39 FINAL DRIVE - FRONT DIFFERENTIAL

FLANGE SHAFT OIL SEAL, REPLACING

Flange shaft oil seal (left-side), replacing

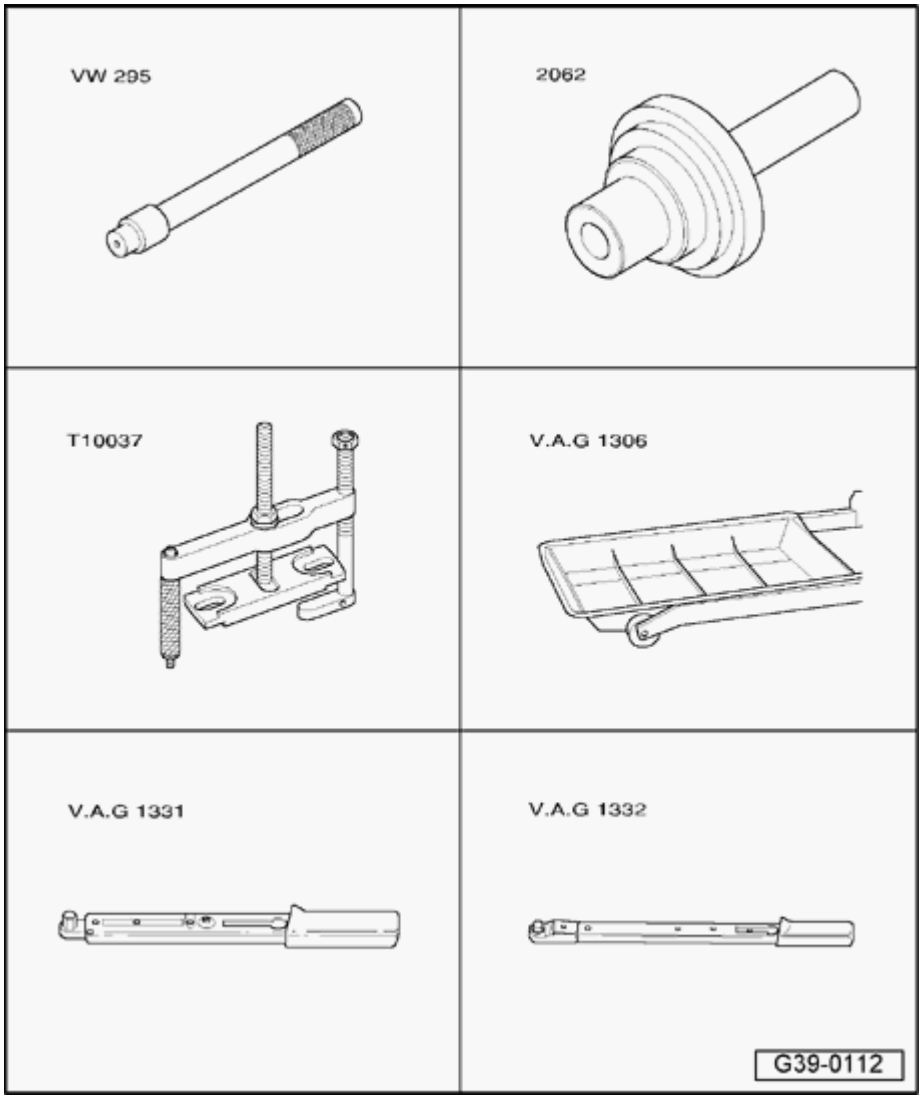

Fig. 465: Identifying Special Tools -- Flange Shaft Oil Seal, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Needle bearing drift VW295
- Driver 2062
- Puller T10037
- Drip tray V.A.G1306

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- Torque wrench V.A.G1331
- Torque wrench V.A.G1332
- **Sealing grease G 052 128 A1**

Removing

- Transmission is installed

Observe the general repair instructions --> **General repair instructions**.

- Remove left front wheel.

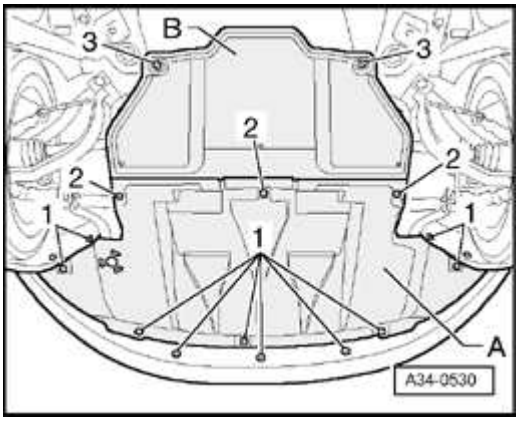

Fig. 466: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

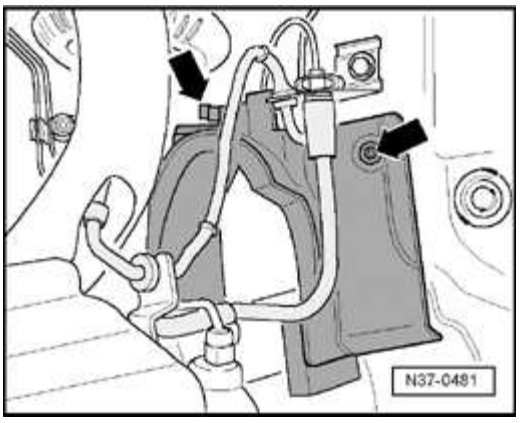

Fig. 467: Axle Shaft Noise Insulation Retainers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove sound insulation - **arrows** - in wheel housing (left-side).

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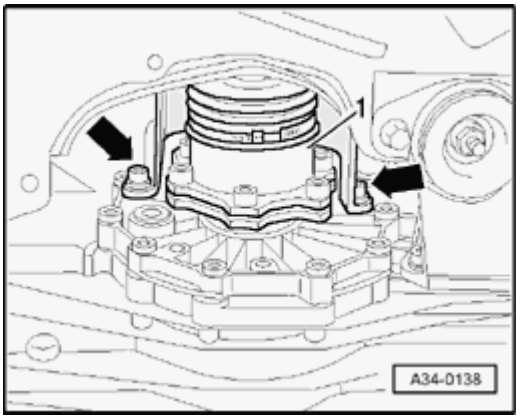

Fig. 468: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove heat shield - **arrows** - for drive axle (left-side).
- Remove drive axle - **1** - from flange shaft and tie as far as possible to front, taking care not to damage surface protection.
- Place drip tray V.A.G1306 underneath.

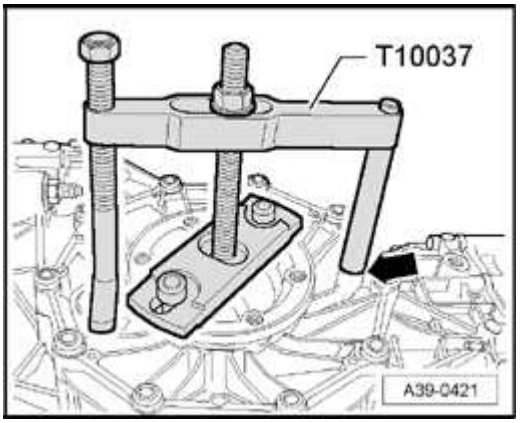

Fig. 469: Removing Flange Shaft Using Puller T10037
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft (left-side) by securing puller T10037 to cover for final drive - **arrow** -.

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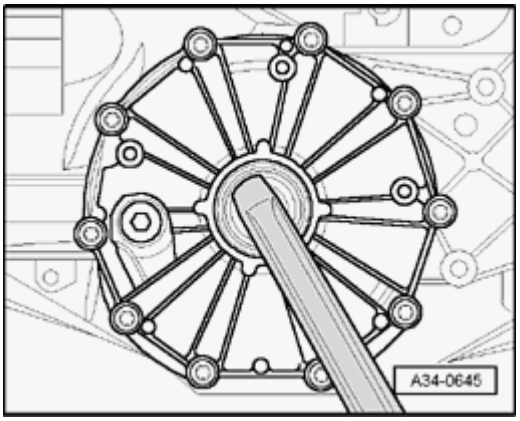

Fig. 470: Prying Out Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out flange shaft oil seal.

Installing

- Lightly oil outer circumference of new oil seal.

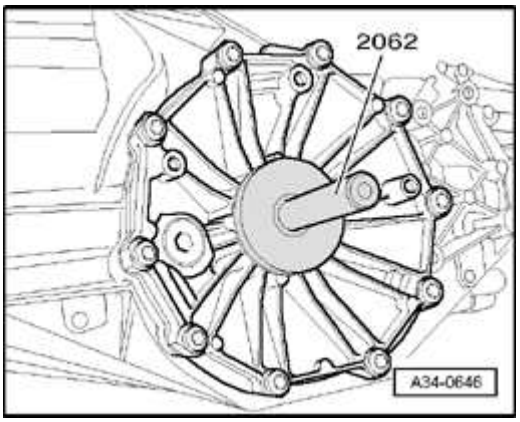

Fig. 471: Driving In New Flange Shaft Oil Seal Using Driver 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive new oil seal for flange shaft using driver 2062; keep seal straight when installing.
- Insertion depth: 5.50 ± 0.15 mm below top of cover.
- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .

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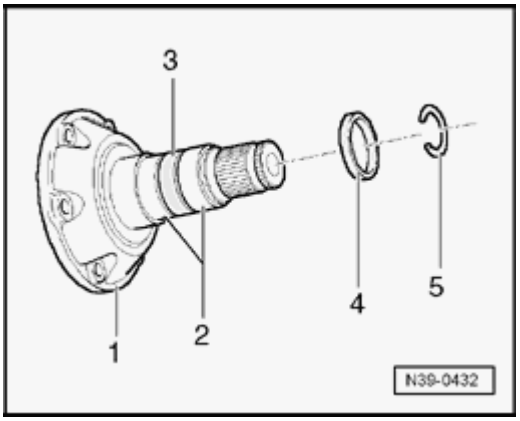

Fig. 472: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Inspect polygon bearings for visible damage - 2 -.**
- **If the polygon bearings - 2 - do not run smoothly with the flange shaft removed, this does not necessarily indicate that the bearings are faulty. A test for noisy bearings can only be performed with the bearings installed.**
- **The polygon bearings can only be replaced together with the flange shaft.**
- **Always replace circlip for flange shaft - 5 -.**

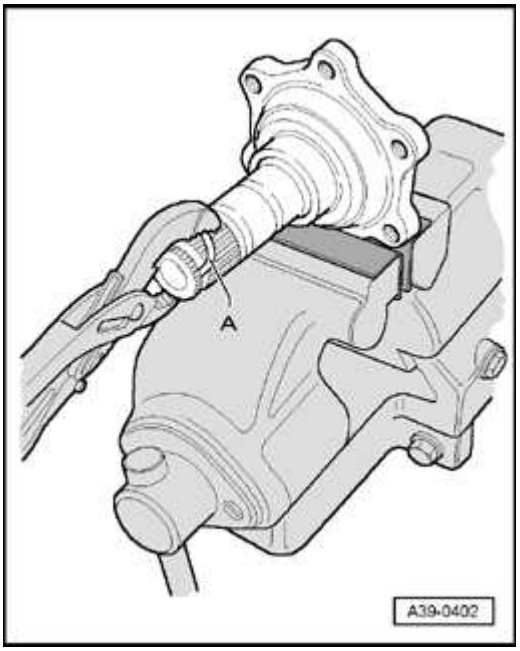

Fig. 473: Identifying Flange Shaft Clamped In Vise And Using New Circlip To Press Old Circlip Out Of Groove In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp flange shaft in vise, using jaw protectors. Use new circlip - **A** - to press old circlip out of groove in flange shaft.

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- Knock flange shaft in with needle bearing drift VW295.
- Bolt drive axle to flange shaft --> **40 - FRONT SUSPENSION**
- If applicable, bolt on heat shield for drive axle (left-side).

- Fill transmission with oil and check oil level --> **Transmission oil level, checking** .
- Install sound insulation.

Tightening torque

Component		Nm
Heat shield above drive shaft to transmission		23

Flange shaft oil seal (right-side), replacing

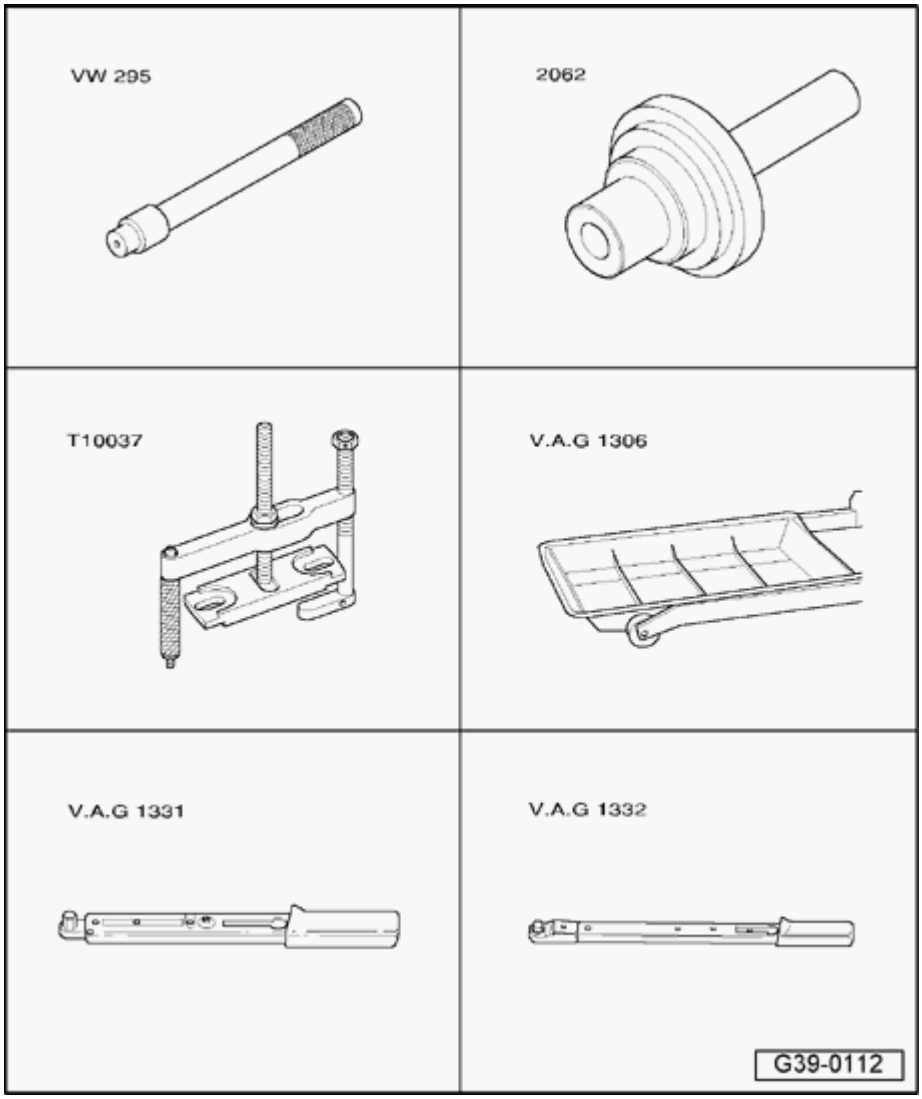

Fig. 474: Identifying Special Tools -- Flange Shaft Oil Seal, Replacing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Needle bearing drift VW295
- Driver 2062
- Puller T10037
- Drip tray V.A.G1306
- Torque wrench V.A.G1331
- Torque wrench V.A.G1332
- **Sealing grease G 052 128 A1**

Removing

- With transmission is installed

Observe the general repair instructions --> **General repair instructions**.

- Loosen bolt for right-side drive axle / wheel hub.
- Remove right front wheel.

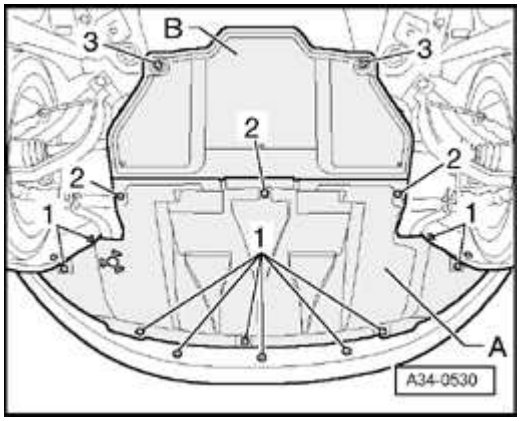

Fig. 475: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

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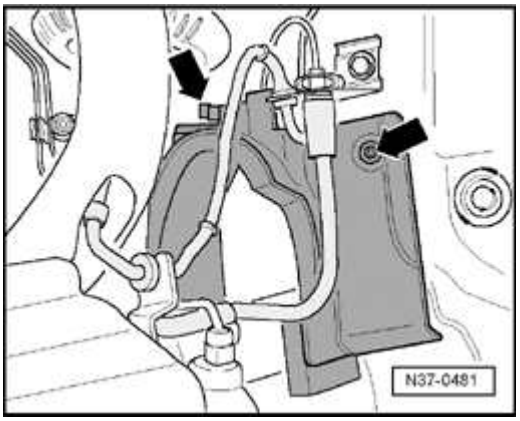

Fig. 476: Axle Shaft Noise Insulation Retainers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove sound insulation - **arrows** - in wheel housing (right-side).

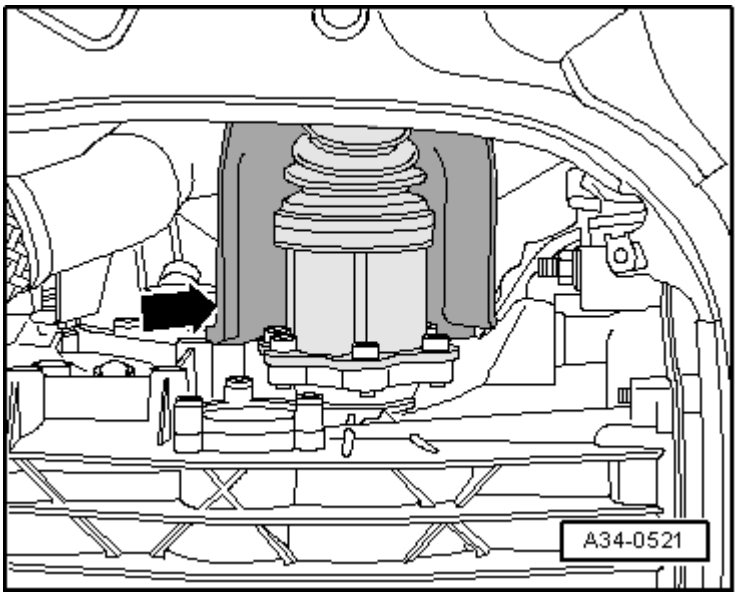

Fig. 477: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for drive axle (right-side).
- Remove drive axle (right-side) --> **40 - FRONT SUSPENSION** .
- Place drip tray V.A.G1306 underneath.

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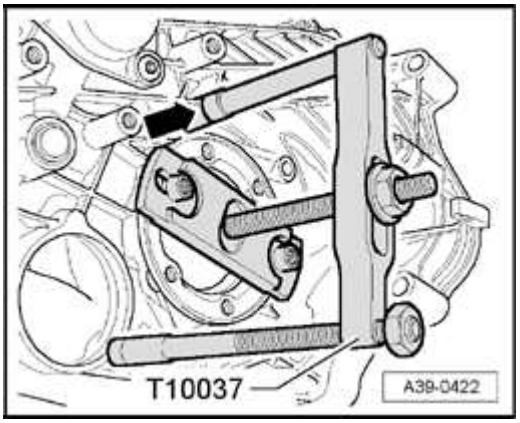

Fig. 478: Removing Flange Shaft By Securing Puller T10037 To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft (right-side); by securing puller T10037 to transmission housing - **arrow** -.

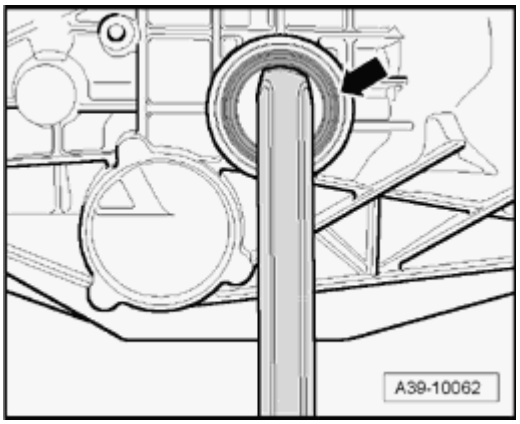

Fig. 479: Prying Out Flange Shaft Oil Seal Using An Assembly Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out flange shaft oil seal - **arrow** - using an assembly lever.

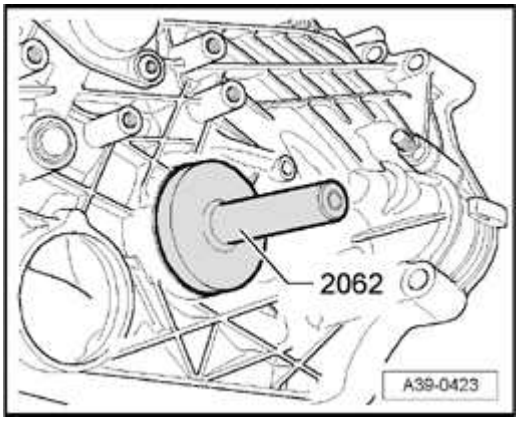

Fig. 480: Driving In New Flange Shaft Oil Seal Using Fitting Drift 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Installing

- Lightly oil outer circumference of new oil seal.
- Drive new oil seal for flange shaft using driver 2062; keep seal straight when installing.

- Insertion depth: 5.50 ± 0.15 mm below top of cover.

- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .

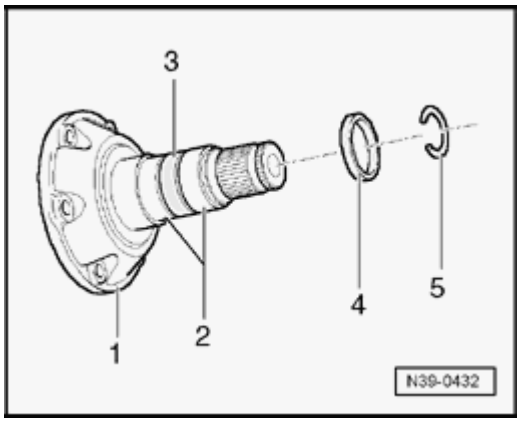

Fig. 481: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Inspect polygon bearings for visible damage - 2 -.**
- **If the polygon bearings - 2 - do not run smoothly with the flange shaft removed, this does not necessarily indicate that the bearings are faulty. A test for noisy bearings can only be performed with the bearings installed.**
- **The polygon bearings can only be replaced together with the flange shaft.**
- **Always replace circlip for flange shaft - 5 -.**

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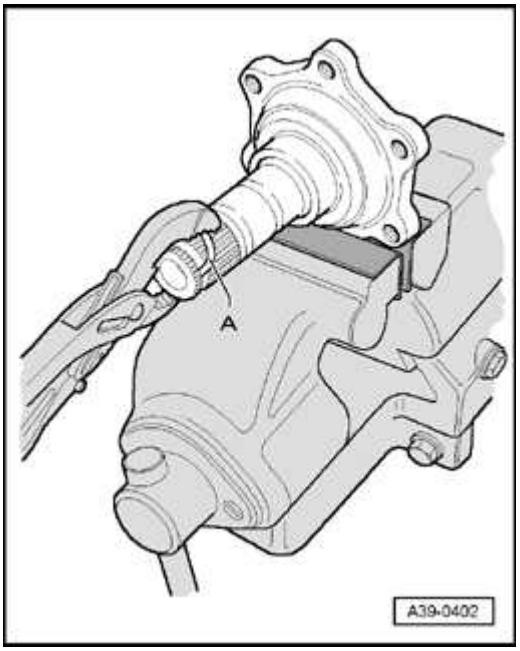

Fig. 482: Identifying Flange Shaft Clamped In Vise And Using New Circlip To Press Old Circlip Out Of Groove In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp flange shaft in vise, using jaw protectors. Use new circlip - **A** - to press old circlip out of groove in flange shaft.
- Knock flange shaft in using needle bearing drift VW295.
- Install drive axle--> **40 - FRONT SUSPENSION** .
- Bolt on heat shield for drive axle (right-side).

- Fill transmission with oil and check oil level--> **Transmission oil level, checking** .
- Install sound insulation.

Tightening torque

Component		Nm
Heat shield above drive axle to transmission		23

DIFFERENTIAL, REMOVING AND INSTALLING

Differential, removing and installing

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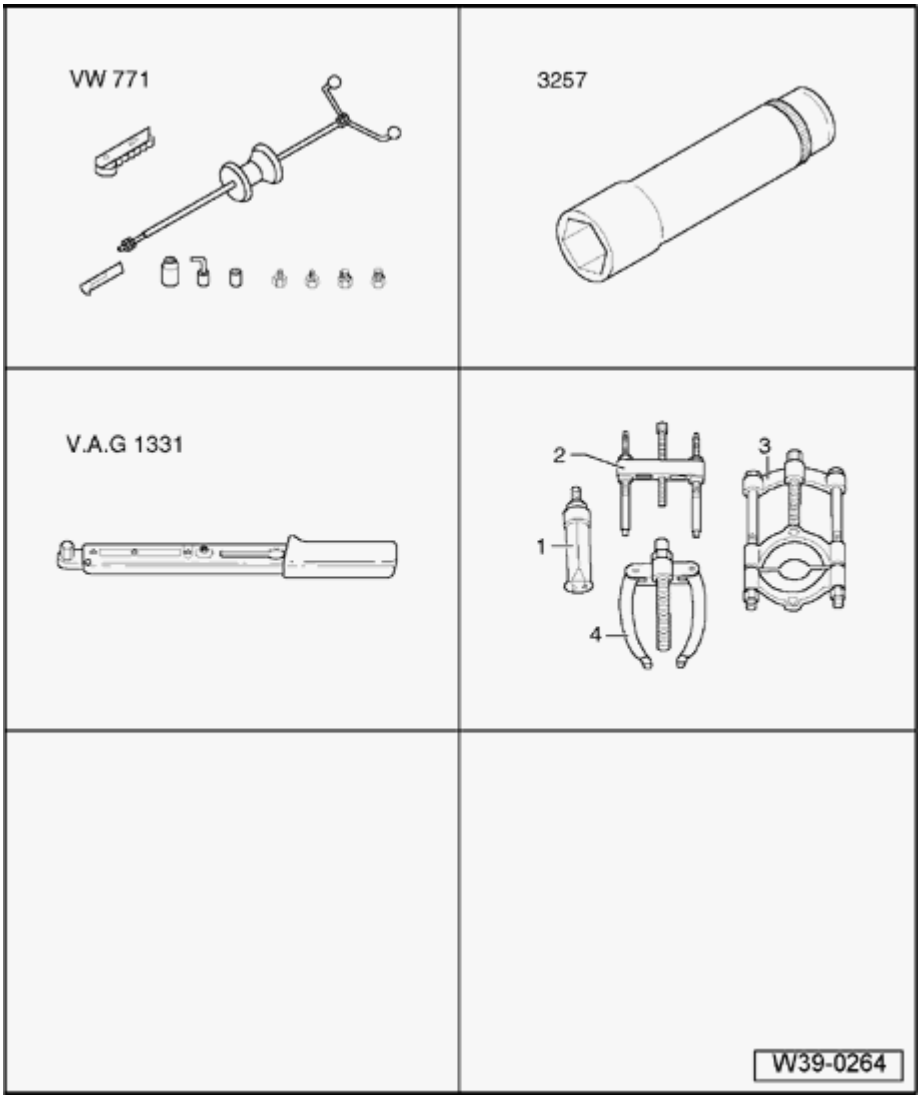

Fig. 483: Identifying Special Tools - Differential, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Slide hammer-complete set VW771
- Socket (27 mm) 3257
- Torque wrench V.A.G1331
- - **1** - Internal puller Kukko 21/5

NOTE:

- **Removing and installing is possible with the transmission installed.**
- **The differential can be removed and installed without removing the selector mechanism, input shaft, pinion shaft/hollow shaft or bearing housing. These components must be removed if the differential needs to be adjusted.**

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- **Inspect polygon bearings for visible damage.**
- **The polygon bearings can only be replaced together with the flange shaft.**
- **If the polygon bearings do not run smoothly with the flange shaft removed, this does not necessarily indicate that the bearings are faulty. A test for noisy bearings can only be performed with the bearings installed.**
- **A spacer ring is installed between the polygon bearing and the differential sun wheel on flange shafts with 30 mm spline diameter Flange shaft assembly, - Item4 -.**
- **Adjustment work is required when replacing the parts marked with 1) . Table of adjustments --> Table of adjustments**

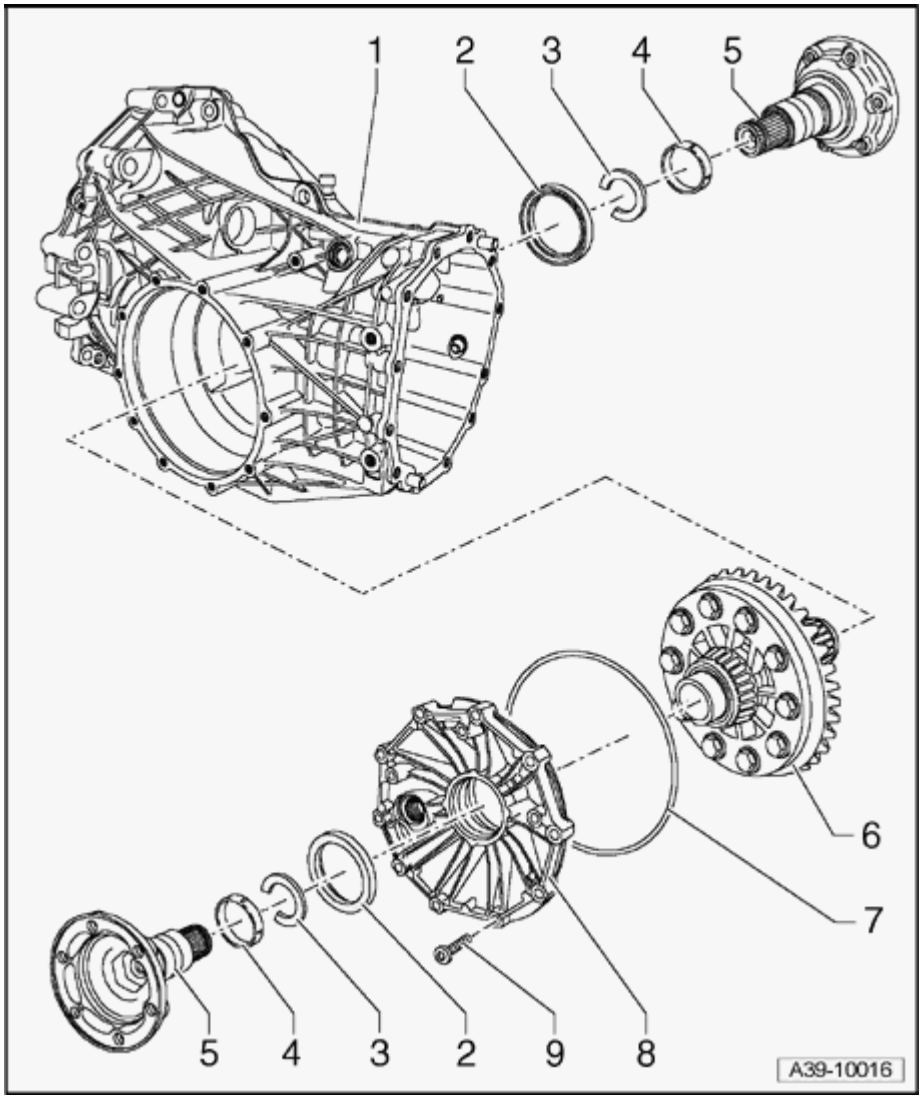

Fig. 484: Differential Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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1 - Transmission housing [1)]

2 - Oil seal

- Removing (left-side) **Removing flange shaft oil seal (left-side)**
- Installing (left-side) **Installing flange shaft oil seal (left-side)**
- Removing (right-side) **Removing flange shaft oil seal (right-side)**
- Installing (right-side) **Installing flange shaft oil seal (right-side)**

3 - Circlip

- Replace
- Removing and installing **Removing and installing circlip**

4 - Spacer ring

- Is only installed on flange shafts with a spline diameter of 30 mm
- Remove with Internal puller 30 to 37 mm, e.g. Kukko 21/5
- Installing **Installing spacer ring**

5 - Flange shaft

- Removing (left-side) **Removing flange shaft (left-side)**
- Removing (right-side) **Remove right flange shaft**
- Drive in with drift VW295.
- Flange shaft assembly **Flange shaft assembly**

6 - Differential with ring gear[1)]

- Disassembling and assembling --> **Differential, disassembling and assembling**

7 - O-ring

- Always replace
- Lubricate with gear oil

8 - Cover for final drive [1)]

9 - TORX bolt, 20 Nm plus an additional 90° $^{1}/_{4}$ turn

Removing flange shaft (left-side)

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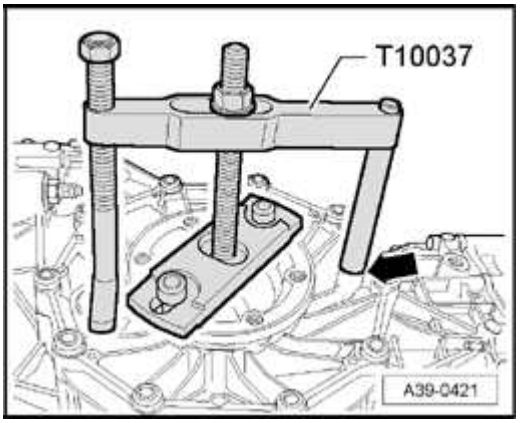

Fig. 485: Removing Flange Shaft Using Puller T10037
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft (left-side) by securing puller T10037 to cover for final drive - **arrow** -.

Remove right flange shaft

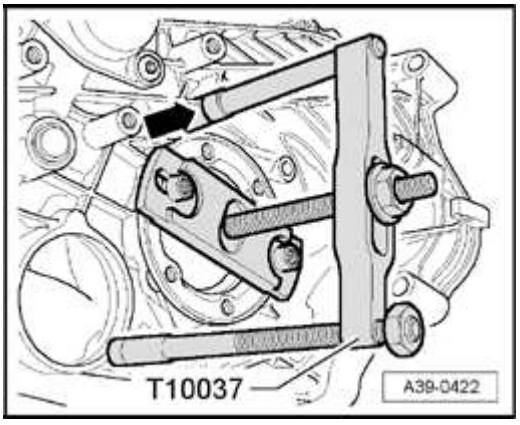

Fig. 486: Removing Flange Shaft By Securing Puller T10037 To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft (right-side) by securing puller T10037 to transmission housing - **arrow** -.

Removing and installing circlip

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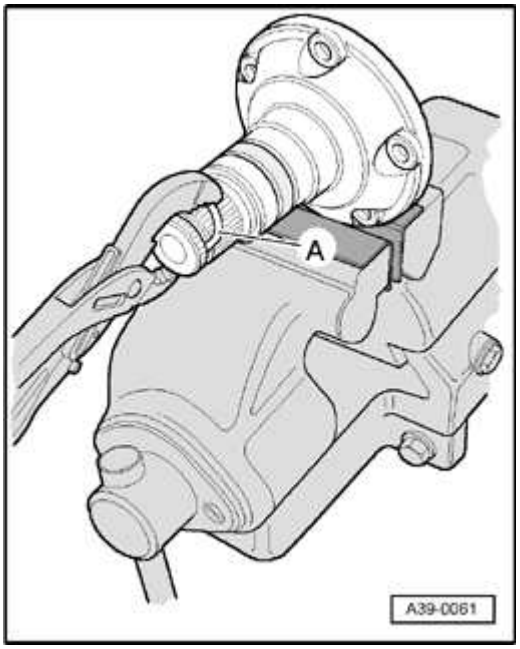

Fig. 487: Removing And Installing Securing Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp flange shaft in vise, using jaw protectors. Use new circlip - **A** - to press old circlip out of groove in flange shaft.

Installing spacer ring

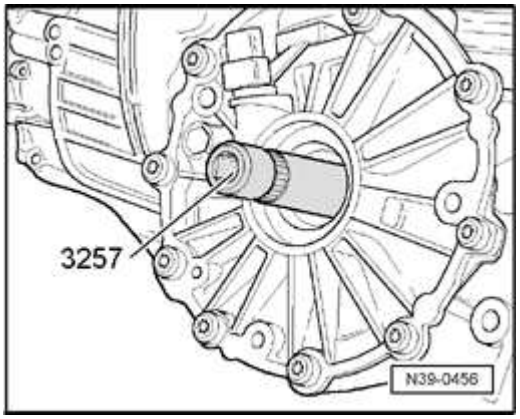

Fig. 488: Installing Spacer Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive new spacer ring in onto stop; do not cant ring when doing this.

Flange shaft assembly

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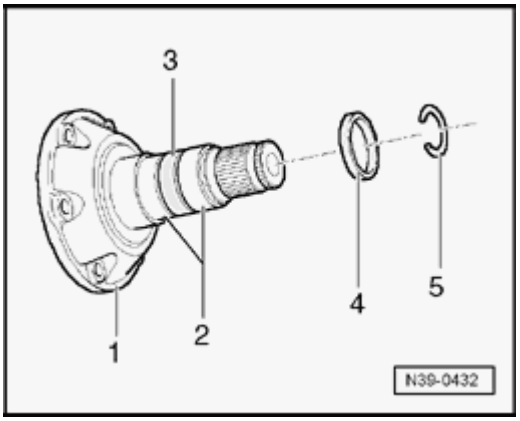

Fig. 489: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Flange shaft
2. Needle bearing (polygon bearing)
3. Spacer ring
4. Spacer ring - installed on shafts with 30mm spline diameter
5. Circlip

NOTE:

- **The needle bearing (polygon bearing) does not turn easily when the flange shaft is removed. This does not indicate that the bearing is faulty.**

Removing flange shaft oil seal (left-side)

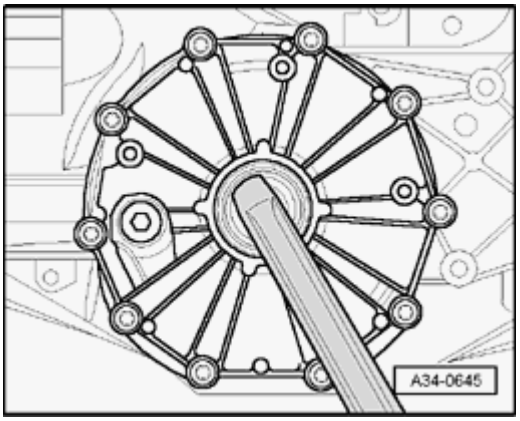

Fig. 490: Prying Out Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out flange shaft oil seal using an assembly lever.

Installing flange shaft oil seal (left-side)

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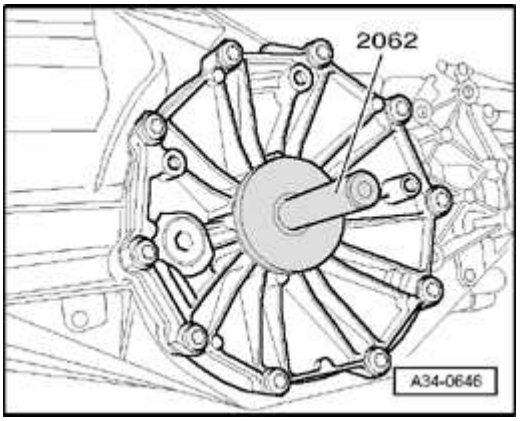

Fig. 491: Driving In New Flange Shaft Oil Seal Using Driver 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil outer circumference of new seal.
- Drive new flange shaft oil seal using driver 2062; keep seal straight when installing.

- Insertion depth: 5.50 ± 0.15 mm below top of cover.
- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .

- Knock flange shaft in with needle bearing drift VW295.

Removing flange shaft oil seal (right-side)

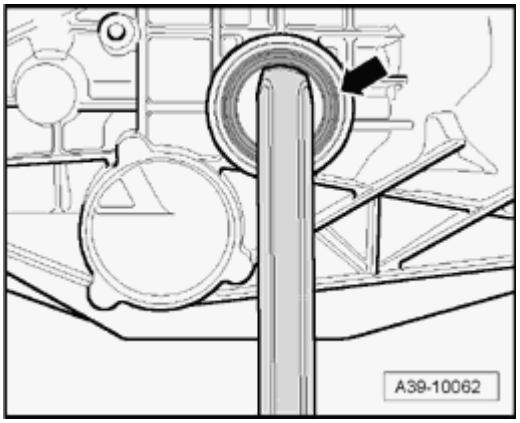

Fig. 492: Prying Out Flange Shaft Oil Seal Using An Assembly Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out flange shaft oil seal - **arrow** - using an assembly lever.

Installing flange shaft oil seal (right-side)

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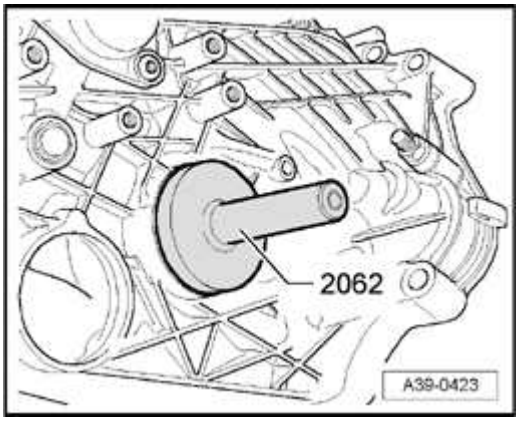

Fig. 493: Driving In New Flange Shaft Oil Seal Using Fitting Drift 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil outer circumference of new seal.
- Drive new flange shaft oil seal using fitting drift 2062; keep seal straight when installing.

- Insertion depth: 5.50 ± 0.15 mm below top of cover.

- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .

DIFFERENTIAL, DISASSEMBLING AND ASSEMBLING

Differential, disassembling and assembling

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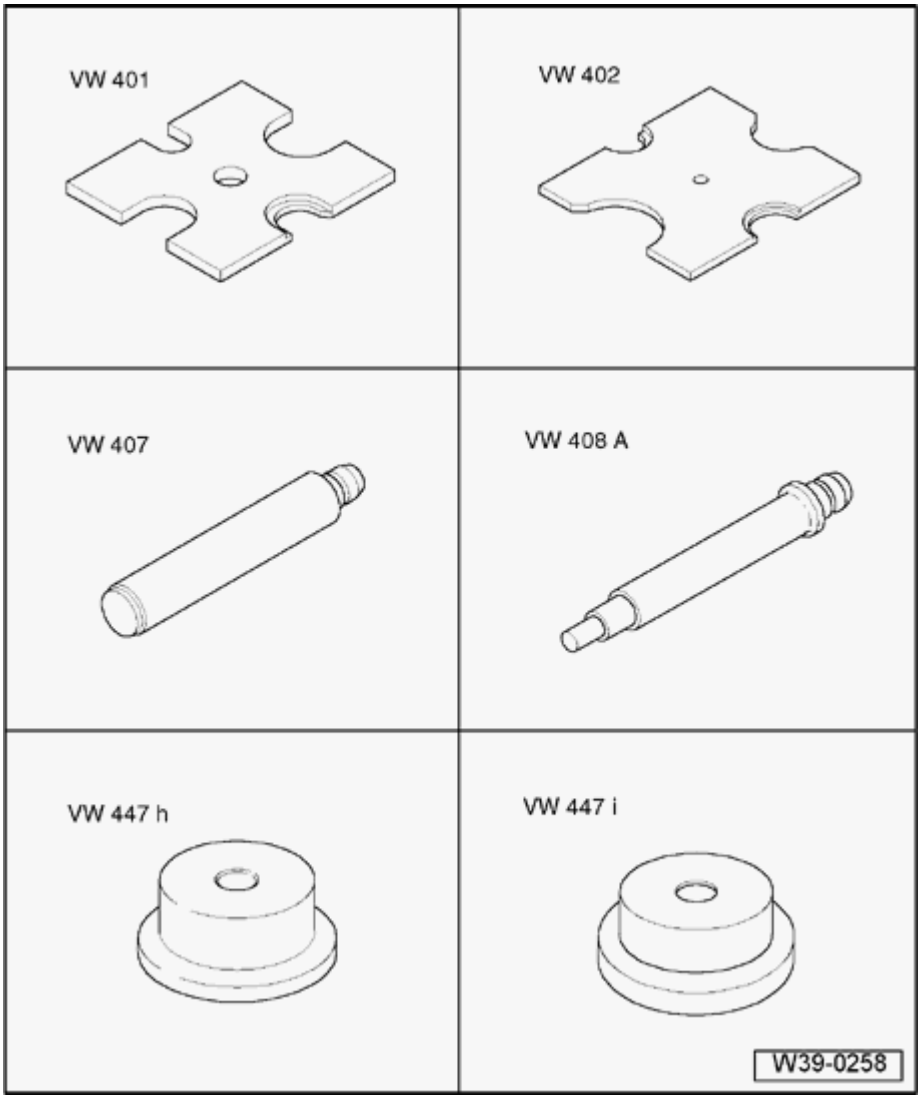

Fig. 494: Identifying Special Tools - Differential, Disassembling And Assembling (1 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW401
- Thrust plate VW402
- Punch VW407
- Punch VW408A

- Thrust pad VW447H
- Thrust pad VW 447 i

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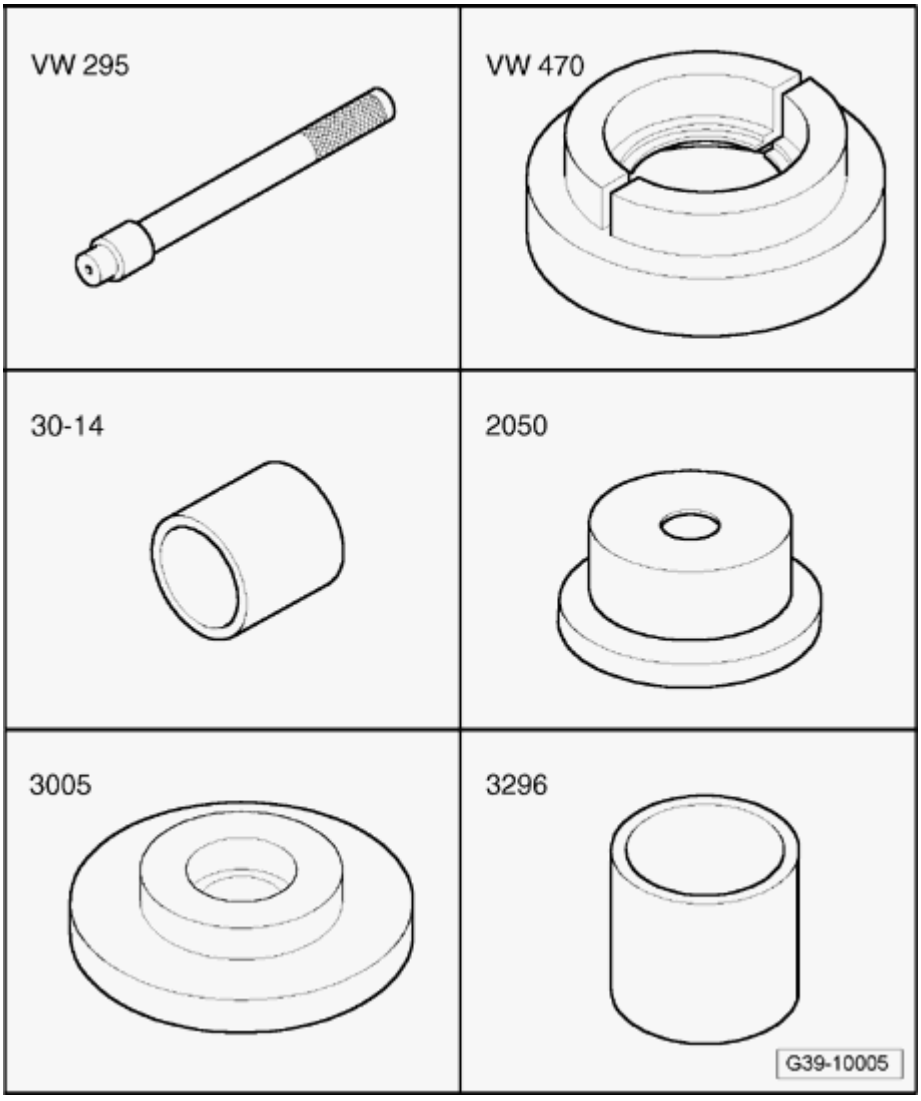

Fig. 495: Identifying Special Tools - Differential, Disassembling And Assembling (2 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Needle bearing drift VW 295
- Thrust ring VW 470
- Sleeve 30 - 14
- Thrust plate 2050

- Thrust pad 3005
- Tube 3296

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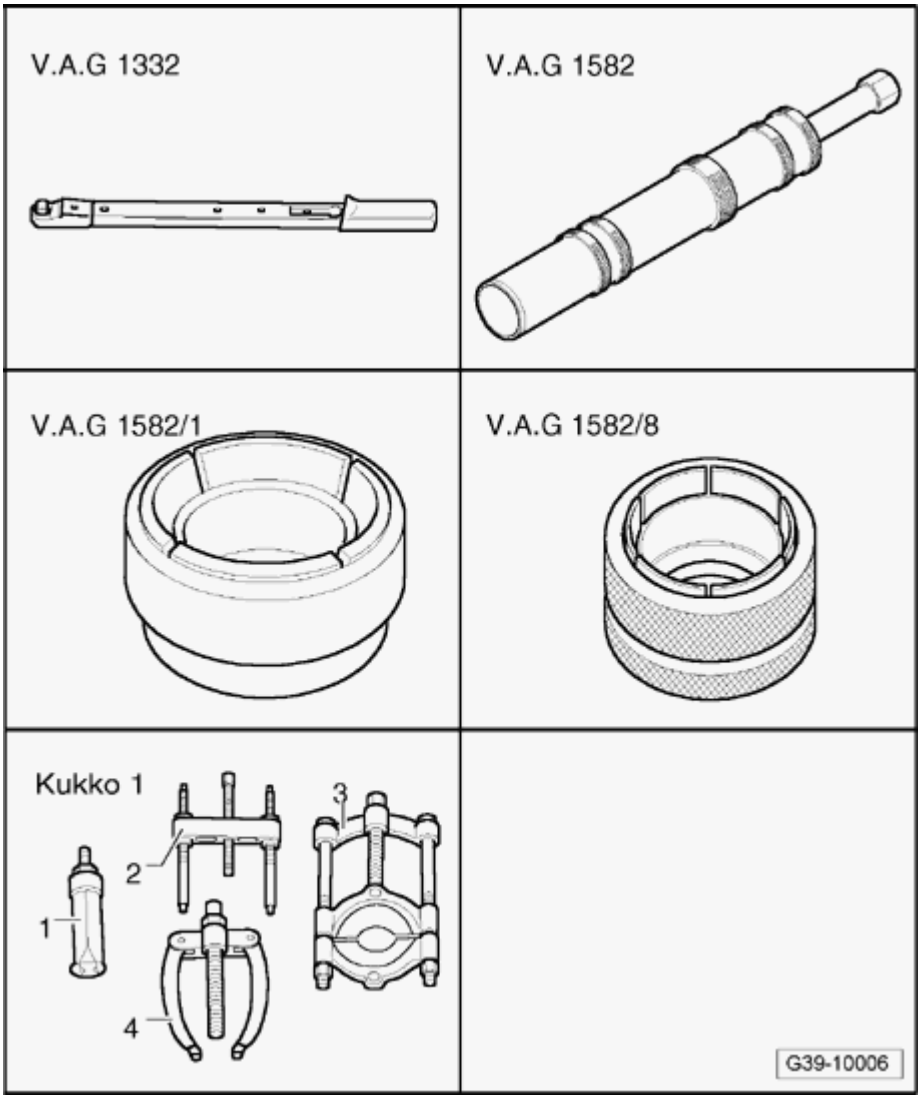

Fig. 496: Identifying Special Tools - Differential, Disassembling And Assembling (3 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Torque wrench V.A.G 1332
- Taper roller bearing puller V.A.G 1582
- Adapter V.A.G 1582/1
- Adapter V.A.G 1582/8

- **- 1 -** Internal puller Kukko 21/8
- **- 4 -** Counter-support Kukko 22/2

Removing and installing differential --> **Differential, removing and installing**.

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NOTE:

- **Always replace both tapered roller bearings together.**
- **Adjustment work is required when replacing the parts marked with 1) . Table of adjustments --> Table of adjustments**

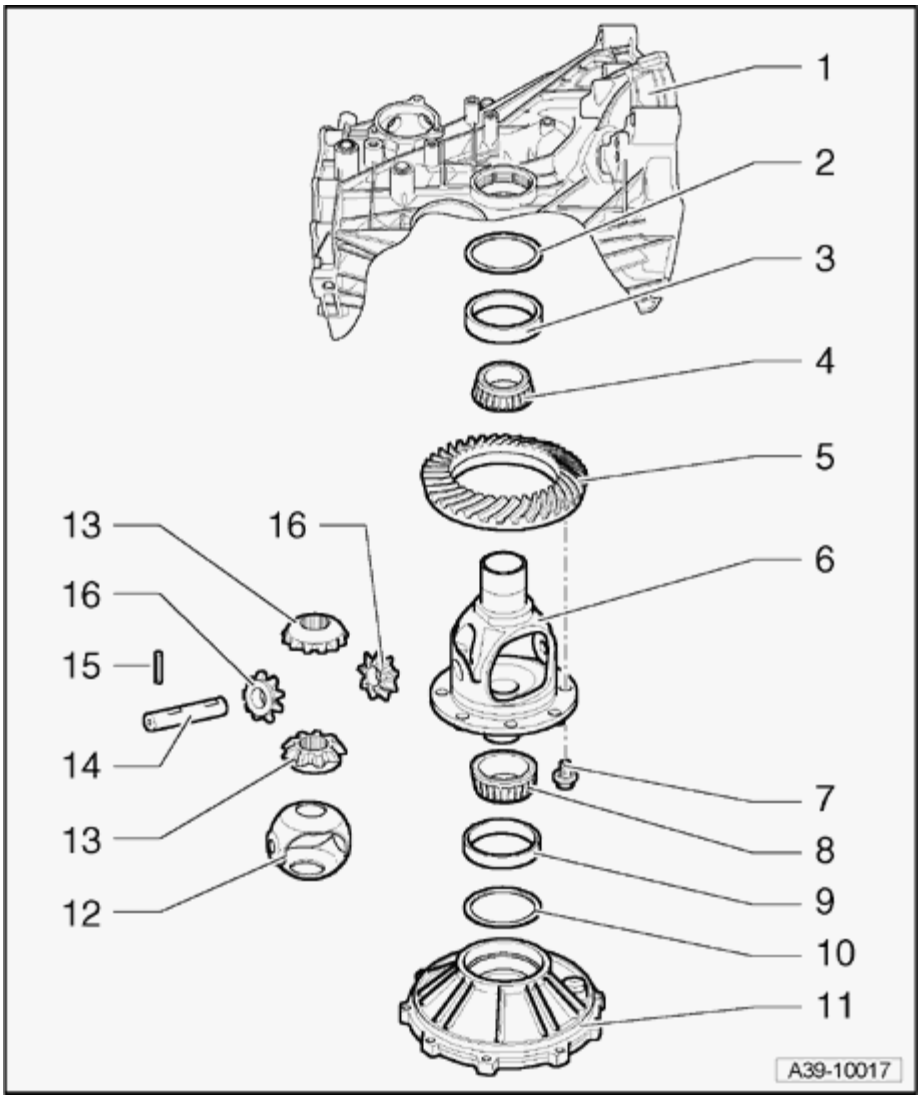

Fig. 497: Differential Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing 1)

2 - Shim "S_2 "

- Note thickness
- Table of adjustments --> **Table of adjustments**

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3 - Outer race for tapered roller bearing (right-side)[1)]

- Pulling out **Pulling tapered roller bearing outer race (right-side) out of transmission housing**
- Driving in **Driving outer race for tapered roller bearing (right-side) into transmission housing**

4 - Inner race for tapered roller bearing (right-side)[1)]

- Pulling off **Pulling off inner race for tapered roller bearing (right-side)**
- Pressing on **Pressing on tapered roller bearing inner race (left and right)**

5 - Ring gear[1)]

- Is paired with pinion shaft (final drive set)
- Select correct version according to transmission code letters
- Drive off housing using a punch **Driving ring gear off cage**
- installing onto differential cage **HEATING RING GEAR TO APPROX. 100° C and installing**

6 - Differential cage[1)]

7 - Bolt, 30 Nm plus an additional 90° $^{1}/_{4}$ turn

- Replace
- Lightly tighten bolts then tighten in diagonal sequence to correct torque

8 - Inner race for tapered roller bearing (left-side)[1)]

- Pulling off **Pulling off inner race for tapered roller bearing (left-side)**
- Pressing on **Pressing on tapered roller bearing inner race (left and right)**

9 - Outer race for tapered roller bearing (left-side)[1)]

- Pulling out **Pulling tapered roller bearing outer race (left-side) out of cover for final drive**
- Pressing in **Pressing tapered roller bearing outer race (left-side) into cover for final drive.**

10 - Shim "S_1 "

- Note thickness
- Table of adjustments --> **Table of adjustments**

11 - Cover for final drive [1)]

- With O-ring

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12 - One-piece thrust washer

- Lubricate with gear oil before installing

13 - Sun wheel

- Installing **Installing differential bevel gears**

14 - Differential pinion pin

- Drive out with drift after removing spring pin

15 - Spring pin

- For securing differential pinion pin
- Drive out from differential cage with drift
- Pressing in value: 1.5 mm above differential cage

16 - Planetary pinion

- Installing **Installing differential bevel gears**

Pulling tapered roller bearing outer race (right-side) out of transmission housing

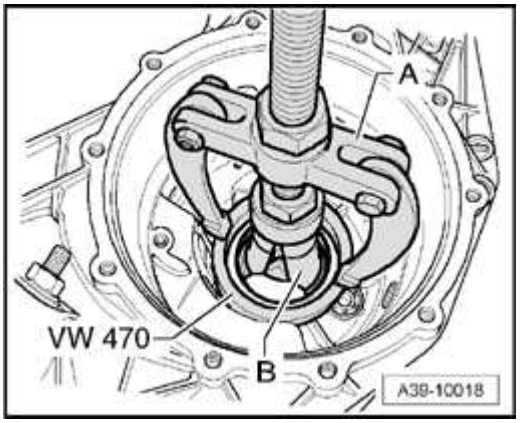

Fig. 498: Pulling Tapered Roller Bearing Outer Race (Right-Side) Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/2

B - Internal puller 56 to 70 mm, e.g. Kukko 21/8

- After removing, check shims for damage.

Driving outer race for tapered roller bearing (right-side) into transmission housing

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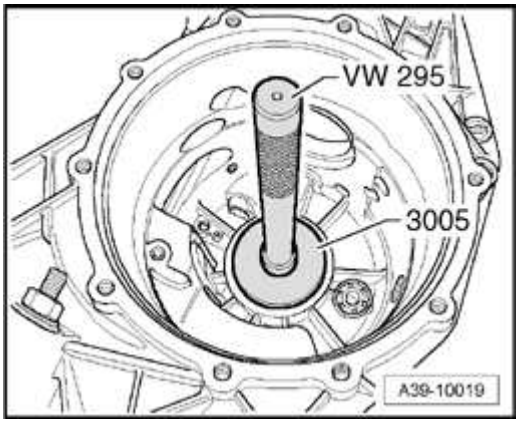

Fig. 499: Driving Outer Race For Tapered Roller Bearing With Shim Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pulling off inner race for tapered roller bearing (right-side)

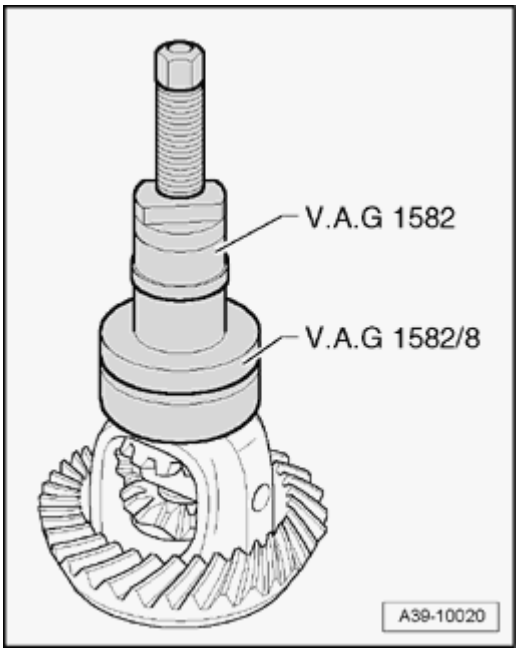

Fig. 500: Pulling Off Inner Race For Tapered Roller Bearing (Right-Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before setting up the puller, place thrust pad VW 447 H on differential cage.

Pressing on tapered roller bearing inner race (left and right)

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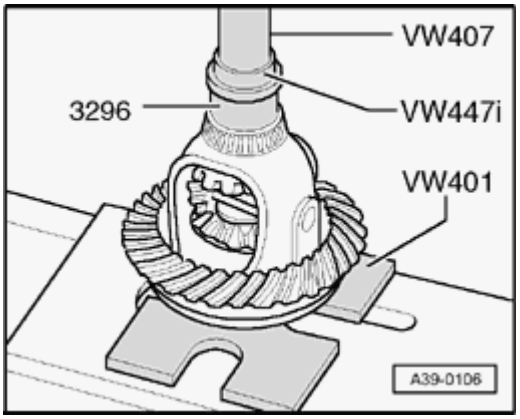

Fig. 501: Pressing On Right Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Use the same tools for pressing on tapered roller bearing inner race on left side and right side.**

CAUTION: Wear protective gloves.

- Heat inner race to approx. 100° C, install in position and press home.

Pulling off inner race for tapered roller bearing (left-side)

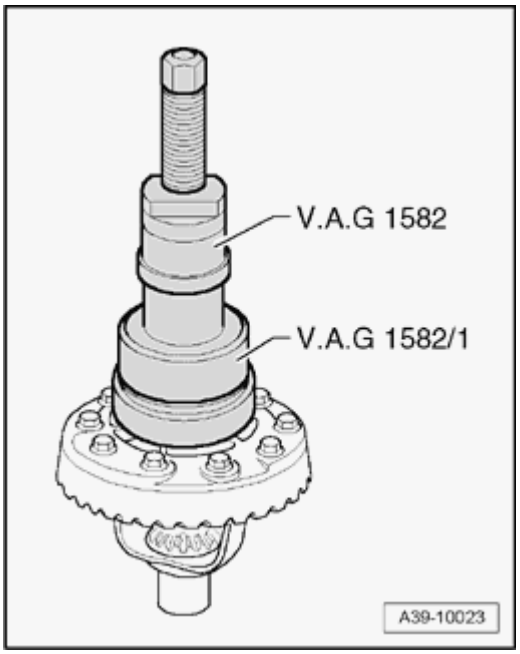

Fig. 502: Pulling Off Inner Race For Tapered Roller Bearing (Left-Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Before setting up the puller, place thrust pad VW 447 H on differential cage.

Pulling tapered roller bearing outer race (left-side) out of cover for final drive

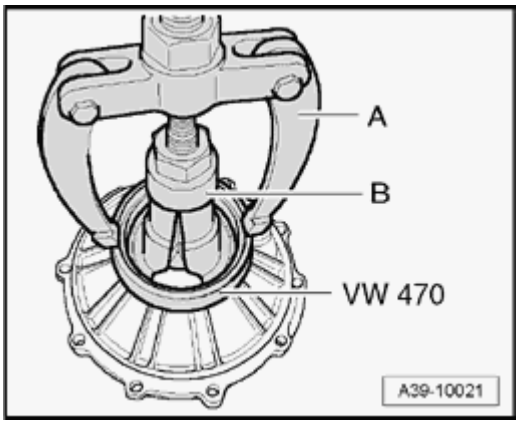

Fig. 503: Pulling Tapered Roller Bearing Outer Race (Left-Side) Out Of Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/2

B - Internal puller 56 to 70 mm, e.g. Kukko 21/8

- After removing, check shims for damage.

Pressing tapered roller bearing outer race (left-side) into cover for final drive.

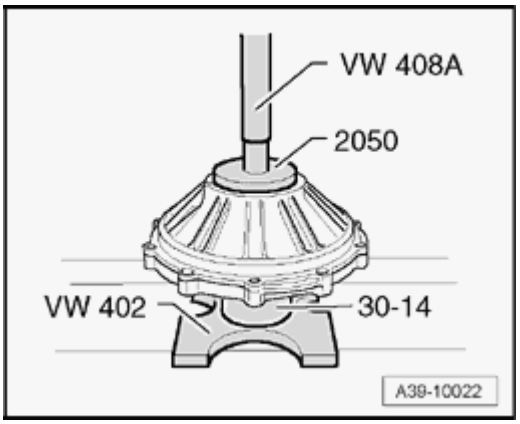

Fig. 504: Pressing Tapered Roller Bearing Outer Race (Left-Side) Into Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving ring gear off cage

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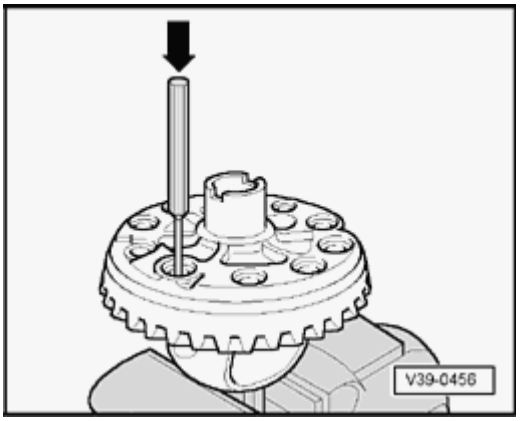

Fig. 505: Driving Out Ring Gear From Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Heating ring gear to approx. 100° C and installing

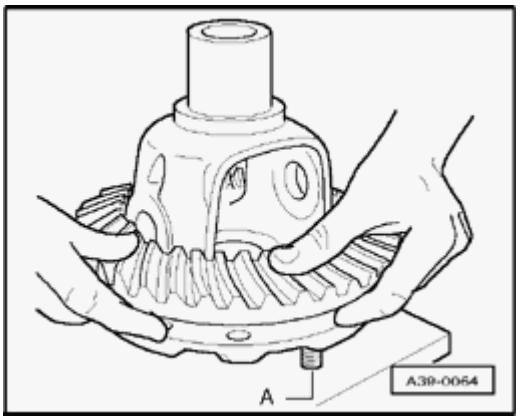

Fig. 506: Installing Ring Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing ring gear, use centralizing pins - **A** - (shop-made tool) to locate.

CAUTION: Wear protective gloves.

- Allow to cool slightly before screwing in new securing bolts. Then tighten to specified torque.

Installing differential bevel gears

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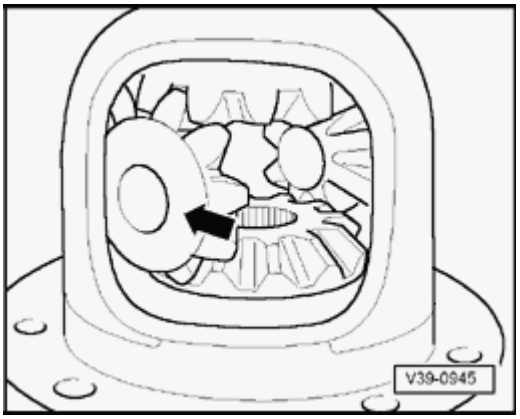

Fig. 507: Installing Small Differential Bevel Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lubricate one-piece thrust washer with gear oil and install.
- Insert sun wheels.
- Insert planet pinions offset 180° and rotate into position - **arrow** -.
- Drive differential pinion pin into final position and secure.

PINION SHAFT AND RING GEAR, ADJUSTING

Pinion shaft and ring gear, adjusting

NOTE:

- **Careful adjustment of the ring gear and pinion shaft is essential to ensure that the final drive gives long service and runs silently. For this reason, the pinion shaft and ring gear are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the pinion shaft in an axial direction and at the same time lifting the ring gear out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.**
- **The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.**
- **The deviation (tolerance) "r" in relation to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the ring gear. The final drive set (pinion shaft and ring gear) may only be replaced together as a matched pair.**
- **Observe the general repair instructions for tapered roller bearings and shims.**

Final drive gear set, adjustment and marking

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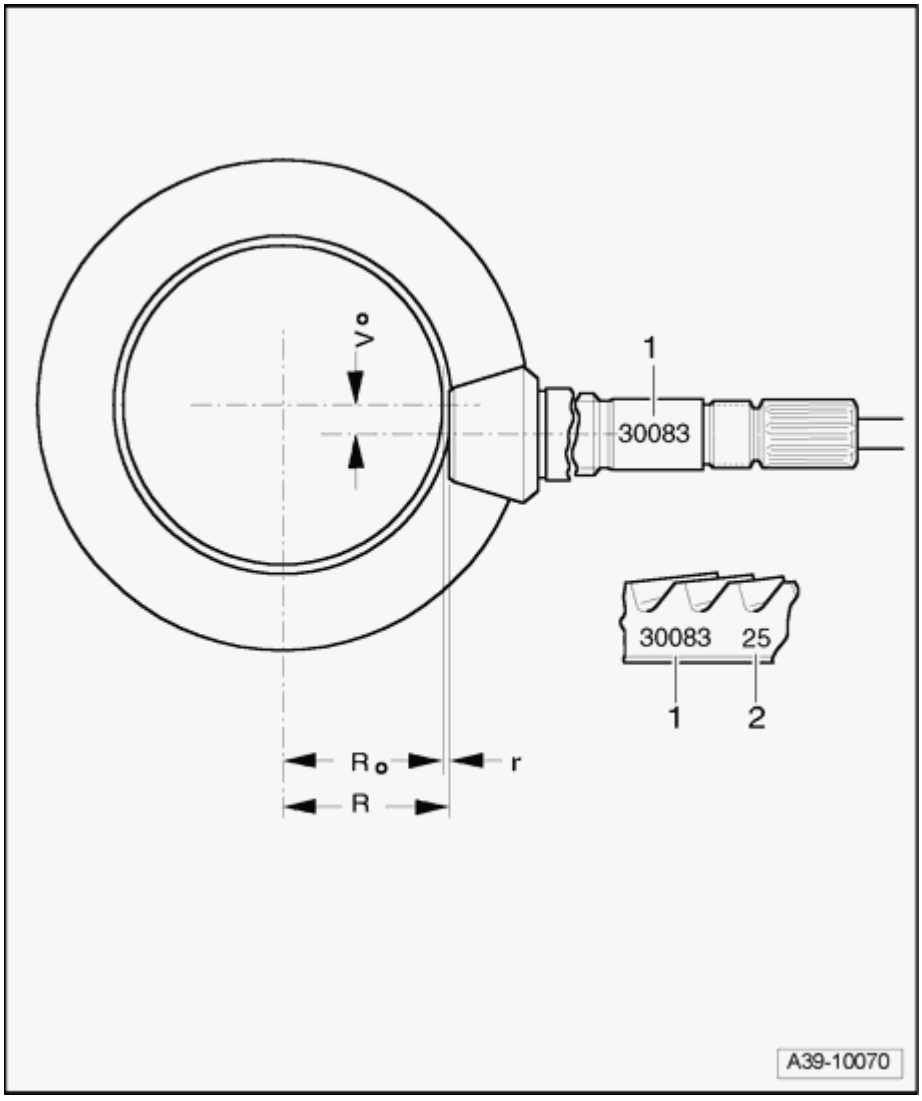

Fig. 508: Final Drive Gear Set, Adjustment And Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - "30083" number of matched pair of gears

- In some cases identification number of matched pair only has four digits

2 - Deviation (tolerance) "r" is based on the master gauge used on the test machine in production. The dimension "r" is always given in 1/100mm. For example: "25" indicates r = 0.25 mm

Ro - Length of test machine master gauge

Ro - Ring gear diameter 182 mm = 59.65 mm

R - Actual distance between ring gear axis and face of pinion shaft in position of quietest running for this gear set.

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Vo - Hypoid offset

Position of shims

NOTE:

- **Table of adjustments when replacing individual components of final drive - -> Table of adjustments.**

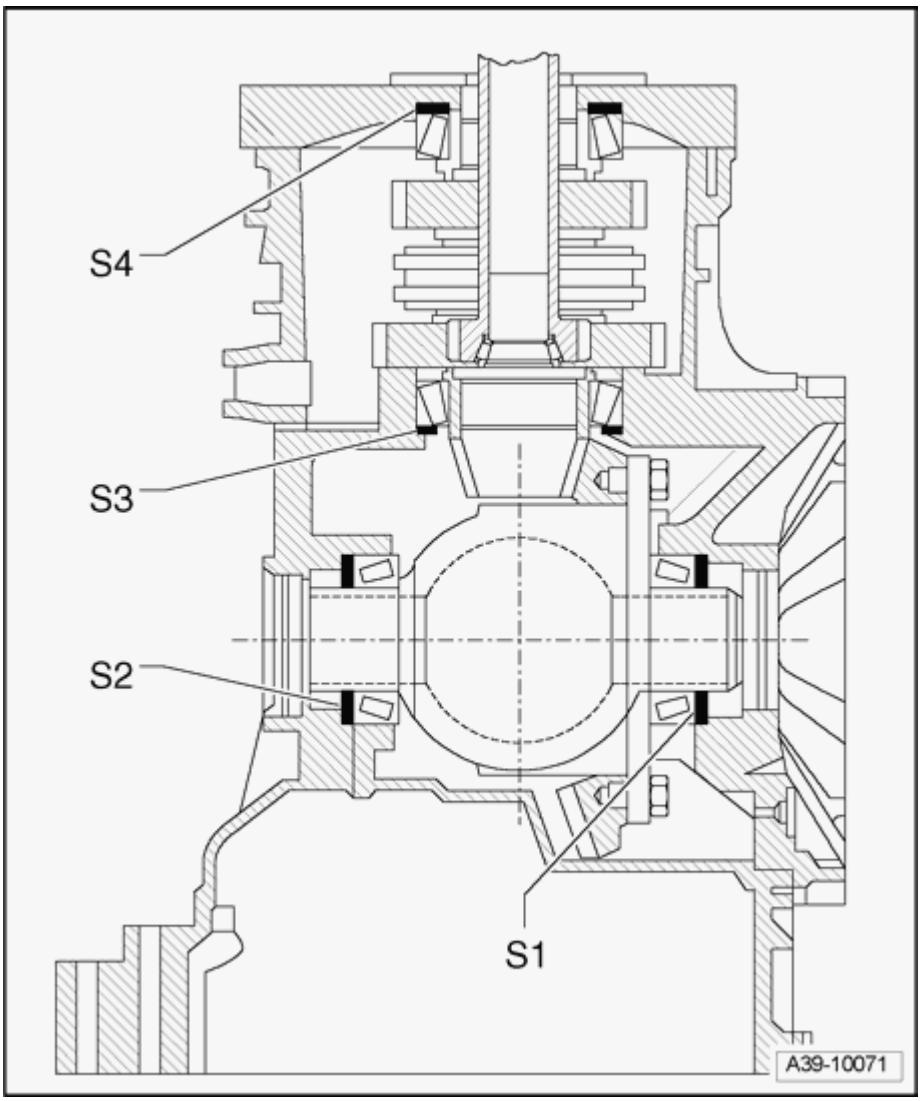

Fig. 509: Position Of Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

S1 - Shim for ring gear in cover for final drive

S2 - Adjustment shim for ring gear in transmission housing

S3 - Adjustment shim for pinion shaft in transmission housing

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S4 - Shim for pinion shaft in bearing housing

Table of adjustments

NOTE:

- **If repairs have been performed to the transmission, it is only necessary to adjust the pinion shaft, ring gear or final drive set if components have been replaced which have a direct effect on the adjustment of the final drive. Refer to the following table to avoid unnecessary adjustment work:**

Components requiring adjustment:	Ring gear	Pinion shaft	Pinion shaft	Backlash
	("S_1 " + "S_2 ")	("S_3 " + "S_4 ") via deviation (tolerance) "r"	Shim "S_4 " only	0.12 - 0.28
	--> **Ring gear, adjusting**	--> **Pinion shaft, adjusting**	--> **Re-determining shim "S4" when replacing bearing housing**	
Component replaced				
Transmission housing * See note	X	X		X
Bearing housing		X	X	
Differential cage	X			X
Tapered roller bearings for pinion shaft/hollow shaft		X		X
Tapered roller bearing for differential	X			X
Final drive gear set * See note	X	X		X
Cover for final drive	X			X

*Pinion shaft and ring gear; only replace together.

*If the transmission housing is replaced the input shaft must also be adjusted --> **Input shaft, adjusting**.

Recommended sequence for adjusting gear set

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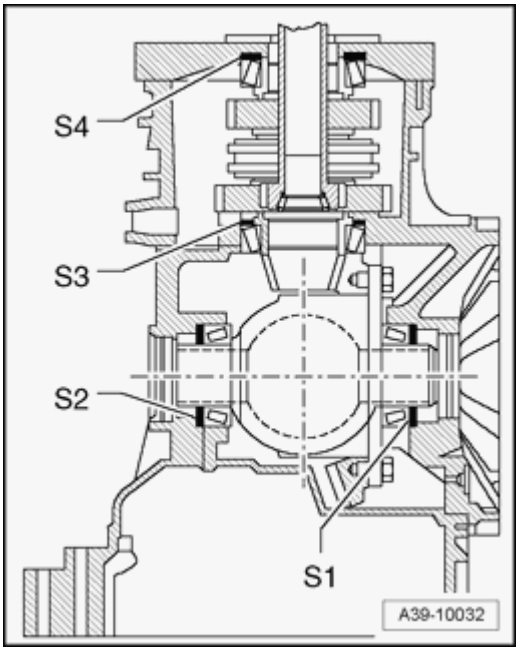

Fig. 510: Adjusting Gear Set
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The following work sequence is recommended to save time when the ring gear and pinion shaft have to be adjusted:

- Determine total shim thickness "S_{total} " (S_3 plus S_4) for the specified preload on pinion shaft tapered roller bearings.
- Distribute total shim thickness "S_{total} " (S_3 plus S_4) so that dimension from center of ring gear to end face of pinion shaft corresponds to installation dimension "R" determined during production.
- Determine total shim thickness "S_{total} " (S_1 plus S_2) for the specified preload on differential tapered roller bearings.
- Distribute total shim thickness "S_{total} " (S_1 plus S_2) so that the specified backlash between ring gear and pinion shaft is obtained.

Pinion shaft, adjusting

(Adjusting pinion shaft with hollow shaft)

Repairs after which the pinion shaft must be adjusted --> **Table of adjustments**.

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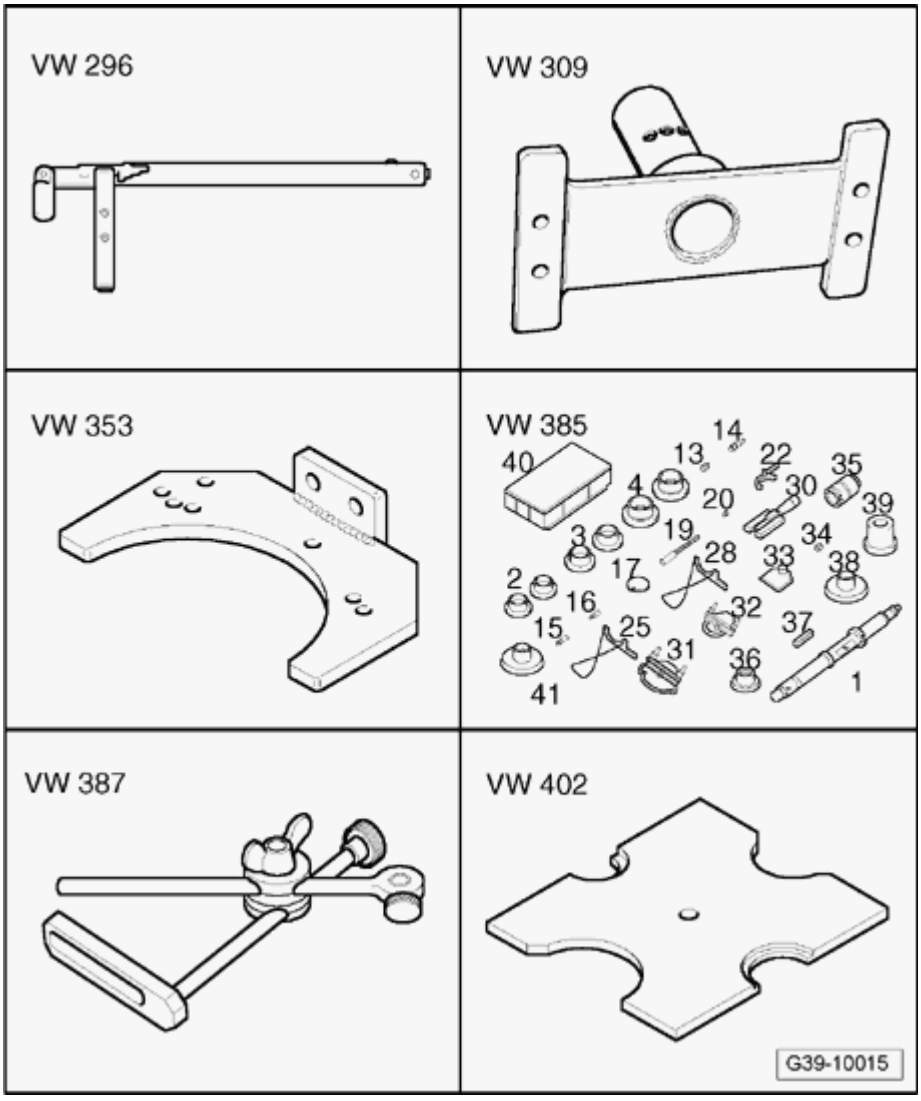

Fig. 511: Identifying Special Tools -- Pinion Shaft, Adjusting (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Removal tool VW 296
- Holding plate VW 309
- Transmission support VW 353
- Universal measuring tool VW385

- Dial gauge holder VW387
- Thrust plate VW402

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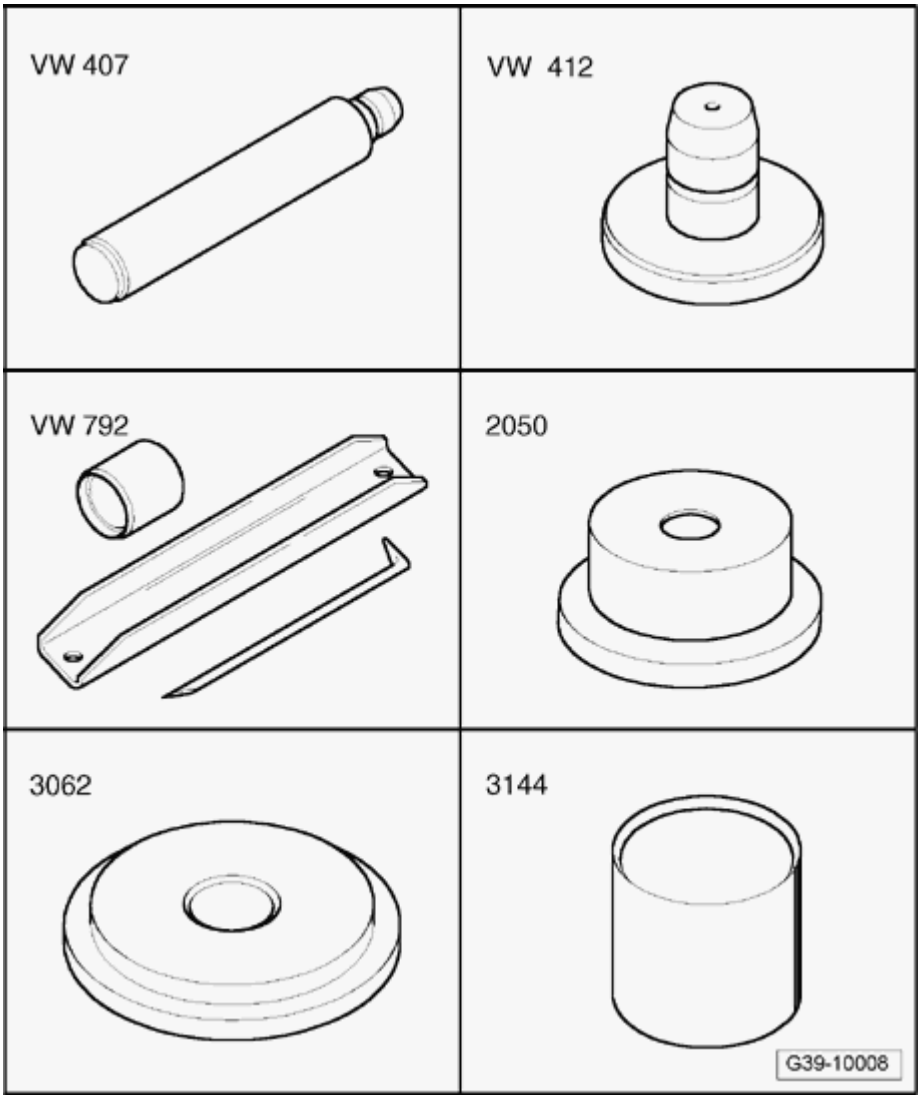

Fig. 512: Identifying Special Tools -- Pinion Shaft, Adjusting (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Punch VW407
- Thrust disc VW 412
- Installation arbor VW792
- Thrust plate 2050

- Thrust pad 3062
- Press Support-R Wheel Brgs. 3144

Special tools, testers and auxiliary items required

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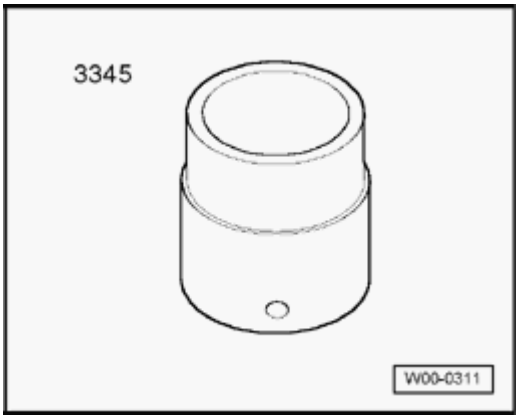

Fig. 513: Identifying Press Tool 3345
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press tool 3345

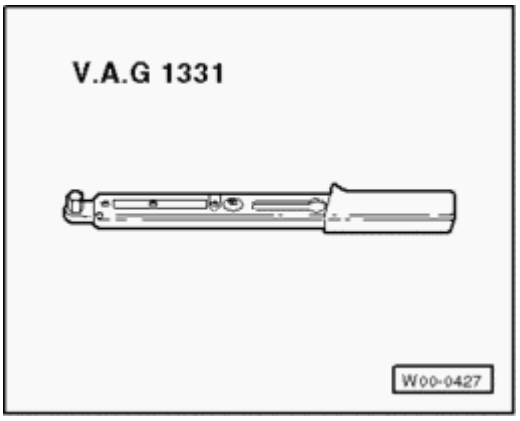

Fig. 514: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331
- Dial gauge
- Dial gauge extension, 30 mm
- Hose clip

Determining total shim thickness "Stotal" for shims "S3" plus "S4"

(Adjustment of pre-load of tapered roller bearings for pinion shaft with hollow shaft)

- Differential removed.

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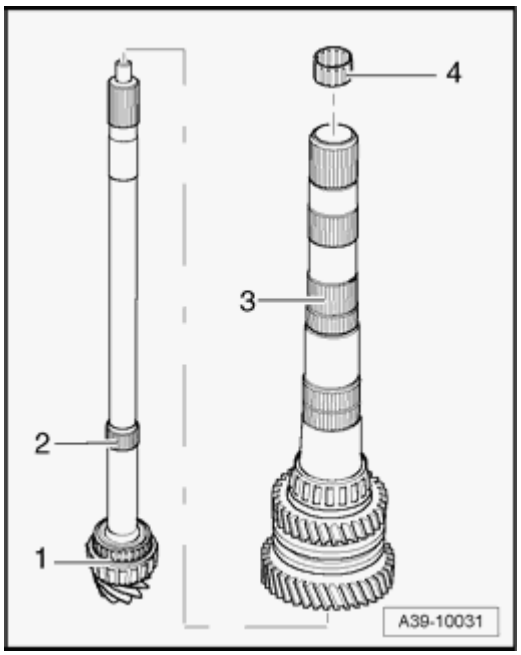

Fig. 515: Double Tapered Roller Bearing Inner Race, Large Needle Bearing, Hollow Shaft And Small Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press double tapered roller bearing inner race - **1** - onto pinion shaft and secure **Pressing on double tapered roller bearing inner race**.
- Install large needle bearing - **2** -.
- Install pinion shaft in hollow shaft - **3** -.

- Reassemble hollow shaft with selector gears and tapered roller bearing inner race.

- Install small needle bearing - **4** -.

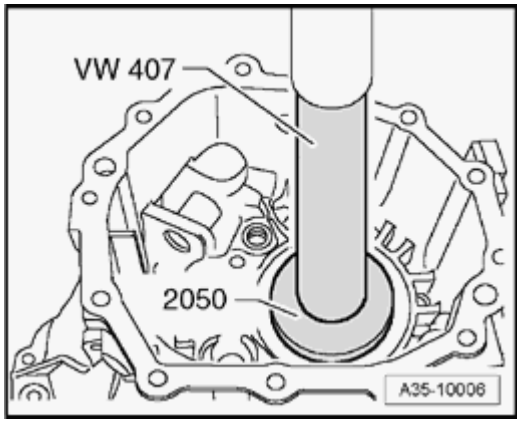

Fig. 516: Pressing Tapered Roller Bearing Outer Race For Pinion Shaft Into Transmission Housing Without Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Press double tapered roller bearing outer race for pinion shaft into transmission housing without shims.

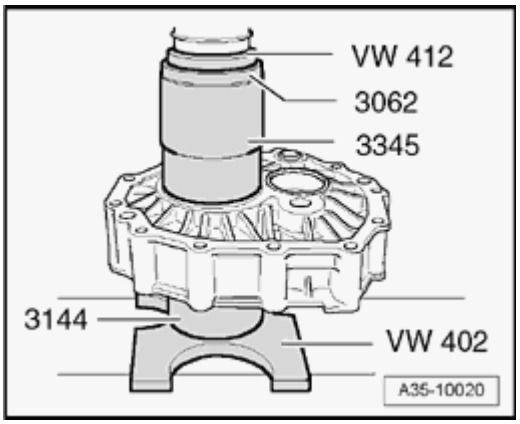

Fig. 517: Pressing In Tapered Roller Bearing Outer Race For Pinion Shaft With Shim Into Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in tapered roller bearing outer race for pinion shaft/hollow shaft with shim "S_4 *" (thickness 1.01 mm) into bearing housing.

NOTE:

- **For measurement purposes a shim "S_4 " with a thickness of 1.01 mm is inserted provisionally. This is referred to in the following as "S_4 *". "S_4 *" is exchanged with the final shim "S_4 " after determining measured value "e".**

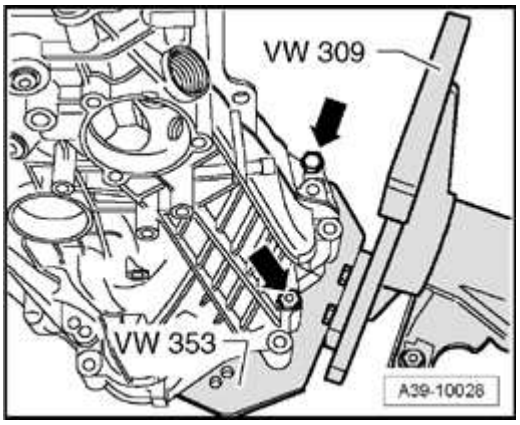

Fig. 518: Securing Transmission Housing Onto Transmission Support VW 353 With Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure transmission housing onto transmission support VW 353 with bolts - **arrows** -.
- Install fully assembled pinion shaft with hollow shaft into transmission housing.
- Install bearing housing and transmission cover and tighten bolts to 35Nm.
- Turn transmission so that the transmission cover points downward.

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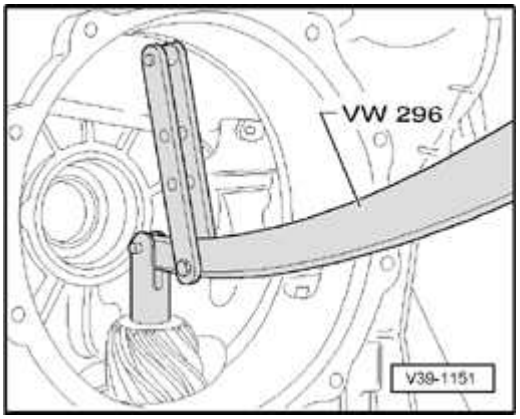

Fig. 519: Pressing Down On Drive Pinion Head Using Removal Tool VW 296
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press down on face of pinion shaft with removal tool VW 296 until tapered bearing outer race contacts bearing housing.
- While still maintaining pressure, rotate pinion shaft 5turns in each direction in relation to the hollow shaft to settle the double tapered roller bearing.
- Rotate pinion shaft together with the hollow shaft 5turns in each direction to settle the hollow shaft tapered roller bearing.
- Turn transmission so that the transmission cover points upward.

- Turn pinion shaft with hollow shaft five turns in both directions so that the double tapered roller bearing settles. Otherwise the result of the measurement will be incorrect.

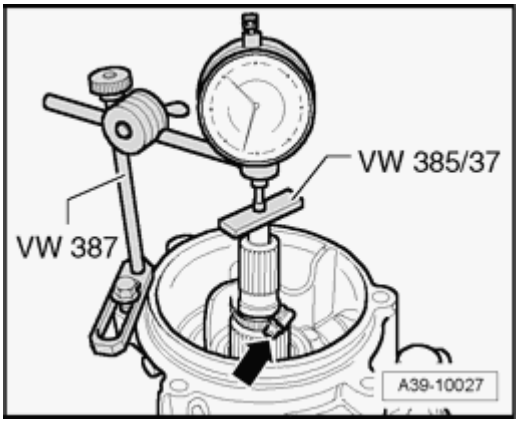

Fig. 520: Pinion Shaft Clamped Onto Hollow Shaft With A Hose Clip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up measuring tool.
- Clamp pinion shaft onto hollow shaft with a hose clip - **arrow** -.
- Set dial gauge (3 mm measuring range) to "0" with 1 mm preload.

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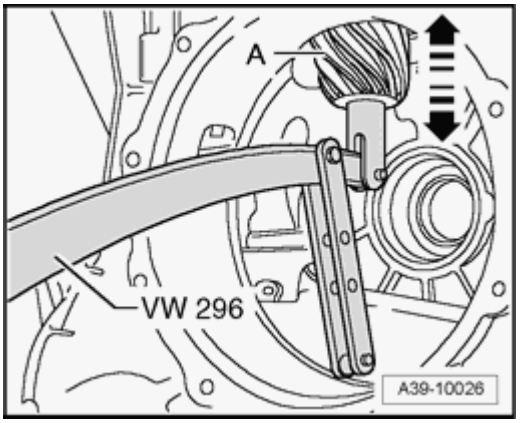

Fig. 521: Moving Pinion Shaft With Hollow Shaft Up And Down
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Then move pinion shaft - **A** - with hollow shaft up and down in direction of - **arrow** -.
- Read off play on dial gauge and note reading.

- Measurement in example: 0.46 mm

NOTE:

- **If the measurement has to be repeated, pinion shaft with hollow shaft must first be rotated another 5turns in each direction to settle the double tapered roller bearing. Preload dial gauge to 1 mm and set to "0" again.**

Formula: "S_{total} " = "S_4 *" + measured value + bearing preload

Example:		
	Inserted shim "S_4 *"	1.01 mm
+	Measured value (example)	0.46 mm
+	Bearing preload (constant value)	0.15 mm
=	Total shim thickness "S_{total} " for "S_3 " plus "S_4 "	1.62 mm

Determining thickness of shim "S_3 *"

Formula: "S_3 *" = "S_{total} " - "S_4 *"

Example:		
	Total shim thickness "S_{total} " for "S_3 " plus "S_4 "	1.62 mm
-	Inserted shim "S_4 *"	1.01 mm
=	Thickness of shim "S_3 *"	0.61 mm

- Remove double tapered roller bearing outer race, install shim "S_3 *" in transmission housing and install

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outer race again.

- Re-install fully assembled pinion shaft with hollow shaft into transmission housing.
- Install bearing housing and transmission cover and tighten bolts to 35Nm.
- To settle the tapered roller bearings: rotate pinion shaft together with hollow shaft 5turns in each direction, then rotate pinion shaft separately in relation to hollow shaft 5turns in each direction.

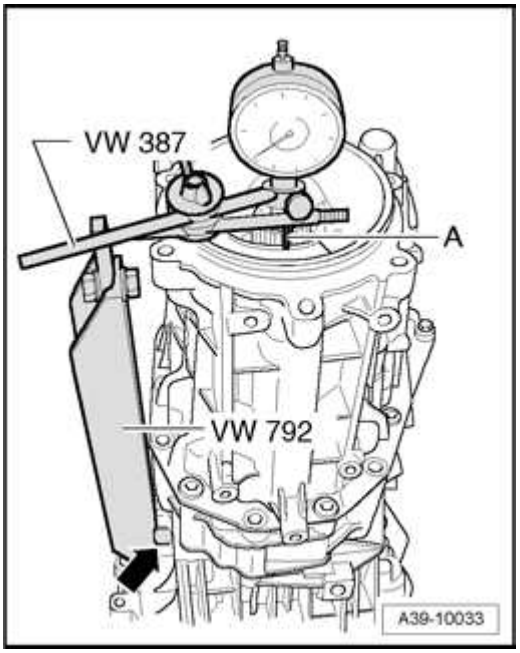

Fig. 522: Determining Thickness Of Shim S3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up measuring tools using dial gauge extension 30 mm - **A** - ; place nut M12 between VW 792 and transmission housing when securing bolt - **arrow** - to transmission housing.

NOTE:

- **Place dial gauge extension - A - onto web in transmission cover.**

- Set dial gauge (3 mm measuring range) to "0" with 1 mm preload.
- Loosen transmission cover bolts and turn pinion shaft several times.
- If correct shims have been selected the dial gauge will now indicate the following value:

- 0.09 to 0.18 mm

- Tighten transmission cover bolts again to 35 Nm.
- Take down measuring tools.
- To settle tapered roller bearings: rotate pinion shaft together with hollow shaft 5turns in each direction, then rotate pinion shaft separately in relation to hollow shaft 5turns in each direction.

Determining dimension "e"

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NOTE:

- **Measurement "e" is required to determine the final shim thickness of "S_3 " and "S_4 ".**

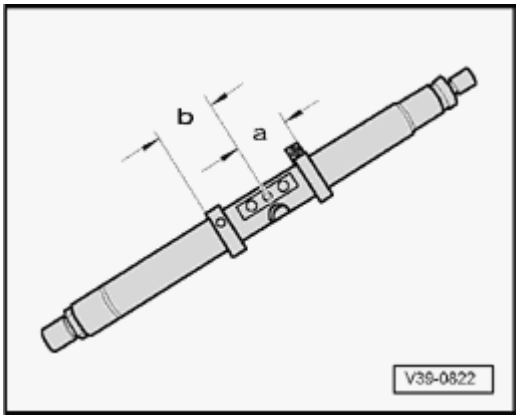

Fig. 523: Setting Adjusting Rings Of Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set adjustment rings of measuring bar VW385/1 to the following values:

- Dimension - **a** - = 45 mm
- Dimension - **b** - = 75 mm

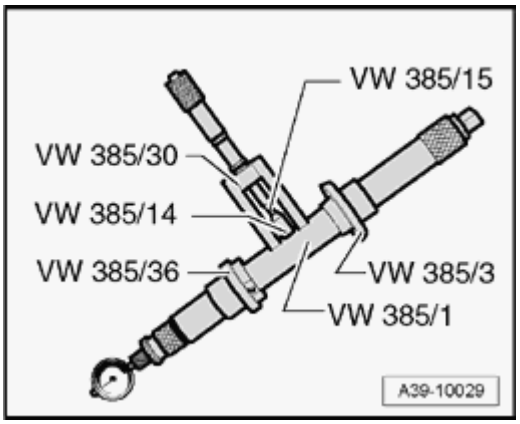

Fig. 524: Universal Measuring Tool VW385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble universal measuring tool VW385/1 as illustrated:

- Dial gauge extension - **VW 385/15** - , 6.5 mm long
- Master gauge-adjustable VW385/30

- Set master gauge-adjustable VW385/30 to Ro = 59.65 mm and install onto measuring tool.
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.

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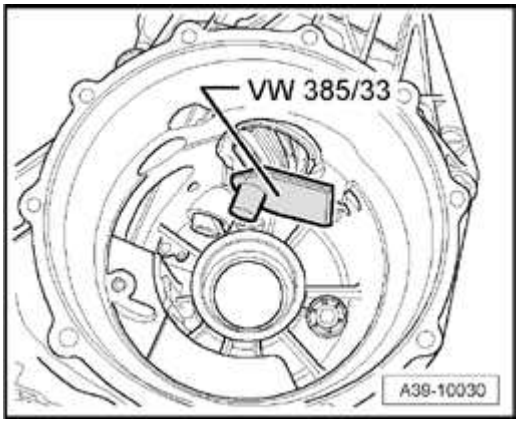

Fig. 525: Measuring Plate End Placed On Face Of Pinion Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place end measuring plate on face of pinion shaft.

NOTE:

- **Make sure plate contact surface fits exactly and is free of oil.**

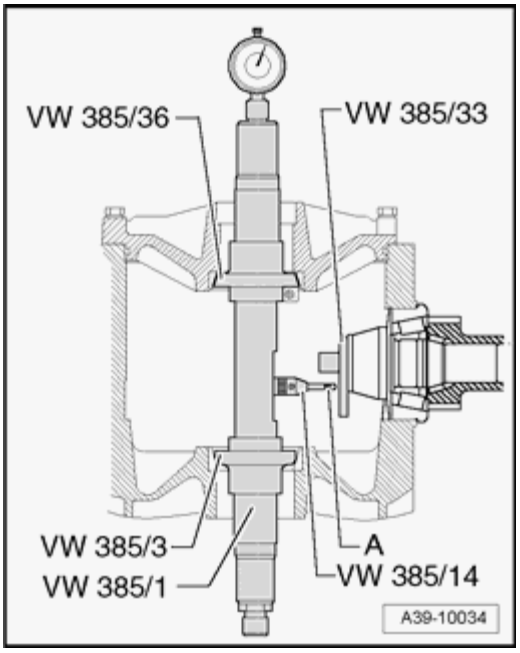

Fig. 526: Identifying Gauge Extension Installed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove master gauge and insert measuring tool into housing.

- Install gauge extension - **A** - (length = 6.5mm).
- The dial gauge faces toward final drive cover

- Install cover for final drive and tighten 4 bolts to 20 Nm.

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- Using adjustable ring, pull 2nd centering pad VW385/36 out as far as possible so that the measuring tool can still just be turned by hand.

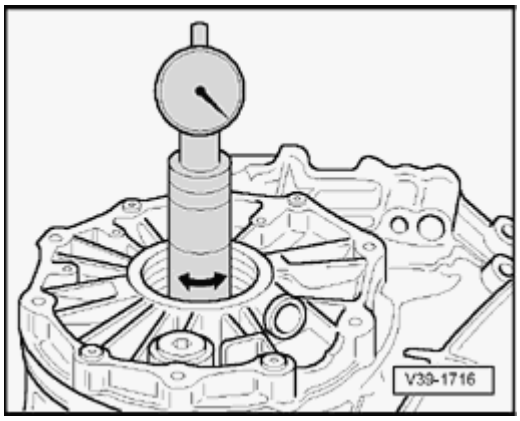

Fig. 527: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn measuring tool until dial gauge point touches the end measuring plate on pinion shaft head, then measure maximum deflection (return point).

- Measurement in following example: "e" = 0.26 mm (in red scale)

NOTE:

- **Then (after removing universal measuring tool), check once again that the dial gauge indicates "0" with 2mm preload when master gauge VW385/30 is in place.**

Determining thickness of shim "S3"

- The deviation (tolerance) "r" in relation to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the ring gear.
- Subtract value "e" if measurement is obtained on red scale.
- Add value "e" if measurement is obtained on black scale.

