



Understanding The 290 Transmission

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Contributing Editor**

The fastest growing segment of the auto market is the light-truck/sport-utility vehicle. Those of us who have driven trucks and 4WD vehicles for years were used to the "bare bones" work horses that were available. Many of the people purchasing light trucks today have no previous truck experience and demand vehicles with more car-like qualities. This has driven the factories to produce quieter, better riding and more luxurious trucks. The demand for more creature comfort in these vehicles has impacted all components of the truck, with strong emphasis on the drivetrain. With these market pressures upon them, GM introduced the HM 290 5-speed transmission in the C & K truck lines in 1988 (See Figure 1). This unit was designed by Getrag in Germany and was, by American standards, a very complex unit, which was not easy to repair. Since its introduction, this unit has undergone significant design changes, which have created part-interchange problems for repair shops and enough confusion to give the 290 a bad name.

HM290 (5LM60) Unit Description

The trans case is aluminium and has a 2-piece design.

Torque capacity310 ft/lbs.

GVW7200 lbs.

Maximum input shaft speed6,000 rpm.

Center line distance between main and counter shaft 85mm.

All forward speeds are synchronized.

All gears including reverse are in constant mesh.

Produced in 2WD and 4WD versions.

Ratios:

1st gear ----- 4.016-1

2nd gear ----- 2.318-1

3rd gear ----- 1.401-1

4th gear ----- 1.00-1

5th gear ----- .729-1

(C&K trucks), .824-1 (S&T Trucks)

