

THE LOST ART OF BENDING, REPAIRING & FLARING TUBES

Words and Photography by Ray Bohacz

If you work on cars, especially older

ones, there will come a time when you need to repair or replace a line of some kind. It may be a fuel line or brake hose or a connection to an air conditioner compressor or power steering unit—regardless of what line goes, one will go, and when it does, you better be prepared.

The biggest mistake an enthusiast can make is not recognizing that proper line repair and installation is an acquired skill, one that will not be perfected on the first try. Much like performing wiring and electrical work, the more you do, the better it comes out, the quicker it is done and the prouder you are of the job. Automotive wiring and tubing can be a work of art that garners accolades or something you'll be embarrassed of and want to hide. Nothing detracts more from a beautiful car than sloppy wiring and plumbing. For this reason, long before you will ever need to make a line or a repair, you need to practice the skill.

Don't try to perform a professional job without the proper tools—that's many an amateur's first mistake. At minimum, you'll need a tubing cutter, flare kit and tubing bender. As with any tool, the quality is usually linked to the cost: A cheap, dollar-store tool will just hinder you. (If you are not willing to invest in the proper tools, locate a shop that makes up lines and have them do the bending and flaring; you will need to provide a template for them to follow.)

Read and then re-read the instructions that come with the tools until you are familiar with them. Buy three three-foot lengths of mild steel tubing; this can be obtained from any good auto parts store. You are going to use one to practice cutting, another for bending and the third for flaring.

Start with a single task—a simple one like cutting the line properly. Make as many cuts as it takes in order for you to feel comfortable with the procedure—steel tube is inexpensive and you can get 35 one-inch cuts from a three-foot piece.

Once you are proud of your cuts, practice making bends of increasingly tighter arcs without kinking or damaging the line. Then advance your skill by identifying exactly where on the line you want the bend and how many degrees it will be. Use a marker to identify the desired location and then work on creating your bend. This will very quickly illustrate the need to calculate the amount of length that will be consumed by the arc of the curve—otherwise, when you make your actual line, it will come up short. The hardest part of this procedure probably lies in determining where to place the line in the tool and begin the arc.

When you are comfortable with your skill in bending, move on to flaring. The tool kit you purchase should have the ability to create single and double flares. It should also be able to produce 37.5- and 45-degree flares.

If you don't have a template of the old line you're replacing, you can make one with welding wire. Welding wire is easy to work with and will allow you to plan out the route the line needs to take; it can then be used as the model for bending and cutting the new line.

Once the welding wire is bent into shape, you can use a length of string to determine the total length of steel tube required. Follow the welding wire with the string and then measure how much was consumed. The finished line will require a piece of steel tube that is at least as long as the string. Start with

a longer piece of tubing, but not one so long that it is wasteful or hard to work with.

When making a flare, the amount of tubing material that will be consumed to make the seat needs to be factored into the placement of the line into the tool fixture.

Saving the old

Line repairs are often required due to mistakes made when working on the vehicle, particularly the use of poor mechanical procedures. Using an open-end wrench instead of a line wrench is the most common mistake, usually resulting in a rounded-off fitting. Another mistake is not using two wrenches on a double fitting; one fitting needs to be held stationary while the other is broken loose, or else the line will twist, weakening it or breaking it off. Impatience when working with rusty fittings usually ends in a repair or replacement. Some penetrating oil and a small amount of heat from a propane torch can go a long way in convincing the old line to come off without damage.

Many times, a line will only be rusted in one place and will not require a complete replacement, just a partial replacement

or patch. This is especially common with brake lines. All brake lines require a double flare, while fuel line connections to a carburetor traditionally use a single flare. When sectioning in a piece of brake line, the corrupted part needs to be cut out; the resulting ends must then be double-flared and joined with a union fitting. This kind of repair is often used even in production applications on longer vehicles: Excessively long lines can be very hard to work with at the assembly plant.

When doing a complete vehicle, you may want to design the system on paper first, identifying the number and type of connections, total amount of bends, line sizing and mooring points. A simple schematic will go a long way in helping to order the proper number of parts and fittings.