Formula:

"S_3 " = "S_3 *" + "r" + "e" ("e" on black scale)

"S_3 " = "S_3 *" + "r" - "e" ("e" on red scale)

Example:		
	Inserted shim "S_3 *"	0.61 mm
+	Deviation "r"	0.38 mm

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-	Determined value "e" (in red scale)	0.26 mm
=	Thickness of shim "S_3 "	0.73 mm

- Determine shim(s) according to table.

Available shims for "S_3 "

Shim thickness (mm) * See note		
0.53	0.85	1.17
0.57	0.89	1.21
0.61	0.93	1.25
0.65	0.97	1.29
0.69	1.01	1.33
0.73	1.05	1.37
0.77	1.09	1.41
0.81	1.13	

*The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Determining thickness of shim "S4"

Formula: "S_4 " = "S_{total} " - "S_3 "

Example:		
	Total shim thickness "S_{total} " for "S_3 " plus "S_4 "	1.62 mm
-	Thickness of shim "S_3 "	0.73 mm
=	Thickness of shim "S_4 "	0.89 mm

- Determine shim(s) according to table.

Shims available for "S_4 "

Shim thickness (mm) * See note		
0.33	0.73	1.13
0.37	0.77	1.17
0.41	0.81	1.21
0.45	0.85	1.25
0.49	0.89	1.29
0.53	0.93	1.33
0.57	0.91	1.37

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0.61	1.01	1.41
0.65	1.05	1.45
0.69	1.09	1.49

*The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Checking adjustment

Checking deviation (tolerance) "r "

- Install pinion shaft and hollow shaft with determined shims "S_3 " and "S_4 ".
- Turn hollow shaft against pinion shaft five turns in both directions so that the double tapered roller bearing settles.
- Turn pinion shaft with hollow shaft five turns in both directions so that the tapered roller bearings settle.

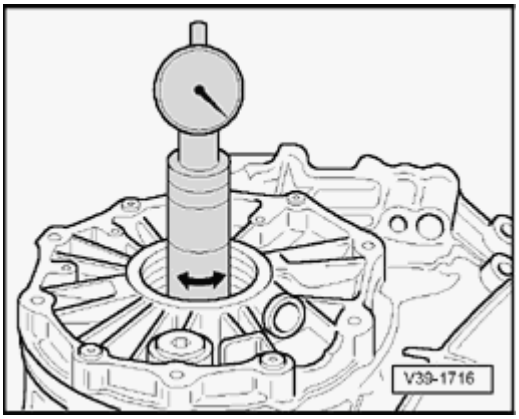

Fig. 528: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert universal measuring tool and check adjustment.
- Read off dial gauge counter-clockwise (red scale).

- If shims have been correctly selected, the deviation "r" (marked on outer circumference of ring gear) should be indicated within a tolerance of ± 0.04 mm.

Re-determining shim "S4" when replacing bearing housing

Special tools, testers and auxiliary items required

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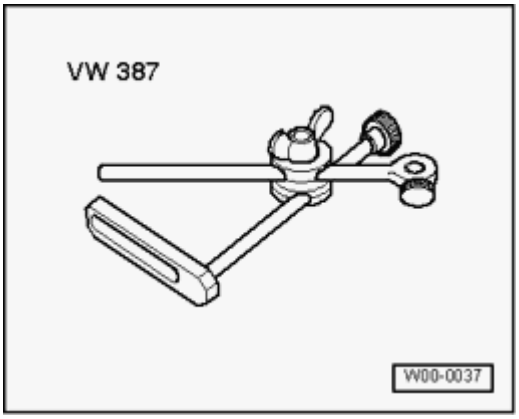

Fig. 529: Identifying Dial Gauge Holder VW 387
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW387

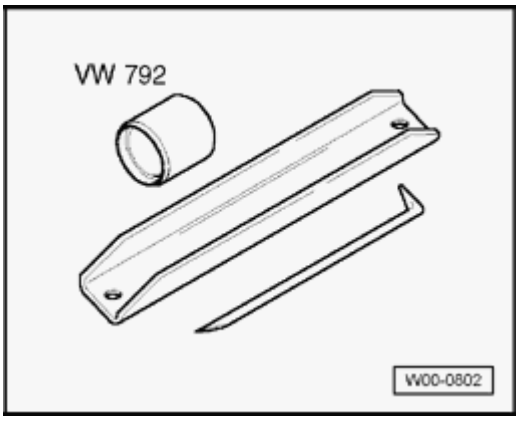

Fig. 530: Installation Arbor VW 792
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation arbor VW792
- Digital depth gauge (e..g. VAS 6087)
- Dial gauge
- Dial gauge extension, 30 mm
- Straightedge
  - Clean housing flange.

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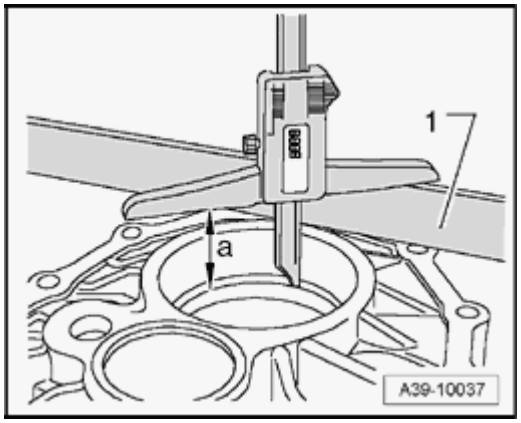

Fig. 531: Measuring Difference Between Depth On Old And New Bearing Housing With A Digital Depth Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place straightedge (e.g. 19.50 mm wide - **1** - onto housing flange.
- Measure difference between depth - **a** - on old and new bearing housing with a digital depth gauge (e.g. VAS 6087).

Example:

	Depth - **a** - of previous bearing housing (with straightedge width)	26.30 mm
	Depth - **a** - of new bearing housing (with straightedge width)	26.45 mm
=	Difference	0.15 mm

- If new bearing housing is deeper, install a thicker "S_4 " shim.
- If previous bearing housing is deeper, install a thinner "S_4 " shim.

Example:

	Previous shim "S_4 "	0.95 mm
+	Difference	0.15 mm
=	New shim "S_4 "	1.10 mm

Shims available.

- Press tapered roller bearing outer race with shim "S_4 " into bearing housing **Pressing tapered roller bearing outer race into bearing housing**.
- Re-install fully assembled pinion shaft with hollow shaft into transmission housing.
- Install bearing housing and transmission cover and tighten bolts to 35Nm.
- To settle tapered roller bearings: rotate pinion shaft together with hollow shaft 5turns in each direction, then rotate pinion shaft separately in relation to hollow shaft 5 turns in each direction.

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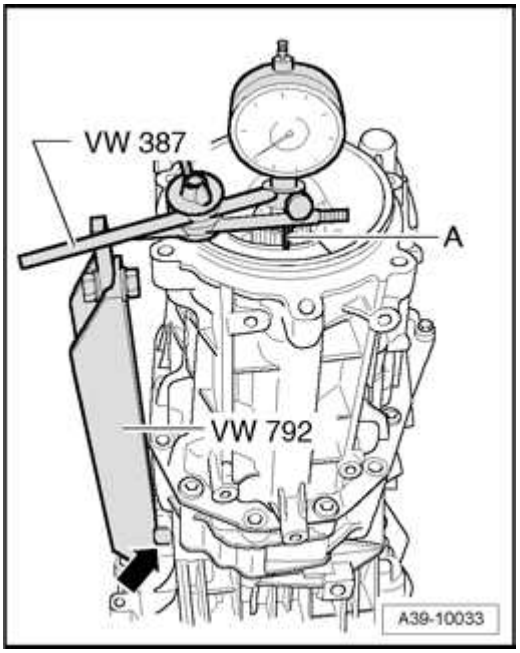

Fig. 532: Determining Thickness Of Shim S3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up measuring tools using dial gauge extension 30 mm - **A** - ; place nut M12 between VW 792 and transmission housing when securing bolt - **arrow** - to transmission housing.

NOTE:

- **Place dial gauge extension - A - onto web in transmission cover.**

- Set dial gauge (3 mm measuring range) to "0" with 1 mm preload.
- Loosen transmission cover bolts and turn pinion shaft several times.
- If correct shims have been selected the dial gauge will now indicate the following value:

- 0.09 to 0.18 mm

If this reading is not obtained, the adjustment must be corrected.

Ring gear, adjusting

(Adjusting differential)

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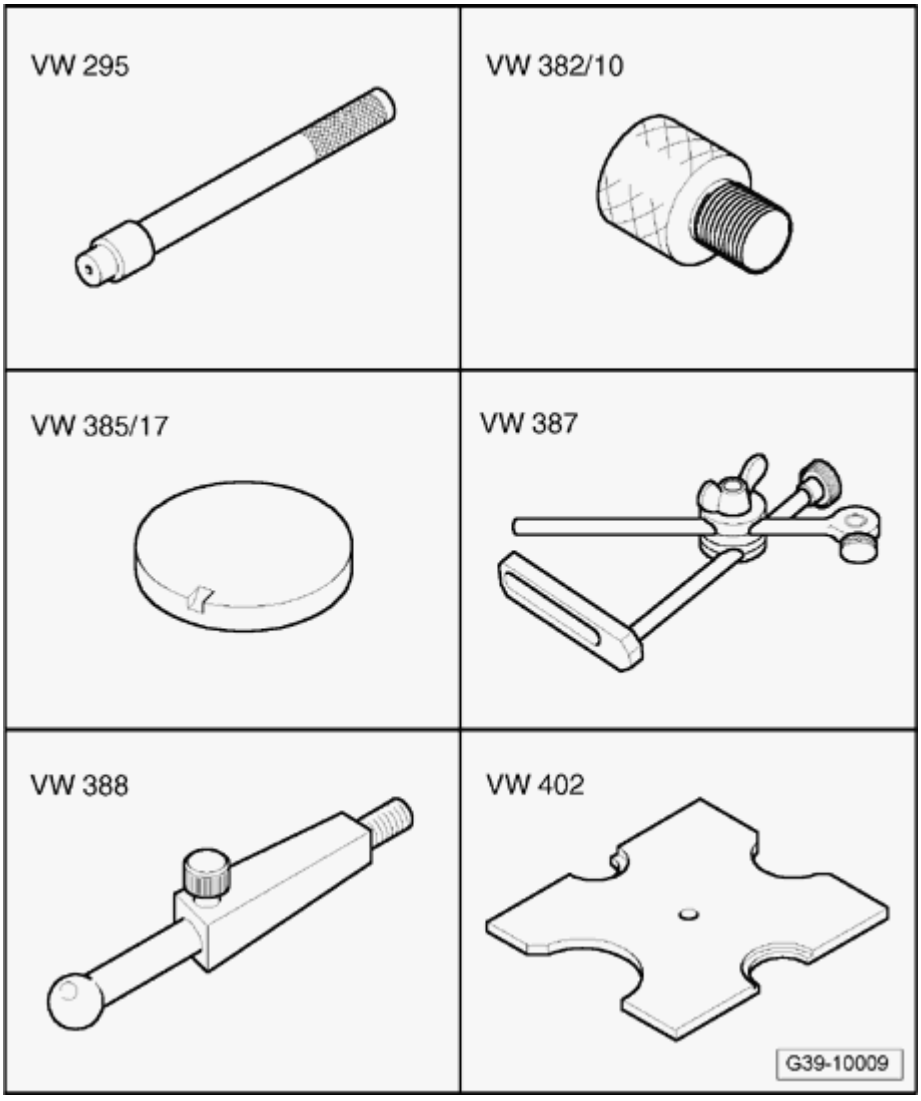

Fig. 533: Identifying Special Tools -- Crown Wheel, Adjusting (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Needle bearing drift VW 295
- Extension pin 6 mm VW382/10
- Magnetic plate 50 mm dia. VW385/17
- Dial gauge holder VW387
- Measuring lever VW 388
- Thrust plate VW402

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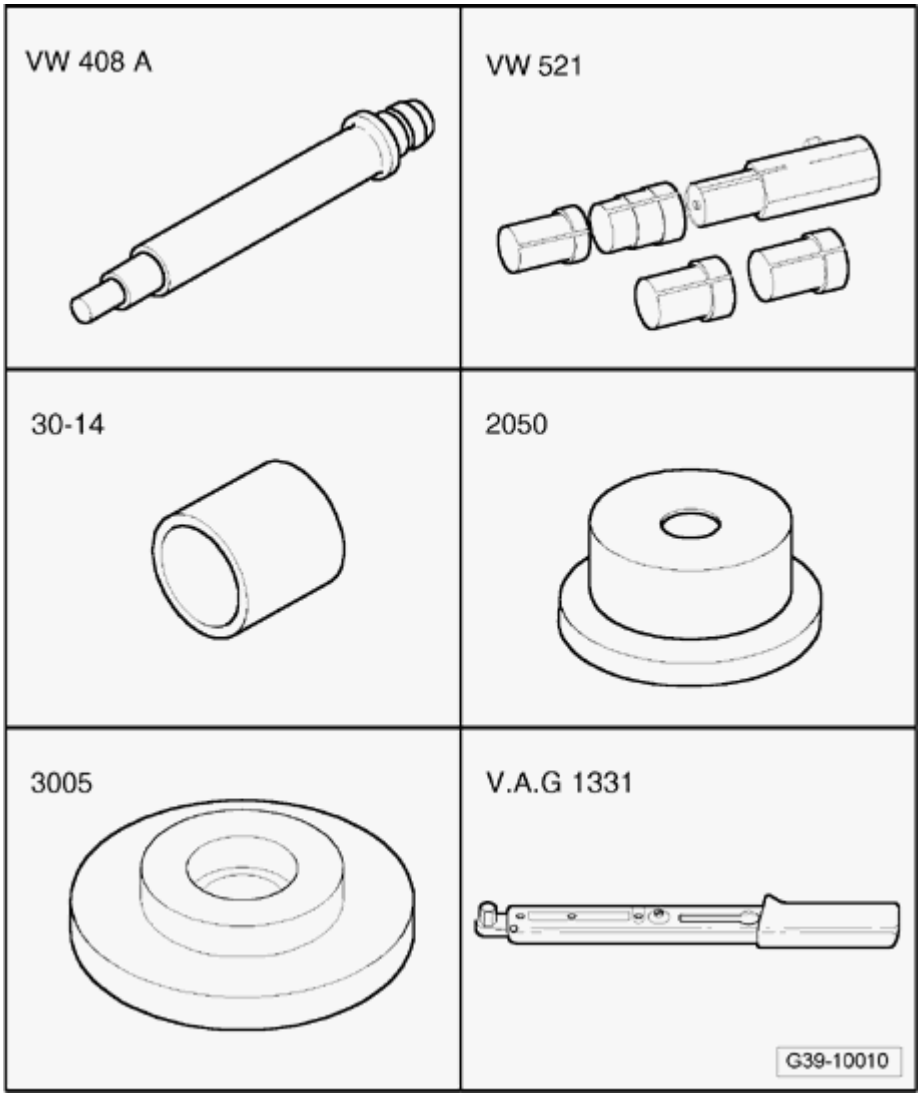

Fig. 534: Identifying Special Tools -- Crown Wheel, Adjusting (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Punch VW408A
- Ring gear adjusting tool VW 521
- Tube 30 - 14
- Thrust plate 2050

- Thrust pad 3005
- Torque wrench V.A.G1331
- Dial gauge
- Dial gauge extension, 30 mm

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It is necessary to readjust the ring gear when the following components have been replaced:

Transmission housing, final drive cover, taper roller bearings for differential, differential cage or the final drive gear set

Table of adjustments --> **Table of adjustments**

Determining total shim thickness "Stotal" for shims "S1" plus "S2"

(adjustment of pre-load of taper roller bearings for differential)

- Pinion shaft removed

- Remove flange shaft oil seals
- Remove tapered roller bearing outer races for differential and take out shims --> **Differential, disassembling and assembling**.

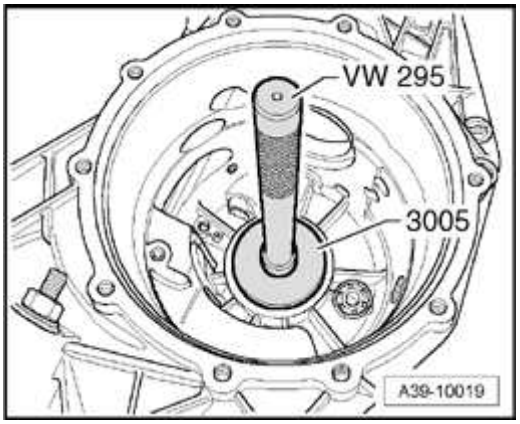

Fig. 535: Driving Outer Race For Tapered Roller Bearing With Shim Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive outer race for tapered roller bearing (right-side) with shim "S_2 " into transmission housing. For measurement purposes use a 1.30 mm thick "S_2 *" shim (or 2 shims of 0.65 mm).

NOTE:

- **For measurement purposes a 1.30mm thick shim "S_2 " is inserted provisionally. This is referred to in the following as "S_2 *". "S_2 *" is exchanged with the final shim "S_2 " after determining backlash.**

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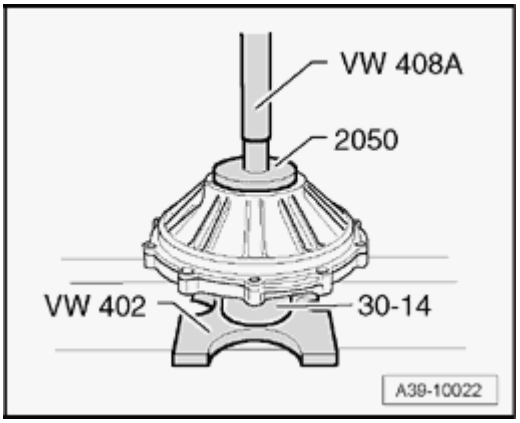

Fig. 536: Pressing Tapered Roller Bearing Outer Race (Left-Side) Into Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press tapered roller bearing outer race (left-side) without shim "S_1 " into cover for final drive.
- Install differential in transmission housing. The ring gear is positioned on the left-hand side (same side as cover for final drive).
- Install cover for final drive with 4 bolts (20 Nm).
- Turn transmission so that cover for final drive points upward.
- Turn differential 5 turns in both directions so that the tapered roller bearings settle.
- Place measuring plate VW385/17 on differential.

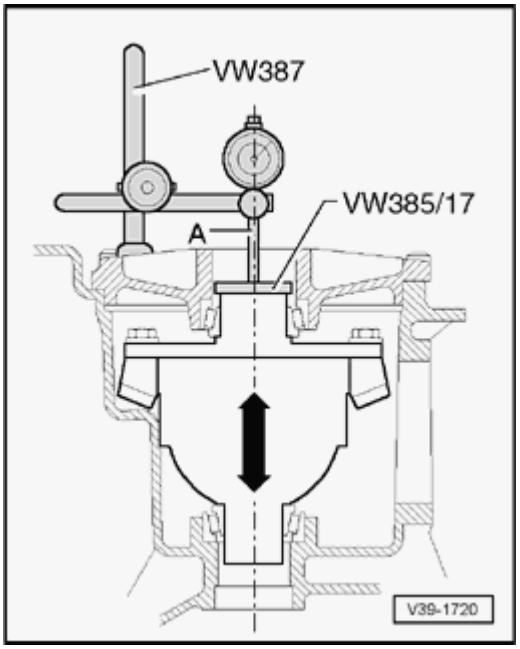

Fig. 537: Installing Magnetic Plate 50Mm Dia. VW 385/17 And Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up measuring tool using 30 mm extension.

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- Set dial gauge (3 mm measuring range) - **A** - to "0" with 2mm preload.

NOTE:

- **Tip of dial gauge must be located at center of differential.**

- Raise differential without turning, read clearance off dial gauge and write down.
- Measurement in following example: 0.62 mm

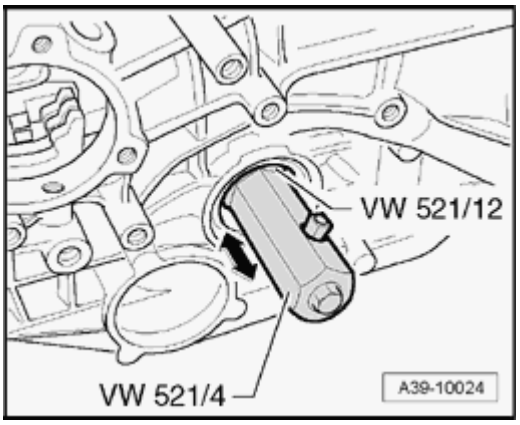

Fig. 538: Special Tools VW521/4 And VW521/12 Secured On Right Of Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Secure special tools VW521/4 and VW521/12 on right of differential (transmission side) to lift differential.**
- **If the measurement has to be repeated, the differential must again first be turned 5 turns in each direction to settle the tapered roller bearings.**

Formula: "S_{total} " = "S_2 *" + measured value + bearing preload

Example:		
	Inserted shim(s) "S_2 *"	1.30 mm
+	Measured value	0.62 mm
+	Bearing preload (constant value)	0.25 mm
=	Total shim thickness "S_{total} " for "S_1 " plus "S_2 "	2.17 mm

Determining thickness of shim "S_1 *"

NOTE:

- **Provisional shim "S_1 *" is replaced with final shim "S_1 " after determining backlash.**
- **Total shim thickness "S_{total} " remains unchanged.**

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Formula: "S_1 *" = "S_{total} " - "S_2 *"

Example:		
	Total shim thickness "S_{total} " for "S_1 " plus "S_2 "	2.17 mm
-	Inserted shim(s) "S_2 *"	1.30 mm
=	Thickness of shim "S_1 *"	0.87 mm

Measuring backlash

- Install pinion shaft with shims "S_3 " and "S_4 ".

- Install differential with ring gear: S_1 is installed on cover side, S_2 in transmission housing.
- Install cover for final drive and tighten bolts to 20 Nm.
- Insert ring gear adjusting tool VW521/4 and VW521/12.
- Turn differential 5 turns in both directions so that the taper roller bearings seat properly.

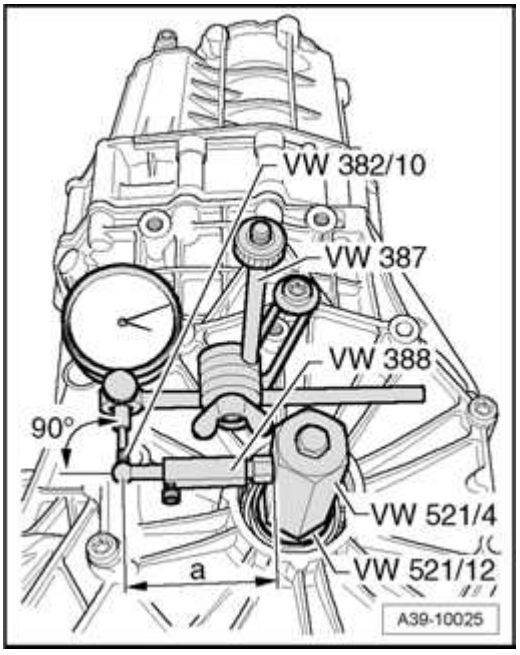

Fig. 539: Measuring Backlash
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure universal dial gauge bracket VW 387 to housing.
- Install dial gauge with dial gauge extension VW382/10 (6mm flat).
- Adjust measuring lever VW388 to distance "a" = 73mm (for 182 mm dia. ring gear).
- Measure play between teeth faces (backlash) as follows:

- Turn ring gear until it makes contact with the face of one tooth (end of backlash travel).

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- Preload dial gauge to 2 mm and set to "0".
- Turn back ring gear until it makes contact with opposite tooth face (backlash).
- Take backlash reading and write down measured value.

- Turn ring gear through 90° and repeat measurements another 3 times.

NOTE:

- **If the pinion shaft rotates during the measurements, counter-hold pinion shaft to make sure that the measured value of the backlash is correct.**

Determining average backlash

- Add the four measured values together and divide by four.

Example:		
	1st measured value	0.28 mm
+	2nd measured value	0.30 mm
+	3rd measured value	0.30 mm
+	4th measured value	0.28 mm
=	Sum of measured values	1.16 mm

- Result: the average backlash is 1.16 mm : 4 = 0.29 mm

NOTE:

- **If the individual measurements differ from each other by more than 0.06 mm, the installation of the ring gear or the final drive gear set itself is not correct. Check installation; replace final drive gear set if necessary.**

Determining thickness of shim "S2"

Formula: "S_2 " = "S_2 *" - measured backlash + specified backlash

Example:		
	Inserted shim "S_2 *"	1.30 mm
-	Measured average backlash	0.29 mm
+	Specified backlash (constant value)	0.20 mm
=	Thickness of shim "S_2 "	1.21 mm

- Determine shim(s) according to table.

Available shims for "S_2 "

Shim thickness (mm) * See note		

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0.45	0.61	0.77
0.49	0.65	0.81
0.53	0.69	0.85
0.57	0.73	

*The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Determining thickness of shim "S1"

Formula: "S_1 " = "S_{total} " - "S_2 "

Example:		
	Total shim thickness "S_{total} " for "S_1 " plus "S_2 "	2.17 mm
-	Thickness of shim "S_2 "	1.21 mm
=	Thickness of shim "S_1 "	0.96 mm

- Determine shim(s) according to table.

Available shims for "S_1 "

Shim thickness (mm) * See note		
0.45	0.61	0.77
0.49	0.65	0.81
0.53	0.69	0.85
0.57	0.73	

*The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Checking adjustment

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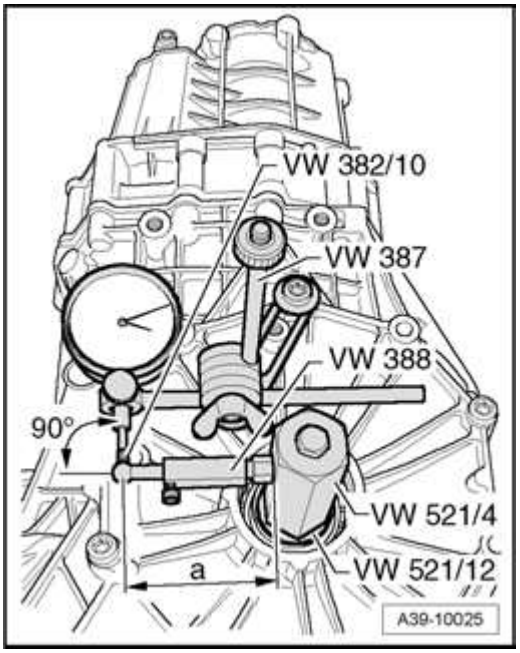

Fig. 540: Measuring Backlash
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- After installing shims "S_1 " and "S_2 ", turn differential 5 turns in both directions so that the tapered roller bearings settle.
- Measure backlash four times on circumference.

- Specification: 0.12to0.28 mm

NOTE:

- **Adjustment must be repeated if backlash is outside tolerance. The total shim thickness "S_{total} " must remain unchanged.**
- **Deviation between individual measured values must not exceed 0.06 mm.**

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TRANSMISSION

6-speed manual transmission 02X, four-wheel drive

00 TECHNICAL DATA

TRANSMISSION IDENTIFICATION

Transmission identification

The 6-speed manual transmission 02X all wheel drive is used on the A4 2002 --> in conjunction with the 1.8liter, 2.0liter, 3.0liter. and 3.2liter engines.

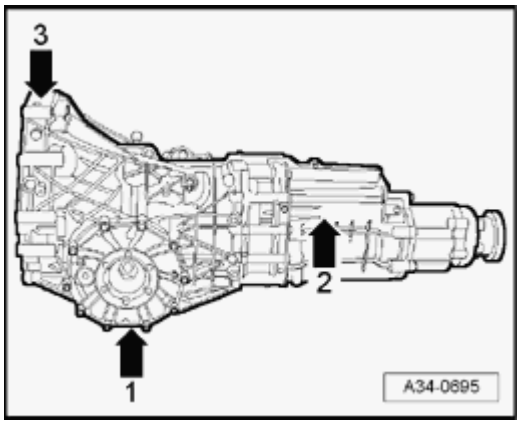

Fig. 1: Transmission Identification
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Location on transmission

- Code letters and date of manufacture - **arrow1** - or - **arrow 3** -
- Manual transmission 02X - **arrow2** -

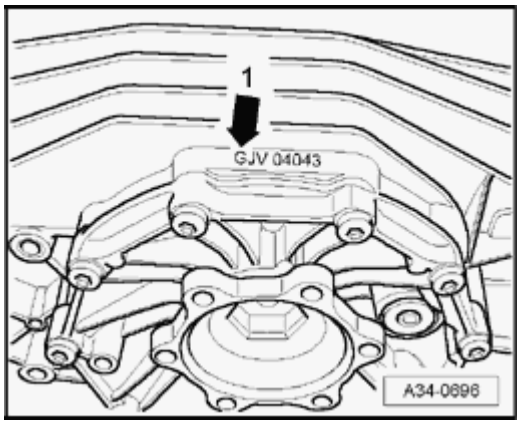

Fig. 2: Code Letters And Date Of Manufacture Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Code letters and date of manufacture of transmission - **arrow1** -

Example:	GJV	04	04	3
	I	I	I	I
	I	I	I	I
	Code letters	Day	Month	Year of manufacture (2003)

Additional data are production-related.

NOTE:

- **The code letters for the transmission are also given on the vehicle data stickers.**

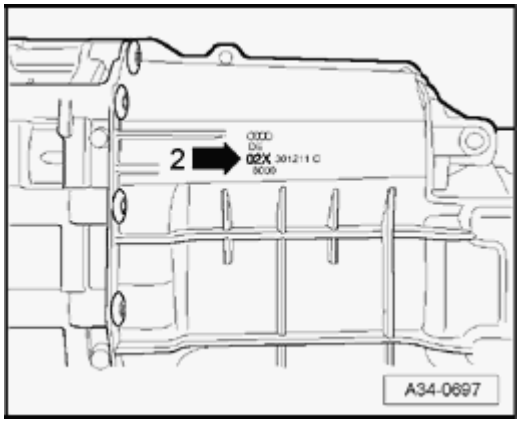

Fig. 3: Code Letters For The Transmission On The Vehicle Data Sticker
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Manual transmission 02X - **arrow2** -

Code letters, allocation, transmission ratios, capacities

Manual transmission		6-speed 02X all wheel drive	
Code letters		GJV	GJW
Manufactured	from	04.03	04.03
	to	05.04	
Allocation	Model	A4 2001 -->	A4 2001 -->
	Engine	3.0 liter. - 162 kW	1.8 liter. - 120 kW
Ratio	Final drive	35 : 9 = 3.889	37 : 9 = 4.111
$i = Z_2 : Z_1$	1st gear	33 : 9 = 3.667	33 : 9 = 3.667
	2nd gear	39 : 19 = 2.053	39 : 19 = 2.053
	3rd gear	37 : 26 = 1.423	37 : 27 = 1.370
	4th gear	33 : 31 = 1.065	32 : 31 = 1.032
	5th gear	29 : 34 = 0.853	28 : 35 = 0.800

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	6th gear	27 : 37 = 0.730	25 : 38 = 0.658
	Reverse gear	34 : 10 = 3.400	34 : 10 = 3.400
Capacity		3.5 liters	
Specification		Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)	
Clutch actuation		Hydraulic	
Clutch plate dia.		240 mm	228 mm
Drive shaft flange dia.		75.5 mm	88 mm
Overall ratio $i_{ov.}$ in top gear		2.839	2.705
Allocation of rear final driveCode letters		ETS	ETR, ETQ

Manual transmission		6-speed 02X, all wheel drive	
Code letters		GVE	GYY
Manufactured	from	11.04	11.04
	to		
Allocation	Model	A4 2001 -->	A4 2001 -->
	Engine	2.0 liter. - 147 kW	3.2 liter. -188 kW
Ratio	Final drive	35 : 9 = 3.889	35 : 8 = 4.375
$i = Z_2 : Z_1$	1st gear	33 : 9 = 3.667	33 : 10 = 3.300
	2nd gear	39 : 19 = 2.053	37 : 20 = 1.850
	3rd gear	37 : 27 = 1.370	36 : 28 = 1.286
	4th gear	32 : 31 = 1.032	31 : 33 = 0.939
	5th gear	28 : 35 = 0.800	27 : 36 = 0.750
	6th gear	25 : 38 = 0.658	25 : 39 = 0.641
	Reverse gear	34 : 10 = 3.400	34 : 10 = 3.400
Capacity		3.5 liters	
Specification		Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)	
Clutch actuation		Hydraulic	
Clutch plate		240 mm	240 mm
Drive shaft flange		88 mm	75.5 mm
Overall ratio $i_{ov.}$ in top gear		2.804	2.804
Allocation of rear final driveCode letters		ETS	FUB

REAR FINAL DRIVE IDENTIFICATION

Rear final drive identification

Rear Final Drive is installed in conjunction with manual transmission 02X (all wheel drive).

NOTE:

- **For identification of rear final drive --> 00 GENERAL, TECHNICAL DATA .**
- **For repairs on the drive shaft or the rear final drive --> 39 FINAL DRIVE,**

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DIFFERENTIAL .

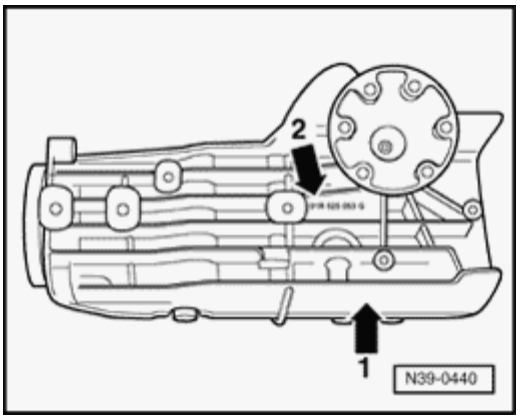

Fig. 4: Locations Of Final Drive Identification
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Location on rear final drive

- Code letters and date of manufacture - **arrow1** -
- Rear Final Drive - **arrow2** -

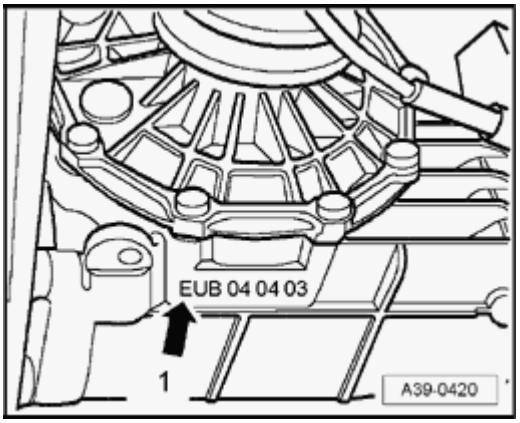

Fig. 5: Code Letters And Date Of Manufacture Of Rear Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Code letters and date of manufacture of rear final drive - **arrow1** - :

Example:	EUB	04	04	03
	I	I	I	I
	I	I	I	I
	Code letters	Day	Month	Year - **2003** - of manufacture

Additional data are production-related.

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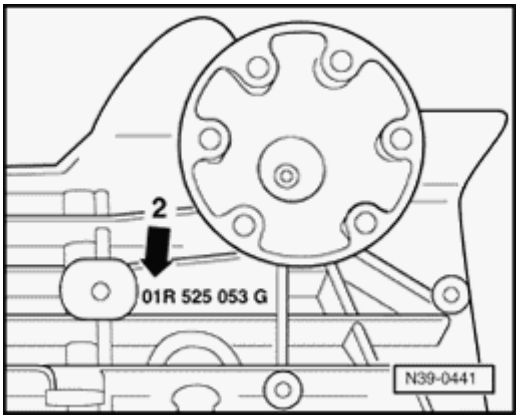

Fig. 6: Final Drive 01R
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Rear Final Drive - **arrow2** -

TRANSMISSION LAYOUT

Transmission layout

Identification

NOTE:

- **- Arrows - point in direction of travel.**

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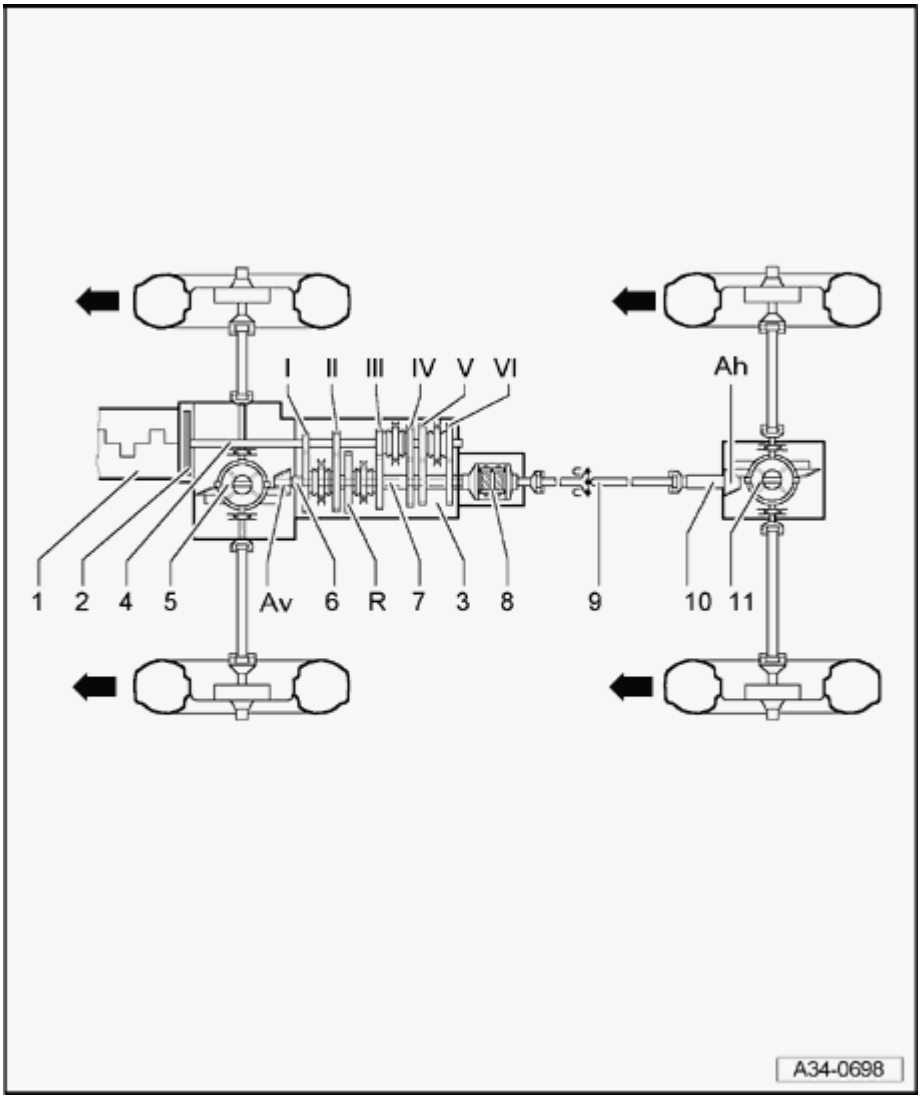

Fig. 7: Transmission Layout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Engine

2 - Clutch

3 - Manual transmission

- Diagram of transmission layout --> **Transmission, general layout**

4 - Input shaft (main shaft)

5 - Differential (front)

6 - Front pinion shaft (output shaft)

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7 - Hollow shaft

8 - Torsen differential

9 - Drive shaft

10 - Rear pinion shaft

11 - Differential (rear)

Ratio

NOTE:

- **- Arrows - point in direction of travel.**

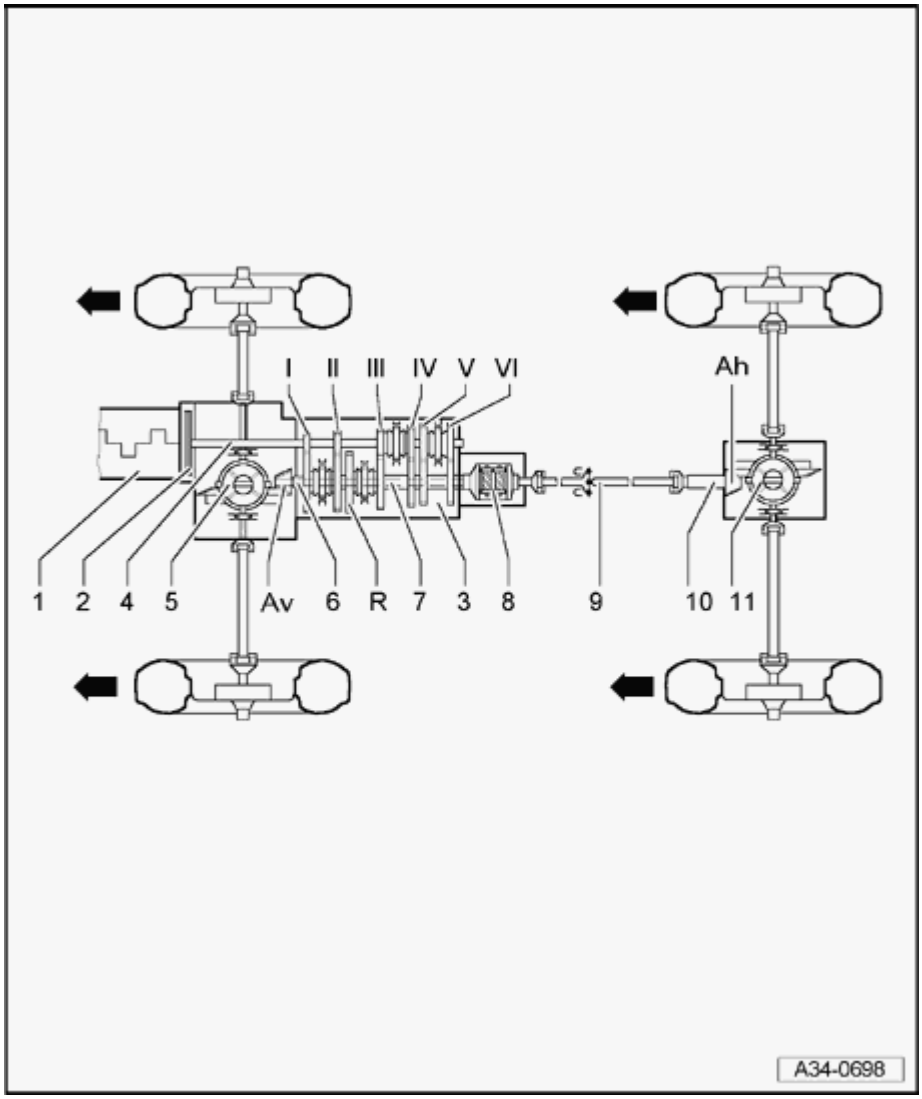

Fig. 8: Transmission Layout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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I - 1st gear

II - 2nd gear

III - 3rd gear

IV - 4th gear

V - 5th gear

VI - 6th gear

R - Reverse gear

Av - Final drive (front)

Ah - Final drive (rear)

CALCULATING RATIO "I"

Calculating ratio "i"

Transmission ratio

Transmission ratio	=	No. of teeth on driven gear	:	No. of teeth on drive gear

Ratios			Formula
i_G	=	Gear ratio	$ZG_2 : ZG_1$
i_A	=	Axle ratio	$ZA_2 : ZA_1$
i_{ov}	=	Overall ratio	$i_G \times i_A$

Example:		
	6th gear	Final drive
Drive gear	$ZG_1 = 38$	$ZA_1 = 10$
Driven gear	$ZG_2 = 25$	$ZA_2 = 34$

Calculations:		
i_G	=	25 : 38 = 0.658
i_A	=	34 : 10 = 3.400
i_{ov}	=	0.658 x 3.400 = 2.237

GENERAL REPAIR INSTRUCTIONS

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General repair instructions

Proper tools and the maximum possible care and cleanliness are essential for successful transmission repairs. The usual basic safety precautions also naturally apply when performing vehicle repairs.

A number of generally valid instructions which apply to individual repair procedures (as listed at various points in the article) are summarized here under "Components"--> **Components**. They apply to the work described in this article.

Components

Transmission

- Select correct bolts and other components according to transmission code letters --> **Code letters, allocation, transmission ratios, capacities**.
- When installing a new transmission, check oil level and fill up with oil if necessary --> **Transmission oil level, checking** .
- Capacities and specifications --> **Code letters, allocation, transmission ratios, capacities**
- When installing a new rear final drive unit, check oil level in rear final drive and top off if necessary --> **39 FINAL DRIVE, DIFFERENTIAL** .

- Thoroughly clean all joints and surrounding areas before Disassembling.
- When installing transmission make sure dowel sleeves are correctly seated.

Sealants

- Thoroughly clean joint surfaces on transmission housing etc. before applying sealing paste.
- Apply **sealing paste AMV18800102** evenly and not too thick.
- Breather holes must remain free of sealing paste.

O-rings, oil seals, gaskets

- Always install new O-rings, oil seals and gaskets.
- After removing gaskets and seals, always inspect the contact surface on the housing or shaft for burrs resulting from removal or for other signs of damage.
- Thoroughly clean housing joint surfaces before assembling.

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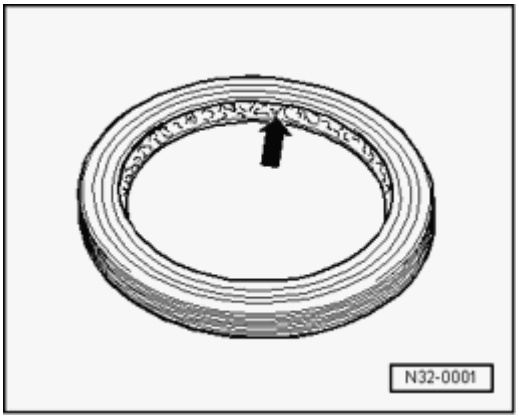

Fig. 9: Identifying Space Between Oil Seal Sealing Lips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before installing oil seals, lightly oil the outer circumference of the seal and fill the space between the sealing lips - **arrow** - about half full with **grease G052128A1** .
- The open side of the oil seals faces toward the side with fluid filling.
- When installing a new oil seal, position the seal in the housing so that sealing lip does not contact the shaft in the same place as the old seal (make use of insertion depth tolerances).
- Lightly oil O-rings before installing to prevent them from being trapped and damaged when assembling.
- After replacing seals and gaskets, check and, if necessary, top off oil level in transmission --> **Transmission oil level, checking** .

Locking elements

- Do not over-stretch circlips.
- Always replace circlips which have been damaged or over-tensioned.
- Locking rings/ circlips must be properly seated in the base of the groove.

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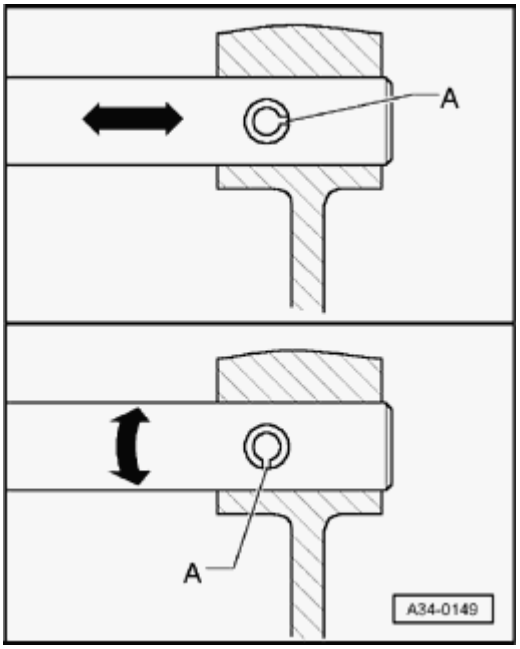

Fig. 10: Identifying Locking Elements
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace spring pins. Position: the slit - **A** - should be in line with the line of force - **arrow** -.

Nuts, bolts

- Loosen nuts and bolts in reverse sequence to the specified tightening sequence.
- Nuts and bolts which secure covers and housings should be loosened and tightened in diagonal sequence and in stages if no tightening sequence is specified.
- Loosen and tighten particularly sensitive parts in diagonal sequence and in stages, taking care to keep them straight.
- The tightening torques stated apply to non-oiled nuts and bolts.
- Always replace self-locking bolts and nuts.
- Clean the threads of bolts which are secured by a locking compound with a wire brush. Then lubricate bolts with **locking compound AMV185101A1** again before installing.
- Threaded holes which take self-locking bolts or bolts coated with locking compound must be cleaned (using a thread tap or similar). Otherwise there is a danger of the bolts shearing when subsequently being removed.

Shims

- Use a micrometer to measure the shims at several points. Tolerance variations make it possible to obtain the exact shim thickness required.
- Check for burrs and damage.
- Only install perfect, undamaged shims.

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Bearings

- Install new tapered roller bearings as supplied; do not lubricate with oil.
- Lubricate all bearings (except tapered roller bearings) with gear oil before installing in transmission.
- Heat inner races of tapered roller bearings to approx. 100° C before installing. Press in onto stop when installing so there is no axial clearance.
- Do not interchange the outer or inner races of bearings of the same size (the bearings are paired).
- If required, replace tapered roller bearings on one shaft together and use new bearings from a single manufacturer.
- Install needle bearings so the lettering (side with thicker metal) faces toward the installing tool.
- Lubricate needle bearing for transmission input shaft in rear of flywheel.

Synchronizer rings

- Do not interchange synchronizer rings. When reusing, always install to the same gear.
- Check for wear; replace if necessary.
- Lubricate with gear oil before installing.

Gear wheels and synchronizing hubs

- Before installing, clean and heat on a hotplate to 130° C (maximum).
- Press in onto stop when installing so there is no axial clearance.
- The temperature can be measured with temperature tester V.A.G1558, ignition tester V.A.G 1767 or diesel tester V.A.G 1743.
- Note installation position.

Selector gears

- After installing, check 1st to 6th speed selector gears for minimal axial play and freedom of movement.

Clutch actuation

- When removing transmission, remove slave cylinder without disconnecting hydraulic lines.
- Do not depress the clutch pedal after removing the slave cylinder if the hydraulic line is still connected. Otherwise the piston will be pressed out of the slave cylinder. As a result the slave cylinder will be destroyed.
- If the clutch pedal does not return to its initial position after releasing it, you must bleed the clutch system (further measures --> **Notes on removing and installing master cylinder and slave cylinder**).
- The clutch system should be bled at the same intervals as the brake system.
- Make sure that the pressure plate is kept straight: loosen and tighten bolts in a diagonal sequence and in several gradual stages (does not apply to SAC pressure plates).
- Note assembly instructions for SAC pressure plate --> **Clutch with SAC pressure plate, removing and**

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installing.

- On vehicles with SAC pressure plate an adjuster ring has to be reset when only the clutch plate is replaced --> **Adjuster ring in SAC clutch pressure plate, resetting**.
- If the clutch has burned out, thoroughly clean the bell housing, flywheel and parts of the engine facing the transmission in order to prevent odors.

30 CLUTCH

CLUTCH MECHANISM, SERVICING

Clutch mechanism, servicing

CAUTION:

- **Follow steps required when disconnecting battery -->**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL for Cabriolet**

.

NOTE:

- **Lubricate all bearings and contact surfaces with polycarbamide grease G052142A2 .**
- **Before working on pedal cluster, remove storage compartment on drivers side -->**
  - **68 - INTERIOR EQUIPMENT**
  - **68 - INTERIOR EQUIPMENT for Cabriolet**

  .
- **Make sure that no brake fluid escapes into the footwell, the plenum chamber or onto the transmission below. If this does happen, clean the affected area thoroughly.**
- **When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.**

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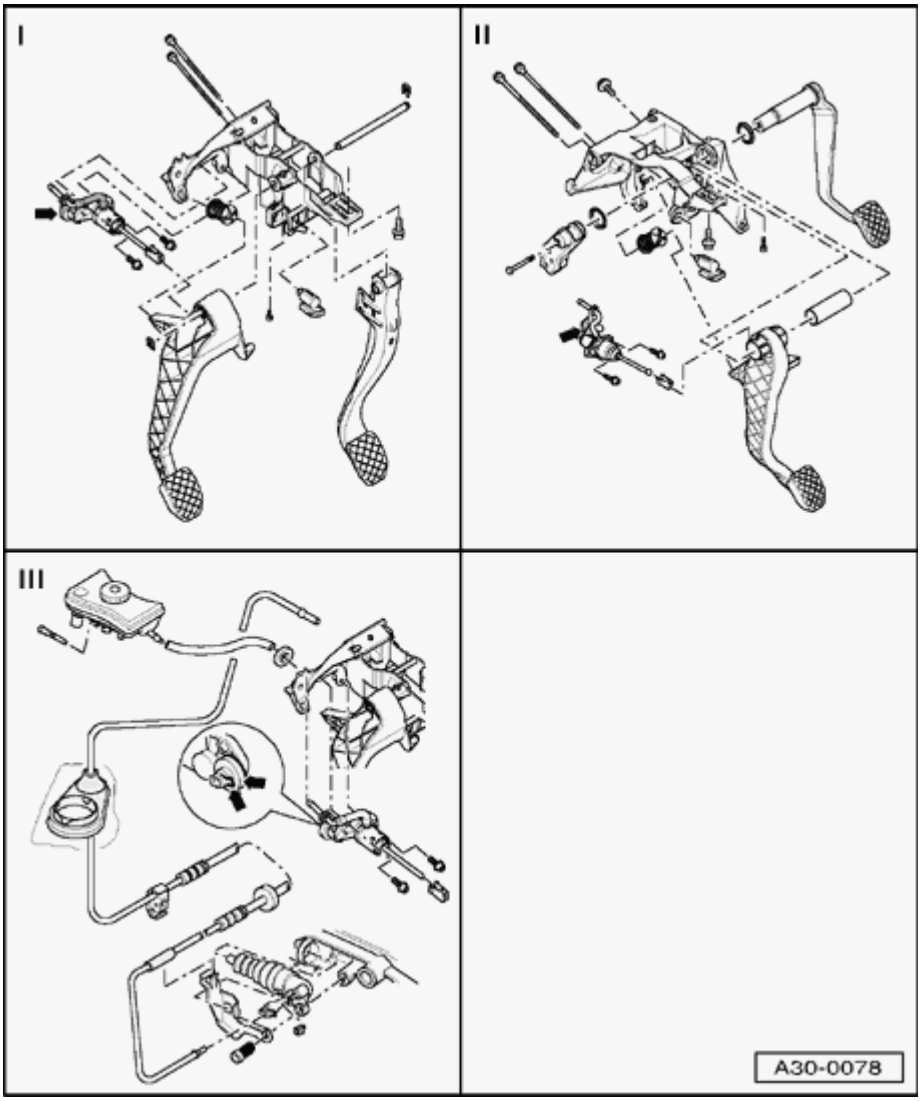

Fig. 11: Exploded View Of Pedal Cluster And Exploded View Of Hydraulic System
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - Pedal cluster (LHD vehicles), assembly overview --> **Pedal cluster (LHD vehicles), assembly overview**

II - Pedal cluster (RHD vehicles), assembly overview --> **Pedal cluster (RHD vehicles), assembly overview**

III - Hydraulics, assembly overview --> **Hydraulic system, assembly overview**

Pedal cluster (LHD vehicles), assembly overview

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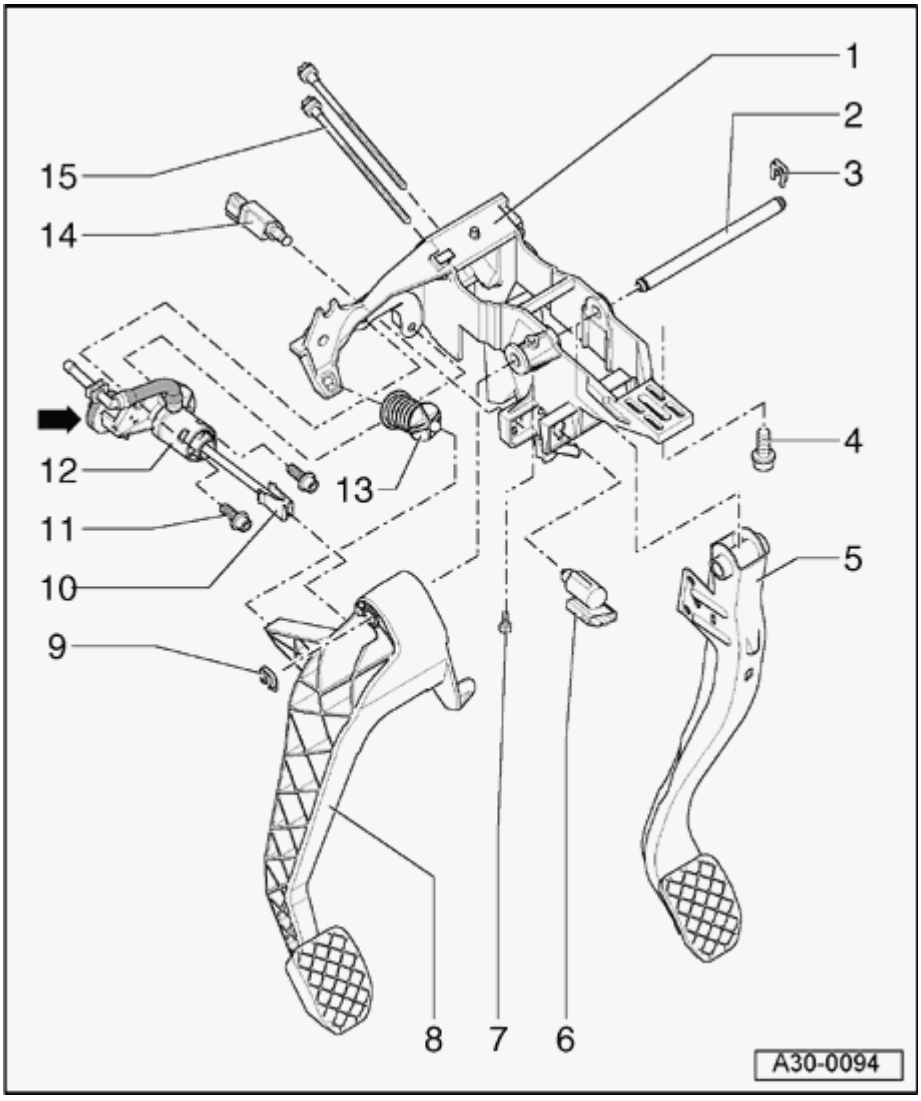

Fig. 12: Pedal Cluster, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Mounting bracket

- Removing and installing --> **Master cylinder, removing and installing**

2 - Pivot pin for clutch and brake pedal

3 - Retaining clip

4 - Hex socket head bolt, 25 Nm

5 - Brake pedal

- Maintenance-free bearing, do not grease

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6 - Clutch pedal switch F36

- Removing and installing --> **Clutch pedal switch F36, removing and installing**
- Can only be installed once
- Replace

7 - Hex socket head bolt, 5 Nm

- Secures clutch and brake pedal pivot pin

8 - Clutch pedal

- Removing and installing --> **Master cylinder, removing and installing**

9 - Retaining clip

10 - Retaining clip

11 - Hex socket head bolt, 20 Nm

12 - Master cylinder

- Removing and installing --> **Master cylinder, removing and installing**
- Gasket - **arrow** - must not be removed

13 - Over-center spring

- Black side points toward clutch pedal
- Removing and installing --> **Over-center spring, removing and installing**

14 - Clutch Pedal Starter Interlock Switch F194

- USA models and vehicles with 3.2liter. FSI engine only
- Engine can only be started when clutch is fully depressed (switch activated).
- Removing and installing --> **Clutch Pedal Starter Interlock Switch F194, removing and installing**
- Replace

- Can only be installed once

15 - Torx bolt, 25Nm

- For securing brake master cylinder/brake servo to mounting bracket

Clutch pedal switch F36, removing and installing

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NOTE:

- **Clutch pedal switch may only be installed once so as to ensure a secure fit.**

Removing

- Remove storage compartment on drivers side -->
  - **68 - INTERIOR EQUIPMENT**
  - **68 - INTERIOR EQUIPMENT** for Cabriolet

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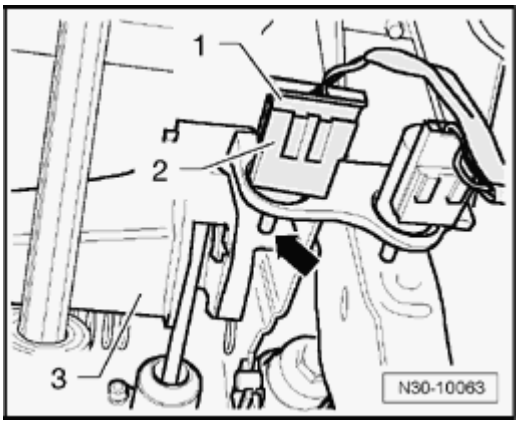

Fig. 13: Identifying Pedal Assembly And Clutch Pedal Switch F36
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **1** - on clutch pedal switch.

- The clutch pedal - **3** - is in the normal position (i.e. not pressed down). The operating rod - **arrow** - of clutch pedal switch should then rest against clutch pedal.

- Release clutch pedal switch - **2** - by turning 45° counter-clockwise and remove from guide.

Installing

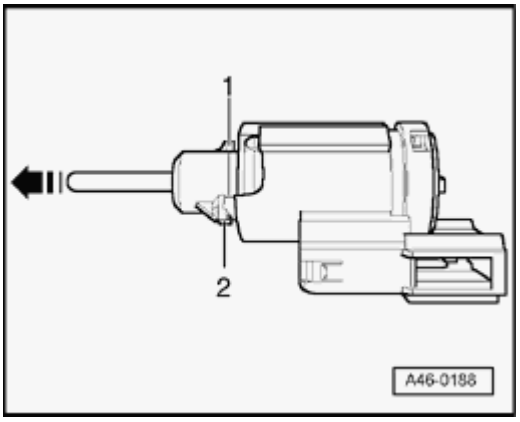

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Fig. 14: Pulling Out Switch Plunger & Identifying Retainer Tabs On Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation is in reverse order of removal. Note the following:

- Pull out operating rod - **arrow** - all the way before installing clutch pedal switch.

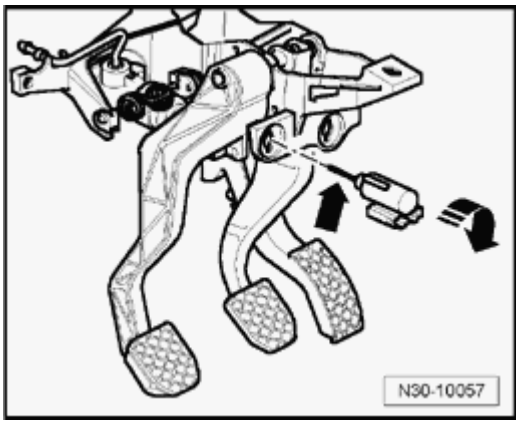

Fig. 15: Identifying Clutch Pedal Switch F36, Plunger
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The clutch pedal should be in the normal position (i.e. not pressed down).

- Guide clutch pedal switch through mounting hole, press against clutch pedal and attach by turning 45° clockwise.
- Connect connector for clutch pedal switch.
- Install storage compartment on drivers side -->
  - **68 - INTERIOR EQUIPMENT**
  - **68 - INTERIOR EQUIPMENT** for Cabriolet

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Clutch Pedal Starter Interlock Switch F194, removing and installing

NOTE:

- **To ensure a secure fit, the clutch pedal starter interlock switch F194 must not be installed more than once.**

Removing

- Remove storage compartment on drivers side -->
  - **68 - INTERIOR EQUIPMENT**
  - **68 - INTERIOR EQUIPMENT** for Cabriolet

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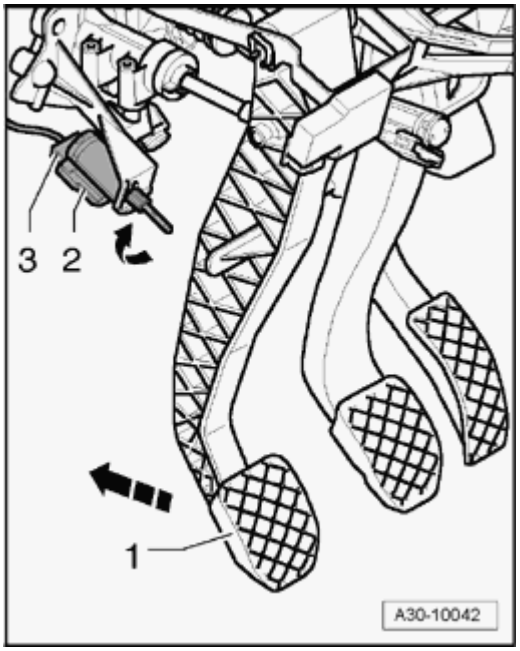

Fig. 16: Installing and Adjusting Clutch Pedal Starter Interlock Switch F194
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **3** - on clutch pedal switch.
- Press clutch pedal - **1** - all the way down and hold it in this position.
- At the same time, release clutch pedal starter interlock switch F194 - **2** - by turning it 45° in the direction indicated - **arrow** - and pull it out of the guide.

Installing

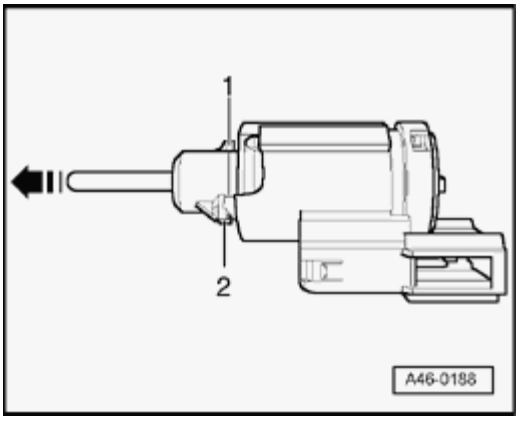

Fig. 17: Pulling Out Switch Plunger & Identifying Retainer Tabs On Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out operating rod - **arrow** - all the way before installing clutch pedal switch.

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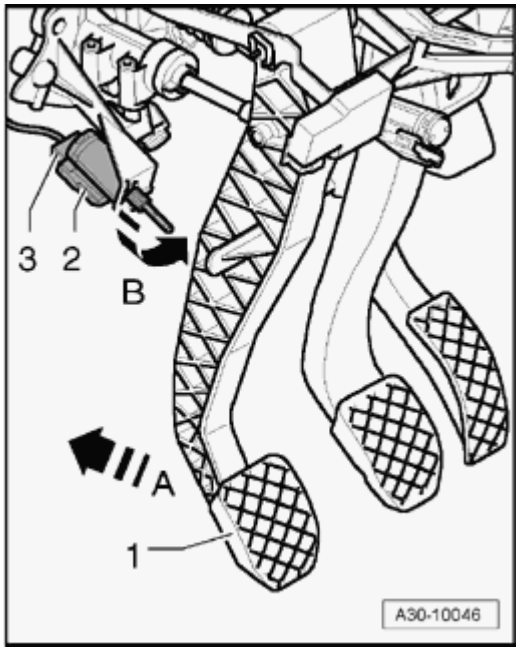

Fig. 18: Pressing Clutch Pedal All The Way Down And Pushing Operating Rod Against Clutch Pedal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing clutch pedal starter interlock switch F194, press clutch pedal - **1** - all the way down - **arrow A** -. Hold clutch pedal in this position.
- Guide clutch pedal starter interlock switch F194 - **2** - through opening in retainer, and at the same time push operating rod against clutch pedal and secure switch by turning it 45° in the direction indicated - **arrow B** -.
- Connect electrical connector - **3** - on clutch pedal starter interlock switch F194.
- Install storage compartment on drivers side -->
  - **68 - INTERIOR EQUIPMENT**
  - **68 - INTERIOR EQUIPMENT** for Cabriolet

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Over-center spring, removing and installing

Special tools, testers and auxiliary items required

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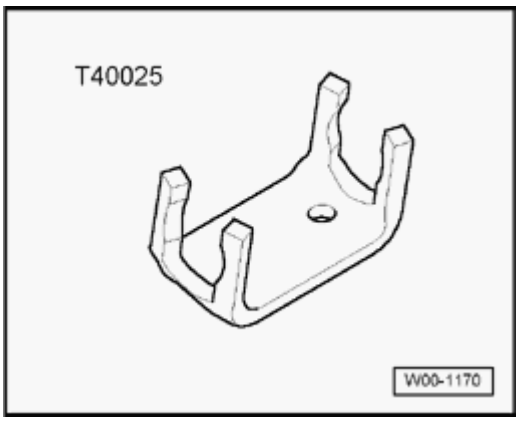

Fig. 19: T40025 Installation Clamp
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assembly clip T40025

Removing

- Remove storage compartment on drivers side -->
  - **68 - INTERIOR EQUIPMENT**
  - **68 - INTERIOR EQUIPMENT** for Cabriolet

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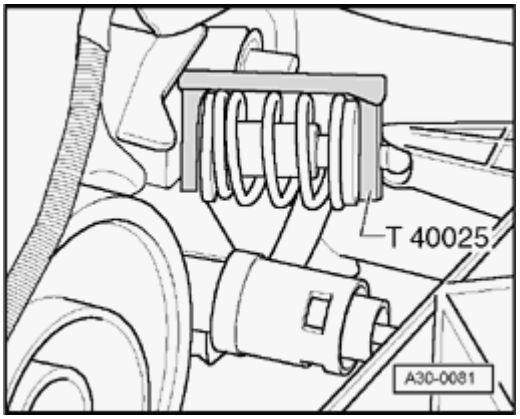

Fig. 20: Installation Clamp T40025 Installed On Over-Center Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tension over-center spring with clutch pedal, at the same time pressing on assembly clamp T40025.
- Move clutch pedal to rest position and remove over-center spring together with assembly clamp T40025 downward.

Installing

- Pull clutch pedal into the passenger compartment.

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Installation position of over-center spring:

- Black side of over-center spring points toward clutch pedal.

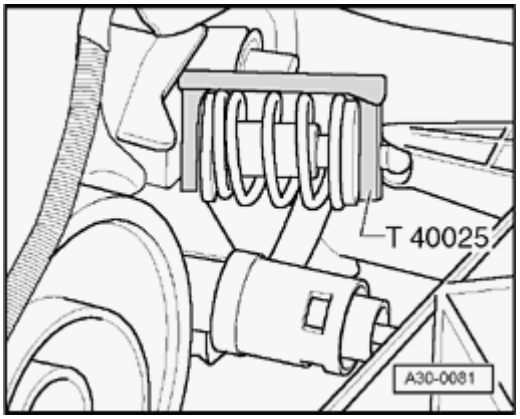

Fig. 21: Installation Clamp T40025 Installed On Over-Center Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install over-center spring with assembly clamp T40025, operate clutch pedal and remove assembly clamp.

Pedal cluster (RHD vehicles), assembly overview

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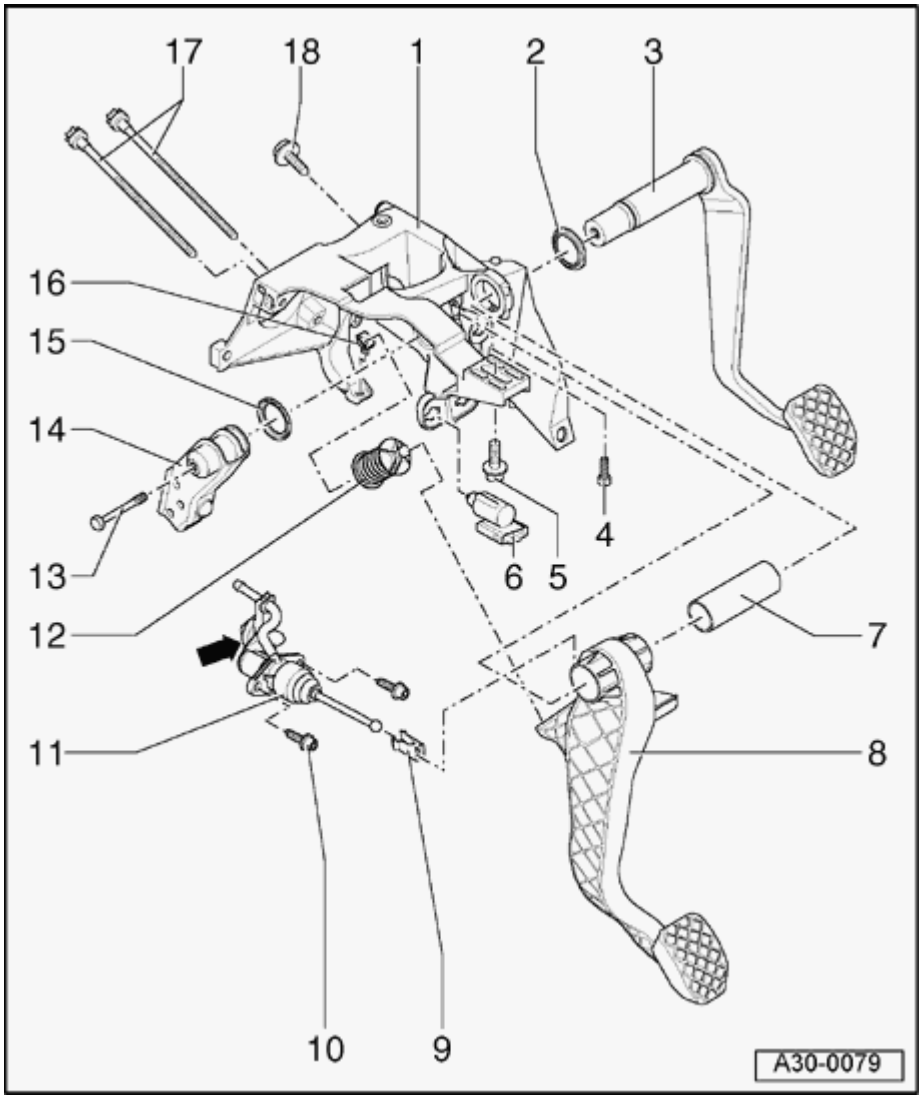

Fig. 22: Pedal Cluster - RHD Vehicles, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Mounting bracket

- Removing and installing --> **Master cylinder, removing and installing**

2 - Washer

3 - Brake pedal

- Maintenance-free bearing, do not grease

4 - Hex socket head bolt, 5 Nm

- For securing the bearing sleeve

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5 - Hex socket head bolt, 25 Nm

6 - Clutch pedal switch F 36

- Can only be installed once
- Replace

7 - Bearing sleeve

- Check for freedom of movement in clutch pedal

8 - Clutch pedal

- Removing and installing --> **Master cylinder, removing and installing**

9 - Retaining clip

10 - Hex socket head bolt, 20 Nm

11 - Master cylinder

- Removing and installing --> **Master cylinder, removing and installing**
- Gasket - **arrow** - must not be removed

12 - Over-center spring

- Removing and installing --> **Over-center spring, removing and installing**

13 - Bolt, 22 Nm

- Self-locking
- Replace

14 - Lever

- Pin only fits in one position

15 - Washer

16 - Mounting

- For over-center spring

17 - TORX bolt, 25 Nm

- For securing brake master cylinder/brake servo to mounting bracket

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18 - Bolt, 25 Nm

Hydraulic system, assembly overview

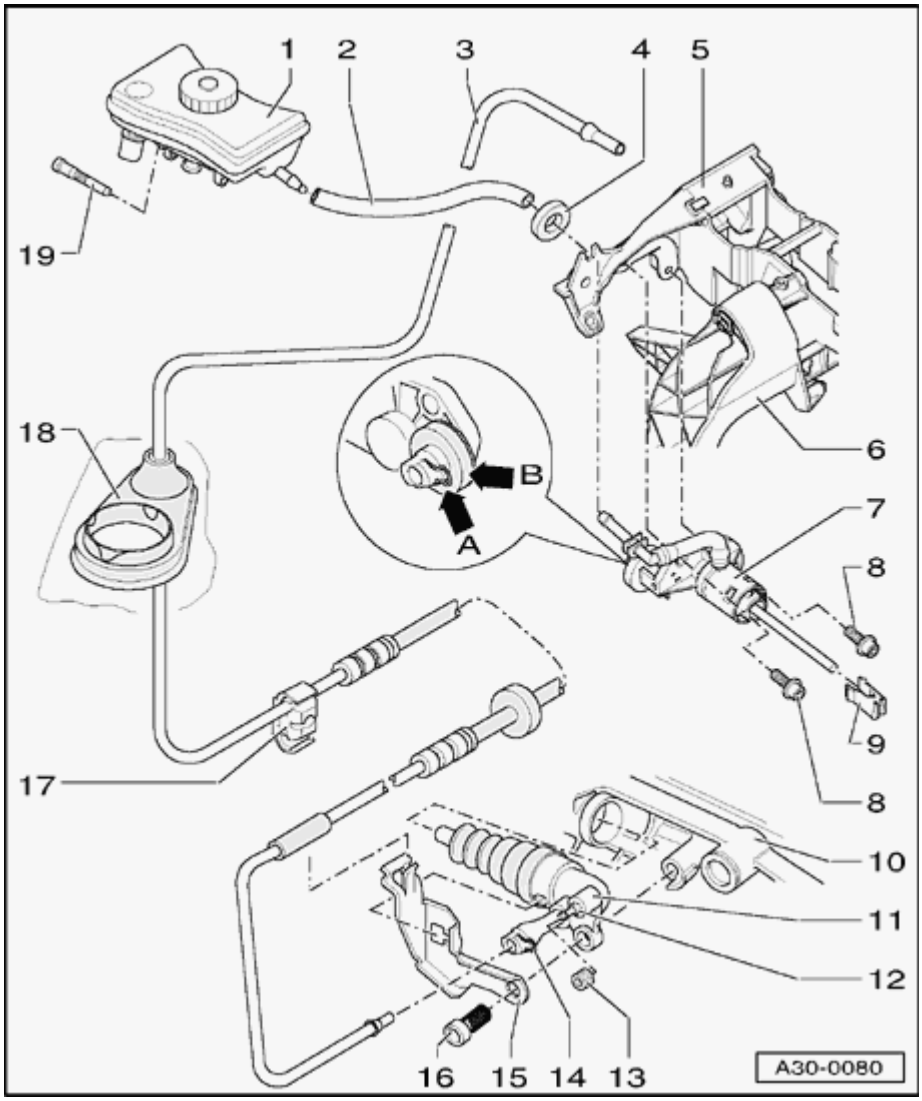

Fig. 23: Hydraulic System, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Brake fluid reservoir

2 - Supply hose

- For clutch master cylinder

3 - Line/hose assembly

- For connections on master cylinder and slave cylinder

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- Disconnecting from master cylinder and installing **Fig. 35**
- Disconnecting from slave cylinder **Disconnecting slave cylinder from hose/line assembly**

4 - Grommet

5 - Mounting bracket

6 - Clutch pedal

7 - Master cylinder

- Removing and installing --> **Master cylinder, removing and installing**
- Do not remove clip - **arrow A** - or seal - **arrow B** -.
- To remove line/hose assembly, pull out clip - **arrow A** - , but only as far as limit stop **Fig. 35**.

8 - Hex socket head bolt, 20 Nm

9 - Retaining clip

- Only replace when master cylinder has been removed
- Pry off to remove **Prying retaining clip - A - off in direction of - arrow -**
- Push in to install **Pressing master cylinder operating rod into retaining clip - A - (in direction of - arrow -).**

10 - Transmission

11 - Slave cylinder

- Do not operate clutch pedal after slave cylinder has been removed.
- Removing and installing --> **Slave cylinder, removing**
- Bleed slave cylinder after working on hydraulic clutch mechanism --> **Clutch hydraulic system, bleeding**
- Disconnecting hose/line assembly **Disconnecting slave cylinder from hose/line assembly**

- Do not allow brake fluid to come into contact with transmission.

12 - Bleeder valve

- Tighten to 4.5 Nm
- Follow correct procedure when bleeding --> **Clutch hydraulic system, bleeding**.
- If bleeder valve has broken off, it can be removed with 3 mm Allen key

13 - Dust cap

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14 - Clip

- To remove line pull out clip as far as limit stop **Disconnecting slave cylinder from hose/line assembly**

15 - Bracket

- For line/hose assembly
- Attached to transmission together with slave cylinder

16 - Hex socket head bolt, 25 Nm

- Slave cylinder to transmission
- Self-locking
- Replace

17 - Retaining clip

18 - Gasket

19 - Securing bolt

- For brake fluid reservoir

Prying retaining clip - A - off in direction of - arrow -

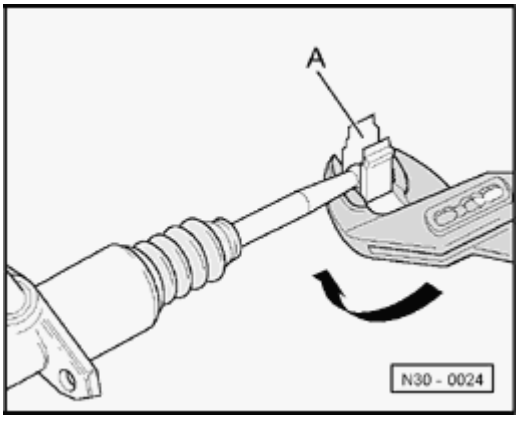

Fig. 24: Removing Retainer By Prying
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing master cylinder operating rod into retaining clip - A - (in direction of - arrow -).

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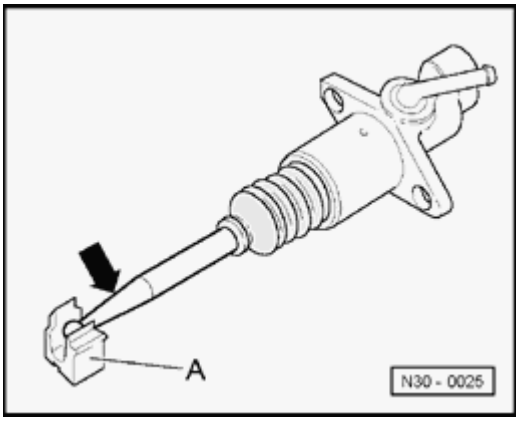

Fig. 25: Installing Clutch Master Cylinder Operating Rod In Retainer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Disconnecting slave cylinder from hose/line assembly

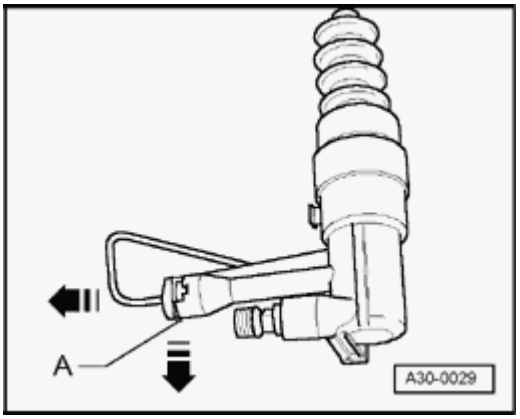

Fig. 26: Removing Hydraulic Line From Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- To remove hose/line assembly, use a screwdriver to pry off clip - **A** - as far as stop. Only then can the hose/line assembly be pulled out.

Installing

- Press retaining clip - **A** - in as far as it will go.
- Insert hose/line assembly in slave cylinder and make sure that it engages audibly.
- Pull on line/hose assembly to check it is secure.

Notes on removing and installing master cylinder and slave cylinder

- Before replacing the master cylinder or slave cylinder on the assumption that it is faulty, first perform a function check.

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- If slave cylinder is removed from transmission with hose/line assembly still attached, make sure you do not press clutch pedal. Otherwise, the piston will be pressed out of the slave cylinder and be destroyed.
- After installing the slave cylinder carefully press the clutch pedal. If an unusually strong point of pressure is felt when depressing the clutch pedal, do not press it down further. The push rod of the slave cylinder is likely to have been guided past the clutch release lever. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

Function check for master and slave cylinder

Before replacing the master or slave cylinder - in the case of the following faults - first perform the appropriate checks.

Noises when operating the clutch:

- First check the over-center spring / clutch pedal switch for noise.
- If you hear a noise, remove over-center spring and repeat check.
- Replace relevant component.

After releasing clutch pedal it still remains depressed / does not return to its initial position.

- Check whether clutch pedal returns all the way to its initial position, thereby uncovering the vent opening in the master cylinder.
- The ventilation opening must be uncovered, otherwise permanent self-ventilation for the hydraulic clutch system cannot function.
- The self-ventilation function of the clutch system can be impaired if the footwell trim or foot mats get trapped, if the clutch pedal switch jams or if the driver rests his foot on the clutch pedal for long periods of time.

Check the complete hydraulic system for external or internal leaks.

- Check brake fluid level in brake fluid reservoir.
- Check master and slave cylinder as well as the line/hose assembly including connecting points for external leaks (visual check).
- If leaks are identified replace the leaking component.
- Bleed clutch system --> **Clutch hydraulic system, bleeding**.

High pedal force:

- Clutch plate is worn (except for SAC)
- Mechanically faulty pressure plate/clutch plate --> **Clutch, servicing**

Pedal forces:

Conventional clutch: - Clutch lining when new: approx. 115 N- Clutch lining at wear limit: approx. 160 N

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SAC clutch: - Approx. 140 N higher for complete service life of the clutch

Clutch does not disengage or does not disengage fully:

- Air in hydraulic system: bleed clutch system --> **Clutch hydraulic system, bleeding** and check hydraulic system for external and internal leaks.
- Clutch plate does not run smoothly on input shaft splines
- Needle bearing in flywheel (centering bearing for input shaft) faulty, replace needle bearing --> **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK** .
- Foreign body in clutch system
- Mechanically faulty pressure plate/clutch plate --> **Clutch, servicing**
- Wrong components used or components forgotten when carrying out repair work (e.g. intermediate plate).

Master cylinder, removing and installing

Special tools, testers and auxiliary items required

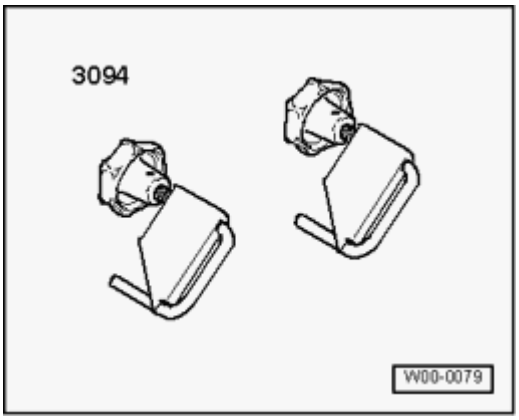

Fig. 27: Identifying Hose Clamps 3094
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp 3094
- Pliers V.A.G1922

Removing

Observe the notes on removing and installing clutch master cylinder and slave cylinder --> **Notes on removing and installing master cylinder and slave cylinder**.

CAUTION:

- **Follow steps required when disconnecting battery -->**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL for Cabriolet**

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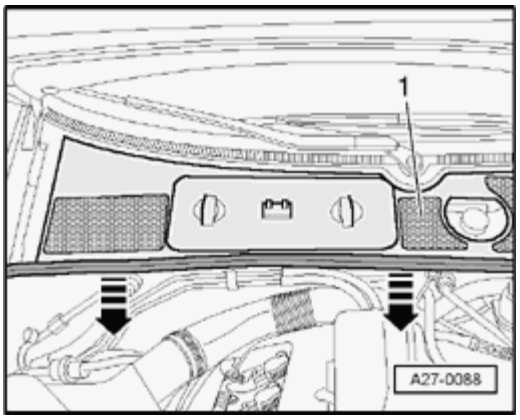

Fig. 28: Identifying Plenum Chamber Cover & Removing Rubber Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal on plenum chamber in direction of - **arrow** -.
- Remove cover - **1** - from plenum chamber.
- With ignition switched off, disconnect battery Ground (GND) strap -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

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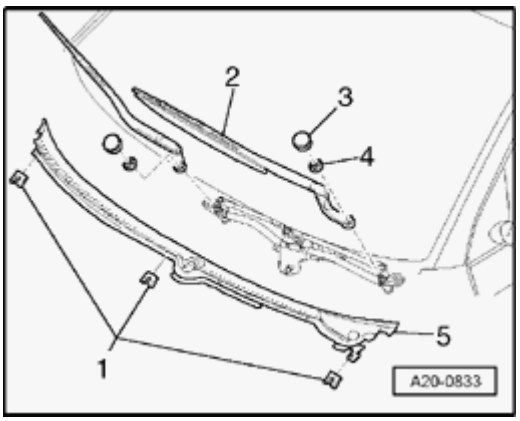

Fig. 29: Removing Securing Clips And Cowl
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use screwdriver to pry off two caps - **3** -.
- Remove nuts - **4** - and take off two wiper arms - **2** -.
- Pull off clips - **1** - and remove cowl panel grille - **5** -.

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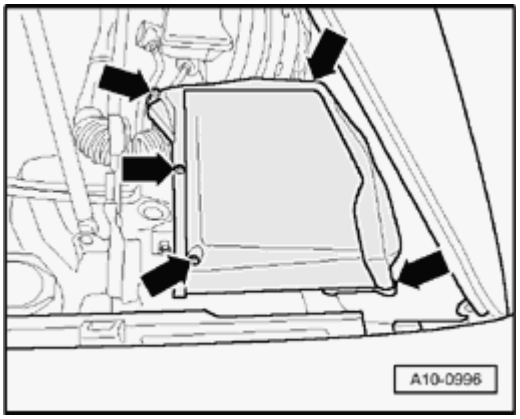

Fig. 30: Removing Screws And Cover From E-Box In Plenum Chamber
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Take electronics box out of plenum chamber as follows:

- Remove bolts - **arrows** - and take off cover.

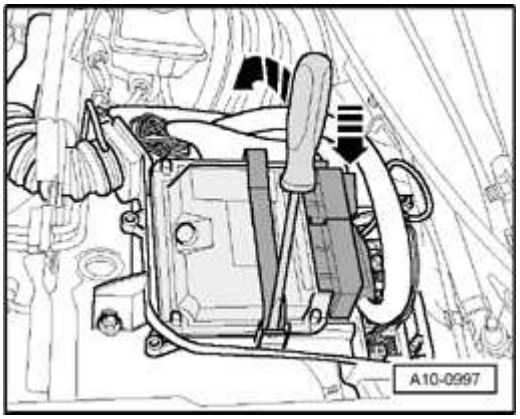

Fig. 31: Using Screwdriver To Remove Retainer Bar And Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use screwdriver to carefully pry off retaining strap - **arrow** -.
- Lay aside engine control module with connectors attached.

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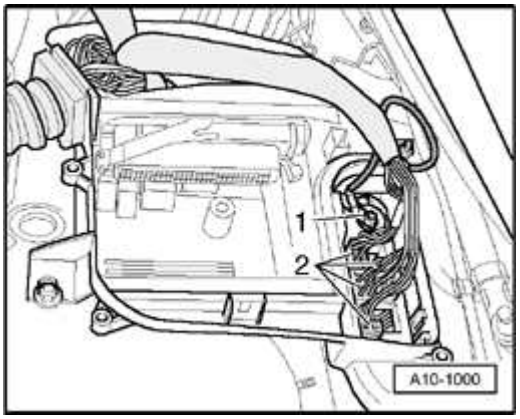

Fig. 32: Disconnecting Electrical Harness Connectors On Connector Station
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors - **2** - at console.
- Disconnect electrical wiring connection - **1** -.

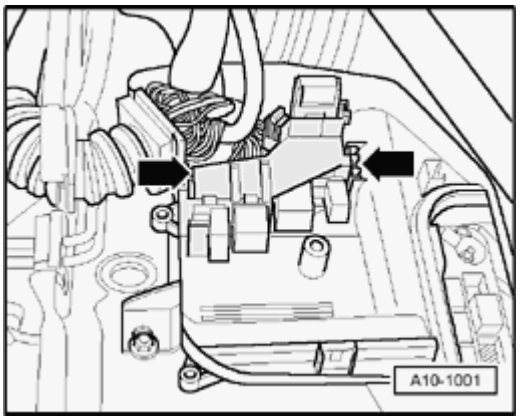

Fig. 33: Locating Auxiliary Relay Carrier Catches
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release catches - **arrows** - and lift auxiliary relay carrier out of electronics box.
- Pull engine wiring harness together with rubber grommet out through opening in electronics box.

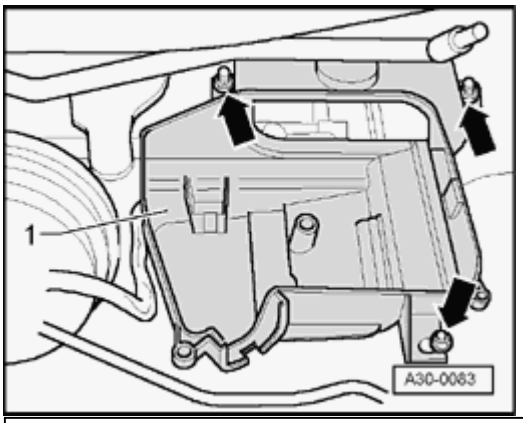

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Fig. 34: Electronics Box Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** - and lift out electronics box - **1** -.

NOTE:

- **In the following steps make sure that no brake fluid escapes into the plenum chamber or onto the transmission below. If this does happen, clean the affected area thoroughly.**
- **When performing work in the footwell, put cloths on the carpet to protect it from possible brake fluid spills.**

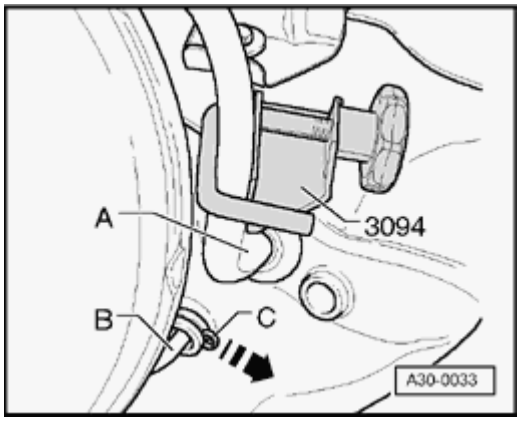

Fig. 35: Identifying Brake Fluid Reservoir Return Hose Grommet
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp supply hose - **A** - from brake fluid reservoir using hose clamp 3094. Disconnect hose from master cylinder and plug hose.
- Remove rubber grommet from bulkhead above connection line for supply hose.
- Pry out retaining clip - **C** - using a screwdriver and pull line/hose assembly - **B** - out slightly.

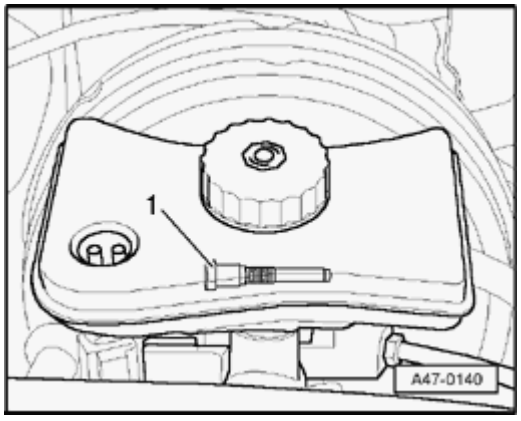

Fig. 36: Location Of Brake Fluid Reservoir Dowel Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove bolt for brake fluid reservoir - **1** - and disconnect connector for brake fluid level warning contact downward.

NOTE:

- **Brake fluid reservoir must not be removed.**

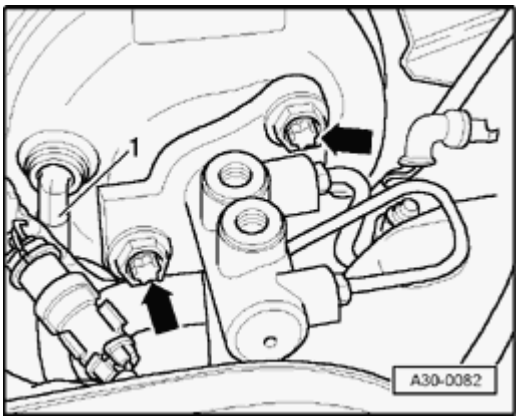

Fig. 37: Location Of Brake Servo Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove vacuum line to brake servo - **1** -.
- Remove two TORX bolts - **arrows** -.

NOTE:

- **To simplify the illustration, the brake fluid reservoir has not been included.**
- **The brake fluid reservoir must be moved slightly to the side in order to unscrew the upper TORX bolt.**

- Remove storage compartment on drivers side -->
  - **68 - INTERIOR EQUIPMENT**
  - **68 - INTERIOR EQUIPMENT** for Cabriolet

  .
- Removing over-center spring --> **Over-center spring, removing and installing**.

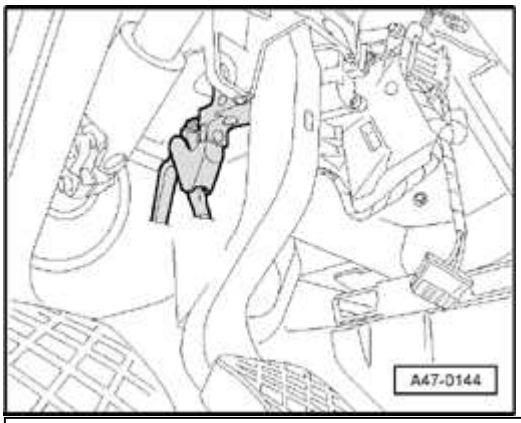

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Fig. 38: Brake Pedal At Brake Servo
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect brake pedal from brake servo --> **47 - BRAKES - HYDRAULIC COMPONENTS** .

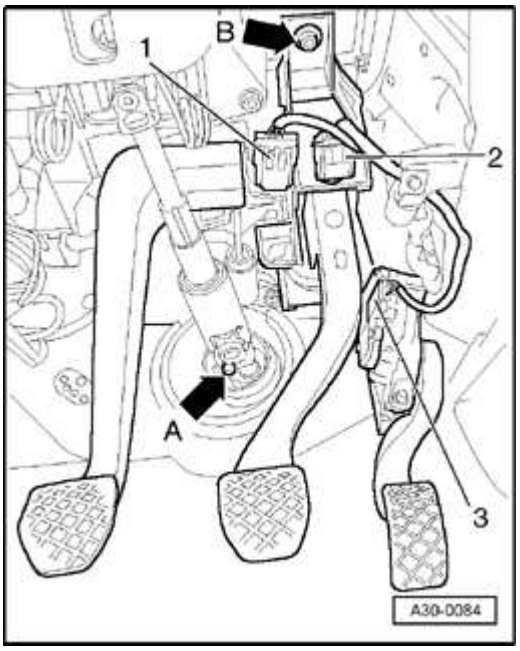

Fig. 39: Locating Steering Column At Steering Gear And Disconnecting Connector On Clutch Pedal Switch, Brake Pedal Switch And On Accelerator Pedal Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect steering column from steering gear - **arrow A** - --> **48 - STEERING** .
- Disconnect connectors from clutch pedal switch F36 - **1** - , brake light switch F - **2** - and accelerator pedal module - **3** -.
- If installed, disconnect connector from clutch pedal switch for engine start F194.
- Remove securing bolt for mounting bracket - **arrow B** - and remove entire pedal cluster.

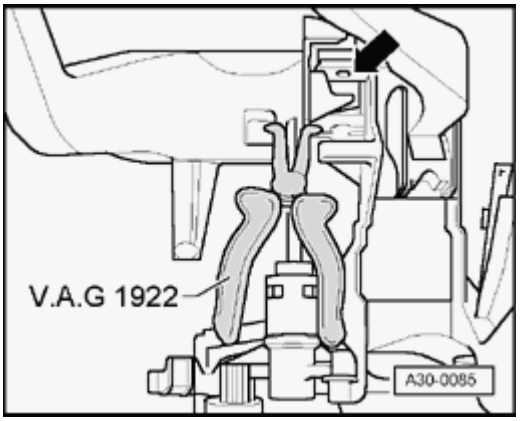

Fig. 40: Pressing Retainer Together And Detaching Clutch Pedal From Master Cylinder Using VAG 1922

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Release master cylinder operating rod from clutch pedal as follows:

NOTE:

- **When releasing the operating rod, make sure that clutch pedal does not collide with mounting bracket for clutch pedal switch - arrow -. The mounting bracket could otherwise break off.**

- Position spark plug connector pliers V.A.G1922 in clutch pedal recesses, press on sides of retaining clip and disconnect clutch pedal from master cylinder.

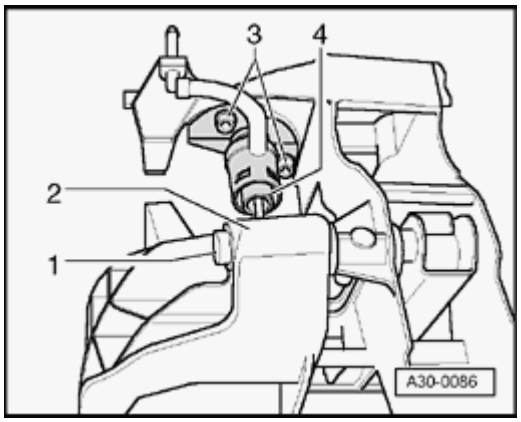

Fig. 41: Identifying Retaining Clip, Clutch Pedal, Bolts And Master Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove retaining clip - **1** - and remove clutch pedal - **2** -.
- Remove bolts - **3** - and remove master cylinder - **4** -.

Installing

Installation is in reverse order of removal. Note the following:

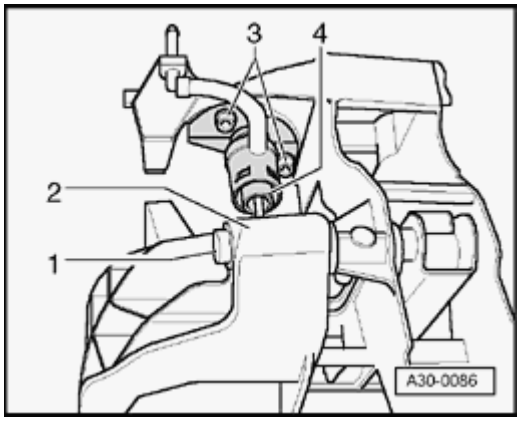

Fig. 42: Identifying Retaining Clip, Clutch Pedal, Bolts And Master Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Insert master cylinder - **4** - and tighten bolts - **3** - to 20Nm.

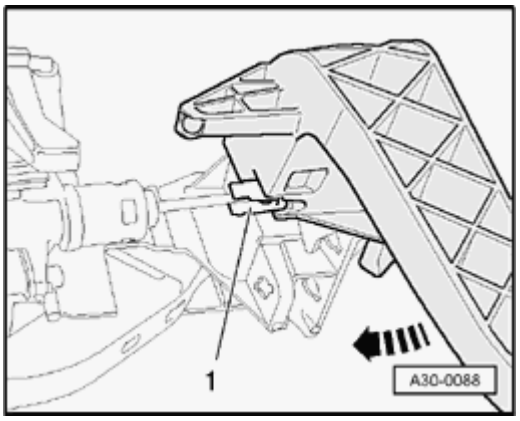

Fig. 43: Pushing Clutch Pedal To Lock Into Place, While Making Sure Mount Is Properly Secured In Clutch Pedal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert retaining clip - **1** - in clutch pedal.
- Lock clutch pedal in position by pressing in direction of - **arrow** -. Make sure retaining clip - **1** - engages correctly in clutch pedal.

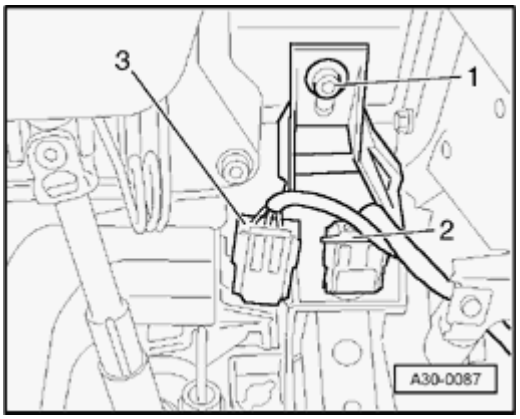

Fig. 44: Location Of Clutch Pedal Switch F36 And Pedal Assembly Securing Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A second technician is required for the next step.

- Insert entire pedal cluster and tighten bolt - **1** - by hand. Second technician must guide hose/line assembly into master cylinder from plenum chamber.

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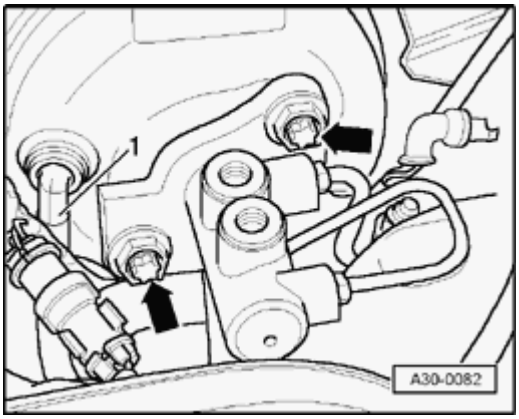

Fig. 45: Location Of Brake Servo Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts for brake servo - **arrows** - to 25 Nm.