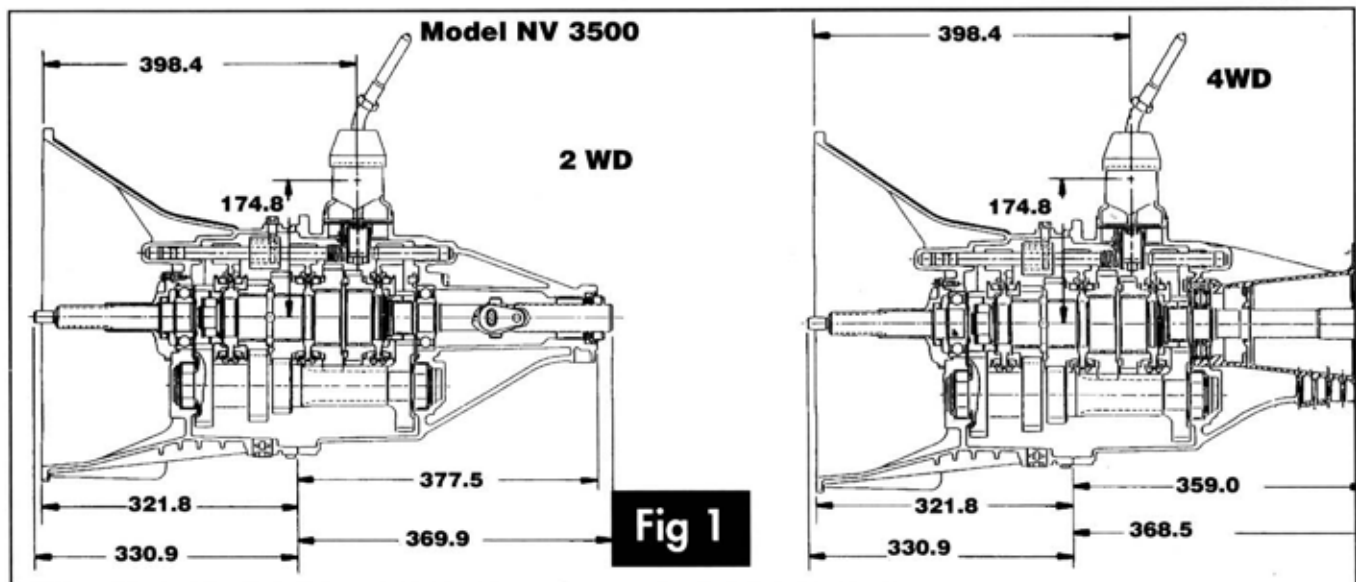
Reverse ----- 3.736-1

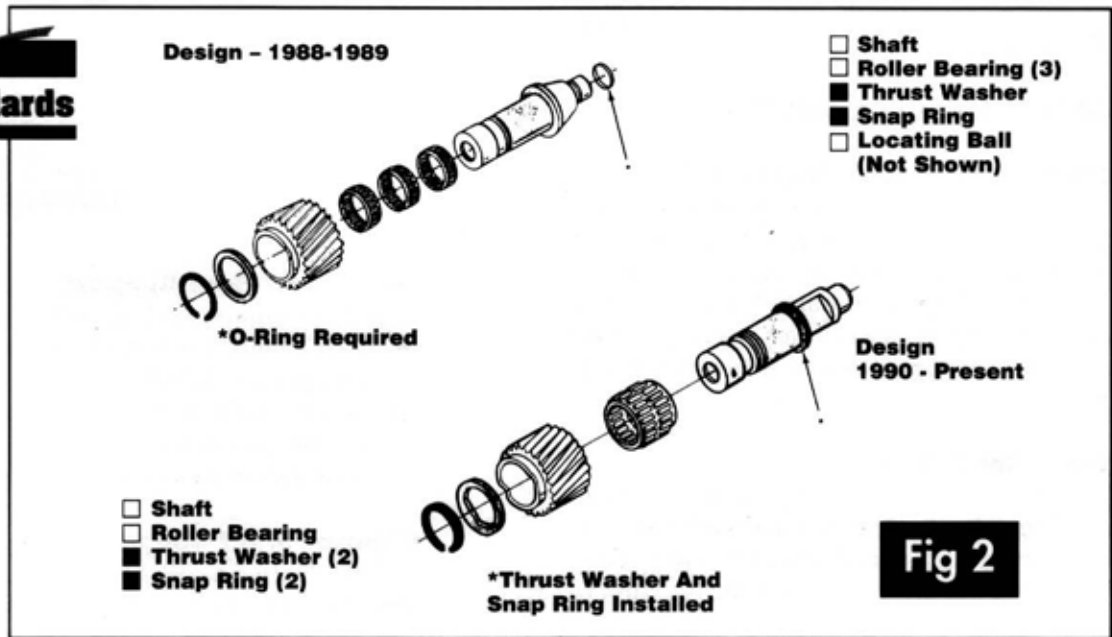
Lube Fill _ 4.2 pints manual trans fluid P/N

10522931

The design of the 290 and the subsequent design changes confused many repair shops. There are several essential service tools which are necessary to rebuild these units properly; one of which is a good

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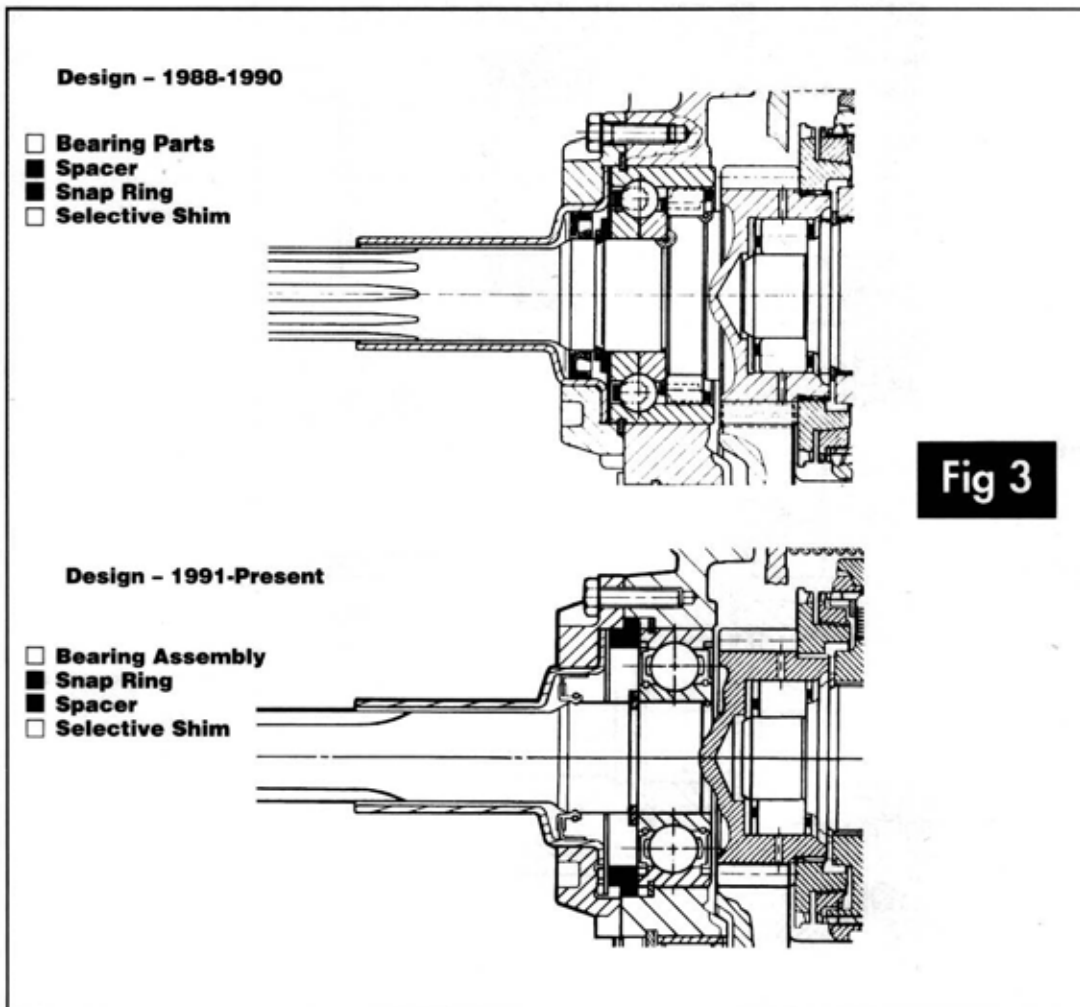




