

Figure 122

Component Rebuild  
Continued on Page 81

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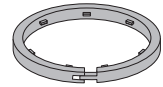
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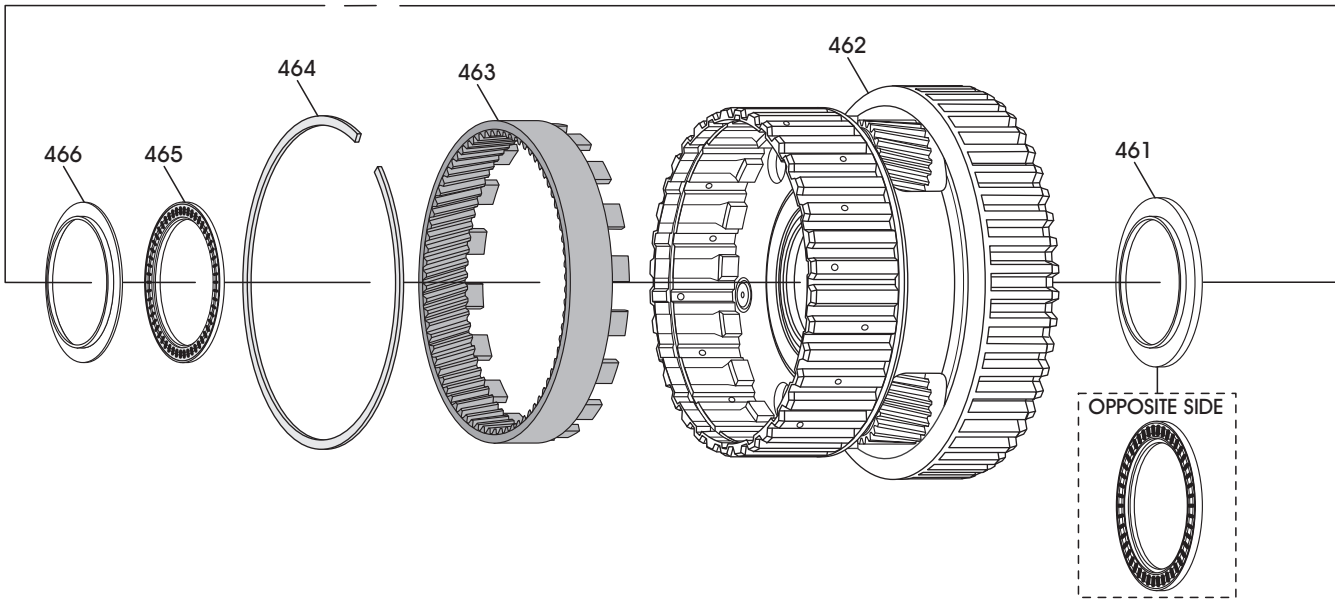
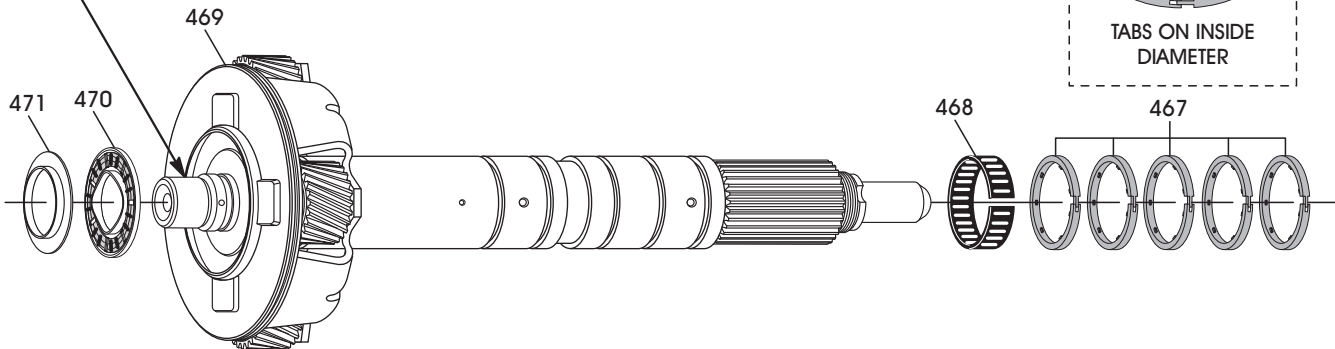
## CENTER AND REAR PLANETARY GEARSET, EXPLODED VIEW

**OUTPUT SHAFT SNOUT DIAMETER:**  
 Bushing in K-2 Drum (Early) = 22.97mm (.904").  
 Bearing in K-2 Drum (Late) = 21.99mm (.866").

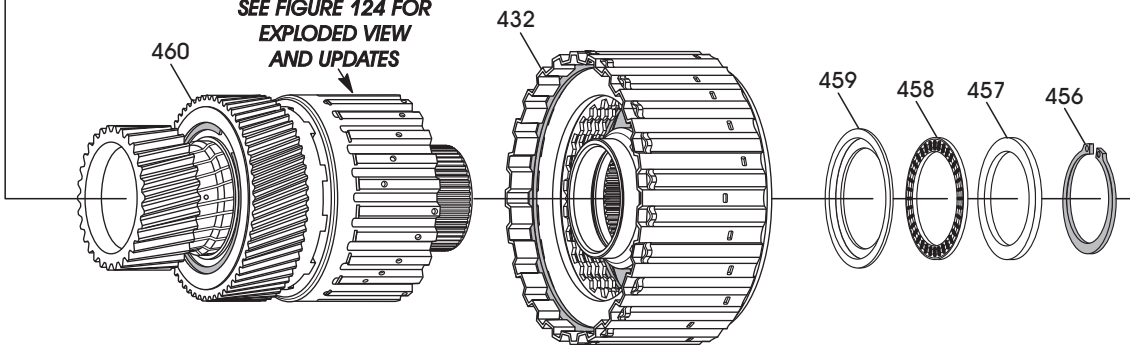
UPDATED SEAL RINGS



TABS ON INSIDE DIAMETER



SEE FIGURE 124 FOR EXPLODED VIEW AND UPDATES



- 432 K-3 CLUTCH HOUSING ASSEMBLY.
- 456 F-2 SPRAG AND SUN GEAR SHAFT RETAINING SNAP RING.
- 457 NUMBER 13 THRUST BEARING RACE.
- 458 NUMBER 12 THRUST BEARING.
- 459 NUMBER 11 THRUST BEARING RACE.
- 460 F-2 SPRAG AND SUN GEAR SHAFT ASSEMBLY.
- 461 NUMBER 8 THRUST BEARING.
- 462 REAR PLANETARY CARRIER AND CLUTCH HUB ASSEMBLY.
- 463 CENTER PLANETARY RING GEAR.

- 464 CENTER PLANETARY RING GEAR RETAINING SNAP RING.
- 465 NUMBER 7 THRUST BEARING.
- 466 NUMBER 6 THRUST BEARING RACE.
- 467 OUTPUT SHAFT SEALING RINGS (5 REQUIRED).
- 468 OUTPUT SHAFT/SUN GEAR SHAFT CAGED NEEDLE BEARING.
- 469 CENTER PLANETARY CARRIER AND OUTPUT SHAFT.
- 470 NUMBER 5 THRUST BEARING.
- 471 NUMBER 4 THRUST BEARING RACE.

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Figure 123

## COMPONENT REBUILD (CONT'D)

### Center & Rear Planetary Gearset

1. Removing the snap ring (456) from the output shaft, as shown in Figure 123, will allow you to disassemble the geartrain using Figure 123 as a guide.
2. The rear sun gear changed with the bushing being replaced with a ball bearing, as shown in Figure 124.
3. This allowed the elimination of the number 9 thrust bearing and number 10 thrust bearing race, as shown in Figure 124.
4. We will cover the assembly process for both the early and late versions.

Continued on Page 83

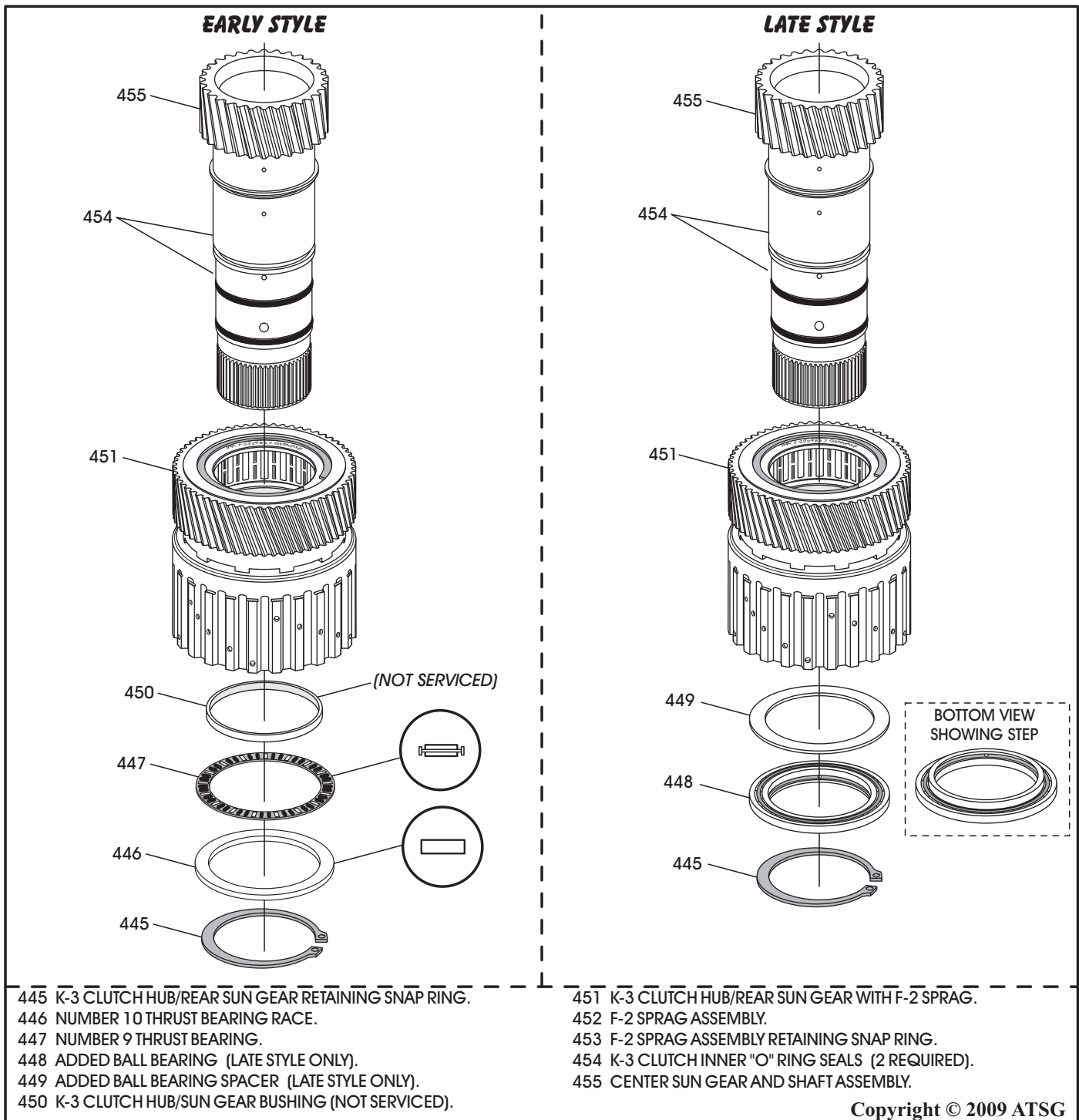


Figure 124

## COMPONENT REBUILD (CONT'D)

### Center & Rear Planetary Gearset (Cont'd) F-2 Sprag & Sun Gear Shaft (Cont'd)

5. The F-2 sprag was upgraded from 14 elements to 20 elements and the Mercedes part number is 220 270 01 31. The F-2 sprag uses 1 brass end bearing that is integral to the cage and uses only one snap ring, as shown in Figure 125. The 14 element sprag is known to slip, which create gear ratio error codes.

**Note: Do Not use 14 element sprag.**

6. Install new 20 element F-2 sprag into the rear sun gear, as shown in Figure 125.

**Note: The elements fall out of the cage very easily. This does not mean that the sprag is defective. Insert the elements back into the cage, as shown in Figure 126.**

7. If you have the late ball bearing style, install spacer and ball bearing with the step facing up, as shown in Figure 127.

