ARTICLE BEGINNING

1998-99 MANUAL TRANSMISSIONS
Volkswagen/Audi V.A.G. Type 02J

1998-99; Beetle
1999; Golf, Jetta

APPLICATION

TRANSAXLE APPLICATIONS

<table>
<thead>
<tr>
<th>Vehicle Application</th>
<th>Transaxle Model &amp; Code</th>
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<tr>
<td>Beetle (2.0L 4-Cyl. Gas)</td>
<td>02J.CZM</td>
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<tr>
<td>Beetle (1.9L 4-Cyl. Turbo Diesel)</td>
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<td>Golf &amp; Jetta (1.9L 4-Cyl. Turbo Diesel)</td>
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IDENTIFICATION

Volkswagen Audi Group (VAG) transaxle is identified by a type number cast into transaxle case. Three letter suffix identifies model. Code letter and production date information is stamped on a machined surface located inside the start mounting area and on upper portion of transaxle clutch housing surface.

DESCRIPTION

Type 02J is a 5-speed transaxle consisting of an input shaft, mainshaft/drive pinion and a differential assembly which transfers power to front wheels.

LUBRICATION

Place vehicle on level surface. Remove sound insulation below transmission, if equipped. Remove filler plug. Oil level should be to bottom of filler opening. Add fluid as needed. Use synthetic gear oil (G50, SAE 75W/90). Capacity is 2.1 qts. (2.0L).

ON-VEHICLE SERVICE

AXLE SHAFTS

See appropriate AXLE SHAFTS article in AXLE SHAFTS & TRANSFER
CASES.

TROUBLE SHOOTING

See GENERAL TROUBLE SHOOTING article.

REMOVAL & INSTALLATION

See appropriate MANUAL TRANSMISSION REMOVAL article in MANUAL TRANSMISSION SERVICING.

TRANSAXLE DISASSEMBLY

1) Mount transmission on Repair Stand (VW 309 and 353). Drain transmission oil. Remove clutch release lever and bearing. Remove guide sleeve. Remove transmission housing cover. Remove 5th gear selector fork bolts and remove fork. Use selector lever to select 5th gear and then 1st gear to lock input and output shafts. Then, remove synchronizer hub bolt and 5th gear bolt.

2) Remove operating sleeve. Use Puller "A" (Kukko 20/10 or Matra V/170) and hex bolt M10x20 "B" to remove 5th gear synchronizer hub with needle roller bearing. Use same puller assembly to remove 5th gear.

NOTE: Apply heat, with heat gun, to assist removal of 5th gear.

3) Remove both flange shafts, along with springs, thrust washers and tapered rings. Remove both reverse shaft support bracket bolts. See Fig. 1. Place selector shaft in neutral position, then remove retaining bolts and pull selector shaft out of transmission housing. Remove cover plate near underside pivot pins, then remove pivot pins.

4) Remove pivot pins from top side of transmission. Remove transmission housing-to-clutch housing bolts at differential. Remove clutch housing-to-transmission housing bolts "A" from inside clutch housing (do not remove 4 output shaft bearing support bolts "B"). See Fig. 2. Remove transmission housing.

5) Remove selector forks and rails "A". Remove reverse gear selector mechanism bolt "B". See Fig. 3. Remove nuts for output shaft bearing support. Remove reverse gear, input shaft and output shaft from clutch housing, in that order. Remove differential.
Fig. 1: Location Of Reverse Shaft Support Bracket Bolts  
Courtesy of Volkswagen United States, Inc.

Fig. 2: Removing Clutch Housing-To-Transmission Housing Bolts  
Courtesy of Volkswagen United States, Inc.

