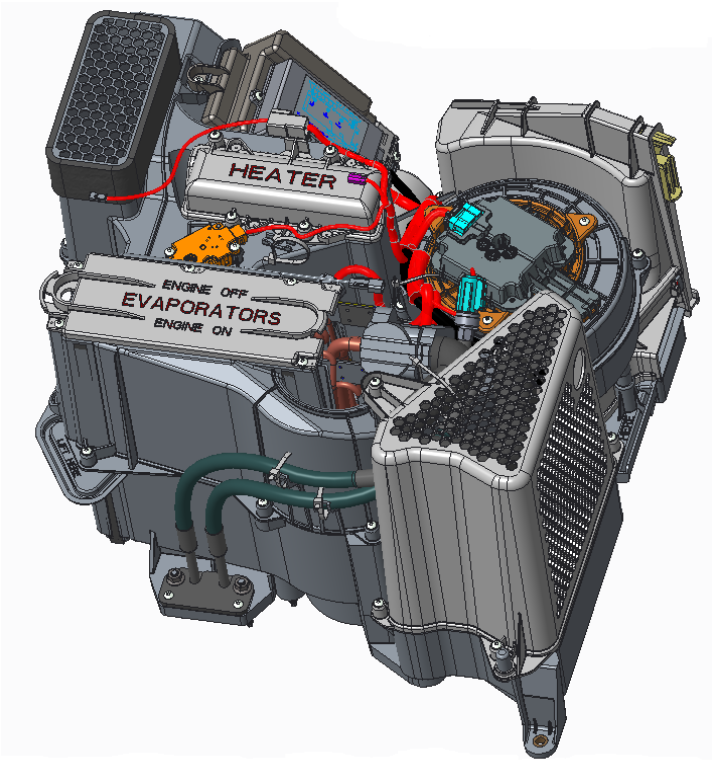
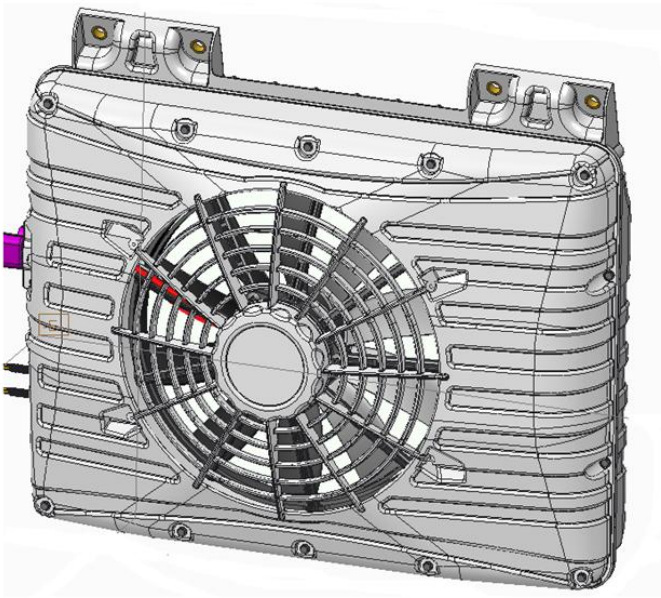
DTNA BPHS - Battery Powered HVAC System

Service Manual

Updated: 5/27/2026





Note (Not applicable for hard copies):

1. Phrases in blue are “**hyperlinks**” that allow user to jump directly to the respective section. Hold “**ctrl**” and click the link to use.
2. All section titles are “**hyperlinks**” allowing the user to jump back to the top of the document.

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Disclaimer

Attention!

Before proceeding with any diagnostics, please read the manual thoroughly and, if needed, contact Bergstrom support (Contact Info HERE). Modifying or servicing the unit could void the warranty.

Technicians are responsible for verifying that all batteries are in good condition and are properly charged. Do not proceed with any diagnostics without checking batteries and connections first!

Refer to OEM PowerNet diagnostics. This will test the entire PowerNet system, battery, cables, starter, and alternator.

Descriptions and specifications within this manual were in effect at the time of production. Models and specifications are subject to change.

Servicing system components require specific instructions and when applicable will include individual torque requirements for fasteners.
Please refer to the instruction sheets provided with replacement parts.
Also see specification list.

Communication

The front HVAC control unit, auxiliary control unit, and the BPHS internal control unit communicate through Cabin Can. The front HVAC control unit uses source address (SA) 25 and the auxiliary control unit uses SA 69. The internal BPHS controller uses SA 58. The messaging communicated is used for operation, diagnostics, and data used to monitor the system with DiagnosticLink 8.07 or later.

Warning!

The technical information provided in this service guide is intended for use by properly trained HVAC service personnel, who can ensure a safe and properly operating system. It is assumed that the user of this guide is trained and experienced in basic refrigeration principles, in addition to being familiar with Bergstrom NITE systems. Technicians who repair or service motor vehicle A/C systems must be certified by Section 609 (MACS) approved by the EPA.

Before any air conditioning service is started, it is the technician's responsibility to determine what type of refrigerant is contained in the system. Component marking and/or service port peculiarities are good places to start to identify the contents.

Bergstrom advises that the usual precautions associated with servicing a motor vehicle are exercised when servicing the HVAC system and assumes no liability regarding vehicle damage or personal injury. Additionally, Federal and any Local regulations regarding the handling and use of refrigerants should be always complied with.

Service

NOTES:

TECHNICAL SUPPORT IS PROVIDED TO CERTIFIED TECHNICIANS ONLY.

THE AIR CONDITIONING SYSTEM CONTAINS REFRIGERANT R134A or 1234YF, UNDER HIGH PRESSURE, AND SHOULD BE SERVICED BY ONLY QUALIFIED PERSONNEL.

REPAIRS ALTERING THE DESIGN OF THE BERGSTROM SYSTEM, INCLUDING USE OF NON-BERGSTROM SUPPLIED PARTS, WILL VOID THE WARRANTY AND ANY BERGSTROM LIABILITY FOR THE HVAC SYSTEM.

THE BERGSTROM HVAC SYSTEM SHOULD BE SERVICED BY A FULLY TRAINED AND ENVIRONMENTALLY LICENSED TECHNICIAN. FAILURE TO AGREE TO ALL STATEMENTS COULD RESULT IN SERIOUS INJURIES, FINES AND POSSIBLE VOIDING OF ANY WARRANTIES.

TECHNICIANS ARE RESPONSIBLE FOR VEIFYING ALL TRUCK BATTERIES AND AUXILIARY SYSTEM BATTERIES ARE IN GOOD CONDITION AND ARE PROPERLY CHARGED. DO NOT PROCEED WITH ANY DIAGNOSTICS WITHOUT CHECKED BATTERIES AND CONNECTIONS.

Safety Precautions & Warnings

Installation, service, and repair of these units should be solicited only by trained service technicians who are acquainted with standard service instructions and training material.

All equipment should be installed in accordance with accepted principles and unit installation instructions. Extreme caution should be observed when troubleshooting electrical components. These messages are for your protection and information. Failure to follow these alerted messages may cause bodily injuries to yourself and/or others as well as damage to the specified unit.

Health, Safety, and Environmental Policy

Under any condition Bergstrom Inc. is committed to protecting the health and safety of all working individuals at or visiting our site. We strategize, administer, conduct, and supervise our efforts in agreement with best practice. Hence, we want to ensure all workers have a clear understanding of their accountability with that of the company.

Environmental Concerns

Public awareness of and education about the benefits of using green technologies, coupled with energy efficiency, has created renewed interest within the HVAC industry.

When materials are discarded, attempt to reclaim and recycle them. To preserve our environment, follow appropriate rules and regulations when disposing of any resources. It is our obligation to put in place a series of practices and procedures that, when taken together, result in an environmental management system.

Service

Important Safety Notices

Servicing Refrigerant Systems:

1. Always wear the proper protective eyewear and clothing before working on any refrigeration system. Remember, refrigerant in the air conditioning system can reach pressures of over 500 PSI – if one of those lines bursts while you're working on the system, it can cause serious injury. If refrigerant gets in your eye, it can freeze your eyeball, causing permanent damage or blindness.

2. Always wear work gloves whenever you're working with condensers or evaporators. The aluminum edges are sharp and can cause serious cuts.

3. Always stay clear of the belts and fan blade and be careful revving the engine on a vehicle with a flex fan – damaged blades have been known to come flying off without a moment's warning.

4. Always use a DOT-approved tank for storing used and recycled refrigerants. Look for the Department of Transportation stamp: DOT 4BW or DOT 4BA.

5. Always provide plenty of ventilation when using any electrical testing, recycling, or recovery equipment. Avoid breathing any refrigerant vapor, lubricant vapor, or mist. Exposure to these (particularly PAG oil mist) may irritate your eyes, nose, and throat.

6. Always follow the instructions for your recycling equipment; failure to follow those directions could end up causing personal injury or damaging your equipment. Never perform any maintenance or service on your recycling equipment while the unit is plugged in (unless directed to do so) or without first consulting with authorized service personnel. Removing internal fittings and filters can release pressurized refrigerant. Use care and always wear appropriate safety wear.

7. Never use compressed air to leak test or pressure test an R-134a/1234yf system or service equipment. Under certain conditions, pressurized mixtures of R-134a/1234yf and air can be combustible. Always follow the proper procedures to prevent any safety hazards. In addition, shop air injects moisture into the system, and a pressure surge could damage the evaporator.

8. Microprocessors and computers are susceptible to damage from electrostatic discharge. Always use a static strap when working with these components and always take the necessary precautions to prevent damage to electronic components.

Note: To prevent cross contamination between refrigerants, verify that the A/C system has the correct label and unique service fittings designed for R134a/1234yf refrigerant. If you're ever in doubt, check the system with a refrigerant identifier.

Service

Contact Information

2390 Blackhawk Road
Rockford, IL 61109
USA

Contact	Phone	E-Mail
Technical Support	866 204 8570	producttechsupport@bergstrominc.com
Customer Service	800 499 6849	customerservice@bergstrominc.com
Parts	800 499 6849	parts@bergstrominc.com

Main Website

bergstrominc.com/us/

NOTE: If you are looking for installation instructions, refer to the installation manual. It can be found here:

https://bergstrominc.com/us/manuals-and-support-installation-manuals/

Service

Request for Technical Support Questionnaire

DESCRIPTION OF COMPLAINT:

_____

_____

_____

DEALER:

_____

CONTACT/TECH:_____PHONE #:

_____

CHASSIS:_____MODEL YR:_____MODEL:

_____

VEHICLE MANUFACTURER: _____

PRESSURE GAUGE READINGS:

LOW_____PSIG @ HIGH BLOWER SPEED

HIGH_____PSIG @ HIGH BLOWER SPEED

AIR TEMPERATURE & HUMIDITY READINGS:

HUMIDITY LEVEL:_____%RH

RECIRCULATION INLET AIR TEMPERATURE:_____ºF

DISCHARGE AIR TEMPERATURE (VENT CLOSEST TO BASE UNIT):_____ºF

SUBTRACT THE TWO AIR TEMPERATURES =_____ºF DIFFERENTIAL

Service

Comments

Battery Powered HVAC System

System Summary

Freightliner's proprietary Dual HVAC no-idle system for the Cascadia® Class 8 truck creates the ideal sleeper climate. With an innovative battery-powered HVAC system that fits seamlessly under the cabinet, the engine no longer needs to be idling to heat or cool your sleeper. The system also helps keep the operating costs down while your sleeper stays comfortable. The fully integrated system provides heat or AC while the truck is running, just like the traditional auxiliary HVAC system. However, when the truck is parked/engine off, the AC system will maintain a comfortable sleeper climate for up to 10 hours*. Additionally, fuel operated heater can maintain the sleeper climate for 34+ hours. This heater circulates engine coolant through the auxiliary heater core and truck engine.

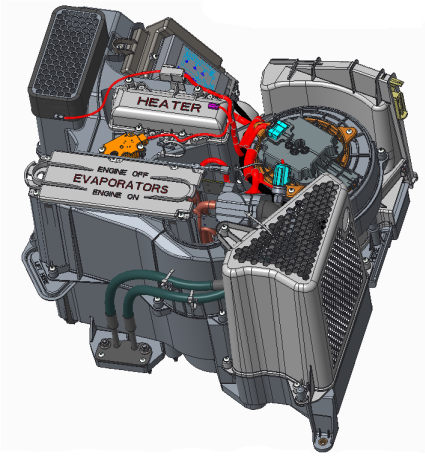
Technical Specifications

Meets TMC Recommended Practices (RP) 432A

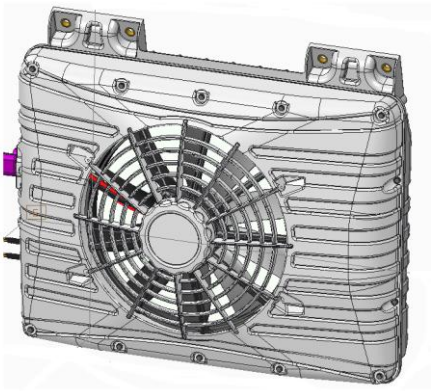
- This RP offers guidelines for performance requirments of engine-off HVAC systems for sleeper cabs
  - Factory installed curtains closed
  - Initial sleeper temperatuyre 73 +/- 5 deg F
  - 100 deg F ambient outside temperature
  - 50% relative humidity
  - 600 W/m^2 solar load on vehicle roof

Weights & Dimensions

Inside Evaporator Unit
- 54.5 lbs. (24,7 kg)
- 21.5" x 23.1" x 13.1"
(547mm x 587mm x 333mm)



Outside Condenser Unit
- 17.5 lbs. (7,9 kg)
- 39.6" x 10" x 15"
(1005mm x 254mm x 381mm)



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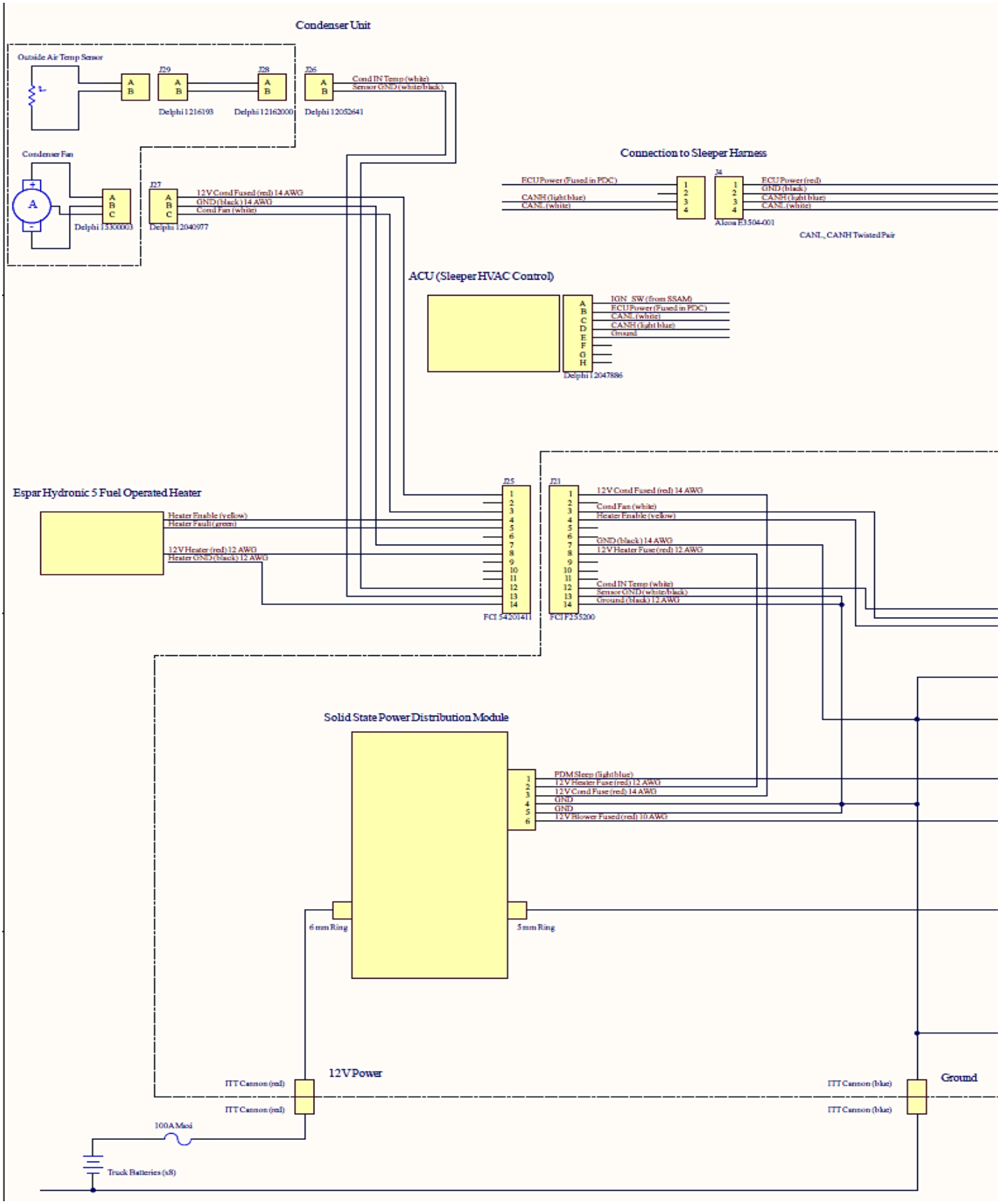
Battery Powered HVAC System

