



Volvo Chassis - Volvo (Bergstrom)Parking Cooler System, Technical Information And Diagnostic Guide - Model Year 2018 And Newer



> Internal Content

For more information regarding the Volvo Parking Cooler System refer to the documents below.

[Volvo Parking Cooler System](#)

[Volvo Parking Cooler System Technical Information and Diagnostic Guide](#)

Relay 41, Rly 41



Tags

[k29581430](#)

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[parking cooler](#)

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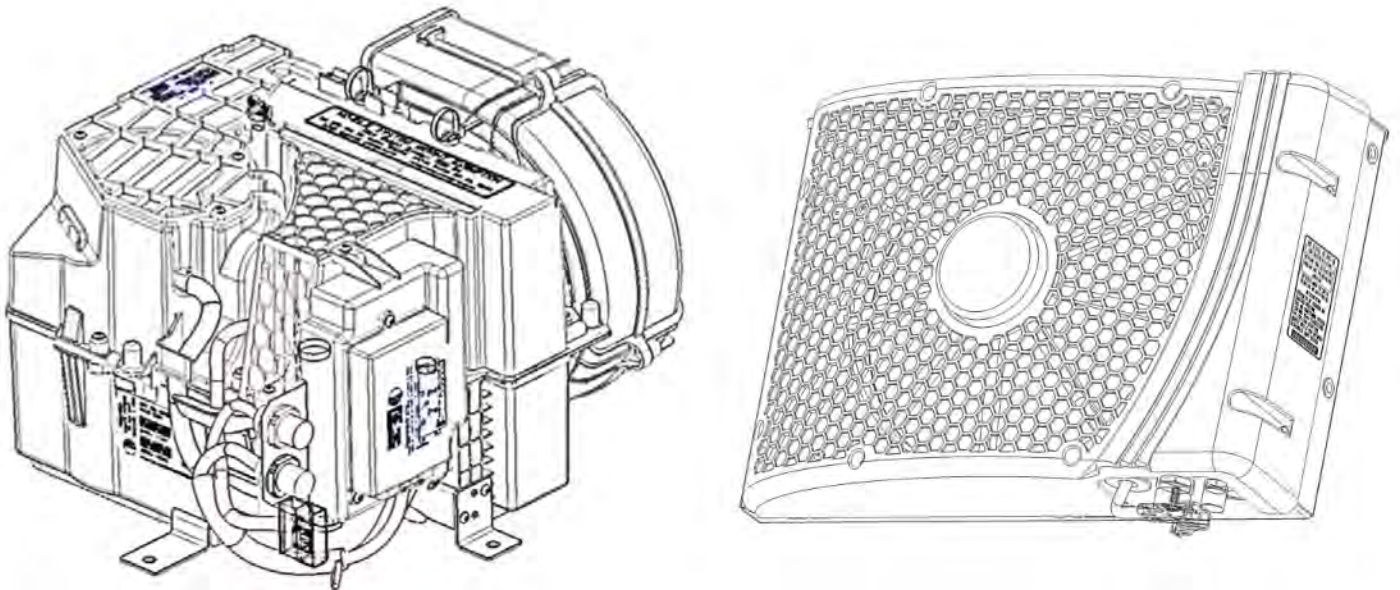


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Technical Information and Diagnostic Guide Volvo Parking Cooler System



This guide will assist you in becoming more familiar with the working components of the Volvo Parking Cooler System and the proper steps and procedures to completely diagnose the unit.

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Unit (external) power circuits - chassis fuses

- (1) - 30 amp for system control - , blower, fan, heater
- (1) - 80 amp for AC compressor.
- (1) – 5 amp for BMS aux battery sense
- (1) – 5 amp for BMS Main battery sense
- (1) – 5 amp for BMS output to battery separator

See appropriate chassis wiring diagram for fuse identification and location.

A: Fuses / Parking Cooler Internal

F1 Fuse 10 Amp (Mini)

This fuse provides short circuit protection for the system control.

Location: On the control center.

F2 Fuse 20 Amp (Mini)

This fuse provides short circuit protection for the condenser fan.

Location: On the control center

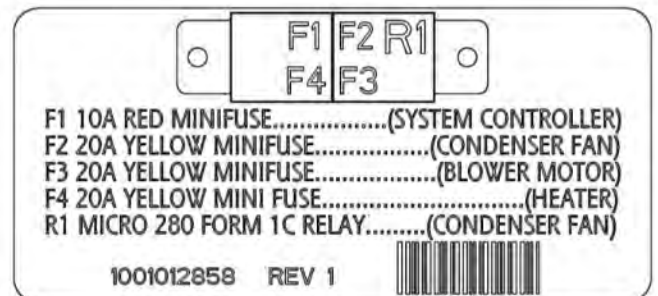
F3 Fuse 20 Amp (Mini)

This fuse provides short circuit protection for the evaporator blower. Location: On the control center

F4 Fuse 20 Amp (Maxi)

This fuse provides short circuit protection for the fuel enabled heater.

Location: On the control center



B: Relays:

Location: On the control center

R1. This relay controls the voltage to the condenser fan.

C: User Interface / Fan and Temperature Control

Allows for temperature and Blower speed adjustment of the Parking Cooler system when operating in Auto, cool or heat mode.

A/C Unit - stops when unit is shut off or batteries are depleted.

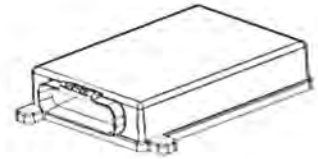
Auxiliary heater will shut down when batteries are depleted but will continue to run through the cool down cycle.

Also displays hours of service, battery health and service items.



D: System Controller:

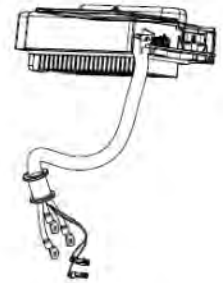
This device stores the operating program and controls the Volvo Parking Cooler system.



E: Compressor Controller

This device controls the output voltage to the variable speed compressor.

See cautions pages 15 / 32-35



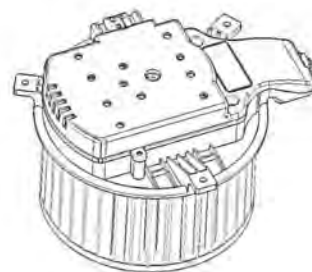
F: Discharge Temperature Sensor - Freeze Switch:

This sensor monitors the evaporator outlet temperature as it enters the vehicle duct system.



G: Evaporator Blower:


This blower pulls air through the evaporator coil and blows conditioned air into the interior of the sleeper.

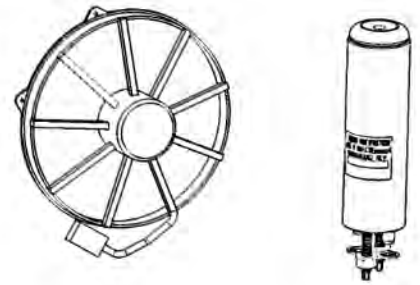
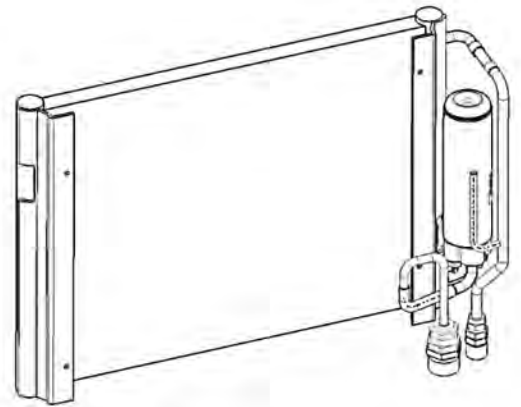


H: Condenser Coil / Fan / Receiver drier:

This fan draws air from behind the truck and pushes it through the condenser coil to cool the refrigerant flowing through the system.

Condenser coil assembly, fan and receiver drier are serviceable items

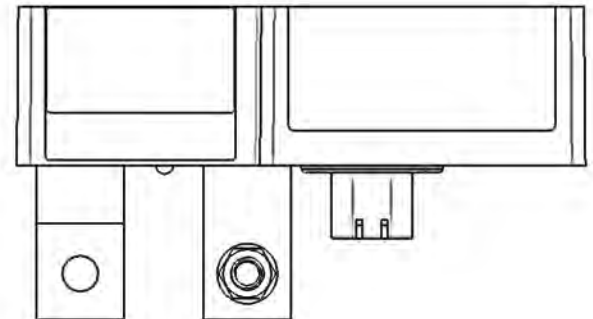
 Cleaning condenser – See page 41



I: Battery Management System:

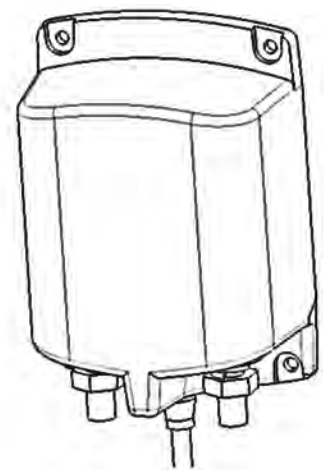
This device monitors the auxiliary batteries for state of charge, communicates with the Parking Cooler system and controls the battery separator solenoid. LED light will blink about once every minute. This only indicates the device has power to operate but does not provide any type of diagnostics. Power inputs to this device are fuse protected.

If one of the BMS fuses blows, the solenoid will disengage.



J: Battery Separator:

This device connects the truck batteries to the Parking Cooler batteries. When the starting batteries are at or above 13.2 volts, the battery management device will engage the solenoid to allow the alternator to charge the auxiliary batteries. When the voltage drops to or below 12.4 volts the battery management system will disengage the solenoid to prevent the truck starting batteries from being discharged below the engine start level.



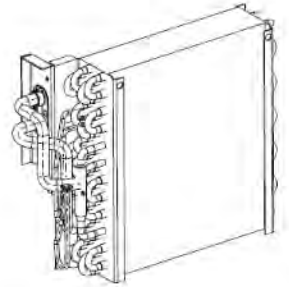
K: Refrigerant Lines

Refrigerant lines are serviceable and have high side service ports.



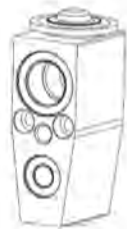
L: Evaporator Coil

Evaporator coil is serviceable and uses slimline seals.



M: TXV / Thermal Expansion Valve

Thermal expansion valve is serviceable and uses slimline seals.



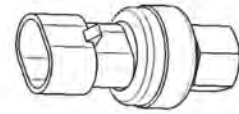
Slimline Seals: These seals are used on several components.

Please refer to service parts list for proper size and quantities.

INTERNAL COMPONENTS

N: Refrigerant Pressure Switch (Binary)

This normally closed pressure switch will open for low or high / high side pressure and prevent the operation of the compressor. It is o ring mounted and serviceable.



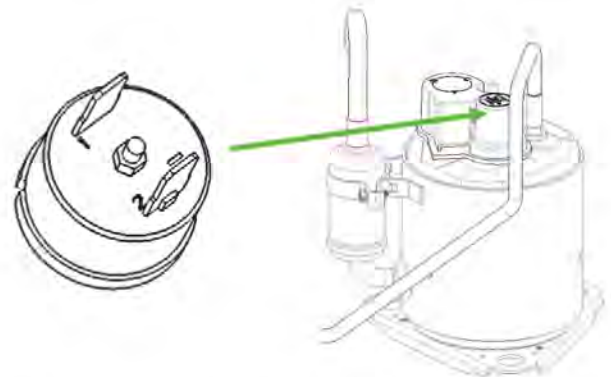
O: Compressor:

The refrigerant compressor is part of the hermetically sealed refrigeration system. See [pages 36-37 for connection service Instructions](#).



P: Thermal Limit Switch on Compressor:

This is a normally closed (auto reset) switch to protect the compressor from high temperature.



Q: Evaporator inlet filter:

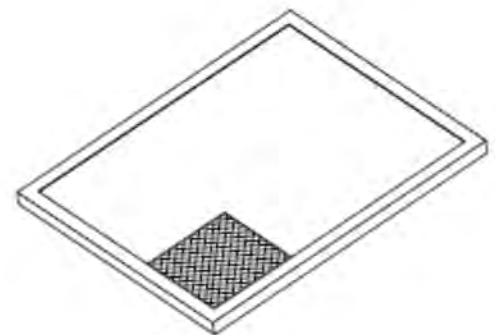
This filter protects the evaporator coil from dust and debris. It is washable and should be serviced every other month by washing dust and debris off with warm water. In environments with pets or dusty environments the filter may need more frequent washing. Failure to do so will affect the performance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

Return air for the Parking Cooler returns through the bunk support wall and cannot be restricted by luggage or clothing. This air must flow freely back to the Parking Cooler.

⚠ NOTE

Odors from luggage compartment may be vented back into the sleeper cab.

When necessary, Check Filter indicator will notify you that the filter must be cleaned or changed. To reset Check Filter: at screen 1 press and hold enter button for 3 seconds.



A/C System Diagnostic Table

Check service screens before troubleshooting, see operating instructions.

Removing fuse F1 for 5-10 seconds will reset the main system controller to factory default settings.