Fig. 3: Removing Selector Forks & Reverse Gear Selector Mechanism Bolt  
Courtesy of Volkswagen United States, Inc.
TRANSMISSION HOUSING COVER & 5TH GEAR ASSEMBLY

Disassembly
Drain transmission fluid. Remove transmission cover bolts and remove cover. Remove Torx socket-head bolt from 5th gear and remove washer. Remove pivot pin-to-transmission housing socket-head bolt, then remove 5th gear selector fork. Remove 5th gear operating sleeve, then remove synchronizer hub with 5th gear and synchronizer ring. Remove springs and disassemble unit. Note position of locking pieces. Remove needle roller bearing, if necessary. Remove 5th gear. See Fig. 4.

Reassembly
Install 5th gear should groove around circumference of gear faces toward transmission housing. Install needle bearing. Assemble 5th gear synchronizer ring, hub and operating sleeve with thin extension of locking pieces facing outward, pointed teeth "A" of sleeve and shoulder "B" of hub facing in same direction. Be sure recesses for locking pieces in sleeve and in hub are aligned. Set angled end of spring directly behind locking pieces and offset springs by 120ø and beneath lug "C". See Fig. 5.

Fig. 4: Exploded View Of Transmission Housing Cover & 5th Gear Assembly
Courtesy of Volkswagen United States, Inc.
TRANSMISSION HOUSING & SELECTOR MECHANISM

NOTE: If transmission housing is replaced, adjust input shaft and differential.

Disassembly & Reassembly
Remove axle shaft from flange and tie axle up as high as possible. Watch for fluid drainage. Remove cone-head bolts retaining flange shaft. Remove flange, with spring. Remove Torx bolts holding reverse shaft support. Remove and discard "O" rings when shift linkage pivot pins are removed. See Fig. 6. Remove cover plate retaining bolt and remove cover plate. Remove bolts and remove transmission housing. Remove 2 retaining bolts and remove selector mechanism. Reverse disassembly procedure to reassemble.
Disassembly & Reassembly

Remove cone-head bolts, remove flange shaft with spring and remove differential. If further disassembly of differential is needed, see DIFFERENTIAL under COMPONENT DISASSEMBLY & REASSEMBLY. Remove output shaft assembly nuts, remove assembly, then remove and discard 4 "O" rings from mounting studs on output shaft. Remove reverse shaft support. Remove reverse shaft assembly. For further disassembly of reverse shaft, see REVERSE SHAFT ASSEMBLY under COMPONENT DISASSEMBLY & REASSEMBLY. See Fig. 7. Remove selector mechanism and forks. If further disassembly of selector mechanism is needed, see SELECTOR MECHANISM under COMPONENT DISASSEMBLY & REASSEMBLY.
Disassembly & Reassembly

1) Remove bolts and remove transmission housing. Do not remove 4 bolts for output shaft (mainshaft) bearing support. Use proper Driver (VW 295 and 447h) to remove needle bearing. Remove oil filler plug. Using Puller (Kukko 21/6 and 22/2), remove output shaft (mainshaft) outer bearing race and tapered roller bearing. See Fig. 8.

NOTE: If bearing assembly is replaced during assembly, adjust output shaft (mainshaft) preload.

2) Remove shims for output shaft and for input shaft. With proper Driver (VW 407 and 477h), drive out input shaft outer bearing race and tapered roller bearing. Using Puller (Kukko 22/1 and 21/2), remove needle bearing.

3) Remove both dowel sleeves. Pull out starter bushing. Remove clutch housing. Remove 3 bolts and remove guide sleeve with input shaft seal and "O" ring. Remove oil seal and sleeve from bottom

4) Remove magnet from clutch housing. Remove differential shim. Remove oil seal from transmission housing. Reverse disassembly procedure to reassemble.

Fig. 8: Exploded View Of Transmission & Clutch Housing Assembly
Courtesy of Volkswagen United States, Inc.

SELECTOR MECHANISM

Disassembly
1) Remove selector shaft. Destroy plastic sleeve of ball sleeve and remove ball bearings, then use an Internal Extractor (Kukko 21/3) to remove ball sleeve. Gently pry oil seal out of selector mechanism cover, using care not to score mating surface of cover. Remove selector mechanism cover. Remove sleeve from backup light
switch housing, then remove self-locking nut and remove backup light switch housing. See Fig. 9.

