General Description

The sleeper heater and air conditioner assembly is mounted in either the baggage compartment or under the lower bunk, depending on the cab model, and contains the following major components. See Fig. 1.

- brushless blower motor
- evaporator
- heater core
- air filter
- actuator
- temperature control doors
- expansion valve
- CDTC temperature sensor

The heating and air conditioning functions of the sleeper heater and air conditioner system are controlled by the sleeper climate control panel. See Fig. 2.

The cab climate control panel may have a bunk override (BUNK OVRD) switch that allows the driver to remotely control the fan speed and temperature settings in the sleeper. The bunk override mode can be canceled by adjusting the fan speed or temperature setting on the sleeper climate control panel when the bunk override mode is on. Refer to the Columbia Driver's Manual for operating instructions.

Principles of Operation

The sleeper heater and air conditioner system is a constant discharge temperature control (CDTC) system. The CDTC maintains a constant temperature of airflow in the sleeper regardless of outside air temperature, selected fan speed, or engine coolant temperature. Once the temperature control switch is turned to the desired temperature, no other adjustments are necessary.

The sleeper heater is plumbed directly to the engine, independent of the cab heater. The sleeper air conditioner is dependent on the cab air conditioning system, sharing the refrigerant and compressor.

When the air conditioner is operating, the amber indicator on the air conditioning button will be on whether the request for air conditioning comes from the cab climate control panel or the sleeper climate control panel. When the instrument panel lights are on, the blue snowflake indicator on the air conditioning button will be on.
Safety Precautions

Whenever repairs are made to any air conditioner parts that hold R–134a refrigerant, you must recover, flush (if contaminated), evacuate, charge, and leak test the system. In a good system, refrigerant lines are always under pressure and you should disconnect them only after the refrigerant charge has been recovered (discharged) at the service valves.

Refrigerant R–134a is safe when used under the right conditions. Always wear safety goggles and non-leather gloves while recovering, evacuating, charging, and leak testing the system. Do not wear leather gloves. When refrigerant gas or liquid contacts leather, the leather will stick to your skin.

**WARNING**

Use care to prevent refrigerant from touching your skin or eyes because liquid refrigerant, when exposed to the air, quickly evaporates and will freeze skin or eye tissue. Serious injury or blindness could result if you come in contact with liquid refrigerant.

Refrigerant splashed in the eyes should be rinsed with lukewarm water, not hot or cold. Do not rub the eyes. Apply a light bandage and contact a physician right away.

Refrigerant splashed on the skin should be rinsed with lukewarm water, not hot or cold. Do not rub the skin. Apply a light coat of a nonmedicated ointment, such as petroleum jelly. Contact a physician right away.

R–134a refrigerant does not burn at ambient temperatures and atmospheric pressure. However, it can be combustible at pressures as low as 5.5 psig (139 kPa absolute) at 350°F (177°C) when mixed with air concentrations that are greater than 60 percent.

**WARNING**

R–134a air conditioning systems should not be pressure tested or leak tested with compressed air. Combustible mixtures of air and R–134a may form, resulting in a fire or explosion that could cause personal injury or property damage.

Always work in an area where there is a constant flow of fresh air when the system is recovered, evacuated, charged, and leak tested. R–134a vapors have a slightly sweet odor that is difficult to detect. Frequent leak checks and air monitoring equipment are recommended to ensure a safe working environment.

IMPORTANT: When servicing an R–134a air conditioning system, use only service equipment certified to meet the requirements of SAE J2210 (R–134a recycling equipment). The equipment should be operated only by qualified personnel who are familiar with the recycling station manufacturer’s instructions.

Because of its very low boiling point, refrigerant must be stored under pressure. To prevent the refrigerant containers from exploding, never expose them to temperatures higher than 125°F (52°C).

