GrudgeBox

MADE IN THE USA

STRIP SERIES

STREET SERIES

BAKER™ DRIVETRAIN

Wielding American power to the pavement for all

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ABOUT YOUR NEW GRUDGEBOX

INTRODUCTION

The GrudgeBox is a 6-Speed Overdrive transmission with significantly more torque capacity than the stock unit. The primary impetus for the design was performance, but the GrudgeBox was also designed for those who spend a lot of time in the saddle looking for that extra gear on the highway. The transmission kit fits in the stock transmission case with no modifications. The GrudgeBox is available in two configurations; Street and Strip. The Street Series features straight cut (spur) 1st through 3rd for uncompromised lower speed performance and helical 4th through 6th for refined higher speed cruising. The Strip Series is an all-spur gearbox for uncompromised performance in all gears. Both units earned their BAKER pedigree with many long highway test miles and many merciless passes at the dragstrip.

The gear ratios in 1st through 5th were selected with performance in mind. 6th gear is a true overdrive that is numerically mild to yield a 250 RPM drop as compared to the stock unit.

FITMENT

GrudgeBox Street and Strip

- 2006-Later Dyna
- 2007-Later Softail &Touring Models

BREAK-IN

The GrudgeBox requires no break-in schedule. However, we do recommend that you take it easy for the first 20 miles to confirm that there are no issues related to basic function of the transmission and the reassembly of the motorcycle. You will notice that the transmission will shift smoother and operate quieter after 2500 miles. Like any machine, scheduled oil changes are key to years of trouble free service. Refer to the transmission oil change schedule on page 28.

FLUIDS

The GrudgeBox requires 28-32 oz. of transmission fluid. We recommend Spectro 6-Speed transmission oil that has long chain polymers that stand up to the harsh environment that this high-performance transmission can deliver. Think of it this way – the transmission is a meat grinder and the oil is the meat. The meat gets ground and re-ground and after a number of miles it turns to mush. Synthetic oils are superior to petroleum based oils in that the polymers and longer and more robust. This means that synthetics take longer to be ground into mush and therefore provide better protection for a longer period of time. Please follow the transmission oil change schedule on page 29 and document your transmission service history. The exception to the stated intervals is winter storage. If the bike is stored in an environment that has significant temperature fluctuations, there will be water condensation inside the transmission. The oil should be changed immediately when it comes out of storage and is put back into service.

FEATURES AND GEAR RATIOS

FEATURES

The GrudgeBox is the most innovative, well executed, robust transmission we have ever endeavored to design and manufacture. Significant GrudgeBox features:

1. **6-Speed Overdrive design**. The 5th gear ratio of the GrudgeBox is 1:1 which is equivalent to the stock transmission 6th gear ratio. The overdriven 6th gear ratio offers a 250 RPM reduction for highway cruising.
2. **Straight cut (spur) gears**. Gear School 101. Helical gears are used in most motorcycles and cars these days because they are quieter than spur gears. However, there's a cost for noise reduction because helical gears give up horsepower. The amount of horsepower given up is proportional to the angle of the helix on a given gear pair. The stock transmission has helical gears in 2nd through 6th. The GrudgeBox Strip version is configured with all spur gears and no sacrificed horsepower. The Street version has spur gears in 1st through 3rd for around-town shit-n-git and helical gears in 4th through 6th for refined cruising.
3. **Gear width.** Stock transmission gear engagement is typically .500", GrudgeBox is .700" in 1st through 4th with nearly twice the circumferential tooth thickness. Generally speaking, torque capacity of a transmission is the product of the gearset center distance, gear engagement width, and circumferential tooth thickness at the pitch line.
4. **Tapered roller main drive gear bearing.** We replaced the problematic self-aligning stock main drive gear bearing with a tried-n-true opposing tapered roller bearing pair; patent pending. We did this because any transmission is only as strong as its weakest link.
5. **Dog tooth engagement.** The dog teeth on the stock 3rd and 4th gears have roughly .200" axial engagement with a less-than 1° undercut. This is a formula for gear hop-out. For the GrudgeBox we chose 4° undercuts with .250" engagement in all positions to guarantee NO gear hop-out or missed shifts which translates into NO lost revenue if you are a Grudge hustler.
6. **Direct acting shifter pawl.** Upshifting with the stock 07-later shifter pawl is much like pushing on a rope. To make upshifts crisp and precise, we developed a direct acting pawl that engages the drum pins with negligible free play and no ropes.

GEAR RATIOS

GrudgeBox Street	GrudgeBox Strip	Stock H-D
1st – 3.30	1st – 3.20	1st – 3.34
2nd – 2.29	2nd – 2.21	2nd – 2.31
3rd – 1.66	3rd – 1.61	3rd – 1.72
4th – 1.27	4th – 1.27	4th – 1.39
5th – 1.00	5th – 1.00	5th – 1.19
6th – 0.92	6th – 0.92	6th – 1.00

WHY GRUDGEBOX?

GRUDGEBOX – BEHIND THE NAME

Grudge racing is street racing, often done illegally, in which thousands of dollars are bet on a single race and the internal configuration of the engine and drivetrain are a closely guarded secret to gain an advantage over the competitors. The GrudgeBox was conceived to be a high-performance transmission with performance inspired gear ratios but no outward appearance to give away the fact that a thoroughbred torque multiplying machine occupies the inner walls of the transmission case.

The GrudgeBox is available with different bearing door finishes: machined billet, chrome, polish, powdercoat with highlights, and Sleeper®. The Sleeper® door is available to achieve the aforementioned anonymity. To make the Sleeper door we apply mechanical taxidermy to a stock factory door by milling out all anatomy and bone structure on the stock door to leave a .125" thick shell with stock factory powdercoat. The shell then fits over a billet sub-door, like a 3D puzzle, to yield the Sleeper® door which fathered the name GrudgeBox (figure 1). Externally, the GrudgeBox with the Sleeper® door gives no indication that a drag racing transmission lives underneath and that may be the difference between winning and losing.

FIGURE 1 | GRUDGEBOX SLEEPER® DOOR

Three different shift drum configurations are offered; standard pattern (1-N-2-3-4-5-6), N1 pattern (N-1-2-3-4-5-6), and reverse N1 pattern kill (6-5-4-3-2-1-N). The N1 drum is similar to the standard pattern drum except neutral is relocated from the standard position between 1st and 2nd to the position below 1st gear. The N1 drum makes it effortless/mindless to find neutral. Racers, those who live in mountainous regions, and people with restricted foot and leg mobility rely on the N1 pattern to find neutral every time without having to think about it.

Reverse N1 pattern kill drums are for the advanced disciples of the quarter-mile club. As the name implies, reverse N1 pattern is just like the aforementioned N1 pattern but reversed. To upshift, you stomp down on the lever. The kill part means it repurposes the neutral switch, triggered by the drum, to open the primary side of the coil between shifts. This allows for clutchless WFO shifts.

WHAT DO I NEED?

REQUIRED PARTS, TOOLS, & REFERENCE MATERIALS

To install the GrudgeBox Transmission Kit, the following is required:

- Factory Service Manual for your year and model motorcycle
- Common hand tools (allen wrenches, sockets, retaining ring pliers, etc.)
- Healthy breaker bar, 1/2" drive
- Torque wrenches, 3/8” & 1/2” drive
- 1-3/16” 6 pt. socket (clutch nut)
- Red and blue threadlocker
- A new primary cover gasket
- Dial indicator (for checking main drive gear endplay)
- MAP/Propane gas or heat gun
- Transmission case bearing service tool – ***included with your GrudgeBox***
    - BAKER TOOLE-GB
- Inner primary race service tool
    - BAKER TOOLB-56
    - H-D equivalent 34902B
- Main drive gear & bearing service tool
    - BAKER TOOLA-07
    - H-D equivalent 35316C
- Pulley locking tool
    - BAKER TOOLC-56
    - H-D equivalent 46282
- Pulley nut socket
    - BAKER TOOLD-07
    - H-D equivalent 47910
- Primary drive locking tool
    - H-D-48219 (Touring models)
    - H-D-47977 (Softail/Dyna)
- 40-46 oz. of primary fluid; see Factory Service Manual
    - BAKER recommends Spectro Heavy Duty Primary Chain Case Oil; R.HDPCO
- Transmission Fluid 32 oz.
    - BAKER recommends Spectro Heavy Duty Platinum 6 Speed Transmission Oil; BD-75140-32

WARRANTY

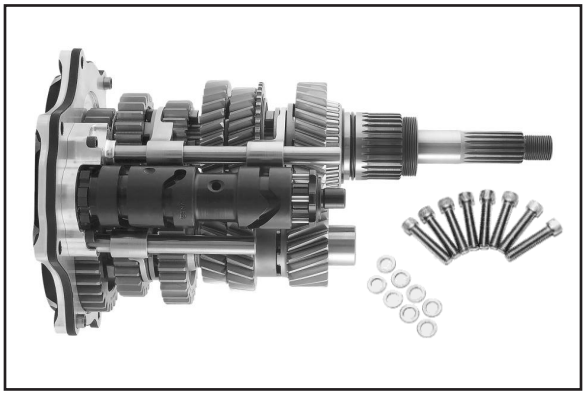
This product includes a 5-year, 50,000-mile warranty. All steps in these instructions, including replacement of the countershaft bearing, must be completed for the warranty to remain valid.

HIGHLY RECOMMENDED ADDITIONAL PART

BAKER highly recommends that the automatic chain tensioner be replaced with a 177-67K Attitude Adjuster (figure 2). Extensive testing and durability miles have proven that the 177-67K Attitude Adjuster puts less shear stress load on the motor sprocket shaft and the transmission mainshaft, thereby extending the life of the drivetrain components.