Electrical Schematics



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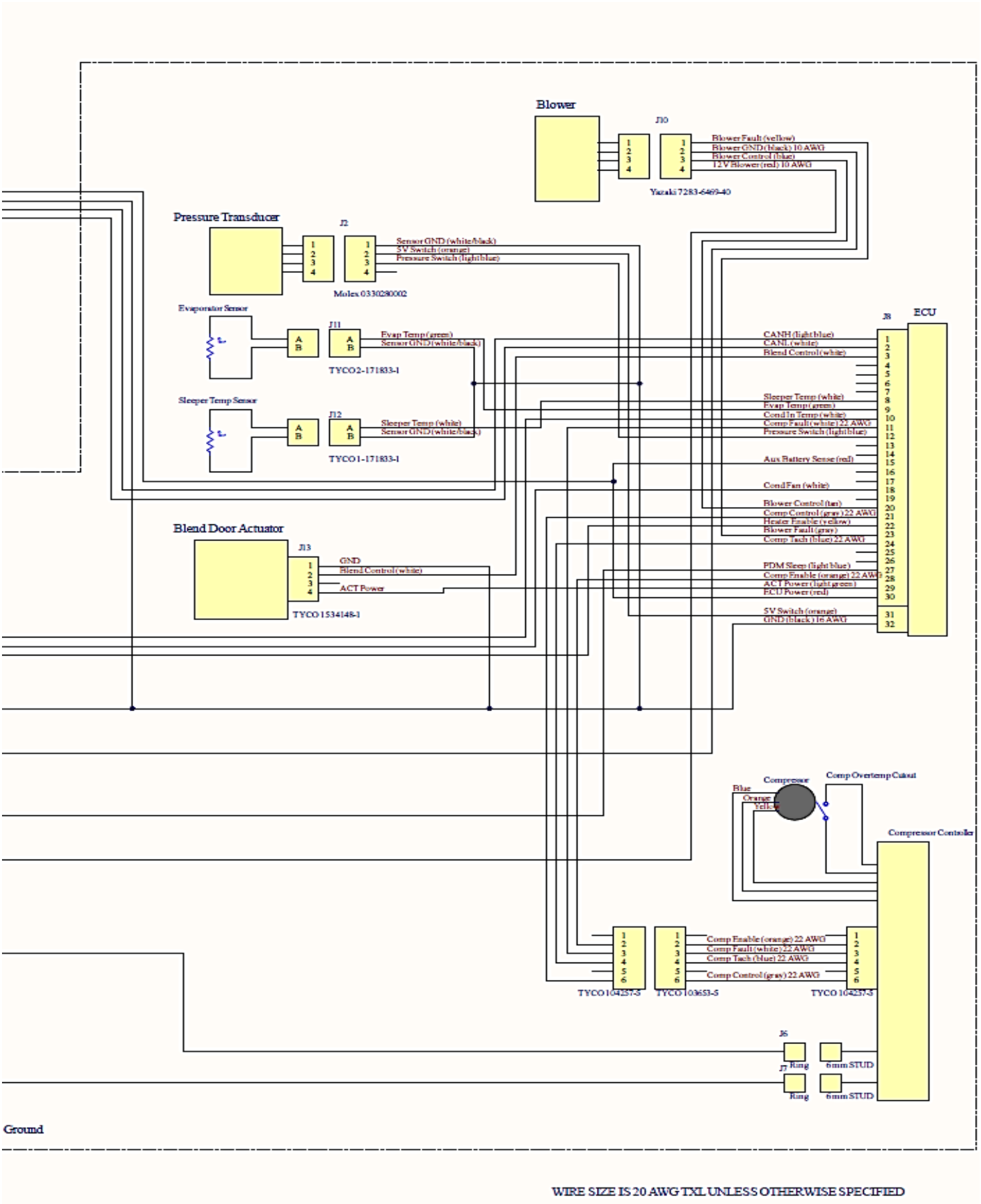
Battery Powered HVAC System



WIRE SIZE IS 20 AWG TXL UNLESS OTHERWISE SPECIFIED

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Battery Powered HVAC System

System Controller Pinout Chart

Pin	Circuit ID	Wire Color	Function	Typical Voltage	Other End of Circuit
1	CANH	Yellow	CAN bus	2.5V+	Cabin CAN
2	CANL	Green	CAN bus	2.5V-	Cabin CAN
3	Blend CTL	White	LIN Control for actuator	0-12V serial signal	Actuator
4	N/C				
5	N/C				
6	N/C				
7	N/C				
8	SLPR TEMP	White	Sleeper Temperature	1.5V-4V	Sleeper Temp Sensor (In Sleeper Control Panel)
9	FREEZE	Green	Evaporator Freeze Protection	1.5V-4V	Freeze Sensor
10	COND IN TEMP	White	Outside Air Temperature	1.5V-4V	Condenser Temp Sensor
11	COMP FAULT	White	Compressor Controller Fault	<1V (no fault) 5V (Fault Present)	Compressor Controller
12	PRESS SW	Lt. Blue	Liquid Line Refrigerant Pressure	0-5V	Pressure Transducer
13	N/C				
14	N/C				
15	BATT SENSE	Red	Supply Voltage Sense	Supply Voltage to NITE ECU	ACU Fuse (PDC)
16	N/C				
17	N/C				
18	COND SIG	White	Condenser PWM Control Signal	<0.5V (Off)	Condenser
19	N/C				
20	BLWR CTL	Blue	Blower PDM Control Signal	2.4V-7V	Blower Motor
21	COMP SPD	Grey	Compressor Speed Control Signal	<0.6V (Compressor Off) 1-4V (Compressor On	Compressor Controller
22	HTR ENABLE	Yellow	Enables Espar Heater Operation	<1V (Heater Off) >11V (Heater on)	Underfloor Connector to Espar Heater
23	BLWR TACH	Yellow	Tach Signal from Blower	0-5V (Pulses)	Blower Motor
24	COMP TACH	Blue	Tach Signal	0-5V (Pulses)	Compressor Controller
25	N/C				
26	N/C				
27	PDM WAKE	Lt. Blue	PDM Wake Up Signal	12V (Power Off) <1 (Power On)	PDM
28	COMP ENABLE	White	Compressor Controller Logic Circuit Power	<1V (Compressor Off) >11 (Compressor On)	Compressor Controller
29	ACT PWR	Green	Power For Blend Door Actuator	<1V (Unit Off) >11V (Unit On)	Blend Door Actuator
30	CTL FUSED	Red	Power for ECU	Battery Voltage	ACU Fuse (PDC)
31	5V	Red	5V Power for Pressure Transducer	4.8-5.2V	Pressure Transducer
32	GOUND	Black	Ground for ECU	Ground	Harness Ground Splice

Battery Powered HVAC System

Fault Code Chart

Hex DTC Number	Suspect Parameter Number	Failure Mode ID #	Error Text	Failure Mode
0X0B0604	1547	4	Evaporator Sensor - Shorted to ground	Voltage below normal or shorted to low source
0X0B0605	1547	5	Evaporator Sensor - Shorted to battery or open circuit	Current below normal or open circuit
0X0C0603	1548	3	COTC Sensor - Voltage above normal or shorted to high source.	Voltage above normal or shorted to high source
0X0C0604	1548	4	COTC Sensor - Shorted to ground	Voltage below normal or shorted to low source
0X36FCE2	523318	2	PCU Blower - Over/Under voltage	Data erratic, intermittent or incorrect
0X36FCE7	523318	7	PCU Blower - Locked rotor	Mechanical system not responding or out of adjustment
0X36FCFF	523318	31	PCU blower - Over temperature	Condition exists
0X44FCEB	523332	11	Temp Blend Door Actuator - Internal fault	Root cause not known
0X6C0303	876	3	PCU Condenser in temp - Shorted to battery or open circuit	Voltage above normal or shorted to high source
0X6C0304	876	4	PCU Condenser in Temp - Shorted to ground	Voltage below normal or shorted to low source
0XBAFCEB	523450	11	PCU Compressor - Internal fault	Root cause not known
0XVCFCE0	523452	0	PCU High Side Pressure Sensor - Pressure high	Data valid but above normal operational range - Most service level
0XBCFCE1	523452	1	PCU High Side Pressure Sensor - Pressure low	Data valid but below normal operational range - Most service level
0XBCFCE3	523452	3	PCU High Side Pressure Sensor - Open or shorted high	Voltage above normal or shorted to high source
0XBCFCE4	523452	4	PCU High Side Pressure Sensor – Shorted to ground	Voltage below normal or shorted to low source
0XC0FCE4	523456	4	Heater Enable - Shorted to ground	Voltage below normal or shorted to low source

Battery Powered HVAC System

A/C Diagnostics Guide

Items listed are possible causes and are not intended to be followed as exact steps. Many items should be confirmed using Diagnostic Link!

Problem	Possible Cause	Corrective Action
Unit Will Not Turn On	Loose connection	Confirm all connections are tight, including ground lugs, wires, and battery cables.
	No power available	Check batteries for voltage. Low voltage cut out through cabin CAN and is approx. 12.1 V. Refer to Power Net Diagnostics to confirm voltages.
	Blown 100-amp fuse	Check 100-amp fuse for continuity and/or voltage and 12-volt input on PDM – power dist. module.
	Loss of power to aux control panel & PCB from VPDM fuse 27 or defective aux control panel.	Check for 12 volts and ground at aux control panel and system control.
	CAN bus communication WAKE UP	Check wake up signal using Diagnostic Link. Wake up is on cabin CAN. Refer to system control.
	Control PCB assembly defective.	Test system control PCB assembly.
	Park switch defective or wrong logics.	Check park brake message on Diagnostic Link.
	No 12V to pin 15 battery sense.	Check 12V power from VPDM fuse 27 to pin 15 on PCB assembly. Refer to pinout chart.
	Broken wire or defective wire harness	Inspect all wiring and harness connections
	PARK button illuminates for a couple of seconds, but unit does not run.	Check for loss of communication on cabin CAN.

Battery Powered HVAC System

Unit Will Not Run – PARKED LIGHT- BLINKS	Check Aux control parameters or chassis LVD.	Incorrect parameters in aux control panel / possible sleeper LVD has been reached - see DTNA aux control panel documents.
Unit Will Not Run – PARKED LIGHT Turns On	PDM locked up	Disconnect each device – reset the PDM – retry operation.
Unit runs in parked mode but not engine running mode.	Truck communication	Inspect all wiring and harness connections, including cabin CAN.
Unit runs in Engine On mode, but not Engine Off	Low batteries	Check batteries.
	Park brake signal	Park brake switch defective, wiring harness issue, or wrong switch logics.
	Wake up signal	Loss of wake-up signal. Check aux control panel and control PCB assy.
	Wiring harness	Check wiring harness connectors and physical condition.
Front HVAC system runs in optimized idle	Cabin CAN	Front unit disable is through cabin CAN. Check Diagnostic Link.
Parked - Unit Runs - But Does Not Blow Cold Air CHECK DIAGNOSTIC LINK Refer to OEM manual for additional information.	Check Diagnostic Link for faults (Examples)	See fault code list for complete listing. Refer to PDM troubleshooting.
	Ambient outside air temperature	
	Evaporator temperature / freeze switch. Sleeper Temperature	
	Refrigerant pressure binary switch	
	Evaporator airflow blockage	Clear any blockage from recirculation filter, grill, and louvers.
	Check Sensors	Check evaporator sleeper and ambient air sensors. Refer to PDM.
	Thermal expansion valve	Blockage in TXV.
	Overcharged refrigerant system	Overcharged system. Refer to pressure transducer and refrigerant charge information.

Battery Powered HVAC System

	Condenser fan or coil blocked	Check condenser fan inlet and outlet for restriction (outside behind sleeper). Refer to condenser fan.
	Condenser fan power & speed signal	Confirm power and signal at fan motor. Refer to condenser fan and wiring diagram.
	Battery power - PDM to condenser fan	Confirm battery output from PDM.
	Evaporator blower power and signal.	Check Evaporator blower power and speed signal at motor. Refer to evaporator blower.
	Evaporator blower power from PDM	Check Evaporator blower power from PDM module. Refer to PDM.
Parked - Unit Runs - But Does Not Blow Cold Air CHECK DIAGNOSTIC LINK Refer to OEM manual for additional information.	Blend door position.	Check blend door operation.
	Compressor thermal switch.	Check thermal switch.
	High side pressure transducer	Check pressure transducer. Refer to fault codes.
	Loss of charge. (Refrigerant system is serviceable)	If all tests check OK, a loss of charge may have occurred. Check for pressure switch fault. Follow Freightliner service instructions.
	Defective compressor	If all above items are ok and power is detected at the compressor, but it does not operate, the system refrigeration compressor and dryer must be replaced. See Freightliner service instructions.
Unit Cycles On and Off	Poor electrical connection.	Check all electrical connections.
	Condenser fan inoperative.	Check condenser fan.
	Air flow blockage causing high pressure or freeze condition.	Check for restricted airflow at condenser inlet and outlet and at louvers and recirculation filter. Check pressure transducer and/or freeze switch.
	Condenser coil blocked	Check for blockage/ clean coil.
Unit Blows Cold Air, But Low Airflow	Check all duct work connections.	Make sure all ducts are connected, sealed, and secure.

Battery Powered HVAC System

	Evaporator coil or filter blocked	Check for airflow at louvers, replace, or clean return air filter
	Evaporator blower motor	Check evaporator blower motor.
Unit Runs Correctly, But Less Than Expected Run Time	Ground terminal(s).	Inspect and tighten ALL connections.
	Batteries weak, not charged correctly.	Check battery condition / state of charge.
	High amperage draw.	Use DC ammeter to check amps when running. Excessive amperage could signal compressor or internal component issue. Amperage ranges 40A to 75A depending on conditions.
	NON-AGM BATTERIES	Non-AGM batteries in any location will greatly reduce run.
Unit is Noisy or Vibrates	Evaporator Blower motor.	Check evaporator blower.
	Condenser fan motor.	Check condenser fan.
	Compressor mounting.	Check rubber compressor mounts.
Unit runs but does not blow hot air	**NOTE: Truck may have an optional Espar AIRTRONIC heater installed. BPHS does not control an AIRTRONIC heater. See Espar controller for operation.**	
	Heater power and ground	Check for power to PDM.
	Heater fuse	Check for power from PDM pin 2.
	Wiring harness	Check wiring harness connectors and physical condition.
	Heater enable signal	Check heater enable 12V at heater pin 7 from PCB pin 22.
	Blend Door	Refer to blend door actuator.
	Park switch	Incorrect Park brake switch will prevent heater from operating.

TRUCK MUST BE IN PARKED MODE TO PERFORM DIAGNOSTIC TESTS!

Note: Heater diagnostics can be performed using Espar's EDITH diagnostics laptop-based program. You must have the ISO cable adapter for the Espar Hydronic heater. Rev 3-4B use the proprietary 4 wire adapter/Rev 5 uses the 8-pin adapter.

If a problem still exists, please contact Bergstrom

Internal/External Components

Battery Condition and Performance

Battery Voltage is critical for system operation. The BPHS has a Low Voltage Disconnect (LVD) of approximately 12.1 volts.

Special attention should be given to both sets of batteries. Follow Freightliner PowerNet assessment guidelines to diagnose battery condition and performance.

Poor quality batteries or a weak alternator will have a negative impact on BPHS unit run time. Always maintain the best possible AGM batteries and charging system.

BPHS Alternator - 270 Amp.

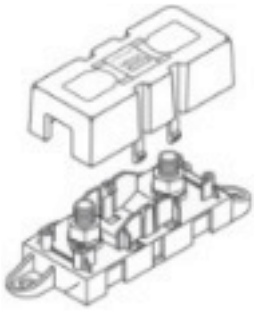
Load test and maintain batteries as required by the manufacturer.

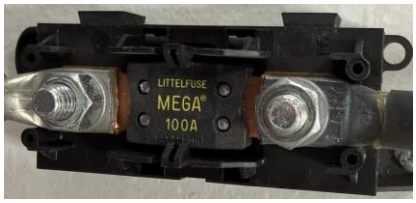
Fuses

Fuse 100 Amp

This fuse provides protection for the main battery power to the BPHS unit.

This fuse is located in the battery box.





Internal/External Components

Aux Control Panel

Backlights light for 8 seconds when touched in Park mode. Operates like standard Auxiliary HVAC when the engine is running.

Pushing “PARK” button with engine off / brakes set starts PARK mode and illuminates PARK button LED. Unit ecits PARK mode when: engine is started, unit is shut off, or batteries are depleted.

See owner’s manual for Opt-Idle operating instructions.

LED PARKED light

NOTE: If opt-idle is engaged, PARK button does not function. Unit operates as a standard bunk unit.

If Parked light blinks continuously check Aux control panel / parameters or chassis LVD!

Testing

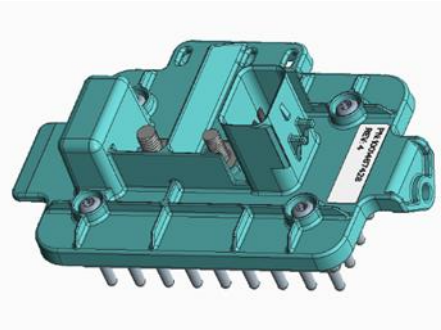
Attention! Conduct this test with engine OFF / key OFF and brakes set!

Auxiliary sleeper control panel is powered from VPDM fuse 27 and connected to cabin CAN. Refer to module 70C in PartsPro for wiring schematic.

Check for proper voltage at the 6-pin aux control panel connector on pin 2. You should have 12 V from VPDM fuse 27. Pushing the parked button signals through the cabin CAN for the BPHS unit to turn on. Check DiagnosticLink for communication.

Internal/External Components

Power Distribution Module (PDM)



This solid-state device provides circuit protection and controls power distribution to the evaporator blower, condenser fan, compressor and hydronic heater.

Testing

When the PDM receives the PDM_sleeper signal from PCB pin 27, the PDM will wake up and send battery power to the appropriate components. The PDM also provides circuit protection for condenser fan, evaporator blower and compressor controller as well as the hydronic (coolant) heater.

No blower output power will set a fault.

No condenser fan power will set a transducer fault when high pressure is reached.

Testing PDM outputs (Turn BPHS off):

Step 1

Disconnect the PCB 32 pin connector. Confirm battery voltage >12V is present on PDM main battery post and pin 27 of the PCB harness connector. If no voltage is present on pin 27, PDM is defective.

Step 2

Using #1 - 1.0mm Dia. Male pin tool from tool kit DKI470E16022, probe the harness connector pin 27 (PDM_sleeper). Connect probe to a suitable wire and connect pin 27 to battery negative. This grounding will “wake up” the PDM. If you have battery power on main battery post coming from the battery bank and the PDM wakes up, you should have battery voltage (output) on each component circuit - heater, condenser fan, evaporator blower and compressor.

While the grounding jumper is connected use a voltmeter and check for each output.

NOTE: The condenser fan should start at high speed any time the PDM wakes up. When no speed signal is present, the condenser fan will operate at high speed.

Internal/External Components

Check for battery voltage at evaporator blower - pin 4.

Check for battery power at condenser fan – pin A

Check for battery voltage at heater - harness connector pin 8.

Check for battery voltage to compressor ECU - main stud.

If any of the outputs from the PDM are not present, disconnect all devices from the system. Disconnect and reconnect ground to pin 27 resetting PDM and recheck the outputs with (NO LOAD) present at the PDM.

If the output returns, reconnect one component at a time and recheck. If an output is not working after a reset, replace PDM.

Reminder: See specification page for proper torque settings when reconnecting battery harnesses.

Truck must be in parked mode to perform diagnostic tests. Do not perform diagnostics in opt-idle mode. Please refer to Module 689, 723, 70C for additional information on components and wiring. When testing A/C portion of unit, Espar Heater must be disconnected.