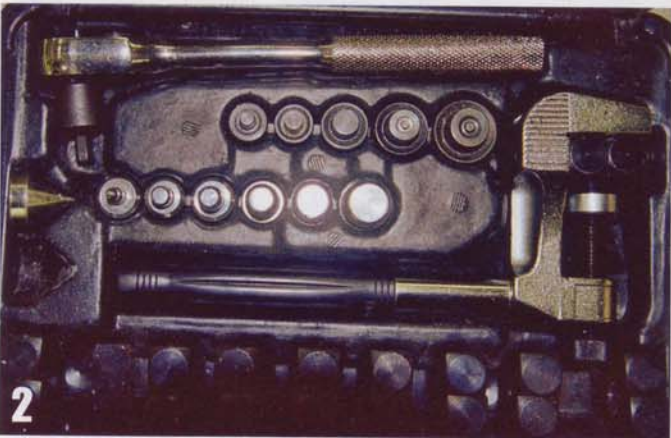
Many enthusiasts like to upgrade factory lines from mild steel to stainless steel. The downside of stainless steel, beyond its greater initial cost, is that it is harder to bend and flare. There is nothing wrong with properly made mild steel lines and many of the newer ones come with a factory anti-corrosion coating. As with every financial decision, only you can decide if the cost versus benefit ratio is in your favor.



1 A line wrench (left), also known as a flare-nut wrench, is used to break loose or tighten the fitting. Once the fitting is loosened, a conventional open-end wrench can be employed.



3 Practice making smooth cuts using a proper tubing cutter. Make sure to dress the finished surface and remove all burrs.



2 High-quality tools are required for a professional job. There are many sources for good bending, cutting and flaring tools.



4 The tool will identify the type of flare. This example is a 45-degree flare.

Going to the experts

To illustrate this primer, we worked with Rob Ida of IDA Automotive and Joe Mangone Jr. of Hydrair. Rob is an expert craftsman and a world-renowned custom car builder and restorer, so he has to make lines that look better than factory stock. Joe has more than 30 years of experience fabricating DOT and SAE lines for all fluids.

Hydrair has the ability to reproduce almost any fluid line; while we were in the shop, Joe was making up some brake hoses for a customer in California who was restoring a muscle car. Brake, power steering and other automotive hoses can be expertly reproduced with an OE-quality product that will make the task of restoration much easier.

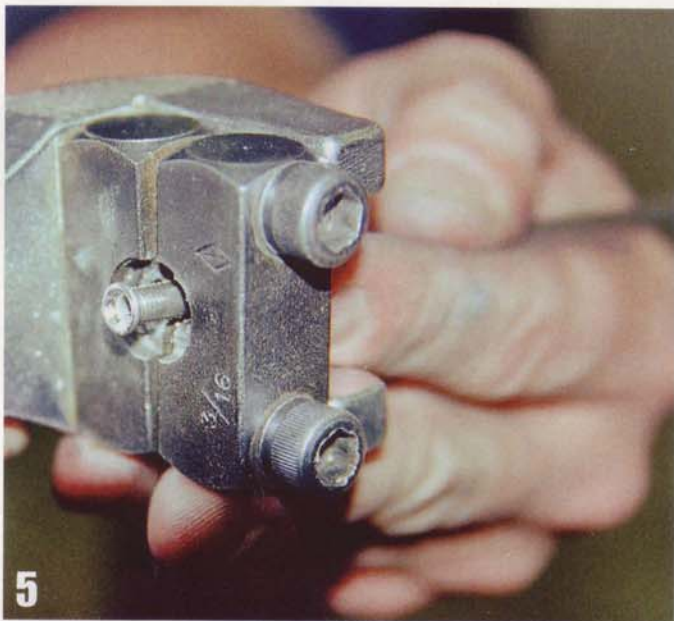
IDA Automotive has the equipment to crimp air-conditioner lines. Rob often performs this service for enthusiasts who are adding air conditioning to their cars.

