THE MOBILE AIR CONDITIONING SOCIETY WORLDWIDE

MACS Service Reports

A service to members – $70 annually to subscribers

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April 2004

Excess Trace Dye Won't Fluoresce?

Is it possible that too much trace dye in a system won't fluoresce at all? This comment was made by a speaker during a 2004 MACS Convention seminar, so we thought we'd clarify the issue.

Yes, it's theoretically possible with some types of dye once made for CFC-12 systems, in mammoth concentrations. It's a phenomenon called "quenching," and the ultraviolet light can't penetrate the dye column. But John Duerr of Tracer Products engineering, suggested the comment was just a bit of hyperbole, meant to urge caution in use of dye, not a real world issue with today's dyes.

In fact, we've seen disassembled compressors that absolutely glowed yellow-green — even without a UV light, because so much dye was used. The big danger, of course, is that too much dye affects the viscosity of the oil, and could be harmful for compressor lubrication.

If you use refrigerant with dye or an oil charge with dye, you don't need any more. The normal refrigerant charge (installed as a liquid) should provide enough dye. As for an oil charge with a new compressor, you should be aware of what the marketer is supplying. Example: Technical Chemical Company (marketer of Castrol refrigerant oils) has a line of eight-ounce containers of the three popular viscosities (46, 100 and 150 centistokes) that has a single dose of trace dye in the eight ounces. Don't add an extra dose if you're using the full container. However, if you are just installing a couple of ounces of new oil with a component replacement, you're probably better off using oil without dye. If you want dye, install a dose as a separate injection or, if you choose, with the refrigerant charge.

Most important to remember: dye may show up in under a half-hour if the leak is huge, but, as one car manufacturer once advised its dealer technicians, it also can take up to two weeks of driving with the air conditioning on. That's why, as good as trace dye is, you really want to look for that leak first with an electronic detector. You don't want the customer to be your road tester, driving until the car is uncomfortable again.

If you are using trace dye, you may find one of the new UV lights can help you pinpoint the smaller leaks. The lighting choices now include flexneck lights with mirrors for really tight corners, lights on the end of a borescope, and flashlight types that are really bright, so you can hold it away and re-aim it as necessary to hit all the nooks and crannies. Tracer claims its new Optimax rechargeable flashlight, which uses a new ultrabright, one-watt LED, works from as far as 20 feet without the beam spreading.

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In this Issue

Evaporator Odor — What to Do Now?

The customer turns on the A/C, and for a minute or two there's an obvious "dirty socks" odor. Straightforward problem — it's evaporator odor. Well, probably, but not necessarily. Even if the odor really is caused by a fungal growth in the evaporator case, applying one of the popular disinfectants may not be the whole answer.

You did an evaporator odor treatment on the car a year ago, and it seemed to work then. You really were careful, and followed the manufacturer's instructions to the letter, including (where recommended) curing the treatment to the evaporator core. So why is the odor back a year later or perhaps a bit less?

It doesn't happen often, but when it does, it's not any fault with the disinfectant itself, and likely not your technique either. A number of evaporators have foam seals that hold water, and the seal becomes the breeding ground for malodorous fungus. The seal is not a big area, so you usually don't get the odor back the same season. If you do, then the problem almost certainly goes beyond the foam seal.

What to do about the annual return from a soaked seal? Well, the vehicle makers have been switching to "closed cell" foam seals that won't hold water. And in one noteworthy case (1994-97 Nissan Quest minivans), the company released a new non-porous seal for service (Figure 1). However, installing that seal requires removing the evaporator. On most vehicles, that's a pricey job, not something a customer would be inclined to okay for the level of the problem. The Quest may be an exception, because the evaporator R-and-R is just about an hour plus system evacuation and recharge time.

There are alternatives for other vehicles with long evaporator R&R times. Is there reasonably quick physical access to the evaporator case even if actual evaporator core removal time is lengthy? Then you may be able to clear out fungal debris in the case itself, washing the case internal surfaces with bleach (also a disinfectant).

When specified by the supplier, curing the disinfectant product to the evaporator core also should dry out the foam seal. For example, AirSept asks for a 20-minute evaporator cure/drying time for its disinfectant. But from there on, it's only a question of how long it takes for the problem to recur. If the customer is willing to come in for an annual treatment, and that keeps the odor at bay, good enough. In addition, there's the universal afterblow module (also called an evaporator dryer module), a subject we last discussed in the March, 2004 issue.

