

VW Dual Circuit Master Cylinder Conversion for the MG TC

(Revised 9.9.09)

by Jim Buell

For those of us who race our MG TC's, having reliable brakes is a must. In addition, many of the sanctioning bodies recommend the use of dual circuit master cylinders (m/c) on the brake system. Conversion of the Lockheed "tin can" m/c to a dual circuit system based on the VW m/c meets both criteria.

Little has been written that helps in setting up and implementing such a conversion. Having just undertaken this installation on TC 9806, I thought I would capture some of my thoughts and experiences.

I would like to give several notes of thanks for help in this undertaking:

Bill Hollingsworth for his pioneering efforts and information;

Kevin Mitz (RennWerks Motorsport, Mountain View, CA) for the fabrication and installation of the mounting plate;

Oz Ruvalcaba (The Hose Shop, Santa Cruz, CA) for helping me sort out all the "plumbing" and building the transition lines;

The folks at www.vw-resource.com for much of the technical information on the VW master cylinder.

This discussion is broken down into the following sections:

1. Parts required
2. Removal of the TC m/c and modification of the stock brake lines
3. Installation of the VW m/c
4. Plumbing the VW m/c
5. Installation of the VW fluid reservoir
6. Bleeding the VW m/c
7. Adjustments

Section 1 - Parts required

- (1) VW Super Beetle* (1971-79) Master Cylinder (VW part # 113611015BH)
- (1) VW Dual Circuit fluid reservoir (VW part #113611301L)
- (2) Brake fluid lines from reservoir to m/c
- (4) Hose clamps for the brake fluid lines
- (3) 10mm caliper adapters
- (3) Transition lines from the caliper adapters to existing brake lines OR all new brake lines (see text)
- (1) VW two contact pressure switch (for brake light wires).

* The Super Beetle m/c is more desirable than a standard VW m/c because the mounting flange is on a 45 degree angle, allowing mounting in a narrow space and better alignment to the push rod.

Section 2 - Removal of the TC m/c and modification of the stock brake lines

The entire TC m/c setup including mounting bracket, heat shield, banjo fitting and switch is removed and the area cleaned and ground smooth.

I wanted to keep as much of my existing brake line system as possible for several reasons. First, because my lines are new, and this kept the transition line length to a minimum, and Second. I wanted to preserve the original look. To do this:

- Remove the right front brake line (it will not be need as it is too long to fit the new m/c).
- Remove, straighten and install the crossover line (that is the line that goes from the old banjo on the rear of the TC m/c to the union on the left front brake line) to the right front brake. It will be about 8" short of the new m/c – that's OK as will be seen in section 3.
- Remove the brake union on the left side – it will not be used.
- Relocated the line to the rear brakes by having it come out of the frame just in front of the hand brake cross shaft. (see photo 5)



Photo 5

Section 3 - Installation of the VW m/c

The VW m/c has 4 outlets, two forward and two rear, and in the VW it is mounted against the forward bulkhead, pointing forward. When mounted in the TC it is mounted facing the rear of the car and requires a new mounting plate and stiffener (see photo 1 & 2 as well as the sketches at the end of the article.)

Note: In the VW the car is plumbed so that one end of the m/c feeds a front and opposite rear brake and the other end feeds the other front and its opposite rear brake. This takes up only two of the outlets. The other two outlets are for dual pressure switches. Also, I have seen several VW m/c where the holes in the outlets are not the same size. You should check them and open up any smaller holes to the same larger size.



Photo 1

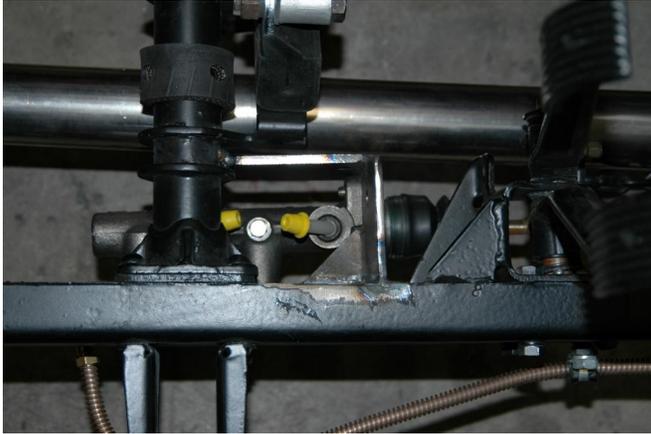


Photo 2

For our purposes, three of the outlets will be used for brake lines (one for the rear brakes, two for the front brakes, and one for the pressure switch. Make sure you are feeding both front brakes from one circuit and the rear brakes and pressure switch from the other circuit. Because of the use of 3 lines, one has to cross over the other (see photo 3 & 4.)

