

Installing Galfer Braided Stainless Steel Brake Lines on a 94-96 K1100RS



Disclaimer: These are just some notes on how I do this. If you choose to follow these instructions then you do so AT YOUR OWN RISK and I accept no responsibility if anything goes wrong. Since brakes are critical to your safety when riding, if you're not comfortable working on brake systems then you might want to consider having a qualified mechanic install your brake lines.

Banjo Bolt Torque Values: The instructions that come with the Galfer kit specify a maximum torque of 17-20 ft-lbs for the steel banjo bolts that come with the kit or 12-15 ft-lbs for the optional aluminum banjo bolts available from Galfer. The BMW K1100 Repair Manual specifies 18 N-m (13.3 ft-lbs) for the banjo bolts. Given that a new front master cylinder from BMW costs over \$350 if you strip the banjo bolt threads in the master cylinder, I'd recommend going with the BMW torque value of 18 N-m for all of the banjo bolts. Other relevant brake system torque values are shown in the table below.

94-96 K1100RS Brakes - Torque Values	Min	Max	Min	Max	Min	Max
	ft-lbs		in-lbs		N-m	
Galfer Steel Banjo Bolts	17	20	204	240	23.0	27.1
Galfer Aluminum Banjo Bolts	12	15	144	180	16.3	20.3
BMW K1100 Manual Banjo Bolts	13.3		159		18	
Front Caliper Bleeders	10.3		124		14	
Rear Caliper Bleeder	8.1		97		11	
ABS Control Unit Bleeders	6.6		80		9	

The BMW manual also specifies 18 N-m for the other brake fitting connections but since I only have a ratcheting torque wrench I just tightened the line to line connections by gut feel.

Brake Fluid: BMW specifies DOT 4 compliant brake fluid for use on K1100s. I've always had good luck using Valvoline synthetic DOT 3 & 4 brake fluid but any DOT 4 brake fluid should work fine. Note that brake fluid likes to eat paint so if you spill any on a painted surface then be sure to wipe it off immediately.

Tools Required:

- Torque wrench
- Sockets: 14mm (for banjo bolts) and deep well 11mm (for bleeder valves)
- Box wrenches: 10mm, 11mm, 13mm, 14mm
- Allen wrenches: 5mm, 6mm, 8mm
- Brake bleeding equipment
- Roll of paper towels to wipe up any brake fluid you spill

Installing Galfer Braided Stainless Steel Brake Lines on a 94-96 K1100RS

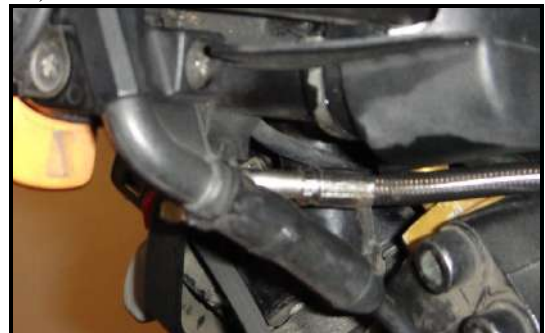
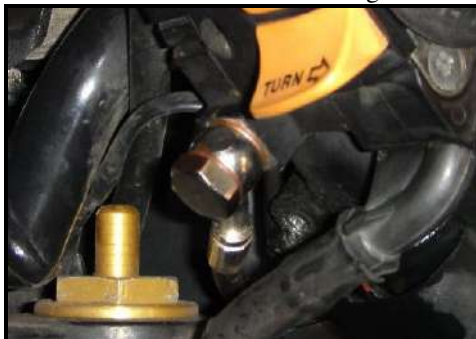
INSTALLING THE FRONT BRAKE LINES

1) Installing The Master Cylinder Line

- Put the bike on the center stand.
- Turn the handlebars to the left and remove the four Phillips screws that hold the cover on top of the front master cylinder reservoir. (Use a good screwdriver and adequate downward pressure as the heads of those screws can strip if you're not careful.)
- Remove the master cylinder cover and the rubber boot underneath it.
- Use some paper towels to absorb and empty the brake fluid from the reservoir.
- The ABS control unit is located under the left side of the rider position of the seat and has two rubber caps on the two brake bleeder valves on top of it. The rear bleeder valve is for the front ABS modulator and the front bleeder valve is for the rear ABS modulator. Use the rear bleeder valve (11mm wrench) to bleed the brake fluid out of the line from the front master cylinder to the ABS control unit.
- Remove the seat.
- Remove the clips holding the rear of the gas tank down, lift the rear of tank and pull the tank backwards to expose the small nylon bracket under the left front of the tank that holds the metal brake lines to/from the ABS control unit together. Undo the 5mm Allen bolt that holds that bracket together and remove the top half of the bracket.