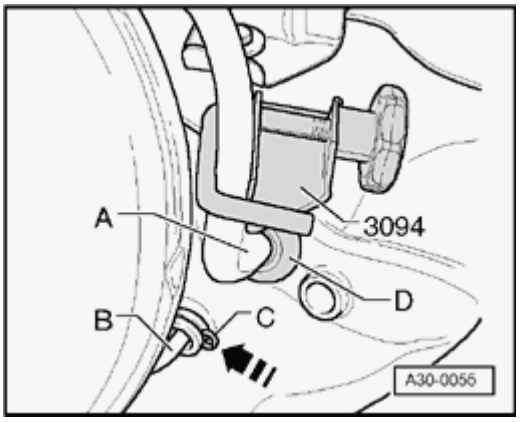

Fig. 46: Installing Rubber Grommet And After-Run Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in retaining clip - **C** - as far as it will go.
- Insert hose/line assembly - **B** - in master cylinder and make sure that it engages audibly.
- Install rubber grommet - **D** - onto connecting line for supply hose - **A** - at bulkhead.
- Push supply hose - **A** - from brake fluid reservoir on as far as it will go.

- Remove hose clamps 3094.

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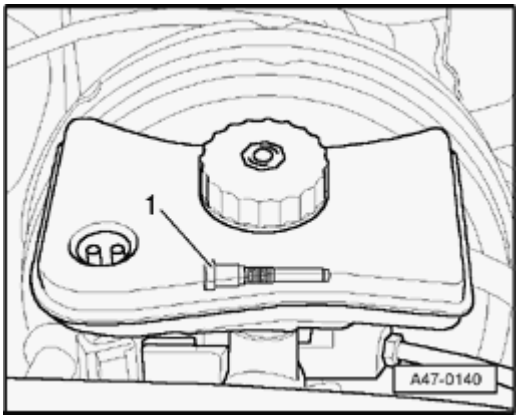

Fig. 47: Location Of Brake Fluid Reservoir Dowel Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten securing bolt - **1** - for brake fluid reservoir and connect connector at brake fluid level warning contact.

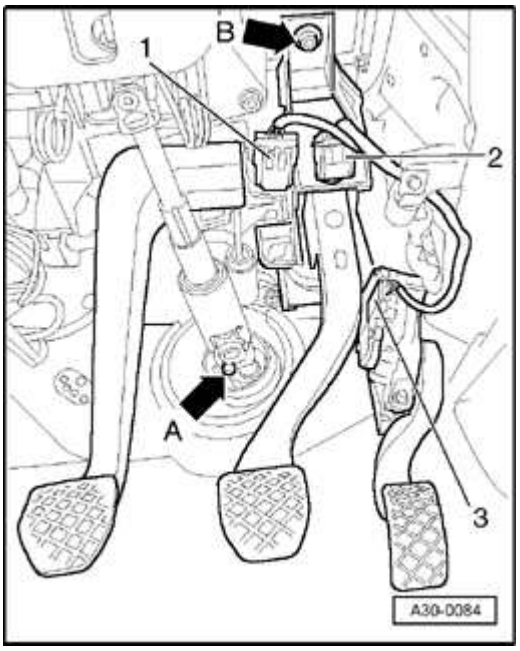

Fig. 48: Locating Steering Column At Steering Gear And Disconnecting Connector On Clutch Pedal Switch, Brake Pedal Switch And On Accelerator Pedal Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten hex socket head bolt - **arrow B** - for securing pedal cluster to instrument panel carrier to 25Nm.
- Connect connectors - **1** - , - **2** - and - **3** -.
- If installed, connect connector for Clutch Pedal Starter Interlock Switch F 194.
- Connect brake pedal to brake servo --> **47 - BRAKES - HYDRAULIC COMPONENTS** .

- Secure steering column to steering gear - **arrow A** - --> **48 - STEERING** .

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- Install over-center spring.
- Install storage compartment on drivers side -->
  - **68 - INTERIOR EQUIPMENT**
  - **68 - INTERIOR EQUIPMENT** for Cabriolet

  .
- Bleed clutch system --> **Clutch hydraulic system, bleeding**.

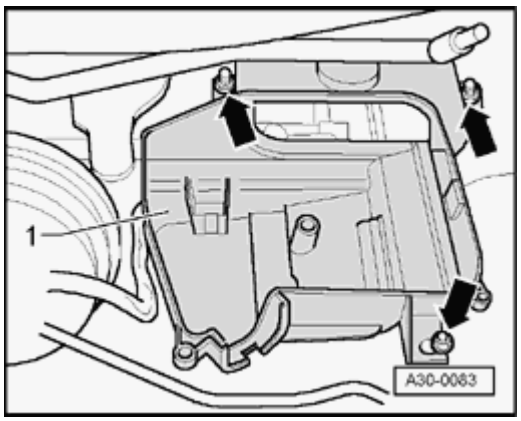

Fig. 49: Electronics Box Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert electronics box and tighten nuts - **arrows** - to 4Nm.
- Route engine wiring harness and plug in connector in connector console.
- Install engine control unit --> **24 - MULTIPORT FUEL INJECTION (MFI)** or **24 - FUEL INJECTION SYSTEM** .
- If applicable, install auxiliary relay carrier and auxiliary fuse carrier -->
  - **97 WIRING**
  - **97 WIRING** for Cabriolet

  .
- Press on cover (hand-tight) and tighten bolts in diagonal sequence to 4Nm.
- Follow steps required after connecting battery -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

  .

Clutch hydraulic system, bleeding

Special tools, testers and auxiliary items required

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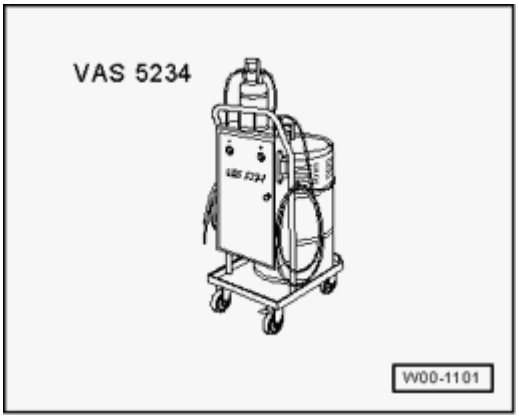

Fig. 50: Identifying Brake Filler And Bleeder Unit VAS 5234
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Brake filler and bleeder unit VAS 5234

Brake fluid specification --> **47 - BRAKES - HYDRAULIC COMPONENTS** .

Procedure

NOTE:

- **Open the bleeder valve before switching on the bleeding appliance.**
- **When performing the following steps, make sure that no brake fluid escapes onto the transmission.**
- **The clutch system must be bled after performing work on the hydraulic clutch mechanism.**
- **Before bleeding the clutch system, pull out clutch pedal and top off brake fluid to "Max" marking on brake fluid reservoir.**
- **The clutch system should be bled at the same intervals as the brake system.**

- Connect brake filler and bleeder unit VAS 5234, but do not switch on at this stage.
- If installed, remove sound insulation beneath transmission.

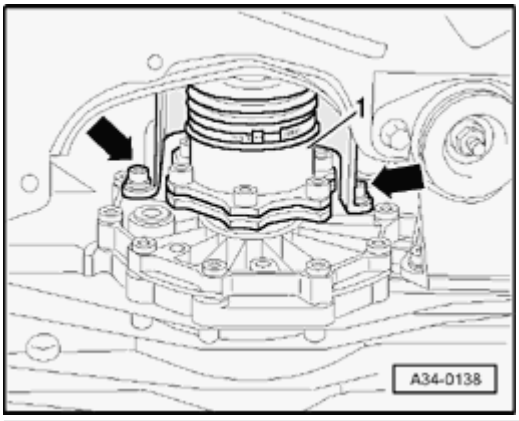

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Fig. 51: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove heat shield - **arrows** - for drive axles (left-side).

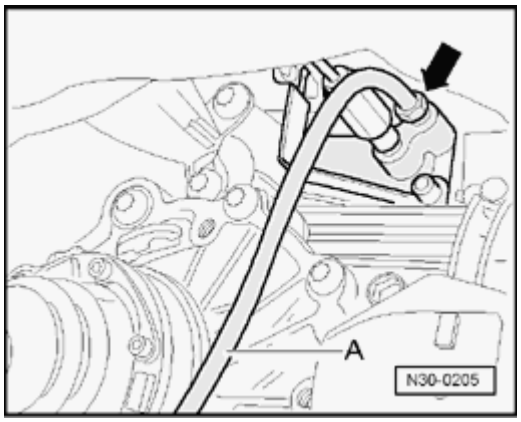

Fig. 52: Connecting Bleeder Hose To Clutch Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect bleeder hose - **A** - to slave cylinder - **arrow** - and open bleeder valve.
- Connect bleeder hose to pressure hose of fluid collector bottle.
- Switch on bleeder appliance and allow about 100cm^3 of brake fluid to drain out.

- Operating pressure 2.5 bar

NOTE:

- **Make sure bleeder hose is correctly installed during bleeding operation.**

- Close bleeder valve and tighten to4.5Nm.
- Depress clutch pedal several times after bleeding process is completed.
- Repeat bleeding procedure if necessary.
- If installed, screw heat shield for drive axle (left-side) onto transmission.

Tightening torques

Component		Nm
Heat shield for drive axle to transmission		23

CLUTCH RELEASE MECHANISM, SERVICING

Clutch release mechanism, servicing

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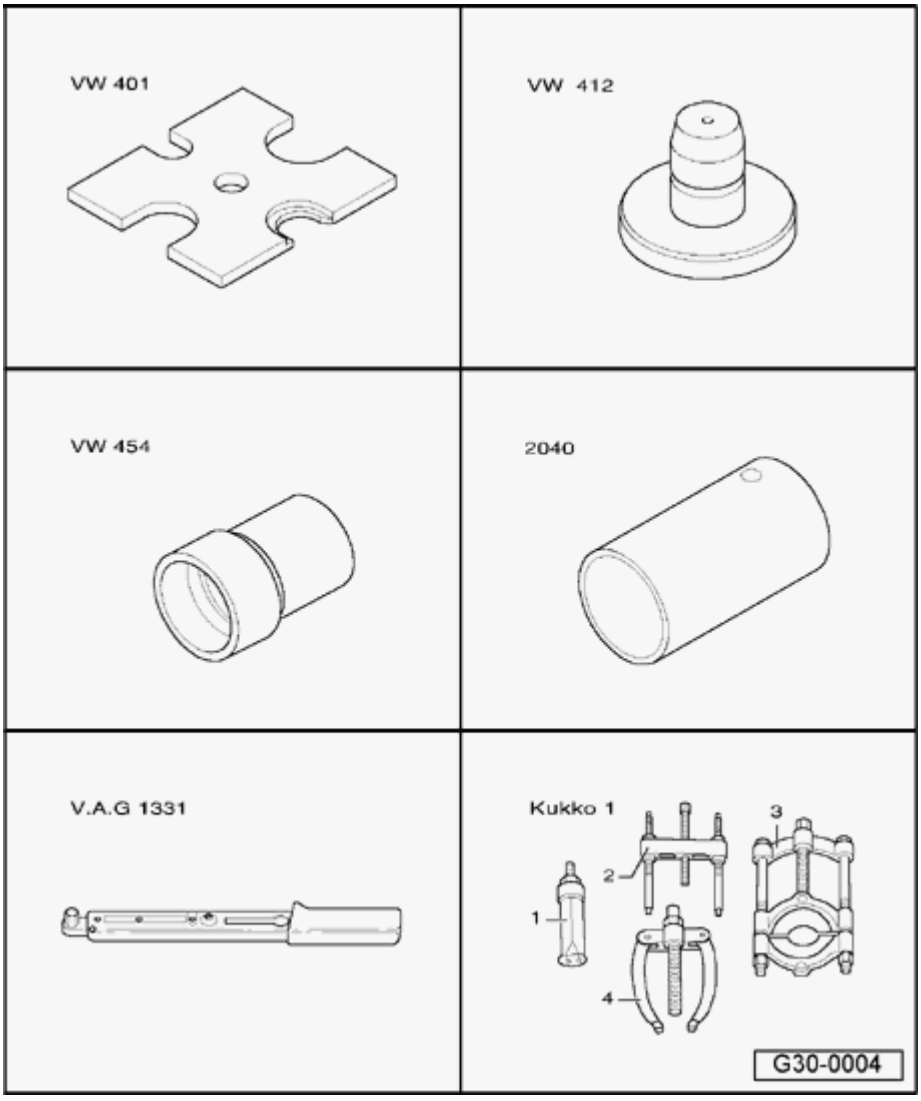

Fig. 53: Identifying Special Tools -- Clutch Release Mechanism, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust disc VW 412
- Thrust tube VW 454
- Tube 2040

- Torque wrench V.A.G 1331
- **- 1 -** Internal puller Kukko 21/4
- **- 4 -** Counter-support Kukko 22/1
- **Locking fluid AMV 185 101 A1**

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- **Sealing grease G 052 128 A1**
- **Copper grease Z 381 351 TE**
- **Adhesive AMV 195 KD1 01**

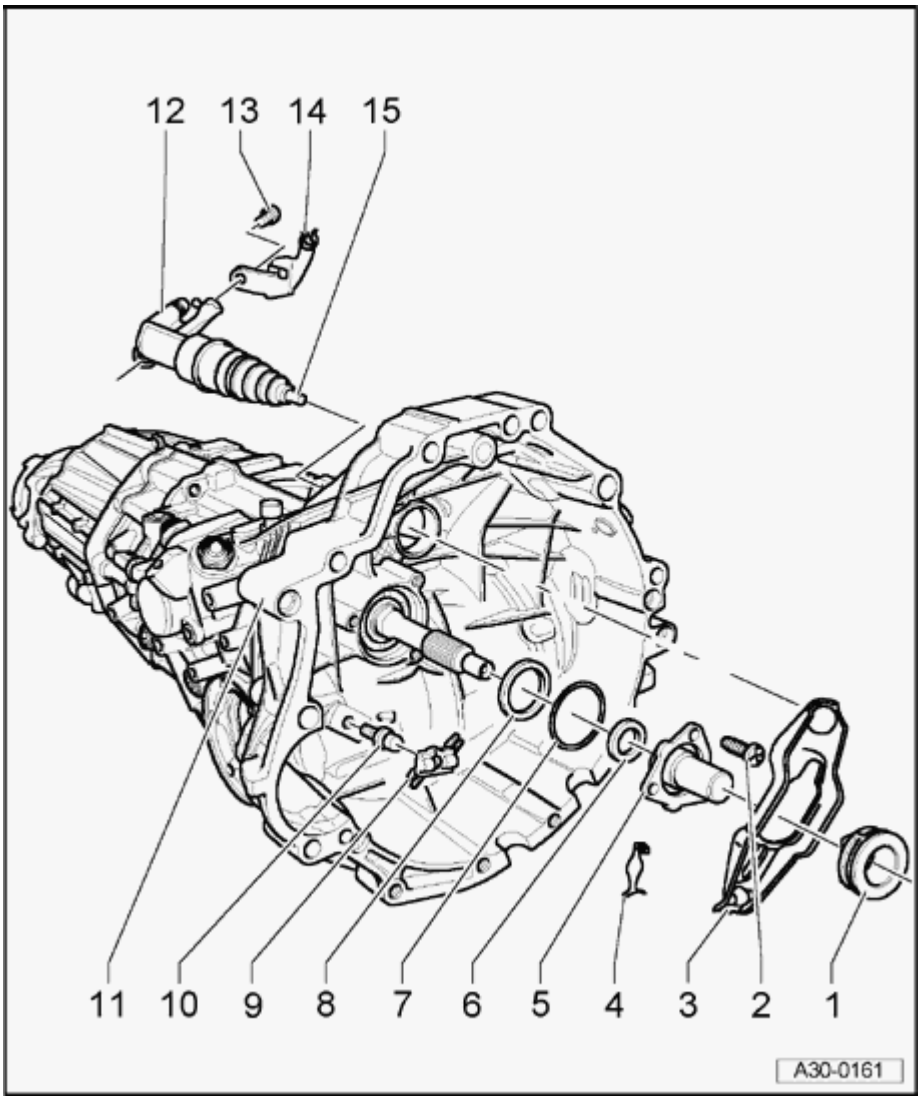

Fig. 54: Clutch Release Mechanism Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Release bearing

- Do not wash out; wipe clean only
- Replace bearings if noisy
- Servicing release bearing with glued plastic ring **Checking and servicing release bearing with glued plastic ring**
- Checking release bearing with mechanically attached plastic ring **Checking release bearing with mechanically attached plastic ring**

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- Replace if running mark (groove) is too deep **Checking release bearing with mechanically attached plastic ring**
- Retainer tabs on release bearing must engage in release lever

2 - TORX bolt, 35 Nm

- 3x
- Apply **locking fluid AMV 185 101 A1** when installing

3 - Clutch release lever

- Before installing, lubricate area which makes contact with operating rod of slave cylinder with **copper grease Z381351TE** .

4 - Retaining spring

- Secure to clutch release lever

5 - Guide sleeve

- Installation position: Oil drain hole points downward.
- Before removing and installing, cover input shaft splines with a shrink-fit hose to protect oil seal.

6 - Seal

- For input shaft
- Pack space between sealing lip and dust lip half full with **sealing grease G 052 128 A1** .

7 - O-ring

- Always replace

8 - Convex washer

9 - Intermediate piece

- Installation position: insert locating element between ribs of housing

10 - Ball head stud

- Lubricate with MoS_2 grease.

11 - Transmission

12 - Slave cylinder

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- Removing and installing --> **Slave cylinder, removing**
- Do not operate clutch pedal after slave cylinder has been removed.
- Follow correct procedure when bleeding --> **Clutch hydraulic system, bleeding**.
- Tighten bleeder valve to 4.5Nm.
- When installing push in until the securing bolt can be installed.

13 - Hex socket head bolt -23 Nm-

- Self-locking
- Replace

14 - Bracket

- For line/hose assembly
- Bolt to transmission with slave cylinder

15 - Operating rod

- Lubricate end of operating rod with **copper grease Z381351TE** .

Checking and servicing release bearing with glued plastic ring

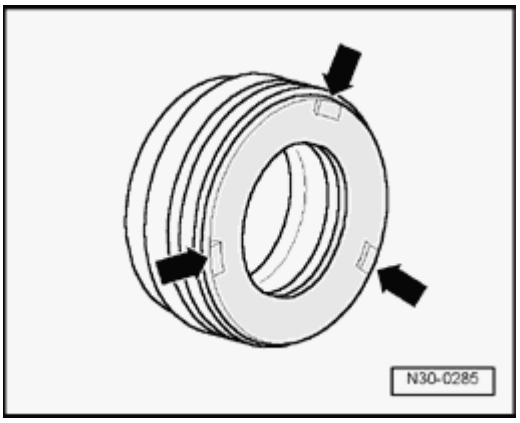

Fig. 55: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Identification: inner side of plastic ring has three tabs - **arrows** -.

The plastic ring - **arrows** - may come loose from the release bearing when the transmission or release bearing is removed. The release bearing does not have to be replaced if this happens.

- Before installing the transmission, glue loose plastic ring back onto bearing with **adhesive AMV195KD101** .

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Three square tabs - **arrows** - of the plastic ring engage in recesses of the bearing ring.

- The release bearing must be replaced if the groove worn on the plastic ring is deeper than 0.8 mm.

Checking release bearing with mechanically attached plastic ring

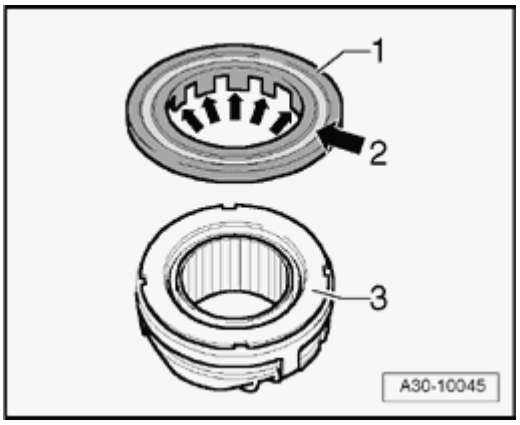

Fig. 56: Checking Release Bearing With Plastic Ring Attached
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Identification: retaining tabs around plastic ring - **arrows** -.

- The release bearing must be replaced if the plastic ring - **1** - has come loose.
- The release bearing - **3** - must be replaced if the groove - **arrow2** - worn on the plastic ring - **1** - is deeper than 0.8mm.

Pulling oil seal out of guide sleeve

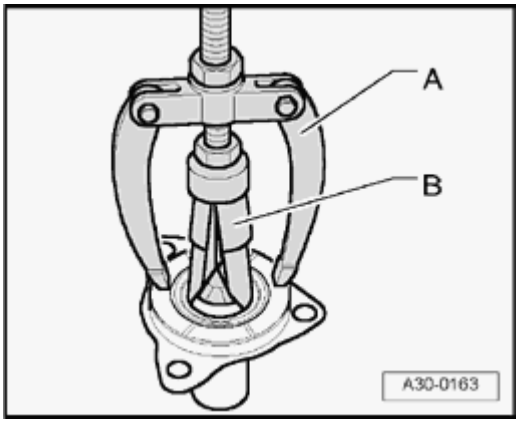

Fig. 57: Pulling Oil Seal Out Of Guide Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/1

B - Internal puller 23.5 to 30 mm, e.g. Kukko 21/4

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Pressing oil seal into guide sleeve (press in onto stop)

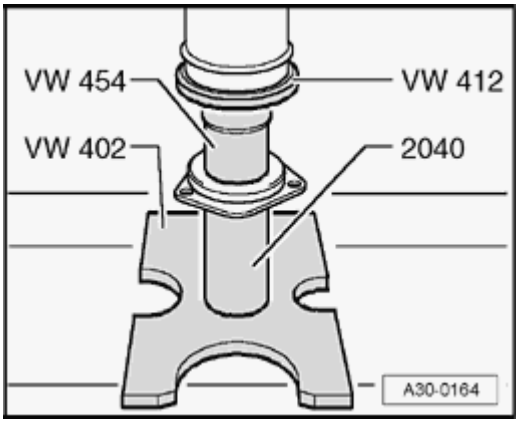

Fig. 58: Pressing Oil Seal Into Guide Sleeve (Press In Onto Stop)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **The open side of seal faces toward thrust tube VW 454.**

Slave cylinder, removing

Observe the notes on removing and installing clutch master cylinder and slave cylinder --> **Notes on removing and installing master cylinder and slave cylinder**.

Special tools, testers and auxiliary items required

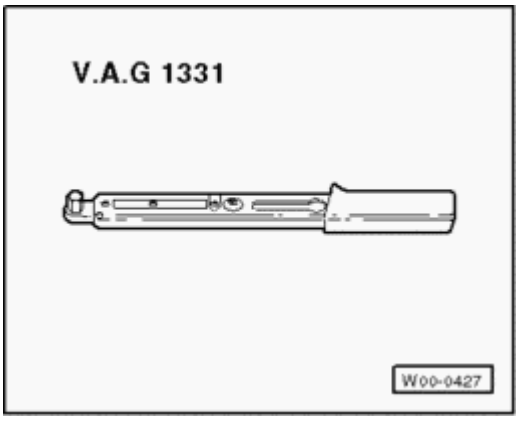

Fig. 59: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331
- **Lithium grease G052150A2**
- **Copper grease Z381351TE**

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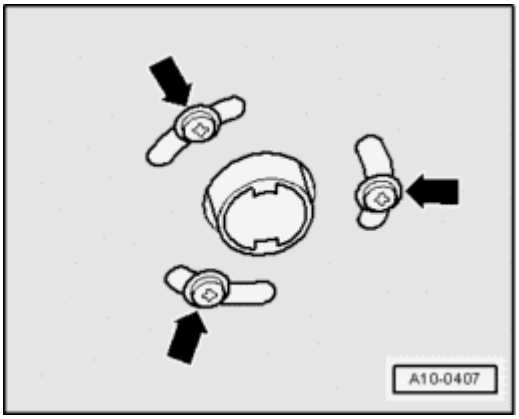

Fig. 60: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- On vehicles equipped with auxiliary heater, remove bolts - **arrows** - securing exhaust pipe of auxiliary heater to sound insulation.

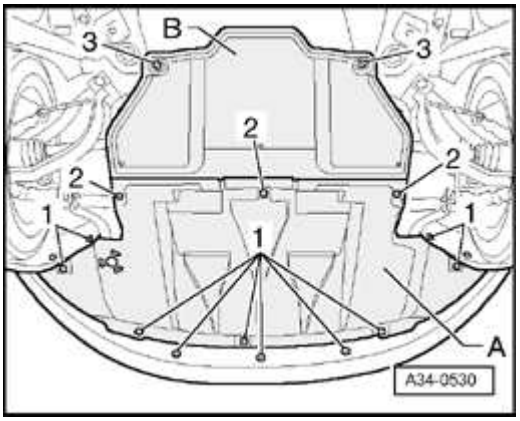

Fig. 61: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

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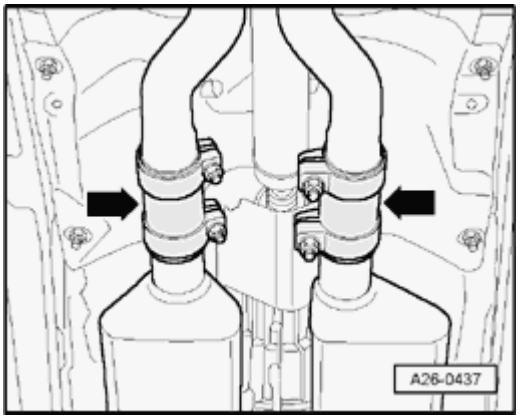

Fig. 62: Exhaust System Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 6-cylinder engine:

- Disconnect exhaust system at clamp (left-side) - **left arrow** -.

NOTE:

- **The flexible pipe connection (de-coupling element) in the front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.**

- Remove front exhaust pipe (left-side) with catalytic converter --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

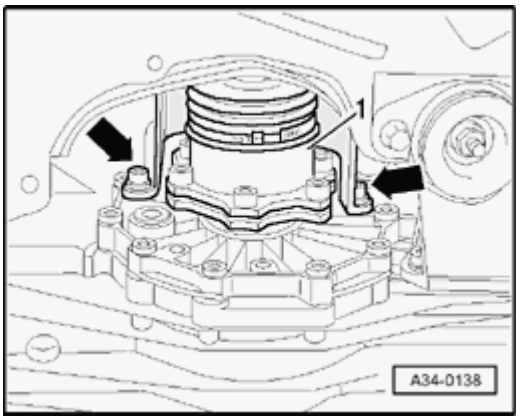

Fig. 63: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for drive axle (left-side).

Continued for all vehicles:

- Remove drive axle (left-side) - **1** - from flange shaft and move to front, making sure you do not damage surface protection.

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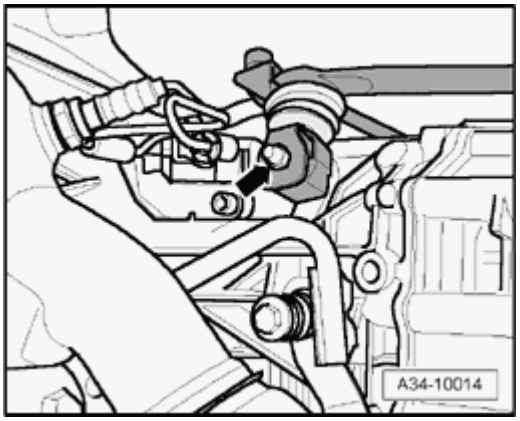

Fig. 64: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **arrow** - and detach selector shaft lever from selector shaft.

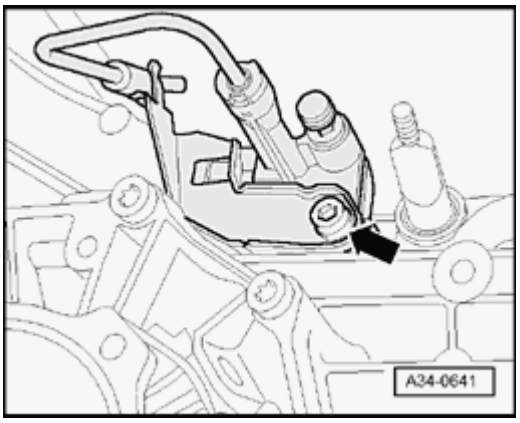

Fig. 65: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - and take out slave cylinder from rear.

NOTE:

- **Do not depress clutch pedal after removing slave cylinder. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.**

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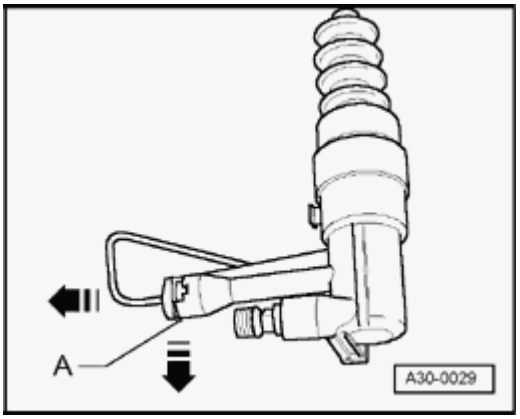

Fig. 66: Removing Hydraulic Line From Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove hose/line assembly, use a screwdriver to pry off clip - **A** - as far as stop. Only then can the hose/line assembly be pulled out.

Installing

Installation is in reverse sequence or removal. Note the following:

NOTE:

- **Do not allow brake fluid to come into contact with the transmission. If necessary, clean the transmission housing.**
- **If the slave cylinder is inserted at an angle, there is a danger that the operating rod will be guided past the clutch release lever.**
- **When installing, press in slave cylinder so that securing bolt can be installed easily.**
- **Always replace securing bolt.**

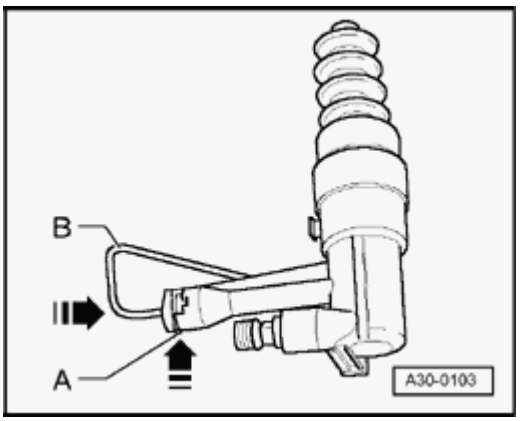

Fig. 67: Identifying Slave Cylinder Hose/Line Assembly
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To connect line to slave cylinder, press in retaining clip - **A** - as far as it will go.

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- Push line - **B** - into slave cylinder until it engages audibly.

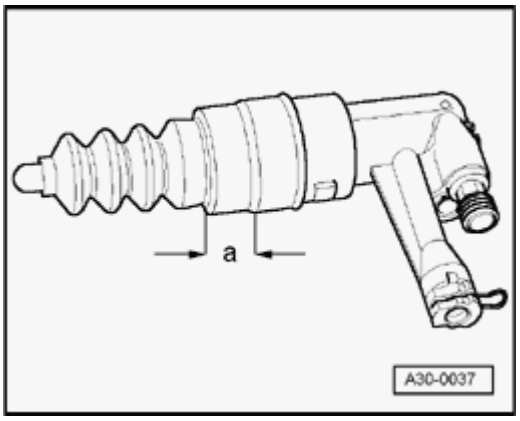

Fig. 68: Coat Boot Area Of Clutch Slave Cylinder With Lithium Grease
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before inserting slave cylinder in transmission housing, lubricate area - **a** - of sleeve with **lithium grease G052150A2** .
- Lightly lubricate surface where operating rod and clutch release lever make contact with **copper grease Z381351TE** .

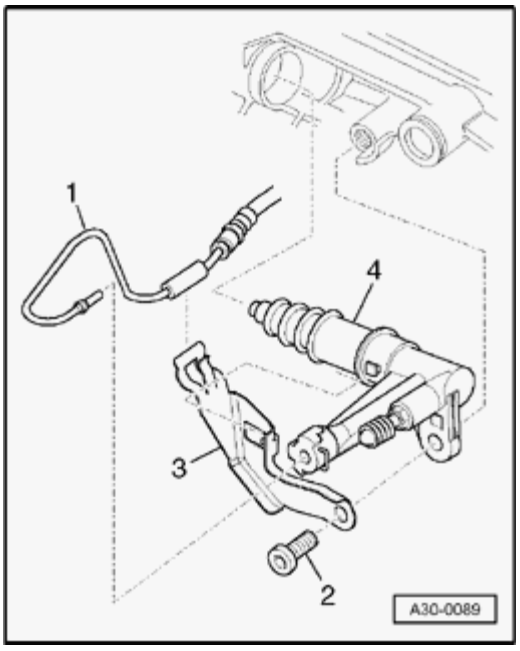

Fig. 69: Clutch Slave Cylinder, Bracket And Hose/Line Assembly
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach bracket for hose/line assembly - **3** - to slave cylinder - **4** -.

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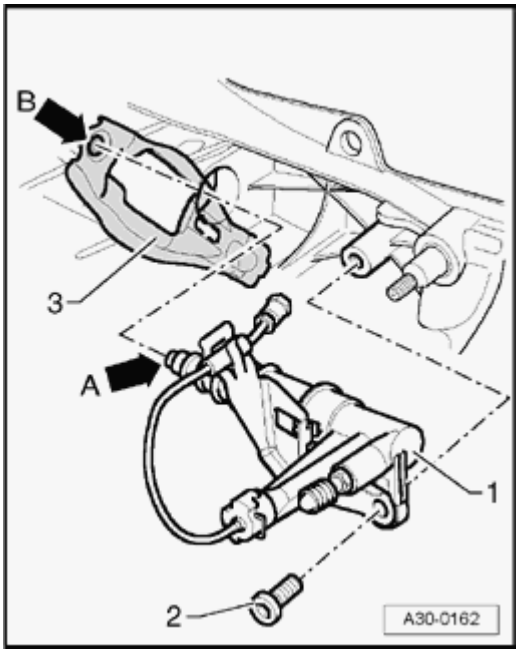

Fig. 70: Guiding Slave Cylinder Into Bore Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Guide slave cylinder - **1** - into opening in transmission housing keeping it as straight as possible (without tilting operating rod - **arrow A** -) and insert in recess - **arrow B** - on clutch release lever - **3** -.
- Use new hex socket head bolt - **2** - to secure to transmission.

NOTE:

- **If the slave cylinder - 1 - is inserted at an angle, there is a danger that the operating rod - arrow A - will be guided past the clutch release lever - 3 -.**
- **After installing the slave cylinder carefully press the clutch pedal. If you feel an unusually strong point of resistance when depressing the clutch pedal, you must not press it down further. The push rod of the slave cylinder is likely to have been guided past the clutch release lever. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.**

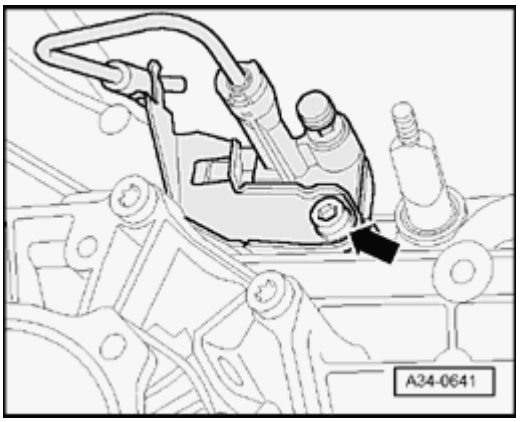

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Fig. 71: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolt - **arrow** - to specified torque.
- If line-hose assembly was disconnected at slave cylinder, the clutch system has to be bled after installing slave cylinder --> **Clutch hydraulic system, bleeding**.

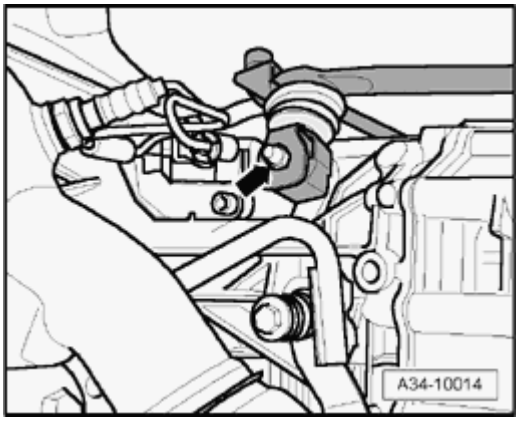

Fig. 72: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install selector shaft lever and tighten nut - **arrow** -.
- Bolt drive axle (left-side) to flange shaft --> **40 - FRONT SUSPENSION**

Vehicles with 6-cylinder engine:

- Screw heat shield for drive axle (left-side) onto transmission.
- Install exhaust system and perform stress-free alignment --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

Tightening torques

Component	Nm
Slave cylinder to transmission* See note	23
Selector shaft lever to transmission	23
Heat shield for drive axle to transmission	23

* Replace bolt

CLUTCH, SERVICING

Clutch, servicing

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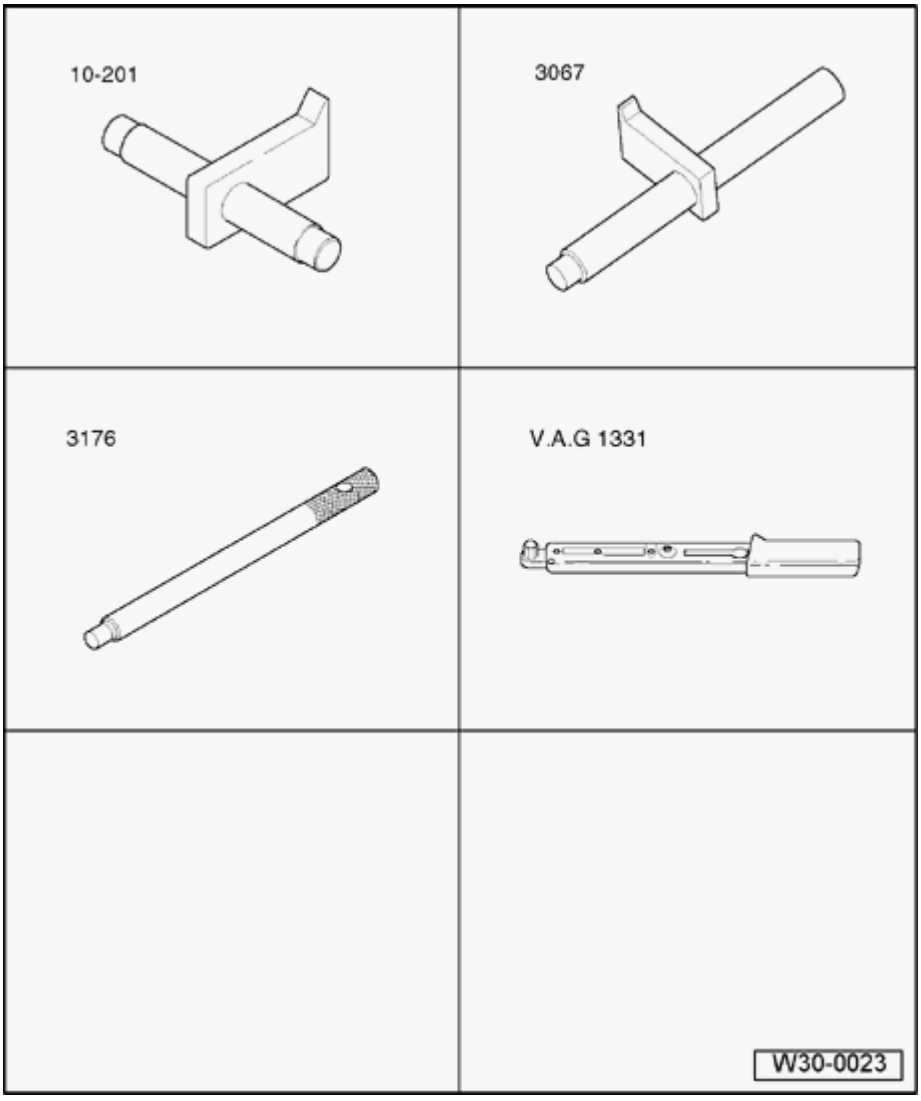

Fig. 73: Identifying Special Tools - Clutch, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Counterhold tool 10 - 201
- Counterhold tool 3067
- Centering mandrel 3176
- Torque wrench V.A.G 1331

- **Grease for clutch plate splines G 000 100**

NOTE:

- **Refer to general repair instructions --> General repair instructions.**
- **Observe the notes on removing and installing master cylinder and slave cylinder --> Notes on removing and installing master cylinder and slave**

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cylinder.

- **On vehicles with SAC pressure plate (self-adjusting clutch, LuK version) an adjuster ring has to be reset when only the clutch plate is replaced --> Adjuster ring in SAC clutch pressure plate, resetting.**
- **To avoid damaging SAC pressure plate when removing and installing, observe assembly instructions for SAC pressure plate --> Clutch with SAC pressure plate, removing and installing.**
- **Check that SAC pressure plate is not distorted Check SAC pressure plate for warpage, cracks and burns.**
- **If the vehicle is fitted with a self-adjusting clutch (Sachs version), the clutch plate and pressure plate can only be replaced together --> Self-adjusting clutch (Sachs version), servicing.**
- **replace clutch plate and pressure plate if riveted fastening is damaged or loose.**
- **Select the correct clutch plate and pressure plate according to engine code**
- **To avoid damaging dual-mass flywheel during removal, please observe instructions for removal Removing dual-mass flywheel**
- **Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease for clutch plate splines G000100 to the splines. Then move clutch plate backward and forward on the input shaft until hub moves freely on shaft. It is important to remove excess grease.**
- **Pressure plates have an anti-corrosion coating and are greased. Only the contact surface may be cleaned, otherwise the service life of the clutch will be considerably reduced.**
- **If the clutch has burned out, thoroughly clean the bell housing, flywheel and parts of the engine facing the transmission in order to prevent odors.**

Servicing conventional clutch --> **Conventional clutch, servicing**

Servicing self-adjusting clutch (Sachs version) --> **Self-adjusting clutch (Sachs version), servicing**

Servicing clutch with SAC pressure plate (LuK version) --> **Clutch with SAC pressure plate (LuK version), servicing**

Conventional clutch, servicing

- Please refer to notes --> **Clutch, servicing**.
- Remove transmission to work on clutch --> **Transmission, removing and installing**.

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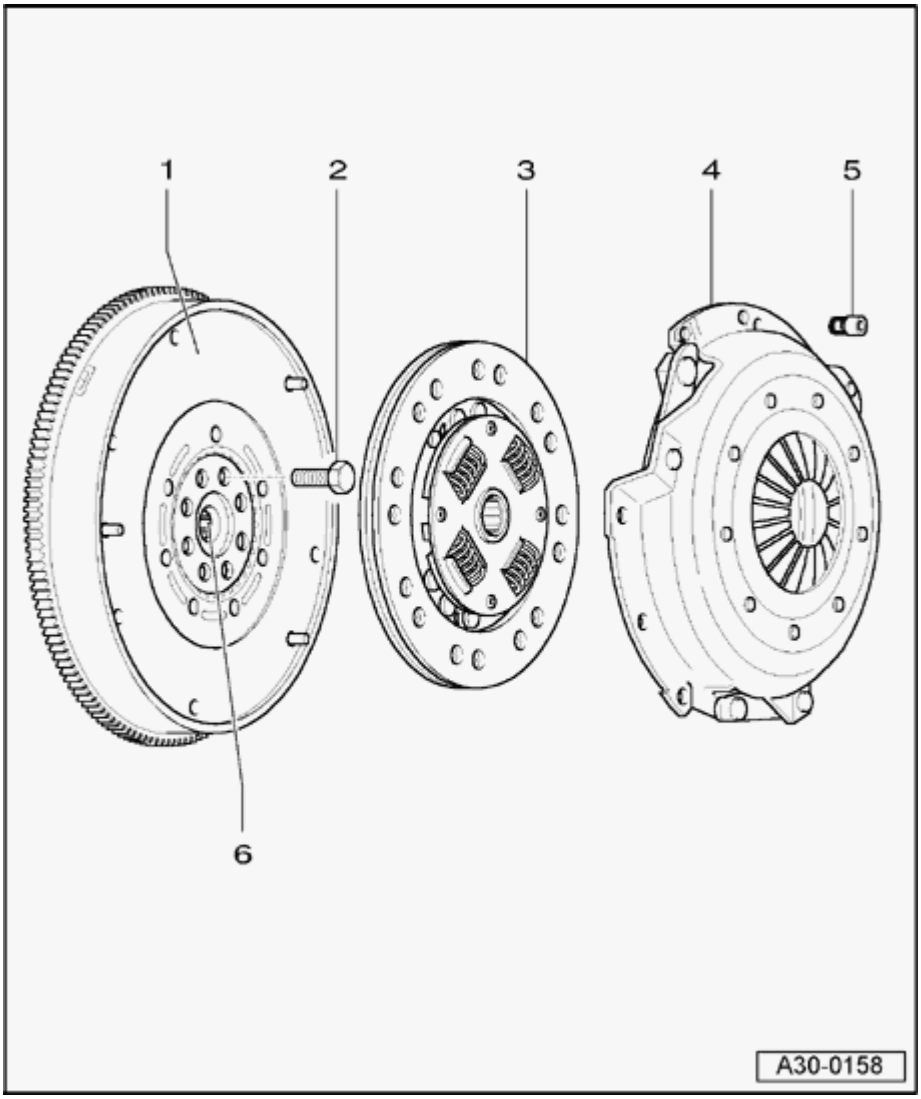

Fig. 74: Conventional Clutch Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Flywheel/dual mass flywheel

- Ensure that dowel pins fit tightly
- Contact surface for clutch lining must be free of grooves, oil and grease
- Removing and installing --> **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK**

2 - Bolt for flywheel

- Always replace
- Bolt length: 22.5 mm; 60 Nm plus an additional 90° $^{1}/_{4}$ turn
- Bolt length: 43 mm; 60 Nm plus an additional 180° $^{1}/_{2}$ turn

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3 - Clutch plate

- Installation position: Clutch lining must make full contact with flywheel
- Marking "Getriebeseite" (transmission side), if provided, faces pressure plate/transmission.
- Coil springs (damper assembly) point toward pressure plate and transmission
- Centralize **Centralizing clutch plate and removing and installing pressure plate**
- Clutch plate diameter --> **Code letters, allocation, transmission ratios, capacities**

4 - Pressure plate

- Removing and installing **Centralizing clutch plate and removing and installing pressure plate**
- Check ends of diaphragm spring **Checking ends of diaphragm spring**
- Check spring connection and rivets **Checking spring connection and rivet**
- Check wire ring **Checking wire ring**

5 - Bolt -22 Nm-

- Loosen and tighten gradually in several stages and in diagonal sequence

6 - Needle bearing

- Removing and installing --> **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK**

Centralizing clutch plate and removing and installing pressure plate

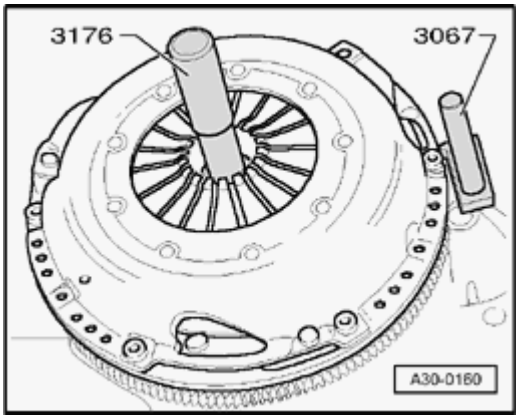

Fig. 75: Changing Over Flywheel Retainer 3067
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen and tighten bolts gradually in several stages and in diagonal sequence.
- To remove, reverse position of counter-hold tool 3067 or counter-hold tool 10 - 201.

Installation position of clutch plate: coil springs (damper assembly) or marking "Getriebeseite" point toward

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pressure plate and transmission.

- Before tightening securing bolts, clutch lining and contact surface of pressure plate must make full contact with flywheel.

Checking ends of diaphragm spring

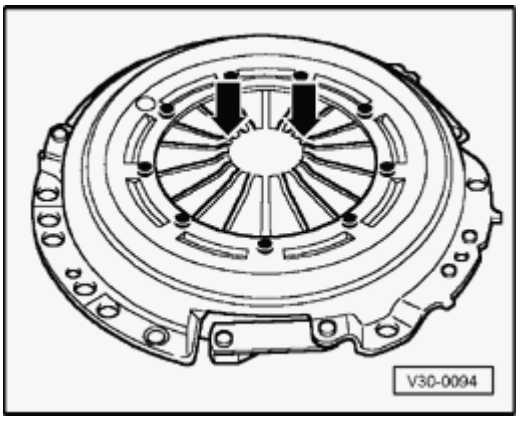

Fig. 76: Checking Ends Of Diaphragm Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Wear up to half the thickness of the diaphragm spring is permitted.

NOTE:

- **When performing repairs, always match the correct clutch pressure plate and clutch plate by checking engine code.**

Checking spring connection and rivet

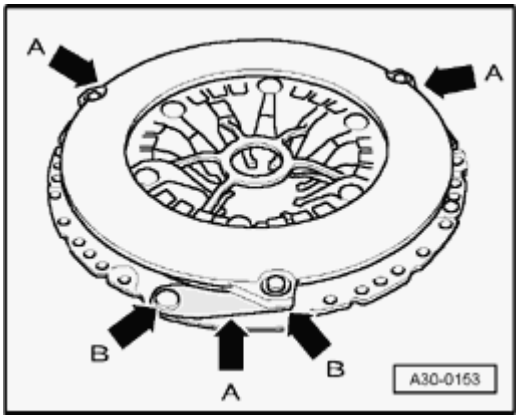

Fig. 77: Checking Spring And Rivet Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check spring connections - **arrows A** - for damage and make sure riveted fastenings - **arrows B** - are seated tightly.

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NOTE:

- **replace pressure plate if spring connections are broken or badly bent, or if riveted fastenings are loose.**

Checking wire ring

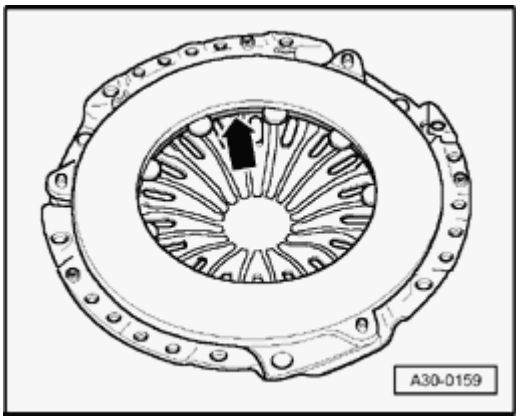

Fig. 78: Identifying Wire Ring In Thrust Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check that wire ring in pressure plate - **arrow** - is not damaged. Replace pressure plate if wire ring is broken.

Self-adjusting clutch (Sachs version), servicing

CAUTION: On this type of clutch the pressure plate and clutch plate can only be replaced together.

- Please refer to notes --> **Clutch, servicing**.
- Remove transmission to work on clutch--> **Transmission, removing and installing**.
- Identification **Identification**
- Select correct clutch plate and pressure plate according to engine code

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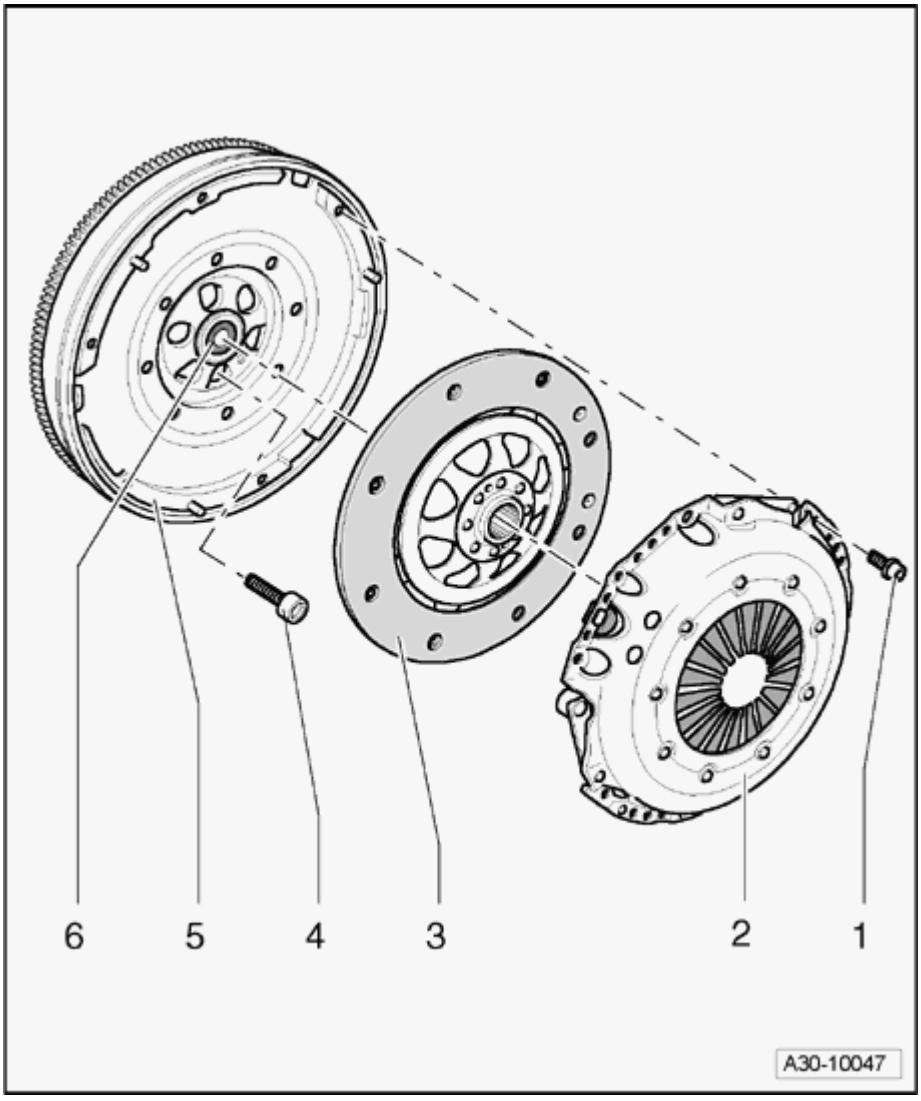

Fig. 79: Self-Adjusting Clutch Assembly Overview (Manufactured By Sachs)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bolt -22 Nm-

- Observe instructions for installation --> **Self-adjusting clutch (Sachs version), removing and installing**

2 - Pressure plate

- Self-adjusting
- Identification **Identification**
- Pressure plate and clutch plate can only be replaced together.
- Removing and installing --> **Self-adjusting clutch (Sachs version), removing and installing**

- Check ends of diaphragm spring **Checking ends of diaphragm spring**

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- Check spring connection and rivets **Checking spring connection and rivet**
- Check wire ring **Checking wire ring**

3 - Clutch plate

- Pressure plate and clutch plate can only be replaced together.
- Installation position: Clutch lining must make full contact with flywheel
- The marking "Getriebeseite" (transmission side), if provided, faces pressure plate/transmission.
- If installed, coil springs (damper assembly) face pressure plate and transmission

- Centralize **Fig. 89**
- Clutch plate diameter --> **Code letters, allocation, transmission ratios, capacities**

4 - Bolt for flywheel

- Always replace
- Observe instructions for removal **Removing dual-mass flywheel**
- Bolt length: 22.5 mm; 60 Nm plus an additional 90° $^{1}/_{4}$ turn
- Bolt length: 43 mm; 60 Nm plus an additional 180° $^{1}/_{2}$ turn

5 - Dual-mass flywheel

- Ensure that dowel pins fit tightly
- Contact surface for clutch lining must be free of grooves, oil and grease
- Observe instructions for removal **Removing dual-mass flywheel**

6 - Needle bearing

- Removing and installing --> **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK**

Identification

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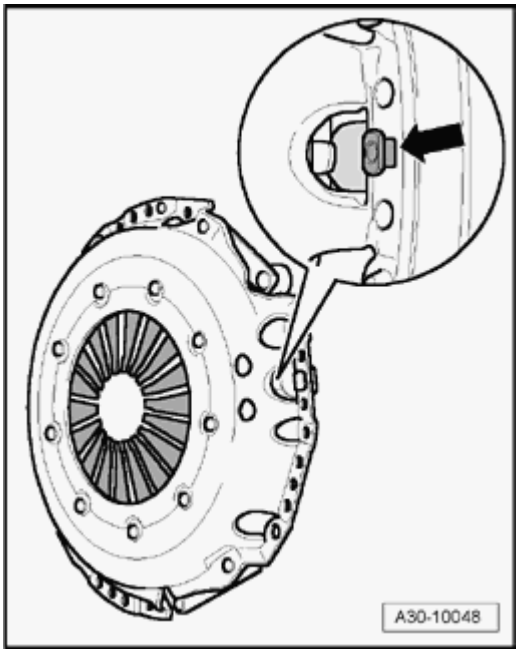

Fig. 80: Pressure Plate With Impact (Position Sensor)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressure plate with stop mechanism (position sensor) - **arrow** -.

Checking ends of diaphragm spring

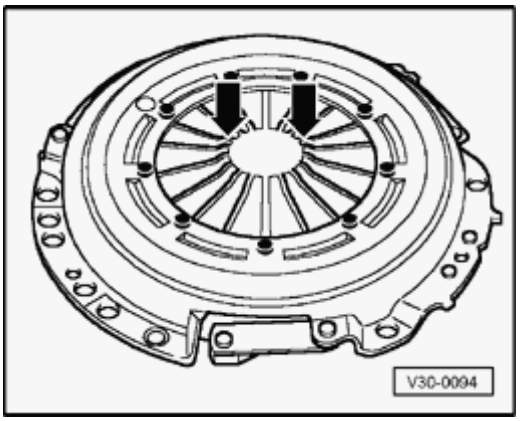

Fig. 81: Checking Ends Of Diaphragm Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Wear up to half the thickness of the diaphragm spring is permitted.

NOTE:

- **Important: When performing repairs, always select the correct clutch pressure plate and clutch plate by checking engine code.**

Checking spring connection and rivet

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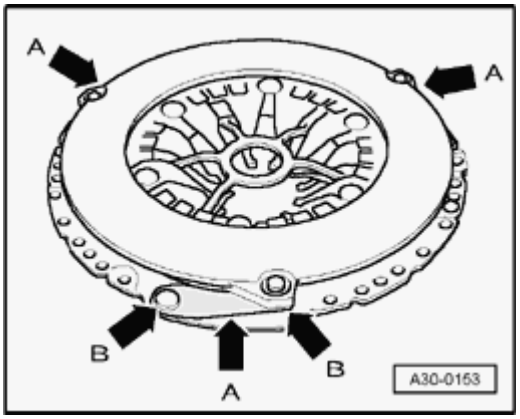

Fig. 82: Checking Spring And Rivet Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check spring connections - **arrows A** - for damage and make sure riveted fastenings - **arrows B** - are seated tightly.

NOTE:

- **Replace pressure plate if spring connections are broken or badly bent, or if riveted fastenings are loose.**

Checking wire ring

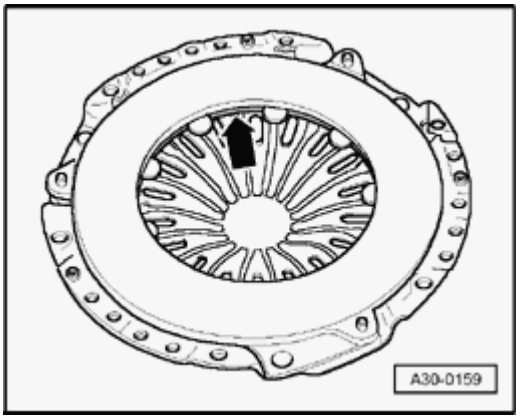

Fig. 83: Identifying Wire Ring In Thrust Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check that wire ring in pressure plate - **arrow** - is not damaged. replace pressure plate if wire ring is broken.

Removing dual-mass flywheel

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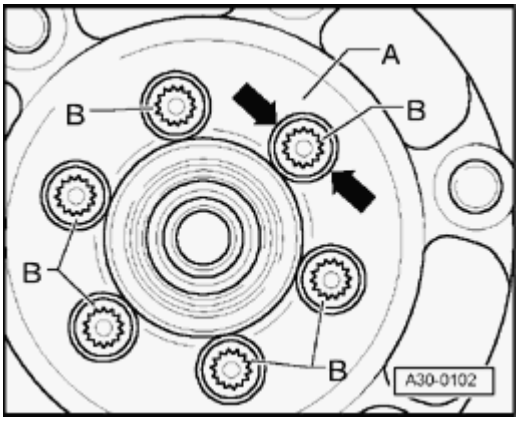

Fig. 84: Identifying Dual-Mass Flywheel & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Do not use an impact wrench or pneumatic wrench to remove bolts - B - : this would severely damage the dual-mass flywheel. Bolts - B - must always be removed by hand.**

- Rotate flywheel - **A** - so that bolts - **B** - are aligned centrally behind the holes - **arrows** -.
- When removing bolts - **B** - , make sure the bolt heads do not contact the flywheel - **arrows** - because this would damage the flywheel when the bolts are turned further.
- Removing and installing dual-mass flywheel --> **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK** for the appropriate engine code.

Self-adjusting clutch (Sachs version), removing and installing

Special tools, testers and auxiliary items required

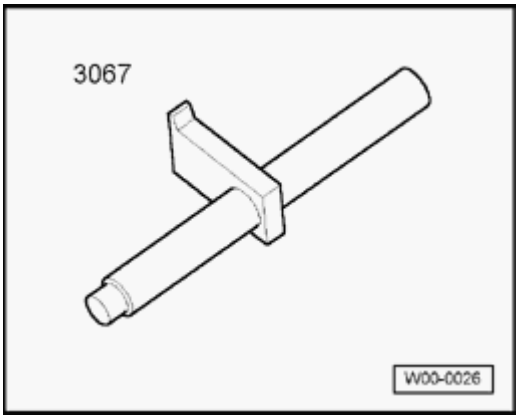

Fig. 85: Identifying Flywheel Retainer 3067
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Counterhold tool 3067

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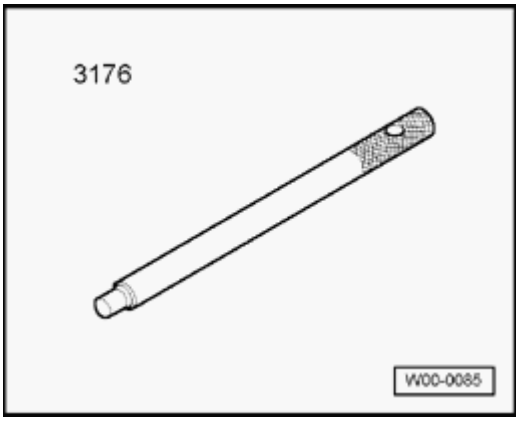

Fig. 86: Identifying Centering Mandrel 3176
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Centering mandrel 3176
- **Grease for clutch plate splines G000100**

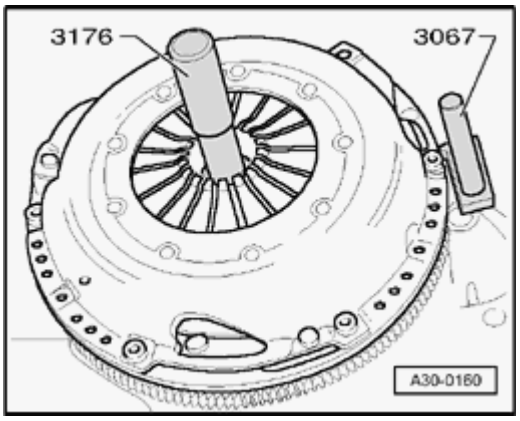

Fig. 87: Changing Over Flywheel Retainer 3067
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach counter-hold tool 3067 or counter-hold tool 10 - 201 before loosening bolts.

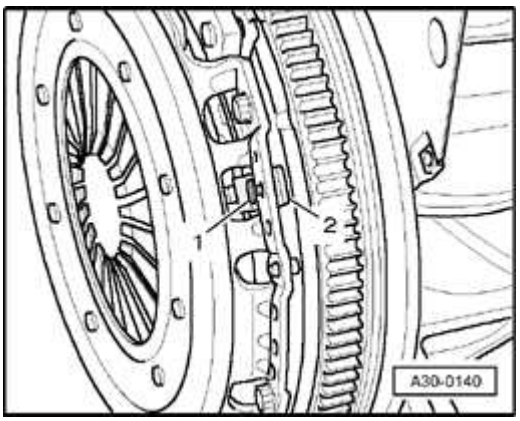

Fig. 88: Identifying Stop & Pin

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

To prevent the pressure plate from becoming distorted during removal (causes clutch grab when driving off), always adhere to the following procedure when unbolting the pressure plate:

- Loosen all six bolts consecutively in clockwise direction and in steps of 90° (1/4 turn) until the pressure plate is released.
- Stop - **2** - with pin - **1** - should come loose when the bolts are loosened.

Installing

- Installation position of clutch plate: coil springs (damper assembly) or marking "Getriebeseite" point toward pressure plate and transmission.

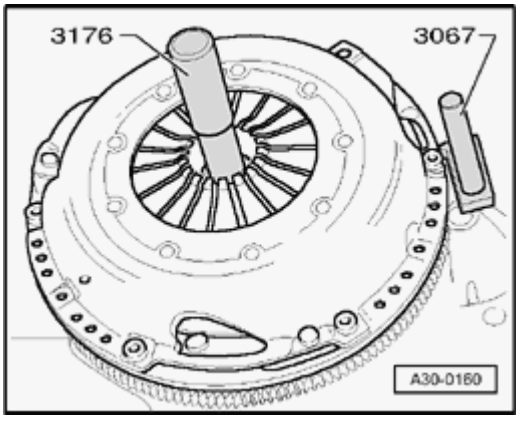

Fig. 89: Changing Over Flywheel Retainer 3067
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove, reverse position of counter-hold tool 3067 or counter-hold tool 10 - 201.
- Use centering mandrel 3176 to centralize clutch plate.

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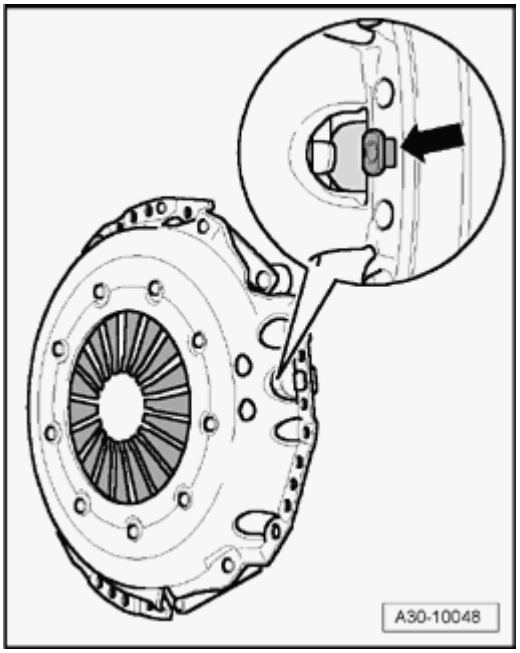

Fig. 90: Pressure Plate With Impact (Position Sensor)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

To prevent the pressure plate from becoming distorted during installation (causes clutch grab when driving off), always adhere to the following procedure when installing the pressure plate:

- Position pressure plate on dowel pins.
- Make sure that the stop mechanism - **arrow** - is free to move.
- Tighten all 6 bolts evenly by hand until bolt heads make contact with pressure plate.
- Tighten all six bolts consecutively in clockwise direction and in steps of 90° (14 turn) until the housing makes contact with flywheel.
- The stop mechanism - **arrow** - should then lift away from the pressure plate.
- Tighten all 6 bolts to final torque (22Nm) consecutively in clockwise direction.

Clutch with SAC pressure plate (LuK version), servicing

- Please refer to notes --> **Clutch, servicing**.
- Remove transmission to work on clutch --> **Transmission, removing and installing**.

NOTE:

- **"SAC" stands for "Self-Adjusting Clutch".**

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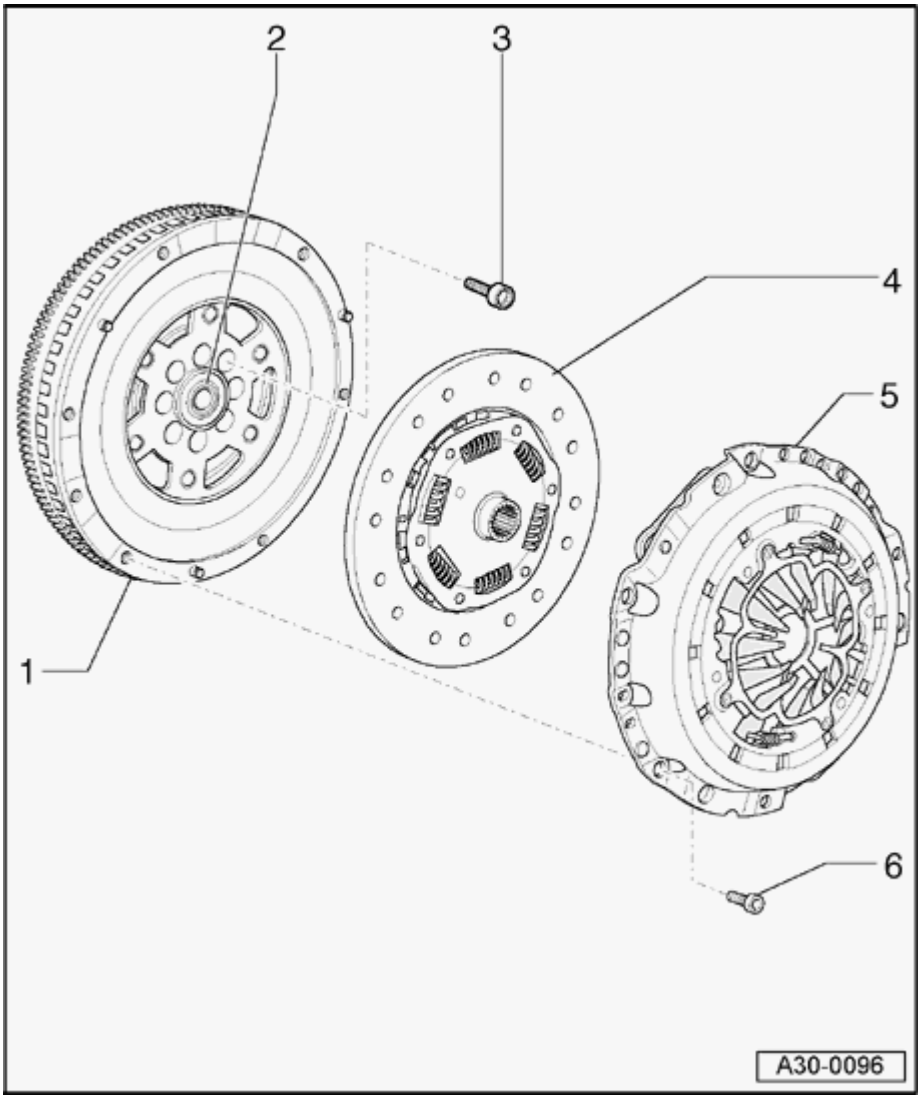

Fig. 91: Clutch With SAC Pressure Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Dual-mass flywheel

- Ensure that dowel pins fit tightly
- Contact surface for clutch lining must be free of grooves, oil and grease
- Observe instructions for removal **Removing dual-mass flywheel**
- Removing and installing --> **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK**

2 - Needle bearing

- Removing and installing --> **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK**

3 - Bolt for flywheel

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- Always replace
- Bolt length: 22.5 mm; 60 Nm plus an additional 90° $^{1}/_{4}$ turn
- Bolt length: 43 mm; 60 Nm plus an additional 180° $^{1}/_{4}$ turn
- Observe instructions for removal **Removing dual-mass flywheel**

4 - Clutch plate

- Installation position: Clutch lining must make full contact with flywheel
- The marking "Getriebeseite" (if provided) faces pressure plate/transmission.
- Coil springs (damper assembly) point toward pressure plate and transmission
- Clutch plate diameter --> **Code letters, allocation, transmission ratios, capacities**

5 - SAC pressure plate

- Removing and installing --> **Clutch with SAC pressure plate, removing and installing**
- Resetting adjuster ring --> **Adjuster ring in SAC clutch pressure plate, resetting**
- Check ends of diaphragm spring **Checking ends of diaphragm spring**
- Check that pressure plate is not warped **Check SAC pressure plate for warpage, cracks and burns**
- Check spring connection and rivets **Checking spring connection and rivet**

6 - Bolt -22 Nm-

- Observe instructions for installation --> **Clutch with SAC pressure plate, removing and installing**

Checking ends of diaphragm spring

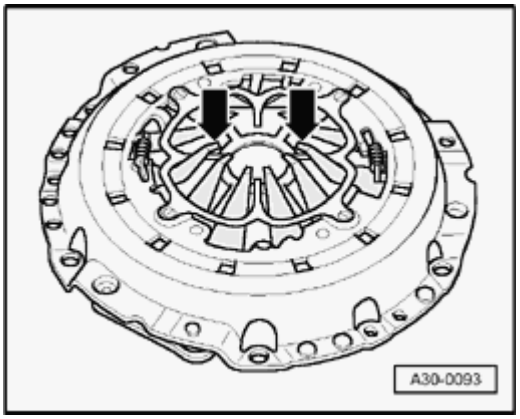

Fig. 92: Checking Ends Of The Diaphragm Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Wear up to half the thickness of the diaphragm spring is permitted.

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NOTE:

- **Important: When performing repairs, always select the correct clutch pressure plate and clutch plate by checking engine code.**

Checking spring connection and rivet

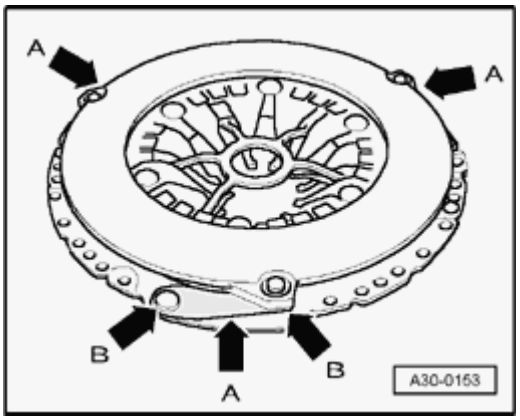

Fig. 93: Checking Spring And Rivet Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check spring connections - **arrows A** - for damage and make sure riveted fastenings - **arrows B** - are seated tightly.

NOTE:

- **Replace pressure plate if spring connections are broken or badly bent, or if riveted fastenings are loose.**

Check SAC pressure plate for warpage, cracks and burns

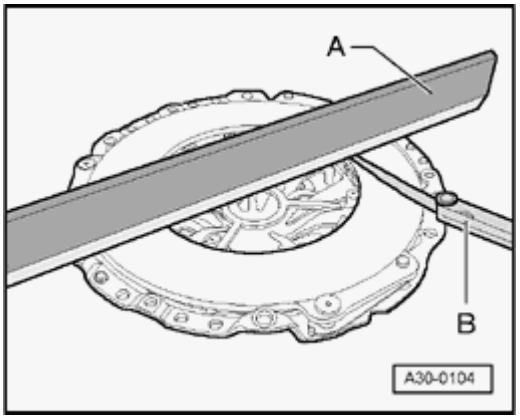

Fig. 94: Check SAC Pressure Plate For Warpage, Cracks And Burns
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Straightedge

B - Feeler gauge

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- Pressure plate warpage up to 1.0 mm is allowed

Removing dual-mass flywheel

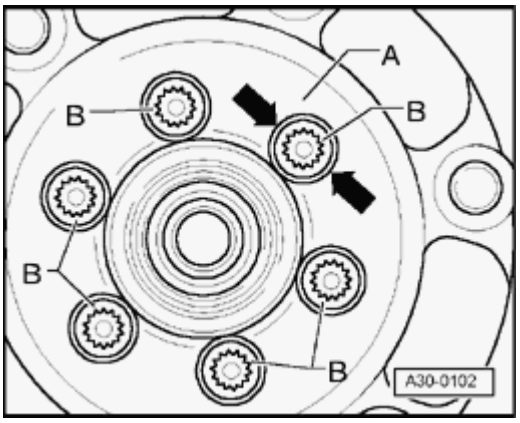

Fig. 95: Identifying Dual-Mass Flywheel & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Do not use an impact wrench or pneumatic wrench to remove bolts - B - : this would severely damage the dual-mass flywheel. Bolts - B - must always be removed by hand.**

- Rotate flywheel - **A** - so that bolts - **B** - are aligned centrally behind holes - **arrows** -.
- When removing bolts - **B** - , make sure the bolt heads do not contact flywheel - **arrows** - because this would damage the flywheel when the bolts are turned further.
- Removing and installing dual-mass flywheel --> **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK** for the appropriate engine code.

Clutch with SAC pressure plate, removing and installing

Special tools, testers and auxiliary items required

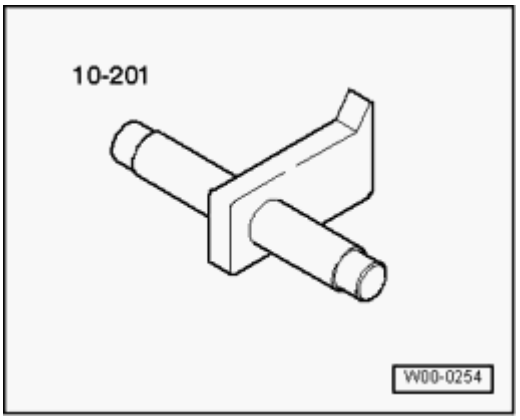

Fig. 96: Counter-Holder Tool 10-201
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Counterhold tool 10 - 201

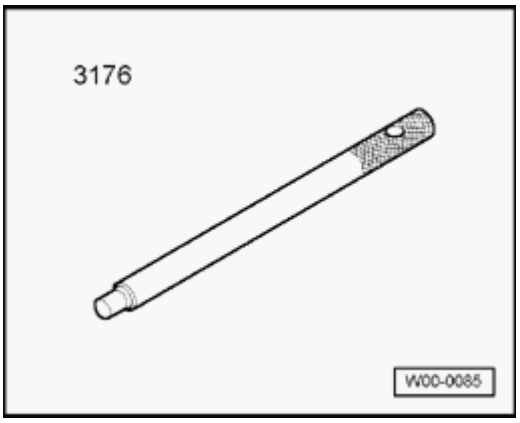

Fig. 97: Identifying Centering Mandrel 3176
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Centering mandrel 3176
- **Grease for clutch plate splines G000100**

Removing

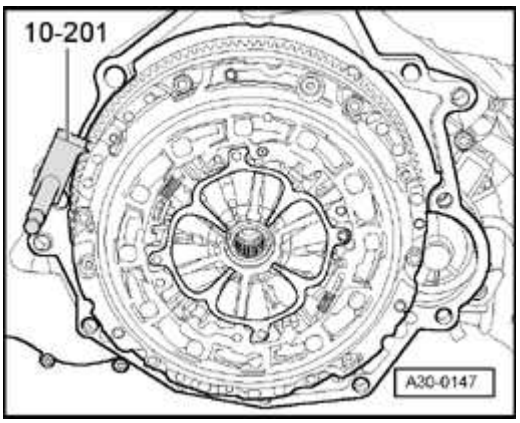

Fig. 98: Counter-Hold Tool 10 - 201 Attached Before Loosening Clutch Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach counter-hold tool 10 - 201 before loosening bolts.

To prevent the pressure plate from becoming warped during removal (causes clutch grab when driving off), always adhere to the following procedure when unscrewing the pressure plate:

- Loosen all six bolts consecutively in clockwise direction and in steps of 90° (1⁄4 turn) until pressure plate is released.

Installing

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NOTE:

- **Before re-installing the SAC pressure plate, check that it is not warped Check SAC pressure plate for warpage, cracks and burns.**
- **When only the clutch plate is replaced, the adjuster ring in the SAC pressure plate has to be reset before assembly --> Adjuster ring in SAC clutch pressure plate, resetting.**
- **Installation position of clutch plate: coil springs (damper assembly) or marking "Getriebeseite" point toward pressure plate and transmission.**

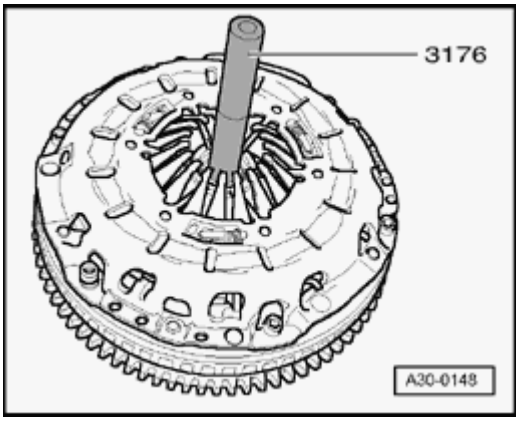

Fig. 99: Using Centering Mandrel 3176 To Centralize Clutch Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use centering mandrel 3176 to centralize clutch plate.
- Re-position counterhold tool 10 - 201 to tighten bolts.

To prevent the pressure plate from becoming warped during installation (causes clutch grab when driving off), always adhere to the following procedure when installing the pressure plate:

- Position pressure plate on dowel pins.
- Tighten all 6 bolts evenly by hand until bolt heads make contact with pressure plate.
- Tighten all six bolts consecutively in clockwise direction and in steps of 90° (14 turn) until housing makes contact with flywheel.
- Tighten all 6 bolts to final torque (22Nm) consecutively in clockwise direction.

Adjuster ring in SAC clutch pressure plate, resetting

NOTE:

- **"SAC" stands for "Self-Adjusting Clutch".**
- **When installing a new clutch plate in conjunction with a used SAC pressure plate, the adjuster ring in the pressure plate has to be reset by turning it back as far as it will go. If you do not reset the adjuster ring in the pressure plate, the SAC pressure plate will operate with reduced clamping force, which will cause excessive wear, especially of the clutch plate (clutch will then slip).**

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- **If the clutch plate is not replaced, it is not necessary to reset the adjuster ring.**
- **New SAC pressure plates are pre-set accordingly, and do not have to be reset.**

Special tools, testers and auxiliary items required

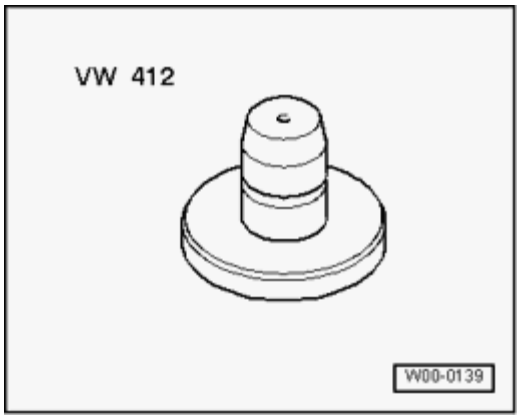

Fig. 100: Thrust Disc VW 412
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press tool VW412

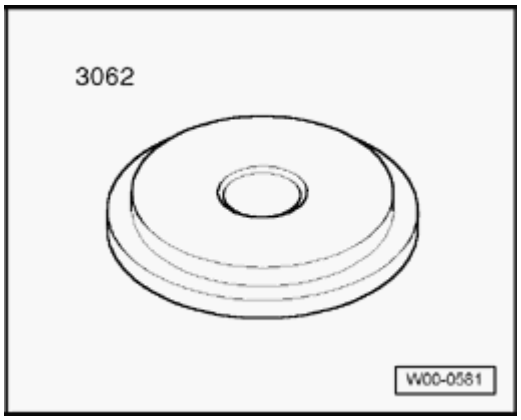

Fig. 101: Identifying Thrust Pad 3062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Thrust pad 3062

Procedure

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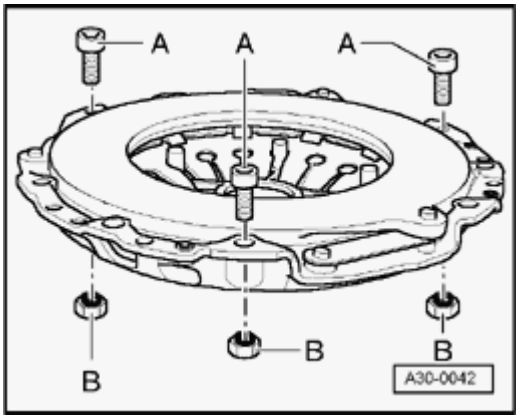

Fig. 102: Inserting Securing Bolts Into Mounting Holes On Pressure Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert 3 bolts for securing pressure plate - **A** - into mounting holes on pressure plate located at 120° (13) intervals, as shown in illustration.
- Screw 3 nuts - **B** - M8 onto bolts - **A** - and tighten nuts.

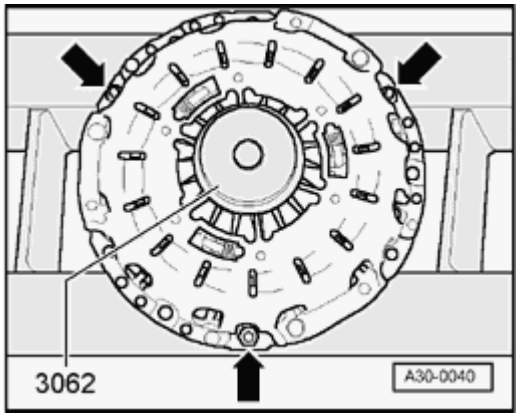

Fig. 103: Placing SAC Pressure Plate Onto Press
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place SAC pressure plate onto press tool so that only the 3 bolt heads - **arrows** - make contact.
- Position thrust pad 3062 in center of pressure plate.

Do not use force when performing the following steps, as this could cause the forks on the adjuster ring to break off.

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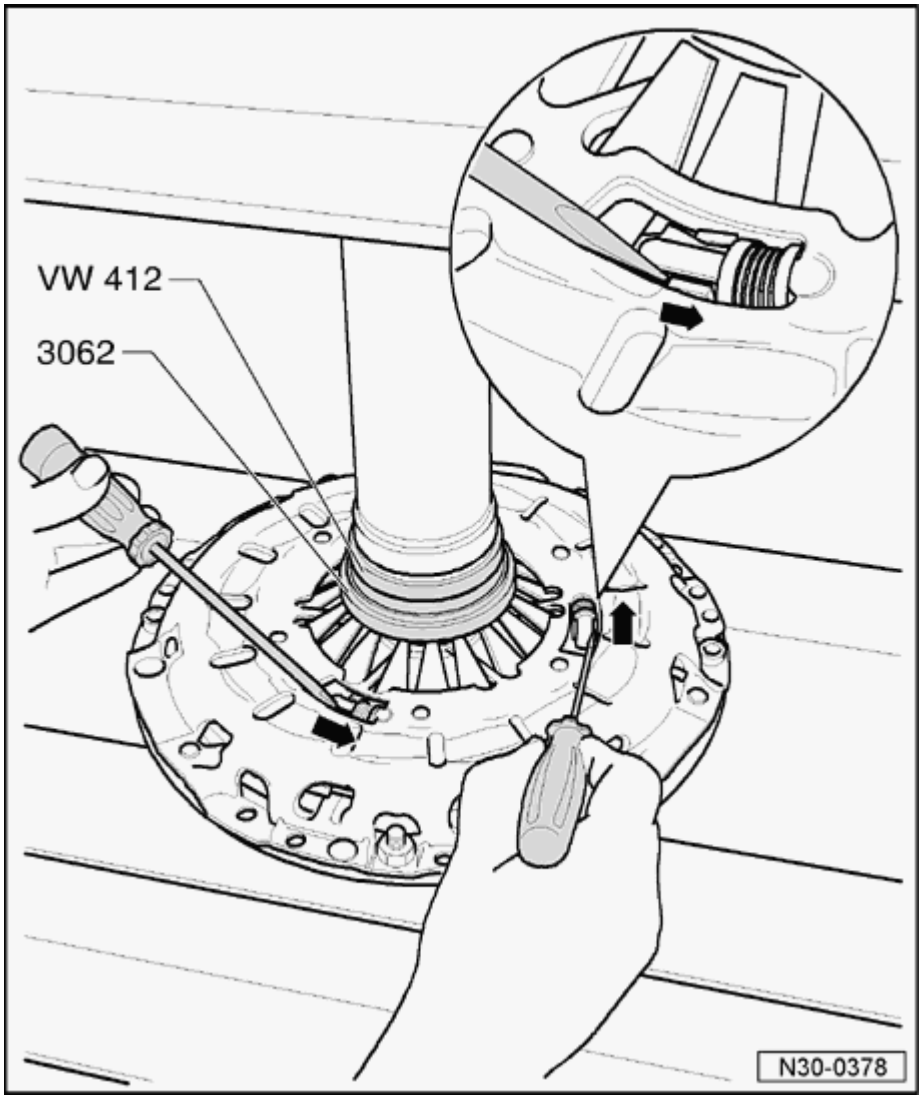

Fig. 104: Positioning Two Screwdrivers On Adjusting Ring Forks
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Apply two screwdrivers to forks on adjuster ring. Use press tool to apply pressure to pressure plate until it is just possible to move adjuster ring.
- Using two screwdrivers, turn back adjuster ring evenly in direction of - **arrows** - until it reaches stop.
- Hold adjuster ring against stop and reduce pressure applied by press tool so that adjuster ring is held in this position.

34 CONTROLS, HOUSING

SELECTOR MECHANISM, SERVICING

Installation position of selector mechanism

- **Arrow A** - gear selection movement

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- **Arrow B** - gate selection movement

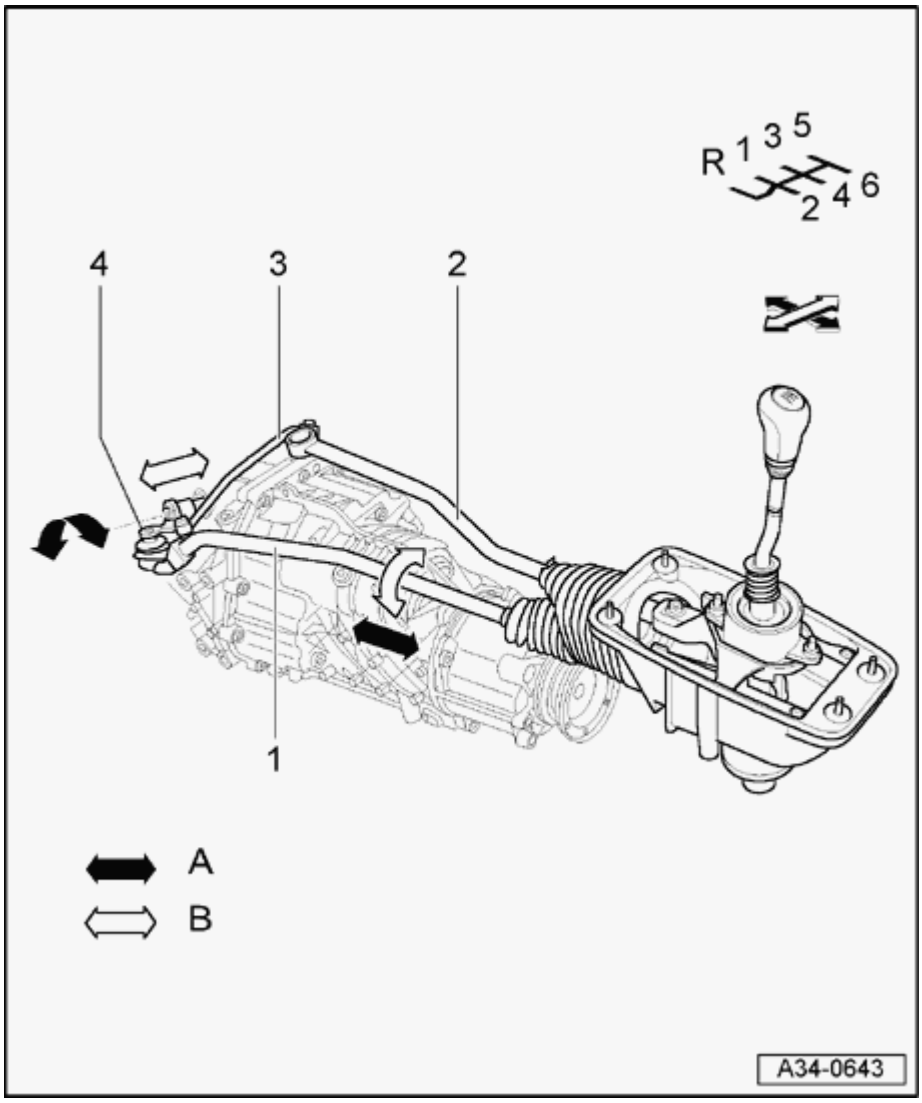

Fig. 105: Installation Position Of Selector Mechanism
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector rod

2 - Push rod

3 - Connecting rod

4 - Transmission selector lever

Selector mechanism components, assembly overview

Part I

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NOTE:

- **Lubricate all bearings and moving surfaces with polycarbamide grease G052142A2 .**

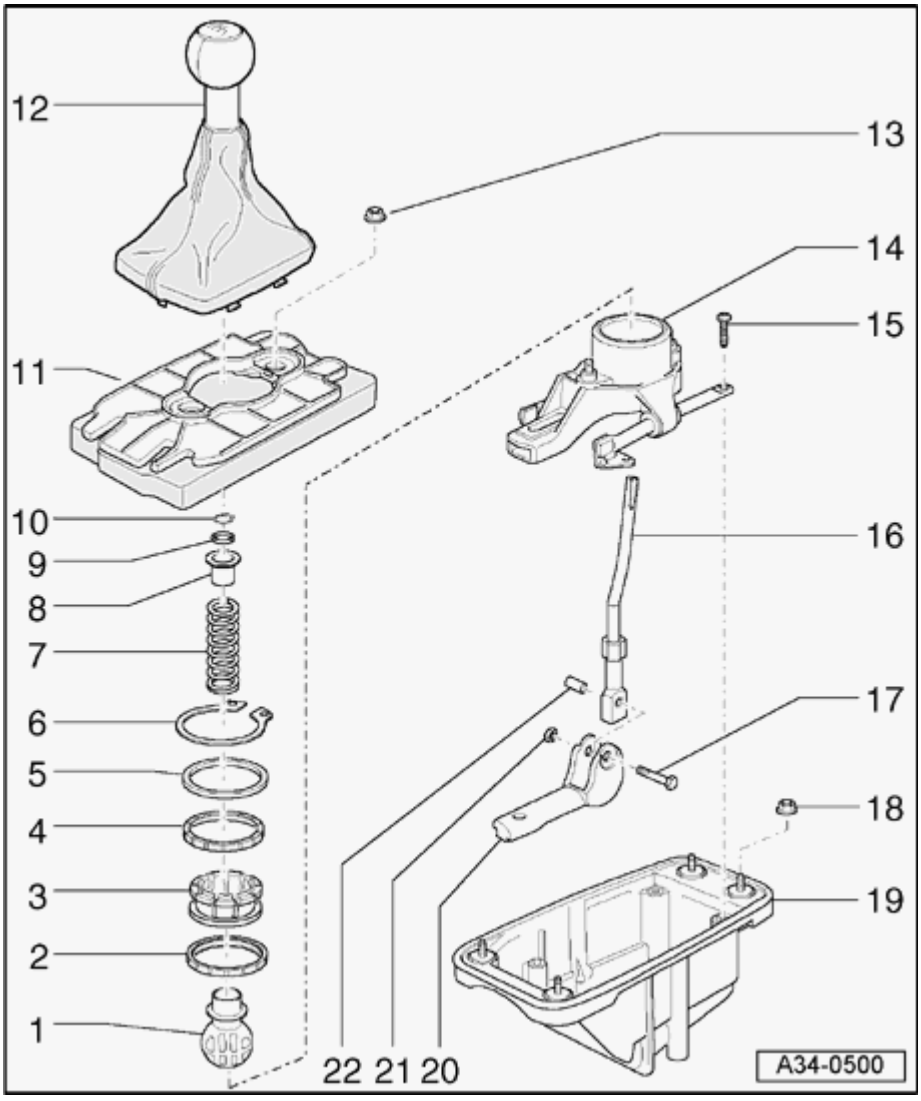

Fig. 106: Selector Mechanism Components, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Ball

2 - Rubber ring

3 - Ball guide

4 - Rubber ring

5 - Washer

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6 - Circlip

- Take out before removing ball

7 - Spring

8 - Spacer sleeve

9 - Washer

10 - Circlip

11 - Sound insulation

- - **Arrow** - marked on sound insulation points in direction of travel

12 - Gear lever knob

- With cover
- Removing and installing --> **Gear lever knob with boot, removing and installing**

13 - Nut, 10 Nm

14 - Ball housing

15 - Torx socket head bolt

16 - Gear lever

- Bend points toward rear

17 - Bolt

18 - Nut, 10 Nm

19 - Selector housing

20 - Joint for gear lever/selector rod

21 - Nut -10 Nm-

- Self-locking
- Replace

22 - Bushing

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Part II

NOTE:

- **Lubricate all bearings and moving surfaces with polycarbamide grease G052142A2 .**

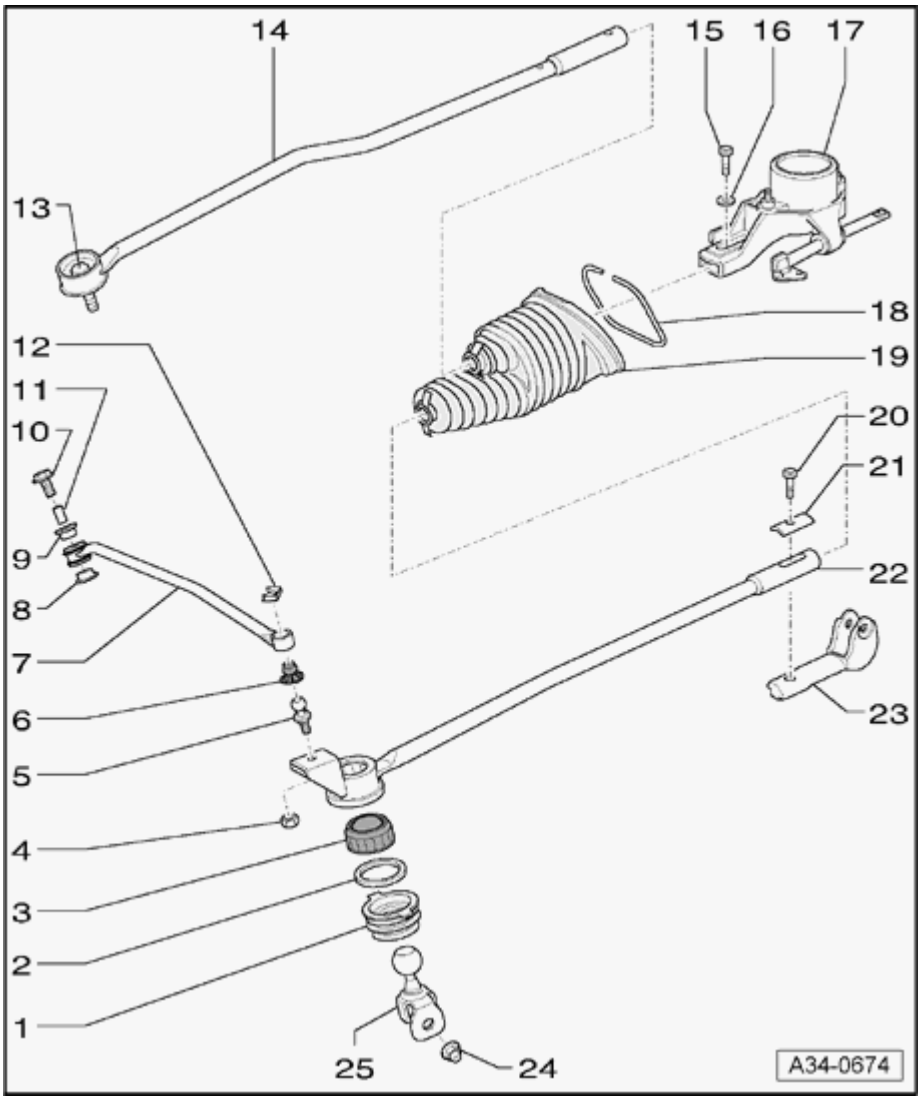

Fig. 107: Shift Mechanism Remove/Install Components -- Part II
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Boot

- Secure to selector rod with commercially available instant adhesive

2 - Washer

3 - Ball socket

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4 - Cap nut, 23 Nm

5 - Ball stud

6 - Ball socket

7 - Connecting rod

8 - Bushing

9 - Bushing

10 - Bolt, 23 Nm

11 - Sleeve

12 - Retaining clip

13 - Bolt, 40 Nm

14 - Push rod

- With bushing, bolt and washers

15 - Hex socket head bolt, 23 Nm

16 - Washer

17 - Ball housing

18 - Clamping ring for boot

19 - Boot

20 - Hex socket head bolt, 23 Nm

21 - Clamp

22 - Selector rod

23 - Joint for gear lever/selector rod

24 - Cap nut, 10 Nm

- Self-locking
- Replace

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25 - Selector shaft lever

Gear lever knob with boot, removing and installing

Special tools, testers and auxiliary items required

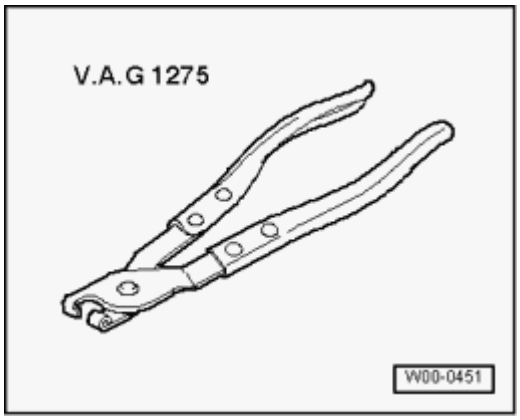

Fig. 108: Identifying Hose Clamp Pliers V.A.G 1275
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clip pliers V.A.G 1275

Removing

NOTE:

- **The gear lever knob is removed together with the gear lever boot and the cover for the center console.**

- Open ashtray.

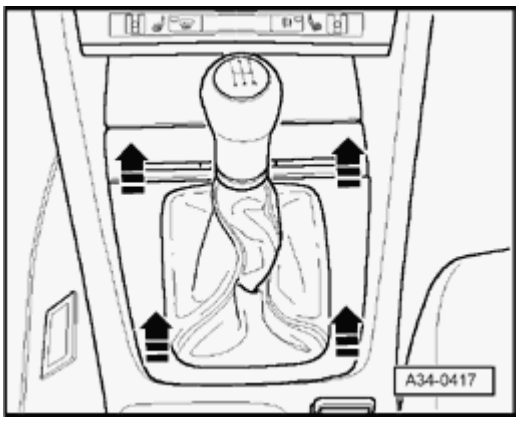

Fig. 109: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unclip cover for center console and lift it off - **arrows** -.

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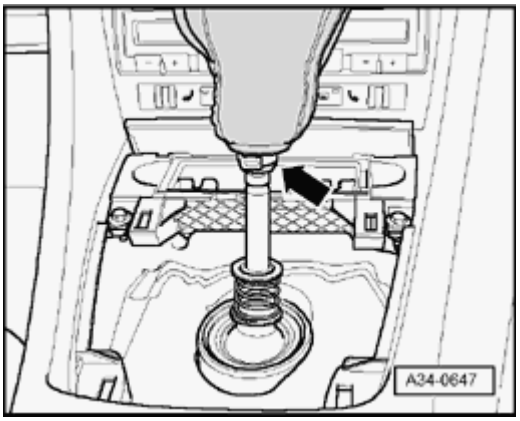

Fig. 110: Locating Clip And Pulling Off Gear Lever Knob Together With Boot
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Gear lever knob with clip:

- Pull boot up and over gear lever knob.
- Open clip - **arrow** - and pull off gear lever knob together with boot.

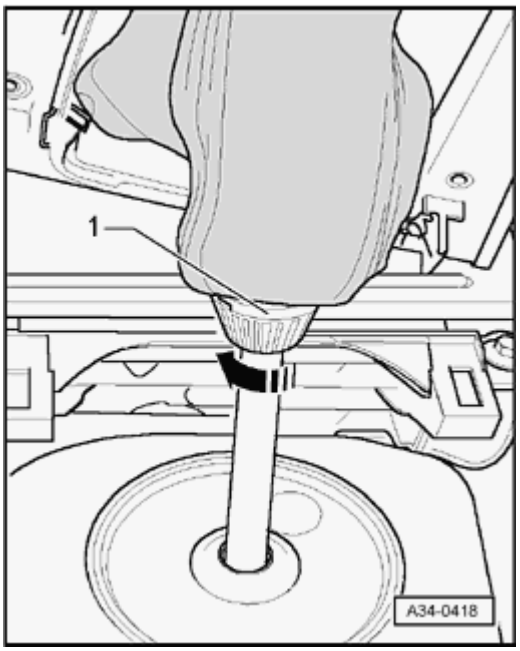

Fig. 111: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Gear lever knob with locking mechanism:

- Release connecting element - **1** - in direction of - **arrow** - and pull gear lever knob off upward together with gear lever boot.

