Do-It-Yourself Brake Bleeder and Fluid Flush Gismo

By Bob Fuelleman

This article as originally intended for the Porsche 928 and Ford Explorer owners. While the pictures are specific, the unit will work with any car that has a secure reservoir cap.

Explorer group members should note that this first go around was for the 928, but that the procedure and device are the same except for the reservoir cap itself. The aftermarket Explorer cap I used takes a little more work because of the cheap way the cap is vented. I had to fill in the vent grooves with RTV and glue the cap gasket into the cap to get a good seal.

The pictures:

ATECAP2.PDF is a diagram that shows the assembly of the 928 cap. The Explorer cap is similar, but lacks the little cavity where the bushing is installed.

0418-26.jpg shows both project caps on the bench with tools and fittings. The cap on the right is the finished 928 cap, with the orange hi-temp RTV sealing the reducer bushing inside the cap.

0418-27.jpg shows the top of the sprayer tank, with the hose splicer and the quick disconnect fittings. The 928 cap is shown attached to the hose with the quick disconnect fitting. You can see where I drilled a couple small holes in the top of the sprayer to secure that hose with tie-wraps. Takes some strain off of that short hose and the splice. I started to redo the fitting on the tank, but the splice turned out to be the best/easiest method.

What to do:

I took a spare stock master cylinder reservoir cap, and drilled a half-inch hole in the middle after removing the vent pieces. On the 928 cap, it's important that you drill in the center, so that the fitting can be installed with a socket that fits inside the vent cavity. From the bottom of the cap, a 1/8nptf x 1/4npt brass reducer bushing is inserted with a little gasket RTV, and it threads into the female end of the male air line disconnect fitting. Look at the picture 0418-026 to see the assembled cap, and look at the way the fitting sits on there. You can also see where I filled in around the fitting with the RTV inside the cavity where the vent diaphragm used to live. (Explorer caps don't have this...) I added the 1/2" flat washer on the outside of the cap to this sandwich, with a thin layer of that same RTV to seal it to the cap. This distributes any mechanical stress around the whole top of the cap. Install the short 1/8 npt nipple into the bottom of the bushing so it extends down inside the cap.

At Home Depot, I picked up a 1 gallon plastic pump garden sprayer, the kind you use to spray for bugs on your roses. About $11. The hose between the tank and the wand is 1/4" id plastic hose, so I cut it off short at the tank and added about six feet of 1/4" reinforced plastic hose to that with a little barbed hose splicer. At the far end, a barbed hose fitting attaches the other (female) side of that air line coupler. Add clamps to the hose fittings. All the the reservoir cap, came from the Home Depot bins. The air line disconnect fittings are in the tool area, by the way.

Once all that's assembled, add a couple quarts of new brake fluid to the tank, assemble the cap fitting into the hose fitting, and get the air out of the hose. I just held the end of the hose up high, and pumped a couple times on the sprayer pump to get the fluid flowing slowly. When it gets real close to the end, pull the disconnect fitting apart to stop the flow.

Now to the car:

Put a plastic bib on the fender while you work. I used a heavy-duty trash bag held on with some masking tape. The intent here is to make absolutely sure that no stray drops of brake fluid get on your paint. Very Important!

Raise the car and remove the wheels so you can access the bleeder valves on the calipers and/or wheel cylinders. Explorer owners may be able to do this by just turning the front wheels and reaching in to access the valves. Later 928 models with 4-piston calipers have two bleeder valves on each caliper. Bleed the inner section first, then the outer.

Replace the original master cylinder reservoir cap with the modified one, and attach the hose from the tank to the cap. Pump the tank a few times to get just a little pressure on the system.

928: If there is air trapped in the master cylinder itself (not referring to the reservoir), bleed from the valve at the end of the master cylinder before moving to the wheels. This might be needed because of a new or
rebuilt cylinder install, replacement of the reservoir grommets, or because the system ran too low on fluid for some reason. If you can, do all your pedal pumping while bleeding the master cylinder valve. No reason to push junk into or through any ABS valves if you can help it.

Starting at the right rear, put a length of plastic hose over the bleeder valve and route it into one of those empty brake fluid containers. Open the valve, and then go pump up the tank some until fluid starts to flow slowly through the bleeder valve tube into the bottle. Don't pump it up any more than it takes to maintain a slow flow. The old fluid may be a little rusty brown, so let it flow for a while until new fluid is coming out of the hose.

Once the fluid starts flowing clear from the right rear, close the valve and move to the left rear. Same procedure there, then the right front, and finally the left front. After the rear is done, the fronts won't take near as much fluid to get cleaned out.

Porsche recommends that you cycle the brake pedal occasionally while bleeding, to make sure any debris that might be in the front of the master cylinder bores gets flushed through. Do this pedal pushing very slowly with the bleeder valve open, so that the front piston in the master cylinder doesn't get stuck at the forward position. Do it early in the cycle so anything you might dislodge has a chance to make it out through the bleeder.