ATTENTION: (PDM) Power Distribution Module Checks.
NO power output from PDM and
PARKED LIGHT stays ON

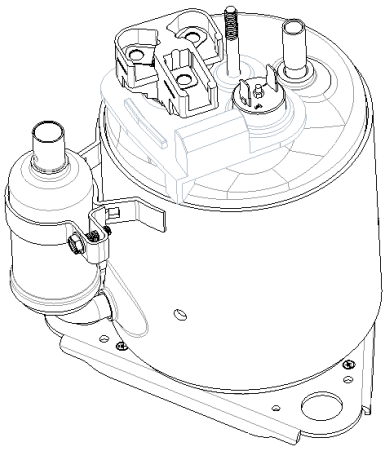
PDM controls power to the blower, condenser fan, compressor controller and hydronic heater. If the Parked light is on and the ECU receives the (PDM signal on pin 27) but no power is coming from the PDM – disconnect 1 device at a time - reset the PDM by cycling the power and retry operating the system. Internal issues with one of these devices can cause the PDM to lock up.

ATTENTION: (PDM) Power Distribution Module Checks.
Continuous power output from PDM

- Condenser runs constantly with system off, stops when door opened – Check for condenser power from PDM not shutting off:
- Shut off master disconnect. If condenser goes to high speed, check voltage at PDM_SLEEP (pin 1). If the voltage is > 1V, replace the PDM. If the voltage is <1V, check for short to ground and repair harness or PCU as needed.

Internal/External Components

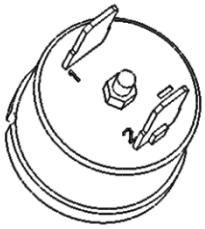
Compressor



This serviceable electric ring terminal compressor is for the parked refrigerant system.

Compressor Thermal Limit Switch

This is a normally closed switch to protect the compressor from high temperature.



Testing

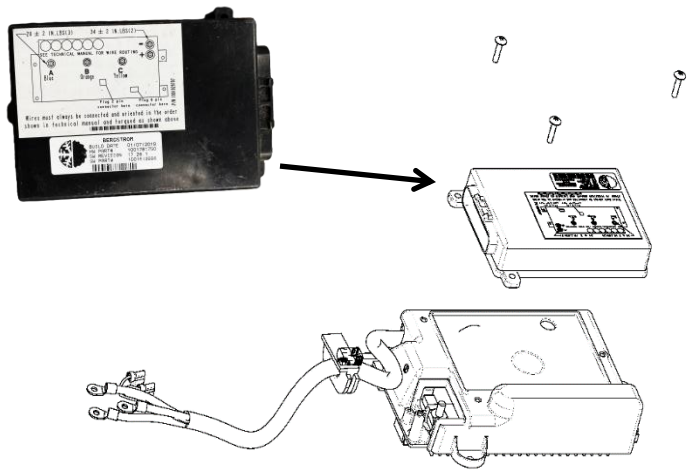
You must remove the compressor cover of the BPHS unit to access the switch. This device is a normally closed switch. If the compressor gets too hot, the thermal limit switch will open, and the compressor will stop. Checking with a meter you should always have continuity between the two terminals when it is cool. Also check harness and connection at circuit board.

Compressor Rubber Mounts

Visual inspection of the compressor rubber mounted may be necessary if excessive vibration is present. Check for loose mounting features.

Internal/External Components

System Controller (PCB/ECU)



This device stores the operating program and controls the BPHS unit. It is located on top of the compressor controller in the lower right section behind the evaporator blower.

System primary LVD is on the cabin CAN.

Testing

Warning! To avoid electric shock and prevent arcing and damage to harness and controller, disconnect power from the system prior to servicing.

Do not attempt to test the controller or compressor until you have eliminated all other possibilities.

Power to the ECU on pin 30 from VPDM, Vehicle Power Distribution Module, fuse 27 must be present. Also, battery power to pin 15 (battery sense) must be above battery LVD.

Starting the system:

With engine off, key off, and brakes set, turn the AUX control blower speed to the max setting and the temperature setting to full cold. Push the “PARK” button to start the system.

The AUX control panel communicates the “WAKE UP” signal through the cabin CAN.

If all safeties are ok, such as the pressure transducer, temperature sensor / freeze switch, and the compressor thermal limit switch, the ECU will signal to the PDM to send power out. In A/C mode the condenser fan and evaporator blower will begin to operate at a speed determined by the AUX control panel and system controller. At the same time, the PCB system controller will send enable and speed signals to the compressor controller to start the refrigerant compressor. When the compressor controller receives the enable signal on pin 2 and the speed signal on pin 6, the compressor controller will send the 6-volt pulse voltage out to the compressor through the phase harness.

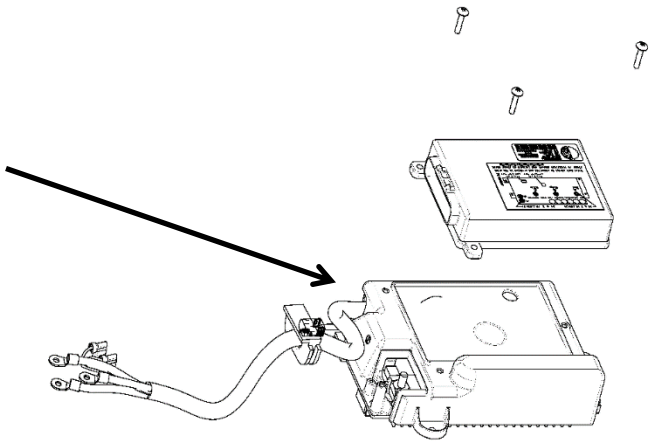
<u>If the PARK button does not start the system:</u>

1. Check Aux control panel - power from VPDM fuse 27
2. Check 100-amp fuse (in battery box) - main system power
3. Determine communication with Diagnostic Link for (Wake up)
4. Check DiagnosticLink for power from Sam module at PCB control
5. Check DiagnosticLink for power at battery sense on PCB
6. Check PDM input from PCB – this input should activate the PDM

Internal/External Components

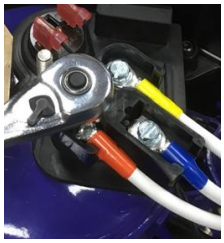
Compressor Controller

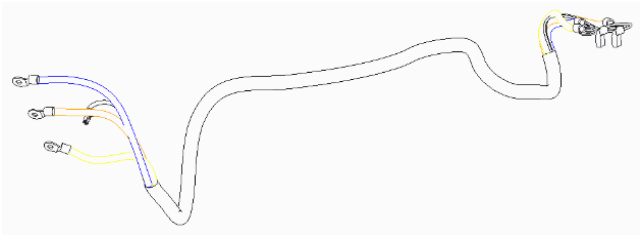
This device controls the output voltage to the variable speed compressor. It is located under the system controller (PCB/ECU). The Compressor Controller is serviceable.



Phase Harness

If you remove the three phase wires from the compressor, you must always use new screws due to special Loctite**.**
Connect blue to A, orange to B, and yellow to C.





Testing

Do not attempt to test the controller or compressor until you have eliminated all other possibilities. The Compressor Controller assembly has a removable phase harness.

Wires must always be connected in this order and torqued to 20 in. ilbs. +/- 2.

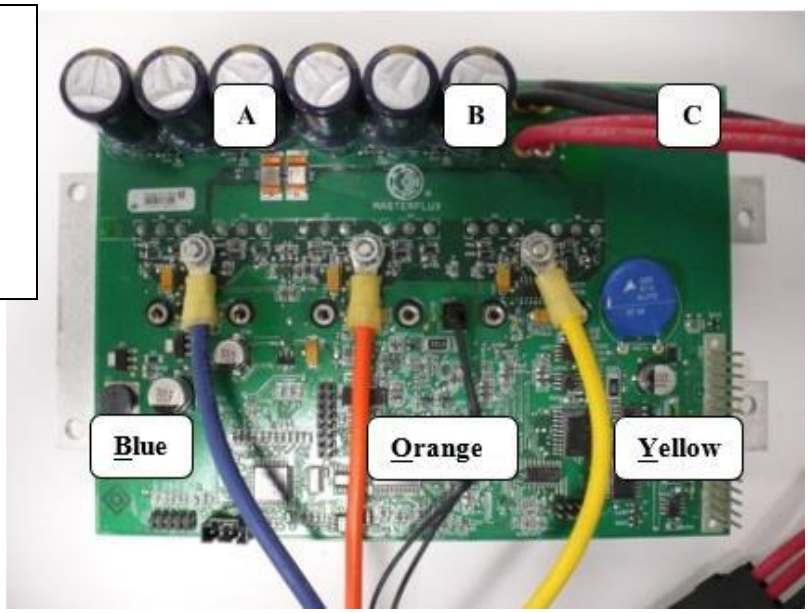


Photo is generic. If replacing a harness, be sure to follow the original OE routing path. See the following pages for proper routing across the board.

Internal/External Components

Attention: Removing the phase harness for testing

Operating the system for troubleshooting purposes with the phase harness disconnected can result in a locked-out system.

With no active fault codes, the controller should always attempt to start the compressor up to 10 times in a period of approx. 2 minutes; even when the phase harness is disconnected. If the controller does not see the compressor start after 10 attempts, it will time out and stop sending voltage to the compressor. The controller will remain in locked out mode until power is cycled. Please make sure the time does not expire during the test procedure. If necessary, cycling the power switch off and back on will reset the controller. NOTE: "The compressor could take up to 2 minutes to start up after the power switch has been cycled.

Prior to testing the compressor controller - check for fault codes with DiagnosticLink. Also check for a fault signal. Faults are set when the compressor controller sends 5 V from pin 3 to the system ECU pin 11.

Temporary removal of the fault wire will prevent a fault from being sent. This will aid in checking for the compressor enable and requested speed signals.

Testing controller / compressor (NO FAULT CODES):

With the phase harness disconnected, turn the BPHS unit on. Check for compressor controller main power coming from the PDM. Check for compressor enable at ECU pin 28 and requested compressor speed at ECU pin 21. Also see compressor commanded speed on DiagnosticLink. If enable/speed signals are not present, check sleeper control settings, temp sensors, system pressure, and/or compressor thermal limit. If all system items are ok, reflash/replace the ECU.

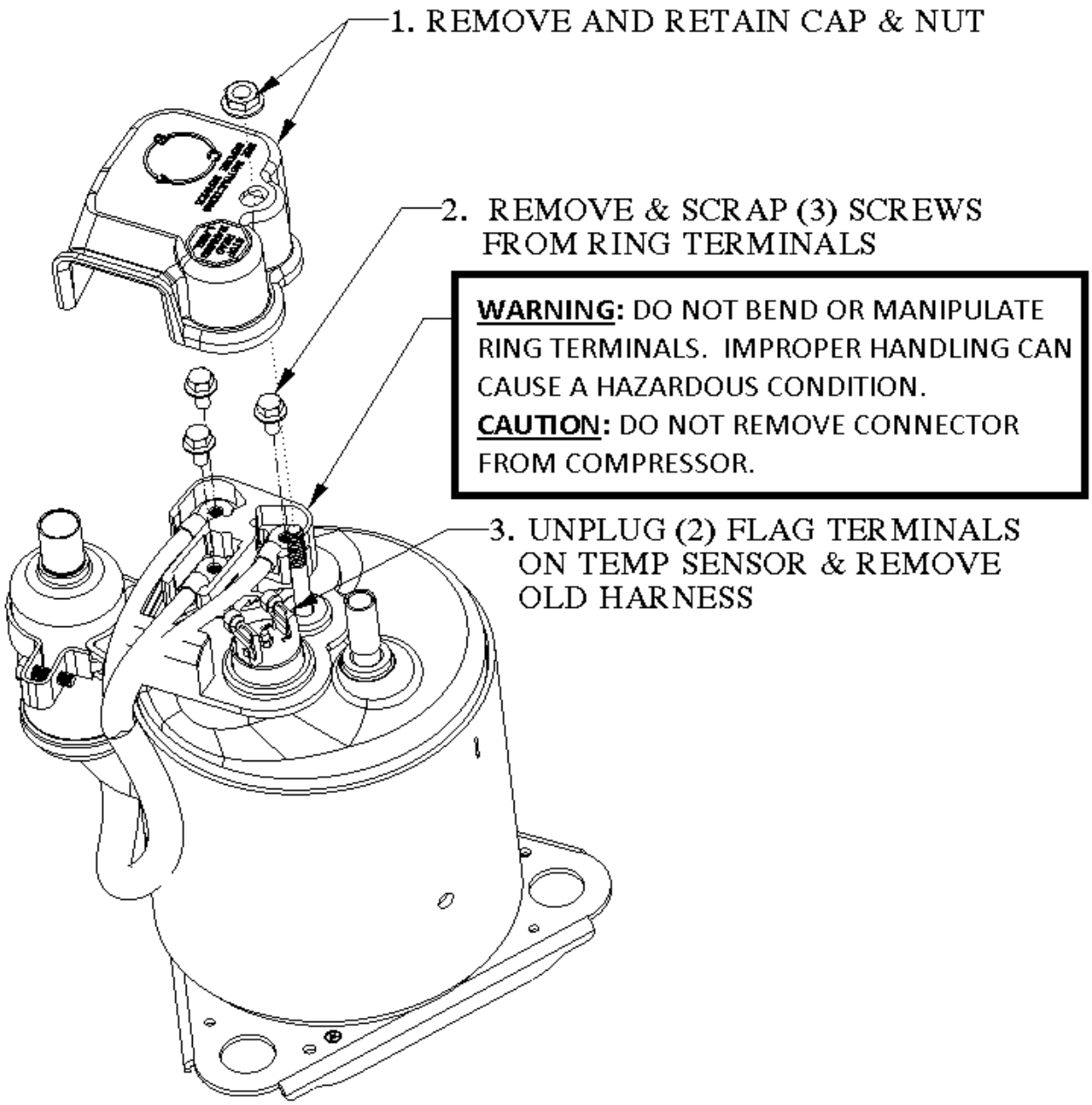
With speed requested, proceed checking each post, positive on (A, B or C) negative to battery ground. If you do not have a 6-volt pulse voltage out on each post replace the compressor controller. Pulse voltage means the controller will cycle to each colored wire. You may see the voltage appear and disappear continuously depending on your meter. It cycles fast and some meters may not pick up the cycles.

If you have a 6-volt pulse voltage out on each post, turn unit off, reconnect the phase harness and retry the compressor. If the compressor does not run, you have a defective compressor.

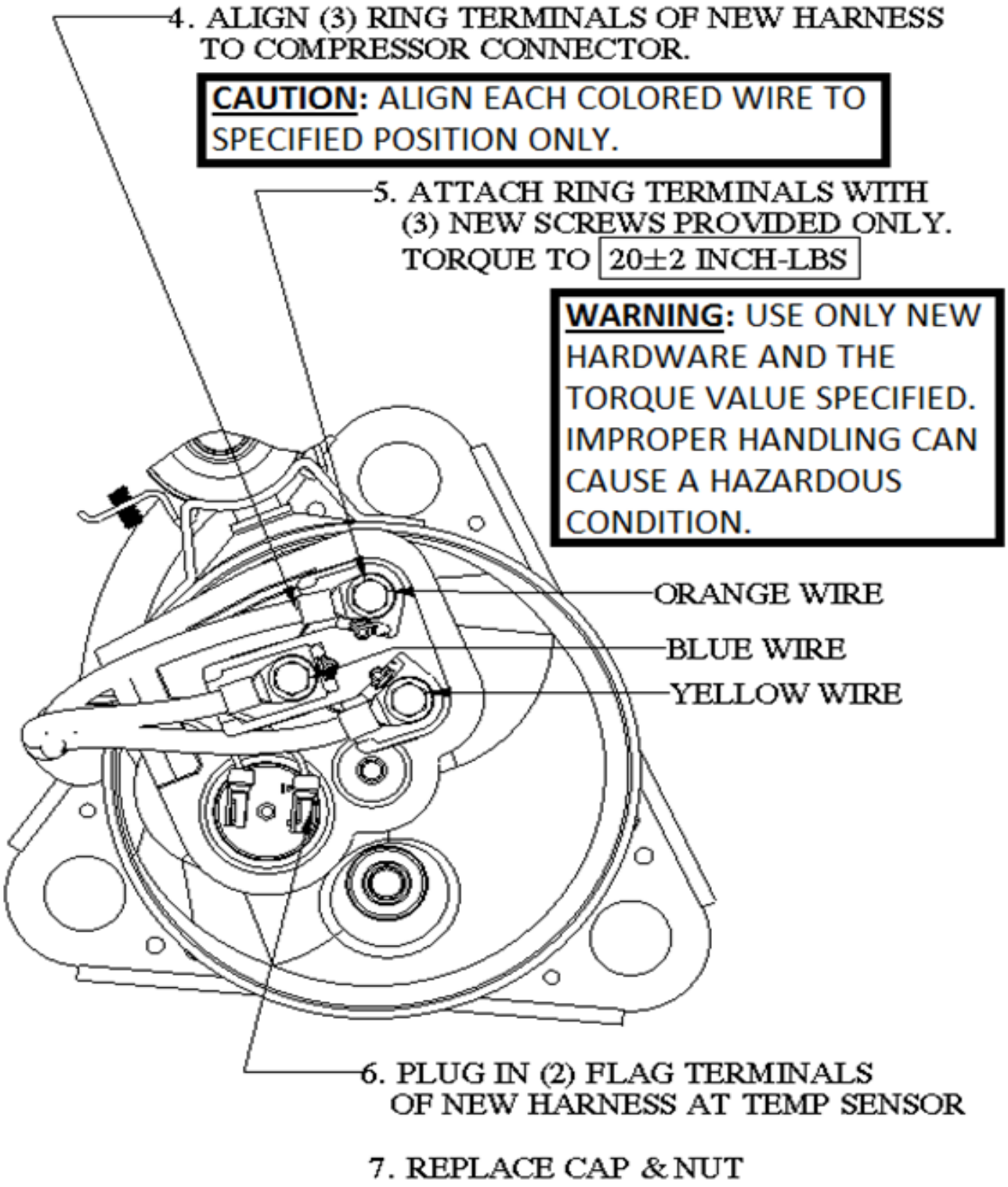
Internal/External Components

Service Instruction for Ring Terminal Controller and Compressor

WARNING: To avoid potential property damage or personal injury, Read Important Safety Warnings and ALL instructions before attempting to install or service product.