**Note: The ball bearing is pressed into the rear sun gear.**

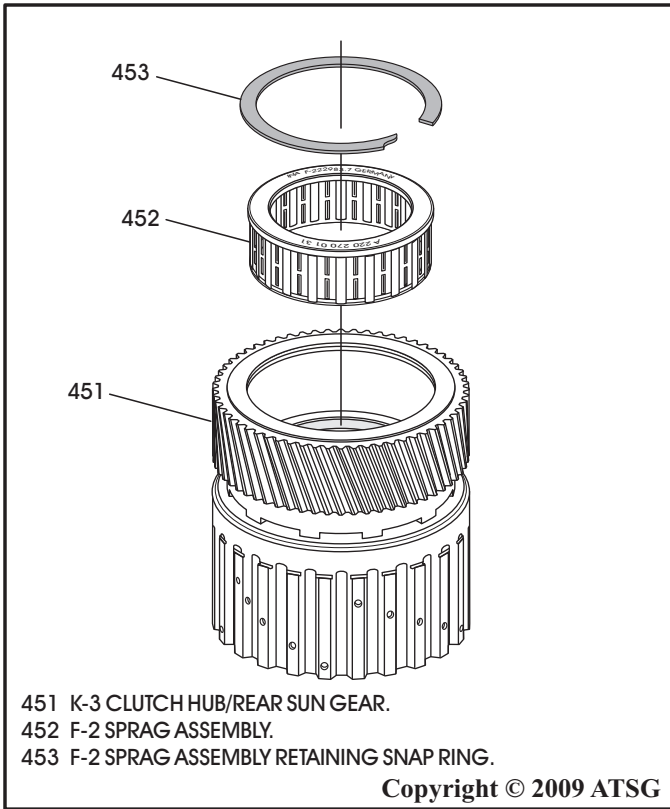


Figure 125

Continued on Page 84

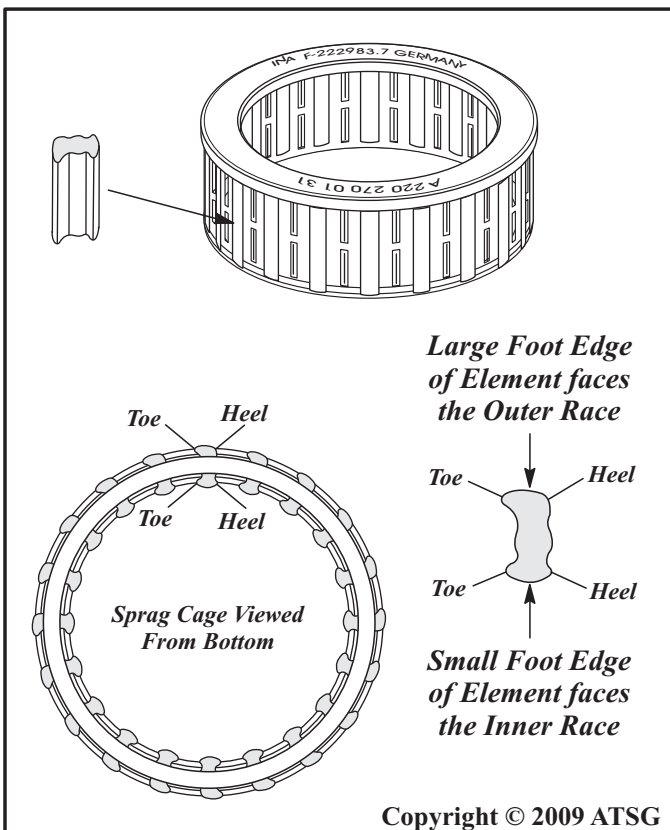


Figure 126

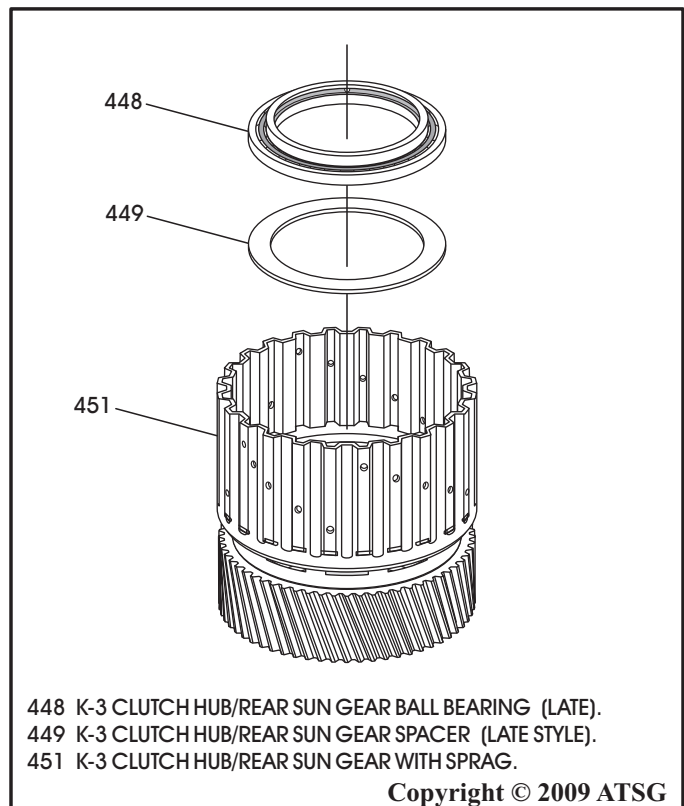


Figure 127

## COMPONENT REBUILD (CONT'D)

### Center & Rear Planetary Gearset (Cont'd) F-2 Sprag & Sun Gear Shaft (Cont'd)

8. Install two new K-3 clutch "O" ring seals into the grooves in the center sun gear and shaft, as shown in Figure 128, and lube with a small amount of Trans-Jel®.
9. Install the K-3 clutch hub/rear sun gear onto sun gear shaft using counter-clockwise motion, as shown in Figure 129.
10. Check for proper sprag rotation, as shown in Figure 130.
11. If you have the late ball bearing style, simply install the snap ring, as shown in Figure 129.

Continued on Page 85

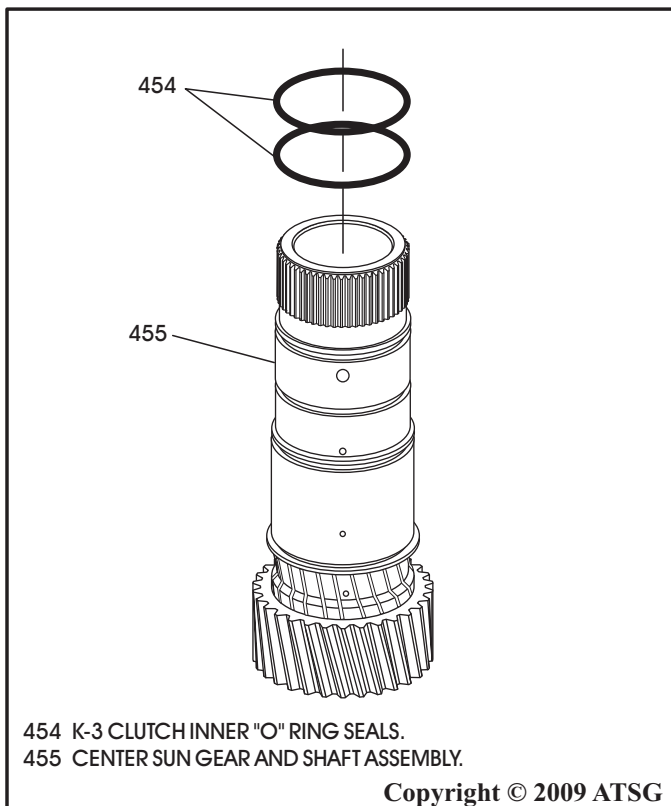


Figure 128

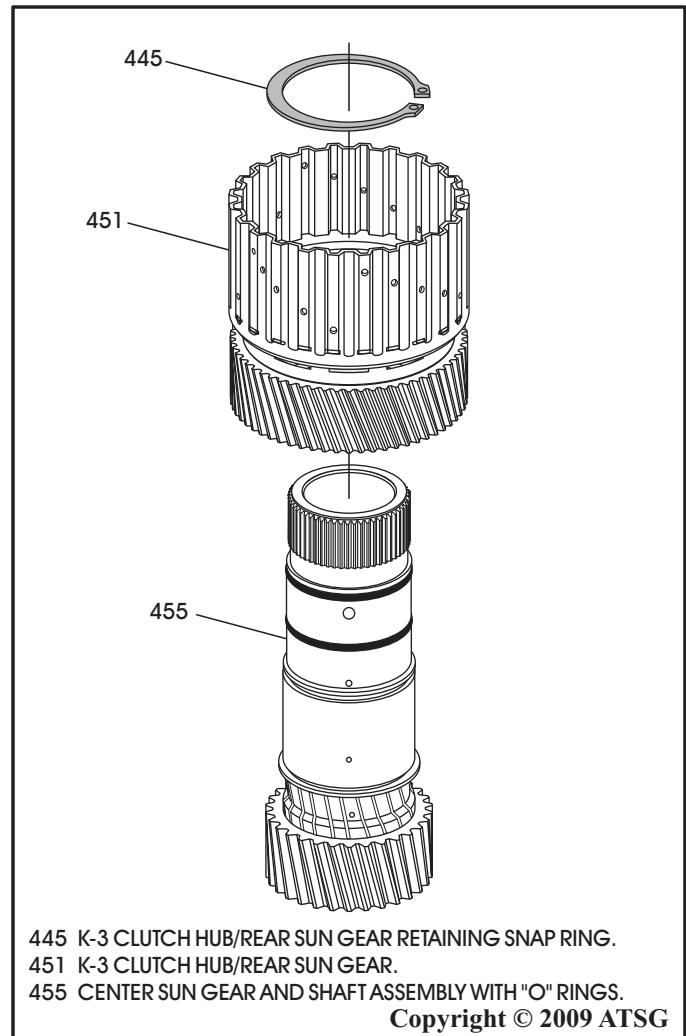


Figure 129

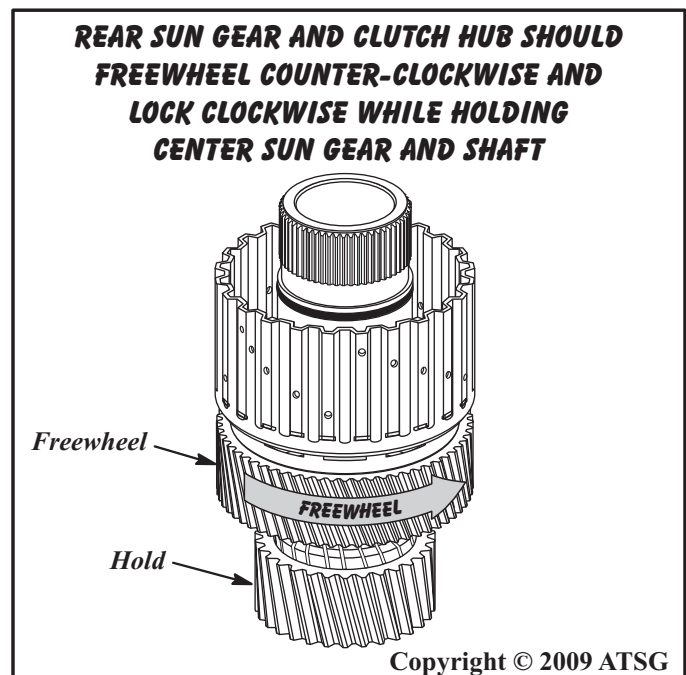


Figure 130

## COMPONENT REBUILD (CONT'D)

### Center & Rear Planetary Gearset (Cont'd) F-2 Sprag & Sun Gear Shaft (Cont'd)

12. If you have the early bushing style, install the No. 9 thrust bearing, as shown in Figure 131.
13. Install the No. 10 thrust bearing race, as shown in Figure 131.
14. Install K-3 clutch hub/ rear sun gear retaining snap ring, as shown in Figure 131.
15. Set the F-2 sprag and sun gear shaft assembly aside for gearset assembly process.

Continued on Page 86

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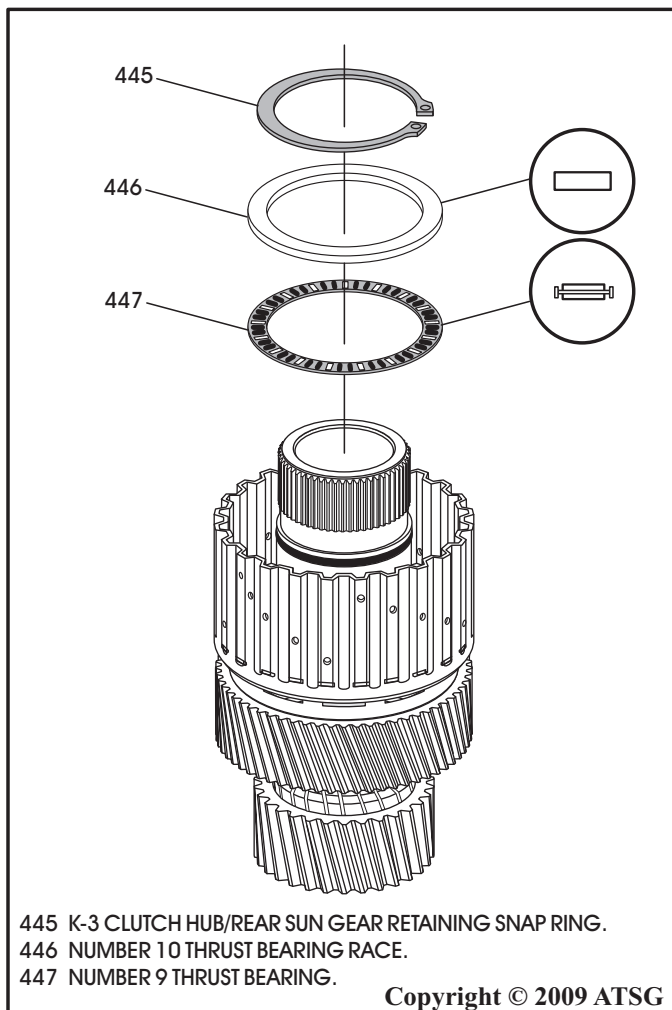


Figure 131

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## COMPONENT REBUILD (CONT'D)

### Center & Rear Planetary Gearset (Cont'd)

#### K-3 Clutch Housing Assembly

16. The K-3 clutch housing is also a component of the center and rear planetary gearset, as shown in Figure 123.
17. Disassemble the K-3 clutch housing assembly, using Figure 132 as a guide.
18. Clean all K-3 clutch housing parts thoroughly and dry with compressed air.
19. Inspect all K-3 clutch housing parts thoroughly for any wear and/or damage.

