

*Running***Hot****W**
C *and* **Old**

hat a difference a year makes. In '97 the big fear was availability of R-12 at a reasonable price, and being ready to do a retrofit to R-134a if it wasn't. What actually happened was beyond our ability to predict.

R-12 supplies came out of hiding places, were smuggled into the U.S. in prodigious quantities and we didn't have a shortage. Prices that were in the range of \$650-\$1000 for a 30-lb. jug have dropped to under \$400. At this rate, we should have adequate R-12 supplies through this year, or (as some marketing types tell us) for as long as there's a market. The price may rise significantly, but if a car needs only a pound or two, even \$50 a pound may be tolerable.

When It Makes Sense to Retrofit

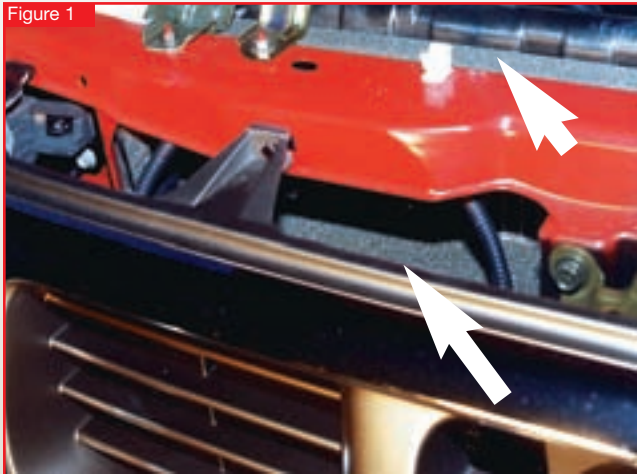
However, most shops decided that if they were doing a major repair—particularly installing a new compressor—they should recommend a retrofit if the vehicle was being kept for at least a couple of more years. After all, R-12 prices could suddenly shoot up again, and R-134a was running under \$4 a pound. This "practical" approach has meant a steady and substantial retrofit business for many shops, and the statisticians predict it will continue through the first year of the new millennium.

Most import car makes have published their retrofit recommendations (check your CD-ROM information system for further information). This year we have the Toyota program (see sidebar). Apparently Mazda will not release retrofit recommendations (it

isn't a legal requirement). But as we warned last year: the R-12 Panasonic (Matsushita) rotary-vane compressor has seals that are not compatible with R-134a. So unless you're changing the compressor to an R-134a model, don't retrofit. At this time, if you can't get a reasonably-priced rebuilt, the least-expensive compressor changeouts seem to be the R-134a Sanden five-cylinder with adapter bracket and compressor block fitting kits. There's only one problem: Do you have the special tools to install the block fitting kits? An ordinary R-12 type barb fitting and clamp will not meet SAE standards for joint integrity with an R-134a system.

If you need current retrofit information, call the Mobile Air Conditioning Society (215-679-2220 or e-mail through the website, www.macsw.org).

Our best information is that there will usually be a slight loss in performance—perhaps 2-3 degrees F. at the A/C registers. It could be more than that if the geographical area is hot and the vehicle is "under-condensed," which will cause high-side pressures to rise and reduce the cooling. Most R-134a systems have the radiator and condenser perimeters well-wrapped with foam seal to ensure maximum airflow through substantially-improved condensers (see **Figures 1 and 2** of the Nissan Frontier). If the factory retrofit procedure calls for a new condenser, you can almost bet on a substantial loss of performance if you don't change it. Of course, with many compressor failures, the condenser ends up plugged with debris, so a replacement is often required.



Looking through the gap between the top of the grille and the radiator support plate of the new Nissan Frontier pickup, you can see a foam seal on top of the condenser. Also note one between the radiator and the top support. Both help ensure the airflow goes through the condenser and radiator for A/C and cooling performance.