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION / SEE APPENDIX
<p>Unit Will Not Run or Turn On</p> <p style="text-align: center;"><u>IGNITION SIGNAL</u></p> <p>Display comes on for 5 seconds, shows service screen for 3 seconds and then powers off (see #9)</p>	<ol style="list-style-type: none"> 1. Ignition / Key is on 2. Loose connection 3. No power is available at the unit. 4. Blown fuse or fuses 5. Check Voltage path to unit and control 6. Check wake up signal 7. Defective user control. 8. A/C system controller defective. 9. Broken wire or defective wire harness 10. Check for Fault code 11. Can Buss connection. 	<ol style="list-style-type: none"> 1. Check Ignition disable signal – see pinout chart page 28 2. Confirm all connections are tight, including ground lugs, and terminals crimped on wires and battery cables. 3. Check All batteries for Voltage. Check battery management system and separator solenoid. Unit has a low voltage disconnect of 11.2 volts. 4. Check all fuses. See wiring diagrams pages 26/27. 5. Check for 12 volt through the 30 amp main fuse and F1 10 amp control fuse to controller pin 15 & 30. 6. See Appendix H. 7. Check user interface control. See appendix B. 8. Test System Controller. See Appendix H. 9. Inspect wiring harness and all ground wires. 10. View faults on the controller. See pg. 31 for instructions. Disables compressor and fan only. 11. Check can bus harness and connections. Reset controller. See appendix M and wiring diagrams pgs. 26/27.
<p>Auxiliary batteries will not recharge</p>	<ol style="list-style-type: none"> 1. Check battery Management System 2. Check Battery Separator 	<ol style="list-style-type: none"> 1. Check battery management device, harness and separator. See appendix M. See appendix M.
<p>Unit Runs - But Does Not Blow Cold Air</p>	<ol style="list-style-type: none"> 1. Airflow blockage. 2. Compressor Fuse 3. System and Compressor controller connections/ defective compressor. 4. Condenser fan and high pressure switch 5. Evaporator discharge temp sensor/Freeze switch defective 6. Thermal Expansion Valve 7. Compressor thermal switch 8. Evaporator blower 9. Loss of charge (refrigerant system is serviceable). 	<ol style="list-style-type: none"> 1. Clear any blockage from recirculation grill or louvers. Also check condenser inlet and outlet for restriction (outside truck). 2. Check compressor fuse FM_A5 . See appendix E. 3. Confirm all wire harness plugs are connected. Test system and compressor controller. See appendix H & I. 4. Check (Binary) high pressure switch and condenser fan. See appendix D & H. 5. Check sensor. See appendix F. 6. Thermal expansion valve/ refrigerant flow -see appendix F. 7. Check normally closed thermal switch. See appendix G. 8. Check Evaporator blower. See appendix K. 9. If all tests check OK, a loss of refrigerant charge may have occurred. See appendix O, system contains refrigerant dye. See appendix Q for refrigerant levels. Call the Nite line at 1-866-204-8570

A/C System Diagnostic Table

Check service screens before troubleshooting, see operating instructions.

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION / SEE APPENDIX
Unit Cycles On And Off and doesn't cool	<ol style="list-style-type: none"> 1. Poor electrical connection. 2. Condenser fan inoperative. 3. Air flow blockage causing high pressure or freeze condition. 	<ol style="list-style-type: none"> 1. Check all electrical connections. 2. Check condenser fan. See appendix J. 3. Check for restricted airflow outside truck at condenser inlet and outlet and at louvers and recirculation grill. Check pressure switch, thermal limit and/or discharge temperature sensor. See appendix D, F, & G.
Unit Blows Cold Air, But Low Airflow	<ol style="list-style-type: none"> 1. Check all duct work connections. 2. Air flow restricted 3. Evaporator Blower motor inoperative. 	<ol style="list-style-type: none"> 1. Make sure all ducts are connected, sealed and secure. 2. Check for airflow at louvers and recirculation grill. 3. Check evaporator blower motor. See appendix K.
Unit Runs Correctly, But Less Than Expected Run Time	<ol style="list-style-type: none"> 1. Ground terminal(s). 2. Batteries weak or not charged correctly. 3. High amperage draw 4. Check battery Management System 5. Check Battery Separator 	<ol style="list-style-type: none"> 1. Inspect and tighten ALL connections. 2. Check batteries for condition and state of charge. Check service screens in PARKING COOLER control. See appendix A. 3. Check amp draw in PARKING COOLER control service screen or use DC ammeter to check amps when running. Excessive amperage could signal compressor or internal component issue. Amperage ranges 35 to 75 depending on settings and conditions. 4. Check battery management device, harness and separator. 5. Same as 4.
Unit is Noisy or Vibrates	<ol style="list-style-type: none"> 1. Evaporator Blower motor. 2. Condenser fan motor. 3. Compressor mounting. 4. Compressor internal. 	<ol style="list-style-type: none"> 1. Check evaporator blower. See appendix K. 2. Check condenser fan. See appendix J. 3. Check rubber compressor mounts. See appendix L. 4. If rubber compressor mounts check out acceptable, and compressor vibrates excessively, call Nite 1-866-204-8570.

Testing the Webasto Heater connected to the Parking Cooler Unit

See the truck chassis wiring for main power harness and fuel pump connections.

The Webasto heater connects to the Parking Cooler unit through the 16 pin connector. Chassis fuse FFB06A provides main control power for the Parking Cooler unit including the heater.

Internally, the unit sends power out through fuse F4 to the heater. Ground is pin D.

Pin C is heater enable. This 12 volt output from the Parking Cooler unit to the Webasto heater enables the heater to turn on. Pin 3 is ground.

Heat level connects between heater pin B and user interface control pin 5. This transmits the temperature signal from the Parking Cooler temperature sensor to the heater ECM. The Webasto heater will regulate heat according to this temperature and the set point of the control. When checking resistance on the temperature circuit, always use pin D for reference.

Selecting HEAT mode will turn the ENABLE signal on. The heat level is controlled by a variable resistance signal from the Parking Cooler User Interface controller. Resistance ranges from approx. 1.1k ohms for low heat and 2.2k ohms for high heat. Use the Parking Cooler pin D for reference.

First, set the Parking Cooler User Interface controller to HEAT mode, set the temperature to full heat 85 degrees. When testing the heater, the ambient temperature in the sleeper should be below 85 degrees.

Check for the heat enable signal on pin 5. You should have 12 volts. If the User Interface controller shows the temperature set point and heat mode and you do not have 12 volts, check the Parking Cooler internal system controller output from pin C. If you have 12 volts on pin C but not outside the unit, you have a bad connection or the harness is defective. If you do not have 12 volts on pin C, you have a defective system controller.

With 12 volts on the heat enable, check the heat level signal at the heater on pin B using pin C as ground. This variable resistance signal will range from approx. 1.1k ohms to 2.2k ohms. If this resistance is within range, the heater should operate. If it does not operate, the problem is likely internal in the heater. See Webasto guide for heater diagnostics.

If the resistance level is not present or correct at the heater, check across pins 5 and 7 on the back of the User Interface controller. If you have the correct resistance at the user interface but not at the heater, you could have a bad connection or a defective harness. If you do not have the correct resistance here, your User Interface controller is defective.

For complete Webasto heater diagnostics go to www.webasto.us.

Appendix

A. Battery Condition and Performance:

Battery Voltage is critical for system operation. Special attention should be given to both sets of batteries.

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

Load test and maintain batteries as required by the manufacturer.

Battery symbol in diagnostics screen indicates battery health. This is created after many cycles. If batteries have been disconnected recently, this symbol will reset. Several cycles will be needed to get accurate battery health.

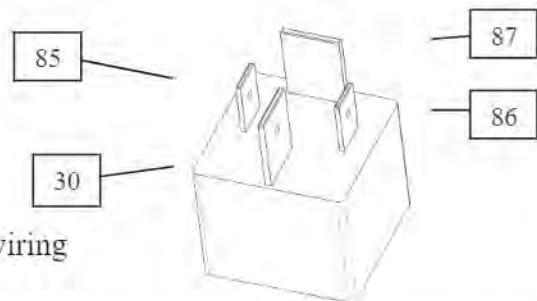
B. User Interface / Fan and Temperature control

With the control off - check for 12 VOLT at and from F1 10 amp fuse to the connector on rear of control panel, terminal P. Terminal S is negative. Check for 12 volts at control terminal K (wake up) coming from the main/ compressor controller terminal 7. Pushing the control (on) will switch this input from the main controller to ground at the control panel. This signals the main control to start the system. When control is on the wake up signal should be less than 1 volt.

C. Relay Testing:

With relay unplugged, confirm there is 12 VOLT on the sockets where 85 and 30 relay terminals are connected

If you do not have 12 VOLT here check fuses, wiring and battery connections.



Now, with relay unplugged, check across terminals 85 and 86 of the relay, using an OHM meter. You should have approx. 90 ohms $\pm 10\%$ at 20°C. This is measuring the resistance through the relay coil. If you do not, replace relay.

Overview

When you turn the **PARKING COOLER** unit on, if all safety switches are ok, such as the high pressure switch, temperature sensor / freeze switch and the compressor thermal limit switch, the system controller will connect the condenser fan relay terminal 86 to ground on terminal 27 of the system controller. This will close the contacts 30 and 87 of the relay and allow power to the condenser fan.

You should now have 12 VOLT passing through the relay on spade terminal 87 (continued next page)

With relay plugged in: TURN THE UNIT ON. If you do not have 12 VOLT on terminal 87, check across terminals 85 (+) and 86 (-). You should have 12 VOLT. If you do not, you may have a defective harness or system controller. If you have 12 VOLT here and do not have 12 VOLT on terminal 87 your relay is defective. The internal coil of the relay is energized but the contacts are not closing. Replace the relay.

If you have 12 VOLT on terminal 87 and the condenser fan does not run you could have a defective condenser fan or missing speed signal.

See testing Condenser Fan appendix J and additional instructions on pages 38-41.

D. Binary Pressure Switch Testing: You must remove top covers to access the switch. Check user interface for any fault codes.

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 page 24.

The Schrader mounted switch is serviceable. It opens on low or high – high side pressure.

If pressure switch is open or user interface shows a fault, you must connect to the refrigerant loop and check system pressure.

When the unit is off for a few minutes, unplug the System Controller and check between harness pins 4 and 32, you should always have continuity. If you do not, you may have a broken wire, bad connection, pressure situation or defective switch. If the pressure switch, harness and connections are ok, the PARKING COOLER unit may need additional diagnostics, recharged or replaced.

E. Check continuity across fuse body (fuse does not look blown)

Remove fuse from fuse holder. Using a meter, check for continuity across the fuse. With fuse installed, check for voltage at and through the fuse using a dc volt meter.

F. Discharge Temperature Sensor/Freeze Switch Testing:

Location: Between evaporator coil and intake side of blower.

The freeze switch is a temperature sensor. To verify the condition you will need a Volt/OHM meter.

If a freeze condition occurs, the unit will stop the compressor. If the freeze condition leaves, the compressor will restart and the unit will continue to run.

Check resistance (ohms) value at the system controller with the 32 pin connector disconnected. You should read a resistance across terminals 9 (pos) and 32 (neg) within the range listed on the table page 25. If you cannot read the resistance, check at the sensor connection. If you read the resistance here, and it's within the range allowed, you have a defective harness.

If you cannot read the resistance or it is not within the given range, your sensor is defective.

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 next to return air filter. A broken capillary tube will also cause the same condition. TXV / cap tube are not serviceable.

G. Compressor Thermal Limit Switch: You must remove cover 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 connector on the compressor controller.

H. System Controller: Located outside the unit on right rear corner, on top of the compressor controller.

Do not attempt to test the controller or compressor until you have completely eliminated all other possibilities such as batteries, fuses, harnesses, etc.

Overview

Power to the main system controller on pins 15 and 30 must be present and ignition signal on pin 14 must be off for system to operate.

When you turn the **Parking Cooler** unit on, the evaporator blower will begin to operate at a speed determined by the manual control. If all safeties are ok, such as the high pressure switch, temperature sensor / freeze switch and the compressor thermal limit switch, the main system controller will connect the condenser fan relay terminal 86 to ground at terminal 27 on the controller. This will close the contacts 30 and 87 of the condenser fan relay and allow power from F2 fuse to the fan. The condenser fan will begin to operate at a speed determined by the main system controller. At the same time, the main system controller will send enable and speed signals to the compressor controller to start the refrigerant compressor.

At the initial power up, the system defaults to Auto Mode, Blower speed 1 and 72°F set point. After the settings are changed for the first time, they will always return to the last setting except for the temperature which always defaults to 72°F.

Use the following steps to check the controller

- a. With the User Interface control off - check for 12 VOLT from F1 - 10 amp fuse to the back of the User Interface control terminal P.
- b. Now check for 12 volts at User Interface control terminal K (wake up) coming from the main system controller terminal 7. Turning the unit on will switch this 12 volt input from the main controller to ground at the control panel. This signals the main controller to start the system. Terminal K (wake up) should be less than 1 volt when button is being pushed.
- c. With 12 volts to the User Interface controller and the correct wakeup signal from the User Interface controller to the main system controller, the system should startup.
- d. At startup, there are 3 main functions starting.
 - 1 The evaporator blower will start and operate at the speed requested by the User Interface controller. Blower power and speed control signal must be present for operation. See appendix K for testing the blower motor.