2) Remove transmission breather cap and sleeve. Remove gear selector lever. Remove relay lever and nut. Remove selector actuating arm with axis pin. Remove "O" ring from actuating arm, then remove spacer. Remove bolt and end cover.

Fig. 9: Exploded View Of Selector Mechanism
Courtesy of Volkswagen United States, Inc.

Reassembly
1) Assemble end cover with new locking bolt. Tighten to 30 ft. lbs. (40 N.m). Press spacer into relay lever. Pull new "O" ring onto actuating arm axis pin. Press bolt into actuating arm.

2) Install actuating arm by positioning gear selector lever as shown. See Fig. 10. Install relay lever in guide rail of gear shift lever, position "A" (lubricate with MoS2 grease). Position actuating arm with flats, "B", of axis face mounting in proper position, since relay lever only fits in one position. Install balance weight on gear selector lever.
INPUT SHAFT ASSEMBLY

Disassembly

1) Remove Torx socket-head bolt from input shaft end in transmission housing. Remove dished washer. Use a gear puller to remove 5th gear operating sleeve and synchronizer hub. Remove 5th gear synchronizer ring with cast locking pieces. Disassemble spring and locking pieces. With puller, remove 5th gear. Remove needle roller bearing and press off sleeve. See Fig. 11. Remove transmission housing from clutch housing.

2) With suitable Drivers (VW 407 and 477h), remove tapered roller bearing outer race from end of input shaft. Using press and Drivers (VW 412, 422 and 401), press off tapered roller bearing inner race from input shaft. Remove thrust washer from end of input shaft. Press off tapered roller bearing inner race, along with 4th gear and sleeve. Press off 4th gear, with tapered bearing outer race and sleeve, using press and Drivers (VW 407, 421 and 401). Remove and discard snap ring. Press off 3rd gear, using suitable press and Drivers (VW 408a, 447h and 401).
1) Install shim into bottom of transmission housing and press in tapered roller bearing outer sleeve. Press on sleeve for needle bearing, using Drivers (VW 41-501 and 401). Install tapered roller bearing outer race into clutch housing, using drift. Install inner races into clutch housing, using suitable Drivers (VW 412, 422 and 401).

2) Press 3rd gear onto input shaft, ensuring shoulder point toward 4th gear. Install new snap ring. Press on 4th gear. Press on tapered roller bearing inner race, install thrust washer and press on outer race. Install new shim into bottom of transmission housing, adjusting thickness as needed. See ADJUSTING INPUT SHAFT PRELOAD.

3) Insert input shaft into clutch housing and position transmission housing in place, tighten retaining bolts. Press on needle roller bearing sleeve, 5th gear, synchronizer ring, and spring. Assemble 5th gear operating sleeve and synchronizer hub. Note proper location of locking pieces "B", in recesses "A" in operating sleeve. See Fig. 12. Install dished washer. Install Torx bolt into end of input shaft and tighten to 59 ft. lbs. (80 N.m).
Fig. 12: Assembling 5th Gear Synchronizer Hub & Locking Pieces
Courtesy of Volkswagen United States, Inc.

OUTPUT SHAFT

NOTE: Output shaft is paired with final drive gear. Always replace these as a set. Perform adjustment following replacement.

Disassembly
1) Position Separating Device (Kukko 17/2) under 2nd gear and press off 3rd and 4th gear synchronizer hub and operating sleeve, 2nd gear, 3rd gear and 4th gear with transmission housing needle roller bearing sleeve. Ensure device is supported so 1st and 2nd gear operating sleeve is not pulled off at same time. See Fig. 13.
2) Use Puller (Kukko 21/6) to extract small tapered roller bearing outer race. Clamp output shaft in soft-jawed vise, with grip piece behind bearing rollers, and use Puller (VAG 1582 and 1582/5) to pull off small tapered roller bearing inner race. With 2-arm Puller (Kukko 20/10), remove operating sleeve with synchronizer hub. Remove and discard snap rings as components are removed.