A “Refrigerant Containment Switch” Is The Law

It isn't an option. The law contains some fuzzy language, but it requires you to install a “refrigerant containment switch” if the vehicle doesn't have one. What is it? A high-pressure cutout switch (threaded into a high-side refrigerant line) designed to disconnect the compressor before the pressure relief valve opens, to prevent venting of the system. Many vehicles have them, although calibrated for R-12—check the wiring diagram. If you're using the R-12 compressor, it certainly makes sense to keep the same pressure cutout as compressor protection. An R-12 compressor may not last long if it's running with much higher pressures because it's very hot and the system contains R-134a with a new refrigerant containment switch calibrated for R-134a. If you're installing an R-134a compressor, use an R-134a pressure switch, which will probably be set to cut out at 425-490 p.s.i.

Last year, when we raised the subject of the switch, one eagle-eyed *Import Service* reader picked the part number off a photo of the GM retrofit switch we ran with the article. He found the instruction sheet said it was set to cut out at 430 p.s.i. and back on at 180 p.s.i. What should he do?

Our answer then still applies: Don't use that switch if you're keeping the R-12 compressor. We don't like the idea that a retrofitted R-12 compressor could be running steady head pressures of 425 p.s.i. And if the customer has to wait for the pressures to come back down to 180 p.s.i. on a warm day, the system probably won't do a very good job of cooling the



This Frontier engine compartment view shows a foam seal at the headlamp openings, another one is installed for A/C and cooling.

interior either. There are lots of switches calibrated to cut out at about 350 p.s.i. and back on at around 200-250 p.s.i. Install one of those on a saddle valve kit, which easily mounts on the liquid line.

Contaminated Systems—Get An Identifier

Despite reasonable prices for R-12 and low prices for R-134a, surveys indicate that approximately one car in 15 has a “contaminated” system. What's that? We're not sure. Some of it is just a lot of air (more on that later). But much of it seems to be a mixture of refrigerants or the use of “blend” refrigerants. Why would anyone do either?



The drive plate shoe and a piston assembly were all “welded” together in the seizure. The rusty appearance of the shaft, which also appeared on aluminum components, apparently is a chemical discoloration.



This Snap-on refrigerant identifier, made by Neutronics, includes the company’s Air-Radicator, a device that identifies and gradually vents air from a vehicle’s system or the recycling machine tank. It operates in the 98 percent accuracy range.

Possible Answers:

- ▶ With the adapters readily available, some shops are installing blends, not because they’re cheap—they’re more than R-12. They apparently think they should install something else to “protect” customers from what they mistakenly believe is an obsolete product that is soon to be unavailable at any price. Aside from a couple of places in Canada, where the laws prohibit the use of R-12, that isn’t true.
- ▶ We believe that many semi-pros, do-it-yourselfers, and some used car dealers are installing whatever they can find into whatever system they have. They can buy R-134a without certification, so that may go into an R-12 system. If they have R-12 left over, they may put it in an R-134a system. Or if they have R-22 (a household and commercial A/C refrigerant), they may use that.
- ▶ Perhaps they’ve heard that the blends give better performance. Under some operating conditions, that’s true for some blends based on R-22. But the same blends may also cause evaporator icing and a resulting total loss of performance. Even worse, the components in an R-22 refrigerant blend may come apart over time.

We warn about R-22 and blends that include it, because this refrigerant attacks the rubber seals used in automotive A/C systems. It’s the law: If an R-22 blend is installed, the system must have the premium barrier hoses. If it doesn’t, the retrofitting shop must install them. But the blends also attack seal materials and the recommended lubrication may not be enough to protect the compressor.

We saw a Nippondenso 10PA compressor that had been trashed by an R-22 blend. The compressor seized and there was a chemical discoloration of the aluminum

that caused it to look rusty. Refer to **Figure 3**.

With so many different kinds and blends of refrigerant in circulation, it has become essential to know what’s in a system before you touch it. If you pull a contaminated refrigerant into your R-12 or R-134a recycling machine, you could contaminate other cars’ systems. And then you’re also in for a time-consuming and expensive purge procedure. That means you need a really good refrigerant identifier. There are lots of brands, but really only three makers that supply true identifiers, which go beyond telling you there’s something besides R-12 in a system (see **Figures 4** and **5**).