- The brake line coupling in blue circle in the picture above is where the line from the front master cylinder connects to the metal brake line to the ABS control unit. Using 11 and 14mm box wrenches, unscrew that coupling.
- Using a 14mm socket or box wrench, unscrew the banjo bolt on the bottom of the front master cylinder. The old front brake master cylinder line can now be removed.
- Route the Galfer brake line labeled "MASTER CYLINDER" from the bottom of the front master cylinder to the coupling under the tank. (I found that the best routing seemed to be running it through the hole in the center of the main fairing bracket.)
- Route the banjo bolt fitting end of the line over the throttle cable and, using one of the banjo bolts supplied in the kit with a new copper washer on each side of the fitting, install the banjo bolt in the bottom of the front master cylinder. (I found that angling it as much as possible inward towards the upper fork tree will make brake any future front brake maintenance easier without having to loosen the banjo bolt.)



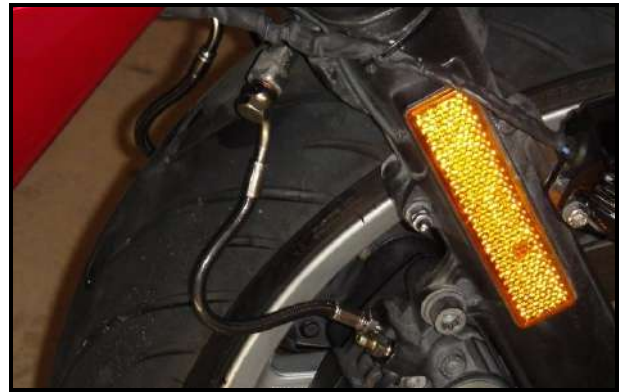
Installing Galfer Braided Stainless Steel Brake Lines on a 94-96 K1100RS

- Connect the other end of the line at the coupling under the left front of the tank and tighten it.
- Replace the top of the nylon bracket that holds the two lines together and tighten it's Allen bolt.
- You might want to replace the gas tank now but I left mine pulled back so I could check for possible leaks later when refilling the system with brake fluid.

2) Installing The Front Caliper Lines



Old



New

- Unscrew the Phillips screw that holds the black plastic cover above the fork brace and remove that cover.
- Loosen the four nuts on the fork reflectors. (Two per side.)
- Unscrew the two bolts holding the front and rear halves of the front fender to the fork brace and remove both halves of the front fender.
- Bleed as much fluid as you can from each of the caliper bleeder valves.
- Remove both caliper bleeder valves.
- Using a 14mm socket or box wrench, remove the two banjo bolts for the caliper brake lines from the splitter mounted in the fork brace.
- Using a 14mm box wrench, slightly loosen the caliper brake lines where they enter the calipers.
- Undo the four 8mm bolts (2 per caliper) that mount the calipers to the forks.
- Remove the calipers. (Note that you'll need to rotate the tops of the calipers towards you to spread the brake pads open a bit wider in order for the calipers to clear the rim of the wheel.)
- Remove the old brake lines from the calipers.
- Remount the calipers on the forks. (The purpose of this is to get the correct angle where the banjo bolt fittings at the tops of the new caliper brake lines connect to the splitter.)
- Using new banjo bolts supplied with the kit and new copper washers install the tops of the new caliper brake lines to the splitter on the fork brace. Just hand tighten them for now.
- Using a 13mm box wrench, install the bottoms of the new caliper brake lines in the calipers.
- Angle the banjo bolt fitting for each caliper brake line far enough out so that the line easily clears the front tire but is close enough to the front tire that it will fit inside the rear half of the front fender when that is reinstalled. Once you have each banjo bolt fitting at the correct angle, tighten it with a torque wrench.
- Then finish tightening the caliper lines where they enter the caliper.
- Reinstall the bleeder valves in the calipers.

