4-9 Air/Heat Pumps

4-9 Air Conditioning/Heat Pump

4-9.1 System Description

Air conditioners are located in the living room and bedroom areas. A wall mounted master thermostat is located in the dinette area to control all units. Directions for operation can be found in "Comfort Control Center" section. Remote temperature sensors are located in the kitchen/dinette area and bedroom. The air conditioners are operable from 120 VAC source (generator or shoreline power). Each air conditioning unit is also a heat pump.

There are four heat pump units mounted on the roof of the coach. These units operate at 42°F and above.

Condensate Drains - Separate drain lines are provided for each air conditioning unit to route condensation from the roof to the ground through the body side walls.

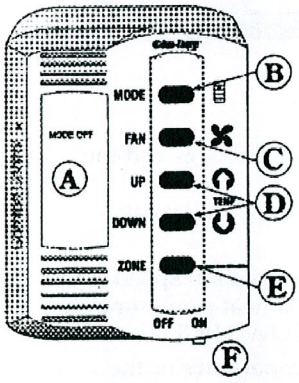
4-9.2 Electric Heat

An electric forced air heater is located in the bath, controlled by remote thermostat. A second electric heater is located in the kitchen.

4-9.3 Comfort Control Center

The coach comes equipped with Duo-Therm's Comfort Control Center™. The Comfort Control Center has been designed for you to easily operate all the air conditioning and gas heating appliances found in the coach from one location.

In order to familiarize yourself with the operation of the Comfort Control Center, the following diagram along with the accompanying text will explain all the functional characteristics of the system.



A. Liquid Crystal Display
B. Mode Selector Button
C. Fan Speed Selector Button
D. Temperature Selector Button
E. Zone and Stage Selector
F. On/Off Switch

A. LIQUID CRYSTAL DISPLAY - Your Comfort Control Center is equipped with a liquid crystal display (LCD) that identifies the mode of operation, the temperature set-point, the zone identification and the fan speed. The Comfort Control Center is designed to accept and control many varied air conditioning and gas heating appliances. When you begin to first operate your Comfort Control Center, you will see that the LCD readout will only show the options available based on the appliances installed on your vehicle. An incandescent light will illuminate the LCD area when a selector button is pushed for easy reading at all times.

B. MODE SELECTOR BUTTON - Modes of operation available are: OFF, FAN ONLY, COOL, HEAT PUMP, FURNACE, HEAT STRIP and AUX. HEAT. Remember, the LCD readout will only show the options available based on the appliances installed on your vehicle. To select the mode of operation, momentarily depress the MODE push-button. You will need to continue to depress and release the button until the desired mode is shown in the LCD readout area on the Comfort Control Center.

To determine the Comfort Control Center options available to you, depress and release the MODE push-button until it goes through all selections.

C. FAN SPEEDS - Possible available fan speeds are: LOW, MEDIUM, HIGH and AUTO. To select the desired fan speed, momentarily depress the FAN push button. Continue to depress and release the FAN button until the desired fan speed is shown in the LCD readout area of the Comfort Control Center.

D. TEMPERATURE SELECTOR BUTTONS - The temperature Set-point range is from 40° to 99°F or 4° to 37°C. Determination of Fahrenheit or Celsius standard is done at the time of the manufacturer's installation of the Climate Control Center. To set the temperature at the desired comfort level, simply depress and release the UP or DOWN push-button until the desired temperature is shown in the LCD readout area of the Comfort Control Center.

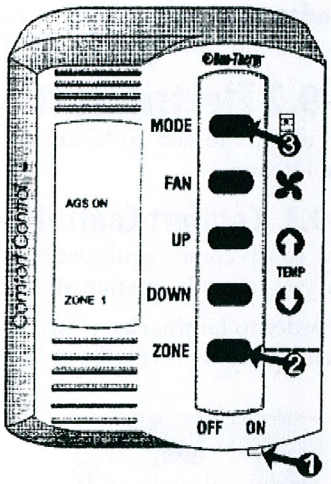
E. ZONE SELECTOR BUTTON - The number of ZONES installed on the coach directly corresponds with the number of heating/cooling systems installed. The 450LXi has ?? Zones (?? Comfort Control Centers).

F. ON/OFF SWITCH - The ON/OFF switch is located on the lower right hand edge of the Comfort Control Center. Move the lever from side to side to change status.

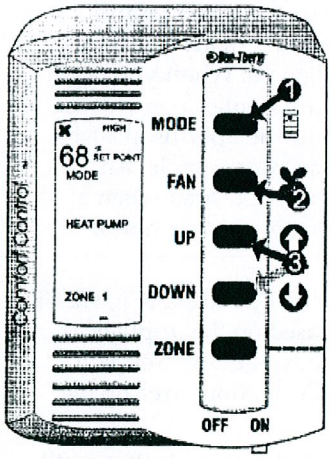
4-9.3.1 Operation

The Comfort Control Center allows the freedom of controlling the vehicle's temperature to provide a comfortable environment. With just a few simple steps, the operator can control which mode of operation to use, the vehicle temperature and the fan speeds.

