Turner Front Disc Brake Conversion

and Dual Master Cylinder Conversion

By Bill Henderson

I recently purchased a 1963 Avanti R2, my first Studebaker, and it exhibited a hard pulling to the left on braking. I knew I had a problem to address before I would drive it anywhere. Investigating, I found that one of my right front disc calipers was not fully applying, and for safety's sake I knew that this job couldn't wait.

I realize I could have fully overhauled the stock system and gotten it to operate properly and as well as it did when new nearly fifty years ago. But having restored several collector cars over the past twenty years, I have a preference for modern technology in critical places, especially when it concerns safety and the upgrade cannot be seen. My decision was to install the Avanti disc brake conversion marketed by Turner Brake and often advertised on these pages. At the same time, I decided to convert to a safer dual-chamber master cylinder, and to replace all brake lines on the car, both steel and rubber ones. After all, a braking system is only as reliable as its weakest part, and John F. Kennedy was in the White House when these brake fittings were last touched by a wrench. From past experience, I have learned it is a foolish waste of time trying to get them apart undamaged.

Jim Turner's front disc kit is well engineered, and for me was worth every penny. He has done all the engineering for us, and installation at the wheels was relatively straight forward and easy, and the results are outstanding. The master cylinder conversion is nearly as easy, but a little more do-it-yourself knowhow is required. Follow along with the conversion. I will try to help you avoid pitfalls along the way.

1) *(Picture 1)* Here is where we started. Pretty grungy, and this is after a liberal dose of Gunk engine cleaner and hot water. I decided not to try to rebuild the original system.

2) *(Picture 2)* First remove the caliper from its attaching bolts in the back, and disconnect the brake hose from its port on the caliper. Perhaps it need not be said, but always use special brake fitting wrenches to avoid rounding the soft fittings, especially if you plan to reuse anything. This is how the spindle looks after removal of all the old brake parts.

3) *(Picture 3)*This machined spacer is used to adapt to the new rotor's grease seal. It is machined a couple of thousandths small, so it must be heated nearly red hot with a torch as you hold the ring with channel lock pliers. Once heated, it will slip right over the spindle base, and should only need a few taps to seat it in place.

4) *(Picture 4)* The caliper mounting brackets are next to be mounted. They are clearly marked RIGHT and LEFT. Take care to use red Loctite on the threads of all bolts, even the ones that have been started for you. Lock washers are used on all bolts, and use a torque wrench to ensure that all these bolts are torqued to 75-80 ft. Lbs.

5) Thoroughly work axle bearing grease into both of the supplied inside and outside wheel bearings. Slide the inside wheel bearing (the larger one) into its race in the rotor The inside bearing is covered by a grease seal, which is included in the kit. I use a shop press to seat my grease seals, but if you are very careful you can seat yours with a block of wood and a small hammer. Never hammer directly on the grease seal.

6) *(Picture 5)* Slide the new rotor over the spindle, insert the greased outer wheel bearing, and reuse the original keyed washer and hub nut. Torque the nut to shop manual specifications and ensure the rotor spins freely before inserting a new cotter pin. I found that the original

My Studebaker dust caps fit much better than the new ones that came with the rotor, so I reused them. You may need to deform them very slightly to ensure that they fit tightly.

7) *(Picture 6)* Carefully clean the rotor surface back and front with brake cleaner. Now the caliper slides right into place. Notice that the caliper on the new kit is mounted behind the spindle, not in the front like the original design. A large hex head Allen wrench is used to secure the caliper in place with two special four inch bolts.

8) Repeat the entire process on the other side of the car.

9) *(Picture 7)* Now we can turn our attention to the replacement of the Master Cylinder. Our original one was full of rusty sludge that looked like toxic mud. We removed it and set it aside to clean and store in our box of original parts. Do future restorers a favor and save everything original you take off your car.

10) *(Picture 8)* The dual master cylinder from a 1973 Chrysler Newport Custom bolts right into place, and has the proper bore for our application (Raybsetos MC36307). Bench bleed your new master cylinder. If you do not do this step properly, you will never get a firm pedal no matter how many times you bleed your brakes at the wheels. This simple bench bleeder kit is available at the any auto parts store. Using a large Phillips screwdriver, depress the piston inside the bore slowly again and again, pausing a few seconds after each thrust, until no more air bubbles are seen in the tubes.