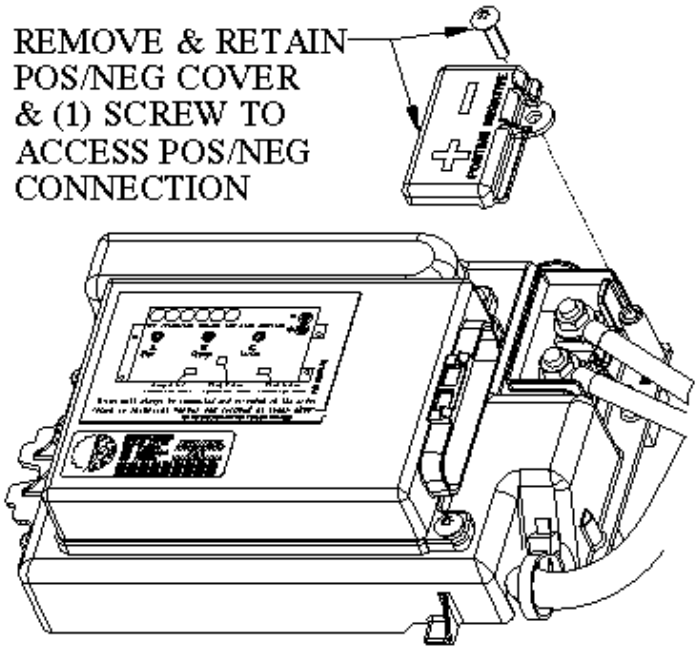
Internal/External Components



Internal/External Components

WARNING: TO AVOID ELECTRIC SHOCK, DISCONNECT A/C UNIT FROM POWER USING PROCEDURE IN FIGURE 1 BEFORE BEGINNING SERVICE.

1. REMOVE & RETAIN POS/NEG COVER & (1) SCREW TO ACCESS POS/NEG CONNECTION

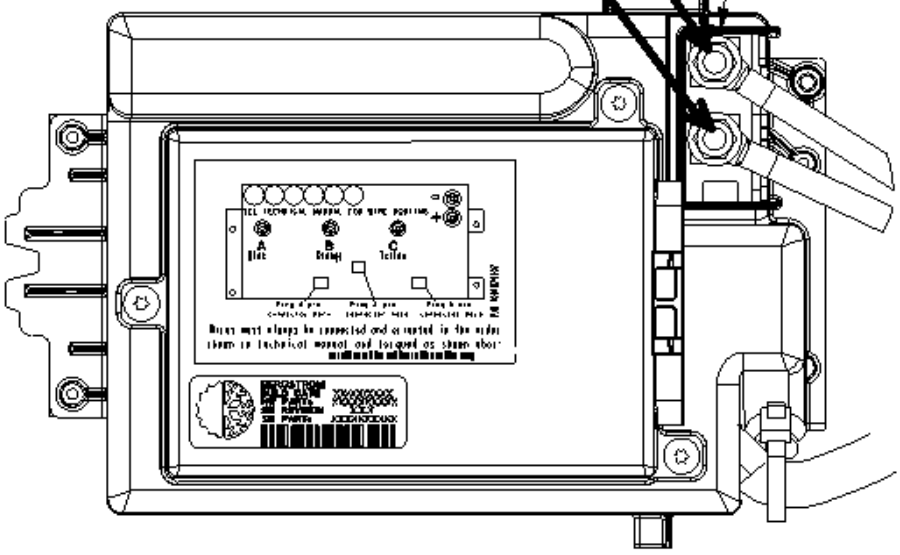


2. REMOVE & SCRAP (2) NUTS

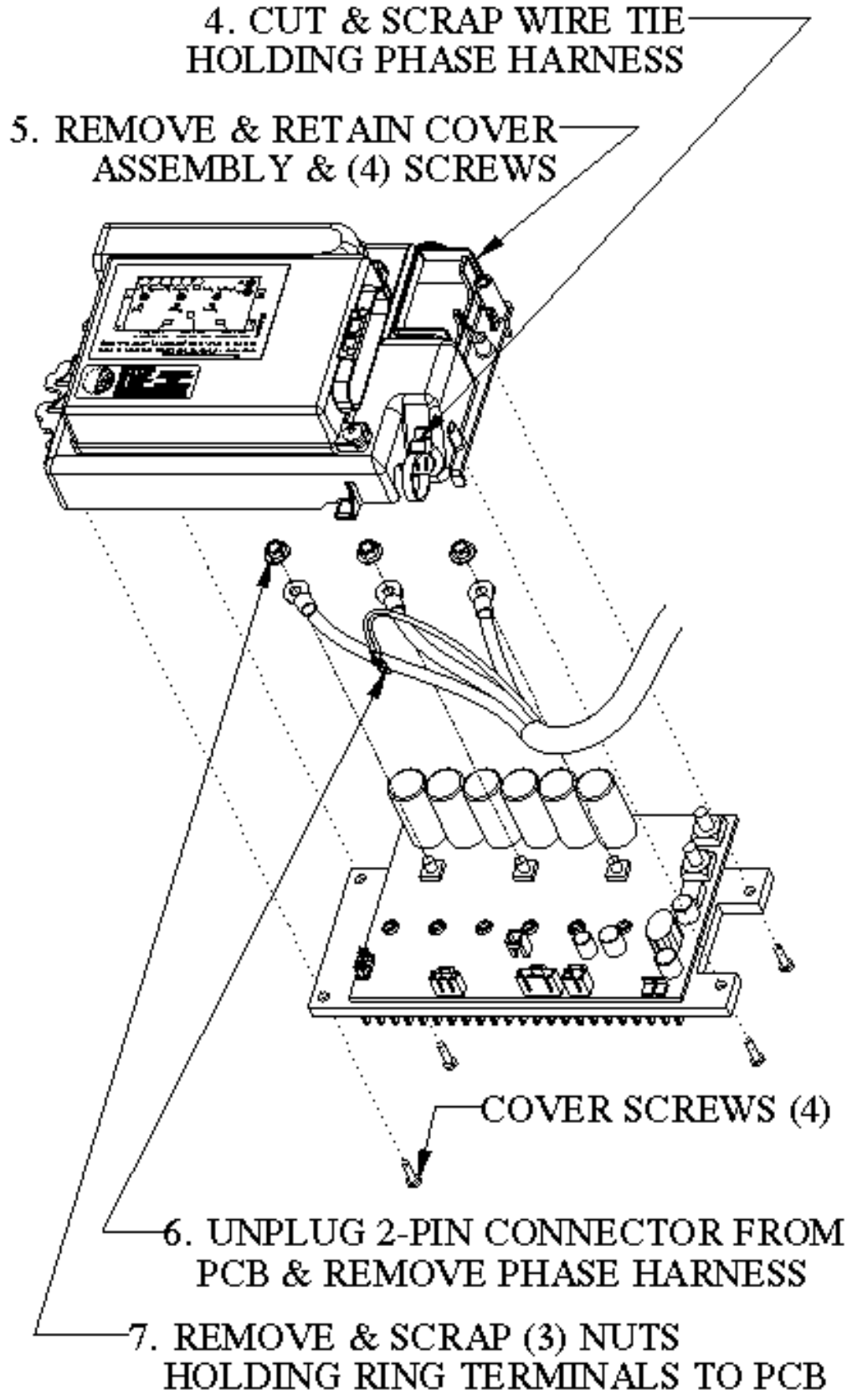
3. REMOVE RED (POS) & BLACK (NEG) RING TERMINALS FROM POSTS ON PCB

BLACK WIRE, NEGATIVE

RED WIRE, POSITIVE



Internal/External Components



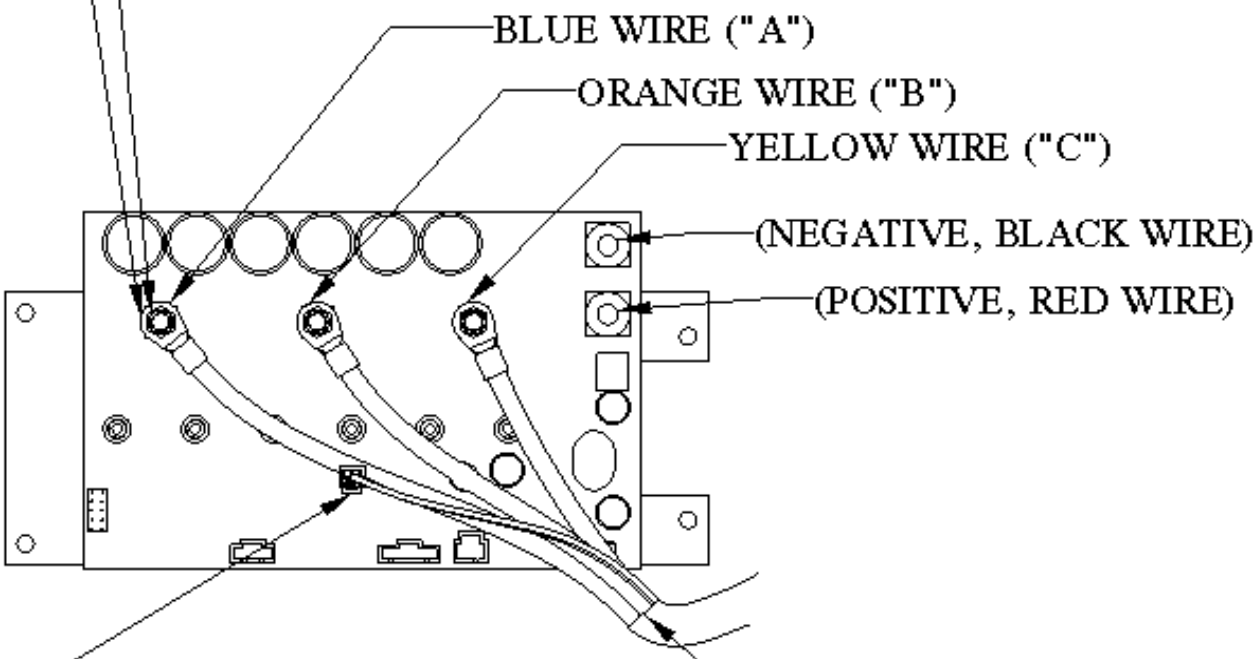
Internal/External Components

8. SLIDE (3) RING TERMINALS OF PHASE HARNESS OVER THREADED POSTS OF PCB.

CAUTION: ALIGN EACH COLORED WIRE TO SPECIFIC THREADED POST IDENTIFIED ONLY.

9. SECURE WITH (3) NEW, SMALL NUTS PROVIDED ONLY. TORQUE TO 20±2 INCH-LBS

CAUTION: USE ONLY NEW HARDWARE AND THE TORQUE VALUE SPECIFIED.



10. PLUG 2-PIN CONNECTOR OF NEW HARNESS INTO PCB

ORIENT RING TERMINALS AND ROUTE HARNESS OUT OF COVER AS SHOWN

11. REPLACE COVER ASSEMBLY & (4) SCREWS. SECURE NEW WIRE-TIE (PROVIDED) AROUND PHASE HARNESS

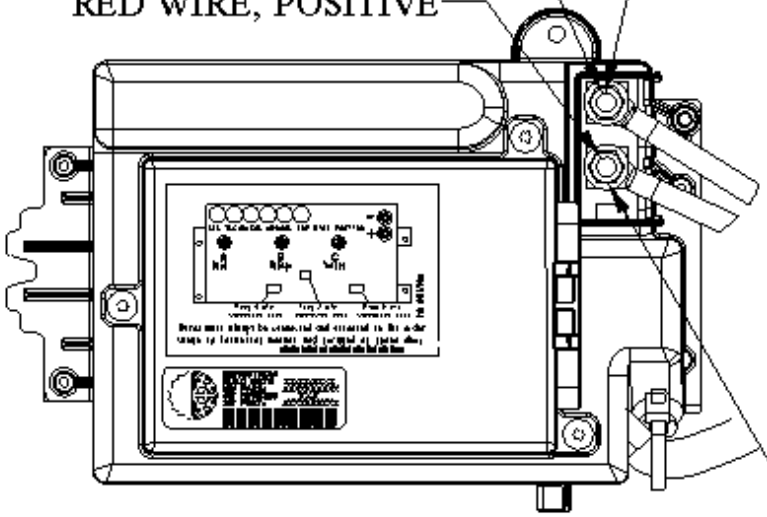
Internal/External Components

12. SLIDE BLACK AND RED RING TERMINALS OF UNIT HARNESS OVER THREADED POSTS OF PCB.

WARNING: ALIGN BLACK AND RED WIRES TO SPECIFIC THREADED POST IDENTIFIED ONLY. REVERSING THE POLARITY CAN CAUSE A HAZARDOUS CONDITION.

BLACK WIRE, NEGATIVE

RED WIRE, POSITIVE



13. SECURE WITH (2) NEW, LARGE NUTS PROVIDED ONLY.
TORQUE TO 34±2 INCH-LBS

CAUTION: USE ONLY NEW HARDWARE AND THE TORQUE VALUE SPECIFIED.

14. REPLACE SMALL (POS/NEG) COVER & (1) SCREW

CAUTION: DO NOT ALLOW THE RING TERMINALS OF THE BLACK AND RED WIRES TO BE IN CONTACT AFTER ROUTING WIRES AND REPLACING COVERS.

Internal/External Components

Pressure Transducer

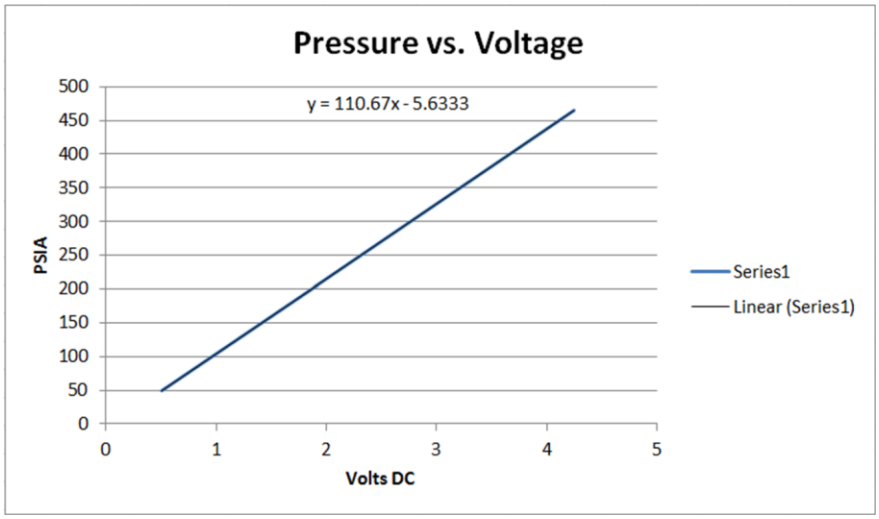
The parked HVAC system has a serviceable Schrader-mounted transducer that seals with an o-ring. This sensor provides system protection by monitoring the refrigerant pressure and will signal to the system controller if pressure conditions require the compressor to be stopped.

Testing

Check cabin CAN for any fault codes.

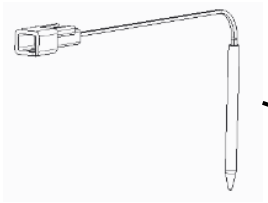
Pressure transducer mounted on the BPHS unit monitors the refrigerant system pressure. The signal from the transducer provides input to the PCB controller and will be displayed through DiagnosticLink as shown below. If a low or high pressure situation exists, the system controller will stop the compressor and/or condenser fan.

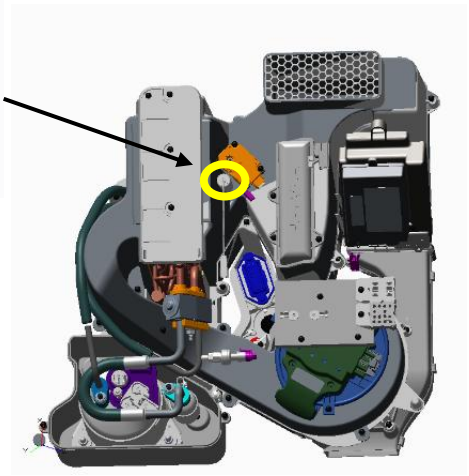
Note: High system pressure and poor performance can occur if the system is overcharged! If the system has been serviced / recharged and does not operate correctly, please verify refrigerant charge level is correct. See refrigerant charge information.



Internal/External Components

Evaporator Sensor / Freeze Switch





The evaporator sensor is located as shown. It is serviceable without removing the cabinet base. This sensor stops and prevents the operation of the compressor if ice forms on the evaporator coil.

Testing

If the sensor or circuit has a short or open circuit, a fault code will be set.

The freeze switch is a temperature sensor. To verify the condition, you will need a Volt/ohm meter. If a freeze condition occurs (temperature at or below 42°) the unit will stop the compressor. If the freeze condition is corrected, the compressor will restart and the BPHS unit will continue to run. See below for sensor test data.

Thermal Expansion valve blocked or partially blocked can cause improper refrigerant flow and a freeze up condition at the evaporator coil. Check for ice on tubes. TXV is serviceable.

