The purpose of this application guide is to provide information for the necessary accessories required to operate 1.5 ton – 5 ton split system air conditioners, heat pumps and convertible package units during low ambient cooling operation.

Section I: Terms and Definitions

Section II: Off Season Cooling Operation Split Systems

Section III: Off Season Cooling Operations Package Units

Position Statement

American Standard and Trane have always recommended installing manufacturer approved, matched indoor and outdoor systems. The benefits of installing approved matched systems are maximum efficiency, optimum performance, and best overall system reliability.
SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

WARNING

R-410A Refrigerant under Higher Pressure than R-22! The unit described in this manual uses R-410A refrigerant which operates at higher pressures than R-22 refrigerant. Use ONLY R-410A rated service equipment or components with this unit. For specific handling concerns with R-410A, please contact your local Trane representative. Failure to use R-410A rated service equipment or components could result in equipment or components exploding under R-410A high pressures which could result in death, serious injury, or equipment damage.

WARNING

Personal Protective Equipment (PPE) Required! Installing/servicing this unit could result in exposure to electrical, mechanical and chemical hazards.
• Before installing/servicing this unit, technicians MUST put on all Personal Protective Equipment (PPE) recommended for the work being undertaken. ALWAYS refer to appropriate MSDS sheets and OSHA guidelines for proper PPE.
• When working with or around hazardous chemicals, ALWAYS refer to the appropriate MSDS sheets and OSHA guidelines for information on allowable personal exposure levels, proper respiratory protection and handling recommendations.

WARNING: HAZARDOUS VOLTAGE - DISCONNECT POWER and DISCHARGE CAPACITORS BEFORE SERVICING

WARNING

This information is intended for use by individuals possessing adequate backgrounds of electrical and mechanical experience. Any attempt to repair a central air conditioning product may result in personal injury and/or property damage. The manufacturer or seller cannot be responsible for the interpretation of this information, nor can it assume any liability in connection with its use.

WARNING

LIVE ELECTRICAL COMPONENTS!
During installation, testing, servicing, and troubleshooting of this product, it may be necessary to work with live electrical components. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.
Section I - Terms and Definitions:

Three phase products:
All 2.5 to 5 ton three phase split system cooling units and heat pumps are shipped from the factory with compressor crankcase heat. Three phase compressors do not require start capacitors or start relays.

Definitions and information:

CCHT - Compressor Crankcase Heater, sometimes called a compressor sump heater. This device is designed to warm the compressor crankcase (or sump) in order to prevent or deter refrigerant migration during the compressor off cycle. Compressor crankcase heaters are required for low ambient cooling operation.

TXV - Thermostatic Expansion Valve. This is a type of refrigerant flow control device designed to maintain constant superheat throughout the operating envelope. For low ambient cooling applications, a non-bleed TXV is required.

Bleed TXV: This type of TXV will allow the refrigerant pressures between the high side and low side to equalize through the valve during the off cycle.

Non Bleed TXV: This type of TXV will not allow the refrigerant pressures between the high side and low side to equalize through the valve during the off cycle. When using this type of valve on single phase units with reciprocating style compressors, compressor start components are required. Check product data specifications for most current information.

Head pressure controller - A device that is field installed on a condensing unit or heat pump designed to maintain system head pressure that will allow safe system operation without indoor coil icing in colder outdoor ambients. The BAYLOAM103 will cycle the condenser fan motor in order to achieve adequate operating head pressure. The control is adjustable.

Evaporator Defrost Control - A device that is field installed on the system's indoor coil in order to prevent the system from running during the cooling cycle when the indoor coil approaches or reaches a temperature in which frost will form on the coil surface. When the indoor coil approaches a safe temperature for cooling operation, the control will close and allow the outdoor unit to restart. This controller makes and breaks the control voltage to the condensing unit.

Quick Start Component - This component may be factory installed or offered as a field installed accessory (BAYKSKT***). A quick start kit consist of a capacitor with a high microfarad rating and a potential relay. It is installed so that the start capacitor is wired in parallel with the compressor’s run capacitor. Prior to start-up the potential relay contacts are closed, therefore placing the start capacitor in the compressor circuit, as the compressor motor reaches operating speed, electrical current flows through the potential relay’s coil and the the relay contacts are opened, thus taking the start capacitor out of the system until the next compressor start up.
Section II – Off Season Cooling Operation – Split Systems

American Standard and Trane split system cooling and heat pump units may be operated in the cooling mode to 55°F outdoor ambient as shipped from the factory when applied with an indoor TXV. Where required, these units with appropriate accessories may be applied to operate at outdoor temperatures below 55°F.

