

R100GS Race Tech Gold Valve

Contributed by Scot Marburger
Monday, 27 February 2006
Last Updated Tuesday, 28 February 2006

Seems like for years I've been hearing about a mysterious "Gold Valve" cartridge emulator that would transform the forks on the GS into race quality works of art. I was curious enough that, when Tom McBride posted a note on the GS mailing list that he was looking for someone to split a Gold Valve kit with him, I decided to try one out. Tom had done all the leg work, calling Race Tech to find out which parts were needed and how much they cost. We ended up with the Harley Showa 41 mm kit, Race Tech part number FEGV S3802. He even forwarded me the install notes put together by another GS lister, Jorge Carbo (I've converted Jorge's original Word document into PDF so everyone can read it). Jorge's notes are good, but they say one picture is worth a thousand words, and I'm hoping this page helps answer the questions others might have related to the install.

The Gold Valve replaces the compression damping* function of the brake side fork leg on the R100GS (for those of you unfamiliar with the peculiarities of the GS front suspension, rebound damping is handled by the left leg). The valve works by modulating the flow of fork oil through holes in the valve body. At slow fork speeds (like when you aren't hitting any bumps) the oil flows through a small hole in a washer in the middle of the valve. The hole is only about .12" in diameter and doesn't let much oil through, so when the bumps get bigger, something has to give. That something is the washer, which unseats from the valve body and lets oil flow around its outer edges. The spring you see on the right side of the valve makes sure that the washer returns to its seat when the bump is done. The spring also controls how far the washer moves, allowing some fine tuning of the valve. In fact, the Gold Valve comes with both 40 pound/inch and a 64 pound/inch springs (Race Tech recommends the 40 pound/incher, so that's what I installed, with three turns of spring preload).

Installation of the Gold Valve consists of removing the brake side fork leg (usually the right leg as you sit on the bike), tipping out the spring and spacer, shortening the spacer, drilling some extra holes in the damping rod, and throwing the thing back together. The extra holes are necessary to allow a less restricted flow of oil to get to the valve so it, instead of the original hole in the damping rod, can do the work. And the spacer gets shortened to make up for the length of the Gold Valve and its adapter ring.

I started by removing the cap from the end of the front axle, then loosening the axle pinch bolts (all four of 'em). Then I put a jack under the skid plate and lifted the front wheel off the ground. Chances are the wheel will be off the ground to start with, but the jack ensures that the front end won't come down unexpectedly. At that point it was a simple matter to pull the axle, let the front wheel drop, and roll out from under the fender. My bike has a low fender, as only real dirt bikes need a high fender, and we all know that the GS is as much a dirt bike as a pig is a ballerina. As such, the lower fender keeps rain and road muck off me and the bike much better than the poseur high fender ever could. But to get the fork leg out I had to remove the four bolts that hold the fender on, disconnect the brake caliper from the fork leg, and move the whole mess up so I could get at the two bolts that hold the fork brace to the right leg.

That's not such a big deal, and it saves opening up the brake line and getting fluid all over the floor. I used a bungee cord through one of the caliper mounting holes to hang it and the fender from the 'roo bar. At that point it was a simple matter to remove the two bolts that hold the fork brace to the fork leg.

It was a good time to drain the fork while the bike's holding up the fork leg. Having gushed fork oil all over the floor on several previous occasions, I decided to take it easy on pulling the drain plug. Toward that end I made sure that the drain screw covered part of the drain hole when it came free of the threads. Tipping it a bit deflected the fluid down into the drain pan instead of letting it shoot across the floor. When the bulk of the oil drained, I worked the slider up and down a few times to make sure none remained in the fork. I slipped a new "O" ring over the drain screw before re-installing it.

I put the axle back into the slider so I'd have something to keep it from turning and removed the damper rod bolt from the bottom of the slider. I made sure that the slider stayed over the drain pan, as some fork oil still remained in the tube. Doing this before removing the fork tube nut lets the fork spring keep pressure on the damper tube, and that keeps the damper tube from turning.

It's easiest to remove the fork tube top nut before dropping the tube out of the triple clamps. I started by loosening the top pinch bolt (I didn't loosen the lower bolts yet, as I didn't want the fork tube to turn while I was unscrewing the fork tube nut). Jorge had suggested squaring off the open end of the 30 mm socket that fits the fork nuts, and when I checked the socket I had it was clear that the big chamfer it had would keep about half of the flats from engaging the fork nut. I'm fortunate enough to have a lathe in the garage, and a few minutes with a carbide cutter quickly put things right.

To get to the fork nuts I had to remove the handlebars, and to protect the tank I just removed it. It's only a couple of fuel lines, the vent line, and the bale at the back (the steel strap went the way of the dodo a long time ago). Then I used an old bath towel to protect the fairing as the bars would lay across the two open sides. Removing the four bolts that hold the handlebar clamps in place had the bars out of the way in no time.

I put the forks at full left lock before engaging the 30 mm socket, and firm pressure with a breaker bar had the fork loose without much trouble. I used steady pressure on the nut so it wouldn't go flying when it came out of the last thread, as the fork spring is under a couple inches of preload. The wrench was pretty close to the fairing at that point, so I had to be careful not to mung anything up with all the loose pieces. With the nut off, it was easy to snatch out the plastic preload spacer and set it aside (after giving it a good wipe down).