Continued on Page 87

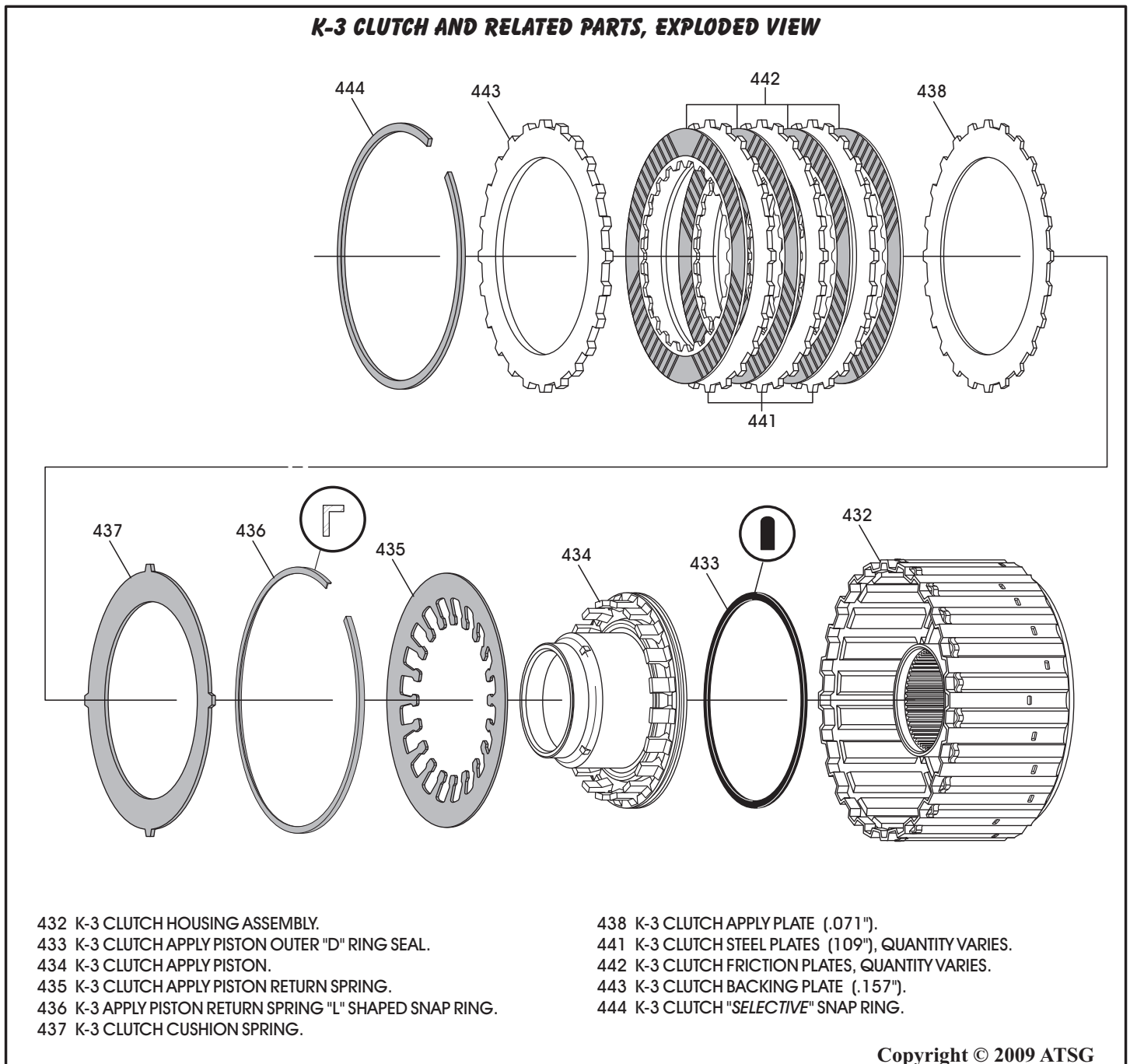


Figure 132

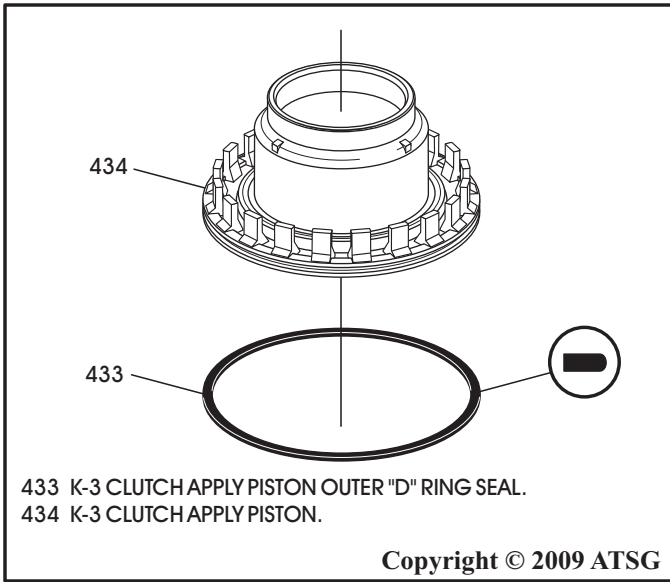


Figure 133

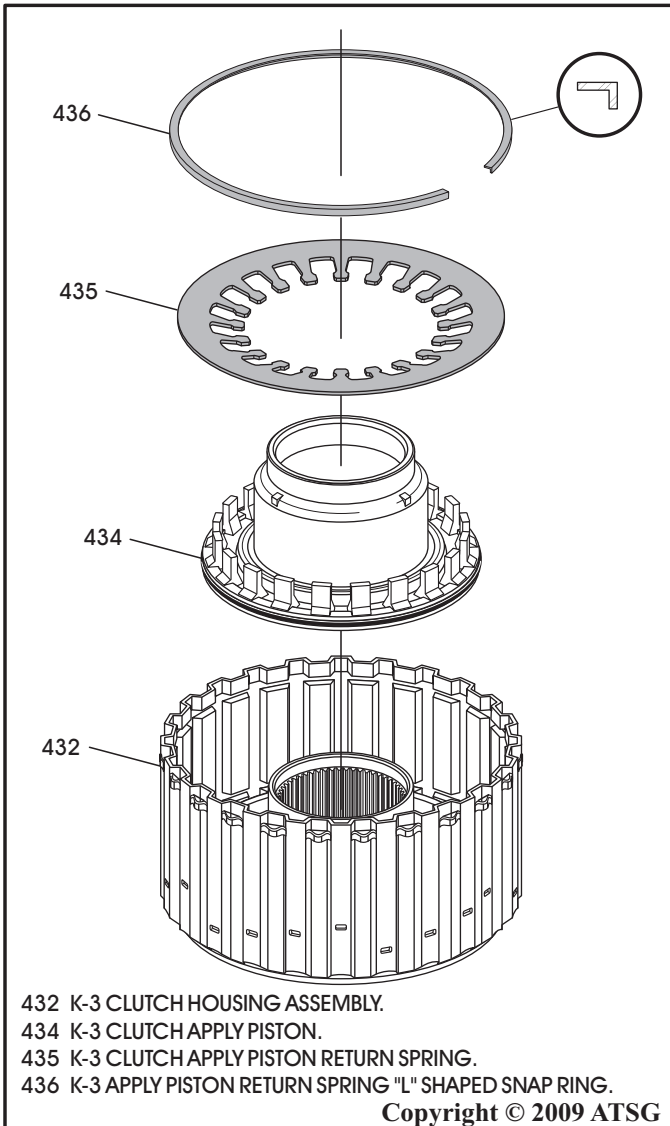


Figure 133

## COMPONENT REBUILD (CONT'D)

### Center & Rear Planetary Gearset (Cont'd) K-3 Clutch Housing Assembly (Cont'd)

20. Install new "D" ring seal into the groove on the K-3 clutch piston, as shown in Figure 133, and lube with small amount of Trans-Jel®.
21. Install the completed K-3 clutch apply piston into the housing, as shown in Figure 134.
22. Install the return spring on top of apply piston, as shown in Figure 134.
23. Install the "L" shaped snap ring by pressing into position until you hear it snap.

**Note:** Snap ring is "L" shaped to keep return spring centered on piston.

24. Use caution when installing K-3 clutch plates. **Caution:** The K-3 clutch may have 3, 4, or 5 "double-sided" friction plates depending on the model. Refer to the chart in Figure 134 for reference. Later models may also use the "single-sided" friction plates. We will cover the assembly process for both. All friction plates should be soaked in proper fluid for 30 minutes before installation.

Continued on Page 88

### K-3 DOUBLE-SIDED CLUTCH QUANTITY CHART

TRANSMISSION MODEL	LINED PLATE	STEEL PLATE	BACK PLATE	THIN APPLY PLATE
722.600/660	3	2	1	1
722.601/602/603/610	3	2	1	1
722.604/606/609/617	4	3	1	1
722.605/607/608/611/614 618/662/664/699	4	3	1	1
722.665	4	3	1	1
722.620/621/624/626/627 628/630/633/636/666	5	4	1	1
722.622/623/625 631/632/663/669	4	3	1	1
722.629/634/661	4	3	1	1

The number of K-3 friction plates used is model dependant and determined by the backing plate snap ring location and the thickness of the steel plates.

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Figure 134



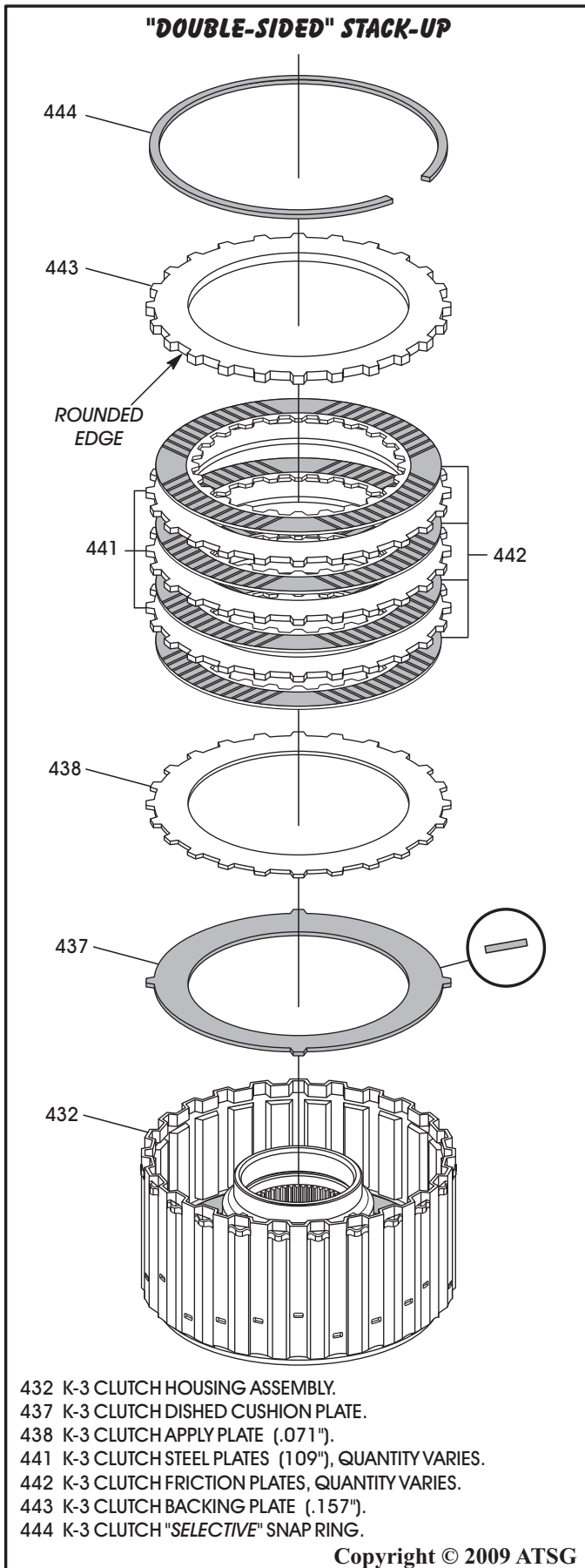


Figure 135

## K-3 Clutch Housing Assembly (Cont'd) "Double-Sided" Clutch Plates

25. Install the K-3 clutch dished cushion plate in the direction shown in Figure 135.
26. Install the K-3 clutch .071" thick apply plate, as shown in Figure 135.
27. Install "double-sided clutches beginning with a friction plate and alternating with steel plates, as shown in Figure 135, until you have proper number of plates installed.

**Note: Steel plate thickness will vary depending on snap ring groove location and number of frictions required (See chart in Figure 136).**

28. Install the K-3 clutch backing plate, as shown in Figure 135, with rounded edge down.
29. Install the K-3 clutch selective snap ring, as shown in Figure 135.