Installing

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Installation is in reverse order of removal.

Selector mechanism, removing and installing

Special tools, testers and auxiliary items required

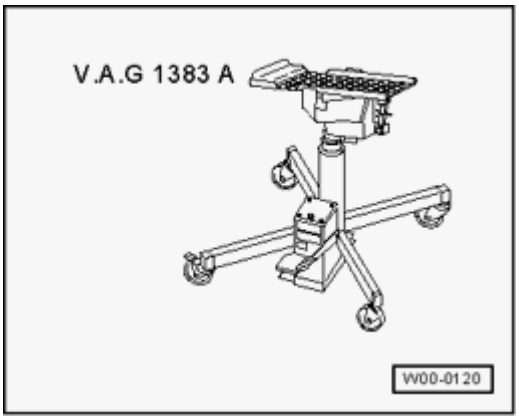

Fig. 112: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine/transmission jack V.A.G 1383 A

Removing

- Remove gear lever knob together with boot --> **Gear lever knob with boot, removing and installing**.

Vehicles with large radio slot:

- Remove air conditioning operating unit --> **87 AIR CONDITIONING** .

Vehicles with small radio slot:

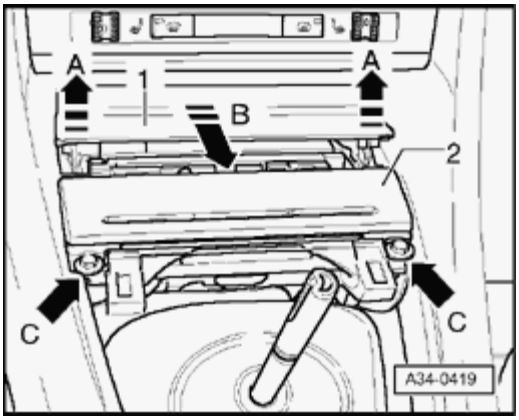

Fig. 113: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- First lift trim panel - **1** - in direction of - **arrow A** - , then pull it out in direction of - **arrow B** -.

Continued for all vehicles:

- Remove bolts - **arrows C** - and then pull ashtray - **2** - out of center console.
- Disconnect electrical connector for ashtray light.
- Remove foam wedges from center console.
- Lift out sound insulation.

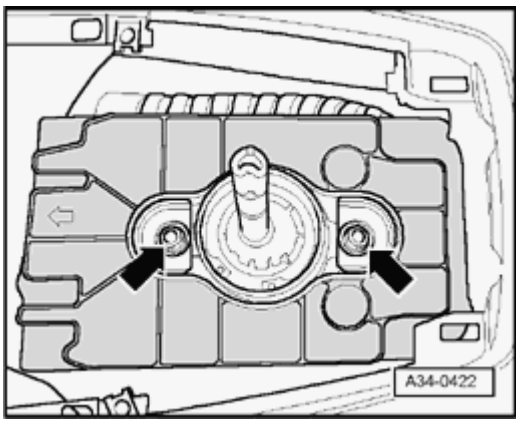

Fig. 114: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove sound insulation for gear lever housing - **arrows** -.

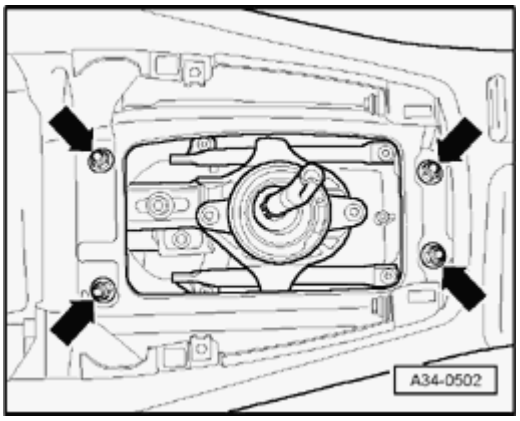

Fig. 115: Shift Lever Housing Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.
- Remove both front wheels.
- On vehicles equipped with auxiliary heater, remove bolts - **arrows** - securing exhaust pipe of auxiliary heater to sound insulation.

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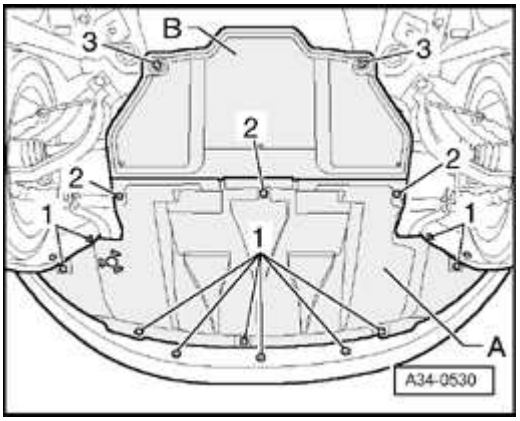

Fig. 116: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

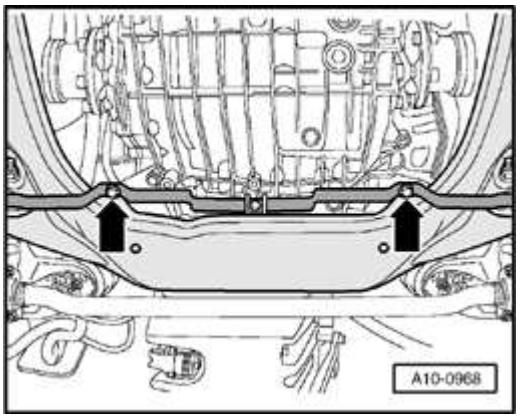

Fig. 117: Removing Bracket For Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for sound insulation - **arrows** -.

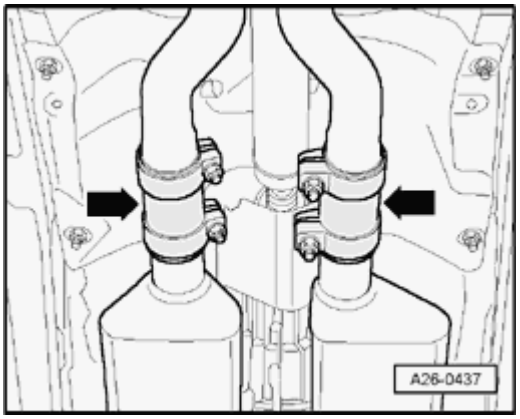

Fig. 118: Exhaust System Clamps

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamps - **arrows** -.

NOTE:

- **The flexible pipe connection (de-coupling element) in the front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.**
- **The illustration shows the exhaust system in conjunction with the 3.0 liter. V6 engine.**

- Disengage rear section of exhaust system at rubber mountings and remove.

NOTE:

- **A second technician is required for removing the rear section of the exhaust system.**

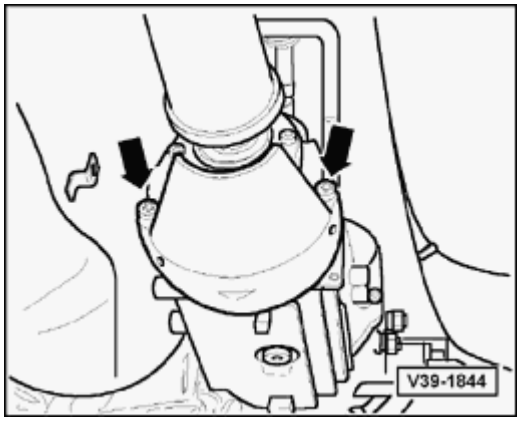

Fig. 119: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove heat shield for drive shaft - **arrows** -.

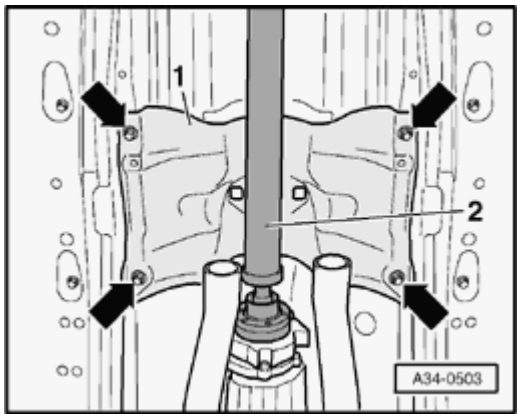

Fig. 120: Heatshield Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove heat shield - **1** - for exhaust system below selector mechanism - **arrows** -.
- Remove bolts at transmission/drive shaft flange.
- Push drive shaft - **2** - together toward rear final drive. The constant velocity joints can be moved axially.

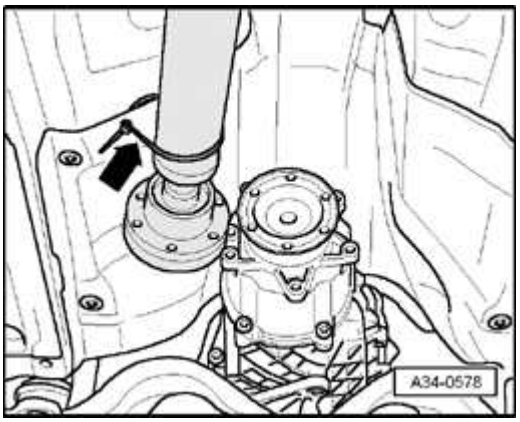

Fig. 121: Drive Shaft Tied To Side, Onto Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tie drive shaft to side, onto heat shield - **arrow** -.

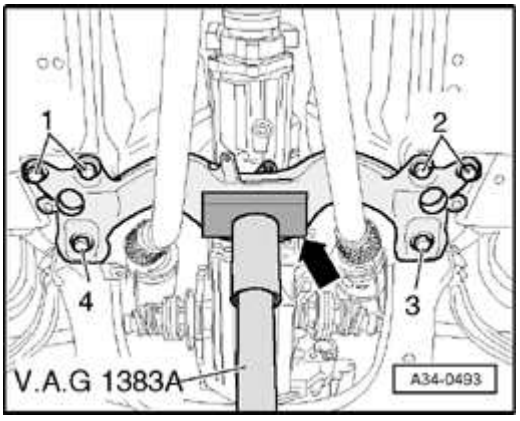

Fig. 122: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove universal transmission mounting V.A.G1359/2 from engine/transmission jack V.A.G 1383 A and place a wooden block - **arrow** - on press tool instead.
- Support rear cross member using engine and transmission jack V.A.G 1383 A.
- Remove bolts - **1** - and - **2** - , then bolts - **3** - and - **4** -.

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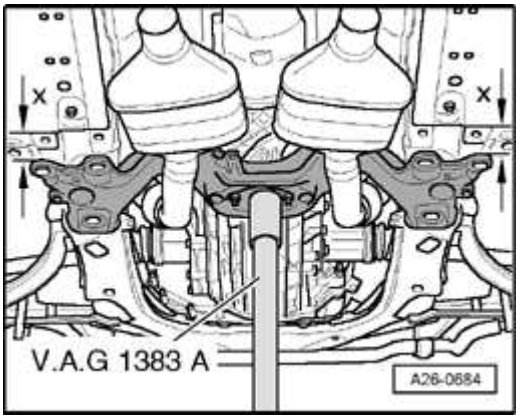

Fig. 123: Identifying Distance Between Cross Member And Body Reaches Dimension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully lower rear cross member with using engine and transmission jack V.A.G 1383 A until distance between rear cross member and body reaches dimension "x".

- Dimension x = 60 mm

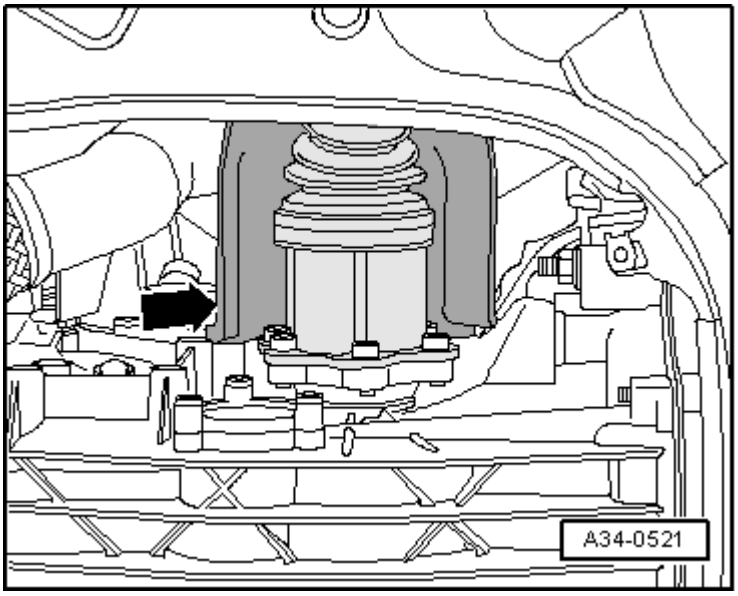

Fig. 124: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrow** - for drive axle (right side) and, if installed, also for drive axle (left-side).

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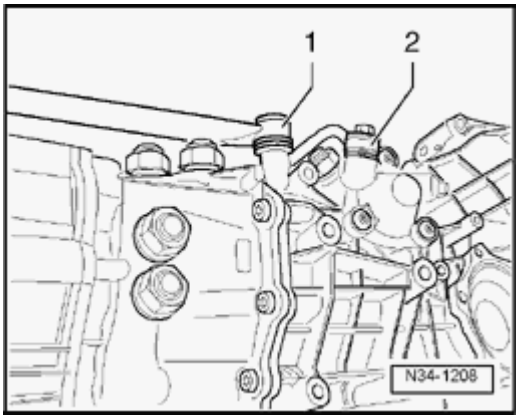

Fig. 125: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove connecting rod - **2** - for selector rod.
- Disconnect push rod - **1** - by removing hex socket head bolt.

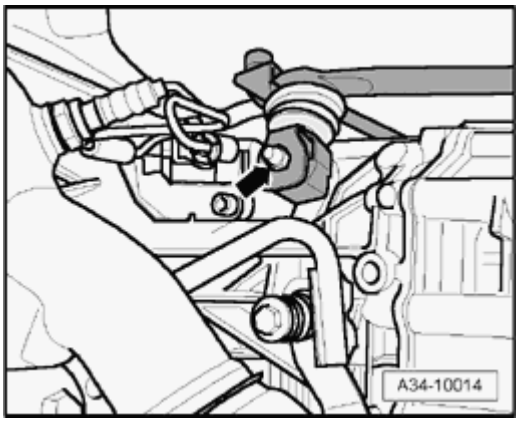

Fig. 126: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **arrow** - and detach selector shaft lever from selector shaft.
- Remove selector mechanism to rear.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- **Always replace seals, gaskets and self-locking nuts.**

- Bolt drive shaft onto transmission --> **39 FINAL DRIVE, DIFFERENTIAL** .
- Install exhaust system free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for appropriate engine code.
- Install tunnel cross member --> **40 - FRONT SUSPENSION** .

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- Adjust selector mechanism --> **Selector mechanism, adjusting**.
- Install air conditioning operating unit --> **87 AIR CONDITIONING** .

Tightening torques

Component		Nm
Connecting rod to transmission		23
Selector shaft lever to selector shaft		23
Push rod to transmission		40
Heat shield for drive axle to transmission		23
Heat shield for drive shaft to transmission cover		25
Bracket for sound insulation to subframe		10
Selector mechanism to body		10
Sound insulation to selector mechanism		10

Selector mechanism, adjusting

The following are requirements for correct gear lever alignment:

- Gear selector linkage must be in proper condition and undamaged.
- Selector mechanism must move freely.
- Transmission, clutch and clutch mechanism must be in proper condition.
- Transmission in neutral.

Procedure

- Remove gear lever knob together with boot --> **Gear lever knob with boot, removing and installing**.

Vehicles with large radio slot:

- Remove air conditioning operating unit --> **87 AIR CONDITIONING** .

Vehicles with small radio slot:

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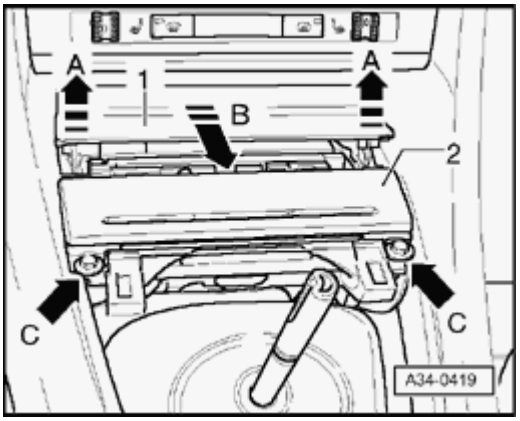

Fig. 127: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift trim panel - **1** - in direction of - **arrow A** - , then pull it out in direction of - **arrow B** -.

Continued for all vehicles:

- Remove bolts - **arrows C** - and then pull ashtray - **2** - out of center console.
- Disconnect electrical connector for ashtray light.
- Remove foam wedges from center console.
- Lift out sound insulation.

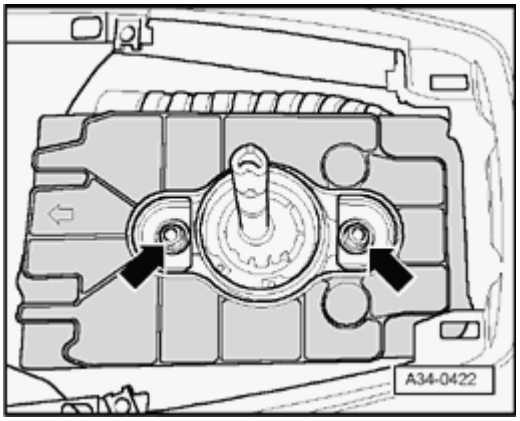

Fig. 128: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove sound insulation for gear lever housing - **arrows** -.

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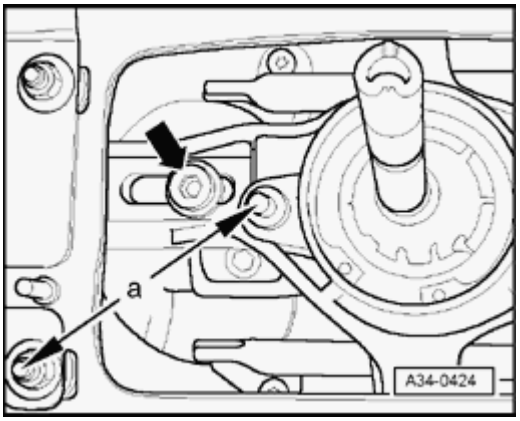

Fig. 129: Shift Mechanism Measurement And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure distance - **a** - between two studs in selector mechanism.
- Specification: distance a = 85 mm

NOTE:

- **Measure from center of one stud to center of the other.**

- If distance measured is not correct, adjust dimension - **a** - as follows:
- Loosen bolt - **arrow** - for push rod.
- Rear push rod (in selector mechanism) must move freely in both directions on slide.
- Set to distance - **a** - by moving rear push rod (in selector mechanism).
- Tighten bolt for push rod - **arrow** - to 23 Nm.

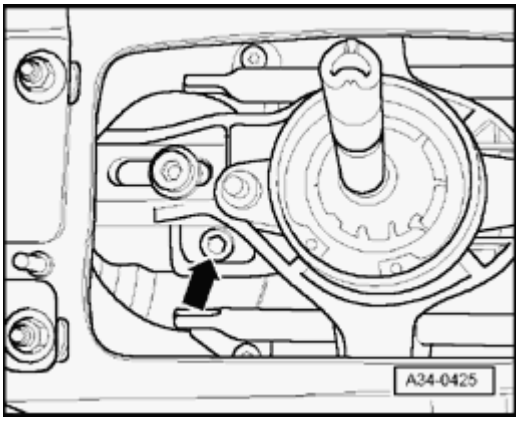

Fig. 130: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt for selector rod - **arrow** -.

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- Connection between selector rod and selector mechanism should move freely.

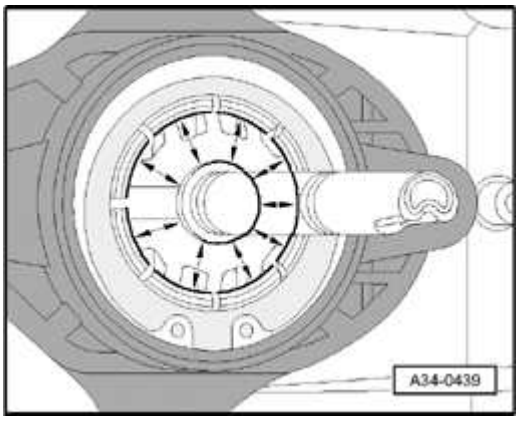

Fig. 131: Centering Bottom Of Shift Lever Centered In Ball Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Align gear lever as follows:

- Position bottom of gear lever in center of ball guide.
- Distance between ball guide and bottom of gear lever - **arrows** - must be equal at all points.

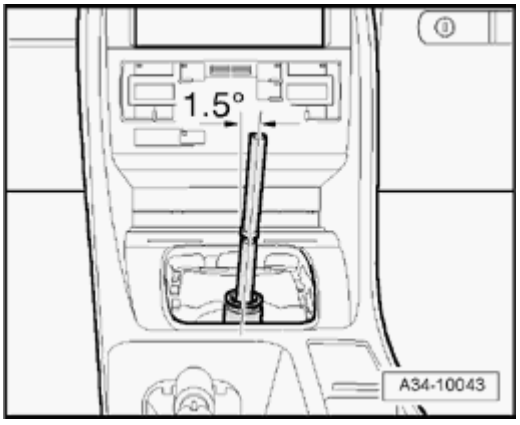

Fig. 132: Gear Lever Alignment Pointing Slightly To Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align gear lever so that it points slightly (1.5°) to the right (as seen in direction of travel).
- Hold gear lever in this position.

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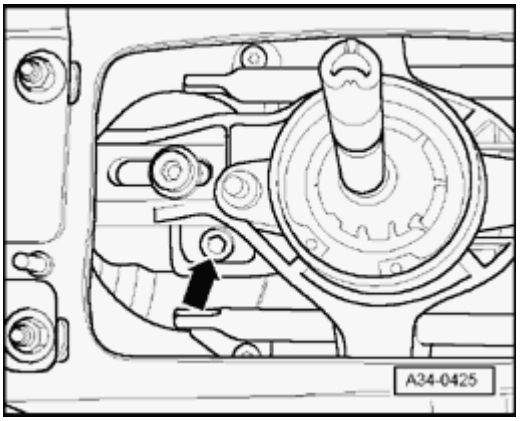

Fig. 133: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolt for push rod - **arrow** - to 23Nm.

NOTE:

- **The gear lever must remain in the same position while the bolt is being tightened.**

Checking gear lever setting

- The gear lever should rest in the 3rd/4th gear gate when the transmission is in neutral.

- Press clutch pedal.
- Check that all gears can engaged.
- Check operation of reverse gear lock.

- It should only be possible to engage reverse gear after pressing the gear lever down to overcome the reverse gear lock.
- The gear lever should return by itself from the reverse gear gate to the 3rd / 4th gear gate.

If after repeated selection of a gear it fails to engage smoothly, gear lever alignment must be repeated.

- Install trim parts and gear lever knob --> **Gear lever knob with boot, removing and installing**.

TRANSMISSION, REMOVING AND INSTALLING

Transmission, removing and installing

Removing transmission on vehicles with 4-cylinder engine --> **Transmission, removing (vehicles with 4-cylinder engine)**.

Removing transmission on vehicles with 6-cylinder engine --> **Transmission, removing (vehicles with 6-cylinder engine)**.

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Installing transmission on vehicles with 4-cylinder or 6-cylinder engine --> **Transmission, installing (vehicles with 4-cylinder or 6-cylinder engine)**.

Transmission, removing (vehicles with 4-cylinder engine)

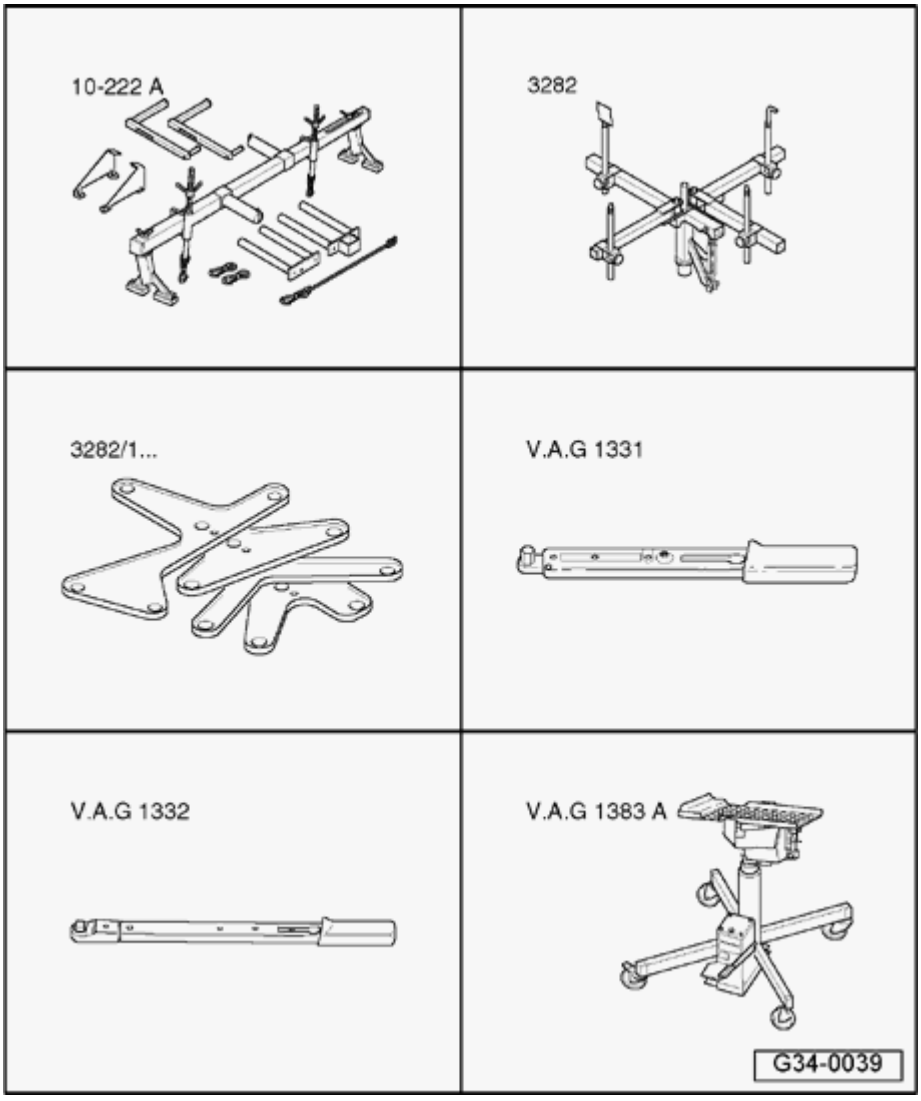

Fig. 134: Identifying Special Tools -- Transmission, Removing From Vehicles
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Support bracket 10 - 222 A
- Transmission support 3282
- Adjustment plate 3282/43
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332

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- Engine/transmission jack V.A.G 1383 A

Special tools, testers and auxiliary items required

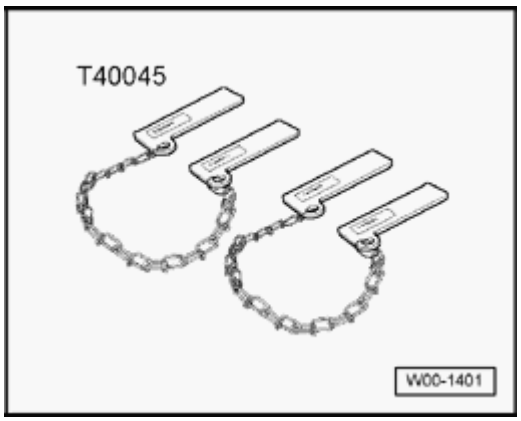

Fig. 135: Insert Pad For Front Fender T40045
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert pad for front fender T40045
- **Grease for clutch plate splines G000100**
- **Copper grease Z381351TE**

Procedure

NOTE:

- **All cable ties which are released or cut open during removal must be installed in the same position when installing.**
- **Heat insulation sleeves removed during removal of transmission must be installed in the same position when installing.**

CAUTION:

- **Follow steps required when disconnecting battery -->**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL for Cabriolet**

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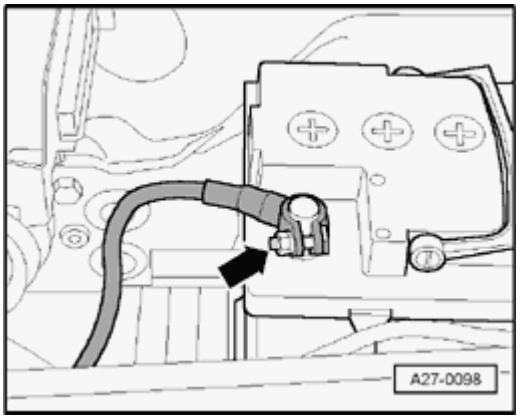

Fig. 136: Disconnecting Battery Ground (GND) Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With ignition switched off, disconnect battery Ground (GND) strap - **arrow** -.

Vehicles with 1.8 liter. turbo engine:

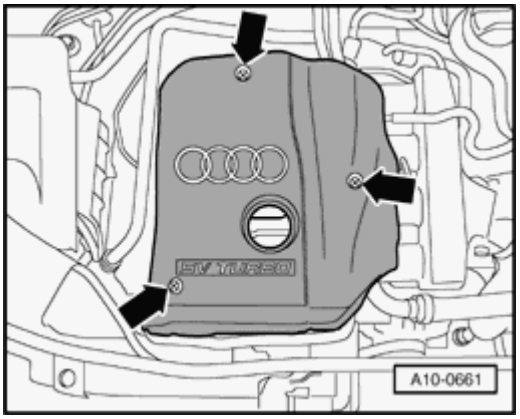

Fig. 137: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover panel - **arrows** -.

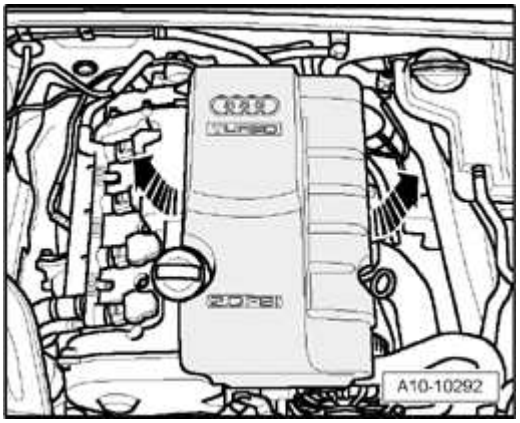

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Fig. 138: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 2.0 liter. turbo engine:

- Remove engine cover panel - **arrows** -.

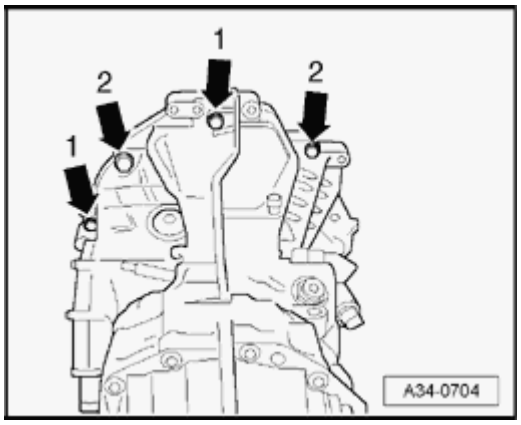

Fig. 139: Upper Engine/Transmission Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove upper engine/transmission securing bolts - **arrows 1** - and - **arrows 2** -. Please note that retaining brackets for wires/lines and coolant pipe may be secured on bolts - **arrows2** - (important for installation).

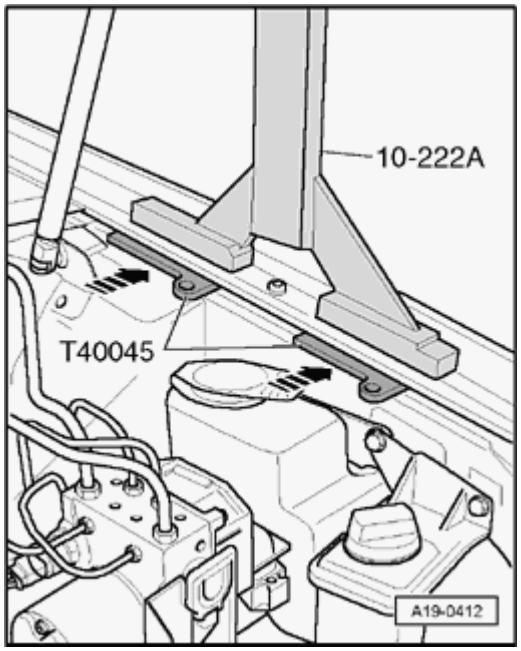

Fig. 140: Placing Insert Pad For Front Fender T40045 On Both Sides Between Fender Attachment Edge And Web Plate Lying Beneath
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove rubber seal from edges of fenders mounting flanges.
- To avoid damaging edges of the fender panels use support bracket 10-222 A, insert insert pad for front fender T40045 on both sides between the fender mounting flange and the body panel underneath.

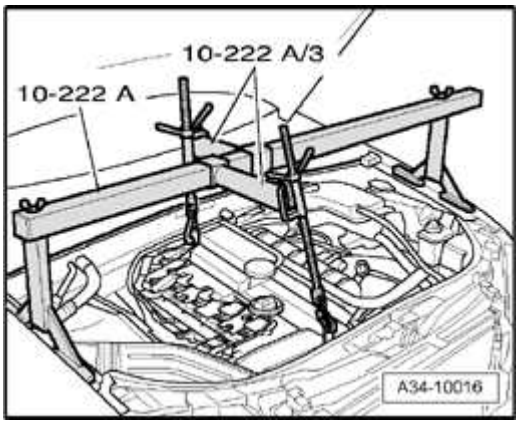

Fig. 141: Engine Support Bridge 10-222 A Set Up With Adapters 10-222/3 On Fender Mounting Flanges
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up support bracket 10-222 A with adapters 10-222/3 on fender mounting flanges.
- Engage spindles on engine lifting eyes as illustrated.
- Take up weight of engine using spindles.

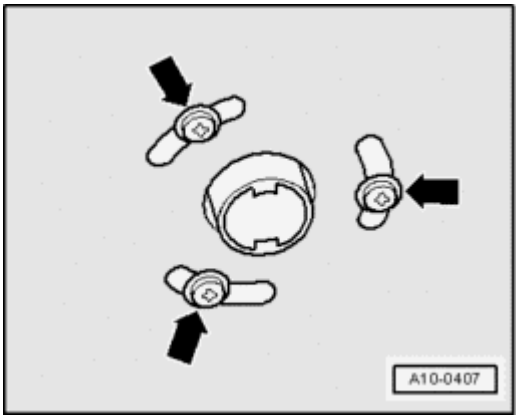

Fig. 142: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- On vehicles equipped with auxiliary heater, remove bolts - **arrows** - securing exhaust pipe of auxiliary heater to sound insulation.

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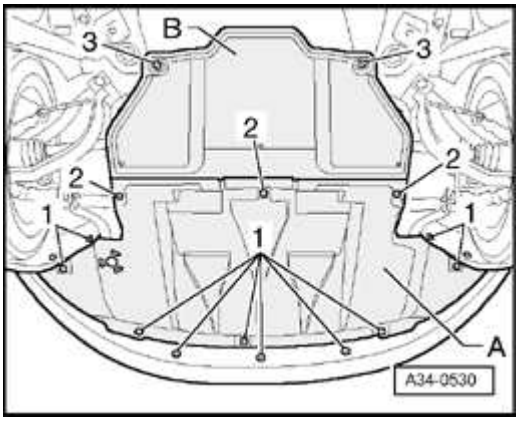

Fig. 143: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

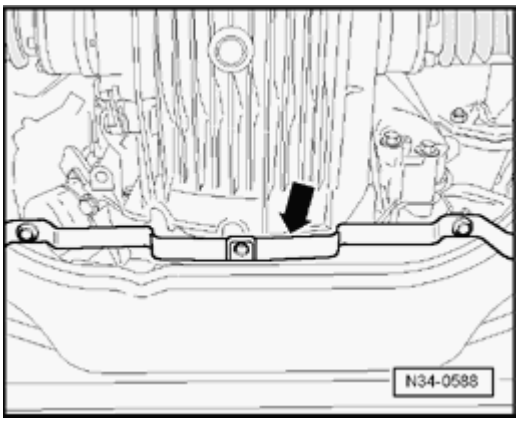

Fig. 144: Removing Noise Insulation Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach bracket - **arrow** - for sound insulation.

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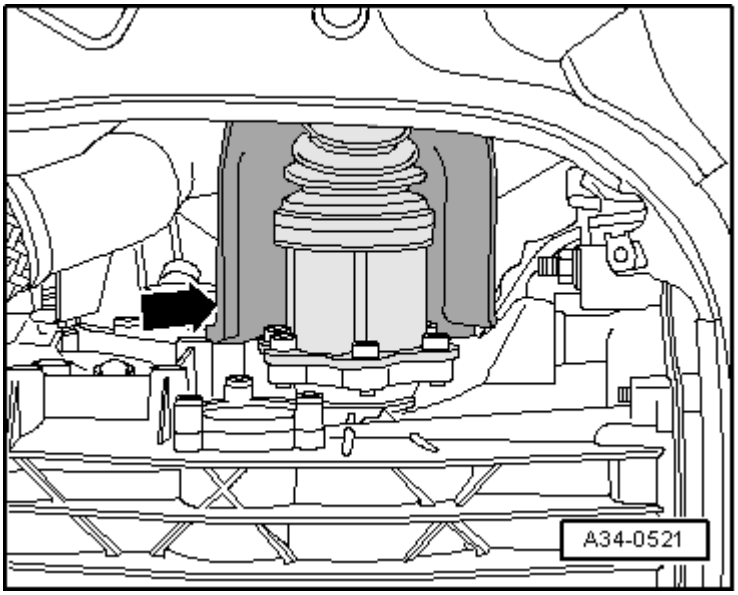

Fig. 145: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for drive axle (right-side).
- Remove drive axles (left and right) from transmission flange shafts.

Make sure you do not damage surface coating on drive axles.

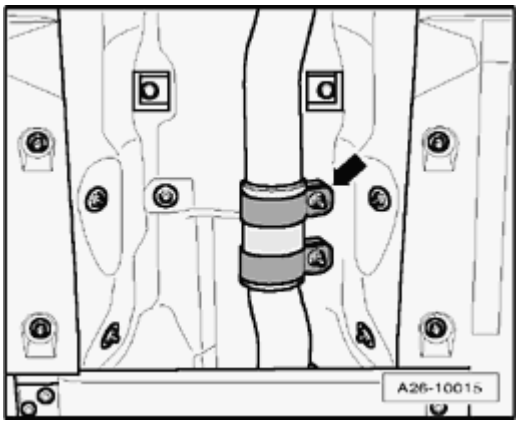

Fig. 146: Loosening Clamping Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **The flexible pipe connection (de-coupling element) on the front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.**

- Separate exhaust system at clamp - **arrow** - and slide clamp to rear.

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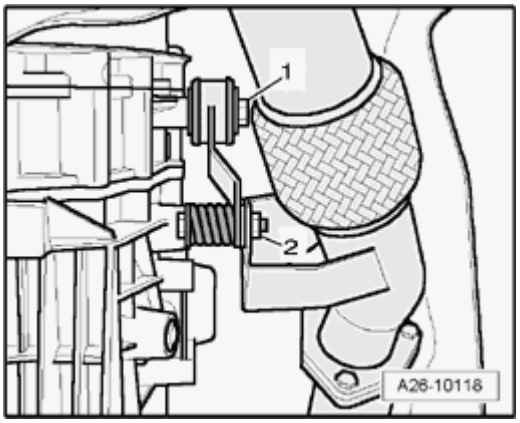

Fig. 147: Retaining Bracket For Front Exhaust Pipe, Bolt And Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **1** - and nut - **2** - and detach retaining bracket for front exhaust pipe.

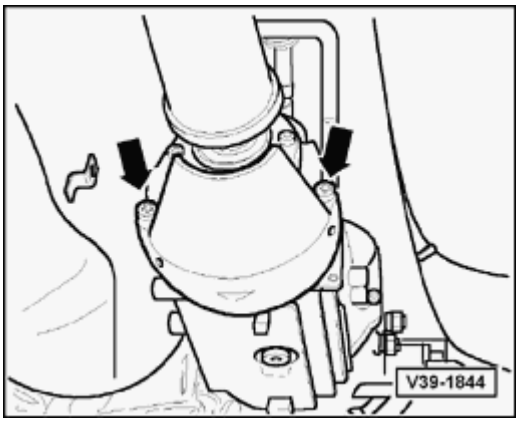

Fig. 148: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove heat shield for drive axle - **arrows** -.

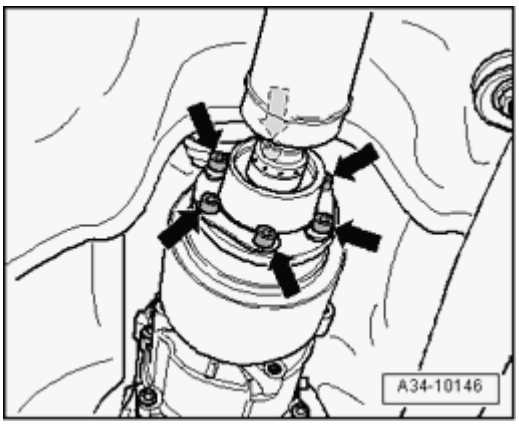

Fig. 149: Locating Bolts At Transmission/Drive Shaft Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove bolts - **arrows** - at transmission/drive shaft flange.
- Slide drive shaft together towards rear final drive. The constant velocity joints can be moved axially.
- Tie drive shaft to side.

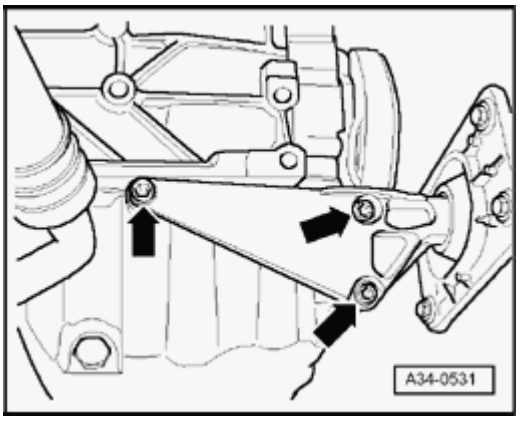

Fig. 150: Torque Reaction Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Cabriolet:

NOTE:

- **On Audi Cabriolet vehicles the following additional steps are required in order to remove the three bottom engine/transmission bolts:**

- Remove torque reaction support - **arrows** -.

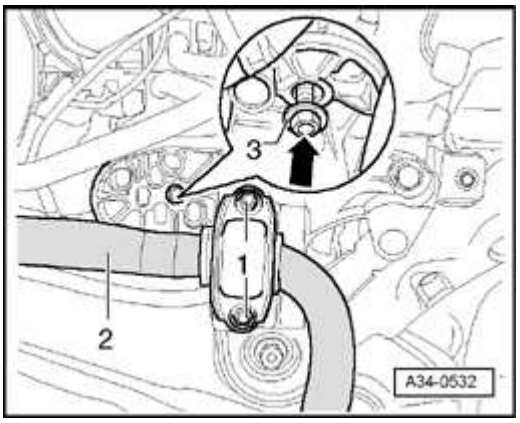

Fig. 151: Swivel Stabilizer Bar Nuts, Engine Mountings Nut And End Of Stud
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nuts - **1** - on left and right sides, and swivel anti-roll bar - **2** - downwards.
- Loosen nut - **3** - on left and right engine mountings until bottom of nut is flush with stud - **arrow** -.
- Use support bracket 10 - 222 A to lift engine just enough for nuts - **3** - to make contact with left and right console.

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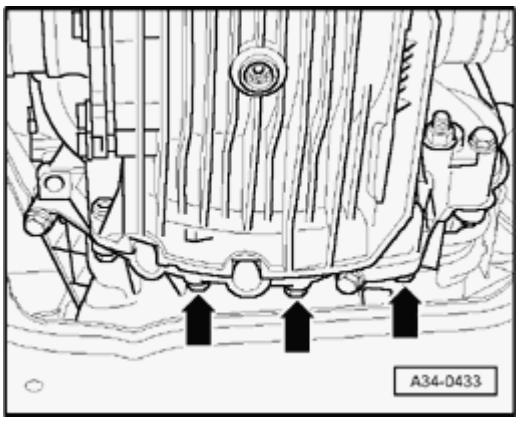

Fig. 152: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Continued for all vehicles:

- Remove three lower engine/transmission securing bolts - **arrow** -.

Cabriolet:

- Lower engine back down.

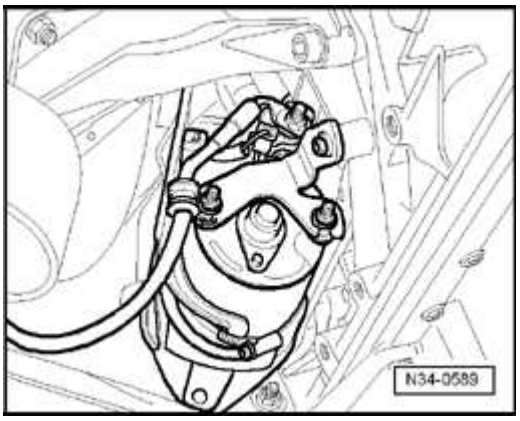

Fig. 153: Locating Starter Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Continued for all vehicles:

- Detach starter from engine/transmission and secure if necessary -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

.

NOTE:

- **Starter cables do not have to be disconnected.**

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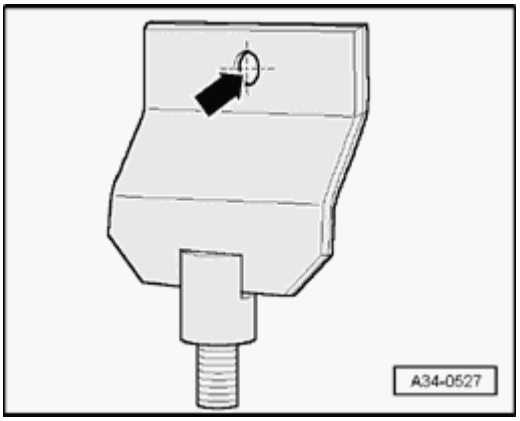

Fig. 154: Hole In Supporting Elements Of Transmission Support 3282
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drill a hole of 10.2mmdiameter - **arrow** - in supporting elements of transmission support 3282.

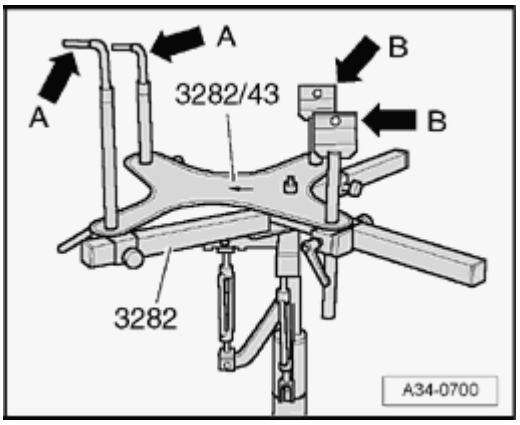

Fig. 155: Support Elements 3282/49 And 3282/52 And Arrow On The Adjustment Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove manual transmission 02X, set up transmission support 3282 with adjustment plate 3282/43 and place on engine/transmission jack V.A.G 1383 A.

NOTE:

- **The support elements 3282/49 - arrows A - and 3282/52 - arrows B - are shown in schematic form on the adjustment plate. The arrow on the adjustment plate points toward the direction of travel.**
- **Adjustment plate can only be installed in one position.**

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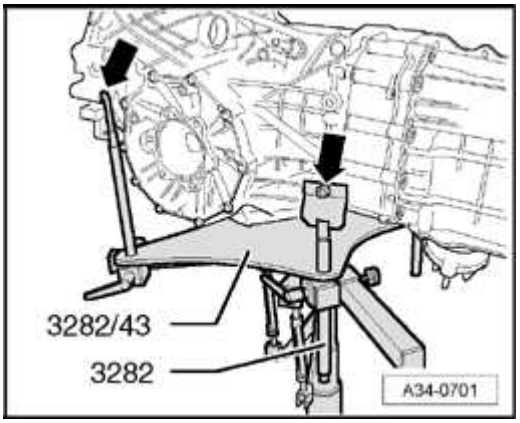

Fig. 156: Supporting Elements Secured To Left Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align adjustment plate parallel to transmission.
- Secure supporting elements to the left side of the transmission, as shown in illustration. Tighten bolt - **arrow on right side** - to 20 Nm.

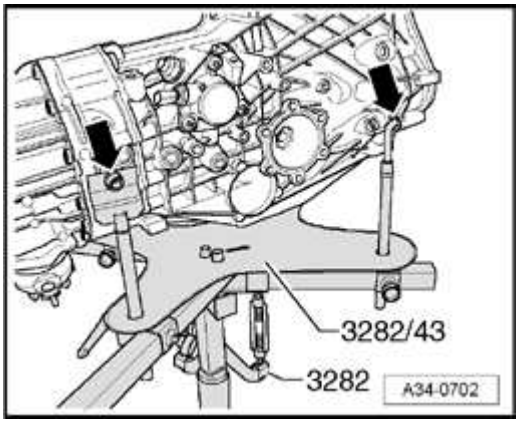

Fig. 157: Supporting Elements Secured To Right Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure supporting elements to the right side of the transmission, as shown in illustration. Tighten bolt - **arrow on left side** - to 20 Nm.

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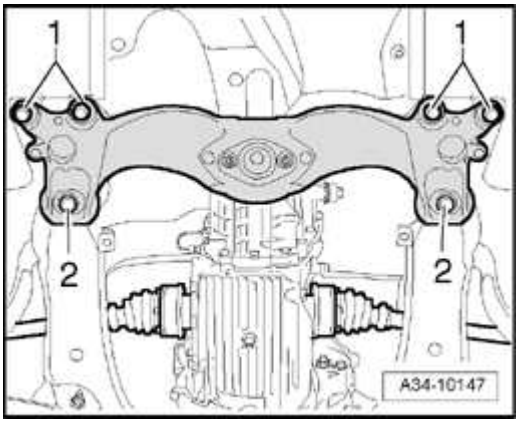

Fig. 158: Tunnel Cross Member Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First remove bolts - **1** - and then bolts - **2** -.

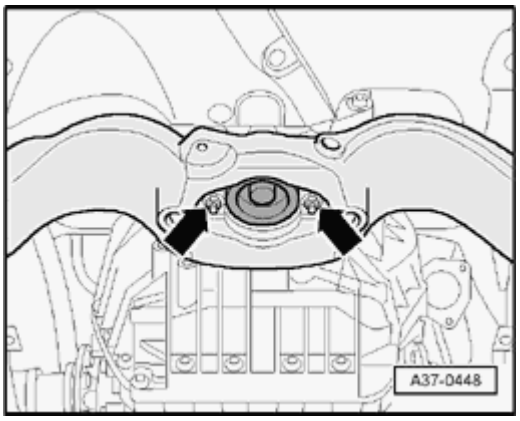

Fig. 159: Removing Nuts And Rear Crossmember
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** - and detach tunnel cross member.
- Lower transmission slightly using engine/transmission jack V.A.G 1383 A.

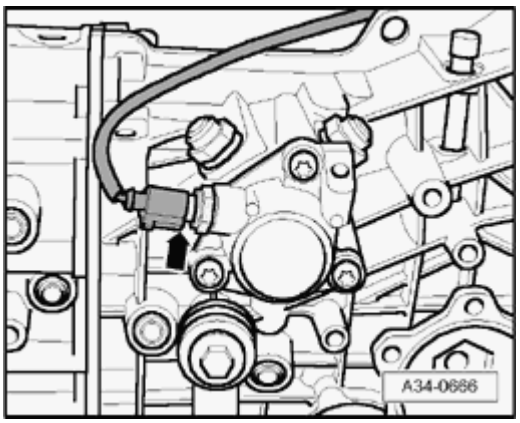

Fig. 160: Back-Up Light Switch F4 Electrical Connector

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - for back-up light switch F4 and move electrical wire clear.

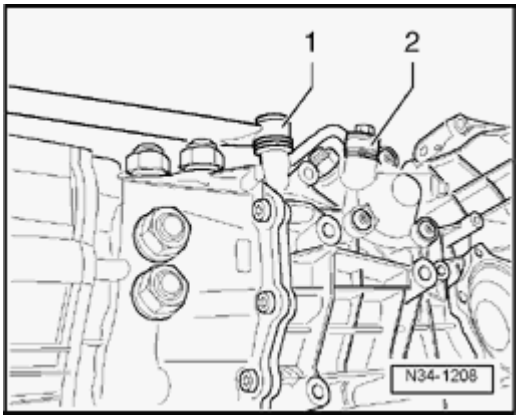

Fig. 161: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove connecting rod - **2** - for selector rod.
- Remove push rod - **1** - by using an 8 mm hex key when unscrewing bolt.

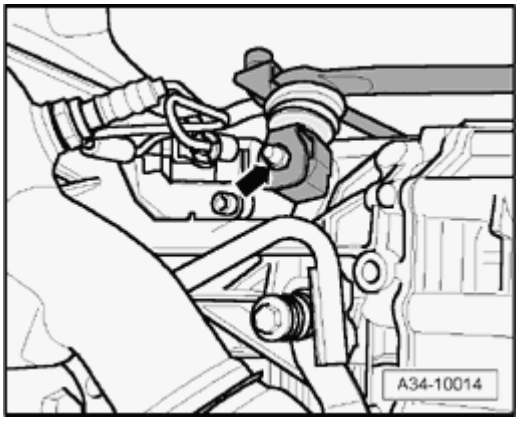

Fig. 162: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **arrow** - and detach selector shaft lever from selector shaft.

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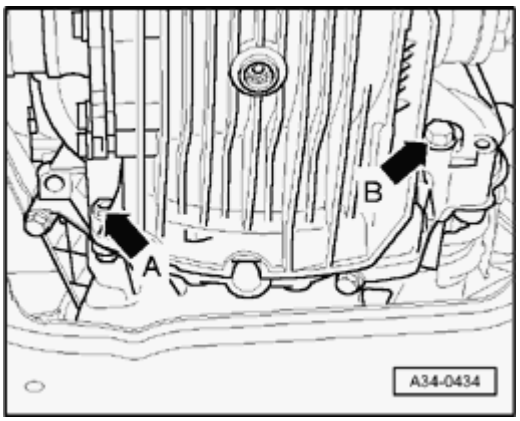

Fig. 163: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove remaining engine/transmission securing bolts - **arrow A** - and - **arrow B** -.
- Press transmission off dowel sleeves and lower carefully using engine/transmission jack V.A.G 1383 A just far enough to gain access to slave cylinder.

NOTE:

- **When lowering transmission, make sure hydraulic line to slave cylinder is not damaged.**

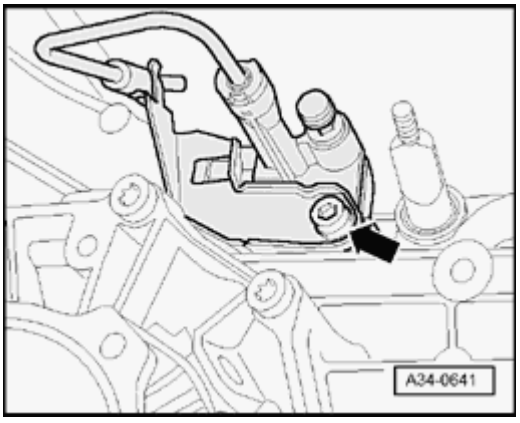

Fig. 164: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove slave cylinder from transmission - **arrow** - and secure with wire. Do not open line/hose system.

CAUTION: Do not depress clutch pedal after removing slave cylinder. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

- If installed, remove retaining clips/cable ties together with Lambda probe wires from top of transmission.
- Lower transmission.

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NOTE:

- **When lowering transmission, make sure there is sufficient clearance to drive shafts.**

- Before performing assembly work, secure transmission to assembly stand, using holding fixture VW 540 --> **Transmission, mounting on assembly stand**.

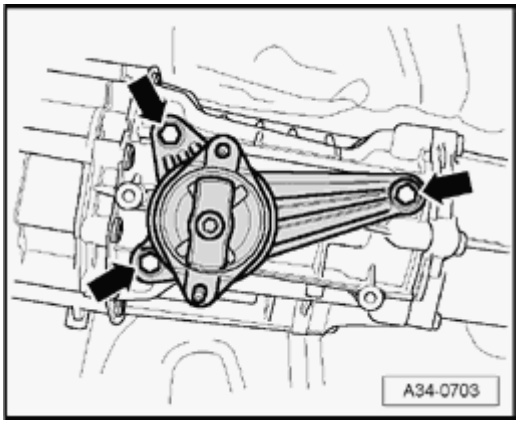

Fig. 165: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installing a new transmission instead of the one removed, the transmission mounting has to be transferred to new transmission - **arrows** -.

Installing transmission --> **Transmission, installing (vehicles with 4-cylinder or 6-cylinder engine)**

Transmission, removing (vehicles with 6-cylinder engine)

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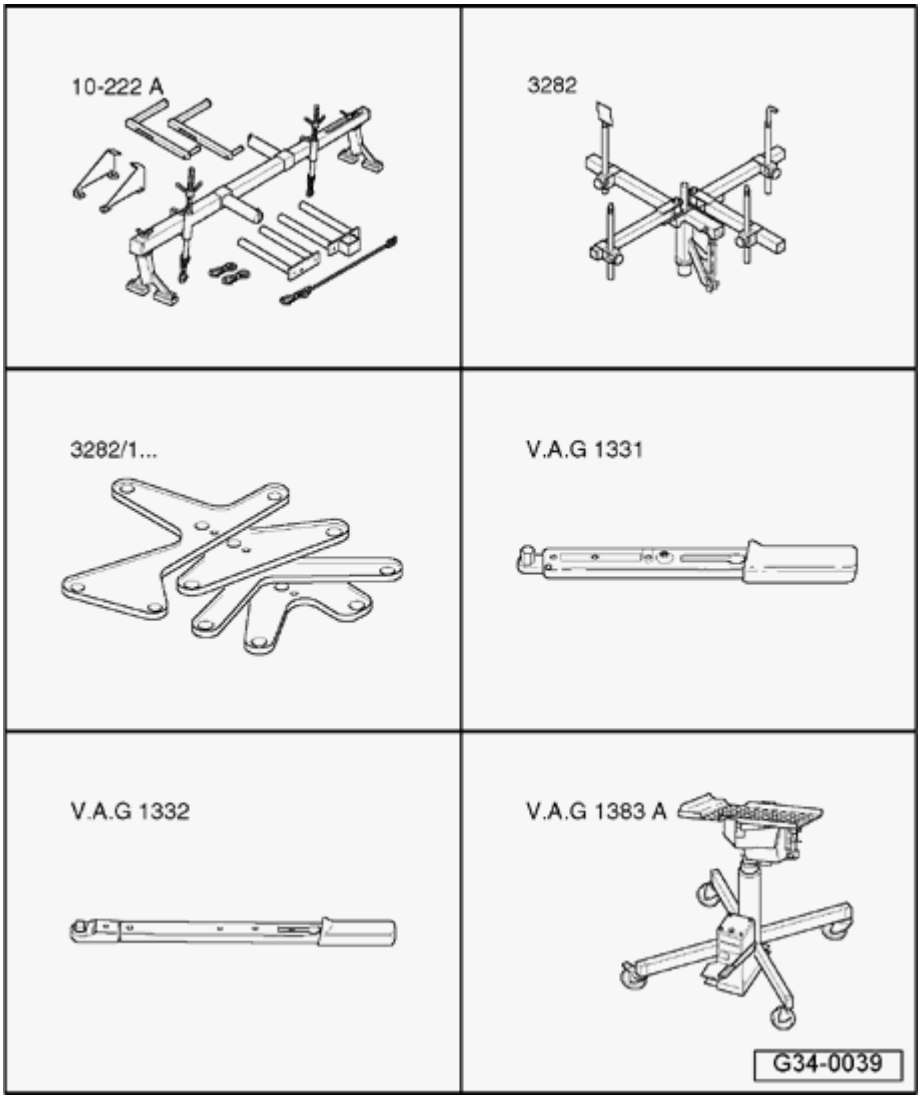

Fig. 166: Identifying Special Tools -- Transmission, Removing From Vehicles
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Support bracket 10 - 222 A
- Transmission support 3282
- Adjustment plate 3282/43
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332
- Engine/transmission jack V.A.G 1383 A

Special tools, testers and auxiliary items required

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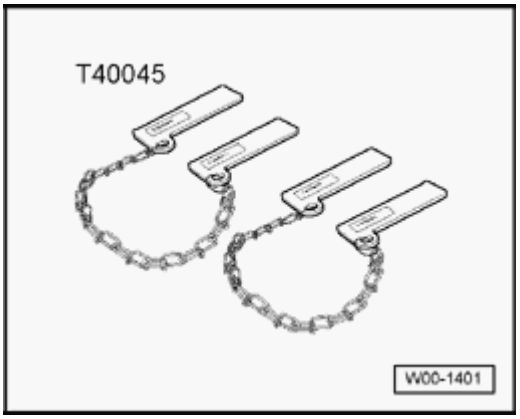

Fig. 167: Insert Pad For Front Fender T40045
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert pad for front fender T40045

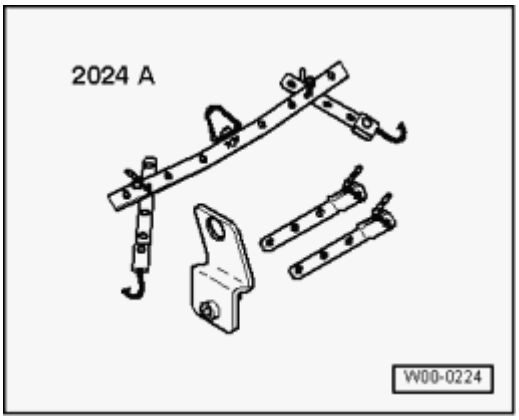

Fig. 168: Engine Sling 2024 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lifting aid 2024 A
- **Grease for clutch plate splines G000100**
- **Copper grease Z381351TE**

NOTE:

- **All cable ties which are released or cut open during removal must be installed in the same position when installing.**
- **Heat insulation sleeves removed during removal of transmission must be installed in the same position when installing.**

CAUTION: Follow steps required when disconnecting battery -->

- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL for Cabriolet**

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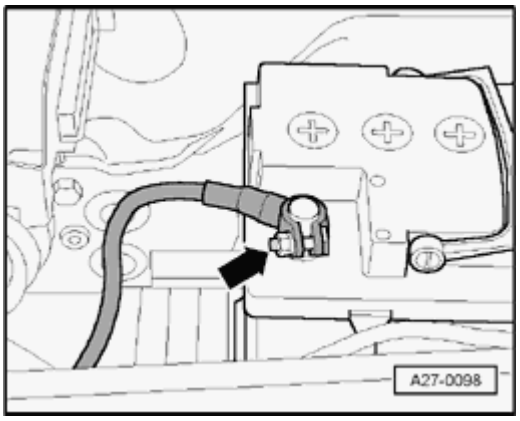

Fig. 169: Disconnecting Battery Ground (GND) Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With ignition switched off, disconnect battery Ground (GND) strap - **arrow** -.

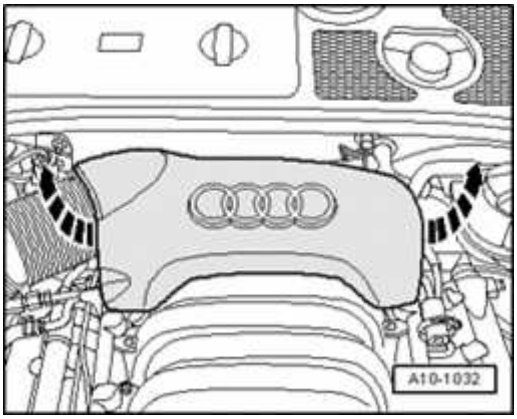

Fig. 170: Removing Rear Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.

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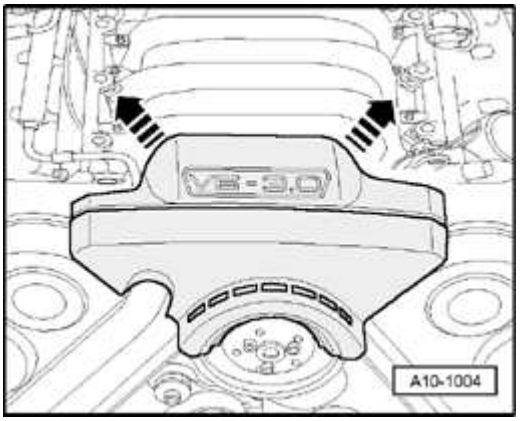

Fig. 171: Removing Front Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.

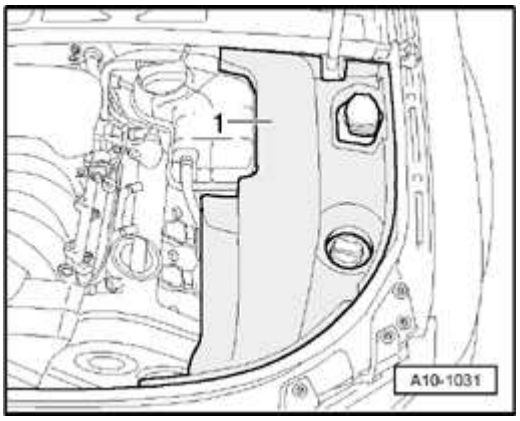

Fig. 172: Removing Cover In Engine Compartment (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - **1** - on left side of engine compartment.

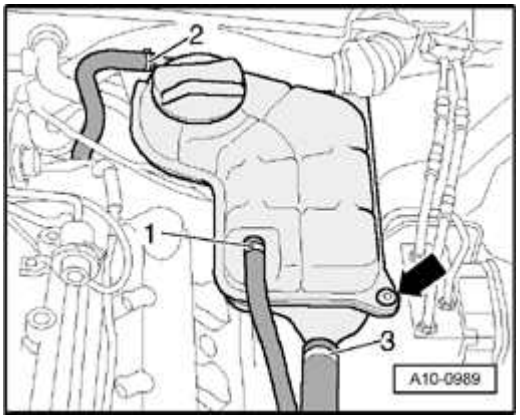

Fig. 173: Removing Coolant Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Unfasten coolant expansion tank - **arrow** -.
- Disconnect electrical wiring for Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant expansion tank.
- Tie coolant expansion tank to one side, leaving coolant hoses - **1** - , - **2** - and - **3** - connected.

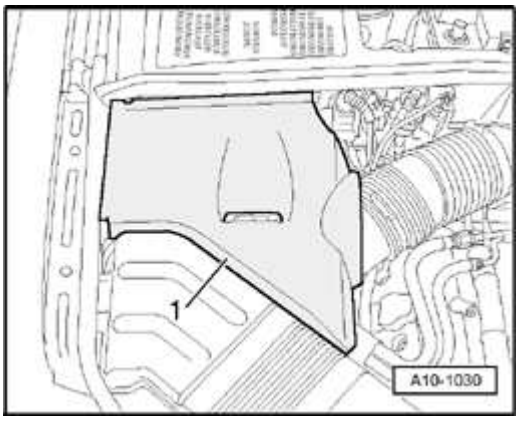

Fig. 174: Removing Cover In Engine Compartment (Right Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - **1** - on right side of engine compartment.

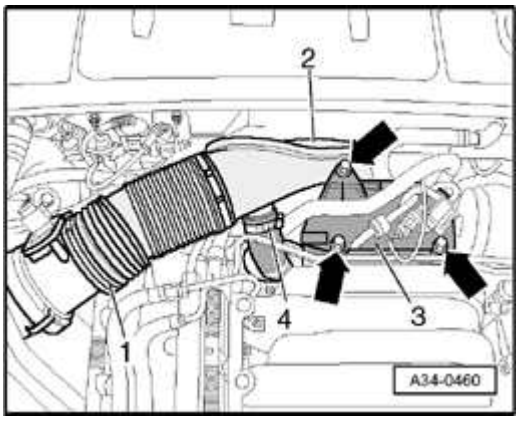

Fig. 175: Identifying Holding Plate, Intake Air Hose, Hose & Air Duct
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - from solenoid valve mounting plate - **3** -.
- Disconnect air intake hose - **1** - from mass air flow sensor.
- Pull hose - **4** - for crankcase breather system off air duct - **2** -.

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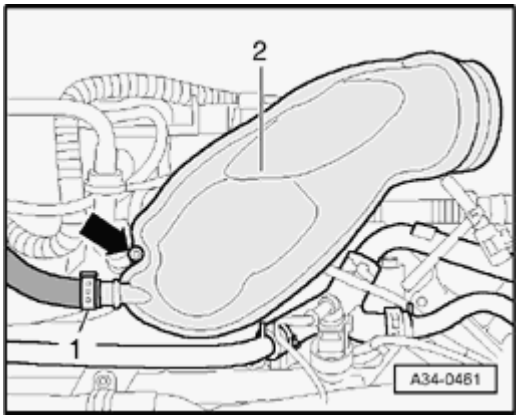

Fig. 176: Removing Bolt And Disconnect Air Duct At Throttle Valve Control Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - and disconnect air duct - **2** - from throttle valve control module.
- If installed, disconnect hose - **1** - from air duct.

NOTE:

- **In the illustration, the air duct is shown from the rear and with the engine removed.**

- Remove engine/transmission securing bolts which are accessible from above.

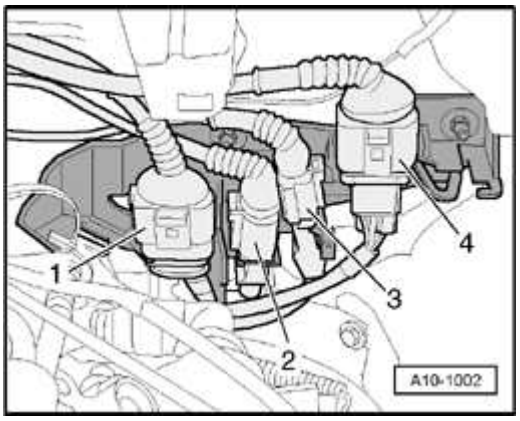

Fig. 177: Removing Harness Connectors From Bracket At Left Of Bulkhead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors - **1 to 4** - from retainer at left of bulkhead.
- Disconnect electrical connectors - **1** - and - **4** -.
- Move Lambda probe wires clear.
- Remove retainer for connectors.

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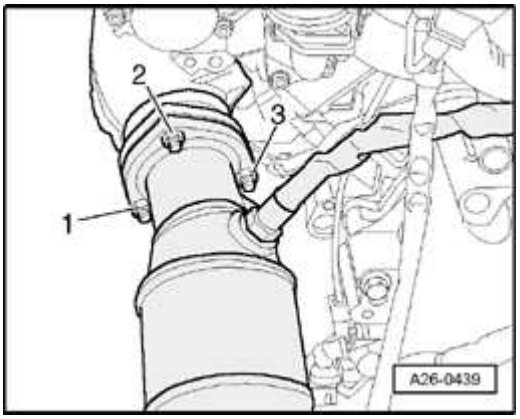

Fig. 178: Left Front Exhaust Pipe To Exhaust Manifold Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **1** - (access from above), connecting left front exhaust pipe with exhaust manifold.

NOTE:

- **In the illustration the engine has been removed.**

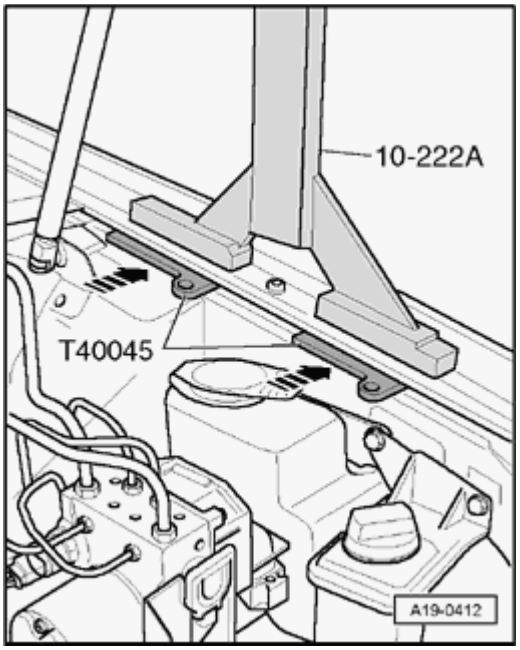

Fig. 179: Placing Insert Pad For Front Fender T40045 On Both Sides Between Fender Attachment Edge And Web Plate Lying Beneath
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal from edges of fender mounting flanges.
- To avoid damaging edges of fender panels with support bracket 10-222 A, insert insert pad for front fender T40045 on both sides between fender mounting flange and body panel underneath.

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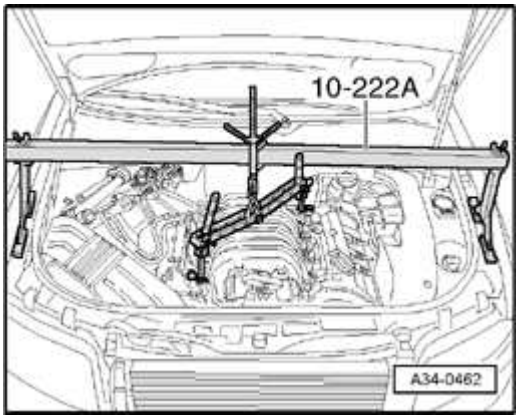

Fig. 180: Positioning 10-222A Engine Support Bridge On Bolted Flanges Of Fenders
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up support bracket 10 - 222 A on fender mounting flanges.

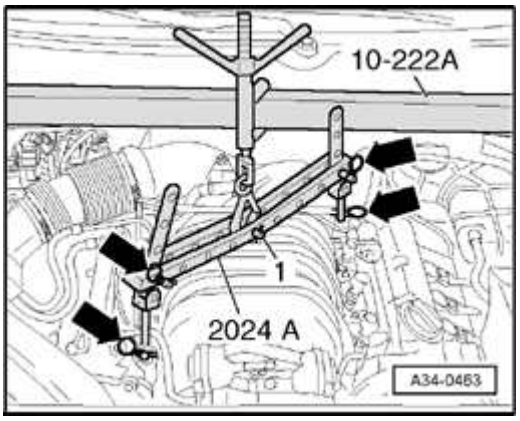

Fig. 181: Removing Eyelet For 2024A Engine Sling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove eye of lifting tackle 2024A.
- Re-insert pin - **1** - in middle hole on lifting tackle and secure it with split pin.
- Hook pin on lifting tackle 2024A onto spindle on support bracket 10 - 222 A.
- Hook lifting tackle 2024A into lifting eyes at front and rear of engine.

CAUTION: Support hooks and locking pins on lifting tackle must be secured with retainers - arrows - in illustration.

- Slightly pretension engine with spindle of support bracket.

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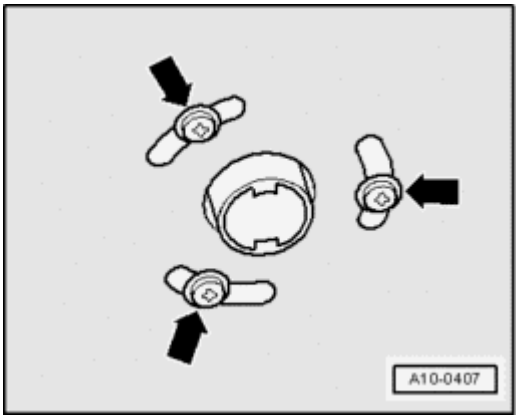

Fig. 182: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- On vehicles equipped with auxiliary heater, remove bolts - **arrows** - securing exhaust pipe of auxiliary heater to sound insulation.

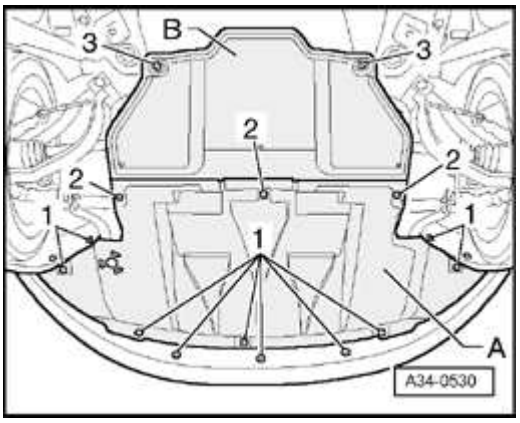

Fig. 183: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

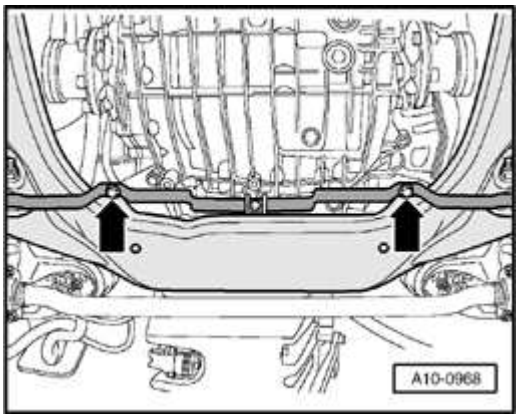

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Fig. 184: Removing Bracket For Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for sound insulation - **arrows** -.

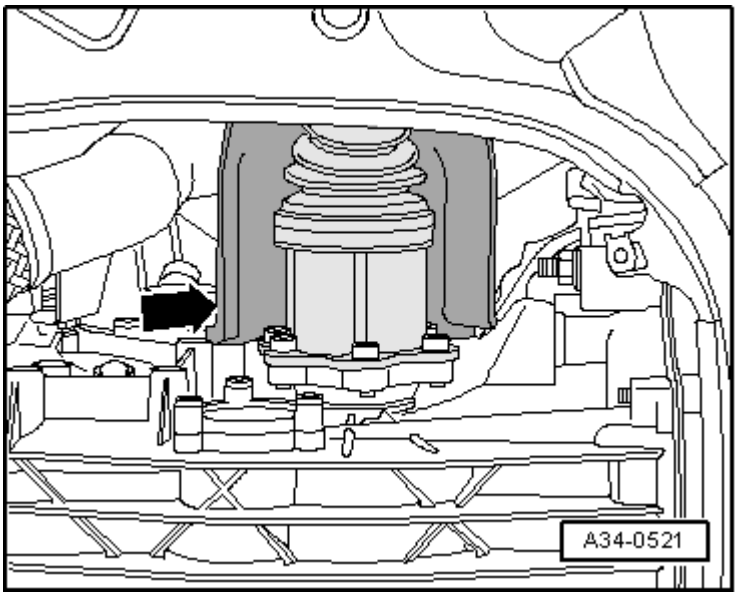

Fig. 185: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrow** - for drive axles (left and right).
- Remove drive axles from flange shafts, lift clear and secure.

NOTE:

- **Make sure you do not damage surface coating on drive axles.**

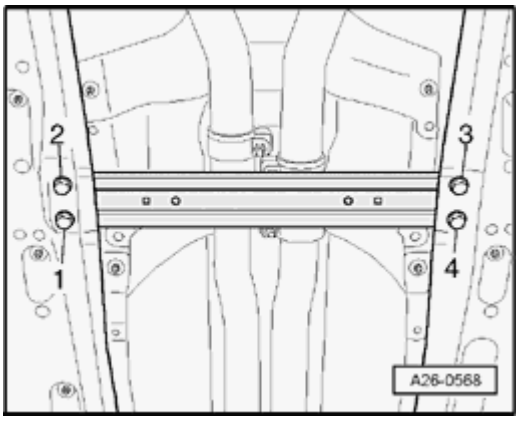

Fig. 186: Removing Bolts For Front Vehicle Floor Crossmember
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove front cross member - **1 to 4** -.

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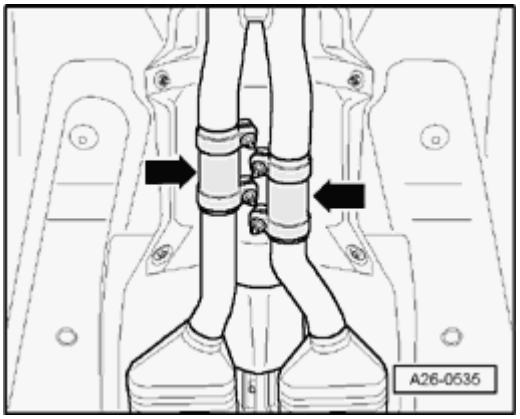

Fig. 187: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamps - **arrows** -.
- Remove front exhaust pipe with catalytic converter (left-side) --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for relevant engine code.
- Remove bracket for exhaust pipe (right front) from transmission.

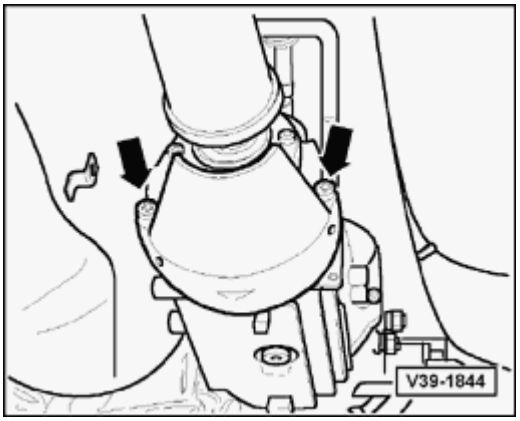

Fig. 188: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove heat shield for drive shaft - **arrows** -.

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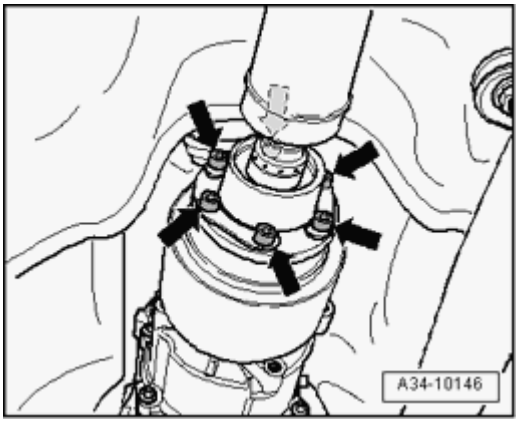

Fig. 189: Locating Bolts At Transmission/Drive Shaft Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - at transmission/drive shaft flange.
- Slide drive shaft together toward rear final drive. The constant velocity joints can be moved axially.
- Tie drive shaft to side.

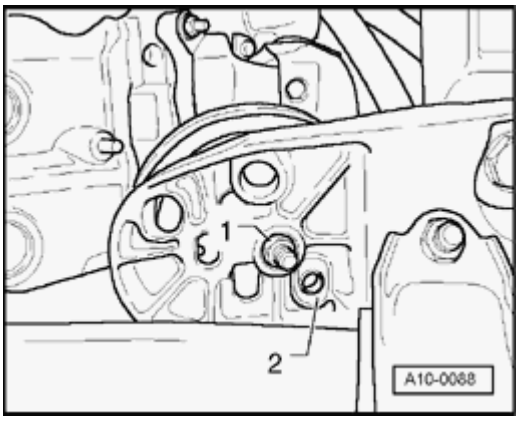

Fig. 190: Threaded Connections And Positioning Sleeves On Lower Engine Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1** - at bottom of engine mountings (left and right).

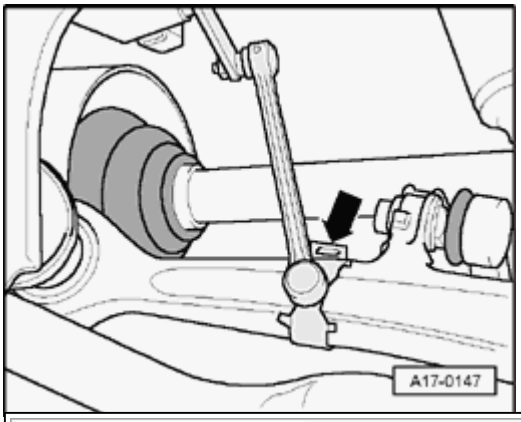

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Fig. 191: Unclipping Operating Rod For Vehicle Levelling Sensor At Lower Transverse Link
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, unclip operating rod for left front level control system sensor G78 from lower transverse link - **arrow** -.

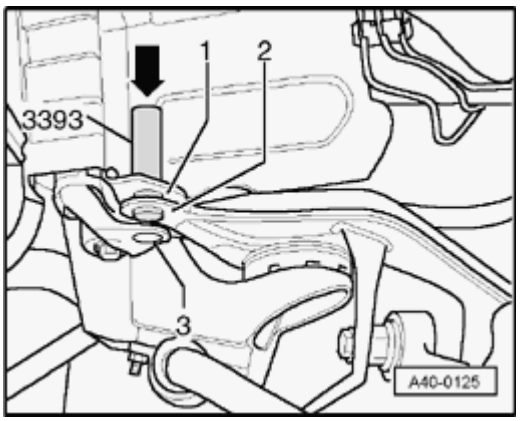

Fig. 192: Checking Holes Align Using Testing Mandrel 3393
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before loosening subframe, use testing mandrel 3393 to check whether holes - **1** - and - **2** - are aligned.

If holes are not aligned, a wheel alignment has to be performed after installing the subframe.

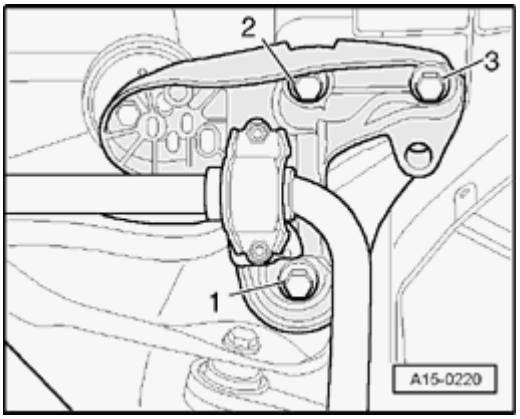

Fig. 193: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front bolts - **2** - and - **3** - on subframe (left and right). Then remove bolts - **1** -.
- Lower subframe at front.

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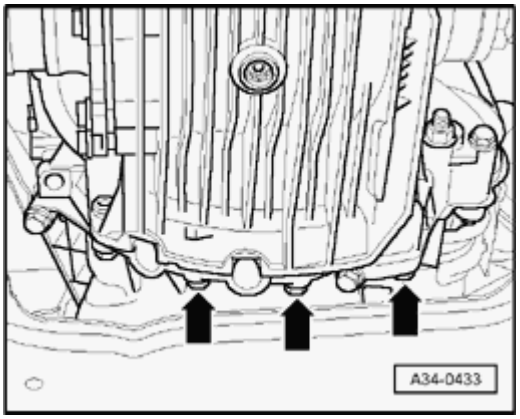

Fig. 194: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove lower engine/transmission securing bolts - **arrows** -.

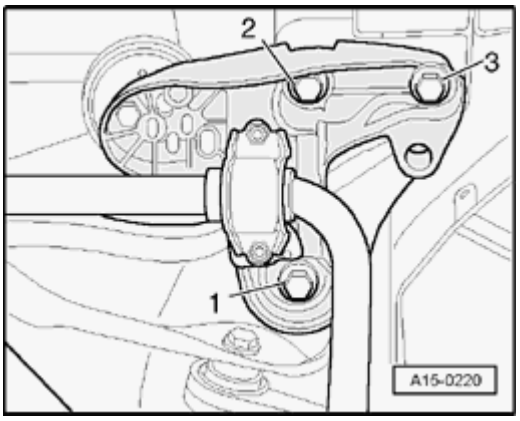

Fig. 195: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Temporarily secure subframe again.

Temporary tightening torque:

1 - approx. 100 Nm

2 - approx. 70 Nm

3 - approx. 70 Nm

CAUTION: Do not replace bolts yet or tighten to their final torque. This will be done when installing the transmission.

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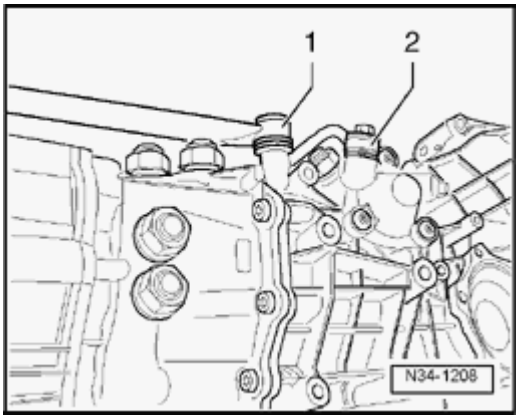

Fig. 196: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove connecting rod - **2** - for selector rod.
- Disconnect push rod - **1** - by removing hex socket head bolt.

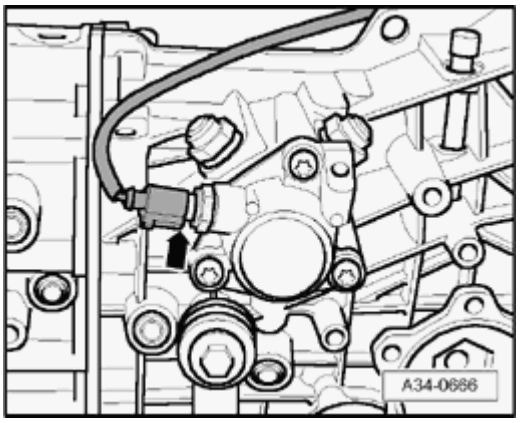

Fig. 197: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - for Back-up light switch F4 and move electrical wire clear.

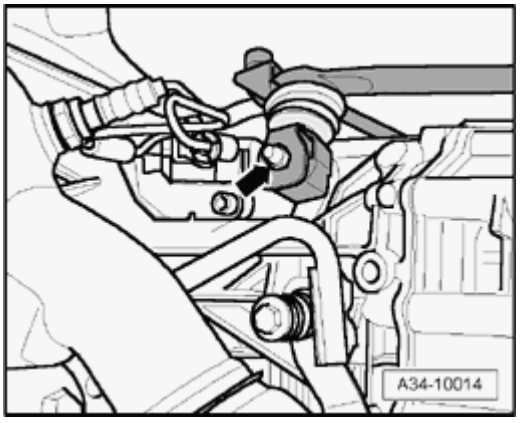

Fig. 198: Selector Shaft Lever Nut

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **arrow** - and detach selector shaft lever from selector shaft.

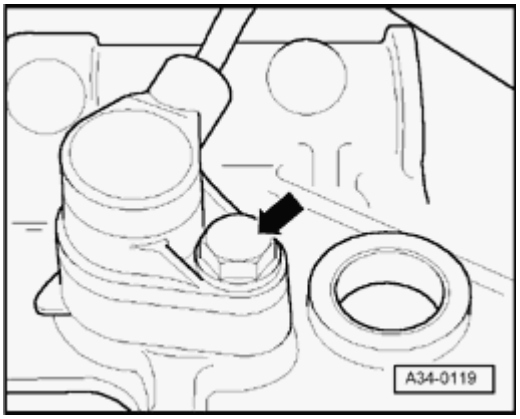

Fig. 199: Location Of Engine Speed (RPM) Sensor G28 On Coupling Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove Engine Speed (RPM) sensor G28 from left side of transmission - **arrow** - and lay aside.

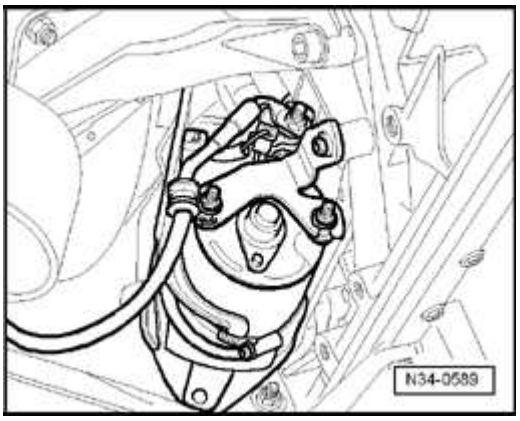

Fig. 200: Locating Starter Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove starter from engine/transmission and secure if necessary -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

.

NOTE:

- **Starter cables do not have to be disconnected.**

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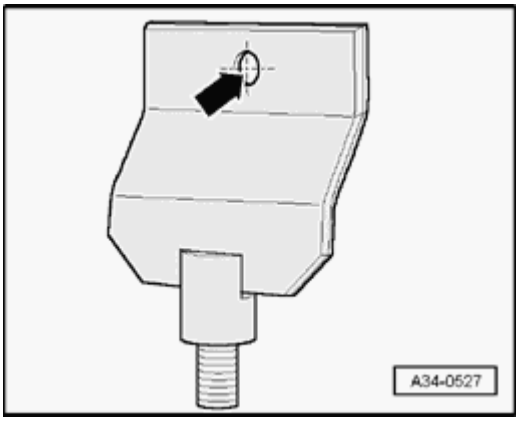

Fig. 201: Hole In Supporting Elements Of Transmission Support 3282
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drill a hole of 10.2mmdia. - **arrow** - in the supporting elements of transmission support 3282.

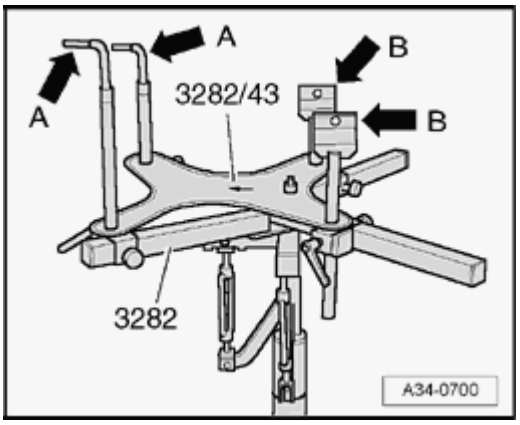

Fig. 202: Support Elements 3282/49 And 3282/52 And Arrow On The Adjustment Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove transmission set up transmission support 3282 with adjustment plate 3282 /43 and place on engine/transmission jack V.A.G 1383 A.

NOTE:

- **The support elements 3282/49 - arrows A - and 3282/52 - arrows B - are shown in schematic form on the adjustment plate. The arrow on the adjustment plate points toward the direction of travel.**
- **Adjustment plate can only be installed in one correct position.**

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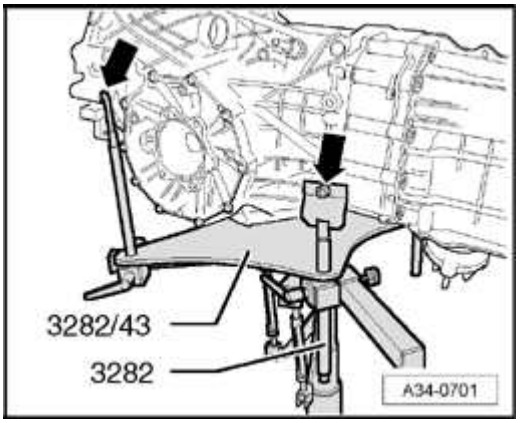

Fig. 203: Supporting Elements Secured To Left Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align adjustment plate parallel to transmission.
- Secure supporting elements to left side of transmission, as shown in illustration. Tighten bolt M10x20 - **arrow on right side** - to 20 Nm.

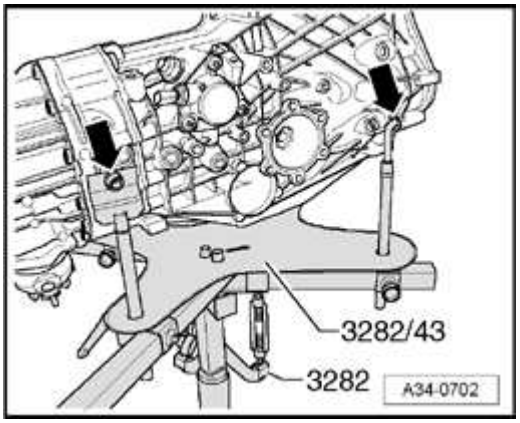

Fig. 204: Supporting Elements Secured To Right Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure supporting elements to right side of transmission, as shown in illustration. Tighten bolt M10x20 - **arrow on left side** - to 20 Nm.

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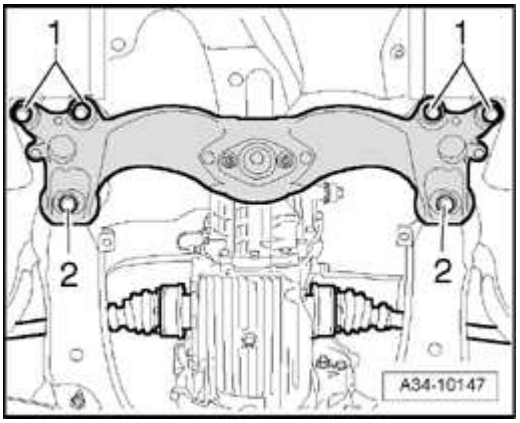

Fig. 205: Tunnel Cross Member Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and then bolts - **2** - at cross member.

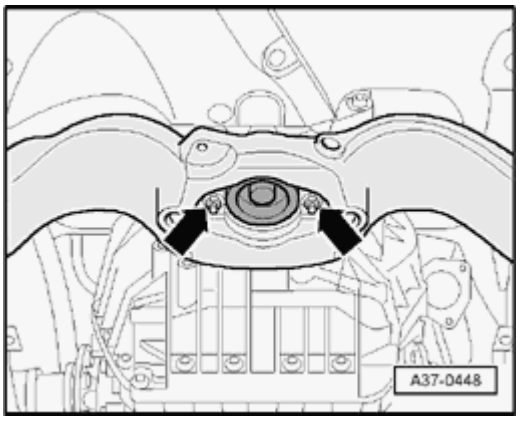

Fig. 206: Removing Nuts And Rear Crossmember
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** - and detach cross member.

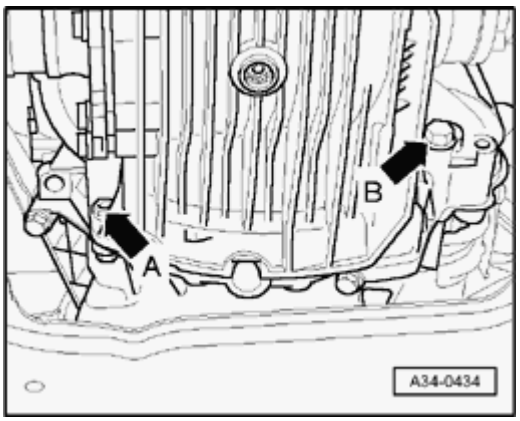

Fig. 207: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove remaining engine/transmission securing bolts - **arrow A** - and - **arrow B** -.
- Press transmission off dowel sleeves and lower carefully using engine/transmission jack V.A.G 1383 A just far enough to gain access to the slave cylinder.

NOTE:

- **When lowering transmission, make sure hydraulic line to slave cylinder is not damaged.**

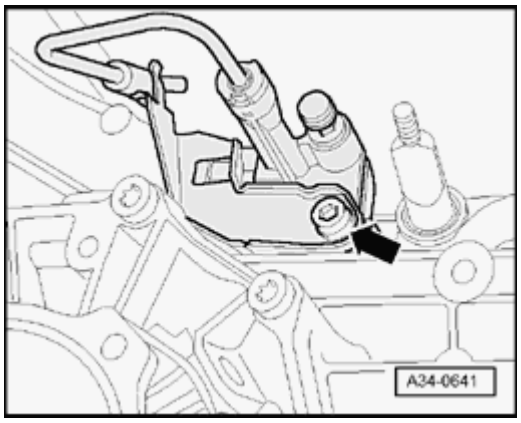

Fig. 208: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove slave cylinder from transmission - **arrow** - and secure with wire, do not open line/hose system.

CAUTION: Do not depress clutch pedal after removing slave cylinder. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

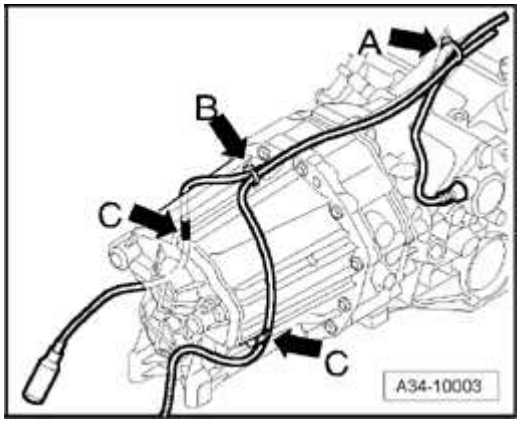

Fig. 209: Locating Cable Ties And Oxygen Sensor Wiring At Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, open cable ties - **arrows A and B** - , unclip Lambda probe cables at the side - **arrows C** - and move cables clear.
- Lower transmission.

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NOTE:

- **When lowering transmission, make sure there is sufficient clearance to drive axles.**

- Before carrying out assembly work, secure transmission to assembly stand, using engine and transmission support VW 540 --> **Transmission, mounting on assembly stand**.

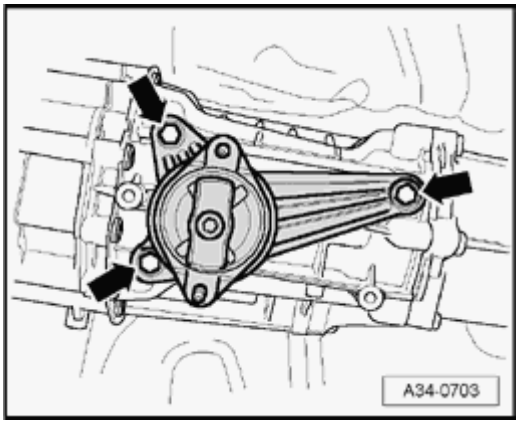

Fig. 210: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installing a new transmission instead of the one removed, the transmission mounting has to be transferred to the new transmission - **arrows** -.

Installing transmission --> **Transmission, installing (vehicles with 4-cylinder or 6-cylinder engine)**

Transmission, installing (vehicles with 4-cylinder or 6-cylinder engine)

Installation is in reverse order of removal. Note the following:

- Use thread tap to remove any remaining locking fluid from all threaded holes which will accommodate self-locking bolts.
- Always replace self-locking bolts and nuts.
- Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of **grease for clutch plate splines G000100** to splines. Do not grease guide sleeve.

It should be possible to push clutch plate back and forth slightly on input shaft.

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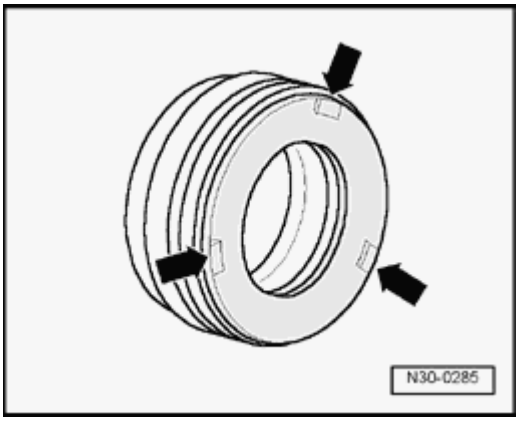

Fig. 211: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check clutch release bearing for wear and replace if necessary.
- If plastic ring - **arrows** - has come loose, service release bearing as required **Checking and servicing release bearing with glued plastic ring**

NOTE:

- **The release bearing must be replaced if the groove worn on the plastic ring is deeper than 0.8mm.**

- Check that dowel sleeves for centralizing engine/transmission are in the cylinder block, install if necessary.
- Place intermediate plate on dowel sleeves at engine flange.
- Before installing transmission, tie electrical wires and brackets off to one side so that they are not trapped between engine and transmission.
- Lightly lubricate surface where operating rod and clutch release lever make contact - **arrow B** - using copper grease Z381351TE.

- Raise transmission far enough to be able to install slave cylinder with bracket for hose/line assembly.