If you have the manual trans car, do the clutch system the same way, bleeding at the slave cylinder valve on the side of the bellhousing.

Explorers: Be absolutely sure that you don't force air into the clutch master cylinder. The angle of the cylinder requires that it be unbolted from the firewall and tilted forward to remove stray air from the front of the cylinder.

Disconnecting the hose from the master cylinder reservoir requires that the pressure is released from the tank first. Slowly unscrew the pump from the sprayer tank until all the pressure is relieved. Then remove the hose from the fitting on the cap using that air line disconnect, and remove the cap from the reservoir.

It's possible that the reservoir will be over full at this point. Remove some of the fluid from that reservoir until it's down to the full line. Using the threaded nipple inside the cap reduces the amount of air that migrates back to the sprayer tank, but requires that you remove any screen from the reservoir opening before threading the cap on.

Be aware that the level in the reservoir changes as the brakes wear. If you have brakes that aren't new, leaving the reservoir full may cause you to spill some out next time you replace the brakes. Just watch the level when you compress the caliper pistons and avoid the spill.

Results: Biggest thing you'll notice is that the pedal is higher and harder. With all the air and moisture out of the fluid, the system is more hydraulic than pneumatic again, plus the components will last a lot longer, and you'll get rid of some possible brake fade.

Just for reference, the Porsche dealer wants about $100 to do this service on my 928. The VW/Audi dealer gets about $50 for their cars. My guess is that Ford is somewhere in between. Porsche recommends that the fluid be flushed and bled at no more than two-year intervals. The track tech sessions at PCA and SCCA require fluid less than six months old for most events. I think PCA Driver Education events are less strict.

The little bit of fluid that remains in the sprayer tank after you are done can be left there. When you go to use the system again at a later time, drain and flush that fluid out before you start on another car. The fluid is just as hygroscopic in the tank as it is in the car, so old fluid should not be used.

Used brake fluid can be disposed of with used motor oil.

"Real" repair shops are required to use a diaphragm-type pressure bleeder, where the pumped air is never in contact with the brake fluid. This keeps the fluid dry, and also pretty much guarantees that the user will never accidentally pump air into the brake system. Using new fluid and keeping the tank level from going dry will do this for the casual home technician. Don't skimp on brake fluid-- use plenty and make sure it's from new unopened containers. Even the better fluids are only about $5 a quart.

Disclaimer:

*** As always, the descriptions and suggestions are for your reading enjoyment. No warranty is expressed or implied. Know your limitations and work within them. Always wear eye protection when working with pressurized fluids, wear gloves to protect your hands from the chemicals, and always use safety stands when working with the car or truck raised. Too many people are blind, sick and/or dead because they ignored some common-sense safety rules. Don't be a statistic! ***

Parts list:

- 1-Gal garden sprayer with the hand pump
- Six feet of 1/4" ID plastic pressure hose, the clear kind with the string reinforcing (see picture 0418-027.jpg for a detail of this hose)
- Two feet of 1/4" ID clear plastic hose for the bleeder valve
- One 1/4x1/4" barbed hose coupler, to connect two pieces of hose together
- One 1/8nptf x 1/4npt reducer bushing fits inside the cap and threads into the male half of the quick-disconnect.
- One 1/4" barbed hose nipple with 1/4" male pipe thread on the other end, connects the hose to the female half.
- One air line quick-disconnect set, with female threads on both pieces. (I use a style that's different from my air tools)
- One 1/2" flat washer fits in a sandwich between the fittings on top of the cap.
- Three hose clamps that will clamp the 1/4" hose.
- A little RTV gasket maker to seal the cap parts together
- 2 Quarts of --new-- brake fluid. 928 Manual says one liter capacity, so I bought two quarts. Many are recommending the ATE super blue fluid, but I've had great experience with Castrol LMA in street-only cars so that's what went in due to local availability.

The reservoir cap:

David Roberts at 928 Specialists supplied the cap for my 928 project. Devek and 928 International also have this cap listed, and it's available at your local Porsche dealer. Costs range from five to maybe ten dollars. It looks to be the same as the cap from my now-deceased '86 Jetta, for what it's worth.

The Explorer cap came from the "Help" parts rack at a Pep Boys store near my house, but the cheap replacement cap isn't as good as a new factory cap from Ford. I made the cheap one work, and it was about five dollars. The OEM cap from the dealer is about ten dollars.

Feedback from users is always welcome!