3) Use Puller (VAG 1582 and 1582/4) to remove large tapered roller bearing inner race, after mounting output shaft in soft-jawed vise and installing M20x10 bolt into output shaft bore.

4) Disassemble 1st and 2nd gear operating sleeve and synchronizer hub by removing the springs and sliding operating sleeve from the synchronizer hub. Watch for locking pieces so they are not lost. See Fig. 14. Follow same procedure for disassembly 3rd and 4th gear operating sleeve and synchronizer hub.
NOTE: Wide shoulder ("A") of synchronizer hub and outer splines ("B") of operating sleeve face opposite directions after assembly. Recesses for locking pieces on synchronizer hub and operating sleeve must align.

Inspection

Check synchronizer gear for wear by pressing ring onto gear cone and measuring gap "a" with a feeler gauge. Normal dimension is .04-.06" (1.0-1.7 mm) and acceptable wear limit is .02" (.5 mm). See Fig. 15. Check inner ring for wear by pressing ring onto 2nd gear cone and measuring gap "a" with feeler gauge. Normal dimension is .03-.05" (.75-1.25 mm). Wear limit is .01" (.3 mm). See Fig. 16.

Fig. 14: Exploded View Of Operating Sleeve & Synchronizer Hub
Courtesy of Volkswagen United States, Inc.

Fig. 15: Checking Synchronizer Ring For Wear
Courtesy of Volkswagen United States, Inc.
Fig. 16: Checking Inner Ring For Wear
Courtesy of Volkswagen United States, Inc.

Reassembly


NOTE: Operating sleeve splines of 1st and 2nd gear operating sleeve should point to splines for 3rd and 4th gear synchronizer hub. Wide shoulder of synchronizer hub faces toward 1st gear.

NOTE: Identify 1st gear synchronizer ring by 3 teeth that are ground down half way and inside of ring have no recesses. The 2nd gear synchronizer ring may have 2 or 3 teeth ground down half way and inside of ring has 3 recesses.

2) Install synchronizer ring (inner ring with lugs located in recesses of 2nd gear synchronizer ring. Install 2nd gear with higher shoulder facing 1st gear. Ensure recesses in shoulder align with lugs of outer ring. Using press (VW402, 545, 544 and 447h), press needle roller bearing sleeve for 3rd gear into position on output shaft.

3) Ensure 3rd and 4th gear operating sleeve and synchronizer hub is properly assembled by pushing sleeve over hub with locking pieces in place and springs offset 1200. Ensure angled end of spring is in hollow locking piece. Install 3rd and 4th gear operating sleeve and synchronizer hub so chamfer of inner splined areas is toward 4th gear. Press into position using Press Tools (VW402, 412, 447h, and 519).

**REVERSE SHAFT ASSEMBLY**

**Disassembly**
Remove reverse shaft. See GEAR ASSEMBLY. Remove reverse shaft support and reverse shaft. Press needle roller bearing out of reverse shaft support. Remove snap ring and remove reverse sliding gear. Remove reverse gear. Press needle roller bearing out of clutch housing. See Fig. 17.

**Reassembly**
Press new needle roller bearings into clutch housing and into reverse shaft support. Ensure new snap ring is installed, with snap ring shoulder facing reverse gear.

*Fig. 17: Exploded View Of Reverse Shaft Assembly
Courtesy of Volkswagen United States, Inc.*

**DIFFERENTIAL ASSEMBLY**

**Disassembly**
1) Remove cone-head bolts retaining flange shaft in transmission housing. Remove flange shaft with springs, thrust washers, tapered rings and snap rings. Remove one-piece thrust washer. Remove differential side gear and threaded piece. Drive differential pinion shaft out of side gear. Repeat for side gear on clutch housing.
side. See Fig. 18.

2) Remove retaining bolts and separate clutch housing from transmission housing. Remove retaining bolts and remove differential cage, note positions of plates under retaining nuts.

