操 作 说 明 书
Operation Manual

阿旺泰经典系列客车空调机组 AvantAC Classic Bus Air Conditioning Units

Carrier

AVANTAC

Carrier TRANSICOLD 开利运输空调冷冻（中国）Carrier Transicold China

公司总部：中国上海市嘉定区叶城路1235号 邮编：201821 电话：86-21-59166868转 传真：86-21-59165013
Headquarter: No.1235 Ye Cheng Rd. Jiading District, Shanghai, 201821, China Tel: 86-21-59166868 Fax: 86-21-59165013
客服中心：中国上海市广粤路60号 邮编：200434 电话：86-21-65923817 传真：86-21-65923827
Service Centre: No.60 Guang Yue Rd. Shanghai, 200434, China Tel: 86-21-65923817 Fax: 86-21-65923827

Carrier
A United Technologies Company

阿旺泰经典系列客车空调机组

（配备CSDD控制器）

操 作 说 明 书

Carrier

AVANTAC

· 目录

阿旺泰经典系列操作手册

本手册供开利运输空调系统的操作者使用。包括空调系统日常操作的基本说明，安全信息以及其它确保乘客舒适的信息。请仔细阅读本手册，在机组操作过程中如遇到问题，请查询本手册。

更多详细信息可查询阿旺泰运行及维修保养手册，此手册可向开利运输空调经销商索取。

本空调系统在正确操作和保养的情况下可长期无故障地运行。详细的保养计划可保障机组连续稳定运行，并可以节省运行成本，延长机组使用寿命，优化机组性能。

有些车辆需要从车厂或其它特殊设备供应商提供的手册中查询信息。开利公司提醒您仔细确认所有资料以确保您的车辆安全无故障地运行。

维修保养时，请使用开利公司提供的优质可靠的零部件。

开利公司致力于不断提高产品品质，如有变更，恕不通知。

开利机组在设计过程中充分考虑了操作人员的安全。正常运行时，所有运动部件均完全密封，以防止事故发生。在运行前检查、日常检查以及故障检修时，运动部件将暴露在相关人员面前，机组运行时请谨防运动部件。

⚠ 警 告

警告

请当心机组在没有任何警告的情况下自动启动。当机组被设置为自动运行模式时，控制系统可能会意外地启动风机和压缩机。维修保养时请关闭机组并切断控制电源。

制冷剂

空调系统中的制冷剂直接接触到皮肤或眼睛会导致冻伤、烫伤、失明。另外，根据相关法规在系统维修时对制冷剂的处理要求，开利公司建议如机组制冷系统需要维修保养，请联系最近的开利公司授权的运输空调经销商。

1.1 什么是空调

空调就是对车内的空气进行冷却、加热、除湿和过滤。

1.2 空调系统

空调系统通常包括蒸发器、冷凝器、压缩机以及制冷剂连接管路、相关配件、电气接线和控制板。系统部件清单及详细说明参见1.3部分。

1.3 系统部件

制冷剂——制冷剂的作用是将车内的热量转移到外面。它通过高温高压时的冷凝进行放热，低温低压时的蒸发进行吸热。制冷剂相变时的换热特性是制冷循环的基础。

压缩机——压缩机是由皮带驱动的高压设备，使制冷剂在蒸发器和冷凝器中循环。压缩机的运行由电磁离合器控制。

电磁离合器——电磁离合器控制压缩机的运行。当吸合时，压缩机压缩制冷剂，进行制冷。

压力开关——系统通过一个高压开关控制压缩机离合器的动力电路。高压开关打开则切断离合器动力电路，压缩机停止运行。当条件恢复正常时，离合器自动恢复，压缩机继续运行。离合器是不可调节的。