FIGURE 2 | BAKER ATTITUDE ADJUSTER

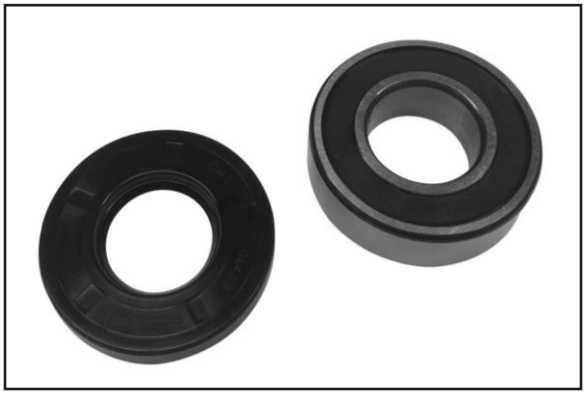
INCLUDED IN YOUR KIT



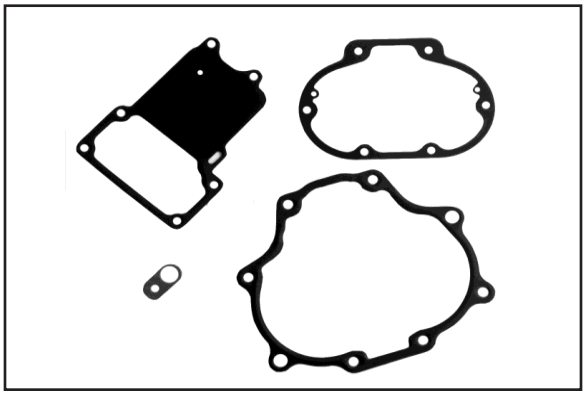
GrudgeBox Gearset w/ Shift System
5/16”-18 SHCS, Stainless Steel, 73497
Washer, Stainless Steel, 6100

Transmission Case Bearing Service Tool, TOOLE-GB

Shifter Pawl, 555-GB-A
Shifter Pawl Washer, 6497HW
Shifter Pawl Retaining Ring, 68010
Shifter Pawl Seal, 37101-84B



High Torque Bearing, P205PP-H
High Torque Bearing Seal, 9758



Bearing Door Gasket, 35654-67
Top Cover Gasket, 34917-06-F
Side Cover Gasket, 36805-06-F
Speed Sensor Spacer, 132-56R

Countershaft Bearing, 8963
Tapered Roller Bearing, HR32910J
Tapered Roller Bearing Adapter, 11610-GB
Pulley Spacer w/ O-Ring, 33334-GB | OR568M52
Main Drive Gear Seal, 12074-67
M85 Beveled Internal Retaining Ring, VHO-334STPA
.102” Bearing Spacer, 11615-GB, White
.104” Bearing Spacer, 11620-GB, Green (Shown)
.106” Bearing Spacer, 11625-GB, Blue

BEARING DOOR EXPLODED VIEW

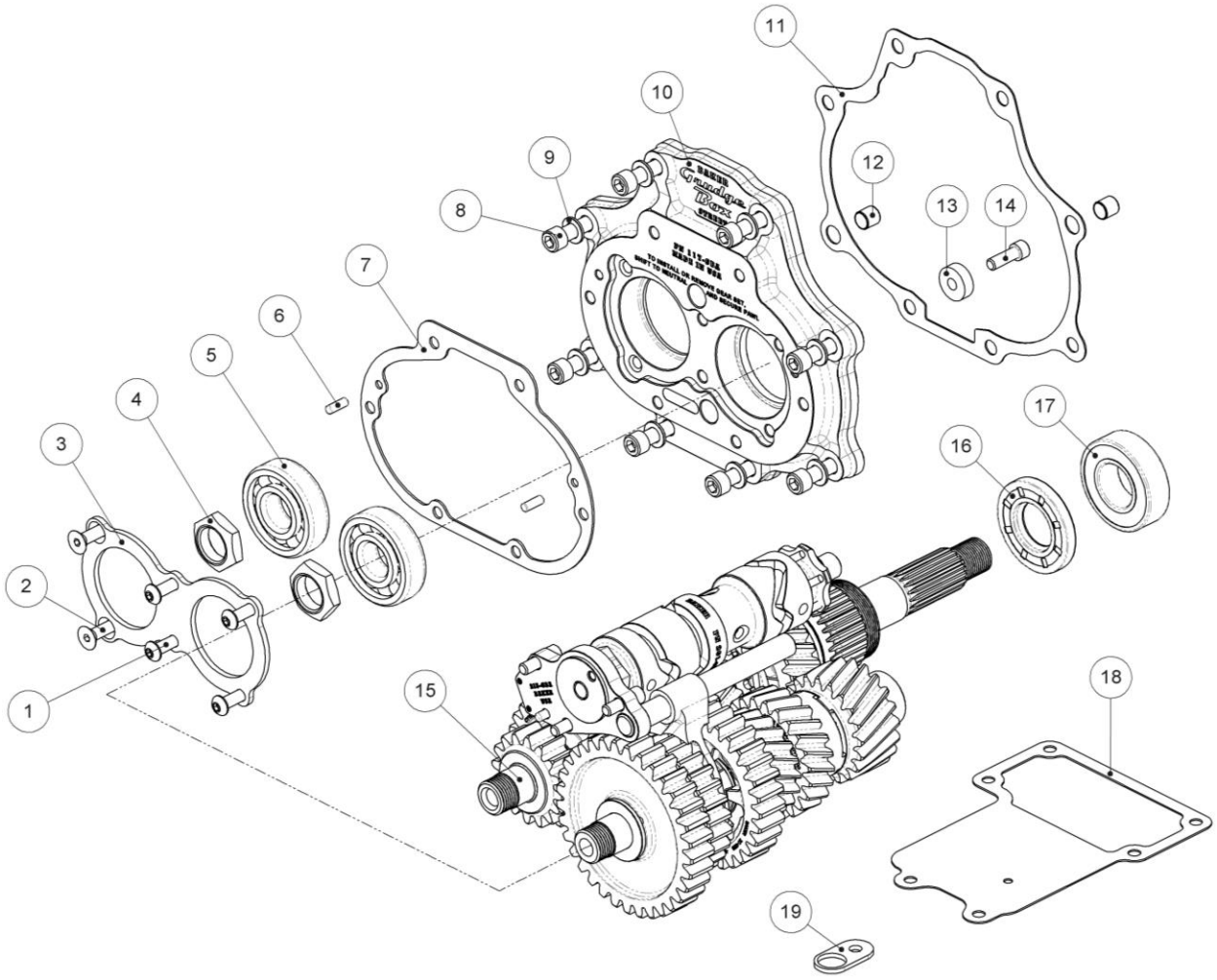


FIGURE 3 | EXPLODED VIEW, BEARING DOOR

BEARING DOOR PARTS LIST

ITEM	P/N	QTY	DESCRIPTION
1	24050	4	BHCS, 1/4"-20 x .625”
2	25C62KFC	2	FHCS, 1/4"-20 x .625”
3	481C-6	1	Retainer Plate, Door Bearings
4	7340BD	2	Nut, 1-1/8" Socket, Mainshaft & Countershaft
5	6304	2	Bearing, Radial Ball, 52mm
6	26735	2	Dowel, 3/16” x .500”
7	36805-06F	1	Gasket, Side Cover
8	73497	8	SHCS, Stainless, 5/16”-18 x 1.500”
9	6100	8	Washer, Stainless, .341” x .560” x .058”
10	107-GB	1	Bearing Door, GrudgeBox Street, Chrome
	108-GB	1	Bearing Door, GrudgeBox Strip, Chrome
	117-GB	1	Bearing Door, GrudgeBox Street, Black w/ Highlight
	118-GB	1	Bearing Door, GrudgeBox Strip, Black w/ Highlight
	119-GB	1	Bearing Door, GrudgeBox, All, Sleeper®
11	35654-67	1	Gasket, Bearing Door
12	16583-67	2	Hollow Dowel, 10mm x .375”
13	F1409	1	Magnet, .265” x .750” x .250”
14	25C75KCS	1	SHCS, 1/4"-20 x .750”
15	N/A	1	GrudgeBox Gearset w/ Shift System
16	9758	1	Seal, Inner Primary, 25 x 52 x 7mm
17	P205PP-H	1	Bearing, Inner Primary, 25 x 52 x 15mm
18	34917-06F	1	Gasket, Top Cover
19	132-56R	1	Spacer, Speed Sensor, .100”