Continued on Page 89

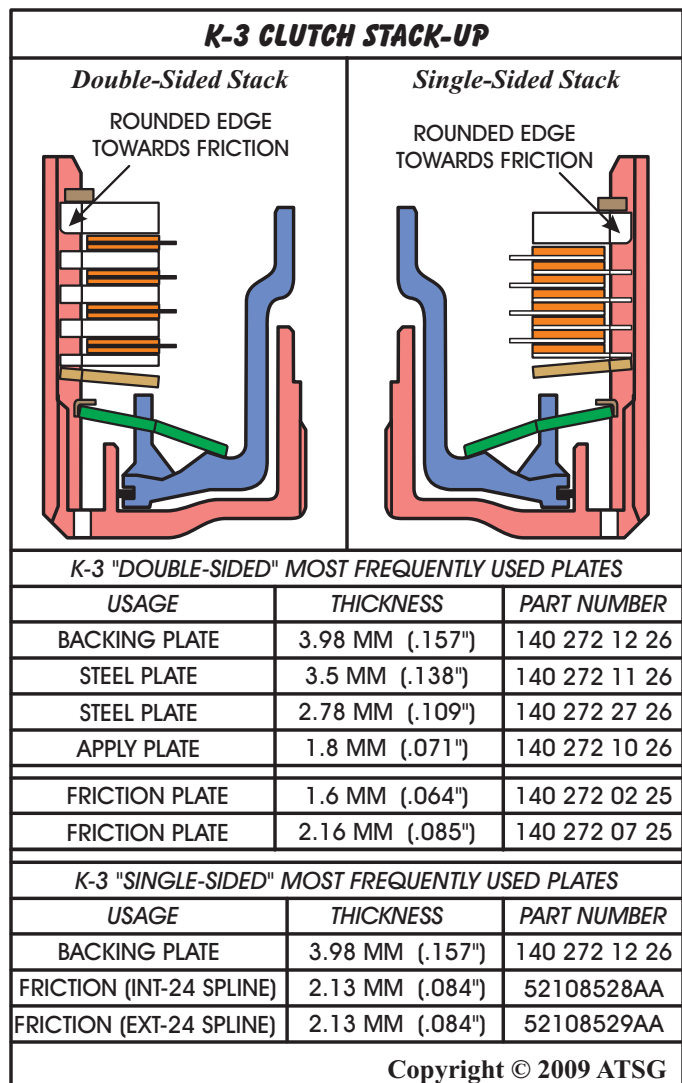
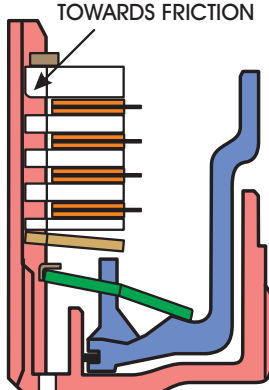
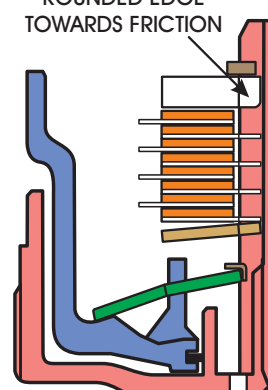


Figure 136

## K-3 Clutch Housing Assembly (Cont'd) "Single-Sided" Clutch Plates

30. Install the K-3 clutch dished cushion plate in the direction shown in Figure 138.  
*Note: The .071" apply plate is not used in the "Single-Sided" stack-up.*
31. Install the "single-sided" frictions beginning with an external spline plate and alternating with an internal spline plate, as shown in Figure 138, until you have the proper amount of plates installed.
32. Install the K-3 clutch backing plate, as shown in Figure 138.
33. Install the K-3 clutch *selective* snap ring, as shown in Figure 138.

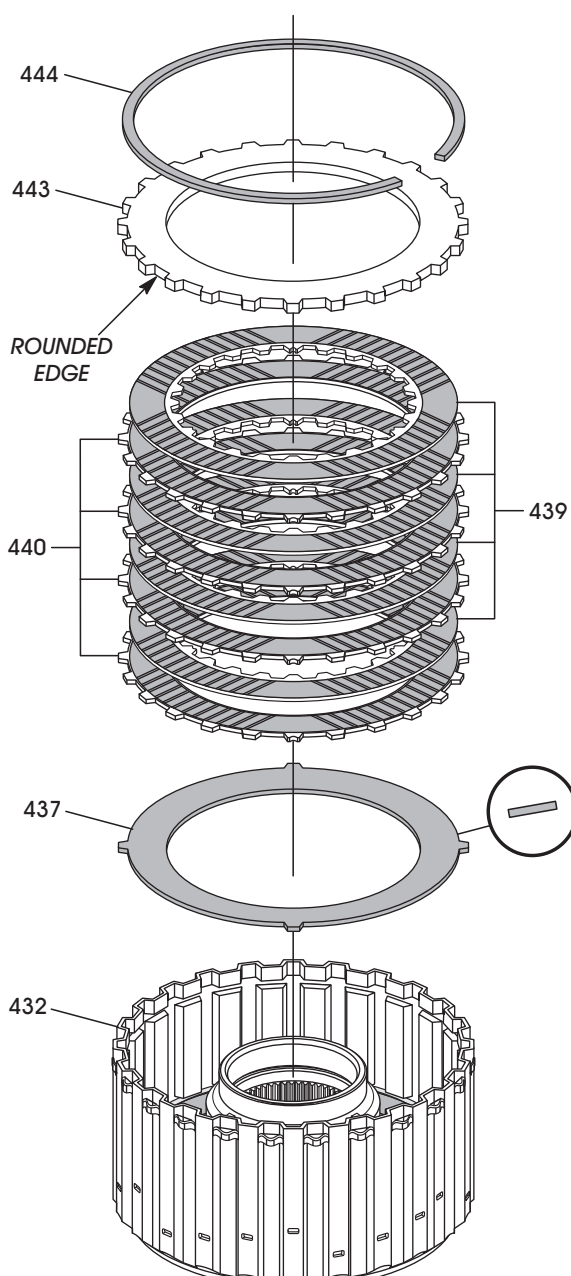
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K-3 CLUTCH STACK-UP		
<b>Double-Sided Stack</b> ROUNDED EDGE TOWARDS FRICTION 	<b>Single-Sided Stack</b> ROUNDED EDGE TOWARDS FRICTION 	
K-3 "DOUBLE-SIDED" MOST FREQUENTLY USED PLATES		
USAGE	THICKNESS	PART NUMBER
BACKING PLATE	3.98 MM (.157")	140 272 12 26
STEEL PLATE	3.5 MM (.138")	140 272 11 26
STEEL PLATE	2.78 MM (.109")	140 272 27 26
APPLY PLATE	1.8 MM (.071")	140 272 10 26
FRICTION PLATE	1.6 MM (.064")	140 272 02 25
FRICTION PLATE	2.16 MM (.085")	140 272 07 25
K-3 "SINGLE-SIDED" MOST FREQUENTLY USED PLATES		
USAGE	THICKNESS	PART NUMBER
BACKING PLATE	3.98 MM (.157")	140 272 12 26
FRICTION (INT-24 SPLINE)	2.13 MM (.084")	52108528AA
FRICTION (EXT-24 SPLINE)	2.13 MM (.084")	52108529AA

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Figure 137

### SINGLE SIDED STACK-UP



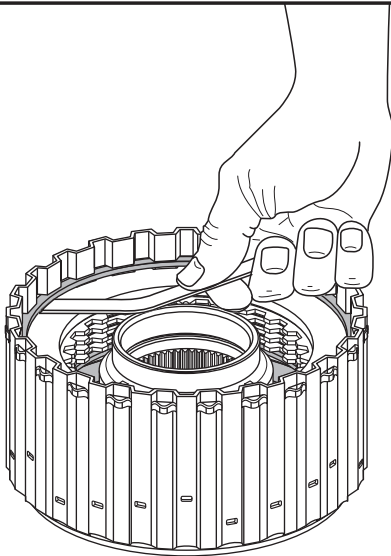
444 K-3 CLUTCH "SELECTIVE" SNAP RING.  
 443 K-3 CLUTCH DISHED CUSHION PLATE.  
 439 K-3 SINGLE SIDED "INTERNAL SPLINE" FRICTION PLATES.  
 440 K-3 SINGLE SIDED "EXTERNAL SPLINE" FRICTION PLATES.  
 443 K-3 CLUTCH BACKING PLATE (.157").  
 444 K-3 CLUTCH "SELECTIVE" SNAP RING.

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Figure 138

## K-3 Clutch Housing Assembly (Cont'd)

34. Measure K-3 clutch clearance using a feeler gauge between the selective snap ring and the backing plate, as shown in Figure 139.
35. K-3 clutch clearance will depend on how many friction plates are used in the pack. The proper clearances for each are listed in Figure 139.  
**Note: ATSG clutch clearances vary from the Mercedes specification, as Mercedes uses a rather costly tool to compress the cushion plate in the clutch pack.**
36. Change the selective snap ring as necessary to obtain the proper clutch clearance. There are 5 different snap ring thickness' available and are listed in Figure 139.



**K-3 "Double-Sided" Clutch Clearance Should Be;**  
 3 Frictions = 0.7 - 0.9mm (.028" - .035")  
 4 Frictions = 1.0 - 1.3mm (.039" - .051")  
 5 Frictions = 1.3 - 2.0mm (.051" - .059")

**K-3 "Single-Sided" Clutch Clearance Should Be;**  
 6 Frictions = 0.7 - 0.9mm (.028" - .035")  
 8 Frictions = 1.0 - 1.3mm (.039" - .051")  
 10 Frictions = 1.3 - 1.5mm (.051" - .059")

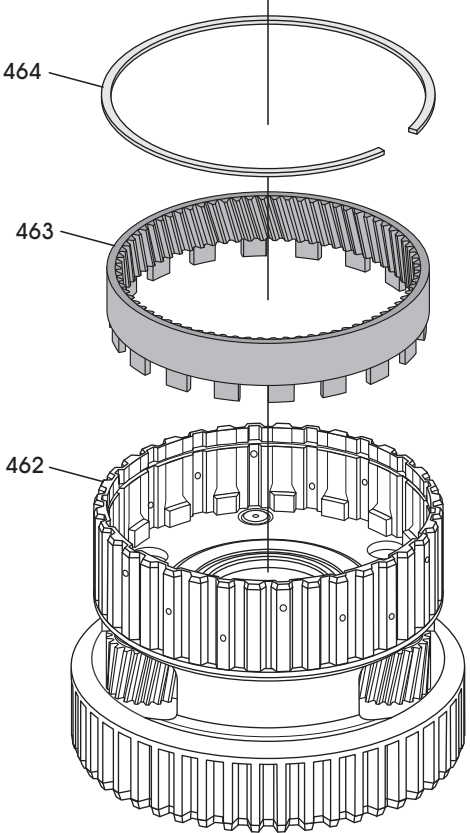
K-3 CLUTCH SELECTIVE SNAP RINGS	
THICKNESS	PART NUMBER
1.9 MM (.075")	140 994 99 40
2.2 MM (.086")	140 994 10 35
2.5 MM (.098")	140 994 11 35
2.8 MM (.110")	140 994 35 35
3.1 MM (.122")	140 994 36 35

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Figure 139

37. We have provided you with frequently used part numbers for the clutches in Figure 137. Keep in mind that part numbers can change without notice.
38. Set completed K-3 clutch housing assembly aside for gearset assembly process.
39. Install the center planetary ring gear into the rear planetary carrier and clutch hub assembly, as shown in Figure 140.  
**Note: This ring gear does not need to be removed unless damaged.**
40. Install the ring gear retaining snap ring into the rear planetary carrier, as shown in Figure 140, and ensure it is fully seated.

Continued on Page 91



462 REAR PLANETARY CARRIER AND CLUTCH HUB ASSEMBLY.  
 463 CENTER PLANETARY RING GEAR.  
 464 CENTER PLANETARY RING GEAR RETAINING SNAP RING.

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Figure 140

## COMPONENT REBUILD (CONT'D)

### Center & Rear Planetary Gearset (Cont'd)

41. Install the number 7 thrust bearing, as shown in Figure 141, by hand pressing into place. *Note: The number 7 and number 8 thrust bearings have been updated with three small protrusions stamped into the outer bearing race and spaced equally around the outside diameter, as shown in Figure 142. This was done to prevent the outer race from turning in the rear carrier and clutch hub assembly. This increased durability by decreasing the planetary failures seen in the past.*
42. Ensure the number 7 thrust bearing is fully seated.
43. Install the number 8 thrust bearing, as shown in Figure 143, by hand pressing into place, and ensure that it is full seated.