NOTE: Final drive gear is production-riveted and must be replaced with output shaft, if either requires replacement.

3) Remove adjusting shim for differential from transmission housing. Use puller to extract tapered roller bearing outer race and inner race. Remove differential housing. Remove speedometer drive gear. Pull off lower tapered roller bearing inner race then drive tapered roller bearing outer race out of clutch housing. Remove oil seal sleeve. Remove oil seal.
Reassembly

1) Position sleeve, then drive in new oil seal. Press in new lower tapered roller bearing inner and outer races. Install speedometer drive gear and install differential housing. When installing final drive gear, ensure circular groove faces toward bolt-on side of differential. Heat final drive gear to about 212øF (100øC) to install. Press in upper tapered roller bearing races. Select shim for differential. See ADJUSTING DIFFERENTIAL PRELOAD.

2) Install differential cage and install plates, nuts and bolts. Install transmission housing and clutch housing and install retaining bolts. Install side gears in reverse of removal procedure. Install flange shafts. See Fig. 18.

ADJUSTING INPUT SHAFT PRELOAD

NOTE: It is only necessary to readjust input shaft when transmission housing, clutch housing, input shaft, 4th gear or tapered roller bearing has been replaced.

1) Press tapered roller bearing outer race (without shim) into transmission housing to its stop. Install input shaft into clutch housing. Install transmission housing. Tighten housing bolts to 18 ft. lbs. (25 N.m), plus 90 degrees.

2) Mount dial indicator and Holder (VW 353, 387 and 385-17) to clutch housing for small tapered roller bearing or to transmission housing for large tapered roller bearing. See Fig. 19. Rotate input shaft several times in both directions to seat roller bearing. Set dial indicator to "0" with .04" (1 mm) preload. Press input shaft toward dial indicator. Read and record clearance indicated. Select appropriate size shim. See INPUT SHAFT SHIM SELECTION CHART.

3) Remove input shaft and press tapered roller bearing outer race from housing. Press shim and roller bearing race into position. Reassemble housing. Tighten housing bolts to 18 ft. lbs. (25 N.m), plus 90 degrees.
Fig. 19: Positioning Dial Indicator Assembly To Measure Input Shaft Clearance

4) Mount holder and dial indicator in clutch housing after separating the housings. Rotate input shaft several times in both directions to seat tapered roller bearing. Press input shaft toward dial indicator and check dial indicator. Bearing play should be .0004-.0035 in. (.01-.09 mm). If not, repeat adjustment.

INPUT SHAFT SHIM SELECTION CHART

<table>
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<th>Shim Size - In. (mm)</th>
<th>Part No.</th>
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<td>.026 (.650)</td>
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<td>.028-.029 (.700-.724)</td>
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ADJUSTING OUTPUT SHAFT PRELOAD

1) Press small tapered roller bearing outer race and .026" (.65 mm) thick shim into clutch housing. Insert output shaft and tighten bearing support bolts to 18 ft. lbs. (25 N.m), plus 90 degrees. Mount dial indicator on end of output shaft, with proper Mount Device (VW 385/17, 387 and 3114/2). Set dial indicator to "0" with .04" (1 mm) preload.

2) Move output shaft up and down and note dial indicator reading. To determine specified bearing preload, add constant preload figure to reading obtained on dial indicator, plus the thickness of the shim installed for this adjustment. See OUTPUT SHAFT SHIM BEARING PRELOAD table.

3) Remove equipment, remove output shaft, pull out small tapered roller bearing outer race. Install selected shim and reassemble. Adjustment shims are available in sizes from .0255-.055" (.65-1.40 mm) in .002" (.05 mm) increments.