Installing the afterblow module should be helpful. About an hour after engine shutdown, these modules turn on the blower motor for 5-10 minutes to blow moisture out of the evaporator case. The universal AirSept module works on negative-switched or positive-switched blowers, and is easy to install.

Certain GM cars have the afterblow feature already built into the instrument panel module (IPM). Afterblow can be enabled by using a Tech 2 scan tool or an aftermarket tool that supports GM Special Functions. Afterblow is listed as a miscellaneous or "Set Options" test on these cars: 1998–2003 Cadillac Seville, 2000–03 Deville, 2000–04 Buick Park Avenue, LeSabre and Pontiac Grand Prix, 2001–03 Olds Aurora, 2003–04 Cadillac CTS and 2004 Cadillac SRX. The how-to procedures vary slightly among the cars, so check your electronic service information system, or call the service information supplier's 800 number. On some older Cadillacs (1996-on with front drive), afterblow could be enabled without a scan tool. See MACS Service Reports, August, 1998.

In addition, of course, it's important to promote good drainage of condensate, so check drain tubes to make sure they're not restricted by debris. If they are, clean them out as part of the job.

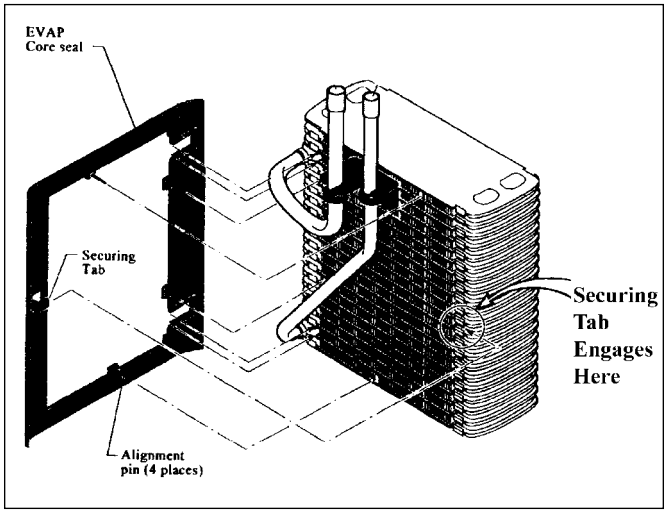

Figure 1. *Nissan released a non-porous evaporator seal for 1994-97 Quest minivans. It reduces cases of evaporator odor from moisture soaking into the seal. However, the Quest evaporator is a lot quicker to remove and reinstall than most others.*

Keeping The Debris Out

Airborne debris is food for the fungus that grows in the evaporator case, and if you add moisture, that's all it needs to grow. So minimizing the amount of debris that gets into the air intake also can extend the life of an evaporator disinfect.

MACS Service Reports often has suggested that if ingestion of airborne debris is a problem, you should install a fine mesh screen over the fresh air intake, making up something from household screening and adhesive-backed foam gasket. In fact, we've noted that Nissan has released a series of fine mesh screens for the 240SX, 300ZX, Maxima, Altima and late-model trucks. And these vehicles already had screens – just very coarse ones.

Now, General Motors is planning to release a line of screens for those vehicles that don't have cabin air filters at the outside air intake, and in the interim is suggesting you make your own (Figure 2). GM actually is more concerned about debris damaging the blower motor; up to 70 percent of blower warranty is caused by debris ingestion.

However, there's also a possible issue with those intake air filters that sit just above the blower motor: when you remove them for replacement, some trapped debris comes off and drops into the blower housing. Using a screen at the air intake reduces the debris that gets to the filter, but be careful with filter removal anyway. If the service interval is extended, eventually that filter also will be packed.

The screens reportedly will be similar to the type that Visteon supplies for the Saturn VUE (Figure 3).

If you're concerned about the effect of a screen on air intake, and especially if the screen becomes restricted, the word from GM is "not to worry." A series of GM tests on Chevy Trailblazer/GMC Envoy/Olds Bravada — in both air conditioning and heater modes — showed that with a new screen, the airflow difference is almost undetectable. In addition, tests with GM full-size SUVs (Chevy Tahoe/GMC Yukon) with significantly-restricted screens (50%), revealed there was only about a 6-7% drop in airflow. Even at 70% restriction, the airflow reduction was moderate, about 20%, and still tolerable.

