



Chill Out

The ozone layer and automotive refrigerant recovery and recycling have been grabbing a lot of headlines for the past couple of years. While most of our attention during this period has been directed toward EPA rules and regulations, technician certification requirements, and new recovery and recycling equipment purchases, we may have given R-134a the back seat. You remember R-134a, don't you? R-134a is the refrigerant that will replace R-12 in all new automotive air conditioning systems by the year 1995.

When we first started talking about the deadline for R-12 phase out, 1995 seemed like it was a long way off. Now it's less than two years away and there are already several manufacturers who have decided to beat the deadline and already have introduced R-134a systems on their 1992 and 1993 models. Some manufacturers are

claiming they will have their complete vehicle lines converted to R-134a well before the 1995 deadline.

We know that R-134a equipped cars are out there, and the numbers are growing every day. Among the import manufacturers, Acura, BMW, Honda, Lexus, Mercedes-Benz, Nissan, Infiniti, Saab, Toyota, Volkswagen, and Volvo all have models with R-134a air conditioning systems. BMW and Volvo have already converted all of their models to the new refrigerant.

While you may not have worked on an R-134a system yet, if you do any import A/C work, chances are you will be seeing your first before long. This article will:

- Familiarize you with the characteristics of R-134a.
- Introduce you to R-134a air conditioning systems and R-134a service equipment.
- Explain R-134a service procedures.

What makes R-134a an environmentally acceptable refrigerant, while R-12 is not? R-12 belongs to a family of refrigerants called CFCs, short for chlorofluorocarbons. When CFCs are released into the atmosphere, they migrate to the stratosphere.

Once the CFC molecules reach the stratosphere, the sun's rays break down the refrigerant's CFC structure, freeing chlorine atoms. These chlorine atoms can then go on to deplete the ozone layer by chemically bonding with the ozone molecules. This process continues for many years before the chlorine is finally broken down too.

Unlike R-12, R-134a is a HFC, or hydrofluorocarbon. It contains no ozone damaging chlorine. It's not entirely harmless, however. While R-134a has no ozone depletion potential (ODP), it does have a small potential for global warming (GWP). For this reason and also because of its high cost, all R-134a refrigerant should be reclaimed and recycled. Never vent the refrigerant from an R-134a air conditioning system into the atmosphere.

Mix and Match

As the production of R-12 rapidly winds down, we've been hearing a lot of talk about alternative refrigerants to replace R-12 in air conditioning systems that were originally designed for R-12. Another hot topic of conversation is the development of retrofit kits that will adapt older R-12 systems to R-134a or some other environmentally friendly refrigerant.

While we're sure that at least one of these ideas will be perfected and approved before long, for right now it's all speculation. So if someone tries to sell you on a wonder refrigerant like R-22, R-142b, R-152, R-176, or some weird blended combination of several different refrigerants, don't be misled. The possible damage to your customers' air conditioning systems as well as your A/C service equipment far outweighs any advantages.

The following are just a few examples of the problems you'll be exposing yourself to if you start messing

around with substitute refrigerants or refrigerant blends:

- R-22 is incompatible with the desiccant used in R-12 systems. The desiccant will break down, clog the expansion valve, and possibly seize the compressor.
- R-22 can also increase the pressure in the system to abnormally high levels, causing the refrigerant to leak past the o-rings and seals and permeate the hoses.
- Many refrigerant blends are unstable and may separate into their component parts. This makes it difficult to add a uniform charge to the system.

Because of these risks, the Mobile Air Conditioning Society (MACS) has asked the EPA to ban sales of R-12 substitutes and any adapters that can be used to introduce the wrong refrigerant into an A/C system.

Even if you haven't experimented with substitute refrigerants or refrigerant blends, your equipment and your customers' A/C systems may still be at risk of contamination. If you unknowingly service an A/C system that has had a bootleg refrigerant installed, your recycling equipment and your supply of recycled R-12 will automatically become contaminated. Even worse, you could inadvertently pass the contaminated refrigerant on to any other A/C systems that you service afterward.

