, touch your body and/or conductive tool being used to the frame to discharge ESD safely. All electronics should be handled carefully and only held by edges of any exposed board. Care should be taken when inserting/extracting connectors and components to avoid exerting excessive stress on the board which could fracture small components nearby, resulting in future failure of circuit.

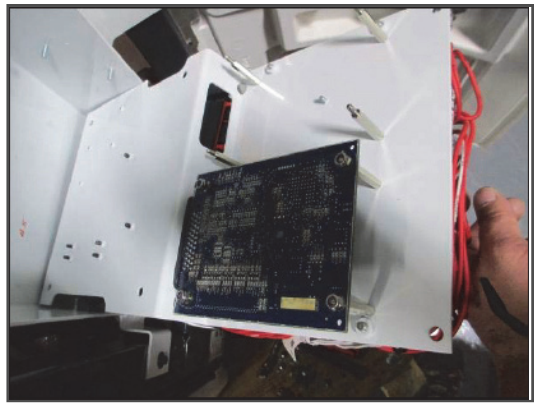
2. Attach a grounded wrist strap (CTD P/N 07-00304-00) and ground it to a good unit frame ground.
3. Remove the four control box cover bolts, then remove the cover ground cable. Set the cover off to the side.
4. Remove the two nuts that secure the PE plate to the box and remove the two nuts that secure the current transformer to the control box.
5. Move the PE plate and the current transformer off the studs towards the center of the box.
6. Remove the two nuts located at the bottom of the sub panel.
7. Disconnect the connectors from CCB1 and CCB2 and remove two nuts.
8. Remove upper mounting bolts.

NOTE

At this point the sub panel may start to swing out of the box. It is best to hold it in while removing the last bolt.

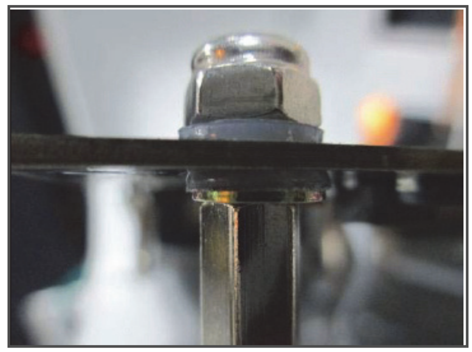
9. Slide the sub panel towards the front of the box until the panel clears the lower studs, then tip the sub panel out on the control box, see **Figure 8.35** (CCB2 is removed for clarity).
10. Remove the four nuts and washers that secure the CCB to the back of the panel. Carefully tip the board up at an angle until the board is clear of the mounting studs. Remove the board.

Figure 8.35 CCB Location in Control Box



11. Install the new CCB, see **Figure 8.36**. When compete, the fastener stack should be in the following order (from top to bottom):
    - Nylock nut
    - Nylon washer
    - CCB
    - Nylon washer
    - 4mm steel washer
    - Standoff

Figure 8.36 CCB Location in Control Box



12. With the fastener stack in the correct order, torque the 4 nylon nuts to 12 in/lbs.
13. Reinstall the sub panel, starting with the upper 2 bolts. Ensure no wires are pinched in the process.
14. Reverse disassembly procedure from this point. Torque all 6mm hardware to 4 ft/lbs (sub panel nuts and bolts, PE plate nuts, current transformer nuts, and cover bolts).

NOTICE

When a module is replaced, software should be upgraded before switching the unit on. This will ensure software compatibility of all modules.

15. Reinstall the negative battery cable.
16. Make sure the latest software has been loaded to ensure all modules are compatible, refer to **Section 5.3.4**.
17. Start unit and run Pretrip to check operation.

8.10.6 Remote Control Boards (CCB, CAN, SVM)

The remote control box houses three boards, the CAN Board (1REC), the Stepper Board (2REC), and the CCB Board (3REC). To service the remote boards do the following:

1. Ensure unit will not start automatically by disabling any two way communication, placing the START/ RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.

NOTICE

Electronic modules MUST be handled with care to prevent accidental damage or degradation from electrical static discharge (ESD), contamination or abuse. Before touching a module, touch your body and/or conductive tool being used to the frame to discharge ESD safely. All electronics should be handled carefully and only held by edges of any exposed board. Care should be taken when inserting/extracting connectors and components to avoid exerting excessive stress on the board which could fracture small components nearby, resulting in future failure of circuit.

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

3. Open the remote grille, and loosen the two control box slot screws; one on each side of the box through its mounting brackets.

4. Position the box so that you can access the three connectors, and re-tighten the two slot screws to retain the box in the desired position.

5. Unplug the three connectors and remove the five faceplate mounting screws.

6. Slide the faceplate / control boards out of the box.

7. To remove the CAN & stepper board, remove the (8) #4 Phillips head screws that secure the connectors to the faceplate.

NOTE

The CAN board is secured to the Stepper board by an electrical header.

8. Tip the CAN and stepper board up so that the connector's lock-tabs clear the openings, and slide both boards out.

9. To remove the CCB, the Stepper and CAN boards must be removed first. If you are only replacing the CAN or stepper board, the CCB does not have to be removed.

Figure 8.37 Faceplate

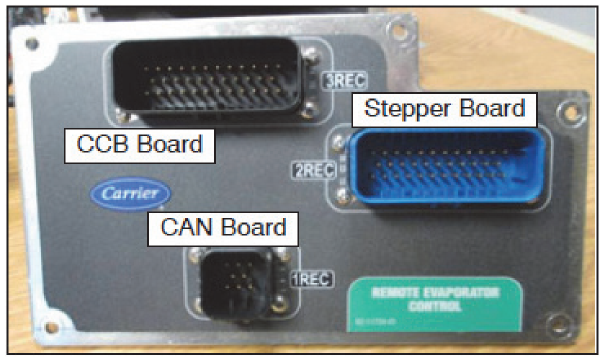
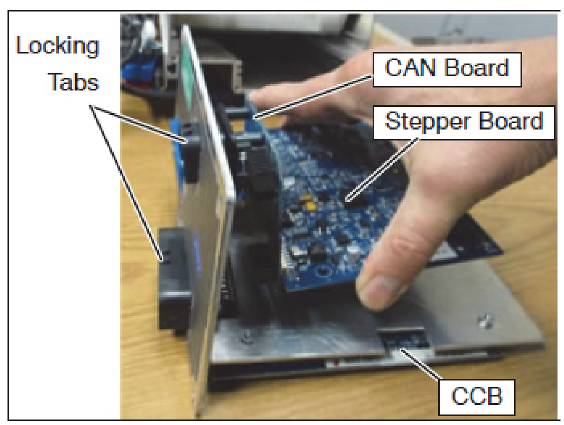


Figure 8.38 CAN/Stepper Boards



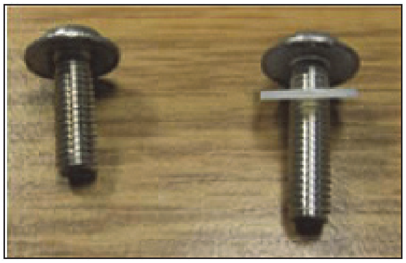
10. To remove the CCB, remove the four screws that secure the CCB to the faceplate and then remove the CCB and back plate.

11. Remove the four screws that secure the CCB to the back plate. Be careful not to drop or lose the four loose spacers underneath.

NOTE

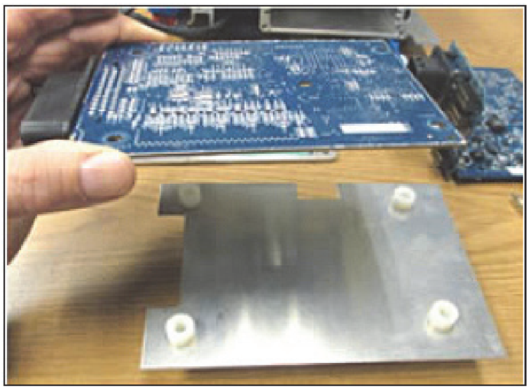
Maintain proper orientation of the back plate and the CCB to install the new board. Do not mix the faceplate screws with the CCB/ back plate screws. The four CCB screws are longer and must be re-used here.

Figure 8.39 Faceplate Screw / CCB Screw



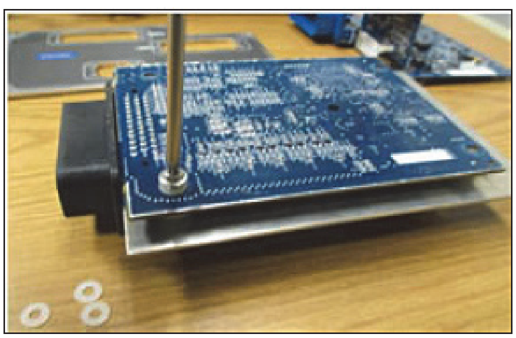
12. Place the back plate on an object to raise it an inch or so off of the work surface. With the four nylon spacers positioned over the four mounting screw holes place the new CCB over the back plate.

Figure 8.40 CCB Board Spacers



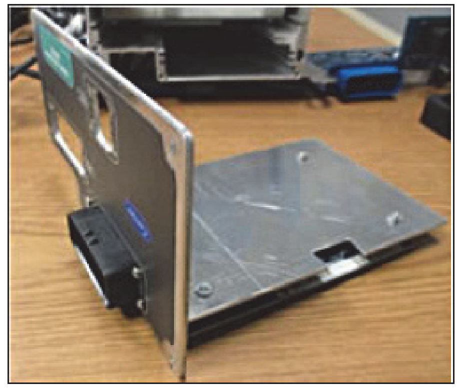
13. Secure the CCB to the back plate by reinstalling four CCB mounting screws (LONG screws) along with new nylon washers (P/N 58-00900-02) under the screw heads. Snug all four screws, then torque to 18+/- 3 in-lb.

Figure 8.41 CCB Board Mounting Screws



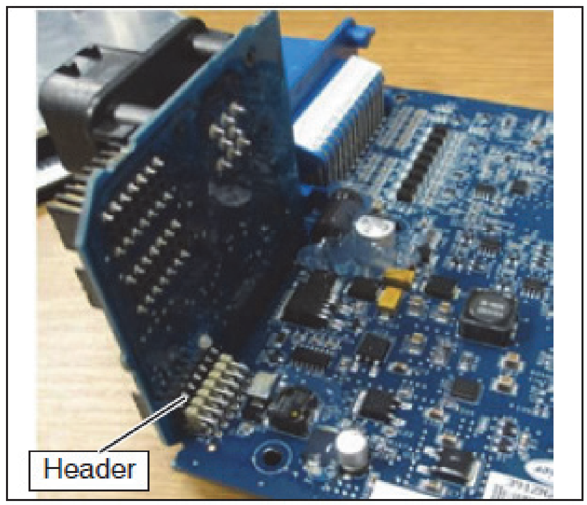
14. Reinstall the CCB board into the faceplate, and snug the four #4 screws. Then torque the screws to 6+/- 1 in-lb. DO NOT over tighten the screws or the connector socket will be damaged / threads stripped.

Figure 8.42 CCB Board Installed



15. To reinstall the CAN and Stepper boards, make sure the two boards are properly secured at the electrical header. If either board was replaced, or if the boards got separated during removal, carefully align the socket on the CAN board with the header pins and slide it fully into place.

Figure 8.43 CAN/Stepper Boards Installed

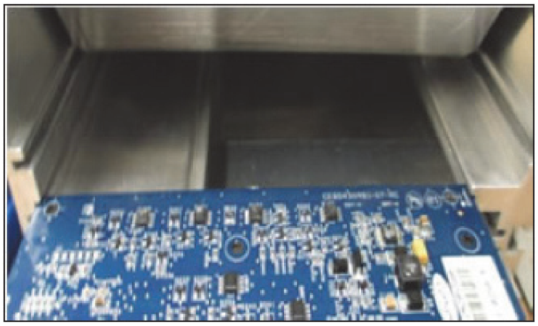


16. Reinsert the CAN and Stepper boards connectors through the faceplate and secure each connector to the faceplate with the four #4 screws. Snug all screws, then torque to 6+/-1 in-lb. DO NOT over tighten.

17. To install the boards/faceplate assembly, align the CCB back plate to the BOTTOM track on the Control Box, and slide the CCB back plate partially into the control box.

Figure 8.44 CCB Back Plate

Figure 8.45 Stepper Board



18. Next, align the stepper board with the corresponding slots, and slide the board assembly in until the faceplate is properly positioned.
19. Reinstall and snug the five faceplate mounting screws, then torque them to 24+/- 4 in-lb.
20. Reinstall all three harness connectors.
21. Reinstall the control box in the proper position and secure.
22. Install negative battery cable.
23. Turn SROS switch on and check for proper operation of unit.

8.10.7 Megohmmeter Test Procedure

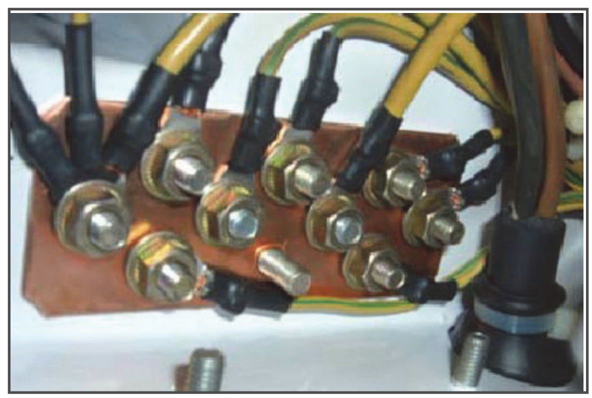
Check of the electrical insulation integrity and connections using a resistance tester (commonly known as a megohmmeter or Megger), such as Carrier Transicold part number 07-00481-00, that can be set to 1000V.