Freeze Switch Resistance Table

TEMP (°C)	R (min)	R (cent)	R (max)	R (min)	R (max)
-30	84.45	86.75	89.11	-2.7%	2.7%
-29	79.39	81.51	83.68	-2.6%	2.7%
-28	74.68	76.62	78.61	-2.5%	2.6%
-27	70.28	72.06	73.89	-2.5%	2.5%
-26	66.16	67.80	69.48	-2.4%	2.5%
-25	62.32	63.82	65.36	-2.4%	2.4%
-24	58.72	60.10	61.51	-2.3%	2.3%
-23	55.35	56.62	57.92	-2.2%	2.3%
-22	52.20	53.37	54.55	-2.2%	2.2%
-21	49.25	50.32	51.41	-2.1%	2.2%
-20	46.49	47.47	48.47	-2.1%	2.1%
-19	43.89	44.80	45.71	-2.0%	2.0%
-18	41.46	42.29	43.13	-2.0%	2.0%
-17	39.18	39.94	40.71	-1.9%	1.9%
-16	37.04	37.74	38.44	-1.8%	1.9%
-15	35.03	35.67	36.32	-1.8%	1.8%
-14	33.14	33.73	34.32	-1.7%	1.8%
-13	31.37	31.90	32.45	-1.7%	1.7%
-12	29.70	30.19	30.69	-1.6%	1.6%
-11	28.13	28.58	29.03	-1.6%	1.6%
-10	26.65	27.06	27.48	-1.5%	1.5%
-9	25.26	25.64	26.02	-1.5%	1.5%
-8	23.95	24.30	24.64	-1.4%	1.4%
-7	22.72	23.03	23.35	-1.4%	1.4%
-6	21.56	21.84	22.13	-1.3%	1.3%
-5	20.46	20.72	20.98	-1.3%	1.3%
-4	19.43	19.66	19.90	-1.2%	1.2%
-3	18.45	18.67	18.88	-1.2%	1.2%
-2	17.53	17.73	17.92	-1.1%	1.1%
-1	16.66	16.84	17.01	-1.1%	1.1%
0	15.84	16.00	16.16	-1.0%	1.0%
1	15.05	15.21	15.37	-1.1%	1.1%
2	14.30	14.46	14.62	-1.1%	1.1%
3	13.60	13.75	13.91	-1.1%	1.2%
4	12.93	13.09	13.24	-1.2%	1.2%
5	12.30	12.46	12.61	-1.2%	1.3%
6	11.70	11.86	12.01	-1.3%	1.3%
7	11.14	11.29	11.45	-1.3%	1.4%
8	10.61	10.76	10.91	-1.4%	1.4%
9	10.10	10.25	10.40	-1.4%	1.5%
10	9.626	9.771	9.918	-1.5%	1.5%
11	9.174	9.316	9.461	-1.5%	1.5%
12	8.745	8.885	9.027	-1.6%	1.6%
13	8.339	8.477	8.616	-1.6%	1.6%
14	7.954	8.089	8.226	-1.7%	1.7%
15	7.589	7.722	7.856	-1.7%	1.7%
16	7.243	7.373	7.504	-1.8%	1.8%
17	6.914	7.041	7.170	-1.8%	1.8%
18	6.602	6.727	6.853	-1.9%	1.9%
19	6.306	6.428	6.552	-1.9%	1.9%
20	6.025	6.144	6.265	-1.9%	2.0%
21	5.758	5.875	5.993	-2.0%	2.0%
22	5.504	5.618	5.734	-2.0%	2.1%
23	5.263	5.374	5.488	-2.1%	2.1%
24	5.034	5.142	5.253	-2.1%	2.2%
25	4.816	4.922	5.030	-2.2%	2.2%
26	4.608	4.712	4.818	-2.2%	2.2%
27	4.411	4.512	4.615	-2.2%	2.3%

TEMP (°C)	R (min)	R (cent)	R (max)	R (min)	R (max)
28	4.223	4.322	4.422	-2.3%	2.3%
29	4.044	4.140	4.239	-2.3%	2.4%
30	3.874	3.968	4.064	-2.4%	2.4%
31	3.711	3.803	3.897	-2.4%	2.5%
32	3.557	3.646	3.738	-2.5%	2.5%
33	3.410	3.497	3.586	-2.5%	2.5%
34	3.269	3.354	3.441	-2.5%	2.6%
35	3.135	3.218	3.303	-2.6%	2.6%
36	3.007	3.088	3.171	-2.6%	2.7%
37	2.886	2.964	3.045	-2.7%	2.7%
38	2.769	2.846	2.925	-2.7%	2.8%
39	2.658	2.733	2.810	-2.7%	2.8%
40	2.553	2.625	2.700	-2.8%	2.8%
41	2.451	2.522	2.595	-2.8%	2.9%
42	2.355	2.424	2.495	-2.9%	2.9%
43	2.262	2.330	2.399	-2.9%	3.0%
44	2.174	2.240	2.307	-2.9%	3.0%
45	2.090	2.154	2.219	-3.0%	3.0%
46	2.009	2.072	2.136	-3.0%	3.1%
47	1.932	1.993	2.055	-3.0%	3.1%
48	1.859	1.918	1.978	-3.1%	3.2%
49	1.788	1.846	1.905	-3.1%	3.2%
50	1.721	1.777	1.834	-3.2%	3.2%
51	1.656	1.711	1.767	-3.2%	3.3%
52	1.594	1.647	1.702	-3.2%	3.3%
53	1.535	1.587	1.640	-3.3%	3.4%
54	1.478	1.529	1.581	-3.3%	3.4%
55	1.424	1.473	1.524	-3.3%	3.4%
56	1.372	1.420	1.469	-3.4%	3.5%
57	1.322	1.369	1.417	-3.4%	3.5%
58	1.274	1.320	1.367	-3.4%	3.6%
59	1.228	1.273	1.318	-3.5%	3.6%
60	1.185	1.228	1.272	-3.5%	3.6%
61	1.142	1.184	1.228	-3.5%	3.7%
62	1.102	1.143	1.185	-3.6%	3.7%
63	1.063	1.103	1.144	-3.6%	3.7%
64	1.026	1.065	1.105	-3.6%	3.8%
65	0.9902	1.028	1.067	-3.7%	3.8%
66	0.9559	0.993	1.031	-3.7%	3.8%
67	0.9229	0.9589	0.9960	-3.7%	3.9%
68	0.8913	0.9263	0.9630	-3.8%	3.9%
69	0.8609	0.8950	0.9304	-3.8%	4.0%
70	0.8317	0.8649	0.8994	-3.8%	4.0%
71	0.8036	0.8360	0.8697	-3.9%	4.0%
72	0.7766	0.8082	0.8410	-3.9%	4.1%
73	0.7506	0.7815	0.8135	-3.9%	4.1%
74	0.7257	0.7558	0.7870	-4.0%	4.1%
75	0.7017	0.7310	0.7615	-4.0%	4.2%
76	0.6786	0.7072	0.7369	-4.0%	4.2%
77	0.6564	0.6843	0.7133	-4.1%	4.2%
78	0.6351	0.6622	0.6905	-4.1%	4.3%
79	0.6145	0.6410	0.6686	-4.1%	4.3%
80	0.5947	0.6206	0.6475	-4.2%	4.3%
81	0.5756	0.6009	0.6271	-4.2%	4.4%
82	0.5573	0.5819	0.6075	-4.2%	4.4%
83	0.5396	0.5636	0.5886	-4.3%	4.4%
84	0.5226	0.5460	0.5704	-4.3%	4.5%
85	0.5062	0.5290	0.5528	-4.3%	4.5%

Internal/External Components

Sleeper Temperature Sensor

This sensor monitors the sleeper compartment temperature.

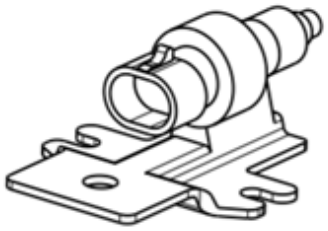
Location: see Freightliners Instructions
If the sensor or circuit has a short or open, the fault code will be seen on J1939
If this sensor fails, the unit will default to 72 degrees.

Sleeper Air Sensor Chart

	A	B	C	D
1	Sleeper, Air Temperature Sensor			
	Temp(ºF)	Temp (ºC)	Resistance (nominal)	Voltage (nominal)
4	-	-40.0	336500.0	4.86
5	-	-35.0	242589.0	4.80
6	-	-30.0	177000.0	4.73
7	-	-25.0	130370.0	4.64
8	-4.0	-20.0	97070.0	4.53
9	5.0	-15.0	72929.0	4.40
10	14.	-10.0	55330.0	4.24
11	23.	-5.0	42315.0	4.04
12	32.	0.0	32650.0	3.83
13	41.	5.0	25388.0	3.59
14	50.	10.0	19900.0	3.33
15	59.	15.0	15708.0	3.06
16	68.	20.0	12490.0	2.78
17	77.	25.0	10000.0	2.50
18	86.	30.0	8057.0	2.23
19	95.	35.0	6531.0	1.98
20	104.	40.0	5327.0	1.74
21	113.	45.0	4369.0	1.52
22	122.	50.0	3603.0	1.32
23	131.	55.0	2986.0	1.15
24	140.	60.0	2488.0	1.00
25	149.	65.0	2083.0	0.86
26	158.	70.0	1752.0	0.75
27	167.	75.0	1481.0	0.65
28	176.	80.0	1258.0	0.56

Internal/External Components

Ambient Air Temperature Sensor



This sensor monitors the air temperature at the condenser coil.

Testing

This sensor monitors the ambient air temperature. See chart below for testing data. If this sensor fails open or shorted a fault code will be set and viewable on diagnostic link.

If this sensor has a partial failure and reads an incorrect temperature, it may prevent compressor operation. Sensor is in the condenser unit outside the truck on rear sleeper wall.

Ambient Air Temperature Chart

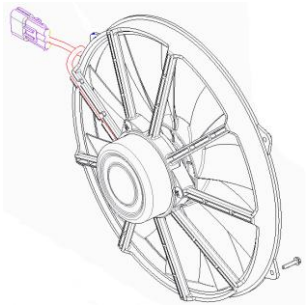
Temp(ºF)	Temp (ºC)	Minimum	Normal	Maximum
		Resistance (kohm)		
-76	-60	1353.41	1596	1838.59
-58	-50	619.8	723.22	826.64
-40	-40	291.49	335.6	381.71
-22	-30	155.2	177.4	199.6
-4	-20	85.85	97.12	108.39
14	-10	49.25	55.34	61.43
32	0	29.33	32.66	35.99
50	10	17.99	19.9	21.81
68	20	11.37	12.49	13.61
77	25	9.12	10	10.88
86	30	7.37	8.06	8.75
104	40	4.9	5.325	5.75
122	50	3.33	3.605	3.88
140	60	2.31	3.605	2.57
158	70	1.63	2.49	1.87
176	80	1.17	1.75	1.34

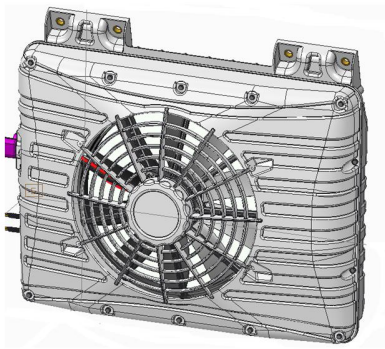
Internal/External Components

Condenser Fan

This fan draws air through the condenser coil to cool the refrigerant flowing through the system. The hot air is exhausted away from the truck.

Fan and coil are serviceable.





Testing

First do a visual inspection of all fan parts. Condenser is located outside the truck on rear sleeper wall.

Using a DC ammeter, you can check the amperage draw of the fan. 12-13 Amps.

Caution: If attempting to connect the fan to an outside power source, internal electronic components are sensitive to arcing or reverse polarity! Damage will occur!!

Anytime the unit has been operating and shits down or is turned off, the condenser fan will continue to run for 90 seconds to cool the system.

Internal/External Components

Diagnoses of Intermittent System Operation

Subject: Diagnoses of intermittent system operation resulting in low or no cooling performance.

Background: Various conditions can cause a system to operate intermittently and have little or no cooling ability. When servicing a specified unit for operation or performance, it is necessary to make sure the condenser fan is operating correctly.

The condenser fan motor may exhibit “dead spots” prohibiting start-up when the HVAC unit is turned on. This motor is made-up of 24 cog positions roughly 1½ inches apart on the condenser blade.

Driver Observation: BPHS no-idle system is not operating continuously or no cooling.

Diagnostic Procedure for Technicians (Estimated time – 10 minutes)

1. Follow manufacture safety guidelines when servicing this vehicle. Verify the following: Engine off, key off, and parking brakes set.
2. Start the BPHS no-idle system in parked mode and adjust settings to full cold and high blower speed to which the parked button must be pushed. Visually inspect condenser fan to verify proper operation. If the condenser fan is not operating, verify for 12 volts across the red and black wires at the condenser fan plug. Also, verify signal voltage is present at the connector. **If the condenser fan has 12 volts and signal voltage but is not working properly please replace fan.**

   Note: For complete fan diagnostics it is necessary to perform additional phase tests. This preliminary test in *step 2* only confirms the condenser fan operates on one phase of the motor.

   If the condenser fan appears to be working properly continue diagnostic and verify the following:

3. ⚠ Disconnect power to the condenser fan before advancing through the diagnostic procedure. Failure to follow this step may cause bodily injuries to yourself and/or others as well as damages to the specified unit. This warning is for your protection and information.
4. Remove all 17 mounting screws from the condenser fan cover.
5. Mark “fan blade” with silver permanent marker as shown. This will be the home location.

Location 1

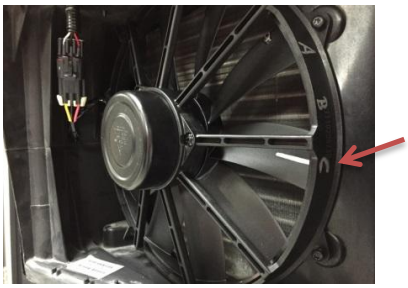
Mark “A” as the first test location

Internal/External Components

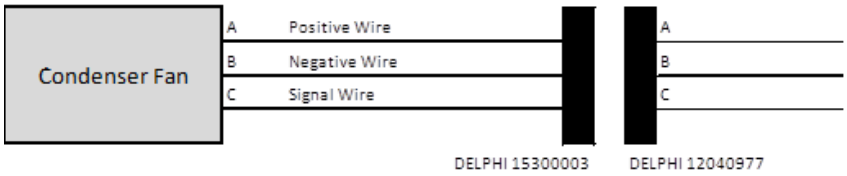
Diagnostic Procedure for Technicians (Estimated time – 10 minutes) - Continued

1. Rotate clockwise 1 cogging torque position and mark the second test location “B”.

2. Rotate clockwise 1 cogging torque position and mark the third test location “C”.



3. Return fan blade to the home location (“A”) and reconnect power to the condenser fan.
4. Start the BPHS no-idle system and adjust settings to full cold and high blower speed. Visually inspect condenser fan to verify proper operation. If the condenser fan is not operating, verify for 12 volts across the red and black wires at the condenser fan plug. Also, verify signal voltage is present at the connector. **If the condenser fan has 12 volts and signal voltage but is not working properly**



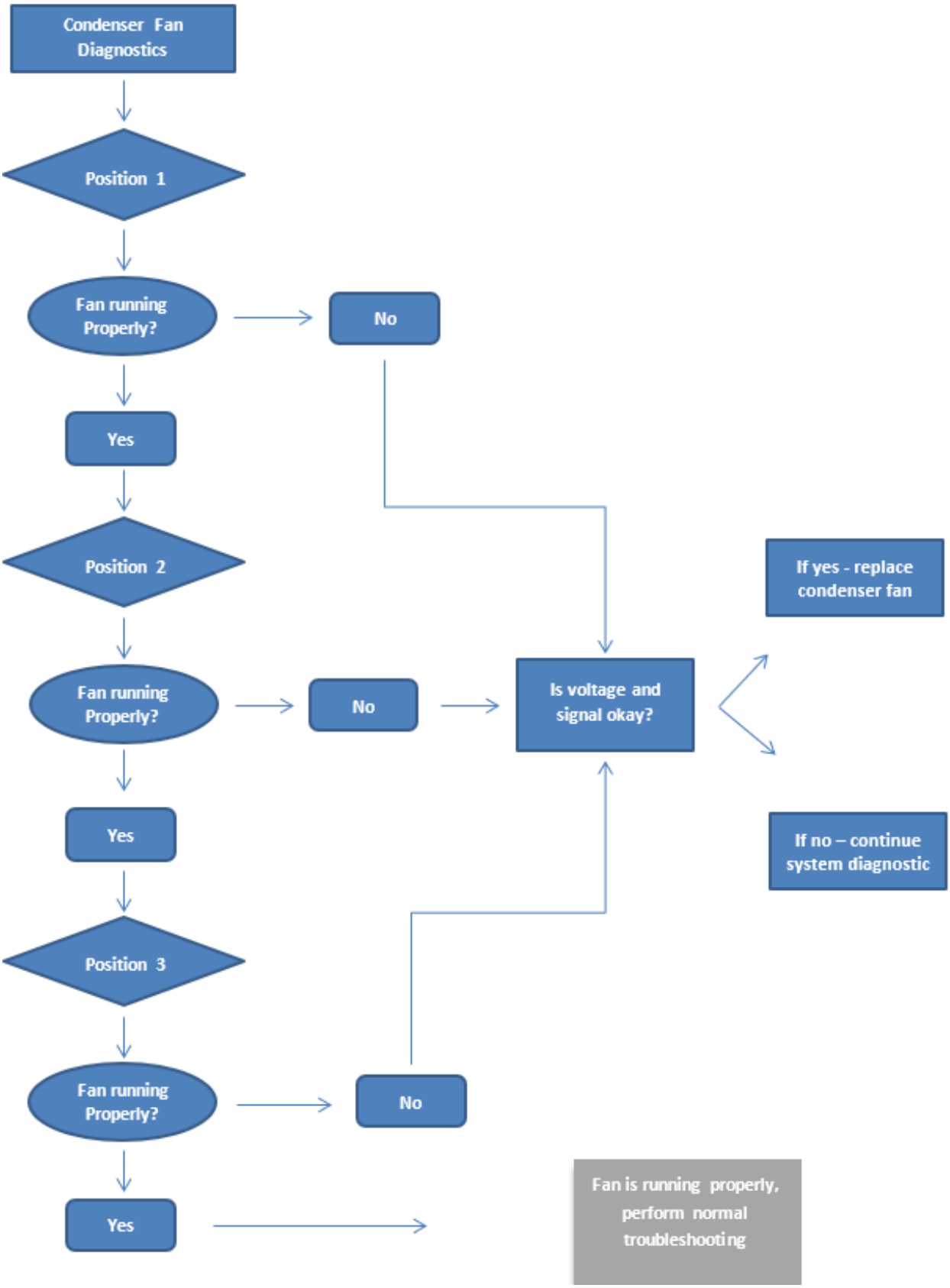
please carry out the service replacement procedure.

5. Once fan has been confirmed functional, shut down the BPHS no-idle system and disconnect power to the condenser fan.
6. Wait until the fan completely stops running.
7. Repeat steps 9-11 for test locations B and C.
8. If the condenser fan is working properly in positions A, B, and C the diagnostic procedure is complete. No further testing is required. Reconnect the condenser fan and reinstall the cover.

Service Replacement Procedure (Only required for confirmed failures)

1. Verify the BPHS no-idle system is turned off and the condenser fan power harness has been disconnected.
2. Remove all the condenser fan mounting hardware and remove the fan from the assembly.
3. Mount the new condenser fan assembly and install the fasteners at 20 in/lbs torque. Do not overtighten.
4. Reconnect the condenser fan and reinstall the cover.
5. Retest BPHS unit – follow step 9 above.