On R–134a refrigerant systems, polyalkylene glycol (PAG) oil is used in the compressor. When handling PAG oil, observe the following guidelines:

- Keep the oil free of contaminants.
- Do not expose the air conditioning system or the PAG oil container to air for more than five minutes. PAG oil has a high moisture absorption capacity and the oil container should be immediately sealed after each use.
- Use care when handling. Spilled oil could damage painted surfaces, plastic parts, and other components such as drive belts.
- Never mix PAG oil with other types of refrigerant oil.
Replacement

1. Turn off the engine, apply the parking brakes, and chock the tires.
2. Disconnect the batteries.
3. Recover the refrigerant from the air conditioning system. For instructions, see Section 83.04, Subject 220.
4. Drain the coolant from the cooling system. For instructions, see Section 20.01, Subject 100.
5. Remove the sleeper heater and air conditioner (HVAC) assembly from the vehicle. For instructions, see Subject 150.
6. Remove the capscrews that attach the temperature actuator to the HVAC assembly and remove the actuator. See Fig. 1.

7. Remove the clips that attach the upper housing of the HVAC assembly to the lower housing. Remove the upper housing.
8. Remove the heater core subassembly from the HVAC assembly.
   8.1 Remove the capscrew that attaches the heater tube retention bracket to the lower housing and remove the bracket. See Fig. 2.
   8.2 Remove the heater core subassembly from the lower housing.

9. Spread the tabs to remove the heater core from the heater core housing. Remove the heater core.
10. Remove the heater core tubes from the heater core.
11. Attach the heater core tubes to the new heater core. Position the heater core tubes as shown in Fig. 2.
12. Install the heater core in the heater core housing. Press firmly on the heater core until the tabs are in the locked position.
13. Install the heater core subassembly in the lower housing. Make sure the entire seam between the two housings is flush.
14. Using a capscrew, attach the heater core tubes and the heater tube retention bracket to the lower housing.
15. Install the upper housing on the lower housing. Make sure the kinematic drive socket is aligned with the hole in the upper housing. See Fig. 3.
16. Check that the kinematic drive socket is aligned with the hole in the upper housing. See Fig. 3.
17. Using clips, secure the upper housing to the lower housing.
18. Check that the temperature kinematic is working. Turn the kinematic drive lever and verify the temperature mix doors move when the drive lever is turned.

19. Install the temperature actuator.
   19.1 Align the actuator to the keyed shaft on the door.
   19.2 Using capscrews, attach the actuator to the HVAC assembly.

20. Install the HVAC assembly in the vehicle. For instructions, see Subject 150.

21. Fill the cooling system with coolant. For instructions, see Section 20.01, Subject 100.

22. Evacuate and charge the air conditioning system. For instructions, see Section 83.04, Subject 220.

23. Connect the batteries.

24. Remove the chocks from the tires.
Replacement

1. Turn off the engine, apply the parking brakes, and chock the tires.
2. Disconnect the batteries.
3. Recover the refrigerant from the air conditioning system. See Section 83.04, Subject 220 for instructions.
4. Drain the coolant from the cooling system. See Section 20.01, Subject 100 for instructions.
5. Remove the sleeper heater and air conditioner (HVAC) assembly from the vehicle. See Subject 150 for instructions.
6. Remove the capscrews that attach the blend door actuator to the HVAC assembly, and remove the actuator. See Fig. 1.
7. Remove the clips that attach the upper housing of the HVAC assembly to the lower housing. Remove the upper housing.
8. Remove the capscrew that attaches the heater tube retention bracket to the lower housing. See Fig. 2.
9. Remove the heater core subassembly from the lower housing.
10. Remove the capscrew that attaches the refrigerant line retaining bracket to the lower housing. See Fig. 3.
11. Remove the evaporator.
12. Remove the capscrews that attach the upper retaining plate and the expansion valve to the refrigerant lines. Remove the expansion valve.

Fig. 1, Sleeper HVAC Assembly

1. CDTC Sensor
2. Upper Housing
3. Blend Door Actuator
4. Auxiliary Control Unit (ACU)
5. Blower Motor
6. Lower Housing
7. Clips

Fig. 2, Heater Core Subassembly

1. Heater Core Subassembly
2. Heater Tube Retention Bracket
3. Refrigerant Line Retaining Bracket

Fig. 3, Evaporator

1. Evaporator
2. Refrigerant Line Retaining Bracket
Evaporator Replacement

13. Remove and discard the Mini Stat-O-Seals from the evaporator refrigerant lines. IMPORTANT: Do not lubricate the Mini Stat-O-Seals prior to installation.