⚠ 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.

1. 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 8.46**. Fully insulate the ground wire terminal with electrical tape.
2. Connect a tester lead to the ground plate.
3. 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 2.6**.
4. Set the tester to 1000V.
5. Press the tester TEST button and record reading. It should be greater than 200 M If not, follow the procedure outlined in Step h.

Figure 8.46 Megohmmeter Connection to Ground Plate



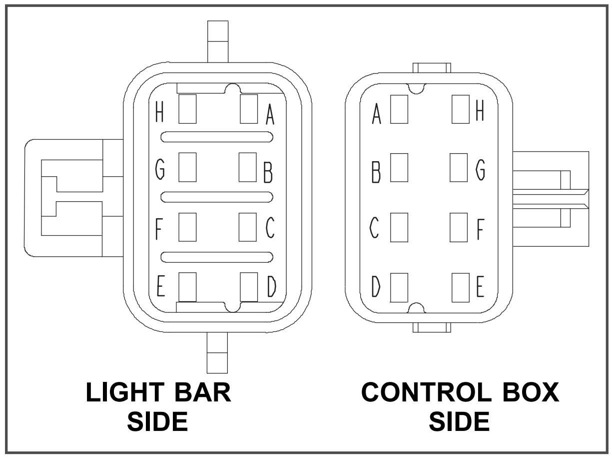
6. Continue testing the generator by testing at the GENCON L2 and then the GENCON L3 terminals. Both should measure greater than 200 M. If not, follow the procedure outlined in step 8.
7. To complete the high voltage circuit testing, test the T1, T2 and T3 terminals on all high voltage contactors listed in **Figure 2.6.** The fuses and the Overload Ground Fault Module (OGF) do not need to be tested. All readings should be greater than 200 M If not, follow the procedure outlined in step 8. If all readings are 200 M or greater, proceed to step 9.
8. If a reading is less than 200 M 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 test again. If the reading does not improve to above 200 M after running 15 minutes, check for a short to ground by:
   - 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.
9. Following the completion of all testing, reconnect the generator ground wire at the unit ground plate.

8.10.8 Light Bar

The light bar may be tested using a 12 VDC source. To test the light bar:

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Connect the ground (-) from the power source to pin G on the light bar side of the connector.
3. The green LED's will illuminate when the 12 VDC side (+) of the power source is connected to pin B.
4. With the connection as in the preceding steps (+ on pin B, and - on pin G), the amber LED's will illuminate when the power (+) from the power source is also connected to pin H.
5. Reinstall the negative battery cable, start unit and run Pretrip to check operation.

Figure 8.47 Light Bar Connections



8.10.9 Overload Ground Fault (OGF)

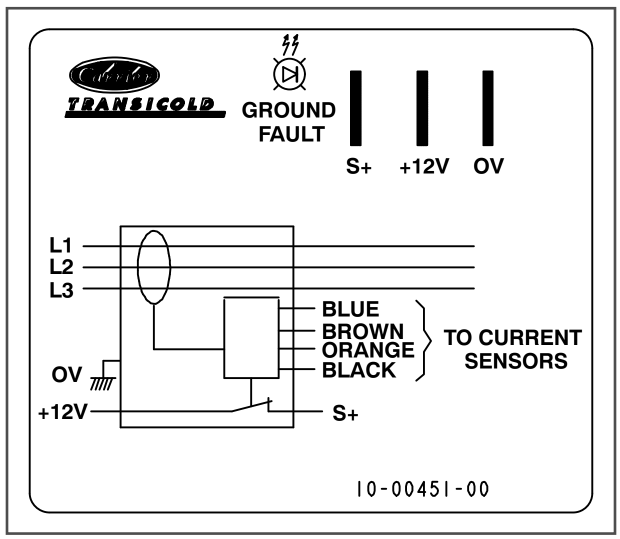
8.10.9.1 Operation

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 HVB1K, energizes the OGF at terminal +12 V. The module is grounded by the microprocessor at the OV terminal through SP50.

This power also flows through the OGF normally closed contacts and the S+ terminal through SP63 to 2CCB. If an overload or excessive leakage to ground condition exists, the OGF contacts open to de-energize and stop the flow of power to CCB1. Loss of power at CCB1 activates the alarm **00100 OVERLOAD/ GROUND FAULT**.

Figure 8.48 Overload Ground Fault Connections



8.10.9.2 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 8.10.2**) 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 alarm **00100 OVERLOAD/GROUND FAULT** is present and the fault LED (on the module) is not illuminated, it means that the module has detected an overcurrent. Verify the current readout on the unit data.

   If current readings are not reading correctly, the current sensor may be at fault. Go to step 5 & 6 to check the current sensor.
3. 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.
4. If module is OK, check for 12 VDC at SP63.

5. Check wiring between CT and pins 1CCB10, 1CCB12, 1CCB31, and 1CCB34 as required.
6. 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 or PSCON 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.
7. Sensor resistance should also be checked, all wires must be disconnected. Check from Black to each phase:

   Black to Orange - 22 ohms

   Black to Blue - 22 ohms

   Black to Brown - 22 ohms

If any resistance values are not within proper range (22 ohms) it indicates a defective sensor.

8.10.10 Evaporator Heaters

NOTE

A good preliminary test of the heaters is to run a Pretrip and check for heater alarms.

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Remove the lower back panel or coil cover as applicable.
3. 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 2.11**.
4. Remove the heater mounting brackets.
5. Remove and replace faulty heater. If removing a drain pan heater, carefully remove heater from the clips on the drain pan.
6. When reinstalling brackets torque to 6 to 7 ft/lbs (8.1 to 9.5 Nm). Rods should move freely from side to side when installed.
7. Route and secure electrical cables. 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. Reinstall the negative battery cable, start unit and run Pretrip to check operation.

8.10.11 Evaporator Blower & Motor

NOTE

Blower motor bearings are factory sealed and do not require additional grease.

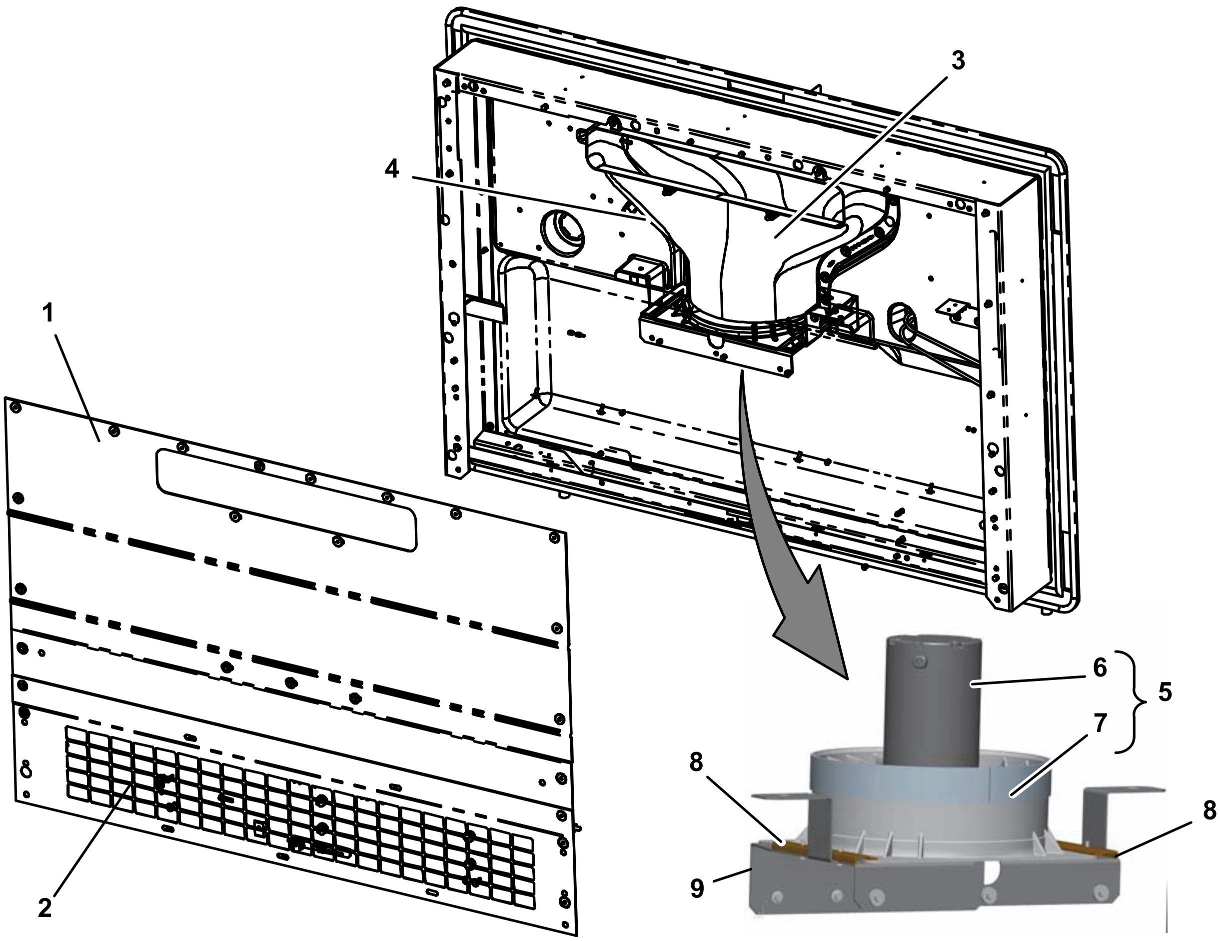
1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
2. From inside of trailer, remove back panel and grille (see **Figure 8.49**).
3. Disconnect the motor electrical connector.
4. Remove the supply air sensor and then remove the nozzle.
5. Loosen the four bolts on the underside of the support bracket that fasten the two mounting brackets.
6. Slide the blower assembly off the support bracket and out of the unit.
7. To remove the fan, loosen the nut holding the blade to the motor shaft using impact gun.

8. To remove motor remove four bolts that hold motor to the stator.
9. Complete the assembly in reverse order of removal. Coat motor shaft with never-seize before assembly.
10. Reinstall the negative battery cable, start unit and run Pretrip to check operation.

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)

Figure 8.49 Evaporator Blower Assembly



1. Access panel
2.Grille
3.Nozzle
4.Supply Air Sensor
5.Blower Assembly

6.Motor
7.Stator
8.Mounting Brackets
9.Support Bracket

- - - - -

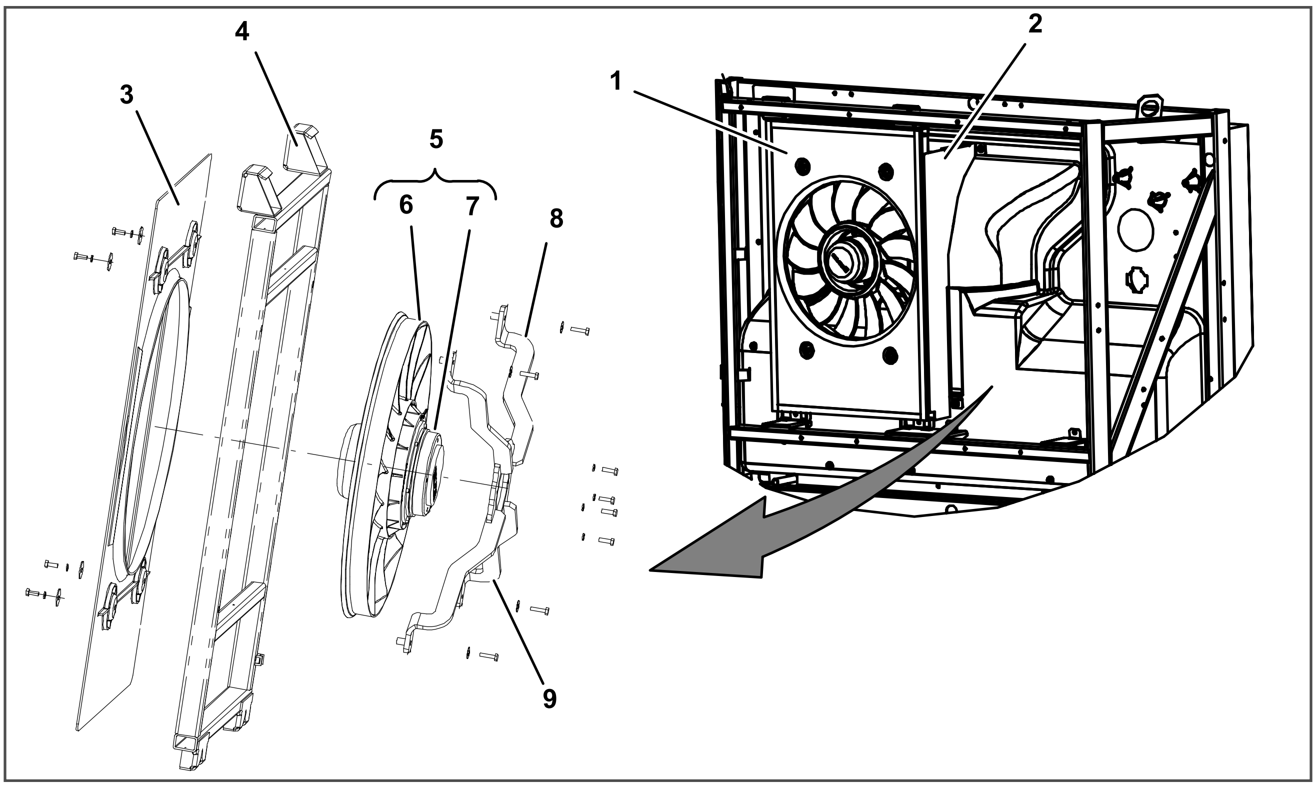
8.10.12 Condenser Fan Assemblies

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
2. 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 8.50**.
3. 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.
4. Disassemble the fan and motor assembly from the mounting and then disassemble the fan from the motor as required.
5. 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 8.50**.
6. Reinstall the negative battery cable, start unit and run Pretrip to check operation.