- 2 The condenser fan will start and operate at the speed determined by the main system controller. Fan power and speed control signal must be present for operation. The main system controller will connect the condenser fan relay terminals 86 to ground at terminal 27 on the controller. This will close the contacts 30 and 87 of the condenser fan relay and allow power from F2 fuse to the fan. See appendix J for testing the condenser fan.
- 3 The main system controller will send enable and speed signals to the compressor controller. The compressor controller will start the refrigerant compressor. Main power from the 80 amp (FM A5) fuse must be present on the compressor controller.
If you lose any signals from the controller it must be replaced.
Safety controls must be in a normal state for the system to operate.

I. Compressor Controller: Located outside the unit on right rear corner, under the system controller.

- a. If all signals are correct and the safety controls thermal limit on compressor, high pressure switch and temp sensor /freeze switch are ok, the User Interface control is calling for cold and the sleeper temperature is above 60 degrees, the compressor controller should send voltage out on the three wires connected to the compressor terminals: A – Blue, B – Orange and C – Yellow. (ABC – BOY), and the compressor should run.
- b. If the compressor does not operate disconnect the three wires from the compressor. You will have to remove plastic cap from the top of compressor.

CAUTION: Screws securing the phase harness to the compressor and nuts securing the power harness to the controller are (1time) use only. If removed for any reason they must be replaced. Use only OE recommended replacements.

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.

Using a volt meter check each wire, positive on (blue, orange or yellow) negative to battery ground. If you do not have a 6 volt pulse voltage out on each wire, replace the controller. Pulse voltage means the controller will cycle to each colored wire. You should see the voltage appear and disappear continuously. If you do have a 6 volt pulse voltage out and the compressor does not run you have a defective compressor.

J. Condenser Fan Motor Testing:

First do a visual inspection of all fan parts. Additional instructions on pages 38-41.

Note: This fan cycles on and off with the compressor! Before testing fan, start the unit, make sure the control is set for full cold and the temperature in the truck will allow the control to attempt to start the compressor and condenser fan.

Turn the unit on; you should have 12 volts across terminals A and B at the condenser fan connector. If you do not have 12 volt at the fan, check fuse F2 And relay R1.If you have 12 VOLT main power, check for the signal voltage from unit pin (R) at fan terminal C. You should have zero voltage with unit off and 1.6 to 3.9 volts unit on. If all voltages are correct, reconnect the plug. If the fan does not run, it is defective, and needs to be replaced

Using a DC ammeter you can check the amperage draw of the fan. Normal amps approx. 4.5

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

K. Evaporator Blower Motor:

First do a visual inspection of all blower parts.

You should have 12 volt at pin 5 (pos), if you do not, check fuse F3. If you have 12 VOLT main power, turn the unit on and check for the speed signal voltage at blower pin 4 coming from the system controller pin 20. You should have approx. 6.3v for speed 1, approx. 5.0v for speed 2 and approx. 2.8v for speed 3. If all of these voltages are correct and the fan does not run, it is defective, and needs to be replaced.

Using a DC ammeter you can check the amperage draw of the blower. Normal amps will range from 4 to 10 amps.

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

L. Compressor Rubber Mounts:

Visual inspection of the compressor rubber mounts may be necessary if excessive vibration is present. Check for loose mounting nuts. If mounting nuts and captive studs are ok, vibration could be from the internal part of the compressor.

M. Testing the Battery Management System (BMS)

Overview

The BMS monitors the auxiliary batteries for state of charge, communicates with the PARKING COOLER system and controls the battery separator solenoid. LED light on the BMS blinks randomly (approx. once every 60 seconds) and indicates power to the device but does not provide diagnostics. Power inputs to the BMS are fuse protected.

When the truck starting battery voltage is above 13.2 volts for at least 15 seconds, the BMS will send an **engage** signal to the separator. The separator will close and allow charging of the aux batteries. When the truck starting battery voltage falls below 12.4 volts for 15 seconds, the BMS will **disengage** the separator. The separator will open and stop the charge of the aux batteries, and prevent the truck starting batteries from being discharged.

Testing

Before testing the BMS or separator, unplug the BMS for at least 1 minute to reset the system then reconnect and attempt to operate the system. If the system does not operate continue with the following tests.

BMS tab with hole must be connected to the negative battery terminal on the aux batteries. First, check the aux battery voltage. Voltage must be above 6 volts for the device to work. Batteries should be tested and fully charged before they are installed in the truck for best results. If not, it can take a considerable amount of time for the battery state of health indicator to be correct.

Depending on BMS model, blinking of the LED light will vary from 15-20 seconds to about once every minute. This only indicates the device has power to operate but does not provide any type of diagnostics. If the aux battery voltage is ok, and the LED is not flashing, check the connection and 5 amp fuse in the aux battery sense wire near the BMS.

With aux voltage ok and LED flashing, check for 12 volts from the truck starting batteries. This voltage passes through a 5 amp fuse in the start battery box and connects at pin 8 (pos) and 1 (neg) in the 8 pin connector on the BMS. This voltage, from the truck batteries, is displayed on the LED controller (service) screen. It also powers the output for the engage signal to the separator. If you do not have 12 volts across pins 8 (pos) and 1 (neg), check the 5 amp fuse and the wiring harness.

With aux voltage ok, LED flashing and 12 volts across pins 8 and 1, start the truck or connect the start batteries to a battery charger and bring the voltage above 13.2 for at least 15 seconds. You should hear a click when the solenoid pulls in. This would indicate that the BMS has sent the engage signal from pin 5 (orange wire) of the BMS to pin 2 on the Terra Power separator, pin 1 is ground on both devices. This is a 12 volt signal. When the separator closes, you should see an increase in voltage on the aux side of the separator and at the aux batteries. The voltage across both sides of the solenoid will slowly become the same value, which indicates that the tractor batteries and auxiliary batteries are tied together in parallel. If the separator did not close by the BMS, check the separator. (See below) If the separator checks ok, recheck the BMS. If the separator closed and does not allow charge to the aux batteries, the internal contacts of the switch could be defective. Replace the separator.

If the separator closes and allows charge to the aux batteries, that part of the BMS is working. Now shut off the truck engine or battery charger and put a load on the tractor batteries. Examples of a load include the headlights and radio. Allow the voltage of the truck batteries to drop below 12.4 volts for 15 seconds. You should hear a click when the solenoid disengages. This would indicate that the BMS has disengaged the signal from pin 5 of the BMS to pin 2 on the separator. The voltage of the tractor batteries and the auxiliary batteries should now start to be different. Turn off the headlights or other loads that were placed on the batteries. When the separator opens, it prevents the starting batteries from being drained. If the separator clicks and does not disengage the internal contacts, the contacts could be welded together. Replace the separator.

Separator Switch Testing:

Disconnect the Deutsch connector of the Terra Power separator. Connecting 12 volts to terminals 2 (Pos) and 1 (Neg) will engage the separator and close the contacts connecting the start and aux batteries. Disconnecting the 12 volts to terminals 2 (Pos) and 1 (Neg) will disengage the separator and open the contacts connecting the start and aux batteries.

If the separator switch tests ok, reconnect the separator wires, unplug the PMS for at least 15 seconds, reconnect BMS and repeat BMS test. If the BMS will not operate the separator, replace the BMS.

N. Can Bus

NOTE: Before checking Can Bus, if control lights for a few seconds and goes out, disconnect the controller harness at the controller or Parking Cooler unit. Reconnect to reset. If unit does not run, continue with Can Bus tests.

POWER TO BOTH DEVICES (PARKING COOLER unit AND BATTERY MANAGEMENT SYSTEM) MUST BE DISCONNECTED TO PERFORM THESE TESTS

The communication from the BMS to the PARKING COOLER unit travels through the controller harness and the BMS harness. These harnesses have a twisted pair of wires, yellow (Can H) and green (Can L). These harnesses should be loomed and routed away from any components in the truck that could cause interference, such as florescent lights, etc.

First, determine what part of the can is affected. If you lose the Can Bus to the BMS, the PARKING COOLER unit will operate normally. You will not see volts and amps displayed on the service screens and the battery symbol will indicate full as a default.

If the User Interface controller does not communicate to the PARKING COOLER unit, the unit will not operate. If the unit is operating and loses communication for more than 5 seconds it will shut down.

With power removed from the unit and Battery Management device and all harnesses connected, the Can Bus circuit should check approx. 60 ohms.

The 120 ohm resistors are internal in the controller and Battery Management System (BMS). Remove controller and disconnect the harness. Check across pins 3 and 4 on the controller. You should have 120 ohms. Back probe the harness. You should have 120 ohms with harness connected to the unit and BMS. If not, check at BMS. Disconnect harness at BMS. Check pins 6 and 7. You should have 120 ohms. With harness still connected to controller and unit, back probe harness. You should have 120 ohms.

With all harnesses connected you should have 60 ohms

O. CONNECTING THE SYSTEM

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

R134a service equipment or vehicle air conditioning systems should not be pressure tested or leak tested with compressed air.

- This air conditioning system may contain R134a fluorescent dye for leak detection. Inspect with a high intensity ultraviolet light system.
- A label on the unit will identify systems with fluorescent dye.

CAUTION

The Parking Cooler 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.

CAUTION

Do not add oil. Parking Cooler uses special PVE oil which is different than standard PAG oil in most AC systems. Addition of PAG oil to the system will greatly reduce performance and void Parking Cooler warranty.

Slim Line Seals / Dryer / Lines -- SERVICE ONLY

Note: Refrigerant lines are shipped after being vacuumed. To service the seals, dryer, coils and /or lines on the Parking Cooler system you must (1) recover the systems refrigerant charge, (2) replace the orings, dryer, or lines, (3) evacuate / leak test system and (4) recharge the system with the recommended " Charge Capacity" from page 24.

SERVICING THE EVAPORATOR UNIT OR CONDENSER UNIT

Note: Evaporator and condenser units are shipped with a holding charge only. For proper system operation all replacement units must be recovered and the Parking Cooler system must be recharged with the recommended "Charge Capacity" from page 24.

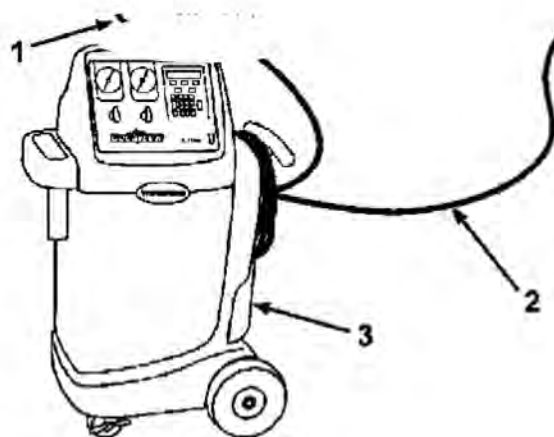
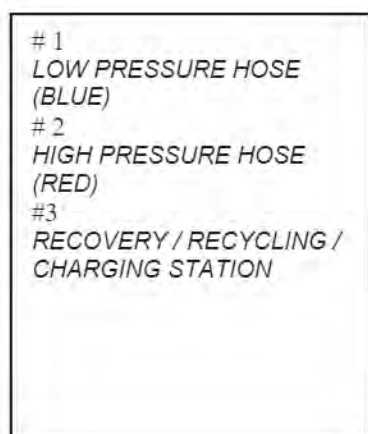
Proper service procedure: (1) recover system refrigerant charge, (2) replace unit, (3) recover holding charge, (4) evacuate / leak test, (5) recharge proper refrigerant level.

NOTE – Although your service equipment may appear physically different from the equipment shown here, the function of the equipment used to perform each service procedure is similar. If you are performing these service procedures using service equipment different from that shown, refer to the manufacturer’s instructions supplied with that equipment.

Typical Equipment Hookup for Servicing the Parking Cooler System

1. Remove the protection cap from service port. The Parking Cooler system uses smaller lines than conventional AC systems. In order to simplify the installation and charging only one service port has been given for the system.

On the recovery station and hose fittings, verify that all valves are closed. The valves at the recovery station must be set to the **CLOSED** position. The valves at the quick-disconnect fittings must be set fully counterclockwise (CCW).



2. Connect the recovery station to the system as follows:
 - a. Connect the blue hose to service port located on the compressor-to-condenser line of the Day Cab outdoor unit.
 - b. Open (turn CW) the valves on the quick-disconnect fittings connected to the service ports on the units.
3. Work may now begin on the air conditioning system.

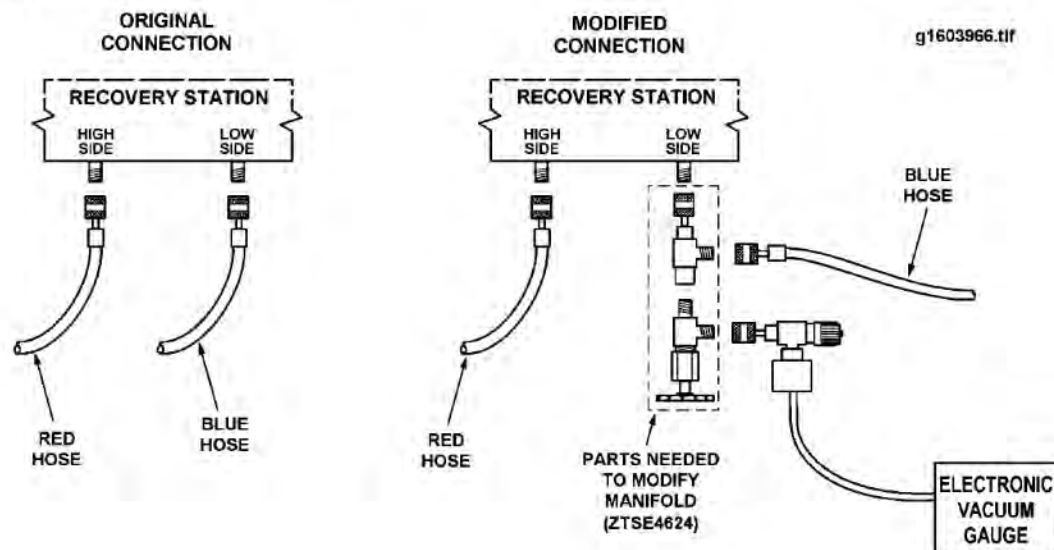
P. EVACUATING THE SYSTEM

EVACUATING THE PARKING COOLER SYSTEM - SERVICE PROCEDURES FOR R-134A

When any part of the refrigeration system has been replaced or requires service, the system must be recovered and evacuated. The system must be completely evacuated of air and moisture before being charged. After evacuation, the system vacuum should measure between 750 and 1000 microns.