repair manual. The design of the 290 is typical of advanced German engineering. Clearances are tight and there are lots of parts in the shift mechanism. The blocker rings are made of forged steel, with a lining of stainless steel coated with a bronze compound. This requires a lubricant with a special additive

package, GM p/n 10522931. Now this stuff is expensive so make sure to bill accordingly. If you encounter one of these units that has run dry, rest assured that the synchro rings are history, as low or no lube will cause quick failure.

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Major Design Changes

Reverse Idler Gear Support

1988 and 89 models use 3 needle bearings to support the reverse idler gear, with the shaft having a shoulder, 1 thrust washer and 1 snap ring. 1990 to present design incorporates 1 double-row needle bearing supporting the idler gear, a shaft without a shoulder, 2 snap rings and 2 thrust washers (See Figure 2).

Input Shaft Support

1988-89 models were built with a multipart input bearing using both rollers and balls (See Figure 3). In 1991, the design was changed to a one-piece ball bearing. Both designs use a selective shim to set end-play.

Main Shaft Rear Support

1988-89 units were built with a multipiece bearing (balls & rollers), a threaded adjuster, a selective shim and a snap ring. In 1990, the design changed using a single-row ball bearing and a snap ring. The threaded adjuster and selective shim no longer are incorporated in the design (See Figure 4).

Counter Shaft Support

1988-89 used a roller bearing at each end with an outer race enclosed on one end and a roller set with a flexible cage. The front c/s bearing has selective shims to control counter shaft endplay. 1991 brought a design change that eliminated the selective shim at the front counter shaft bearing (See Figure 5). Endplay is set by the design and fit of the case halves and is not adjustable.

More discussion on this will be found later in this article.