GEARSET EXPLODED VIEW

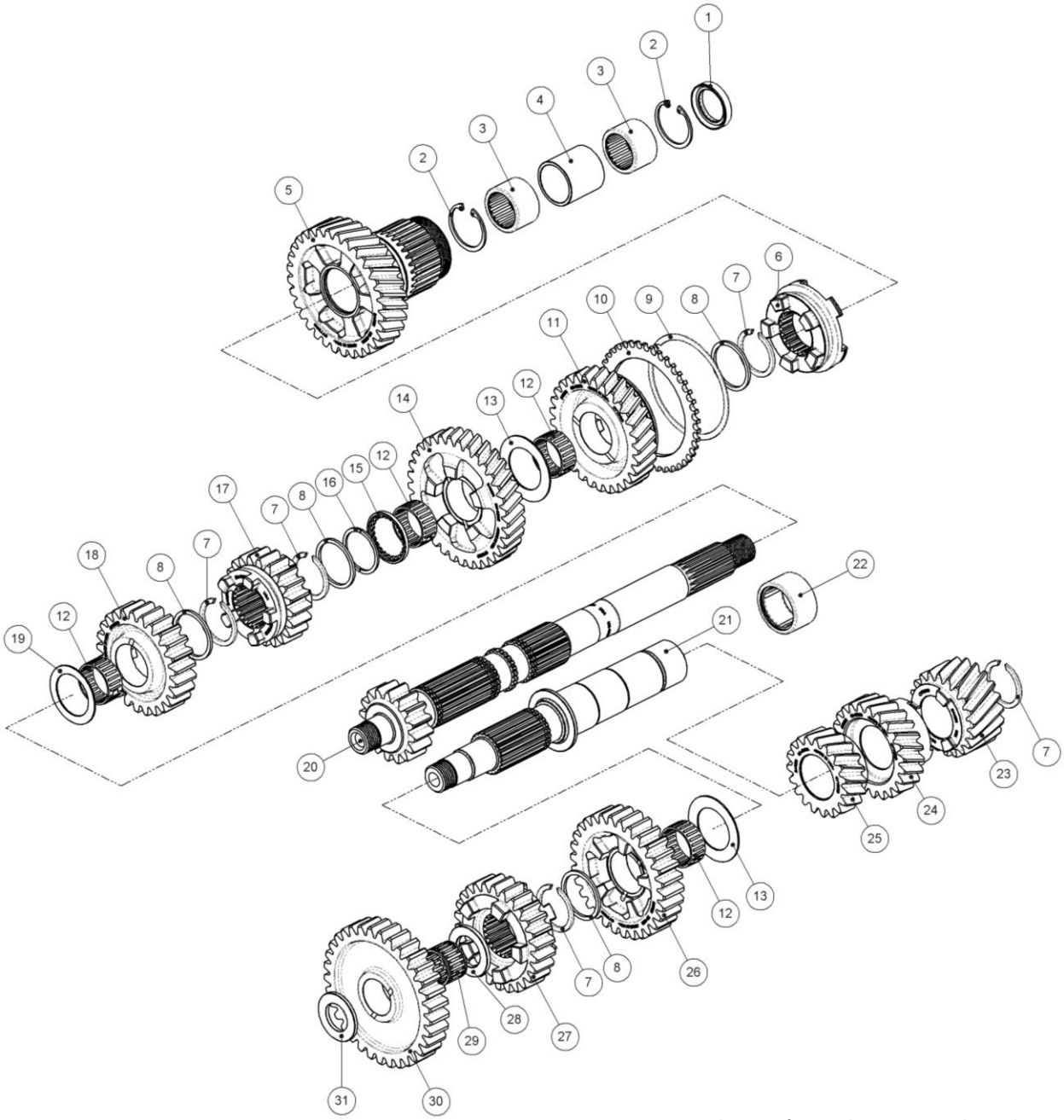


FIGURE 4 | EXPLODED VIEW, GEARSET

GEARSET PARTS LIST

ITEM	P/N	QTY	DESCRIPTION
1	12035B	1	Seal, Main Drive Gear, 25 x 32 x 6mm
2	125RRBI	2	Retaining Ring, Internal, 1.250”
3	HK2520	2	Bearing, Drawn Cup Needle, 25 x 32 x 20mm
4	11599-90	1	Spacer, Main Drive Gear, 1.060” x 1.250” x 1.225”
5	5M-GBS	1	5th Gear, Mainshaft, 32T, Helical
	5M-GBW	1	5th Gear, Mainshaft, 31T, Spur
6	DC45-GB	1	Dog Clutch, 4th-5th Gear, GrudgeBox, All
7	11067	5	Retaining Ring, External, Eaton Style, 30mm
8	6003B	4	Thrust Washer, 1.185” x 1.380” x .071”
9	VS-275	1	Retaining Ring, External, 2.750”
10	BD-7241	1	Reluctor Ring, Speedometer, 41T
11	4M-GBS	1	4th Gear, Mainshaft, 29T, Helical
	4M-GBWZ	1	4th Gear, Mainshaft, 28T, Spur
12	8876A	4	Bearing, Split Cage Needle, 26 x 30 x 13mm
13	AS3047	2	Thrust Washer, 1.185” x 1.843” x .039”
14	6M-GBS	1	6th Gear, Mainshaft, 33T, Helical
	6M-GBW	1	6th Gear, Mainshaft, 32T, Spur
15	BD-11081	1	Thrust Washer, Splined, 1.185” x 1.430” x .125”
16	11082	2	Segment Ring, 1.102” x 1.280” x .056”
17	2M-GB	1	2nd Gear, Mainshaft, 21T, Spur
18	3M-GB	1	3rd Gear, Mainshaft, 25T, Spur
19	BD-3042	1	Thrust Washer, 1.185” x 1.645” x .039”
20	MS-GB	1	Mainshaft & 1st Gear, 16T, Spur
21	CS-GB	1	Countershaft
22	8963	1	Bearing, Drawn Cup Needle, 30 x 37 x 21mm
23	5C-GBS	1	5th Gear, Countershaft, 20T, Helical
	5C-GBW	1	5th Gear, Countershaft, 20T, Spur
24	4C-GBS	1	4th Gear, Countershaft, 23T, Helical
	4C-GBWZ	1	4th Gear, Countershaft, 23T, Spur
25	6C-GBS	1	6th Gear, Countershaft, 19T, Helical
	6C-GBW	1	6th Gear, Countershaft, 19T, Spur
26	2C-GB	1	2nd Gear, Countershaft, 30T, Spur
27	3C-GB	1	3rd Gear, Countershaft, 26T, Spur
28	TWD1423	1	Thrust Washer, .883” x 1.420” x .125”
29	K22X26X17	1	Bearing, Caged Needle, 22 x 26 x 17mm
30	1C-GB	1	1st Gear, Countershaft, 33T, Spur
31	BD-2035	1	Thrust Washer, .791” x 1.361” x .107”

SHIFT SYSTEM EXPLODED VIEW AND PARTS LIST

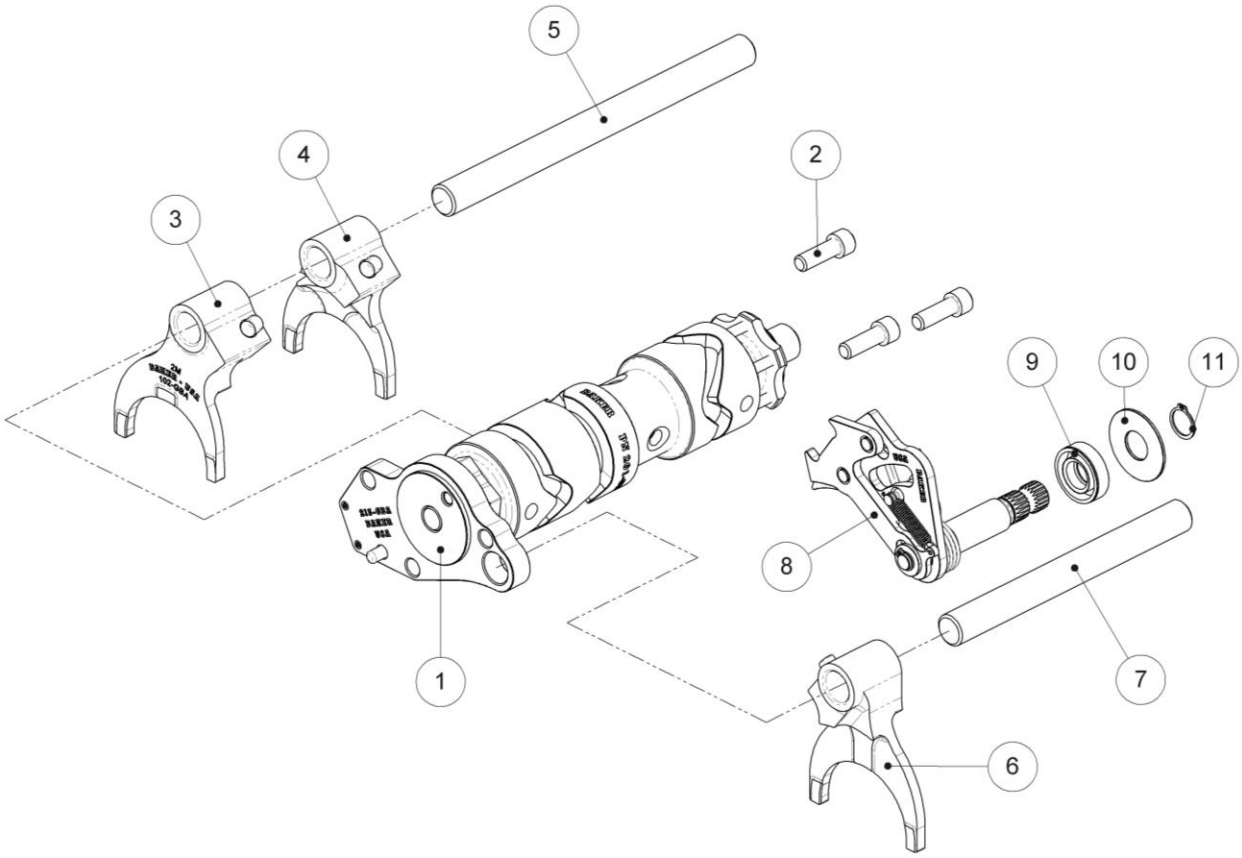


FIGURE 5 | EXPLODED VIEW, SHIFT SYSTEM

ITEM	P/N	QTY	DESCRIPTION
1	200-GB-A	1	Shift System, Standard Pattern
	200-GBN1-A	1	Shift System, N1 Pattern
	200-GBN1RK-A	1	Shift System, Reverse N1 Pattern w/ Ign. Kill
2	23205	3	SHCS, 1/4"-20 x .750”
3	102-GB	1	Shift Fork, 2nd Gear, Mainshaft
4	101-GB	1	Shift Fork, 4-5 Dog Clutch, Mainshaft
5	35224-GB	1	Fork Rod, Mainshaft, 6.285” Long
6	103-GB	1	Shift Fork, 3rd Gear, Countershaft
7	35222-67	1	Fork Rod, Countershaft, 4.825” Long
8	555-GB-A	1	Shifter Pawl
9	37101-84B	1	Seal, Shifter Pawl, .500” x .750” x .170”
10	6497HW	1	Washer, .459” x 1.125” x .045”
11	68010	1	Snap Ring, External, .4375”

