

Communique'

King Air Series

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King Air Air-Conditioning FAQ All

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Technical Support receives many questions regarding the vapor cycle air conditioning systems in the various King Air models. Many of the “issues” with these systems have more to do with improper maintenance techniques than the design of the systems. Our goal here is to answer many of the frequently asked questions and to provide some *tips and advice* on vapor cycle air conditioning service and maintenance.

The # 1 concern when performing maintenance on vapor cycle air conditioning systems is eliminating “MOISTURE” in the system. Moisture in the system may cause several potential problems. First, it can create “freeze-ups” in the form of ice crystals at the expansion valves. Moisture can mix with the refrigerant oils and cause “sludging” which greatly reduces the lubricating ability of the oil. POE and PAG oils used in R134A systems are extremely sensitive to moisture. When servicing any system with oil, we recommend using new oil from a factory - sealed container. Discard any unused oil due to the highly hygroscopic nature of POE oils. POE oil is 10 times more moisture sensitive than mineral oil used in R12 systems and PAG oil is about 100 times more sensitive than mineral oil. Beech Aircraft does not recommend the use of PAG oil in King Air systems. *** The most effective way to eliminate moisture from a system is the use of a “high capacity” vacuum pump and a thermistor vacuum gauge to measure the 125 micron vacuum level as required in the King Air Series Maintenance Manuals. ***Remember, the term “high vacuum” describes a condition where the internal system pressure is extremely low, close to a perfect vacuum. The higher the vacuum level is in a system, the closer the micron reading is to 0. When selecting a vacuum pump, Technical Support recommends a quality, two-stage model equipped with a gas ballast and high internal running temperature with a 10 cfm or better capacity. It is also vital that whenever the system is opened that all connections be capped and plugged **immediately** and always replace the receiver dryer when a system is opened.

Moisture “WILL” lead to corrosion and contamination within any system. There can be many possible types of and reasons for contamination. Corrosion within the system usually begins by the mixture of Freon and remaining moisture that is not fully evacuated from a system. This mixture forms an acid that attacks the aluminum lines, fittings and

components throughout the system. The aluminum oxides that result from this corrosion will appear as a black or dark gray, gritty substance that will block critical orifices within the system. In the King Air Model 200 and 300 Series systems, this can cause frequent high pressure or low pressure faults which require reset of the 'press to test' switch in the nose wheel well. Another form of contamination can come from maintenance facilities using a Freon charging cart that was previously contaminated by corrosion or debris from another aircraft or by working on an aircraft that had an unauthorized refrigerant installed. There are many refrigerant products out in the marketplace that operators may be using without fully understanding the consequences of their actions. Some of these products have additives or are Freon mixtures or blends that are not approved for use in the King Air. Please take every precaution to protect yourself and your customers by ensuring that your maintenance equipment is not contaminated. We also strongly recommend placing your refrigerant servicing equipment on regularly scheduled maintenance program to insure proper operation.

The other, more obvious concern with contamination may be traced back to a mechanical fault occurring within the system. This could be the result of a compressor that experienced an internal fault or rupture of a desiccant bag inside the receiver dryer. Any contamination of the system requires a thorough flushing of the complete system and proper servicing of the system after repairs.

Here are some things to consider when flushing these systems. The condenser and evaporator coils are the most difficult items to flush and may need to be replaced to prevent further contamination of the system. Also, do not forget flushing the hot gas bypass valve circuit. When flushing the system you will need to remove the valve to flush properly. The receiver dryer must be removed when flushing. The amount of time required to flush the system is dependant upon the level and type of contamination and the type of equipment and methods used. Remember, the desired end result is a clean, uncontaminated system. Any contamination allowed to remain in the system may cause some type of damage later, resulting in more maintenance costs and downtime.

Technical Support recommends using a flush cart similar to the Robinair Model 17570, Cliplight Flushworks or Classic Tools Cobra Flush Cart Model 22-1490 and a suitable flush fluid such as A/C Flush by Castrol or Cobra A/C Flush from Classic Tools. One method of determining what contaminants are in a system is to cut open the receiver dryer and inspect the screen. Severe cases of contamination can cause the internal screen to collapse and block Freon flow in some cases. In cases of extreme contamination, it may be helpful to obtain samples of the oil and contaminates for laboratory analysis to determine the source of the contamination. If oil samples are analyzed, pay particular attention to the aluminum composition type (i.e. 1000, 2000 series) and contact RAC Technical Support for further recommendations.

Proper servicing practices are extremely important in today's air condition systems especially when considering the United States Environmental Protection Agency rules and other governmental rules. Remember that Section 609 of the Clean Air Act Amendment, in part, basically states that "no person repairing or servicing motor vehicles

for consideration may perform any service on a motor vehicle air conditioner involving the refrigerant for such air conditioner without properly using approved refrigeration recycling equipment and no such person may perform such service unless such person has been properly trained and certified.” Be sure that shop personnel are properly trained and licensed before working on air conditioner systems.

Equally important to proper maintenance procedures are the proper servicing levels of both oil and refrigerant. The following is a reference chart to assist in the proper servicing of these King Air systems. Something to remember in today’s world is that there are many modifications possibly installed on any given airplane. These may include refrigerant conversion kits, ground cooling kits, etc. For this reason, it is impossible for Technical Support to list all servicing quantity possibilities and therefore we list servicing data for airplanes without STC modifications only. It is the responsibility of the technician to determine what mods or STC’s may be installed and to act accordingly when performing maintenance. Experience also teaches us that it is vital for the refrigerant charge to be correct. However, when operating aircraft in extreme climates or under unusual flight profiles, servicing levels may need to be adjusted slightly to provide optimal operational performance. The current, correct values for servicing the vapor cycle systems on King Air models are listed in the following chart. When servicing R-134A systems, always service the refrigerant by weight as the sight glass is not an accurate method. Bubbles in the sight glass WILL appear in a properly serviced R134A system. The following information is for R134A equipped airplanes:

Model	Refrigerant Charge	Oil Charge/ Total
C90A- Sanden compressor	40 oz.	10 oz.
B200-Single evaporator	96 oz.	29 oz.
B200- Dual evaporator	131.2 oz.	32 oz.
B300	131.2 oz.	32 oz.

Remember some of the oil is placed in the compressor and the remainder is placed throughout the system and carried by the refrigerant. The best method of adding the additional oil to a system after correctly servicing the compressor is the use of an oil injector while servicing the refrigerant. Special note: *R134A refrigerant may lose as much as 70 percent of its ability to carry the oil if the level of charge losses only 10 percent.* This makes it essential to locate and correct leaks in the system as soon as possible to prevent oil starvation to the compressor and eventual mechanical faults. On the other hand, an excessive oil charge will cause slugging of the compressor and premature mechanical faults. Please be observant when servicing the oil charge in these systems.

Service vapor cycle air conditioning systems today has become highly technical and very complex. The days of adding “a pound of refrigerant and sending the airplane out” are long gone. Air conditioning service requires dedicated and specialized equipment and personnel and while the systems and operation are not complex the issues involved can be very complex.