A. FAN ONLY MODE OF OPERATION



1. Begin by placing the power switch on the lower right hand edge of the Control Center on the ON position. To do this, simply move the lever to the right.
2. Momentarily depress and release the MODE push-button until the FAN ONLY indicator on the Liquid Crystal Display (LCD) is illuminated.
3. Momentarily depress and release the FAN push-button until the desired fan speed indicator (LOW, MED, HIGH, AUTO) is illuminated. If your vehicle is equipped with a heat pump air conditioning system, the selection choice will be LOW, HIGH or AUTO.
4. After approximately 5 seconds, the selected fan speed will come on. The MODE and FAN speed you have selected will remain shown in the LCD area of the Control Center until the selection is changed.
5. If The coach contains more than one ZONE, depress the ZONE push-button to select ZONE 2, and repeat procedures from step two above. Repeat entire procedure for each additional zone.

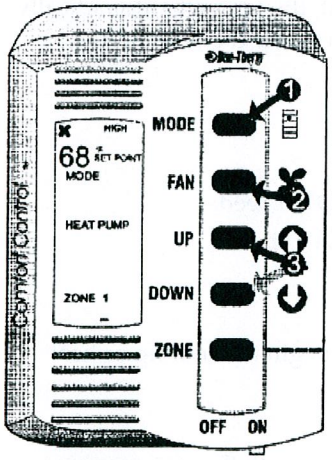


B. COOLING MODE OPERATION

(To set cooling temperatures and fan speeds on Duo-Therm Air Conditioners and the cooling mode of Duo-Therm Heat Pumps.)

1. Momentarily depress and release the MODE push-button until the COOL indicator on the LCD is illuminated.
2. Depress and release the FAN push-button to select your desired fan speed (LOW, MEDIUM, HIGH or AUTO). If the coach is equipped with a heat pump or a dual basement air conditioner system, selection choice will be LOW, HIGH or AUTO.
3. Depress and release the UP push-button to increase the temperature or the DOWN push-button to decrease the desired temperature. The final selected SET-POINT will be displayed in the LCD area of the Comfort Control Center.
4. After a delay of approximately 2 minutes the air conditioner's compressor will come on and the cooling process will begin. Once the room temperature reaches the selected SET-POINT, the compressor will cycle off. Once the Comfort Control Center senses the need for cooling, the compressor will restart in approximately two minutes. At this point, the fan will either:
5. continue to operate in the single selected fan speed or,
6. cycle OFF and ON with the compressor if the AUTO fan speed has been selected.

5. If The coach contains more than one ZONE, depress the ZONE push-button to select ZONE 2, and repeat procedures from step two above. Repeat entire procedure for each additional zone.



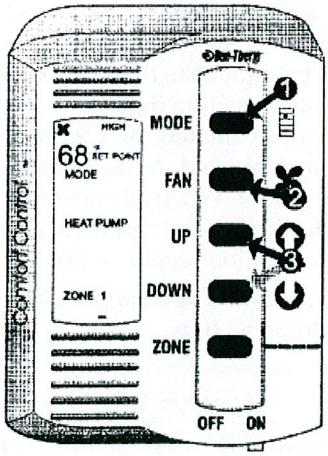
NOTE: See Defrost Cycle and Optional Automatic Generator Start (AGS) for additional Special Heat Pump Features.

C. HEAT PUMP OPERATION

(To set heating temperatures for coaches equipped with a Duo-Therm rooftop heat pump. To operate cooling mode with a heat pump, see "B. Cooling Mode Operation" found previously.

1. Momentarily depress and release the MODE push-button until the HEAT PUMP indicator on the LCD is illuminated.
2. If the fan speed was not previously set, do so by depressing and releasing the FAN push-button to select the desired fan speed.
3. Depress and release the UP push-button to increase the temperature or the DOWN push-button to decrease the desired temperature. The final selected SET-POINT will be displayed in the LCD area of the Comfort Control Center.
4. After a delay of approximately 2 minutes the heat pump's compressor will come on and the heating process will begin. Once the room temperature reaches the selected SET-POINT, the compressor will cycle off. Once the Comfort Control Center senses the need for heating, the compressor will restart in approximately two minutes. At this point, the fan will either:
   a. continue to operate in the single selected fan speed, or,
   b. cycle OFF and ON with the compressor if the AUTO fan speed has been selected.
5. If The coach contains more than one ZONE, depress the ZONE push-button to select ZONE 2, and repeat procedures from step two above. Repeat entire procedure for each additional zone.