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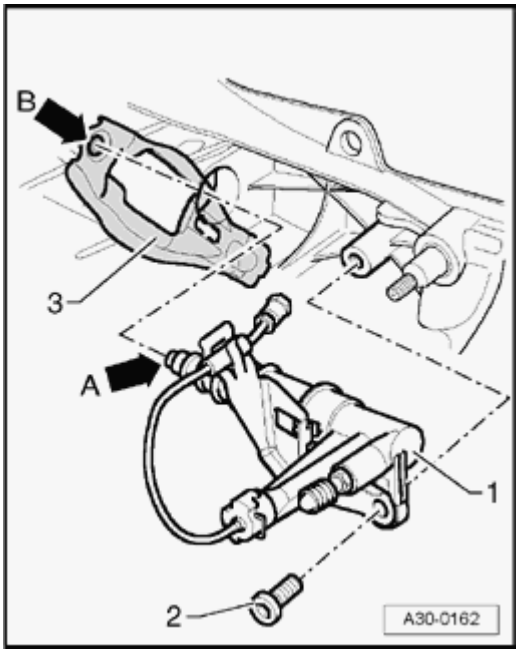

Fig. 212: Guiding Slave Cylinder Into Bore Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Guide slave cylinder - **1** - into opening in transmission housing keeping it as straight as possible (without tilting operating rod - **arrow A** -) and insert in recess - **arrow B** - on clutch release lever - **3** -.

NOTE:

- **If the slave cylinder - 1 - is inserted at an angle, there is a danger that the operating rod - arrow A - will be guided past the clutch release lever - 3 -.**

CAUTION: After installing the slave cylinder carefully press the clutch pedal. If you feel an unusually strong point of pressure when depressing the clutch pedal, do not press it down further. The push rod of the slave cylinder is likely to have been guided past the clutch release lever. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

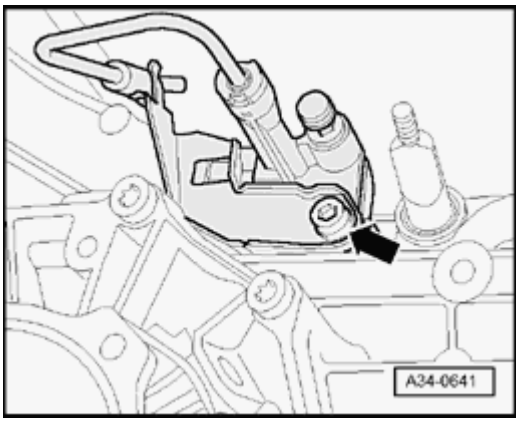

Fig. 213: Slave Cylinder Bracket And Fastener

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure slave cylinder with new bolt - **arrow** -.
- Insert transmission, making sure there is sufficient clearance to drive shafts.

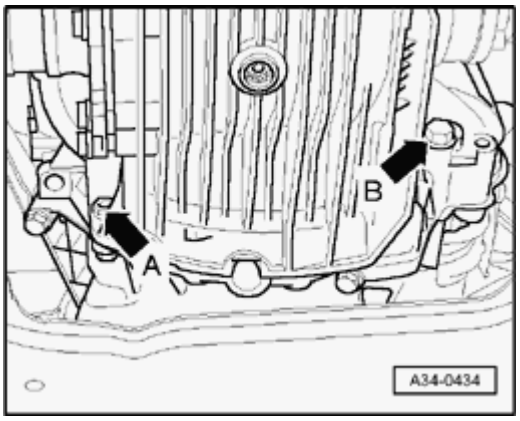

Fig. 214: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install engine/transmission securing bolts - **arrow A** - and - **arrow B** -.
- Install starter -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

.

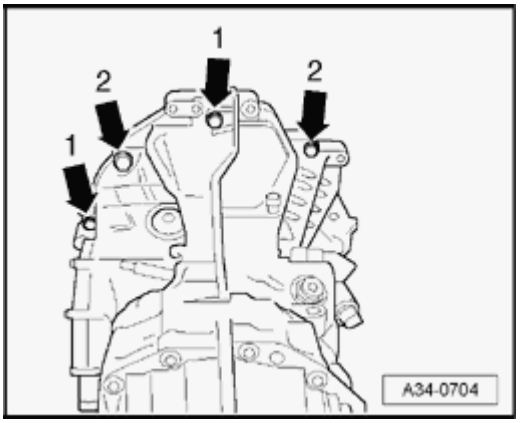

Fig. 215: Upper Engine/Transmission Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully lower transmission a short distance using engine and transmission jack V.A.G 1383 A.
- If possible, tighten upper engine/transmission securing bolts - **arrows1** - and - **arrows2** -.

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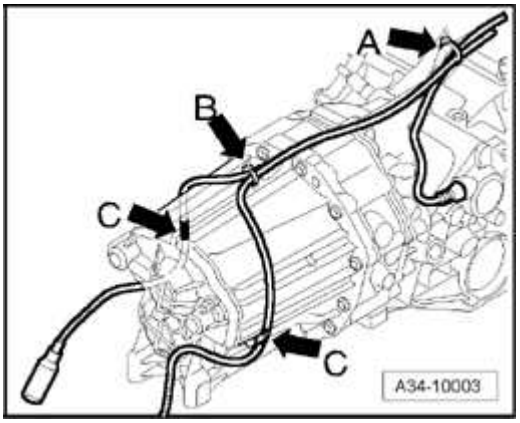

Fig. 216: Locating Cable Ties And Oxygen Sensor Wiring At Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, secure all electrical wiring to transmission again - **arrows A to C** -.

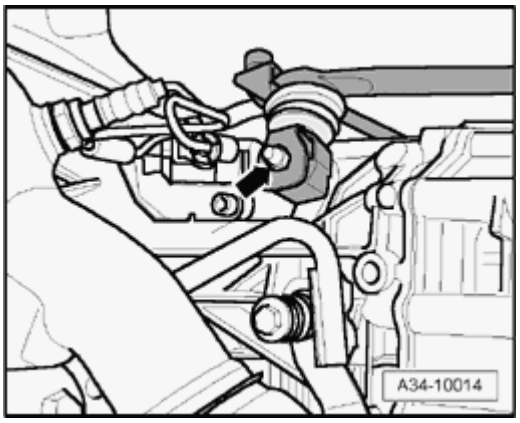

Fig. 217: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install selector shaft lever and tighten nut - **arrow** -.

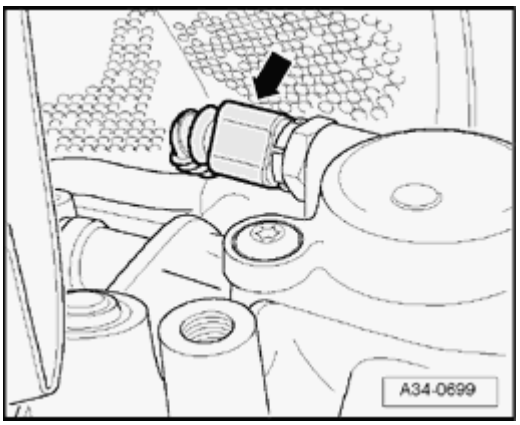

Fig. 218: Back-Up Light Switch Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Connect connector - **arrow** - for back-up light switch F 4 on right side of transmission.

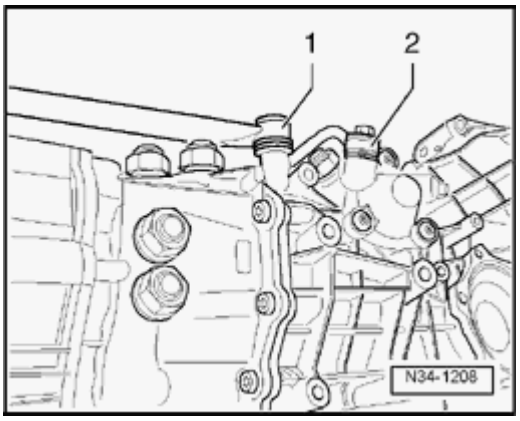

Fig. 219: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install push rod - **1** - by tightening hex socket head bolt.
- Secure connecting rod - **2** - for selector rod.

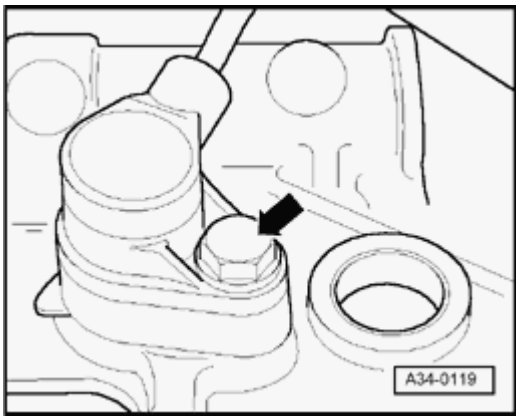

Fig. 220: Location Of Engine Speed (RPM) Sensor G28 On Coupling Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, install Engine Speed (RPM) Sensor G28 on left side of transmission.

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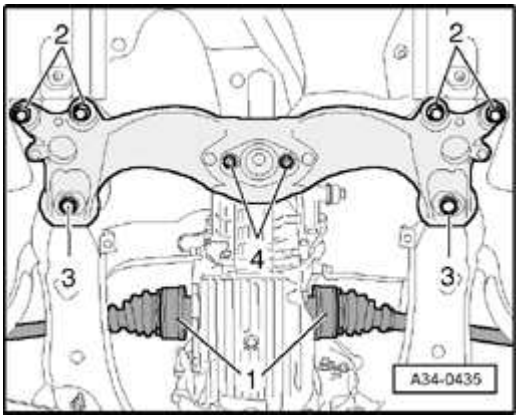

Fig. 221: Drive Shafts And Flange Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift transmission again using engine/transmission jack V.A.G 1383 A.
- Attach cross member to body with new bolts - **2** - and - **3** - (tighten hand-tight only).
- Secure cross member to transmission mounting - **4** - --> **40 - FRONT SUSPENSION** .
- Carefully lower engine/transmission jack V.A.G 1383 A and move it aside.

- Bolt drive axles - **1** - to flange shafts --> **40 - FRONT SUSPENSION** .

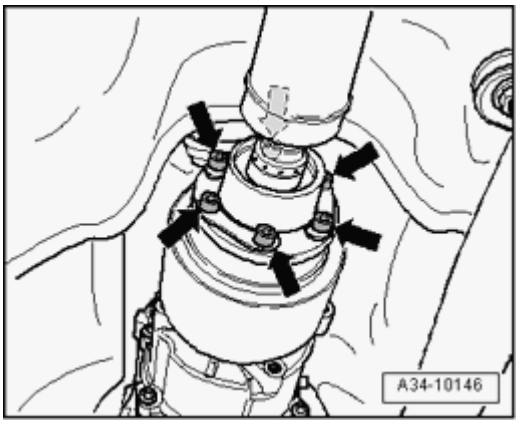

Fig. 222: Locating Bolts At Transmission/Drive Shaft Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- It is important to clean threaded holes for drive axle bolts to remove any remaining locking fluid. The threads can be cleaned with a thread tap.
- Bolt drive axle onto transmission - **arrows** - --> **39 FINAL DRIVE, DIFFERENTIAL** .

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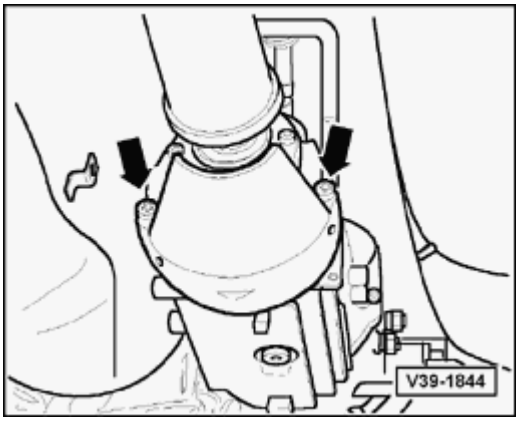

Fig. 223: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, install heat shield for drive shaft - **arrows** -.

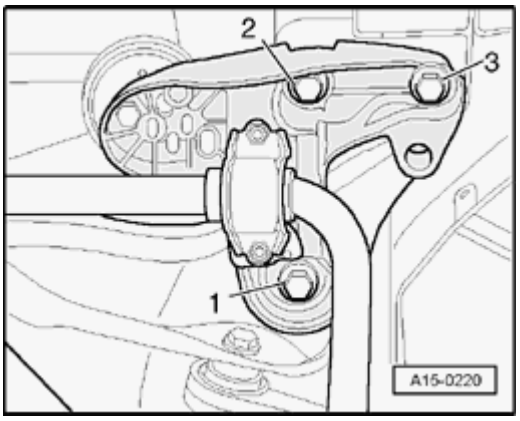

Fig. 224: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 6-cylinder engine:

- Take up weight of engine with support bracket 10 - 222 A.

- Remove front bolts - **2** - and - **3** - on subframe (left and right). Then remove bolts - **1** -.
- Lower subframe at front.

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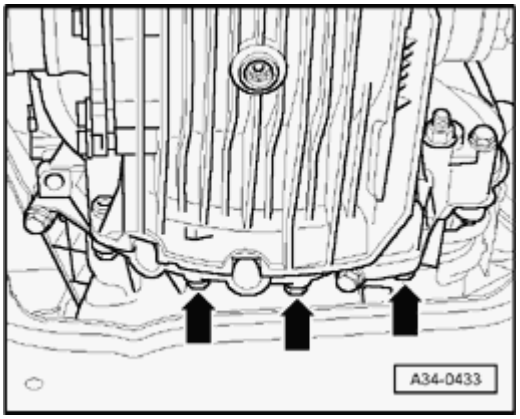

Fig. 225: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten three lower engine/transmission securing bolts at bottom - **arrows** -.

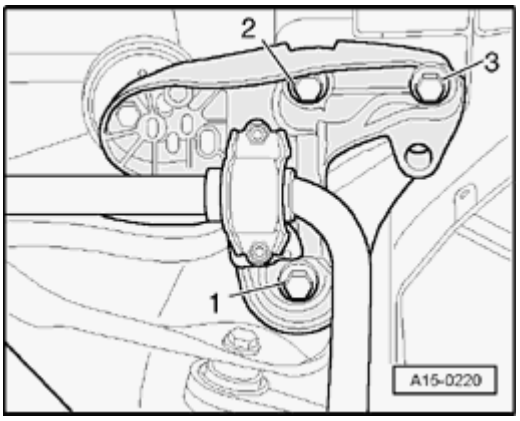

Fig. 226: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace front subframe bolts - **1** - , - **2** - and - **3** - on both sides of vehicle.

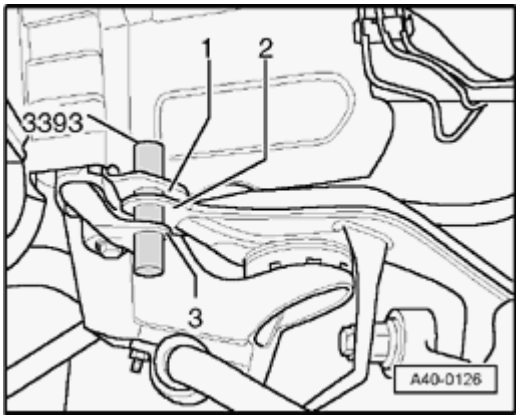

Fig. 227: Identifying Hole, Sub-Frame Hole And Aluminum Console Hole Align On Both Sides
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Before tightening subframe, it must be aligned with body using testing mandrel 3393.

- Hole - **1** - and hole - **2** - of subframe and hole - **3** - of aluminum bracket must be flush on both sides.

NOTE:

- **This alignment can only replace a subsequent wheel alignment if holes - 1 - and - 2 - coincided before the repair work was performed.**

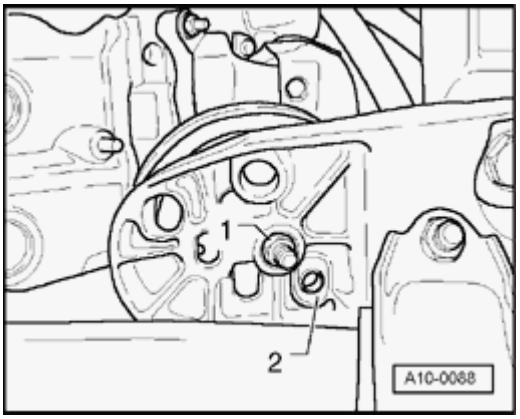

Fig. 228: Threaded Connections And Positioning Sleeves On Lower Engine Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten nuts - **1** - for engine mountings --> **10 - ENGINE - ASSEMBLY** .

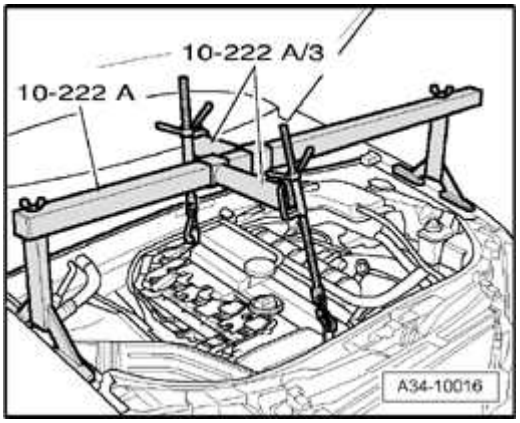

Fig. 229: Engine Support Bridge 10-222 A Set Up With Adapters 10-222/3 On Fender Mounting Flanges
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Cabriolet vehicles with 4-cylinder engine:

- Lift engine slightly using spindles.

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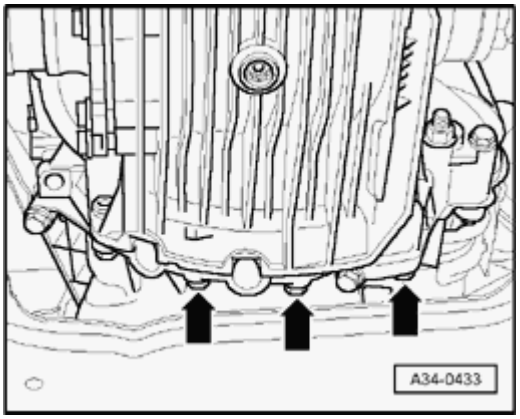

Fig. 230: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bottom engine/transmission securing bolts - **arrows** -.
- Lower engine back down.

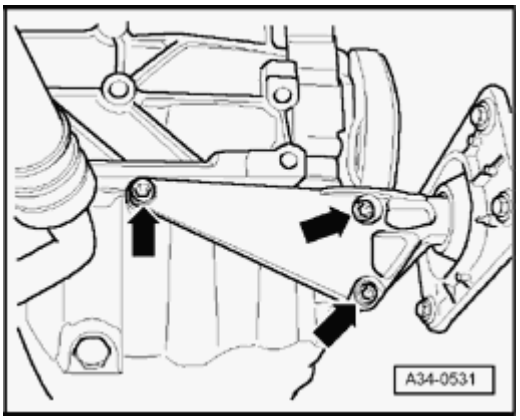

Fig. 231: Torque Reaction Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure torque reaction support - **arrows** -.

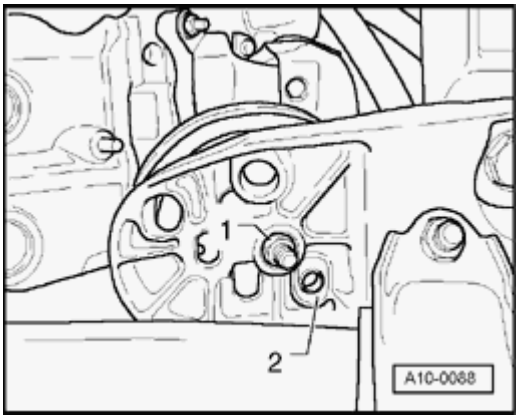

Fig. 232: Threaded Connections And Positioning Sleeves On Lower Engine Mounts

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten nuts - **1** - for engine mountings --> **10 - ENGINE - ASSEMBLY** .

Continued for all vehicles:

- Secure subframe and cross member --> **40 - FRONT SUSPENSION** .
- Install exhaust system so it is free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for the relevant engine code.
- Check selector mechanism setting and adjust if necessary --> **Selector mechanism, adjusting**.
- Check gear oil level in transmission --> **Transmission oil level, checking** .
- Follow steps required after connecting battery. -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

  .
- If necessary, perform wheel alignment --> **44 - WHEELS, TIRES, VEHICLE ALIGNMENT** .

- Wheel alignment is not necessary if subframe was secured to body using testing mandrel 3393 prior to disassembling and assembly of subframe (before tightening bolts).
- Wheel alignment must, however, be performed, if the subframe was not secured to body using testing mandrel 3393 or if it was not possible to fully insert the two drifts into holes.

Tightening torques

NOTE:

- **Tightening torques only apply to lightly greased, oiled, phosphated or blackened nuts and bolts.**
- **Additional lubricant such as engine or transmission oil may be used, but do not use graphite lubricant.**
- **Do not use parts which have been degreased.**
- **Tolerance for tightening torques ±15%.**

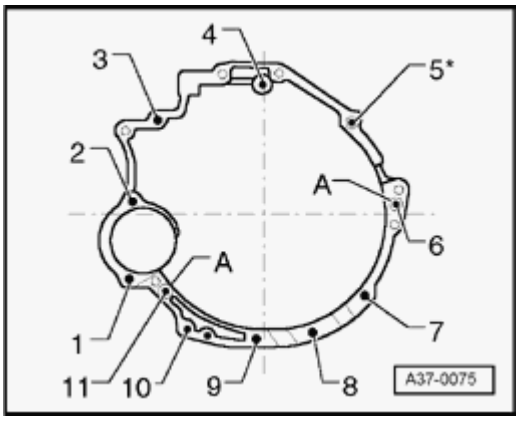

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Fig. 233: Identifying Engine/Transmission Mountings (Automatic/Manual Transmission)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission attachment (1.8 liter engine)

Item	Bolt	Nm
1* See note	M12 x 75	65
2* See note	M12 x 90	65
3* See note	M12 x 75	65
4, 6	M12 x 90	65
5* See note	M12 x 110	65
7* See note	M10 x 50	45
8, 9, 10	M10 x 45	45
11* See note	M12 x 110	65

* For securing starter to transmission

* With bracket for wiring harness

* Hammer head bolt with nut

* With nut

A: dowel sleeves for centralizing

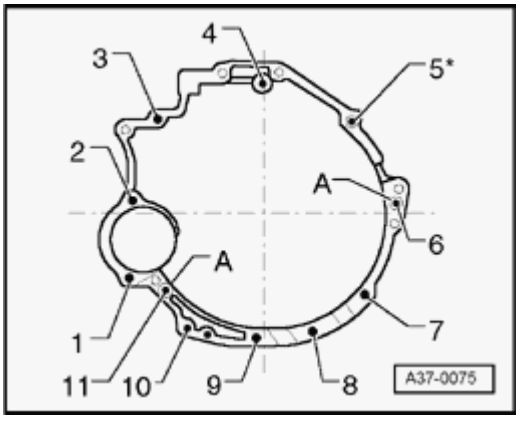

Fig. 234: Identifying Engine/Transmission Mountings (Automatic/Manual Transmission)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission attachment (2.0 liter engine)

Item	Bolt	Nm
1 * See note	M12x75	65
2 * See note	M12x90	65

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3 * See note	M12x75	65
4, 6	M12x90	65
5 * See note	M12x110	65
7 * See note	M10x50	45
8, 9, 10	M10x45	45
11 * See note	M12x110	65
A	Dowel sleeves for centralizing	

*For securing starter to transmission

*With bracket for wiring harness

*Hammer head bolt with nut

*With nut

A: dowel sleeves for centralizing

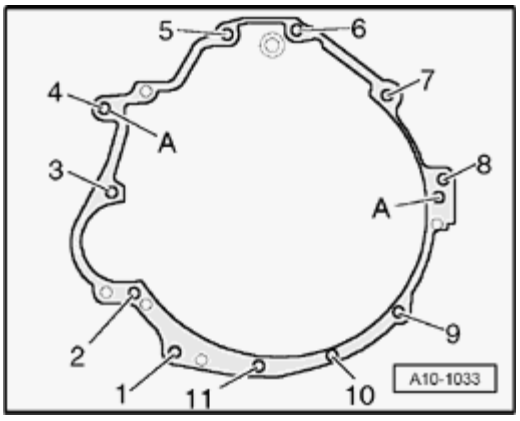

Fig. 235: Identifying Engine/Transmission Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission attachment (6-cylinder 3.0 liter engine)

Item	Bolt	Nm
1, 10, 11	M10 x 60	45
2* See note	M10 x 150	65
3* See note	M12 x 130	65
4	M12 x 85	65
5, 6	M12 x 90	65
7	M12 x 100	65
8	M12 x 95	65
9* See note	M10 x 60	45

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* For securing starter to transmission

* Hammer head bolt with nut

A: dowel sleeves for centralizing

Component	Nm
Slave cylinder to transmission	23* See note
Selector shaft lever to transmission	23
Push rod to transmission	40
Connecting rod for selector rod to transmission	23
Cross member to transmission mounting	23
Heat shields above drive axles to transmission	23
Heat shield for drive axle to transmission cover	25
Engine mounting to engine support	23
Bracket for sound insulation to subframe	10

*Replace bolt

Transmission, transporting

Special tools, testers and auxiliary items required

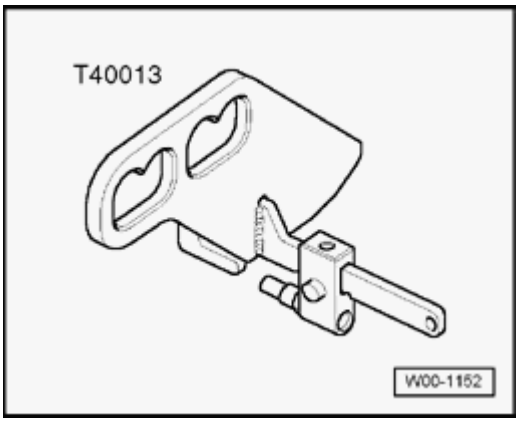

Fig. 236: Transmission Lift Hook T40013
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lifting aid T40013

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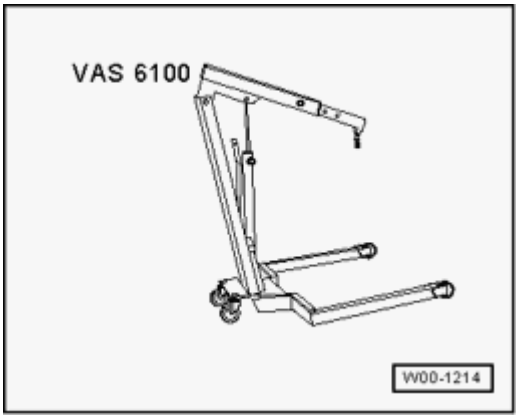

Fig. 237: Identifying Shop Crane VAS 6100
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Workshop crane VAS 6100

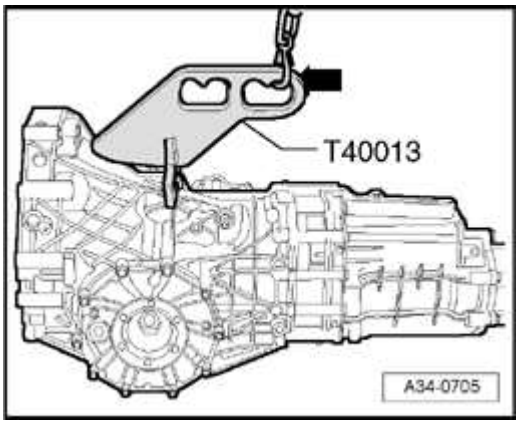

Fig. 238: Hook Of Workshop Crane Fastened In 4th Notch On Lifting Tackle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert lifting tackle T40013 in lifting eye on transmission and secure.
- Fasten hook of workshop crane in 4th notch - **arrow** - on lifting tackle.
- Lift transmission using workshop crane and lifting tackle T40013.

TRANSMISSION MOUNTS, REMOVING AND INSTALLING

Transmission mounts, removing and installing

Special tools, testers and auxiliary items required

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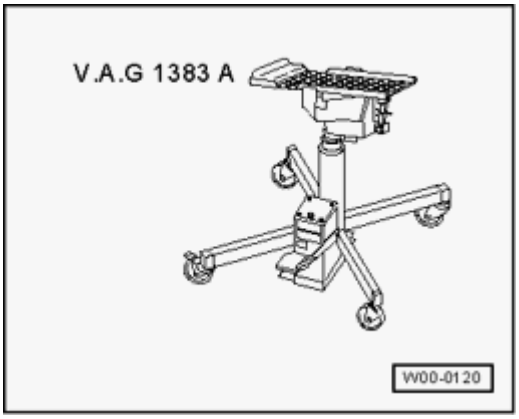

Fig. 239: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine/transmission jack V.A.G 1383 A

Removing

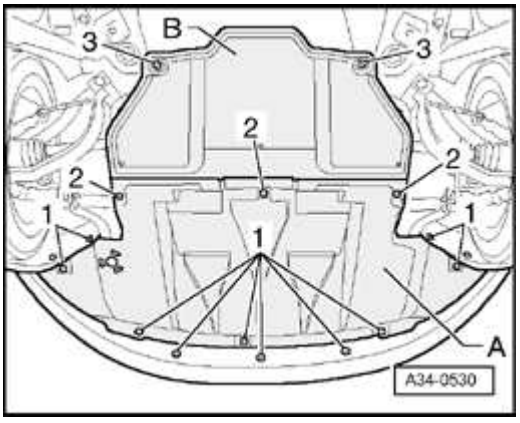

Fig. 240: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, loosen quick-release fasteners - **3** - and remove rear sound insulation - **B** -.

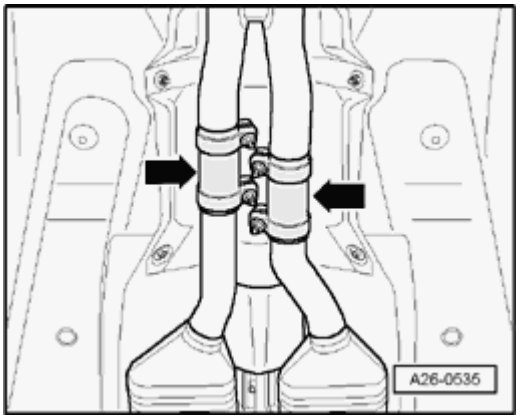

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Fig. 241: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamps - **arrows** -.

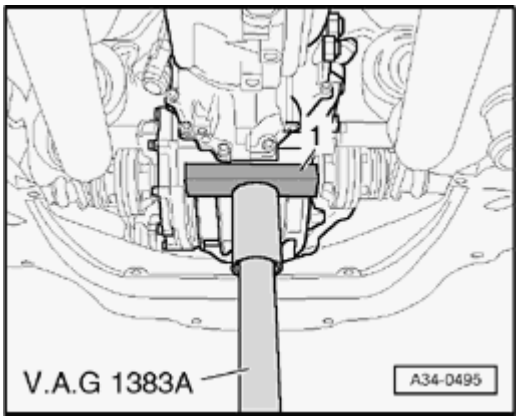

Fig. 242: Transmission Raised Using Punch Of VAG 1383 A So That A Piece Of Wood Can Be Placed In Between
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use engine/transmission jack V.A.G 1383 A to lift transmission up slightly. Insert a wooden block - **1** - between transmission and transmission jack.

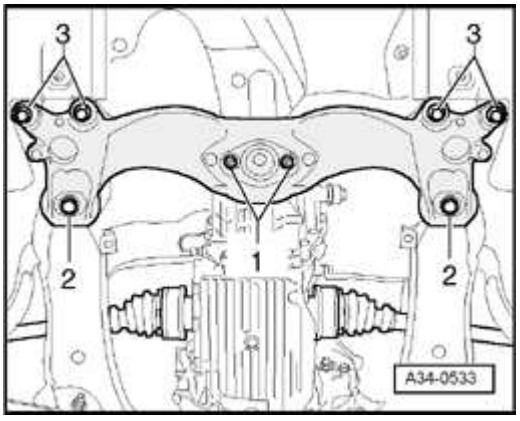

Fig. 243: Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **3** - and then bolts - **2** - at cross member.
- Lower transmission slightly.
- Remove two nuts - **1** - and push cross member backward slightly.

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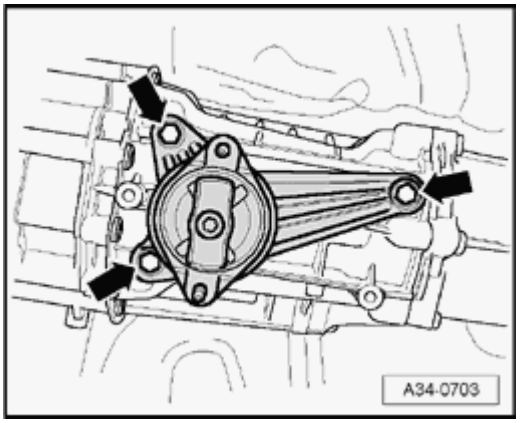

Fig. 244: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove transmission mounts - **arrows** -.

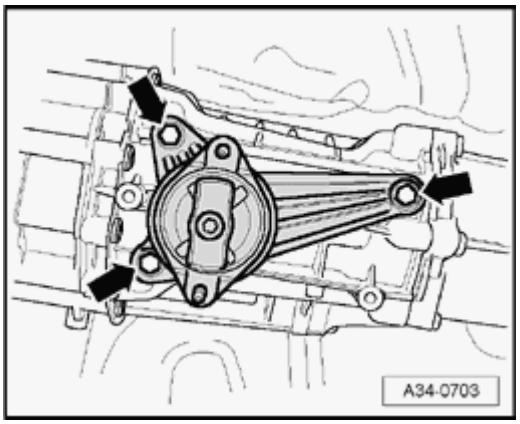

Fig. 245: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

Installation is in reverse order or removal. Note the following:

- Secure transmission mount to transmission - **arrows** - (tightening torque: 23 Nm).

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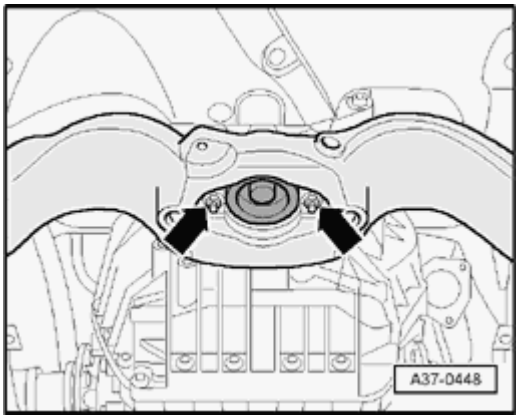

Fig. 246: Removing Nuts And Rear Crossmember
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt tunnel cross member onto transmission mount - **arrows** -.

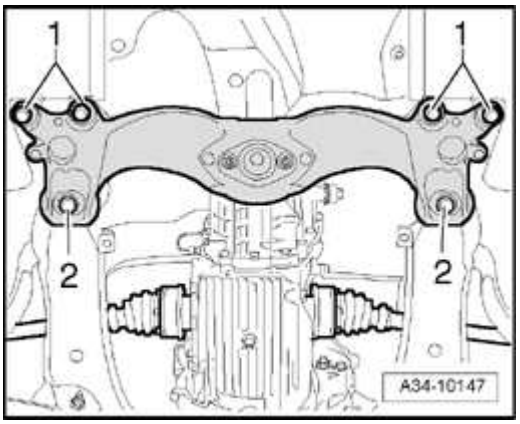

Fig. 247: Tunnel Cross Member Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift transmission far enough to be able to tighten bolts - **2** -.
- Tighten bolts - **2** - and then bolts - **1** - --> **40 - FRONT SUSPENSION** .

NOTE:

- **Replace bolts - 1 - and - 2 -.**

- Install exhaust system free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

Tightening torques

Component	Nm
Transmission mount to transmission	23
Cross member to transmission mounting	23
Clamp for exhaust pipe	40

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TRANSMISSION OIL

Transmission oil level, checking

Special tools, testers and auxiliary items required

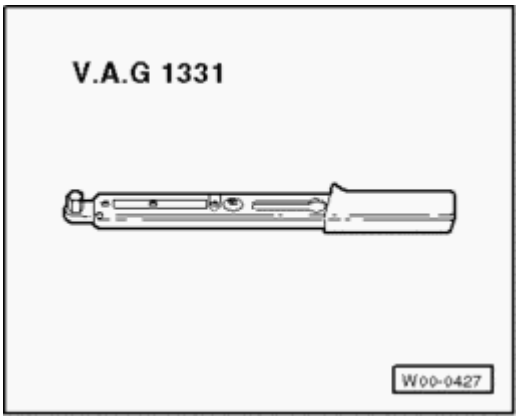

Fig. 248: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

NOTE:

- **The vehicle must be horizontal when checking gear oil level.**

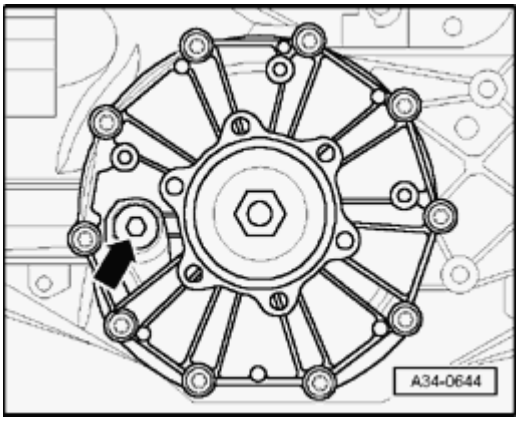

Fig. 249: Locating Oil Filler Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To check gear oil level, remove oil filler plug - **arrow** -.

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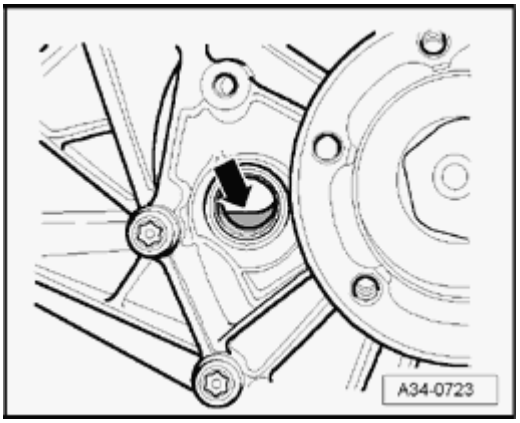

Fig. 250: Identifying Correct Oil Level
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The oil level is correct when transmission is filled up to edge of housing - **arrow** -.

- Top off with gear oil if necessary. Specification --> **Code letters, allocation, transmission ratios, capacities**.
- Install oil filler plug and tighten.

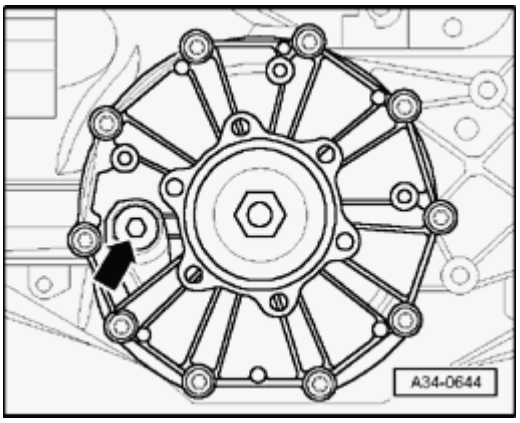

Fig. 251: Locating Oil Filler Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Note the following when filling with new oil:

- Remove oil filler plug - **arrow** -.

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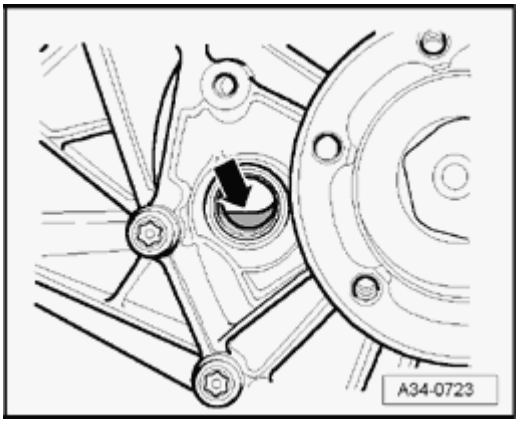

Fig. 252: Identifying Correct Oil Level
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fill with gear oil up to edge of housing - **arrow** -.
- Install oil filler plug.
- Start engine, engage a gear and allow transmission to turn for approx. 2 minutes.
- Switch off engine and remove oil filler plug.

Once more, fill with gear oil up to edge of housing - **arrow** -.

- Install oil filler plug and tighten.

Tightening torque

Component	Nm
Oil filler plug	45

TRANSMISSION, MOUNTING ON ASSEMBLY STAND

Transmission, mounting on assembly stand

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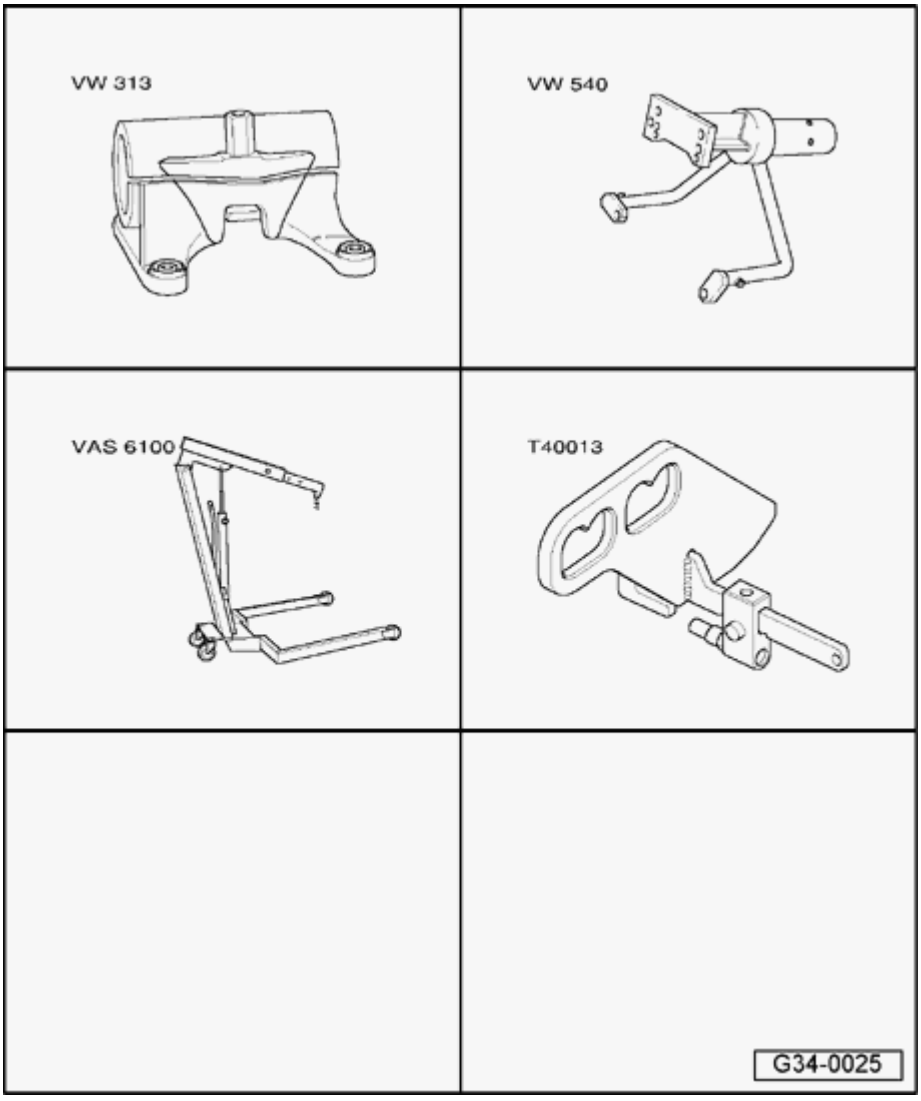

Fig. 253: Identifying Special Tools -- Transmission, Mounting On Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Support clamp VW313
- Engine/transmission support VW540
- Workshop crane VAS6100
- Lifting aid T40013

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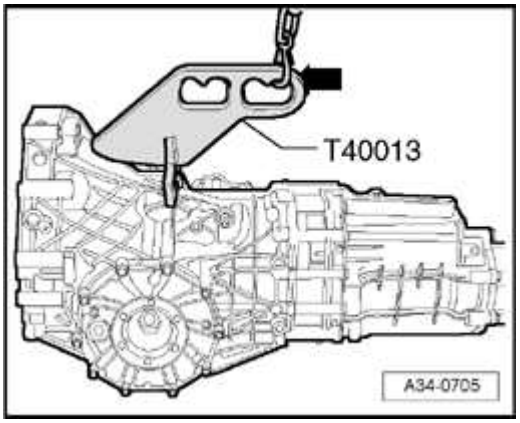

Fig. 254: Hook Of Workshop Crane Fastened In 4th Notch On Lifting Tackle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert lifting tackle T40013 in lifting eye on transmission and secure.
- Fasten hook of workshop crane VAS6100 in 4th notch - **arrow** - on lifting tackle T40013.
- Lift transmission using workshop crane VAS6100 and lifting tackle T40013.

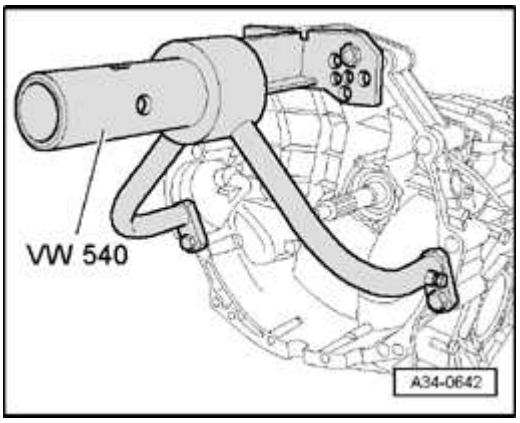

Fig. 255: Holding Fixture VW 540 Secured To Transmission And Installed Into Support Clamp VW313
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure holding fixture VW 540 to transmission and fit into support clamp VW313.

TRANSMISSION, DISASSEMBLING AND ASSEMBLING

Transmission, general layout

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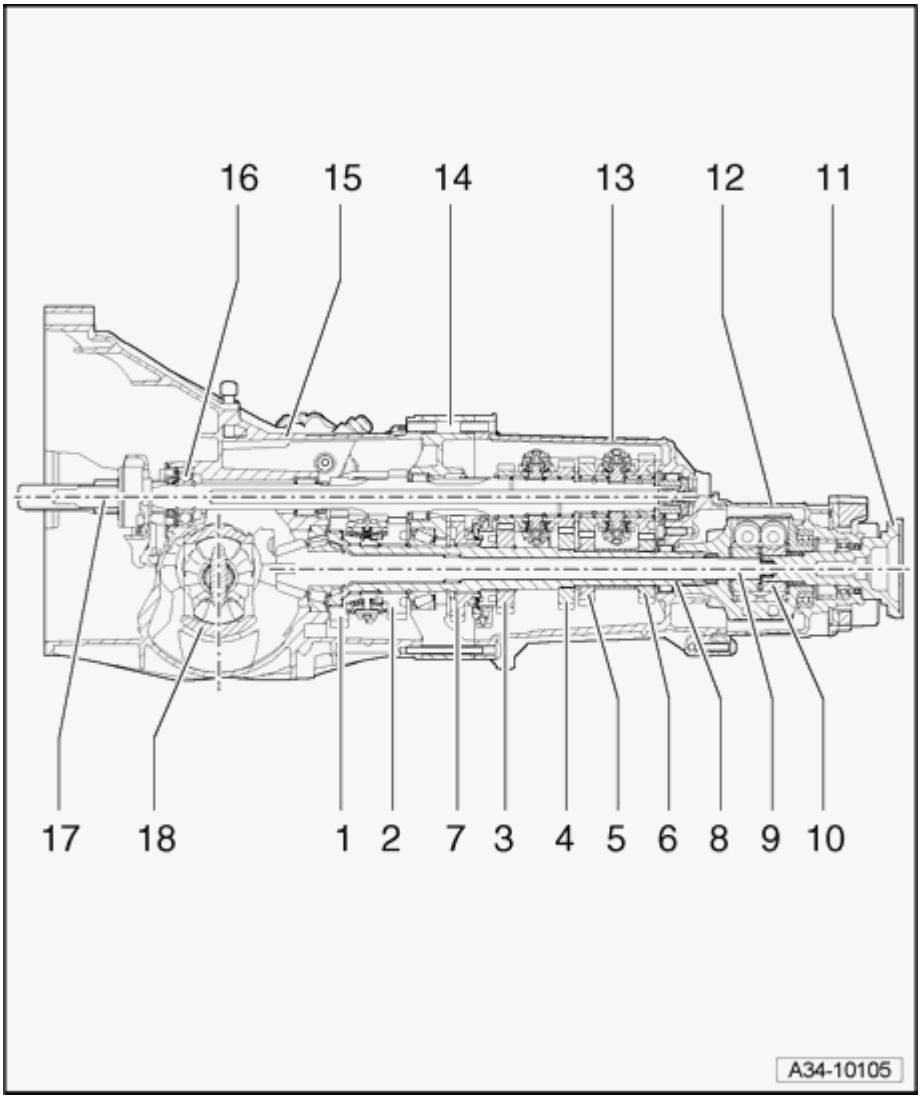

Fig. 256: Transmission, General Layout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 1st gear

2 - 2nd gear

3 - 3rd gear

4 - 4th gear

5 - 5th gear

6 - 6th gear

7 - Reverse gear

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8 - Hollow shaft

9 - Pinion shaft (output shaft)

10 - Torsen differential

11 - Flange shaft

12 - Torsen housing

13 - Transmission cover

14 - Bearing housing

15 - Transmission housing

16 - Ball bearing

- For input shaft

17 - Input shaft

18 - Differential

Assembly overview

Sequence for disassembling and assembling --> **Disassembling and assembling sequence**

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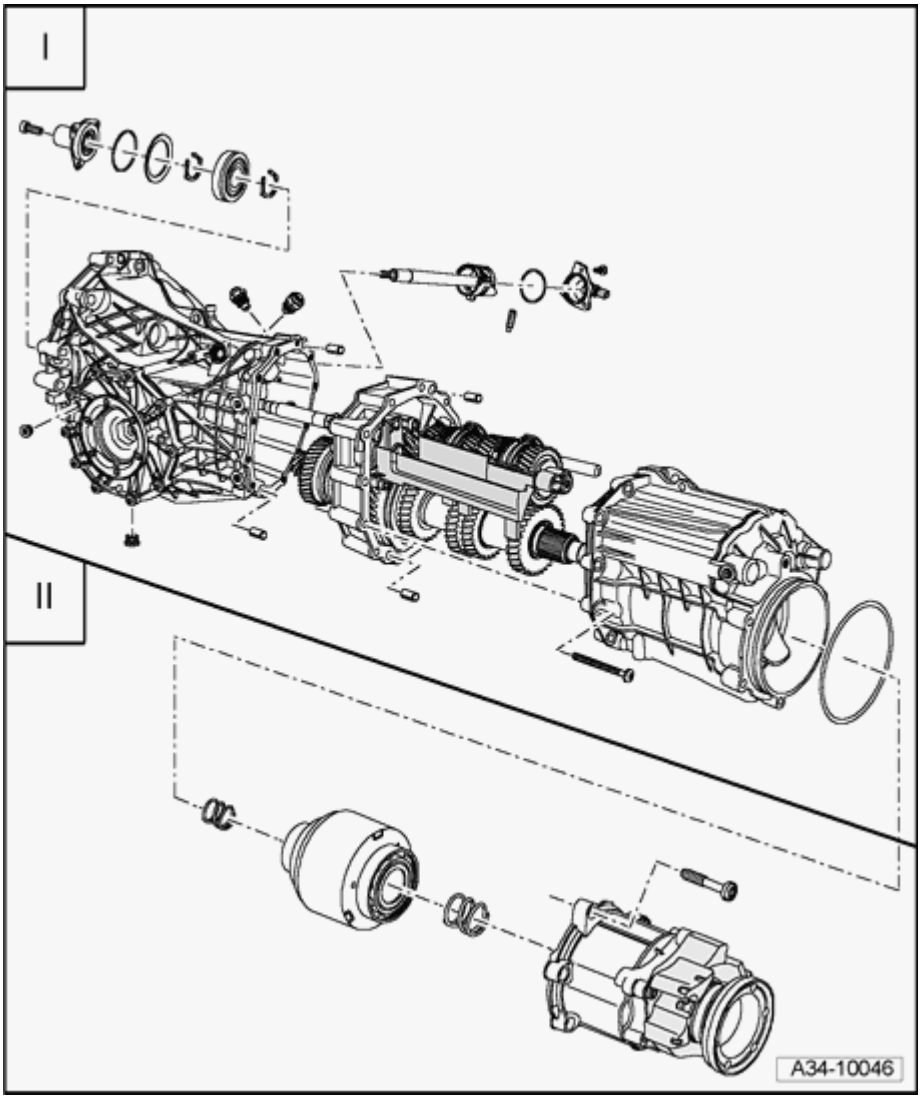

Fig. 257: Transmission Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - Removing and installing ball bearing for input shaft, transmission cover, bearing housing and selector shaft --> **Ball bearing for input shaft, transmission cover, bearing housing and selector shaft, removing and installing**

- Removing and installing 3rd to 6th gear --> **3rd to 6th gear, removing and installing**
- Removing and installing input shaft, pinion shaft/hollow shaft, reverse gear wheel and reverse selector gear --> **Input shaft, pinion shaft/hollow shaft, reverse gear wheel and reverse selector gear, removing and installing**

II - Removing and installing Torsen housing and Torsen differential with transmission removed --> **Torsen housing and Torsen differential, removing and installing**

- Removing and installing Torsen housing with transmission installed --> **Torsen housing, removing and**

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installing (with transmission installed)

- Disassembling and assembling Torsen housing --> **Torsen housing, disassembling and assembling**

Ball bearing for input shaft, transmission cover, bearing housing and selector shaft, removing and installing

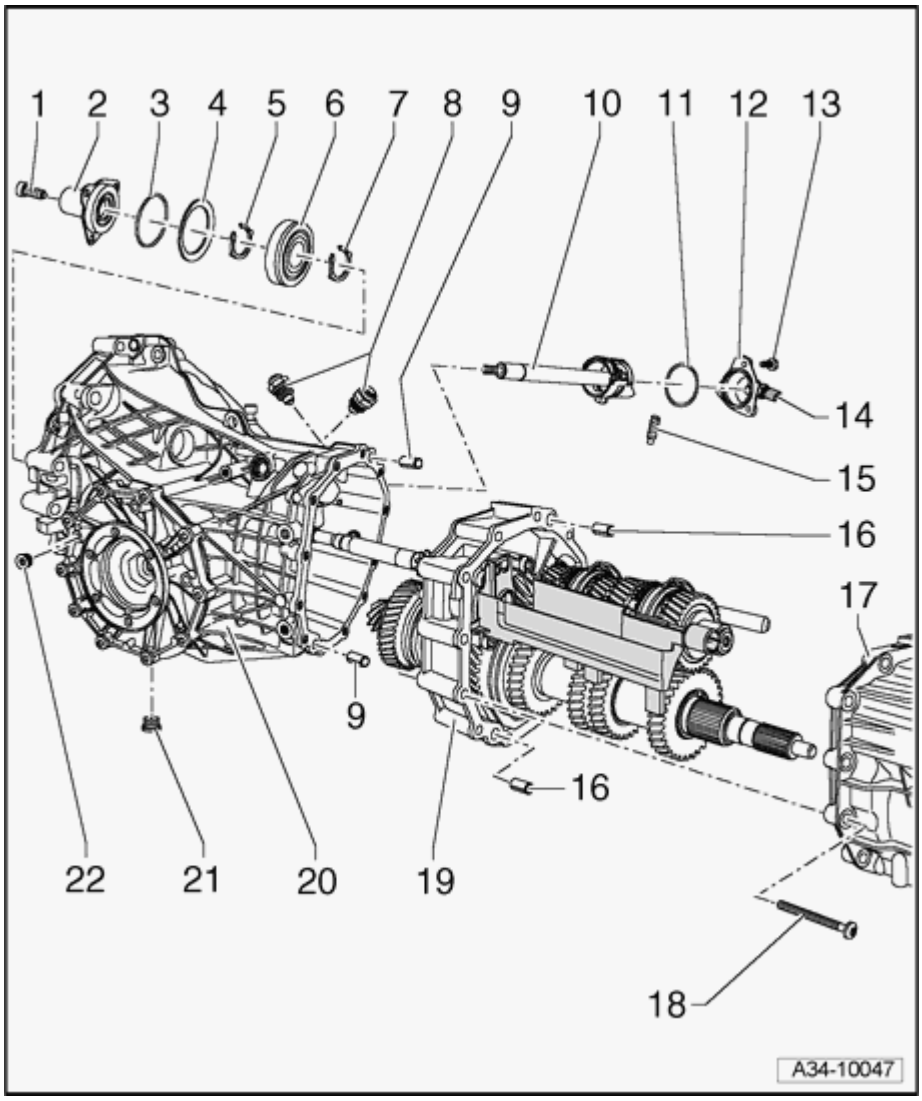

Fig. 258: Ball Bearing For Input Shaft, Transmission Cover, Bearing Housing And Selector Shaft, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - TORX bolt, 35 Nm

- 3 x
- Apply **locking fluid AMV 185 101 A1** when installing

2 - Guide sleeve

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- With seal
- Removing and installing --> **Disassembling and assembling sequence**

3 - O-ring

- Always replace

4 - Dished spring

5 - Circlip

- Note thickness
- Re-determining thickness

6 - Ball bearing

- Removing and installing --> **Disassembling and assembling sequence**

7 - Circlip

- Note thickness
- Re-determining thickness

8 - Locking bolt, 45 Nm

- 2 x
- Apply **locking fluid AMV185101A1** when installing

9 - Dowel sleeve

- 2 x
- Insert in transmission housing
- Remove and install with drift 3121

10 - Selector shaft with selector cylinder

- Removing and installing --> **Disassembling and assembling sequence**

11 - O-ring

- For selector shaft cover
- Always replace
- Lubricate with gear oil

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12 - Cover for selector shaft

- With back-up light switch F4
- Removing and installing --> **Disassembling and assembling sequence**

13 - Bolt -24 Nm-

- 3 x
- Apply **locking fluid AMV185101A1** when installing

14 - Back-up light switch F4, 20 Nm

15 - Pin

- For selector shaft stop
- Insert in transmission housing
- Installation position: groove on threaded pin points toward selector shaft cover

16 - Dowel sleeve

- 2 x
- Insert in bearing housing
- Remove and install with drift 3121

17 - Transmission cover

- Servicing --> **Transmission cover, servicing**

18 - Bolt, 35 Nm plus an additional $90°^{1}/_{4}$ turn

- 12 x

19 - Bearing housing

- Removing and installing 3rd to 6th gear --> **3rd to 6th gear, removing and installing**
- Removing and installing input shaft, pinion shaft/hollow shaft, reverse gear wheel and reverse selector gear --> **Input shaft, pinion shaft/hollow shaft, reverse gear wheel and reverse selector gear, removing and installing**
- Servicing --> **Bearing housing, servicing**

20 - Transmission housing

- With differential and flange shafts
- Removing and installing differential --> **Differential, removing and installing**

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- Servicing transmission housing --> **Transmission housing, servicing**

21 - Oil drain plug, 45 Nm

22 - Oil filler plug, 45 Nm

Torsen housing and Torsen differential, removing and installing

NOTE:

- **The Torsen housing can also be removed when the transmission is in the vehicle --> Torsen housing, removing and installing (with transmission installed).**

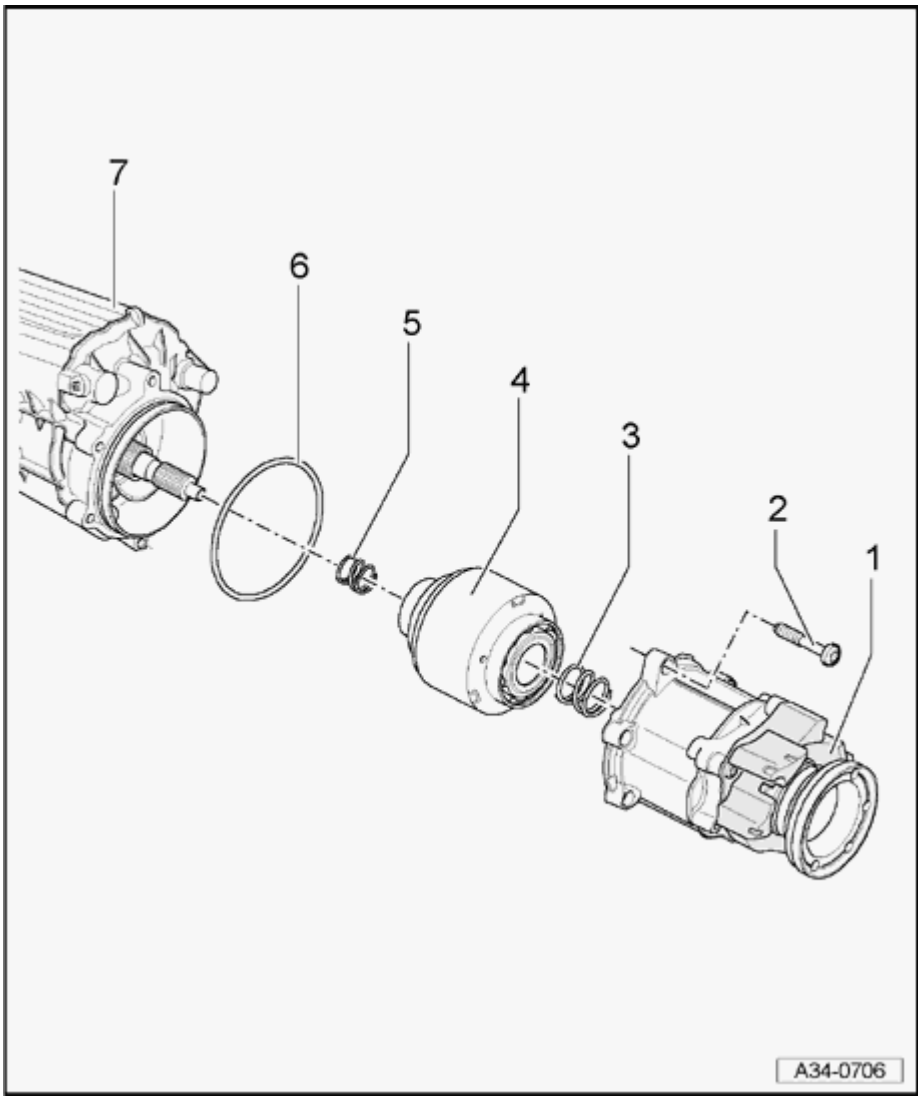

Fig. 259: Torsen Housing And Torsen Differential Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Torsen housing

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- With or without vibration damper, depending on design
- Removing and installing --> **Disassembling and assembling sequence**
- Disassembling and assembling --> **Torsen housing, disassembling and assembling**

2 - Bolt, 10 Nm plus an additional 45° $^{1}/_{8}$ turn

- 6x

3 - Spring

- Fit onto flange shaft in Torsen housing
- Outside diameter: approx. 35 mm

4 - Torsen differential

- Can only be serviced by manufacturer
- Pressing off ball bearing from Torsen differential **Pressing ball bearing off Torsen differential**
- Pressing ball bearing onto Torsen differential **Pressing ball bearing onto Torsen differential**

5 - Spring

- Fit onto pinion shaft/hollow shaft
- Outside diameter: approx. 31 mm

6 - O-ring

- Always replace
- Lubricate with gear oil

7 - Transmission

- Mounting on assembly stand --> **Disassembling and assembling sequence**

Pressing ball bearing off Torsen differential

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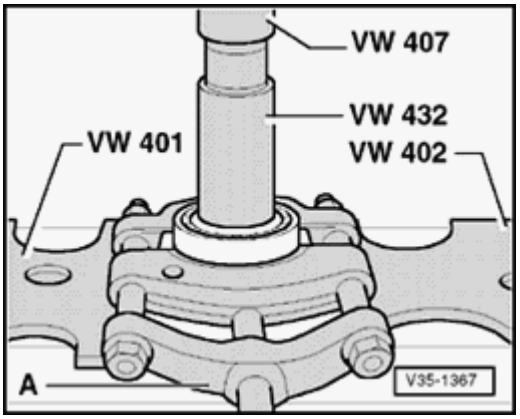

Fig. 260: Pressing Off Grooved Ball Bearing From Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Splitter 22 to 115 mm, e.g. Kukko 17/2

Pressing ball bearing onto Torsen differential

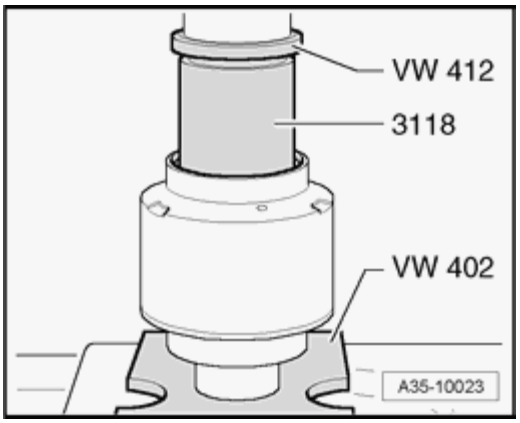

Fig. 261: Pressing Ball Bearing Onto Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The collar of press tool 3118 points toward thrust disc VW 412.

3rd to 6th gear, removing and installing

NOTE:

- **3rd to 6th speed selector gears should have an axial play of 0.20to0.50mm after installing.**

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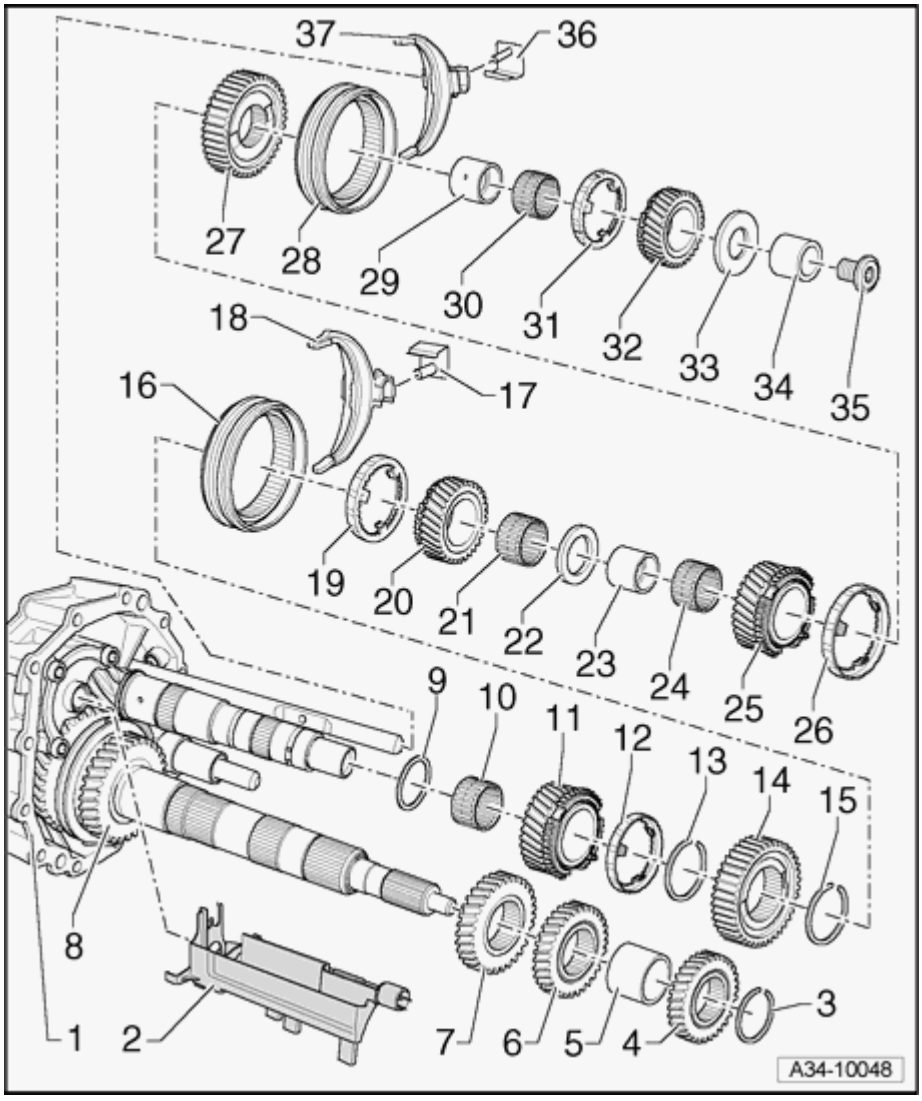

Fig. 262: 3rd To 6th Gear Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

2 - Oil collector

- With magnet
- Clipped into reverse shaft support.

3 - Circlip

- Install thickest circlip that will still just fit.
- Re-determining thickness --> **Disassembling and assembling sequence**

4 - 6th gear wheel

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5 - Spacer sleeve

6 - 5th gear wheel

- Installation position: high inside collar faces 4th gear wheel

7 - 4th gear wheel

- Installation position: high inside collar faces 5th gear wheel

8 - 3rd gear wheel

- Detach bearing housing from transmission housing and remove pinion shaft prior to removing and installing --> **Disassembling and assembling sequence**

9 - Thrust washer

- For 3rd speed selector gear

10 - Needle bearing

- For 3rd gear

11 - 3rd speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

12 - 3rd gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

13 - Circlip

- Mark

14 - Synchronizing hub for 3rd and 4th gear

- Installation position: high inside collar faces 3rd speed selector gear

15 - Circlip

- Re-determining thickness --> **Disassembling and assembling sequence**

16 - Locking collar for 3rd and 4th gear

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- Mark position in relation to synchronizing hub prior to removing

17 - Pin with clip

- For securing selector fork for 3rd and 4th gear to selector rod

18 - Selector fork for 3rd and 4th gear

19 - 4th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

20 - 4th speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

21 - Needle bearing

- For 4th gear

22 - Thrust washer

- For 4th speed and 5th speed selector gears

23 - Needle bearing inner race

- For 5th gear

24 - Needle bearing

- For 5th gear

25 - 5th speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

26 - 5th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

27 - Synchronizing hub for 5th and 6th gear

28 - Locking collar for 5th and 6th gear

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- Mark position in relation to synchronizing hub prior to removing

29 - Needle bearing inner race

- For 6th gear

30 - Needle bearing

- For 6th gear

31 - 6th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

32 - 6th speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

33 - Thrust washer

- For 6th speed selector gear

34 - Inner race

- For needle roller bearing

35 - Multi-point socket head bolt, 150Nm

36 - Pin with clip

- For securing selector fork for 5th and 6th gear to selector rod

37 - Selector fork for 5th and 6th gear

Input shaft, pinion shaft/hollow shaft, reverse gear wheel and reverse selector gear, removing and installing

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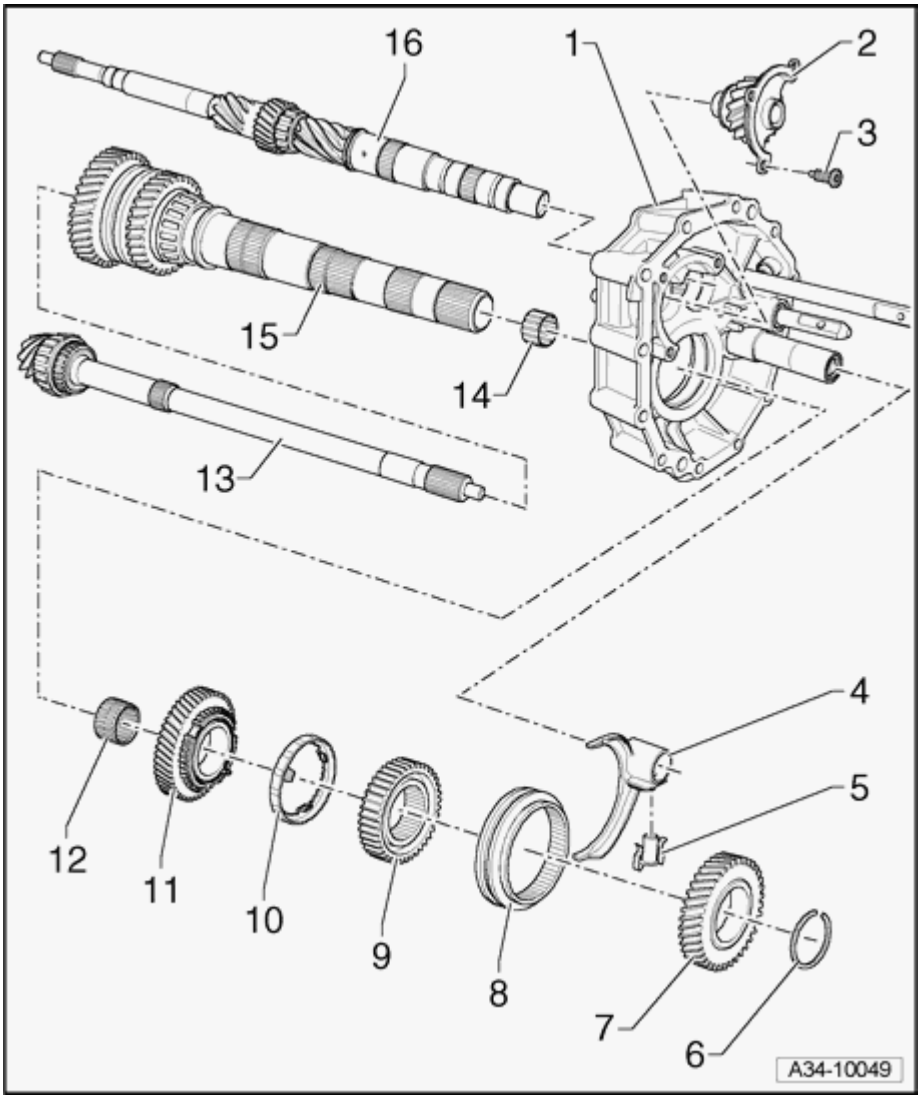

Fig. 263: Input Shaft, Pinion Shaft/Hollow Shaft, Reverse Gear Wheel And Reverse Selector Gear Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

2 - Reverse gear wheel

- With support for reverse shaft
- Exploded view - reverse gear wheel **Exploded view - reverse gear wheel**

3 - Bolt -30 Nm-

- 3 x

4 - Reverse gear selector fork

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5 - Pin with clip

- For securing reverse gear selector fork to selector rod

6 - Circlip

- Install thickest circlip that will still just fit.
- Re-determining thickness --> **Disassembling and assembling sequence**

7 - 3rd gear wheel

- Installation position: machined side faces reverse gear synchronizing hub

8 - Reverse gear locking collar

- Mark position in relation to synchronizing hub prior to removing
- Installation position: taper faces reverse gear synchro-ring

9 - Reverse gear synchronizing hub

- Installation position: high inside collar faces 3rd gear wheel

10 - Synchronizing ring for reverse gear

- Checking for wear **Checking synchro-ring for wear**

11 - Reverse selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

12 - Needle bearing

- For reverse gear

13 - Pinion shaft

- With inner race/double tapered roller bearing and needle bearing
- Disassembling and assembling --> **Pinion shaft and hollow shaft**

14 - Needle bearing

- For pinion shaft/hollow shaft
- Remove needle bearing prior to pulling pinion shaft out of hollow shaft

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15 - Hollow shaft

- With 1st speed and 2nd speed selector gears
- Disassembling and assembling

16 - Input shaft

- Disassembling and assembling --> **Input shaft**

Exploded view - reverse gear wheel

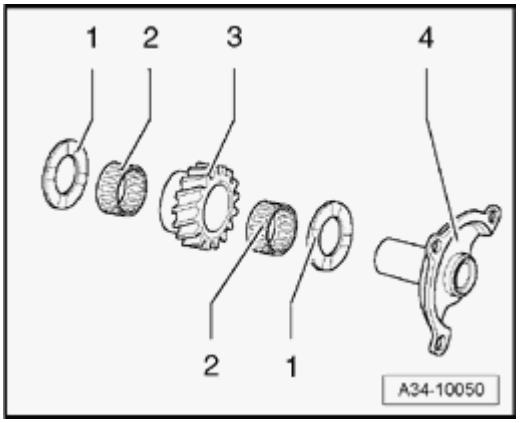

Fig. 264: Assembly Overview - Reverse Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Thrust washer
2. Needle bearing
3. Reverse gear wheel

Installation position: collar points toward bearing housing

4 - Reverse shaft support

Disassembling and assembling sequence

Removing and installing ball bearing for input shaft, end cover, Torsen differential, transmission cover, selector shaft and bearing housing with input shaft and pinion shaft/hollow shaft.

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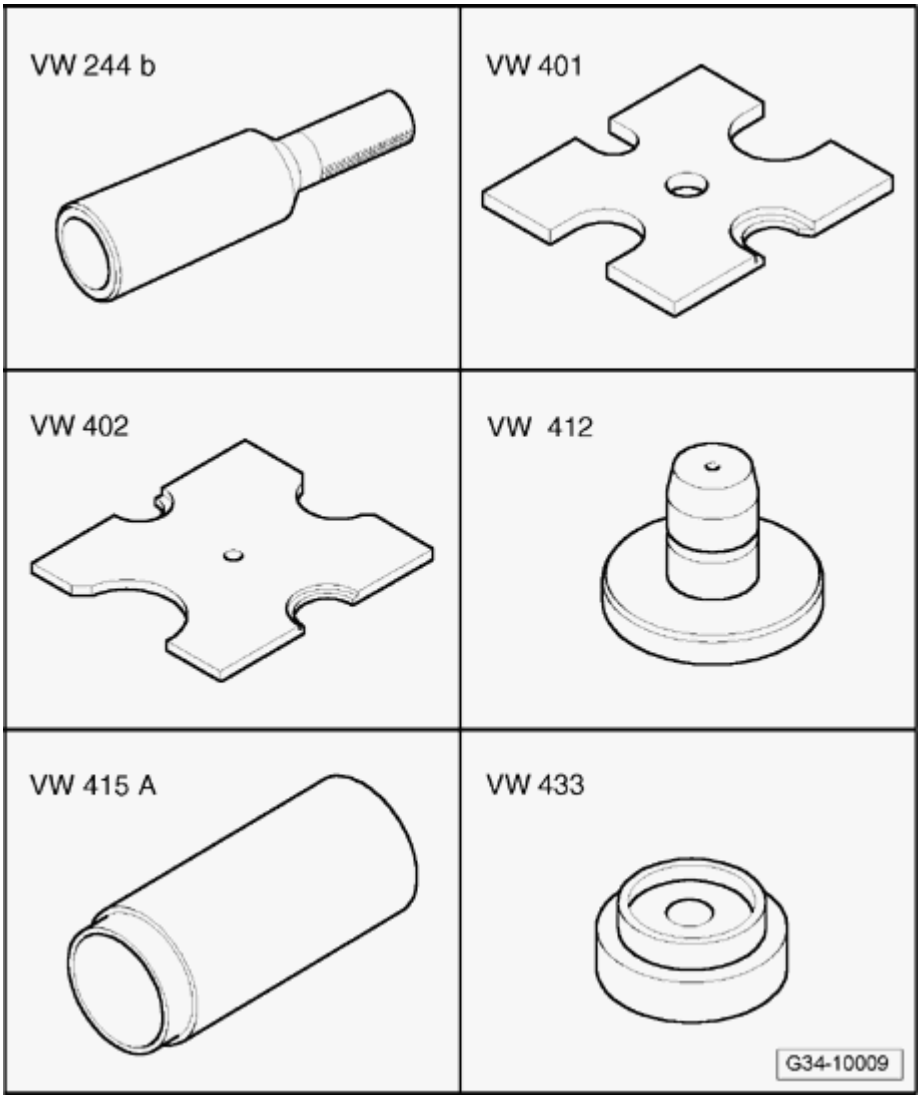

Fig. 265: Identifying Special Tools -- Transmission Disassembling And Assembling Sequence (1 Of 4)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift sleeve VW 244 B
- Thrust plate VW 401
- Thrust plate VW 402
- Thrust disc VW 412

- Tube 60 mm dia. VW 415 A
- Thrust pad con. 8/65 VW 433

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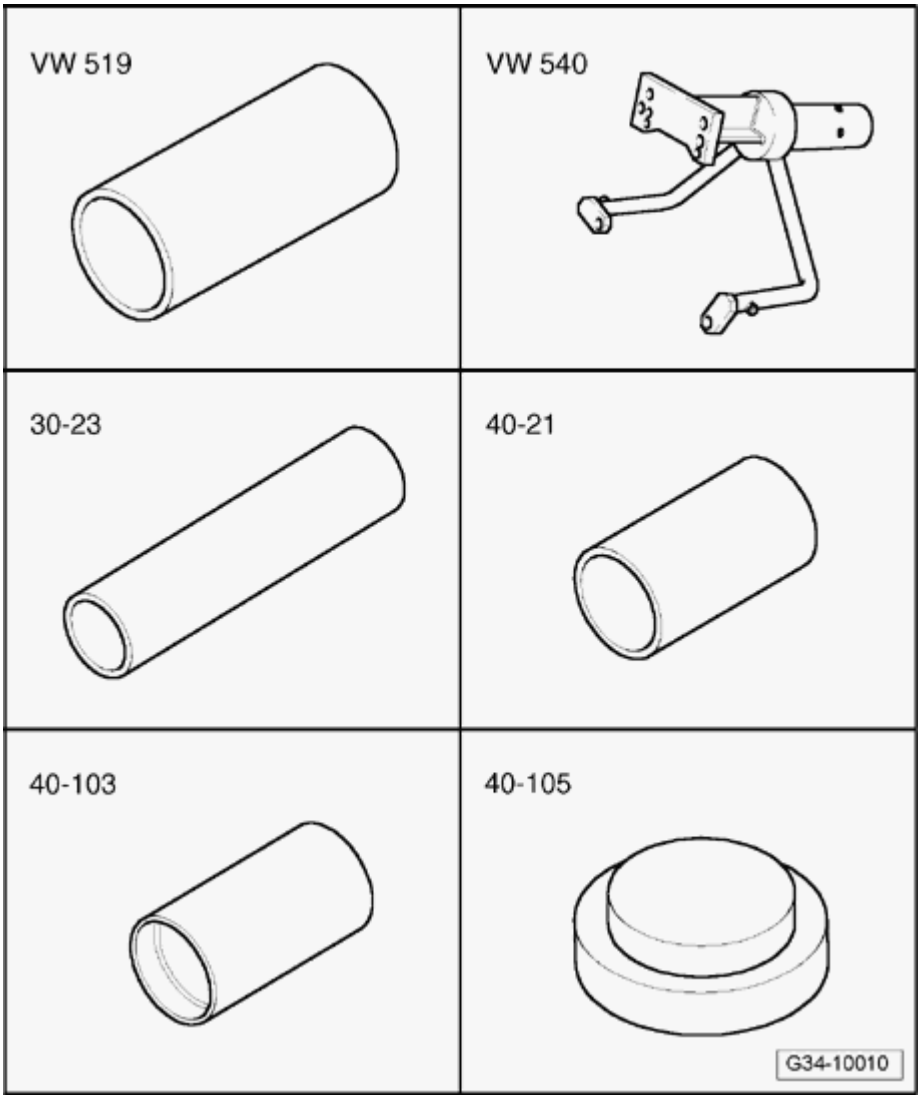

Fig. 266: Identifying Special Tools -- Transmission Disassembling And Assembling Sequence (2 Of 4)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Sleeve VW 519
- Holding fixture VW 540
- Extension 30 - 23
- Press tool 40 - 21

- Sleeve 40 - 103
- Thrust piece 40 - 105

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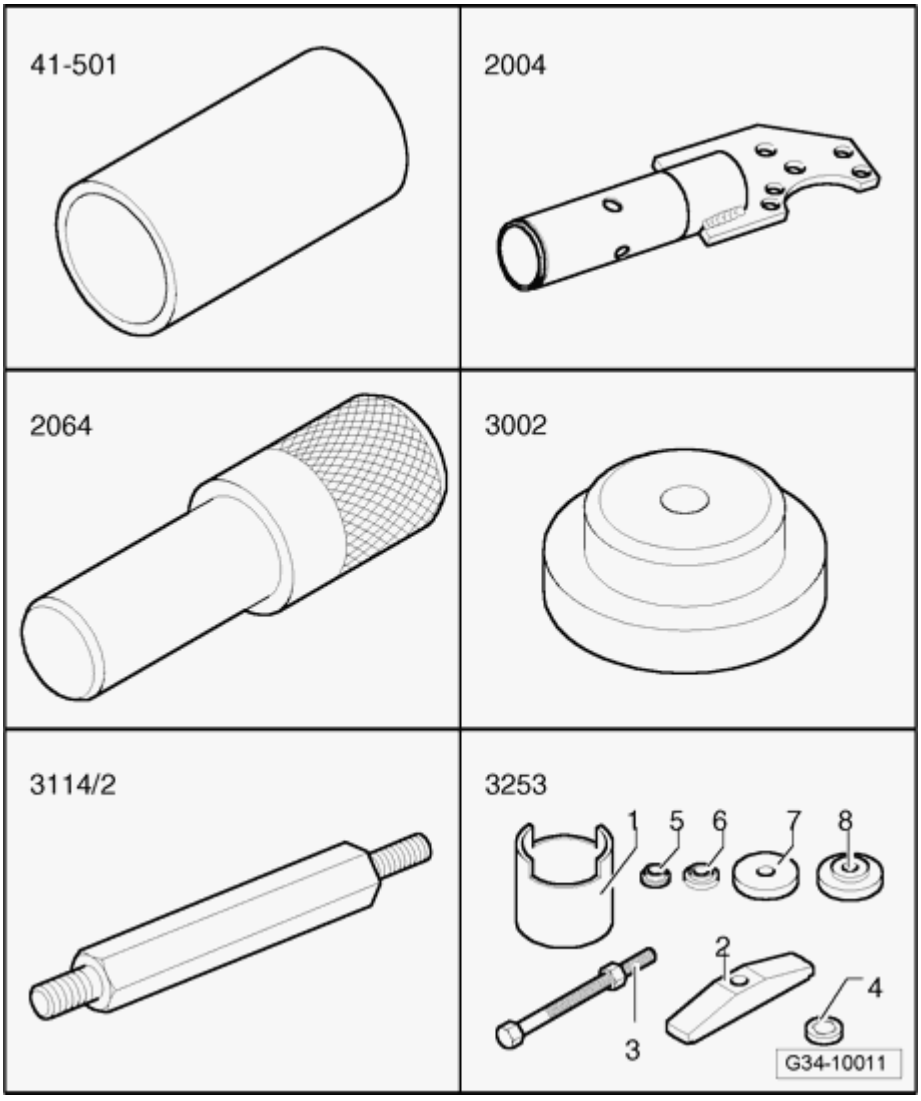

Fig. 267: Identifying Special Tools -- Transmission Disassembling And Assembling Sequence (3 Of 4)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift sleeve 41 - 501
- Transmission holder 2004
- Lock pin 2064
- Thrust piece 3002

- Replacement stud (M8 and M10) 3114/2
- Wheel bearing assembly set 3253

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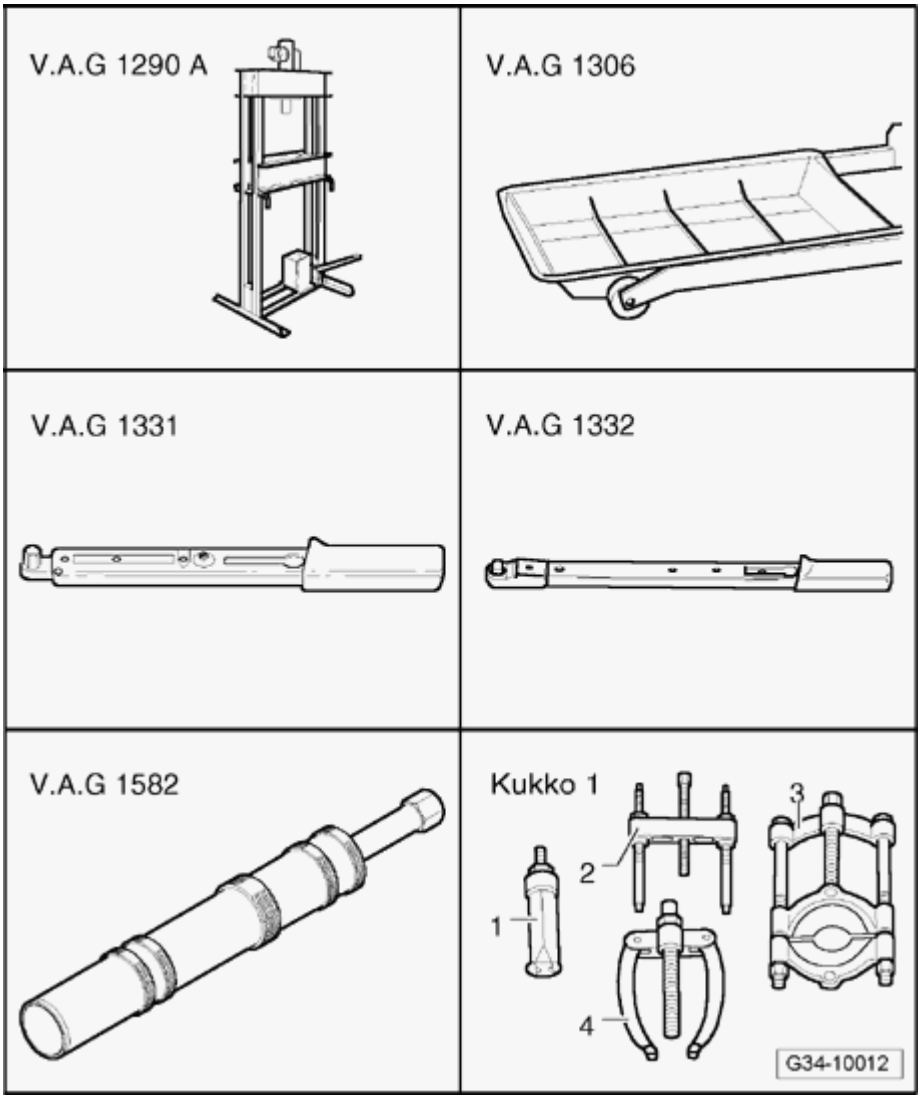

Fig. 268: Identifying Special Tools -- Transmission Disassembling And Assembling Sequence (4 Of 4)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Workshop press V.A.G 1290 A
- Drip tray V.A.G 1306
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332

- Taper roller bearing puller V.A.G 1582
- Adapter V.A.G 1582/12
- - **1** - Internal puller Kukko 21/2
- - **2** - Puller Kukko 18/2

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Special tools, testers and auxiliary items required

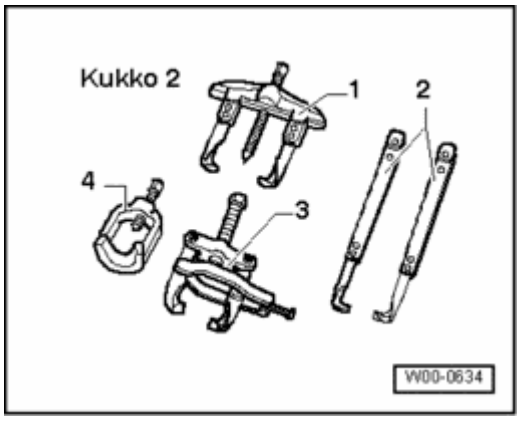

Fig. 269: Identifying Special Tools - Kukko 20/10 Puller Set
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **- 1** - Two-arm puller Kukko 20/10
- **- 2** - Puller hook, length 200 mm
- **- 2** - Puller hook, length 250 mm
- Fitting tool T10246

- Holding plate T40086
- Holding plate T40088/1
- Sleeve T40088/2
- Feeler gauge

- 2 bolts M8 (length 70 mm) with washers
- **Sealing paste AMV 188 001 02**
- **Assembly sleeve 01E311120**
- **Locking fluid AMV185101A1**

Disassembling transmission

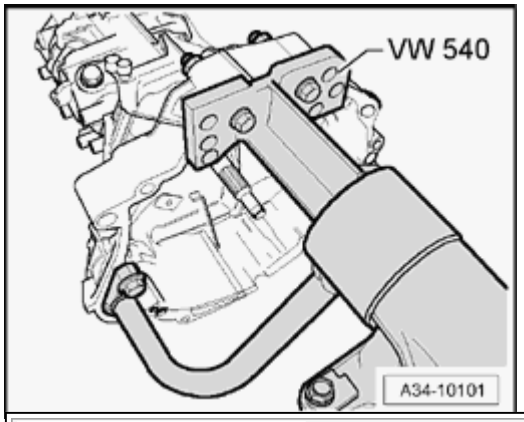

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Fig. 270: Transmission Mounted On Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mount transmission on assembly stand.
- Place drip tray V.A.G 1306 under transmission.
- Drain gear oil.

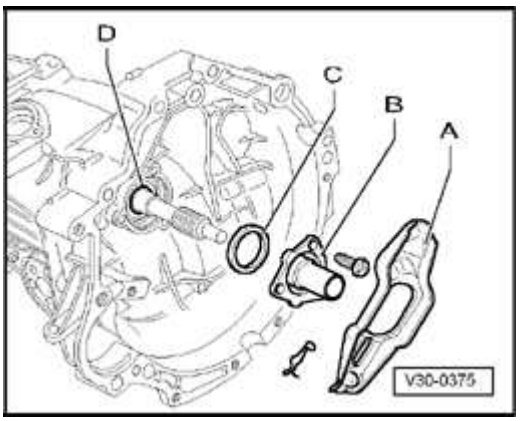

Fig. 271: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clutch release lever - **A** - together with release bearing.
- Remove guide sleeve - **B** -
- Remove dished spring - **C** -.
- Then remove circlip - **D** - in front of ball bearing for input shaft.

- If input shaft or transmission housing is not to be replaced, note thickness of circlip.

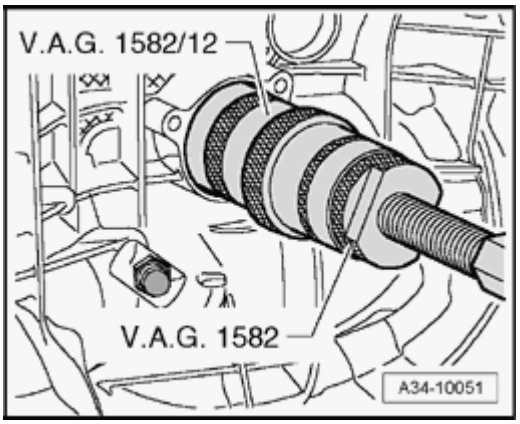

Fig. 272: Pulling Ball Bearing For Input Shaft Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull input shaft ball bearing out of transmission housing.

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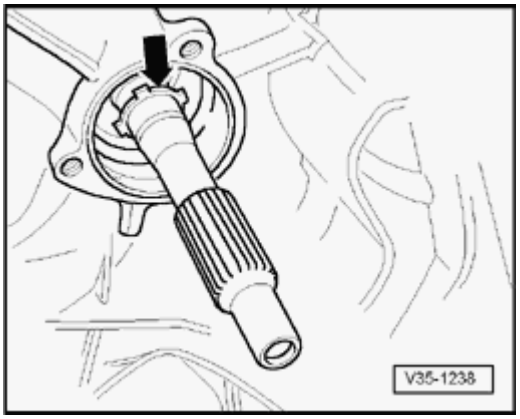

Fig. 273: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip - **arrow** - behind ball bearing for input shaft.
- If input shaft or transmission housing is not to be replaced, note the thickness of circlip.

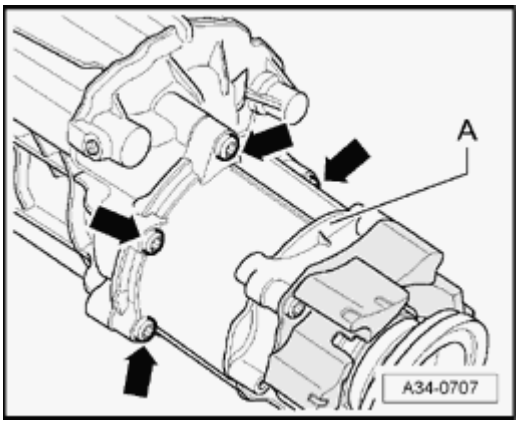

Fig. 274: Locating Torsen Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and detach Torsen housing - **A** -.

NOTE:

- **The illustration shows only 4 of the 6 securing bolts.**

- Remove Torsen differential and spring from pinion shaft/hollow shaft.

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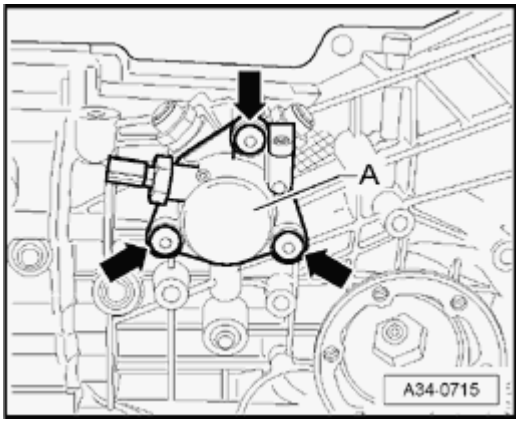

Fig. 275: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove selector shaft cover - **A** -.

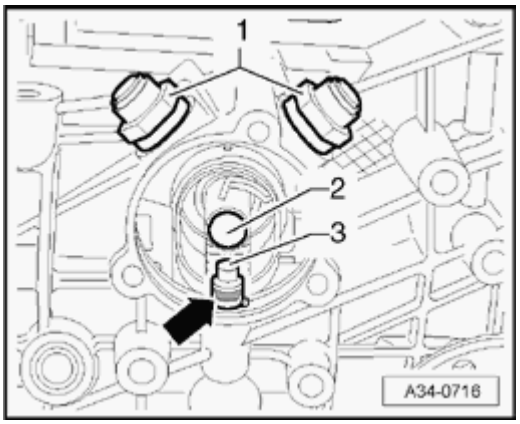

Fig. 276: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove two locking bolts - **1** - for selector shaft.

- Make sure gear has not been engaged.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously removing pin - **3** -.
- Pull out selector shaft.

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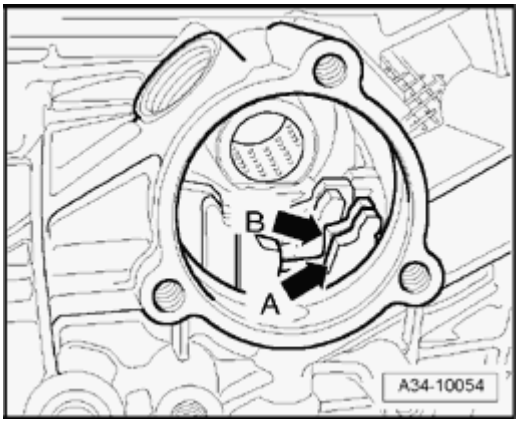

Fig. 277: Locating Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Move two selector rods - **arrow A** - and - **arrow B** - to lock input shaft by selecting two gears (e.g. reverse gear and 1st gear).

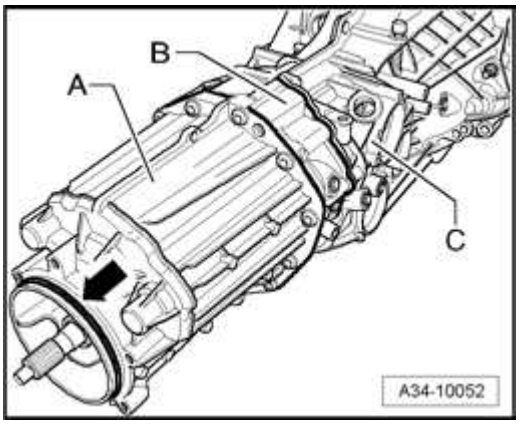

Fig. 278: Removing Bolts Securing Transmission Cover And Bolts Securing Bearing Housing To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts securing transmission cover - **A** - and bolts securing bearing housing - **B** - to transmission housing - **C** -.
- Carefully remove transmission cover toward rear. The bearing housing remains installed to transmission housing.

NOTE:

- **Always replace transmission cover O-ring - arrow -.**

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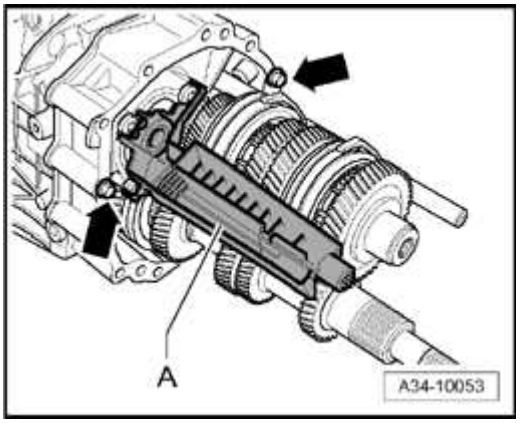

Fig. 279: Bearing Housing Secured To Transmission Housing With Two Bolts M8 And Washers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure bearing housing to transmission housing - **arrows** - with two bolts M8 (length approx. 70 mm) and washers.
- Tighten two bolts to max. 10 Nm.
- Remove oil collector - **A** -.

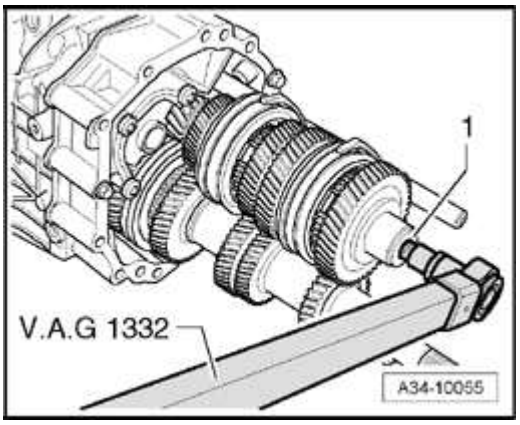

Fig. 280: Removing/Installing Multi-Point Socket Head Bolt For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove multi-point socket head bolt - **1** - for input shaft.

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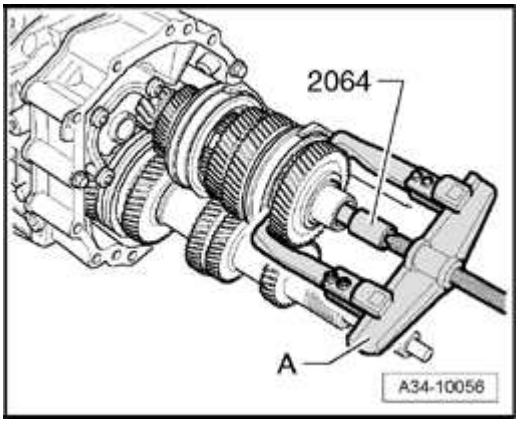

Fig. 281: Detaching 6th Speed Selector Gear With Inner Race For Roller Bearing And Thrust Washer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach 6th speed selector gear with inner race for roller bearing and thrust washer.

A - Two-arm puller, e.g. Kukko 20/10

NOTE:

- **Check the gear teeth on the selector gears and gear wheels for damage after pulling them off.**

- Remove synchro-ring and needle bearing for 6th speed selector gear.

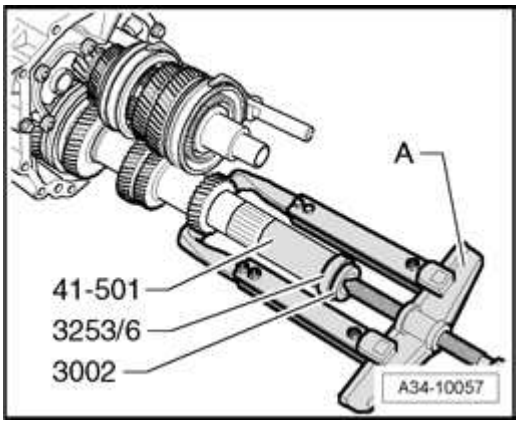

Fig. 282: Pulling Off 6th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 6th gear wheel.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 200 mm

- Remove spacer sleeve from hollow shaft.

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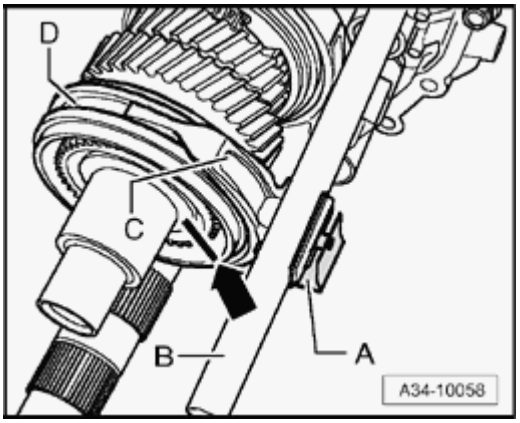

Fig. 283: Identifying Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pin with clip - **A** - for securing selector fork for 5th and 6th gear from selector rod - **B** -.
- Mark installation position of locking collar in relation to synchronizing hub - **arrow** -.
- Move selector fork - **C** - downward and detach with locking collar - **D** -.

