

## Converting Stock Yamaha 1100 Exhaust to True Duals - By Kent Hartland

Includes: Lowering Stock Silverado Saddle Bags



### Overview

I love my 2006 Silverado 1100 V-Star and don't mind that it is primarily stock. Previously I had removed the baffles from the stock catalytics and was happy with the sound and appearance of the mufflers. But, it always seemed to me that the saddlebags rode high and stuck out a bit too much. That was all necessary due to the mufflers being stacked on top of each other. And, I wasn't wild about that, either.

There had been reports of a couple brave souls converting similar bikes to true dual exhaust, albeit with some custom fabrication and chroming and – importantly, not with the stock mufflers. But, I wondered, how hard could it be? True duals, running along both sides of the bike, would give me room to drop the bags a few inches.

Perhaps naively, I set forth but with one major difference. I was on a tight budget. - too tight to pay for fabrication or chroming. After studying the stock pipes, I figured I could do it almost exclusively with the stock pipes and some additional metal.

The finished product includes simple but stout brackets to secure the mufflers on both sides, some pipe grafting to get the mufflers to end up at the right length, a heat shield addition or two and reworking the saddle bag brackets to drop them and tuck them in.

Yeah, it might look a little better with a custom chromed header pipe and fancier mufflers but I'm happy with the look, sound and proportions of the end result. The bike appears longer, lower and more graceful now.

So, are you still with me? Let's see what happened.

## **Before you begin**

This is not a project for the faint of heart or under-equipped. You will need a welder, cutting torch (probably), grinder, metal cutting band saw (probably), with a good blade, a Sawz-all (reciprocating saw) with hacksaw blades, a metal file to smooth sharp edges, a drill (and preferably a drill press) and a tape measure.

**Remember: this describes a prototype setup that was formed through trial and error and a good bit of SWAG. All dimensions are close approximations. You do want to verify your own dimensions before cutting, welding or drilling. You may be able to improve upon the design or appearance. I'm just trying to get you into the ballpark.**

READ THIS DOCUMENT COMPLETELY THROUGH A COUPLE TIMES BEFORE YOU START. Get familiar with the basic flow and sequence of events before you start whacking away. It will make more sense to you that way.

## **You'll want to acquire:**

**1 - stock 1100 V-Star rear header**, which you will cut up to graft the pieces onto various parts of the system. We'll refer to this as the donor header. If you also purchase a stock front header you could remove its heat shields and put them on the exposed part of the left (rear) header if you want. Personally, I think it looks fine with some (sinister, ooh) black header pipe exposed behind the stock heat shield.

**1 - 12" x 8" (minimum) piece of 1/8" aluminum sheet** to make the saddlebag lowering brackets. Or steel, I guess. Aluminum is easier to cut.

**1 – 3" x 36" piece of 3/16" (or 1/4") steel bar**

**1 – 1" x 36" piece of 3/16" (or 1/4") steel bar**

**A few metric bolts and nuts to attach the brackets together.** I also suggest star lock washers. They not only help keep nuts and bolts tight they help keep brackets from moving around (by putting a star lock washer between two pieces of steel you're bolting together, they hold the angle that you want without trying to slip out of position).

If you plan to reroute and retain the stock AIS system you'll also need:

**1 piece of 1/2" OD soft copper tube 18" long**

**1 piece of 1/2" ID rubber hose 18" long.**

**A half dozen petite heater hose type clamps**

**A roll of painter's masking tape** (like the blue stuff since it comes off cleanly and doesn't try to become one with your bike)

**Two new copper gaskets** for the exhaust headers

## **Initial Steps:**

To begin, put the bike up on a jack or, preferably, jack stands. Remove the side covers, seat,issy bar, saddlebags, saddlebag brackets and mufflers. Remove both header pipes (only remove the front one if you plan to install the right-foot heat shield on the front header). Disconnect the battery (you don't want to weld on a bike with the electrical system connected). Make sure the bike is level front-rear and side-to-side.

This would be a good time to change the oil and filter while you've got the exhaust pipes off (ORK users disregard).

Remove the cast iron exhaust header gooseneck from the rear cylinder head. Flip the gooseneck over and temporarily reinstall it on the head, pointed out the left side of the bike. (Get used to taking things on and off several times before you finish the project. It'll just work out that way. Wait till you're all finished before using the Loctite and Anti-Seize). Attach the rear header pipe to the gooseneck.

This is a good time to look closely at the nuts that hold the gooseneck to the head. Unless they are pristine, I would suggest replacing them with new ones. The heat at that point of the engine ages steel prematurely, causing the nuts to crystallize and corrode. Also, use some high-temp copper filled anti-seize on the studs.

## Optional: Rerouting the Air Injection System (AIS) plumbing

If you want to remove your AIS, do it now. (If you plan to retain the stock catalytic mufflers, conventional wisdom is NOT to remove the AIS due to a fire hazard. Seems the AIS helps keep the catalytic converters cool). If you have removed your AIS, skip this section. Otherwise:

Remove the chrome  $\frac{1}{2}$ " tubing that snakes around from the front and rear cylinders into that little AIS valve body thing under your tool pouch compartment, to the far right center of Fig. 1. Note how each end of the chrome tubing connects so you get your new tubes hooked up correctly. Cut off the rear chrome tube, leaving about two inches of the end that attached to the cylinder head. Your new rubber hose will clamp to this. Bend a semi-spiral piece of  $\frac{1}{2}$ " soft copper tubing to replace the rear chrome tube and reattach it to the cylinder head chrome tube piece and AIS valve body with short pieces of rubber hose and clamps. Keep the copper and rubber clear of the hot stuff. See Fig. 1.