The major refrigerant identifier manufacturers are:

- ▶ Neutronics, which introduced the infra-red technology everyone uses, and which sells primarily through Snap-on and Four Seasons.



Yokogawa’s new identifier also is in the 98 percent accuracy range, and can operate on 12-volt DC, 110-volt AC, and an optional battery pack.

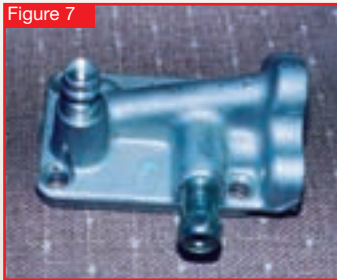
- ▶ Yokogawa, which makes the legendary H10 series of electronic leak detectors.
- ▶ Robinair, maker of an extensive line of cooling system and A/C equipment. There are two new identifiers in its line. The PrismProOE from Robinair is a premium model which operates within the 98 percent accuracy range required to meet SAE retrofit standards. The lower-priced PrismPro operates in the 90 percent range.

Identifiers from all three manufacturers identify flammable refrigerants and air content. Only the PrismPro OE model also specifically identifies two of the blend refrigerants, FRIGC and Freeze 12. Although the new Robinair PrismPro OE is the only one that can identify any blend, that has become less of an issue. All three can identify enough specific refrigerants to produce a “fingerprint” readout, that can be related to a specific blend, even if the contents and proportions usually are not correct.

The important thing to know is when there’s a particular blend in a system. Then if you choose to service the system, you can hook it up to a recovery-only machine, not a recycler.



If the tank pressures are too high for the ambient temperatures, following the overnight “soak,” briefly open the manual air purge valve on machines so equipped. Do this every morning before you open for business and you’ll get a small, insignificant air purge each time (check pressures vs. temperatures on the chart in the owner’s manual). There are problems associated with trying to purge too much air too quickly.



This is the flange that holds the pressure relief valve and high-side service valve on many applications of a Nippondenso compressor. Notice that the service valve is at the bottom of the flange. (Courtesy Mobile Air Conditioning Society Worldwide)

Warning: If you do plan to collect a blend or any refrigerant contaminated with something other than air, be sure you know where to legally dispose of it. The pickup service for your hazardous waste may do it, or may identify a source. But be sure before you invest in a recovery-machine and use it.

Getting Rid Of The Air

It’s easy for recycled refrigerant to become contaminated with air, and if there’s as little as six percent present in a system, the compressor will knock and system performance will suffer (air is not a good refrigerant and it can throw off some electronic temperature sensors).

If you have a recycling machine with a manual air purge, operate it every morning during the A/C season, just before you open the doors (Figure 6). If your machine has an automatic air purge, it operates only when the machine is pulling a deep vacuum on the system. But it has to run the vacuum pump for a specific amount of time, often 15 minutes or more, so if you shorten the vacuum-pumping time, the air purge may never work. The premium refrigerant identifiers provide accurate readouts of air percentage, so you can check a customer’s car or the jug of recycled refrigerant.

A special warning when you deep-vacuum a system: Check to see if the machine pulled out a lot of oil. If it did, inject some fresh oil for makeup. Every modern A/C system relies on refrigerant circulation to carry droplets of oil to the compressor for lubrication.

A modern compressor has very tight tolerances, and can be primed for a quick failure if oil has been pulled out of the compressor itself. Then the compressor dies early because the whole system is low on oil.

If there’s a service valve on the compressor or very close to it, be particularly wary. The Nippondenso 10PA compressor is often built that way, and oil in the compressor collects in a “well” next to the service valve (Figures 7 and 8). A top shop lost a compressor on a busy day because they failed to notice and add oil to the system.