冷凝器——冷凝器安装在客车顶部，它的主要功能是排放制冷剂通过蒸发器从车内吸收的热量。

干燥过滤器——干燥过滤器的作用是去除制冷剂中混入的水份和杂质。

膨胀阀——控制进入蒸发器盘管的制冷剂流量。

蒸发器——蒸发器安装在客车顶部，主要功能是将车内的热量传递给制冷剂，制冷剂由压缩机循环，通过蒸发器盘管。在此过程中，空气同时被除湿。

回风传感器——系统配有一个温度传感器，它是一个感温元件，当被激活时可向电磁离合器发出吸合或脱离的信号。回风传感器通常安装在蒸发器的回风口处。

1.4 型号及机组编号铭牌

为了确认空调系统的部件，你需要知道设备的型号及机组编号。所有的开利运输空调系统均在装配面板内侧贴有一个型号 / 机组编号铭牌。 知道铭牌的位置及信息可帮助您确认正确的维修保养程序。

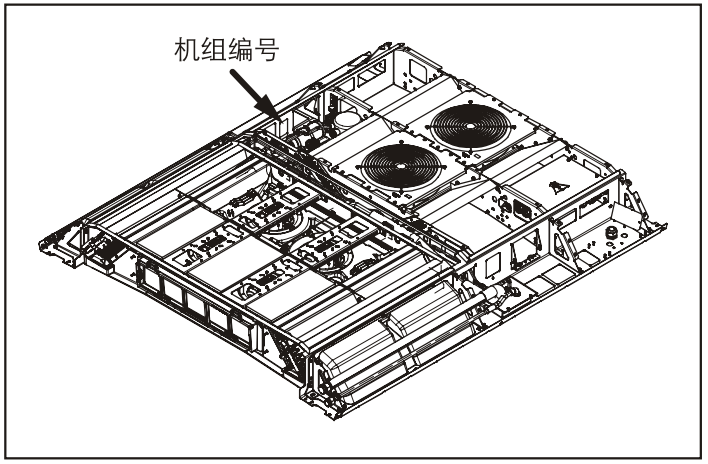

图 **1-1**　机组编号铭牌位置

空调机组启动前，汽车电瓶必须可用。若汽车发动机未启动，则需先启动发动机。只有当控制器接收到汽车点火的信号后空调机组才能启动。

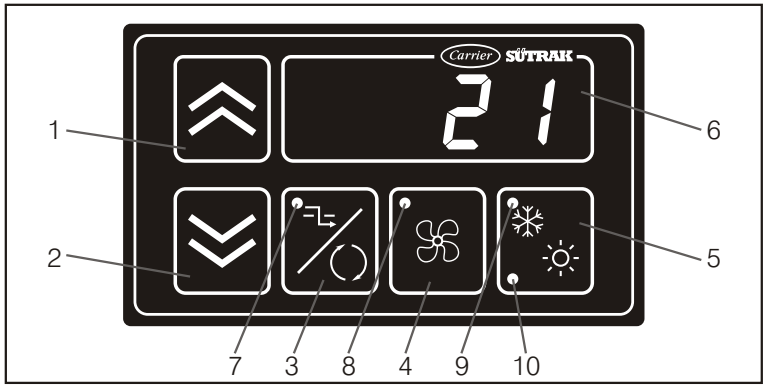

图 **2-1**　司机操作面板

按键	指示灯
1、＋ 键	6、显示屏
2、 – 键	7、新风指示灯（绿）
3、回风/新风转换键	8、送风指示灯（绿）
4、风速控制键	9、自动温控指示灯（绿）
5、自动温控键	10、故障指示灯（红）

2.1 司机操作面板功能

2.1.1 开机/关机

开机：按任意键均可开机。

关机：同时按下 和 键，停止控制面板的所有功能，并关闭控制面板的显示。

2.1.2 按键功能，开机状态

＋键：在相应的模式下，按键一次车内温度设定值提高1℃或在送风运行状态下风机转速提高一级。

– 键：在相应的模式下，按键一次车内温度设定值降低1℃或在送风运行状态下风机转速降低一级。

回风/新风转换键：执行全新风和全回风的状态切换。

风速控制键： 将送风风机从风速自动控制模式切换到手动控制模式，按 和 键可实现风机在1-5档间运行，对应的风机转速分别为20%、40%、60%、80%、100%。