1. On the recovery station and hose fittings, verify that all valves are closed. The valves at the recovery station must be set to the CLOSED position. The valves at the quick-disconnect fittings must be set fully counterclockwise (CCW).
2. Connect the electronic vacuum gauge to the recovery station, at the vacuum manifold, using a valve and 'T' fittings.
3. Connect the recovery stations blue hose to the service port located on the Parking Cooler system.
4. On the blue hose, open the valves on the quick-disconnect fittings (turn the knobs fully CW).
5. On the recovery station, set both hand valves to the RECOVERY/VACUUM position.
6. On the recovery station, turn on main power switch and press the VACUUM button.
7. After the low pressure gauge on the station shows that vacuum is being established in the system, continue to operate the vacuum pump for fifteen minutes.
8. 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

The valve for the electronic vacuum gauge must be in the closed position until instructed to open. If the valve is open during system charging, excess pressure may damage the electronic vacuum gauge



If there are no leaks:

- A. Set both hand valves on the recovery station to the RECOVERY/VACUUM position and press the VACUUM button.
 - B. Open the valve connecting the electronic vacuum gauge to the recovery station low side line.
 - C. Continue to operate the recovery station vacuum pump until the system has pulled a vacuum of 750 – 1000 microns as measured by the electronic vacuum gauge (15 minutes minimum).
 - D. Close both hand valves on the recovery station, and the valve connecting the electronic vacuum gauge to the recovery station low side line.
9. The A/C system is ready to be charged.

NOTE: The full amount of refrigerant oil has already been added to the system, **DO NOT ADD OIL** when charging the Parking Cooler system.

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

Q. CHARGING THE PARKING COOLER SYSTEM

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 R-134a refrigerant; not any of the so called “direct replacement” refrigerants. Use of equipment dedicated for R-134a 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 – Although your service equipment may appear physically different from the equipment shown here, the function of the equipment used to perform each service procedure is basically the same. If you are performing these service procedures using service equipment different from that shown, refer to the manufacturer’s instructions supplied with that equipment.

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 recovery station, or refrigerant oil injector tool, to disable this feature.

DO NOT ADD OIL TO THE PARKING COOLER SYSTEM

The recovery station blue (suction) hose should still be connected as it was during the evacuation operation.

CAUTION

Due to the density of R-134a, the amount of refrigerant required to charge a typical air conditioning system has been reduced. Overcharging the system will result in excessively high head pressures during operation and may damage the compressor.

1. Determine install type.

All models have 25.00 oz. of R134a

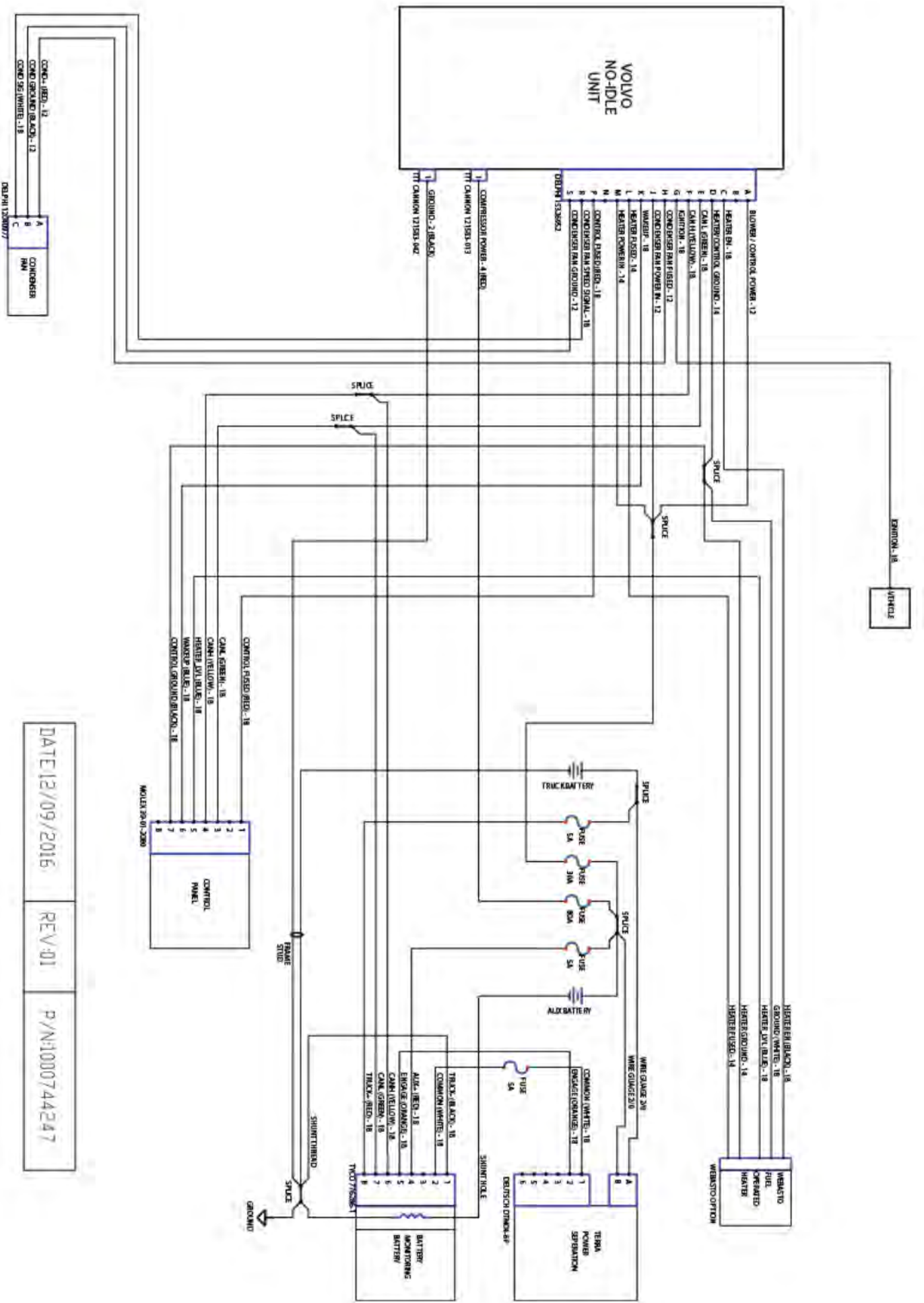
Above shows tested charge levels. Following the instructions provided with the recovery station, set the recovery station to charge the system with the specified amount of refrigerant.

2. On the recovery station, set the high side valve to **CLOSED** and the low side valve to **CHARGE**.
3. Press the **CHARGE** button to start the charge procedure. When the system is fully charged, the recovery station will turn off.
4. Complete the charging procedure by setting both hand valves on the recovery station to the **CLOSED** position.
5. Close valve on hose at condenser, then disconnect the red hose quick-disconnect fitting from the Parking Cooler service port.
6. Install the protective cap on the Parking Cooler service port fitting.

DISCHARGE SENSOR / FREEZE SWITCH TESTING CHART

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%



Volvo Parking Cooler External Wiring


DATE: 12/09/2016	REV: 01	P/N: 1000744247
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Volvo Parking Cooler / System Controller Pinout Chart

Connector Pin	Circuit ID	Wire Color	Function	Typical Voltage	Other End of Circuit
1	CANH	Yellow	CAN bus	2.5V+	Control panel, BMS
2	CANL	Green	CAN bus	2.5V-	Control panel, BMS
3	N/C				
4	PRESS_IN	Orange	Pressure switch Input	Ground (switch closed)	Binary Pressure Switch
5	N/C				
6	COMP_SERIAL	White	Not currently used	0-5V	Compressor Controller
7	WAKEUP	Blue	Wakeup from control panel	10-11V (system off) <1V (system on)	Control Panel
8	N/C				
9	FREEZE	Green	Evaporator Freeze protection	1.5V-4V	Freeze sensor
10	N/C				
11	COMP_FAULT		Compressor controller fault output	<1V (no fault) 5V (fault present)	Compressor controller
12	N/C				
13	N/C				
14	IGNITION	White	Ignition switch input	<1V (key off) >10V (key on)	Vehicle ignition circuit
15	BATT_SENSE	Red	Supply voltage sense	Same as NITE batteries	
16	HTR_OPTION	Red	Heater version sensing	>10V (Espar heater) <1V (Webasto)	Heater
17	N/C				
18	COND_SIG	White	Condenser PWM control signal	<0.5V (off)	Condenser
19	N/C				
20	BLWR_CTL	Blue	Blower PWM control signal	6.3V (speed 1) 5.0V (speed 2) 2.8V (speed 3)	Blower motor
21	COMP_SPD	Grey	Compressor speed control signal	<0.6V (compressor off) 1-4V (compressor on)	Compressor Controller
22	N/C				
23	BLWR_TACH	Yellow	Tach signal from blower	Not currently used	Blower motor
24	COMP_TACH	Blue	Tach signal from compressor controller	Not currently used	Compressor Controller
25	N/C				
26	N/C				
27	COND_RLY_SIG	White	Condenser relay control signal	12V (relay off) <1V (relay on)	Condenser Relay
28	COMP_ENABLE	White	Compressor controller logic circuit power	<1V (compressor off) >11V (compressor on)	Compressor Controller
29	HTR_ENABLE	Yellow	Activates fuel operated heater	<1V (heater off) >11V (heater on)	Heater
30	CTL_FUSED	Red	Power for ECU	Aux battery voltage	Control fuse
31	N/C				
32	Ground	Black	Ground for ECU	Ground	Harness ground splice

OPERATING INSTRUCTIONS FOR CONTROLLER

To start the system push ON/OFF button,
Display will show current mode/ temperature
setting / battery level.

First time system is powered on - Initial default
setting is Blower Speed 1 / AUTO- MODE /
Temp 72 °F
Battery charge level indicator  shows 4
bars for fully charged and 1 bar equals low
batteries. In most cases, 1 bar will remain visible
when system reaches the LVD, low voltage
disconnect.



Changing MODE – press ENTER, while mode
is flashing, use up or down arrows to select
AUTO / COOL / HEAT. After 5 seconds
selection will be set.



Changing BLOWER SPEED – press ENTER
until display shows FAN and SPEED. Press up
or down arrows to select 1 – 2 – 3 speed. After
5 seconds selection will be set.



Changing TEMPERATURE set point,
Anytime the temperature set point is displayed
on the screen, push the up or down arrows to
change. Temperature range is from 60 °F
(coolest) to 85 °F (warmest).

NOTE: Control will retain the last Mode and
Blower settings but the Temperature will always
default back to 72 °F degrees on restarts.



Adjusting
Temperature

To view system runtime/hours – press ENTER
until “Hrs” show on display. When hours are
displayed, pressing ENTER for 7 seconds will
reset the hours to zero.



ENTER

To change from °F to °C press ENTER until
temperature symbol only shows – push the up or
down arrow to change. After 5 seconds
selection will be locked.

Anytime the control is idle for 5 seconds the
screen will return to the temperature set point
screen.



ENTER

To enter SERVICE MODE: Push both the ON/OFF and ENTER button simultaneously at any time.

Display will show service indicator and a code 00 unless a fault has occurred. If there is an active fault the display will show it as 01, 02, etc. Use up and down arrows to scroll through the Fault Codes. See fault code chart page 42 for definitions.

- 1) Evap sensor open or shorted high
- 2) Evap sensor shorted low
- 3) High pressure switch open or shorted high

Press the ENTER button to proceed through the available service screens. Use up/down arrows to scroll through voltages and amps.

- 1) SV = Starting batteries Voltage
- 2) AV = Auxiliary batteries Voltage
- 3) AA = Unit Amperage draw

Pressing ENTER arrow after viewing service screen will return you to the fault code screen.