TAPERED BEARING EXPLODED VIEW AND PARTS LIST

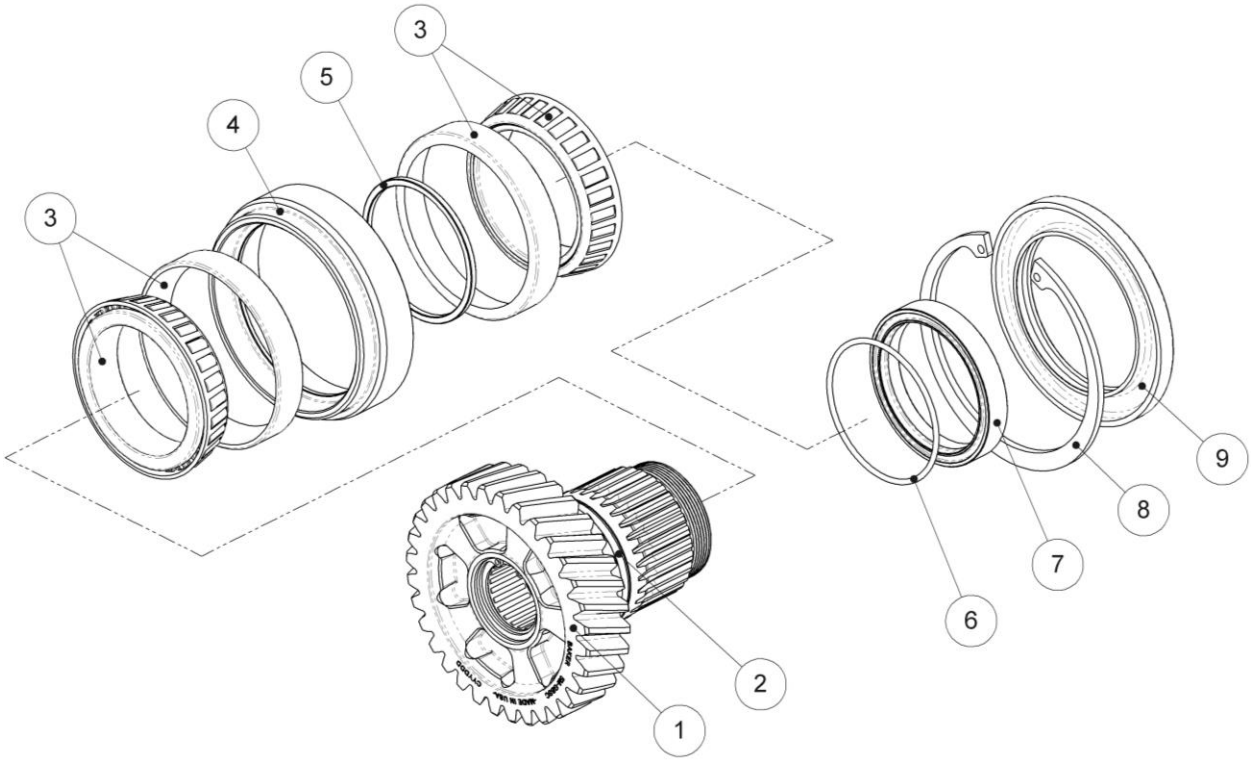


FIGURE 6 | EXPLODED VIEW, TAPERED ROLLER BEARING

ITEM	P/N	QTY	DESCRIPTION
1	5M-GBS	1	5th Gear, Mainshaft, 32T, Helical (Shown)
	5M-GBWZ	1	5th Gear, Mainshaft, 31T, Spur
2	OR568132	1	O-Ring, Buna #132
3	HR32910J	2	Bearing, Tapered Roller, 50 x 72 x 15mm
4	11610-GB	1	Adapter, Tapered Roller Bearings
5	11615-GB	1	Spacer, Tapered Roller Bearing, .102”, White
	11620-GB	1	Spacer, Tapered Roller Bearing, .104”, Green
	11625-GB	1	Spacer, Tapered Roller Bearing, .106”, Blue
6	OR568M52	1	O-ring, Pulley / Sprocket Spacer, 52mm
7	33334-GB	1	Spacer, Pulley / Sprocket
8	1302-334PP	1	Retaining Ring, Beveled Internal, 85mm
9	12074-67	1	Seal, Main Drive Gear, 2.380” x 3.375” x .285”

***** .104” spacer (green) is pre-installed on main drive gear *****
***** .102” (white) and .106” (blue) spacers are included separately in your kit *****

BEFORE INSTALLING YOUR GRUDGEBOX

BEFORE YOU DO A DAMN THING

Know the following. The transmission is a component in the powertrain of your motorcycle. As such, it's function is highly dependent on other components in the powertrain to perform as designed. If the clutch, clutch actuator, primary, or shift linkage is worn, tired, or compromised in any way, the transmission will not perform as designed. The process of installing the GrudgeBox is the perfect time to assess and freshen up these components to ensure the transmission gives you years of trouble-free service.

TORQUE SPECIFICATIONS

FASTENER	APPLICATION	TORQUE VALUE	THREADLOCKER
1/4"-20	Side cover, top cover, derby cover, outer primary, VSS, pulley locking plate	125 – 135 in-lb	Blue recommended
5/16"-18	Bearing door, inner primary	22 – 25 ft-lb	Blue recommended
5/16"-24	Shift arm pinch bolt	18 – 22 ft-lb	Blue recommended
9/16"-12	BAKER comp sprocket bolt	150 ft-lb	Red required
9/16"-12	H-D comp sprocket bolt	See Factory Service Manual	Red required
3/4"-18	Clutch nut	70 – 80 ft-lb	Red required
1-3/4"-20	Pulley nut	35 ft-lb + 35° – 45°	Red required
N/A	Neutral switch	120 – 180 in-lb	None
N/A	Transmission dipstick	25 – 75 ft-lb	None
N/A	Transmission drain plug	14 – 21 ft-lb	None
N/A	Primary drain plug	14 – 21 ft-lb	None

GEARSET AND MAIN DRIVE GEAR REMOVAL

Refer to your Factory Service Manual for detailed instructions on how to remove your stock gearset and main drive gear from the transmission case. Softails, Dynas, and Touring models are all different configurations and require a different method to accomplish the removal. Ensure that you have the correct Factory Service Manual for your year, make, and model of motorcycle.

BERT TIPS:

Apply heat to the comp sprocket bolt head prior to removal. Failure to do so could result in mangled sprocket shaft threads and halt the installation of your GrudgeBox.

Remove the dipstick prior to removing the gearset from the transmission case. Failure to do so will result in a broken dipstick and a trip to the nearest H-D dealer.

BEFORE INSTALLING YOUR GRUDGEBOX

TRANSMISSION CASE PREPARATION

Surgically clean the left side of the transmission case in preparation for installing the new GrudgeBox main drive gear and gearset. This surgical cleansing includes the main drive gear and countershaft bearing boss areas, the three inner primary mount bosses, and the shifter pawl boss. See figure 7.

The bearing boss areas need to be clean so no dirt or debris scores the bearing bores during the removal of old bearings and installation of new ones. The three inner primary mount bosses need to be clean so the TOOLE-GB plate registers flat on the left side transmission case.

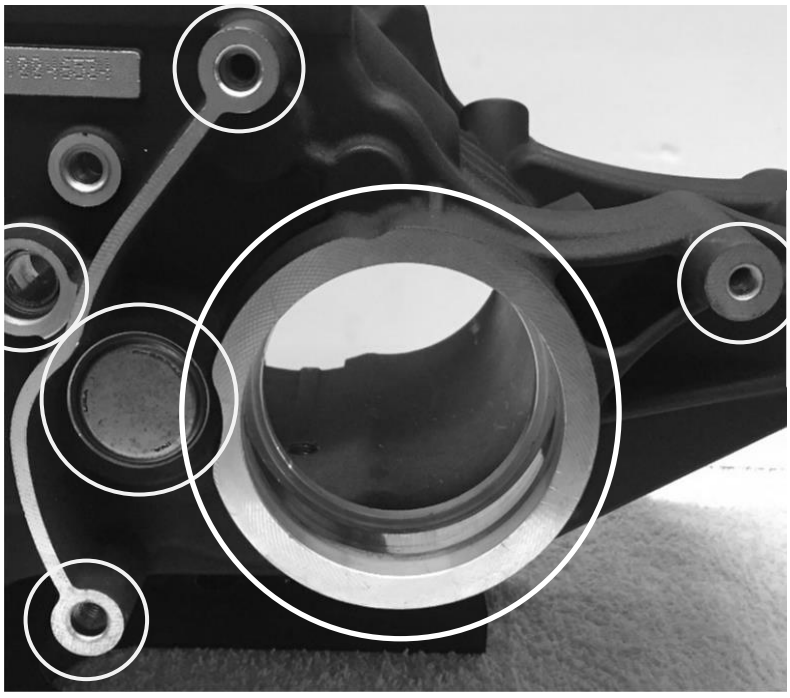


FIGURE 7 | SURGICALLY CLEAN THE LEFT SIDE OF THE TRANSMISSION CASE IN THE AREAS INDICATED ABOVE

CAUTIONARY NOTE:

There are special tools available from other manufacturers that remove and install the countershaft bearing but they all have one fundamental error in common. That is, they push on the inside of the cup shaped countershaft bearing (from right to left in the motorcycle) for removal and installation. THIS IS WRONG! “Cup bearings”, as they are sometimes called, require that the installation force be applied to the outside of the ‘cup’. The BAKER TOOLE-GB (provided in this kit) applies removal and installation force on the outside of the cup (from left to right).