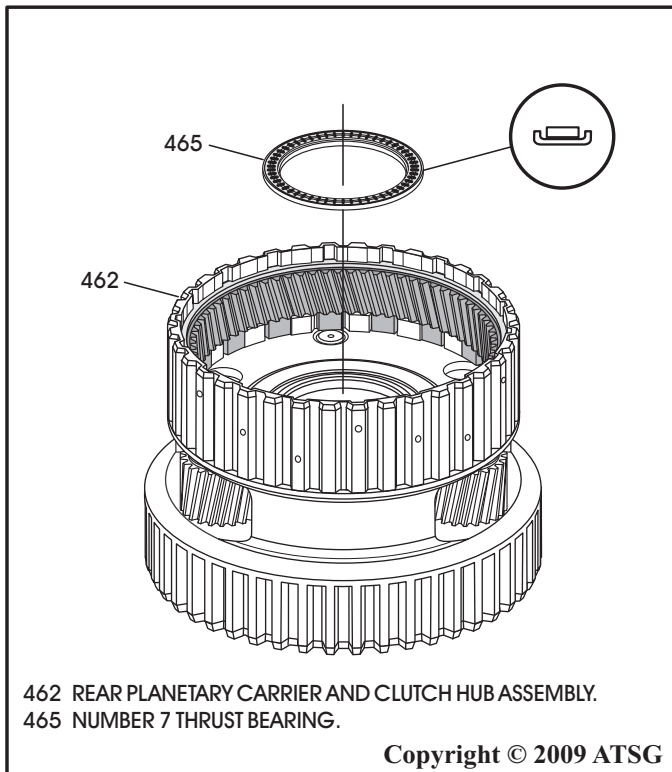


Figure 141

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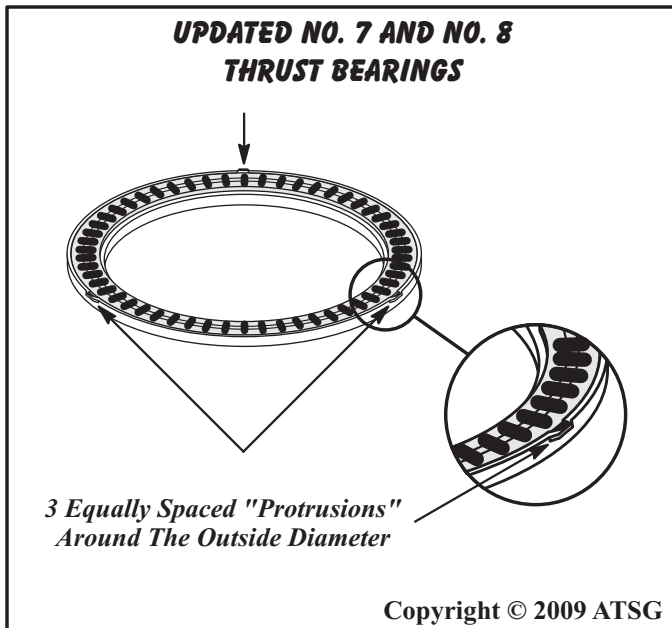


Figure 142

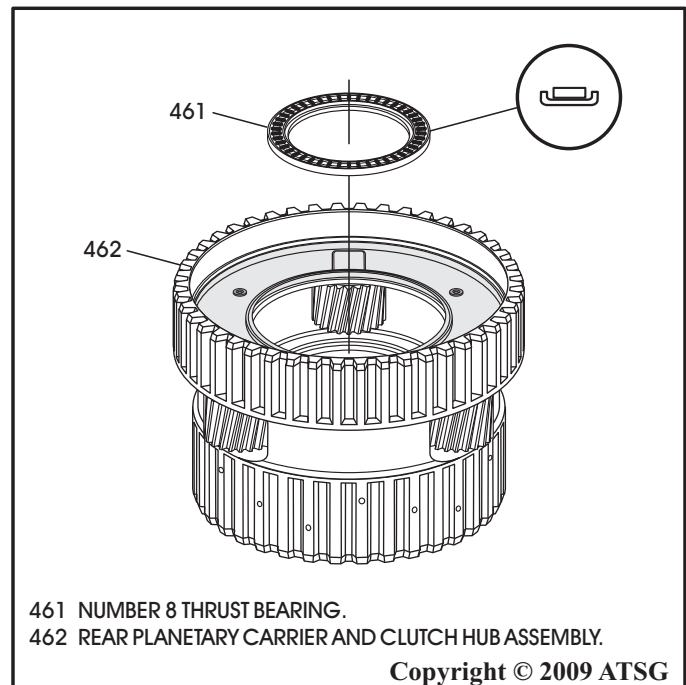


Figure 143

## COMPONENT REBUILD (CONT'D)

### Center & Rear Planetary Gearset (Cont'd)

44. Position the center planetary carrier and output shaft, as shown in Figure 144.
45. Install five new updated output shaft sealing rings into the five grooves of the output shaft, as shown in Figure 144.  
*Note: Updated seal rings have "tabs" on the inside diameter and a step joint.*
46. Ensure the step joints are properly engaged.
47. Install the number 6 thrust bearing race, as shown in Figure 145, and retain with a small amount of Trans-Jel®.

48. Install the caged needle bearing into the output shaft groove, as shown in Figure 145, by gently spreading just enough to get it over the output shaft.
49. Ensure that it spins freely in the groove after installation and apply some fluid.

Continued on Page 93

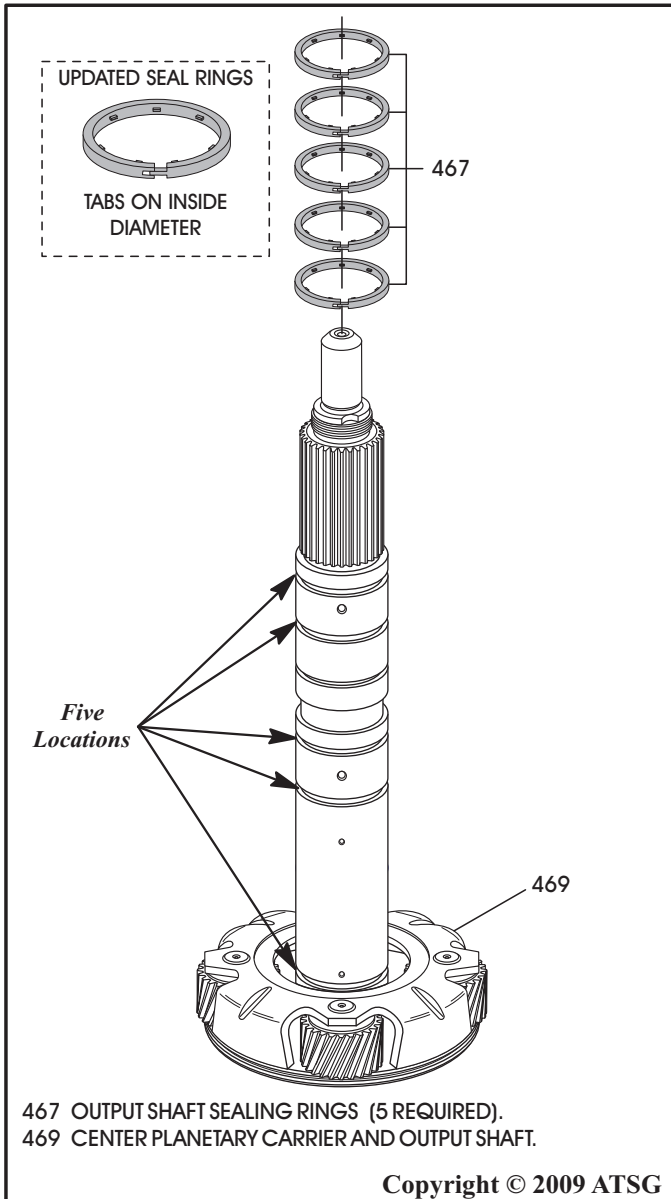


Figure 144

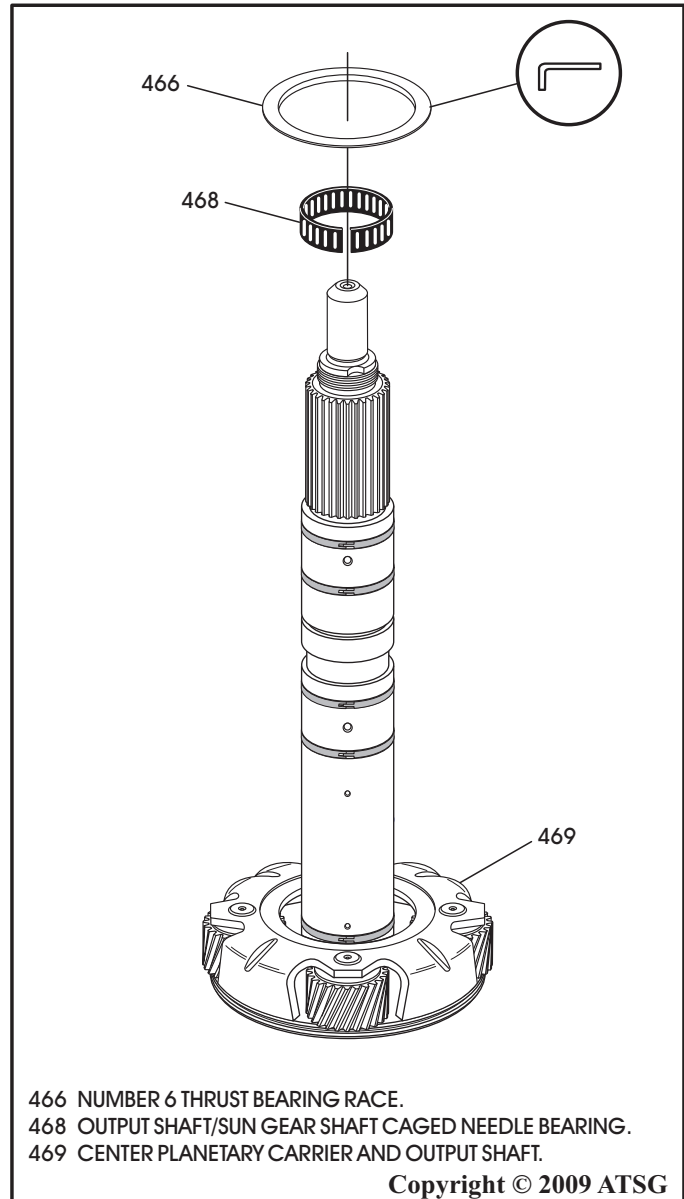


Figure 145

## COMPONENT REBUILD (CONT'D)

### Center & Rear Planetary Gearset (Cont'd)

50. Install the rear carrier and clutch hub assembly as shown in Figure 146, by rotating to engage the center ring gear to the planetary pinions.

*Note: This would be a good time for one last check of the F-2 sprag assembly. Refer to Figure 130 on Page 84.*

51. Install the completed F-2 sprag and sun gear shaft assembly, as shown in Figure 147.

Continued on Page 94

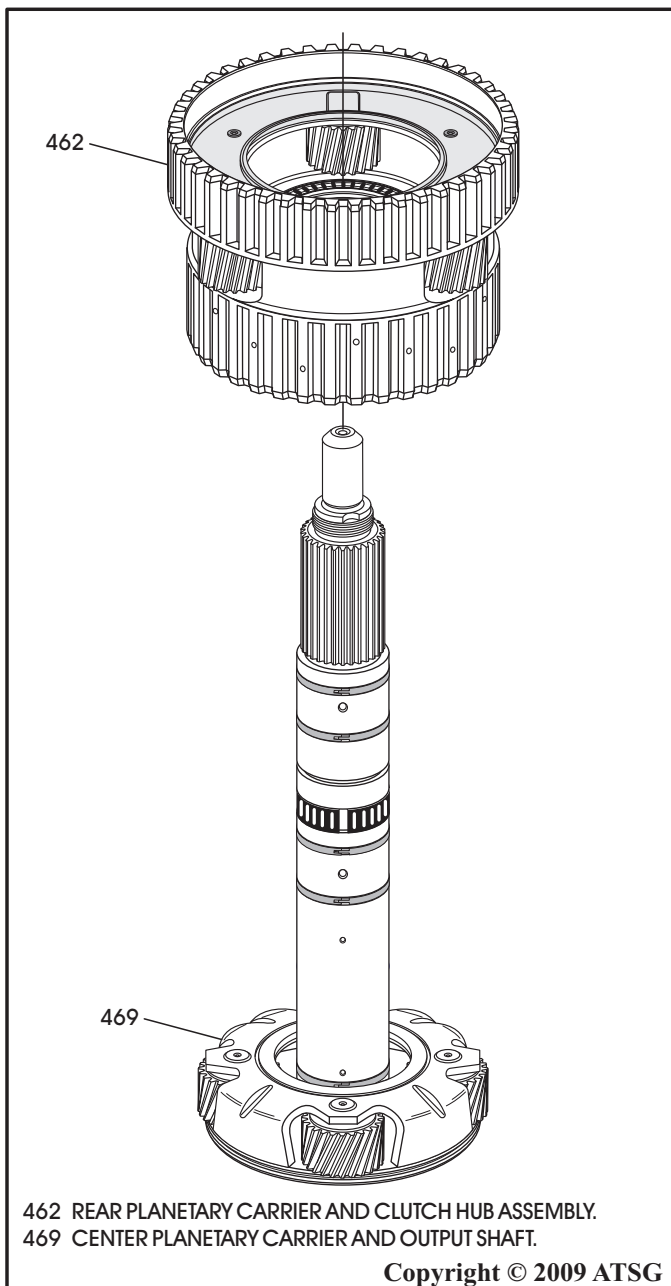


Figure 146

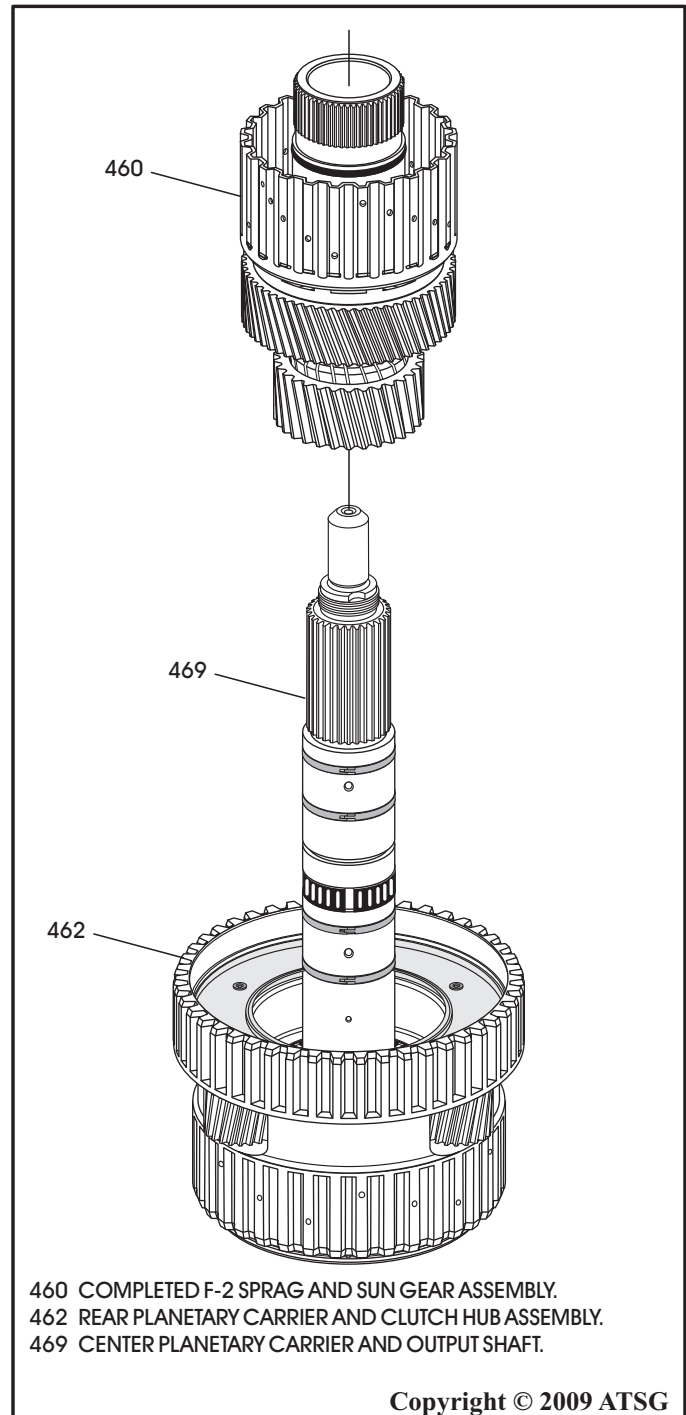


Figure 147

## COMPONENT REBUILD (CONT'D)

### Center & Rear Planetary Gearset (Cont'd)

52. Lubricate the inside diameter of the K-3 piston in completed K-3 clutch housing with a small amount of Trans-Jel® (See Figure 148).
53. Install the completed K-3 clutch housing, as shown in Figure 148, rotating back and forth until fully seated.