15. Using capscrews, attach the expansion valve and the upper retaining plate to the evaporator refrigerant lines. Tighten the capscrews 35 lbf-in (400 N·cm).

16. Install the evaporator in the lower housing as follows.
   16.1 The base of the evaporator should rest on the condensate channels and the expansion valve should protrude through the bottom of the lower housing.
   16.2 Attach the refrigerant line retaining bracket to the housing. See Fig. 3.

17. Install the heater core subassembly in the lower housing. Make sure the heater core tubes protrude through the bottom of the housing.

18. Using a capscrew, attach the heater tube retention bracket to the lower housing. See Fig. 2.

19. Install the upper housing on the lower housing. Make sure the entire seam between the two housings is flush, and that the kinematic drive socket is aligned with the hole in the upper housing. See Fig. 4.

20. Using clips, secure the upper housing to the lower housing.

21. Check that the blend door kinematic is working. Turn the kinematic drive socket and verify the blend doors function correctly.

22. Align the blend door actuator to the drive socket. Then, using capscrews, attach the actuator to the HVAC assembly.

23. Install the HVAC assembly in the vehicle. For instructions, see Subject 150.

24. Fill the cooling system with coolant. For instructions, see Section 20.01, Subject 100.

25. Connect the batteries.

26. Evacuate and charge the air conditioning system. For instructions, see Section 83.04, Subject 220.
Replacement

1. Turn off the engine, apply the parking brakes, and chock the tires.
2. Disconnect the batteries.
3. Access the sleeper heater and air conditioner (HVAC) assembly.
   - On vehicles with a baggage compartment on the right side of the cab, open the door to the baggage compartment.
   - On vehicles without a baggage compartment on the right side of the cab, raise the mattress and bunk panel to the locked position.
4. Disconnect the electrical connector from the blower motor. See Fig. 1.

![Fig. 1, Sleeper HVAC Assembly](image)

   1. CDTC Sensor
   2. Sleeper HVAC Assembly
   3. Temperature Actuator
   4. Auxiliary Control Unit (ACU)
   5. Blower Motor

5. Remove the capscrews that attach the blower motor to the HVAC assembly and remove the blower motor.
7. Connect the electrical connector to the blower motor.
8. Lower the sleeper mattress and bunk panel or close the baggage compartment door.
9. Connect the batteries.
10. Remove the chocks from the tires.
Replacement

1. Turn off the engine, apply the parking brakes, and chock the tires.
2. Access the sleeper heater and air conditioner (HVAC) assembly.
   
   On vehicles with a baggage compartment on the right side of the cab, open the door to the baggage compartment.
   
   On vehicles without a baggage compartment on the right side of the cab, raise the mattress and bunk panel to the locked position.
3. Remove the capscrews that attach the temperature actuator to the HVAC assembly. See Fig. 1.
4. Disconnect the electrical connector from the actuator and discard the actuator.
5. Connect the electrical connector to the new actuator.
6. Align the actuator to the keyed shaft on the door.
7. Using capscrews, attach the actuator to the HVAC assembly.
8. Lower the sleeper mattress and bunk panel or close the baggage compartment door.
9. Remove the chocks from the tires.
Removal

1. Turn off the engine, apply the parking brakes, and chock the tires.
2. Recover the refrigerant from the air conditioning system. For instructions, see Section 83.04, Subject 220.
3. Drain the coolant from the cooling system. For instructions, see Section 20.01, Subject 100.
4. Place a drain pan under the sleeper on the right side of the vehicle to catch any coolant that may spill from the coolant lines. Remove the clamps that attach the coolant hoses to the coolant lines and remove the coolant hoses. See Fig. 1.
5. From under the sleeper on the right side of the vehicle, remove the capscrew that attaches the lower retaining plate and refrigerant lines to the expansion valve. Quickly cap the refrigerant lines. See Fig. 1.
6. From under the sleeper, remove the nuts and washers that attach the sleeper heater and air conditioner (HVAC) assembly to the floor of the sleeper.
7. Access the HVAC assembly.
   On vehicles with a baggage compartment on the right side of the cab, open the door to the baggage compartment.
   On vehicles without a baggage compartment on the right side of the cab, raise the mattress and bunk panel to the locked position.
8. From inside the sleeper, disconnect the wiring harnesses from the HVAC assembly.
9. Remove the HVAC assembly from the vehicle.