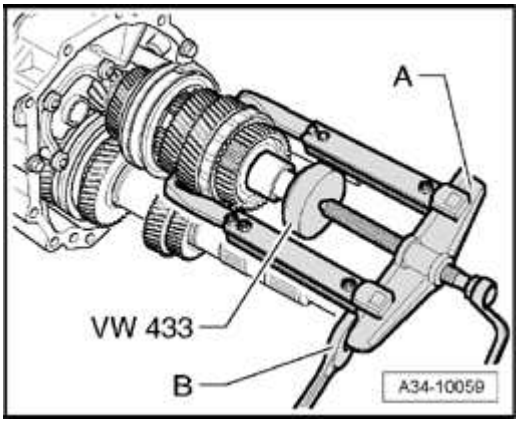

Fig. 284: Removing 5th Speed Selector Gear Together With Needle Bearing Inner Race For 6th Gear And Synchronizing Hub For 5th And 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 5th speed selector gear together with needle bearing inner race for 6th gear and synchronizing hub for 5th and 6th gear.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 200 mm

NOTE:

- **Counter-hold two-arm puller using e.g. open end wrench - B -.**
- **If the needle bearing inner race for 6th gear is in contact with thrust pad con. 8/65 VW 433, insert lock pin 2064 into hole in input shaft to pull off the components all the way.**

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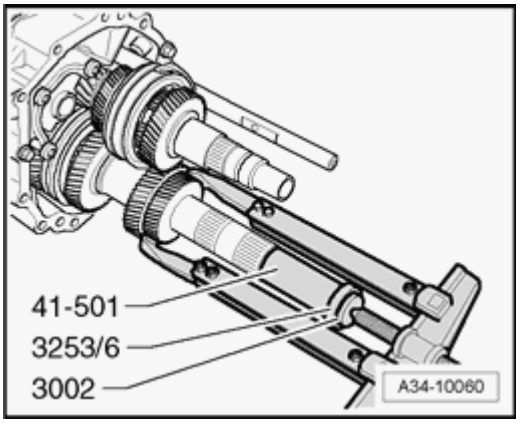

Fig. 285: Pulling Off 5th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 5th gear wheel.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 250 mm

NOTE:

- **The 5th gear wheel can also be pulled off together with the 4th gear wheel Fig. 286.**

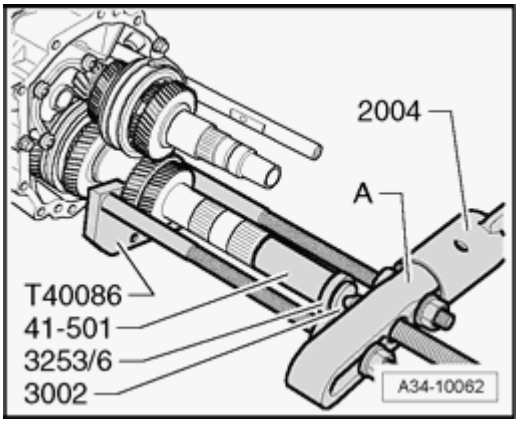

Fig. 286: Pulling Off 5th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 4th gear wheel.

A - Puller, e.g. Kukko 18/2

NOTE:

- **Counter-hold puller - A - using e.g. transmission holder 2004.**

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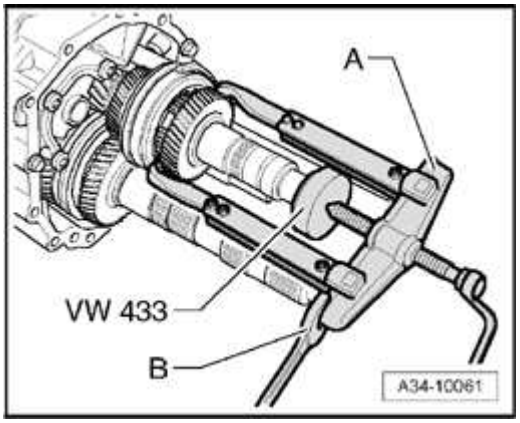

Fig. 287: Removing 4th Speed Selector Gear With Needle Bearing Inner Race For 5th Gear And Thrust Washer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 4th speed selector gear with needle bearing inner race for 5th gear and thrust washer.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 200 mm

- Counter-hold two-arm puller using e.g. open end wrench - **B** -.
- Remove synchro-ring and needle bearing for 4th speed selector gear.

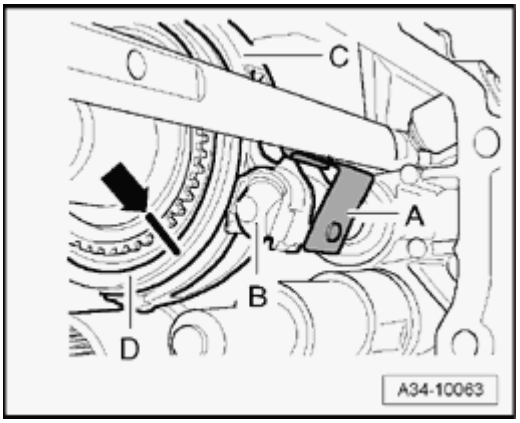

Fig. 288: Pulling Pin With Clip Securing Selector Fork For 3rd And 4th Gear Out From Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pin with clip - **A** - securing selector fork for 3rd and 4th gear out from selector rod - **B** -.

- Mark installation position of locking collar in relation to synchronizing hub - **arrow** -.

- Remove selector fork - **C** - with locking collar - **D** -.
- Remove circlip for 3rd gear and 4th gear synchronizing hub and note thickness of circlip.

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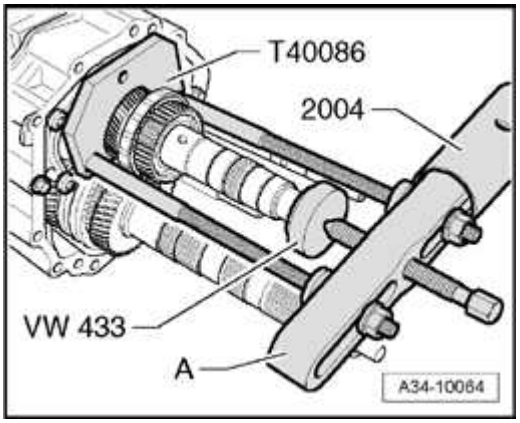

Fig. 289: Pulling Off 3rd Speed Selector Gear With Synchronizing Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Remove 3rd speed selector gear with synchronizing hub for 3rd and 4th gear.

A - Puller, e.g. Kukko 18/2

NOTE:

- **Counter-hold puller - A - using e.g. transmission holder 2004 to prevent plate T40086 from making contact with 3rd gear wheel or selector rod for 5th and 6th gear.**

- Remove circlip for 3rd speed selector gear needle bearing and detach 3rd gear needle bearing.

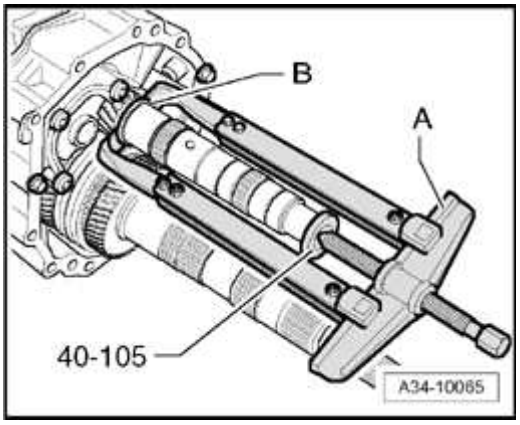

Fig. 290: Pulling Off Thrust Washer For 3rd Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off thrust washer - **B** - for 3rd speed selector gear.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 250 mm

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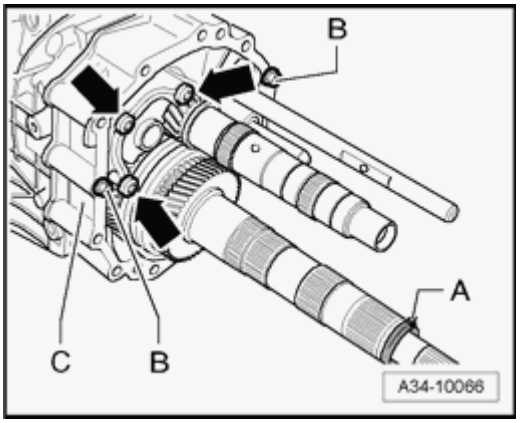

Fig. 291: Identifying Reverse Shaft Support Bolts, Hose Clip And Bolts Securing Bearing Housing To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for reverse shaft support.
- Prevent pinion shaft from falling out and secure onto hollow shaft using e.g. a hose clip - **A** -.
- Remove two bolts - **B** - securing bearing housing to transmission housing and detach bearing housing.
- Remove hose clip from pinion shaft.

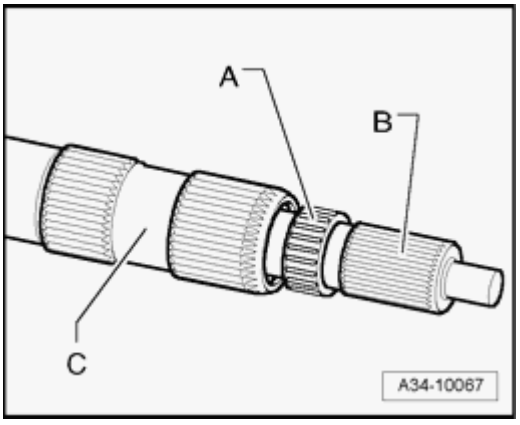

Fig. 292: Identifying Needle Bearing For Pinion Shaft And Hollow Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove needle bearing - **A** - for pinion shaft - **B** - and pull out pinion shaft from hollow shaft - **C** -.

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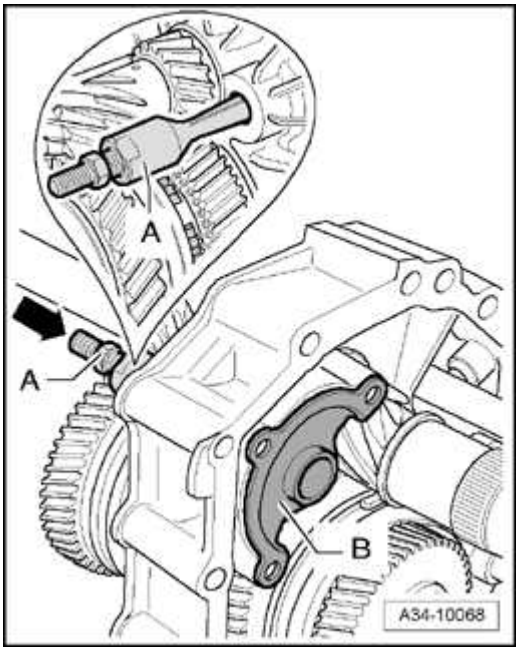

Fig. 293: Driving Reverse Shaft Support Carefully Out Of Bearing Housing And Removing With Reverse Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert an internal puller - **A** - e.g. Kukko 21/2 into hole for reverse shaft support.
- Spread open internal puller far enough for it to make contact with reverse shaft support - **B** -.
- Drive reverse shaft support carefully out of bearing housing direction of - **arrow** - and remove with reverse gear wheel.

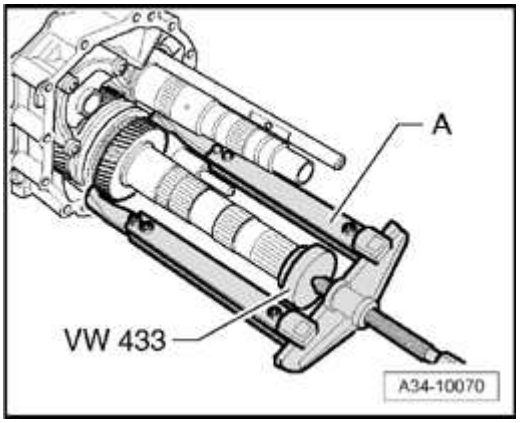

Fig. 294: Removing Circlip For 3rd Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip for 3rd gear wheel and note thickness of circlip.
- Pull off 3rd gear wheel.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 250 mm

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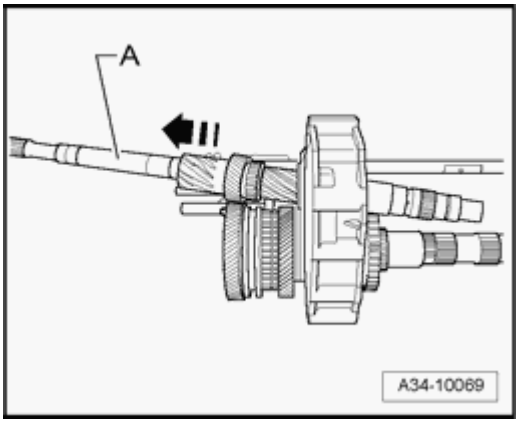

Fig. 295: Pulling Out Input Shaft From Bearing Housing At An Angle From The Front
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out input shaft - **A** - carefully from bearing housing at an angle from the front direction of - **arrow** -.

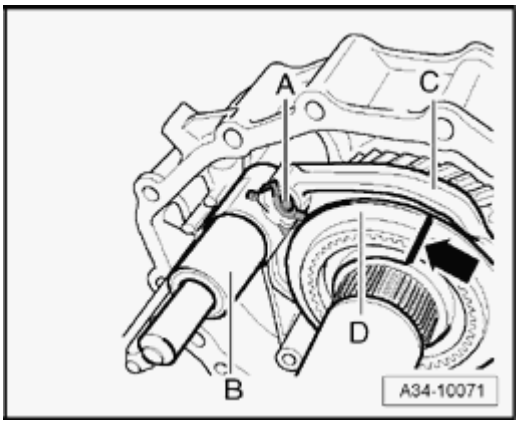

Fig. 296: Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pin with clip - **A** - for securing selector fork for reverse gear out from selector rod - **B** -.
- Mark installation position of locking collar in relation to synchronizing hub - **arrow** -.
- Remove selector fork - **C** - with locking collar - **D** -.

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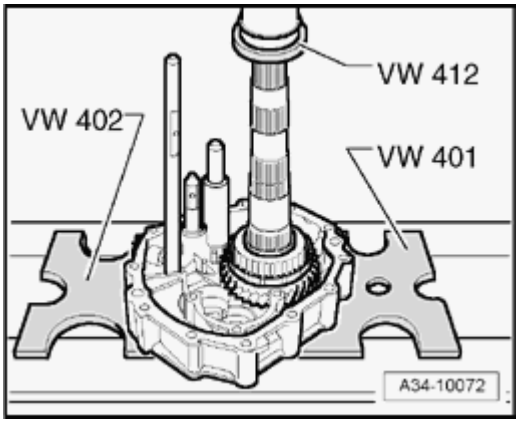

Fig. 297: Pressing Off Synchronizing Hub For Reverse Gear From Output Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press off synchronizing hub for reverse gear from hollow shaft.

NOTE:

- **Place the bearing housing onto thrust plates VW 401 and VW 402 so that the hollow shaft and selector rods are not damaged when pressing off the synchronizing hub.**

- Remove reverse selector gear, needle bearing for reverse selector gear and reverse gear synchronizing hub.
- Guide hollow shaft out of selector fork for 1st and 2nd gear and bearing housing.

Assembling transmission

If the input shaft or the transmission housing have been replaced, you must first re-determine the thickness of the input shaft circlips --> **Circlips for input shaft ball bearing, determining**.

NOTE:

- **Lubricate all needle bearings with gear oil before installing.**
- **Check synchro-rings for wear Checking synchro-ring for wear**
- **Insert spring in selector gear Inserting spring in selector gear**
- **Heat gear wheels, needle bearing inner races and synchronizing hubs to 130° C (max.) before pressing on (wear protective gloves).**

- Insert hollow shaft in bearing housing and selector fork for 1st and 2nd gear.
- Place reverse gear selector gear with needle bearing, spring and synchro-ring onto hollow shaft.

- The tabs on synchro-ring should engage into recesses in selector gear.

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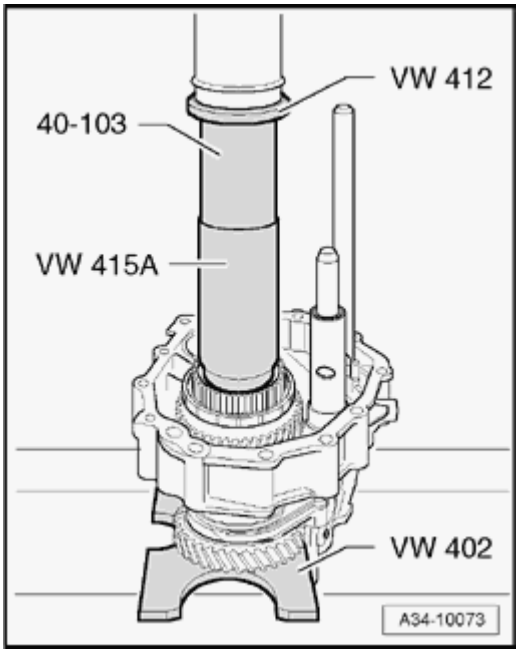

Fig. 298: Pressing On Reverse Gear Synchronizing Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on reverse gear synchronizing hub.
- Installation position: high inside collar faces 3rd gear wheel.
- Check axial clearance of reverse selector gear.

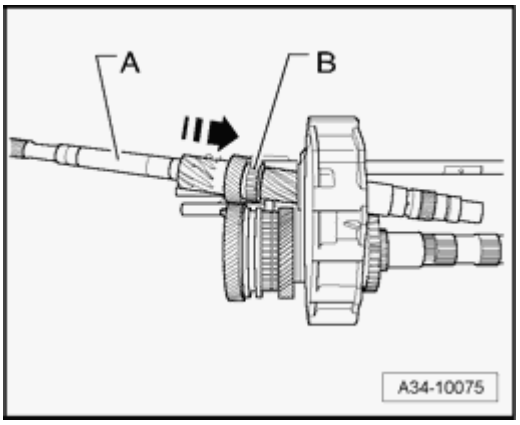

Fig. 299: Inserting Input Shaft With Needle Roller Bearing Into Bearing Housing At An Angle Toward Rear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert input shaft - **A** - with needle roller bearing - **B** - into bearing housing in direction of - **arrow** - at an angle toward rear.
- Install reverse gear wheel and tighten 3 bolts for reverse shaft support to 30 Nm.

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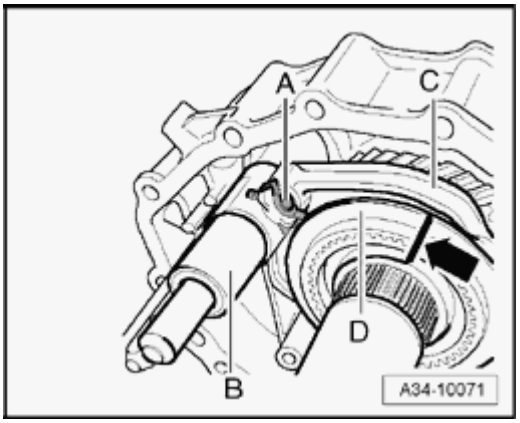

Fig. 300: Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide reverse gear selector fork - **C** - together with locking collar - **D** - onto selector rod - **B** - and reverse gear synchronizing hub.

- The markings on locking collar and synchronizing hub - **arrow** - must coincide.
- The chamfer on locking collar faces reverse selector gear.

- If the holes of selector fork and selector rod coincide, clip in pin with clip - **A** -.

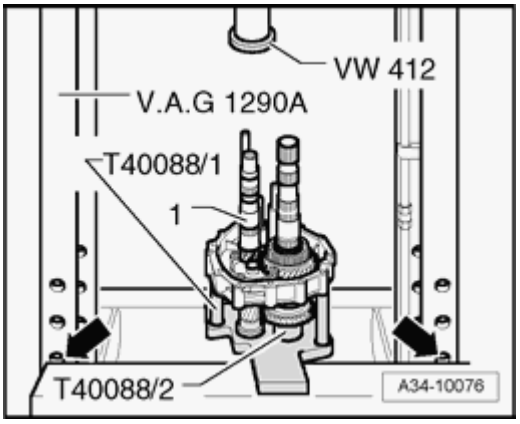

Fig. 301: Work Surface Of Workshop Press V.A.G 1290 A Aligned So That The 3rd Hole Is Visible Above Work Surface
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align work surface of workshop press V.A.G 1290 A so that the 3rd hole - **arrow** - is visible above work surface.
- Place holding plate T40088/1 with sleeve T40088/2 onto work surface.
- Insert bearing housing with shafts and selector rods into holding plate T40088/1.

The distance between input shaft - **1** - and thrust disc VW 412 should be approx. 210 mm, so that it is possible to perform the following work steps without changing the position of the work surface.

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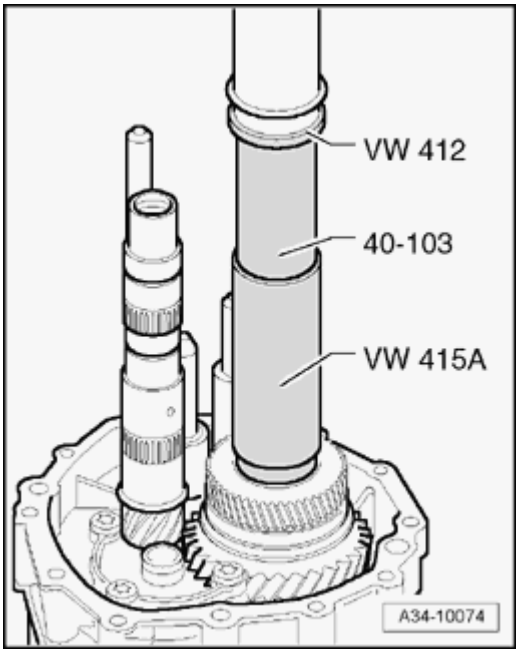

Fig. 302: Pressing On 3rd Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on 3rd gear wheel.
- Installation position: machined side faces reverse gear synchronizing hub.
- Insert circlip for 3rd gear wheel.
- When replacing gear wheel or hollow shaft:

Re-determine thickness of circlip for 3rd gear wheel:

- Determine thickest circlip that will just fit and install it.

The following circlips are available:

Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	2.10

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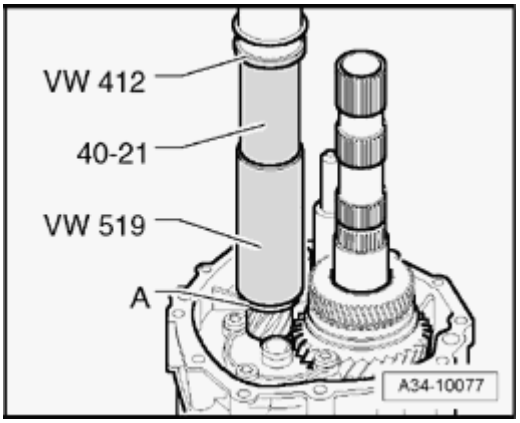

Fig. 303: Pressing On Thrust Washer For 3rd Speed Selector Gear Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on thrust washer - **A** - for 3rd speed selector gear until limit stop.

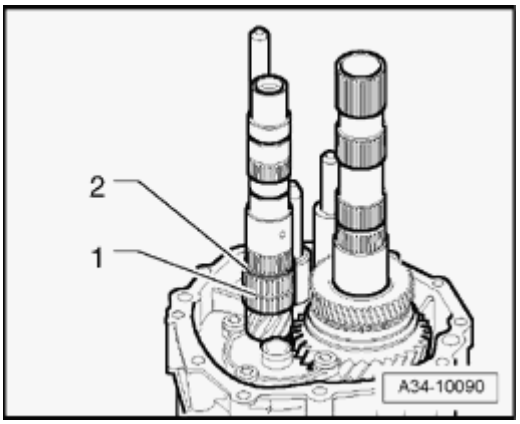

Fig. 304: Installing Needle Bearing For 3rd Speed Selector Gear And Circlip For 3rd Gear Needle Bearing Onto Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install needle bearing for 3rd speed selector gear - **1** - and circlip - **2** - for 3rd gear needle bearing onto input shaft.
- Install 3rd speed selector gear with spring and synchro-ring.

- The tabs on synchro-ring should engage into recesses in selector gear.

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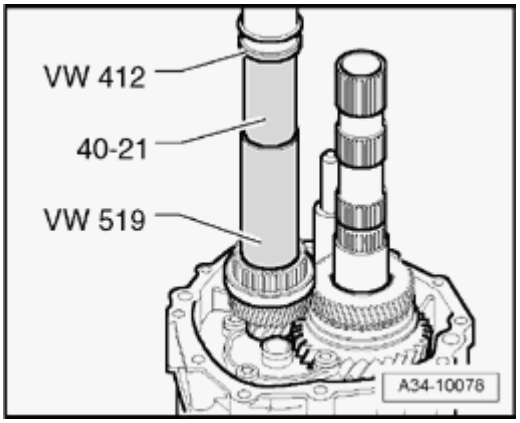

Fig. 305: Pressing On Heated Synchronizing Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on heated synchronizing hub for 3rd and 4th gear
- Installation position: high inside collar faces 3rd speed selector gear.

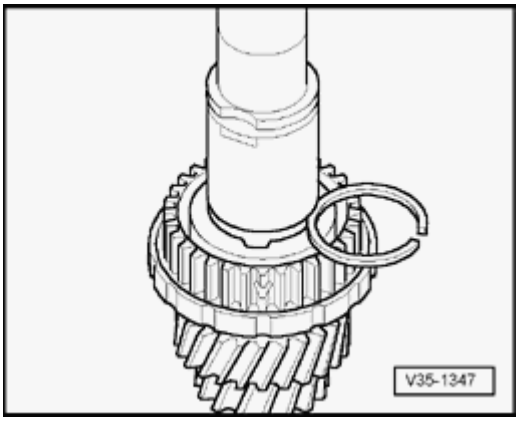

Fig. 306: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert circlip for synchronizing hub for 3rd and 4th gear.
- When replacing synchronizing hub or input shaft:

Re-determine thickness of circlip for synchronizing hub for 3rd and 4th gear:

- Determine thickest circlip that will just fit and install it.

The following circlips are available:

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

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- Check axial clearance of 3rd speed selector gear.

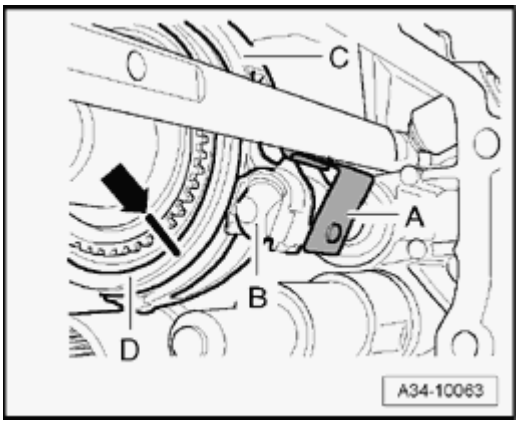

Fig. 307: Pulling Pin With Clip Securing Selector Fork For 3rd And 4th Gear Out From Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide selector fork for 3rd and 4th gear - **C** - together with locking collar - **D** - onto selector rod - **B** - and synchronizing hub for 3rd and 4th gear.

- The markings on locking collar and synchronizing hub - **arrow** - must coincide.

- If the holes of selector fork and selector rod coincide, clip in pin with clip - **A** -.

NOTE:

- **Do not insert pin with clip for 5th/6th gear selector fork (diameter 6 mm) into selector fork for 3rd and 4th gear.**

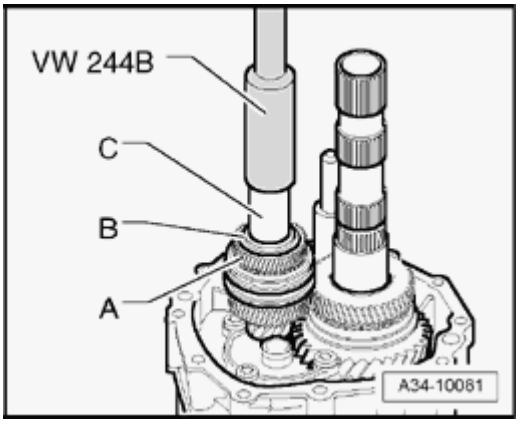

Fig. 308: Installing 4th Speed Selector Gear With Spring, Synchro-Ring, Needle Bearing And Thrust Washer For 3rd And 4th Gear And Pressing On Heated Inner Race For Needle Bearing For 5th Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install 4th speed selector gear - **A** - with spring, synchro-ring, needle bearing and thrust washer for 3rd and 4th gear - **B** -.

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- Press on heated inner race - **C** - for needle bearing for 5th speed selector gear.
- Check axial clearance of 4th speed selector gear.

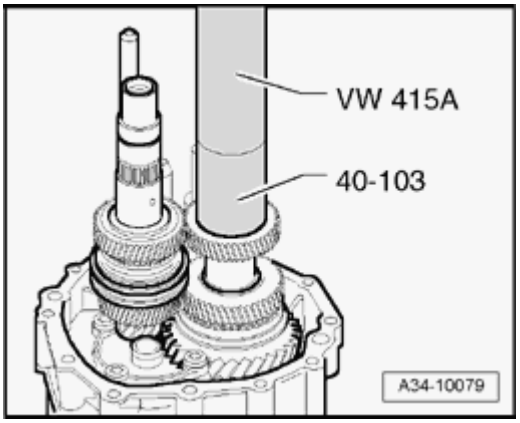

Fig. 309: Pressing On 4th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 4th gear wheel and press on.

- Installation position: high inside collar faces 5th gear wheel.

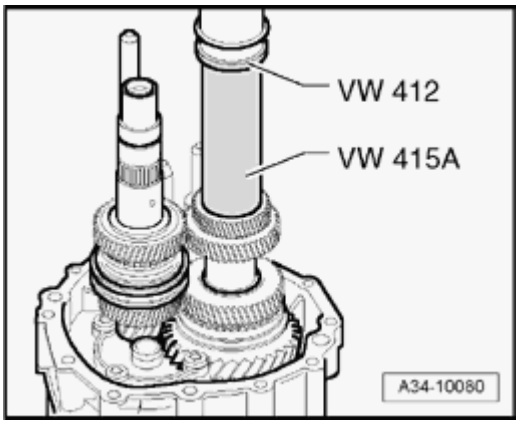

Fig. 310: Pressing On 5th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 5th gear wheel and press on.

- Installation position: high inside collar faces 4th gear wheel.

- Place 5th speed selector gear with spring, synchro-ring and needle bearing onto input shaft.

- The lugs on synchro-ring should engage into recesses in selector gear.

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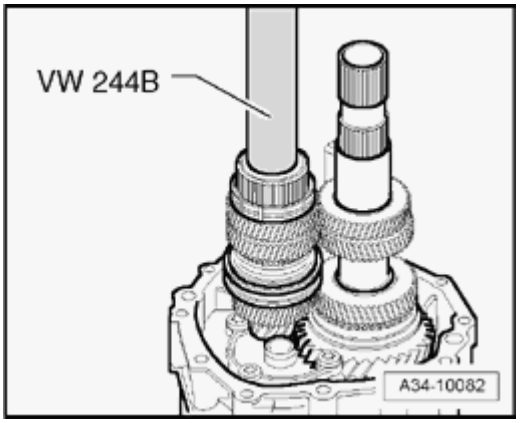

Fig. 311: Pressing On Heated Synchronizing Hub For 5th And 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install and press on heated synchronizing hub for 5th and 6th gear.
- Check axial clearance of 5th speed selector gear.

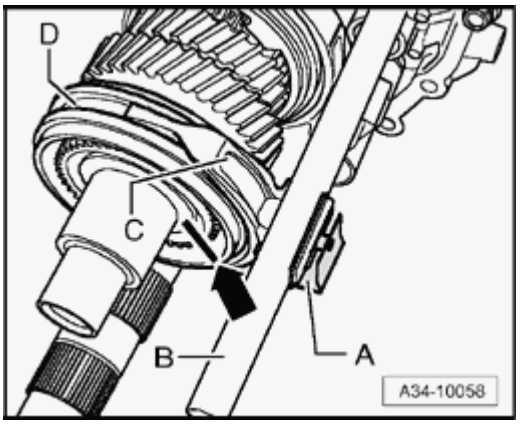

Fig. 312: Identifying Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide selector fork for 5th and 6th gear - **C** - together with locking collar - **D** - onto synchronizing hub for 5th and 6th gear.

- The markings on locking collar and synchronizing hub - **arrow** - must coincide.

- Move selector fork for 5th and 6th gear - **C** - into selector rod - **B** -.
- If the holes of selector fork and selector rod coincide, clip in pin with clip - **A** -.

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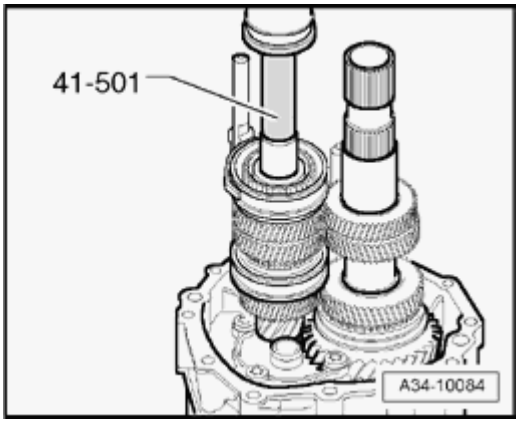

Fig. 313: Pressing On Heated Inner Race For Needle Bearing For 5th Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on heated inner race for needle bearing for 5th speed selector gear.

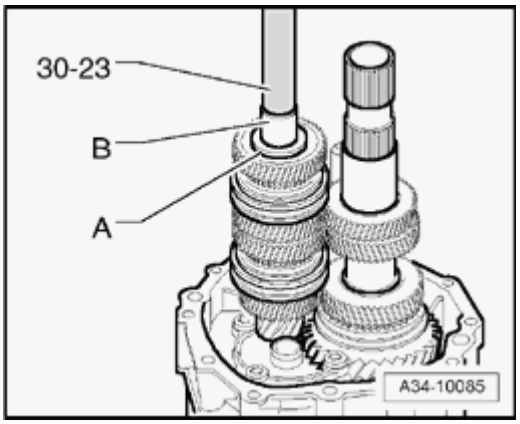

Fig. 314: Pressing On 6th Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install 6th speed selector gear with spring, synchro-ring, needle bearing and thrust washer for 6th gear - **A** -.
- Heat inner race - **B** - for needle roller bearing and press on.
- Check axial clearance of 6th speed selector gear.

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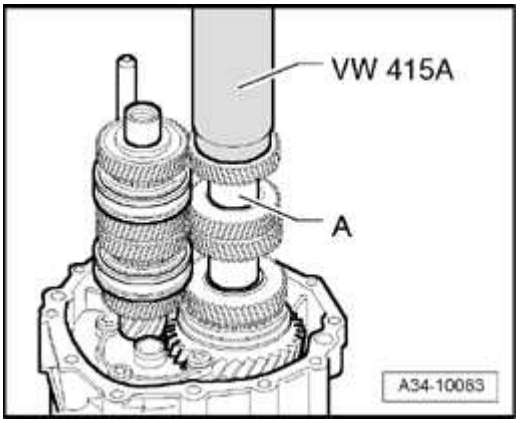

Fig. 315: Pressing On 6th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install spacer sleeve - **A** - onto hollow shaft.
- Heat 6th gear wheel and press on.

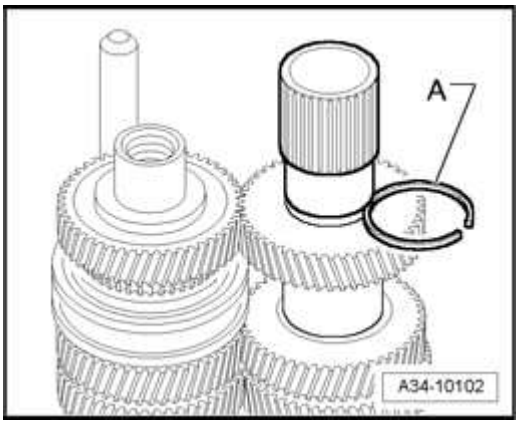

Fig. 316: Circlip For 6th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Insert circlip - **A** - for 6th gear wheel.

- When replacing gear wheel or hollow shaft:

Re-determine circlip - **A** - for 6th gear wheel:

- Determine thickest circlip that will just fit and install it.

The following circlips are available:

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17

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1.96	2.08	2.20
1.99	2.11	

- Remove bearing housing from holding plate T40088/1.

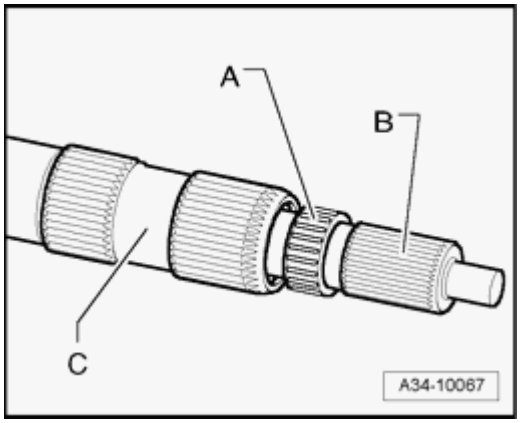

Fig. 317: Identifying Needle Bearing For Pinion Shaft And Hollow Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push pinion shaft - **B** - with large needle bearing into hollow shaft - **C** - and fit small needle bearing - **A** -.
- Prevent pinion shaft from falling out and secure on hollow shaft using e.g. a hose clip **Fig. 291**.

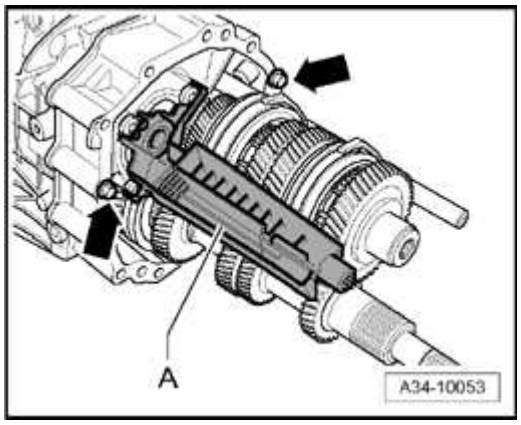

Fig. 318: Bearing Housing Secured To Transmission Housing With Two Bolts M8 And Washers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure bearing housing to transmission housing with two bolts M8 (length approx. 70 mm) - **arrows** - and washers.
- Tighten two bolts to max. 10 Nm.

NOTE:

- **Do not install oil collector - A - at this stage.**

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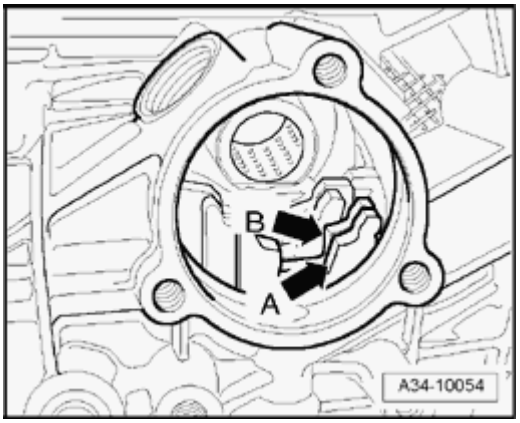

Fig. 319: Locating Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Move two selector rods - **arrow A** - and - **arrow B** - to lock input shaft by selecting two gears (e.g. reverse gear and 1st gear).

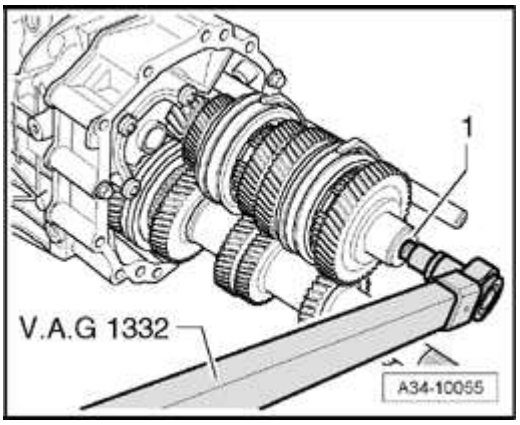

Fig. 320: Removing/Installing Multi-Point Socket Head Bolt For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten multi-point socket head bolt - **1** - for input shaft to 150 Nm.
- Remove complete bearing housing from transmission housing.
- Check that the two dowel sleeves for centralizing bearing housing are installed in transmission housing.
- Apply **sealing paste AMV 188 001 01** evenly and not too thickly onto contact surfaces between transmission housing and bearing housing.

- Install bearing housing onto transmission housing.

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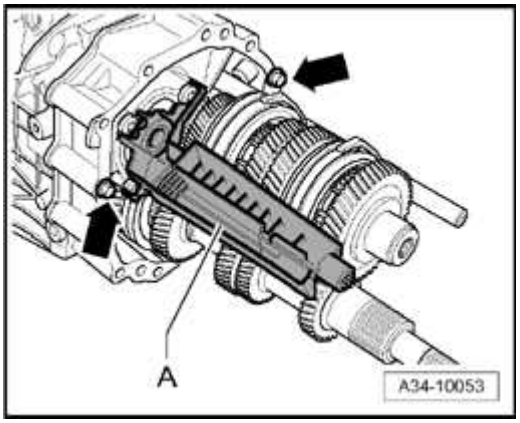

Fig. 321: Bearing Housing Secured To Transmission Housing With Two Bolts M8 And Washers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clip oil collector - **A** - into reverse shaft support.

NOTE:

- **Make sure that the bolts - arrows - are removed.**

- Remove hose clip from pinion shaft **Fig. 291**.
- Check that the two dowel sleeves for centralizing the transmission cover are installed in bearing housing.
- Apply **sealing paste AMV 188 001 02** evenly and not too thick onto contact surfaces between bearing housing and transmission cover.

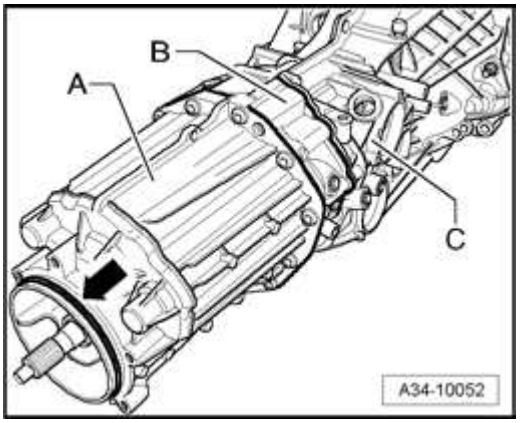

Fig. 322: Removing Bolts Securing Transmission Cover And Bolts Securing Bearing Housing To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten securing bolts for transmission cover - **A** - and bearing housing - **B** - to transmission housing - **C** - to 35 Nm plus an additional 90° $^{1}/_{4}$ turn.
- Lubricate new O-ring - **arrow** - with gear oil.

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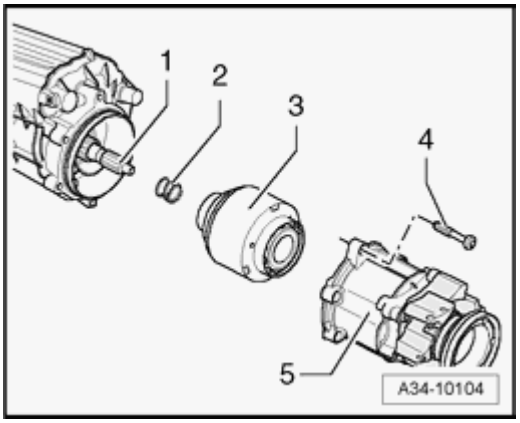

Fig. 323: Torsen Differential, Spring, Pinion Shaft/Hollow Shaft, Torsen Housing And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place spring - **2** - and Torsen differential - **3** - onto pinion shaft/hollow shaft - **1** -.
- Install Torsen housing - **5** - onto transmission cover.
- Tighten bolts - **4** - to 10 Nm plus an additional 45° $^{1}/_{8}$.

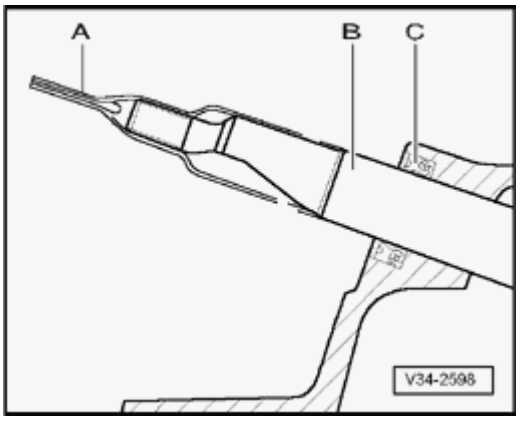

Fig. 324: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push **assembly sleeve 01E311120** - **A** - onto selector shaft - **B** -.

NOTE:

- **Avoid damaging oil seal - C - by only installing oil seal and selector shaft using assembly sleeve assembly sleeve 01E311120 - A -.**

- Move selector rods to neutral.
- Install complete selector shaft.

- Installation position: Chamfer of selector shaft points downward.

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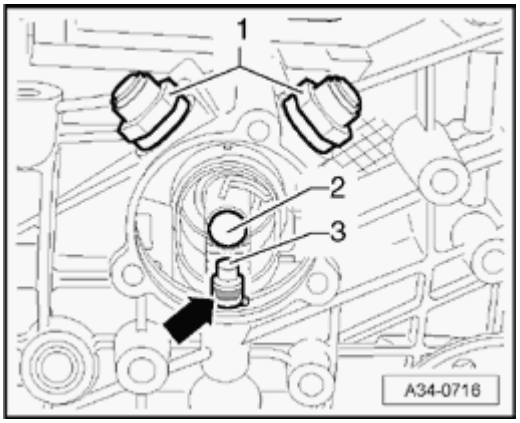

Fig. 325: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously inserting pin - **3** -.
- Installation position for pin - **3** - : The groove - **arrow** - on pin points toward selector shaft cover.
- Clean bolt threads of locking fluid - **1** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 45 Nm.

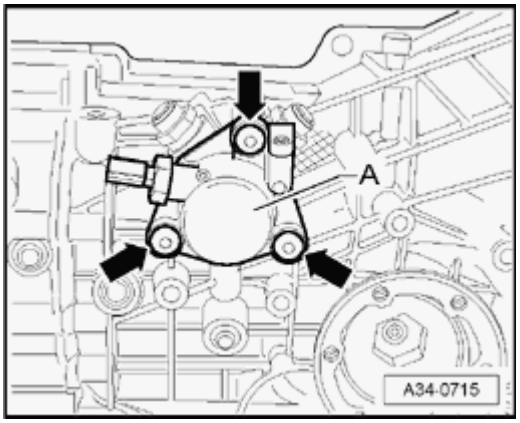

Fig. 326: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install cover - **A** - with new O-ring.
- Clean threads of bolts - **arrows** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 24 Nm.

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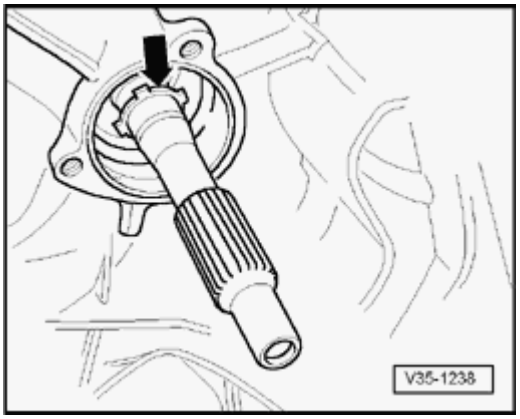

Fig. 327: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install rear circlip - **arrow** - for input shaft ball bearing.
- Push ball bearing onto input shaft.

Installation position:

The sealed side of ball cage faces transmission housing.

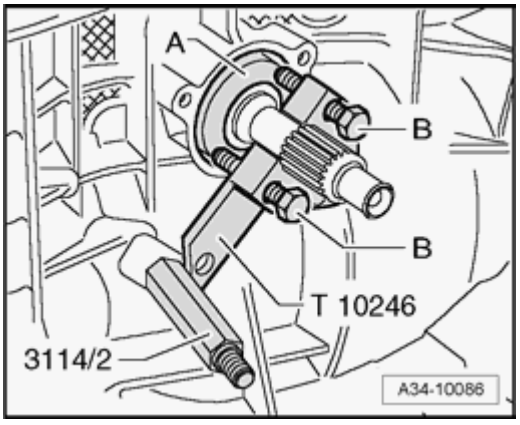

Fig. 328: Pressing In Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing in ball bearing:

Screw replacement stud (M8 and M10) 3114/2 into tapped hole for ball head stud.

Slide thrust plate - **A** - of fitting tool T10246 onto input shaft.

Position fitting tool T10246 behind splines for clutch plate. Tighten bolts - **B** - lightly. The bolts locate in the recess in thrust plate - **A** -.

Press in ball bearing onto stop by tightening bolts alternately (1/2 turn at a time).

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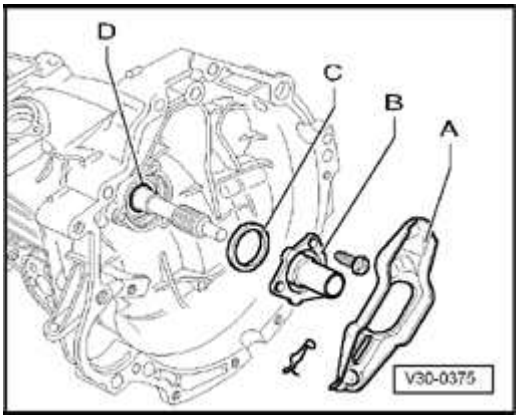

Fig. 329: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install front circlip - **D** - for input shaft ball bearing.
- Install dished spring - **C** -.

Installation position:

The curved side faces guide sleeve - **B** -.

- Install a shrink hose onto input shaft splines.
- Install guide sleeve - **B** - for release bearing.
- Remove shrink hose.
- Install clutch release lever - **A** - with release bearing.

- Select all gears.

TORSEN HOUSING, DISASSEMBLING AND ASSEMBLING

Torsen housing, disassembling and assembling

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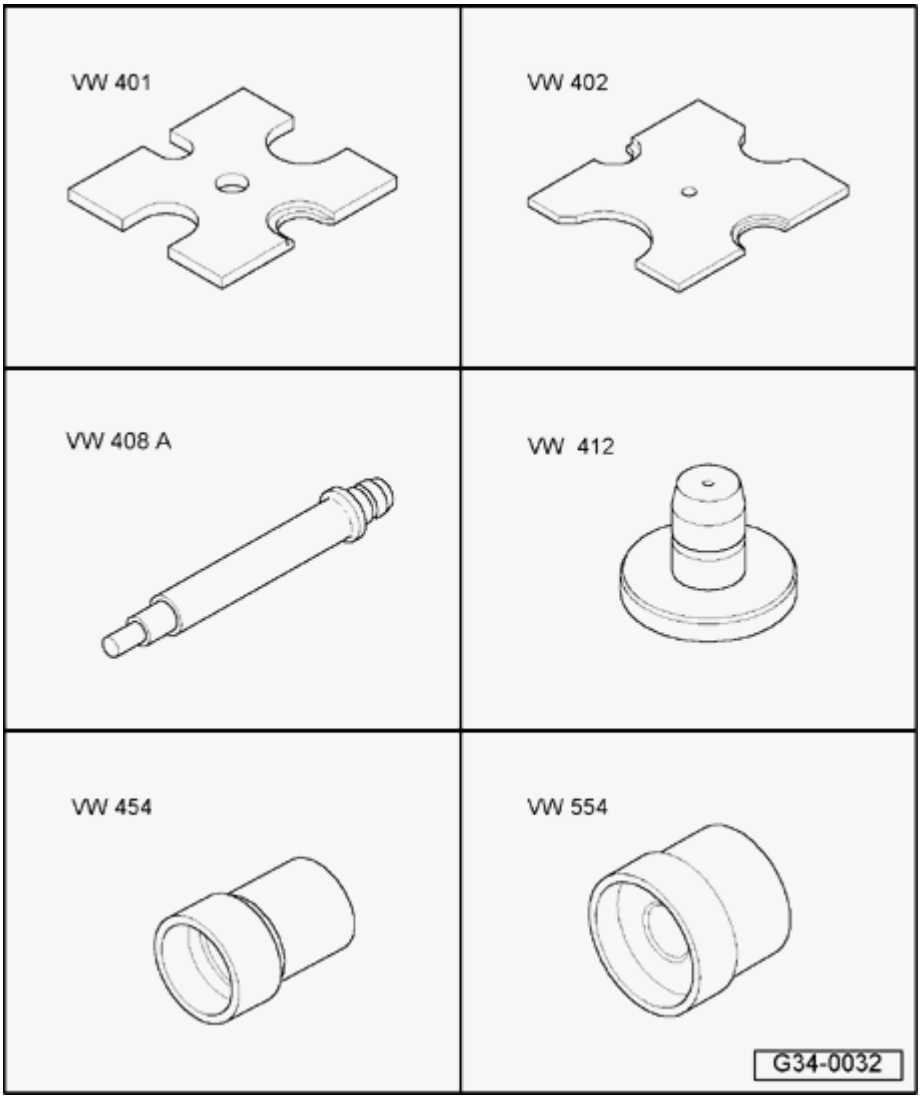

Fig. 330: Identifying Special Tools - Torsen Housing, Disassembling And Assembling (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW401
- Thrust plate VW402
- Punch VW408A
- Thrust disc VW412

- Thrust tube VW454
- Arbor thrust piece VW554

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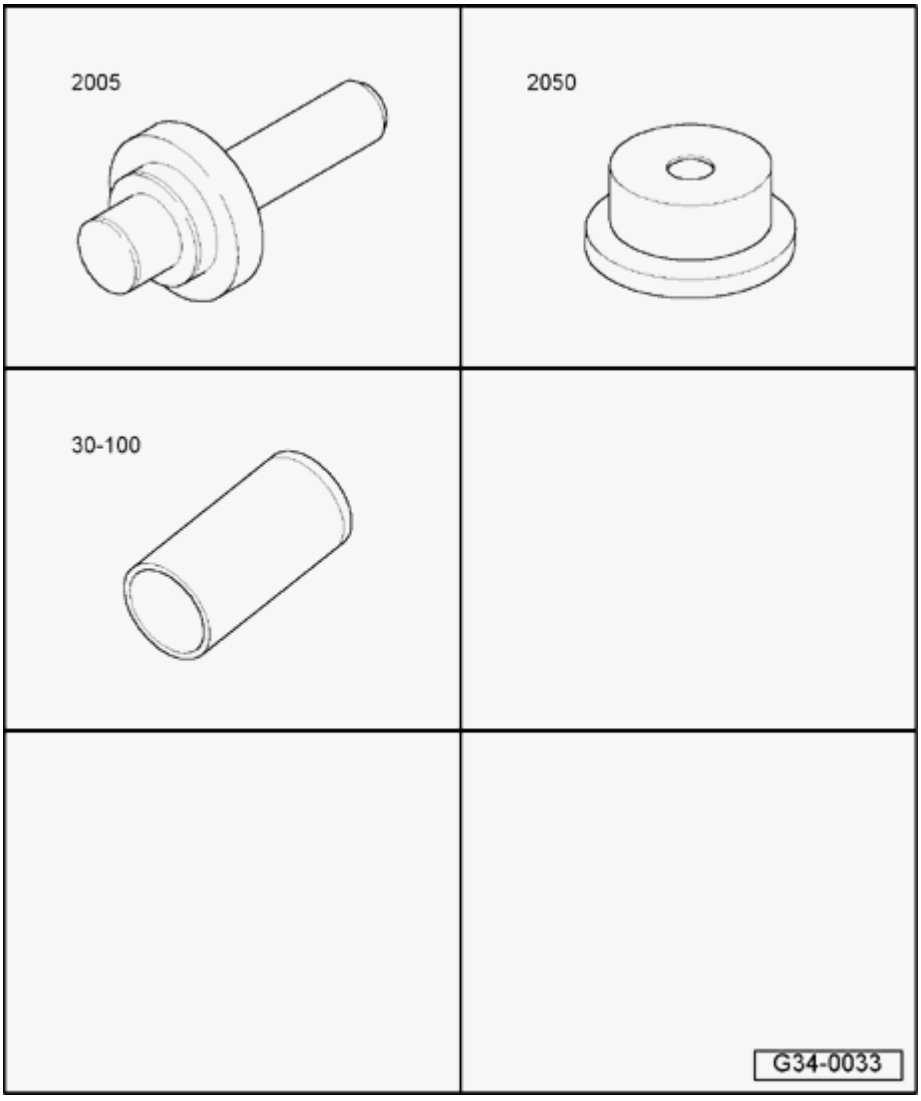

Fig. 331: Identifying Special Tools - Torsen Housing, Disassembling And Assembling (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Punch 2005
- Thrust piece 2050
- Drift sleeve 30 - 100
- Torque wrench V.A.G 1331

- **Shim 016311391A**
- **Locking fluid AMV 185 101 A1**
- **Sealing grease G 052 128 A1**

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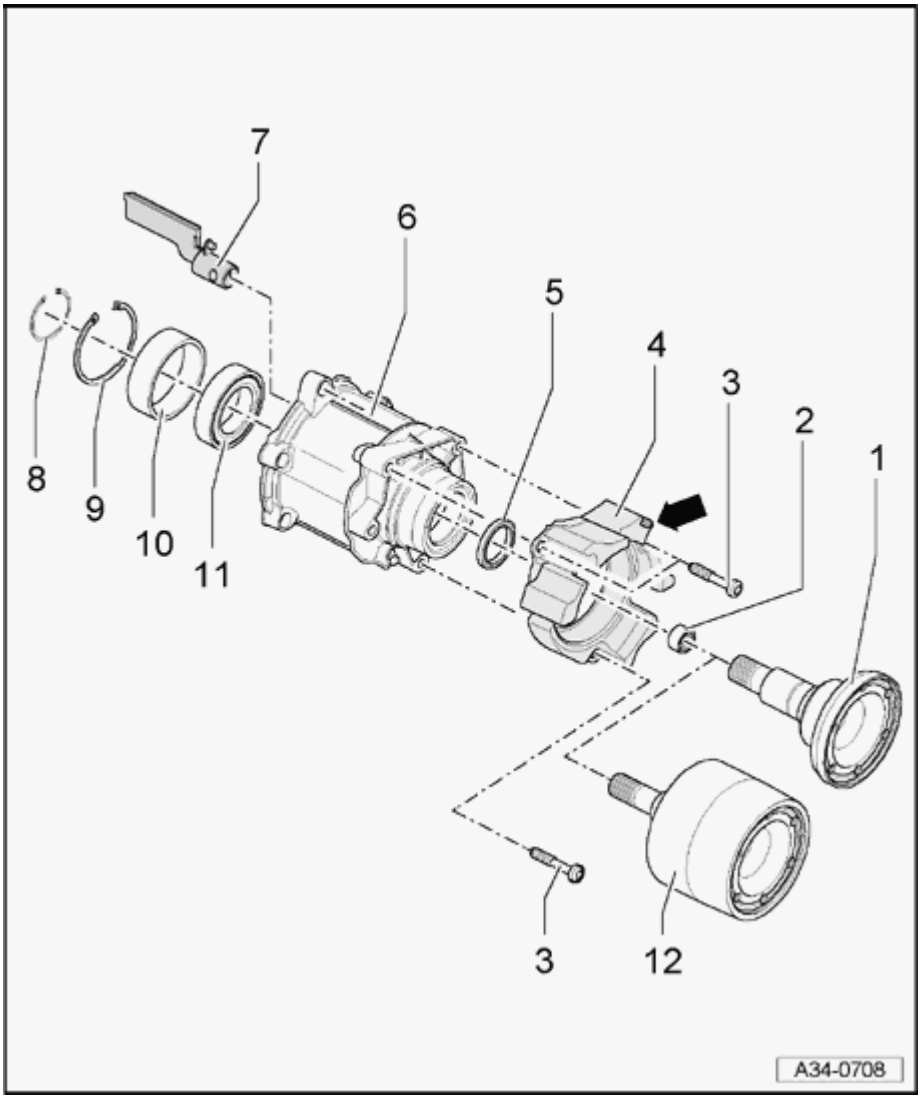

Fig. 332: Torsen Housing Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Flange shaft

- Without vibration damper
- Pressing out **Pressing out flange shaft**
- Pressing in **Pressing in flange shaft**

2 - Needle bearing

- Pull out of flange shaft using internal puller Kukko 21/1 and counter-support Kukko 22/1.
- Press into flange shaft as far as it will go using punch VW 408 A.

3 - Bolt - 15 Nm plus an additional 90° $^{1}/_{4}$ turn

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- For vibration damper
- 3x
- Apply **locking fluid AMV 185 101 A1** when installing

4 - Vibration damper

- Not installed on all versions
- Select correct version according to color coding - **arrow** - or transmission code

5 - Oil seal

- Prying out **Prying off oil seal.**
- Preparing for installation **Preparing oil seal for installation**
- Driving in **Drive in seal onto stop.**

6 - Torsen housing

- Removing and installing (transmission removed) --> **Disassembling and assembling sequence**
- Removing and installing (transmission installed) --> **Torsen housing, removing and installing (with transmission installed)**

7 - Oil collector

- Insert in hole on transmission cover

8 - Circlip

- For flange shaft
- Installation position **Installation position of circlips - A - and - B -**

9 - Circlip

- For ball bearing and sleeve
- Installation position **Installation position of circlips - A - and - B -**

10 - Sleeve

11 - Ball bearing

- For flange shaft
- Pressing out **Pressing out ball bearing for flange shaft**
- Pressing in **Pressing in ball bearing for flange shaft**

12 - Flange shaft with vibration damper

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- Only replace as complete unit
- Pressing out **Pressing out flange shaft**
- Pressing in **Pressing in flange shaft**

Pressing out flange shaft

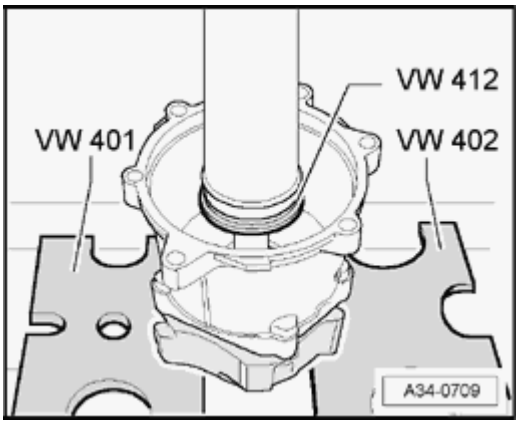

Fig. 333: Pressing Out Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before pressing out flange shaft remove circlip from flange shaft **Installation position of circlips - A - and - B -**
- Position Torsen housing in such a way that the flange shaft does not make contact with thrust plates VW 401 and thrust plates VW 402 when it is pressed out.

Pressing in flange shaft

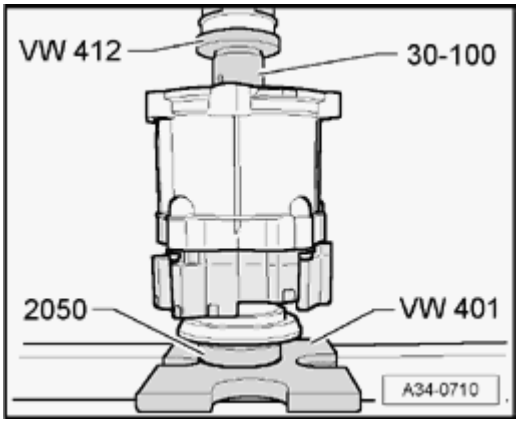

Fig. 334: Pressing In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before pressing in flange shaft, tighten vibration damper (if installed).
- Support flange shaft with thrust piece 2050.
- Install circlip onto flange shaft **Installation position of circlips - A - and - B -**

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Prying off oil seal.

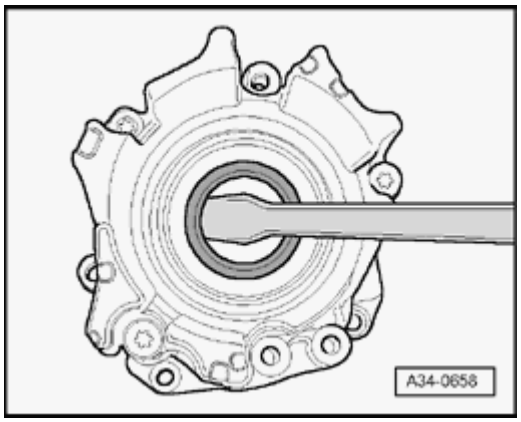

Fig. 335: Prying Off Oil Seal.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Preparing oil seal for installation

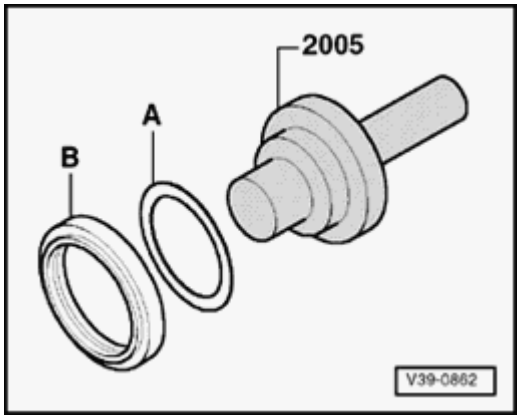

Fig. 336: Preparing Seal For Installation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - **Shim 016311391A** (1.4 mm thick)

B - Oil seal

- Pack space between sealing lip and dust lip half full with **sealing grease G052128A1** .
- Place shim and oil seal on tool, as shown in illustration.

- Installation position: open side of oil seal points toward Torsen housing

Drive in seal onto stop.

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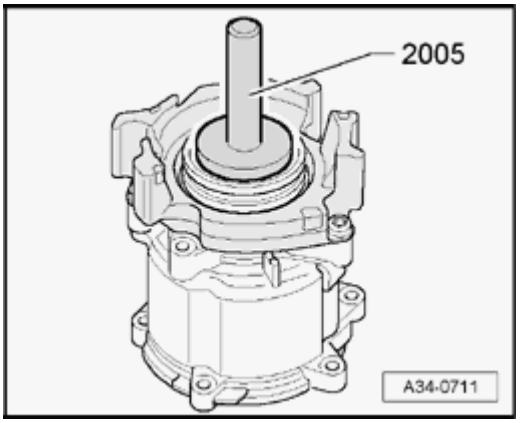

Fig. 337: Driving In Seal Onto Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove shim.

Pressing out ball bearing for flange shaft

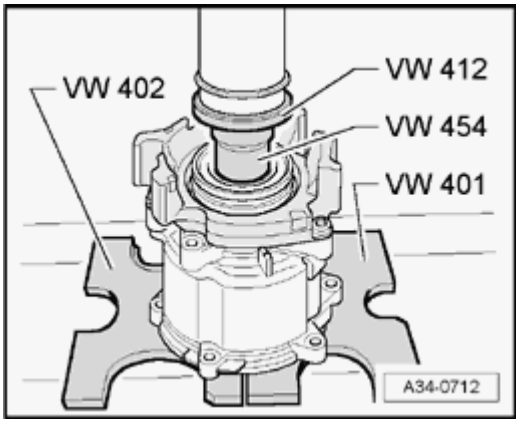

Fig. 338: Pressing Out Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before pressing out ball bearing, remove circlip **Installation position of circlips - A - and - B -** and sleeve.

Pressing in ball bearing for flange shaft

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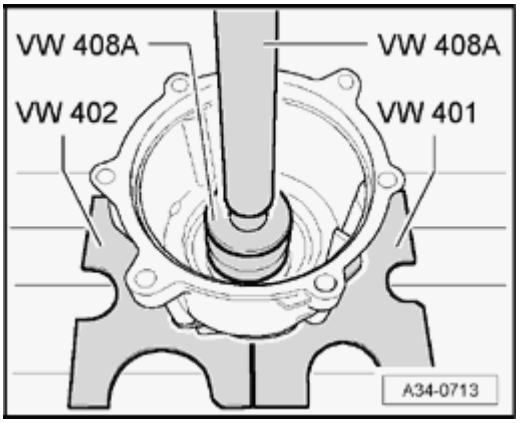

Fig. 339: Pressing In Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert sleeve.
- Install circlip for ball bearing and sleeve **Installation position of circlips - A - and - B -**

Installation position of circlips - A - and - B -

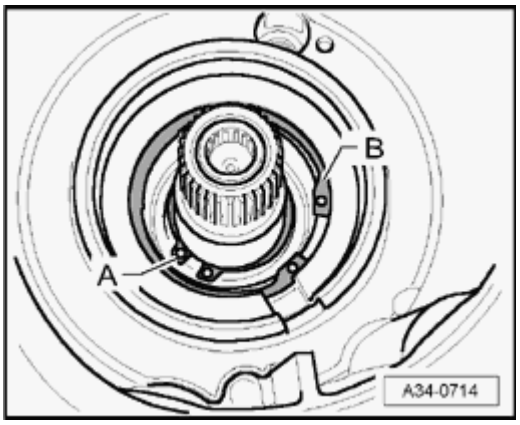

Fig. 340: Installation Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Circlip for flange shaft

B - Circlip for ball bearing and sleeve

Torsen housing, removing and installing (with transmission installed)

Special tools, testers and auxiliary items required

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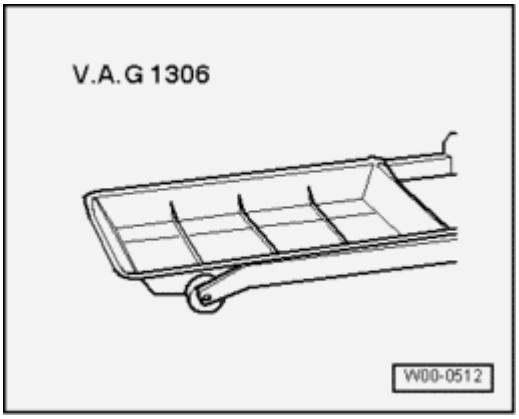

Fig. 341: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray V.A.G1306

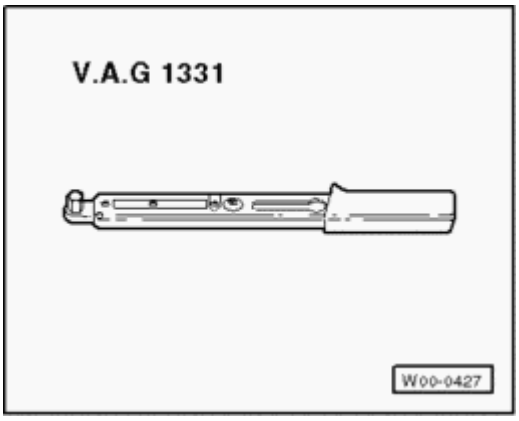

Fig. 342: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

Removing

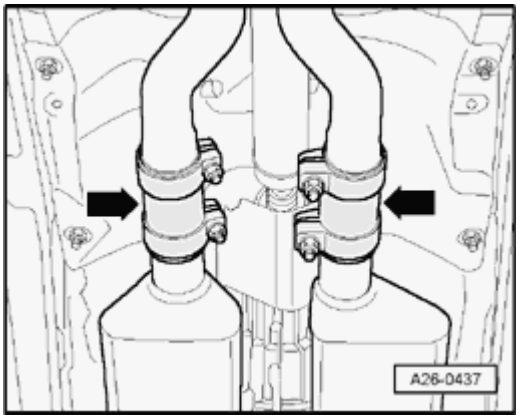

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Fig. 343: Exhaust System Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamps - **arrows** -.

NOTE:

- **The flexible pipe connection (de-coupling element) in the front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.**
- **The illustration shows the exhaust system in conjunction with the 3.0 liter. V6 engine.**

- Disengage rear section of exhaust system at rubber mountings and remove.

NOTE:

- **A second technician is required for removing the rear section of the exhaust system.**

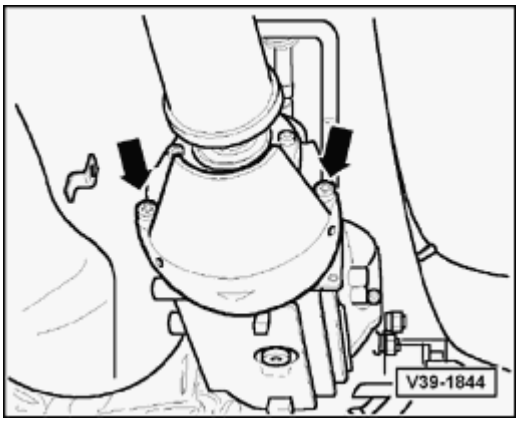

Fig. 344: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove heat shield for drive shaft - **arrows** -.

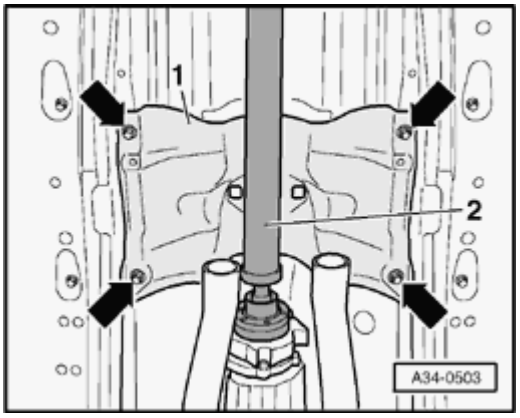

Fig. 345: Heatshield Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove heat shield - **1** - for exhaust system below selector mechanism - **arrows** -.

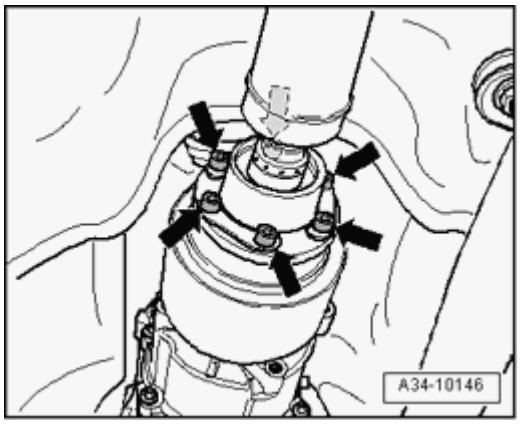

Fig. 346: Locating Bolts At Transmission/Drive Shaft Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - at transmission/drive shaft flange.
- Slide drive shaft together toward rear final drive. The constant velocity joints can be moved axially.

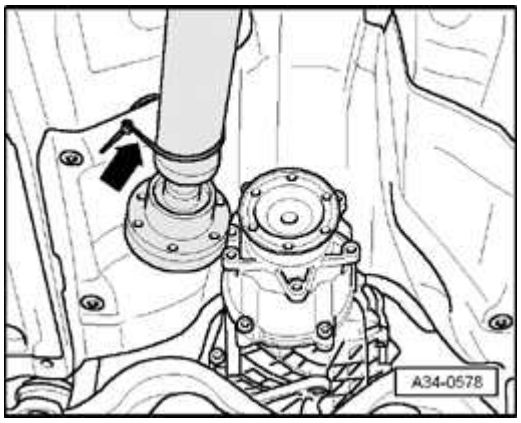

Fig. 347: Drive Shaft Tied To Side, Onto Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tie drive shaft to side, onto heat shield - **arrow** -.
- Place drip tray V.A.G1306 under transmission.
- Drain off gear oil.

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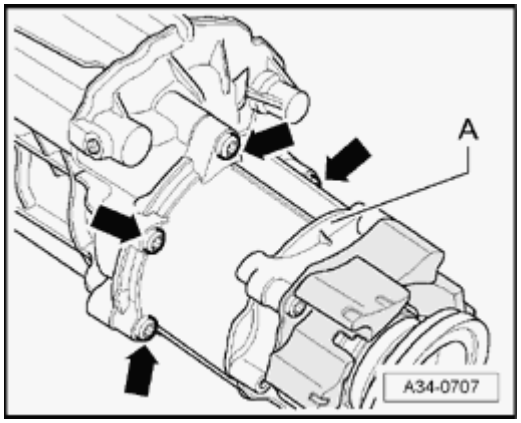

Fig. 348: Locating Torsen Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and carefully detach Torsen housing - **A** -.

NOTE:

- **The illustration shows only 4 of the 6 securing bolts.**

Installing Torsen housing

Installation is in reverse order of removal. Note the following:

- Replace O-ring on Torsen housing.
- It is important to clean threaded holes for drive shaft bolts to remove any remaining locking fluid. The threads can be cleaned with a thread tap.

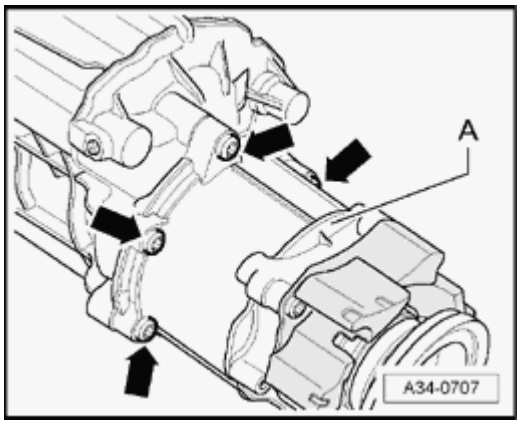

Fig. 349: Locating Torsen Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install Torsen housing - **A** - onto transmission and tighten bolts - **arrows** - to 10Nmplus an additional 45° (18 turn).

NOTE:

- **The illustration shows only 4 of the 6 securing bolts.**

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- Fill up with gear oil and check gear oil level --> **Transmission oil level, checking** .
- Bolt drive shaft onto transmission --> **39 FINAL DRIVE, DIFFERENTIAL** .
- Install exhaust system so it is free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for relevant engine code.

Tightening torques

Component	Nm
Torsen housing to transmission housing	10 Nm plus an additional 45° $^{1}/_{8}$ turn
Heat shield for drive shaft to Torsen housing	25

TRANSMISSION COVER, SERVICING

Transmission cover, servicing

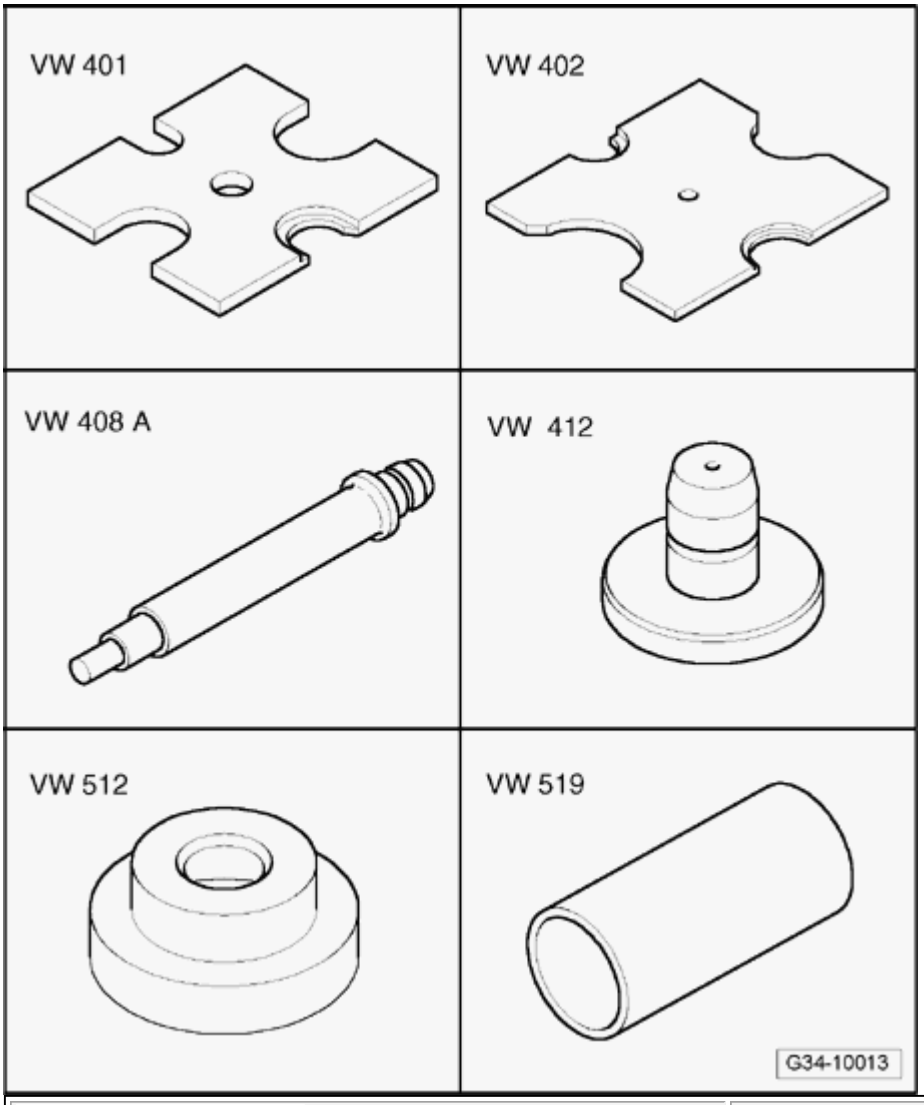

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Fig. 350: Identifying Special Tools -- Transmission Cover, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust plate VW 402
- Punch VW 408 A
- Thrust disc VW 412
- Thrust pad VW 512
- Sleeve VW 519

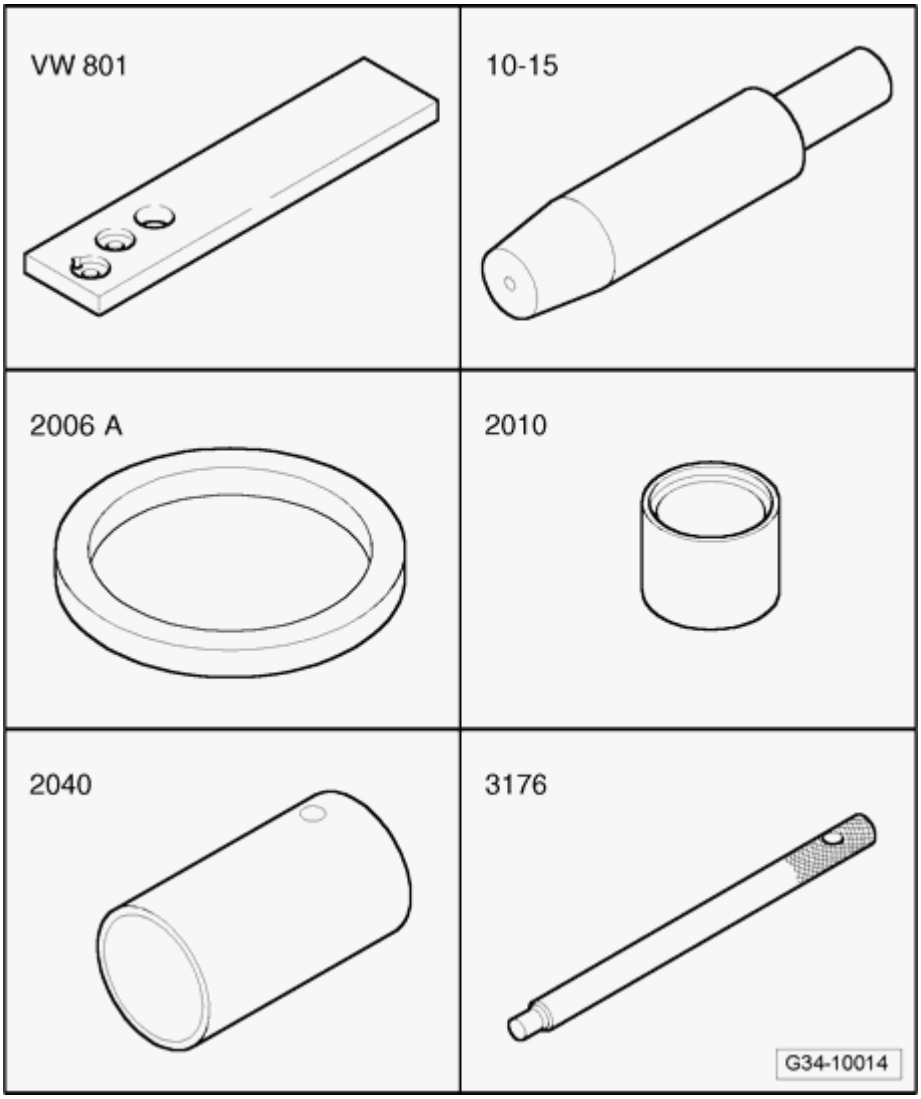

Fig. 351: Identifying Special Tools -- Transmission Cover, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Special tools, testers and auxiliary items required

- Holding fixture VW 801
- Guide pin 10 - 15
- Thrust ring 2006 A
- Tube 2010
- Tube 2040
- Centering mandrel 3176

Special tools, testers and auxiliary items required

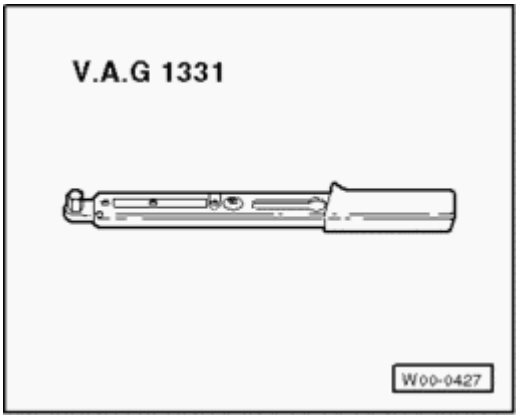

Fig. 352: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

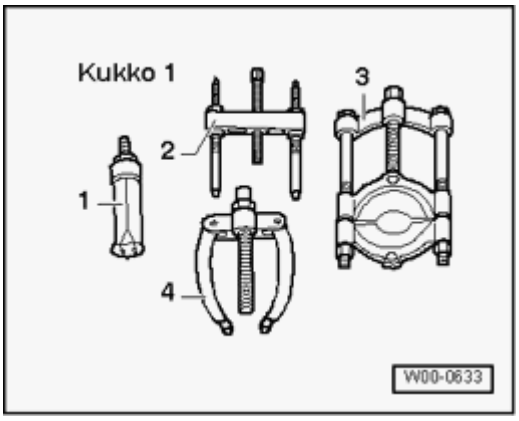

Fig. 353: Kukko 21/2 Internal puller, Kukko 21/4 Internal puller, Kukko 22/2 Counter support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **- 1 -** Internal puller Kukko 21/2
- **- 1 -** Internal puller Kukko 21/5

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- **- 4 -** Counter-support Kukko 22/2

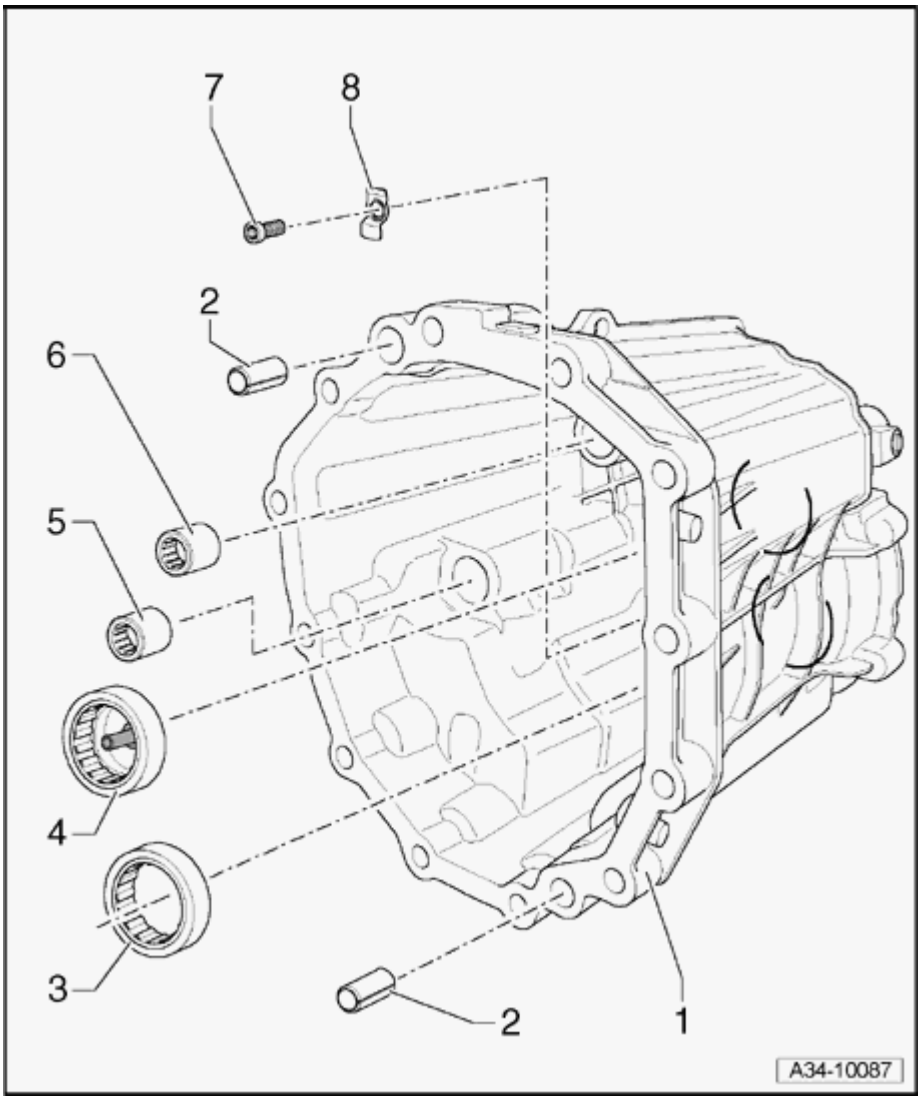

Fig. 354: Transmission Cover Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission cover

2 - Dowel sleeve

- 2 x
- For centralizing transmission cover on bearing housing
- Drive out and in with drift 3121

3 - Needle bearing

- Bearing for hollow shaft in transmission cover

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- Pressing out **Pressing needle bearing out of transmission cover**
- Pressing in **Pressing needle bearing into transmission cover**

4 - Roller bearing

- Bearing for input shaft in transmission cover
- With lubricating unit
- Always replace
- Pulling out **Pulling out needle roller bearing from transmission cover**
- Pressing in **Carefully press in new needle roller bearing into transmission cover until limit stop.**

5 - Ball sleeve

- For selector rod for 1st and 2nd gear
- Pulling out **Pulling out ball sleeve - C - from transmission cover**
- Driving in **Driving ball sleeve into transmission cover until flush**

6 - Ball sleeve

- For selector rod for 5th and 6th gear
- Pulling out **Pulling out ball sleeve - C - from transmission cover**
- Driving in **Driving ball sleeve into transmission cover until flush**

7 - Multi-point socket head bolt, 24Nm

8 - Retaining plate

- Installation position **Securing needle roller bearing and needle bearing in transmission cover.**

Pressing needle bearing out of transmission cover

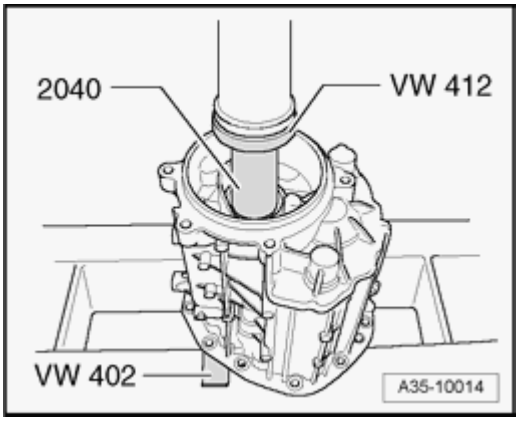

Fig. 355: Pressing Needle Bearing Out Of Transmission Cover

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing needle bearing into transmission cover

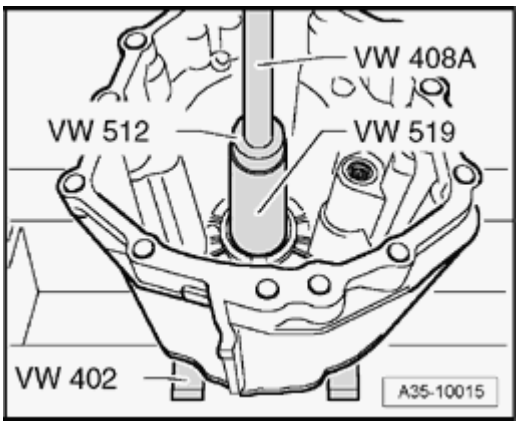

Fig. 356: Pressing Needle Bearing Into Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Support transmission cover with tube 2010 directly below bearing mounting.

Pulling out ball sleeve - C - from transmission cover

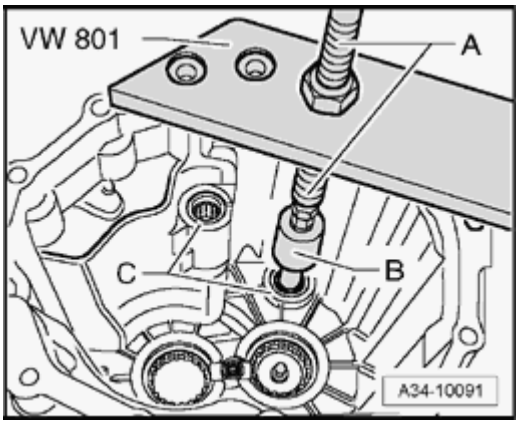

Fig. 357: Pulling Out Ball Sleeve From Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/2

B - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving ball sleeve into transmission cover until flush

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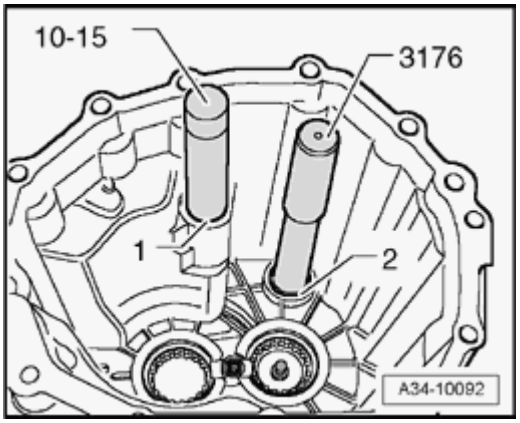

Fig. 358: Driving Ball Sleeve Into Transmission Cover Until Flush
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve - **1** - and - **2** - so that side with lettering (thicker metal) faces guide pin 10 - 15 or centering mandrel 3176.

NOTE:

- **Due to the housing depth use centering mandrel 3176 for driving in ball sleeve - 2 -.**

Pulling out needle roller bearing from transmission cover

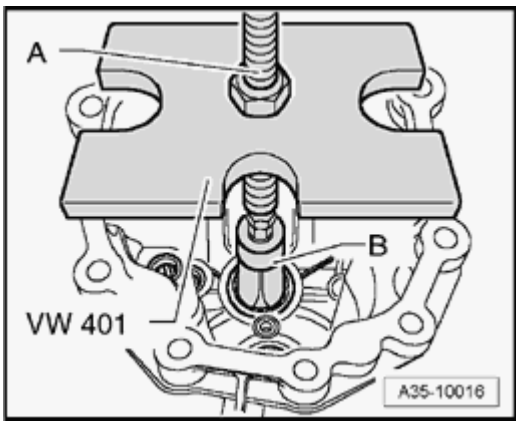

Fig. 359: Pulling Out Needle Roller Bearing From Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Shorten (cut off) lubricating unit in needle roller bearing in order to insert internal puller - **B** -.

A - Counter-support, e.g. Kukko 22/2

B - Internal puller 30 to 37 mm, e.g. Kukko 21/5

NOTE:

- **Always replace needle roller bearing after pulling out.**

Carefully press in new needle roller bearing into transmission cover until limit stop.

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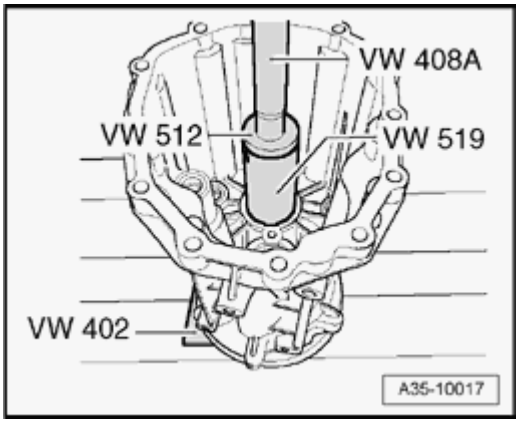

Fig. 360: Pressing New Roller Bearing For Input Shaft Into Transmission Cover As Far As Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Support transmission cover below bearing mounting using thrust ring 2006 A.

Securing needle roller bearing and needle bearing in transmission cover.

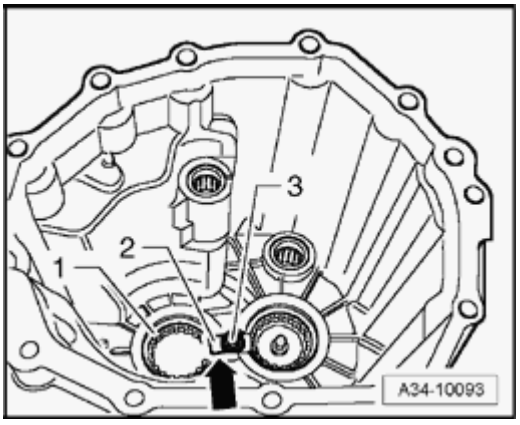

Fig. 361: Securing Needle Roller Bearing And Needle Bearing In Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert retaining plate - **2** - with the high shoulder - **arrow** - facing needle bearing - **1** - into transmission cover.
- Tighten hex socket head bolt - **3** - to 24 Nm.

BEARING HOUSING, SERVICING

Bearing housing, servicing

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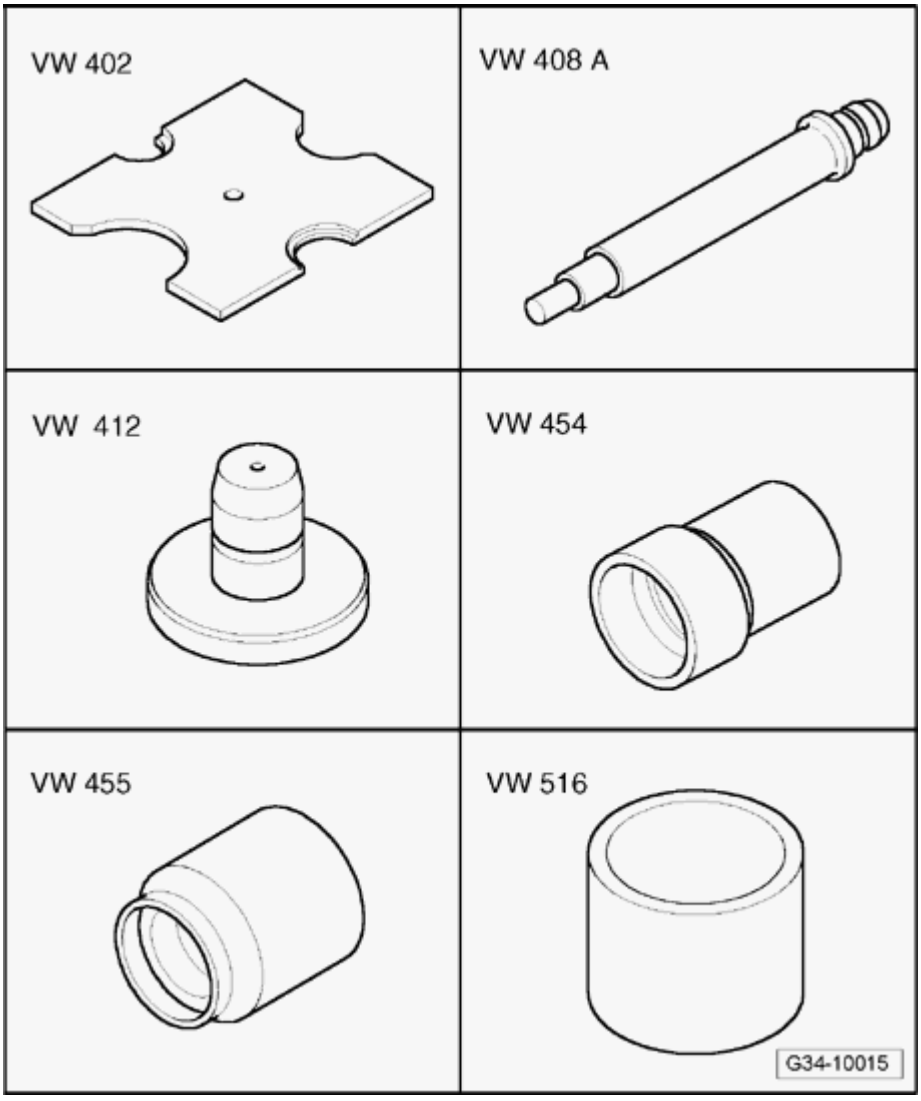

Fig. 362: Identifying Special Tools -- Bearing Housing, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 402
- Punch VW 408 A
- Thrust disc VW 412
- Thrust tube VW 454

- Installing sleeve VW 455
- Tube VW 516

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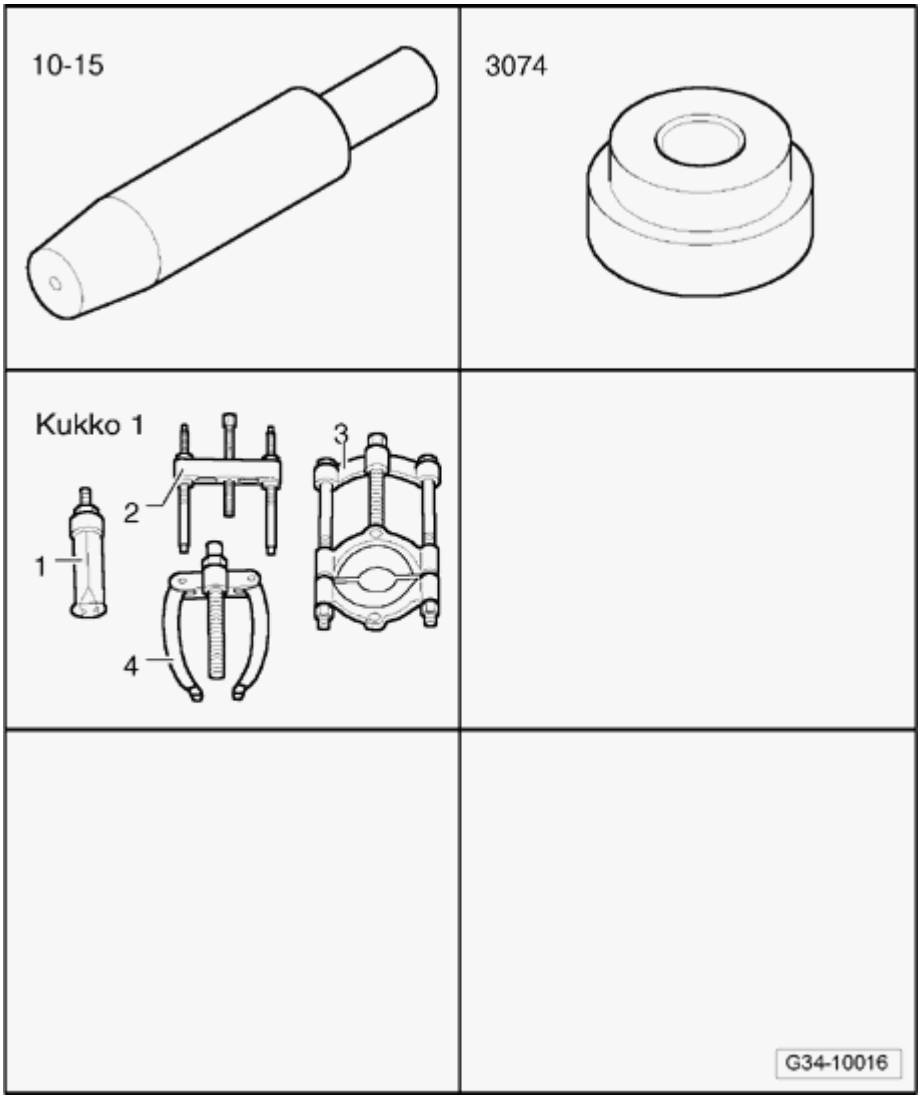

Fig. 363: Identifying Special Tools -- Bearing Housing, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Guide pin 10 - 15
- Thrust pad 3074
- **- 1 -** Internal puller Kukko 21/2
- **- 4 -** Counter-support Kukko 22/1
- Drift T40085

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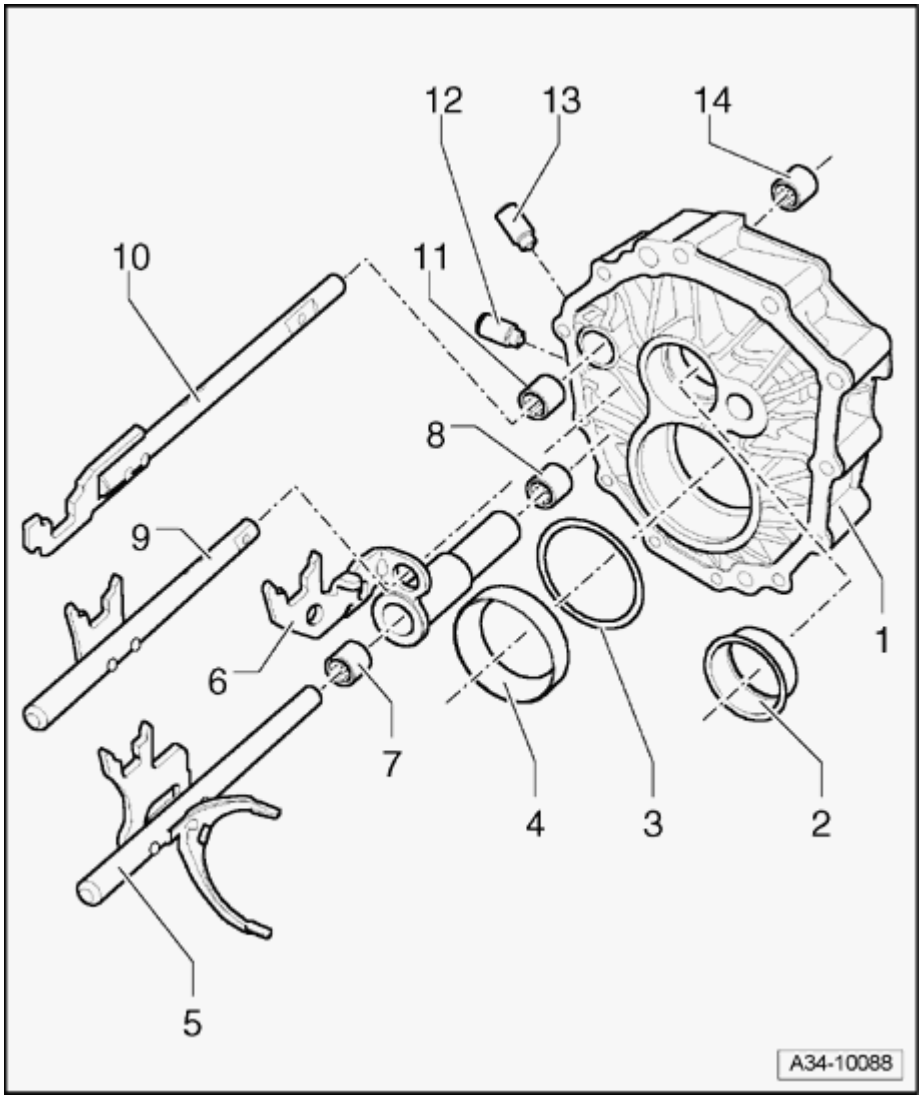

Fig. 364: Bearing Housing Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

- Re-determine shim "S_4 " when replacing --> **Re-determining shim "S4" when replacing bearing housing**

2 - Outer race

- For needle roller bearing on input shaft
- Driving out **Driving outer race for needle roller bearing out of bearing housing**
- Pressing in **Pressing outer race for needle roller bearing into bearing housing until limit stop**

3 - Shim "S_4 "

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- Table of adjustments --> **Table of adjustments**
- Re-determine when replacing bearing housing --> **Re-determining shim "S4" when replacing bearing housing**

4 - Tapered roller bearing outer race

- For pinion shaft/hollow shaft

5 - Selector rod for 1st and 2nd gear

- Only replace together with selector fork for 1st and 2nd gear (secured together by means of a pin)

6 - Reverse gear selector rod

7 - Ball sleeve

- (Front) for reverse gear selector rod
- Pulling out **Pulling front ball sleeve out of reverse gear selector rod**
- Pressing in **Pressing front ball sleeve into reverse gear selector rod until limit stop.**

8 - Ball sleeve

- (Rear) for reverse gear selector rod
- Pulling out **Pulling out rear ball sleeve for reverse gear selector rod**
- Pressing in **Pressing in rear ball sleeve - A - for reverse gear selector rod**

9 - Selector rod for 3rd and 4th gear

10 - Selector rod for 5th and 6th gear

- Remove burrs and scoring after removing from bearing housing

11 - Ball sleeve

- For selector rod for 5th and 6th gear
- Pull out with internal puller Kukko 21/2
- Drive in until flush using guide pin 10 - 15

12 - Locking bushing

- For selector rod for 3rd and 4th gear
- Removing and installing **Removing and installing locking bushing for selector rod**

13 - Locking bushing

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- For selector rod for 5th and 6th gear
- Removing and installing **Removing and installing locking bushing for selector rod**

14 - Ball sleeve

- For selector rod for 3rd and 4th gear
- Pull out with internal puller Kukko 21/2
- Driving in **Driving in ball sleeve for selector rod for 3rd and 4th gear**

Driving outer race for needle roller bearing out of bearing housing

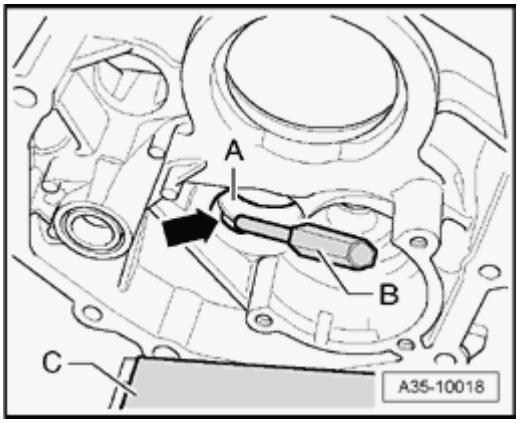

Fig. 365: Driving Outer Race For Needle Roller Bearing Out Of Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp bearing housing in vise, using jaw protectors - **C** -.
- Drive out outer race - **A** - using drift - **B** - by alternately applying drift to the bearing housing recesses located opposite each other - **arrow** -.