There are two critical dimensions that define the centerline of the m/c mounting hole. These dimensions are shown on the sketches but should be verified on your car. The first is the distance from the top of the frame to the centerline of the brake rod (when it is in the horizontal position) and the second is the distance from the inside of the frame to the centerline of the brake rod. Once verified the plates can be fabricated and welded to the frame and transmission mounting tube. (Ignore the gusset shown in photo 1, it was our first attempt to brace the mounting plate and it proved to be inadequate)

When mounting the VW m/c make sure that both of the reservoir inlets face the rear of the car.

Note: Since this installation, we have determined that it may be desirable to make the mounting plate 6" high (add material below mounting holes) and eliminate the 45 degree cutoff, and modify the stiffener by eliminating the cutoff and increase the height to match the new bottom of the mounting plate. This provides for extra protection as well as act as a heat sink against the exhaust pipe. (The advantage of this change can be seen in photo 1).

Section 4 - Plumbing the VW m/c

The existing TC brake lines are male 7/16-20 UNF thread, inverted flare. The VW m/c is female 10mm. The caliper adapters convert the VW m/c outlets to male 10mm x 1.0 DIN seat (because of the difference in brake line size, I was unable to find a single fitting to transition to the TC lines). These are now the threads that must be connected.

Three new brake lines will be required to make this transition.

- Each line is 7/16-20 female (this is usually a fixed – non swivel) fitting on one end and a 10mm x 1.0 DIN seat 90 degree swivel to fit the caliper adapter on the other end.
 - The 90 degree fitting is required to keep the brake lines inside the frame line. . .
- The lines are stainless steel braided brake hoses, available plain or vinyl coated (see brochure photo) Fortunately, this is easily accomplished by having these lines made up by a local hose shop.
 - The length that I used was 8” to the right front line, 35” to the left front line and 20” to the rear feed line. Your length may vary and should be checked
 - The lengths are measured from the center line of the 90 degree fitting to the end of the 7/16-20 fitting

Photos 3 & 4 show the final setup.

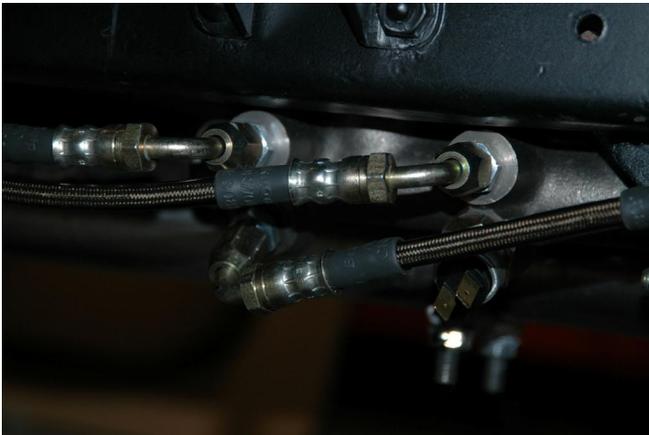


Photo 3

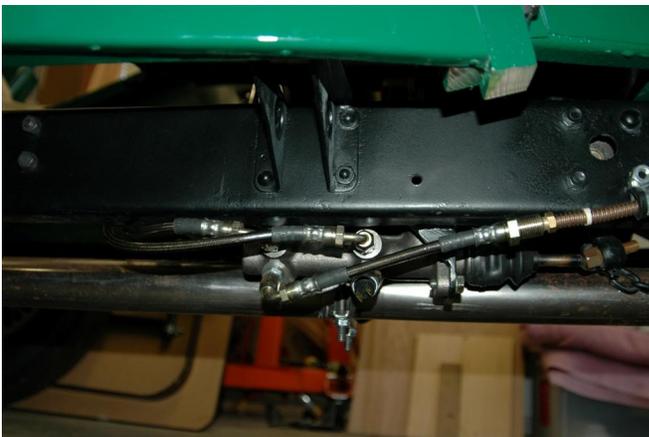


Photo 4

Note: If replacing the entire brake line system use a 7/16-20 male inverted flare fitting instead of the female fittings. All lengths will have to be carefully measured. You may also want to consider reversing the entire brake line system on the rear end. This will put the rear feed line on the same side of the car as the m/c and would substantially shorten the length of line required to feed the rear brakes as well as making it a straight run down the right side frame rail.

Section 5 - Installation of the VW fluid reservoir

Selection of a mounting position for the fluid reservoir will be an individual decision based on the configuration of your car. The only considerations are:

- keep it as high as possible above the level of the m/c
- be able to feed the lines through the frame to the m/c..