温度自动控制键：将设备切换到温度自动控制模式。

＋ 温度显示：同时按下两键，将显示车内温度10秒钟，第二次同时按下两键，则显示车外温度10秒钟。

和 除湿：同时按下两键，系统以除湿模式运行3分钟。

2.1.3 指示灯功能，开机状态

a. 显示屏——标准显示值为设定的温度值。

b. 新风——当新风门打开时，新风指示灯(绿) - 7亮。

c. 送风控制——当送风风机切换到手动控制模式时，送风指示灯(绿) - 8亮。

d. 制冷 / 制热——当设备以自动温控模式运行时，自动温控指示灯(绿) - 9亮。

e. 故障——当低压或高压安全开关动作时故障指示灯(红) - 10亮。

f. 除湿——当除湿功能激活时，新风指示灯(绿)和送风指示灯(绿) - 7和8同时闪烁。

2.2 运行前检查

系统启动后，让系统稳定10-15分钟，检查下列事项：

a. 倾听压缩机或风扇电机是否有异常响声。

b. 检查压缩机油位。

c. 检查制冷剂充注量。

d. 确定没有任何警报指示。

2.3 操作说明

发动机启动后，先前设定的控制功能将自动再次激活。

2.3.1 显示屏

设备处于关机状态时，显示屏处于黑屏状态。设备开启，显示屏上将显示车内设定温度。选定具体功能后，显示屏将短暂显示相应信息。

2.3.2 启动和车内温度控制

如果发动机没有处于运转状态，那么启动发动机。

按下  键， 将启动车内温度自动控制。

按下  或 键设定所需温度。温度设定范围为18～28℃。

如果环境温度低于2℃，制冷功能将失效。

2.3.3 自动温控

如果选择自动温控模式，空调设备将根据车内温度和设定温度自动调节。

制热：如果车内温度低于设定温度0.5℃， 控制开关切换至制热模式。当车内温度达到设定值，制热功能关闭。

制冷：若系统未运行在节能模式下且车内温度高于设定温度0.5℃以上， 控制系统启动压缩机进行制冷。当车内温度达到设定值，压缩机关闭。若环境温度传感器处于运行状态，当环境温度低于2℃时，制冷模式失效。

送风风机：若选定温度自动控制功能，送风风机的转速将根据车内温度以及设定温度自动调节。

2.3.4 通风

按下  键，送风风机切换到手动运行模式。按  或  键，可以在6档风速间进行切换（20%、40%、60%、80%、100% 和关闭）。

在自动温控模式下，送风风机不能关闭。

在自动温控模式关闭状态下，如果将手动运行模式切换到关闭状态，送风风机将停止。

2.3.5 手动除湿

除湿模式用以降低空气湿度，除去挡风玻璃上的雾气。同时按下  和  键，则激活除湿功能。制热和制冷功能将开启3分钟。同时，送风风机将切换到最高转速且新风门关闭。除湿完毕，机组将以原来的设置模式运行。

