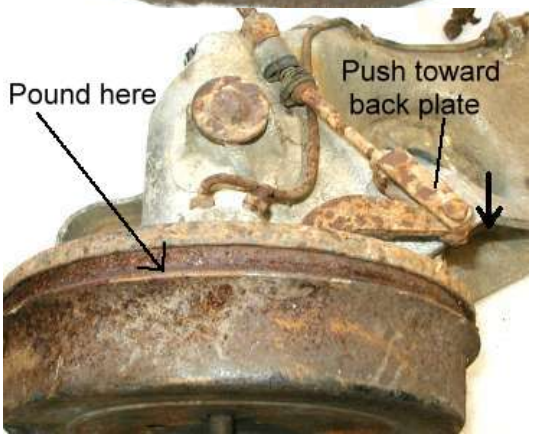
TR250 & TR6 Brakes
Overhauling Rear Brakes

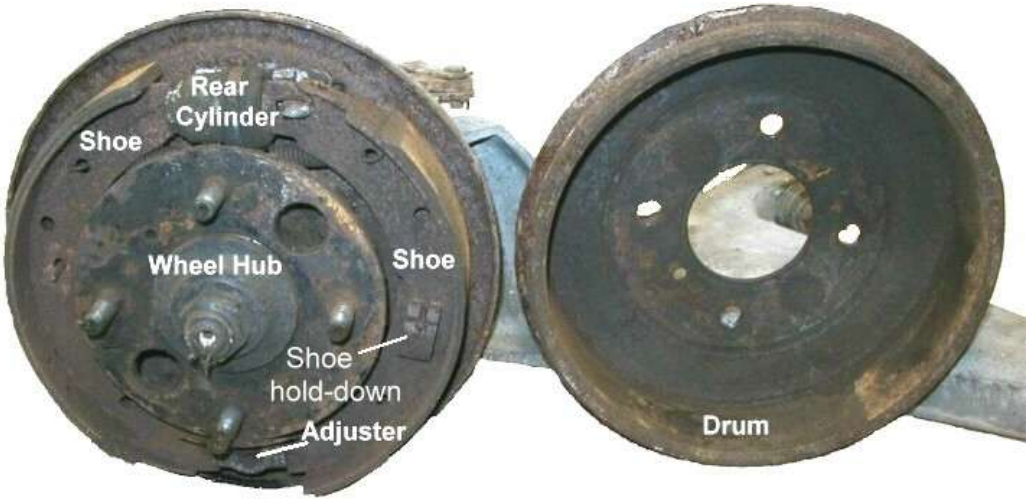
These notes describe what I did on my car for my personal use and are provided here for entertainment; they are not meant to be instructions for others to do maintenance on their vehicles.

This section describes how I overhauled the rear brakes for my '70 TR6. As mentioned in other notes, the car is completely disassembled and I was able to take the rear suspension arms to the workshop to do the work (it's February, cold in the garage but nice and warm in the basement workshop). Everything done here could have been done with the suspension arms still on the car.

Removing the drum: The first step to get at the rear brake components is to remove the drum. The photos at right show the right rear suspension arm with hub on the workbench. The drum is retained to the hub by the two little flat head screws. (Actually, the drum is sandwiched between the wheel and hub and held in place by the four studs and lug nuts. The main purpose of the little screws is to make drum removal difficult.) If I can't get the screws out and end up buggering up the heads I drill out the screw heads with a 1/4 inch drill. I only drill though the head far enough so I can knock the head off with a chisel and not so far as to damage the threads in the hub. I later use PB Blaster on the remnants in the hub and then a screw extractor.

The book says that once the little screws are out, you withdraw the drum --- like it's going to slide right off. No way! That sucker holds on like a tick to a dog. If the stuff is still on the car, I make sure that the handbrake is released and then push the lever where the handbrake cable connects as far as it will go toward the brake back plate as shown in photo. I next make sure I can turn the drum. If not I use a brake-adjusting wrench to turn the adjusting screw out as far as it will go out. The adjuster screw is on the bottom of the back plate. I always use a brake-adjusting wrench to avoid damaging the 1/4 inch square head of the adjuster screw. Once the hub can be turned, I use a big hammer and punch on the lip around the outside of the drum. It usually comes off after I pound a while. (This task usually expands the vocabulary of observing children).