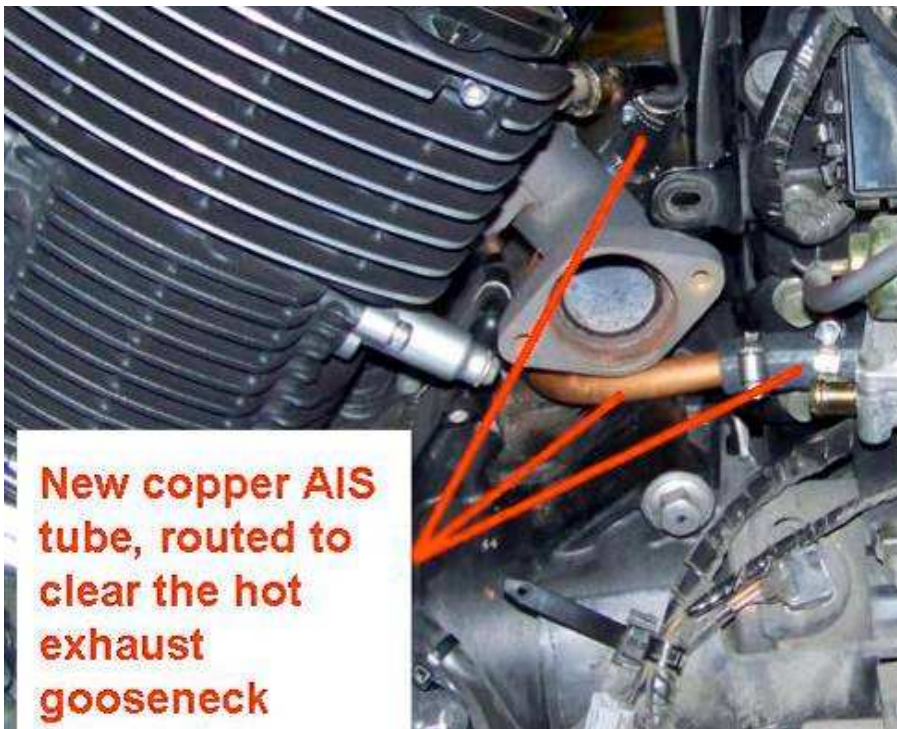


Fig. 1 New copper AIS tube, seen from the left side of the bike.



Fig 2. The new copper AIS tube, seen from the right hand side of the bike. You may choose to spray the tube with black VHT paint unless you are a 'form follows function' kind of guy.

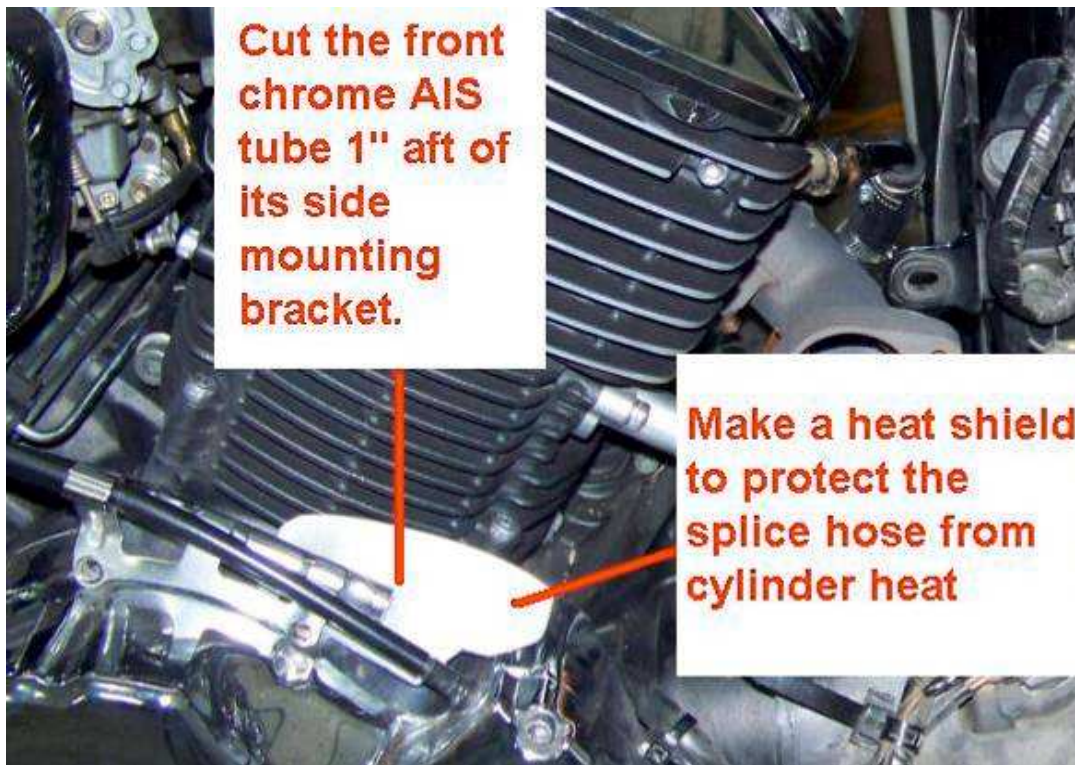


Fig. 3 Cut the front cylinder's chrome AIS tube, leaving enough to slide the new rubber hose over. Fabricate a heat shield from aluminum or stainless to prevent the rubber hose from melting.



Fig. 4 Connect several inches of rubber hose to the front chrome AIS tube and route it to the AIS valve body as shown, keeping clear of the header pipe. Note the new heat shield that attaches to the AIS tube mounting bracket cap screw.



Fig. 5 Drill a  $\frac{3}{4}$ " hole in the left engine lower side cover and route the rubber AIS hose through it. Alternately, you could use a piece of clear plastic tubing instead of rubber hose for better appearance.

That completes the rerouting of the AIS plumbing.

## Modifying the Left Side Cover

At this point, hold up the left side cover (the one with the key lock) and you'll begin to see that you need to make some clearance for the header pipe. You want to ensure that your plastic is at least an inch away from the hot exhaust pipe. Also, the stock metal ear that the front edge of the cover hooks over is against the gooseneck and must be removed or bent out of the way.



Fig. 6 The stock side cover retaining 'ear' is right up against the repositioned exhaust gooseneck and must be moved. I bent mine back rather than remove it, in the event some future owner might want to revert to the stock over-under exhaust and stock side covers.



Fig. 6 Cutting the left side cover to clear the header pipe. Caution: measure twice, eyeball things good, then cut. You could use a hand held coping saw for this too. The nice thing about these plastic covers is, if you cut off too much you can glue it back on with PVC cement (like you use for plastic pipe), smooth it up with filler, re-cut and repaint. Don't ask me how I know. ;^)



Fig. 7 The left side cover, after the cut.

I also made a new 'ear' and catch piece inside the left side cover to replace the stock one. Same idea, different location.

That concludes modifying the left side cover.

## Separating the Stock Catalytic Mufflers

The stock over-under catalytic mufflers are cojoined by a welded crosspiece and a cross pipe. These have to be cut to separate the mufflers. I suggest a Sawzall (reciprocating saw) with a metal cutting blade, or a really good band saw.



Fig. 8 Separating the stock mufflers.