若环境温度低于 2℃ 或环境温度传感器失效，除湿功能将不能启动。

2.3.6 温度显示

同时按下  和  键，将显示车内温度（例如“i 22”）。10秒钟后，显示屏返回原始设定。

再次按下  和  键，将显示环境温度（例如“o 19”）。

传感器故障则显示屏显示为“i --”或“o --”。

2.3.7 干热模式

若启动干热模式，压缩机将会在制热时候运行。

干热模式激活时，手动再热功能将失效。

环境温度传感器丢失或故障将使干热功能失效。

若新风门打开，干热功能将失效。

2.3.8 节能模式

在节能模式下，控制器将允许车内温度在舒适的温度范围内上升。

当环境温度上升到节能模式的启动点时，控制器将根据环境温度和车内温度的温差控制车内温度。

此时不能用  或  键手动重新设定温度。

如果当前以节能模式运行，手动除湿功能将失效。

环境温度传感器故障或丢失将导致节能模式失效。

3.1 保养计划

开始作业前，仔细阅读全部程序要求。将车辆停放于平面上，拉上停车制动装置。将主要电气断路开关拉到断开位置。

为了保护地球臭氧层，每次转移制冷剂都必须使用制冷剂回收系统。对制冷剂进行作业时，必须遵守所有当地环境法律法规。

3.2 质保/维修保养

感谢您选择开利运输空调系统。开利公司将一直关注您对空调系统的满意程度。如果您有任何问题，请联系最近的开利运输空调经销商。

3.3 系统保养表

系统 开	系统 关	操 作
a. 日常维护		
*	*	启动后进行运行前检查
	*	检查三角带的状况及张力
b. 每周维护		
	*	进行日常检查
	*	检查冷凝器、蒸发器盘管以及回风和新风滤网是否清洁
	*	检查制冷剂软管及压缩机轴封是否泄漏
*		检查干燥过滤器两侧是否有明显温差
c. 月度检查和维护		
	*	进行每周检查和维护
	*	清洁蒸发器冷凝水盘和排水管
	*	检查线束是否有磨损以及接线端是否松脱
	*	检查风扇电机轴承
	*	检查压缩机安装螺栓是否拧紧
d. 半年检查和维护		
*		检查系统压力
*		检查视液镜中冷媒
	*	检查液管视液镜（如果已安装）中组分
	*	检查冷凝风扇叶片
	*	打开加热盘管阀门（冬季）
	*	关闭加热盘管阀门（春季）
e. 每年检查和维护		
	*	检查控制板及接头，如有必要，用专用的优质清洁器进行清洁
	*	检查蒸发器冷凝水盘 （如有必要，进行清洁）
*		检查压力开关使用情况
	*	检查顶置机组的安装和密封情况

OPERATION MANUAL

BUS AIR CONDITIONING UNITS
AvantAC Classic with CSDD Controller

Contents

AvantAC Classic Operation Manual

This guide has been prepared for the operator of Carrier Transport Air Conditioning systems. It contains basic instructions for the daily operation of the air conditioning system as well as safety information, and other information that will help you to maintain a comfort level for your self and your passengers. Please take the time to read the information contained in this booklet and refer to it whenever you have a question about the operation of your Carrier Transport Air Conditioning system.

More comprehensive information can be found in the AvantAC Operation and Service Manual. This manual can be obtained from your Carrier Transport A/C dealer.

Your air conditioning system has been engineered to provide long, trouble-free performance when it is properly operated and maintained. A comprehensive maintenance program will help to insure that the unit continues to operate reliably. Such a maintenance program will also help to control operating costs, increase the unit's working life, and improve performance.

Some Vehicles may require information from manuals supplied by the vehicle manufacturer or other special equipment suppliers. We urge you to review all these publications carefully. This will help you enjoy safe and trouble-free operation of your vehicle. When having your unit serviced, be sure to specify genuine Carrier Transicold replacement parts for the highest quality and best reliability.

At Carrier Transport Air Conditioning, we are continually working to improve the products that we build for our customers. As a result, specifications may change without notice.

Your Carrier Transport Air Conditioning system has been designed with the safety of the operator in mind. During normal operation, all moving parts are fully enclosed to help prevent injury. During all pre-trip inspections, daily inspections, and problem troubleshooting, you may be exposed to moving parts; please stay clear of all moving parts when the unit is in operation.

⚠ WARNING

Beware of unannounced starting of the unit. The unit may cycle the fans and operating compressor unexpectedly as control requirements dictate. Turn system off and disconnect battery power.

REFRIGERANT

The refrigerant contained in the air conditioning system can cause frostbite, severe burns, or blindness when in direct contact with the skin or eyes. For this reason, and because of legislation regarding the handling of refrigerants during system service, we recommend that, whenever your unit requires service of the refrigeration system, you contact your nearest Carrier Transport Air Conditioning authorized dealer for service.

1.1 WHAT IS AIR CONDITIONING

Air Conditioning is the cooling, heating, dehumidification, and filtration of the air within the passenger compartment of a vehicle.

1.2 AIR CONDITIONING SYSTEM

An Air Conditioning System normally includes an evaporator(s), a condenser(s), a compressor and interconnecting refrigerant hoses, fittings, and electrical harnesses and controls. A listing of the system components, along with specific data for each, is provided in Paragraph 1.3.