11) *(Picture 9)*The shaft that come out of the booster will have to be shortened for this application. Measure carefully and adjust the shaft to fit without either binding or free play. I found that my adjustment screw was rusted so solidly together that I used a cut-off wheel to simply lop the end off, then filed the stub smooth.

12) Carefully mount the new master cylinder on the car's booster, remembering that DOT 3 or 4 brake fluid makes excellent paint remover for your fenders. When doing this job, I keep everything well covered and wear rubber gloves, pausing frequently to wash my gloved hands.

13) Now comes the fun part. Re-plumbing the brake system is not terribly difficult but it is awkward to do, with small fittings in tight places. You can order a complete set of pre-bent brake lines for your Avanti (one source is www.inlinetube.com) or you can fabricate your own. I chose the latter route as it is less expensive, and I do not plan on entering any concours shows. You will not find steel lines of exactly the same length as the originals at AutoZone or NAPA, so you will have to make do with stock lengths or flare your own.

14) *(Picture 10)* This small brass multi-port junction block is factory mounted on the frame directly below the Master Cylinder. It has four ports, counter clockwise from 9 o'clock, the ports feed the back brakes, right front caliper, left front caliper, and Master cylinder (the port pointing straight up). As I was replacing the old lines, I used a small cutting tool to simply snip the lines at this block. There is no point in struggling to loosen the fittings in this impossibly small space. In fact, I needed to use a torch and Vice Grips pliers to get the stubs out of the fittings while the block was tightly clamped in my table vice. Be careful with the junction block so it can be cleaned as it will be reused.

This photo shows the block with new lines attached. You will notice that the original back brake port is filled with a threaded plug. That is because the back brakes now are plumbed directly into the primary port (small reservoir) of the new MC. If you plan to use an original style pressure switch for the brake lights you can mount it here instead. I have moved my brake light switch inside the car where it is activated electrically by the simple movement of the pedal (see article in Avanti Magazine issue ##), a much safer alternative in my mind.

15) *(Picture 11)* Steel brake lines are available in only a few choices of pre-cut lengths. Junctions allow you to connect long sections together. You can also cut and double-flare your own lines if you want; it is not that hard to do. Some of the auto supply chains (like AutoZone) will even loan you a brake flaring kit and a tubing bender. Remember, always use double flaring on brake fittings for safety. The tube end fittings you will use need to be Inverted Flare style. Do not mix different diameters of brake tubing on your car as thicker lines deliver lower pressure. Use 3/16 line exclusively for all runs. (the fittings on the ends of 3/16 tubes are 3/8" 24 thread. Confusing, because often they are referred to by the men at the parts counter simply as 3/16" lines). Never use Teflon tape or pipe dope on brake lines. The high pressure sealing comes from the flared tip pushed tightly against its matching flared seat, not from the sealing of the threads.

16) The large bowl on the Master Cylinder feeds the junction block, where both front calipers are plumbed. Use a 24" length of straight tube between the MC and the port on the top of the junction block, forming a loop in the middle of the run for safety. Here is a tip—before using your expensive new brake lines, test bend a wire coat hanger to fit, then when you are satisfied with your work replicate the design in the brake line using the tubing bender. ***An important word of caution-- disconnect your battery before running these brake lines. The starter solenoid with its hot connections are right below the master cylinder on the fender apron, and the line from the MC to the junction block will run right past it. Carefully bend the tube so there is no chance of it ever coming in contact with the car's live electrical system when it is attached in place.***

17) the line from the junction block to the left front brake is easy. Use a six-inch pre-cut line (slightly longer than original) and assure that it is bent so that it will not come into contact with any moving suspension pieces.

18) The line from the junction block to the right front brake is a little tricky. The original line is about 42", but pre-cut lines are available in only 40" or 51". While one could use 2-24" lines with a junction in the middle, I decided that this would be sloppy and chose instead to cut the 51" line down to size, using the double-flaring tool to re-do the end I had snipped. It worked fine and fit perfectly.