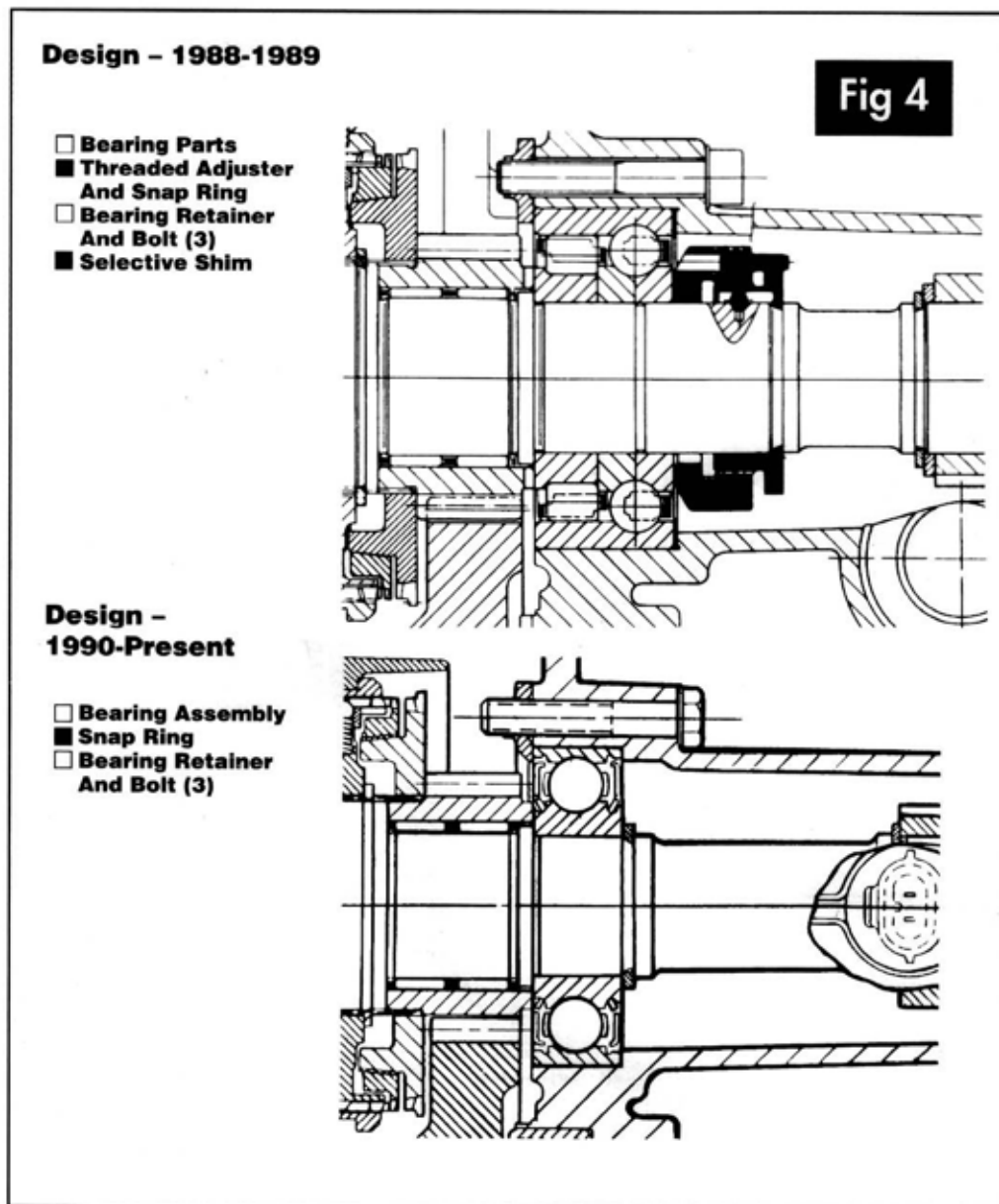
Main Shaft

All speed gears are supported by needle roller bearings. 1988-89 design 2nd speed gear has a separate inner race which was eliminated in 1991. The later design uses a 2 piece thrust washer with a retaining ring between 2nd and 3rd gears.

