KYSOR
A Division of Bergstrom Inc.

Air Conditioning & Heating Replacement Parts

Kysor Retrofit Guide

SYSTEM CHECK AND PREPARATION PRIOR TO RETROFIT

Initially perform a visual inspection of the refrigerant hoses, fittings and components for signs of lubricant leakage, damage and corrosion. Determine that the vehicle's air conditioning system has not already been retrofitted. Check the engine compartment area for labels indicating a retrofit has been done or stating which refrigerant is contained in the existing system. Verify the R-12 service ports are on the air conditioning system on the high and low side and identify all service port usages (e.g. switches). Caution must be used during this inspection procedure to insure that an empty port intended for switch mounting is not mistaken for a service port on an air conditioning system which has already been retrofitted.

Determine possible refrigerant leaks. With the engine off check the air conditioning system pressure. Verify the system pressure corresponds to the saturation pressure at the current ambient and inspect the system for leaks. Follow SAE J1628 Leak Check Procedure by adding R-12 to locate system leaks. Components found to be leaking should be replaced or repaired in a manner compatible with the retrofit.

If possible it is helpful to operate the air conditioning system fully charged at the maximum load condition. Record the compressor suction and discharge pressures, panel outlet temperatures and the ambient conditions (temperature and humidity) during the test. This information will be helpful in determining the R-134a charge amount.

REMOVAL OF R-12 FROM SYSTEM

Using approved R-12 recovery/recycle equipment, recover the refrigerant according to the service procedures in SAE J1989. Service procedures shall be followed to minimize the R-12 remaining in the system. Excess levels of R-12 may cause system chemical contamination and system damage. Be sure that all equipment including the connecting hose lines and manifold are compatible with the refrigerant in the system with which you are going to work, and that your equipment has been previously used only with the refrigerant you are about to service. Operate the recovery unit and extract the refrigerant from the vehicle's air condition system in accordance with the equipment manufacturer's instructions. Be sure to store the extracted refrigerant in only an approved container containing only the refrigerant you are currently extracting.

DO NOT VENT REFRIGERANT TO ATMOSPHERE. VENTING OF CFC CONTAINING REFRIGERANTS IS ILLEGAL AND SUBSTANIAL PENALTY AND/OR FINES COULD RESULT.

Continue extracting the refrigerant until the air conditioning system has been brought into a vacuum and there is no refrigerant remaining in the vehicle's system. Verify that all refrigerant has been removed by shutting of the extraction machine and observing system pressure. Wait five minutes and verify that the system still contains no pressure. If pressure remains, additional recovery is required to remove the remaining refrigerant. Repeat the operation until the vehicle's system vacuum level remains stable for two minutes.

LUBRICANT REMOVAL

Removal of the mineral oil is important to reduce the amount of R-12 remaining in the system and to assure proper compressor lubrication with the new refrigerant. Mineral oil is not miscible in R-134a and therefore will not circulate through the system as the R-134a circulates. R-134a will react with mineral oil and cause the oil to become chemically unstable. Draining oil from components, replacing components, flushing or a combination of these efforts will need to be done.

Several companies are currently working on flushing agents which are environmentally friendly and will not require as much care in handling as R-12. At the time of this writing R-12 is the only SAE approved medium recommended for flushing of existing equipment containing R-12 and mineral oil.

A lot of testing has been taking place on this subject as to the effects of residual mineral oil on R-134a systems. Recent data has been suggesting that residual mineral oil itself does not adversely effect a retrofitted R-134a system as much as was initially thought and thus system cleanliness levels need not be extreme. In fact it has been shown that residual mineral oil in non-barrier type hoses acts as a barrier to protect the hose from PAG and ester lubricants as well as help limit R-134a leakage rates through the hose wall.

In most situations removal of system components and physically draining the mineral oil out and purging the equipment with dry nitrogen is adequate.

RETROFIT PART REPLACEMENT

Compressor

Most late model compressors can be removed, drained of mineral oil, and install an equivalent amount of R-134a compatible lubricant. The following compressor manufacturers and models are retrofitted with the above procedure.

Make	Model	Approved Lubricant
ZEXEL (SELTEC)	Any CH model or newer compressor	ZXL 100 PG (DH-PS) PAG
SANDEN	All models except SD-510	SP-20 Oil PAG
CCI	Any model compatible with conversion	RETRO-FIX PAG Lubricant or Castrol Retro 100 Ester

Receiver Dryer

Change dryer to one containing XH7 or XH9 desiccants. All R-134a dryers will be labeled as being “R-134a compatible” or contain a sky blue label indicating desiccant type.

Expansion Valve

Kysor recommends changing the expansion valve to a R-134a TXV. Failure to change the TXV could result in allowing liquid returning to the compressor causing compressor failure.