19) The final brake line travels from the MC's primary port to the rear brake hose. Originally, the factory used a 76" steel line at the rear of the car, joined to a 42" line ahead (at least they did on my car) but that was when the rear brakes were plumbed into the front junction block. Now, since we are running the line directly from the new MC to the rear hose, two 60" lines with a 12" line right between them work well. And putting the short section in the middle makes it easy to reach the junction fittings right underneath the car, as they are nestled inside the frame rails. By the way, the 17" rear rubber brake hose is available from NAPA for one, part number 11146. (Note: the final two steel lines in the system are mounted on top of the rear axle carrier, and I will replace them when I convert the back brakes to discs in the very near future. Another article to come!)

20) *(Picture 12)* The last parts are the tiniest but if you expect to pop by the auto parts store and pick them up on the way home from work you may be confounded by the shear number of brass fittings packed in plastic sleeves or hung in small transparent packages on the pegboard. Let me make this easy for you. If you use the Master Cylinder I referenced, here is the exact description of what you need:

- Primary port: Brass Dual Master Cylinder adapter fitting/ 9/16"-20 Inverted Flare Male to 3/8"-24 Inverted Flare Female. (Auto Zone part number BLF-27C)

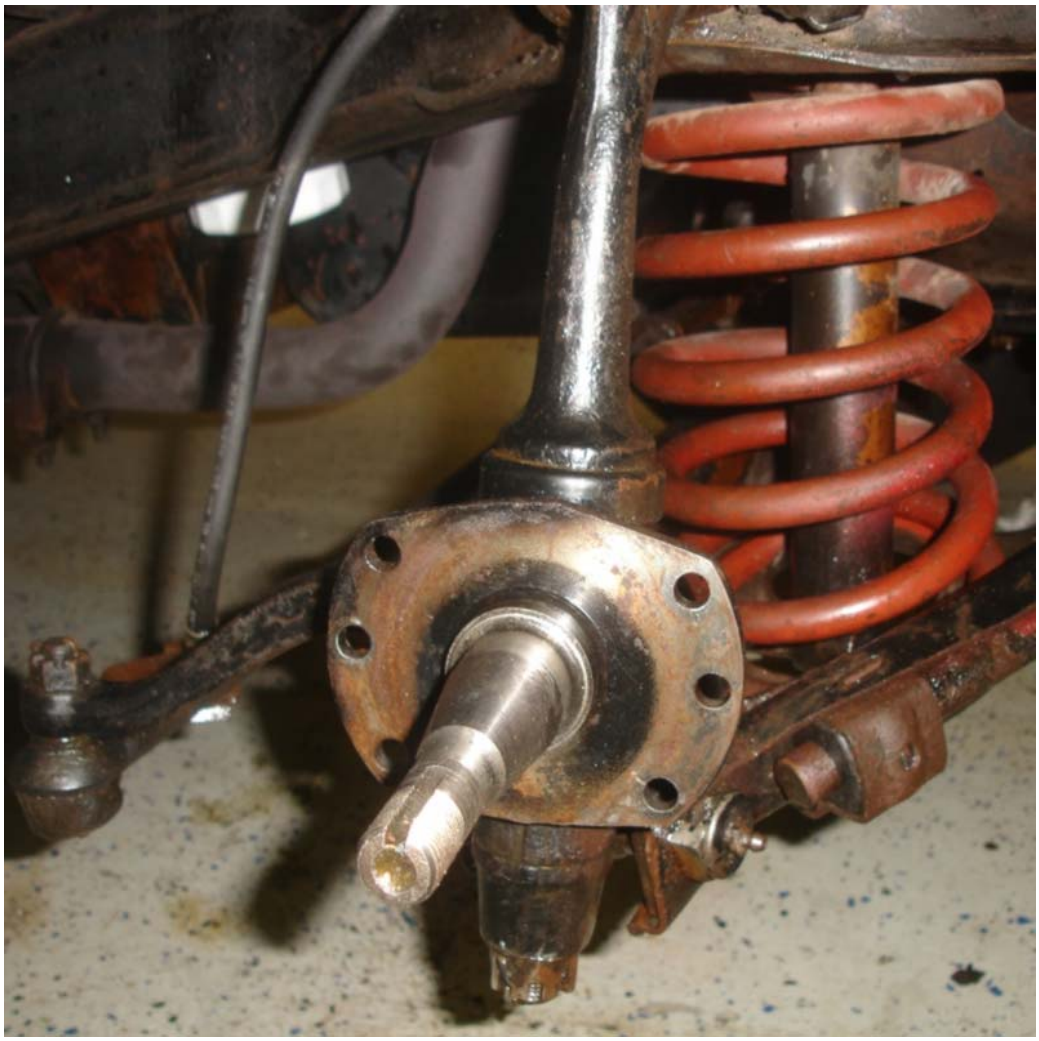
- Secondary Port: Brass Dual Master Cylinder adapter fitting/ ½”-20 Inverted Flare Male to 3/8”-24 Inverted Flare Female. (Auto Zone part number BLF-20C)