Figure 2. *An air intake screen can be made from fine-mesh household screen sandwiched between layers of two-sided adhesive foam gasket material.*

Figure 3. *This air intake screen on a Saturn VUE gives you an idea of what GM is planning to release as a service part, and possibly as original equipment on vehicles without an air intake filter.*

Blower current draw is not a concern, because it drops with increasing restriction. The only possible issue would be the blower resistor, which depends on the airflow for cooling, and even at the 70% restriction, GM tests reportedly showed resistor cooling was no problem. Of course, a screen that badly restricted should be visually obvious—just something else you learn to check and service to improve HVAC performance, as you should with cabin air filters, which are not as visible.

Where's The Schrader Valve?

Figure 4. *This is the old "Kwik-Charge," which was sold to prevent compressor slugging from liquid charging into the suction side. We bought it in the days of CFC-12. It apparently has some sort of restriction to meter droplets of liquid refrigerant, and (what sounds like when we shake it) an anti-blowback valve in case it was connected to the high side.*

This is a follow up to "Are We Lucky?…" in the March issue, where we featured the effort by Honda to make the 2004 Acura TL service valve fittings accessible in a sea of underhood plastic. And we also bemoaned some of the access problems, along with the absence of a second service valve on the PT Cruiser Turbo.

To continue: We hear complaints (and make them too) when some vehicle comes through with just one Schrader-type service valve. We're not even thrilled when the side of the system with the missing valve has a pressure switch that can be removed from a Schrader-type valve to permit access. Of course, in some cases, there isn't a switch to remove and in others, with a switch taken out, the access for a service coupling still is nearly impossible.

So when the opportunity came recently, we asked a leading HVAC systems engineer why one is missing, and if he could explain the fact that sometimes it's the low-side valve that's left out, sometimes the high-side. He said that he always specified service valves on both sides of the system. Where only one service valve actually appeared on a model of his line of cars, the change was made in manufacturing, by people who didn't know what they were doing. (His language was even stronger).

He said they make the decision on the basis of what's needed to charge the system on the assembly line, and they figure they'll save money by eliminating the cost of the second service valve. Also, theoretically, they improve reliability by taking out a potential leak point. So if the system is factory-charged through the high side service valve, that's what stays — unless of course there's a specific special-size charging valve, as used on some GM vehicles and the Chrysler PT Cruiser. Then the high-side valve may be deleted.

But, you say, many shops charge vapor into the low side, and in fact, that's what their equipment is designed to do. That's true, but today some car companies are really set against that procedure, even though it's the way we did it for eons (at least the first pound or so in a three-pound system). The reason is that they're afraid technicians will get impatient and charge liquid into the low side, which will slug the compressor.

Most systems have anti-slugging protection for the compressor, such as valves and accumulators, but "an attitude's an attitude" and manufacturing engineers often get the final call — even if briefly. Old-timers may remember our fears about liquid slugging and our impatience with vapor charging way back in the CFC-12 days. If you're in that class, you may remember the Imperial Kwik-Charge, a gadget that was supposed to allow liquid charging safely, by metering droplets into the low side. Did it really work? Don't know, only that we used it and never seemed to slug a compressor (Figures 4 and 5).

In most cases, the complaints about the missing service valve come in from the dealer technicians, so the HVAC engineer finds out what happened and demands that the second service valve be reinstated. And sure enough, it appears, sometimes even later in the same model year. Interestingly, the solution depends on how many A/C problems exist on that model. Problems that force dealer technicians to go through diagnostics without the ability to use both gauges get attention. If a system is almost trouble-free for the warranty period, and the dealer technicians don't have something to complain about, it takes longer for the omission to be redressed.

We do occasionally hear, "Well, the car doesn't have a high-side service valve, but there is a transducer, so you can read that with a scan tool to get the pressures, if you can't just take out a switch and thread in an adapter for the service coupling." Not ideal, but true.

Figure 5. *The "Kwik-Charge" inlet side was supposed to be threaded into the low-pressure gauge's male fitting on the gauge manifold (at left), with the service hose threaded onto the device's outlet and to the suction side service valve. More often, it was in line with the end of a small can tapper and service hose, as shown at right.*

Tight Fit

Sometimes you can see the "Schrader" service valve, but that's it. There's a problem of actually getting a service coupling on it.