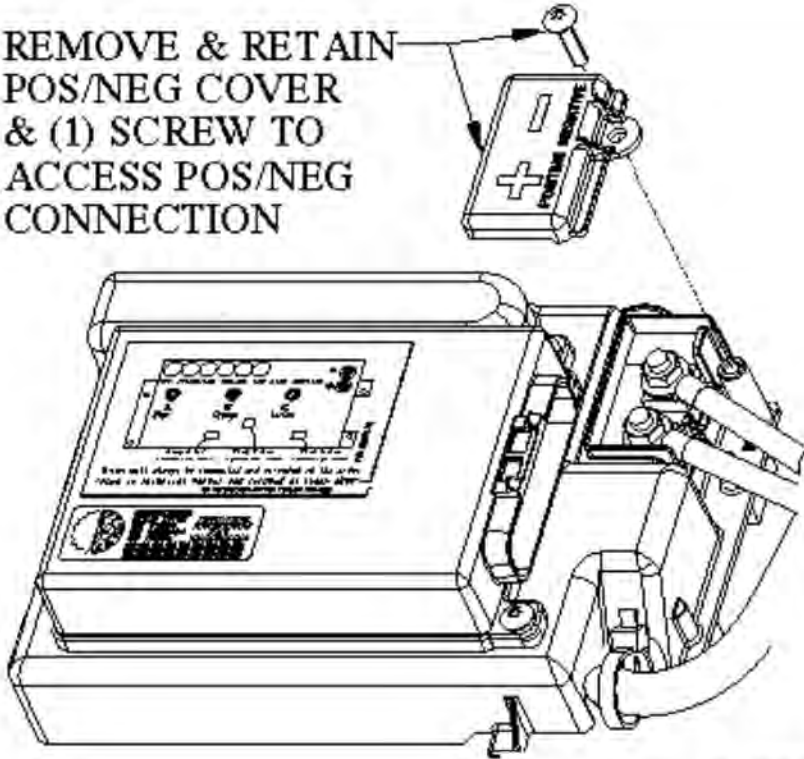
Pressing the ON/OFF button will return you to the Temperature Display screen.

When necessary, Check Filter light will notify you that the filter must be cleaned or changed. To reset filter: at screen 1 press and hold enter button for 3 seconds.



WARNING: TO AVOID ELECTRIC SHOCK AND PREVENT ARCING AND DAMAGE TO HARNESS AND CONTROLLER, DISCONNECT POWER FROM SYSTEM PRIOR TO SERVICING!

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

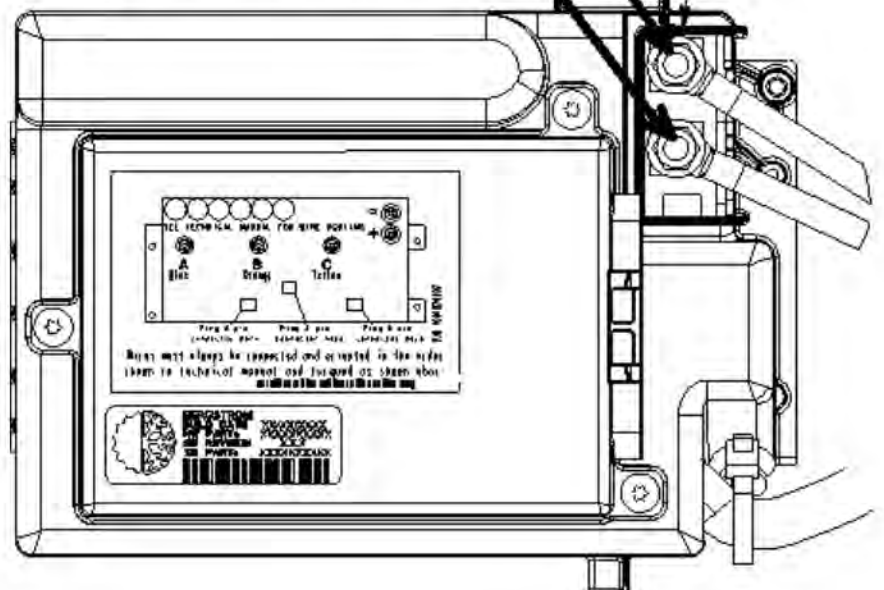


2. REMOVE & SCRAP (2) NUTS

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

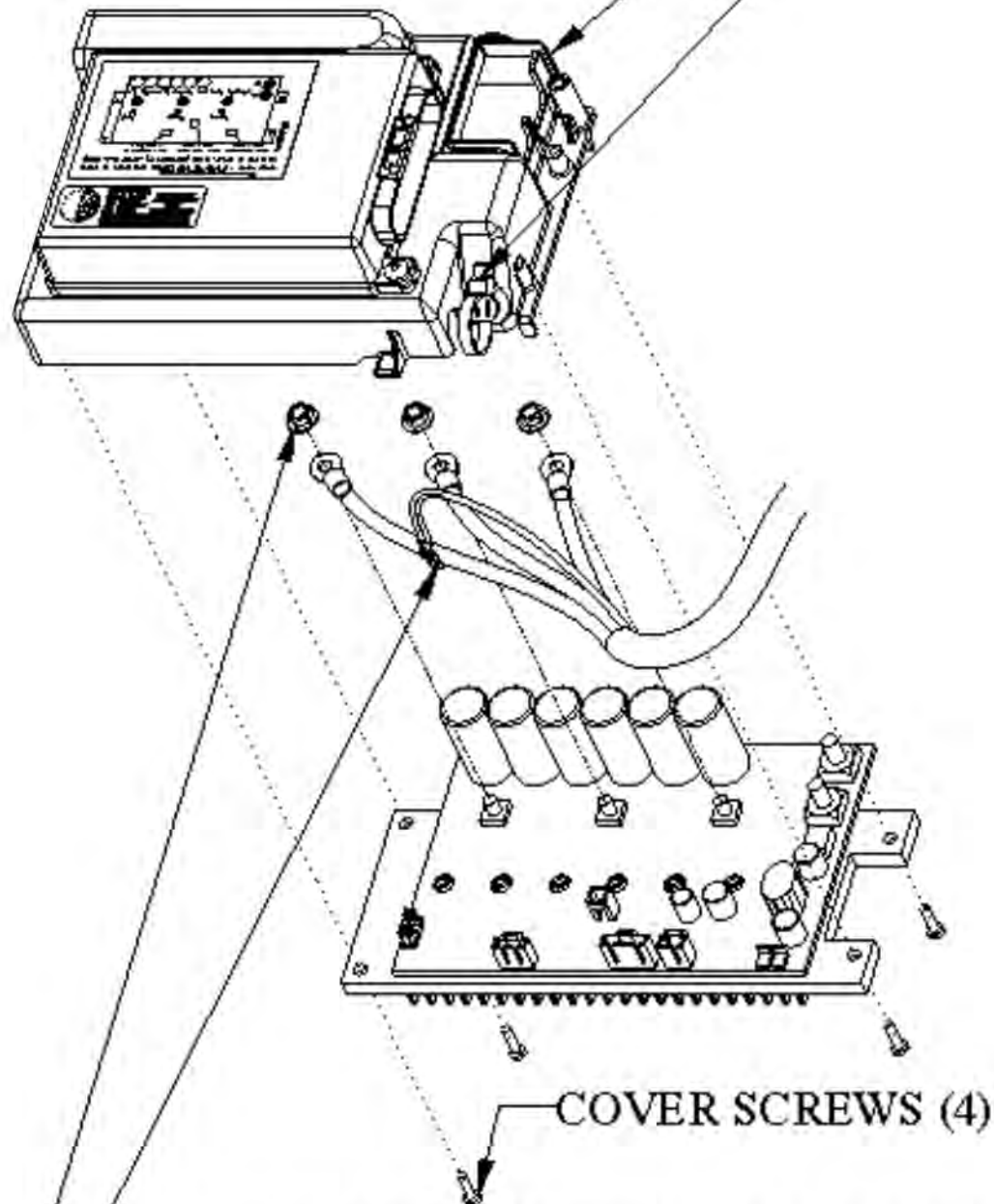
BLACK WIRE, NEGATIVE

RED WIRE, POSITIVE



4. CUT & SCRAP WIRE TIE
HOLDING PHASE HARNESS

5. REMOVE & RETAIN COVER
ASSEMBLY & (4) SCREWS



6. UNPLUG 2-PIN CONNECTOR FROM
PCB & REMOVE PHASE HARNESS

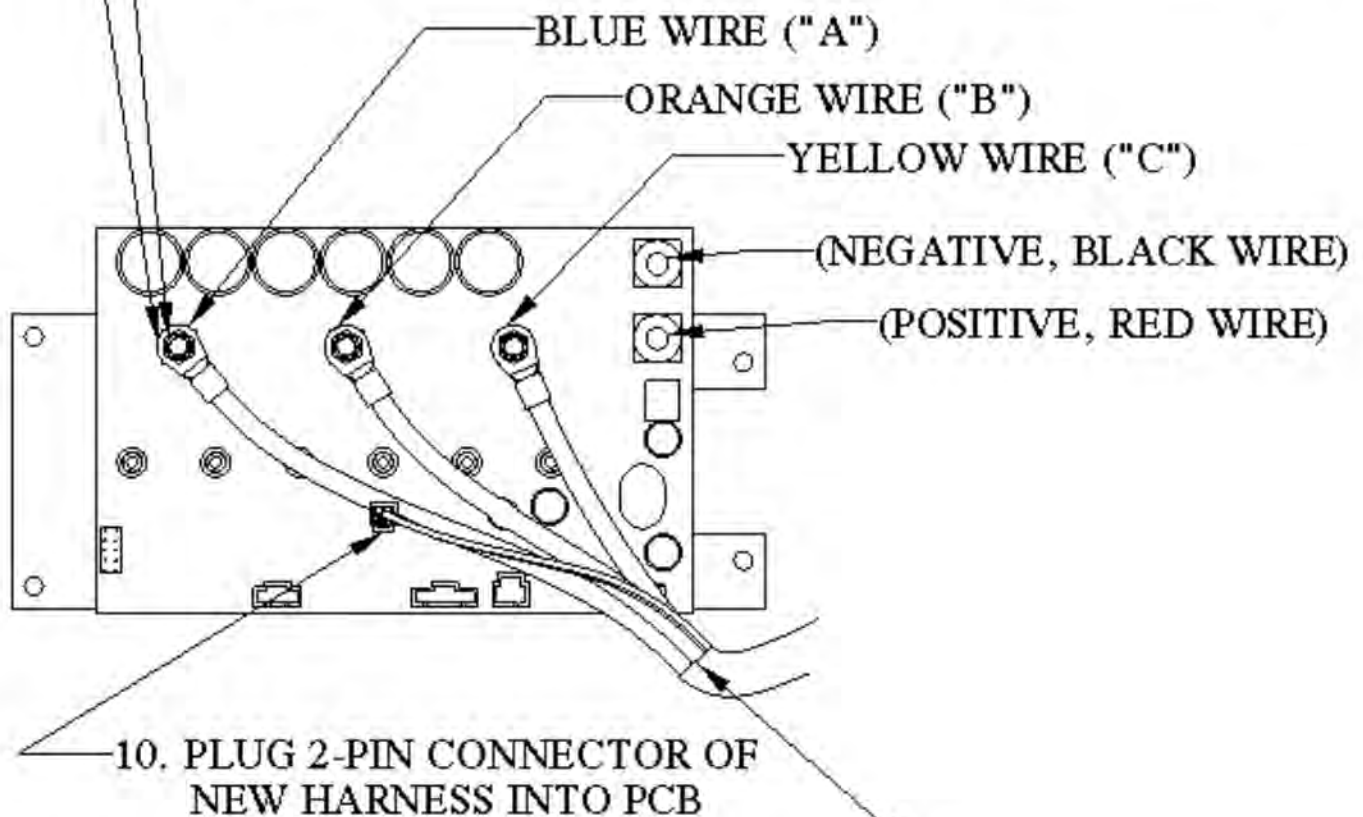
7. REMOVE (3) NUTS HOLDING PHASE
HARNESS RING TERMINALS TO PCB.

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 NUTS REMOVED IN STEP 7. TORQUE TO 20 ± 2 INCH-LBS

CAUTION: USE ONLY THE TORQUE VALUE LISTED WHEN INSTALLING PHASE HARNESS TO PCB!



ORIENT RING TERMINALS AND ROUTE HARNESS OUT OF COVER AS SHOWN

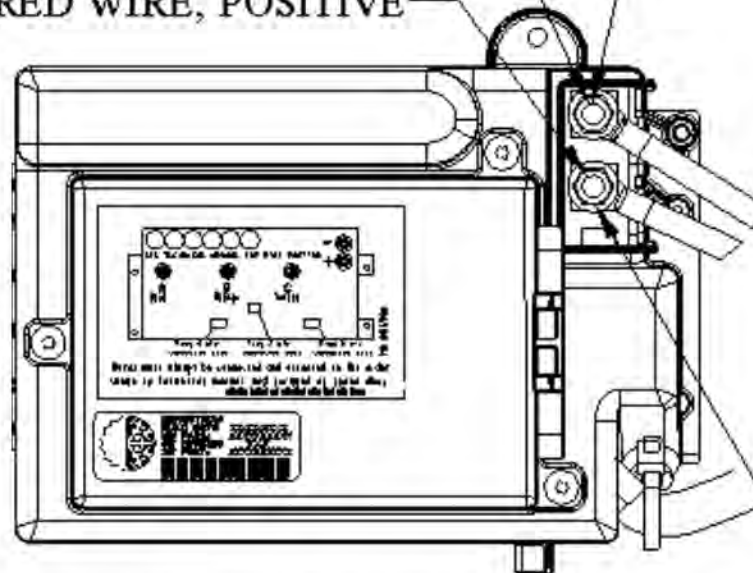
11. REPLACE COVER ASSEMBLY & (4) SCREWS. SECURE NEW WIRE-TIE (PROVIDED) AROUND PHASE HARNESS

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.