Pressing outer race for needle roller bearing into bearing housing until limit stop

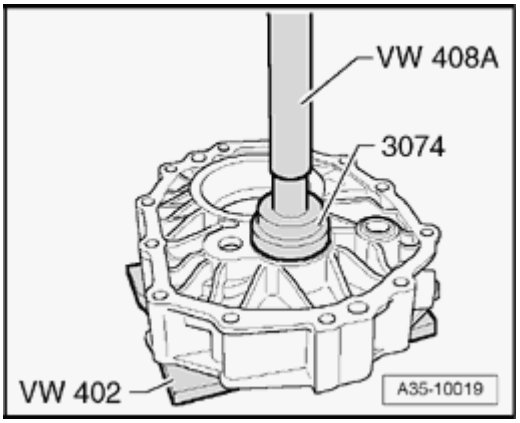

Fig. 366: Pressing Outer Race For Needle Roller Bearing Into Bearing Housing Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Pulling front ball sleeve out of reverse gear selector rod

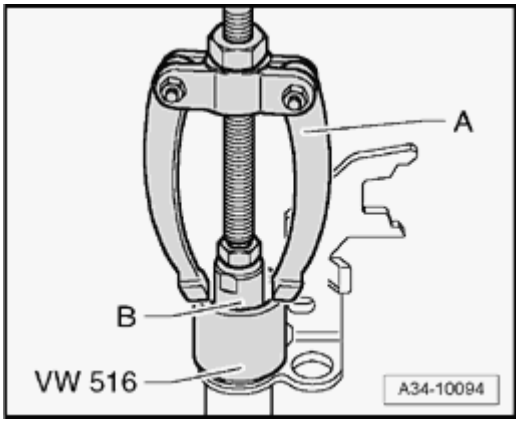

Fig. 367: Pulling Front Ball Sleeve Out Of Reverse Gear Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/1

B - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Pressing front ball sleeve into reverse gear selector rod until limit stop.

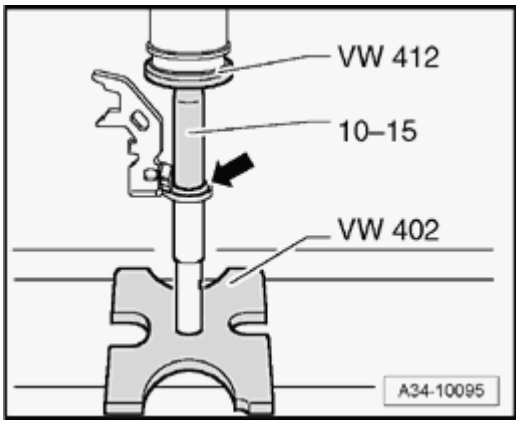

Fig. 368: Pressing Front Ball Sleeve Into Reverse Gear Selector Rod Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve - **arrow** - so that side with lettering (thicker metal) faces guide pin 10 - 15.

Pulling out rear ball sleeve for reverse gear selector rod

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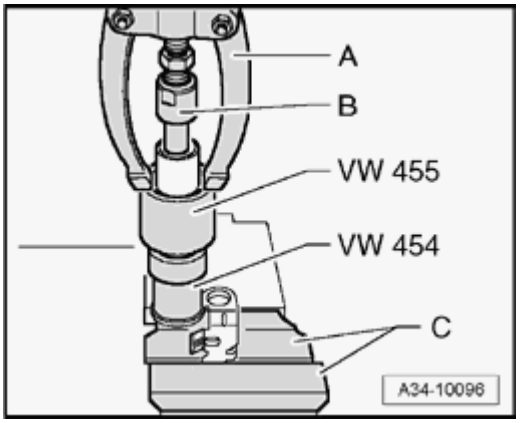

Fig. 369: Pulling Out Rear Ball Sleeve For Reverse Gear Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp actuating arm of selector rod in vise, using jaw protectors - **C** -.
- Install thrust tube VW 454 and installing sleeve VW 455 onto selector rod.

A - Counter-support, e.g. Kukko 22/1

B - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Pressing in rear ball sleeve - A - for reverse gear selector rod

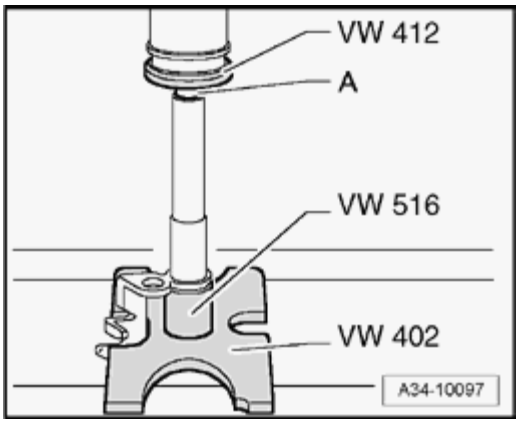

Fig. 370: Pressing In Rear Ball Sleeve For Reverse Gear Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving in ball sleeve for selector rod for 3rd and 4th gear

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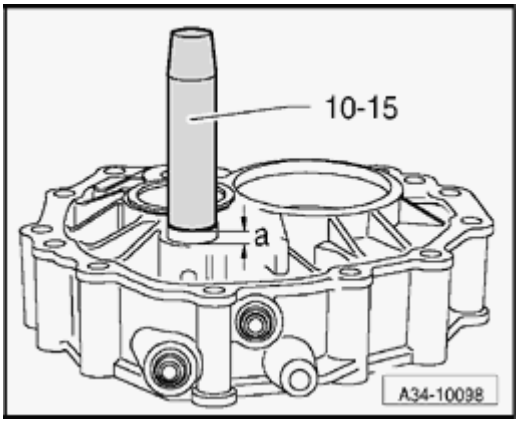

Fig. 371: Driving In Ball Sleeve For Selector Rod For 3Rd And 4Th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve so that side with lettering (thicker metal) faces guide pin 10 - 15.

- Dimension for pressing in - **a** - = 2.5 mm

Removing and installing locking bushing for selector rod

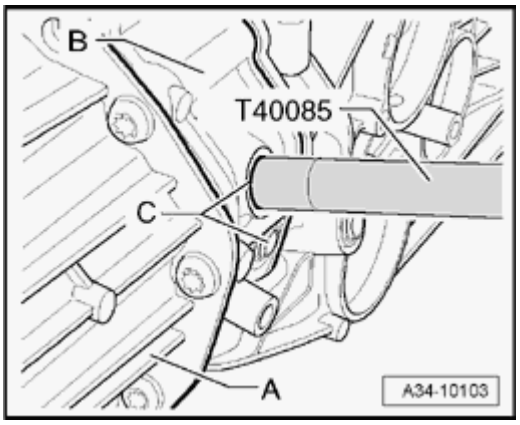

Fig. 372: Removing And Installing Locking Bushing For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove relevant selector rod (for 3rd and 4th gear or for 5th and 6th gear).
- Bolt bearing housing - **B** - with transmission cover - **A** - onto transmission housing prior to driving out and driving in locking bushings - **C** -.

- Drive out old locking bushing inward into bearing housing.
- Drive in new locking bushing until flush.

TRANSMISSION HOUSING, SERVICING

Transmission housing, servicing

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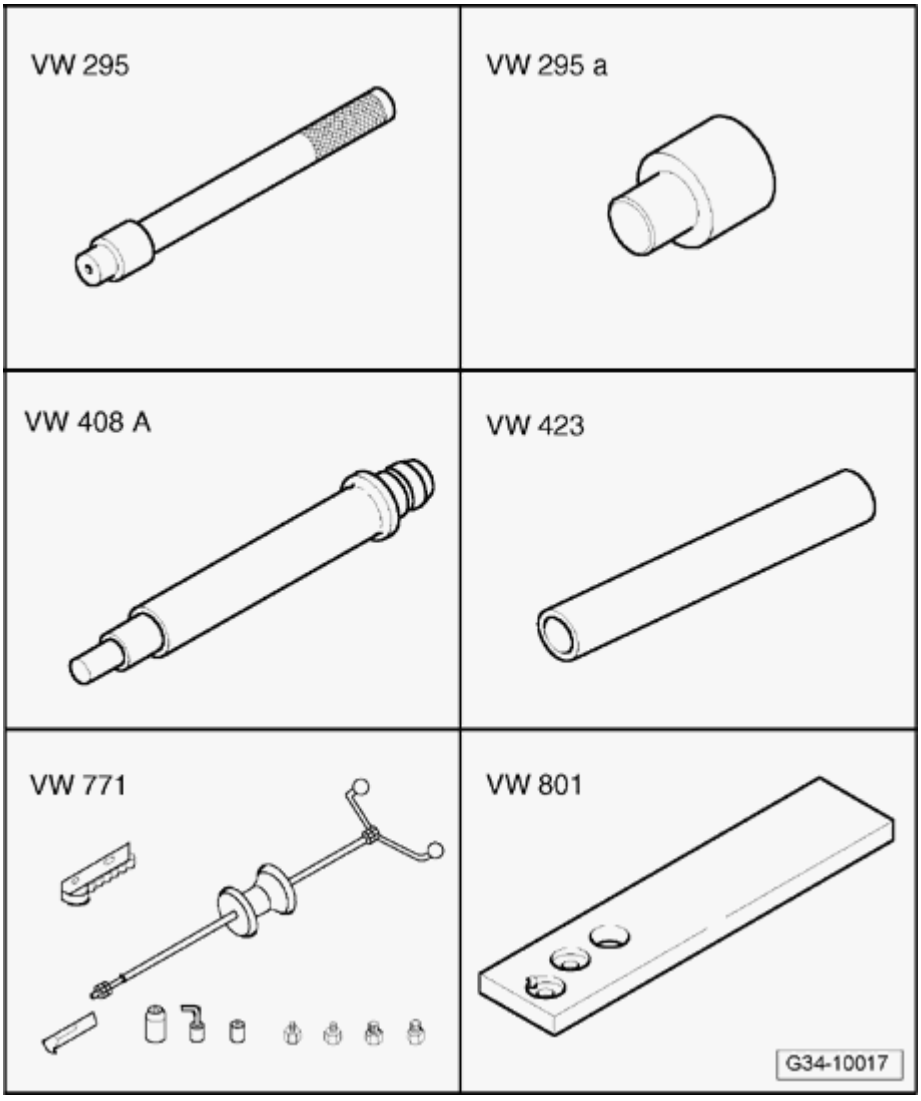

Fig. 373: Identifying Special Tools -- Transmission Housing, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW 295
- Adapter VW 295 A
- Punch VW 408 A
- Tube VW 423

- Slide hammer-complete set VW 771
- Holding fixture VW 801

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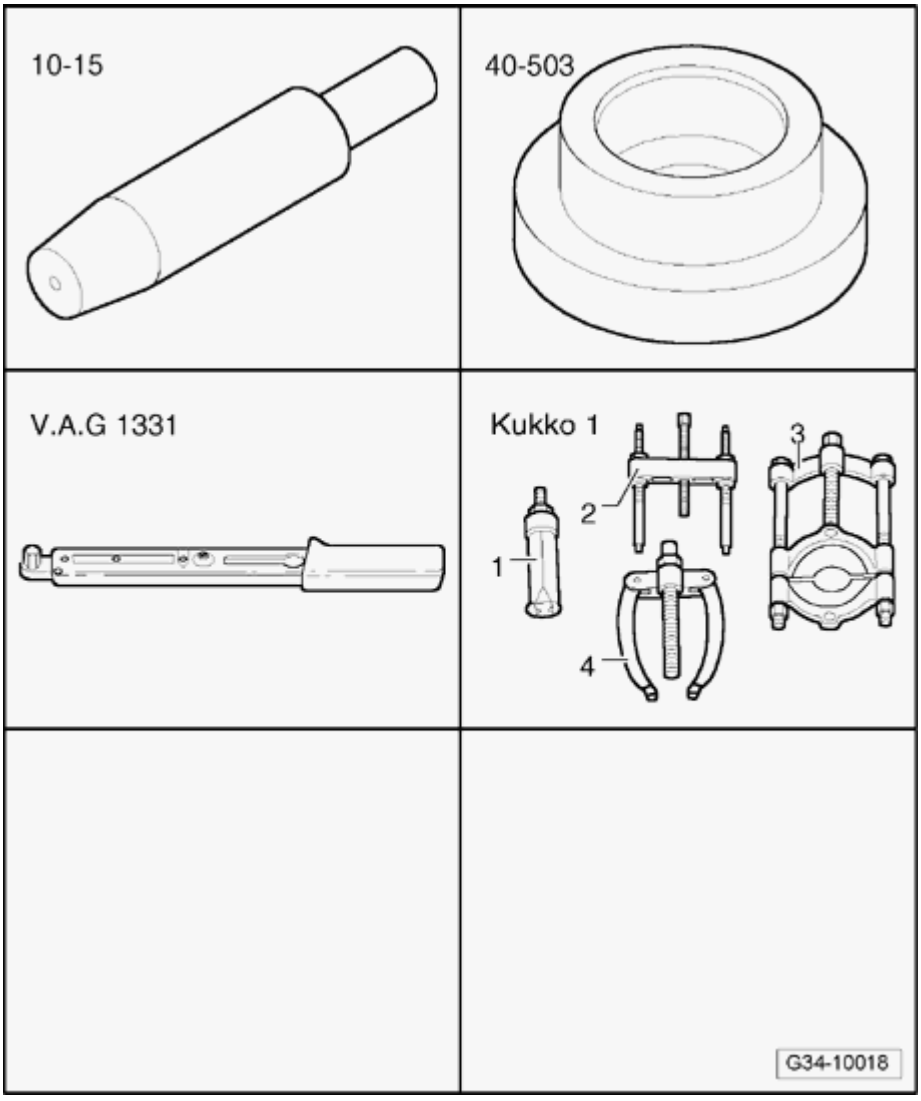

Fig. 374: Identifying Special Tools -- Transmission Housing, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Guide pin 10 - 15
- Installing tool 40 - 503
- Torque wrench V.A.G 1331
- - **1** - Internal puller Kukko 21/2
- - **4** - Counter-support Kukko 22/2
- Drift T40085

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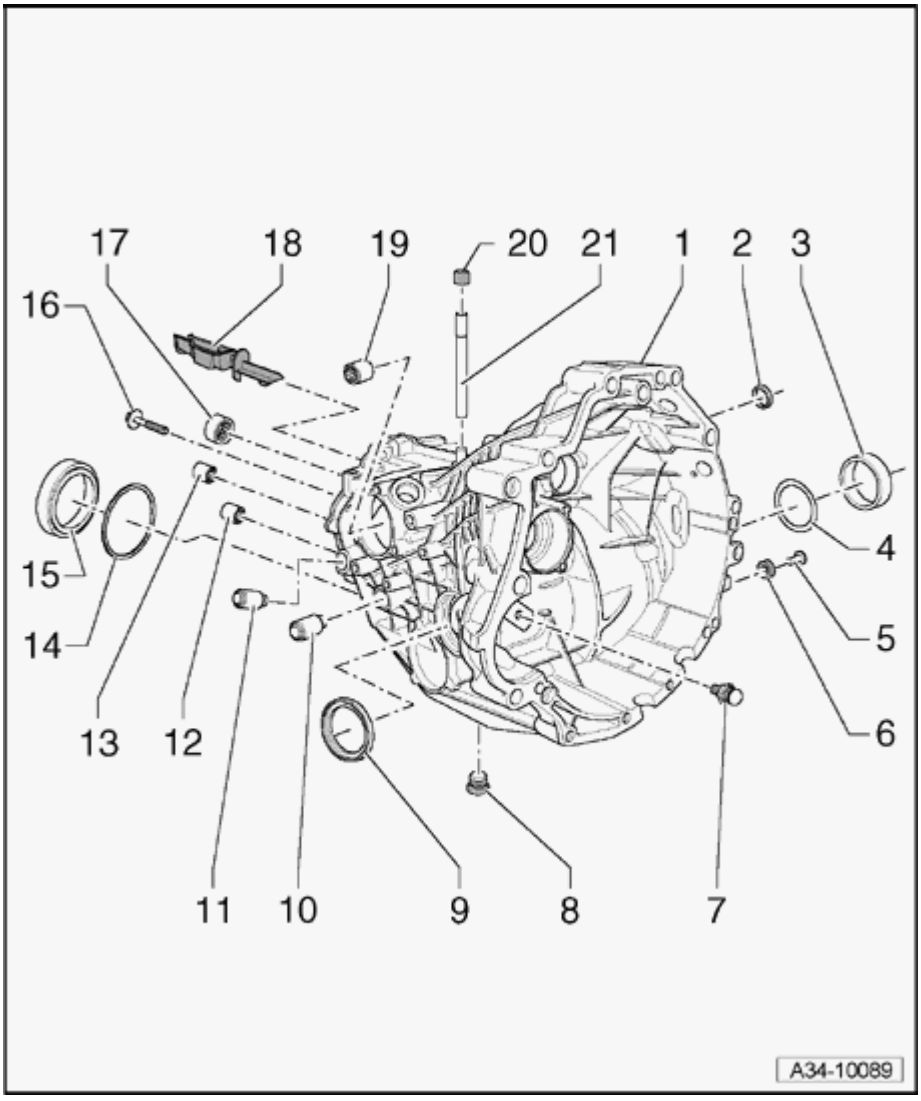

Fig. 375: Transmission Housing Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing

- When replacing: adjust input shaft --> **Input shaft, adjusting**, adjust pinion shaft/hollow shaft and differential (final drive gear set) --> **Table of adjustments**

2 - Oil seal for selector shaft

- Replacing with transmission installed --> **Selector shaft oil seal, replacing (with transmission installed)**
- Can be replaced with transmission removed (transmission remains assembled) --> **Selector shaft oil seal, replacing (with transmission removed) (transmission remains assembled)**
- Always replace
- Pulling out **Pulling out oil seal for selector shaft with transmission disassembled**

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- Driving in **Driving in seal for selector shaft**
- Use assembly sleeve to install (selector shaft remains installed) **Installing oil seal - C - with selector shaft installed**

3 - Tapered roller bearing outer race (right-side)

- For differential
- If replaced: adjust differential (ring gear) --> **Ring gear, adjusting**

4 - Shim "S_2 "

- Note thickness
- Table of adjustments --> **Table of adjustments**

5 - Bush

- Drive in (for example, with punch VW 408 A when replacing transmission

6 - Magnet

- Clean

7 - Ball head stud, 25 Nm

- Grease with **MoS2** grease

8 - Oil drain plug, 45 Nm

9 - Oil seal

- For flange shaft (right-side)
- Removing and installing --> **Flange shaft oil seal (right-side), replacing**

10 - Locking bushing

- For selector rod for 1st and 2nd gear
- Removing and installing **Removing and installing locking bushing for selector rod**

11 - Locking bushing

- For reverse gear selector rod
- Removing and installing **Removing and installing locking bushing for selector rod**

12 - Ball sleeve

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- For selector rod for 1st and 2nd gear
- Pulling out **Pulling front ball sleeve out of reverse gear selector rod**
- Drive in until flush using guide pin 10 - 15

13 - Ball sleeve

- For selector rod for 3rd and 4th gear
- Pulling out **Pulling front ball sleeve out of reverse gear selector rod**
- Drive in until flush using guide pin 10 - 15

14 - Shim "S_3 "

- Note thickness
- Table of adjustments --> **Table of adjustments**

15 - Outer race of double tapered roller bearing

- For pinion shaft

16 - Bolt, 24 Nm

17 - Needle bearing

- For input shaft
- Driving out **Driving out input shaft needle bearing from transmission housing**
- Driving in **Pressing in input shaft needle bearing until limit stop**

18 - Oil collector

- With magnet
- Installation position in transmission housing **Securing input shaft needle bearing**

19 - Ball sleeve

- For selector shaft
- Pulling out **Removing selector shaft ball sleeve**
- Driving in **Driving in ball sleeve for selector shaft**

20 - Cap

- For transmission breather

21 - Breather tube

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- Drive in onto stop
- Clip in cap for transmission breather

Pulling out oil seal for selector shaft with transmission disassembled

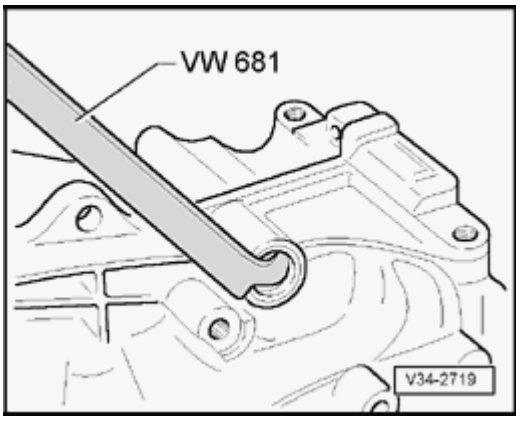

Fig. 376: Removing Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing oil seal - C - with selector shaft installed

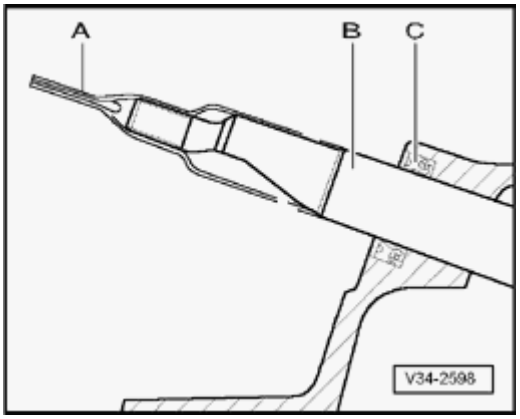

Fig. 377: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push **assembly sleeve 01E311120** - **A** - onto selector shaft - **B** -.

Driving in seal for selector shaft

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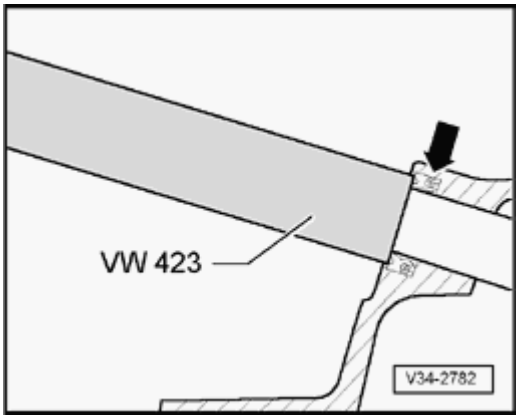

Fig. 378: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .
- Lightly oil outer circumference of seal.
- Drive oil seal - **arrow** - into housing as far as it will go.

Removing and installing locking bushing for selector rod

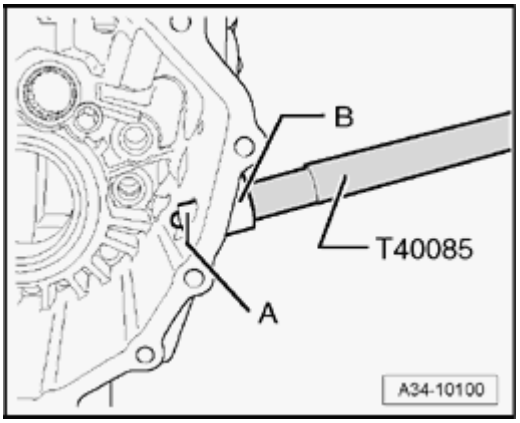

Fig. 379: Removing And Installing Locking Bushing For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive out used locking bushing - **A** - inward into transmission housing.
- Drive in new locking bushing into transmission housing - **B** - until flush.

Pulling out ball sleeve - C - from transmission housing.

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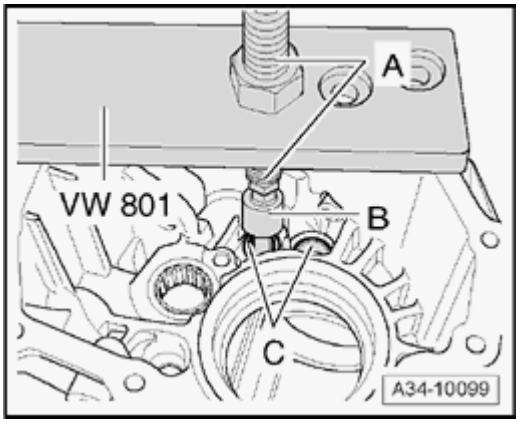

Fig. 380: Pulling Out Ball Sleeve From Transmission Housing.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/2

B - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving out input shaft needle bearing from transmission housing

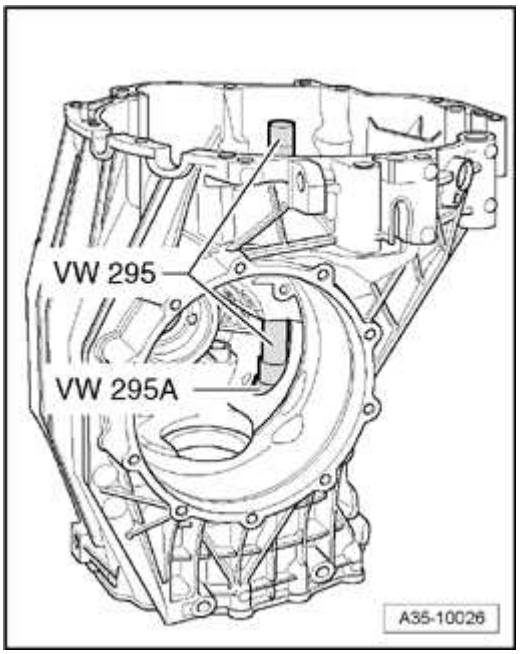

Fig. 381: Driving Out Input Shaft Needle Bearing From Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt for securing needle bearing **Securing input shaft needle bearing**.
- Install adapter VW 295 A with smaller outside diameter into needle bearing.
- Drive out needle bearing with drift VW 295.

Pressing in input shaft needle bearing until limit stop

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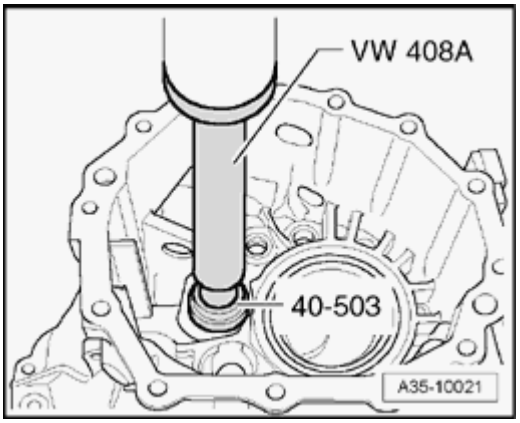

Fig. 382: Pressing In Input Shaft Needle Bearing Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure needle bearing after pressing in **Securing input shaft needle bearing**

Securing input shaft needle bearing

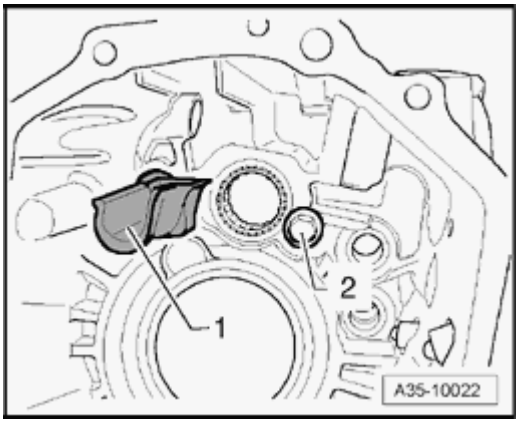

Fig. 383: Securing Input Shaft Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure input shaft needle bearing with bolt - **2** -.
- Insert oil collector - **1** - into transmission housing.

Removing selector shaft ball sleeve

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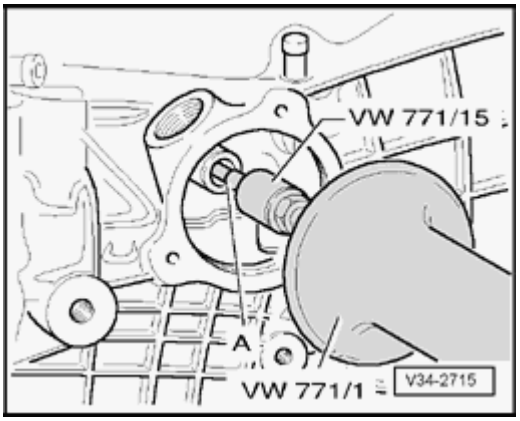

Fig. 384: Pulling Out Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving in ball sleeve for selector shaft

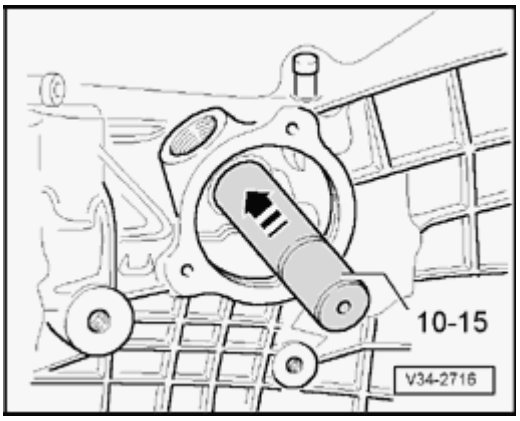

Fig. 385: Driving In Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve so that side with lettering (thicker metal) faces guide pin 10 - 15.

- Drive in ball sleeve until flush.

SELECTOR SHAFT, OIL SEAL AND BACK-UP LIGHT SWITCH F4, SERVICING

Selector shaft, oil seal and back-up light switch F4, servicing

Removing and installing selector shaft with transmission installed --> **Selector shaft, removing and installing (with transmission installed)**

Replacing oil seal for selector shaft with transmission removed (transmission remains assembled) --> **Selector shaft oil seal, replacing (with transmission removed) (transmission remains assembled)**

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Replacing oil seal for selector shaft with transmission installed --> **Selector shaft oil seal, replacing (with transmission installed)**

Removing and installing back-up light switch F4 --> **Back-up light switch F4, removing and installing**

Selector shaft, removing and installing (with transmission installed)

Special tools, testers and auxiliary items required

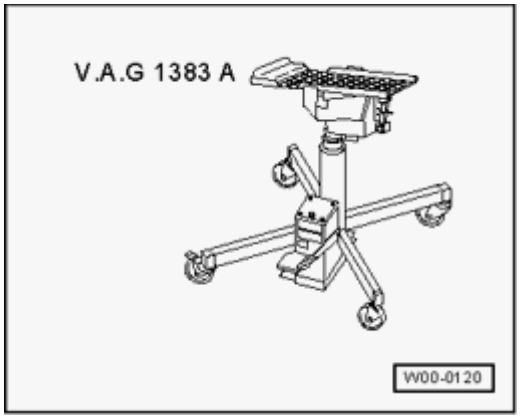

Fig. 386: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine/transmission jack V.A.G 1383 A

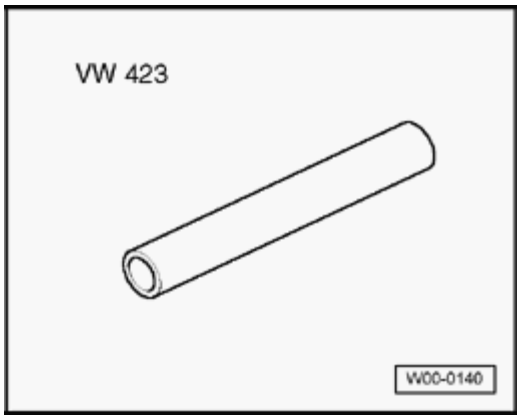

Fig. 387: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW423

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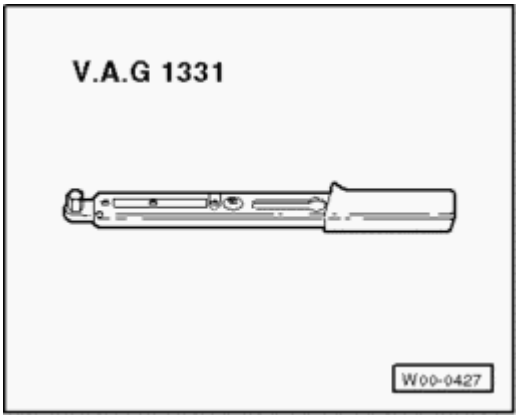

Fig. 388: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331
- **Assembly sleeve 01E 311 120**
- **Locking fluid AMV 185 101 A1**

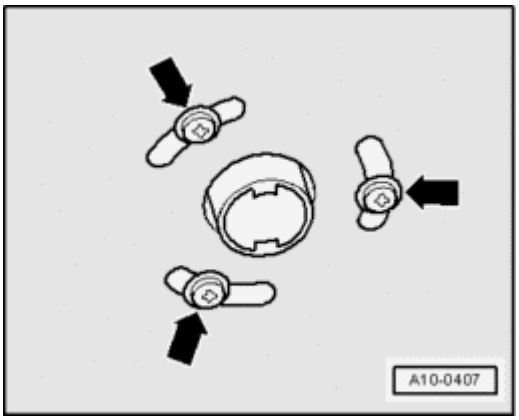

Fig. 389: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- On vehicles installed with auxiliary heater, remove bolts - **arrows** - securing exhaust pipe of auxiliary heater to sound insulation.

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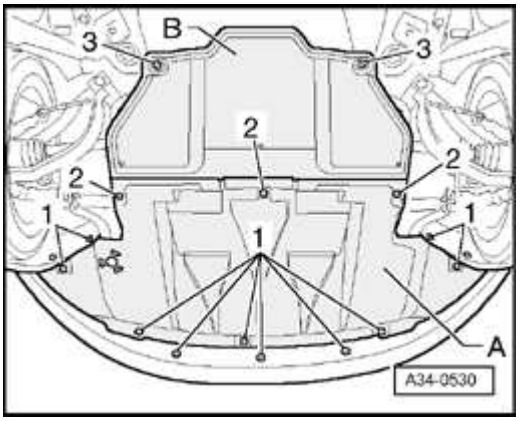

Fig. 390: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

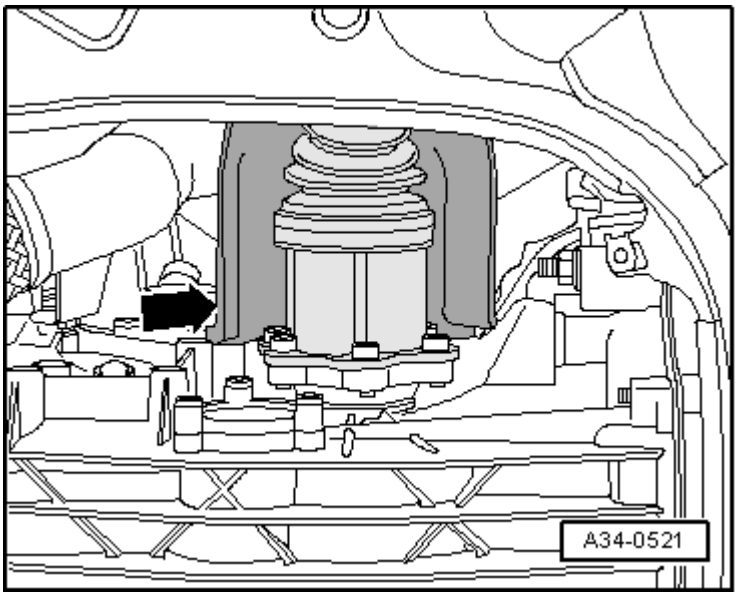

Fig. 391: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrow** - for drive axle (right side) and, if installed, also for drive axle (left-side).
- Remove front exhaust pipe (right side) --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

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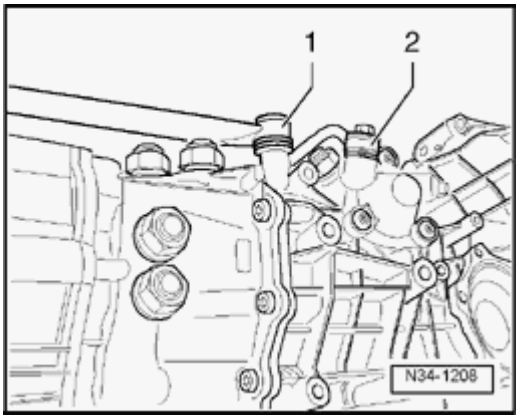

Fig. 392: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove connecting rod - **2** - for selector rod.

NOTE:

- **- Item 1 - can be disregarded.**

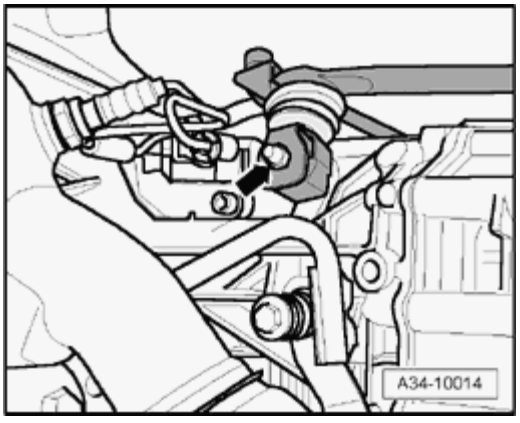

Fig. 393: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **arrow** - and detach selector shaft lever from selector shaft.

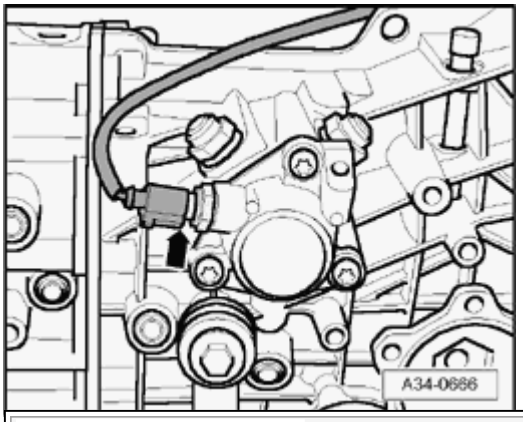

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Fig. 394: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - for back-up light switch F4.

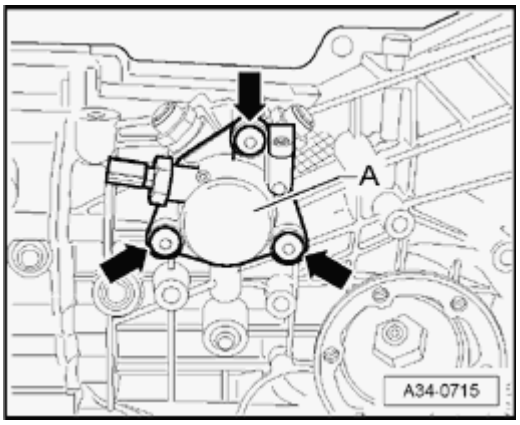

Fig. 395: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove selector shaft cover - **A** -.

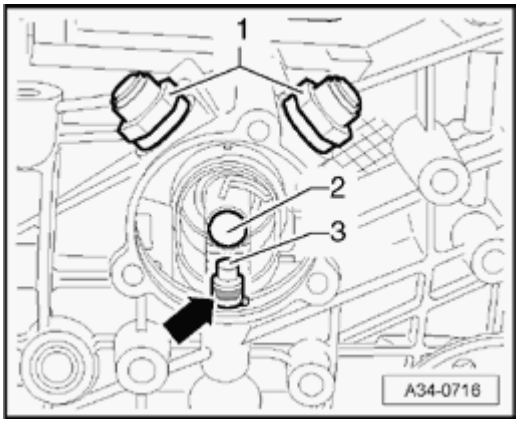

Fig. 396: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove two locking bolts - **1** - for selector shaft.

- Make sure gear has not been engaged.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously removing pin - **3** -.
- Remove selector shaft.

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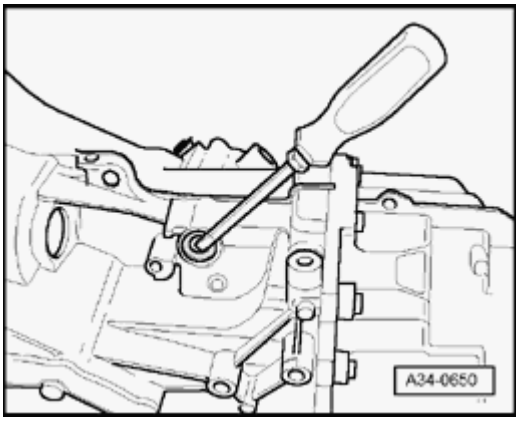

Fig. 397: Prying Out Seal With A Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry out seal with a screwdriver.

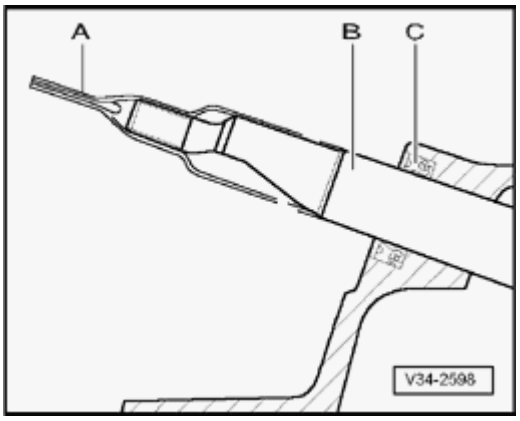

Fig. 398: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

NOTE:

- **Replace seals and O-rings.**

- Install selector shaft.

- Installation position: Chamfer of selector shaft - **B** - points downward.

NOTE:

- **Ignore - item A - and - item C -.**

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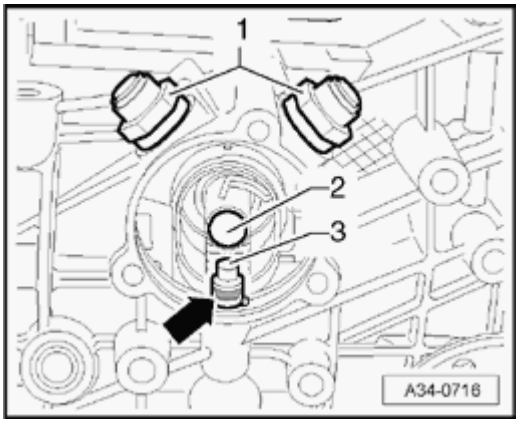

Fig. 399: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously inserting pin - **3** -.
- Installation position: groove - **arrow** - on pin - **3** - faces toward selector shaft cover.
- Clean bolt threads of locking fluid - **1** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 45 Nm.

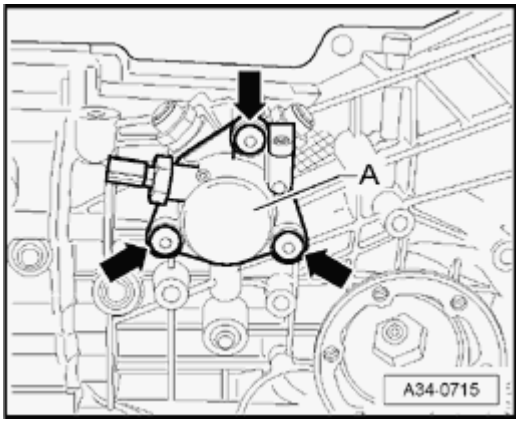

Fig. 400: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install cover - **A** - with new O-ring.
- Clean bolt threads of locking fluid - **arrows** - with a wire brush. Then apply **locking fluid AMV185101A1** to bolts and tighten.

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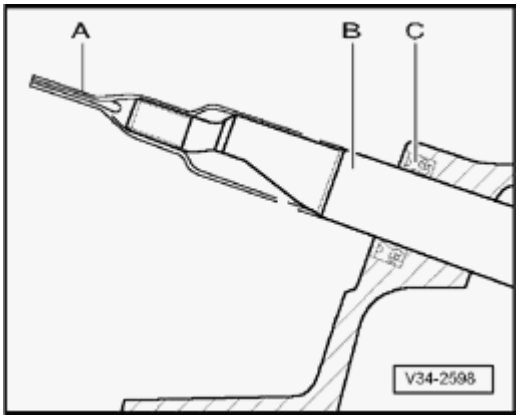

Fig. 401: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Use mounting sleeve 01E311120 - item A - to prevent damaging the seal - C - when installing.**

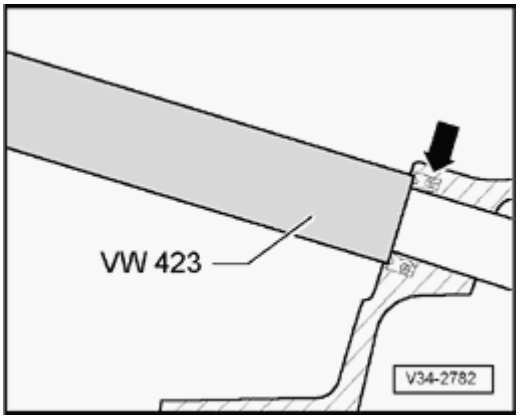

Fig. 402: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil outer circumference of seal - **arrow** -.
- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .
- Drive oil seal - **arrow** - into housing as far as it will go.

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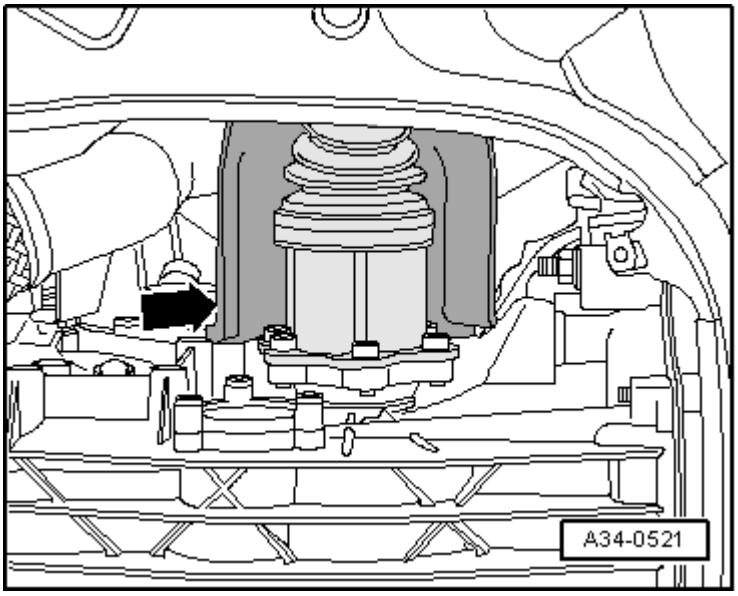

Fig. 403: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install front exhaust pipe align exhaust system free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .
- Remove heat shield - **arrow** - for drive axle (right side) and, if installed, also for drive axle (left-side).

Tightening torques

Component	Nm
Locking bolts for selector shaft	45
Cover for selector shaft	24
Connecting rod to transmission	23
Selector shaft lever to selector shaft	23
Heat shield for drive shaft to transmission	23

Selector shaft oil seal, replacing (with transmission removed) (transmission remains assembled)

NOTE:

- **Removal is also possible with transmission installed in vehicle --> Selector shaft oil seal, replacing (with transmission installed).**

Special tools, testers and auxiliary items required

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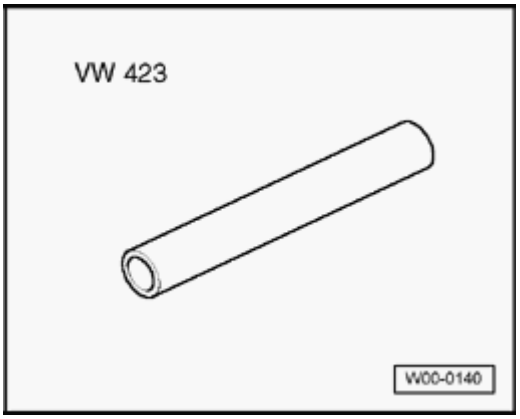

Fig. 404: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW423

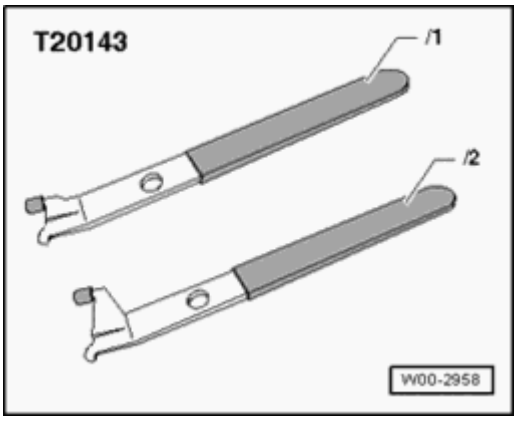

Fig. 405: Identifying Extractor Hook T20143
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor lever T20143/1
- **Assembly sleeve 01E 311 120**
- **Sealing grease G 052 128 A1**

Removing

- With selector shaft installed

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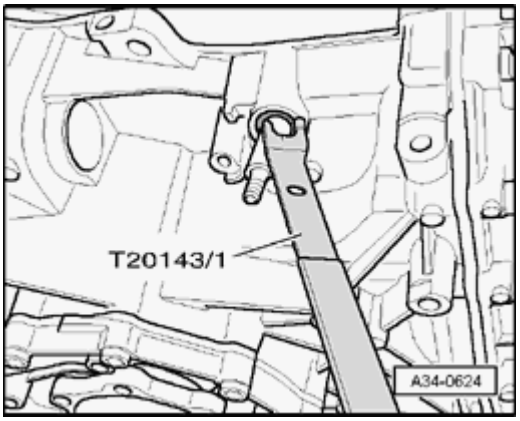

Fig. 406: Prying Out Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry out oil seal, making sure shaft is not damaged.

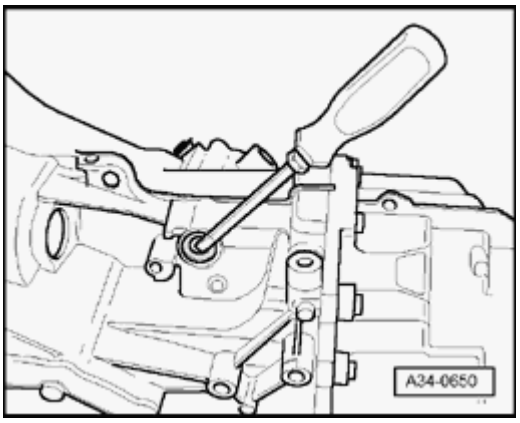

Fig. 407: Prying Out Seal With A Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With selector shaft removed

- Carefully pry out oil seal using a screwdriver or oil seal extractor lever VW 681.

Installing

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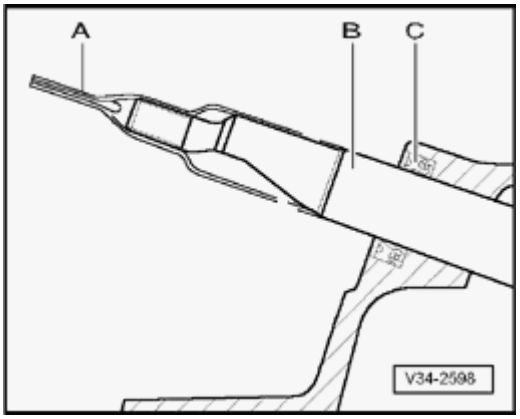

Fig. 408: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Avoid damaging oil seal - **C** - by only installing oil seal and selector shaft using assembly sleeve **assembly sleeve 01E311120** - **A** -.
- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .
- Lightly oil outer circumference of seal.

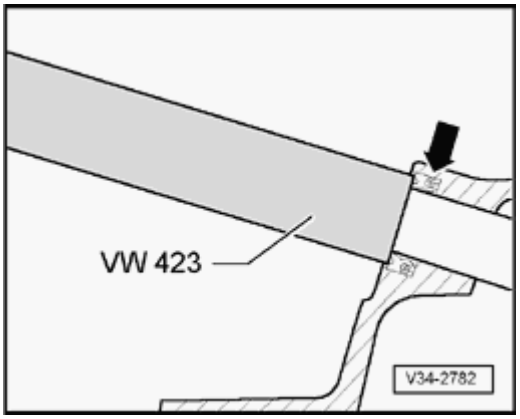

Fig. 409: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive oil seal - **arrow** - into housing as far as it will go.

Selector shaft oil seal, replacing (with transmission installed)

Special tools, testers and auxiliary items required

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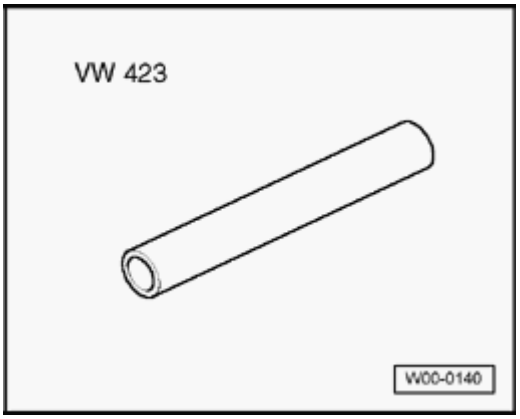

Fig. 410: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW423

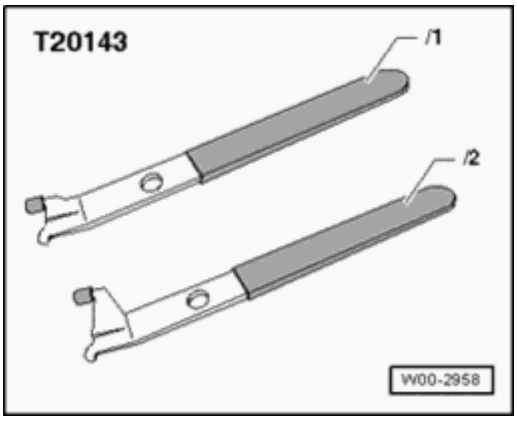

Fig. 411: Identifying Extractor Hook T20143
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor lever T20143/1

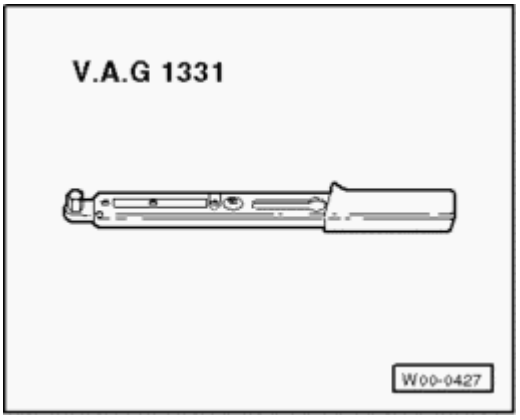

Fig. 412: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Torque wrench V.A.G 1331
- **Assembly sleeve 01E 311 120**
- **Sealing grease G 052 128 A1**

Removing

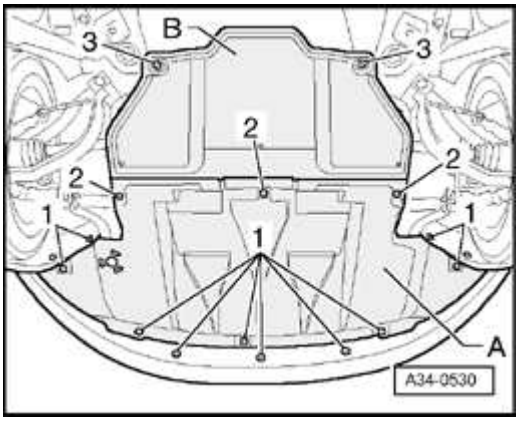

Fig. 413: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

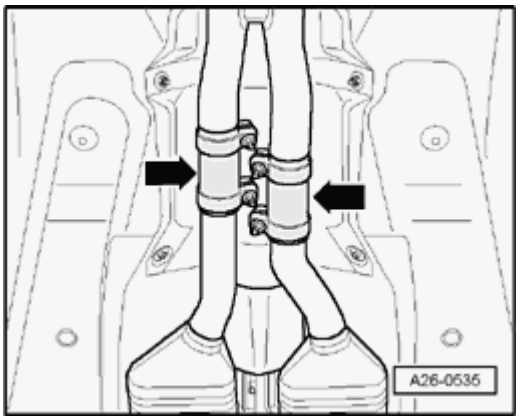

Fig. 414: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 6-cylinder engine:

- Remove heat shield for drive axle (left-side).
- Disconnect exhaust system at clamp (left-side) - **left arrow** -.
- Remove front exhaust pipe (left-side) with catalytic converter --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

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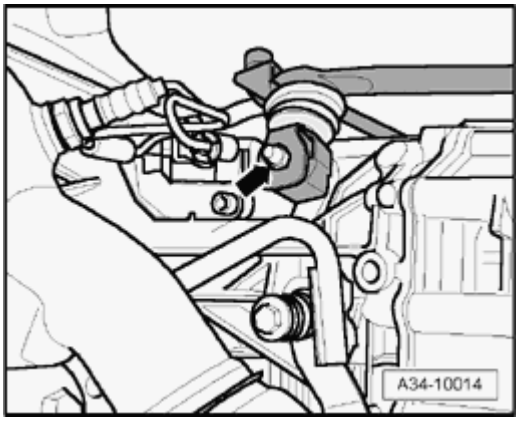

Fig. 415: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Continued for all vehicles:

- Remove nut - **arrow** - and detach selector shaft lever from selector shaft.

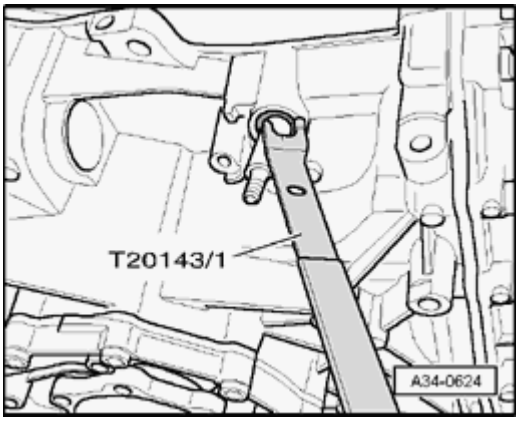

Fig. 416: Prying Out Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry out oil seal, making sure shaft is not damaged.

Installing

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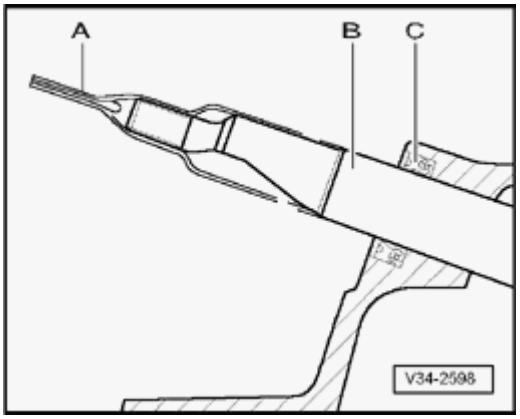

Fig. 417: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Avoid damaging oil seal - **C** - by only installing oil seal and selector shaft using assembly sleeve **assembly sleeve 01E311120** - **A** -.
- Pack space between sealing lip and dust lip half full with **sealing grease G052128A1** .
- Lightly oil outer circumference of seal.

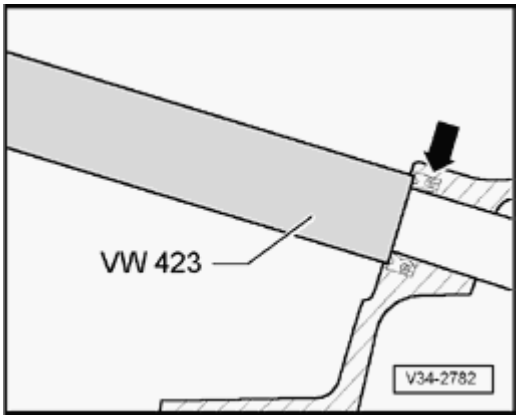

Fig. 418: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive oil seal - **arrow** - into housing as far as it will go.

The remaining installation steps are in reverse order of removal. Note the following:

Vehicles with 6-cylinder engine:

- Install exhaust system and perform stress-free alignment --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .
- Install heat shield for drive shaft (left-side).

Continued for all vehicles:

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- Check gear oil level in transmission --> **Transmission oil level, checking** .

Tightening torques

Component		Nm
Transmission selector lever to transmission		23
Heat shields above drive shafts to transmission		23

Back-up light switch F4, removing and installing

Special tools, testers and auxiliary items required

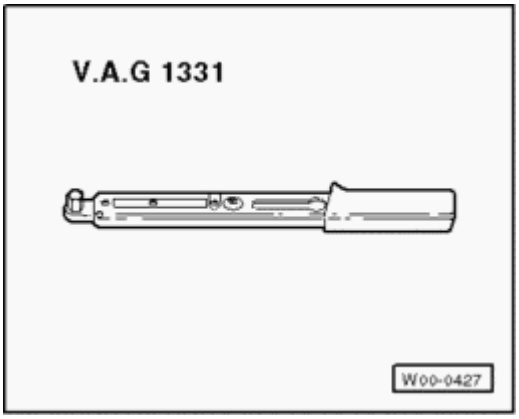

Fig. 419: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

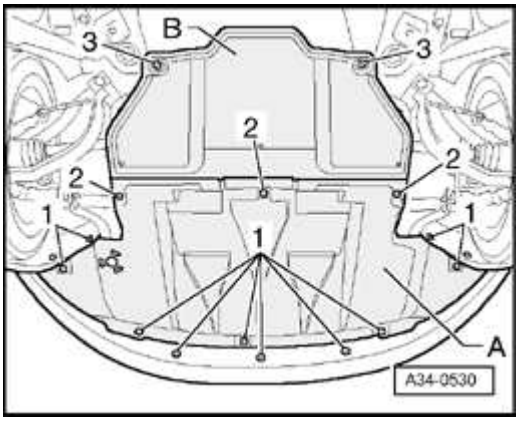

Fig. 420: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

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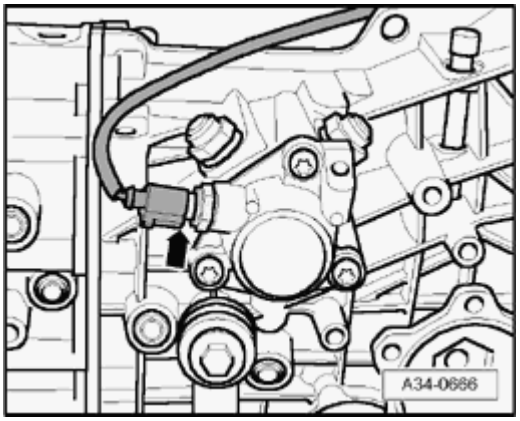

Fig. 421: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - for back-up light switch F4 on transmission (right side).

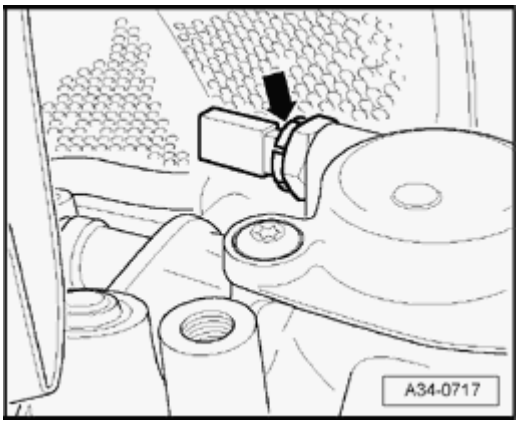

Fig. 422: Removing Back-Up Light Switch F4 From Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Back-up light switch F4 - **arrow** - from selector shaft cover.

Installing

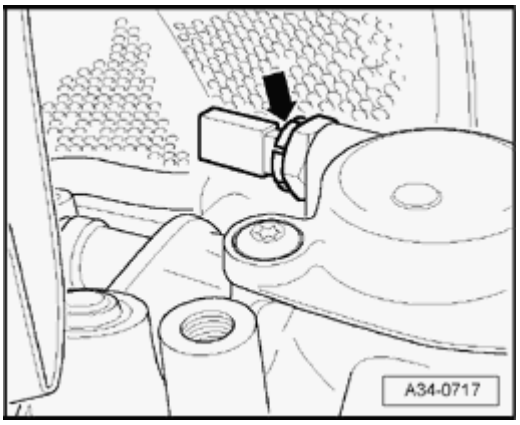

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Fig. 423: Removing Back-Up Light Switch F4 From Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Screw Back-up light switch F4 - **arrow** - into selector shaft cover.

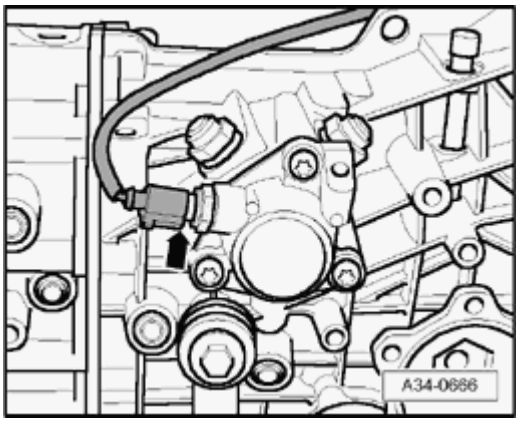

Fig. 424: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect electrical connector - **arrow** - for back-up light switch F4 on transmission (right side).

Component	Nm
Back-up light switch F4 to selector shaft cover	20

35 GEARS, SHAFTS

INPUT SHAFT

Input shaft, assembly overview

NOTE:

- **Refer to technical data when installing new gears --> Transmission identification.**
- **Lubricate all bearings on input shaft with gear oil before installing.**

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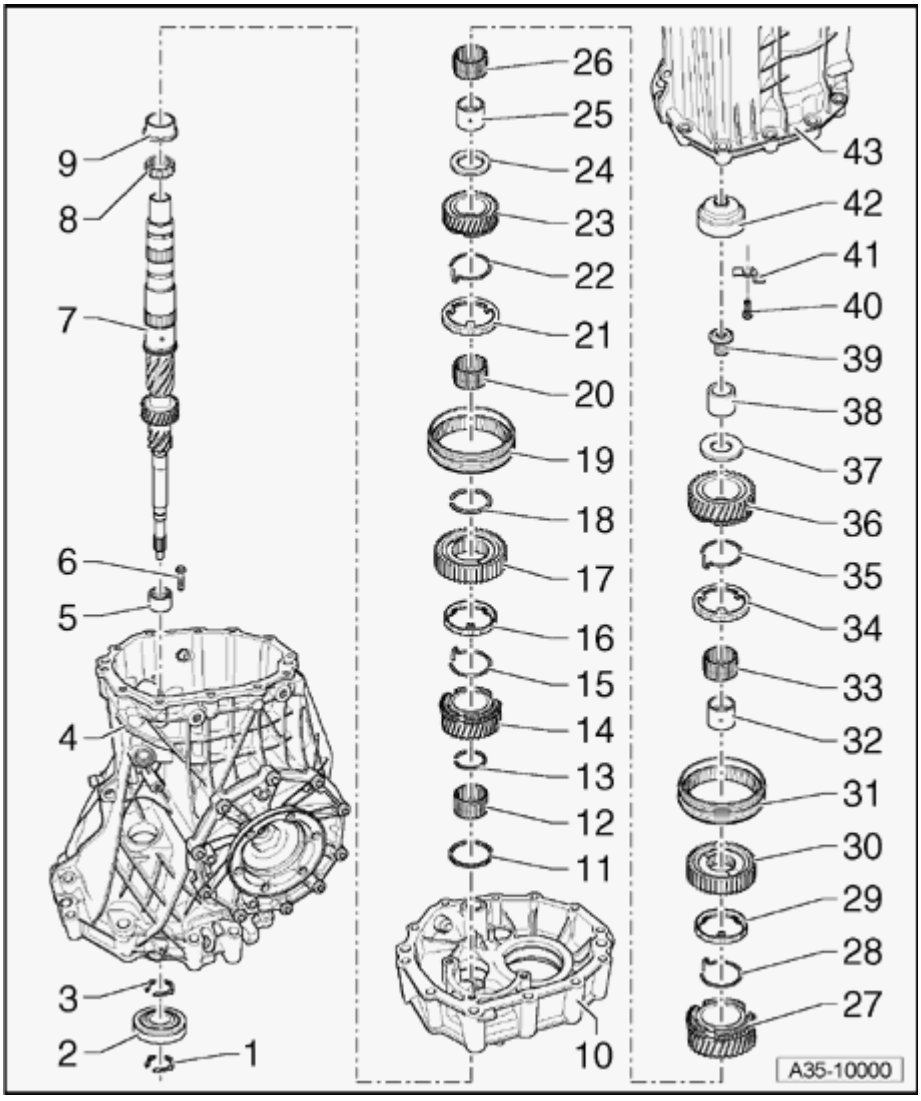

Fig. 425: Input Shaft, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 1** -
- Determining thickness

2 - Ball bearing

- Removing and installing --> **Disassembling and assembling sequence**

3 - Circlip

- Mark

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- Installation position **Installation position of circlips**, - **item 2** -
- Determining thickness

4 - Transmission housing

5 - Needle bearing

- For input shaft

6 - Bolt, 24 Nm

7 - Input shaft

- Adjusting --> **Input shaft, adjusting**

8 - Roller bearing

- Detaching and installing **Detaching needle roller bearing from input shaft and installing needle roller bearing onto input shaft**
- Installation position: collar faces splines for 2nd gear

9 - Outer race

- For needle roller bearing

10 - Bearing housing

11 - Thrust washer

- For 3rd speed selector gear

12 - Needle bearing

- For 3rd gear

13 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 3** -

14 - 3rd speed selector gear

15 - Spring

- Insert in 3rd speed selector gear --> **Inserting spring in selector gear**

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16 - 3rd gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

17 - Synchronizing hub for 3rd and 4th gear

- Installation position: high inside collar faces 3rd speed selector gear

18 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 4** -
- Re-determining thickness **Determining thickness of circlip for synchronizing hub for 3rd and 4th gear**

19 - Locking collar for 3rd and 4th gear

- Mark position in relation to synchronizing hub prior to removing

20 - Needle bearing

- For 4th gear

21 - 4th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

22 - Spring

- Insert in 4th speed selector gear --> **Inserting spring in selector gear**

23 - 4th speed selector gear

24 - Thrust washer

- For 4th speed and 5th speed selector gears

25 - Needle bearing inner race

- For 5th gear

26 - Needle bearing

- For 5th gear

27 - 5th speed selector gear

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28 - Spring

- Insert in 5th speed selector gear --> **Inserting spring in selector gear**

29 - 5th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

30 - Synchronizing hub for 5th and 6th gear

31 - Locking collar for 5th and 6th gear

- Mark position in relation to synchronizing hub prior to removing

32 - Needle bearing inner race

- For 6th gear

33 - Needle bearing

- For 6th gear

34 - 6th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

35 - Spring

- Insert in 6th speed selector gear **Inserting spring in selector gear**

36 - 6th speed selector gear

37 - Thrust washer

- For 6th speed selector gear

38 - Inner race

39 - Multi-point socket head bolt, 150Nm

40 - Multi-point socket head bolt, 24Nm

41 - Retaining plate

42 - Roller bearing

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- Bearing for input shaft in transmission cover
- With lubricating unit
- Always replace

43 - Transmission cover

Input shaft, disassembling and assembling

NOTE:

- **Removing and installing 3rd to 6th speed selector gears is described in chapter on disassembling and assembling transmission --> Disassembling and assembling sequence.**

Special tools, testers and auxiliary items required

- Feeler gauge

Detaching needle roller bearing from input shaft and installing needle roller bearing onto input shaft

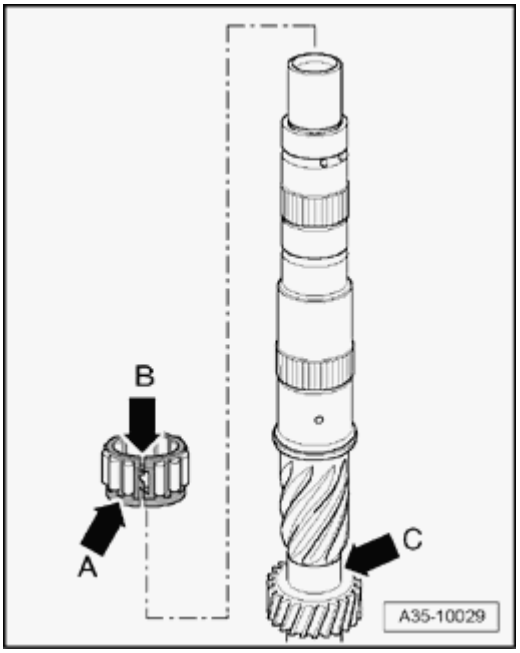

Fig. 426: Detaching Needle Roller Bearing From Input Shaft And Installing Needle Roller Bearing Onto Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Detaching needle roller bearing:

- Bend open needle roller bearing at separating point - **arrow B** - far enough for it to be detached from input shaft (do not bend open more than necessary).

Installing needle roller bearing:

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- The shoulder - **arrow A** - faces toward splines for 2nd gear.

  - Only bend open needle roller bearing at separating point - **arrow B** - far enough for it to be guided over the input shaft and onto its seat - **arrow C** -.

Inserting spring in selector gear

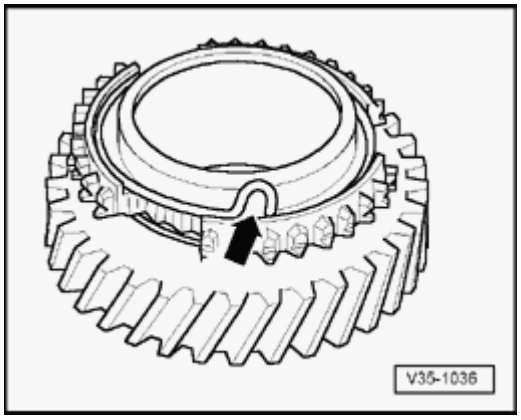

Fig. 427: Inserting Spring Into Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The bent end of spring - **arrow** - must be hooked into hole in selector gear.

Checking synchro-ring for wear

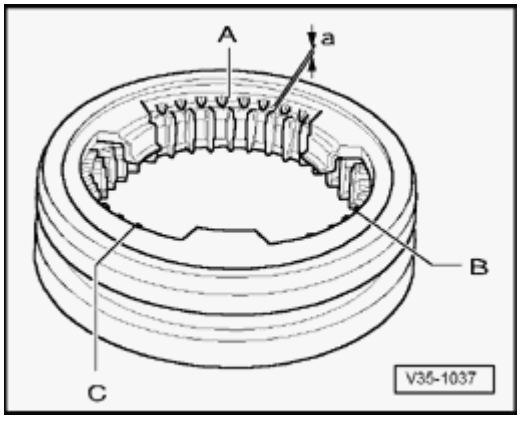

Fig. 428: Checking Synchronizer For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

  - Press synchro-ring into locking collar and measure gap - **a** - at positions - **A** - , - **B** - and - **C** - using feeler gauge.
  - Add measured values and divide by 3.

- The determined value should not exceed 0.45 mm.

Installation position of circlips

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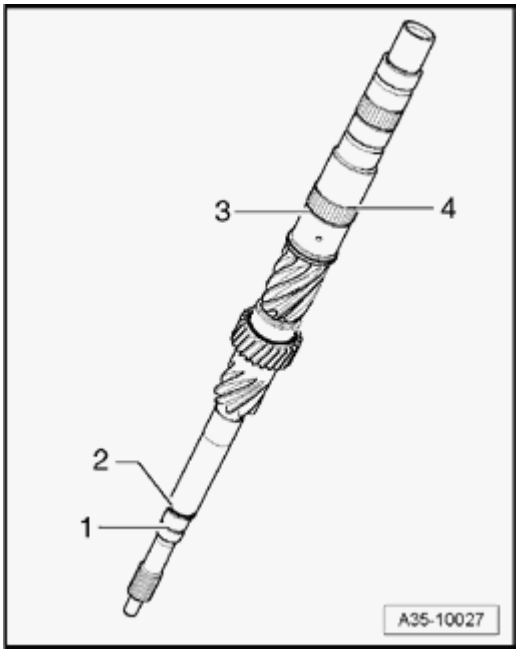

Fig. 429: Installation Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlips - **1** - and - **2** - secure input shaft ball bearing.

Determining thickness --> **Circlips for input shaft ball bearing, determining**.

- Circlip - **3** - secures needle bearing for 3rd speed selector gear and 3rd and 4th gear synchronizing hub.

Thickness: 2.00 mm.

- Circlip - **4** - secures 3rd and 4th gear synchronizing hub.

Determining thickness **Determining thickness of circlip for synchronizing hub for 3rd and 4th gear**.

Determining thickness of circlip for synchronizing hub for 3rd and 4th gear

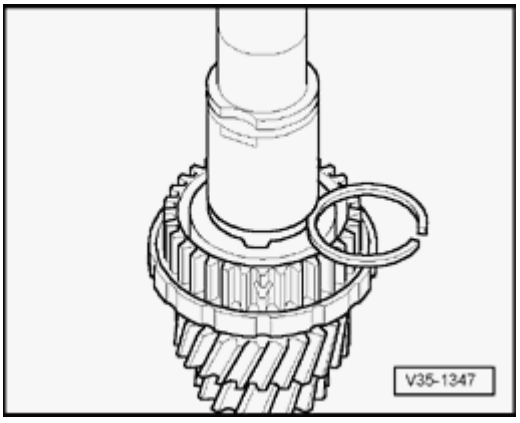

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Fig. 430: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchronizing hub onto stop.
  - Determine thickest circlip that will just fit and install it.

The following circlips are available:

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

INPUT SHAFT, ADJUSTING

Circlips for input shaft ball bearing, determining

It is necessary to readjust the input shaft when:

- Transmission housing

or the

- Input shaft

are replaced.

Special tools, testers and auxiliary items required

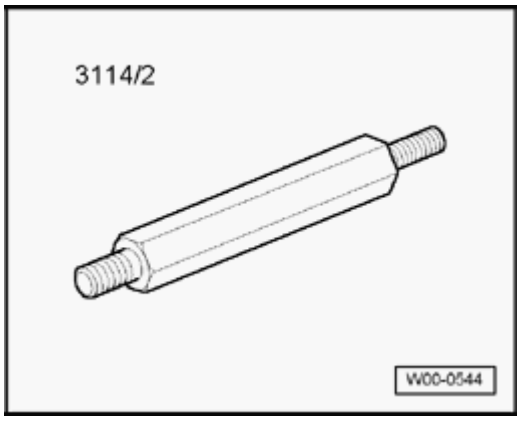

Fig. 431: 3114/2 Straightening Tool
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replacement stud (M8 and M10) 3114/2

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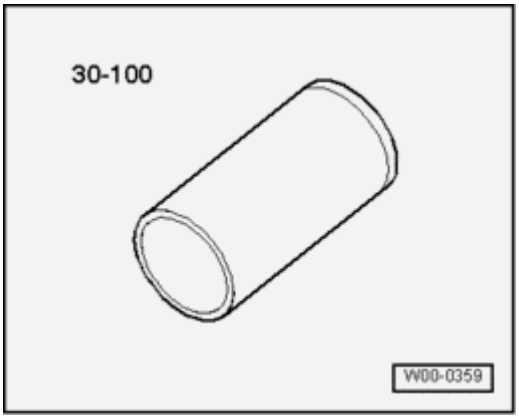

Fig. 432: Press Tube 30-100Identifying Special Tools - Oil Pump/Front Sealing Flange, Drive Chain And Chain Sprocket For Oil Pump, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drift sleeve 30 - 100
- Fitting tool T10246
- Digital depth gauge e.g. VAS 6087

Determining thickness for circlip behind the input shaft ball bearing

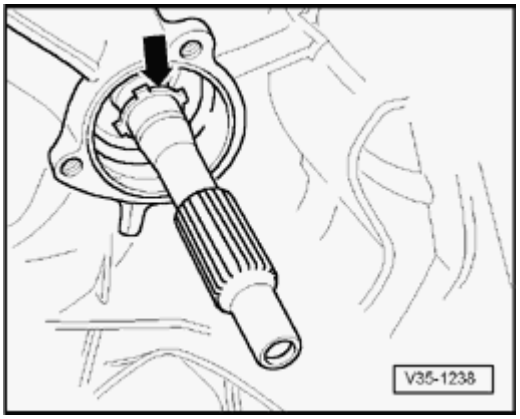

Fig. 433: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install a provisional circlip - **arrow** - in rear groove on input shaft.
- Then push ball bearing onto input shaft.

Installation position:

The sealed side of the ball cage faces transmission housing.

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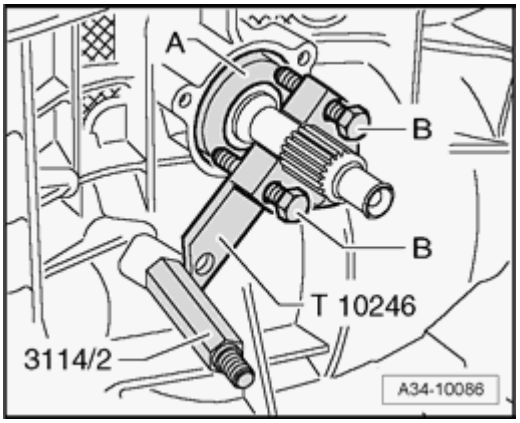

Fig. 434: Pressing In Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing in ball bearing:

Screw replacement stud (M8 and M10) 3114/2 into tapped hole for ball head stud.

Slide thrust plate - **A** - of fitting tool T10246 onto input shaft.

Position fitting tool behind splines for clutch plate. Tighten bolts - **B** - lightly. The bolts locate in the recess in the thrust plate - **A** -.

Press in ball bearing onto stop by tightening bolts alternately (1/2 turn at a time).

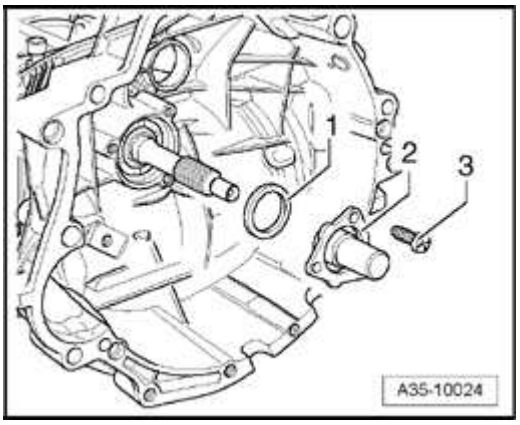

Fig. 435: Dished Spring, Guide Sleeve And Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install dished spring - **1** -.

Installation position:

The convex side faces guide sleeve - **2** -.

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- Install a shrink hose onto input shaft splines.
- Bolt guide sleeve to transmission housing - **2** - with bolts - **3** -.
- Turn the transmission housing so the joint flange for the bearing housing points upward.

- The contact surface must be cleaned to remove **sealing paste** .

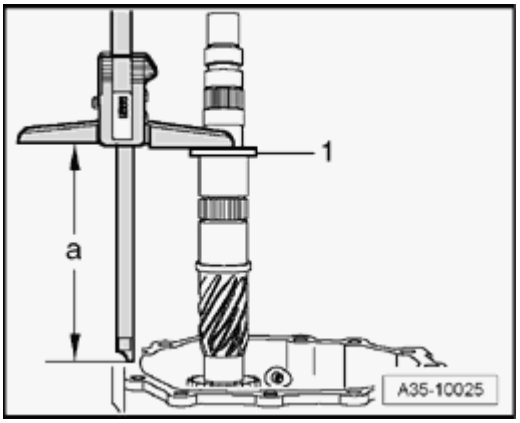

Fig. 436: Measuring From Thrust Washer To Contact Surface Of Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place thrust washer - **1** - for 4th and 5th speed selector gears onto input shaft.
- Place a digital depth gauge (e. g. VAS 6087) onto thrust washer and measure the distance to the contact surface of housing. The measuring point on the housing contact surface must be as close to the input shaft as possible.

NOTE:

- **When measuring, lift the input shaft with e.g. support bridge 30-211A or the help of a second technician until the play in the ball bearing is taken up.**

Specification: distance "a" = 164.14 mm

NOTE:

- **If the measured value exceeds the specification, use a thinner circlip than the circlip installed so that the specification is attained.**
- **If the measured value is below the specification, use a thicker circlip than the circlip installed so that the specification is attained.**
- **Determine the circlip thickness to meet the specification as exactly as possible (164.14 mm).**

The following circlips are available:

Circlip thickness (mm)		
1.54	2.08	2.62
1.63	2.17	2.71

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1.72	2.26	2.80
1.81	2.35	2.89
1.90	2.44	
1.99	2.53	

- Select circlip from table.

Checking adjustment and checking distance "a"

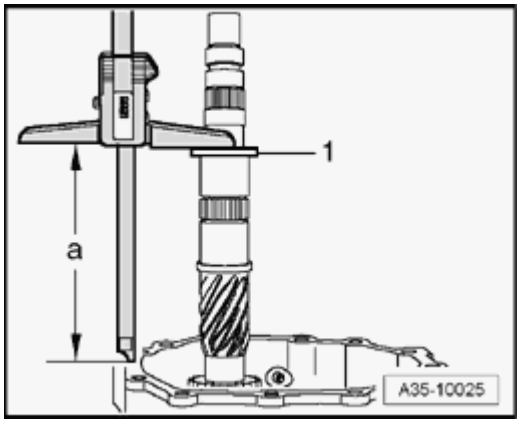

Fig. 437: Measuring From Thrust Washer To Contact Surface Of Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determined circlip is installed.

The distance "a" should be 164.14mm +- 0.04 mm if correct circlip has been selected.

Determining thickness for circlip in front of input shaft ball bearing

- Knock rear circlip (as determined) and ball bearing onto input shaft using drift sleeve 30 - 100.

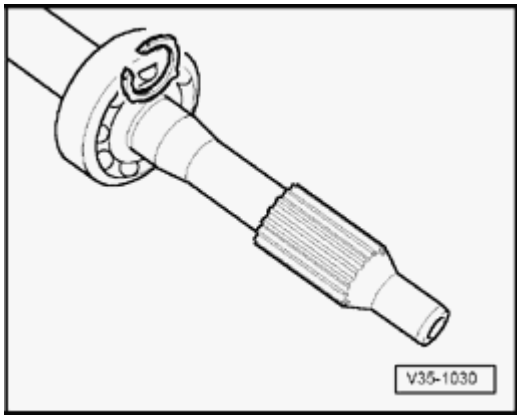

Fig. 438: Input Shaft And Thickest Circlip Which Can Still Just Be Installed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Determine thickest circlip which will still fit.
- Refer to table **The following circlips are available:** to determine correct circlip.

PINION SHAFT AND HOLLOW SHAFT

Pinion shaft and hollow shaft, assembly overview

NOTE:

- **When installing new gear wheels or the final drive set consult technical data --> Transmission identification.**
- **Observe technical data when installing new gear wheels**
- **Lubricate all needle bearings on hollow shaft with gear oil before installing.**
- **Adjustment work is required when replacing the parts marked with 1) . Table of adjustments --> Table of adjustments**

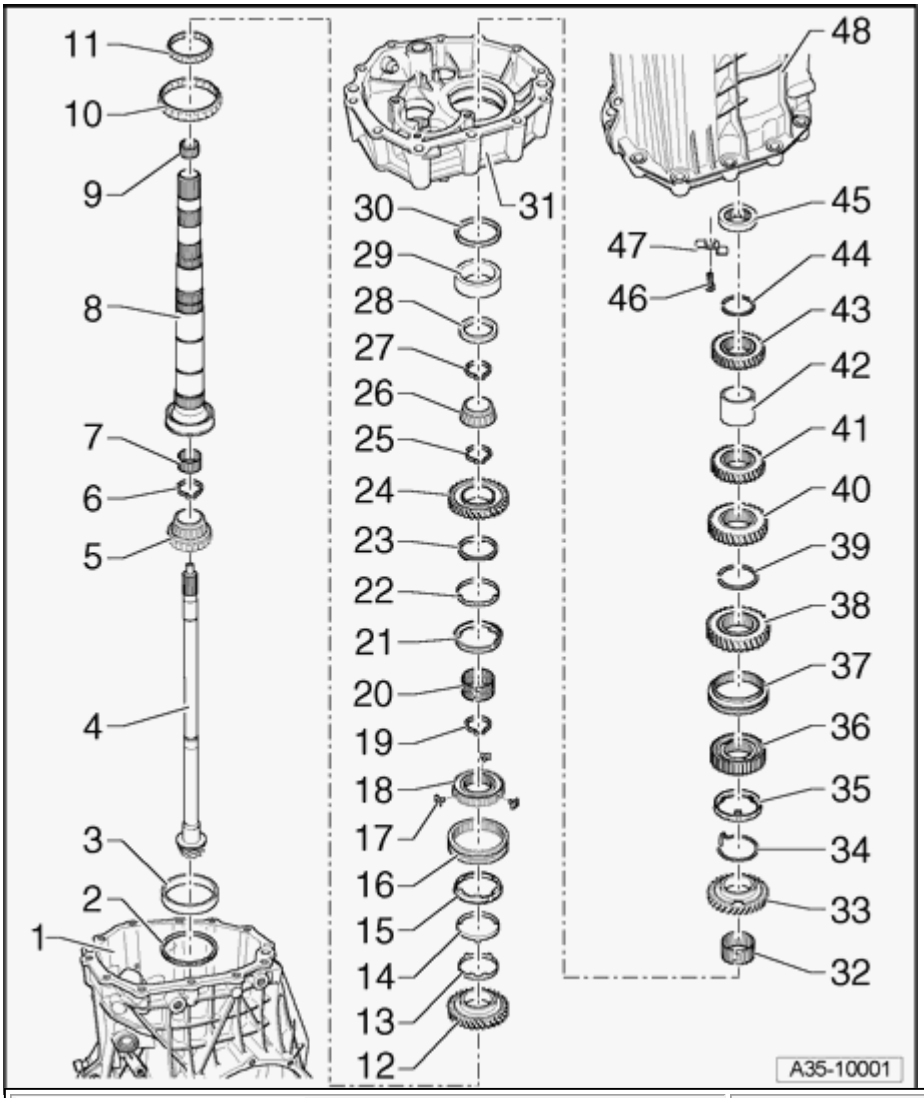

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Fig. 439: Pinion Shaft And Hollow Shaft, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing [1)]

2 - Shim "S3"

- Table of adjustments --> **Table of adjustments**

3 - Double tapered roller bearing outer race [1)]

- Pulling out **Pulling out double tapered roller bearing outer race**
- Pressing in **Heating transmission housing in order to install double tapered roller bearing outer race** and **Pressing in double tapered roller bearing outer race**

4 - Pinion shaft [1)]

- Is mated with ring gear, always replace together as a set
- Adjusting ring gear and pinion shaft --> **Pinion shaft and ring gear, adjusting**

5 - Double tapered roller bearing inner race [1)]

- Will be damaged during removal
- Replace
- Pressing off **Pressing off double tapered roller bearing inner race**
- Pressing on **Pressing on double tapered roller bearing inner race**

6 - Circlip

- Redetermine thickness if double tapered roller bearing is replaced **Determining thickness of circlip**

7 - Large needle bearing

- For pinion shaft in hollow shaft
- Lubricate with gear oil

8 - Hollow shaft

- Disassembling and assembling

9 - Small needle bearing

- For pinion shaft in hollow shaft
- Lubricate with gear oil

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10 - Large needle bearing for 1st gear

11 - Small needle bearing for 1st gear

12 - 1st speed selector gear

- Check axial clearance after installing using feeler gauge **Checking axial play of selector gears** (0.20 to 0.50 mm)

13 - Inner ring for 1st gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st gear inner ring for wear**
- Replace if scored or if there are visible traces of wear

14 - Intermediate ring for 1st gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**

15 - Synchro-ring for 1st gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**
- Replace if scored or if there are visible traces of wear

16 - Locking collar for 1st and 2nd gear

- Mark position in relation to synchronizing hub prior to removing
- Assembling locking collar/synchronizing hub **Assembling 1st and 2nd gear locking collar/synchronizing hub**

17 - Locking piece

- Install locking pieces (3x) **Assembling 1st and 2nd gear locking collar/synchronizing hub**

18 - Synchronizing hub for 1st and 2nd gear

- Installation position: high inside collar faces 2nd speed selector gear
- Pressing off **Pressing off 1st and 2nd gear synchronizing hub**
- Pressing on **Pressing on 1st and 2nd gear synchronizing hub**
- Assembling locking collar/synchronizing hub **Assembling 1st and 2nd gear locking collar/synchronizing hub**

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19 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 1** -
- Re-determine thickness when replacing 1st and 2nd gear synchronizing hub or hollow shaft **Determining thickness of circlip**

20 - Needle bearing

- For 2nd gear

21 - Synchro-ring for 2nd gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**
- Replace if scored or if there are visible traces of wear

22 - Intermediate ring for 2nd gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**

23 - Inner ring for 2nd gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**
- Replace if scored or if there are visible traces of wear

24 - 2nd speed selector gear

- Check axial clearance after installing using feeler gauge **Checking axial play of selector gears** (0.20 to 0.50 mm)

25 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 2** -

26 - Tapered roller bearing inner race[1)]

- Pressing off **Pressing off tapered roller bearing inner race with 2nd speed selector gear**
- Pressing on **Pressing on tapered roller bearing inner race**

27 - Circlip

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- Mark
- Installation position **Installation position of circlips**, - **item 3** -

28 - Thrust washer

- For reverse selector gear
- Pressing off **Pressing off thrust washer for reverse selector gear**
- Pressing on **Pressing on thrust washer for reverse selector gear**

29 - Tapered roller bearing outer race 1)

- Pulling out **Pulling tapered roller bearing outer race out of bearing housing**
- Pressing in **Pressing tapered roller bearing outer race into bearing housing**

30 - Shim "S_4 "

- Table of adjustments --> **Table of adjustments**

31 - Bearing housing 1)

32 - Needle bearing

- For reverse selector gear

33 - Reverse selector gear

- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

34 - Spring

- Insert into reverse selector gear **Inserting spring in selector gear**

35 - Synchronizing ring for reverse gear

- Checking for wear **Checking synchro-ring for wear**

36 - Reverse gear synchronizing hub

- Installation position: high inside collar faces 3rd gear wheel

37 - Reverse gear locking collar

- Mark position in relation to synchronizing hub prior to removing
- Installation position: taper faces reverse gear synchro-ring

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38 - 3rd gear wheel

- Installation position: machined side faces reverse gear synchronizing hub

39 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 4** -
- Re-determine thickness when replacing 3rd gear wheel, reverse gear synchronizing hub or hollow shaft **Determining thickness of circlip**

40 - 4th gear wheel

- Installation position: high inside collar faces 5th gear wheel

41 - 5th gear wheel

- Installation position: high inside collar faces 4th gear wheel

42 - Spacer sleeve

43 - 6th gear wheel

44 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 5** -
- Re-determine thickness when replacing gear wheels for 4th to 6th gear, the spacer sleeve or the hollow shaft **Determining thickness of circlip**

45 - Needle bearing

- Bearing for hollow shaft in transmission cover

46 - Multi-point socket head bolt, 24Nm

47 - Retaining plate

48 - Transmission cover

Inserting spring in selector gear

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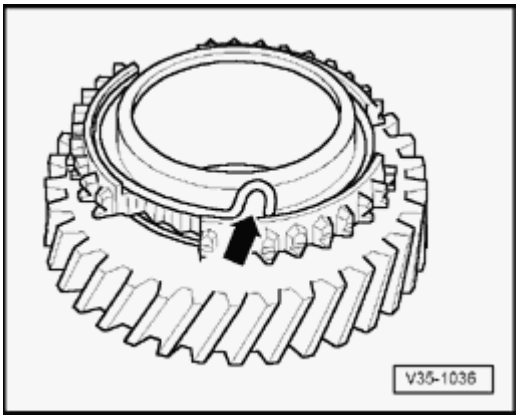

Fig. 440: Inserting Spring Into Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The bent end of spring - **arrow** - must be hooked into hole in selector gear.

Checking synchro-ring for wear

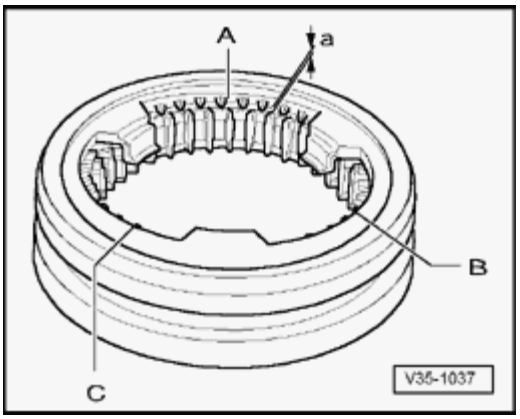

Fig. 441: Checking Synchronizer For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchro-ring into locking collar and measure gap - **a** - at positions - **A** - , - **B** - and - **C** - using feeler gauge.
- Add measured values and divide by 3.

The determined value should not exceed 0.45 mm.

