

A/C Retrofit Update

Since 1996, original equipment manufacturers have been using R-134a in all automotive air conditioning systems. R-134a is now the

refrigerant of choice. This short article will help you learn proper safety procedures regarding the use of R-134a. Also, to stress the importance of refrigerant identification for OEM automotive A/C systems, we will explain some of the specific system component changes, and discuss important changes to A/C service equipment.

You may already be familiar with R-134a, A/C retrofits, and proper procedures. If you are confident of your abilities and retrofit knowledge, try answering the 20 question quiz that ends this article. If you are not sure about your R-134a retrofit knowledge, read this article first.

What Is R-134a?

R-134a does not contain suspected ozone-depleting chlorofluorocarbons. The chemical compounds and molecular structures of the old refrigerant R-12 and the new refrigerant R-134a are completely different. However, the temperature/pressure relationships of the two are very similar. Automotive publications,

equipment manufacturers, and refrigerant suppliers, provide technical specifications and properties for R-134a.

R-134a and R-12 are not compatible. Under no circumstances should they be mixed. Vehicle and service manufacturers have gone to great lengths to prevent cross-charging or contamination of these two refrigerants. For instance, R-12 systems use a small high-side service port, and a large low-side service port. R-134a service fittings are completely different. The high side service port is now the larger of the two. These quick disconnect fittings will not work with R-12 service equipment.

Component Changes

The service valve on an R-134a container has a thread size that is different from an R-12 container. The service gauges and fittings are different, and should never be adapted to interchange between R-12 and R-134a systems.

The construction and appearance of most R-12 and R-134a components is usually very similar. However there are several critical and significant changes between the two systems. For instance:

- Compressor lubrication for R-134a systems requires a new type of refrigerant oil.
- Condensers for R-134a systems require greater efficiency, since high side operating pressures tend to be slightly higher than those of an equivalent R-12 system.
- R-134a type receiver driers contain a different type of desiccant.
- Expansion valve set points are different.
- Refrigerant hoses are constructed of less permeable material.

Intermixing of components, refrigerants, or lubricants is not recommended due to the risk of hindering performance, and possible system failure. That's why manufacturers of automotive A/C systems and components are placing extra emphasis on labeling and identification.

Refrigerant Oils

Let's take a look at the lubrication and type of oil that is recommended for use with the new refrigerant. Service technicians should understand the differences between these lubricants.

R-134a systems use a synthetic oil known as polyalkaline glycol, or PAG. This oil mixes well with R-134a and circulates throughout the A/C system. Due to possible differences in chemical makeup PAG oil from one manufacturer should never be mixed with other types of PAG oil.

Unfortunately, and most important of all, is that mineral-based oils, the type used with R-12 systems, will not mix with R-134a refrigerant. Therefore,



Subaru Equipped With R-134a A/C System

mineral based oil will not effectively lubricate an R-134a system.

An important point to remember is that PAG oil will absorb moisture at a much greater rate than mineral-based oil. In fact, PAG oil's capacity for moisture absorption is 1000 times greater than that of mineral-based oils. Proper "capping" of the compressor and lines while servicing must be done to protect the air conditioning system.

PAG oil should never be left in an open container in the shop area. The moisture it absorbs could form compounds that will damage the air conditioning system.

Due to the increased risk of moisture absorption, and to be compatible with R-134a refrigerants, the new A/C systems will use an R-134a specific receiver drier. This drier uses a new type of desiccant. The amount of desiccant used in an R-134a A/C system has also been increased. Generally speaking, the receiver-drier looks the same, and it serves the same purpose, but again critical differences do exist and proper identification is important.

Expansion Valves

The expansion valve set points for an R-134a system are different from the setting of an R-12 expansion valve, to compensate for the slight difference in operating pressures and efficiency ratios. Subaru expansion valves are not field serviceable, and should always be replaced if faulty. Again, proper identification when replacing system components will be critical on future A/C systems.

Refrigerant Hoses

Refrigerant hoses on many of today's R-12 systems are constructed with barrier type inner linings. This helps minimize the permeation of refrigerant over long periods of time. These types of hoses will also be used on R-134a systems. Another important note to remember about hoses, and other pipe assemblies, is that manufacturers have intentionally changed mating connections in many cases, to help prevent accidental inter-mixing. Be specific when

ordering replacement components to avoid costly delays.

A/C Service Equipment

R-134a manifold gauge sets are equipped with "quick-disconnect" fittings. Verify that you are using the correct equipment by checking the gauge face labeling and the R-134a "ID" with the stripe along the hose area.

When servicing R-134a systems, you may notice some slight differences in the normal operating pressures, especially on the discharge, or high side. Always refer to the service manual or diagnostic aids to determine the correct pressures for the particular vehicle you're servicing. Remember also that R-12 and R-134a manifold gauge sets are calibrated differently, and should not be interchanged.