Keep in mind that TOOLE-GB serves two functions. Removal and installation of the countershaft cup bearing AND installation of the tapered roller main drive gear bearing adapter.

You are now ready to remove the old countershaft bearing and replace it with the new one (8963, provided in this kit). Use TOOLE-GB and follow the instructions on the next pages.

REPLACING THE COUNTERSHAFT BEARING

COUNTERSHAFT BEARING REMOVAL

1. Reference figure 8 for the positional relationships of the TOOLE-GB tool components required to remove the countershaft bearing from the case. Loosely assemble the support plate (1) with spacers (8), cap screws (10), threaded shaft (2), and cup (9). Push the cup (9) onto the O-ring end of the threaded shaft (2) until it snaps into position.

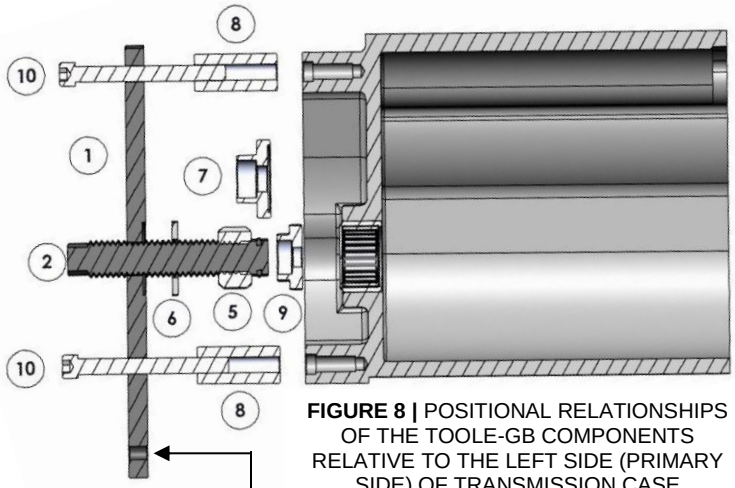


FIGURE 8 | POSITIONAL RELATIONSHIPS OF THE TOOLE-GB COMPONENTS RELATIVE TO THE LEFT SIDE (PRIMARY SIDE) OF TRANSMISSION CASE

FOR COUNTERSHAFT BEARING REMOVAL AND INSTALLATION, SUPPORT PLATE IS LOCATED AS SHOWN WITH COUNTERBORE POCKET AND ENGRAVING FACING THE CASE

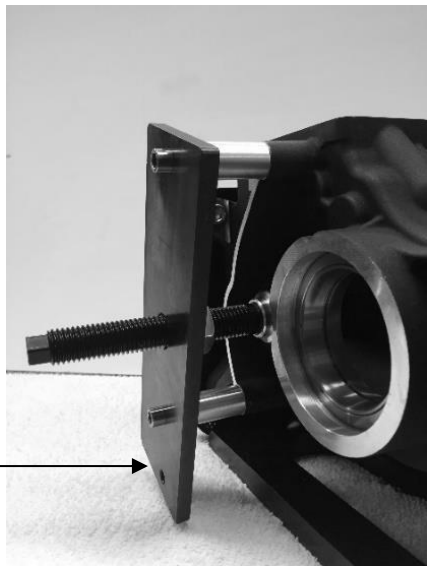


FIGURE 9 | SUPPORT PLATE POSITION FOR COUNTERSHAFT BEARING REMOVAL AND INSTALLATION

2. With the cup (9) centered on the countershaft bearing, finger tighten the nut (5) and cap screws (10). Secure the cap screws (10) with an Allen wrench. Hold the threaded shaft (2) with a 9/16” combo wrench or 5/16” allen wrench. Press the countershaft bearing through the case by tightening the nut (5) against the washer (6) and case support plate (1); see figure 10.

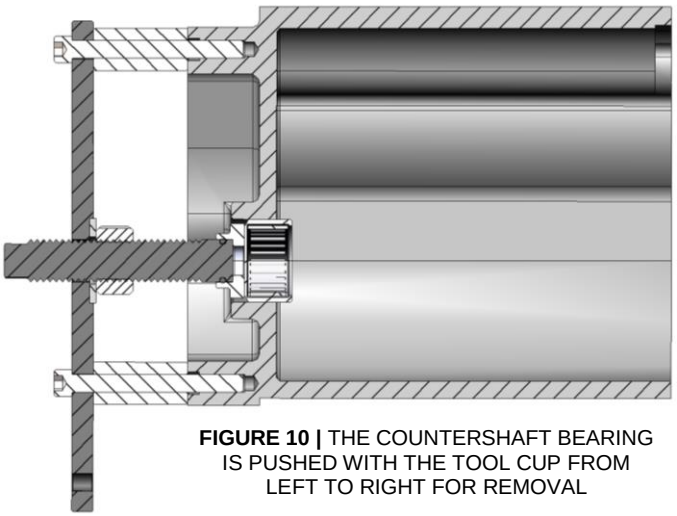


FIGURE 10 | THE COUNTERSHAFT BEARING IS PUSHED WITH THE TOOL CUP FROM LEFT TO RIGHT FOR REMOVAL

REPLACING THE COUNTERSHAFT BEARING

COUNTERSHAFT BEARING INSTALLATION

3. With the old countershaft bearing removed, loosen the nut (5) to allow removal of the cup (9) from the threaded shaft (2). Wipe out the countershaft bearing bore in the case with a clean rag and apply a thin film of oil for installing the new bearing. Install cup (7) on the end of the threaded shaft (2) until it fully seats. Place the new bearing between the cup (7) and the case as shown in figure 8. Snug the threaded shaft (2) by hand until the bearing registers squarely in the bore of the case; see figure 11.

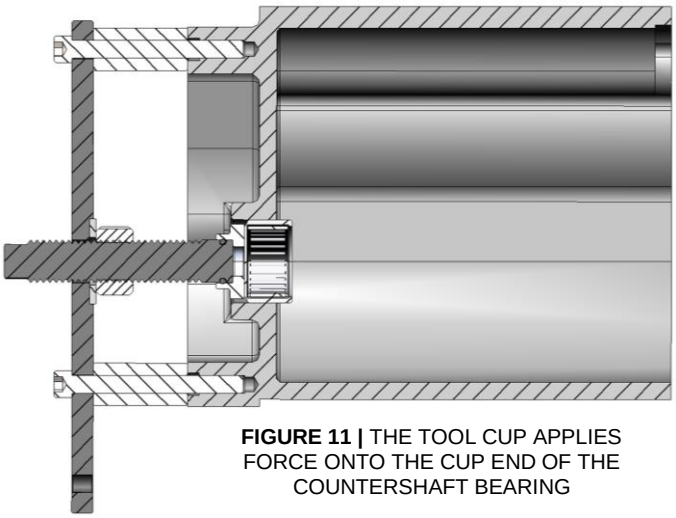


FIGURE 11 | THE TOOL CUP APPLIES FORCE ONTO THE CUP END OF THE COUNTERSHAFT BEARING

4. With the new bearing registered squarely in the case bore, hold the threaded shaft (2) with a 9/16” combo wrench or 5/16” Allen wrench. Tighten the nut (5) until the cup (7) is completely bottomed out on the case to ensure that the bearing is installed at the correct depth; see figure 12. Bearing should be slightly above the surface of the case.

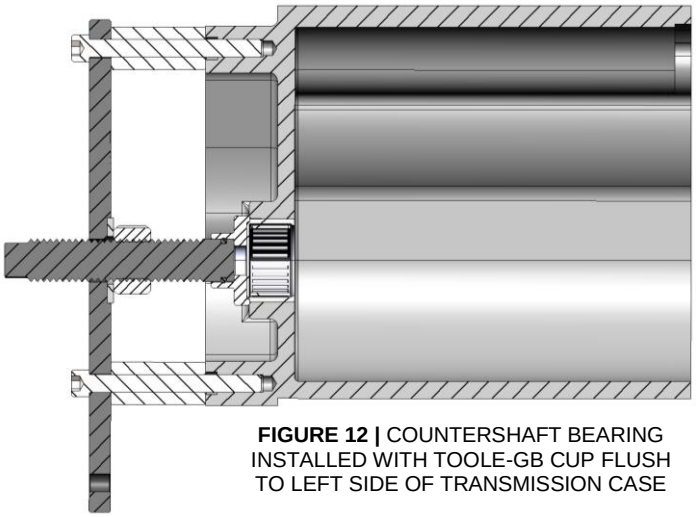


FIGURE 12 | COUNTERSHAFT BEARING INSTALLED WITH TOOLE-GB CUP FLUSH TO LEFT SIDE OF TRANSMISSION CASE

BERT TIP:
Do not over tighten the nut (5) after the cup (7) bottoms on the case. Doing so will damage the cup (7).