**Note:** *There should be approximately 1/4 inch of sun gear shaft spline showing when fully seated, as shown in Figure 149.*

54. Install the number 11 thrust bearing race, as shown in Figure 149.
55. Install the number 12 thrust bearing, as shown in Figure 149.
56. Install the number 13 thrust bearing race, as shown in Figure 149.
57. Install the sun gear shaft retaining snap ring, as shown in Figure 149.

Continued on Page 95

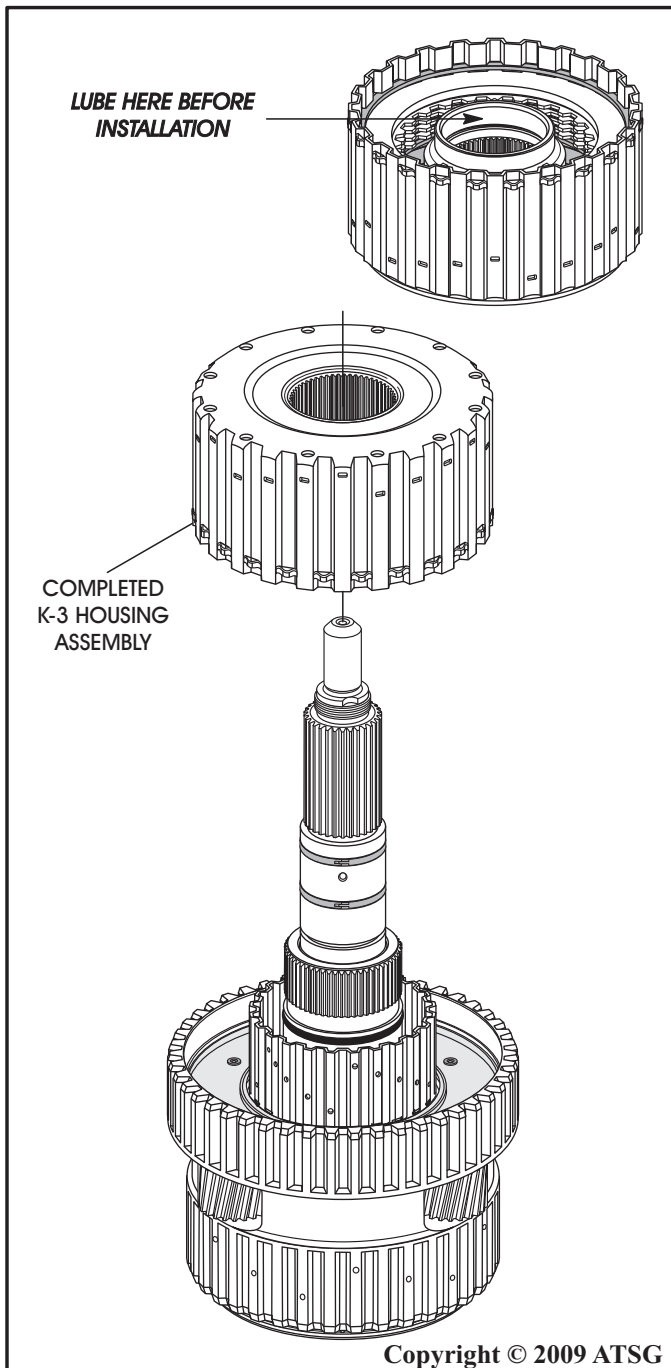


Figure 148

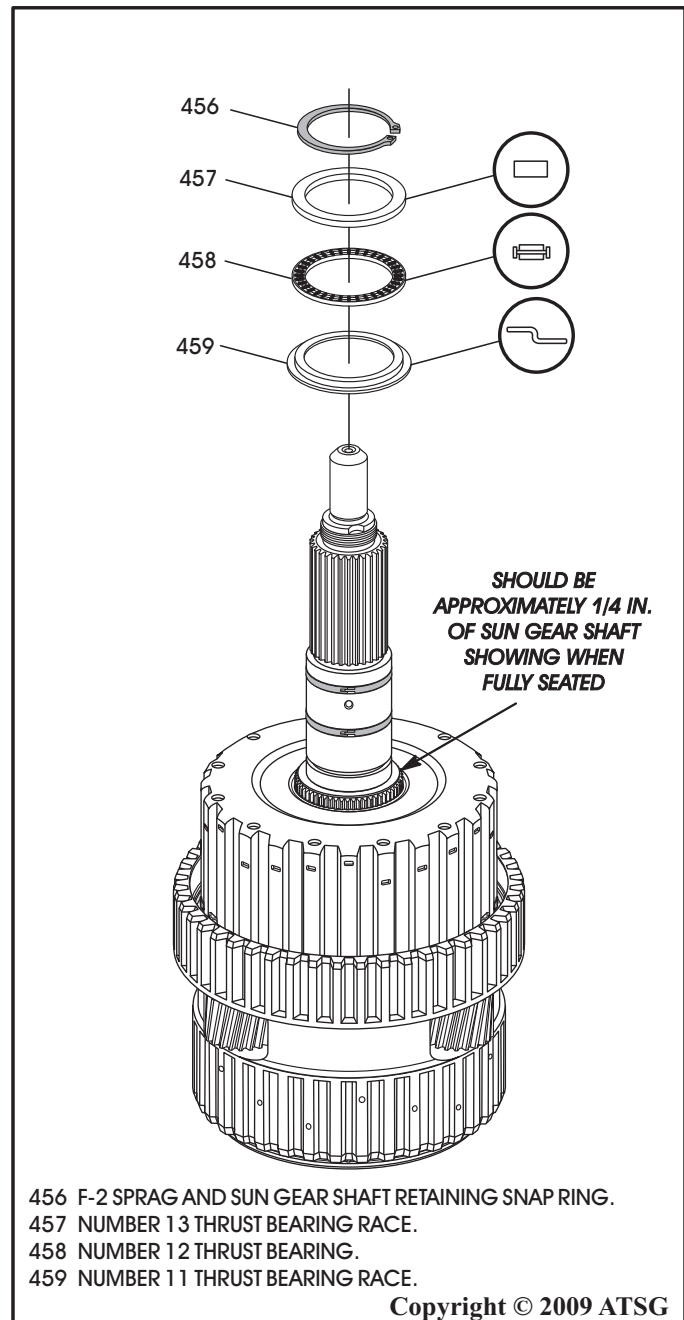


Figure 149

## COMPONENT REBUILD (CONT'D)

### Center & Rear Planetary Gearset (Cont'd)

58. Measure clearance using feeler gauge between snap ring and number 13 thrust bearing race, as shown in Figure 150.
  59. The planetary gearset axial clearance should be 0.15mm - 0.6mm (.006" - .024"), as shown in Figure 150.
  60. Change the number 13 thrust bearing race to obtain the proper clearance. There are three selectives for this location and are listed in Figure 150.
61. Turn the center and rear planetary gearset over and install number 5 thrust bearing, as shown in Figure 151.
- Note: Number 4 thrust bearing race was installed on K-2 clutch housing.*
62. Set the completed center and rear planetary gearset aside for the final assembly process.