Installation

1. Place the HVAC assembly on the floor of the sleeper. Make sure the heater core tubes, water drain tube, and mounting studs protrude through the floor.
2. Connect the wiring harnesses to the HVAC assembly.
3. From under the sleeper, install the washers and nuts on the mounting studs. Tighten the nuts 48 lbf·in (542 N·cm) maximum.
4. Uncap the refrigerant lines and install new Mini Stat-O-Seals on the refrigerant lines.
5. Using a capscrew, attach the lower retaining plate and the refrigerant lines to the expansion valve. Torque the capscrew 11 to 15 lbf·ft (15 to 20 N·m).
6. Lower the mattress and the bunk panel or close the baggage compartment door.
7. Fill the cooling system with coolant. For instructions, see Section 20.01, Subject 100.
8. Evacuate and charge the air conditioning system. For instructions, see Section 83.04, Subject 220.
9. Remove the chocks from the tires.
Replacement

1. Turn off the engine, apply the parking brakes, and chock the tires.
2. Recover the refrigerant from the air conditioning system. For instructions, see Section 83.04, Subject 220.
3. From under the sleeper on the right side of the vehicle, remove the capscrew that attaches the lower retaining plate and refrigerant lines to the expansion valve. Remove and discard the Mini Stat-O-Seals. Quickly cap the refrigerant lines. See Fig. 1.

4. Remove the capscrews that attach the expansion valve to the upper retaining plate and remove the expansion valve.
5. Remove and discard the Mini Stat-O-Seals from the refrigerant lines.

IMPORTANT: Do not lubricate the Mini Stat-O-Seals prior to installation.

6. Install new Mini Stat-O-Seals on the evaporator refrigerant lines.
7. Using capscrews, attach the new expansion valve to the upper retaining plate. Using a torque wrench set to inch-pounds, tighten the capscrews 35 lbf-in (395 N·cm).
8. Uncap the lower refrigerant lines and install new Mini Stat-O-Seals on the refrigerant lines.
9. Using a capscrew, attach the lower retaining plate and the refrigerant lines to the expansion valve. Torque the capscrew 11 to 15 lbf-ft (15 to 20 N·m).
10. Evacuate and charge the air conditioning system. For instructions, see Section 83.04, Subject 220.
11. Remove the chocks from the tires.

Fig. 1, Expansion Valve

IMPORTANT: Under no circumstances should the refrigerant lines remain uncapped for longer than five minutes. Water and dirt can damage the refrigerant system. Do not blow shop air through refrigerant lines since shop air is wet (humid).

4. Remove the capscrews that attach the expansion valve to the upper retaining plate and remove the expansion valve.

5. Remove and discard the Mini Stat-O-Seals from the refrigerant lines.

IMPORTANT: Do not lubricate the Mini Stat-O-Seals prior to installation.
Replacement

1. Turn off the engine, apply the parking brakes, and chock the tires.
2. Disconnect the batteries.
3. Access the sleeper heater and air conditioner (HVAC) assembly.
   - On vehicles with a baggage compartment on the right side of the cab, open the door to the baggage compartment.
   - On vehicles without a baggage compartment on the right side of the cab, raise the mattress and bunk panel to the locked position.
4. Disconnect the electrical connector from the auxiliary control unit (ACU). See Fig. 1.
5. Release the clips at the bottom of the auxiliary control unit to remove the ACU from the HVAC assembly.
6. Connect the electrical connector to the new auxiliary control unit.
7. Install the new auxiliary control unit on the HVAC assembly.
8. Lower the sleeper mattress and bunk panel or close the baggage compartment door.
9. Connect the batteries.
10. Remove the chocks from the tires.