3) Installing The Line From The ABS Line To The Splitter

- *(To be completed when I get the correct line from Galfer.)*

Installing Galfer Braided Stainless Steel Brake Lines on a 94-96 K1100RS

4) Refilling The Front Brake System With Brake Fluid

Master Cylinder To ABS Control Unit

- Turn the handlebars all of the way to the left.
- Fill the front brake reservoir about halfway full of brake fluid.
- S-L-O-W-L-Y squeeze the front brake lever. (If you don't squeeze slowly enough it will spurt out a little fountain of brake fluid and make a mess.)
- Keep an eye on the small hole inside the reservoir while repeatedly slowly squeezing the brake lever. Small air bubbles will come out of that hole as the air inside the master cylinder brake line is replaced with brake fluid. During this process, pour more brake fluid into the reservoir as needed.
- Once you no longer see little air bubbles coming up take a 5-10 minute break to let any remaining air in the master cylinder line work it's way up to the master cylinder.
- Slowly squeeze the front brake lever a few more times to see if there are still any air bubbles coming up.

ABS Control Unit To Splitter And Calipers

Due to the design of the ABS system, brake pressure (and fluid) from the ABS control unit must travel “uphill” to the steering head and then back “downhill” to the splitter and calipers. Therefore, if you try to bleed the system from empty to full with the calipers installed on the forks then there's a good chance lots of air will get stuck in the “hump” between the ABS control unit and the calipers. (Air is much more compressible than brake fluid so you want as little as possible of it in your brake system.)

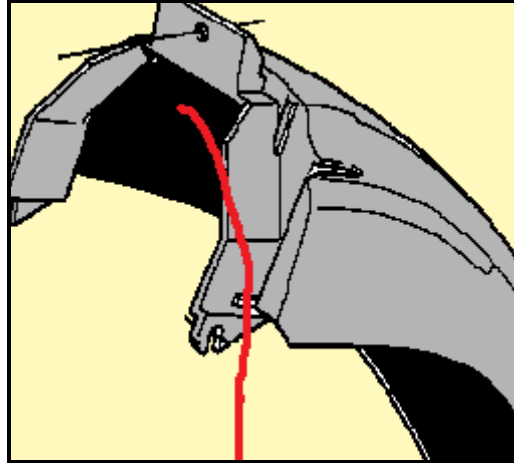
What I've found works well is to remove the splitter and calipers from the forks and hang the left caliper from the ceiling as high as possible so that the left caliper's bleeder valve is the highest point in the system so that any air in the system will rise to the left caliper's bleeder valve and can be bled out from there.

- Remove the four 6mm Allen bolts that hold the fork brace to the forks.
- Remove the 5mm Allen bolt that holds the splitter to the fork brace.
- Push the fork brace up the brake line to the near the steering head and tape it out of the way so that it doesn't scratch any paint.
- Run a rope from the ceiling to the upper mounting hole on the left caliper and get the left caliper as high as possible.
- Place some sort of spacer in between the brake pads on each caliper to keep the brake pads spread apart while bleeding. (5mm Allen wrenches taped so that they stay between the pads work pretty well.) If you fail to do this then the brake pads will get pushed together when you're doing the bleeding and then you'll need to spread them back apart in order to get the calipers reinstalled on the forks. Not only is this a hassle but it also causes a lot of backpressure on the master cylinder seals which they really aren't designed to handle. If you do end up needing to spread the pads then I recommend opening the bleeder valve to relieve the backpressure it can create.
- Bleed the front brakes until all air has been removed from the system. Keep an eye on the fluid level in the master cylinder reservoir as you bleed the brakes and top it off as needed.