Grind the remaining stubs of bracket and cross pipe down and weld the cross pipe holes closed with a round blank or large fender washer. These areas will be marginally visible on the finished product so take time to clean them up some. I shot flat black high-temp engine enamel over this part of each muffler, taping them so the painted areas are the same size and appearance on both mufflers. Most of the visible muffler is still chrome. Look at the picture on the title page of this document and you'll see what I mean.

This completes the separation of the mufflers.

## Finishing Out The Rear Header

Now, remember that 'donor' rear header I told you to buy? You did get that didn't you? Good. Now cut it so that you get the shallow elbow off as shown in Fig. 9. Cut right through the heat shield, pipe and everything. Make little slits in the end of the elbow as shown in Fig. 9.

Weld that shallow elbow piece onto your left header pipe as shown in Fig. 10. **DON'T THROW ANY SCRAPS OF YOUR DONOR HEADER PIPE AWAY.** You'll use most of it later.



Fig. 9 Notch the ends of the short elbow, as shown, so that end can shrink inside the muffler.



Fig. 10 Weld the donor elbow onto the end of your rear header pipe. Now the left muffler has something to connect to.



Fig. 11 I added a heat shield to the rear header to prevent passenger shoe melt.

Finally, I made a heat shield from a piece of stainless (actually a 10" drywall taping knife blade) and pop-riveted it to the rear header pipe. I ran the rivets through a short stack of small washers under the stainless so it stands off the hot pipe and stays cool. See Fig. 11.

Mask the chrome and spray the inner header pipe with black VHT paint.

This concludes modifying the rear header pipe.

## Modifying the Front (right side) Header Pipe

In order for both mufflers to evenly end at the same point, we need to add nine inches to the right side header pipe. We get the nine inches from the scraps of the donor header pipe. When you cut the shallow elbow off the donor header, it left a piece of straight pipe with attached heat shield. You need to weld a short piece of straight 1 3/8" pipe (the stock inner pipe) to that to make it nine inches long. Smooth the jagged cut edge of heat shield and round the sharp corners a bit. See Fig. 12

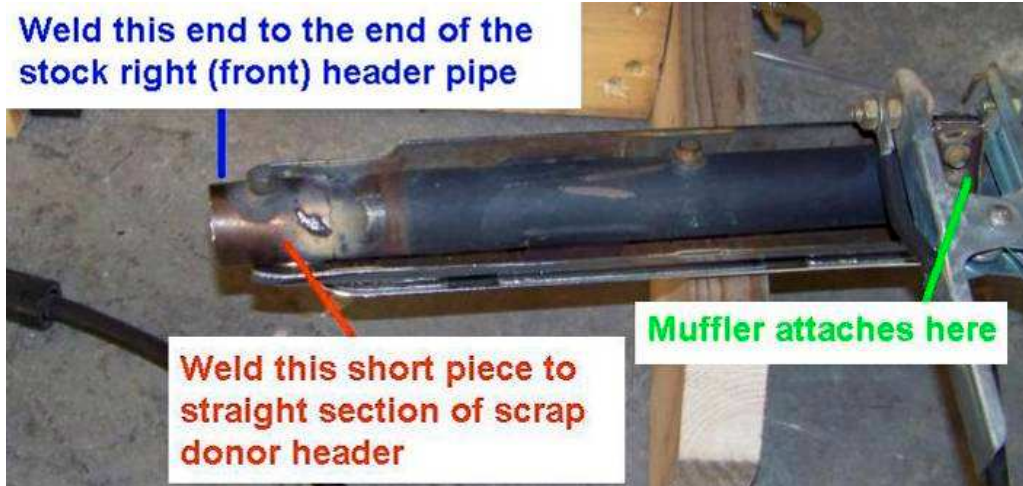


Fig. 12 Making the nine-inch addition to the right side header pipe.

Weld the nine-inch section to the right-side header pipe with the muffler clamp toward the rear. Now the right muffler has something to attach to. Bolt the right side header pipe onto the front head. Fig. 18 shows how it looks welded and bolted together.

This completes the modification of the right side header pipe.

## Adding a Heat Shield to the Front (Right Side) Header Pipe

Do you get tired of cleaning melted shoe goo off your front header pipe? Yeah, me too. Why Yamaha didn't provide a heat shield there, I don't know. But, we can do that with a little bit of trickery and deceit.

First, you have to remove the heat shield from one of those last scraps of that donor header. You want the piece with the slight bend in the heat shield (see Fig. 13). Round and smooth the cut end of the heat shield. Locate the shield on your header pipe (see Fig. 14), mark it and drill a 1/4" hole completely through the header pipe.



Fig. 13 The hole for the new heat shield.

Now goop a small amount of high-heat epoxy (like JB Weld) on the heat shield mounting nut boss (the flat part that touches the header pipe). Slide a stainless steel (for heat resistance) metric bolt with star lock washer through your new hole and attach the heat shield to the pipe. NOTE: the header pipe is actually a double-wall pipe at this point, so you are attaching the heat shield to the outer pipe, not on the hellishly hot inner pipe. The epoxy should be fine. The epoxy is there to prevent the heat shield from twisting around or getting bumped out of alignment.



Fig. 14 The new “right foot” heat shield (next to my '48 Studebaker brake pedal).

That completes the installation of the new right foot heat shield.

## Mounting the Right Side Muffler

We're ready to fabricate the mounting brackets for the mufflers. Again, this assumes we're utilizing the stock mufflers and their existing mounting ears. If you use different mufflers or slash tips, you'll have to figure out your own brackets.

Begin on the right side (there's a reason). The muffler for the right side will be the one that was on the bottom originally (It's the muffler with the little triangular heat shield near the forward end).

If you loosely slide the right muffler onto the header pipe, you'll see that the chrome mounting ear on the muffler lines up almost exactly with the rear mounting hole in the stock muffler hanger (it used to mount to the front hole). Except the rear hole is pointed up instead of out. Take the muffler off, remove the muffler hanger, cut the end off and re-weld it rotated 90 degrees as shown in Fig. 15, 16 and 17.



Fig. 15. We've cut the end off the muffler hanger. This is the new position we want to weld the end back on.



Fig. 16 Clamp it and weld away!



Fig. 17 We put the right side muffler hanger back on the bike. Now the right muffler has a place to hang out. Almost.