We noted the existence of ultra-compact service couplings (Figure 6) in the March, 2004 issue. These may fit in, but you have to push them on so they also depress the pin. They don't have the knurled knob, which allows you to simply install the quick-connect and then manually turn the knob to depress the service valve pin. So unfortunately, they usually aren't as easy to use in the tight quarters in which only they fit. An ultra-compact service coupling with a turn-down depressor would be a nice development. Of course, there are cases where you have to remove a pressure switch that's on a Schrader-type service valve, then install an HFC-134a adapter. There you might be able to install the service coupling on the adapter first, and thread the assembly onto the "Schrader."

Figure 6. *Two service hose couplings. The knurled knob on the larger one permits you to first install the coupling on the service valve, then turn the knob to push open the valve. The smaller one, although it goes into tighter quarters, may be more difficult to install because it requires a single push-on operation.*

Unique But Normal

The following condition may seem strange, particularly if it didn't exist until you replaced a defective manual HVAC control head:

The A/C compressor runs whenever Recirc is selected on early 2000 Chevy Silverado/GMC Sierra pickups, even though the A/C is off, if the mode control is in the Panel position (A/C registers). However, the controls won't allow Recirc in Floor or Defrost — the Recirc indicator flashes a few times and the control head automatically switches Recirc off when Floor and/or Defrost are selected.

Of course, this isn't a commonly selected situation (Panel, A/C off and Recirc). But maybe a motorist wants lukewarm air blowing on his face, or hits Recirc when driving through a smelly industrial area. The engineer's idea was to improve interior dehumidification just in case. Even if the system didn't behave this way before, it will with a replacement control head, as will the replacement control heads from 1999 model year on.

The important thing is to realize these strategies exist, and that there may not be an electrical problem. Although it's not likely a customer will report the condition, it's something you might notice during diagnosis for some HVAC problem. You'd possibly think, "Hey, the A/C is off but compressor is engaged," and conclude that there's a wiring problem, perhaps a short. Or you might think the control head is defective, replace it and find there's no change. The cause of the A/C performance problem you're looking for is elsewhere, and you were misdirected by an engineer's attempt to cover a remotely possible interior comfort issue with a clever software algorithm.

GM once mentioned this strategy in a technical publication. Since the behavior is "normal," they never issued a service bulletin (that we could find) because dealer shops didn't report it as a problem. We wish we could keep an accessible database of things like this, but that would be a fulltime job in itself. So all we can suggest is that you avoid a rush to judgment, particularly on Recirc strategies. We do report on the really offbeat stuff we hear about. (Remember the cell phone harness effect on '93 Lexus SC400 blower speed?) But that's just to keep you alert.

You Never Know What You'll Find, Or Where You'll Find It

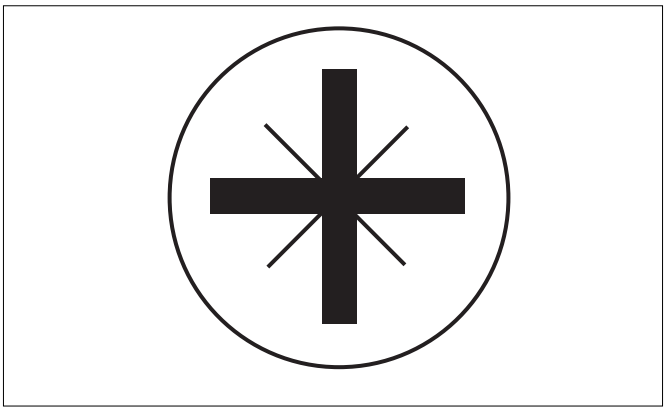

Figure 7. *Pozidriv and Supadriv look like a Phillips slot, but look closely and you'll see what appear to be hairline cracks at the apex of the cross. They are part of a shape that produces a tighter grip on the screw. Use a conventional Phillips driver and it will probably twist, come out of the slot and most likely damage the slot.*

When you pop the hood and face a sea of black or silver plastic "beauty" coverings, you have to decide whether or not to take it all off so you can find the service valves. One of the things you can do first is look around, because some of those beauty covers are held by not-always-accessible fasteners. On a few European cars we've worked on, the covers are held by screws with heads of unknown type, not even Pozidriv or Supadriv (Figure 7). If the screw is buried so you have to feel with a screwdriver, that adds to the headache.

Although all sort of parts are being buried, the A/C service valve fittings usually remain open access, probably because the size of the couplings, the need for a push-on access and the fact the system has to be running for a pressure check.