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)

Figure 8.50 Condenser Fan Assembly



1. Condenser Fan Assembly
2. Divider
3. Shroud
4. Frame
5. Fan & Motor Assembly
6. Fan
7. Motor
8. Welded Support
9. Wire Routing

8.10.13 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.

1. Run the unit with the battery charger connected to the battery as usual.
2. Using a clamp-on ammeter, take a reading of the amperage on both output wires of the battery charger.
3. 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.
4. If charging Amps = 0, check the AC input voltage to the charger. The AC input voltage range should be between 350 and 600 VAC.
5. If there is no AC voltage, Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lock-out/tagout the receptacle.
6. Check battery charger fuses and inspect fuse holder wire connections. Inspect plugs, pins and wires at charger connections.
7. If input voltage, wiring connections and the fuses are good, replace the battery charger.

8.10.14 Generator

8.10.14.1 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 instruction, 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.

NOTICE

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 8.10.2**.)

⚠ WARNING

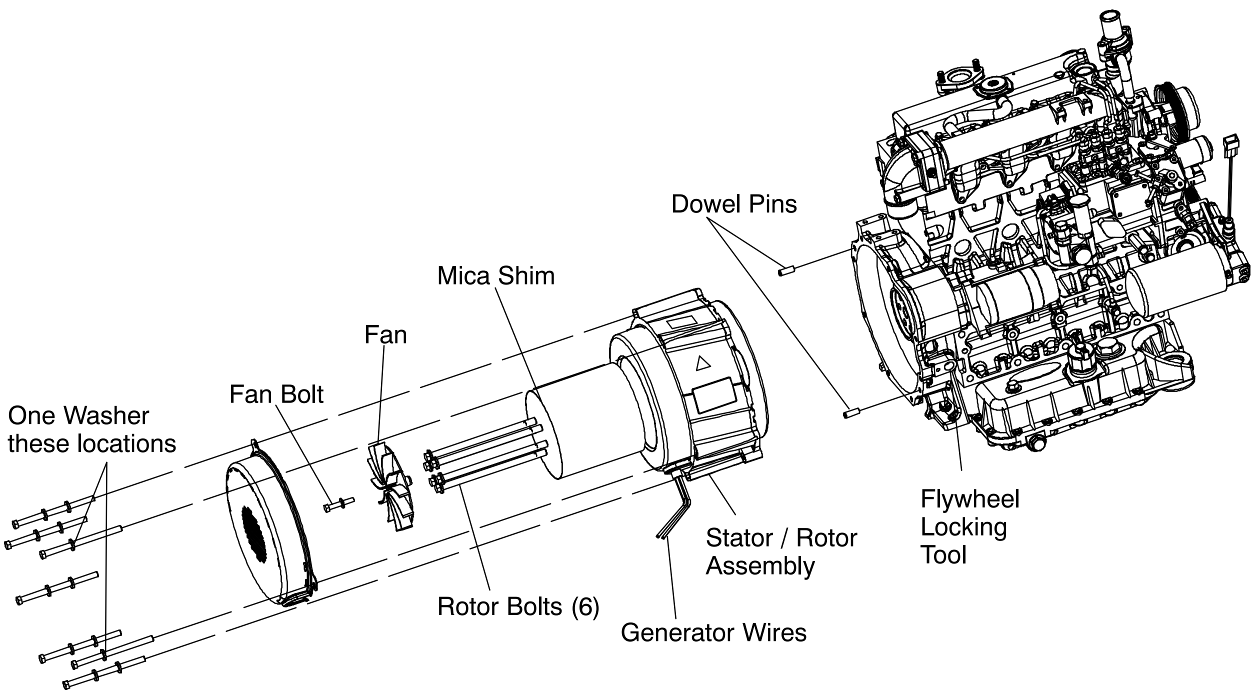
Generators of this type should not be "flashed." Operation with external voltage source or momentary shorting of leads will damage the generator and may cause injury.

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.

8.10.14.2 Generator Replacement

Service procedures for replacement of the generator (see **Figure 8.55**) 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.

Figure 8.51 Generator/Unidrive Assembly



8.10.14.3 Generator Removal

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Remove the front roadside and curbside doors.
3. Disconnect the negative battery cable from the battery.
4. Disconnect the positive battery cable from battery.
5. Remove the tie wraps holding the connectors to the intake hose at the intake manifold connection. Disconnect the air intake hose from the intake manifold.
6. Remove any brackets securing the positive and negative battery cables to the unit (the brackets may remain clamped to the cables).
7. Remove the heat shield from the exhaust connection at the manifold (see **Figure 8.52**) and then remove the hardware holding the exhaust to the manifold.
8. Remove the radiator hose “P” clamp.
9. Remove the tie wraps holding the generator connections to the frame mount.

Figure 8.52 Exhaust Connection Disassembly

10. If equipped, disconnect the generator thermistor.
11. Remove the hardware attaching the generator ground strap at the frame and the harness ground wire at the back of the generator.
12. Pull the fuel lines from the back of the engine in order to provide slack so that the lines are not damaged when the unidrive assembly is pulled forward.
13. Remove the two engine mounts at the generator end of the unidrive.
14. Remove engine end unidrive mount at the rear, (toward trailer) and then loosen the remaining unidrive mount sufficient to allow the unidrive to rotate.
15. Install the support tool (Carrier P/N 86-04751-00) under the back of the unidrive (see **Figure 8.53**). 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 8.53 Support Tool Secured, Bottom View

16. To prepare for removal of the rotor bolts, install the flywheel locking tool (Carrier P/N 07-60083-00, see **Figure 8.51**, **Figure 8.54**).

17. Swing the unidrive assembly out sufficient to remove the generator.

18. 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.

19. Cut the generator splices from the harness.

Figure 8.54 Flywheel Locking Tool

20. Remove the hardware attaching the fan cover. 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 fan cover.

21. Remove the center (fan) mounting bolt and washer and remove the fan.

⚠ WARNING

A service/shipping sleeve (54-00656-23) must be installed before removal of the generator from the engine. The generator MUST be removed as an assembly, with the shim in place. DO NOT attempt to separate the rotor or stator.

22. Install the shipping sleeve (Carrier P/N 54-00656-23) between the rotor and stator, see **Figure 8.51**.

23. Note (see **Figure 8.55**, **Figure 8.56**) 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 P/N SKM-5671). Snug the rods in position and then remove the three remaining rotor bolts.

Figure 8.55 Generator, Flywheel View

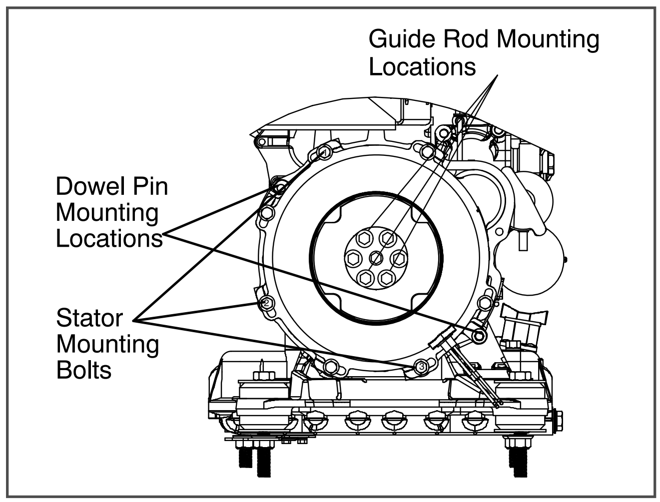
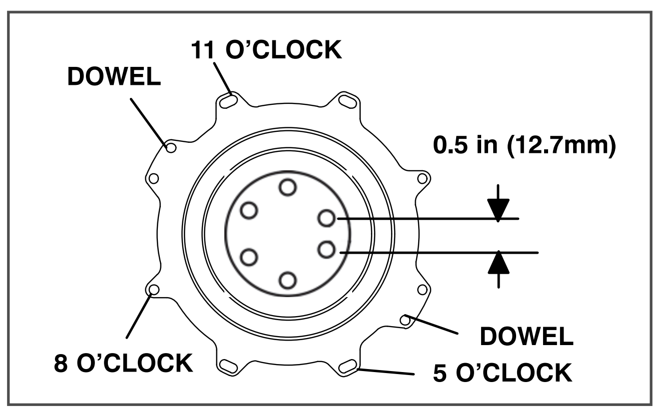


Figure 8.56 Guide Rod Installation



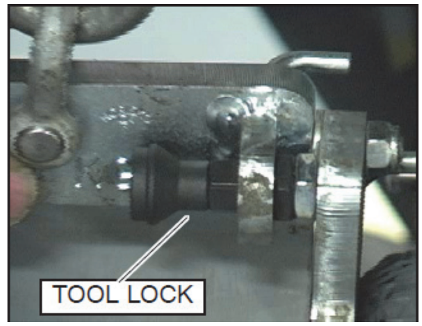
WARNING

Never disassemble the generator rotor from the stator due to the high force required to do so and the high magnetic field that will result. The field present when the rotor is disassembled from the stator may interfere with cardiac implants such as pacemakers and defibrillators.

24. Remove the stator bolt at the 11:00 o'clock position and install the lift tool (see Figure 8.57, Carrier P/N 07-60085-02). Remove the remaining stator bolts.

25. 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 8.57) in position. Once the lock is in position, remove the generator from the unit.

Figure 8.57 Generator Lifting Tool Installation



8.10.14.4 Generator Assembly Procedure

26. Verify the existence and condition of the two original dowel pins in the bell housing. (See Figure 8.51, Carrier P/N 34-06329-00; not included in the kit. If replacement is required, the pins are to be installed with the chamfer facing out.

WARNING

Never disassemble the generator rotor from the stator due to the high force required to do so and the high magnetic field that will result. The field present when the rotor is disassembled from the stator may interfere with cardiac implants such as pacemakers and defibrillators.

27. 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.

28. Using two flat washers on each, install the stator bolts at the 5 o'clock (ensure ground strap is in position on this bolt) and 8 o'clock positions. Snug the bolts sufficient to hold the generator in place on the engine. Remove the flywheel lifting tool and then, using two flat washers install and snug the stator mounting bolt at the 11 o'clock position.

29. 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, 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).

30. Remove the shipping sleeve.

31. Install the fan (with the blades facing away from the engine) and torque the fan bolt 12 to 14 ft/lbs (16.3 to 19 Nm).

32. Remove the flywheel locking tool.

33. Prepare the replacement generator power wires by installing four crimp splices (see **Figure 8.58**), one on each wire, and then route the wires through the cover grommet.

34. Bring the cover in place, using two flat washers on each, (only use one washer at 2 and 5 o'clock positions, see **Figure 8.51**) install the remaining cover/ stator bolts and torque all cover and stator blots 33 to 37 ft/lbs (44.7 to 50.2 Nm).

35. 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).

36. Use four pieces each ¼ inch and ½ inch heat shrink (Carrier P/N 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 8.59**. 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 8.58 Generator Wires

Note: Green wire not shown

Figure 8.59 Generator/Harness Wire Connections

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

37. Complete wire installation by gathering the four wires and covering with tape (Carrier P/N 02-00137-10). Refasten wiring in place to the frame mount.

38. If equipped, reconnect the Generator Thermistor.

39. Reconnect the radiator hose "P" clamp.

40. 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.

41. Reconnect the air intake hose at the intake manifold connection. Refasten the connectors to the intake manifold connection.

42. Reinstall the positive & negative battery cables. When reinstalling the positive wire to the starter torque to 6 to 8 ft-lbs (9.4 Nm). See **Figure 8.60**.

43. Re-seal the positive & negative battery cable connections using Red glyptol varnish, Carrier P/N 07-00479-00.

44. Reinstall the hardware attaching the generator ground strap at the frame and the harness ground wire at the back of the generator.