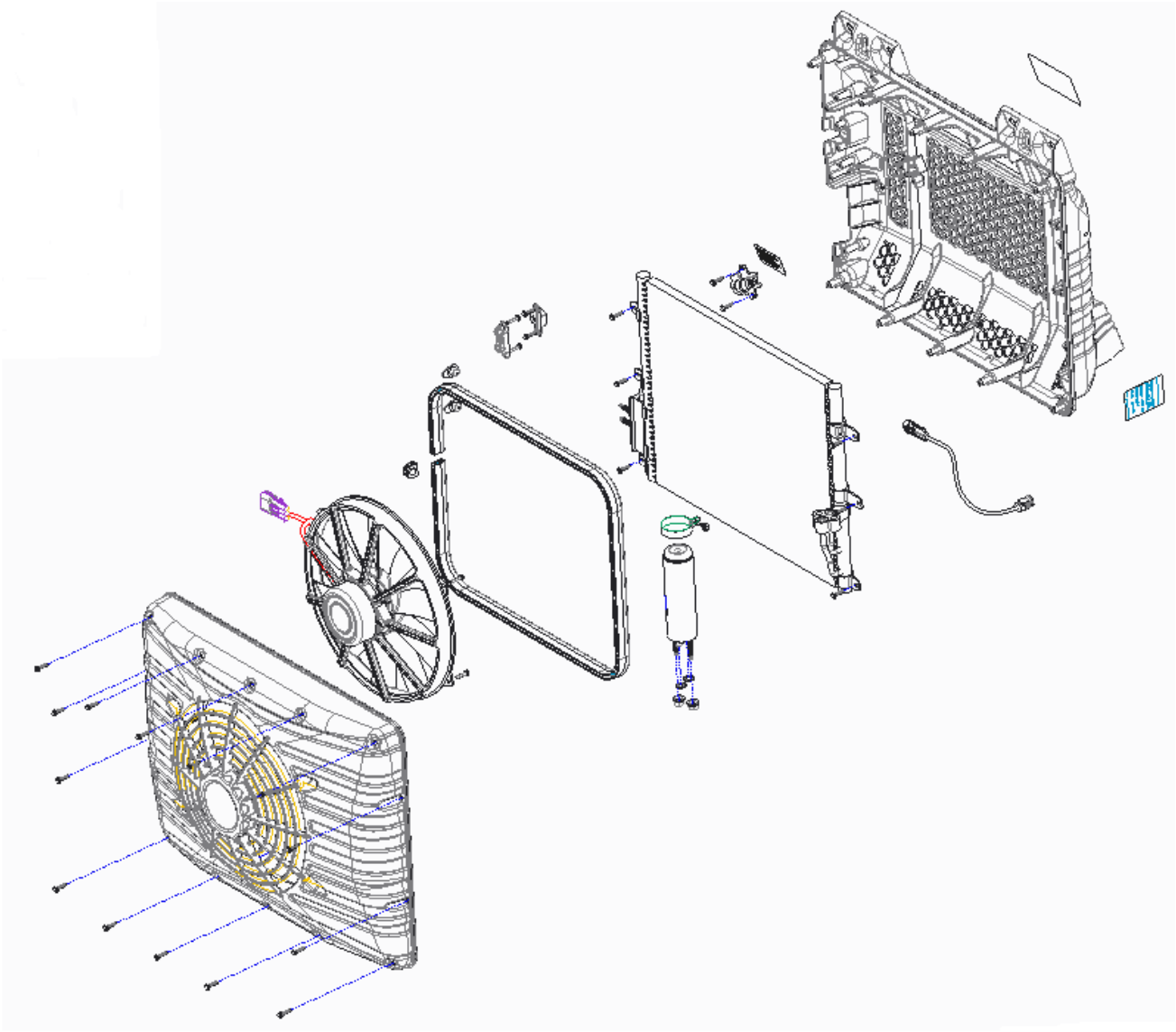
Internal/External Components



Bergstrom

Internal/External Components

Condenser Unit Exploded View



Cleaning Condenser: "It is recommended to clean the condenser coil every 25k miles in the summer months with an A/C core cleaner that is approved for copper and aluminum cores. Additionally, low pressure water can also be used to clean it. It is also recommended to use a core cleaner that is non caustic, detergent-based alkaline coil cleaner, biodegradable, and releases no VOCs."

Internal/External Components

Receiver Drier

Torque in gradual steps. 20 in-lbs. / 50 in-lbs. / 15 ft-lbs.

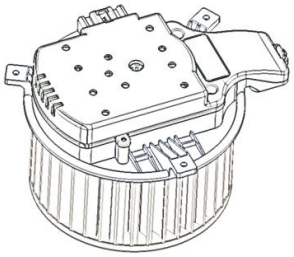
Caution: When loosening the two hex nuts securing the dryer to the condenser assembly, care must be taken to prevent the dryer base from moving. Using a large plier, hold the dryer base to prevent the movement. Failure to secure the base during removal and installation can result in a cracked or damaged coil.

For BPHS units with build date post 2/21/2022, the desiccant is replaceable without removing the entire receiver dryer assembly:

1. Recover refrigerant and gain access to the dryer by removing the front cover of the condenser unit.
2. Use a 17mm hex to remove the cap and remove old desiccant.
3. Lubricate new O-rings with refrigerant oil and install the new desiccant and cap (torque to 9 +/- 1 Nm).

Internal/External Components

Evaporator Blower



This blower pushes air through the evaporators or heater coil to condition the interior of the sleeper.

Testing

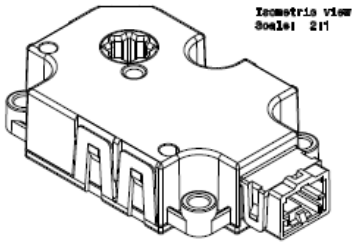
First do a visual inspection of all blower parts. Check DiagnosticLink for any fault codes.

Using a DC ammeter, you can check the amperage draw of the blower.

Caution: If attempting to connect the fan to an outside power source, internal electronic components are sensitive to arcing or reverse polarity! Damage will occur!!

Check for power, ground, and signal at the blower connector. Pin 4 is 12V power, pin 2 is ground. Pin 3 is the blower PWM control signal and should have between 2.4-7 V. Pin 1 is the tach signal from the blower pulsing 0-5V.

Blend Door Actuator



The actuator operates the blend door, changing the air flow path through the BPHS evaporator coil and heater core.

The blend door actuator is located on top of the BPHS unit, under the cabinet base center section in between the evaporator heater coils.

Internal/External Components

Testing

Visual inspection of operation is possible from the top of the unit. Each time the BPHS is powered up the door sets to full cold.

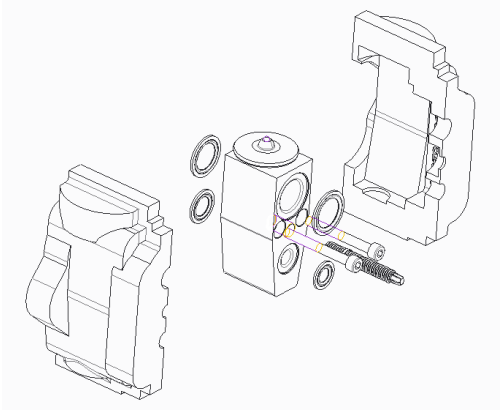
When in heat mode, the blend door will direct air through the heater core as directed by the Aux. control panel to maintain a preset temperature. The Espar Hydronic coolant heater will provide a constant flow of heated coolant through the heater core for internal bunk heat as well as engine heat.

Check Diagnostic Link for any fault codes. You cannot bench test this actuator.

Check for 12V at pin 4 on the actuator, this is power from pin 29 on the system control ECU. Use pin 1 for ground when checking this voltage. With unit operating, phases A, B, C and D are switched to ground in a sequence. With the door in a stationary position check for 12V, you should have 12V on each phase. When the door is positioned, these phases will be switched to ground. The voltage will be near zero on a switching phase.

Thermal Expansion Valve (TXV) – Engine OFF

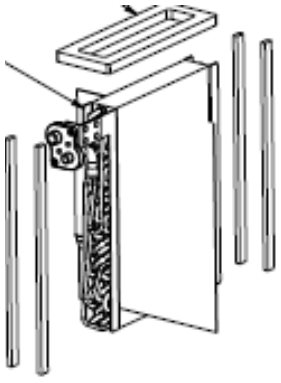
This component meters the refrigerant into the engine off evaporator coil.



Evaporator Coil – Engine OFF

This component is the refrigerant coil for the parked side of the HVAC system.

It is serviceable.

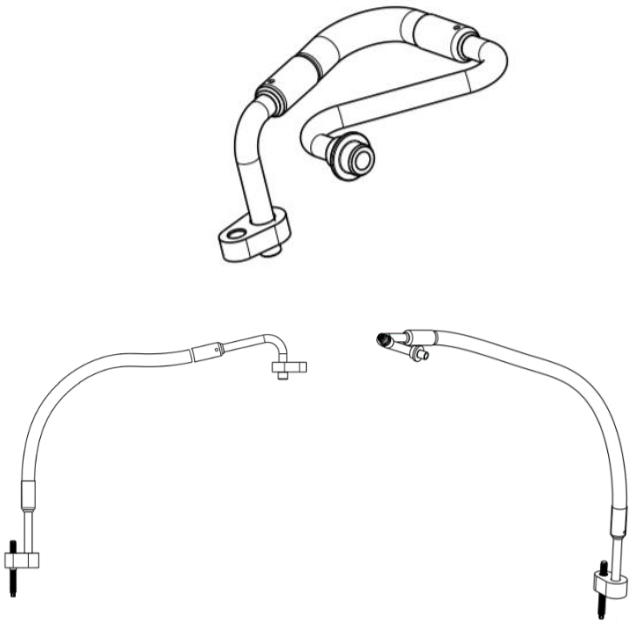


Internal/External Components

Refrigerant Lines

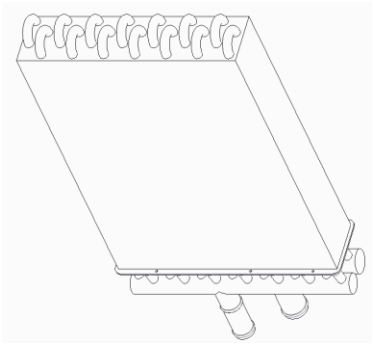
Serviceable refrigerant lines inside the BPHS unit.

Includes the engine off suction, discharge, and liquid line sections.



Heater Coil – Engine OFF

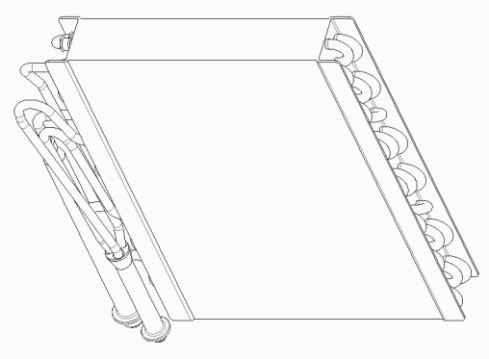
Coolant flows through this coil so the BPHS unit can produce heated air.



Evaporator Coil – Engine ON

This component is the refrigerant coil for the engine on circuit.

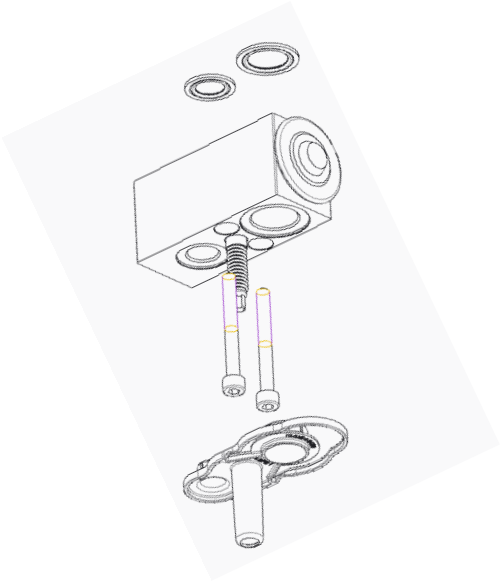
It is serviceable.



Internal/External Components

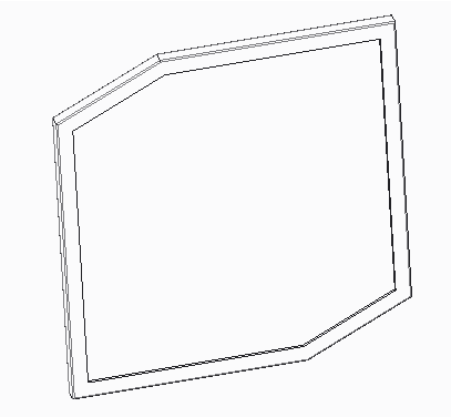
Thermal Expansion Valve (TXV) – Engine ON

Meters the refrigerant into the engine on evaporator coil.



Evaporator Inlet Filter

This filter protects the evaporator coil from dust and debris. It is washable and should be serviced every other month by washing dust and debris off with warm water. In environments with pets or excess dust, the filter may need more frequent washing. Failure to do so will affect performance of the unit and could lead to drain tube clogging.



Evacuating the System

Upon initial installation of the BPHS system, the system must be completely evacuated of air and moisture prior to being charged. After evacuation, the system pressure should measure between 750 and 1000 microns.

1. On the machine and hose fittings, verify that all valves are closed. The valves at the refrigerant machine must be set to the CLOSED position. The valves at the quick-disconnect fittings must be set fully counterclockwise (CCW).
2. Connect the refrigerant machine hoses to the two charge ports on the BPHS system refrigerant lines.
3. Open the valves on the quick-disconnect fittings (turn the knobs fully CW).
4. On the machine, set both hand valves to the RECOVERY/VACUUM position.
5. On the machine, turn on main power switch and press the VACUUM button.
6. After the low-pressure gauge on the machine shows that vacuum is being established in the system, continue to operate the vacuum pump for fifteen minutes.
7. After 15 minutes, set both valves on the recovery station to the CLOSED position, and observe low side gauge for one minute. The gauge should not indicate a rise of more than 2 inches-Hg. If the gauge rises more than 2 inches-Hg in one minute, the system has a leak, which must be repaired.
8. If there are no leaks, the A/C system is ready to be charged.

Caution! The BPHS system uses PVE lubricant in the refrigerant system. PVE oils absorb atmospheric moisture very quickly. Never leave PVE oil exposed to air for a prolonged time. Tightly reseal the system after each charge or service.

Note: The full amount of refrigerant oil has already been added to the system, DO NOT ADD OIL when charging the BPHS system unless the system has been recovered in excess of 4 times.

Note: DO NOT disconnect the recovery/recycling/charging station from the A/C system before charging the system.

Air Conditioning System

Refrigerant Charge Information

Warning! Before doing any of the work below, be aware of the dangers involved. Working with refrigerant could lead to serious personal injury.

Caution! Use only new or clean recycled R134a refrigerant; not any of the so called “direct replacement” refrigerants. Use of equipment dedicated for R134a is necessary to reduce the possibility of oil and refrigerant incompatibility concerns.

Caution! When charging the A/C system, the refrigerant tank must be kept upright. If the tank is not in the upright position, liquid refrigerant may enter the system and cause compressor damage.

Note: If recycled refrigerant is to be used, follow the instructions supplied with the recycling equipment to purge the air from the refrigerant before charging the system.

Perform the charging procedure, using new or recycled refrigerant, only after the following actions have been completed:

- System components completely installed
- System completely evacuated

Caution! If the equipment being used adds system refrigerant oil during the evacuation/charging procedure, you must first DISABLE this feature. Follow the instructions furnished with the refrigerant machine, or refrigerant oil injector tool, to disable this feature.

DO NOT ADD OIL TO THE SYSTEM

Refrigerant Charge Level

No-Idle System Charge: 24 oz. R-134a

Caution! For the engine ON refrigerant circuit, refer to the vehicle refrigerant tags or user manual.

Always follow recommended charging instructions. The receiver drier contains a dye wafer. Adding additional dye to the system is no required or recommended.

Component Servicing

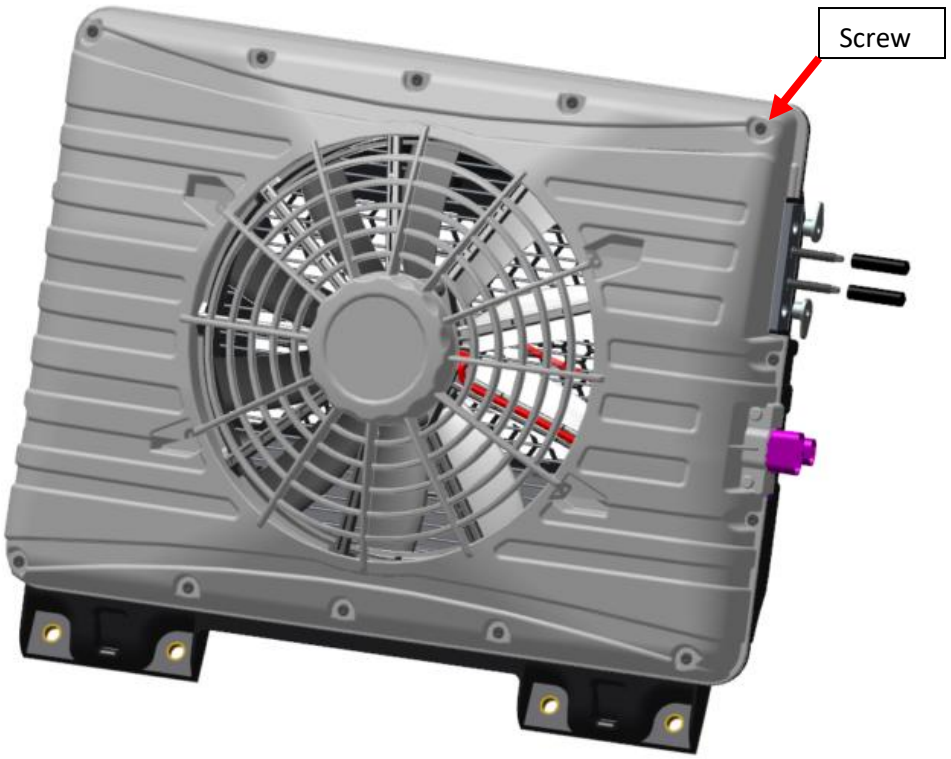
Condenser Fan

Condenser Fan Removal

1. Remove the plastic cover + fan on the condenser assembly by removing the 14 T20 screws.
2. Disconnect the electrical connector and cut zip tie if needed.
3. Remove the 4 T20 screws holding the fan to the plastic cover and slide out fan.

Condenser Fan Installation

1. Slide new fan into place and secure to plastic case with 4 screws. Torque to 15 in. lbs.
2. Connect electrical connector and secure harness with zip ties if needed.
3. Install plastic cover and secure using 14 screws. Torque to 20 in. lbs.