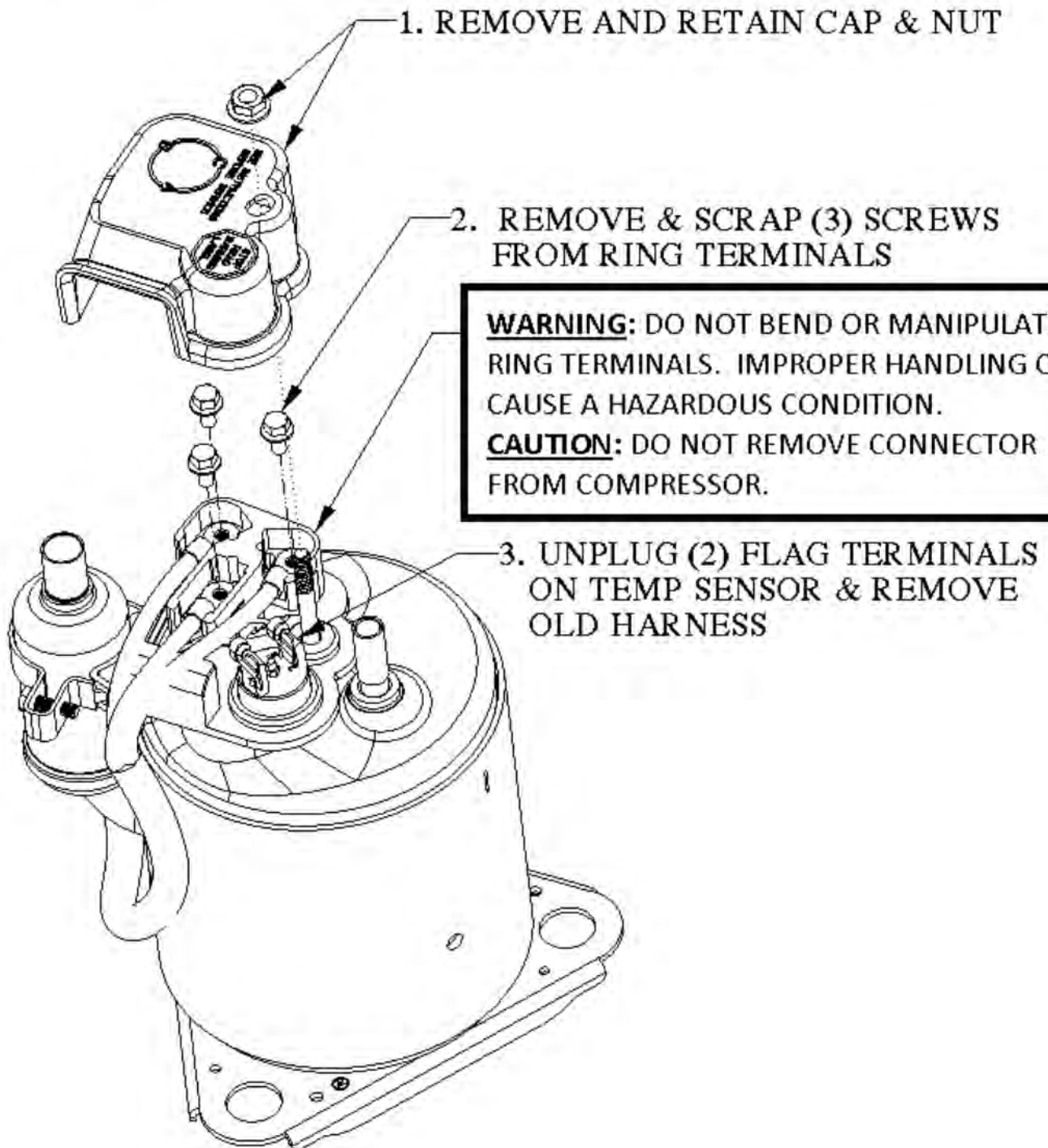
14. REPLACE SMALL (POS/NEG) COVER & (1) SCREW

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

Service Instructions for Phase Harness / **Ring Terminal** Compressor Only



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



Service Instructions for Phase Harness / **Ring Terminal** Compressor Only



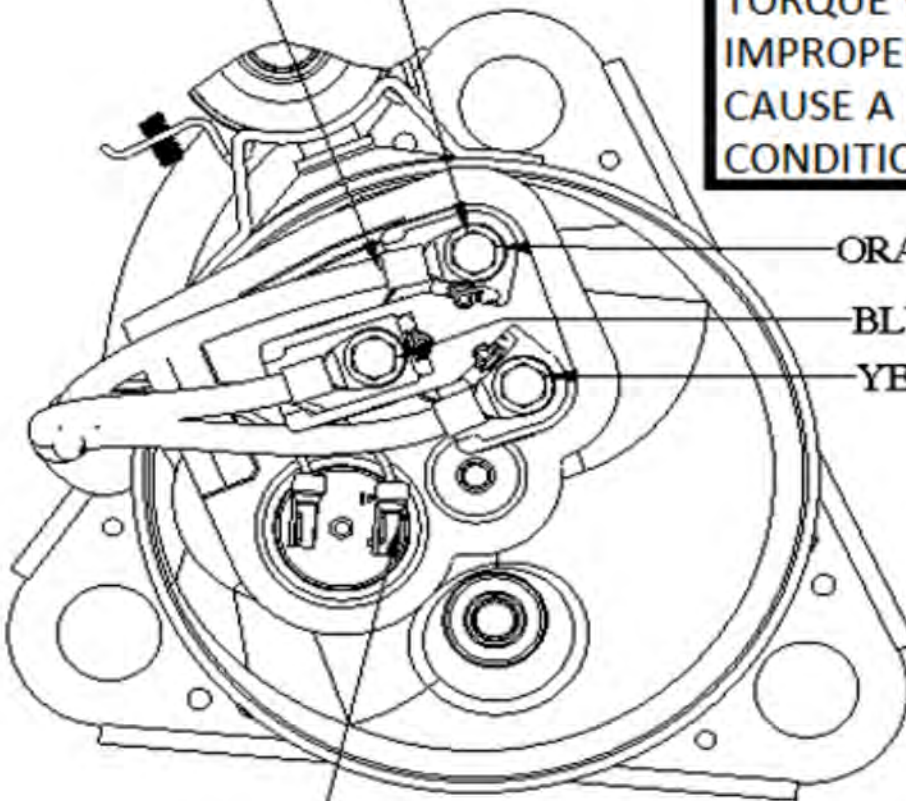
WARNING: To avoid potential property damage or personal injury, Read Important Safety Warnings and ALL instructions before attempting to install or service product.

4. ALIGN (3) RING TERMINALS OF NEW HARNESS TO COMPRESSOR CONNECTOR.

CAUTION: ALIGN EACH COLORED WIRE TO SPECIFIED POSITION ONLY.

5. ATTACH RING TERMINALS WITH (3) NEW SCREWS PROVIDED ONLY. TORQUE TO 20 ± 2 INCH-LBS

WARNING: USE ONLY NEW HARDWARE AND THE TORQUE VALUE SPECIFIED. IMPROPER HANDLING CAN CAUSE A HAZARDOUS CONDITION.



ORANGE WIRE

BLUE WIRE

YELLOW WIRE

6. PLUG IN (2) FLAG TERMINALS OF NEW HARNESS AT TEMP SENSOR

7. REPLACE CAP & NUT

PARKING COOLER

Subject: Diagnosis 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.



See exploded view on page 41

Driver Observation


- Parking Cooler 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 Parking Cooler 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. (See page 39).**

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 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
(Home location)



Mark "A" as the first test
location

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

6. Rotate clockwise 1 cogging torque position and mark the second test location "B".



7. Rotate clockwise 1 cogging torque position and mark the third test location "C".



8. Return fan blade to the home location ("A") and reconnect power to the condenser fan.
 9. Start the Parking Cooler 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**

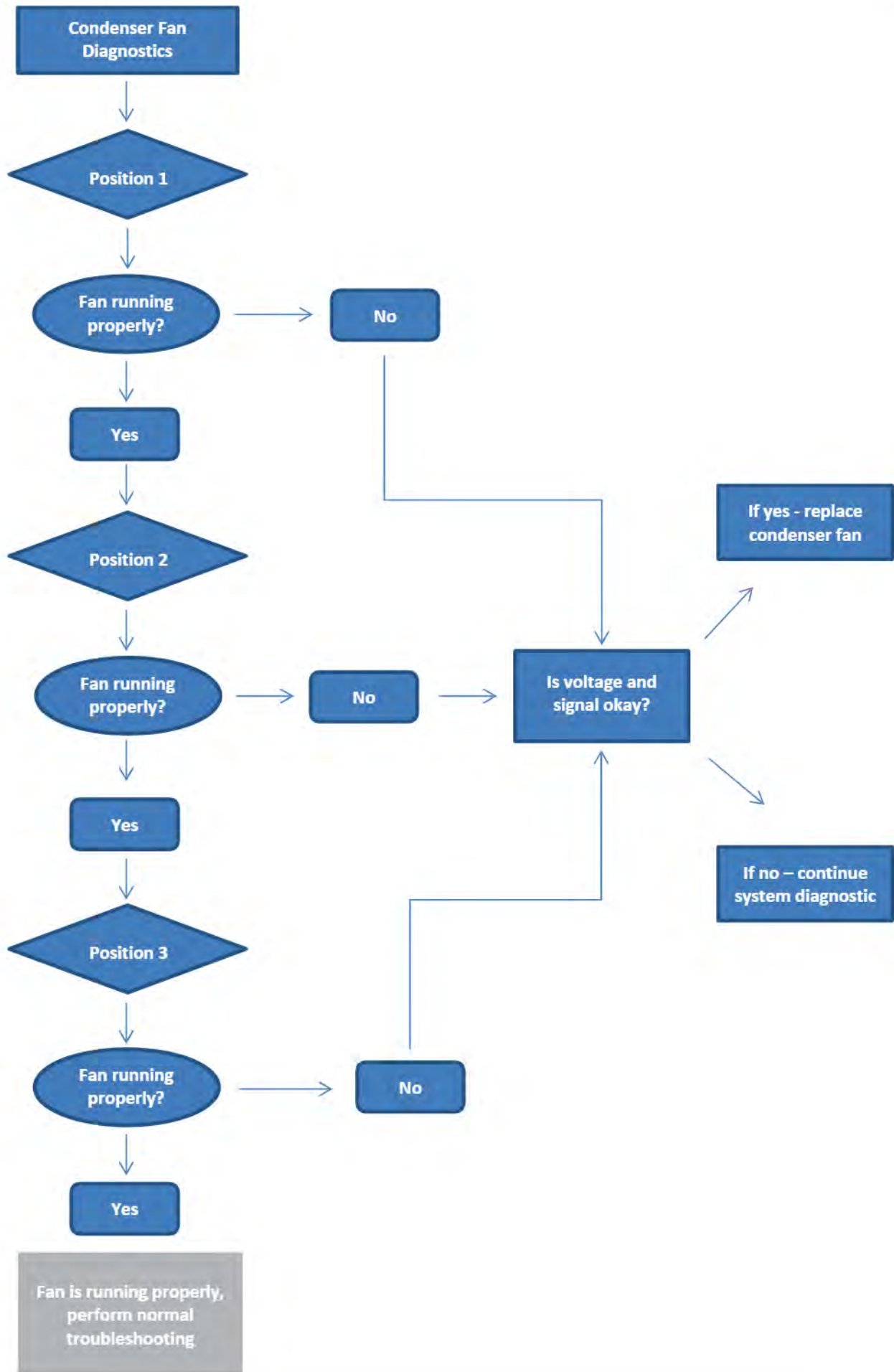


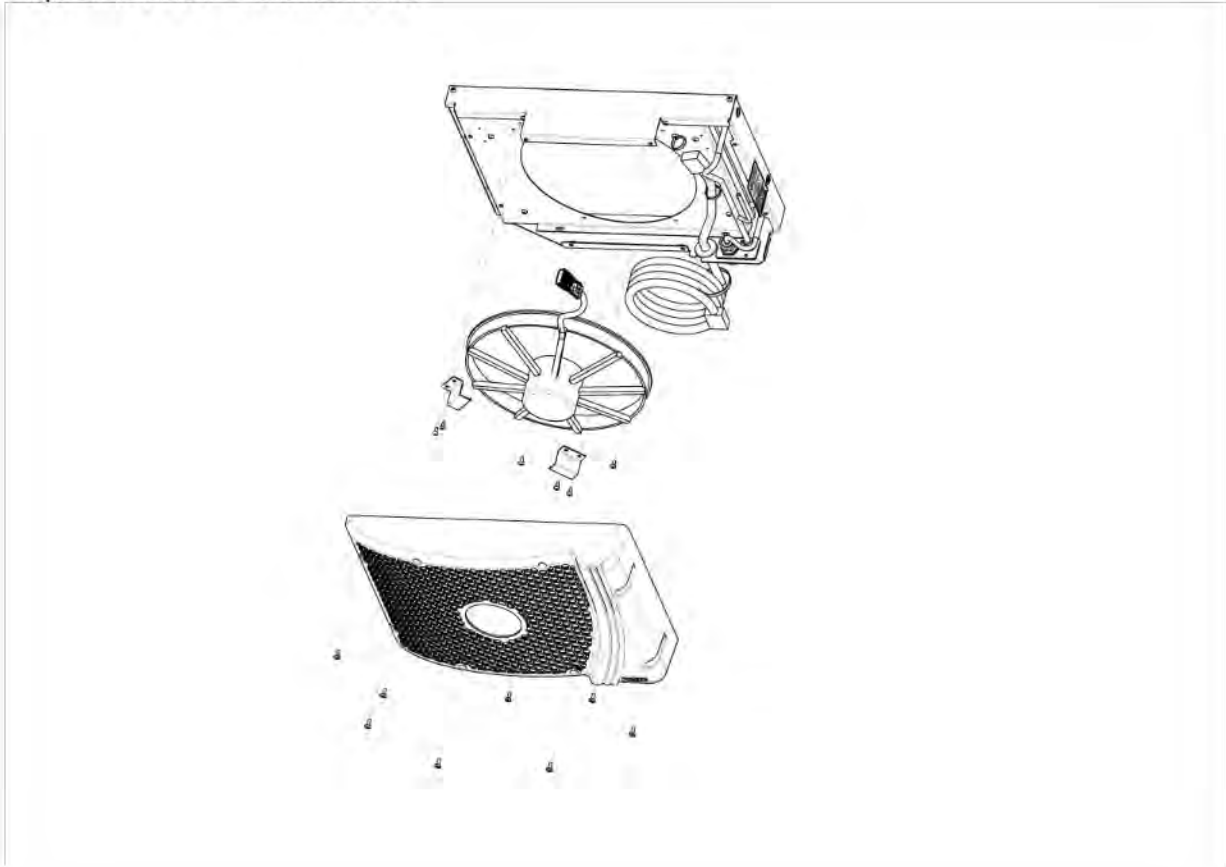
procedure.