1.3 SYSTEM COMPONENTS

Refrigerant - A refrigerant is a material that is used to move heat from the passenger compartment to the outside air. It is a substance that gives up heat by condensing at high temperature and pressures and absorbs heat by evaporating at low temperatures and pressures. The heat transfer properties exhibited when refrigerant changes state is the foundation of the refrigerant cycle.

Compressor - The compressor is a belt driven, high-pressure pump, which circulates the refrigerant through the evaporator and condenser . The operation of the compressor is controlled by the Electro-Magnetic clutch.

Electro-Magnetic Clutch - The Electro--Magnetic clutch controls the operation of the compressor. When engaged, the compressor circulates refrigerant and provides cooling.

Pressure Switch - The systems use a high pressure switch wired to control the power circuit of the compressor clutch. If the pressure switch opens, interrupting the circuit to the clutch, the operation of the compressor will stop. When conditions return to normal the switch will automatically reset and the compressor will resume operating. The switch is non--adjustable.

Condenser - The condenser is located on the roof of the vehicle. Its primary function is to reject heat, which was transferred to the refrigerant by the evaporator from the passenger compartment of the vehicle.

Filter/Dryer - The filter/dryer removes moisture and particulate matter from the refrigerant.

Expansion Valve - Meters the refrigerant flow into the evaporator coil.

Evaporator - The evaporator is located on the roof of the vehicle. Its primary function is to transfer heat contained in the passenger compartment air, into the refrigerant, which is circulated by the compressor, through the evaporator coil. During this process the air is also dehumidified.

Return Air Sensor - The system is supplied with a thermistor. This device is a temperature sensitive component which when activated, signals the Electro-Magnetic Clutch to engage/disengage. The return air thermistor is normally located in the return air flow of the evaporator assembly.

1.4 MODEL AND SERIAL NUMBER TAGS

In order to identify the air conditioning components you have, you will need to know the model number and serial number. All Carrier Transport Air Conditioning systems have a model/serial number tag located on the assembly. Knowing these locations and the information on the data tags will aid you in identifying the correct service procedures.

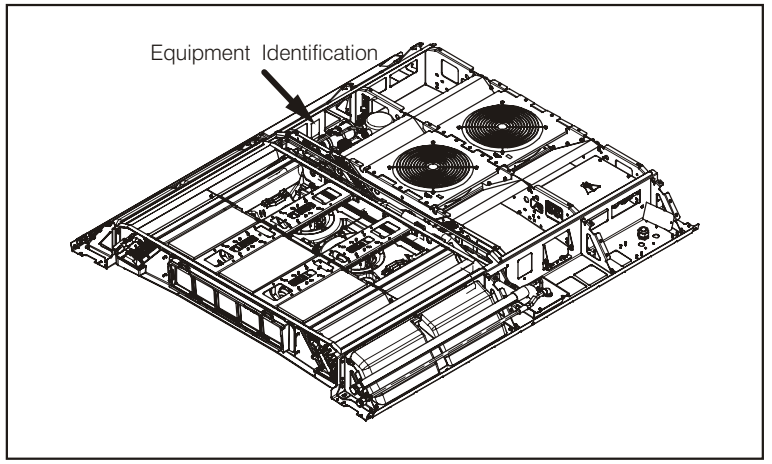

Figure 1-1 I.D. Tag Location

Before attempting to operate the system, power must be available from the vehicle battery. If the engine is not running, start the engine. Most systems will not operate unless a signal is received at the controller from the vehicle ignition.

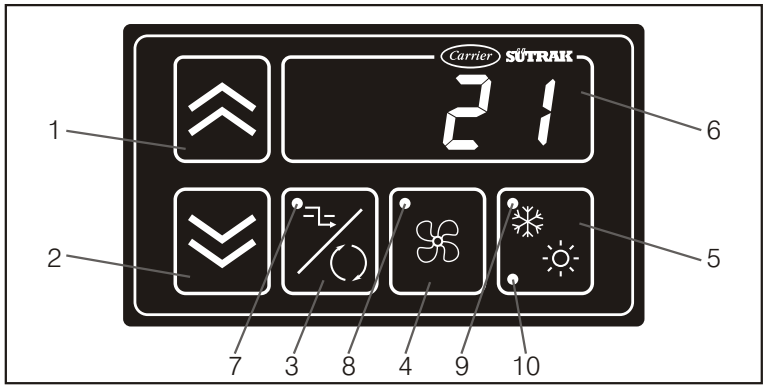

Figure 2-1 Drivers Display

KEYS
1. Plus Key
2. Minus Key
3. Recirculate/Fresh Air
4. Blower Control
5. Automatic Climate Control