**Component Rebuild  
Continued on Page 96**

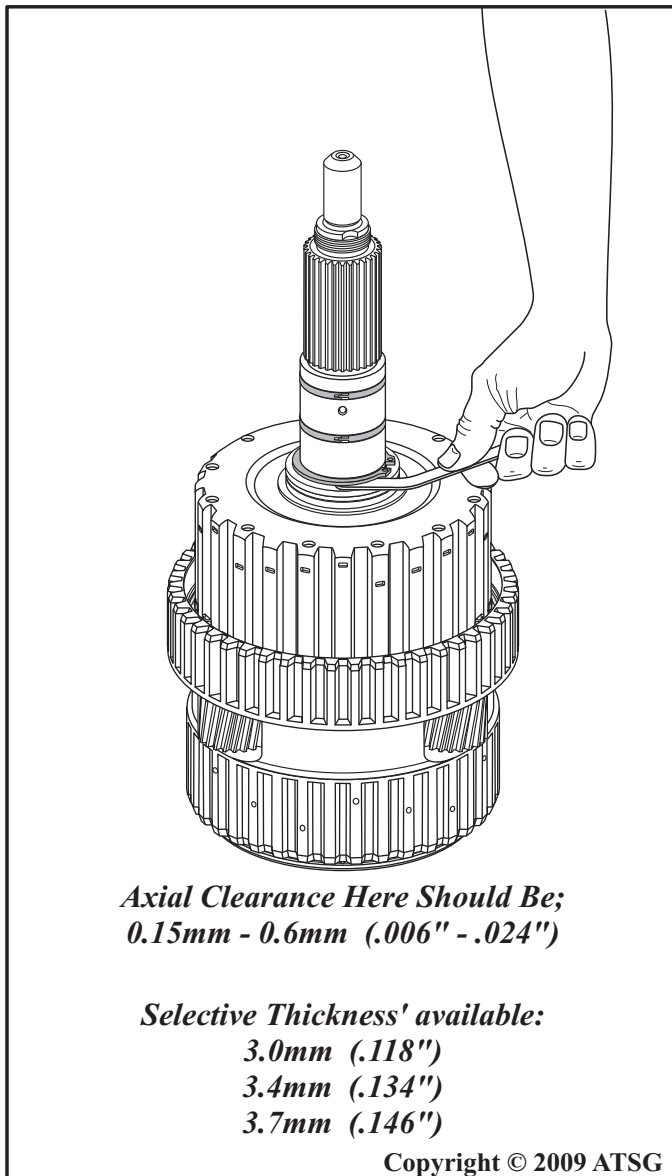


Figure 150

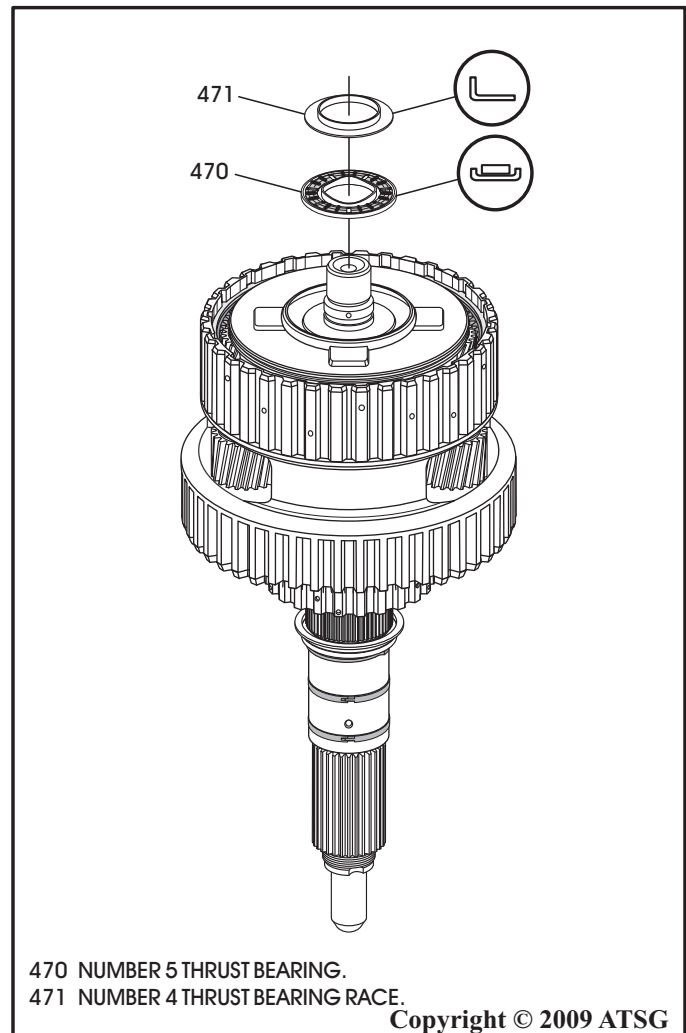
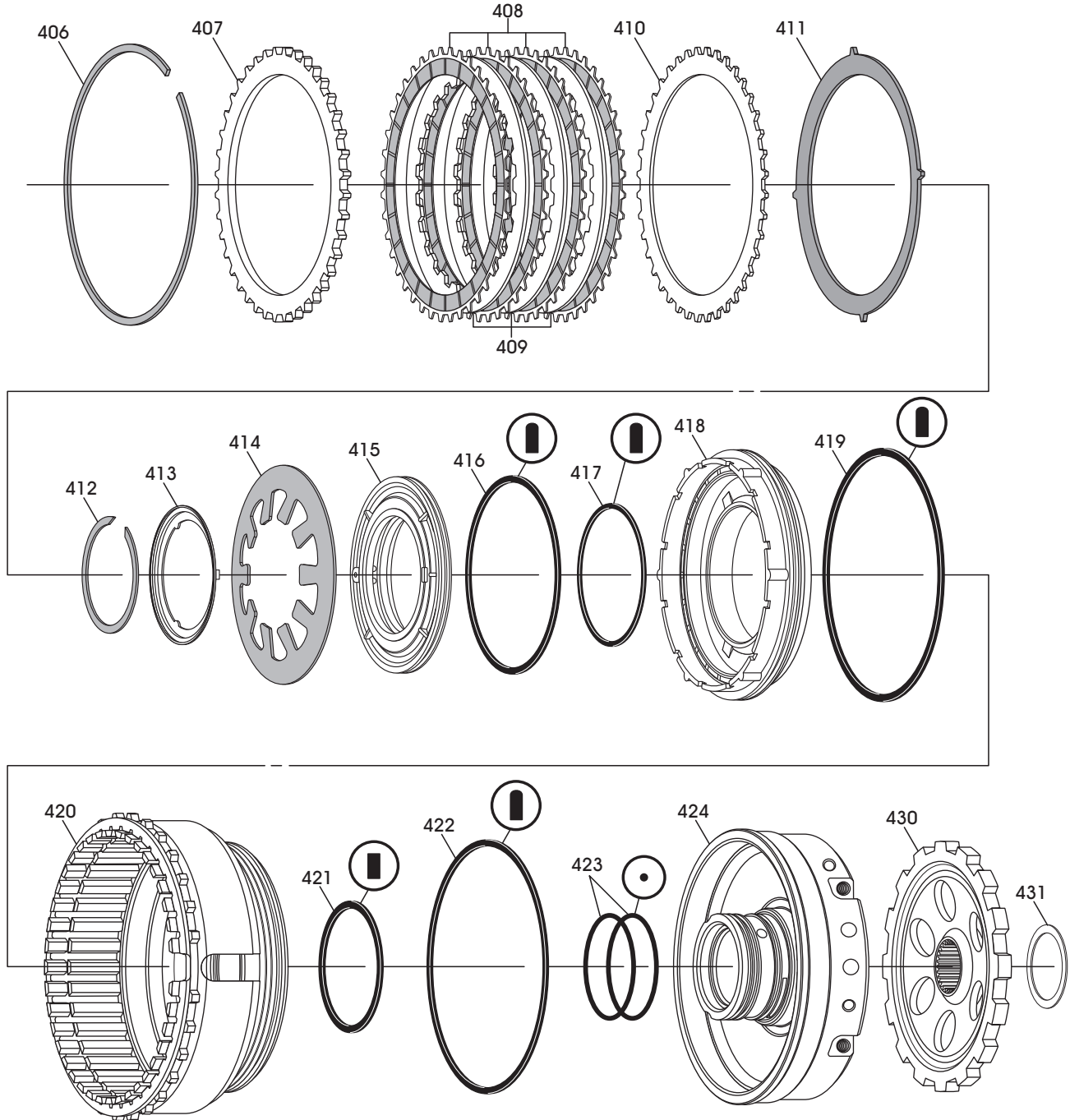


Figure 151



## B-2 CLUTCH AND RELATED PARTS, EXPLODED VIEW



- 406 B-2 CLUTCH BACKING PLATE "SELECTIVE" SNAP RING.
- 407 B-2 CLUTCH BACKING PLATE.
- 408 B-2 CLUTCH FRICTION PLATES (EXTERNAL SPLINE).
- 409 B-2 CLUTCH STEEL PLATES (INTERNAL SPLINE).
- 410 B-2 CLUTCH APPLY PLATE (.071").
- 411 B-2 CLUTCH CUSHION PLATE.
- 412 B-2/B-3 APPLY PISTON SPRING RETAINER SNAP RING.
- 413 B-2/B-3 APPLY PISTON SPRING RETAINER.
- 414 B-2/B-3 APPLY PISTON RETURN SPRING.
- 415 B-2 APPLY PISTON GUIDE WITH 1-WAY CHECK VALVE.
- 416 B-2 APPLY PISTON GUIDE LARGE "D" RING SEAL.

- 417 B-2 APPLY PISTON GUIDE SMALL "D" RING SEAL.
- 418 B-2 CLUTCH APPLY PISTON.
- 419 B-2 CLUTCH APPLY PISTON OUTER "D" RING SEAL.
- 420 B-3 CLUTCH APPLY PISTON.
- 421 B-3 CLUTCH APPLY PISTON INNER SEAL (SQUARE-CUT).
- 422 B-3 CLUTCH APPLY PISTON OUTER "D" RING SEAL.
- 423 B-2/B-3 CLUTCH HOUSING INNER "O" RING SEALS (2 REQ).
- 424 B-2/B-3 CLUTCH PISTON HOUSING ASSEMBLY.
- 430 PARKING GEAR.
- 431 PARKING GEAR TO REAR BEARING SHIM (END-PLAY).

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Figure 152

## COMPONENT REBUILD (CONT'D)

### B-2 Clutch Housing Assembly

1. Disassemble the B-2 clutch housing assembly using Figure 152 for a guide.
2. Clean all B-2 clutch housing parts thoroughly and dry with compressed air.
3. Inspect all B-2 clutch housing parts thoroughly for any wear and/or damage.

4. Install new square cut inner seal in B-3 clutch apply piston, as shown in Figure 153.
5. Install new "D" ring outer seal on B-3 clutch apply piston, as shown in Figure 153.
6. Lubricate both B-3 apply piston seals with a small amount of Trans-Jel®.
7. Install a new "D" ring seal on the small portion of the B-2 apply piston guide with the 1-way check valve, as shown in Figure 154.
8. Install a new "D" ring seal on the large portion of the B-2 apply piston guide with the 1-way check valve, as shown in Figure 154.
9. Lubricate both B-2 apply piston guide seals with a small amount of Trans-Jel®.
10. Install a new outer "D" ring seal on B-2 clutch apply piston, as shown in Figure 155, and lube with a small amount of Trans-Jel®.

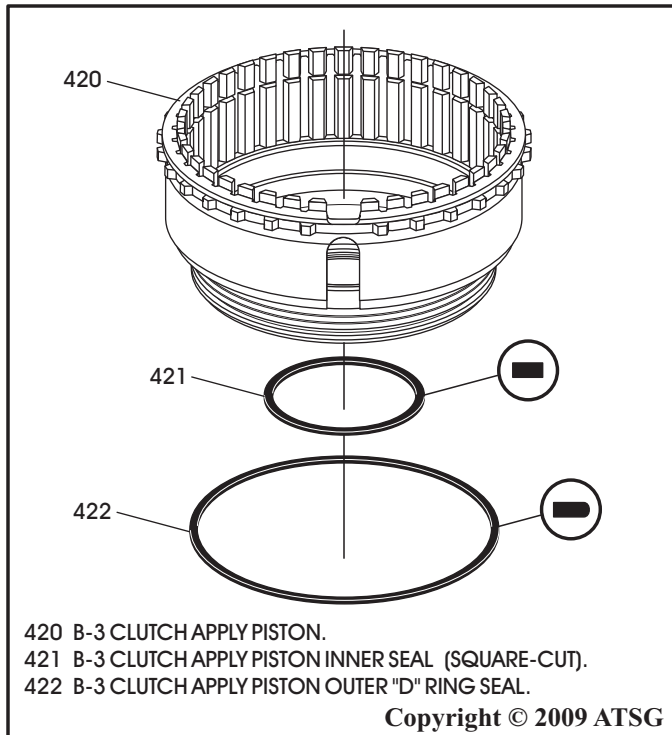


Figure 153

Continued on Page 98

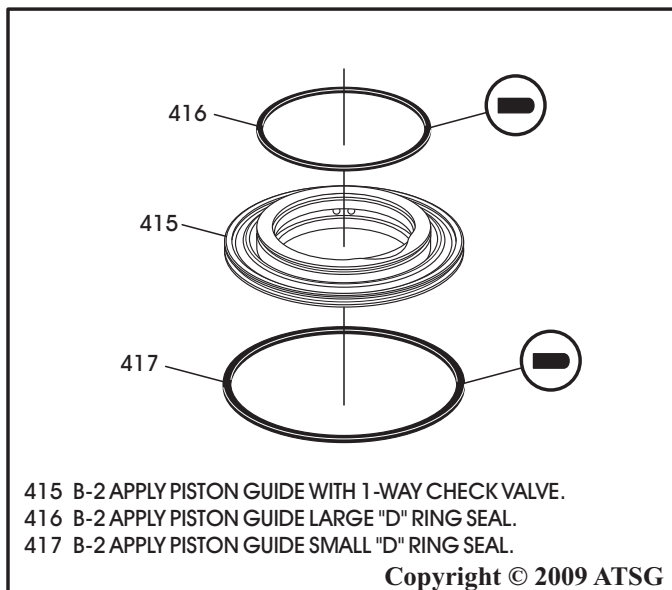


Figure 154

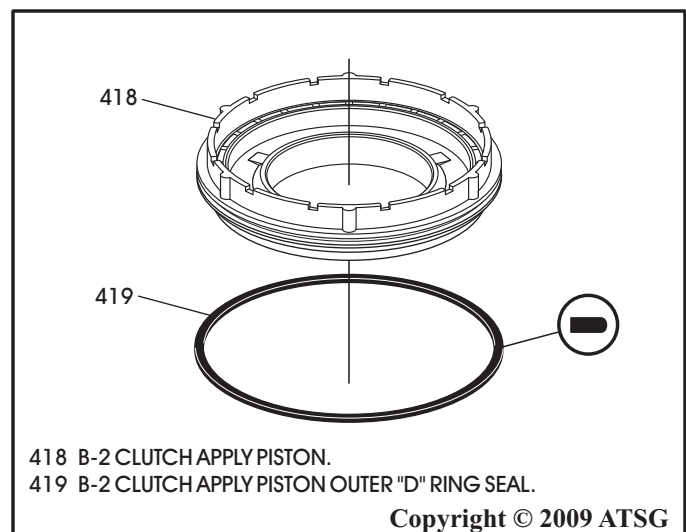


Figure 155

## COMPONENT REBUILD (CONT'D)

### B-2 Clutch Housing Assembly (Cont'd)

11. Install two new "O" ring seals into the grooves of the B-2/B-3 clutch piston housing, as shown in Figure 156, and lubricate with small amount of Trans-Jel®.

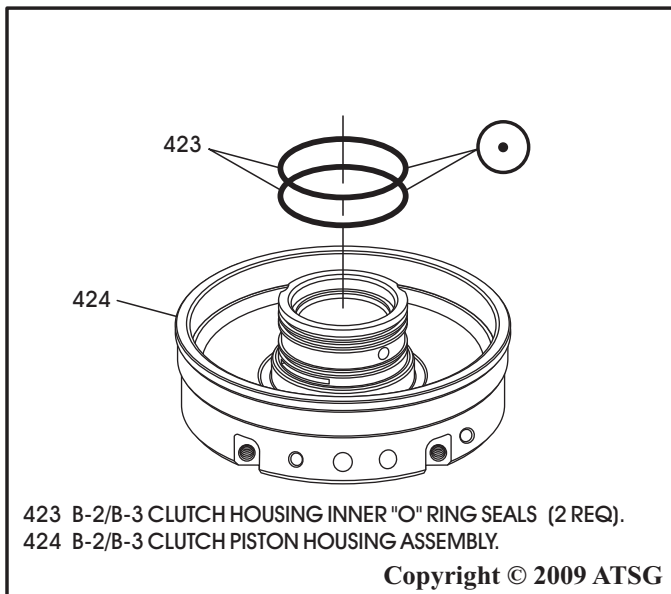


Figure 156

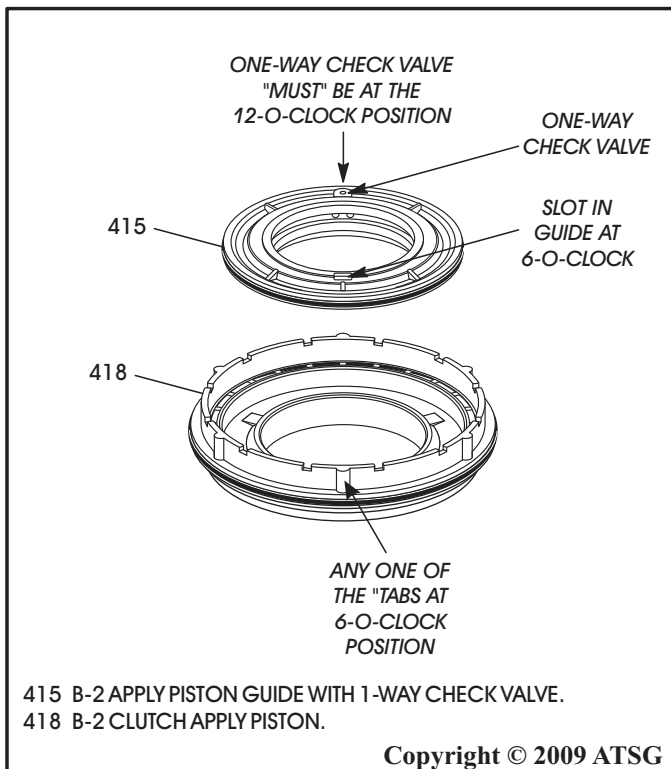


Figure 157

12. Place the B-2 apply piston on flat work surface with one of the "tabs" at **exactly** the 6-O-clock position, as shown in Figure 157.
13. Install B-2 apply piston guide with the 1-way check valve into the B-2 apply piston with the 1-way check **exactly** at the 12-O-clock position as shown in Figure 157.

