BAKER DRIVETRAIN'S N-1shift drum install

Intro by Fab Kevin, how-to by Dan Roedel

When James Simonelli first told me that BAKER Drivetrain was working on an N-1 Shift Drum for ratchet top 4 speeds, I couldn't wait to get my hands on one. Jockey shifters would now be able to build their own "ultimate jockey trans" with off the shelf parts. When it came in the mail, I called up my friend Dan Roedel to see if he wanted to install and test it on his '76. His bike is the perfect candidate, mainly because he rides it - a lot. It also gave us an excuse to get together and goof around on motorcycles (like we need an excuse). Dan can take it from here.

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What is it about 4-speed transmissions? For me, they speak tradition, simplicity, and durability. Let's face it, a 4-speed big twin has been in production nearly fifty years - a pretty good run in my eyes. What other product of any type on the open market can say the same? Starting in the early eighties, the 5-speeds started to take over. Bikes got heavier, engine power started going down, and some would have said there was a need for more gear ratios. That may very well be true for the general public, but what about us geezers who dearly love our shovels, pans, knuckles and flatheads with 4-speeds? How many companies are there that produce parts who truly understand what high quality and long lasting is? Very few producers, including OEM, all seem to be mostly imported junk. Sorry for getting side tracked, but I feel this strongly about my 4-speed.

When I first heard that a local transmission builder started building replacement 4-speeds, I was excited to say the least. At last, us 4-speed shifting geezers can trash the junk replacement parts and never look back. For me, a complete BAKER replacement 4-speed sounds like I can have my cake and eat it too. After I started looking into it some, the BAKER DRIVETRAIN crew didn't just build a simple replacement copy, but instead they came up with what they call the N-1 shifter. On a hand shifted 4-speed with their drum installed, neutral will now be the last notch forward. No longer will you need to hope and guess if you found neutral between first and second when you set your foot on the ground.

Racers will like the new set up if they are foot shifting as well. With the N-1 shifter and normal FLH type foot lever parts used from 52 through early 79, the shift pattern is neutral up top and stomp down for every gear with fourth gear the last stomp down.

The BAKER N-1 shifter kit is a basic, all you need kit, to convert any 52 through early 79 Harley ratchet top trans. There is no machine work involved, and it's truly a simple bolt in conversion. Included in the kit are gaskets, the all important shifter drum, matching ratchet gear, and ratchet shaft.

The complete kit must be used, not just the drum only. The ratchet gear has a different tooth count than the OEM part, and the ratchet shaft also is designed for the extra amount of rotation needed to properly shift the N-1 drum. I found the BAKER replacement parts to be fully machined from solid stock, not some die cast recycled junk. I have no idea what the exact material used is, but I am sure someone at BAKER tech support could tell the story on all materials used if need be.

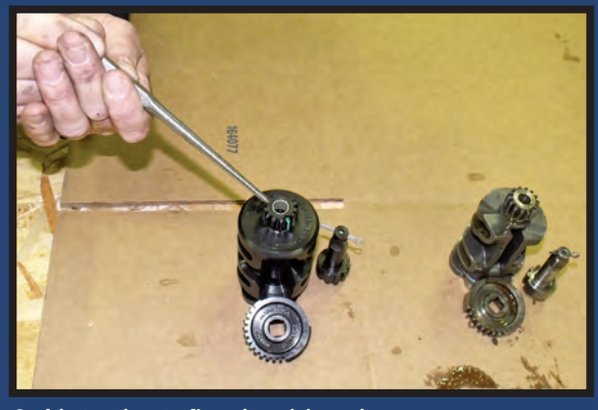
Today's victim is a 76' FLH turned rigid with the trans top in pretty open view. It was a pretty simple matter to remove the trans shifter top, with everything else left mostly untouched. How you get at your transmission may differ depending on the bike, but the conversion inside the transmission lid will be the same.

If you're rebuilding a swap meet 4 speed for a new project, you will find it's no more difficult to install the Baker kit than OEM parts. To install this kit, you won't need special tools or machine work - it's truly as simple as yank out the old, poke in the new, and go. Well, it may be slightly more involved than that, but with a few hours of quality time, your 4 speed will be a happy shifter again. The only special tool I used was a shifter fork gauge. I wanted to confirm that the shifter forks and clutches stayed centered between gear, as they must be.