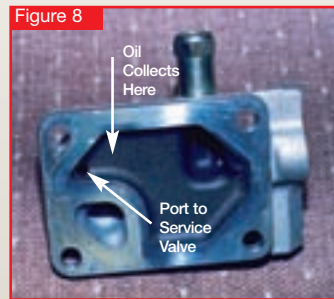
Air contamination can also be recognized by a refrigerant identifier, but other options are available. Air contamination is a big problem, and two new pieces of equipment have been introduced to help you deal with it: the Air ID from Robinair and the Air-Radicator from Neutronics (Figures 9 on page 14 and 4). Both can be attached to

your recycled refrigerant jug, where they automatically check for air and gradually purge it—the best way. In addition, the Air-Radicator can be attached to a vehicle system, where it will purge enough air in a few minutes to make a noticeable difference in performance. If it does, you’ve diagnosed the problem.

Flushing the System

We used to be able to flush A/C systems with R-11 and R-113 and vent the stuff to the atmosphere. But these are CFCs (chlorofluorocarbons) in the same banned family as R-12. The flushing alternatives available today are more expensive, often requiring closed-loop machines that cost \$1200-1800. And the safe, relatively-effective flushing agents, such as Bright Solutions Clear Flush (approved by Ford) aren’t cheap.

The best combination of effectiveness and safety comes from just a handful of products. Unless you do a lot of A/C work, your most economical bet is R-141b, a refrigerant/flush that will remain on the “acceptable” list for several more years at least, and can be used with an ordinary flushing gun and a collection tank. You may already have the gun



A look inside the flange shows there’s a well next to the opening for the service valve, and the compressor oil collects in this well. You’ll probably draw out most of the oil when you deep-vac the system, so be sure to check and inject a replacement quantity. (Courtesy Mobile Air Conditioning Society Worldwide)



Robinair's Air ID attaches to the recycled refrigerant jug and gradually purges it, checking for air automatically every hour. The Neutronics Air-Radiator, a more expensive machine, is also designed for limited air-purging of vehicle systems.



A simple flush gun, plus collection tank and hoses are all you need to flush systems with R-141b. You may already have this flush gun in your shop.



The Modine PF (parallel flow) condenser is a high-performance design used by Honda. Modine now has its own tooling and is supplying two replacements to the aftermarket.

oil. Although low-cost equipment to do this is available to bolt onto a Robinair machine, adapters for import cars (and most domestics) are not yet available.

An important warning: You must purge R-141b from the system. Although it vaporizes at about 90 degrees F., it may not be that hot in your shop. The liquid can get trapped in some of the convoluted passages of a modern evaporator or condenser, so if you use shop air as the purge, take plenty of time to get the stuff out—at least a half-hour.

If the flush is left in, it apparently attacks the alloys in the aluminum compressor. And as with an R-22 blend, we've seen quick seizures and the same "rusty" aluminum look as in the Nippondenso. Inasmuch as both R-22 and R-141b are HCFCs (hydrochlorofluorocarbons), they may produce the same chemical discoloring reaction.

Some Better News—Import Parts Availability

You don't have to go to the dealer for what you used to consider "captive" parts for many imports, particularly Toyota and Honda. Aftermarket companies are bringing in parts from Japanese suppliers, and some of the parts are made by U.S. companies. We sell more A/C than anyone else, which means you can get great hoses, expansion valves, even condensers.

In fact, Honda's high-performance PF parallel-flow

(Figure 10), and the hoses and tank you'll need are inexpensive. Another choice is to flush R-134a systems with liquid R-134a. It doesn't remove debris, but will purge dirty

condenser was invented and then made by Modine (Circle No. 123) using Honda-owned tooling. Now Modine has bought its own tooling and is offering two versions of the PF (Figure 11). One fits the four-cylinder versions of the 1994-97 Accord and 1997-98 Acura CL. The other is for the 1995-97 Accord V-6.

There's a rapidly-expanding line of refrigerant hoses for imports available from Long Manufacturing (Circle No. 124), another top U.S. manufacturer. Long now has virtually complete coverage for 1990-97 Toyota, Suzuki, Mitsubishi and Mercedes and extensive coverage for Honda and Nissan (Figure 12 on next page). They're all barrier hoses with triple-bubble crimps, to meet original equipment and SAE standards for joint integrity.