Next, we need to make a spine gusset to weld to the right muffler. This will provide a rigid two point attachment to the muffler hanger so the muffler doesn't wobble around at supersonic speeds. See Fig. 18 and 19



Fig. 18 The right muffler spine gusset welds to the muffler near the rear and along the chrome mounting ear. I welded them from behind so the welds are hidden. Note how the gusset and chrome muffler mounting ear bolts to the stock muffler hanger we previously modified, with the same bolt.

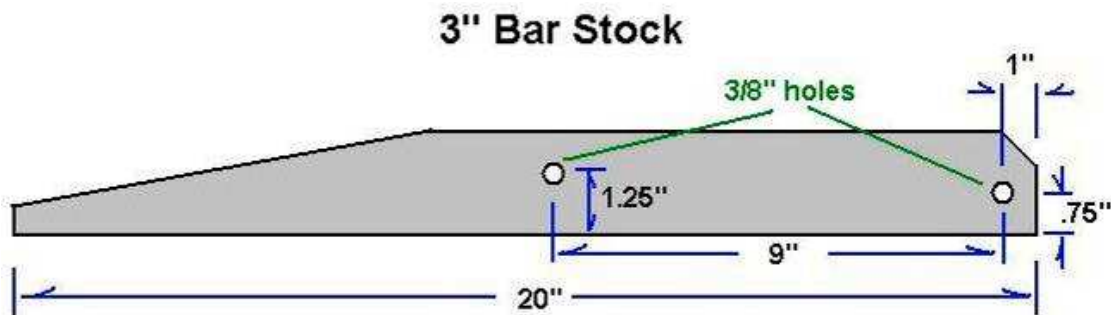


Fig. 19 The right side muffler spine gusset. Remember, dimensions are close approximations. Do your own measuring. If you don't like the angly look of my brackets, round them off. I was going for strength and less concerned with beauty since these things will live in the dark netherworld under my saddlebags.



Fig. 20

Remove the muffler, mask it off and paint the welded areas and the spine gusset with black VHT paint (see Fig. 18). After it is dry, re-hang the muffler and snug up all the bolts and clamps on the right side so you have dependable reference points when hanging the left side muffler. You want to get them even.

Finally, you should cut the right side passenger foot peg mounting bracket down so it looks more or less like Fig. 21. Smooth it up, primer and repaint it.

We mounted the right side muffler first because we want to match the left side to it, getting them the same height off the ground and equidistant from the centerline of the bike.

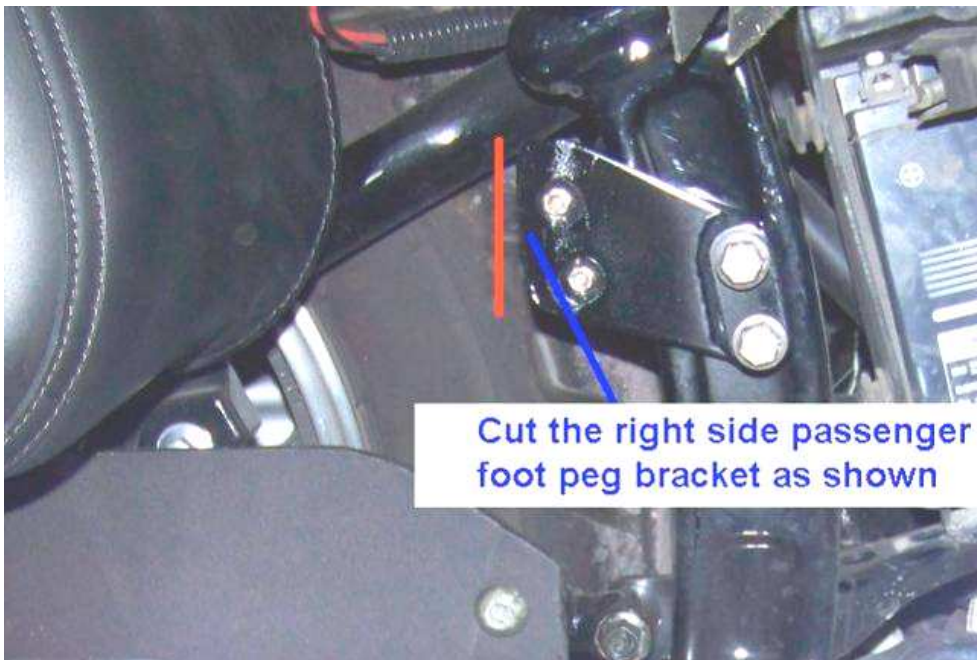


Fig. 21

This concludes mounting the right side muffler.

## Mounting the left side muffler

First, cut down the left side passenger foot peg mounting bracket, separating it from the saddlebag bracket. See Fig. 22

