

Workshop

DOWN THE TUBES

How to replace the brake system tubing, and what goes inside

Most of us know that we need to go through the hydraulic cylinders and mechanical parts of our classic car's brake system periodically, but not as many seem to understand how important it is to replace the system's hydraulic tubing. Rust, dents and kinks on the outside of the tubing can weaken it and make it unsafe, but worse than that, the conventional D.O.T. 3 (D.O.T. is a U.S. standard and stands for Department Of Transportation) brake fluid that most systems contain attracts moisture that rusts steel brake tubing from the inside and decreases its burst point.

Replacing the brake tubing should be part of any restoration. It's easy to do, and can go a long way toward making your car safer to drive. Replacement can also be necessary for cosmetic reasons, too, if you plan to show the car. All you need to do the job are a tubing cutter, a tubing bender, a flaring tool, the correct brake nipples, and the tubing itself. Tubing is sold in various lengths, but it is generally best to buy it in seven-metre coils rather than trying to piece together individual pre-cut tubes.

Brake hydraulic lines should always be made of steel. Copper tubing won't do because it does not have a high enough burst point. Brake tubing must also be double flared at the ends for extra strength. A single flare tube can fatigue and leak. Bending steel tubing is easy if you have a bending tool to avoid kinking. For gradual bends, you can even do it with your bare hands. Flaring requires a special tool, available from automotive tool suppliers.

Remove each tube from the chassis one at a time, then use the old tube as a template for

bending the new one so you won't get confused. Cut the tubing about 20 millimetres too long to avoid problems when flaring. Save any clips for holding the tubing in place, as well as any brass tees or other fittings such as are usually found on the rear axle housing and at the front of the chassis where the brake tubing splits off.

Cut the tubing to length, then file its ends flat and bevel the edges. Bend the tubing slowly and gently using a tubing bender, so as not to kink it. When you have it the way you want it, try placing the tube in its location to make sure it fits properly before adding the nuts and flaring the tubing. After any minor adjustments, you are ready to flare the ends. Pop a nut on the end of the tube and push it down out of the way.

Now place the tube in the holder part of the flaring tool and make sure it sticks up at the right height by using the forming tool as a guide. Compress the forming tool over the end of the tube, then remove the forming tool and use the compression tool to finish the double flare.

To install the tubing, make sure the flares are flat against the nipples, then, using a tubing wrench, tighten the nuts into place evenly. Never use any type of sealant or Teflon tape to seal the threads, because the nipples need to be self sealing. Tape or sealant could mask a serious problem until the system is under heavy pressure.

GOING FOR SILICON

Ordinary, mineral-based brake fluid (D.O.T. 3) attracts moisture like bickies on a damp day and can cause your brake system to rust from the inside; but there is a better solution (no pun intended) and that is to fill your restored brake system with D.O.T. 5 synthetic brake fluid. It's as expensive as French perfume (a litre is around \$80 NZ, plus GST) but it's worth it.

Most people don't know that you really should change ordinary D.O.T. 3 brake fluid every two years or so, whether you use your classic car or not. Otherwise, moisture builds up in the tubing and cylinders. Rust in the tubes, and pits in the cylinders are the result. And even before the system fails due to corrosion, the water in your

brake system can boil under severe braking and cause vapour lock and brake fade.

The new synthetic brake fluid was developed in the States for postal system vehicles, but it is also commonly used in race cars, and sold as racing brake fluid in New Zealand. Not every auto supply dealer sells the stuff, but I found that my favourite parts house can supply it:

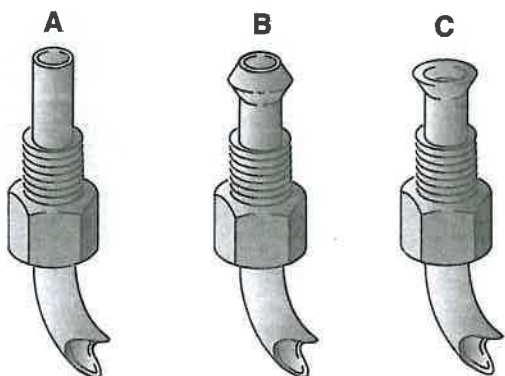
Automotive Supplies Ltd
306 Pollen St
Thames, New Zealand
07 868 7034

There is a myth among some restorers that the new synthetic brake fluid will cause old-style rubber parts to shrink/swell and cause brake failure. It's not so. I have put D.O.T. 5 fluid in American, British, German and Japanese cars and never had a single problem, and I know of a high performance brake shop in the States that has put D.O.T. 5 in hundreds of cars without incident. The only place where it is not appropriate is in anti-lock brakes, but very few classic cars are so equipped.

D.O.T. 5 fluid is fully compatible with the old mineral D.O.T. 3 fluid but the only way to get the full benefit of synthetic fluid is to purge your brake system of the old stuff, including any moisture that has accumulated. If you are doing a complete restoration, you will want to go through your classic's brake system anyway, so that would be the ideal time to switch. Any items such as cylinders that you don't intend to rebuild will need to be taken apart and cleaned using alcohol-based brake cleaner.