10. Once fan has been confirmed functional, shut down the Parking Cooler no-idle system and disconnect power to the condenser fan.
 11. Wait until the fan completely stops running.
 12. Repeat steps 9-11 for test locations B and C.
 13. 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 Parking Cooler 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 Parking Cooler unit – follow step 9 above.



Exploded View / Condenser Fan

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.”

Phoenix Fault Code List

10/1/2017

CODE	FAILURE	Description	SOLUTION
01	Evap Sensor	Shorted high or missing, (received through can)	See technical guide Appendix F Page 13
02	Evap Sensor	Shorted low (received through can)	See technical guide Appendix F Page 13
03	High Pressure Switch	(received through can)	See technical guide Appendix D Page 13
09	Filter Clean or Change	Active after 500 hrs	See technical guide Page 31
10	HVAC unit Communication Error	loss of communication or error - controller / panel	See technical guide Appendix N Page 18
11	BMS Communication Error	Error 11 active on user interface controllers using software 2:09 or prior	See technical guide Appendix M Page 17
13	HMI Temperature Sensor Error	BLUETOOTH Controller only / System defaults to 72F	See technical guide Appendix F Page 13

EFFICIENT SLEEPER COMFORT

Volvo's Battery-powered Parking Cooler Option



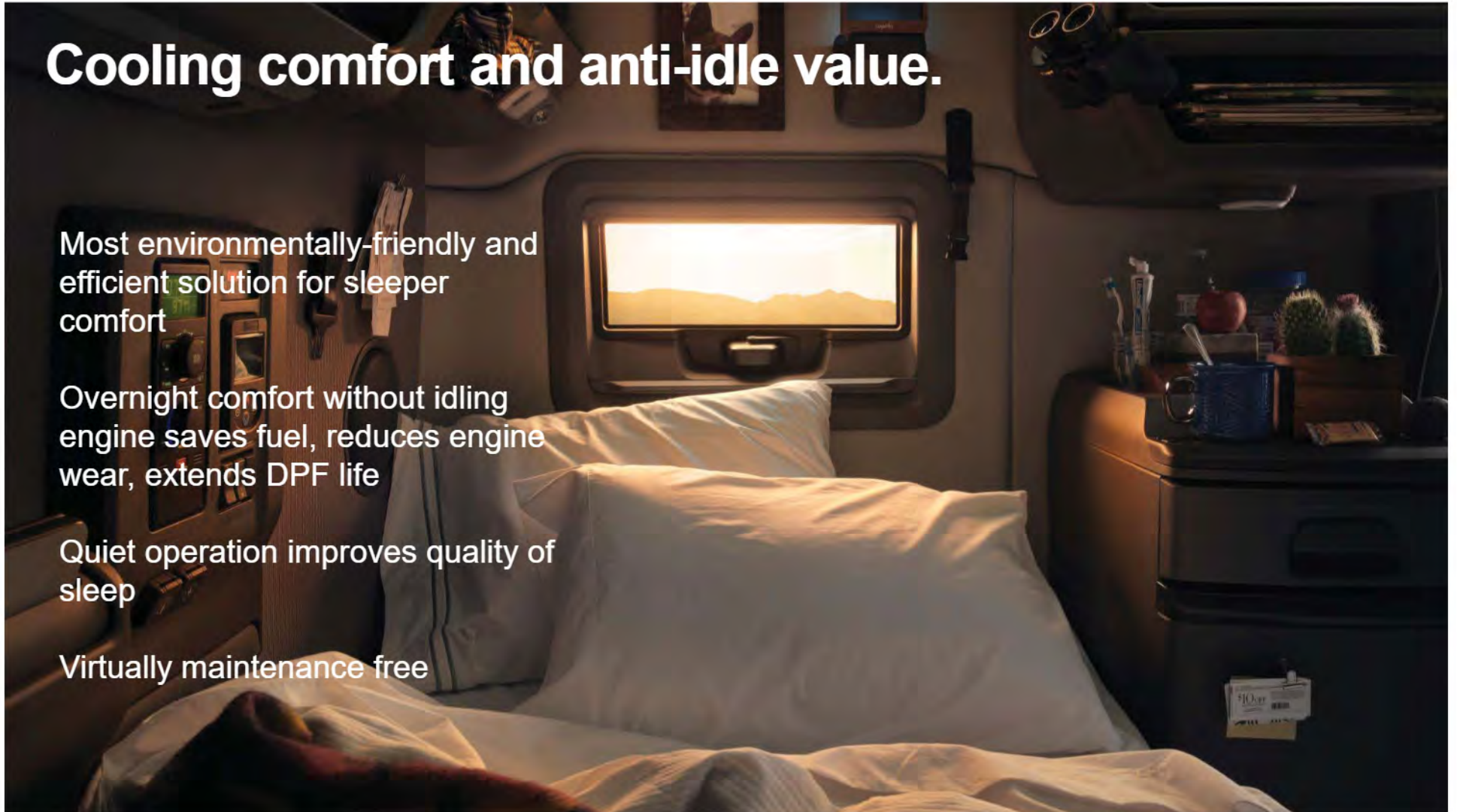
Cooling comfort and anti-idle value.

Most environmentally-friendly and efficient solution for sleeper comfort

Overnight comfort without idling engine saves fuel, reduces engine wear, extends DPF life

Quiet operation improves quality of sleep

Virtually maintenance free



Power off, comfort on.

Electrically-powered AC operates while truck ignition switch is in OFF position

Can operate wherever vehicle is parked

TMC-approved, rated to keep sleeper at 23°C (74°F) for up to 10 hours*

*TMC RP 432A Criteria

Factory-installed curtains closed.

Initial sleeper temp 23°C (73°F) +/- 2°C (5°F).

34°C (100°F) ambient outside temp.

50% relative humidity.

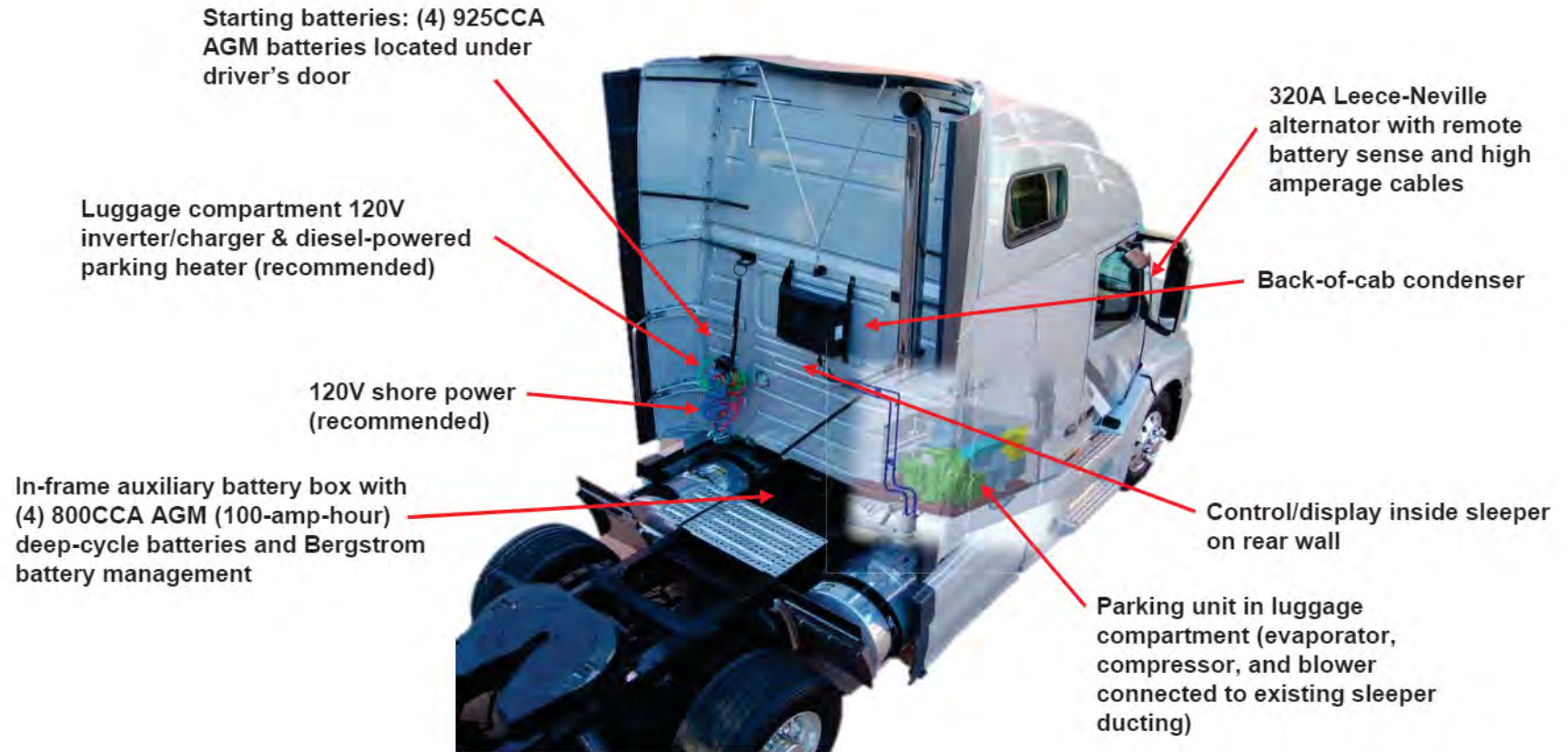
600 W/m² solar load on vehicle roof.

Features

- Quiet operation
- Automatic temperature control
- 7,500 BTU/hour (2.2 kW)
- Start protection with smart battery management
- Integrates with optional Shore Power kit and inverter (additional run time and battery charging)
- Also controls diesel-powered parking heater (option); single thermostat control
- 3-year warranty
- CARB approved
- Exempt from FET



System components



System function

Internal unit (evaporator assembly)

- Located under bunk, passenger side
50.5 x 43.4 x 31.2 cm, 19 kg
(19.9 x 17.1 x 12.3 in, 42 lbs)
- Contents:
 - Evaporator
 - Blower (serviceable)
 - Compressor
 - Controllers (serviceable)
 - Thermostatic Expansion Valve (serviceable)
- Connected to sleeper ducting
- Brushless motors for extended life



System function

External unit (condenser assembly)