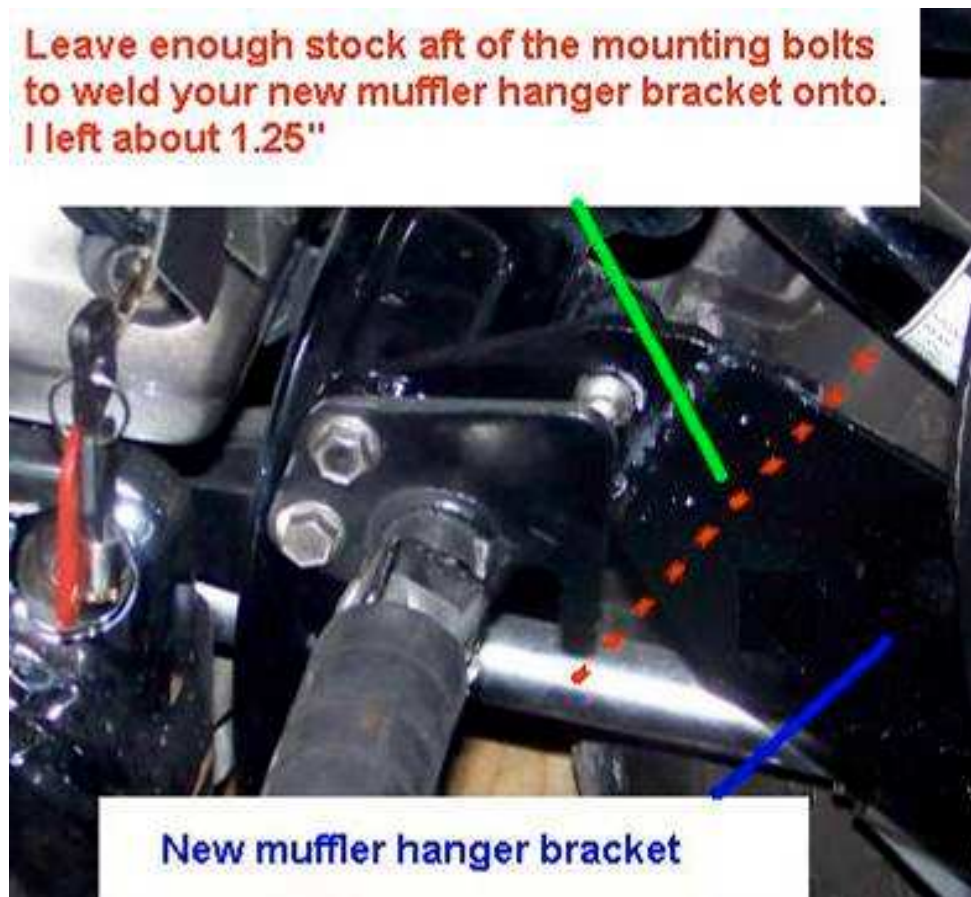


Fig. 22 The left side passenger foot peg bracket has been cut down and the new muffler bracket welded to it.

Note that your muffler is not symmetrical, that is to say, the pipe does not go straight down the center. Since the pipe is slightly off center, you want to get the muffler set right or it will be a different distance from the centerline of the bike than the right side muffler. To that end, the left side muffler requires that we heat (with a gas torch) and bend its chrome mounting ear almost 90 degrees up so it hangs equidistant from centerline. We'll get to that in a minute.

Temporarily install the left side saddlebag bracket to the fender. Slide the left side muffler on the left header pipe and prop the rear end of it up with a block. Loop a long piece of masking tape from the saddlebag bracket down around the muffler, remove your block and hang the muffler from the tape, eyeballing it to get it about level (actually, slightly downhill seems to settle out best). Tape it well enough that it doesn't fall off when you take a potty break.

You need to get both mufflers the same distance from the floor and the pipe-to-muffler alignment looking from the rear to the front of the bike should be smooth and straight. Raise or lower your masking tape loop until the left muffler is hanging just right. Both mufflers should be the same height from the floor and pretty equidistant from the centerline of the bike (the center of the tire tread).

Now, fabricate your two left side muffler hanger pieces as shown in Fig. 24. Once again, the dimensions are close approximations of what you'll need. Make your own measurements.

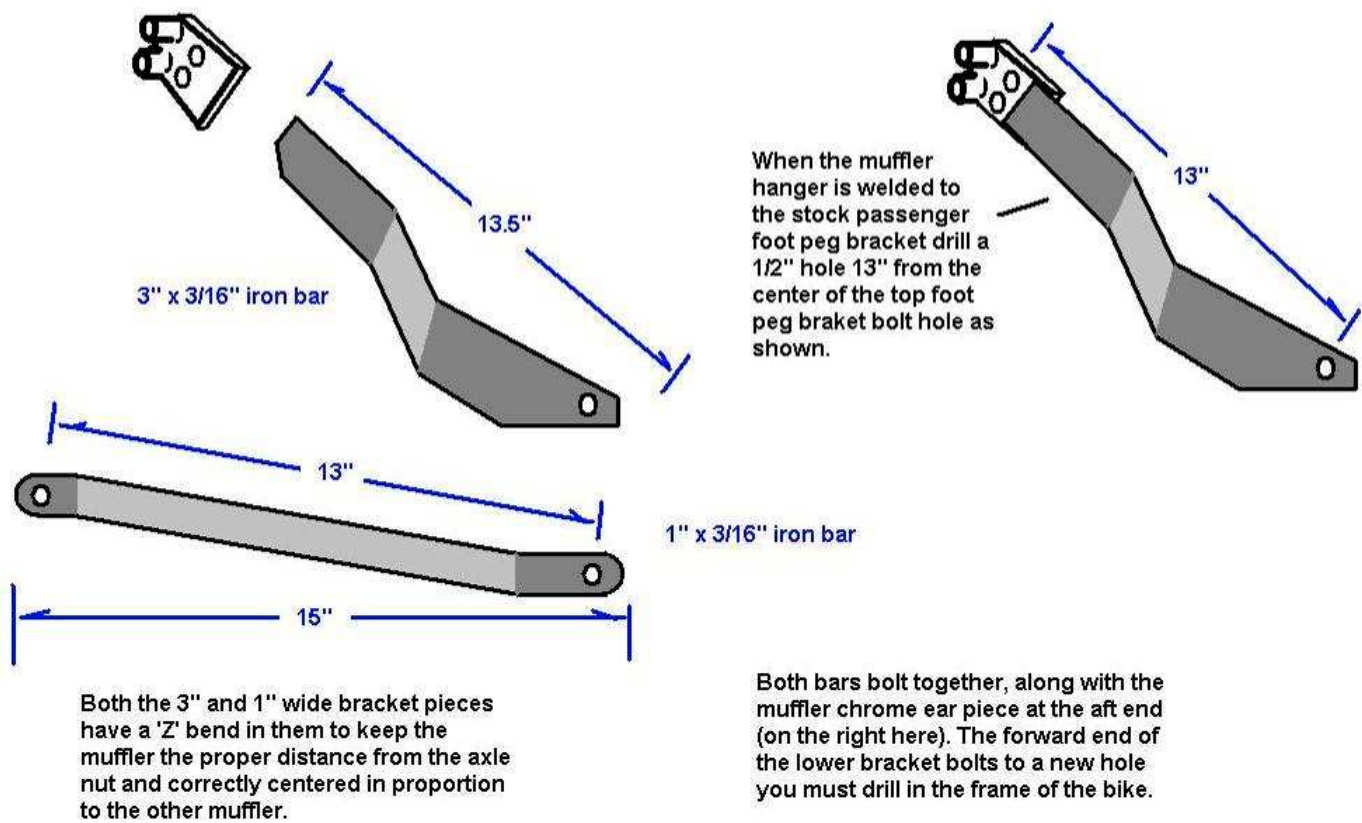


Fig. 24 You might be okay with a 2" bar for the top piece, I like the rigidity of 3" to prevent lateral movement.

Fig. 25 shows how it looks on the bike.