Figure 8.60 Positive Starter Wire Installation

45. Replace the Air Cleaner Assembly and hoses.

46. Reinstall the battery cable connections at the battery.

47. Reinstall the doors.

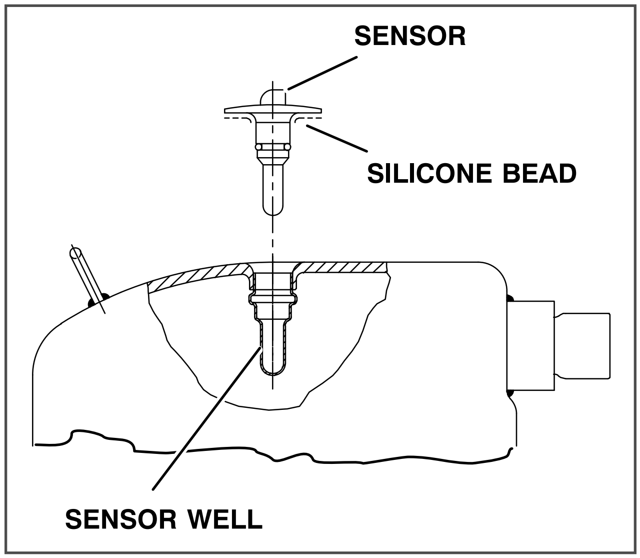
48. Remove the lockout/tagout equipment, start unit and run Pretrip.

8.10.15 Compressor Discharge Temperature Sensor

Values for testing the sensor, in accordance with standard procedures, are provided in **Table 8–4**. To replace the compressor discharge temperature sensor (see **Figure 8.61**) do the following:

1. Ensure the unit will not start automatically by placing the START/RUN-OFF switch in the OFF position and removing the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Remove the existing sensor. Clean all silicone sealer and dielectric compound from the sensor well. Ensure well is clean and dry. Top of compressor, where the sensor seals, must also be clean and dry.
3. Using the syringe supplied with the replacement sensor, squeeze all of the dielectric compound into the sensor well.
4. Place a bead of the silicone sealer supplied with the replacement sensor around the sensor sealing ring. Insert sensor into the well with the leads parallel to the suction fitting.

Figure 8.61 Compressor Discharge Temperature Sensor



5. Reconnect sensor connector, reinstall the negative battery cable, start unit and run Pretrip to check operation.

8.10.16 Sensor Checkout

An accurate ohmmeter must be used to check resistance values shown in **Table 8–3** or **Table 8–4**.

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 8–3 Sensor Resistance

Sensors AAT, RAT, SAT, ENCT, DTT, CST, EVOT, REMSN 1, 2, & 3											
°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 8–4 Sensor Resistance (CDTS)

°C	°F	Ohms	°C	°F	Ohms	°C	°F	Ohms	°C	°F	Ohms
-40	-40	2,889,600	18	64.4	117,656	76	168.8	12,306	134	273.2	2,335
-38	-36.4	2,532,872	20	68.0	107,439	78	172.4	11,524	136	276.8	2,223
-36	-32.8	2,225,078	22	71.6	98,194	80	176.0	10,793	138	280.4	2,119
-34	-29.2	1,957,446	24	75.2	89,916	82	179.6	10,122	140	284.0	2,021
-32	-25.6	1,724,386	26	78.8	82,310	84	183.2	9,494	142	287.6	1,928
-30	-22.0	1,522,200	28	82.4	75,473	86	186.8	8,918	144	291.2	1,839
-28	-18.4	1,345,074	30	83.0	69,281	88	190.4	8,376	146	294.8	1,753
-26	-14.8	1,190,945	32	89.6	63,648	90	194.0	7,869	148	298.4	1,670
-24	-11.2	1,056,140	34	93.2	58,531	92	197.6	7,404	150	302.0	1,591
-22	-7.6	938,045	36	96.8	53,887	94	201.2	6,972	152	305.6	1,508
-20	-4.0	834,716	38	100.4	49,656	96	204.8	6,571	154	309.2	1,430
-18	-0.4	743,581	40	104.0	45,812	98	208.4	6,197	156	312.8	1,362
-16	3.2	663,593	42	107.6	42,294	100	212.0	5,848	158	316.4	1,302
-14	6.8	593,030	44	111.2	39,078	102	215.6	5,529	160	320.0	1,247
-12	10.4	530,714	46	114.8	36,145	104	219.2	5,233	162	323.6	1,193
-10	14.0	475,743	48	118.4	33,445	106	222.8	4,953	164	327.2	1,142
-8	17.6	426,904	50	122.0	30,985	108	226.4	4,692	166	330.8	1,096
-6	21.2	383,706	52	125.6	28,724	110	230.0	4,446	168	334.4	1,054
-4	24.8	345,315	54	129.2	26,651	112	233.6	4,204	170	338.0	1,014
-2	28.4	311,165	56	132.8	27,750	114	237.2	3,977	172	341.6	975
0	32.0	280,824	58	136.4	23,005	116	240.8	3,759	174	345.2	938
2	35.6	253,682	60	140.0	21,396	118	244.4	3,550	176	348.8	902
4	39.2	229,499	62	143.6	19,909	120	248.0	3,354	178	352.4	867
6	42.8	207,870	64	147.2	18,550	122	251.6	3,173	180	356.0	834
8	46.4	188,494	66	150.8	17,294	124	255.2	3,004	182	359.6	798
10	50.0	171,165	68	154.4	16,133	126	258.8	2,850	184	363.2	764
12	53.6	155,574	70	158.0	15,067	128	262.4	2,711	186	366.8	733
14	57.2	141,590	72	161.6	14,078	130	266.0	2,580	188	370.4	706
16	60.8	129,000	74	165.2	13,158	132	269.6	2,454	190	374.0	697

NOTICE

Refer to the following tables for Temperature Pressure Charts for R-452A and R-4A refrigerants. Note that the liquid state pressure values and the vapor state pressure values of the R-452A refrigerant are different from those of the R-404A refrigerant.0

Table 8–5 R-404A 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

Table 8–6 R-452A Temperature Pressure Chart

Temperature		Liquid		Vapor		Temperature		Liquid		Vapor	
°F	°C	psig	bar	psig	bar	°F	°C	psig	bar	psig	bar
-29.2	-34	10.4	0.72	6.5	0.45	68	20	144.6	9.97	128.6	8.87
-25.6	-32	12.7	0.87	8.5	0.58	71.6	22	153.5	10.59	136.9	9.44
-22	-30	15.1	1.04	10.6	0.73	75.2	24	162.8	11.23	145.6	10.04
-18.4	-28	17.6	1.21	12.8	0.88	78.8	26	172.4	11.89	154.7	10.67
-14.8	-26	20.3	1.40	15.2	1.05	82.4	28	182.4	12.58	164.1	11.32
-11.2	-24	23.2	1.60	17.7	1.22	86	30	192.8	13.29	174.0	12.00
-7.6	-22	26.2	1.81	20.4	1.41	89.6	32	203.6	14.04	184.2	12.71
-4	-20	29.5	2.03	23.3	1.61	93.2	34	214.8	14.81	194.9	13.44
-0.4	-18	32.9	2.27	26.3	1.82	96.8	36	226.4	15.61	206.0	14.21
3.2	-16	36.5	2.52	29.6	2.04	100.4	38	238.4	16.44	217.5	15.00
6.8	-14	40.4	2.78	33.0	2.28	104	40	250.9	17.30	229.5	15.83
10.4	-12	44.4	3.06	36.6	2.53	107.6	42	263.8	18.19	242.0	16.69
14	-10	48.7	3.36	40.5	2.79	111.2	44	277.1	19.11	255.0	17.59
17.6	-8	53.2	3.67	44.5	3.07	114.8	46	291.0	20.07	268.5	18.51
21.2	-6	57.9	3.99	48.8	3.36	118.4	48	305.3	21.06	282.5	19.48
24.8	-4	62.9	4.34	53.3	3.68	122	50	320.1	22.08	297.0	20.48
28.4	-2	68.1	4.70	58.0	4.00	125.6	52	335.4	23.13	312.1	21.52
32	0	73.6	5.08	63.0	4.35	129.2	54	351.2	24.22	327.7	22.60
35.6	2	79.4	5.48	68.3	4.71	132.8	56	367.6	25.35	344.0	23.72
39.2	4	85.4	5.89	73.8	5.09	136.4	58	384.4	26.51	360.9	24.89
42.8	6	91.7	6.33	79.6	5.49	140	60	401.8	27.71	378.4	26.10
46.4	8	98.4	6.78	85.7	5.91	143.6	62	419.8	28.95	396.7	27.36
50	10	105.3	7.26	92.1	6.35	147.2	64	438.4	30.23	415.7	28.67
53.6	12	112.5	7.76	98.7	6.81	150.8	66	457.5	31.55	435.4	30.03
57.2	14	120.0	8.28	105.7	7.29	154.4	68	477.2	32.91	456.1	31.45
60.8	16	127.9	8.82	113.0	7.79	158	70	487.4	34.30	477.6	32.94
64.4	18	136.1	9.39	120.6	8.32						

Table 8–6 Compressor Discharge Pressure Transducer Pressure/Voltage

PSIG	Bar	Voltage
0	0	0.5
10	0.7	0.6
20	1.4	0.7
30	2.0	0.7
40	2.7	0.8
50	3.4	0.9
60	4.1	1.0
70	4.8	1.1
80	5.4	1.1
90	6.1	1.2
100	6.8	1.3
125	8.5	1.5
150	10.2	1.7
175	11.9	1.9
200	13.6	2.1
225	15.3	2.3
250	17.0	2.5
275	18.7	2.7
300	20.4	2.9
325	22.1	3.1
350	23.8	3.3
375	25.5	3.5
400	27.2	3.7
450	30.6	4.1

Table 8–7 Compressor Suction Pressure Transducer Pressure/Voltage

PSIG	Bar	Voltage
-10	-0.7	0.7
-5.0	-0.3	0.8
0.0	0.0	1.0
5.0	0.3	1.2
10.0	0.7	1.4
15.0	1.0	1.5
20.0	1.4	1.7
25.0	1.7	1.9
30	2.0	2.1
35	2.4	2.2
40	2.7	2.4
45	3.1	2.6
50	3.4	2.8
55	3.7	3.7
60	4.1	3.1
65	4.4	3.3
70	4.8	3.5
75	5.1	3.6
80	5.4	3.8
85	5.8	5.8
90	6.1	4.1
95	6.5	4.3
100	6.8	4.5

Table 8–8 Current Sensor Millivolt Output vs Current Sensed

Amps	MV Output	Amps	MV Output	Amps	MV Output	Amps	MV Output
0	0	10	0.167	20	0.334	30	0.501
1	0.0167	11	0.1837	21	0.3507	31	0.5177
2	0.0334	12	0.2004	22	0.3674	32	0.5344
3	0.0501	13	0.2171	23	0.3841	33	0.5511
4	0.0668	14	0.2338	24	0.4008	34	0.5678
5	0.0835	15	0.2505	25	0.4175	35	0.5845
6	0.1002	16	0.2672	26	0.4342	36	0.6012
7	0.1169	17	0.2839	27	0.4509	37	0.6179
8	0.1336	18	0.3006	28	0.4676	38	0.6346
9	0.1503	19	0.3173	29	0.4843	39	0.6513

SECTION 9
Unit Troubleshooting

NOTICE

Under no circumstances should anyone attempt to repair sealed module internal 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
9.1.1 Engine Will Not Start		
Starter motor will not crank or low cranking speed	Battery insufficiently charged	**9.2**
	Battery cable connections loose or corroded	Check
	Damaged or corroded electrical connections at starter	Check/Repair
	Starter motor malfunction	**9.1.4**
	Starter motor solenoid defective	Engine Manual
	Open starting circuit	**9.1.5**
	Incorrect grade of lubricating oil	**2.8**
	High suction pressure	**8.9.7**
	Internal generator damage Generator magnetically locked, casing drag	**8.10.14**
Starter motor cranks but engine fails to start	No fuel in tank	Check
	Air in fuel system	**8.6.2**
	Water in fuel system	Drain Sump & **8.6.5**
	Plugged fuel filter	**8.6.5**
	Plugged inlet screen to mechanical pump	**8.6.3**
	Plugged inlet screen to electric pump	**8.6.4**
	Plugged fuel lines to injector(s)	Check
	ENCU defective	Replace
	Engine preheat defective	**8.6.11**
Starter cranks, engages, but dies after a few seconds	Incorrect grade of lubricating oil	**2.8**
	Voltage drop in battery cable(s)	Check
	ENCU defective	Replace

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	**8.6.5**
	Plugged inlet screen to mechanical pump	**8.6.3**
	Plugged inlet screen to electric pump	**8.6.4**
	Injector nozzle(s) defective	Engine Manual
	Injection pump defective	Engine Manual
	Air cleaner or hose restricted	**8.6.10**
	Safety device open	**2.13**
	ENCU defective	Replace
	Electric fuel pump malfunction	**8.6.4**
	Mechanical fuel pump malfunction	Engine Manual
	Oil pressure switch defective	Replace
9.1.3 Engine Will Not Shut Off		
Engine will not shut off	ENCU operation defective	Replace
9.1.4 Starter Motor Malfunction		
Starter motor will not crank or turns slowly	Battery insufficiently charged	**9.2**
	Battery cable connections loose or corroded	Check
	Battery cables defective	Replace
	Excessively worn, open or defective starter brushes	Engine Manual
	Starter motor solenoid defective or damaged	Engine Manual
	Incorrect grade of lubricating oil	**2.8**
	Internal generator damage Generator magnetically locked, casing drag	**8.10.14**
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 condition	Load Test
	Damaged or corroded electrical connections at starter	Check/Repair
	ENCU defective	Replace
	No power from 3MM-12 to Starter Solenoid connector	Check/Repair