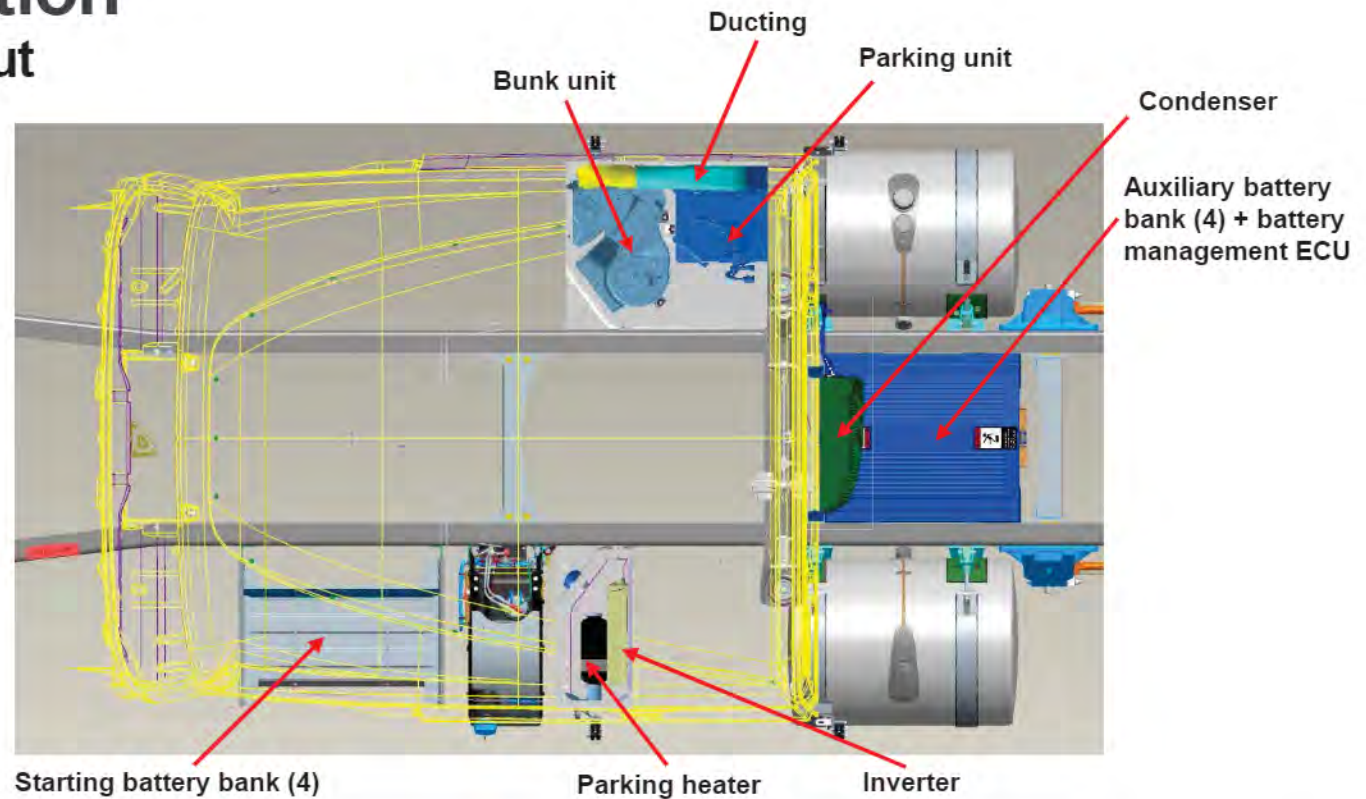
- Located on BOC
52.6 x 14.5 x 35.8 cm, 8 kg
(20.7 x 5.7 x 14.1 in, 18 lbs)
- Contents:
 - Condenser
 - Fan (serviceable)
 - Receiver drier (serviceable)
- Brushless motors for extended life



System function

Components layout

- Parking cooler is powered by both banks (8 batteries) until starting battery voltage level decreases to 12.4V.
- Battery isolator relay then disengages starting batteries to protect truck starting capacity.
- When starting batteries charged up to 13.2V, battery isolator relay re-engages starting batteries to alternator charging circuit.



System function

Battery management

- Auxiliary batteries
 - dedicated to parking cooler
 - 4 deep-cycle AGM batteries, 800 CCA and 100 Ah each
 - in-frame battery box

- Battery management system (BMS)
 - mounted in auxiliary battery box
 - monitors voltage and current in/out of aux batteries
 - monitors battery charge status and health status
 - Controls battery isolator relay to engage/disengage auxiliary batteries from starting batteries.



Operating the system

Starting the system

Push ON/OFF button. This screen is the temperature set point screen.

Display will show current mode/ temperature setting / battery level.

Initial default setting is blower speed 1/ AUTO- MODE /72 °F.



Note: when the control is idle for 5 seconds, the screen will return to this temperature set point screen.



Operating the system

Changing MODE

Press ENTER.

While mode is flashing, use up or down arrows to select
AUTO / COOL / HEAT.

After 5 seconds selection will be set.

*Note: when the control is idle for 5 seconds, the screen will return to
the temperature set point screen.*



Operating the system

Changing blower speed

Press ENTER until display shows FAN and SPEED.

Press up or down arrows to select 1 – 2 – 3 speed.

After 5 seconds selection will be set.

Note: when the control is idle for 5 seconds, the screen will return to the temperature set point screen.



Operating the system

Changing temperature set point

Whenever the temperature set point is displayed on the screen, push the up or down arrows to change.

Temperature range is from 60°F/ 16°C(coolest) to 85°F/29°C (warmest).

NOTE: Control will always default to 72°F when the unit is turned on.

Note: when the control is idle for 5 seconds, the screen will return to the temperature set point screen.



Operating the system

View system runtime hours

Press ENTER until "Hrs" shows on display. This displays the total runtime of the parking cooler.

To reset, press and hold ENTER for 7 seconds. Hours will be reset to zero.

Note: when the control is idle for 5 seconds, the screen will return to the temperature set point screen.



Operating the system

Change temperature scale (°F to °C)

Press ENTER until temperature symbol only shows.

Push the up or down arrow to change.

After 5 seconds selection will be locked.

Note: when the control is idle for 5 seconds, the screen will return to the temperature set point screen.



Operating the system

Service mode

Push the ON/OFF and ENTER button simultaneously.

Display will show service indicator and a code 00 unless a fault has occurred.

If there is an active fault the display will show it as 01, 02, or 03.
Use up and down arrows to scroll through the Fault Codes.

- (1) Evaporator sensor open or shorted high
- (2) Evaporator sensor shorted low
- (3) High pressure switch open or shorted high



Operating the system

Service mode (continued)

Press the ENTER button to proceed through the available service screens:

1. SV = Starting batteries Voltage
2. AV = Auxiliary batteries Voltage
3. AA = Unit Amperage draw

Pressing ENTER arrow after viewing service screen will return you to the fault code screen.

Pressing the ON/OFF button will return you to the Temperature Display screen.



Operating the system

Check filter

A “Check Filter” screen will notify you that the parking cooler filter must be cleaned or changed.

To reset filter: at screen 1 press and hold enter button for 3 seconds.



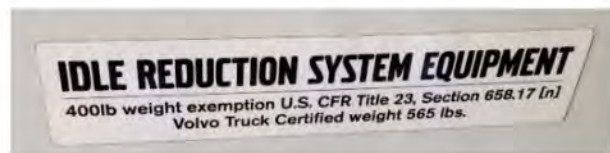
Availability

- VNR 640
- VNL 680
- VNL 740
- VNL 760
- VNL 860

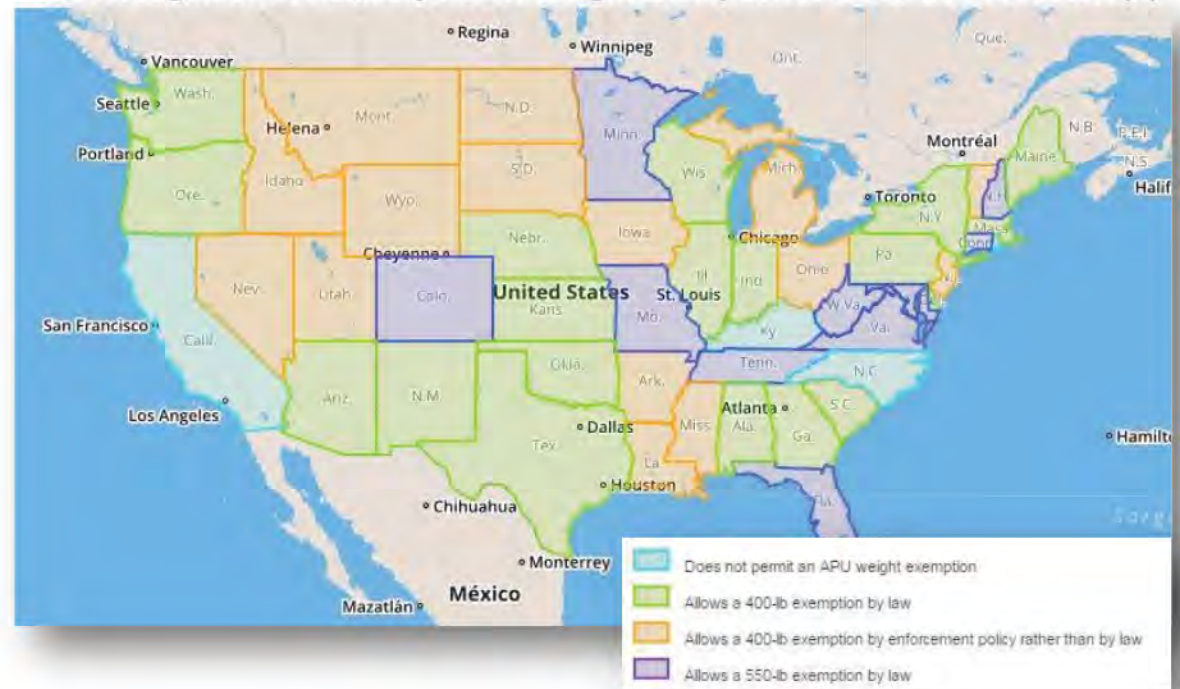


Weight exemptions (US only)

- Exemption varies by state:
181 – 249 kg (400 – 550 lbs.)
- Certified weight, including batteries:
256 kg (565 lbs.)

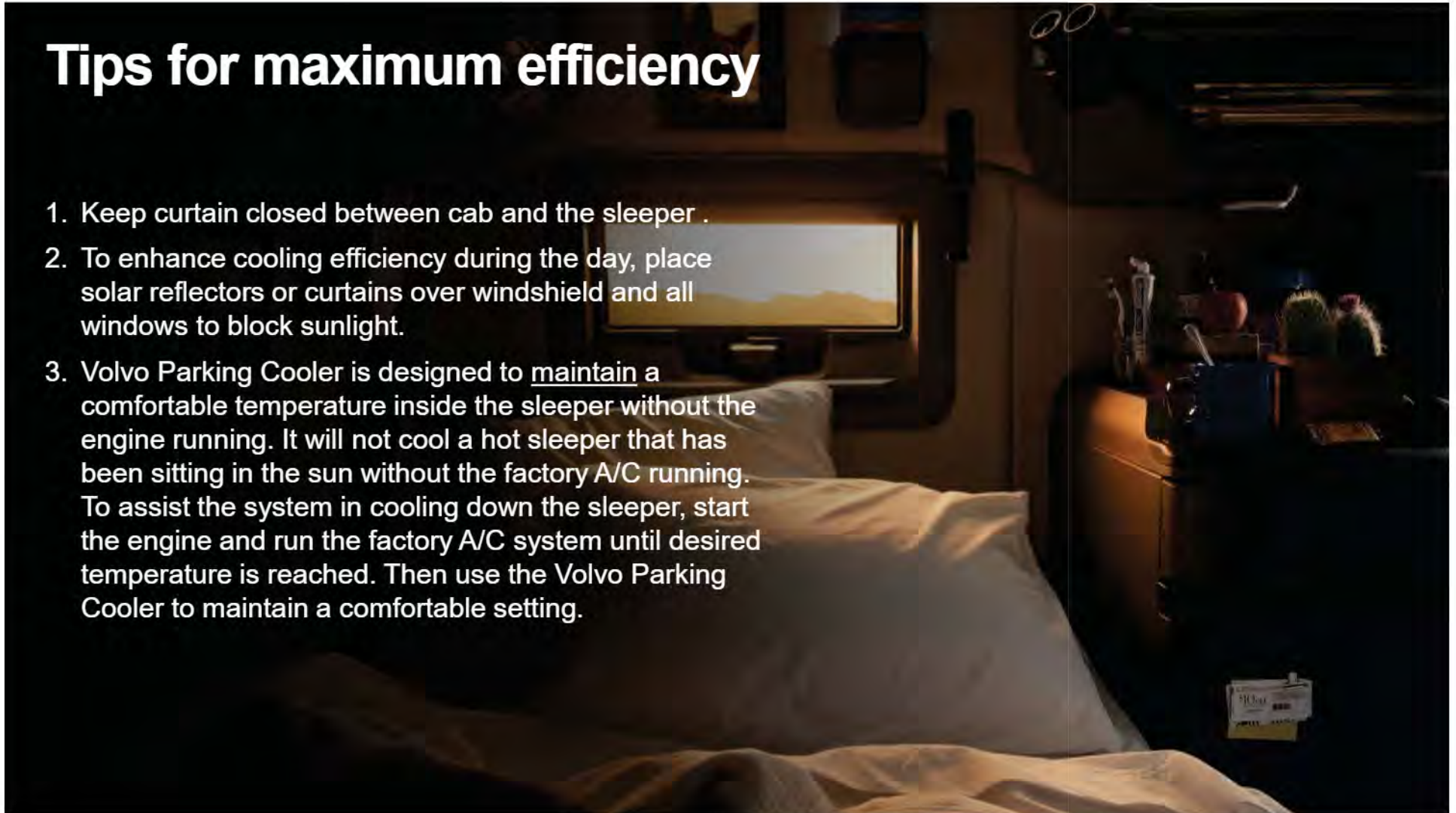


State Recognition of Auxiliary Power Weight Exemption to GVW: 23 CFR 658.17(n)



Tips for maximum efficiency

1. Keep curtain closed between cab and the sleeper .
2. To enhance cooling efficiency during the day, place solar reflectors or curtains over windshield and all windows to block sunlight.
3. Volvo Parking Cooler is designed to maintain a comfortable temperature inside the sleeper without the engine running. It will not cool a hot sleeper that has been sitting in the sun without the factory A/C running. To assist the system in cooling down the sleeper, start the engine and run the factory A/C system until desired temperature is reached. Then use the Volvo Parking Cooler to maintain a comfortable setting.



Technical questions?

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