Removing the Hub: The components with the drums removed are shown above. Yes they are filthy. All maintenance can be done on the bakes without removing the hub. However, I wanted to clean and paint the back plate so I pulled the hub at this point. It also makes for better photos with the hub out of the way. (Also, to make for better photos I removed the back plate, wheel cylinder and adjuster, cleaned them up and then put everything back together.) The six nuts holding the hub to the studs in the suspension arm are accessed through the two holes in the hub using a socket and extension as shown on the left photo below. I used a construction pry bar to get the hub loose. The hub was then withdrawn as shown in center photo. The handbrake cable and hydraulic pipe were then disconnected (right photo). The pipe in this case was not worth saving so I cut it at the wheel cylinder.



Removing the Shoes: I removed the brake shoes next. The ends of the brake shoe hold-down pins were grasped with pliers and rotated 90 degrees to release them from the hold-down springs, see left photo below. The trick I use to remove the shoes is to grasp the top end of the rear shoe with pliers as shown in the middle photo --- the pliers act like a lever --- then lift the end of the shoe out of the slot in the cylinder and pull it in front of the cylinder. This releases some of the tension so it is easy to pull the lower end of one of the shoes out of the slot in the adjuster. At this point the springs are all loose and shoes with springs can be pulled off leaving the plate with wheel cylinder and adjuster as shown in right photo.

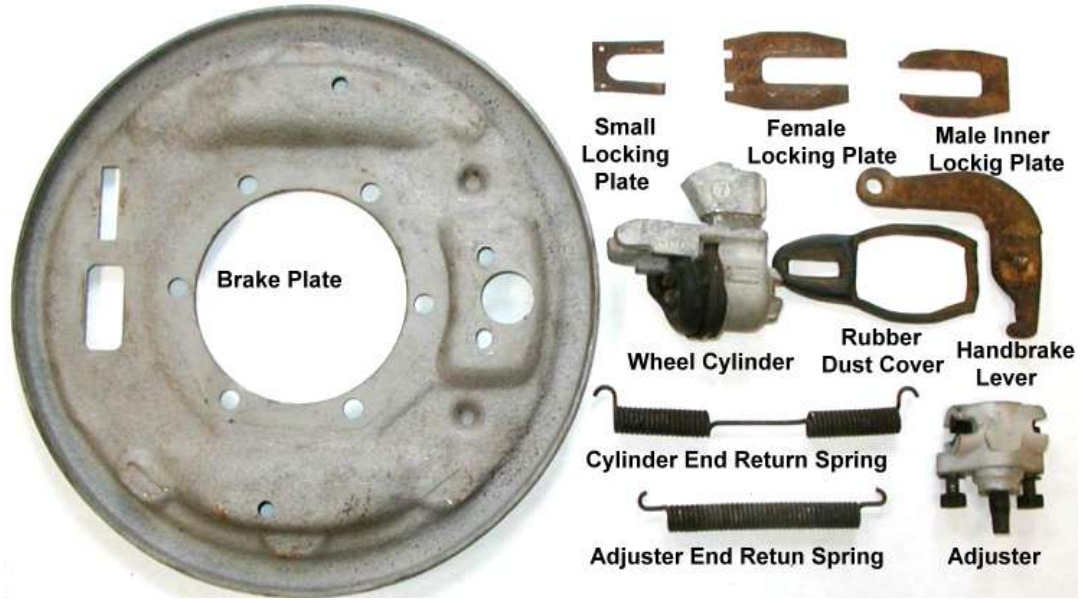


Removing Adjuster & Wheel Cylinder: I removed the two nuts that hold the adjuster next as shown on the right.

The wheel cylinder is a little more difficult to remove. I first drove the small locking plate to the rear using a punch as shown in left photo below. Next, I slipped two small screwdrivers under the back end of the female locking plate and pried it up and out of the two tabs on the male inner locking plate. I could then drive the female plate to the rear as shown in the middle photo. Once the female plate was out of the way, the rubber dust cover was removed. This left sufficient slack in the cylinder so that it could be lifted away from the plate enough to slip the handbrake lever out of the retaining slots. The handbrake lever was then removed from the brake plate. With the lever out of the way, the male retaining plate was free to slide toward the front allowing the wheel cylinder to be removed (right photo).




The right side brake components are shown in the photo below --- less the drum and shoes. The left side is identical (same part numbers) except for the Brake Plate. Different pipes and rear hoses are used on each side as discussed in the section on pipes.



Disassembling Adjuster & Wheel Cylinder: The adjuster came apart pretty easy this time. In the past however I've had trouble freeing the adjuster screw. A shot of PB Blaster, and overnight wait and then heating with a propane torch seems to free the steel parts from the grasp of the aluminum castings. I usually don't want to wait so give it a shot of PB Blaster --- get a cup of coffee --- heat -- PB Blaster, heat again, at which point it usually comes free.