Indication/Trouble	Possible Causes	Action/Reference Section
9.1.6 Miscellaneous Engine Troubleshooting		
Loss of power	Air cleaner or hose restricted	**8.6.10**
	Air in fuel system	**8.6.2**
	Air vent restricted in fuel tank cap	Clean
	Restricted fuel lines	Engine Manual
	Defective fuel injection pump	Engine Manual
	Defective injector(s) or incorrect type	Engine Manual
	Incorrect fuel injection pump timing	Engine Manual
	Incorrect valve timing	Engine Manual
	Poor compression	Engine Manual
Vibration	Engine shockmounts defective	Replace
	Poor compression	Engine Manual
Overheating	Air cleaner or hose restricted	**8.6.10**
	Exhaust pipe restriction	Remove
	Restriction in water jacket	Engine Manual
	Restriction in radiator	**8.6.14**
	Coolant level too low	**8.6.14**
	Loose water pump	Engine Manual
	Defective thermostat	Engine Manual
	Water pump belt loose/broken	**8.6.16**
Excessive crankcase pressure	Plugged crankcase breather	**8.6.16**

9.2 Battery Charger

Indication/Trouble	Possible Causes	Action/Reference Section
F33, F34, F35 fuse blown	Short in 12 volt wiring causing overload of charger	**8.10.13**
	Internal short	**8.10.13**
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 F33 or F34 or F35	Replace
	Charger is not receiving AC input	**8.10.13**
	AC input exceeding design limits	**8.10.13**
	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	**8.6.12**
	Irregular speed of engine	**8.6.12**
	Loose terminal or load connections	Tighten
High voltage	Excessive engine speed	**8.6.12**
Overheating	Generator overloaded	Check
	Clogged ventilation openings	Clean
	Insufficient circulation	Check Fan
	Unbalanced load	Balance
Mechanical Noise	Loose laminations	**8.10.14**

9.4 Refrigeration / Temperature Control

Indication/Trouble	Possible Causes	Action/Reference Section
9.4.1 Unit Will Not Cool		
Compressor malfunction	Compressor contactor defective	Check
	Compressor defective	**8.8**
Refrigeration system	Defrost cycle did not terminate. Check Compartment DTT	**8.10.16**
	Abnormal pressure	**9.4.8**
	Check system for noncondensibles	**8.7.2**
9.4.2 Unit Runs But Has Insufficient Cooling		
Refrigeration system	Compressor internal damage	**8.8**
	Abnormal pressure	**9.4.8**
	Expansion valve malfunction	**9.4.11**
	No or restricted evaporator airflow	**9.4.10**
	Suction Modulation Valve malfunction	**8.9.7**
	Check system for noncondensibles	**8.7.2**
	Check economizer	**8.7**
	Check refrigerant charge	**8.7**
	Check condenser coil	**8.7**
Engine	Check Air Filter	**8.6.10**
	Check Engine Rack Position sensor calibration	**8.6.13**

Indication/Trouble	Possible Causes	Action/Reference Section
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	**8.10.16**
	Check system for noncondensibles	**8.7.2**
Compressor	Defective	**8.8**
9.4.4 Unit Will Not Terminate Cooling		
Unit fails to stop cooling	Temperature sensor malfunction	**8.10.16**
	Incorrect temperature scale, check whether microprocessor is set for °C or °F	Check
	Incorrect DC Charging Current limit	**4.5.2**
	Low Battery Voltage	**4.5.2**
	Supply air temperature limit is too low	**4.5.2**
9.4.5 Unit Will Not Heat Or Has Insufficient Heating		
Unit will not heat or has insufficient heat	Heater(s) defective	**8.10.4**
	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	**8.10.16**
9.4.6 Unit Will Not Terminate Heating		
Unit fails to stop heating	Microprocessor temperature improperly set	Reset
	Microprocessor malfunction	**8.10**
	Temperature sensor malfunction	**8.10.16**
9.4.7 Defrost Cycle Malfunction		
Will not initiate defrost automatically	Defrost timer has not expired	Check/Reset
	Defrost air switch (DAS) malfunction	**8.9.12**
	A Compartment DTT is above 40°F (4.4°C)	Cool Down
	Loose terminal connections (DAS)	Tighten
Will not initiate defrost manually	Keypad defective	**8.10.4**
	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	**8.10.4**
	Evaporator fan contactor stuck closed	Check

Indication/Trouble	Possible Causes	Action/Reference Section
Frequent defrost	Defrost air switch (DAS) out of adjustment	**8.9.12**
	Wet load	Normal
Does not terminate or cycles on defrost	Defrost air switch (DAS) out of adjustment	**8.9.12**
	DTT malfunction	**8.10.16**
Refrigerated Compartment	Hot Load	Allow time to pull down
	Defective or insufficient refrigerated compartment insulation or air leak	Correct
9.4.8 Abnormal Pressure - Cooling		
High discharge pressure	Condenser coil dirty	**8.9.2**
	Condenser fans rotating backwards	Check Wiring
	Refrigerant overcharge or noncondensibles	**8.7.2**
	Discharge service valve partially closed	Open
	Stuck Open Economizer Valve	**8.9.8**
	Stuck Open LIV	**8.9.9**
	Defective High Pressure Switch	**8.9.10**
Low discharge pressure	Low refrigerant charge	**8.7.2**
	Suction modulation valve malfunction	**8.9.7**
	Damaged Compressor	**8.8**
	Compressor rotation backwards	Check Contactor Wiring
	Discharge transducer circuit faulty pressure reading	**8.9.11**
Low suction pressure	Filter-drier partially plugged	**8.9.3**
	Low refrigerant charge	**8.7.2**
	Expansion valve malfunction	**8.9.8**
	No evaporator air flow or restricted air flow	**9.4.10**
	Excessive frost on evaporator coil	**8.9.12**
	Suction modulation valve malfunction	**8.9.7**
	Liquid or suction line service valve partially closed	Open
High suction pressure	Transducer defective	**8.9.11**
	EVXV stuck open	**8.9.8**
	Compressor defective	**8.8**
Suction and discharge pressures tend to equalize when unit is operating	Compressor rotation backwards	Check Contactor Wiring
	Damaged Compressor	**8.8**
9.4.9 Abnormal Noise		
Compressor	Loose mounting bolts	Tighten
	Worn bearings	**8.8**
	Liquid slugging	**9.4.11**
Condenser or evaporator fan	Condenser Fan	**8.10.12**
	Evaporator Fan	**8.10.11**

Indication/Trouble	Possible Causes	Action/Reference Section
9.4.10 No Evaporator Air Flow Or Restricted Air Flow		
Evaporator coil blocked	Frost on coil	**8.9.12**
	Dirty coil	**8.9.1**
No or partial evaporator air flow	Evaporator fan rotating backwards	**8.10.11**
	Evaporator fan defective	**8.10.11**
	Evaporator air flow blocked	Check
9.4.11 Expansion Valve (EVXV) Malfunction		
EVXV not controlling correctly	Low refrigerant charge	**8.7.2**
	EVOT defective	**8.10.16**
	Coil not seated properly on valve	**8.9.11**
	Valve / Valve Coil defective	**8.9.8**
	EVOP defective	Check
	EVXV inlet screen plugged	Check/Replace
	Damaged or corroded electrical connections at valve or EVXV	Check/Repair
9.4.12 Compressor Suction Modulation Valve (CSMV) Malfunction		
CSMV not controlling correctly	Coil not seated properly	Check
	Coil defective	**8.9.7**
	CSP defective	**8.9.11**
	CST defective	**8.10.16**
	Damaged or corroded electrical connections at valve or SVM	Check/Repair
	Stepper Valve Module (SVM)	Check **2.6.3** Repair **8.10.3**
9.4.13 Economizer Valve (ECXV) Malfunction		
ECXV not controlling correctly	Coil not seated properly	Check
	Valve / Valve Coil defective	**8.9.8**
	ECOT defective	**8.10.16**
	Damaged or corroded electrical connections at valve or SVM	Check/Repair
	Stepper Valve Module (SVM)	Check **2.6.3** Repair **8.10.3**
	Stuck open LIV	**8.9.9**
9.4.14 Abnormal Discharge Temperature (High)		
Refrigeration system	Plugged LIV strainer, or defective LIV	**8.9.9**
	Defective CDT	**8.10.15**
	Low refrigerant charge	**8.7.2**
	Non-Condensibles	**8.7.2**
	Damaged Compressor	**8.8**

SECTION 10

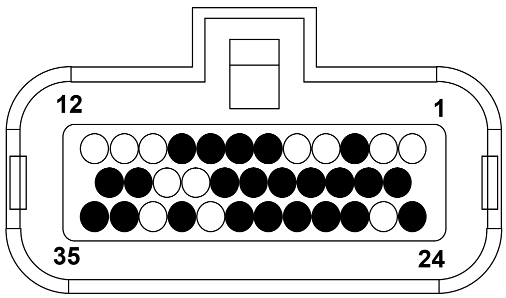
Wiring

10.1 Harness Connector Wire

NOTE

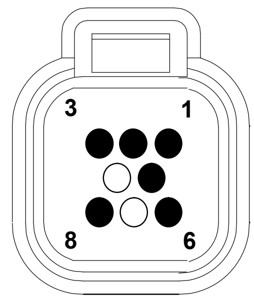
All illustrations provided in this section are looking at the connector connection end (with the wires in the back).

PCM – WHITE



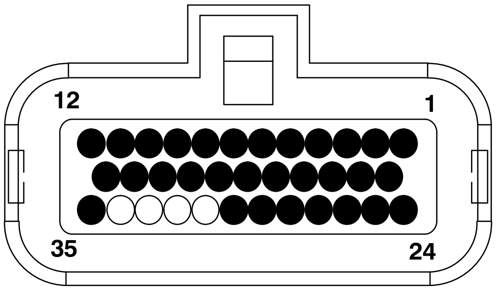
Component	Terminal
SP–25	3
MTLV–F	4
SATPWR–A	6
LB–B	7
3MM–34	8
3MM–23	9
HVB7–E	10
MTLV–C	12
PCM–35	13
SP–25	14
HVB7–F	15
3MM–18	16
3MM–17	17
SP–17	18
1MM–1	19
MTLV–D	20
FLS–A	22
3MM–15	23
AFAS–A (F6–A)	24
3MM–13	26
3MM–14	27
3MM–28	28
2MM–12	29
2MM–23	30
1MM–6	32
MTLV–E	33
SP–18	34
PCM–13	35
Unused terminals: 1, 2, 4, 5, 10, 11, 12, 20, 21, 25, 31, 33	

1MM – BLACK



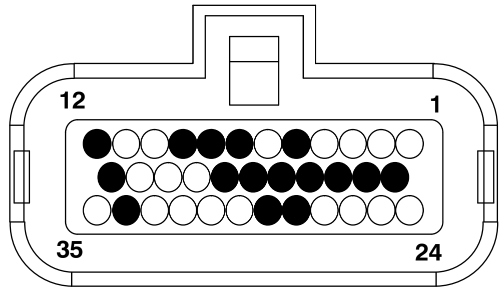
Component	Terminal
PCM–19	1
HVB7–C	2
SP–15	3
HVB7–D	4
PCM–32	6
SP–16	8
Unused terminals: 5 & 7	

2MM – BLACK



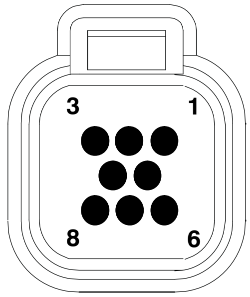
Component	Terminal
AAT–B	1
AAT–A	2
DP16–G	3
DP16–H	4
DP16–C	5
DP16–D	6
DP16–E	7
CDT–B	8
CSP–3	9
CDP–3	10
DP16–B	11
PCM–29	12
FLS–C	13
ECOP–3	14
ECOT–B	15
CST–B	16
DP16–S	17
DP16–F	18
CDT–A	19
CSP–1	20
CDP–1	21
DP16–A	22
PCM–30	23
FLS–B	24
DP16–P	25
ECOT–A	26
CST–A	27
ECOP–1	28
PCM–31	29
SP–20	30
SP–24	35
Unused terminals: 31, 32, 33 & 34	

3MM – GRAY



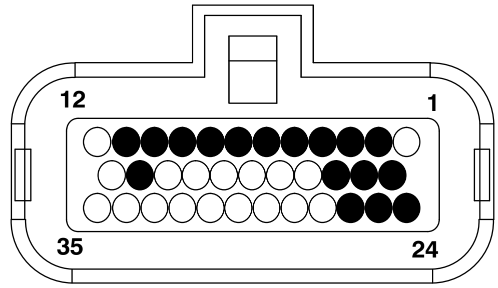
Component	Terminal
LIV–1	5
LB–H	7
FP+	8
SP–29	9
SS–A	12
PCM–26	13
PCM–27	14
PCM–23	15
SP–23	16
PCM–17	17
PCM–16	18
DAS Common (A)	19
PCM–9	23
PCM–28	28
DAS Open (B)	29
PCM–8	34
Unused terminals: 4, 5, 20, 21, 22, 24, 25, 26, 27, 30, 31, 32, 33 & 35	