LEDS
6. Display
7. Fresh Air Open (Green)
8. Manual Blower 'ON' (Green)
9. Cooling/Heating (Green)
10. Malfunction Cooling Unit (Red)

2.1 DRIVER DISPLAY FUNCTIONS

2.1.1 Key Functions, On

Plus Key - Increases vehicle setpoint by 1 degree per stroke or increases manual blower speed, depending on displayed mode.

Minus Key - Decreases vehicle setpoint by 1 degree per stroke or decreases manual blower speed, depending on displayed mode.

Recirulating/Fresh Air - Switches from Recirculating Air to Fresh Air and vice versa.

Blower Control - Switches the evaporator blower motors from automatic speed control (based on contoller inputs) to manual control where the operator may select blower speed based on the number of times the Plus Key is stroked.

Automatic Climate Control - Switches on the automatic temperature control.

+ **Temperature Indication** - Use two keys, Minus Key and the Recirulating/Fresh Air Key - If both keys are pressed simultaneously the display shows the inside temperature for 10 seconds, if both keys are pressed a second time, the outside temperature will be displayed for 10 seconds.

+ **Reheat** - Use two keys, Recirulating/Fresh Air Key plus Automatic Climate Control - If both keys are pressed simultaneously the system will run in reheat for 3 minutes.

2.1.2 LED Functions, On

a. Display - The standard indication is the set point temperarture.
b. Fresh Air - (7)This green LED will illuminate when the fresh air damper is open.
c. Blower Control - (8)This green LED will illuminate when the evaporator blower motors are controlled manually as described in **2.1.1 'Blower Control'**.
d. Cool/Heat - (9)This green LED will illuminate when the unit is operating in Auto Mode.
e. Malfunction - (10)This red LED will illuminate when a low or high pressure safety switch activates.
f. Reheat - (7-8) Both green LED's will flash when the reheat function is active.

2.2 PRE-TRIP INSPECTION

After starting system, allow system to stabilize for ten to fifteen minutes and check for the following:

a. Listen for abnormal noises in compressor or fan motors.
b. Check compressor oil level.
c. Check refrigerant charge.
d. Ensure that there are no alarms indicated.

2.3 OPERATING INSTRUCTIONS

When the engine is started, previously set functions of the control are reactivated.

2.3.1 Display

The display is dark when the unit is OFF. When the unit is ON the display shows the interior setpoint temperature. When selecting individual functions, the display shows the corresponding information for a short period of time.

2.3.2 Starting And Interior Temperature Control

If the engine is not running, start the engine.

Pressing the Automatic Climate Control key - will start vehicle interior temperature control. Press the Plus - or Minus - Keys to set the required temperature. The temperature can be adjusted between 18℃ and 28℃. The cooling functions will be disabled if ambient air temperatures are below 2℃.

2.3.3 Automatic Climate Control

After selecting the automatic climate control the unit will be governed in relationship to the vehicle interior temperature and set point temperature.

Heating: If the vehicle interior temperature drops more than 0.5℃ below the setpoint temperature, the control switches on the heating. If the vehicle interior temperature reaches the set point, the heating is switched off.

Cooling: If system is not operating in ECO Mode (see Section2.3.8) and if the vehicle interior temperature rises more than 0.5℃ above the setpoint temperature, the control energizes the compressor clutch. If the vehicle interior temperature reaches the set point, the compressor clutch is switched off. If the ambient temperature sensor is in operational, cooling is not allowed whenever the ambient temperature is below 2℃.

Blower: If automatic blower control is selected, the evaporator blower speed will vary in response to the relationship to the vehicle interior temperature and the controller set point temperature.