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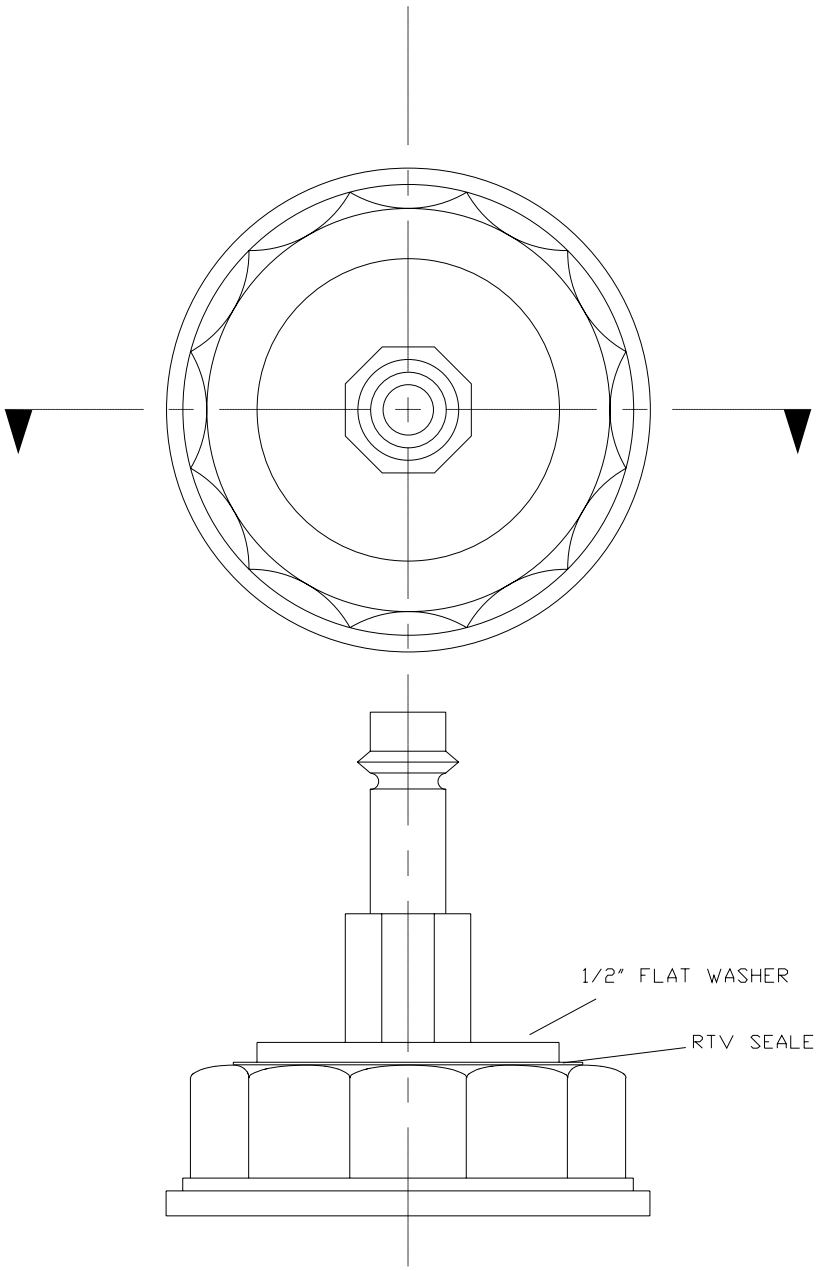
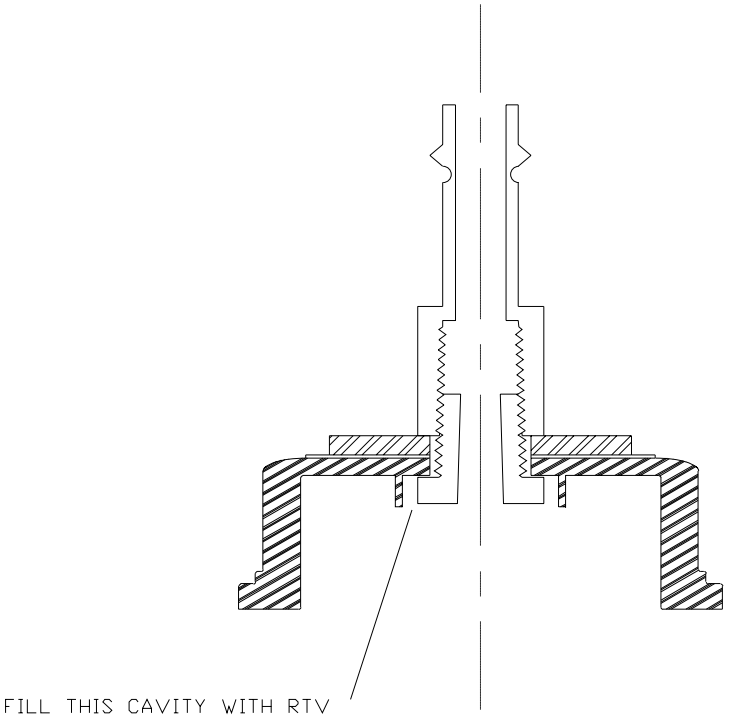

1/2" FLAT WASHER
RTV SEALER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