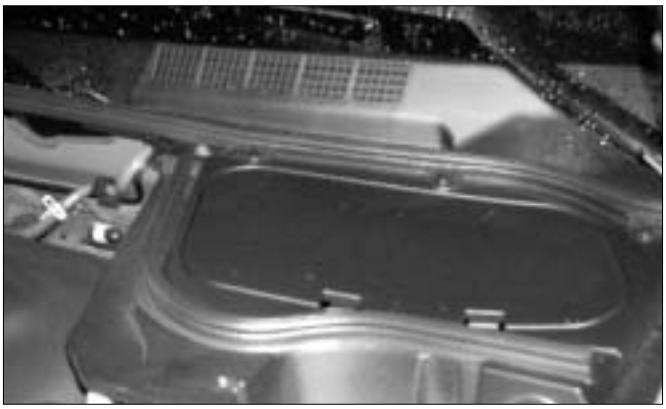

Figure 8. *Can't see the A/C service valves anywhere in the limited amount of underhood area of the new Infiniti FX that isn't covered by "beauty" plastic? The cover says "Brake Fluid," but the covers are the easiest parts to lift. Why not look underneath?*

Figure 9. *The cover is off and there's the brake fluid reservoir, all right. But both A/C service valves are there too.*

On the new Infiniti FX35 and FX45 SUVs, the underhood has the typical plastic look. Ignore the labeling on the BRAKE FLUID cover, lift it up and although the brake fluid reservoir is there, so are both A/C service valve fittings, nicely accessible (Figures 8, 9).

And if you ever have to cure a low heat complaint on this vehicle, maybe the problem is an air pocket. There's an open-access air bleed plug up against the cowl (Figure 10).

Moral: don't let the labels of easy-to-lift covers dissuade you. As another example, we've found A/C and fan relays under a cover for the battery.

Figure 10. *In the small open area between the plastic and the cowl is this air bleed for the heater circuit on the Infiniti FX. We've seen this type on other Japanese cars too; if you have an air pocket causing poor heater output, it's worth trying to find a bleed.*

Suction Screens — Are They Worth It?

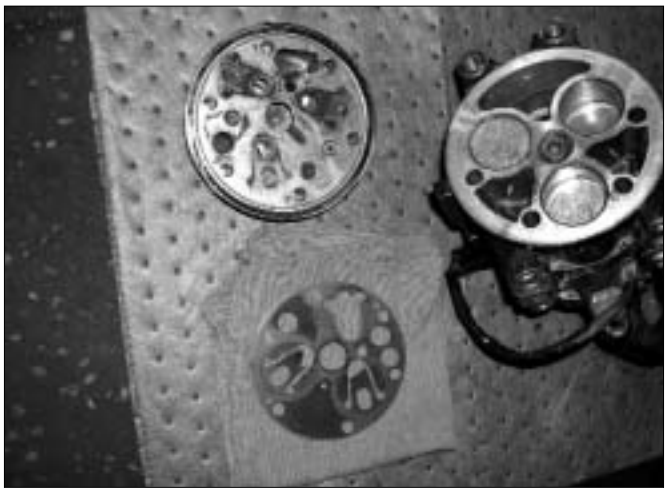

Figure 11. *This compressor failed to perform for obvious reasons: broken suction reed valves. Could chunks of suction reed have blown back into the low-side hose? It didn't seem to have a restriction, but with this evidence from the compressor, why take a chance? Yes, the technician installed a suction screen to protect the new compressor.*

You'd think there was nothing but a simple yes to that question. After all, General Motors has approved a suction screen kit as a service part after a compressor failure. Go back to the earliest days of factory air conditioning systems and you'll find them installed on the assembly line, from the big GM A-6 cast-iron compressors of the 1960s all the way through the Alma Products version of the A-6 built today, and also in the GM V-5 and V-7 variable displacement pumps.

But we also hear negatives, from "Why bother?" to "They're no good!"

The "Why bother?" comes down to this: debris from a failed compressor will be pushed into the discharge line and condenser, and what gets through today's tiny condenser passages will be trapped in a liquid line filter anyway. Better to put one of those in, particularly if there's no orifice tube/filter.