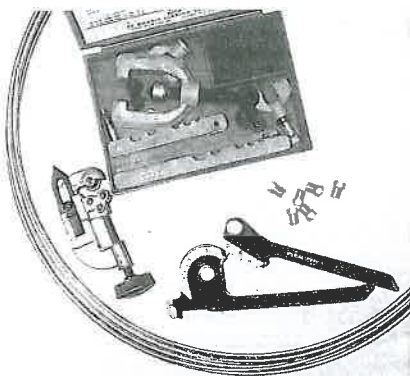
Once the brake system is thoroughly purged and cleaned, put it back together and follow the instructions in part one of this series for bleeding your brakes. Don't try to reuse any of the brake fluid that comes out while bleeding the brakes because it will likely be contaminated. This is painful, considering the cost of the stuff, but if you are going to this much trouble, now is not the time to take chances.

Be sure to attach a tag to the top of your brake master cylinder to advise any service people that you only want silicone fluid in your classic's brake system, and then keep a supply of the stuff in the boot for just such occasions. I have used this type of fluid in my classic cars for the last 15 years and have never had to rebuild the hydraulics on any of them. When I had to take a back axle apart to repair the differential a couple of years ago on my '40 Packard, the rear-wheel cylinders were as shiny inside as when they were first installed 10 years before.



Brake tubing should be double-flared

A: Tubing is cut square and filed flat. B: Tubing is belled out, using a special bit that comes with flaring tool. C: Tubing is pushed in and double-flared using flaring tool.



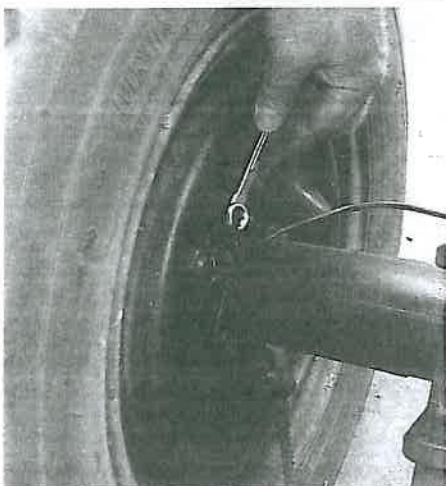
1. Tools required to replace brake hydraulic lines are: pipe cutter, tubing bender, flaring tool. You will also want to buy a seven-metre roll of steel tubing and the required nipples for your make.



4. File the end flat, then bevel the tubing for flaring.



7a. Forming tool is tightened into place.



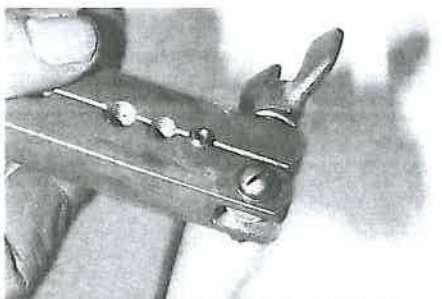
9. Brake line wrench helps prevent rounding nipple flats.



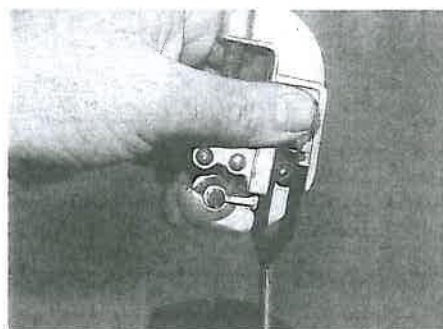
2. Cut the tube to length using a pipe cutter, by tightening the tool, turning one full turn, tightening again and turning again until the tube is cut.



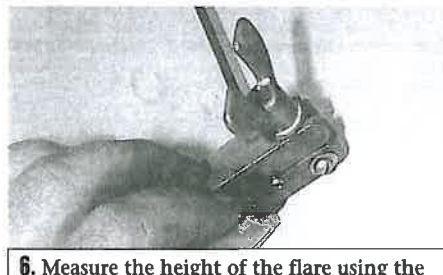
5. Bend the tubing to the correct shape, using your old tubing for a template, and using a tubing bender to avoid kinks. Pop on nipples and push them down, out of the way.



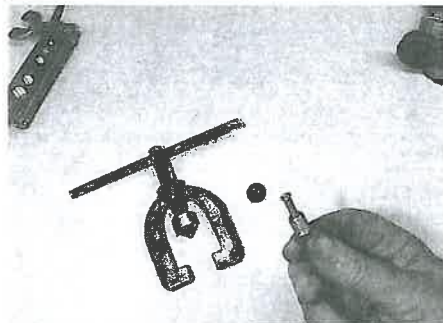
7b. This steps creates a rounded bell.



3. Clean the end of the tube using the de-burring tool on the tubing cutter.



6. Measure the height of the flare using the bottom of the forming tool in the flaring tool kit as a guide, then clamp the tubing in the holder.



8. Clamp and flaring tool are used to make the final, double flare.



10. Front tubing usually goes behind front cross-member and over to passenger-side front wheel.



11. While you are replacing your brake system's hydraulic lines, replace the three flex hoses as well for safety reasons.



12. Switching to D.O.T. 5 synthetic brake fluid will end hydraulic system problems in your classic. It's expensive but worth it. Otherwise, Ford brake fluid has the highest boiling point of any mineral-type brake fluid and was perfected for their heavy trucks. You can buy it at a Ford dealer.