1SVM – BLACK



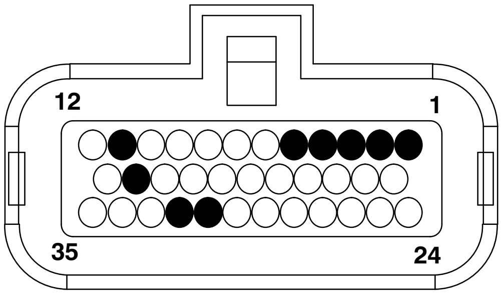
Component	Terminal
SP–15	1
ES–D	2
DM–1	3
ES–C	4
SP–13	5
SP–16	6
SP–14	7
DM–10	8
Unused terminals: None	

2SVM – BLUE



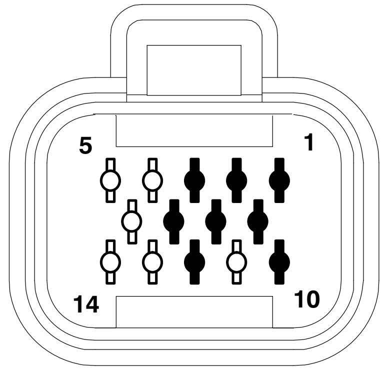
Component	Terminal
CSMV–A	2
CSMV–B	3
CSMV–C	4
CSMV–D	5
DP16–N	6
DP16–J	7
DP16–K	8
DP16–L	9
DP16–M	10
SP–17	11
DS–A	13
REM–A*	14
REM–C*	15
SP–18	22
DS–B	24
REM–B*	25
REM–D*	26
Unused terminals: 1, 12, 16 to 21, 23, 27 to 35	

3SVM – BLUE



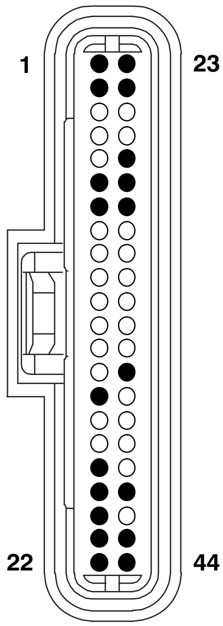
Component	Terminal
ECXV–E	1
ECXV–A	2
ECXV–B	3
ECXV–C	4
ECXV–D	5
SP–17	11
SP–18	22
3SVM–32	31
3SVM–31	32
Unused terminals: 6 to 10, 12 to 21, 23 to 30, 33, 34 & 35	

DM – BLACK



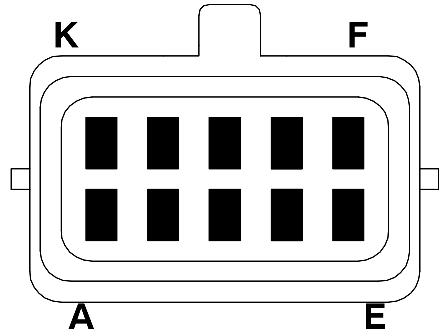
Component	Terminal
1SVM–3	1
ES–H	2
SATCOM–B	3
ES–G	6
J1–A	7
SATCOM–C	8
1SVM–8	10
SATCOM–A	12
Unused terminals: 4, 5, 9, 11, 13, 14	

ENCU



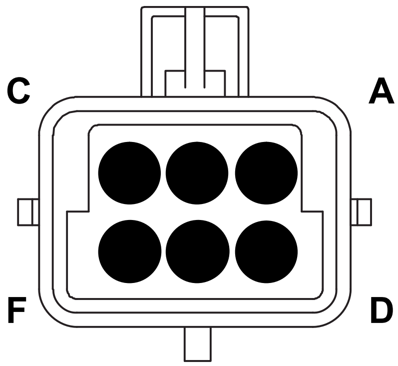
Component	Terminal
ENCT–B	1
ENSSN–2	2
ENCT–A	6
RPS–3	7
ENOPS–A	15
ENOPS–B	18
ENCU GND A	19
ENSSN–1	20
SM	21
SP–18	22
SP–13	23
SP–14	24
RPS–2	27
RPS–1	29
FSA–1	36
FSA–2	41
ENSSN–3	43
SP–29	44
Unused Terminals: 3–5, 8–14, 16, 17, 25, 26, 30–35, 37–40, 42	

HVB7



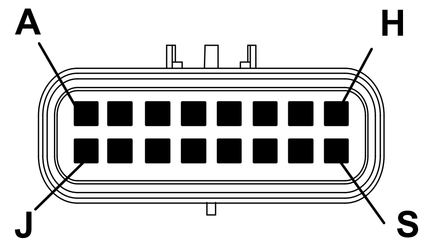
From	Terminal
SP–15	A
SP–16	B
1MM–2	C
1MM–4	D
PCM–10	E
PMC–15	F
SP–14	G
SP–13	H
SP–10	J
SP–23	K
Unused Terminals: None	

HVB8



From	Terminal
REM–E	A
REM–G	B
REM–J	C
SP–26	D
MTLV–A	E
MTLV–B	F
Unused Terminals: None	

DP16



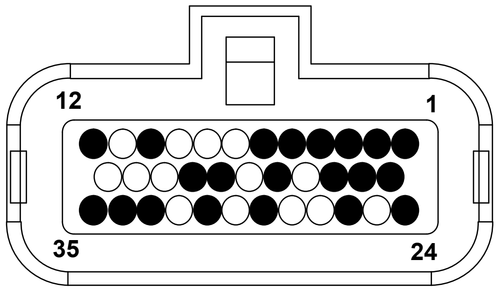
Engine Harness Connector Shown

From	Terminal	To (Evaporator Component)
2MM–22	A	1DTT–B
2MM–11	B	1DTT–A
2MM–5	C	1SAT–A
2MM–6	D	1SAT–B
2MM–7	E	EVOT–A
2MM–18	F	EVOT–B
2MM–3	G	1RAT–A
2MM–4	H	1RAT–B
2SVM–7	J	EVXV–A
2SVM–8	K	EVXV–B
2SVM–9	L	EVXV–C
2SVM–10	M	EVXV–D
2SVM–6	N	EVXV–E
2MM–25	P	EVOP–1
SP–20	R	EVOP–2
2MM–17	S	EVOP–3
Unused Terminals: None		

Splice Point No.	Component
SP−10 (Ground)	GND−RING1
	SATPWR−B
	LIV−2
	FP − (negative)
	LB−G
	FH−B
	AFAS−B
	ES−A
	HVB7−J
	MTLV−H
SP−13 (CAN HI)	1SVM−5
	HVB7−H
	ENCU−23
SP−14 (CAN LO)	1SVM−7
	HVB7−G
	ENCU−24
SP−15 (Ground)	1MM−3
	HVB7−A
	1SVM−1
SP−16 (Power)	1MM−8
	1SVM−6
	HVB7−B
SP−18 (Power)	PCM−34
	2SVM−22
	3SVM−22
	ENCU−22
	MTLV−G

Splice Point No.	Component
SP−20 (+5v Power)	CSP−2
	ECOP−2
	CDP−2
	DP16−R
SP−23 (Power)	HVB7−K
	HPS−A
	3MM−16
SP−24 (Power)	2MM−35
	HPS−B
	J1−B
SP−25 (Power)	FH−A
	PCM−14
	PCM−3
SP−26 (ground)	HVB8−D
	REM−F
	REM−H
	REM−K
SP−27 (MAP Ground − If Equipped)	ENCU−27
	MAP−1
	RPS−2
SP−28 (MAP Power − If Equipped)	ENCU−29
	MAP−2
	RPS−1

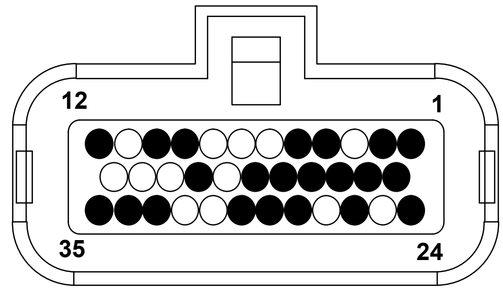
1CCB



Component	Terminal
HVB9−3	1
SP−60	2
SP−61	3
SP−52	4
HVB6−3	5
2CCB6	6
SP−59	10
SP−57	12
HVB9−2	13
SP−55	14
SP−51	15
HVB6−4	17
SP−64	19
CDCON2−A1	20
HVB9−1	24
SP−50	26
2CCB29	29
SP−56	31
CDCON1−A1	33
SP−58	34
SP−65	35
Unused terminals: 7, 8, 9, 11, 16, 18, 21, 22, 23, 25, 27, 28, 30, 32	

*Based on 22−04289

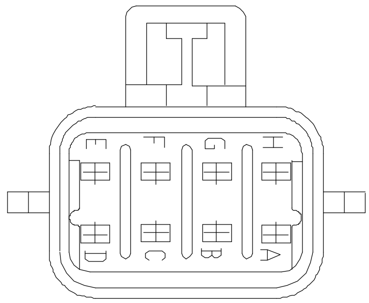
2CCB



Component	Terminal
SP−62	1
CCON−A1	2
SP−52	4
HVB6−8	5
HVB5−6	9
HVB5−3	10
SP−63	12
HTCON2−A1	13
SP−55	14
SP−51	15
HVB5−7	16
HVB6−7	17
2CCB−30	18
HVB5−5	20
HTCON1−A1	24
SP−50	26
HVB5−8	28
1CCB29	29
2CCB−18	30
HVB5−4	33
1EVCON−A1	34
SP−71A	35
Unused terminals: 7, 8, 9, 11, 16, 18, 21, 22, 23, 25, 27, 28, 32	

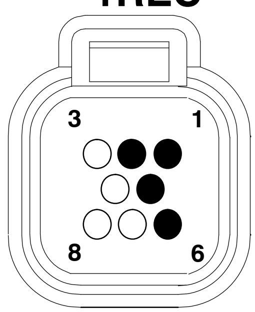
*Based on 22−04289

MTLV



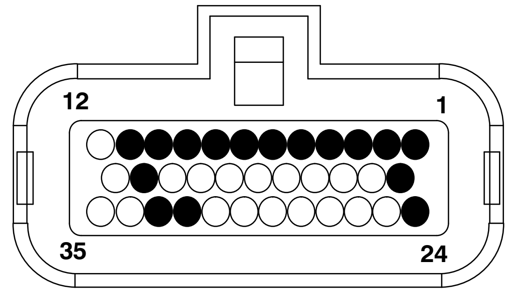
Component	Terminal
HVB8−E	A
HVB8−F	B
SP−30	C
PCM−20	D
PCM−33	E
PCM−4	F
SP−18	G
SP−10	H
Unused terminals: None	

1REC



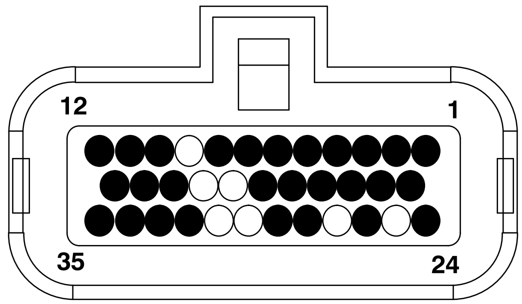
Component	Terminal
SP−101	1
3REC−6	2
3REC−29	4
SP−100	6
Unused terminals: 3, 4, 7, 8	

2REC



Component	Terminal
EVXV1−E	1
EVXV1−A	2
EVXV1−B	3
EVXV1−C	4
EVXV1−D	5
EVXV2−E	6
EVXV2−A	7
EVXV2−B	8
EVXV2−C	9
EVXV2−D	10
SP−102	11
RMT DS−A	13
C1−G	22
RMT DS−B	24
2REC−33	32
2REC−32	33
Unused terminals: 12, 14−21, 23, 25−31, 34, 35	