INSTALLING THE TAPERED BEARING ADAPTER

TAPERED BEARING ADAPTER INSTALLATION

1. Reference figure 13 for the positional relationships of the tool components required to install the tapered bearing adapter into the transmission case. Loosely assemble the support plate (1) with spacers (8), cap screws (10), threaded shaft (2), and cup (4). Push the cup (4) onto the O-ring end of the threaded shaft (2) until it snaps into position.

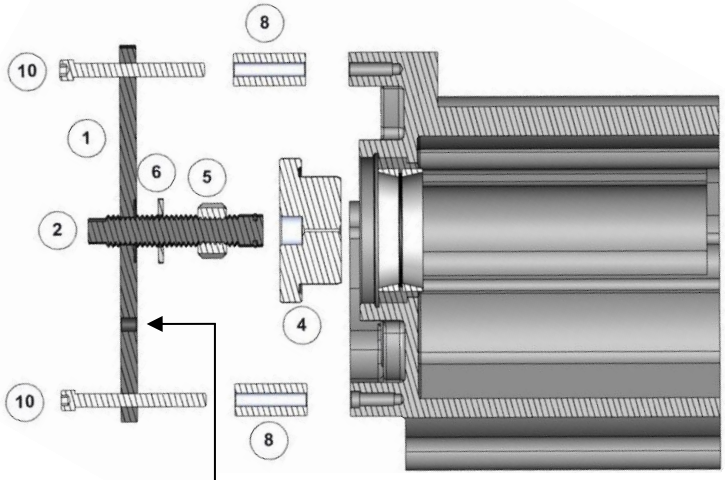


FIGURE 13 | POSITIONAL RELATIONSHIP OF THE TOOLE-GB COMPONENTS FOR TAPERED BEARING ADAPTER INSTALLATION

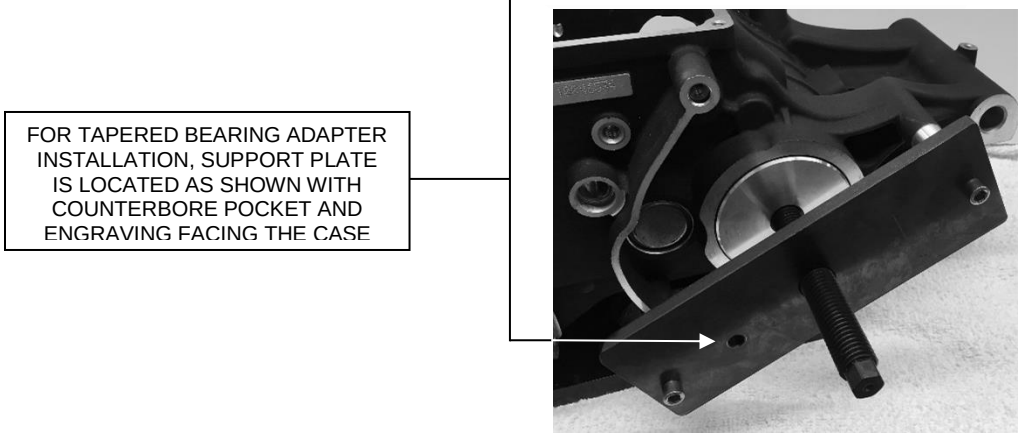


FIGURE 14 | SUPPORT PLATE POSITION FOR TAPERED BEARING ADAPTER INSTALLATION

2. Before the cap screws (10) are threaded into the case, slide the tapered bearing adapter onto the cup (4). Snug the cap screws (10) then loosen one half turn. Snug the threaded shaft (2) by turning the nut (5) by hand until the tapered bearing adapter registers squarely with the transmission case bore. With the adapter registered squarely with the case, loosen the threaded shaft (2) just enough to allow the cap screws (10) to be tightened; see figure 15.

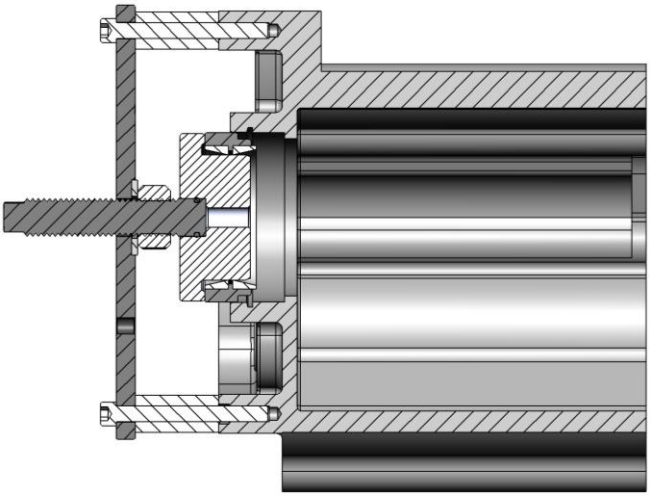


FIGURE 15 | TAPERED BEARING ADAPTER WITH TOOLE-GB APPLYING FORCE FROM LEFT TO RIGHT

INSTALLING THE TAPERED BEARING ADAPTER

3. The tapered bearing adapter is a press fit into the transmission case unlike the stock bearing which has a slip-fit. To ensure successful installation of the tapered bearing adapter and longevity of the installation tool, you must heat the transmission case as shown in figure 16. Use a MAP/propane torch or a heat gun as shown in figure 17.

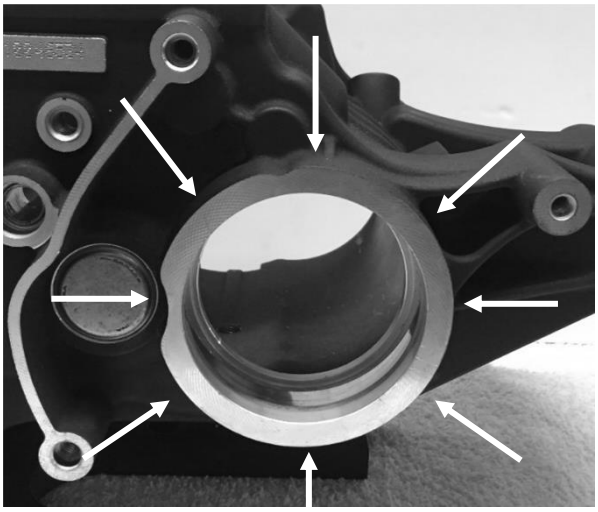


FIGURE 16 | APPLY HEAT AROUND THE MAIN DRIVE GEAR BEARING BOSS AREA

4. Apply heat evenly around the boss of the main drive gear bearing bore from the outside of the case as shown in figure 16. DO NOT heat the boss from the inside of the case (this could damage your speedometer sensor) and keep heat away from the tapered bearing adapter that is staged and ready for installation. The bearing bore boss should be heated to approximately 200 – 250°F.

FIGURE 17 | USE MAP/PROPANE GAS OR A HEAT GUN

INSTALLING THE TAPERED BEARING ADAPTER

5. Immediately after the case is heated, secure the 9/16” hex or 5/16” Allen end of the threaded shaft (2) and tighten the nut (5) to drive the tapered bearing adapter into the case until it bottoms out in the bore; see figure 18. This operation must be done quickly with no interruptions while the case is warm.

   BERT TIP:
   Do not over tighten the nut (5) after the tapered bearing adapter is bottomed out. Doing so may damage the tool or main drive gear bearing bore landing in the case.

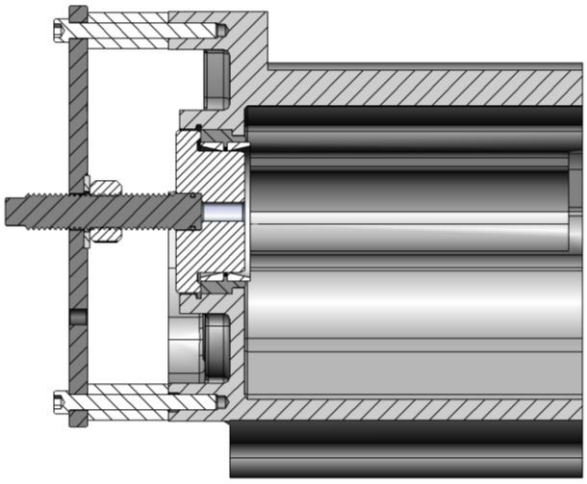


FIGURE 18 | TAPERED BEARING ADAPTER FULLY SEATED IN CASE

6. Remove the installation tool. You will know the tapered bearing adapter is seated into the bore when the beveled retaining ring groove is fully visible and the retaining ring fully seats into the groove; see figure 19.