Even when you work with tubing on a daily basis, the possibility of a leak still exists, especially with a flare. You should always check your work under the highest possible system operating pressure. When examining a brake line, you need to hit the

pedal hard and keep it pressed down with all of your strength to check for leaks. The same holds true on an air conditioner or power steering line: Load the power steering so the pressure is high by turning the wheel back and forth without moving the car (this is an undesirable practice for regular use because it stresses everything, but a few times for testing purposes is not going to hurt the system or wear the front end). When testing an air conditioner, the under-hood temperature needs to be high and the day hot and muggy.

When installing brake or fuel lines that travel from the frame to a movable point (such as the wheel or engine), you must employ a rubber connecting hose. The hose will allow the required movement that a rigid line will not. It is important to securely moor both the mating of the rubber to steel and the steel line to the frame. A poorly secured hose/line will fail prematurely and can be life-threatening.

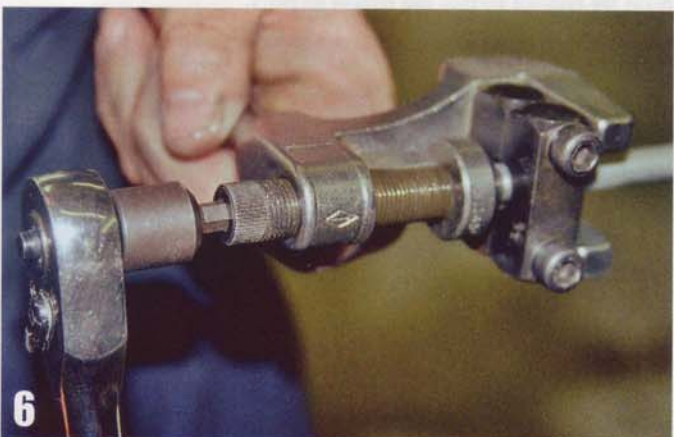
Working with line is a necessary part of muscle car ownership and can be a very rewarding experience. Practice makes perfect, so start bending, cutting and flaring now, and in no time you will be doing it like a professional.



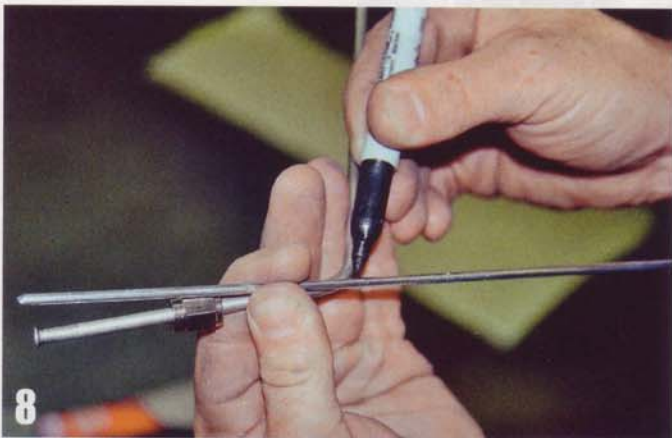
5 Positioning the line properly in the holding fixture is critical, especially when making a double flare. You will only learn this through experience.



7 In most instances, the best template is the old line itself, such as the Mopar fuel line (above). To fabricate a template, welding wire is a good choice because it's easy to work with.



6 With some harder line, you may need to fix the tool in a vise and employ a ratchet. As you tighten the flaring tool, pay close attention to the flare being made. You can back the tool up to inspect what it looks like and then continue. You want to "sneak up" on the proper flare.

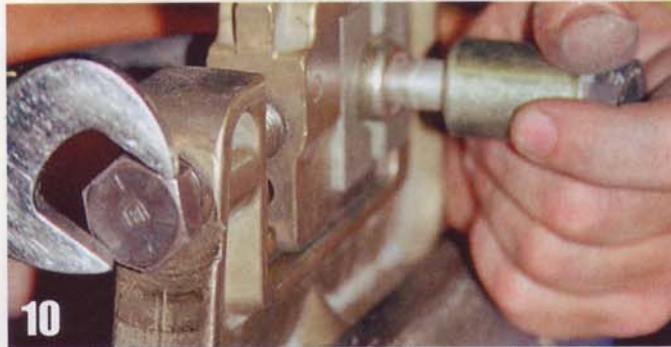


8 Use a marker to identify where you want the bend to begin and end. Once you become familiar with your bending tool, you will know how much length it uses and where it needs to grip for the desired result.