Reply: maybe it's belt-and-suspenders, but after a compressor failure, why gamble on a repeat for the modest price of a suction screen? Yes, most of the time the debris does go out to the discharge side, and a liquid line filter is a no-brainer. But that's not etched in stone. Debris also may be blown back into the suction side, and even if you run a flush through the hose, there's no guarantee it will all come out. The trash could have gotten stuck in the hose and later been loosened, going toward the new compressor. Sure, that possibility may occur to you if you take apart the failed compressor and see the damage (Figure 11).

So, if suction screens are so good, why don't all manufacturers recommend them? A number of manufacturers make their decisions based on warranty records, and if they don't have enough evidence telling them to use a screen, they won't. Also, some manufacturers have

Figure 12. *The AirSept kits use sizing gauges that enable the technician to pick the right screen for the compressor manifold's suction port. The early kits with three screens were for GM systems with Delphi compressors and the sizing gauge (shown) has just three steps. If this is used for other than Delphi compressors, you could select a wrong-size screen. The new kits, with eight screens, span a greater range and cover most systems, and contain a double-end design sizing gauge with a total of eight steps. However, most is not all, and even if the screen is supposed to fit an application, an occasional out-of-tolerance manifold port might not hold a screen. But the gauge tells you.*

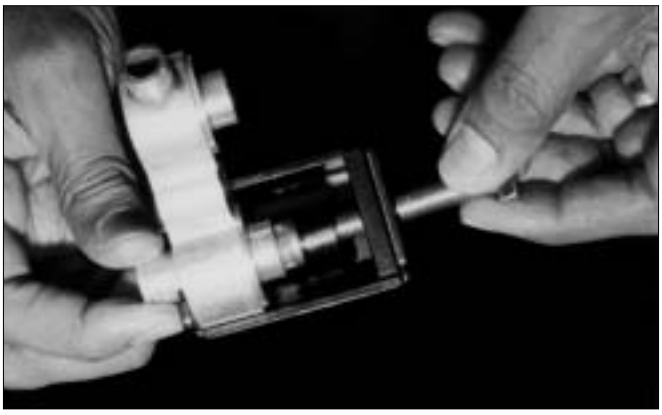

Figure 13. *If you can push the screen in easily with your thumb, it's probably the wrong size. The screen should require press-in installation with this special tool.*

expressed concern about debris in the suction side plugging the screen. It seems that a plugged screen and subsequent system shutdown from low pressure is a better gamble than a repeat failure.

In any case, we haven't heard of any manufacturer that specifically bars the use of suction screens. Could a screen become plugged and the compressor fail from lack of lubrication because the system didn't shut down? That's not nearly as likely, but the compressor probably would have failed from the debris anyway.

And why focus on the most extreme situation? More likely: a small amount of abrasive debris that was blown back into the suction side gets trapped by the screen. The refrigerant and oil flow continues at a normal rate, the system blows cool air and the vehicle doesn't come back.

What if the screen comes loose and gets blown into the compressor? Although we haven't heard of a compressor failure from this problem, the subject of the dislodged screen does come up occasionally. Usually, someone did something wrong.

As a recent example, one shop reported this problem in an on-line tech forum of iATN. The technician even said that after installing the screen from the GM-approved AirSept kit on a '92 Ford Explorer, he staked it in place by crimping the fitting with diagonal pliers. It came loose anyway, blew into the compressor, but because of the shape of the port, became stuck there. It was not responsible for the compressor failure.

When MACS Service Reports got AirSept to follow up on this one, it was found that the technician installed a screen from the original kit, which contained three screens just for GM applications. When the technician got the kit with eight screens, he was amazed at how close the sizing is.

The screens ranged in diameter from 0.471 to 0.618 inch – less than 0.15 inch total, spread among eight screens, or an average of less than 0.02 inch per screen. You hopefully realize that there are that many (with that small an average difference) just to insure proper fit. The kit includes a sizing gauge to make it easy to pick the right one (Figure 12), and a pressing tool for installation (Figure 13). Before any car company will approve a service repair kit, it has to go through a lot of testing, and there must be a way of insuring selection of the right part and correct installation.

MACS Service Reports **is published monthly by the Mobile Air Conditioning Society Worldwide. It is distributed to members in good standing of MACS Worldwide. If nonmembers wish to participate by receiving the *MACS Service Reports*, contact the national office. Non-member price for 12 issues is $70. It is intended for the educational use of members of the automotive air conditioning service and repair industry. Suggestions for articles and/or articles will be considered for publication, however, MACS Worldwide reserves the right to choose and edit all submissions. Address correspondence to the MACS Worldwide national office.**

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