The wheel cylinders are usually not so easy. The piston can be pulled out with pliers. The problem is the bleed nipple and the pipefitting. I've had good luck with the PB Blaster & heat cycle described above for the adjuster. I use a 7/16 inch 6 point socket and try not to twist them off. If I twist one off -- all is not lost. Both the fitting and bleed nipple have holes in the center so they can usually be drilled out 21/64" and then tapped 3/8-24. Usually the old threads from the steel parts come out when the tap is started. Note that the drill should not go all the way into the hole as it might damage the end part where the fitting and nipple seal. The end of the nipple and the end of the fitting aren't threaded and should come out after the top threaded part is drilled out.

The rubber parts were discarded and everything else was sandblasted and the castings were then powder coated aluminum color at the same time as the master cylinder. The powder coating should keep everything looking nice longer.

I decided to purchase the following new parts:

- Wheel Cylinder Fitting Kits
- Shoe hold-down pins
- Return Springs
- Bleed Nipples
- Wheel Cylinder Seal Kit - I measured cylinder carefully and determined it was 0.70 inch diameter and not the later 0.75 inch diameter.

I decided not to pay $2 each for the shoe hold-down springs. I already had a new set of brake shoes and was also considering reusing the old ones, so I didn't order those either. Replacement of both the springs and wheel cylinder fitting kits is probably overkill. I'm keeping all the used parts -- maybe I'll blast and powder coat them for some future project.

Before starting the reassembly I blasted and powder coated the backing plates, and shoe hold-down springs gloss black. The wheel cylinders, adjusters and park brake lever were all powder coated in aluminum.

Reassembling the Adjuster: I ran a tap into the casting threads and a die down the adjuster screw threads. I then put some wheel bearing grease inside the casting and screwed the adjuster screw all the

way in. I then coated the tappets with grease and slid them into position. The adjuster was then mounted to the freshly painted back plate as shown on the right using stainless steel internal lock washers and nuts. I have two wrenches for the 1/4" square adjuster screw heads, a ratcheting type that can stand little torque and a longer box end, both shown in photo on right. The handle on the box end wrench is at an angle to the end to give some clearance for the wheel and tire. I recently had a bout with the 5/16" square head taper bolts used to secure shifting forks in the gearbox and was on the lookout for a couple 4-point sockets. I found that McMaster-Carr carries 8 point sockets and that's probably the best I'll be able to do.

Reassembling the Wheel Cylinder: The first step in the reassemble process was to hone the cylinder (to remove any glaze as well as any imperfections. I use a little brake fluid for lubricant when honing. The hone is shown in action in the left photo below.) These cylinders were pretty crummy looking when we started on them but are now better than new with the nice powder coat. I then ran a 3/8-24 tap into the two ports to clean out the threads. I then washed them thoroughly in detergent, rinsed and dried with air. The pistons were then polished on a wire wheel, coated with red rubber grease. The piston with a new seal installed is as shown in center photo. The inside of the cylinder was coated with brake fluid, the piston inserted and the area around the end of the piston and cylinder coated with grease as shown in the right photo. The piston orientation is off about 90degrees in that last photo. It was easily rotated with a pair of pliers.

The next step was to install the dust cover and dust cover retainer as shown on right. The final step was to coat the threads on the bleed nipple with the red rubber grease, install the nipple and then the bleed nipple cap. It'll be at least a year before these see service so it's import to close the input port. I temporarily used silicone plug from my powder coating masking kit. After everything is installed I plan to plug the hole with a short 3/8-24 bolt.

Installing the Wheel Cylinder: I bought a new wheel cylinder fitting mounting kit containing rubber dust covers and the three wheel cylinder locking plates for two cylinders. The mounting hardware for one cylinder

and the rear wheel cylinder lever assembly are shown on the right. The new locking plates were black with no corrosion protection so I powder coated them when I did the lever. The fitting kit also contained a small packet of green mechanical grease. I was going to use a light lithium grease if there was no grease in the fitting kit.

The first step in installing the cylinder is to coat the under side of the cylinder when it fits against the back plate with grease, coat both sides of the male locking plate with grease and mount the cylinder and secure with the locking plate with the tabs away from the cylinder as shown on the right.,

The lever assembly was then inserted from the front side and the pivot rods on the lever slipped into the mating recesses in the cylinder. The rubber dust cover was then slipped over the end of the lever and positioned around the male locking plate.