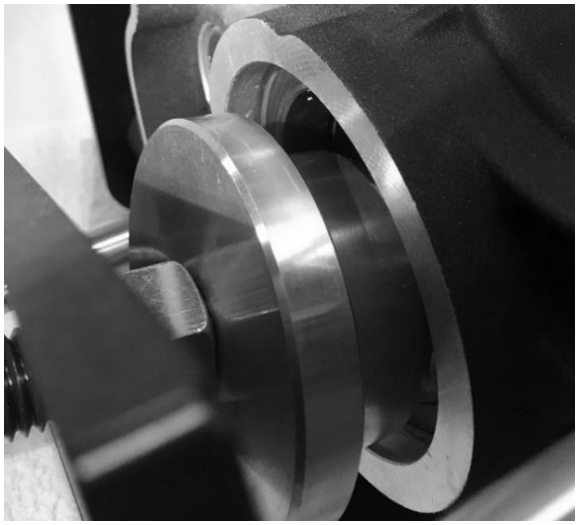


FIGURE 19 | TAPERED BEARING ADAPTER VISUAL INSPECTION

7. Install the beveled retaining ring (VHO-334STPA) with the bevel facing outward; see figure 20.

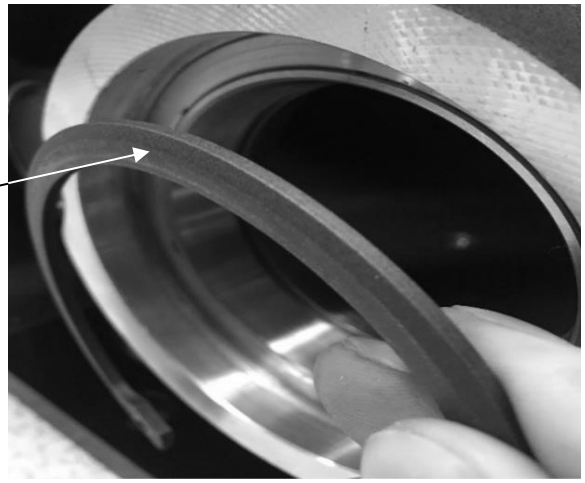


FIGURE 20 | BEVELED RETAINING RING WITH BEVEL FACING OUTWARD

INSTALLING THE MAIN DRIVE GEAR

MAIN DRIVE GEAR INSTALLATION

1. After installing the retaining ring, put a thin coating of oil on the tapered bearing races. We recommend a light spray lubricant like WD-40®; see figure 21. A thicker oil could give you a false reading when checking endplay.

   So far in the GrudgeBox installation process, everything has been pretty much like servicing a stock bike, but that's going to change right now. Setting up end play in the tapered roller bearings is NOT a task for someone whose only experience is changing turn signal bulbs. If anything so far in this process has tested your wrenching aptitude, now is a good time to turn the job over to seasoned wrench, preferably one who has experience setting up the tapered rollers in the left side of the motor case.

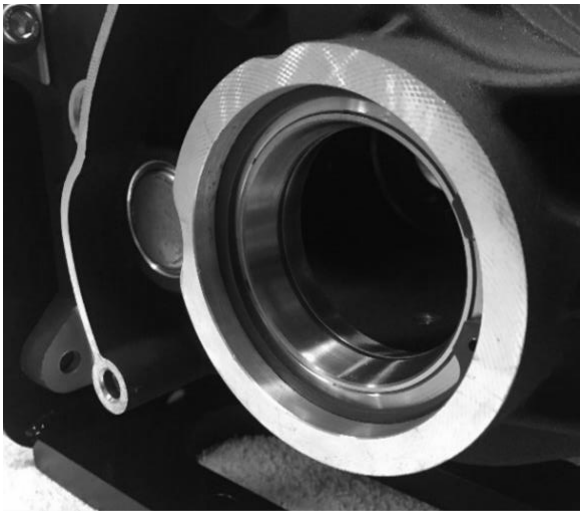


FIGURE 21 | LIGHTLY OIL BEARING RACES AFTER INSTALLING THE TAPERED BEARING ADAPTER

2. The kit comes with three spacers for setting up endplay in the tapered roller bearings: .102" (white), .104" (green) and .106" (blue) thick. The most commonly used spacer (.104") is pre-installed on the main drive gear. The .102" and .106" spacers are in your kit if they are required after the end play is measured with the pre-installed .104" spacer.

   Before installing the main drive gear, put a thin coating of transmission oil on the O-ring; see figure 22.

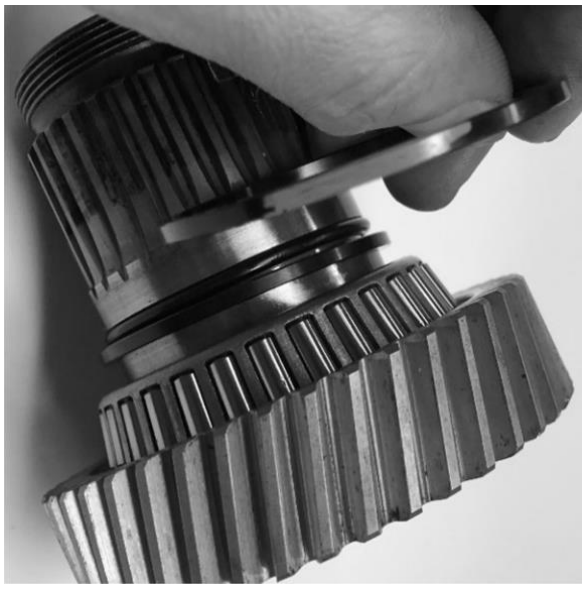


FIGURE 22 | MAIN DRIVE GEAR WITH SPACERS

INSTALLING THE MAIN DRIVE GEAR

3. Follow the Factory Service Manual to install the main drive gear using BAKER TOOLA-07 or H-D equivalent 35316C. If the H-D equivalent tool is used, you will need to use the pulley spacer 33334-GB from your GrudgeBox kit for extra spacing while pressing the tapered bearings together.

   If you need to use the pulley spacer (33334-GB), temporarily remove the O-ring. Remember to re-install it after the end play is set.

FIGURE 23 | IF USING H-D TOOLING, THE GRUDGEBOX PULLEY SPACER IS NEEDED TO EXTEND THE LENGTH OF THE INSTALLATION CUP

4. Gently slide the assembled main drive gear through the case. Take the loose tapered roller bearing (HR32910J) and slide it over the main drive gear, letter side facing out. Slide the pulley spacer onto the gear if needed (O-ring groove facing bearing), followed by the remaining press tools; see figure 23.

FIGURE 24 | INSTALLING THE MAIN DRIVE GEAR

5. With the tooling installed, snug the assembly by hand while making sure the installation tool cup is properly aligned and not skewed to the side of the tapered bearing. Hold the bolt on the inside of the case using the proper socket and ratchet. Tighten the main drive gear tooling on the primary side of the bike until it is fully seated and tight. Refer to the main drive gear tool instructions and figure 24.

INSTALLING THE MAIN DRIVE GEAR

6. Do not remove the install tool yet; leave everything tight. Measure the amount of endplay in the main drive gear assembly using a dial indicator as shown in figure 25. Total axial endplay (pulling / pushing on the gear) must be between .0005" and .003". Measuring end play is tricky. The end play measurement can easily be skewed if radial (up-and-down, side-to-side) or rotational forces are applied, so Bert says, "*DON'T DO THAT*". Old timers that have experience setting up left side motor case end play can do so without a dial indicator. Instead, they rely on feel and sound. A correctly set up GrudgeBox main drive gear should make a soft 'tunk-tunk-tunk' sound when axial loads are applied.

FIGURE 25 | CHECKING AXIAL ENDPLAY IN THE MAIN DRIVE GEAR TAPERED ROLLER BEARINGS

IF YOUR SETUP IS TOO TIGHT (UNDER .0005"), REMOVE THE MAIN DRIVE GEAR FROM THE CASE USING THE PROPER TOOLING. REMOVE THE O-RING FROM THE 'SNOUT' OF THE MAIN DRIVE GEAR FOLLOWED BY THE .104" (GREEN) SPACER. INSTALL THE .106" (BLUE) SPACER, REPLACE THE O-RING, AND GO BACK TO STEP 4.

IF YOUR SETUP IS TOO LOOSE (OVER .003"), REMOVE THE MAIN DRIVE GEAR FROM THE CASE USING THE PROPER TOOLING. REMOVE THE O-RING FROM THE 'SNOUT' OF THE MAIN DRIVE GEAR FOLLOWED BY THE .104" (GREEN) SPACER. INSTALL THE .102" (WHITE) SPACER, REPLACE THE O-RING, AND GO BACK TO STEP 4.

7. Remove the tooling used to install the main drive gear along with pulley spacer if you had to use it. If necessary, reinstall the O-ring (OR568M52) that you removed from the pulley spacer in step 4.

INSTALLING THE MAIN DRIVE GEAR

8. Install the pulley spacer and main drive gear seal, making sure the O-ring is facing inward (toward the bearing); see figure 26.

FIGURE 26 | INSTALLING THE PULLEY SPACER AND THE MAIN DRIVE GEAR SEAL

9. Install the main drive gear seal until it is flush with the transmission case all the way around the bearing boss; see figure 27.

FIGURE 27 | MAIN DRIVE GEAR SEAL INSTALLED FLUSH WITH CASE

INSTALLING THE GEARSET

SHIFTER PAWL INSTALLATION

1. Install the GrudgeBox shifter pawl along with the new seal, washer, and 7/16” retaining ring just like a stock shifter pawl is installed. Do not remove the zip tie because it is placed on the pawl to keep the active plate retracted during gearset installation into the case; see figure 28.