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Fig. 1, Sleeper HVAC Assembly

1. CDTC Sensor
2. Sleeper HVAC Assembly
3. Temperature Actuator
4. Auxiliary Control Unit (ACU)
5. Blower Motor
Fan Switch Replacement

1. Turn off the engine, apply the parking brakes, and chock the tires.
2. Disconnect the batteries.
3. Remove the Torx® fasteners that attach the climate control panel to the cab wall and pull the panel away from the wall. See Fig. 1.
4. Pull the fan switch knob off the fan switch.
5. Disconnect the electrical connector from the fan switch.
6. Remove the nut and pull the fan switch out of the control panel.
7. Using a new nut, install a new fan switch on the climate control panel.
8. Attach the fan switch knob to the fan switch.
9. Connect the electrical connector to the fan switch.
10. Using Torx fasteners, attach the climate control panel to the cab wall.
11. Connect the batteries.
12. Remove the chocks from the tires.

Temperature Control Switch Replacement

1. Turn off the engine, apply the parking brakes, and chock the tires.
2. Disconnect the batteries.
3. Remove the Torx fasteners that attach the climate control panel to the cab wall and pull the panel away from the wall. See Fig. 1.
4. Pull the temperature control switch knob off the temperature control switch.
5. Disconnect the electrical connector from the temperature control switch.
6. Remove the nut and pull the temperature control switch out of the control panel.
7. Using a new nut, install a new temperature control switch on the climate control panel.
8. Attach the temperature control switch knob to the temperature control switch.
9. Connect the electrical connector to the temperature control switch.
10. Using Torx fasteners, attach the climate control panel to the cab wall.
11. Connect the batteries.
12. Remove the chocks from the tires.
R–134a is the only refrigerant that is approved for use on Freightliner vehicles. Several companies offer less expensive, hydrocarbon-based refrigerant, such as propane and methane. Use of these refrigerants will void the warranty on the air conditioning system, cause damage to the air conditioning system, and possibly result in personal injury or property damage. Leaking air conditioning systems charged with hydrocarbon-based refrigerants pose a serious risk of fire or explosion under the hood, or inside the passenger compartment. No vehicle built by Freightliner Trucks can be safely charged with hydrocarbon-based refrigerants, regardless of what the refrigerant supplier states.

When servicing an air conditioning system, be sure to use a refrigerant identifier to ensure that the system has not been charged with something other than R–134a. This should be standard practice since there is no way to tell what services have been previously performed. Identification by service technicians will help to avoid the risk of explosion and guard against contamination of equipment when refrigerant is recovered and recycled.

See Fig. 1 for an illustration that shows the difference between the Behr and Modine condensers.

Temperature/pressure specifications and wiring diagrams for the blend air HVAC system can be found in Section 83.06, Subject 300.

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**Table 1, Refrigerant Oil Specifications**

<table>
<thead>
<tr>
<th>Refrigerant Compressor Make</th>
<th>Oil Type</th>
<th>Refrigerant Oil Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanden</td>
<td>PAG</td>
<td>10.1 oz (286 grams)</td>
</tr>
<tr>
<td>Climate Control</td>
<td>PAG</td>
<td>14 oz (397 grams)</td>
</tr>
</tbody>
</table>

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**Table 2, Refrigerant Charge Specifications**

<table>
<thead>
<tr>
<th>Condenser Make</th>
<th>Type of Cab</th>
<th>Refrigerant Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behr</td>
<td>Day Cab</td>
<td>2.875 lb or 2 lb 14 oz (1.30 kg)</td>
</tr>
<tr>
<td></td>
<td>SleeperCab</td>
<td>3.438 lb or 3 lb 7 oz (1.56 kg)</td>
</tr>
<tr>
<td>Modine</td>
<td>Day Cab</td>
<td>3.25 lb or 3 lb 4 oz (1.47 kg)</td>
</tr>
<tr>
<td></td>
<td>SleeperCab</td>
<td>3.75 lb or 3 lb 12 oz (1.70 kg)</td>
</tr>
</tbody>
</table>

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Fig. 1, Behr and Modine Condensers