Component Servicing

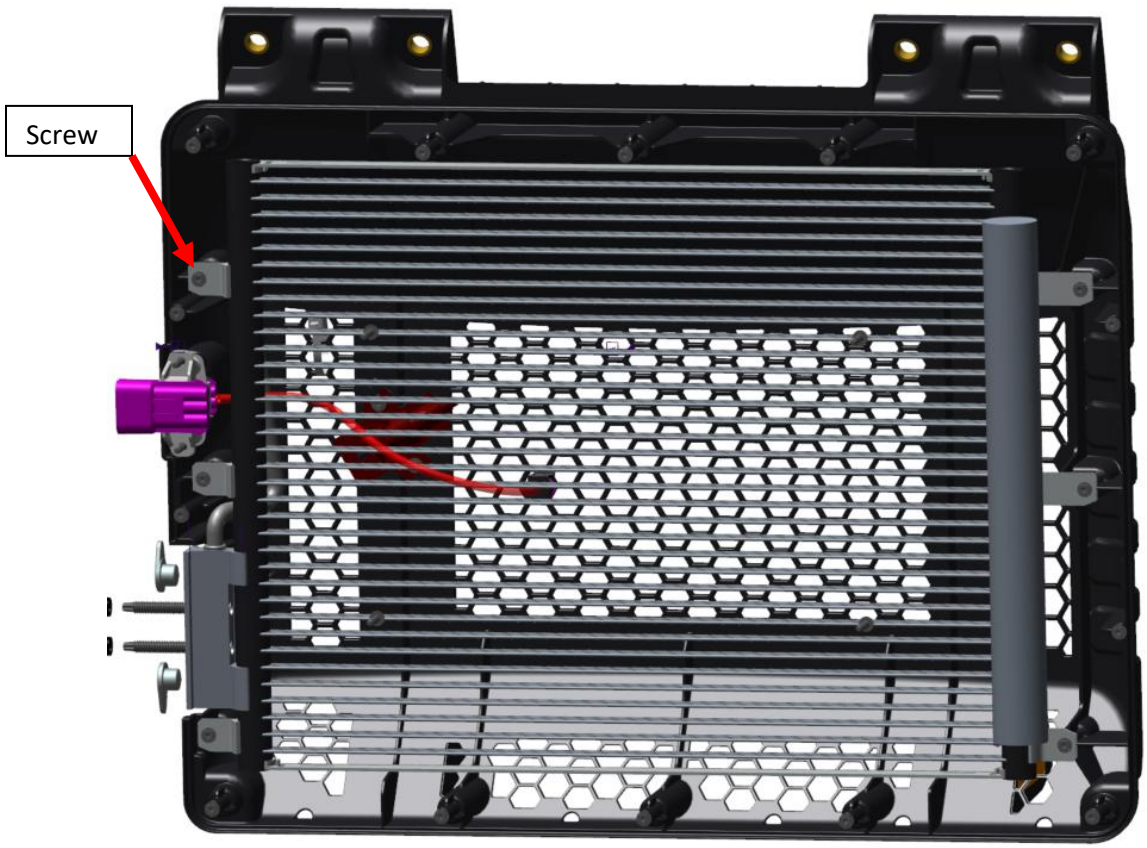
Condenser Coil

Condenser Coil Removal

1. Recover no-idle A/C circuit refrigerant. Refer to Evacuating the System.
2. Disconnect refrigerant lines at condenser coil connection. Cap refrigerant lines temporarily.
3. Remove the plastic cover + fan assembly by removing 14 T20 screws.
4. Remove the coil by removing 4 T20 screws holding the coil to the rear plastic casing.

Condenser Coil Installation

1. Insert the new coil and secure using the 4 screws. Torque to 20 in. lbs.
2. Install the plastic cover + fan assembly with 14 screws. Torque to 20 in. lbs.
3. Connect refrigerant lines at condenser coil connection and charge no-idle refrigerant system. Refer to refrigerant charge information.



Component Servicing

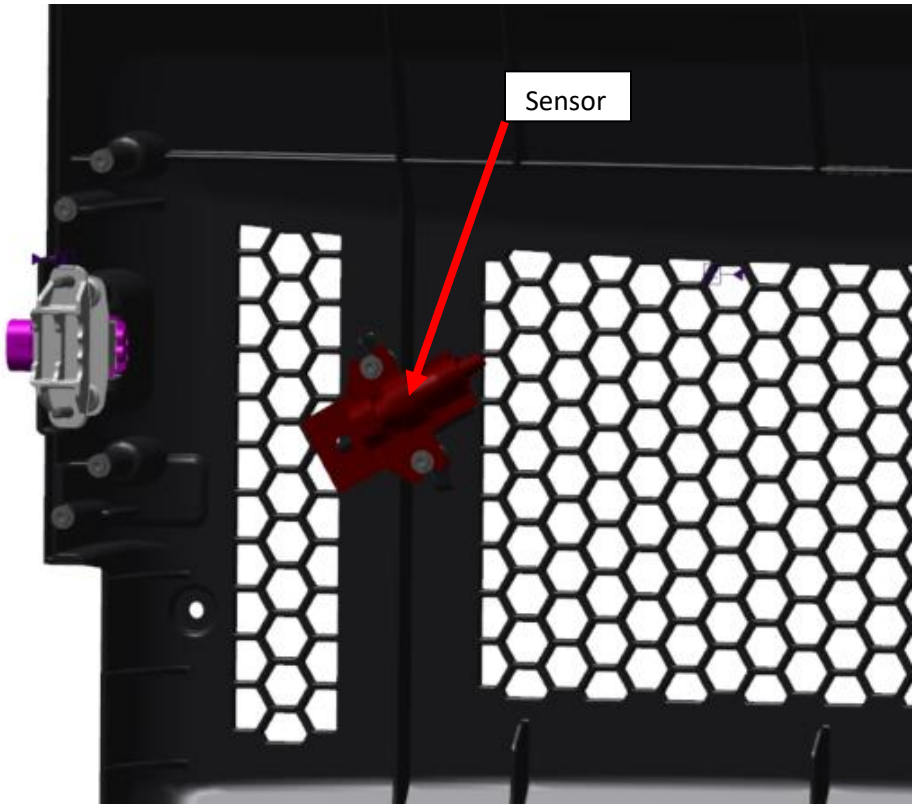
Ambient Air Temperature Sensor

Ambient Air Temperature Sensor Removal

1. Remove the condenser coil **WITHOUT** removing the refrigerant charge. You can flex the coil out of the way due to the refrigerant line hose nearby. Refer to condenser coil servicing.
2. Disconnect the sensor electrical connector.
3. Remove the sensor by removing 2 T20 screws.

Ambient Air Temperature Sensor Installation

1. Install the new sensor by securing it with 2 screws. Torque to 15 in. lbs.
2. Connect the electrical connector.
3. Install and secure the condenser coil. Refer to condenser coil servicing.



Component Servicing

Receiver Drier

Receiver Drier Removal

1. Recover no-idle A/C circuit refrigerant. Refer to Evacuating the System.
2. Remove the plastic cover + fan assembly by removing 14 T20 screws.
3. Remove the desiccant using a 17mm hex.

Receiver Drier Installation

1. Lubricate the new o-ring with PVE refrigerant oil and install the desiccant and cap in the drier compartment. Torque to 6.6 ft. lbs.
2. Install the plastic cover + fan assembly with 14 screws. Torque to 20 in. lbs.
3. Charge no-idle refrigerant system. Refer to refrigerant charge information.

Component Servicing

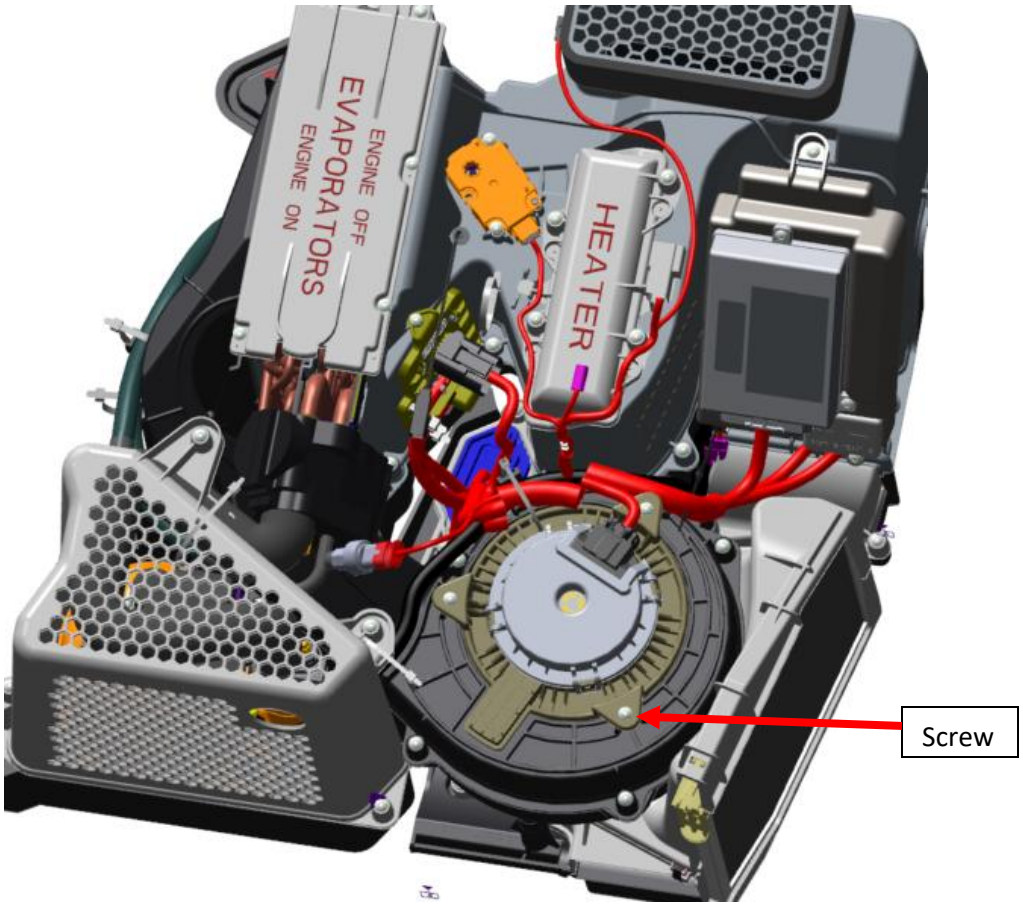
Evaporator Blower

Evaporator Blower Removal

1. Remove the electrical connector for the blower.
2. Remove the blower by removing 3 T20 screws.

Evaporator Blower Installation

1. Insert the blower in the orientation shown. Secure with 3 screws. Torque to 20 in. lbs.
2. Connect the electrical connector.



Component Servicing

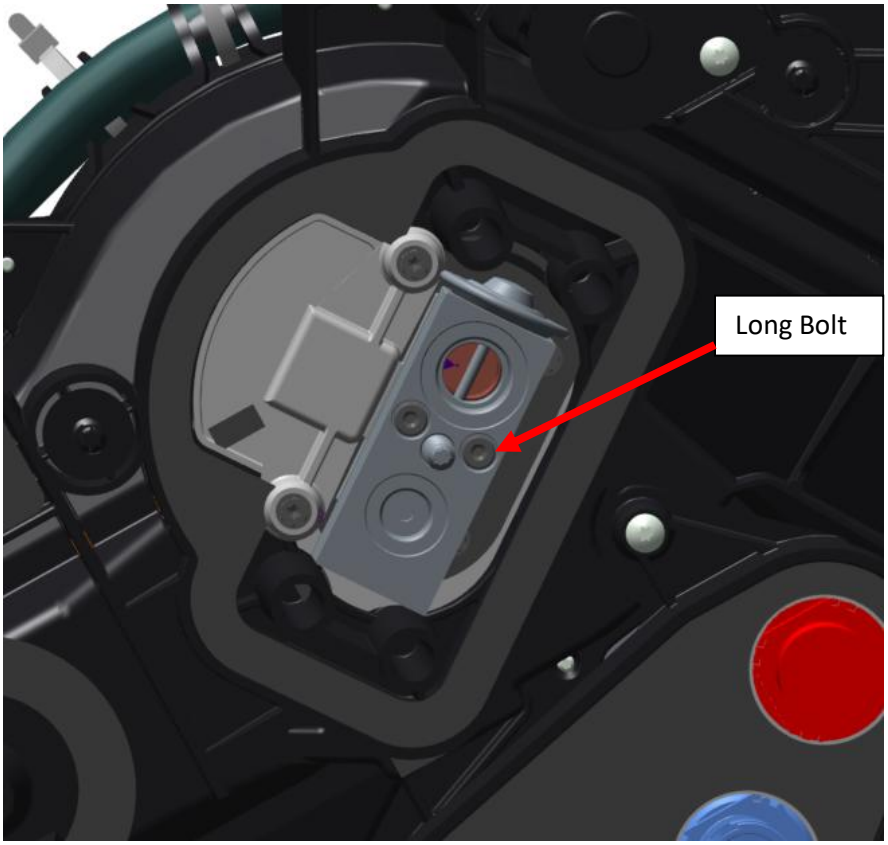
Thermal Expansion Valve – Engine ON

TXV Removal

1. Recover OEM A/C circuit refrigerant. Refer to vehicle instructions and manuals.
2. Disconnect the refrigerant lines connected to the engine on TXV by removing the TXV clamp.
3. Remove the 2 long bolts securing the TXV with a 4mm Allen. Remove TXV.

TXV Installation

1. Verify refrigerant line seals are in place and insert the new TXV. Secure with the 2 long bolts. Torque to 84 in. lbs.
2. Verify refrigerant line seals are in place and connect the refrigerant lines to the engine ON TXV with the TXV clamp.
3. Charge OEM refrigerant system. Refer to refrigerant charge information.



Component Servicing

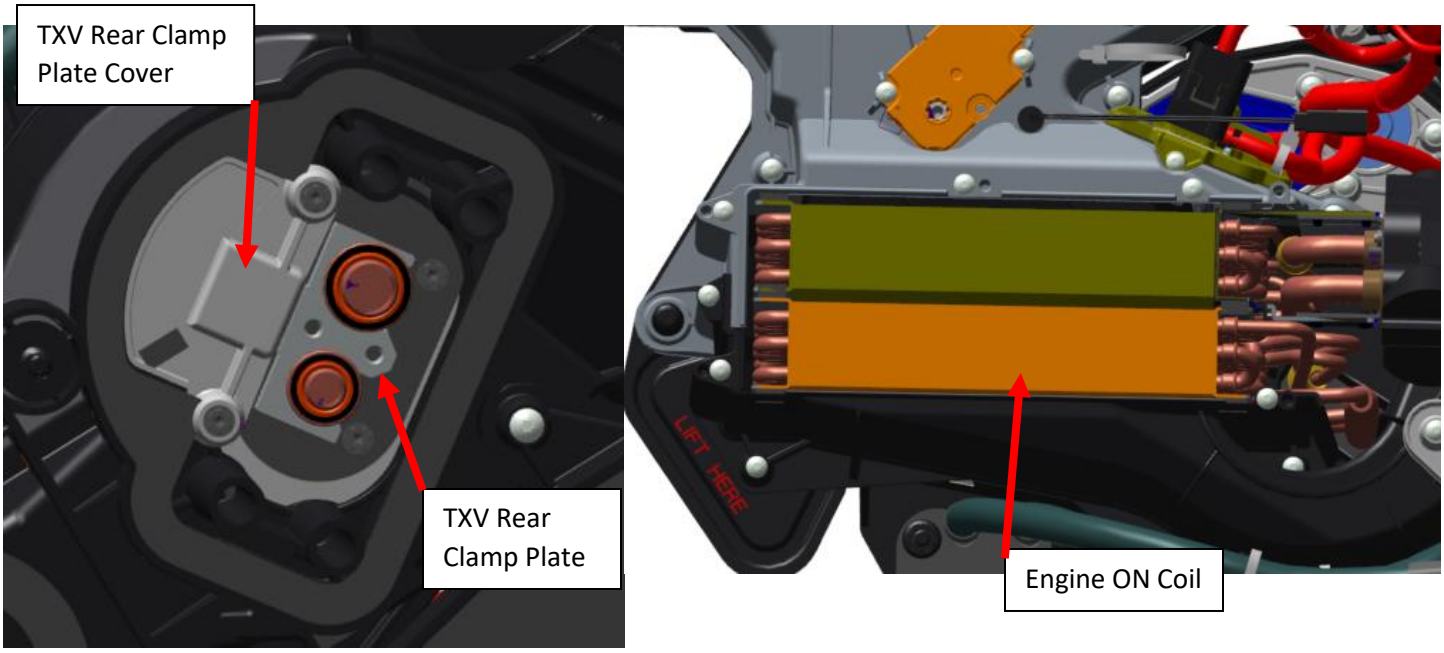
Evaporator Coil – Engine ON

Evaporator Coil Removal

1. Remove the engine ON thermal expansion valve (TXV). Refer to TXV engine ON servicing.
2. Remove the evaporator plastic cover by removing 5 T20 screws.
3. Remove the TXV clamp plastic cover with 2 T20 screws.
4. Remove the rear TXV clamp plate.
5. Raise the evaporator coil assembly out of the BPHS unit.

Evaporator Coil Installation

1. Insert the new coil assembly into place.
2. Secure by adding the rear TXV clamp plate and securing the TXV clamp plastic cover with 2 screws. Torque to 20 in. lbs.
3. Secure the evaporator plastic cover with 5 screws. Torque to 20 in. lbs.
4. Install the engine ON thermal expansion valve (TXV). Refer to TXV engine ON servicing.



Component Servicing

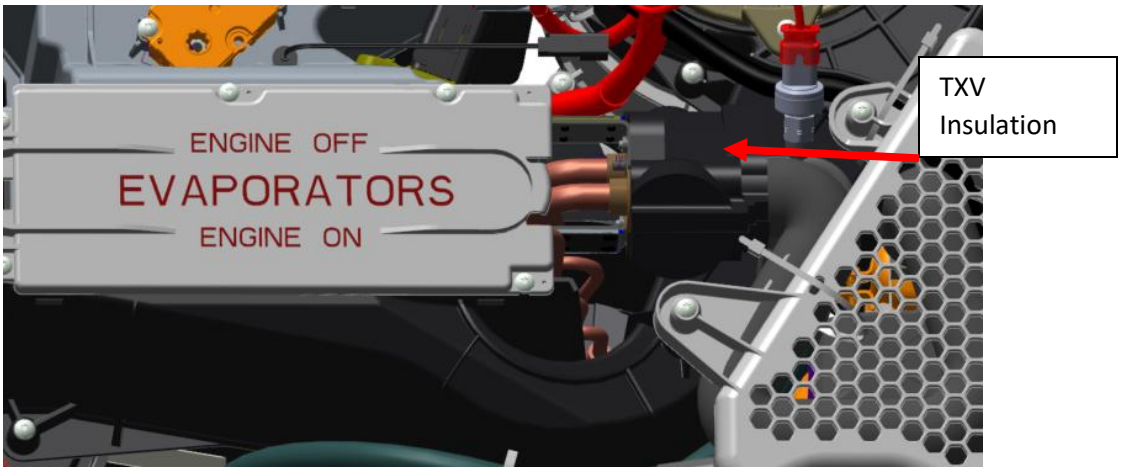
Thermal Expansion Valve – Engine OFF

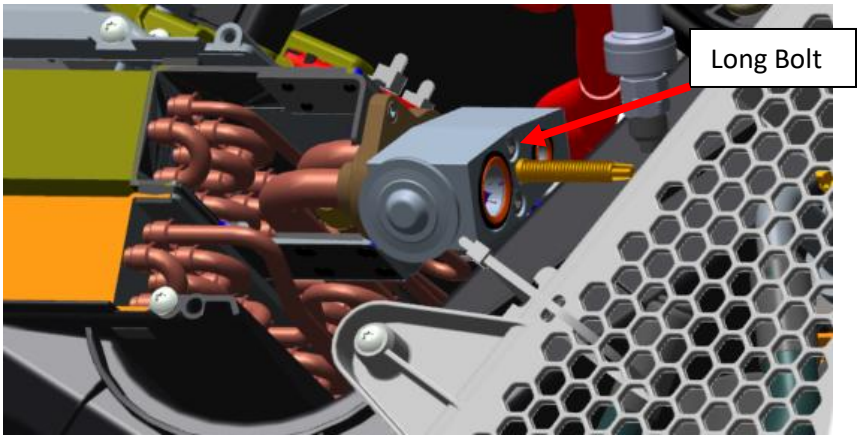
TXV Removal

1. Recover no-idle A/C circuit refrigerant. Refer to Evacuating the System.
2. Remove the evaporator plastic cover by removing 5 T20 screws.
3. Remove the insulation surrounding the engine OFF TXV.
4. Remove the refrigerant lines connected to the TXV by removing the nut holding the clamp with a 13mm socket.
5. Remove the TXV by removing the 2 long bolts with a 4mm Allen.