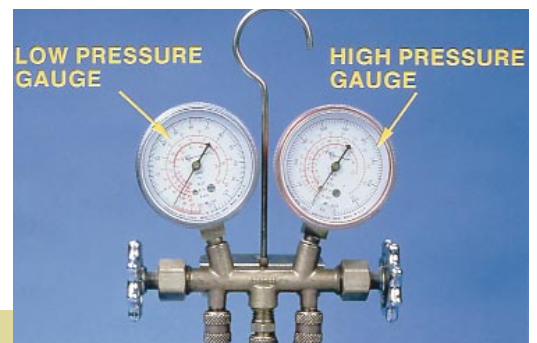
Leak detection is one of the most important steps in the new approach to refrigerant use, and it plays a vital role in the "Recover, Recycle and Reuse" program. First, always make a visual check of the system to see if there are any obvious signs of leakage. Many manufacturers are offering leak detectors designed for use on R-12 and R-134a. Always follow the manufacturer's instructions carefully. Be thorough when checking for a leak. TAKE YOUR TIME! If additional refrigerant is required to locate a leak, add only enough to establish positive pressure.

Service shops have very few options regarding system evacuation. Subaru recommends using a vacuum pump that is specifically designed and dedicated for R-134a systems.

Positive identification for your shop tools is very important. Gauge and hose sets cannot be interchanged between R-12 and R-134a systems. There may be some residual oil or refrigerant left in the manifold which could lead to cross-contamination of the entire system.

The same potential problem exists with your recovery and recycling equipment.

Conventional R-12 A/C Gauge Set



A/C Retrofit Update

Make sure that your equipment is clearly marked so there is no way an R-12 recovery machine can be used on an R-134a system. If you suspect refrigerants have been mixed within the vehicle A/C system or the reclaiming, we recommended using a D.O.T. approved evacuated container to capture the contaminated refrigerant. At this point, the container must be properly disposed of. There may be a local recycler who can help you with disposal. Remember, the service shops and technicians are truly the “point men” in our environmental challenge.

Recovery And Recycling Procedures

Let's take a look at the recovery and recycling of R-134a. Federal law now requires recovery and recycling, as well as technician certification. Even beyond the federal requirements, it just makes sense to recover and recycle R-134a. It's the environmentally responsible thing to do.

Here are some important things to remember about the recovery and recycling of refrigerants. First of all, make sure that the equipment is U.L. approved. Never use an R-12 recovery machine on an R-134a vehicle. Never mix components, refrigerants, or service equipment, since this can lead to cross contamination and possible system failure.

R-134a has been around for a few years, and it's now the required refrigerant in all new car A/C systems. Test your R-134a and retrofit knowledge by answering the following True or False questions. The correct answers are printed upside down at the bottom of page 21.

1. Although the chemical compounds and molecular structures of R-12 and R-134a are completely different, the temperature pressure relationships of the two are very similar.
2. R-134a and R-12 can be mixed under certain circumstances.
3. R-134a systems use a synthetic oil known as polyalkaline glycol, or PAG.
4. Gauge and hose sets cannot be interchanged between R-12 and R-134a systems.

5. R-12 will be the refrigerant used in all OEM automotive A/C systems by the year 2000.
6. R-12 and R-134a service fittings are the same, with a small high side service port and a large low-side service port.
7. PAG oils absorb moisture at the same rate as mineral-based oils.
8. R-134a-type receiver driers contain a different type of desiccant.
9. PAG oil mixes well with both R-134a and R-12.
10. R-134a systems use refrigerant hoses with barrier lining, the same type found on many R-12 systems.
11. Service gauges and fittings can be adapted to interchange between R-12 and R-134a systems.
12. The five basic components in a typical A/C system are: the compressor, condenser, receiver-drier, expansion valve and evaporator.
13. The expansion valve set points for all R-134a systems are similar to those of an R-12 expansion valve.
14. Manufacturers have intentionally changed connections in hoses and other pipe assemblies to prevent intermixing of refrigerants.
15. You will never notice any differences in the normal operating pressures of an R-134a system as opposed to a similar R-12 system.
16. At present Federal law does not require recovery and recycling but suggests service technicians practice both within their service shops.
17. Manufacturers of automotive A/C systems and components are placing extra emphasis on labeling to identify R-12 and R-134a systems.
18. R-12 A/C systems use mineral-based oil.
19. To verify that your manifold gauge set is equipped for R-134a refrigerant, verify that it is equipped with the proper “quick-disconnect” fittings, check the gauge face labeling, and verify the R-134a “ID” with the stripe along the service hoses.
20. When handling refrigerants you should always wear protective gloves and goggles, work in an area that is properly ventilated, and make sure service tools are labeled to prevent intermixing of refrigerants.



Refrigerant Leak Detector



A/C Refrigerant Recycling Equipment

R-134a And Retrofit Quiz