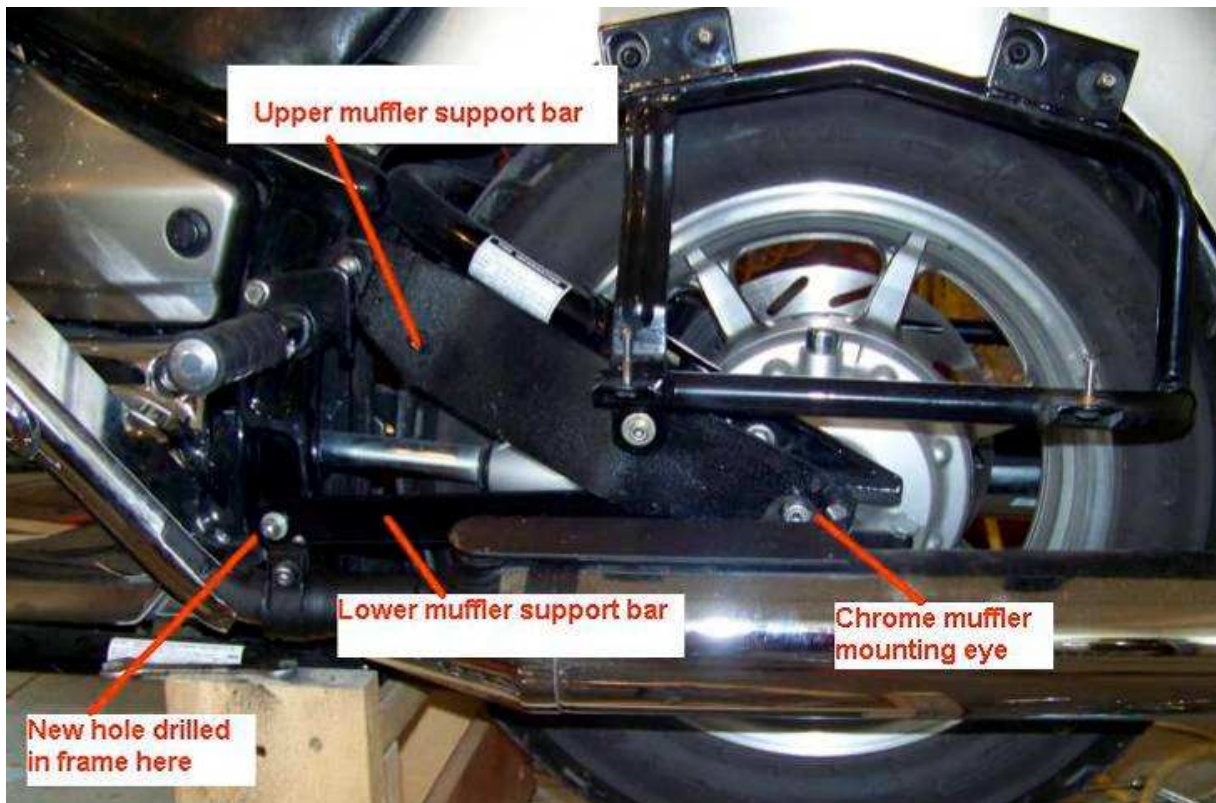


Fig. 25 Left side muffer hanger brackets installed.

This is a good place to stop and verify that both muffler tips end at the same point. If not, make adjustments now.

You should be able to see how you need to heat and bend the left muffler's chrome mounting ear up so bolt to your bracket. Do so now.

In Fig. 25 you'll notice a horizontal piece of flat stock welded to the stub of the crosspipe near the front of the muffler. That is what we will weld another short piece of 1" bar to, which will bolt to the upper muffler support bar, as seen in Fig. 26.

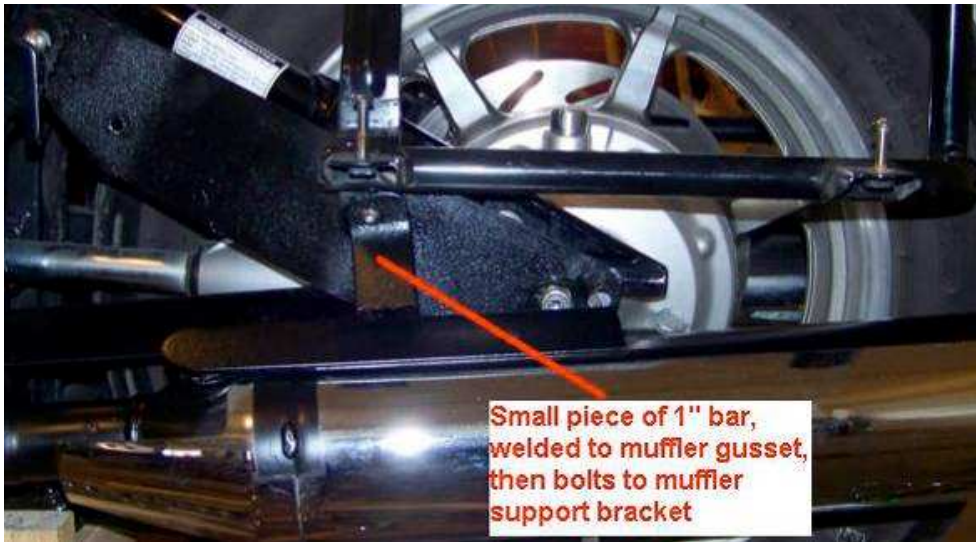


Fig. 26 With the second attachment point, the left side muffler is now secure.

Snug up all your connections. That completes the installation of the left side muffler.

## Lowering the Saddlebags

Along the way, we have managed to remove the lower attachment point for each saddlebag support bracket. We must now add a short piece of 1" bar to the bottom of each saddlebag bracket so they can be secured to the new muffler support brackets we've just made. Do both sides the same as shown in Fig. 27.



Fig. 27 Modifying the lower mount hole of each saddlebag bracket

Now, fabricate two new upper saddlebag bracket mounting plates as shown in Fig. 28 and temporarily bolt them to the fender.