As a last step I loosened the lower pinch bolts and wiggled the fork tube until it came out of the tripple clamps. Inverting the tube over the drain pan let the spring and damper rod slide into my waiting hand, and the little dribble of fork oil landed in the pan.

Now it's not necessary to remove the spacer from both fork tubes, but I wanted both on hand to keep track of how much to shorten the right one. The idea here is to get the total stack height of the right spacer and Gold Valve to equal the stack height of the original spacer. When I did the math, the spacer length turned out to be $6.646" - 1.010" = 5.636"$, with the first figure being the original length of the spacer, 1.010" the length of the Gold Valve and its spacer, and 5.636" ending up as the target length of the shortened spacer. As you can see from the dial gage, I ended up short by about 0.025", but that was plenty close enough.

Race Tech recommends using a tubing cutter on the spacer, and that's the way to go unless you've got a lathe handy. I shortened the tube with a hacksaw, to within a quarter inch of the desired length, then faced it down in the lathe to the final length. A steady rest kept the thing from flopping around too much.

With the first round of butchery complete it was time to turn my attention to the damper rod. As it comes from the factory, the damper rod has one hole running transverse through it near the bottom. It provides enough resistance to flow that BMW didn't need any other valving for compression damping. But since the Gold Valve was going to take over that mission, the resistance had to be eased a bit. Race Tech specifies two additional holes drilled 7/16" above and below the original hole. I eyeballed the center of the original hole, and estimated the 90 degrees to the tube's side. Then I marked and center punched the location for the new holes, and drilled them first with a 1/8" pilot hole and finally with the 5/16" holes recommended by Race Tech. Again I relied on my eyeball to get the punch marks at top dead center on the tube when it was mounted in the drill press vice, but as a check I ran the drill down past the end of the tube to verify that it would emerge pretty much centered on the opposite wall.

The drilling left the edges of the holes with some pretty big burrs, especially on the back side of the holes. This was true both where the holes broke through on the back side of the damper rod, but also on the inside of the rod. I used a Dremel tool with a little spherical burr to smooth off the holes and leave a chamfer at the edges. I found I could reach the inside of the new holes not only through the holes themselves, but also through the original hole. That made it pretty easy to clean off the burrs, but as a final measure I used a fine file to smooth the tiny burr raised by the Dremel. A few squirts of contact cleaner and some compressed air had the tube clean and chip free, both inside and out.

The last step I took before reassembly was to clean the inside of the fork slider. This helped a lot when it came time to torque the damper rod bolt, since a dry junction between the slider and the damper rod had a lot more friction than one slicked up with fork oil. This kept the damper rod from turning as the bolt was torqued. I used a few spritzes of contact cleaner shot down the fork tube, then compressed air to force the contact cleaner out the damper rod bolt hole. It helped to use my hand around the air duster to form a seal with the fork tube.

First I dropped the damper rod down the fork leg, making sure it bottomed in the slider by giving it a few side to side shakes. Then I put a new sealing washer on the damper bolt and threaded it into the damper rod, but I didn't attempt to torque it yet. Per the Race Tech instructions, I put the aluminum spacer on top of the damper rod, and slid the Gold Valve into the tube with the spring sticking up. You can see the basic orientation of the pieces in the picture. The aluminum spacer wanted to cock in the fork tube, so I had to reach in with a long screwdriver and tip it so it sat square. Next in was the fork spring, and I made sure that the end with the steel plug went in first. On top of this went the shortened plastic spacer. Now to keep the damper rod from turning as I tightened the damper rod bolt I had to get the fork tube bolt installed. That way the preload on the fork spring would increase the friction between the damper rod and the slider, hopefully enough to let me torque the bolt. Only problem was that when I pushed on the top of the fork tube to push the fork bolt into tube, the tube would collapse into the slider and move away from the bolt. So I ended up holding the fork tube in my left hand while I forced the fork tube bolt into the threads with the heel of my right hand. It took a few

tries to get the alignment right so a quarter twist would engage the threads, but the feat was accomplished without too much sweat. Then I snugged up the damper rod bolt and used the axel in the slider to keep things from turning as I torqued the damper rod bolt.

At that point I could slide the fork leg back into the tripple clamps and snug up the lower pinch bolts. I left the fork tube proud of the upper tripple clamp until I torqued the fork tube bolt home, then dropped the tube in the clamp until the top of the fork tube bolt was flush with the top of the tripple clamp. Then I torqued the top pinch bolt and loosened the bottom one.

Next I reattached the fork brace, repositioned the fender and caliper, and reinstalled their respective mounting bolts. I made sure that the brake shoes were pushed back into the caliper, then reinstalled the front wheel. The cap on the end of the axel was bolted on, and I removed the jack and bounced the front end up and down a few times to let things realign properly. Then tighten the axel and fork tube pinch bolts. Remove the filler plugs in the fork top bolts if they're not already out, and fill each leg with 15 weight fork oil to the BMW spec: 430-450cc for the right hand leg, 400-420cc for the left (as seen sitting on the bike).

After all that I was sure hoping that the Gold Valve would live up to its reputation, and after some back road blitzing I wasn't dissappointed. No, the change wasn't pronounced or revolutionary. But the harshness I'd experienced after going to 15 weight oil on the right (compression) side was gone, and there seemed to be less dive when I clamped down hard on the big M.A.P. rotor. The real test will come the next time the GS goes crashing over the rocks, but that'll have to wait a few weeks.

* It's damping, not dampening. Dampening is what happens when it rains.