21) *(Picture 13)* After bleeding the brakes at all four wheels, have a helper stand on the brake pedal while you check every fitting for leaks.

Conclusion: Our results were fantastic. The car stops straight and true, and in about half the distance as it did before, all without evoking a feeling of panic. My confidence is building for my first road trip! Total time from start to finish (minus trips to the parts store and time spent compulsively cleaning and painting things) was about five hours. If you have never done anything like this before, leave yourself an entire weekend and ask a friend to help. Have fun stopping faster!

Picture 1

Picture 2



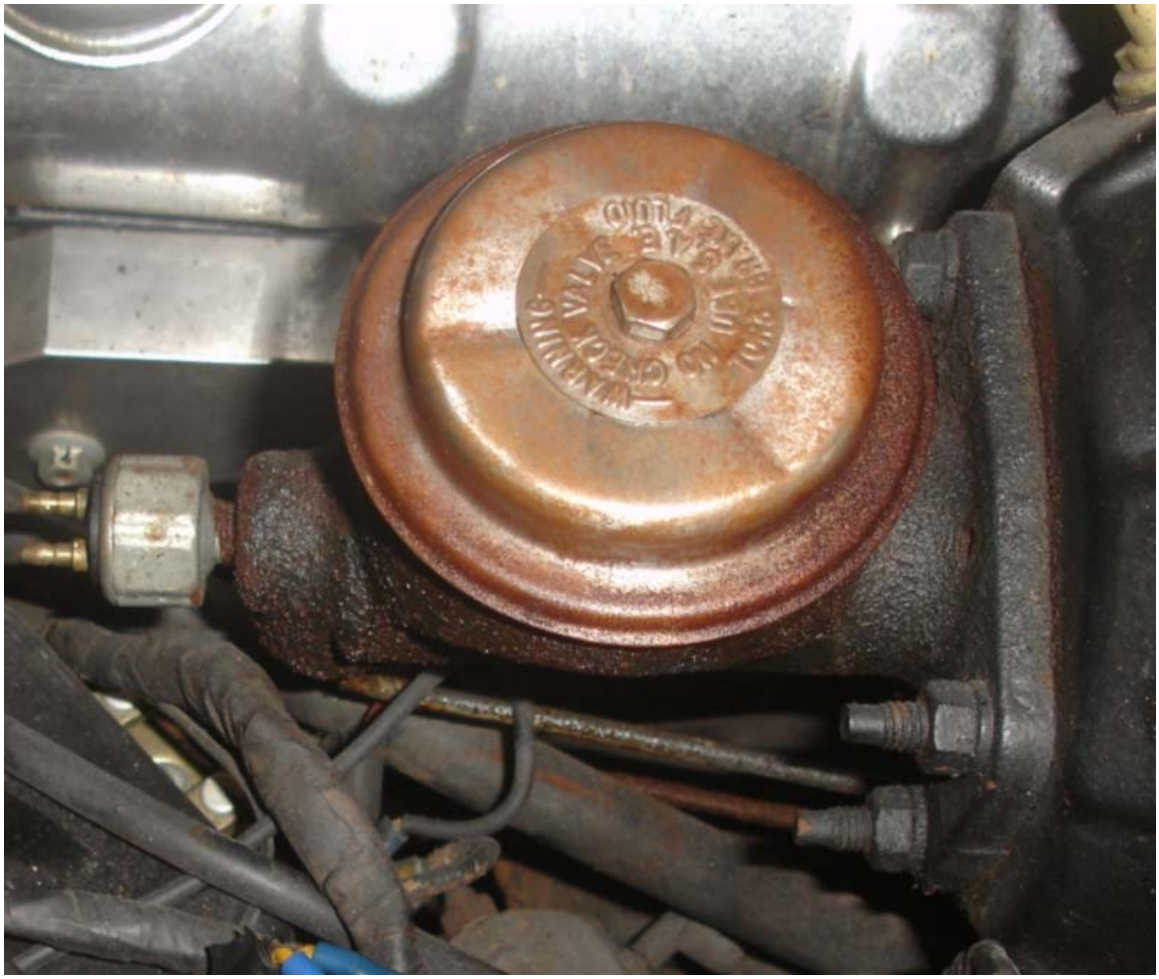