TXV Installation

1. Verify refrigerant seals are in place and insert the new TXV into place. Secure with 2 long bolts. Torque to 84 in. lbs.
2. Verify refrigerant line seals are in place and connect the lines to the TXV. Secure with the clamp and nut. Torque to 100 in. lbs.
3. Attach the insulation to the TXV.
4. Secure the evaporator plastic cover with 5 screws. Torque to 20 in. lbs.
5. Charge no-idle refrigerant system. Refer to refrigerant charge information.





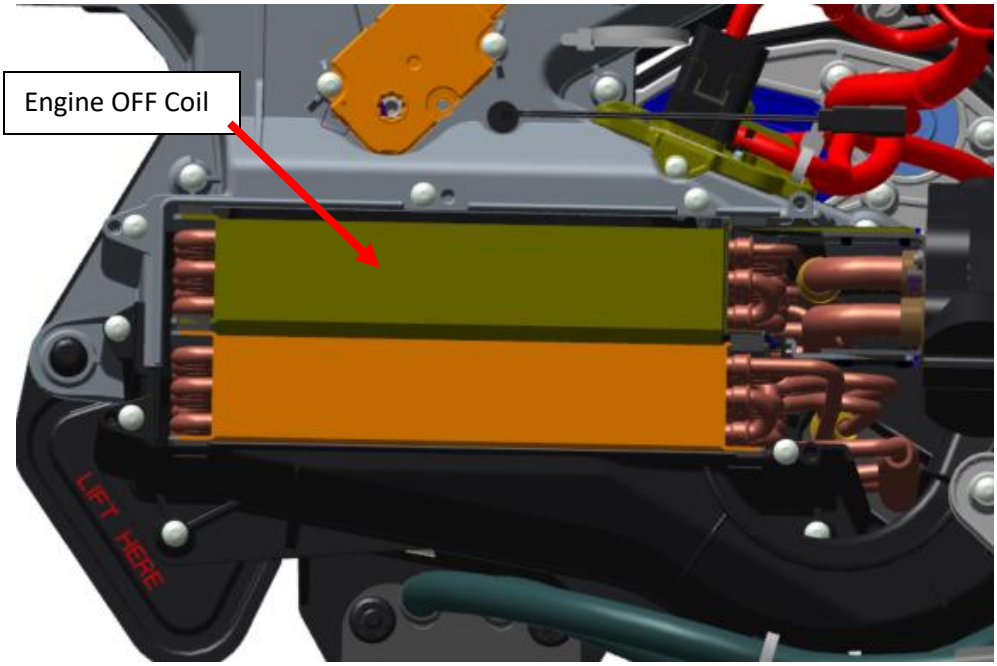
Evaporator Coil – Engine OFF

Evaporator Coil Removal

1. Remove the engine OFF thermal expansion valve (TXV). Refer to TXV engine OFF servicing.
2. Remove the evaporator plastic cover by removing 5 T20 screws.
3. Raise the engine OFF coil up and out of the BPHS unit.

Evaporator Coil Installation

1. Slide the new coil assembly into place.
2. Secure the evaporator plastic cover with 5 screws. Torque to 20 in. lbs.
3. Install the engine OFF thermal expansion valve (TXV). Refer to TXV engine OFF servicing.



Component Servicing

Compressor

Compressor Removal

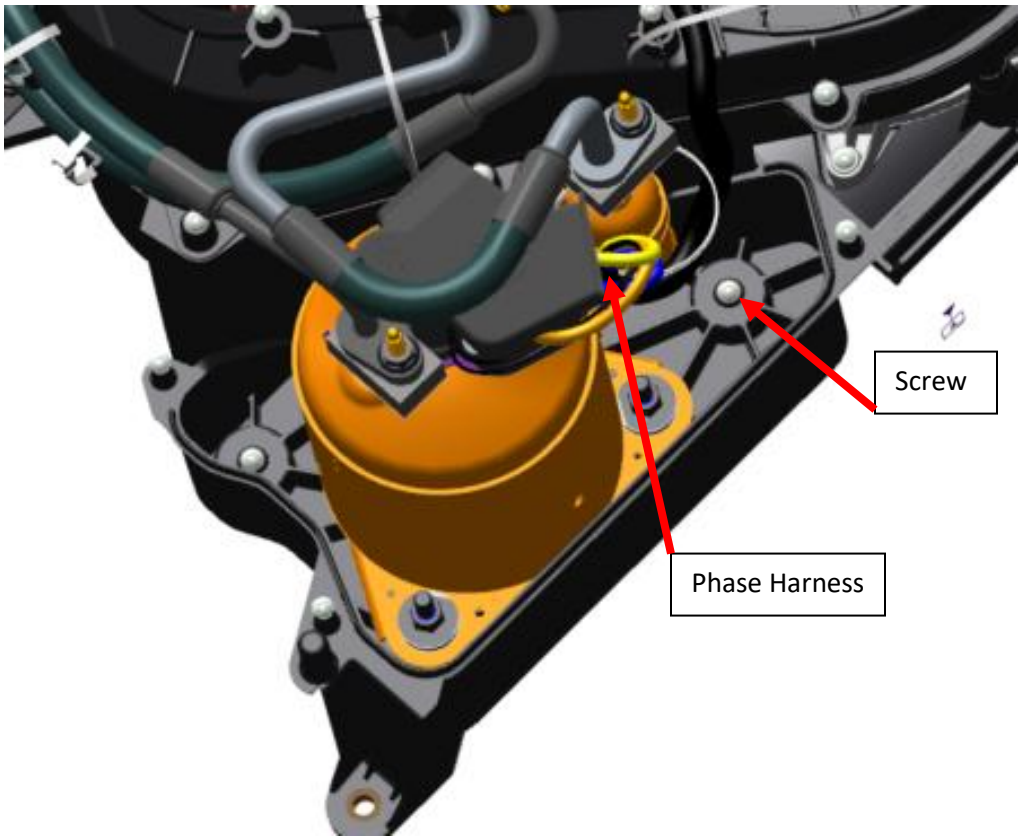
1. Recover no-idle A/C circuit refrigerant. Refer to Evacuating the System.
2. Remove the plastic cover for the compressor by removing 5 T20 screws.
3. Remove the phase harness on top of the compressor. Refer to servicing the compressor.
4. Remove the refrigerant line connections to the compressor with a 13mm socket.
5. Remove the full compressor + plastic mounting base by removing 2 T20 screws. Remove the entire assembly.

Compressor Installation

1. Install the new assembly and secure to the BPHS unit using 2 screws. Torque to 20 in. lbs.
2. Connect the refrigerant lines to the compressor. Torque to 100 in. lbs.
3. Connect the phase harness on top of the compressor. Refer to servicing the compressor.

Note: Compressor phase terminal screws are one-time-use only. Use new screws.

4. Secure the plastic cover with 5 screws. Torque to 20 in. lbs.
5. Charge no-idle refrigerant system. Refer to refrigerant charge information.



Component Servicing

Pressure Transducer

Pressure Transducer Removal

1. Disconnect the pressure switch electrical connector.
2. Use a crescent wrench to **quickly** remove the pressure switch.

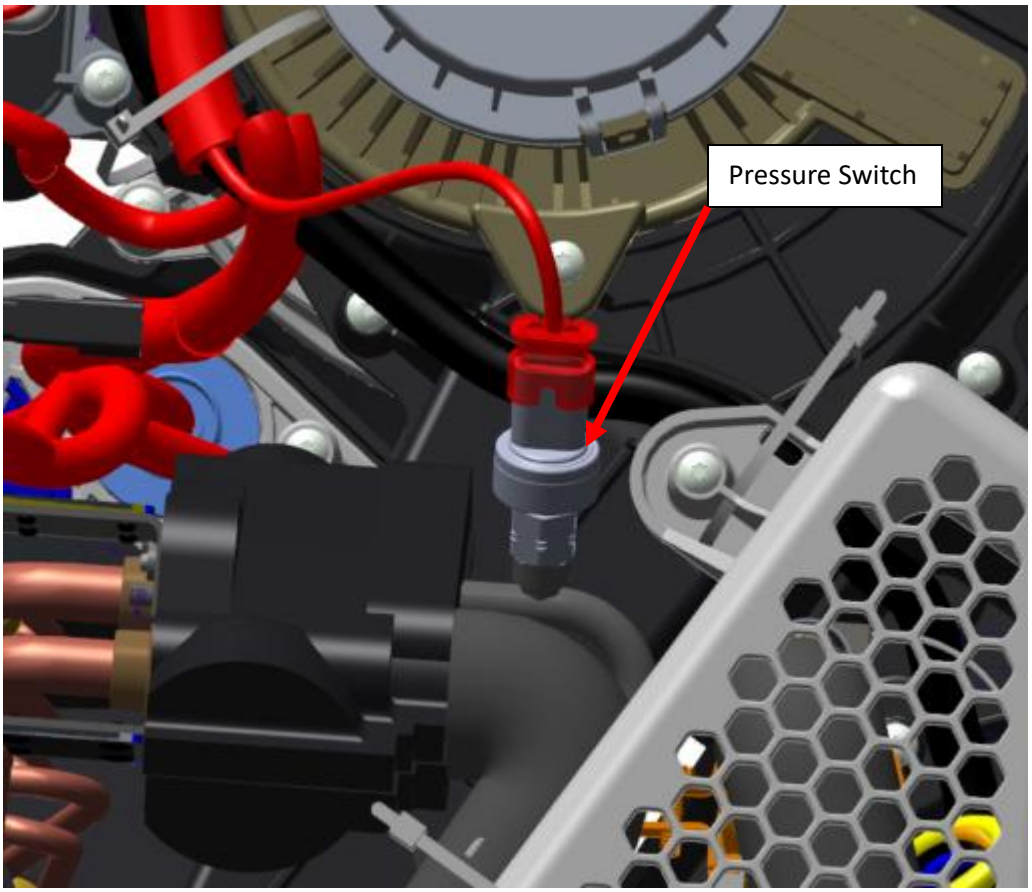
Note: Due to internal Shrader valve, the pressure switch can be removed without recovering refrigerant. However, this must be done very quickly.

Pressure Transducer Installation

1. Use a crescent wrench to **quickly** connect the pressure switch.

Note: Due to internal Shrader valve, the pressure switch can be connected without recovering refrigerant. However, this must be done very quickly.

2. Connect the pressure switch electrical connector.



Component Servicing

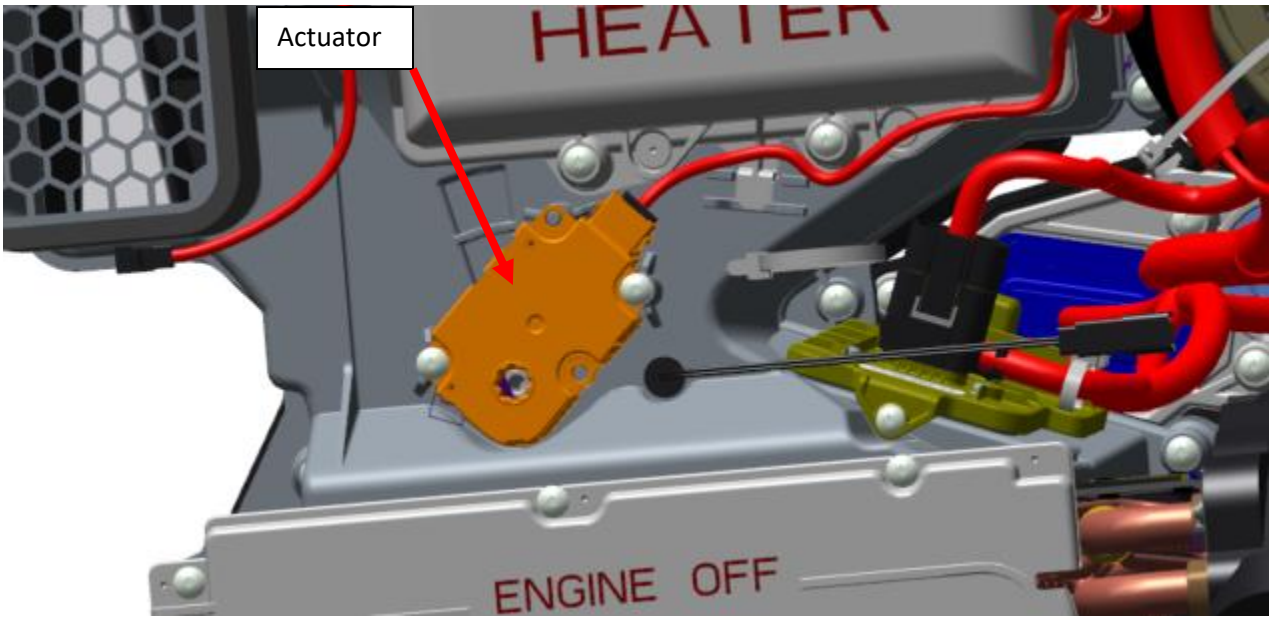
Blend Door Actuator

Blend Door Actuator Removal

1. Disconnect the blend door actuator electrical connector.
2. Remove the 2 T20 screws on top of the actuator.
3. Carefully pull out the actuator.

Blend Door Actuator Installation

1. Carefully insert the new actuator into position.
2. Secure the actuator with 2 screws. Torque to 20 in. lbs.
3. Connect the actuator electrical connector.



Component Servicing

Other Serviceable Components

Heater Coil

Temperature Sensor

System Controller

Compressor Controller

PDM

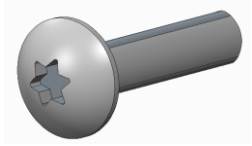
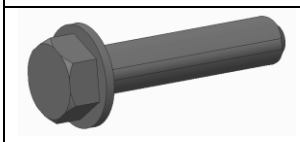
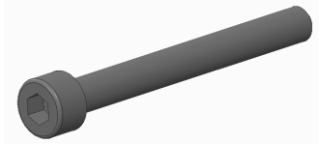
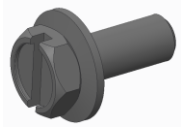
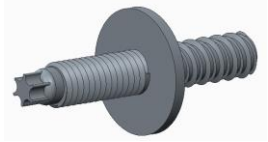
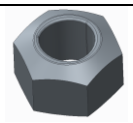
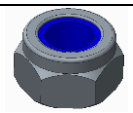
Unit Wire Harness

Certain Refrigerant Lines

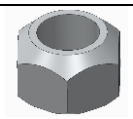
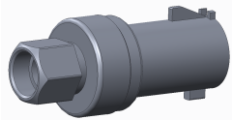
Blend Door Assembly

Torque Specification Table

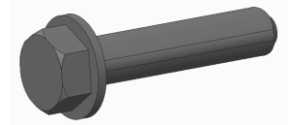
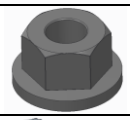
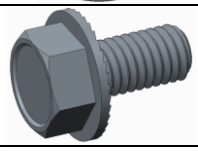
HVAC Unit

GRAPHIC	QTY	WHERE USED	DESCRIPTION	TORQUE Nm	TORQUE In. lbs.
	67	Case, Heater & Evap Covers, Blower	#8–16 x 19.1 Tri-Lobe Screw	2.3 +/- 0.22	20 +/- 2
	5	TXV Cover	#8-16 x 19.1 Tri-Lobe Hex Screw	2.3 +/- 0.22	20 +/- 2
	4	TXV	M5 Socket HD Cap x 45L Screw	9.5 +/-1.0	84 +/- 8.9
	3	Compressor-Phase Harness	#10-32 x 0.5, Hex Conical Sems Screw	3.4 +/- 0.22	30 +/- 2
	6	Bottom Case	M8 Stud, Hi/Lo	9.5 +/- 1.0	84 +/- 8.9
	3	Slimline Fitting, TXV	M8 x 1.25 x 51 Stud	2.8 +/- .28	25 +/- 2.5
	7	Cond. Conn., Slimline Fitting, TXV Insulation	M8 x 1.25 Serr Hex Flange Nut	11 +/- 2	100 +/- 10
	1	PDM	M6 Tri-Lobe Locknut	4.3 +/- 0.22	38 +/-2
	3	Compressor Hold-down	8mm Locknut	2.3 +/- 0.22	20 +/- 2

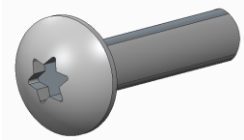
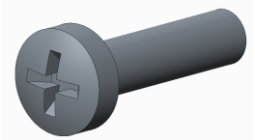
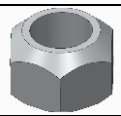
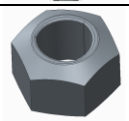
Component Servicing

	1	Compressor stud	¼ - 28 Hex Flange Nut	2.3 +/- 0.22	20 +/- 2
	1	Controller – Phase Harn, PDM	M5 x 0.8 Hex Locknut	2.3 +/- 0.22	20 +/- 2
	1	TXV	Pressure Transducer	7.0 +/- 1	62 +/- 9

Condenser Unit

GRAPHIC	QTY	WHERE USED	DESCRIPTION	TORQUE Nm	TORQUE In-Lbs
	30	Cases, Fan & Sensor Brackets	#8-16 x 19.1 Tri-Lobe Hex Screw	1.7 +/- 0.5	15 +/- 4
	2	Receiver Drier	M8 – 1.25 Nut w/ Conical Keps Washer	15 +/- 2	133 +/- 18
	1	Receiver Drier Clamp	#10 – 32 x 3/8 SH SS Screw	3.4 +/- 0.22	30 +/- 2

Compressor Controller

GRAPHIC	QTY	WHERE USED	DESCRIPTION	TORQUE Nm	TORQUE In-Lbs
	3	Cover Top	#8 - 16 x 19.1 Tri-Lobe Screw	2.3 +/- 0.22	20 +/- 2
	8	Cover Bottom	#6 – 19 x ½L Hi-Lo Pan Screw	0.9 +/- 0.1	8.0 +/- 0.9
	3	Phase Harness	M5 x 0.8 Hex Locknut	2.3 +/- 0.22	20 +/- 2
	2	Main Harness Studs	M6 Tri-Lobe Locknut	4.3 +/- 0.22	38 +/- 2