If you don't know the service history of the car, question the customer closely to determine whether any previous A/C repairs have been made and whether any substitute refrigerants have been used. R-134a is now being sold in handy 14-ounce cans, so it's even possible that the customer may have put the wrong refrigerant into the system.

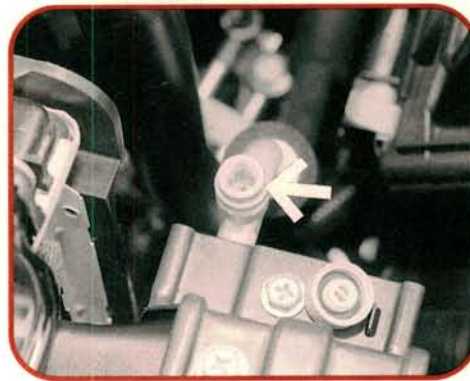
Your own caution is your best defense against accidental contamination. If you're the least bit suspicious about what's inside a customer's A/C system, you're probably better off turning down the job. It's not worth the risk to your equipment and to your other customers' A/C systems. Until official standards for safe and fully compatible R-12 system conversions are announced, steer clear of substitute refrigerants and refrigerant blends.

— By Karl Seyfert



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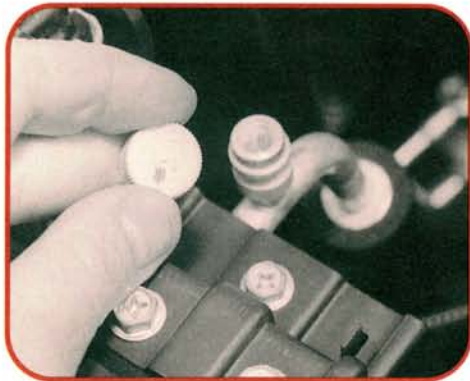
There are many differences between R-134a system components and their R-12 predecessors. To prevent accidental system cross connection and damage, all of these Nissan R-134a components are marked with a distinctive powder blue sticker. The main sticker lists lube type and charge quantities.



2

The high and low side service fittings have been changed to prevent incorrect refrigerant charging and system contamination. The valves have no external threads and feature a quick release design to minimize refrigerant venting during service. Don't try to attach your R-12 equipment to these fittings.

Chill Out



3

The light blue service valve caps are labeled L and H. The high side service valve has a smaller thread to prevent incorrect service hose connection. Always reinstall the valve caps when you finish an A/C service. An o-ring inside the cap stops any refrigerant that makes it past the service valve.



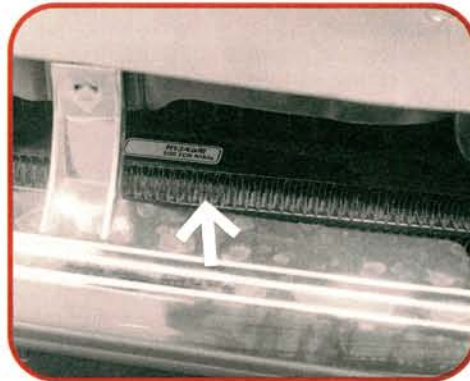
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The flexible hoses in an R-134a system contain a nylon inner barrier liner to prevent any refrigerant loss through the hose. No copper lines are used in an R-134a system because copper may interact with refrigerant contaminants to form plating deposits that may damage the compressor.



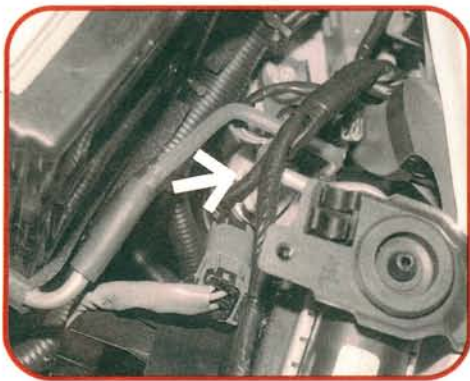
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Never swap o-rings between an R-12 and an R-134a system. The NBR (nitrile butyl rubber) o-rings used in R-12 systems will foam, swell, and leak if they're installed in an R-134a system. Only H-NBR (hydrogenated nitrile butyl rubber) o-rings should be used in an R-134a system. Many o-rings are color coded.