I mounted mine on the front of the tool box. To accomplish this, I had to move the regulator forward about 2" . Feed the supply lines to the m/c and secure with clamps on both ends. You may also wish to use a couple of clips along the length of the hose to hold it in place.

Section 6 - Bleeding the VW m/c

The instructions that came with my VW m/c called for bench bleeding prior to installation. The idea is to get as much air out of the m/c as possible before installation. For me this proved impractical as I had to have 3 of the 4 outlets open during installation. One of the lower outlets (rear circuit) is plugged with the pressure sensor. It would be possible to plug the other lower outlet prior to installation, bench bleed then carefully and quickly change from the plug to the line connection before losing too much fluid. For additional information on bench bleeding see a very good explanation at www.vw-resource.com/bench_bleed.html

Bleed the brakes in the normal manner. If you are pumping the pedal and you feel no resistance and nothing is coming out of the bleeder valve at the wheel cylinder, the m/c is probably air locked. To fix this, loosen the union nut for each brake line a bit (one line at a time). Have someone push on the pedal as you watch what oozes from the connection. When air and or bubbles stop coming out and only fresh fluid is oozing, tighten the union nut. When you are doing this, you want to have the other person press on the pedal and hold it as long as the connection is open. Close the connection before you have them let up on the pedal so that no air is sucked backing to the m/c This process can repeat this as necessary. Note. if the m/c is air locked, you will get a lot of air out and then fluid. This will make the fluid level in the reservoir drop. Make sure you top it up before you continue bleeding the wheel cylinders.

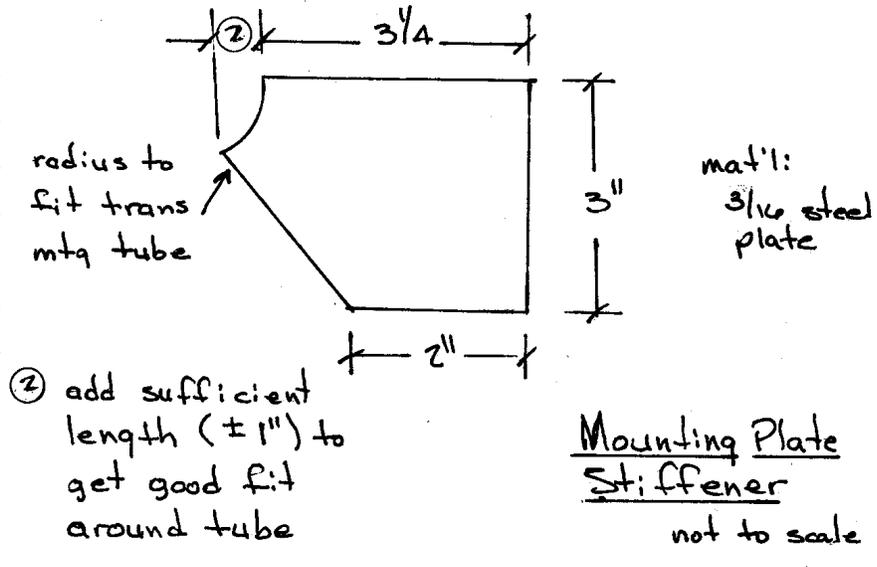
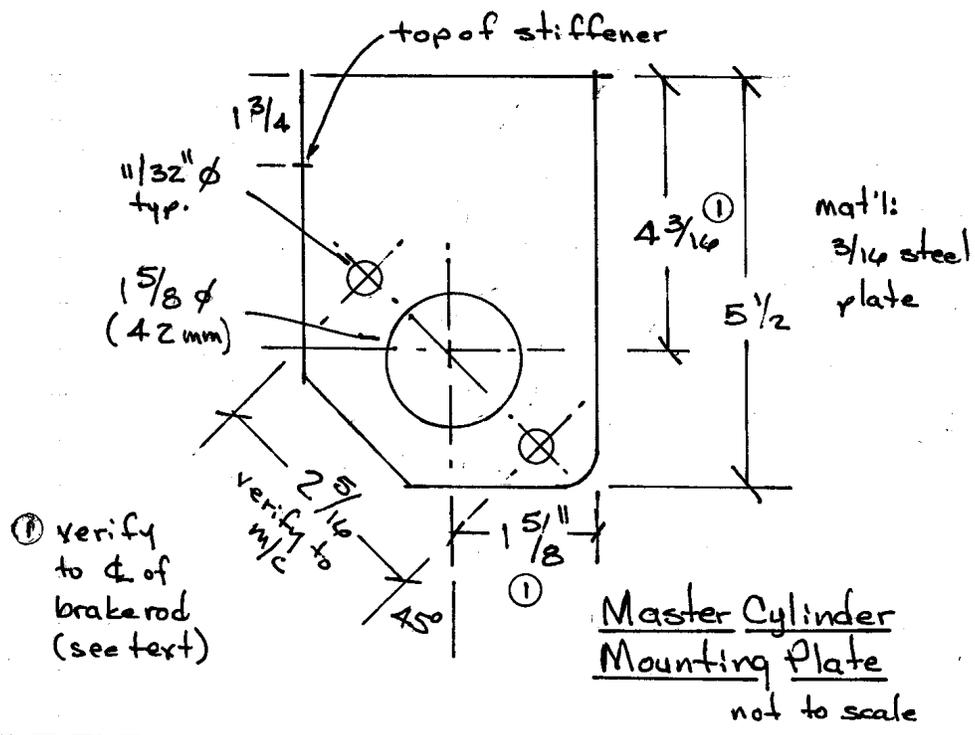
Section 7 – Adjustments