Installing Galfer Braided Stainless Steel Brake Lines on a 94-96 K1100RS

- Untie the calipers from the ropes suspending them from the ceiling.
- Reinstall the splitter to the fork brace.
- Reinstall the fork brace to the forks.
- Reinstall the calipers to the forks.
- Reinstall the front and rear halves of the fender to the fork brace making sure that the tabs on each of them are inside of the washers on the insides of the fork reflector bolts. When mounting the rear half of the front fender make sure that the ABS sensor wiring is mounted outside of the mounting tab as shown below so that the ABS sensor wiring doesn't rub against the tire:



- Tighten the fork reflector bolts.
- Fill the master cylinder about halfway full and reinstall the boot and cover on the top of it.
- Pump the brake lever a few times to get the pads seated and after a few pumps of the lever you should feel a familiar level of resistance in the lever.
- Inspect each brake line connection and check it for leaks.
- Reinstall the plastic cover over the fork brace.
- Reinstall the gas tank and seat.
- Take a short (and careful) ride to ensure that the front brakes are working properly.

Installing Galfer Braided Stainless Steel Brake Lines on a 94-96 K1100RS

INSTALLING THE REAR BRAKE LINE



Old



New

I had the rear wheel off to get a tire mounted while doing this. Though probably not 100% necessary I'd guess that doing this with the rear wheel off makes it easier.

- The Ohlins shock on my bike has a larger diameter spring than a stock shock so I had to remove the nut on the lower shock stud so I could pull the bottom of the shock out in order to be able to remove the rear caliper.
- Remove the right side cover.
- Take the cap off and empty the rear brake reservoir of brake fluid. (It's located up under the right rear of the fuel tank.)
- Bleed the rear brake system of as much fluid as you can.
- Using 11mm and 14mm box wrenches, disconnect the coupling between the metal line from the ABS control unit and the line to the rear caliper.



- Slightly loosen the banjo bolt where the rear brake line goes into the caliper.
- Undo the two bolts that mount the rear caliper to the final drive.
- Remove the caliper and remove the banjo bolt for the rear brake line from it.
- Using one of the new banjo bolts from the kit and two new copper washers, install the banjo bolt fitting of Galfer brake line labeled "REAR LINE" to the rear caliper. Just hand tighten it for now.
- Reinstall the rear caliper on the final drive with it's mounting bolts.
- Using 11mm and 14mm box wrenches, connect the coupling between the new rear master line and the metal line from the ABS control unit.
- Torque the banjo bolt on the rear caliper.

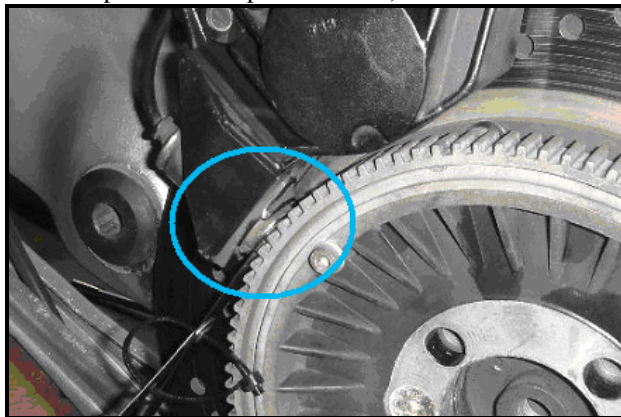
Installing Galfer Braided Stainless Steel Brake Lines on a 94-96 K1100RS

Refill The Rear Brake System With Brake Fluid

- Undo it's mounting bolts and remove the rear caliper.
- Hang the rear caliper by the rear mounting hole by a rope from the ceiling so that it's as high as possible and it's bleeder valve is the highest point in the system.



- Refill the rear brake reservoir with brake fluid.
- Repeatedly squeeze the hose from the reservoir to the rear master cylinder until the air bubbles stop to get the air out of that line.
- Bleed the rear brake system to fill it with brake fluid. I try to do it quickly to get as much air as possible out of the metal line that goes down from the ABS control unit to the rear caliper.
- Reinstall the rear caliper but leave the mounting bolts loose.
- Place a 0.60mm-0.65mm feeler gauge between the ABS sensor on the caliper and the ABS ring on the brake rotor. Press down on the rear caliper while tightening it's mounting bolts. (This ensures that the gap between the ABS sensor and ABS ring is 0.60-0.65 per BMW's specifications.)



- Fill the rear reservoir to between the Min and Max lines, replace it's cap and reinstall the reservoir in it's bracket.
- Put the rear wheel back on.
- Take a short (and careful) ride to ensure that the rear brakes is working properly.