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The marker line is then used with the scale on the tool to make an accurate and professional bend. Note the degree scale on the tool.



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A special crimping tool is required to make air conditioner lines due to the high pressure they experience.



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If you are going to use a whiz wheel to cut braided line, use duct tape to protect the uncut ends from fraying. The best method, though, is to use hose-cutting pliers.



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Whenever you cut any line, always be mindful of the possibility of depositing debris inside the line, especially if using a high-speed tool. Every cut line should be blown out with high-pressure air and finger- or tissue paper-tested for dirt.



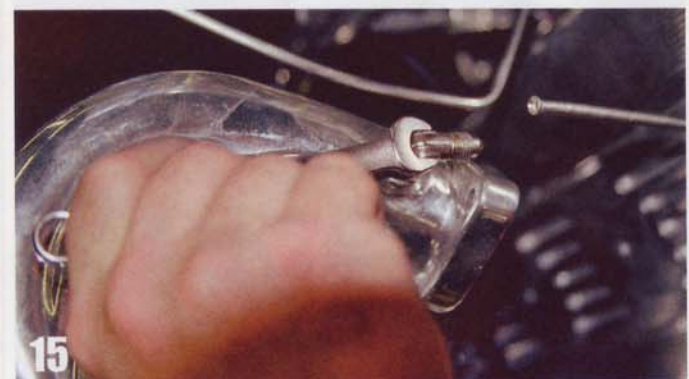
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Apply anti-seize compound to aluminum or stainless steel fittings (except for brake lines).



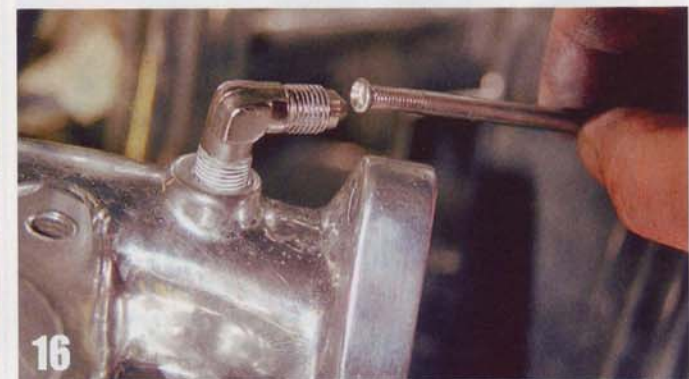
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Teflon tape is a good choice for engine and transmission connections that are NPT (national pipe thread).



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The fitting needs to be tight so it does not leak, but also oriented properly to mate with the line. Here, an oil-feed line with a single flare is connecting to a turbocharger.



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A properly designed line will attach with no stress on the fitting. If it is too long or short, the fitting and threads will be stressed and may leak and fail prematurely.

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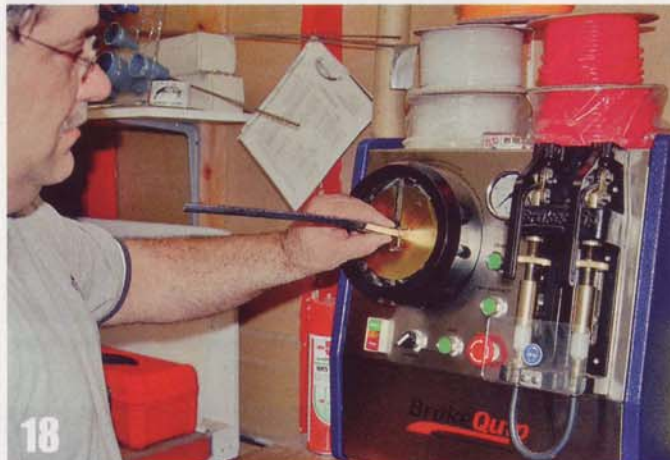
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Joe Mangone Jr. uses a special OE-style crimping machine to reproduce automotive hoses.



Hydrair's finished product has the DOT stamp and I.D. number and is ready for service. 🛠️

Sources:

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