Hose & Fittings

Some judgement is required in deciding what needs to be done when retrofitting hose and fittings. The age of the system to be retrofitted and the expected remaining service life will effect what expense can be justified when performing a retrofit. PAG's and ester oils attack unlined rubber hose common to existing R-12 air conditioning systems. Swelling and chemical breakdown of the hose can cause buildup on system components and eventually degrade the performance of the system. Some field testing has shown, however, that the saturation of the inner lining of the rubber hose by mineral oil actually helps provide a protective barrier against attack from PAG's and esters and also reduces leakage rates. This phenomenon obviously will occur in varying degrees throughout a system and there is no way to determine just how well this barrier is protecting the hose. However, it does appear to function and is a viable alternative on systems where cost of retrofitting are forced to be at a minimum and system longevity and durability are not paramount.

It is Kysor's opinion that a retrofit is an opportunity to improve the integrity and durability of poorly designed and installed systems and provide a new system which will function as well or better than the R-12 system it is replacing. All new R-134a systems are being designed with barrier type neoprene lined nylon inner tube hoses with one piece bubble crimp o-ring style fittings. These hoses and fittings should be used in any retrofit situation where hoses and fittings are deemed to require replacement.

O-Rings

O-rings should be replaced in air conditioning systems whenever the connection they are located in is taken apart. These O-rings should be replaced with either HNBR or neoprene O-rings.

Condenser

Follow guidelines described in condenser section of "Recommended System Changes" found earlier in this article. Once again, good judgment is required, and always attempt to design in as much condenser capacity as practical to provide superior system performance and longevity.

Service Ports

When retrofitting R-12 air conditioning systems you are required to convert existing R-12 service ports to R-134a Quick disconnect type service ports using conversion assemblies. The conversion assembly shall attach to the R-12 fitting with a thread locking adhesive or separate mechanical latching mechanism in a manner that prevents the assembly from being removed inadvertently.

Due to the size of the quick disconnect service valves, it is impractical to locate the service ports on the compressor. New compressors purchased for use with R-134a have no service ports located on them.

Locate high and low side service ports in practical accessible locations. Hose splice assemblies are available with R-134a service ports on them. A variety of fitting shapes are also available to facilitate port installations.

SYSTEM LABELS

Systems retrofitted to R-134a must be labeled "NOTICE: RETROFITTED TO R-134a." Labels should be a sky blue color. Refer to SAE J1660 for additional information.

SYSTEM EVACUATION

After the system is prepared for R-134a the evacuation procedure is critical in helping remove additional remaining R-12 and any moisture that was introduced during the retrofit procedure. Kysor recommends a rotary vane single or dual stage vacuum pump with a minimum of 1 CFM capacity capable of producing a vacuum of 29.91" HG. When evacuating the air conditioning system turn the pump and vacuum gauge on and watch the gauge reading. Allow the system to pull down until the gauge reaches 1000 microns or less. When this level is reached continue this vacuum for an additional 5 minutes. Now isolate the pump from the A/C system. Allow the system pressure to balance. If the pressure will not balance (continues to climb) the system has a leak. If it does balance, but at a pressure which is too high (2000 microns or above), it is an indication of too much moisture and more pumping time is required. The process of dehydration can take from 10 to 15 minutes if the system is fairly dry, or possibly a number of hours if the system contains excessive moisture. When the system does balance at the acceptable level. Isolate and shut down the pump and the system is ready for charging.

R-134a CHARGING PROCEDURE

The PAG lubricants used with R-134a have an upper solubility limit of approximately 140° F. Operating near this refrigerant temperature causes the oil to give a milky appearance to the refrigerant in the sight glass. Although a clear sight glass may be obtained on some R-134a systems, there will be system that will not have a clear sight glass even at reduced operating ambients. This means that charging an R-134a system to a clear sight glass is not a reliable method of determining proper charge.

The preferred method of charging any system is to add the weight of refrigerant recommended by the manufacturer based on test data for the vehicle's system. This data is not always available because of the many variations in field installations. Note that when charging by weight as with other methods, gauges must be used to verify proper operation of system.

If the R-134a system being charged is identical to an R-12 system, (same physical size components and line lengths) the charge will be approximately 95% of the R-12 charge. Begin with approximately 85% of the known value for R-12. Add charge in one or two ounce increments at five-minute intervals. Add charge until the suction pressure is within ± 5 PSIG of previous values obtained for R-12, and the discharge pressure is no greater than 10% higher than previously obtained for the R-12 system. Note that these pressures are to be compared for the same ambient temperatures and compressor speeds. On systems where the sight glass clears, add 2 to 4 ounces beyond the charge required to clear the sight glass, while observing the above pressure limitations. ***WARNING: DO NOT charge a system without monitoring operating pressures.*** Once the required charge has been determined, identical systems can be charged by weight using the charge determined above.

Note that the charge determinations are to be conducted at maximum load (cab doors open, outside air mode and blowers on high speed).