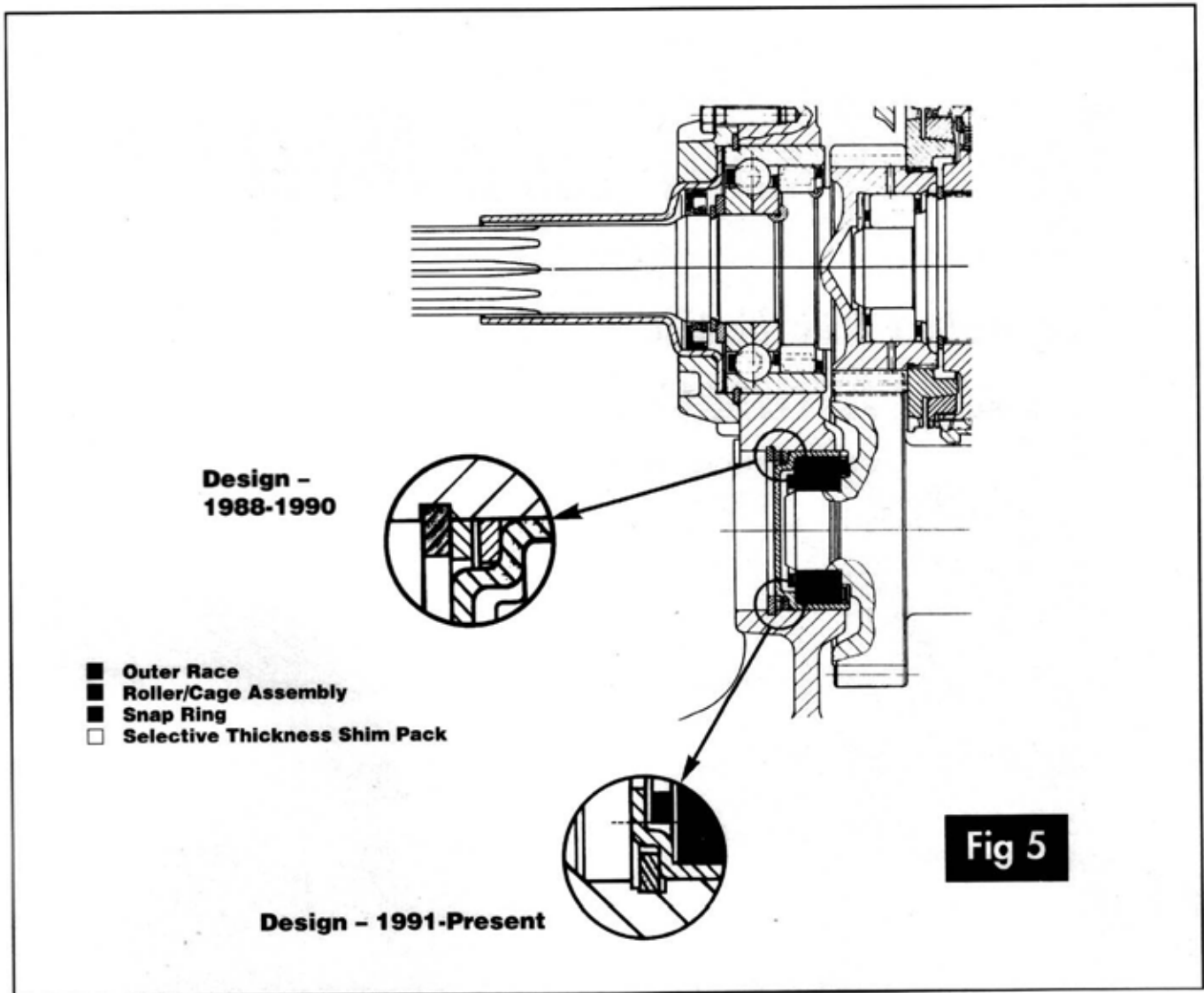
Shift Controls

The original shift mechanism used a main shift shaft with 3 shift rails and a complex interlock and detent system. In 1993, the engineers at New Venture Gear Inc. redesigned the

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complete shift linkage making it into a single-rail system (See Figure 6). The unit was renamed the New Venture 3500. New Venture Gear is a joint effort between Chrysler Corp. and General Motors, producing transmissions for both firms. The NV3500 (ex-290) now is found in GM and Dodge trucks.

Changes For 1995

On GM vehicles a new dual cone design synchronizer was introduced for the 1-2 gears. This design increases synchro capacity significantly and provides for smoother shifts. For the S & T GM trucks, a new set of ratios has been released for improved driveability.

1st gear	3.5-1
2nd gear	2.16-1
3rd gear	1.4-1
4th gear	1.0-1
5th gear	.79-1

Excessive Counter Shaft Endplay Concerns

I have received numerous tech calls from shops having problems with counter shaft endplay on 2nd-

design units. There is no way to set endplay on the counter shaft. Many rebuilders have called with units with excess endplay that clunked on throttle tip in and tip out. We are working at present to find a practical way to adjust endplay on the counter shaft during a rebuild. If and when this occurs, it will be printed here. In doing the research for this article, I discussed this problem with the engineers at New Venture Gear. They have done extensive research on throttle-related clunk and their findings indicate that the problem is not transmission related. Clearly there will be transmissions that can cause a clunk because of internal damage, but with a good unit, the clunk may be outside the gear box. The improvements made in engine throttle response through the advanced fuel-injection systems now available are part of the problem. Instant throttle response taking the slack out of various driveline components may "walk through" drive shafts and sound as if it originates in the unit. Swapping brand new units with those suspected of clunking made no difference, according to the engineer in charge of the 3500 program. It may