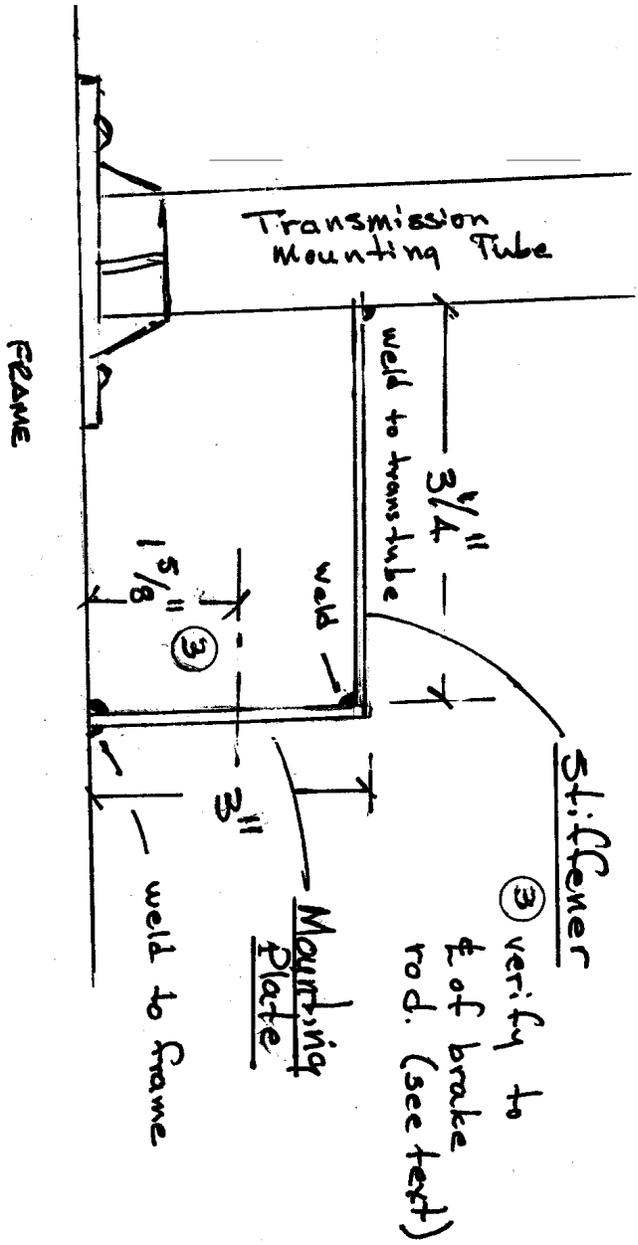
Apart from the standard brake adjustments typical to all TC's, the only other adjustment necessary for the conversion is the brake pedal free play adjustment.

Brake pedal free play is the amount of pedal movement before the pushrod touches the piston inside the m/c, before the piston starts to move. There needs to be 1 mm (0.040 in.) of free play - measured with a dial indicator. This distance is critical to assure that after braking the piston comes back far enough (but not too far) so that it does not block the transfer ports to the reservoir, allowing the pressure built up during braking to return to the reservoir and relax the system. Failure to release this pressure will keep the brakes tight to the drums, overheating them and eventually locking them.

These thoughts and comments are from my experience at the conversion. I encourage users of this article to make corrections, additions or comments. They should be addressed to:

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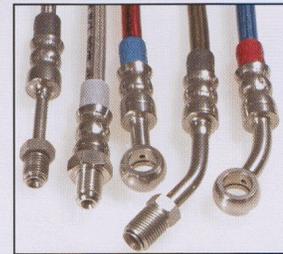
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