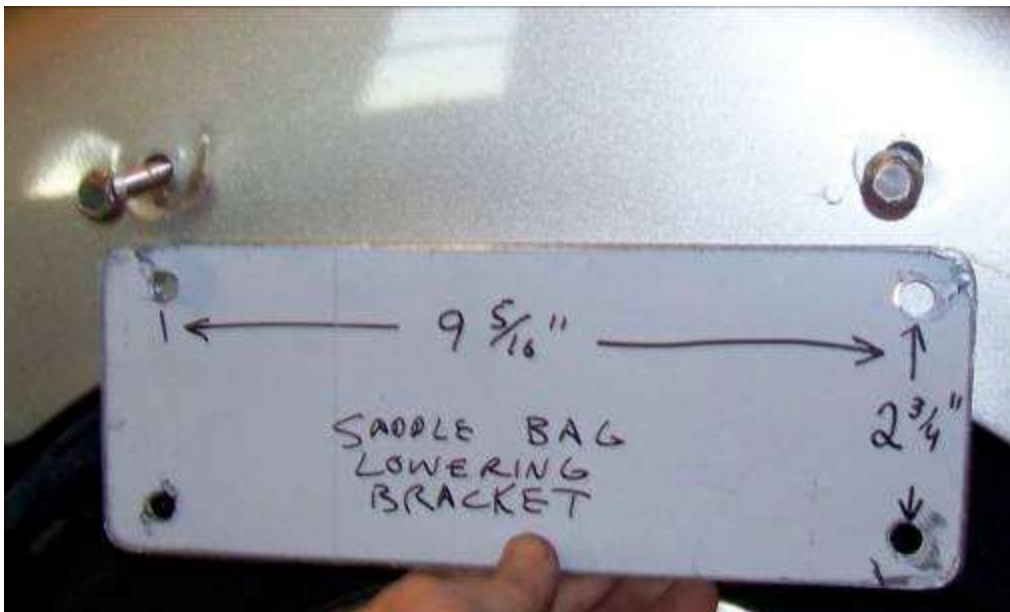


Fig. 28 The new 1/8" aluminum upper saddlebag mounting plates, with the protective plastic skin still on.

Install the right side saddlebag bracket as shown in Fig. 29

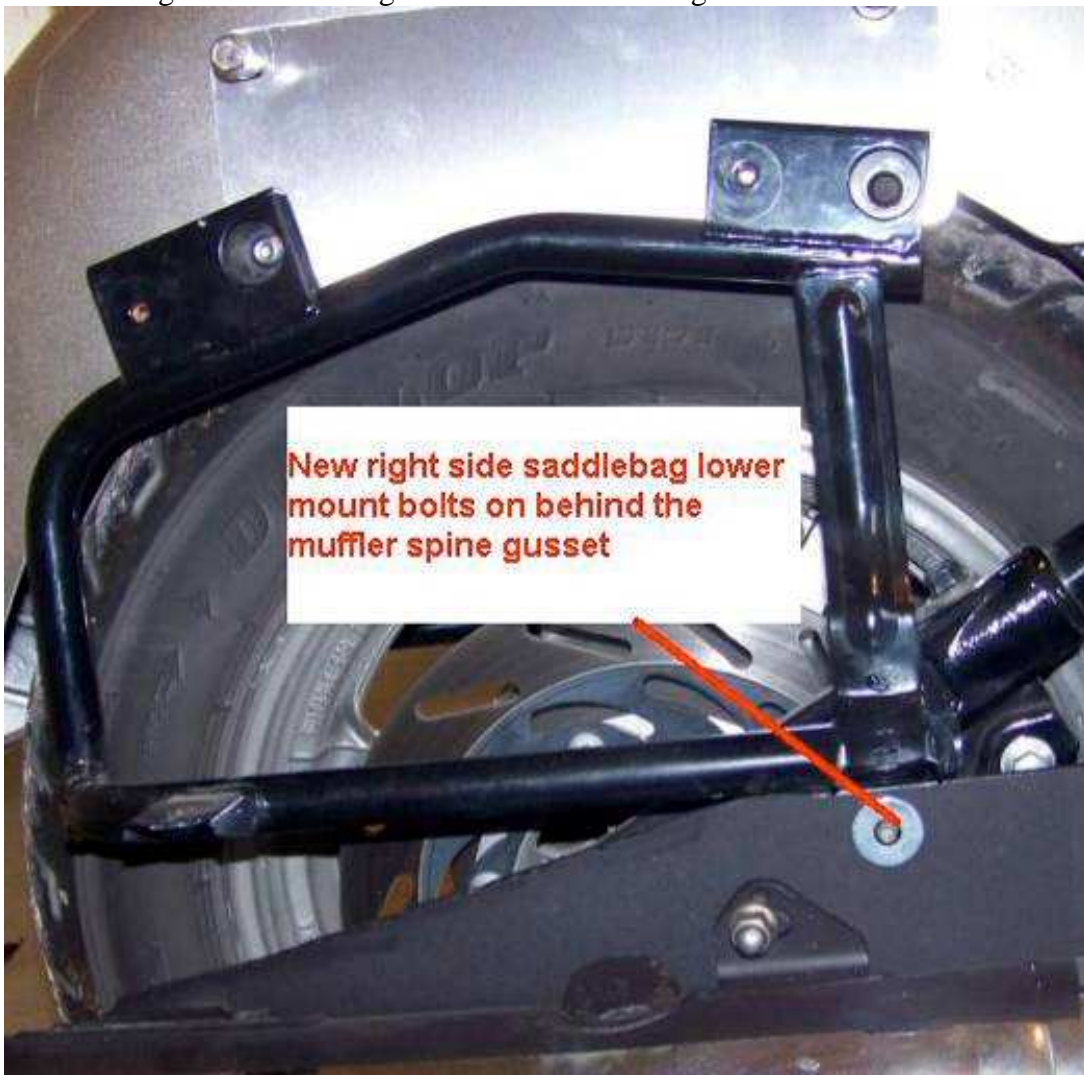


Fig. 29 Right side saddlebag bracket installed.