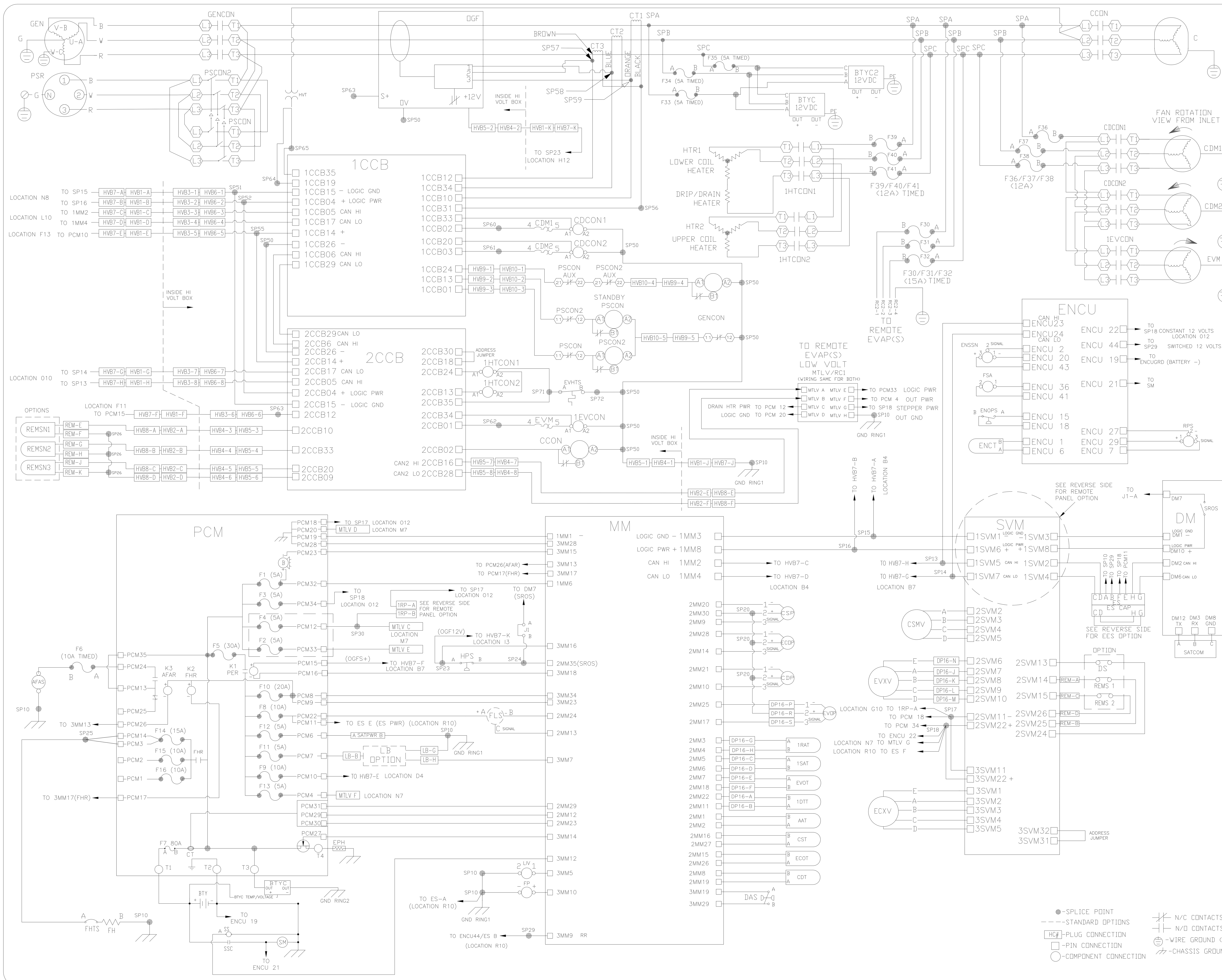
3REC



Component	Terminal
SP−110	1
RMT EVCON−A1	2
SP−108	3
SP−100	4
C1−A	5
1REC−2	6
3REC−18	7
RMT EVOP−2	8
RMT SAT−A	10
RMT EVOT1−B	11
RMT EVOT1−A	12
RMT HTCON2−A1	13
C1−F	14
SP−101	15
C1−J	16
C1−B	17
3REC−7	18
RMT SAT−B	21
RMT DTT−B	22
RMT EVOP−1	23
RMT HTCON2−A1	24
SP−102	26
C1−K	28
1REC−4	29
RMT RAT−B	32
RMT RAT−A	33
RMT DTT−A	34
RMT EVOP−3	35
Unused terminals: 9, 18−21, 25, 27, 30, 31	

10.2 Wiring Schematic

The wiring schematic is provided on the following page.



-SPLICE POINT
----STANDARD OPTIONS
HC# -PLUG CONNECTION
-PIN CONNECTION
-COMPONENT CONNECTION

N/C CONTACTS
N/O CONTACTS
-WIRE GROUND (PE)
-CHASSIS GROUND

ZONE	ACRONYM	DESCRIPTION
M14	AAT	AMBIENT AIR TEMP SENSOR
C12	AFAS	AUTO FRESH AIR RELAY (OPTION)
A12	AFAS	AUTO FRESH AIR SOLENOID (OPTION)
K7E10	B	BUZZER
D15	BTY	BATTERY
M2	BTYC	BATTERY CHARGER
N2	BTYC2	BATTERY CHARGER2 (OPTION)
S1	C	COMPRESSOR
F4	1CCB	1 CONTACTOR CONTROL BOARD
F6	2CCB	2 CONTACTOR CONTROL BOARD
R1,J8	CCON	COMPRESSOR CONTACTOR
M12	CDP	COMPRESSOR DISCHARGE PRESSURE SENSOR
M15	CDT	COMPRESSOR DISCHARGE TEMPERATURE SENSOR
J4,S4	CDCON1	CONDENSER MOTOR CONTACTOR1
J5,S5	CDCON2	CONDENSER MOTOR CONTACTOR2
T3	CDM1	CONDENSER MOTOR 1
T4	CDM2	CONDENSER MOTOR 2
O11	CSMV	COMPRESSOR SUCTION MODULATION VALVE
M11	CSP	COMPRESSOR SUCTION PRESSURE SENSOR
M14	CST	COMPRESSOR SUCTION TEMPERATURE SENSOR
D15	CT	DC CURRENT SENSOR
J2	CT1,2,3	AC CURRENT SENSOR
M15	DAS	DEFROST AIR SWITCH
S9	DM	DISPLAY MODULE
L13,P12	DP16	LOW VOLT IN-LINE CONNECTOR TO EVAP SECTION
R11	DS	DOOR SWITCH
M14	1DTT	DEFROST TEMPERATURE SENSOR
M11	ECOP	ECONOMIZER PRESSURE SENSOR
M15	ECOT	ECONOMIZER TEMPERATURE SENSOR
O14	ECXV	ECONOMIZER EXPANSION VALVE
R11	EES	ENGINE EMISSION SYSTEM
P8	ENCT	ENGINE COOLANT TEMPERATURE
P7	ENOPS	ENGINE OIL PRESSURE SWITCH
F14	EPH	ENGINE PRE HEATER
R6	ENCU	ENGINE CONTROL UNIT
P6	ENSSN	ENGINE SPEED SENSOR
R11	ES	ES CONNECTOR (EES OPTION)
R11	ES CAP	ES CONNECTOR JUMPER (EES OPTION)
J8,S5	1EVCON	1 EVAPORATOR FAN CONTACTOR
T5	EVM	EVAPORATOR FAN MOTOR
I7	EVHTS	EVAP HIGH TEMPERATURE SWITCH
N12	EVOP	EVAPORATOR OUTLET PRESSURE SENSOR
M13	EVOT	EVAPORATOR OUTLET TEMPERATURE SENSOR
O11	EVXV	EVAPORATOR EXPANSION VALVE
D10	F1	FUSE -5 AMP
D11	F2	FUSE -5 AMP (MT ONLY)
D10	F3	FUSE -5 AMP
D10	F4	FUSE -5 AMP (MT ONLY)
D11	F5	FUSE - POWER ENABLE 30 AMP
A11	F6	FUSE - 10 AMP TIME DELAY AFAX (OPTION)
C15	F7	FUSE - 80 AMP MAIN
D12	F8	FUSE - 10 AMP FLS\EES (OPTIONS)
D13	F9	FUSE - 10 AMP CONTROL BOX
D12	F10	FUSE - 20 AMP
D13	F11	FUSE - 5 AMP LIGHT BAR (OPTION)
D13	F12	FUSE - 5 AMP SAT POWER
D14	F13	FUSE - 5 AMP (MT ONLY)
C13	F14	FUSE - 15 AMP FUEL HEAT (OPTION)
P5	F30/31/32	FUSE - MULTI-TEMP 15AMP TIME DELAY
K2	F33/34/35	FUSE - BATTERY CHARGER(S) 5 AMP TIME DELAY
Q3	F36/37/38	FUSE - FANS 12 AMP TIME DELAY
O3	F39/40/41	FUSE - HEATERS 12 AMP TIME DELAY
B16	FH	FUEL HEATER
C12	FHR	FUEL HEATER RELAY
B16	FHTS	FUEL HEATER THERMOSTATIC SWITCH
H12	FLS	FUEL LEVEL SENSOR (OPTION)
I15	FP	FUEL PUMP (OPTION)
Q2	FSA	FUEL SOLENOID ACTUATOR
D1,J5	GENCON	GENERATOR CONTACTOR
A1	GEN	GENERATOR
G11	HPS	HIGH DISCHARGE PRESSURE SWITCH
H7,N4	1HTCON1	1 HEATER1 CONTACTOR
H7,N5	1HTCON2	1 HEATER2 CONTACTOR
L4	HTR1	HEATER 1
M5	HTR2	HEATER 2
D4,D7,K8, N9,I3	HVB1-HVB7	MATING LOW VOLT IN-LINE CONNECTORS (OUTSIDE HV BOX)
D8,H8	HVB2-HVB8	MATING LOW VOLT IN-LINE CONNECTORS (OUTSIDE HV BOX)
D4,D7	HVB3-HVB6	MATING LOW VOLT IN-LINE CONNECTORS (INSIDE HV BOX)
H2,D8,J8	HVB4-HVB5	MATING LOW VOLT IN-LINE CONNECTORS (INSIDE HV BOX)
H5,K5	HVB9-HVB10	MATING LOW VOLT IN-LINE CONNECTORS (INSIDE HV BOX)
E2	HVT	HIGH VOLTAGE TRANSFORMER
I5	IPCDM1,2	INTERNAL PROTECTORS CONDENSER FAN MOTORS
I7	IPEVM	INTERNAL PROTECTOR EVAPORATOR FAN MOTOR
G11	J1	OPTION CONNECTOR
G11	JUMPER (J1)	CONNECTOR JUMPER
F13	LB	LIGHT BAR (OPTION)
I15	LIV	LIQUID INJECTION VALVE
J10	MM	MAIN MICRO MODULE
N7	MTLV	LOW VOLT IN-LINE CONNECTOR TO REMOTE EVAPS
G2	OGF	OVERLOAD/GROUND FAULT MODULE
D10	PER	POWER ENABLE RELAY
D10	PCM	POWER CONTROL MODULE
D3,I7	PSCON	POWER SOURCE CONTACTOR
D2,I6	PSCON2	POWER SOURCE CONTACTOR 2
B8,R12	REM	REMOTE SENSOR (OPTIONS) CONNECTOR
R12	REMS1,2	REMOTE SWITCH 1,2
A8	REMSN1,2	REMOTE SENSOR 1,2
T8	RPS	RACK POSITION SENSOR
A2	PSR	STANDBY POWER PLUG
M13	1RAT	RETURN AIR TEMPERATURE
M13	1SAT	SUPPLT AIR TEMPERATURE
S11	SATCOM	SATELLITE COMMUNICATIONS CONNECTOR
F13	SATPWR	SATELLITE POWER (OPTION)
E16	SM	STARTER MOTOR
	SP__	- SPLICE POINTS, SEE LIST BELOW
I11	SROS	START/RUN-OFF SWITCH
D16	SS	STARTER SOLENOID
D16	SSC	STARTER SOLENOID CONTACTOR
Q10	SVM	STEPPER VALVE MODULE

SPLICE POINT LOCATIONS

ZONE	SP	ZONE	SP	ZONE	SP
H13,H15	SP10(GND)	B13	SP25	J1	SP57,58,59
A12,L8,N7,R10,C16		C8	SP26	H4	SP60,61
P10	SP13, SP14	I16	SP29	H7	SP62
N9	SP15, SP16	F11	SP30	E7,F2	SP63
O12	SP17, SP18	E4,G3,K4-8	SP50(GND)	E3	SP64,65
M11,M12	SP20(SENSOR 5V)	D4	SP51,52,55	I7	SP71,72
H11	SP23, SP24	K4	SP56		