2.3.4 Vent

The blowers may be switched to manual mode of operation by pressing the Blower key . Press the plus or minus keys to select one of 6 (20%, 40%, 60%, 80%, 100%, and OFF) different blower speeds.

The blowers cannot be switched OFF when Automatic Climate Control is ON.

When Automatic Climate Control is OFF, the blowers stop when the manual blower control is turned to OFF.

2.3.5 Manual Reheat

The Reheat mode is used to lower the air humidity and to help defogging the windshields. Press the Recirculating/Fresh Air Key and the Automatic Climate Control Key at the same time to activate Reheat. Heating and cooling will be energized for 3 minutes. In addition, the evaporator blowers will be switched to maximum speed and the fresh air flap will be closed. At the end of the of Reheat, the functions will return to previouly selected settings.

Reheat is disabled with ambient temperatures below 2℃ or if the ambient air sensor fails.

2.3.6 Temperature Indication

Press the Recirculating/Fresh Air Key  and the Minus Key  at the same Time to display the interior temperature (example "i 22"). The display will return to the original setting after 10 seconds.

Pressing the Recirculating/Fresh Air Key  and the Minus Key  a second time will display the ambient temperature (example "o 19").

A sensor malfunction will display as "i --" or "o --".

2.3.7 Dry Heat Mode

If the Dry Heat mode is active, the compressor will operate when heating is called for.

Manual Reheat is disabled when Dry Heat is active.

An absent or defective ambient sensor disables Dry Heat.

Dry Heat is disabled if the Fresh Air Flap opens for any reason.

2.3.8 ECO Mode

In ECO Mode the controller will allow the vehicle interior temperature to rise but at a rate that maintains comfort levels.

When ambient temperature rises to the ECO Mode start point, the controller will control the vehicle interior temperature in accordance with a set difference in temperature between ambient temperature and vehicle interior temperature.

Manual re-setting of the set point temperature with the Plus or Minus keys is not possible.

Manual Reheat is disabled if ECO mode is operational.

A defective or missing ambient sensor disables the ECO mode Function.

⚠ WARNING

Be sure to observe warnings listed in the safety summary in the front of this manual before performing maintenance on the HVAC system.

⚠ WARNING

Read the entire procedure before beginning work. Park the coach on a level surface, with parking brake applied. Turn main electrical disconnect switch to the off position.

NOTE

To avoid damage to the earth's ozone layer, use a refrigerant recovery system whenever removing refrigerant. When working with refrigerants you must comply with all local government environmental laws.

3.1 Warranty/Service

Thank you for choosing a Carrier Transport Air Conditioning system for your vehicle. We want to assure you of our continuing interest in your pleasure and satisfaction with your air conditioning system. Remember, if you have a question or concern and need help, contact your nearest Transport Air Conditioning Dealer.

3.2 Maintenance Schedule

SYSTEM ON	SYSTEM OFF	OPERATION
a. Daily Maintenance		
*	*	Pre-trip inspection - after starting. (Refer to paragraph 2.2)
	*	Check tension and condition of drive belts.
b. Weekly Maintenance		
	*	Perform daily inspection
	*	Check condenser, evaporator coils, return air filters
		(if equipped) and fresh air filters for cleanliness
	*	Check refrigerant hoses and compressor shaft seal for leaks
*		Feel filter-drier for excessive temperature drop across drier
c. Monthly Maintenance and Inspection		
	*	Perform weekly inspection
	*	Clean evaporator drain pans and hoses
	*	Check wire harnesses for chafing and loose terminals
	*	Check fan motor bearings
	*	Check compressor mounting bolts for tightness
d. Semi-Annual Inspection and Maintenance		
*		Check system pressures
*		Check refrigerant in sight glass
	*	Check element in the the liquid line sight glass. (If equipped)
	*	Inspect condenser fan blades
	*	Open bus heater valves (In winter)
	*	Close bus heater valves (In spring)
e. Annual Inspection and Maintenance		
	*	Inspect electrical panel and terminals. Clean if needed with a high-
		grade cleaner specifically formulated for this purpose.
	*	Inspect Evaporator drain pan. (Clean if needed)
*		Check pressure switch operation
	*	Check system roof mounting and sealing