Then install the left side saddlebag bracket as shown in Fig. 26 and Fig. 30

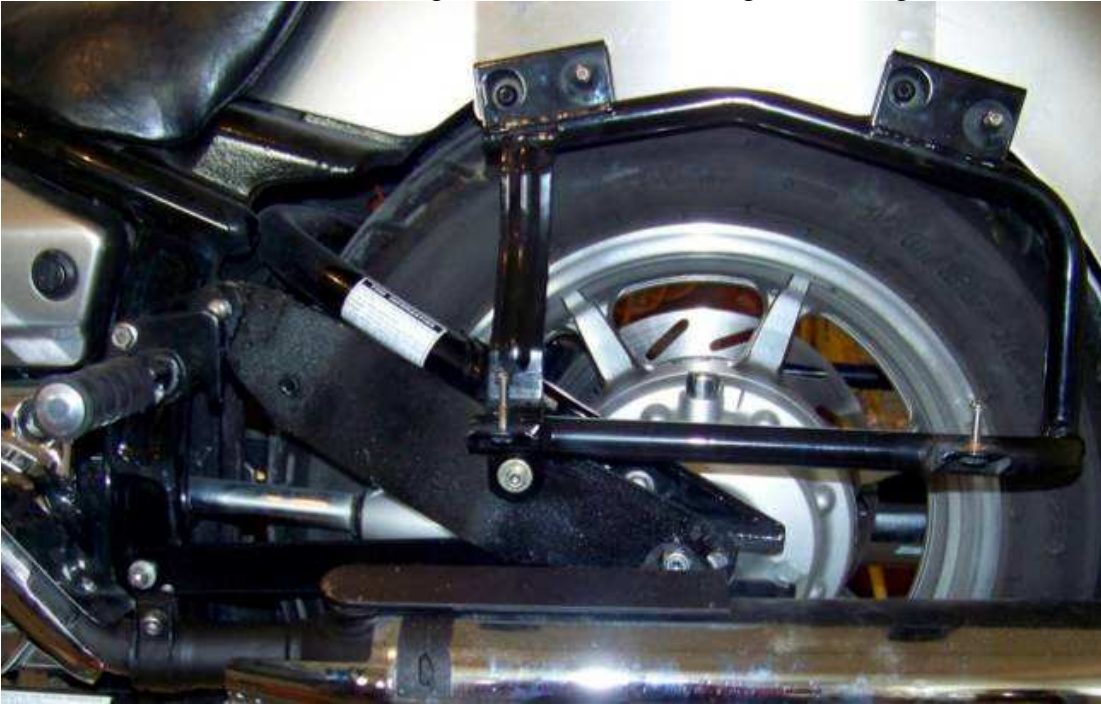


Fig. 30 Left side saddlebag bracket attaches to muffler bracket as shown. See also Fig. 26 for finished appearance.

Finally, snug everything up and check to see that your mufflers are level at the tips and equidistant from the centerline of the bike, as in Fig. 31. Also, ensure that the tips of the mufflers end evenly at the same point (as shown in the title page photo). If things are a little off, which they may well be, just pry, loosen and adjust or heat and bend until you convince it to hang your way.

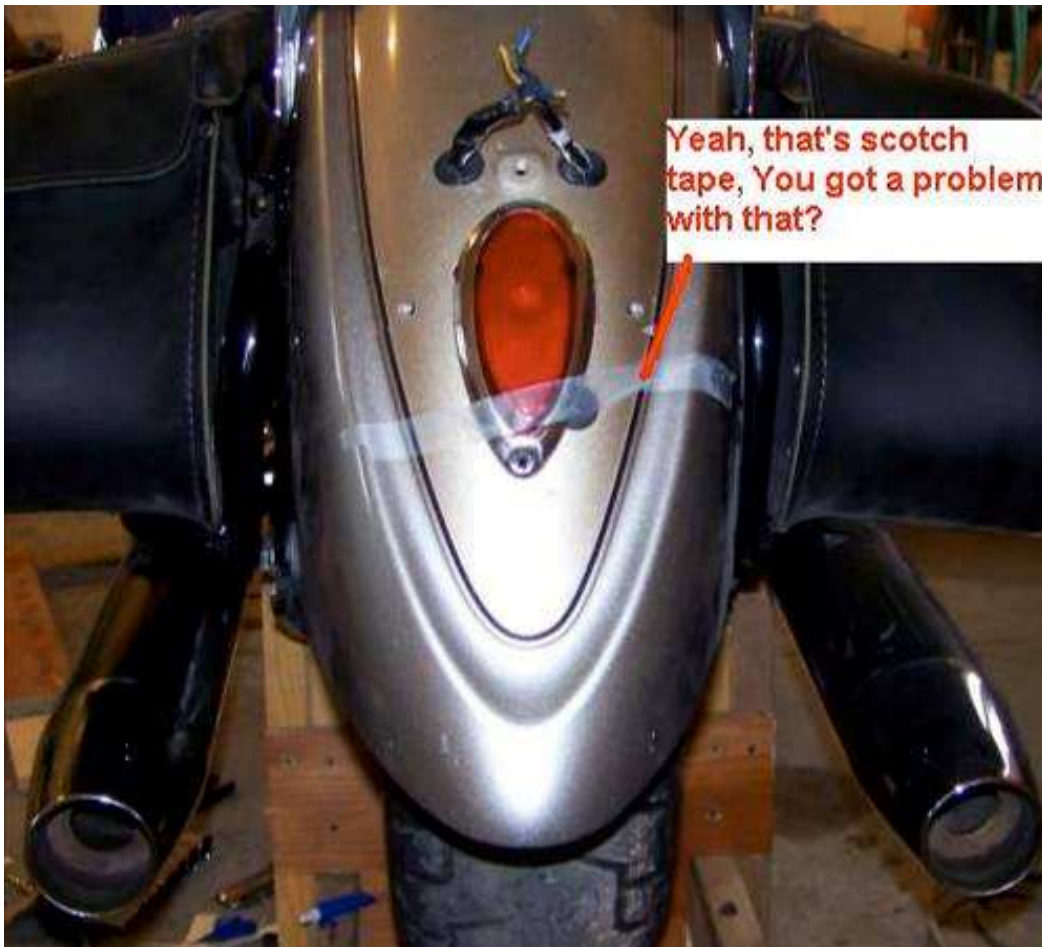


Fig. 31



Fig. 32 Here's another look. You can't (really) see the muffler hanger brackets.



Fig. 33 The aluminum saddle bag lowering brackets are hidden behind the sissy bar and the saddle bag itself.

Because the saddlebags no longer attach on the outside of the fender eyebrows, they are about an inch closer in and almost three inches lower than stock, but still far enough away from the mufflers to stay cool. Again, all the brackets we made aren't really noticeable once everything is back together again.

### **Final thoughts**

This was a prototype. If I did it again, I would do a few things a little differently. I'd use cold rolled steel instead of black iron bar. I would only use stainless if I had a better way to cut and drill it (that stuff is tough!). Also, I'd likely invest in a custom made heat shield for the left side header and maybe a cosmetic 'heat shield' along the top of each muffler. But, hey, for \$50 more or less, it's hard to beat for a budget project.

Once you're all done, go back, apply the high-temp copper-filled anti-seize on your exhaust flange (gooseneck) studs, apply blue LocTite to all the bracket bolts and nuts and tighten everything up securely. You don't want to drop a muffler in front of your riding buddies this summer.

Happy Trails!