NOTE:-

SP- NUMERIC LESS THAN 50,LOW VOLT LOCATED IN ENGINE HARNESS

SP- NUMERIC 50 OR GREATER, LOW VOLT LOCATED IN CONTROL BOX

SP-ALPHA HIGH VOLT

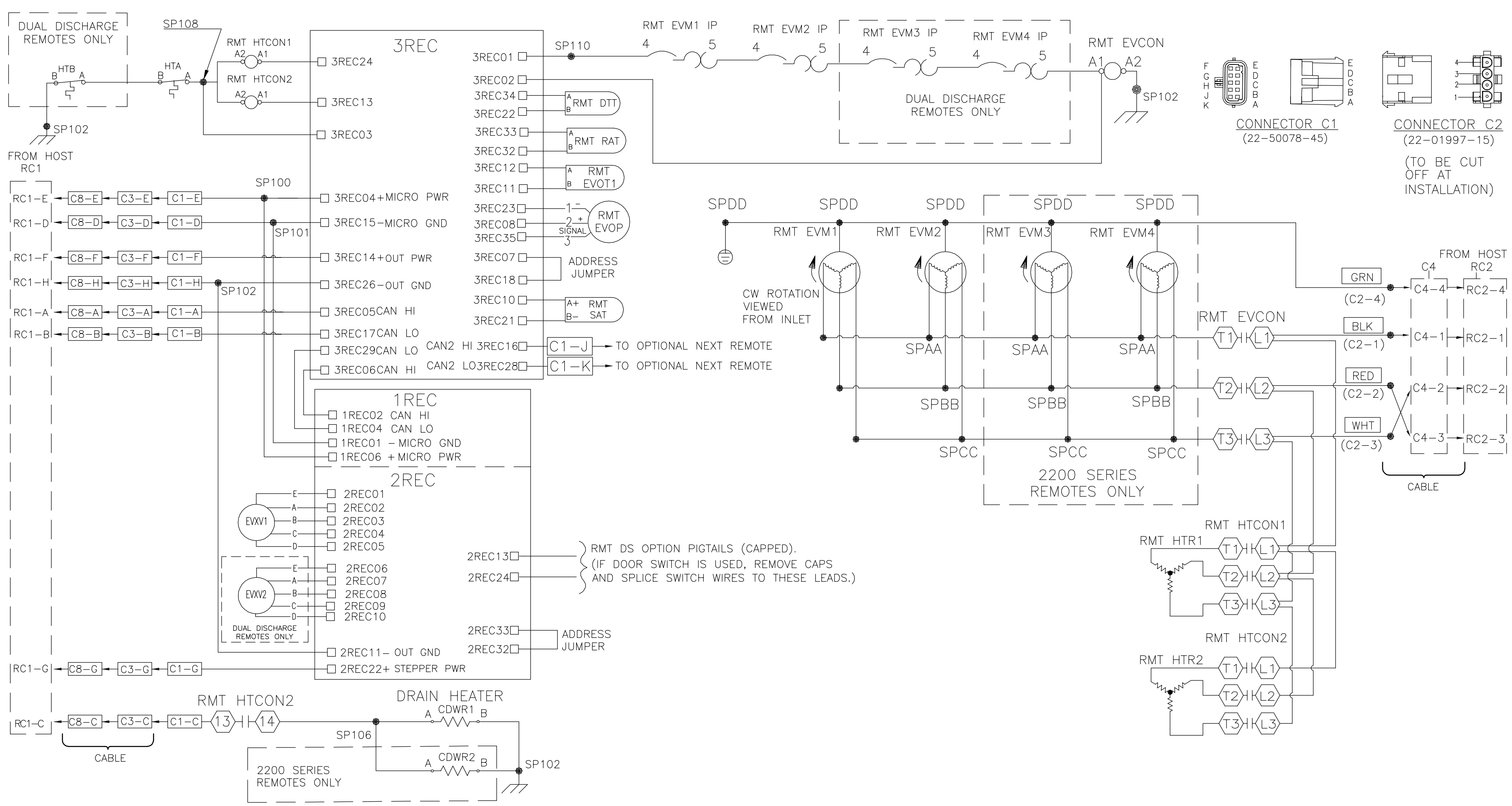
DECAL NO.	REV
62-11620-04	K

VECTOR 8600 APX

MULTI TEMP W/STBY

62-11620_ART7_S7_RK

WIRING DIAGRAM FOR MJS/MJD-1100/2200 REMOTE EVAPORATORS WITH APX CONTROLLER

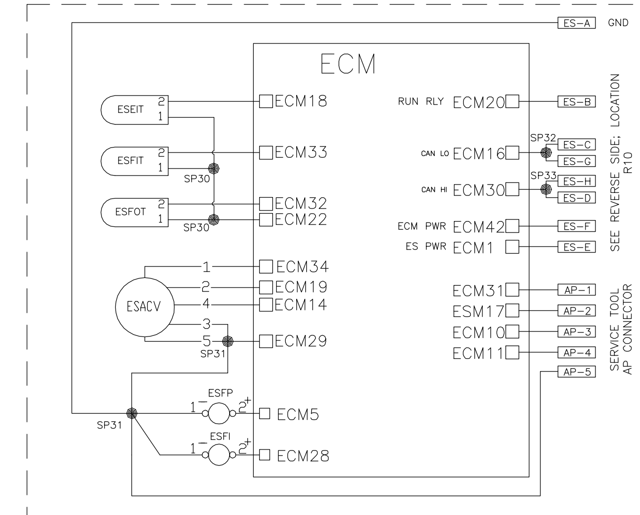


REMOTE EVAPORATOR CONNECTOR C1			TO
PIN	TERMINAL PATH	DESCRIPTION	
A	C1-A/3REC05	CAN HI	N/A
B	C1-B/3REC17	CAN LO	N/A
C	C1-C/RMT HTCON2-13	DRAIN HEATER PWR (+)	N/A
D	C1-D/SP101/3REC15 (& 1REC01)	MICRO GND (-)	N/A
E	C1-E/SP100/3REC04 (& 1REC06)	MICRO PWR (+)	N/A
F	C1-F/3REC14	OUT PWR (+)	N/A
G	C1-G/2REC22	STEPPER PWR (+)	N/A
H	C1-H/SP102/3REC26 (& 2REC11)	OUT GND (-)	N/A
J	C1-J/(OPT.)/C1-A ON NEXT REMOTE	CAN2 HI	NEXT REMOTE EVAP
K	C1-K/(OPT.)/C1-B ON NEXT REMOTE	CAN2 LO	NEXT REMOTE EVAP
	(SEE 62-11620)		

REMOTE EVAPORATOR CONNECTOR C2		
PIN	TERMINAL PATH	CABLE LEAD
1	C2-1/RMT EVCON-L1 (& RMT HTCON1-L1 & RMT HTCON2-L1)	BLK
2	C2-2/RMT EVCON-L2 (& RMT HTCON1-L2 & RMT HTCON2-L2)	RED
3	C2-3/RMT EVCON-L3 (& RMT HTCON1-L3 & RMT HTCON2-L3)	WHT
4	C2-4/SPDD/RMT EVM1 (& RMT EVM2 & RMT EVM3 & RMT EVM4)	GRN

ZONE	ACRONYM	DESCRIPTION
D5	1REC	REMOTE EVAPORATOR CONNECTOR 1
D6-D7	2REC	REMOTE EVAPORATOR CONNECTOR 2
F1-F5	3REC	REMOTE EVAPORATOR CONNECTOR 3
A3-A9,F4, N2	C1	REMOTE EVAPORATOR LOW VOLTAGE CONNECTOR
P2-P5	C2	REMOTE EVAPORATOR HIGH VOLTAGE CONNECTOR
E8	CDWR1	CONDENSATE DRAIN WIRE RESISTANCE HEATER 1
E9	CDWR2	CONDENSATE DRAIN WIRE RESISTANCE HEATER 2
C6	EVXV1	ELECTRONIC EXPANSION VALVE 1
C7	EVXV2	ELECTRONIC EXPANSION VALVE 2
B2	HTA	HIGH TEMERATURE SWITCH A
A2	HTB	HIGH TEMERATURE SWITCH B
H4,O4	GRN	PHYSICAL EARTH (GROUND)
A3-A9	RC1	REMOTE COMPARTMENT CONNECTOR 1
P3-P5	RC2	REMOTE COMPARTMENT CONNECTOR 2
F7	RMT DS	REMOTE DOOR SWITCH
G2	RMT DTT	REMOTE DEFROST TERMINATION THERMISTOR
L2,N4	RMT EVCON	REMOTE EVAPORATOR MOTOR CONTACTOR
I3	RMT EVM1	REMOTE EVAPORATOR FAN MOTOR 1
J3	RMT EVM2	REMOTE EVAPORATOR FAN MOTOR 2
K3	RMT EVM3	REMOTE EVAPORATOR FAN MOTOR 3
L3	RMT EVM4	REMOTE EVAPORATOR FAN MOTOR 4
G1	RMT EVM1 IP	REMOTE EVAPORATOR FAN MOTOR 1 INTERNAL PROTECTOR
H1	RMT EVM2 IP	REMOTE EVAPORATOR FAN MOTOR 2 INTERNAL PROTECTOR

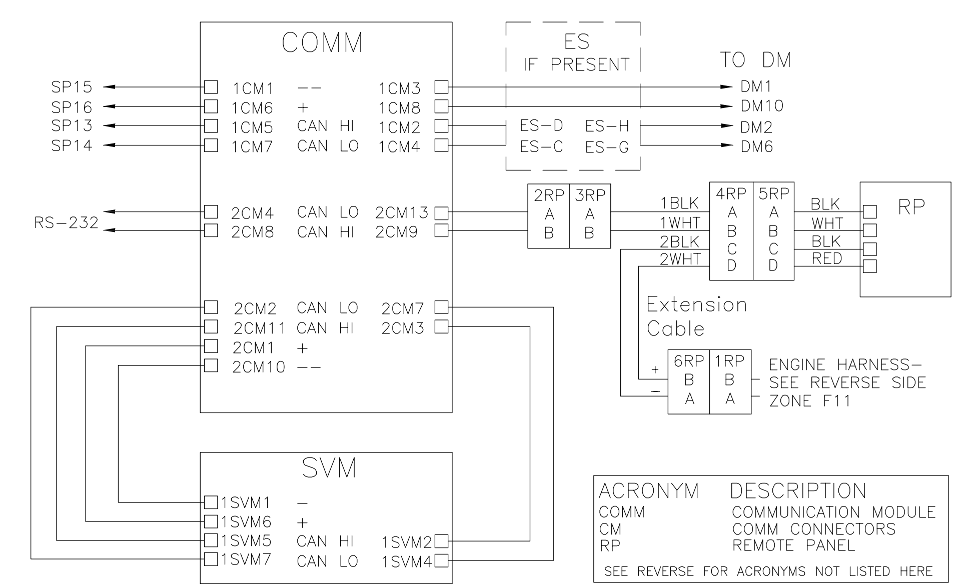
ZONE	ACRONYM	DESCRIPTION
J1	RMT EVM3 IP	REMOTE EVAPORATOR FAN MOTOR 3 INTERNAL PROTECTOR
K1	RMT EVM4 IP	REMOTE EVAPORATOR FAN MOTOR 4 INTERNAL PROTECTOR
G3	RMT EVOP	REMOTE EVAPORATOR OUTLET PRESSURE SENSOR
G3	RMT EVOT1	REMOTE EVAPORATOR OUTLET TEMPERATURE SENSOR 1
C1,M6	RMT HTCON1	REMOTE HEATER 1 CONTACTOR
C2,C8, M8	RMT HTCON2	REMOTE HEATER 2 CONTACTOR
L7	RMT HTR1	REMOTE HEATER 1
L8	RMT HTR2	REMOTE HEATER 2
G2	RMT RAT	REMOTE RETURN AIR SENSOR
G4	RMT SAT	REMOTE SUPPLY AIR SENSOR
C3	SP100	SPLICE POINT 100
C3	SP101	SPLICE POINT 101
A2,C4, F9,L2	SP102	SPLICE POINT 102
E9	SP106	SPLICE POINT 106
B2	SP108	SPLICE POINT 108
F1	SP110	SPLICE POINT 110
J4-L4	SPAA	SPLICE POINT AA
J5-L5	SPBB	SPLICE POINT BB
J5-L5	SPCC	SPLICE POINT CC
H3-L3	SPDD	SPLICE POINT DD



EES (ENGINE EMISSIONS SYSTEM) OPTION

ACRONYM	DESCRIPTION
AP	ADVANCED PANEL (SERVICE CONNECTION, CAPPED)
ECM	EMISSIONS (SYSTEM) CONTROL MODULE
EES	ENGINE EMISSIONS SYSTEM
ES	EMISSIONS SYSTEM (ESS TO ENGINE)
ESACV	EMISSIONS SYSTEM AIR CONTROL VALVE
ESEIT	EMISSIONS SYSTEM EXHAUST INLET TEMPERATURE
ESFIT	EMISSIONS SYSTEM FILTER INLET TEMPERATURE
ESFOT	EMISSIONS SYSTEM FILTER OUTLET TEMPERATURE
ESFP	EMISSIONS SYSTEM FUEL PUMP
ESFI	EMISSIONS SYSTEM FUEL INJECTOR

NOTE: THE 1CM CONNECTOR WAS ORIGINALLY INSTALLED AT THE 1SVM LOCATION ON STEPPER MODULE; SO WIRES ARE MARKED FOR THE 1SVM CONNECTOR. EXAMPLE: WIRE TO 1CM1 IS MARKED "1SVM1", ETC.



ACRONYM	DESCRIPTION
COMM	COMMUNICATION MODULE
CM	COMM CONNECTORS
RP	REMOTE PANEL
SEE REVERSE FOR ACRONYMS NOT LISTED HERE	

REMOTE PANEL OPTION

●-SPLICE POINT
----STANDARD OPTIONS
□-PIN CONNECTION
○-COMPONENT CONNECTION
-N/C CONTACTS
-N/O CONTACTS
-WIRE GROUND (PE)
-CHASSIS GROUND

NOTE:-
SP- NUMERIC LESS THAN 50,LOW VOLT LOCATED IN ENGINE HARNESS
SP- NUMERIC GREATER THAN 50,LOW VOLT LOCATED IN CONTROL BOX
SP- NUMERIC GREATER THAN 100,LOW VOLT LOCATED IN REMOTE EVAPORATOR
SP-ALPHA HIGH VOLT

DECAL NO.	REV
62-11620-04	G
VECTOR 8600 MT REMOTE EVAPORATOR W/APX	

62-11620_ART6_S6_RG

WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information, go to www.P65warnings.ca.gov/diesel

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