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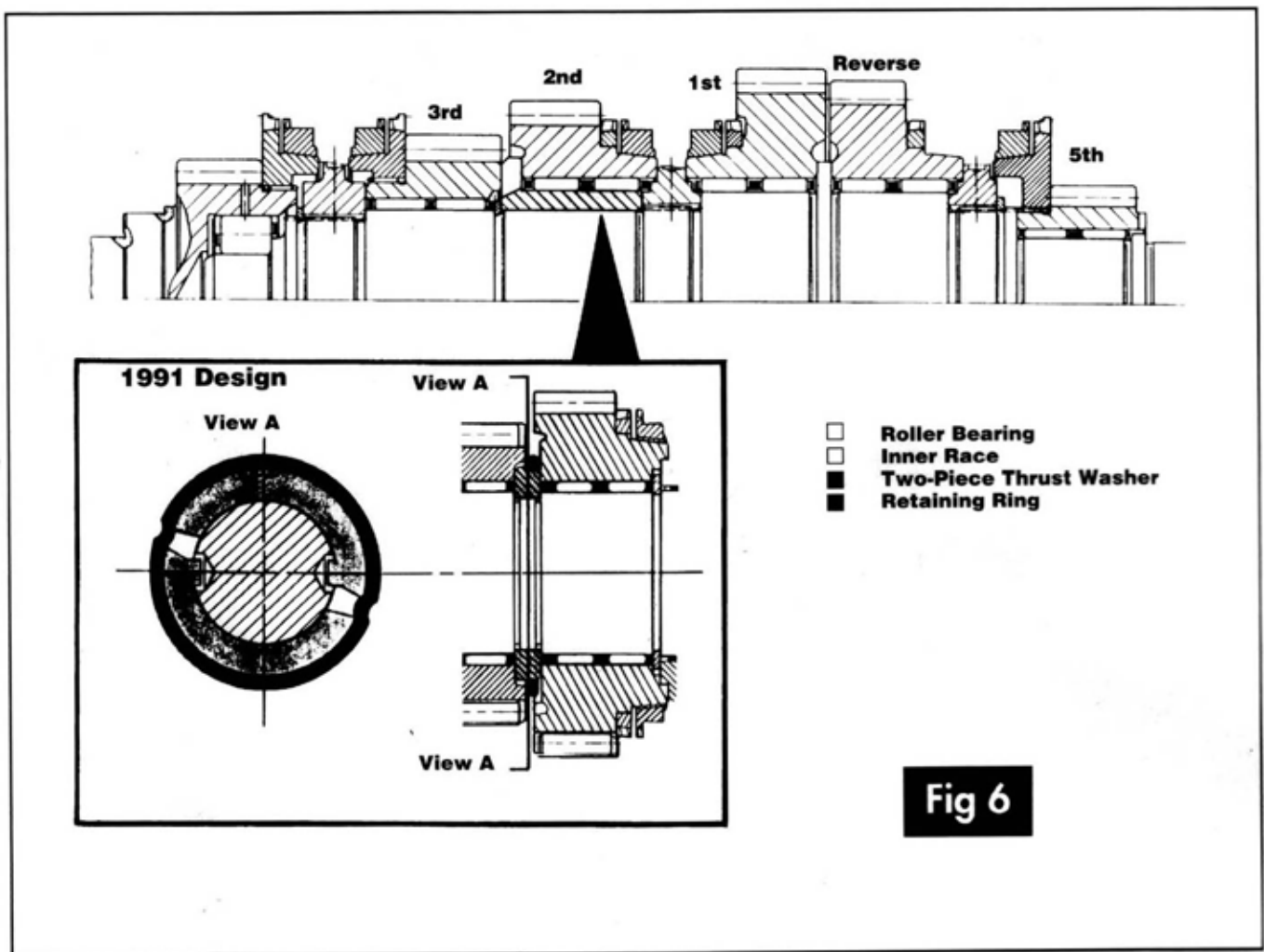


Fig 6

well be that other driveline components have to be upgraded as was the transmission to solve this problem. New Venture has been tightening up the manufacturing tolerances for the counter shaft every year. The manufacturing tolerances are listed below:

The original 290 design suffered from a bad case of over-engineering. The design problems have by and

Model	Year	Minimum	Maximum	Target
290	1991	.75mm(.0293)	1.15mm(.0452)	.969mm(.0381)
290	1992	.60mm(.0236)	.920mm(.0362)	.744mm(.0292)
3500	1993	.35mm(.013)	.530mm(.0208)	.450mm(.0177)

large been eliminated by the 3500 redesign. The engineering staff at New Venture Gear deserve a salute for their efforts. It is much more difficult to revamp an existing unit than it is to start with a clean sheet of paper. If you have driven the 290 series units, you will be impressed with the 3500. This unit is a major improvement in noise reduction and driveability. Nothing comes easy in this life, not for us and not for

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the factories. Many times we are tempted to curse a bad design, but remember that no automaker starts out trying to build a bad design. When

parts or designs don't provide the level of performance required, a lot of effort is expended trying to solve the problem and more money than you can imagine. We are all in this together, so try not to shoot down a unit to your customers, it serves no good purpose and often comes across as an excuse in advance for less than quality repairs. **TD**