Always remove the battery cables negative cable first, before starting any motorcycle repairs. The first real step was remove the shifter lever and clutch lever to gain working room. Some clown decided to run the exhaust close, but I could still get at all of shifter lid mounting screws. The two screws closest to the seat post are a bit tricky on this bike, and guessing most others are too, but they will come out. Once the lid is off the transmission, beware of dropping anything inside. Watch out for dropping the two shifter rollers, or any road grunge and grit. Place a rag inside to catch all things that may want to spoil your day, including the gasket material that yet needs to be removed. Once the transmission lid is safely on the bench, the conversion can begin.

1. Contents of the Baker kit.

2. Gear tooth count.



3. Note the teflon bushings!

4. Install the drum.

After all gasket material is removed from the lid, install and adjust the shifter fork gauge. I use a Jims P/N 16-0641, and it's a copy of the OEM P/N 96384-39. Next off is any outside shift levers, and the dust shield if not removed before. I scrapped the dust shield on this one years ago, so don't look for it here.

Next, remove the 6 flathead screws from the ratchet cover (stainless Phillips heads on this one) and the nut from the bottom screw. With a light tap, the outer ratchet cover should pop off. Under the cover is the shifter pawl carrier, springs, and most likely some grunge. Carefully slide the pawl carrier off the shift shaft, watching for springs to pop out and go into orbit, or up you nose, or wherever. The actual shifter pawls and springs will also pop out, but they have less force behind them, so look for them. Once all the ratchet parts are removed, there will be a single fillister head slot screw between the shift shaft and the spring channels, hiding in the old grease and grunge. Remove it. After that screw is removed, the steel back plate can be removed. The gasket may have it stuck, so with a light tap, pop it off.

With the ratchet parts off, the shift drum detent and neutral switch is next. Now, locate and remove the shift drum shaft lock screw. Once the lock screw is removed, tap the drum shaft out from the ratchet end. There should be a rubber O ring on the shaft that seals it in the lid. When the shaft has been removed, the drum should slide out. It may take a bit of fumbling around, but it will fall out. After the drum is removed, pull the cotter pin that holds the gear in the shift shaft. Sometimes the gear will just slide off the shaft, but I always expect to tap the shaft out of the gear. There is not room to go straight at it, so use some caution.

Once that shaft is removed, the gear has a spring behind it. It may take a bit of fumbling around with a screw driver or whatever to get the gear and spring out of the lid. Once all parts are removed, it's clean everything time: old gaskets, old gear oil, and whatever else that shouldn't be inside the trans.

Once all is clean, inspect the lids ratchet shaft bushing for fit with the shaft. The ratchet shaft should slide in freely, without any binding or sloppy loose clearance. If all is well, install the ratchet gear and spring inside the lid. The spring fits into the BAKER gear recess, same as it did with the OEM gear. When the gear and spring are roughly in place, slide the ratchet shaft in, making sure to time the shaft and gear properly. You have a chance of screwing up here, so match the gear and shaft timing marks. Once the shaft and gear are timed properly, compress the gear and spring some, and install the new cotter pin provided in the kit.

The shift drum is next to go in. It took me a bit of fumbling around to slip the gear in, as end clearances of the drum are tighter than the worn out OEM shift drum was. Once roughly in place, match up the timing marks with the drum, and ratchet gear. BAKER did us all a favor, by painting the gear teeth green so it's easy to see. However, OEM timing marks are not so easy. Now that the timing marks are in line, slide the drum pin into the lid, and through drum.