Picture 3

Picture 4

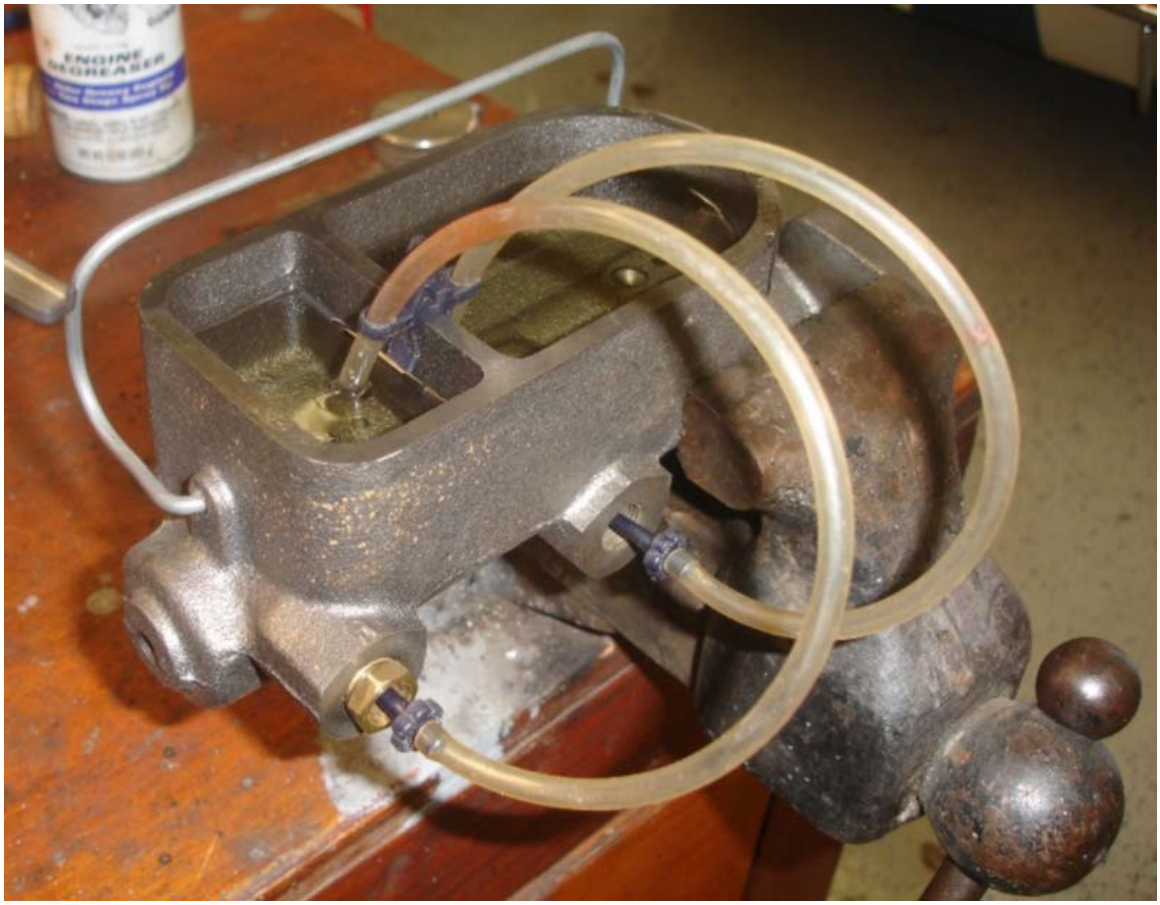
Picture 5

Picture 6

Picture 7



Picture 8



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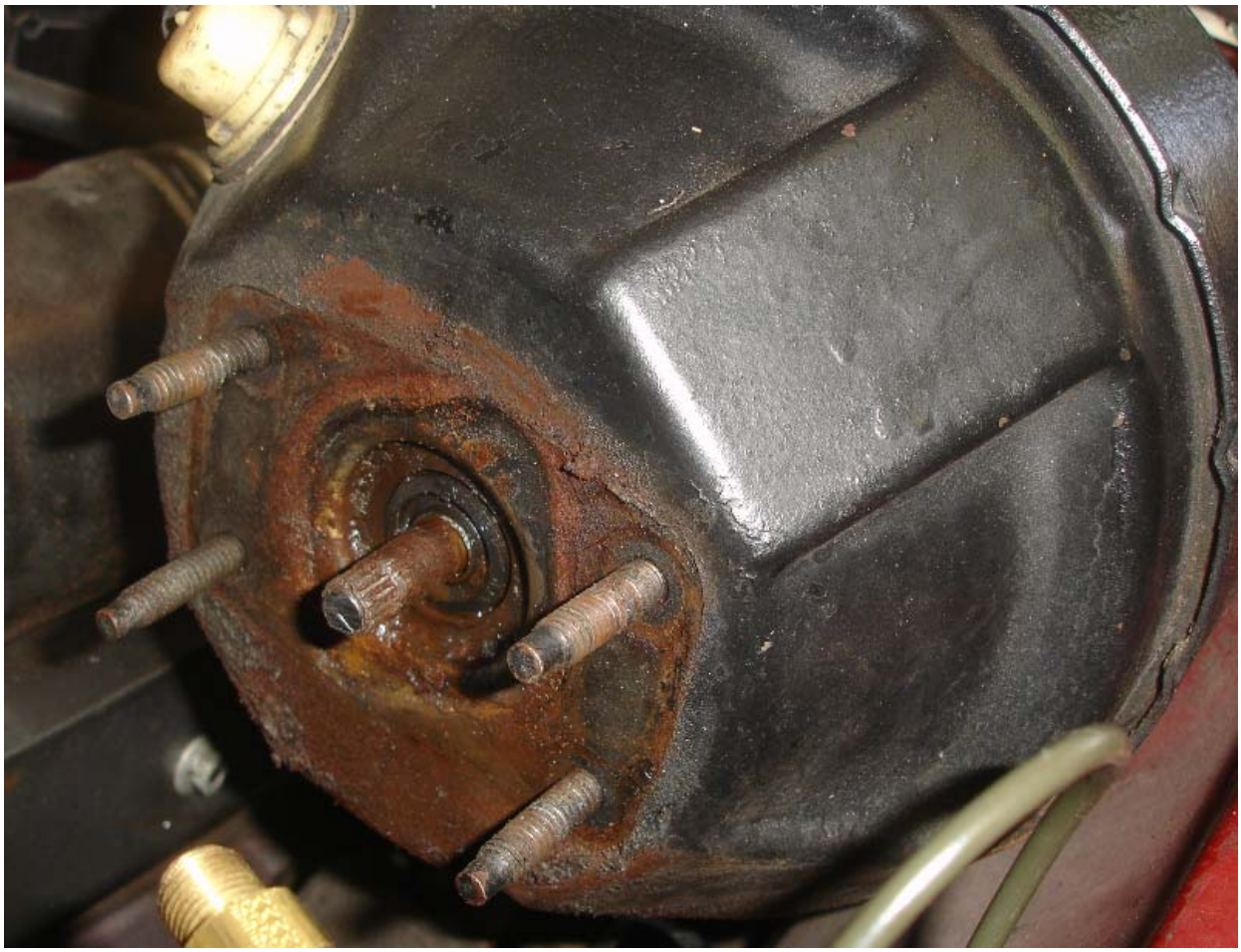
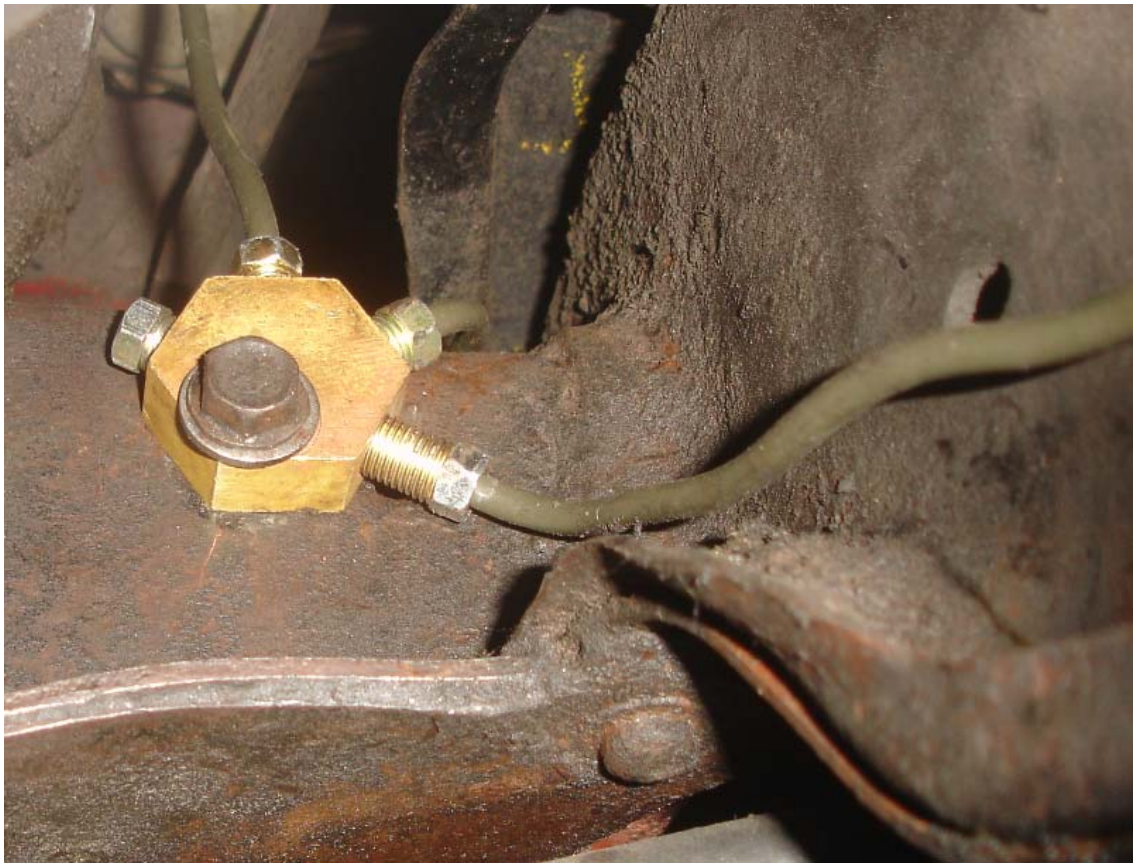
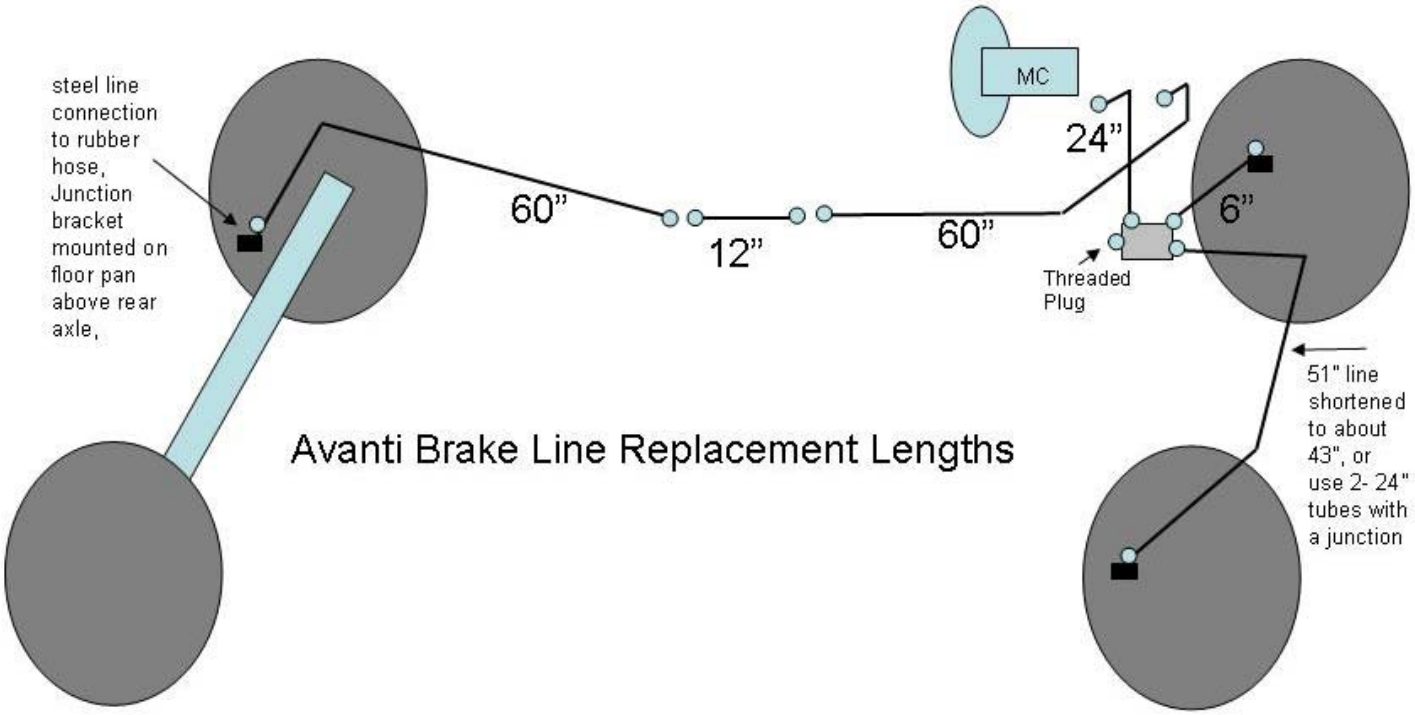


Picture 10



Picture 11


steel line connection to rubber hose, Junction bracket mounted on floor pan above rear axle,
MC
24"
60"
12"
60"
6"
Threaded Plug
51" line shortened to about 43", or use 2- 24" tubes with a junction
Avanti Brake Line Replacement Lengths

Picture 12


BLF-20C
AGS
SOLID BRASS
DUAL MASTER
CYLINDER ADAPTER
BRONCE SÓLIDO
ADAPTADOR PARA
CILINDRO MAESTRO
DOBLE
INVERTED MALE
MACHO INVERTIDO
(1/2-20)
Interchange/Intercambio
Edelmann 258350
Weatherhead
INVERTED FEMALE
HEMBRA INVERTIDA
(3/8-24)


BLF-27C
AGS
SOLID BRASS
DUAL MASTER
CYLINDER ADAPTER
BRONCE SÓLIDO
ADAPTADOR PARA
CILINDRO MAESTRO
DOBLE
INVERTED MALE
MACHO INVERTIDO
(9/16-20)
Interchange/Intercambio
Edelmann 258303
Weatherhead 7910
INVERTED FEMALE
HEMBRA INVERTIDA
(3/8-24)

Picture 13