D. FURNACE MODE OPERATION



(The coach is equipped with a hydronic heating system connected to the Comfort Control Center)

1. Momentarily depress and release the MODE push-button until the FURNACE indicator on the LCD is illuminated.
2. The A/C fan does not operate in the FURNACE mode.
3. Depress and release the UP push-button to increase the temperature or the DOWN push-button to decrease the desired temperature. The final selected SET-POINT will be displayed in the LCD area of the Comfort Control Center.
4. Your Duo-Therm air conditioning system will not operate when the Comfort Control System is in the FURNACE mode. For cooling, change the MODE to COOL.
5. If The coach contains more than one ZONE, depress the ZONE push-button to select ZONE 2, and repeat procedures from step two above. Repeat entire procedure for each additional zone.

4-9.3.2 Special Control Features

A. AUTO FAN

When AUTO FAN is selected, the fan speed will be determined by the mode you are in.

1. COOL MODE - In the COOL mode, which is the air conditioning mode, the fan will automatically select the speed depending upon the difference between the temperature SET-POINT and the room temperature.

   When the difference is:

8° or more	The fan will operate on HIGH
4° to 8°	The fan will operate on MED
4° or below	The fan will operate on LOW

2. **COOL MODE** (Heat Pump units) - If the coach is equipped with a Duo-Therm Heat Pump unit, the fan will automatically select the fan speed depending upon the difference between the temperature SET-POINT and the room temperature.

When the difference is:

Greater than 4°	The fan operates on HIGH
4° or less	The fan operates on LOW

3. **HEAT PUMP MODE** - When HEAT PUMP mode is selected, the fan will start running in the LOW speed.
4. **HEAT STRIP MODE** - When HEAT STRIP mode is selected, the fan will start running in the LOW speed.
5. **FAN ONLY MODE** - In the FAN ONLY mode, the fan will start running in the LOW speed

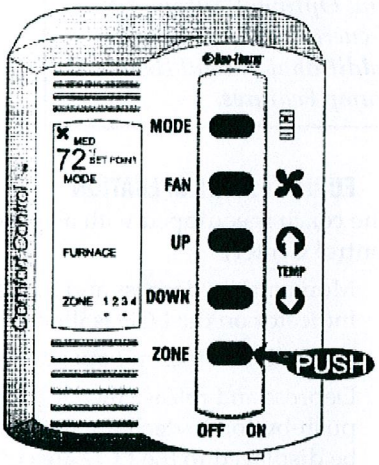
B. REFRIGERANT COMPRESSOR TIME DELAY

A time delay of approximately two minutes occurs any time the compressor is required to begin the cooling or heat pump cycle.

C. POWER INTERRUPTION

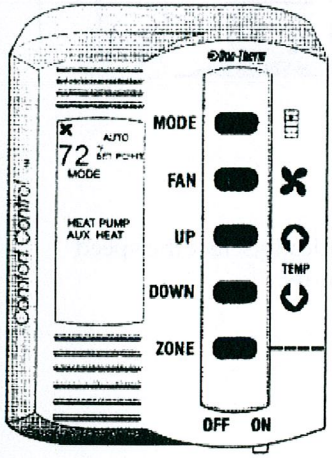
In the event that power to the air conditioner or control is interrupted, the system will restart with the same settings you have previously set.

D. ZONE CONTROL



Your Duo-Therm Control Center will operate cooling and heating appliances which your vehicle manufacturer has designed to heat or cool different areas (ZONES) of your coach. The Comfort Control Center will advise you if your coach has multiple ZONES, by showing ZONE 1,2,3 or 4 illuminated in the LCD readout. In the event your coach has multiple zones designed, you have the freedom of selecting the MODE of operation for each zone independently. To change from one zone to another, depress the ZONE push-button. Each time you depress and release this push-button, the indicator will change the zone data displayed. The zone number flashing indicates zone being programmed. The zone number will flash for approximately 30 seconds unless another zone is selected or programming has been completed. At this time the number will stop flashing and the display light will go out. When all zones have been programmed, the zones in operation will be underlined. To program each zone, simply repeat the programming steps shown in the operation section of this manual.

Please note: The Comfort Control Center will prevent operating FURNACE and COOL or FURNACE and HEAT PUMP at the same time.

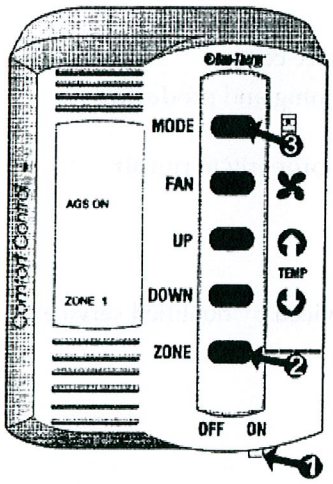


E. AUX. HEAT

When in the HEAT PUMP mode, if the outside ambient temperature is measured to be below 30°F, the control will automatically select the FURNACE operation. When this happens, the AUX. HEAT and the HEAT PUMP indicators on the LCD will illuminate. Once the outside ambient temperature is measured above 38°F, the control will return to the HEAT PUMP operation. If the coach does not contain a furnace, and there is a Duo-Therm Heat Pump, once the outside ambient temperature goes below 30°F, the system will shut down until the outside temperature reaches 38°F, at which time the Heat Pump will resume operation.