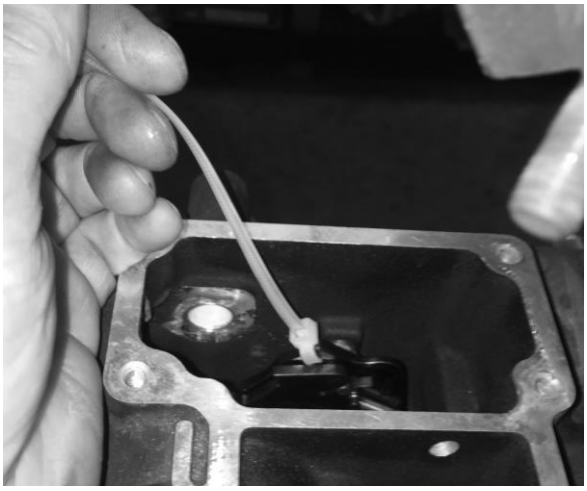


FIGURE 28 | LEAVE THE ZIP TIE ON THE SHIFTER PAWL UNTIL AFTER THE GEARSET IS INSTALLED AND THE BOLTS ARE TORQUED

GEARSET INSTALLATION

2. The time has come to stuff the gearset into the transmission case. Before that is done, take time to ensure no debris or tarantulas have found their way into the case. Check that the two bearing door dowels came out of the case with old bearing door. Locate the new bearing door gasket onto the dowels of the GrudgeBox bearing door.

   Generously apply transmission lube to the last 6” of the mainshaft, end of the countershaft, countershaft bearing, tapered roller bearings, and the bearings/seal in the main drive gear. Do not remove the black rubber cap from the end of the mainshaft. Its function is to protect the seal in the main drive gear as the gearset is installed.

FIGURE 29 | GRUDGEBOX GEARSET READY FOR INSTALLATION INTO THE CASE

INSTALLING THE GEARSET

3. Carefully install the gearset into the transmission case. It is helpful to have a second set of hands on the left side of the motorcycle to grab onto the mainshaft as it passes through the main drive gear. The person on the left side can help the process along by gently rotating the main drive gear back and forth; this helps the 5th gear on the countershaft find home with the main drive gear.

   It is rare, but sometimes the fork rods need to be jostled to find home on the left side of the transmission case.

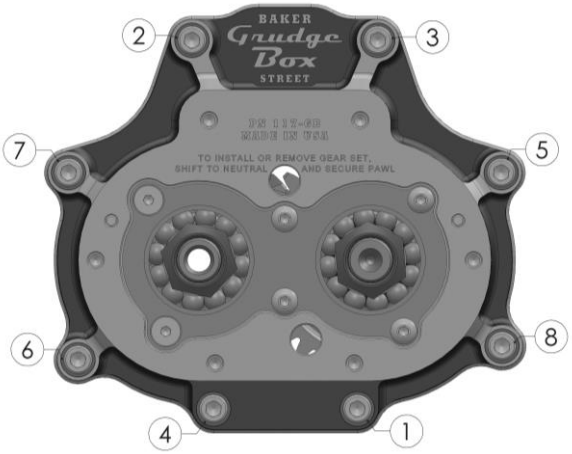


FIGURE 30 | TORQUE SEQUENCE FOR GRUDGEBOX BEARING DOOR BOLTS

4. Install the eight stainless steel cap screws and washers onto the bearing door using blue threadlocker. Be sure to replace the exhaust bracket beneath the bottom inner bolts. Torque to 22 – 25 ft-lb using the torque sequence in figure 30. You may remove the zip tie from the shifter pawl and the black rubber cap from the mainshaft at this time.

5. Remove the speed sensor from the transmission case. Remove the O-ring from the speed sensor, install the provided spacer (132-56R), and re-install the O-ring. The speed sensor with spacer can now be placed back in the transmission case. Torque the bolt to 125 – 135 in-lb with blue threadlocker.

6. With the new side cover gasket in place, re-install the side cover and torque the bolts to 125 – 135 in-lb with blue threadlocker. Go to the other side of the motorcycle and re-install the drive pulley or sprocket onto the main drive gear. Use BAKER TOOLD-07 or H-D equivalent to torque the pulley / sprocket nut to 35 ft-lb + 35° – 45° with red threadlocker. Refer to your Factory Service Manual for details.

TRANSMISSION FLUID

7. Re-install the transmission drain plug and torque it to 14 – 21 ft-lb. Re-install the transmission dipstick and torque it to 25 – 75 in-lb.

8. Put 28 oz. transmission fluid (75-85W140 synthetic gear oil) into the transmission by pouring it through the top cover cavity onto the main drive gear and shifter pawl. Make sure to coat as much of the gearset components as possible with the fluid.

FINAL STEPS

FINISH LINE

1. Re-install the top cover with the new gasket provided. Button up the primary, exhaust, shift linkage, and floorboards/footpegs per your Factory Service Manual. Make sure to re-install the primary drain plug and fill the primary with fluid.

2. You have successfully completed the installation of your new transmission. Be observant of basic transmission function and overall vehicle operation during the first 20 miles. Check for leaks after your first ride. Provided there are no issues, give 'em hell and enjoy your new BAKER GrudgeBox.

SPEEDOMETER, GEAR INDICATOR, & CRUISE CONTROL

The GrudgeBox has different gear ratios than the stock transmission (except GrudgeBox 5th gear is the same as stock 6th gear, 1:1). This changes the input to the ECM. The 41-tooth reluctor ring in the GrudgeBox compensates to correct the speedometer within ± 2 mph with no re-flash to the ECM. However, the gear indicator and cruise control may only operate in 5th gear. To correct the gear indicator in all gears and enable cruise control in 3rd, 4th, and 6th, an ECM re-flash is required.

TERMS & CONDITIONS

ORDERS

Orders can be pre-paid using VISA, MasterCard, American Express, and Discover or via wire transfer ($30 wire transfer fee applies). All orders not pre-paid will be sent C.O.D. certified check or money order only unless pre-approved for company check acceptance. Any orders from outside the USA must be pre-paid in US funds via wire transfer ($30 transfer fee applies).
Prices shown are F.O.B. Haslett, MI. BAKER™ ships via UPS Ground or USPS Parcel Post for all orders. UPS air shipment or USPS Priority/ Express services are available upon request. Customer is responsible for all shipping charges unless otherwise arranged at the time of sale.

CUSTOMER SUPPORT

For any installation or service questions, please contact our BAKER technical department: 1-517-339-3835.

LIMITED WARRANTY

BAKER™ transmission assemblies, transmission kits, primaries, and oil pans are guaranteed to the original purchaser to be free of manufacturing defects in materials and workmanship for a period of 5 years from the date of purchase or up to 50,000 miles. BAKER™ clutches, kicker cover kits, belt drives, F6F kit, reverse systems, covers and accessories are guaranteed to the original purchaser to be free of manufacturing defects in materials and workmanship for a period of 2 years from the date of purchase or up to 24,000 miles. Electrical components are guaranteed for 90 days, chrome finish is guaranteed for 6 months.

If the product is found by BAKER™ to be defective, such products will, at the option of BAKER™, be replaced or repaired at cost to BAKER™.

In the event warranty service is required, the original purchaser must call or write BAKER™ immediately with the problem. If it is deemed necessary for BAKER™ to make an evaluation to determine whether the transmission assembly or transmission kit is defective, the entire transmission assembly, whether originally purchased as an assembly or kit, must be properly packaged and returned prepaid to BAKER™ with a copy of the original invoice of purchase. If after an evaluation has been made by BAKER™ and a defect in materials and/or workmanship is found, BAKER™ will, at BAKER™ option, repair or replace the defective part of the assembly.

BAKER Warranty card must be returned within 45 days of purchase to be valid.

RETURNS AND EXCHANGES

Any merchandise returned for any reason (exchange, credit or modification) must be accompanied by a Returned Goods Authorization (RGA) number or it will be refused. Call BAKER™ to obtain this number prior to returning goods for any reason. There is a 15% restocking fee for all returned items. BAKER™ is not liable for any shipping changes or damages incurred during shipping. Shipments of returned goods must be insured by the customer.

ADDITIONAL WARRANTY PROVISIONS

NOTE: This limited warranty does not cover labor or other costs or expenses incidental to the repair and or replacement of BAKER™ products. This warranty does not apply if one or more of the following situations is judged by BAKER™ to be relevant: improper installation, accident, modification (including but not limited to use of unauthorized parts), racing, high performance application, mishandling, misapplication, neglect (including but not limited to improper maintenance), or improper repair.

BAKER™ shall not be liable for any consequential or incidental damages arising out of or in connection with a BAKER™ transmission assembly, transmission kit, swingarm, fender, component or part. Consequential damages shall include without limitation, loss of use, income or profit, or losses sustained as the result of injury (including death) to any person or loss of or damage to property.

BAKER™ transmissions, transmission kits, and accessories are designed exclusively for use in American V-Twin motorcycles. BAKER™ shall have no warranty or liability obligation if a BAKER™ part is used in any other application.

If it is determined that a BAKER™ transmission assembly has been disassembled during the warranty period for any reason, this limited warranty will no longer apply unless you were instructed to do so by a BAKER Drivetrain technician for diagnostic purposes.

DISCLAIMER

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It is the sole responsibility of the user to determine the suitability of this product for his or her use, and the user shall assume all legal, personal injury risk and liability and all other as well as all other obligations, duties and risks associated therewith.

NOTES

GENERAL MAINTENANCE LOG

DATE	ODOMETER	WORK PERFORMED	SERVICED BY

TRANSMISSION OIL CHANGE LOG

DATE	ODOMETER	OIL USED	SERVICED BY
	500		
	2,500		
	7,500		
	12,500		
	17,500		
	22,500		
	27,500		
	32,500		
	37,500		
	42,500		
	47,500		
	52,500		
	57,500		
	62,500		
	67,500		
	72,500		
	77,500		
	82,500		
	87,500		
	92,500		