**Caution: Step 12 and 13 must be followed "exactly" as written. This is to ensure that when we are ready to install the return spring retainer it will fit without complications.**

14. The return spring retainer (413) has two off-set tabs on the inside diameter, that align with two off-set slots in the hub of the B-2/B-3 clutch piston housing assembly (424). Refer to Figure 158.

15. The return spring retainer also has a square tab on bottom of the retainer at 6-O-clock position that must align with a slot in B-2 apply piston guide at the 6-O-clock position. Refer to Figure 157 and 158.

**Note: All of this is designed so that it ensures the 1-way check valve is installed correctly, at the 12-O-clock position.**

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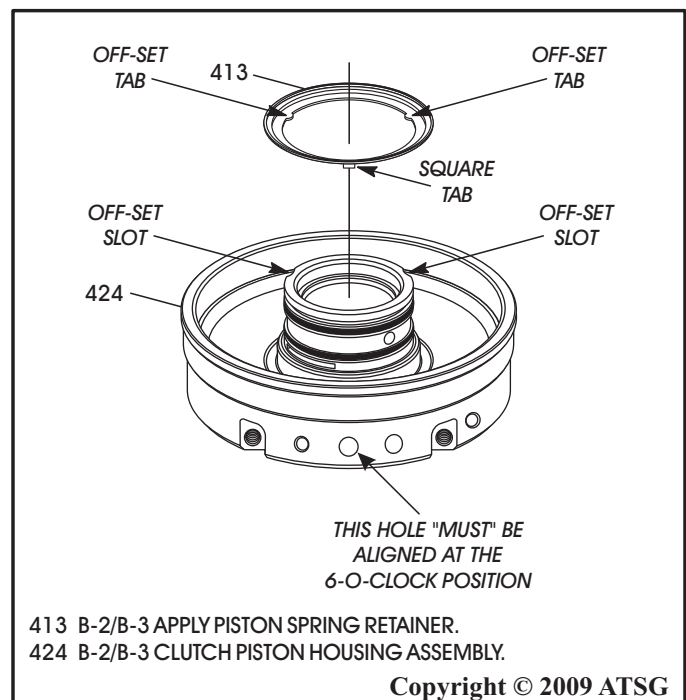


Figure 158

## COMPONENT REBUILD (CONT'D)

### B-2 Clutch Housing Assembly (Cont'd)

16. Place B-2/B-3 clutch piston housing assembly on a flat work surface with the hole shown in Figure 159 at **exactly** the 6-O'clock position.
17. Install B-3 clutch apply piston with opening at **exactly** the 6-O'clock position, as shown in Figure 159.

**Note: Steps 16 and 17 must be followed "exactly" as written. Align perfectly after piston is installed, if necessary.**

18. Install the B-2 apply piston with B-2 piston guide installed, as shown in Figure 160.  
**Note: 1-way check valve must be installed "exactly" at the 12-O'clock position and is shown in Figure 160.**
19. Install the B-2/B-3 piston return spring in the direction shown in Figure 161.
20. Install B-2/B-3 piston return spring retainer, as shown in Figure 161.
21. Compress the return spring and retainer and install the snap ring, as shown in Figure 161. Everything done properly, it goes right on.

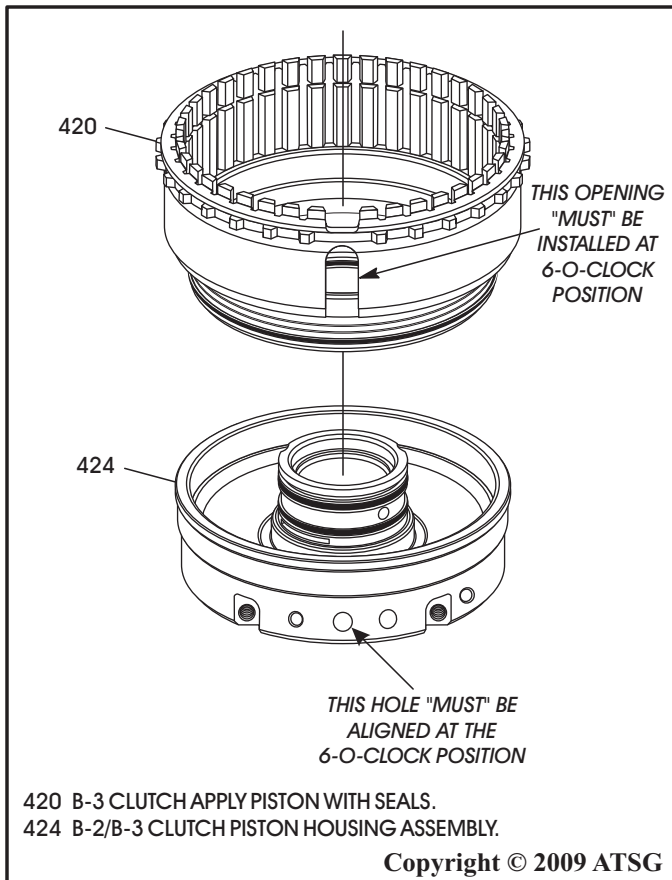


Figure 159

Continued on Page 100

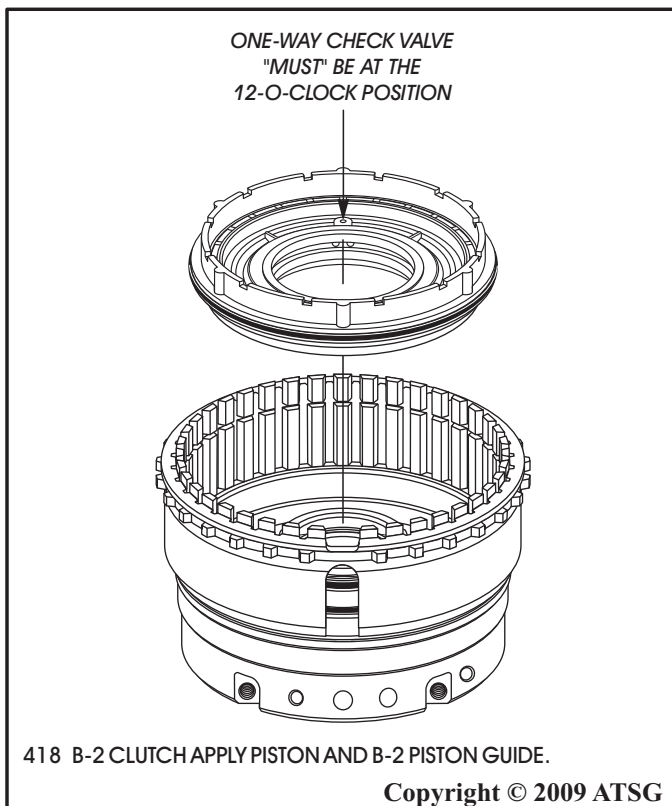


Figure 160

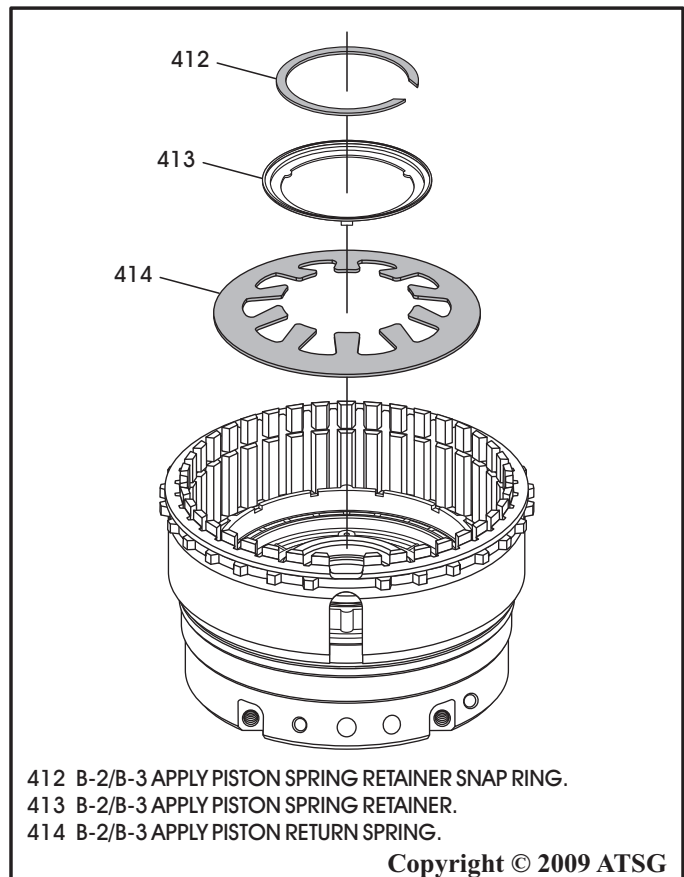


Figure 161

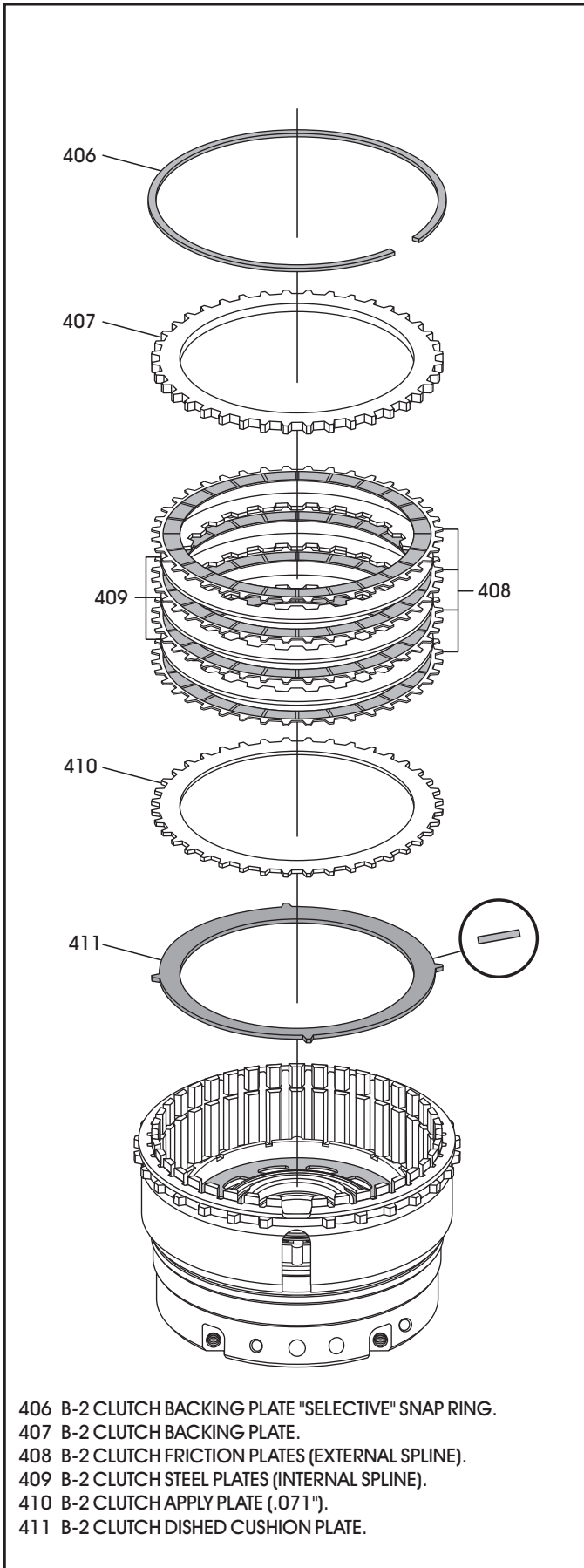


Figure 162

## COMPONENT REBUILD (CONT'D)

### B-2 Clutch Housing Assembly (Cont'd)

22. Use caution when installing B-2 clutch plates.  
**Caution: The B-2 clutch may have 4, or 5 "double-sided" friction plates depending on the model. Refer to the chart in Figure 163. All friction plates should be soaked in proper fluid for 30 minutes before installation.**
23. Install the B-2 clutch dished cushion plate in the direction shown in Figure 162.
24. Install the B-2 clutch .071" thick apply plate, as shown in Figure 162.
25. Install "double-sided" clutches beginning with a friction plate and alternating with steel plates, as shown in Figure 162, until you have proper number of plates installed.  
**Note: Steel plate thickness will vary depending on snap ring groove location and number of frictions required (See Figure 163). Also unique to the B-2 clutch, steel plates are inside spline and frictions are external spline.**
26. Install the B-2 clutch backing plate, as shown in Figure 162.
27. Install the B-2 clutch selective snap ring, as shown in Figure 162.

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### B-2 CLUTCH QUANTITY CHART BY MODEL

TRANSMISSION MODEL	LINED PLATE	STEEL PLATE	BACK. PLATE	THIN APPLY PLATE
722.600/660	4	3	1	1
722.601/602/603/610	4	3	1	1
722.604/606/609/617	4	3	1	1
722.605/607/608/611/614 618/662/664/699	5	4	1	1
722.665	4	3	1	1
722.620/621/624/626/627 628/630/633/636/666	5	4	1	1
722.622/623/625 631/632/663/669	5	4	1	1
722.629/634/661	5	4	1	1

*The number of B-2 friction plates used is model dependant and determined by the backing plate snap ring location and the thickness of the steel plates.*

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Figure 163