<table>
<thead>
<tr>
<th>Air Conditioner</th>
<th>55°F - 30°F</th>
<th>55°F - 30°F</th>
<th>55°F - 30°F</th>
<th>30F - 20F or 30F - 0F see lowest approved OD ambient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Pump</td>
<td>TXV-NB</td>
<td>CHT</td>
<td>BAYLOAM103</td>
<td>BAYLOAM107</td>
</tr>
<tr>
<td>TXV-NB</td>
<td></td>
<td></td>
<td></td>
<td>Start Kit</td>
</tr>
<tr>
<td>Solenoid Valve</td>
<td></td>
<td></td>
<td></td>
<td>Shield</td>
</tr>
<tr>
<td>Lowest Approved</td>
<td></td>
<td></td>
<td></td>
<td>Outdoor Ambient Cooling Mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0°F</td>
</tr>
<tr>
<td>13 SEER</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Approved to 0 deg F</td>
</tr>
<tr>
<td>14 SEER</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Approved to 0 deg F</td>
</tr>
<tr>
<td>15 SEER</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Approved to 0 deg F</td>
</tr>
<tr>
<td>16 SEER</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Approved to 0 deg F</td>
</tr>
<tr>
<td>17 SEER</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Approved to 0 deg F</td>
</tr>
<tr>
<td>18 SEER</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Approved to 0 deg F</td>
</tr>
<tr>
<td>20 SEER</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Approved to 0 deg F</td>
</tr>
<tr>
<td>18 SEER VS</td>
<td>X</td>
<td>Not Approved</td>
<td>Not Approved</td>
<td>Approved to 55 deg F</td>
</tr>
<tr>
<td>20 SEER VS</td>
<td>X</td>
<td>Not Approved</td>
<td>Not Approved</td>
<td>Approved to 55 deg F</td>
</tr>
</tbody>
</table>

Notes:
1. DO NOT apply BAYLOAM to model tonnages with variable speed condenser fan motors. Models with VS condenser fan motors are approved to 30°F with EDC and air handlers with EEV.
2. AY28X*** EDC not required when indoor unit has EEV.
3. 20 SEER includes two compressor and VS. 20 SEER OD units approved to 55°F.
4. Liquid line solenoid shall be used for isolation purposes. Also used if liquid line is 1/2" and installed before the evaporator coil.

See SS-APG006-EN Refrigeration Piping Application Guide.

Unit requires a compressor crankcase heater and start accessory only if it is not factory installed.

Compressor Crankcase Heaters:

Reciprocating Compressor: BAYCCHT300
Large Scroll Compressor: BAYCCHT301RES
Small Scroll Compressor: BAYCCHT302RES

As noted in the above table, systems may be operated lower than 55°F by applying the BAYLOAM103 or BAYLOAM107 and other accessories. The BAYLOAM*** controller cycles the outdoor fan motor as needed to maintain liquid line temperature as set by the DIP switches located on the control. There is no need to change the outdoor motor on approved products since the controller does not vary the frequency to the motor. However the BAYLOAM*** CANNOT be applied to those model tonnages with a variable speed condenser fan motor.
For start component accessory kits, BAYKSKT***, review the Service Facts literature of the specific outdoor unit. The start kit part number, if not already factory installed will be located in the accessory and wiring section of the Service Facts.

On indoor furnaces and air handlers, a condensate float switch should be installed to interrupt the compressor circuit during cooling operation, if the condensate management becomes restricted, preventing proper drainage.
Windshields:
If low ambient cooling operation is required, windshields are a must in order to block prevailing winds from impacting system performance at low outdoor temperatures. Reference figure 1.

Figure 1 - Windshield Construction Information

Low ambient cooling utilizing the frost control in GAM5A, TAM4 and TAM7 indoor units:
The GAM5A, TAM4 and TAM7 fan coil units utilize an electronic expansion valve (EEV). With this enhancement the controls that monitor the EEV also allow us to take advantage of monitoring coil temperature.

How it works:
The on-board electronic controls include a relay that will open at 27°F when the indoor coil begins to frost. When this occurs, the contacts to the YO circuit will open and de-energize the outdoor unit, provided figure 2 and 3 are followed. When the YO circuit opens the outdoor unit is taken off line; however, the indoor blower continues to operate, thus clearing the indoor coil of frost build-up.