6

Early doomsayers predicted the new R-134a systems would need huge condensers. While the new condensers are different, they aren't much bigger than their predecessors. Heat exchanging efficiency has been increased by switching to parallel tube construction with closely spaced rows of cooling fins.



7

Never install a receiver drier from an R-12 system on an R-134a system. If the R-12 system's XH-5 desiccant material is exposed to R-134a, it may break up, plug the system, and possibly starve the compressor of oil. The correct desiccant material for R-134a systems is called XH-9. Desiccant quantity has also been changed.



8

R-134a systems often operate at higher pressures than their R-12 predecessors. To get the maximum cooling efficiency out of the compressor, the compressor clutch has been strengthened to prevent slippage at these higher operating pressures. Compressor seals have also been changed to prevent refrigerant leaks.

Chill Out



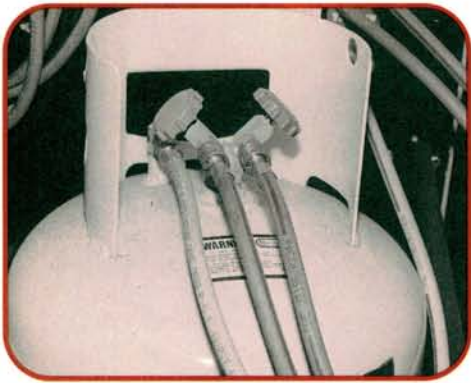
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R-12 systems use a mineral-based refrigerant oil. R-134a systems use a polyalkylene glycol refrigerant oil (PAG). Never add mineral oil to an R-134a system. Small amounts of mineral oil will cloud the refrigerant, and larger amounts of contamination will cause compressor failure.



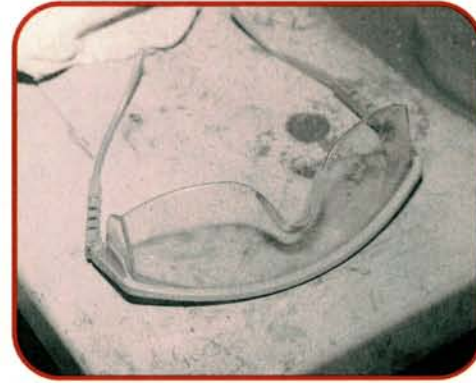
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PAG refrigerant oil absorbs and holds moisture much faster than mineral oil. Keep the oil in a tightly sealed container before and after use. To keep moisture out of the system during an A/C installation or component replacement, don't remove the protective caps until you're ready to install the component.



11

All R-134a containers should be blue in color. If someone tries to sell you a different color container that he swears contains R-134a, don't believe him. Bulk container service fitting sizes have also been changed to prevent confusion. Small 14-ounce R-134a cans are also available.



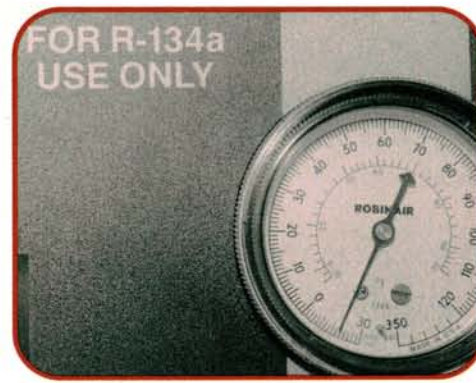
12

We're all adults, so I'm not going to spend a lot of time harping on safety. Wear gloves and goggles while servicing an R-134a or any A/C system. Avoid breathing A/C refrigerant and lubricant vapor or mist. If the system is accidentally discharged, ventilate the area before resuming service work.