That's about the time I noticed that the new N-1 BAKER

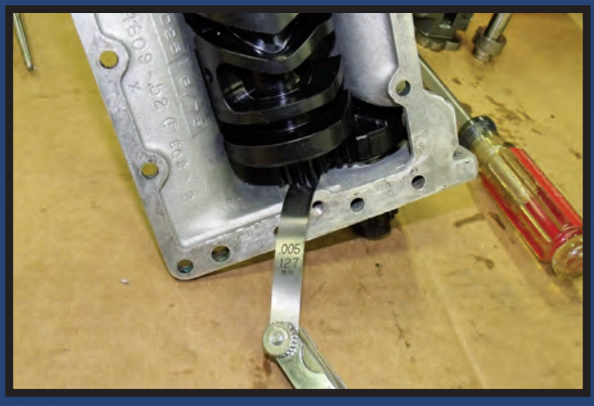
drum rides on Teflon bushings, not "metal to metal" like factory drums. The new drum fit precise on the shaft, unlike this old OEM drum. End play of the drum should be checked, and corrected (if needed) at this time. Baker recommends end play of 0.0005' to 0.0065' on the shift drum. I was lucky with the 0.005' on this one so no further work needed. If you find yours is out of spec, a shim stock washer should take care of it.

At this time, I like to confirm there is no binding of the ratchet gear or drum. This one rotated freely, and without excessive gear tooth lash, other than the spring pressure on the ratchet gear. Baker also recommends, that the detent plunger has all burrs removed, where it contacts the drum detent locations. Any burrs, or other defects in the plunger, or spring, will make shifting not as smooth as it should be. I had used a wet stone on mine during the rebuild of the trans years ago, and all was still fine. I like to install the detent, and then roll the drum into every location, to check for binding at this time. This drum, with the Teflon bushings, slipped from one detent location to the next very nicely. I'm guessing that the Teflon bushings, with their lower friction than metal on metal, is a big part of it.

Ratchet parts are next to be installed. Loosely install the steel ratchet back plate, gasket, and screw. There is a notch in the back plate, that must align with a ratchet shaft notch, before the screw is locked down. If the notch is not aligned properly, the ratchet will never work as intended. I like to use a water proof grease, in the back plate curved spring slots. Grease will prevent wear, and binding of the springs. These springs are still in good shape, but always check them for wear.

It is not uncommon to see flat spots, or broken coils, in a well used trans. The shift pawl carrier has a small flat head screw, mounting the pawl carrier spring retainer plate, so remove it now. With the pawl spring retainer removed, it's a simple matter to install the carrier onto the ratchet shaft, with the tab between the curved return springs. I say simple, but at times the springs will want to escape, and hide under benches or whatever, slinging the grease all the way. After the pawl carrier is safely in place on the ratchet shaft, lightly lube the actual pawls, and light springs. The pawls have slots along their sides, and those slots slide over small dowel pins in the carrier, to keep them from spinning. The pawls "beveled end" is what grabs the notches, or spline if you will, in the ratchet shaft. The back plate timing notch is what lets them grab the proper spline, or notch, for an up shift, or down shift. Compress the pawl springs, and mount the spring retainer, with the single flat head screw. Lightly grease the outer face of the shifter pawl carrier, where it will rub on inside of the cover. Install the gasket, ratchet cover, and the six screws.

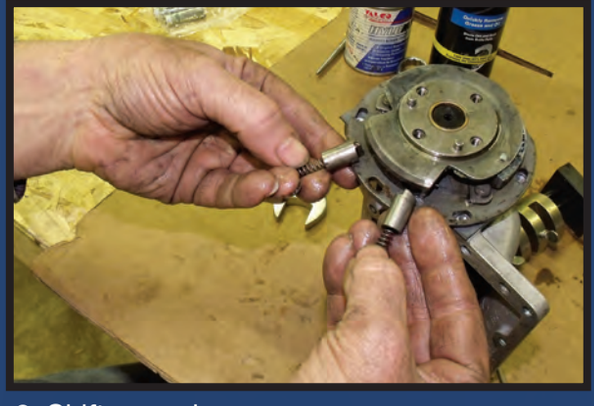
I like to test the ratchet at this time, and this one worked better than perfect. That is, it was perfect, until I installed the neutral light sender switch, uh-oh. With the switch out, or loose, it shifted fine, but when tight, it bound up. This turned out to be my fault, because I didn't use a gasket, only a thread sealer. That missing gasket acts as a shim, to locate the switch at the proper depth. No gasket, and the switch went too deep. With a copper oil drain plug gasket from the auto parts store, all was well again. I have no need for the neutral switch on this bike, and it's only there to plug the