Low ambient cooling utilizing thermostatic control found in the AY28X079 and AY28X084.
How it works:
These controls are thermally controlled contacts with a capillary style sensor. The capillary tube is inserted into the coil fins in between the tube rows. When the sensor detects 25°F, the contacts open. The contacts close when the coil temperature reaches 60°F. When wired as shown in figures 4 and 5, the outdoor unit is de-energized when the EDC contact opens and re-energizes when the EDC contact closes.
Typical wiring the frost control located in GAM5A, TAM4 or TAM7 fan coil unit

Figure 2
Cooling split system and GAM5A, TAM4 or TAM7 fan coil unit

*NOTE: Y2 and BK is present on TAM7 units and not present on GAM5 or TAM4.

Figure 3
Heat pump split system and GAM5A, TAM4 or TAM7 fan coil unit

Warning! High voltage present in the outdoor unit and indoor unit. Assure high voltage power is disconnected using lockout / tag-out procedures if applicable prior to connecting low voltage wiring.
Typical wiring when using the evaporator defrost control (EDC):

Figure 4 -
Single Speed Cooling Split System and AY28X079 Evaporator Defrost Control

![Diagram of Single Speed Cooling Split System and AY28X079 Evaporator Defrost Control]

Figure 5 -
Single Speed Heat Pump Split System and AY28X084 Evaporator Defrost Control

![Diagram of Single Speed Heat Pump Split System and AY28X084 Evaporator Defrost Control]

Warning! High voltage present in the outdoor unit and indoor unit. Assure high voltage power is disconnected using lockout / tag-out procedures if applicable prior to connecting low voltage wiring.
Section III – Off Season Cooling Operation – Package Units

American Standard and Trane convertible package units may be operated in the cooling mode to 55°F outdoor ambient temperature as shipped from the factory. Where required these units with the appropriate accessories may be applied to operate at outdoor temperatures below 55°F.

<table>
<thead>
<tr>
<th>Packaged Convertible Air Conditioner, Heat Pump, Gas/Electric</th>
<th>55° As Manufactured</th>
<th>EDC BAYLOAM011A</th>
<th>CCHT</th>
<th>BAYLOAM105A</th>
<th>BAYLOAM107A</th>
<th>Start KIT</th>
<th>Lowest Approved Outdoor Ambient Cooling Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>4TC**</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>4TCC4**</td>
<td>2-5T</td>
<td>X 20°F</td>
</tr>
<tr>
<td>4WC**</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>4WCC4**</td>
<td>2-5T</td>
<td>X 10°F</td>
</tr>
<tr>
<td>4YC**</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>4YCC4**</td>
<td>2-5T</td>
<td>X 20°F</td>
</tr>
<tr>
<td>4DC</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X 10°F</td>
</tr>
<tr>
<td>4WHC**</td>
<td>45°F</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X 10°F</td>
</tr>
</tbody>
</table>

Notes:
1. NO Start KIT on 3 phase product

Compressor Crankcase Heaters

BAYCCHT101A for reciprocating compressors, 65 watt, 230vac
BAYCCHT102A for 6.5" scroll compressors, 60 watt, 230vac
BAYCCHT103A for 5.5" scroll compressors, 40 watt, 230vac
BAYCCHT404B for 6.5" scroll compressors, 60 watt, 460vac
BAYCCHT405A for 5.5" scroll compressors, 40 watt, 460vac
BAYCCHT301 for 6.5" - 7.5" diameter scroll compressors 60 watt, 230vac
BAYCCHT302 for 5.5" diameter scroll compressors 40 watt, 230vac

Start KITS

BAYQSTK300A for 4TC & 4WC 230vac, Single Phase Only
BAYQSTK301A for 4YC & 4DC 230vac, Single Phase Only
The air conditioner or heat pump package systems may be operated lower than 55°F by applying the BAYLOAM105 or BAYLOAM107 and other accessories. The BAYLOAM*** controller cycles the outdoor fan motor as needed to maintain liquid line temperature as set by the DIP switches located on the control. There is no need to change the outdoor motor on approved products since the controller does not vary the frequency to the motor.

The BAYLOAM011A is an evaporator defrost control (EDC) installed on the indoor coil. Its purpose is to cycle the compressor when the evaporator coil surface frosts under low outdoor ambient cooling conditions. The BAYLOAM011A will open at 0°F and de-energize the compressor contactor circuit. With the indoor fan still operating, after an increase in evaporator coil surface temperature, the EDC will re-close at 50°F and re-energize the compressor contactor.
The manufacture has a policy of continuous product and product data improvement, and it reserves the right to change design and specifications without notice.

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