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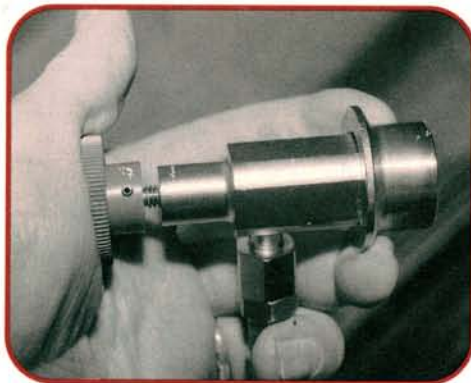
Many older refrigerant leak detectors will not detect R-134a. Most of the detectors sold in the last couple years will handle both R-12 and R-134a. If you're not sure about yours, check with the manufacturer. This month's **Tools and Techniques** article covers refrigerant leak detector etiquette.



14

Manifold gauge sets for R-134a systems look very similar to the R-12 gauges you're already using. The hose fitting threads have been changed, however. To avoid system contamination, never try to adapt your R-12 manifold gauge set to an R-134a system. If you're working on both types, use separate outfits.

Chill Out



15

Quick disconnect hose couplers are used to prevent refrigerant loss during service procedures. The control valve at each coupler must be completely closed before the coupler can be removed or attached to the service port on the vehicle. R-134a compatible charging hoses are marked on the outside casing.



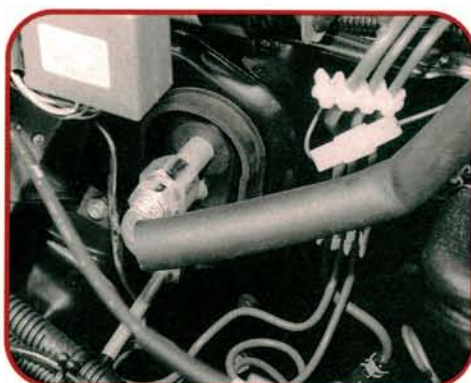
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Here's a refrigerant recovery hint. Before recovery, run the engine with the hood down and the A/C system turned on for a few minutes. During the recovery process, turn the engine off and the A/C blower on high speed. Always follow the general operating instructions included with your recycling equipment.



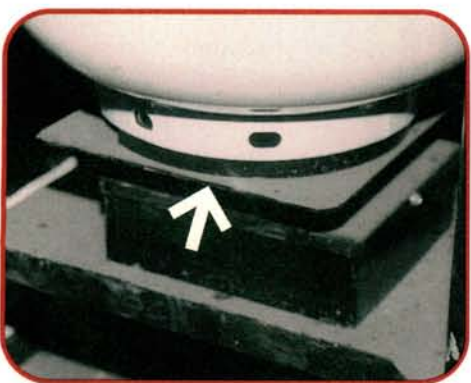
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Vacuum pump design hasn't been changed for R-134a systems. The same pump can be used on both R-12 and R-134a systems if the correct adapter is used. The adapter has the correct threads for both types of service hose and a magnetic valve that prevents cross contamination between the two systems.



18

Evacuation procedures are the same for R-134a and R-12 systems, with one exception. A strong vacuum pump should pull a leak-free system to 29 inches of vacuum. However, some R-134a o-ring joints may leak under system pressure. So if there's evidence of a leak, you may have to partially charge the system to find it.



19

R-134a systems have no sight glass. Unlike R-12 systems, the sight glass wouldn't be clear, even if the system were properly charged. Since charging "by eye" is no longer possible, accurate refrigerant measurement is especially important. This electronic scale precisely measures the refrigerant.



20

R-134a normal manifold gauge readings will look a little different than you're used to seeing with R-12 systems. As the refrigerant temperature climbs above 60 degrees, R-134a's pressure increases at a faster rate than R-12. Consult a service manual for the normal manifold gauge readings for specific systems.