5. Drum end play check.

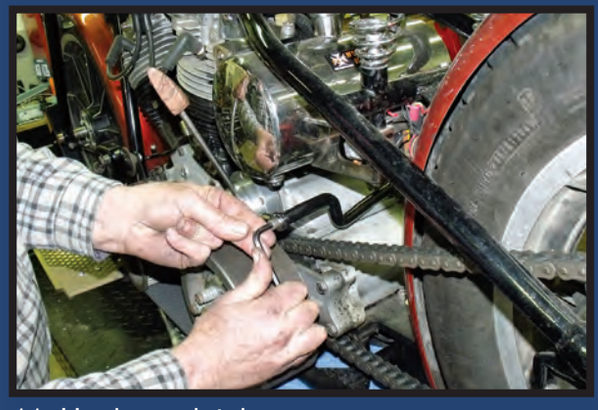

6. Fork gauge new drum.


7. Gasket goo.


8. Shifter pawl.

9. Time back plate.

10. Ratchet cover goes on.



11. Hook up clutch arm.

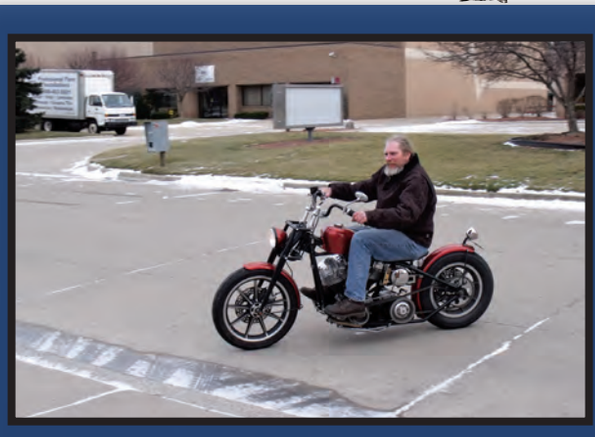
12. Ready to go!

hole. Once the shifter lid is completed, I mounted the shifter fork gauge. I wanted to see just how close the grooves lined up with the old OEM drum. I was very happy to notice, that the neutral area of the drum slot in the BAKER drum was spot on to the neutral area on the old drum. That same slot alignment, meant no shimming changes in my shift forks. Not all drums will be the same, so check yours, I got lucky.

Now that your shifter lid is assembled, adjusted, and ready to install, it is time to clean the case gasket surface. Use extreme care to not drop loose gasket material, grit or anything else into the transmission. There is no room for grit to ride between the gears. I like to mount the shift fork rollers on the fork guides, with a heavy, sticky grease. It will help hold them in place when installing the lid. Drop a fork roller into the gears, and it will never shift properly, and most likely will cost you hundreds of dollars very soon after. There are several of the lid mounting screws that pass through the case, and have threads exposed to the gear oil. I like to use a sealer on those mounting screws, to prevent leaks. A light coating of anti-seize compound works well on the screws in blind holes. Be sure to install the single vented screw in the second hole back from the front, on the kicker end. After the lid is mounted, it's just a matter of bolting on the rest of removed parts, shift lever, clutch arm, and whatever else you may have taken off to get to lid out. Install the battery cables when all other work is done, hooking the negative cable up last.

This BAKER DRIVETRAIN N-1 conversion, took about two hours of goofing around on the simple rigid bike I installed it on. I had to road test it, just to see how slick the shifting action was. This conversion was done on New Year's Day, with temps about 25 degrees, and the synthetic gear oil was thick to say the least. I was very pleased, to now have an easy to move lever, with a positive shift, and a great feel through every gear. Best of all, neutral is easy to find every time-- just jam it forward. I have no doubt after a few of those "oops, what way does it shift now?" moments, I will be hand jamming gears just like I know what I'm doing!

We all owe BAKER DRIVETRAIN a big thanks, for such high quality products, made just for us grumpy "set in our ways" 4-speed riders. I also want to thank Fabricator Kevin, for the warm shop, the photos, and the good humor while we both got our New Years off to a good start.



13. The fruits of our labor, the test ride.