If you need Toyota expansion valves (Figure 13 on next page), Automotive Air International (Circle No. 125) has them for both R-12 and R-134a systems, covering the Camry, Avalon and pickups.

Evaporator Odor Fixes

When it comes to treatments for the "dirty socks" evaporator fungus odor, the best answers seem to have been invented here. Toyota has been bragging about a new coating on its '98 Corolla evaporator. It contains a resin that prevents the "wet cement" odor. Great, but that doesn't bother most people very much. It's the fungus, everyone.

The AirSept disinfectant is used by most original equipment manufacturers, because the company has validated a union of product, applicator and technique for treatment of specific models. O.E manufacturers do not "buy" a generic approach—they want to know what and how the disinfectant will work on its particular system, and that's what AirSept features. The information is typically given in a service bulletin, and that's the rub: AirSept sells only to car manufacturers and aftermarket suppliers, such as ACDelco, Four Seasons, etc.

Figure 12



Barrier-type refrigerant hoses for imports are available from top U.S. aftermarket sources. Newest additions to Long Manufacturing's line are the four hoses shown. They are, from top to bottom, 1994-96 Camry and 1995-97 Avalon suction side; 1994-97 T100 four-cylinder pickup suction side and below that, discharge side; and at bottom, the 1994-97 T100 V-6 discharge side

Figure 13



If these expansion valves for Toyota Camry/Avalon and pickups look identical, look closer. The sizes and depth of the pilot holes is different, as is the calibration of the valves. The one at left is for R-134a systems, at right for R-12 systems. Today, aftermarket sources have them both.

AirSept's original product, still available, is an aerosol can with a closed end slotted applicator straw. The slots along the length of the straw produce a "fogging" spray for a good coating of the evaporator—if you can get it close enough to the evaporator face (you may be able to drill a 3/16-inch hole or take out a blower resistor for access).

Now, a new tool kit with a long access probe is being released, through ACDelco for openers (at *Import Service* press time all we have is the GM dealer part No. 12346380; the ACDelco 15-XXXX number was not available). It uses shop air to apply the disinfectant, which means a more consistent

possibility of a recurrence of evaporator odor. Unlike the one currently on the market, the new module has just four wires (power, ground and blower connections), compared with one that has double the wiring and for simplified installation, has required a blower relay kit. The new module also should be almost half the price of the old, under \$50.

Say, it seems as if some things do get better, and the profitable jobs are still there to be done. ■

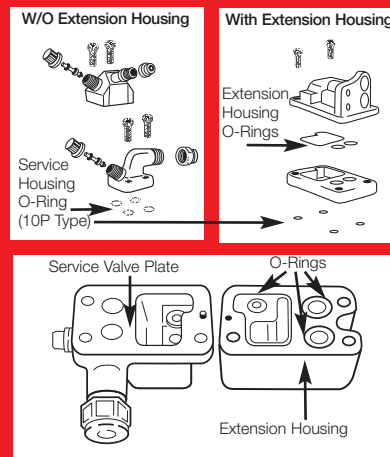
—By Paul Weissler

Toyota Retrofits

If a customer has an R-12 equipped Toyota and plans to keep the car a while, he or she may be interested in a retrofit to R-134a. Most A/C shops discuss retrofit in such situations, particularly if there's been a major component failure, such as a compressor. In addition to retro-fittings and labels, the Toyota retrofit procedure for these models calls for a new receiver-dryer (with new o-rings there of course), and replacement of the o-rings for the refrigerant line connections to the compressor and the discharge line at the condenser.

In the case of 10P compressors with an extension housing, some new seals and o-rings also are required. The new seals were not available last year, when the retrofit program was tested at just a small number of dealers. You should be able to get them now, and they may all be included with a new replacement compressor.

Toyota specifies ND-8 oil for all piston compressors, ND-9 for all "TV" (rotary vane) models. Both are Poly Alkylene Glycol (PAG) oils. Toyota does not recommend any other oils for retrofit. Refer to the chart on page 44.



See Toyota-Lexus Retrofit Chart on page 44