The female locking plate was then slipped into position over the male locking plate with the tabs on the male plate sliding into the slots on the female plate as shown on the right. (This almost sounds like sex education.)

The last step was to install the small outer locking late. All the other plates slide into position easily by hand. This plate is a force fit. I used a hammer and small punch to drive the plate into position. The cylinder was then checked to make sure it would slide back and forth in the slot on the back plate.

Shoes: My old Haynes manual says the shoes must be replaced when the shoe linings are worn down to 0.06 inches at the thinnest point. My shoes were much thicker than that but the linings had cracked in a few places so I decided to install new shoes. The old shoes are shown in left photo below. Note that the front (right) shoe has a rectangular hole at the top end for the lever and the rear shoe doesn't have a rectangular hole. Excepting that rectangular hole, the shoes are identical. Note that the lining is closer to the bottom end of the front shoe and closer to the top end of the rear shoe. The shoes are mounted with the opposite ends at the top. Note the hole for the shoe retaining pin is above the midpoint on the rear shoe and below the midpoint on the front shoe. When the holes are in this position they line up with the holes in the back plate. So, you know you have the shoes oriented correctly the retaining pin holes line up with the hoes in the back plate. The new shoes are shown in the right photo. Note that there is no difference between the front and rear shoes. (And yes, the other two shoes look just like these two.) These shoes were purchased in 1989 so for at least 13 years some manufactured have been providing identical shoes in the new sets of four shoes. About three weeks after installing these shoes I found another box of new shoes purchased in 1999. The rear shoes in that set don't have the square hole.

Springs: When I open the package of new springs I found them a little shorter than the old ones as shown in the left photo below (new springs are black). That should be expected as springs stretch with age. The upper spring was much shorter than expected however, upon further inspection I found the new spring attaches with a hook rather than the loop of the old spring. The right photo shows how the old style connects to the brake shoe. The new style upper spring is the same as both the old and new lower springs and attach the only way I can see possible, hook in the hole.

Installing the Shoes: The first thing I do to install the shoes is to fit the rectangular hole in the front shoe over the lever and slide the edge of the shoe into the slot in the wheel cylinder piston. I then fit the bottom of the front shoe into the slot in the adjuster. I next attach the bottom spring to the holes in the two shoes, place the bottom of the rear shoe into the back of the adjuster and pull the top of the shoe toward the rear (right photo) and temporarily set the top of the rear shoe in the slot in the rear of the wheel cylinder.

I next hook one end of the top spring into the top hole in the front shoe and then grasp the top of the rear shoe with pliers as shown on the right. The rear shoe is lifted off the wheel cylinder and brought to the front far enough to hook the back of the top spring into the top hole in the rear shoe. The pliers are then used to gain extra leverage to push the top of the rear shoe to the rear far enough so that it can be positioned in the back of the wheel cylinder.

The last step is to push the shoe retaining pins in from the rear and secure with the shoe hold down springs. I chose not to

order new hold down springs because the cost~ $2 each. Instead, I blasted four old springs and powder coated them. (I must share this tale of economy with the wife who seems to think I spend too much money on car parts.) The assembled brake unit is shown on the right.

The next thing I did was to blast the drums and powder coat them using the high temperature silver I use on exhaust manifolds. This should solve the problem of paint coming off after a few short trips. I decided not to turn the drums. I look at two things before deciding to turn the drums. The first is to determine if the surface is rough --- in my case it was not. The other thing I look for is a ridge just to the outside of the area where the shoes rub against the drum. As the drums wear, this small section near the edge of the drum doesn't wear and forms the ridge. If this ridge gets very high then it may be even more difficult to slide the hubs over the shoes. There was a very small ridge on these drums but not enough to expend the effort to turn the drums. Also, one should avoid turning the drums if not necessary because there is a maximum safe inner diameter. One of the drums here had "**9.04 INS MAXIMUM DRUM DIA WITH NOT LESS THAN .06 INS LINING THICKNESS**" cast into the front surface. The assembled unit is shown on the right.

Photo of rear suspension goes here --- after I get it all cleaned up.

Links to other notes on TR250 & TR6 Brakes:

Brake Theory & Overview
Overhauling Brake Master Cylinder & PDWA
Overhauling Brake Servo
Overhauling Pedal Assembly
Overhauling Front Brakes
Overhauling Handbrake
Overhauling Brake Pipes
Selecting Brake Fluid
Bleeding & Adjusting Brakes
Troubleshooting Brakes