F. DEFROST CYCLE

This cycle is active during HEAT PUMP operation and allows the heat pump to operate down to 30°F. When the outside ambient temperature is less than 42°F and greater than 30°F, a defrost timing cycle will begin. The defrost timing cycle will allow operation of the heat pump for 25 minutes. The fan will then be shut off, the refrigerant flow reversed and run for 4 ½ minutes, this is the DEFROST cycle. The refrigerant flow will then be returned to normal and, after a 30 second delay will continue until the temperature is greater than 42°F or until the temperature becomes less than 30°F, at which time the furnace will activate. (See AUX. HEAT section). During the defrost cycle, the DEFROST indicator on the LCD shall be illuminated.



G. OPTIONAL AUTOMATIC GENERATOR START (AGS)

On coaches equipped with an optional AGS kit the coach generator will automatically start when any zone calls for cooling and will shut off when all zones reach set point.

1. Put the power switch in the ON position.
2. Momentarily depress and release the ZONE push-button until AGS indicator appears on the LCD.
3. Momentarily depress and release the MODE push-button to select AGS status.

IMPORTANT: When shore power is available, AGS must be switched to the off position.

4-9.3.3 General Information

The ability of the air conditioner to maintain the desired inside temperature depends on the heat gain of the coach. Some preventative measures taken by the occupants of the coach can reduce the heat gain and improve the performance of the air conditioner. During extremely high outdoor temperatures, the heat gain of the vehicle may be reduced by:

1. Parking the coach in a shaded area.
2. Using window shades (blinds and/or curtains).
3. Keeping windows and doors shut or minimizing usage.
4. Avoiding the use of heat producing appliances.

Starting the air conditioner early in the morning and giving it a "head start" on the expected high outdoor ambient temperature will greatly improve its ability to maintain the desired indoor temperature.

The manufacturer of this air conditioner will not be responsible for damage caused by condensed moisture on ceilings or other surfaces. Air contains moisture and this moisture tends to condense on cold surfaces. When air enters the coach, condensed moisture may appear on the ceiling windows, metal parts, etc. The air conditioner removes this moisture from the air during normal operation. Keeping doors and windows closed when this air conditioner is in operation will minimize condensed moisture on cold surfaces.

This equipment must be serviced by qualified personnel and some states require these people to be licensed.

4-9.3.4 Rebooting

Just like your computer which you may have to reboot from time to time to correct erratic behavior, you also may need to reboot the Comfort Control panel. Voltage spikes may get it off message Resetting takes it back to the factory settings.

1. Turn slide switch to OFF position
2. Press and hold down MODE and ZONE buttons
3. Turn slide switch to ON position
4. Release MODE and ZONE buttons
5. FF appears in display, indicating reset is complete

4-9.3.5 Maintenance

AIR FILTER: Periodically remove the return air filter. Wash the filter with soap and warm water; let dry and then reinstall or replace as required.

NOTE: Never run the air conditioner without the return air filter in place. This may plug the unit evaporator coil with dirt and may substantially affect the performance of the unit.

Comfort Control Center™: clean the Comfort Control Center™ with a moist, soft cloth. DO NOT use solvents for cleaning.

4-9.3.6 Service

If your unit fails to operate or operates improperly, check the following before calling your service center.

a. If your coach is connected to a motor generator, check to be sure the motor generator is running and producing power.
b. If the coach is connected to a power supply by a land line, check to be sure the line is sized properly to run air conditioner load and it is plugged into the power supply.
c. Check the 115VAC fuse or circuit breaker to see if it is open.
d. Check the 12VDC fuse or circuit breaker to see if it is open.
e. After the above checks, call your local service center for further help. This unit must be serviced by qualified service personnel only.

When calling for service, always give the following:

1. Air Conditioner Model Number and Serial Number found on Rating Plate located on the Base Pan of the air conditioner.
2. Electronic Control Kit Part Number and Serial Number found on Rating Plate located on the side of the kit.

RETURN AIR GRILL MUST BE REMOVED FROM THE RETURN AIR COVER TO VIEW THESE RATING PLATES

4-9.4 Automotive Air and Heat System

The dash heat and air system are a separate HVAC system designed to meet the latest refrigerant requirements. This unit provides the ability to mix heat and air to provide defrosting capability.