OUTPUT SHAFT SHIM BEARING PRELOAD

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<th>Specification</th>
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<td>Dial Reading</td>
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<td>(.30)</td>
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<tr>
<td>Preload Constant</td>
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<td>Shim Thickness</td>
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<td>(1.15)</td>
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ADJUSTING DIFFERENTIAL PRELOAD

1) Press tapered roller bearing outer race into clutch housing. Press tapered roller bearing outer race, without shim, into transmission housing. Mount differential in clutch housing, install transmission housing and tighten bolts to 18 ft. lbs. (25 N.m). Mount dial indicator on end of differential, with proper Mounting Device (VW 385/17 and 387). Set dial indicator to "0" with .04" (1 mm) preload.

2) Move differential up and down and note dial indicator reading. To determine specified bearing preload, add constant preload figure to reading obtained on dial indicator. See DIFFERENTIAL BEARING PRELOAD table.

3) Remove equipment. Remove transmission housing and pull out tapered roller bearing outer race. Install selected shim. Drive outer race into transmission housing. Complete reassembly of components. Adjustment shims are available in sizes from .0255-.055" (.65-1.40 mm) in .002" (.05 mm) increments.

DIFFERENTIAL BEARING PRELOAD

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<th>Application/Item</th>
<th>Specification</th>
<th>In. (mm)</th>
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TRANSAXLE REASSEMBLY

1) Install differential. Install input shaft, output shaft and reverse shaft, using new "O" rings on output shaft studs. Install and tighten nuts for output shaft bearing support.

2) Clean any remaining thread locking compound from reverse shaft support threads. Install reverse gear selector mechanism. Install selector forks with rails. See Fig. 3. Install M8x100 mm stud into reverse shaft support so shaft will be aligned after installing transmission housing. Align selector rails with selector segments positioned in grooves on operating sleeves. Install transmission housing.

3) Install reverse shaft support bolts by inserting bolt "a", removing M8x100 mm stud, then inserting and hand-tightening bolt "b". Tighten both bolts to 22 ft. lbs. (30 N.m). See Fig. 20.

4) Align selector mechanism with screwdriver and install pivot pin for selector forks. Install selector shaft by first placing selector rails in Neutral position. Set locating lug "1" in recess in transmission housing. Position selector shaft so selector finger "2" is inserted in selector rails. See Fig. 21.
5) Install 5th gear so groove around circumference faces toward transmission housing. Use suitable driver to seat 5th gear. Assemble 5th gear synchronizer hub and operating sleeve. Install assembly with pointed teeth of operating sleeve and high shoulder of synchronizer hub facing transmission housing. Drive on 5th gear synchronizer hub assembly. Install washers, then hand-tighten bolts for synchronizer hub and 5th gear.

6) Engage 2 gears and tighten 5th gear synchronizer hub and gear retaining bolts. Install 5th gear selector fork. Engage 5th gear. Loosen bolt "1". Press operating sleeve and selector fork jaws in direction of arrows, then retighten bolt to 18 ft. lbs. (25 N.m). Clearance must be less than .008" (.2 mm) between operating sleeve and gear. Disengage 5th gear so operating sleeve is in Neutral position. Synchronizer ring must move freely. Check selection of all gears. If okay, install transmission housing cover.

7) Install flange shafts with springs, thrust washers and tapered rings. Install release clutch release bearing guide sleeve. Install clutch release lever and bearing.

TORQUE SPECIFICATIONS

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<th>Application</th>
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<tr>
<td>5th Gear Torx Bolt</td>
<td>59 (80)</td>
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<tr>
<td>5th Gear Selector Fork Bolts</td>
<td>18 (25)</td>
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<tr>
<td>Axle Shaft Heat Shield Bolts</td>
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<td>Axle Shaft-to-Flange Shaft Bolts</td>
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<td>Reverse Gear Selector Fork Torx Bolt</td>
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<td>Reverse Shaft Support Bolts</td>
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Speedometer Drive .......................................... 22 (30)
Transmission Housing Cover Plate Bolt ...................... 18 (25)
Transmission Housing Cover Bolt .............................. 7 (10)
Transmission Housing Guide Sleeve Bolts .................... 15 (20)

(1) - Plus an additional 90 degrees.

END OF ARTICLE