Pinion shaft and hollow shaft, disassembling and assembling

NOTE:

- **Removing and installing gear wheels for 3rd to 6th gear and the reverse selector gear is described in chapter on disassembling and assembling transmission --> Disassembling and assembling sequence.**

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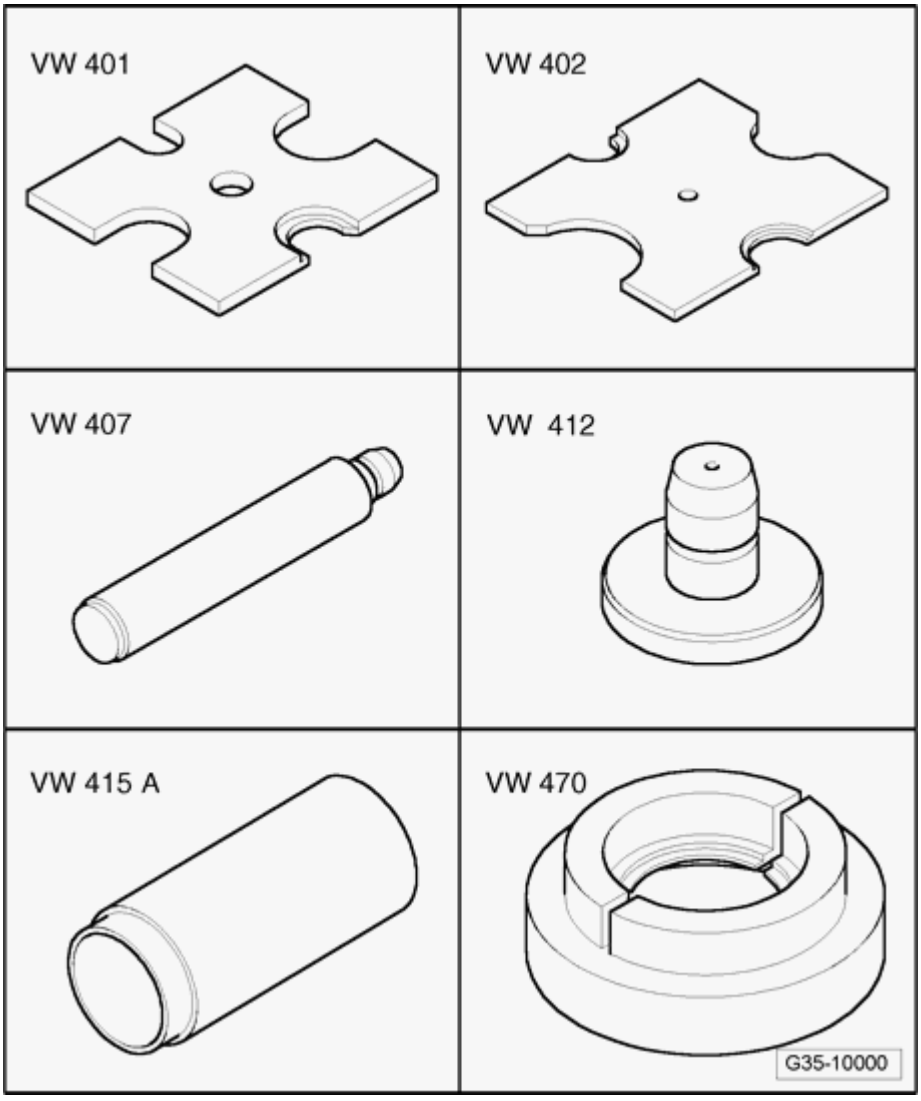

Fig. 442: Identifying Special Tools - Pinion Shaft And Hollow Shaft, Disassembling And Assembling (1 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust plate VW 402
- Punch VW 407
- Thrust disc VW 412

- Tube VW 415 A
- Thrust ring VW 470

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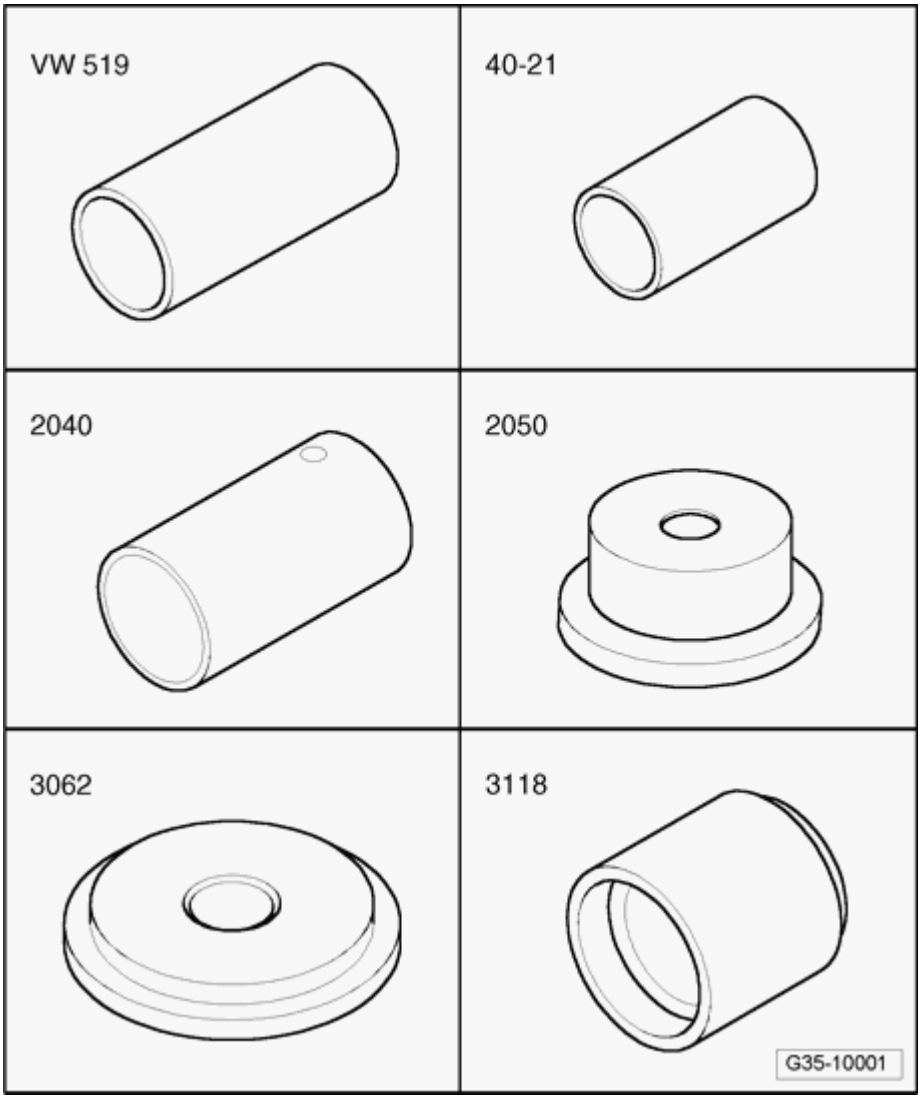

Fig. 443: Identifying Special Tools - Pinion Shaft And Hollow Shaft, Disassembling And Assembling (2 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Sleeve VW 519
- Press tool 40 - 21
- Tube 2040
- Thrust piece 2050
- Thrust pad 3062
- Press tool 3118

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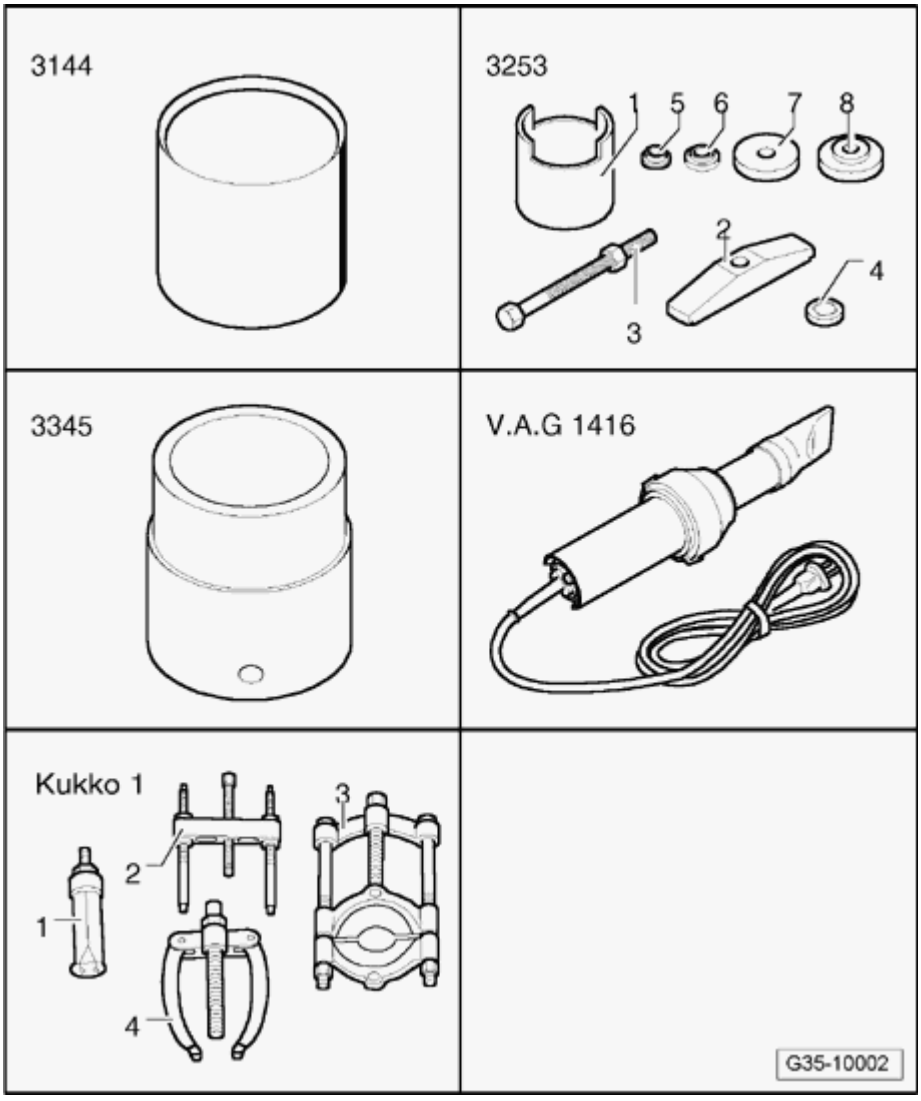

Fig. 444: Identifying Special Tools - Pinion Shaft And Hollow Shaft, Disassembling And Assembling (3 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Sleeve 3144
- Wheel bearing assembly set 3253
- Tube for wheel bearing 3345
- Hot air blower V.A.G 1416

- **- 1 -** Internal puller Kukko 21/8
- **- 3 -** Splitter Kukko 17/2
- **- 4 -** Counter-support Kukko 22/2
- Feeler gauge

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Pulling out double tapered roller bearing outer race

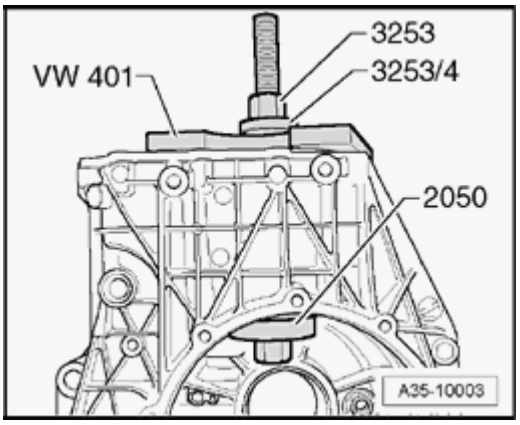

Fig. 445: Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Removing differential --> **Differential, removing and installing**.
- Install thrust piece 2050 with large diameter pointing toward outer race.
- Install threaded spindle and thrust pad of wheel bearing assembly set 3253 with thrust plate VW 401 onto transmission housing.

The outer race will be pulled out of transmission housing when nut is tightened.

Pressing off double tapered roller bearing inner race

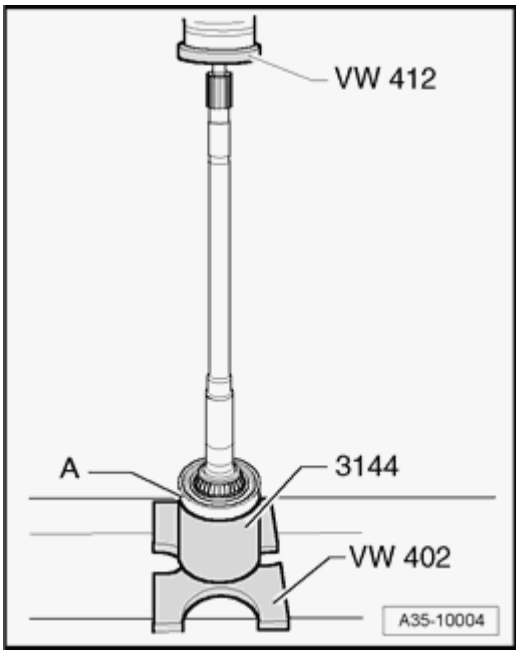

Fig. 446: Pressing Off Double Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove circlip before pressing off.
- The outer race of double tapered roller bearing - **A** - must be installed prior to pressing off inner race.

Pressing on double tapered roller bearing inner race

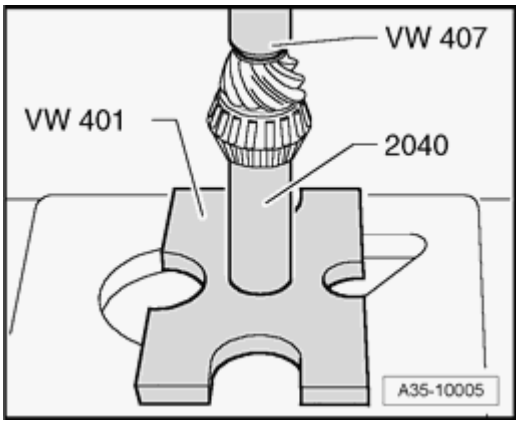

Fig. 447: Pressing On Double Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat inner race to approx. 100° C and press on.
- Determine thickness of required circlip **Determining thickness of circlip** and install circlip.

Determining thickness of circlip

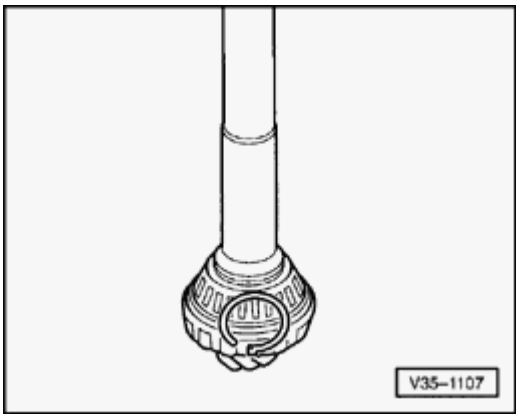

Fig. 448: Determining Circlip To Be Installed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine thickest circlip that will just fit and install it.

NOTE:

- **The circlips for the synchronizing hubs and individual gear wheels should also be determined as shown for the double tapered roller bearing.**

The following circlips are available:

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Circlip thickness (mm)		
2.00	2.06	2.12
2.03	2.09	2.15

Heating transmission housing in order to install double tapered roller bearing outer race

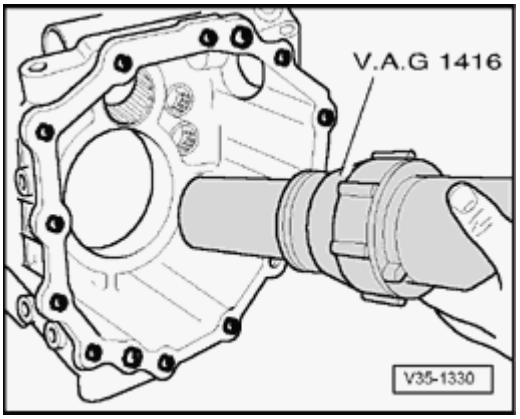

Fig. 449: Heating Transmission Housing To Insert Outer Race Of Large Taper Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat transmission housing in area of bearing seat for approx. 15 minutes, to approx. 100° C, with hot air blower V.A.G 1416.

Pressing in double tapered roller bearing outer race

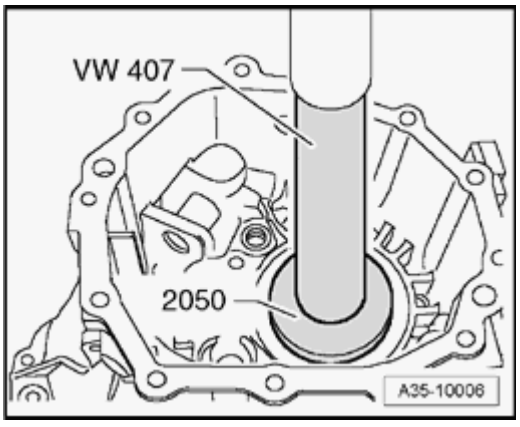

Fig. 450: Pressing Tapered Roller Bearing Outer Race For Pinion Shaft Into Transmission Housing Without Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert outer race only after heating transmission housing and push into position under workshop press until heat exchange has taken place.

Pulling tapered roller bearing outer race out of bearing housing

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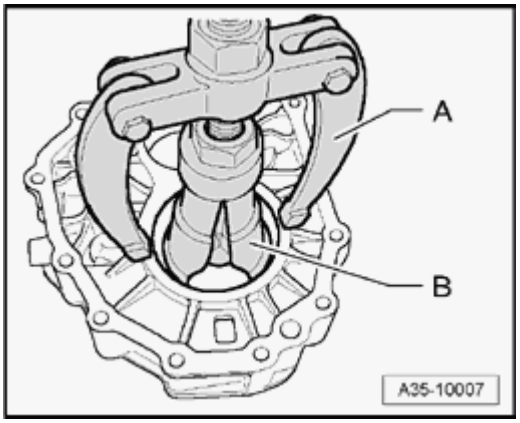

Fig. 451: Pulling Tapered Roller Bearing Outer Race Out Of Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/2

B - Internal puller 56 to 70 mm, e.g. Kukko 21/8

Pressing tapered roller bearing outer race into bearing housing

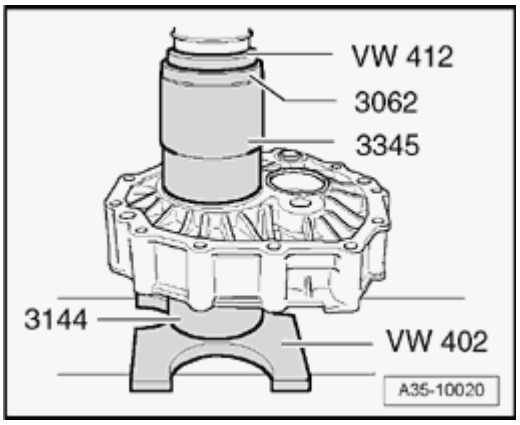

Fig. 452: Pressing In Tapered Roller Bearing Outer Race For Pinion Shaft With Shim Into Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Support bearing housing with sleeve 3144 directly below bearing mounting.

- Press in outer race until limit stop.

Disassembling and assembling hollow shaft

Pressing off thrust washer for reverse selector gear

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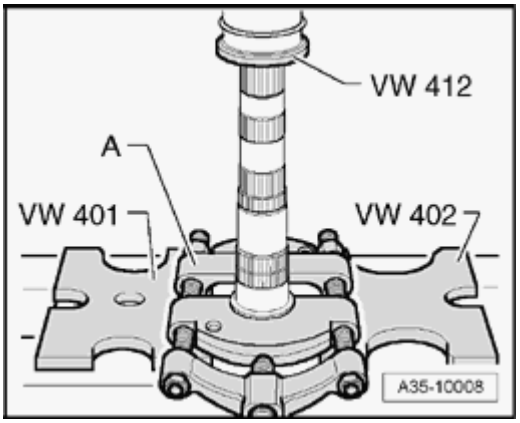

Fig. 453: Pressing Off Thrust Washer For Reverse Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Splitter 22 to 115 mm, e.g. Kukko 17/2

NOTE:

- **Install splitter - A - below thrust washer, and not below circlip.**
  - Then detach circlip below thrust washer.

Pressing off tapered roller bearing inner race with 2nd speed selector gear

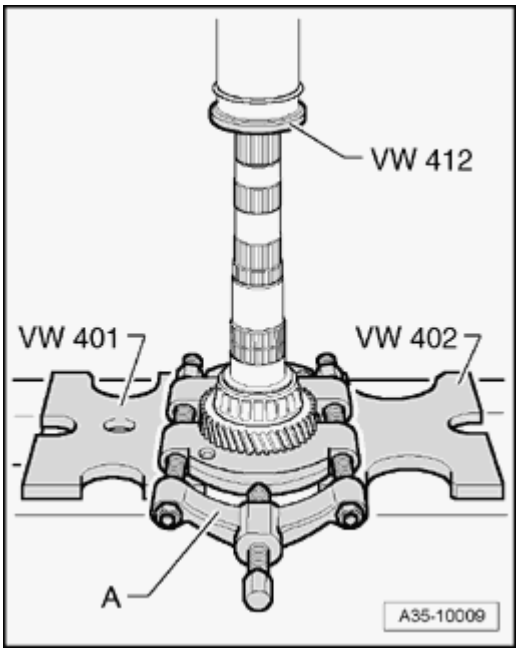

Fig. 454: Pressing Off Tapered Roller Bearing Inner Race With 2Nd Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Splitter 22 to 115 mm, e.g. Kukko 17/2

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NOTE:

- **When pressing off, make sure that only the gear teeth of the selector gear and not the gear shift splines contact the splitter - A -. Otherwise the gear shift splines will be damaged.**

- Remove circlip for tapered roller bearing inner race.

Pressing off 1st and 2nd gear synchronizing hub

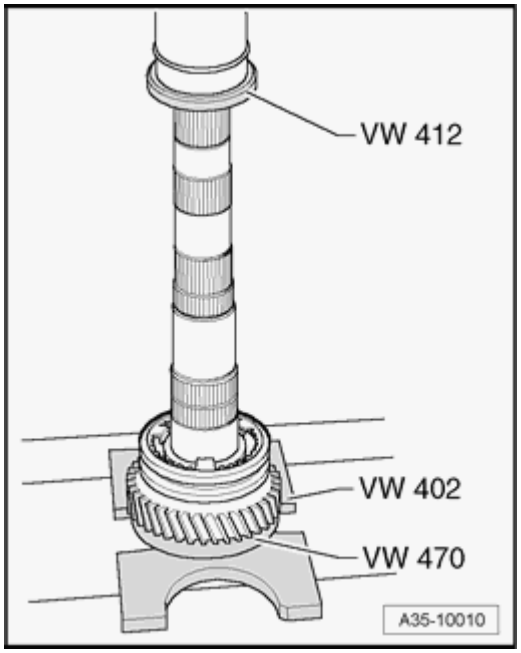

Fig. 455: Pressing Off 1st And 2nd Gear Synchronizing Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- Place selector gear in center of thrust ring VW 470 to press off synchronizing hub with 1st speed selector gear.

Installation position of circlips

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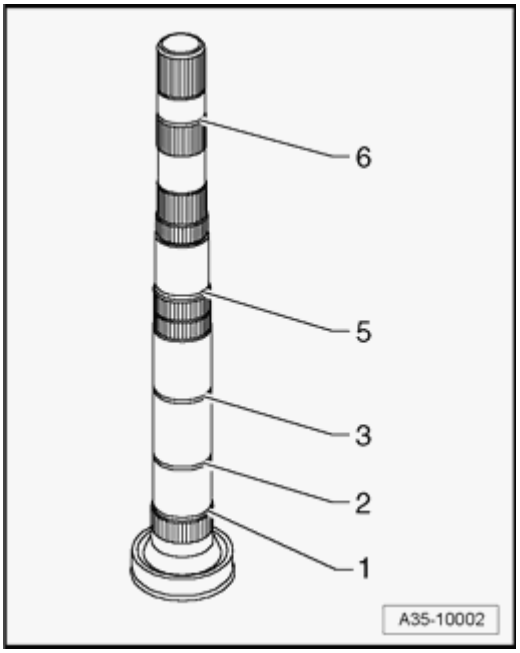

Fig. 456: Installation Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The required circlips for synchronizing hubs, needle bearings and individual gear wheels should be selected as shown in **Determining thickness of circlip**

- Circlip - **1** - secures the 1st and 2nd gear synchronizing hub.

Identification: blue color

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17
1.96	2.08	
1.99	2.11	

- Circlip - **2** - secures tapered roller bearing inner race.

Circlip thickness (mm)
3.50

- Circlip - **3** - secures thrust washer for reverse selector gear.

Circlip thickness (mm)
3.50

- Circlip - **4** - secures the 3rd gear wheel.

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Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	2.10

- Circlip - **5** - secures the 6th gear wheel.

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17
1.96	2.08	2.20
1.99	2.11	

- Determine circlips according to table.

Installation position of synchronizing rings for 1st and 2nd gear:

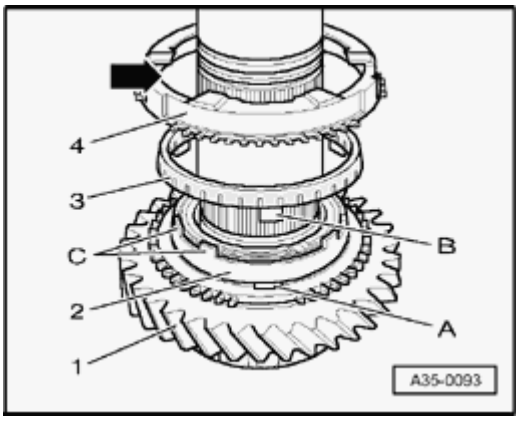

Fig. 457: Installation Position Of Synchronizer Rings For 1St And 2Nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **If components are not being replaced, make sure they are re-installed on same gear.**

- Install inner ring - **2** - onto selector gear - **1** -.
- Install intermediate ring - **3** -. Lug - **B** - must be inserted into recess - **A** -.
- Synchro-ring - **4** - installed. Guide tabs - **C** - through recess - **arrow** -.

Checking 1st gear inner ring for wear

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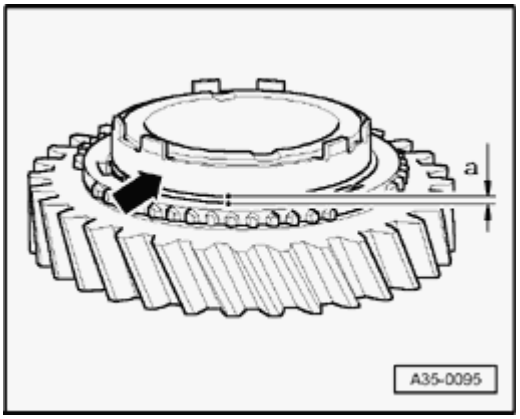

Fig. 458: Checking Inner Race Of 1st Gear For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check outer contact surface - **arrow** - for scoring or visible traces of wear and replace if necessary.
- Press inner ring onto chamfer on selector gear and measure gap - **a** - using a feeler gauge.

Gap - **a** -	As-new installation value	Wear limit
Inner ring for 1st gear	1.2 to 2.0 mm	0.6 mm

Checking 1st and 2nd gear intermediate ring for wear

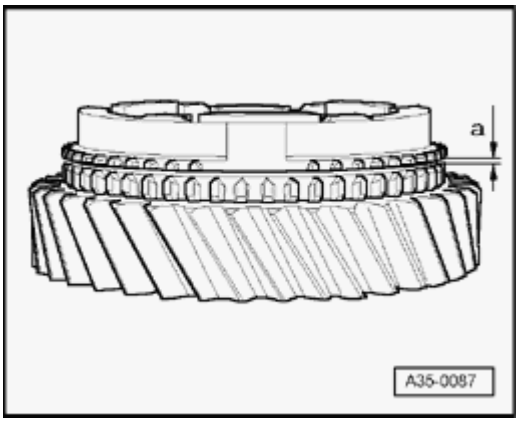

Fig. 459: Checking Synchronizer Ring For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check inner contact surface of synchro-ring for scoring or visible traces of wear and replace if necessary.
- Press inner ring, intermediate ring and synchro-ring onto chamfer on selector gear and measure gap - **a** - using a feeler gauge.

Gap - **a** -	As-new installation value	Wear limit
1st and 2nd gear	1.4to2.0 mm	0.8 mm

Pressing on 1st and 2nd gear synchronizing hub

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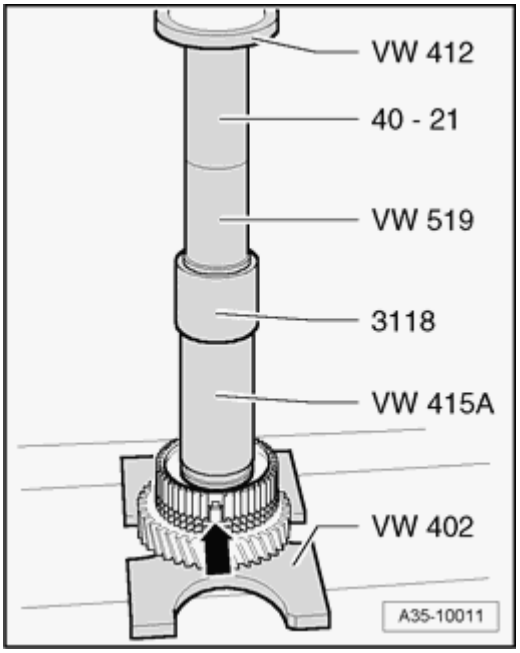

Fig. 460: Pressing On 1st And 2nd Gear Synchronizing Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inside collar faces 2nd gear.

- The tabs of 1st gear synchro-ring and recesses on synchronizing hub must align - **arrow** - when pressing on.

Assembling 1st and 2nd gear locking collar/synchronizing hub

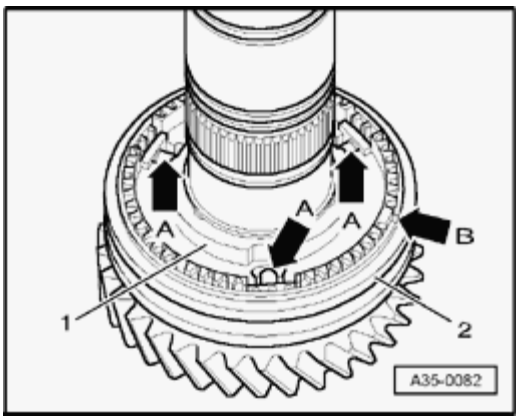

Fig. 461: Assembly Of Operating Sleeve/Synchronizers For 1st And 2nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install locking pieces - **arrows A** - into mounted synchronizing hub - **1** -.
- Install locking collar - **2** - onto synchronizing hub so that the wide splines of locking collar and

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synchronizing hub - **arrow B** - coincide.

- Install circlip for 1st and 2nd gear synchronizing hub.
- Install 2nd speed selector gear with needle bearing and synchro-rings.
- Install circlip for tapered roller bearing inner race onto hollow shaft.

Pressing on tapered roller bearing inner race

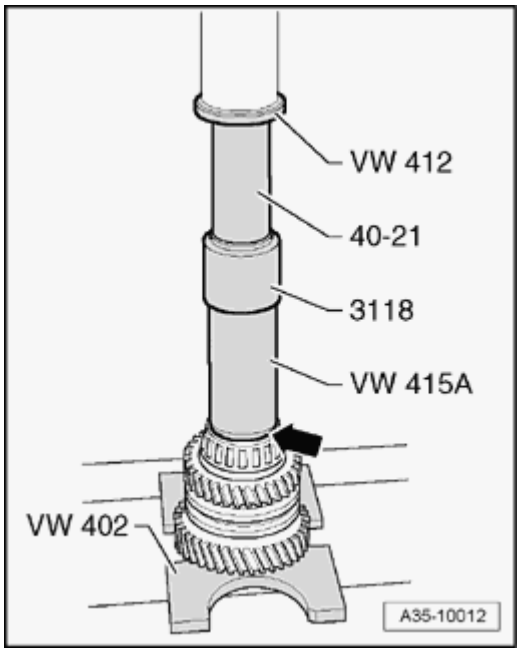

Fig. 462: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Shoulder of tube VW 415 A faces inner race - **arrow** -.

Then check axial play of 1st speed and 2nd speed selector gears **Checking axial play of selector gears**.

Checking axial play of selector gears

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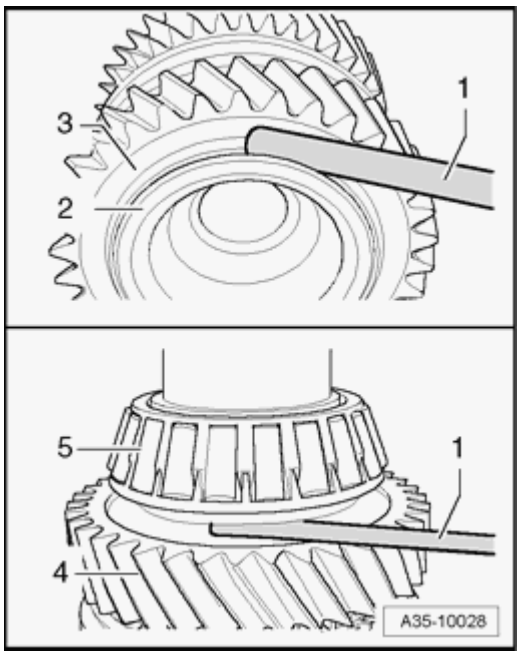

Fig. 463: Checking Axial Play Of Selector Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check axial play of selector gears between hollow shaft - **2** - and 1st speed selector gear - **3** - and also between 2nd speed selector gear - **4** - and tapered roller bearing inner race - **5** - using feeler gauge - **1** -.

- The play must be 0.20 to 0.50 mm.

Pressing on thrust washer for reverse selector gear

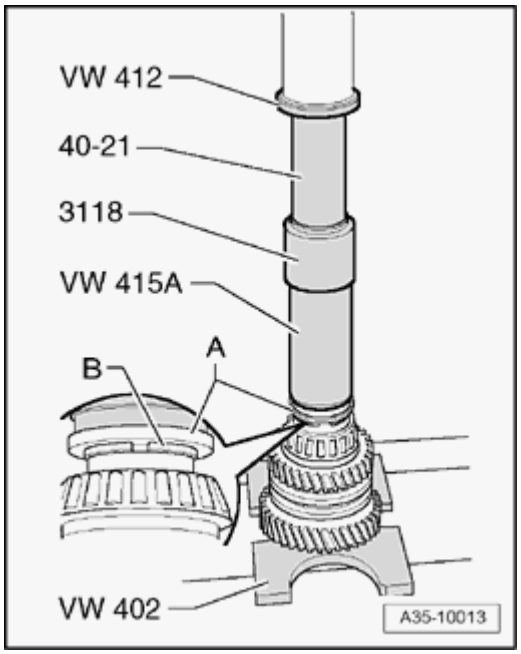

Fig. 464: Pressing On Thrust Washer For Reverse Selector Gear

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install circlip - **B** - onto hollow shaft.
- Press on thrust washer - **A** - until it makes contact with circlip.

39 FINAL DRIVE - FRONT DIFFERENTIAL

FLANGE SHAFT OIL SEAL, REPLACING

Flange shaft oil seal (left-side), replacing

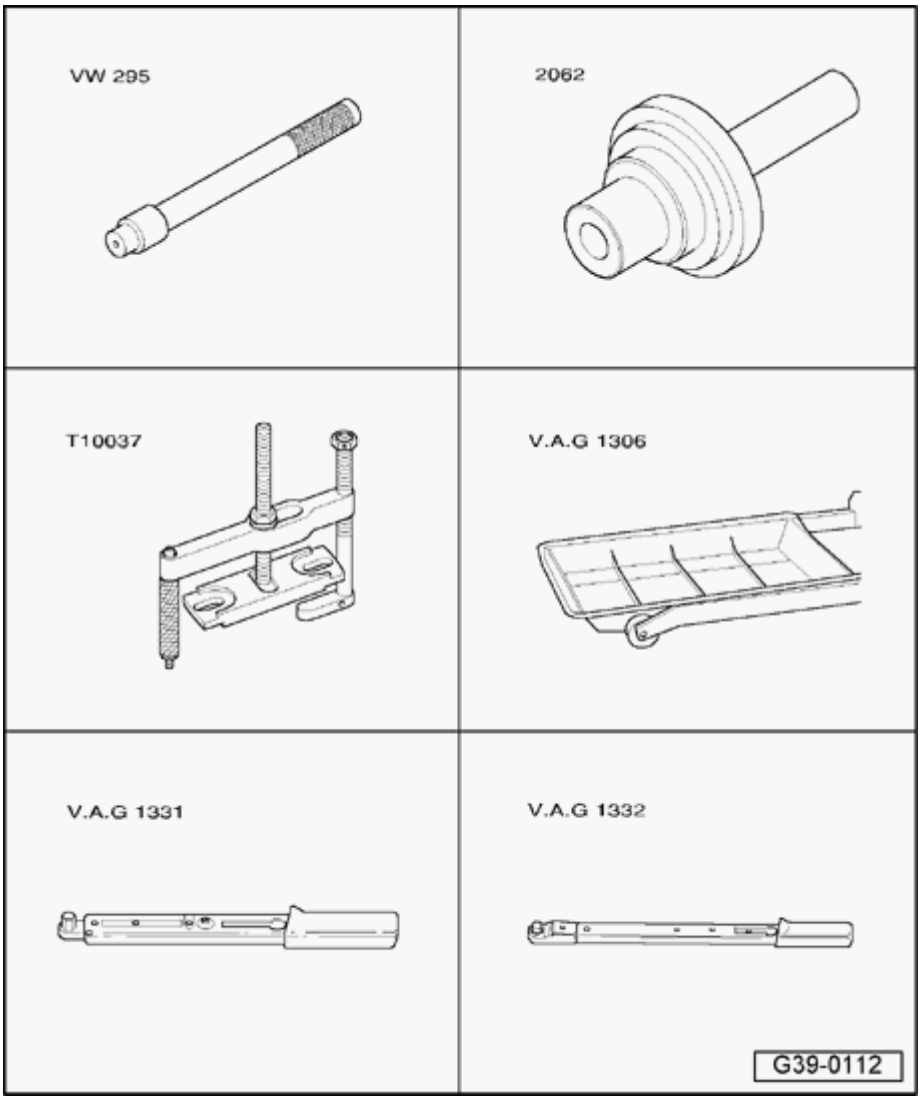

Fig. 465: Identifying Special Tools -- Flange Shaft Oil Seal, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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- Needle bearing drift VW295
- Driver 2062
- Puller T10037
- Drip tray V.A.G1306

- Torque wrench V.A.G1331
- Torque wrench V.A.G1332
- **Sealing grease G 052 128 A1**

Removing

- Transmission is installed

Observe the general repair instructions --> **General repair instructions**.

- Remove left front wheel.

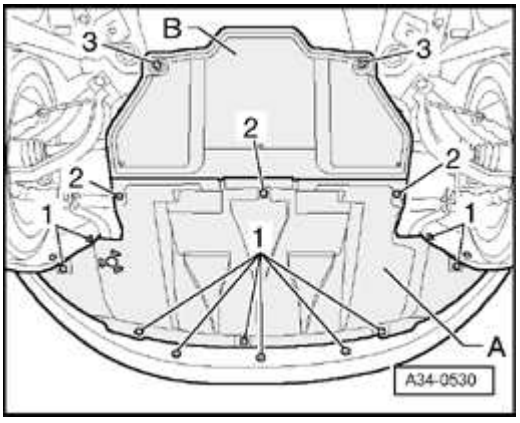

Fig. 466: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

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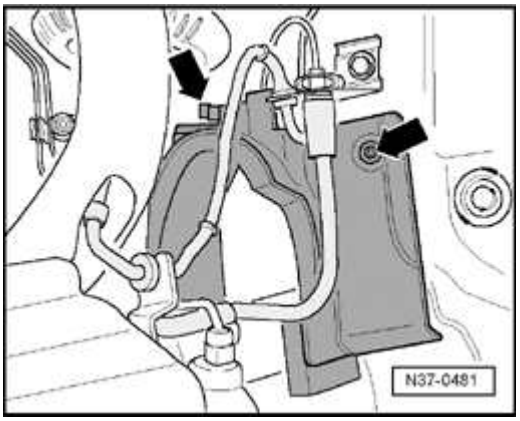

Fig. 467: Axle Shaft Noise Insulation Retainers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove sound insulation - **arrows** - in wheel housing (left-side).

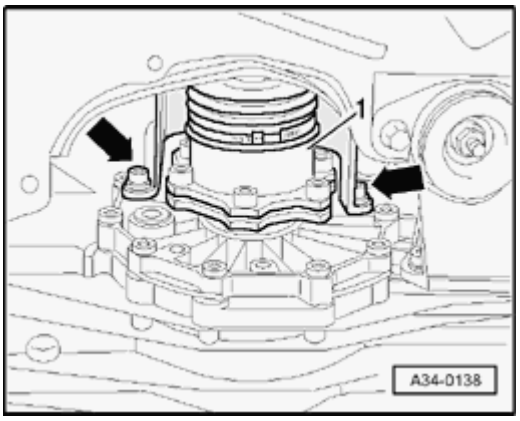

Fig. 468: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove heat shield - **arrows** - for drive axle (left-side).
- Remove drive axle - **1** - from flange shaft and tie as far as possible to front, taking care not to damage surface protection.
- Place drip tray V.A.G1306 underneath.

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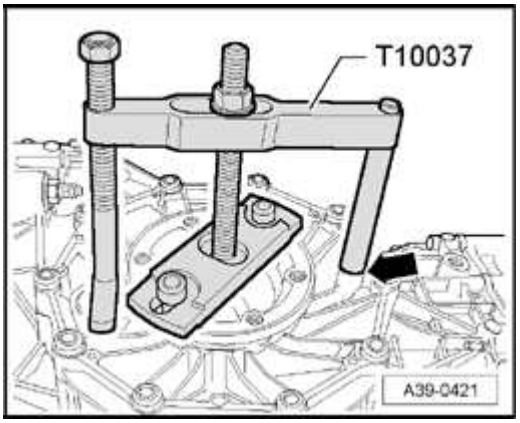

Fig. 469: Removing Flange Shaft Using Puller T10037
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft (left-side) by securing puller T10037 to cover for final drive - **arrow** -.

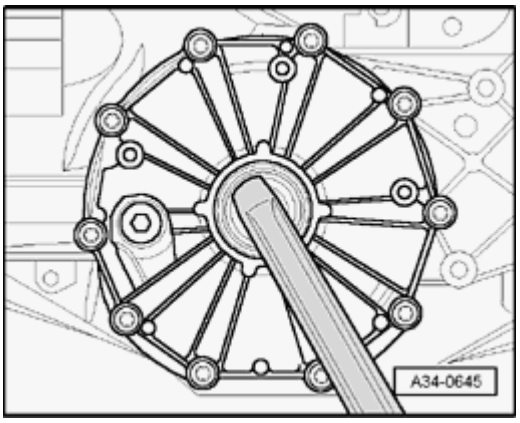

Fig. 470: Prying Out Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out flange shaft oil seal.

Installing

- Lightly oil outer circumference of new oil seal.

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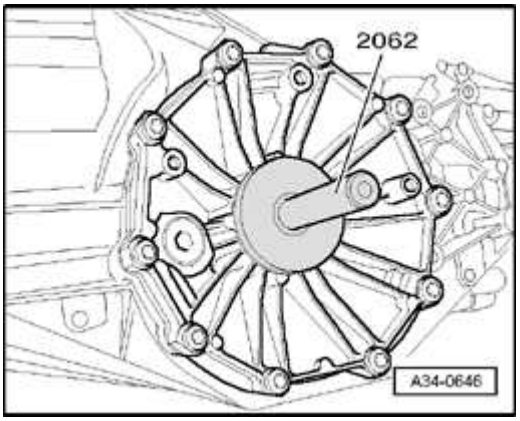

Fig. 471: Driving In New Flange Shaft Oil Seal Using Driver 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive new oil seal for flange shaft using driver 2062; keep seal straight when installing.
- Insertion depth: 5.50 ± 0.15 mm below top of cover.
- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .

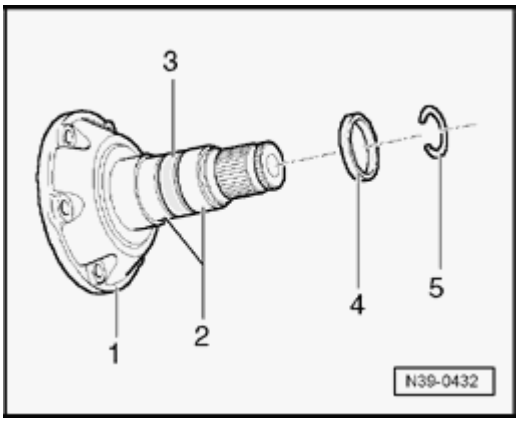

Fig. 472: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Inspect polygon bearings for visible damage - 2 -.**
- **If the polygon bearings - 2 - do not run smoothly with the flange shaft removed, this does not necessarily indicate that the bearings are faulty. A test for noisy bearings can only be performed with the bearings installed.**
- **The polygon bearings can only be replaced together with the flange shaft.**
- **Always replace circlip for flange shaft - 5 -.**

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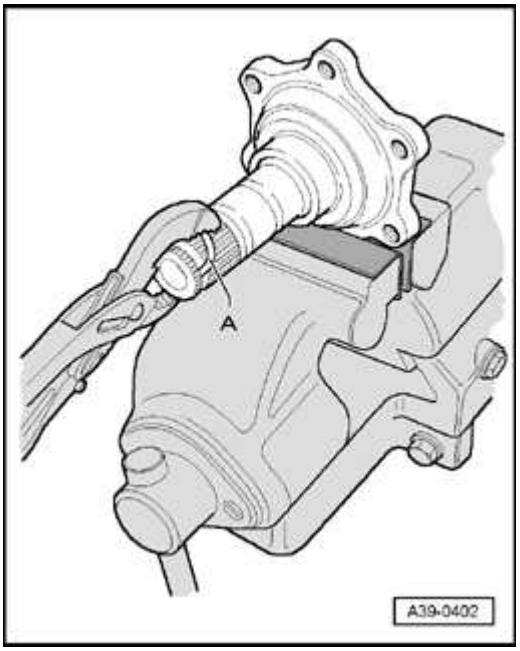

Fig. 473: Identifying Flange Shaft Clamped In Vise And Using New Circlip To Press Old Circlip Out Of Groove In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp flange shaft in vise, using jaw protectors. Use new circlip - **A** - to press old circlip out of groove in flange shaft.
- Knock flange shaft in with needle bearing drift VW295.
- Bolt drive axle to flange shaft --> **40 - FRONT SUSPENSION**
- If applicable, bolt on heat shield for drive axle (left-side).

- Fill transmission with oil and check oil level --> **Transmission oil level, checking** .
- Install sound insulation.

Tightening torque

Component		Nm
Heat shield above drive shaft to transmission		23

Flange shaft oil seal (right-side), replacing

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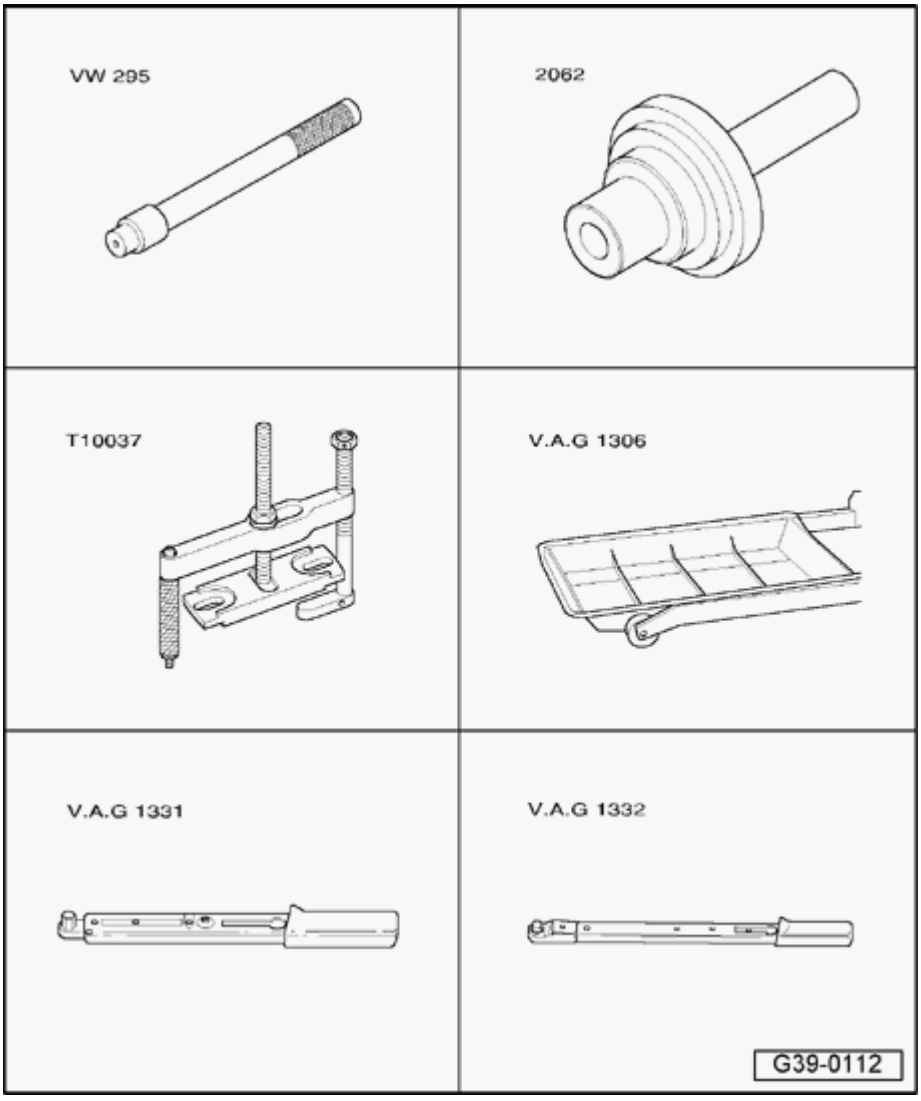

Fig. 474: Identifying Special Tools -- Flange Shaft Oil Seal, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Needle bearing drift VW295
- Driver 2062
- Puller T10037
- Drip tray V.A.G1306

- Torque wrench V.A.G1331
- Torque wrench V.A.G1332
- **Sealing grease G 052 128 A1**

Removing

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- With transmission is installed

Observe the general repair instructions --> **General repair instructions**.

- Loosen bolt for right-side drive axle / wheel hub.
- Remove right front wheel.

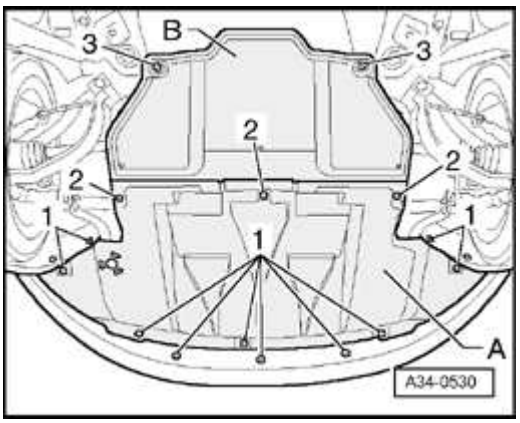

Fig. 475: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

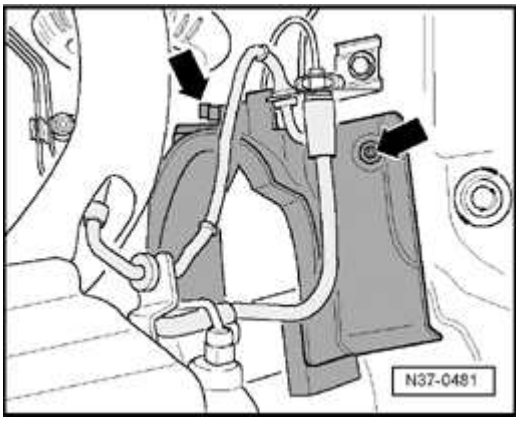

Fig. 476: Axle Shaft Noise Insulation Retainers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove sound insulation - **arrows** - in wheel housing (right-side).

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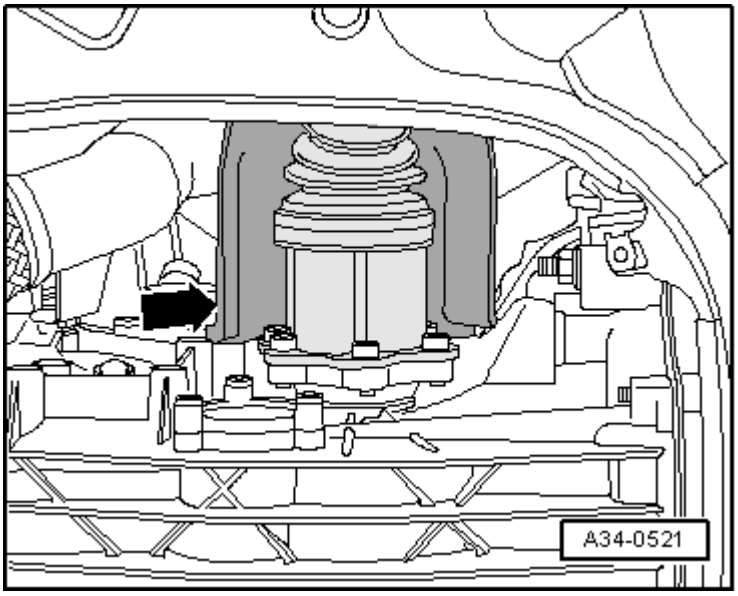

Fig. 477: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for drive axle (right-side).
- Remove drive axle (right-side) --> **40 - FRONT SUSPENSION** .
- Place drip tray V.A.G1306 underneath.

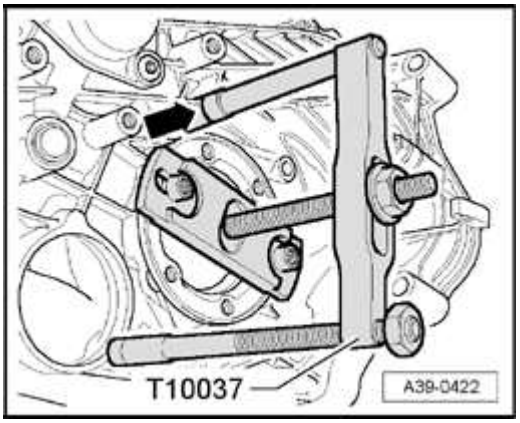

Fig. 478: Removing Flange Shaft By Securing Puller T10037 To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft (right-side); by securing puller T10037 to transmission housing - **arrow** -.

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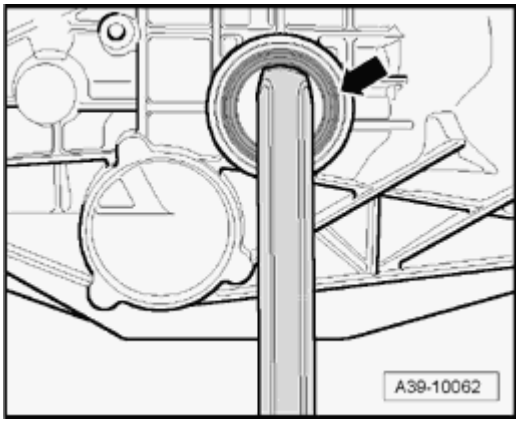

Fig. 479: Prying Out Flange Shaft Oil Seal Using An Assembly Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out flange shaft oil seal - **arrow** - using an assembly lever.

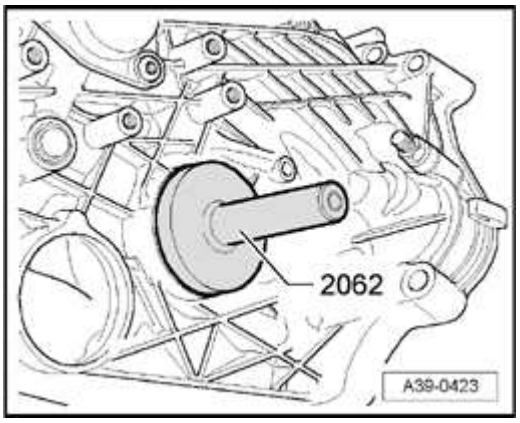

Fig. 480: Driving In New Flange Shaft Oil Seal Using Fitting Drift 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

- Lightly oil outer circumference of new oil seal.
- Drive new oil seal for flange shaft using driver 2062; keep seal straight when installing.

- Insertion depth: 5.50 ± 0.15 mm below top of cover.

- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .

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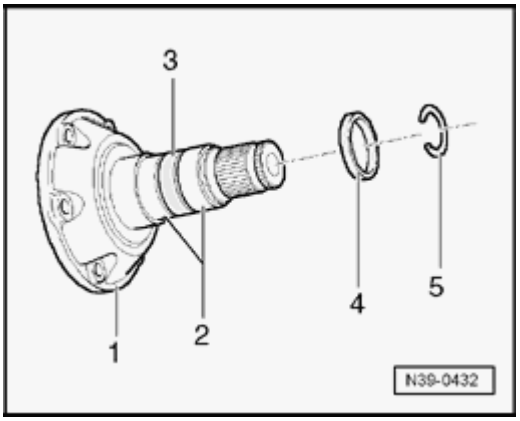

Fig. 481: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Inspect polygon bearings for visible damage - 2 -.**
- **If the polygon bearings - 2 - do not run smoothly with the flange shaft removed, this does not necessarily indicate that the bearings are faulty. A test for noisy bearings can only be performed with the bearings installed.**
- **The polygon bearings can only be replaced together with the flange shaft.**
- **Always replace circlip for flange shaft - 5 -.**

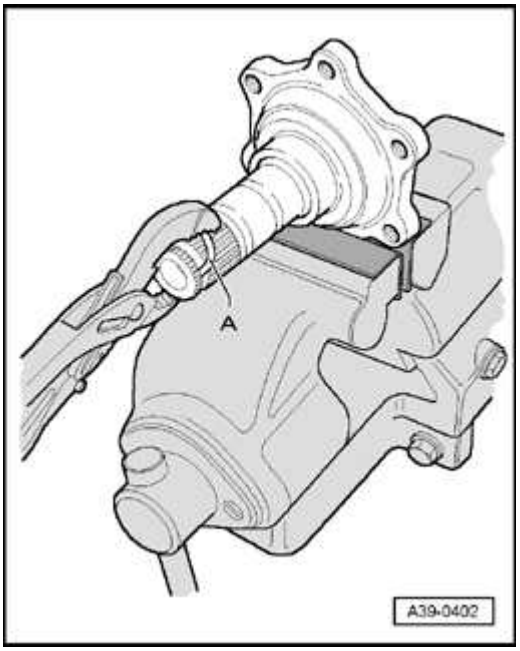

Fig. 482: Identifying Flange Shaft Clamped In Vise And Using New Circlip To Press Old Circlip Out Of Groove In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp flange shaft in vise, using jaw protectors. Use new circlip - **A** - to press old circlip out of groove in flange shaft.

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- Knock flange shaft in using needle bearing drift VW295.
- Install drive axle--> **40 - FRONT SUSPENSION** .
- Bolt on heat shield for drive axle (right-side).

- Fill transmission with oil and check oil level--> **Transmission oil level, checking** .
- Install sound insulation.

Tightening torque

Component		Nm
Heat shield above drive axle to transmission		23

DIFFERENTIAL, REMOVING AND INSTALLING

Differential, removing and installing

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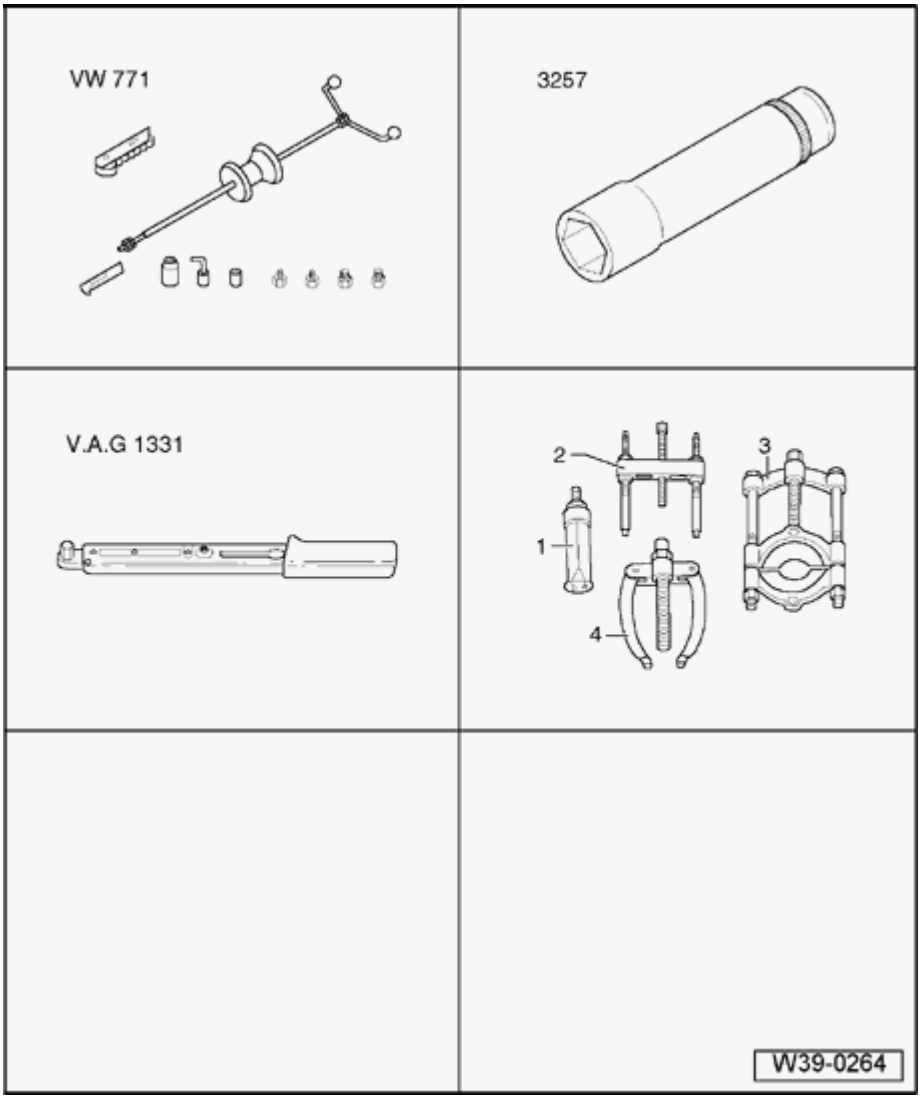

Fig. 483: Identifying Special Tools - Differential, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Slide hammer-complete set VW771
- Socket (27 mm) 3257
- Torque wrench V.A.G1331
- - **1** - Internal puller Kukko 21/5

NOTE:

- **Removing and installing is possible with the transmission installed.**
- **The differential can be removed and installed without removing the selector mechanism, input shaft, pinion shaft/hollow shaft or bearing housing. These components must be removed if the differential needs to be adjusted.**

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- **Inspect polygon bearings for visible damage.**
- **The polygon bearings can only be replaced together with the flange shaft.**
- **If the polygon bearings do not run smoothly with the flange shaft removed, this does not necessarily indicate that the bearings are faulty. A test for noisy bearings can only be performed with the bearings installed.**
- **A spacer ring is installed between the polygon bearing and the differential sun wheel on flange shafts with 30 mm spline diameter Flange shaft assembly, - Item4 -.**
- **Adjustment work is required when replacing the parts marked with 1) . Table of adjustments --> Table of adjustments**

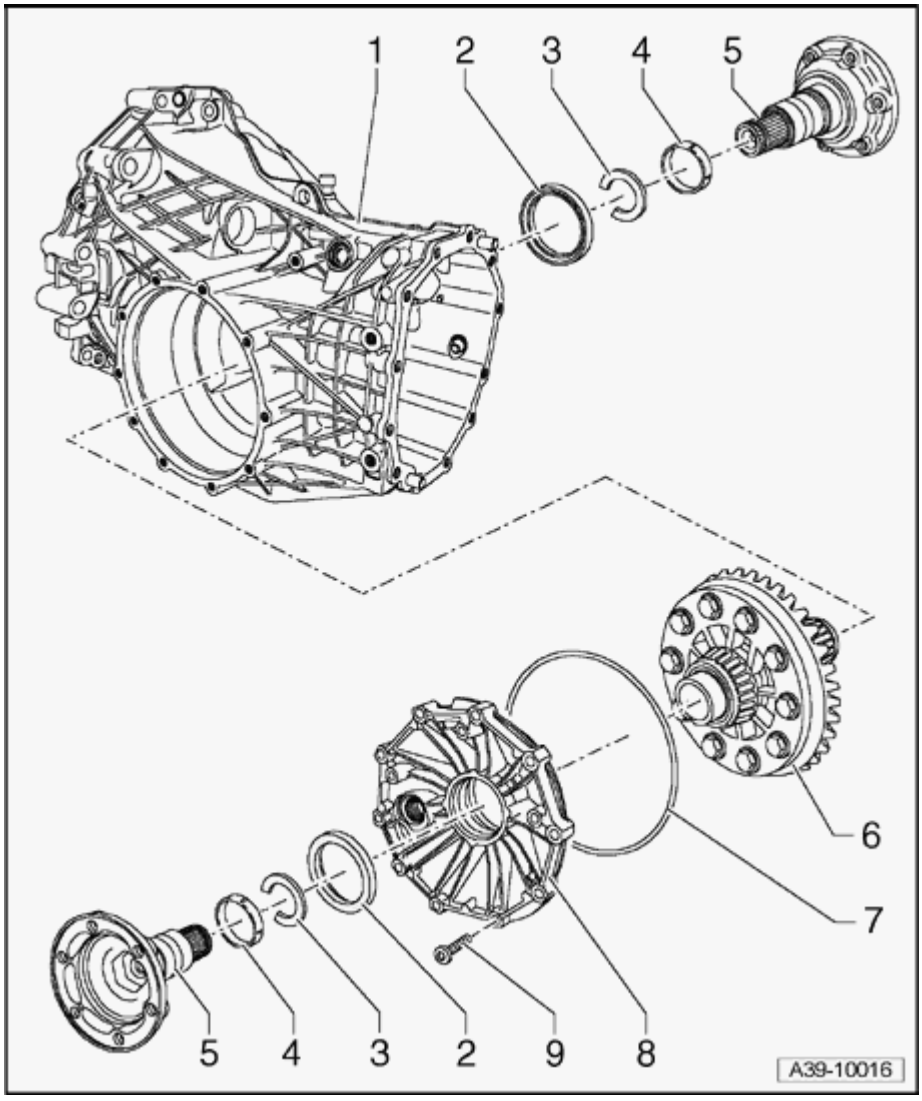

Fig. 484: Differential Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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1 - Transmission housing [1)]

2 - Oil seal

- Removing (left-side) **Removing flange shaft oil seal (left-side)**
- Installing (left-side) **Installing flange shaft oil seal (left-side)**
- Removing (right-side) **Removing flange shaft oil seal (right-side)**
- Installing (right-side) **Installing flange shaft oil seal (right-side)**

3 - Circlip

- Replace
- Removing and installing **Removing and installing circlip**

4 - Spacer ring

- Is only installed on flange shafts with a spline diameter of 30 mm
- Remove with Internal puller 30 to 37 mm, e.g. Kukko 21/5
- Installing **Installing spacer ring**

5 - Flange shaft

- Removing (left-side) **Removing flange shaft (left-side)**
- Removing (right-side) **Remove right flange shaft**
- Drive in with drift VW295.
- Flange shaft assembly **Flange shaft assembly**

6 - Differential with ring gear[1)]

- Disassembling and assembling --> **Differential, disassembling and assembling**

7 - O-ring

- Always replace
- Lubricate with gear oil

8 - Cover for final drive [1)]

9 - TORX bolt, 20 Nm plus an additional 90° $^{1}/_{4}$ turn

Removing flange shaft (left-side)

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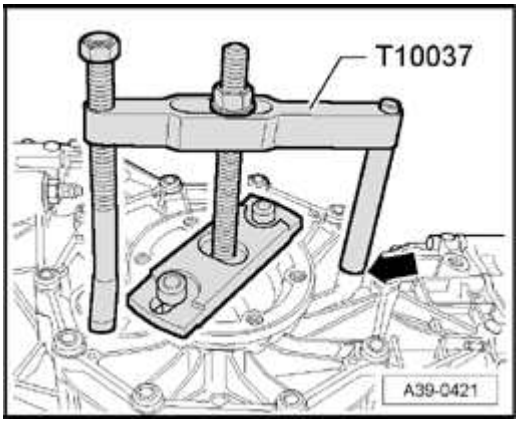

Fig. 485: Removing Flange Shaft Using Puller T10037
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft (left-side) by securing puller T10037 to cover for final drive - **arrow** -.

Remove right flange shaft

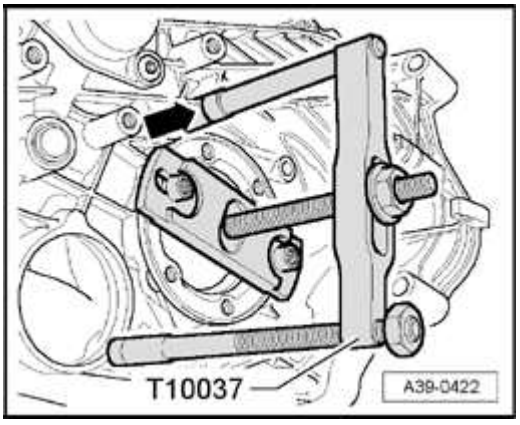

Fig. 486: Removing Flange Shaft By Securing Puller T10037 To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft (right-side) by securing puller T10037 to transmission housing - **arrow** -.

Removing and installing circlip

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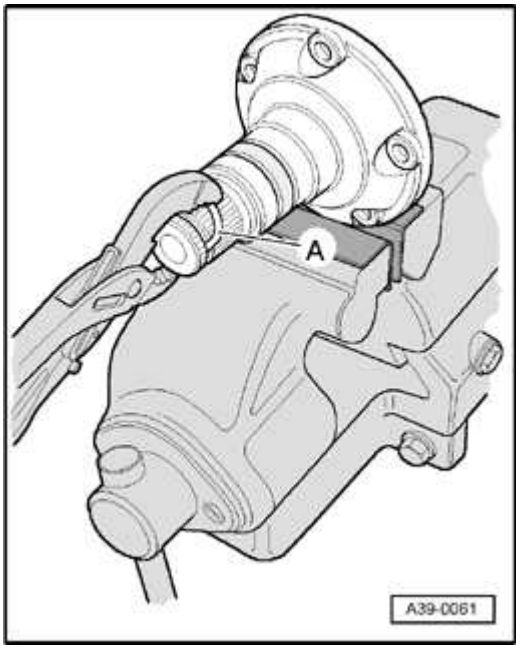

Fig. 487: Removing And Installing Securing Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp flange shaft in vise, using jaw protectors. Use new circlip - **A** - to press old circlip out of groove in flange shaft.

Installing spacer ring

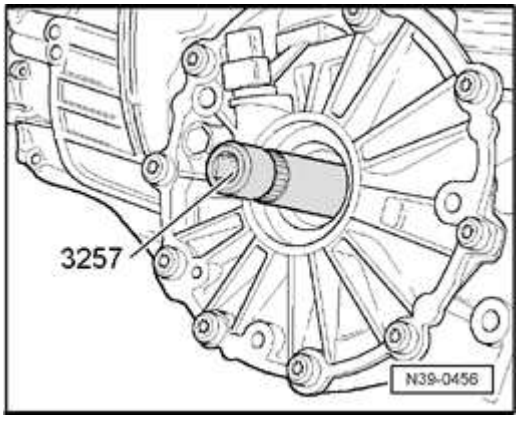

Fig. 488: Installing Spacer Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive new spacer ring in onto stop; do not cant ring when doing this.

Flange shaft assembly

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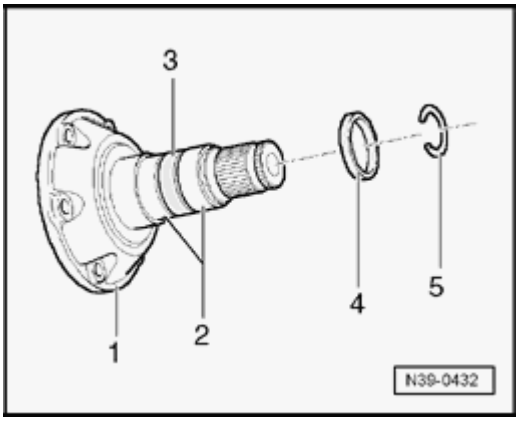

Fig. 489: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Flange shaft
2. Needle bearing (polygon bearing)
3. Spacer ring
4. Spacer ring - installed on shafts with 30mm spline diameter
5. Circlip

NOTE:

- **The needle bearing (polygon bearing) does not turn easily when the flange shaft is removed. This does not indicate that the bearing is faulty.**

Removing flange shaft oil seal (left-side)

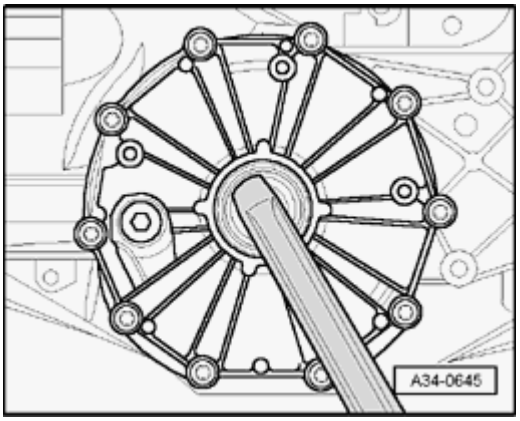

Fig. 490: Prying Out Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out flange shaft oil seal using an assembly lever.

Installing flange shaft oil seal (left-side)

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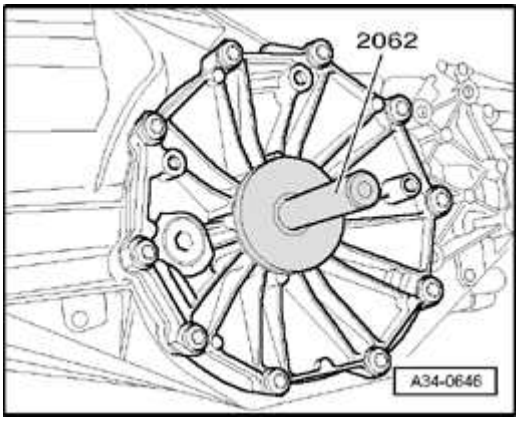

Fig. 491: Driving In New Flange Shaft Oil Seal Using Driver 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil outer circumference of new seal.
- Drive new flange shaft oil seal using driver 2062; keep seal straight when installing.

- Insertion depth: 5.50 ± 0.15 mm below top of cover.
- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .

- Knock flange shaft in with needle bearing drift VW295.

Removing flange shaft oil seal (right-side)

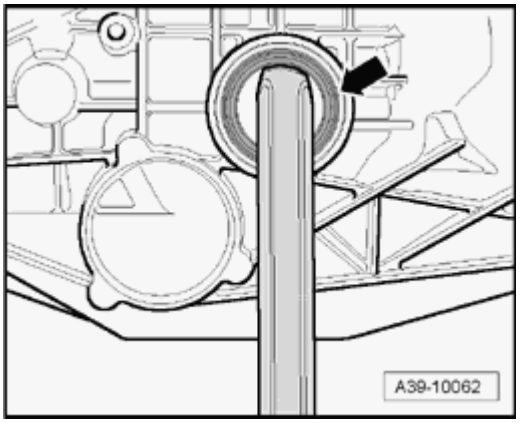

Fig. 492: Prying Out Flange Shaft Oil Seal Using An Assembly Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out flange shaft oil seal - **arrow** - using an assembly lever.

Installing flange shaft oil seal (right-side)

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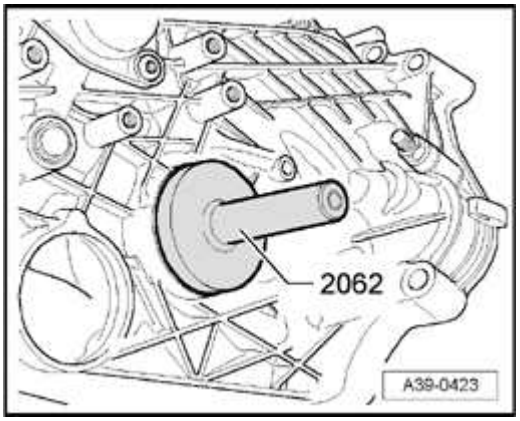

Fig. 493: Driving In New Flange Shaft Oil Seal Using Fitting Drift 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil outer circumference of new seal.
- Drive new flange shaft oil seal using fitting drift 2062; keep seal straight when installing.

- Insertion depth: 5.50 ± 0.15 mm below top of cover.

- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .

DIFFERENTIAL, DISASSEMBLING AND ASSEMBLING

Differential, disassembling and assembling

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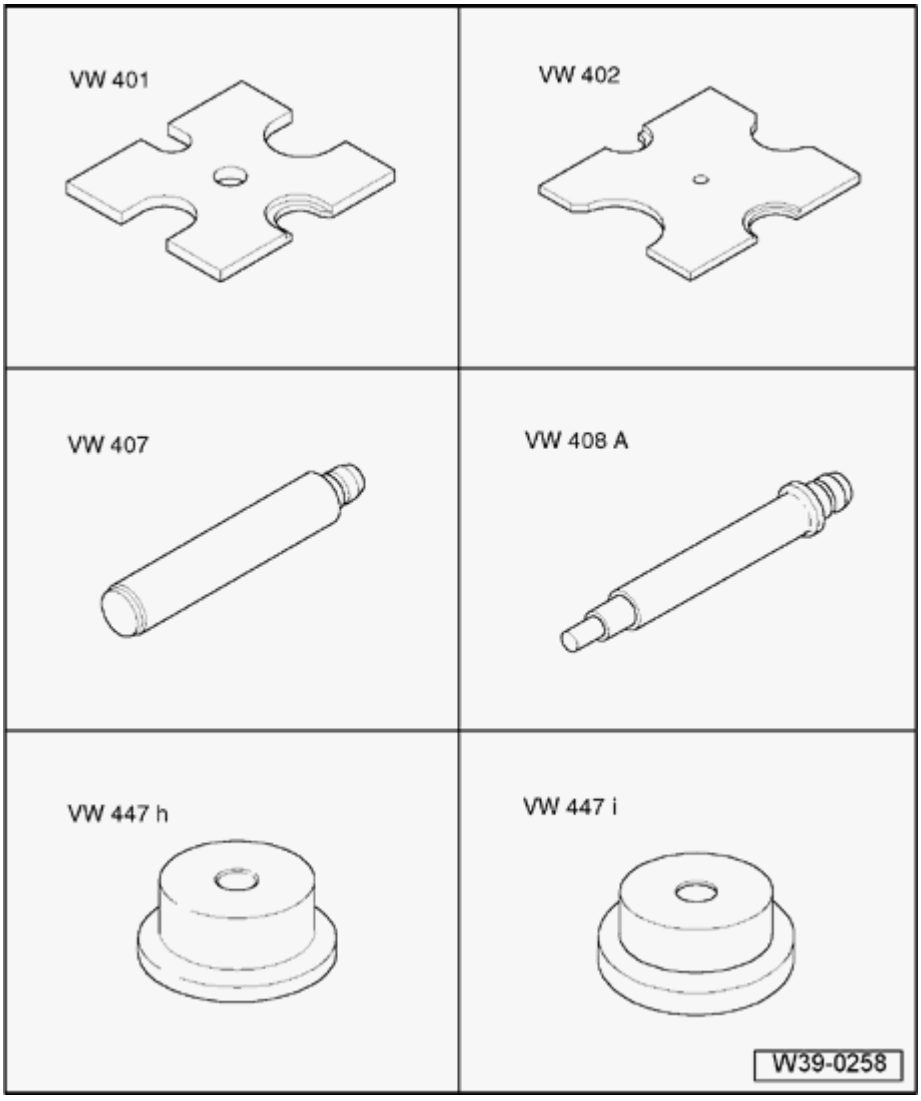

Fig. 494: Identifying Special Tools - Differential, Disassembling And Assembling (1 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW401
- Thrust plate VW402
- Punch VW407
- Punch VW408A

- Thrust pad VW447H
- Thrust pad VW 447 i

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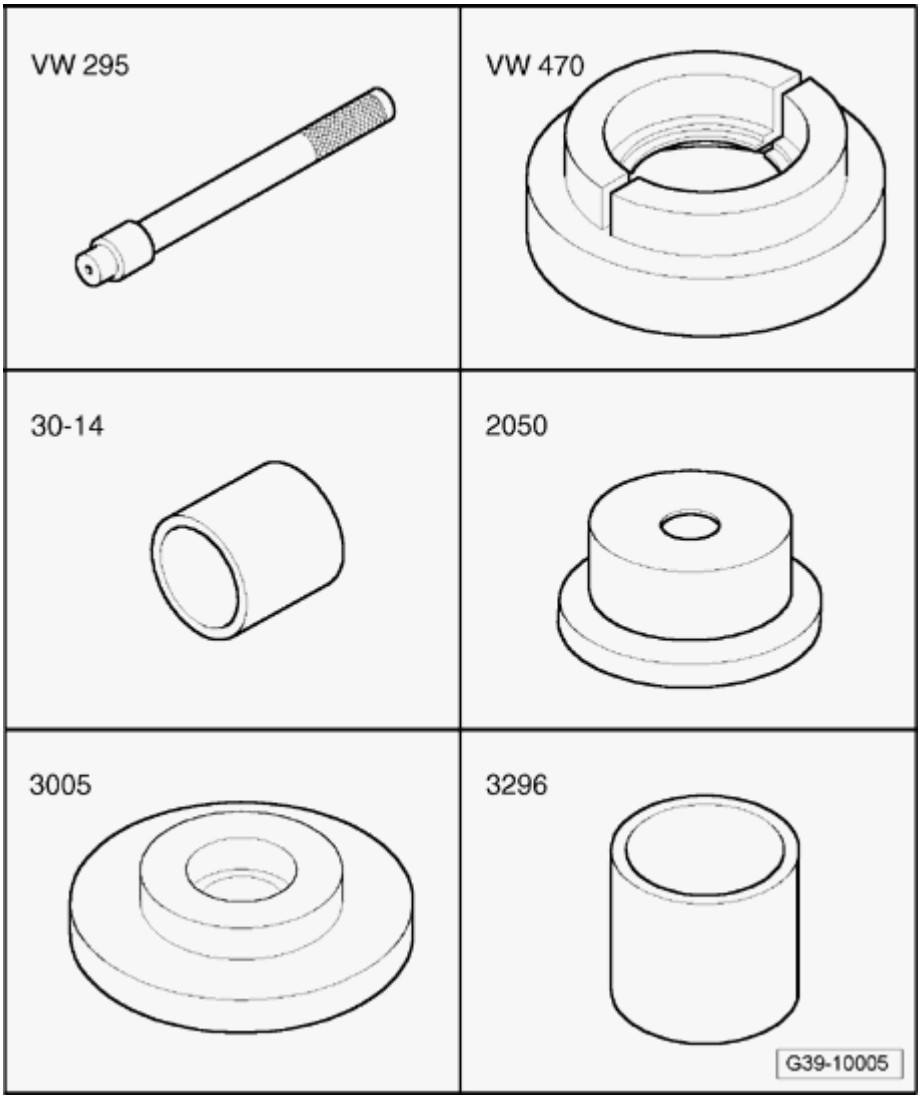

Fig. 495: Identifying Special Tools - Differential, Disassembling And Assembling (2 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Needle bearing drift VW 295
- Thrust ring VW 470
- Sleeve 30 - 14
- Thrust plate 2050

- Thrust pad 3005
- Tube 3296

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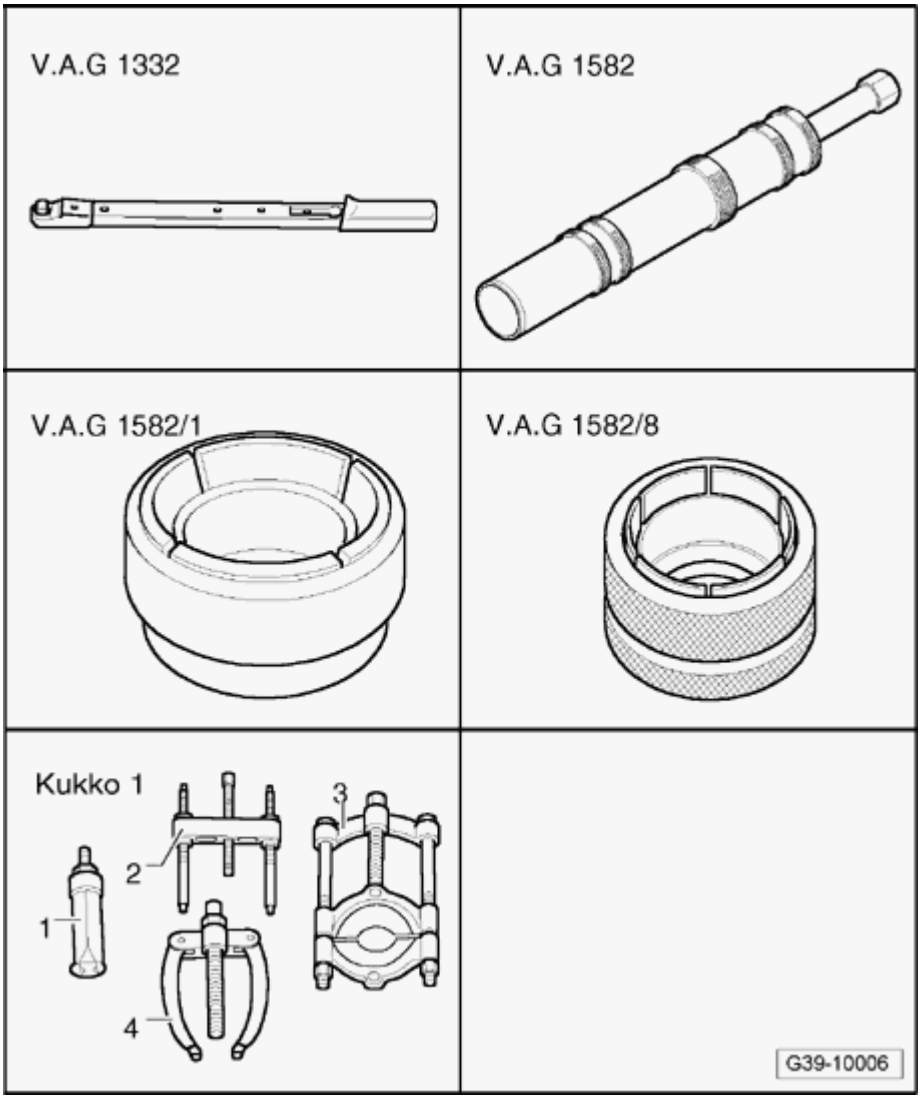

Fig. 496: Identifying Special Tools - Differential, Disassembling And Assembling (3 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Torque wrench V.A.G 1332
- Taper roller bearing puller V.A.G 1582
- Adapter V.A.G 1582/1
- Adapter V.A.G 1582/8

- **- 1 -** Internal puller Kukko 21/8
- **- 4 -** Counter-support Kukko 22/2

Removing and installing differential --> **Differential, removing and installing**.

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NOTE:

- **Always replace both tapered roller bearings together.**
- **Adjustment work is required when replacing the parts marked with 1) . Table of adjustments --> Table of adjustments**

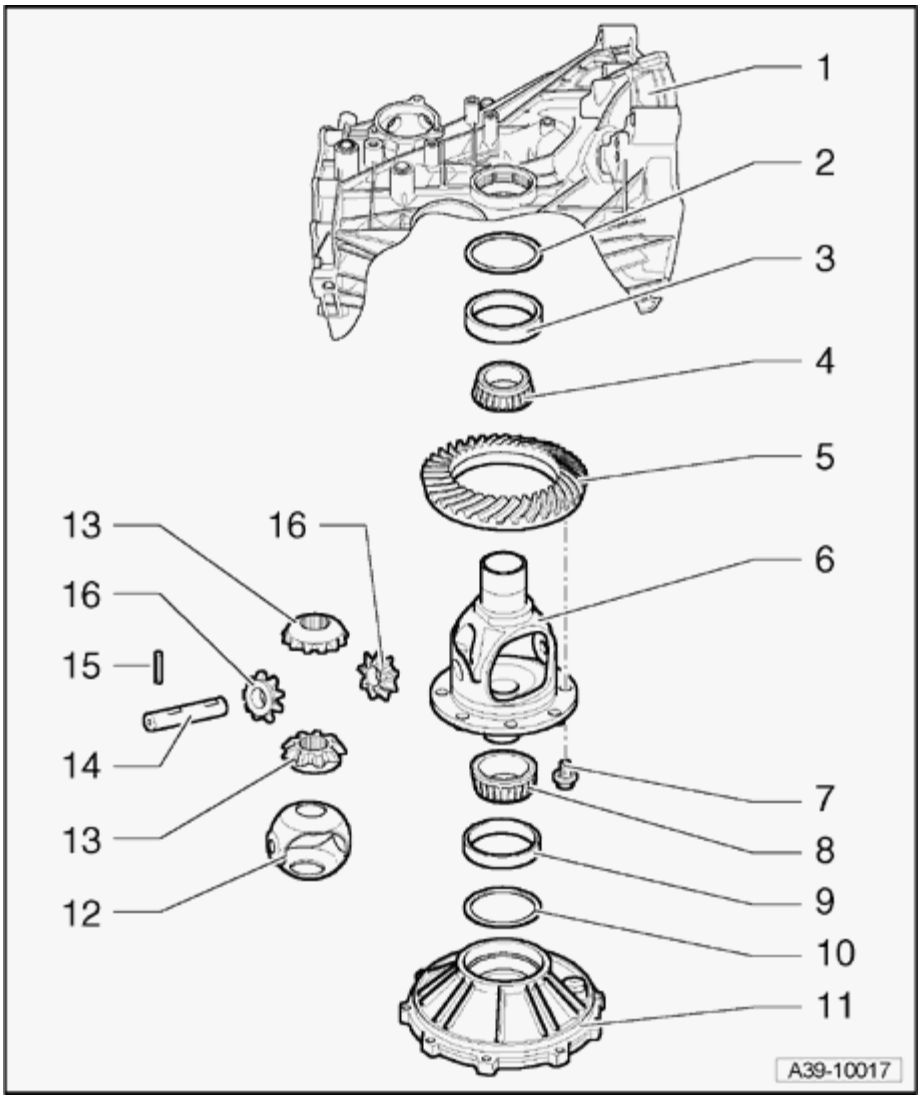

Fig. 497: Differential Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing 1)

2 - Shim "S_2 "

- Note thickness
- Table of adjustments --> **Table of adjustments**

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3 - Outer race for tapered roller bearing (right-side)[1)]

- Pulling out **Pulling tapered roller bearing outer race (right-side) out of transmission housing**
- Driving in **Driving outer race for tapered roller bearing (right-side) into transmission housing**

4 - Inner race for tapered roller bearing (right-side)[1)]

- Pulling off **Pulling off inner race for tapered roller bearing (right-side)**
- Pressing on **Pressing on tapered roller bearing inner race (left and right)**

5 - Ring gear[1)]

- Is paired with pinion shaft (final drive set)
- Select correct version according to transmission code letters
- Drive off housing using a punch **Driving ring gear off cage**
- installing onto differential cage **HEATING RING GEAR TO APPROX. 100° C and installing**

6 - Differential cage[1)]

7 - Bolt, 30 Nm plus an additional 90° $^{1}/_{4}$ turn

- Replace
- Lightly tighten bolts then tighten in diagonal sequence to correct torque

8 - Inner race for tapered roller bearing (left-side)[1)]

- Pulling off **Pulling off inner race for tapered roller bearing (left-side)**
- Pressing on **Pressing on tapered roller bearing inner race (left and right)**

9 - Outer race for tapered roller bearing (left-side)[1)]

- Pulling out **Pulling tapered roller bearing outer race (left-side) out of cover for final drive**
- Pressing in **Pressing tapered roller bearing outer race (left-side) into cover for final drive.**

10 - Shim "S_1 "

- Note thickness
- Table of adjustments --> **Table of adjustments**

11 - Cover for final drive [1)]

- With O-ring

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12 - One-piece thrust washer

- Lubricate with gear oil before installing

13 - Sun wheel

- Installing **Installing differential bevel gears**

14 - Differential pinion pin

- Drive out with drift after removing spring pin

15 - Spring pin

- For securing differential pinion pin
- Drive out from differential cage with drift
- Pressing in value: 1.5 mm above differential cage

16 - Planetary pinion

- Installing **Installing differential bevel gears**

Pulling tapered roller bearing outer race (right-side) out of transmission housing

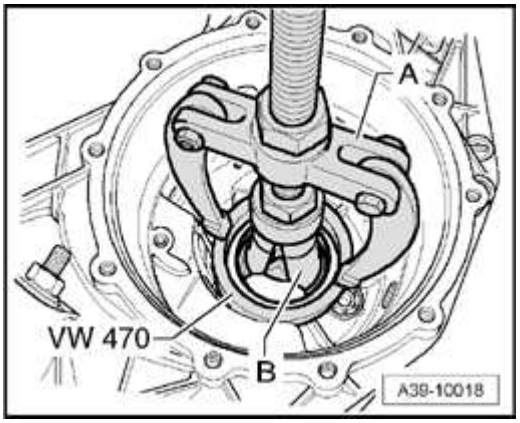

Fig. 498: Pulling Tapered Roller Bearing Outer Race (Right-Side) Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/2

B - Internal puller 56 to 70 mm, e.g. Kukko 21/8

- After removing, check shims for damage.

Driving outer race for tapered roller bearing (right-side) into transmission housing

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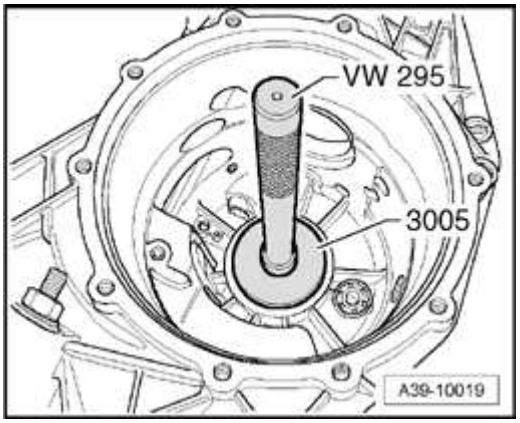

Fig. 499: Driving Outer Race For Tapered Roller Bearing With Shim Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pulling off inner race for tapered roller bearing (right-side)

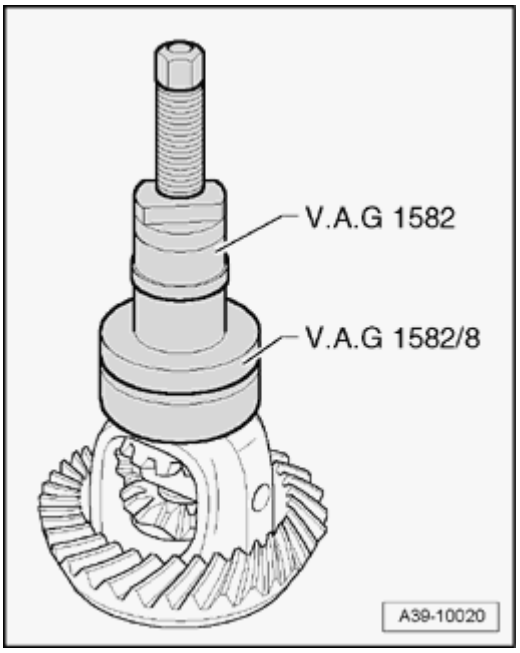

Fig. 500: Pulling Off Inner Race For Tapered Roller Bearing (Right-Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before setting up the puller, place thrust pad VW 447 H on differential cage.

Pressing on tapered roller bearing inner race (left and right)

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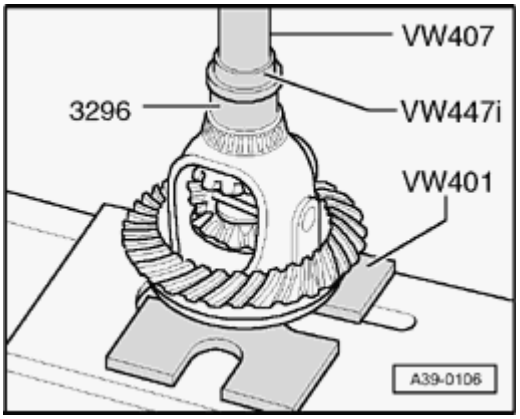

Fig. 501: Pressing On Right Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Use the same tools for pressing on tapered roller bearing inner race on left side and right side.**

CAUTION: Wear protective gloves.

- Heat inner race to approx. 100° C, install in position and press home.

Pulling off inner race for tapered roller bearing (left-side)

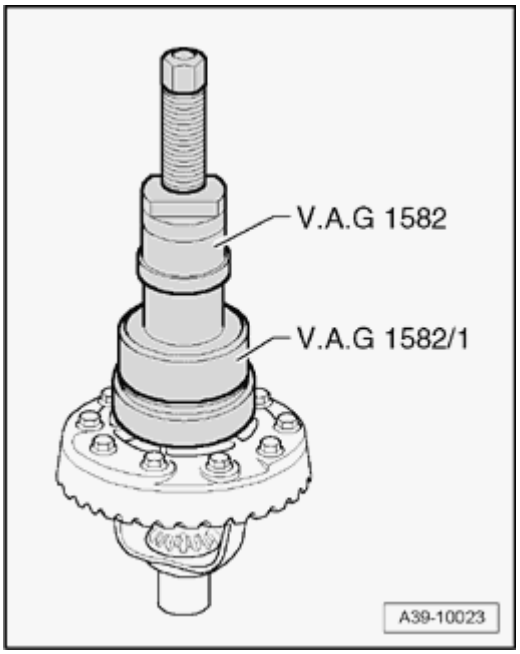

Fig. 502: Pulling Off Inner Race For Tapered Roller Bearing (Left-Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Before setting up the puller, place thrust pad VW 447 H on differential cage.

Pulling tapered roller bearing outer race (left-side) out of cover for final drive

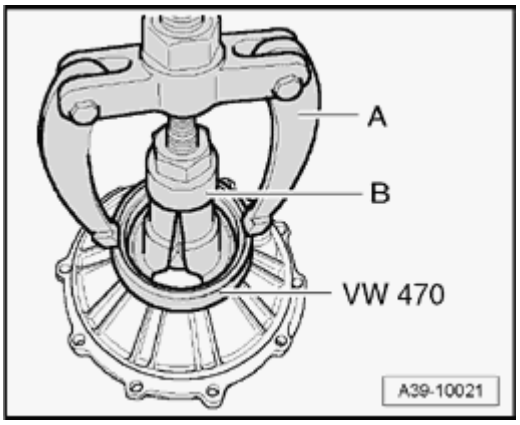

Fig. 503: Pulling Tapered Roller Bearing Outer Race (Left-Side) Out Of Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/2

B - Internal puller 56 to 70 mm, e.g. Kukko 21/8

- After removing, check shims for damage.

Pressing tapered roller bearing outer race (left-side) into cover for final drive.

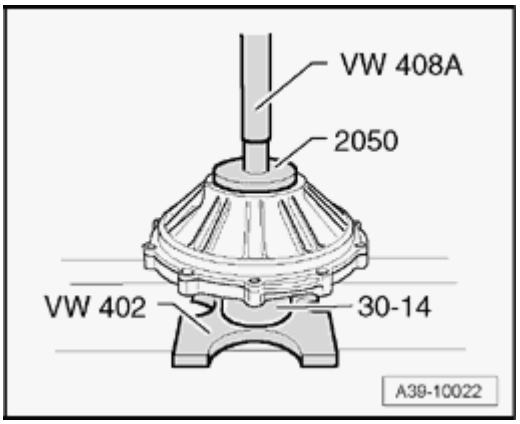

Fig. 504: Pressing Tapered Roller Bearing Outer Race (Left-Side) Into Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving ring gear off cage

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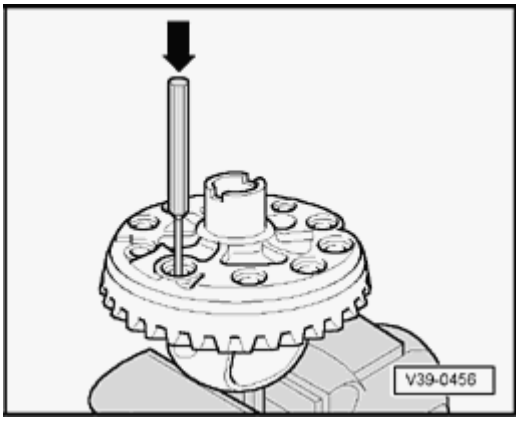

Fig. 505: Driving Out Ring Gear From Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Heating ring gear to approx. 100° C and installing

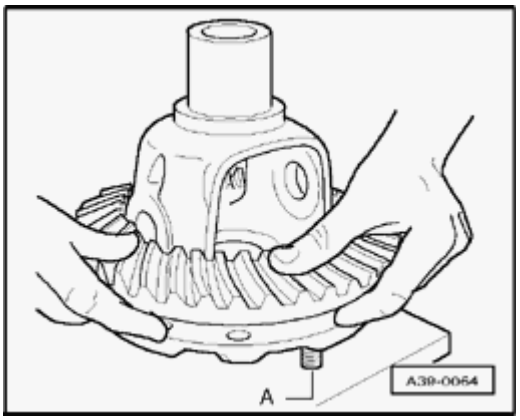

Fig. 506: Installing Ring Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing ring gear, use centralizing pins - **A** - (shop-made tool) to locate.

CAUTION: Wear protective gloves.

- Allow to cool slightly before screwing in new securing bolts. Then tighten to specified torque.

Installing differential bevel gears

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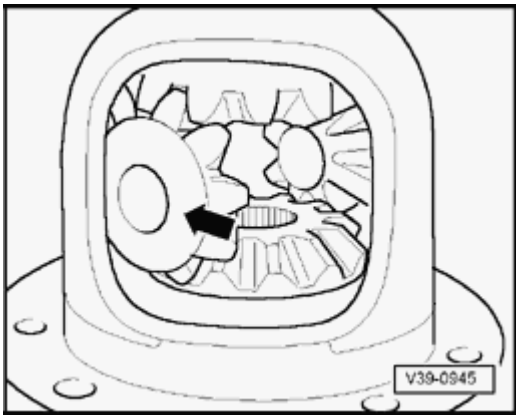

Fig. 507: Installing Small Differential Bevel Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lubricate one-piece thrust washer with gear oil and install.
- Insert sun wheels.
- Insert planet pinions offset 180° and rotate into position - **arrow** -.
- Drive differential pinion pin into final position and secure.

PINION SHAFT AND RING GEAR, ADJUSTING

Pinion shaft and ring gear, adjusting

NOTE:

- **Careful adjustment of the ring gear and pinion shaft is essential to ensure that the final drive gives long service and runs silently. For this reason, the pinion shaft and ring gear are matched together during manufacture, and checked to ensure a good mesh pattern and quiet running in both directions of rotation. The position of quietest running is found by moving the pinion shaft in an axial direction and at the same time lifting the ring gear out of the zero-play mesh position by the amount necessary to maintain the backlash within the specified tolerance.**
- **The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.**
- **The deviation (tolerance) "r" in relation to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the ring gear. The final drive set (pinion shaft and ring gear) may only be replaced together as a matched pair.**
- **Observe the general repair instructions for tapered roller bearings and shims.**

Final drive gear set, adjustment and marking

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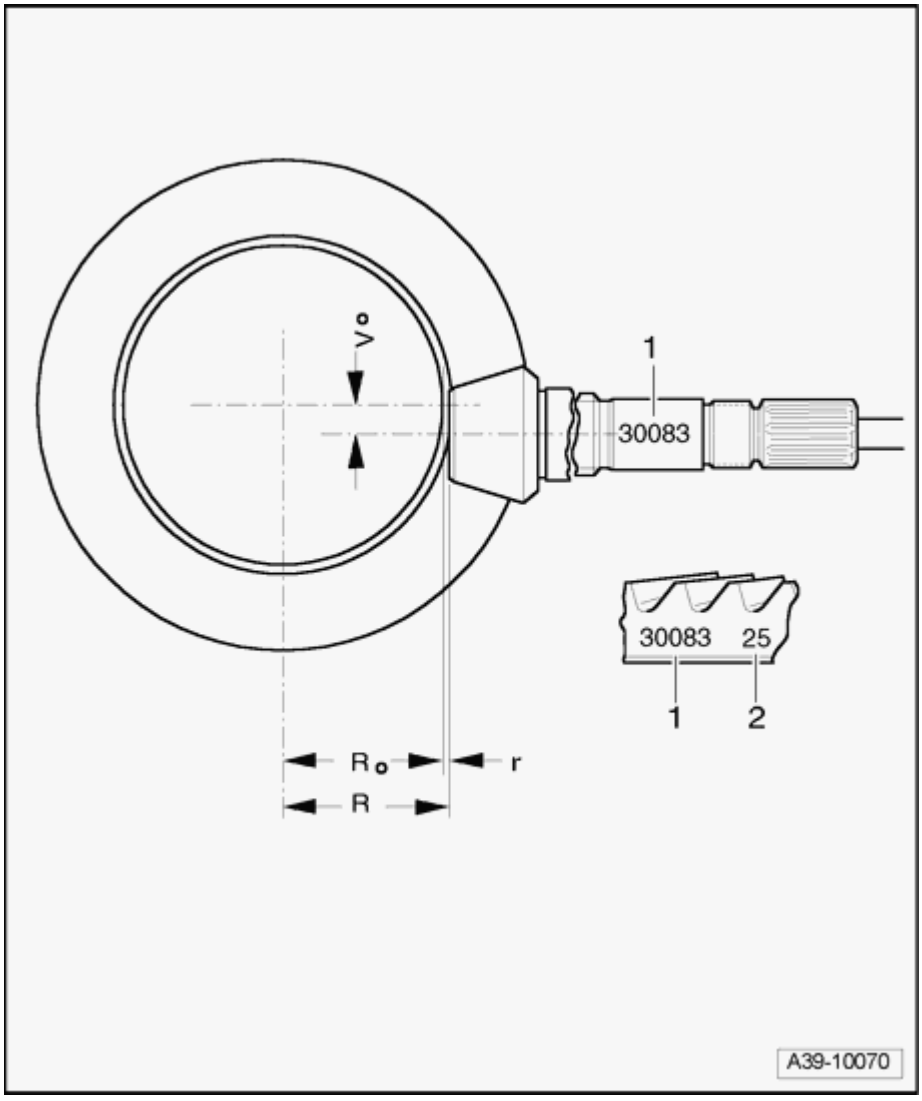

Fig. 508: Final Drive Gear Set, Adjustment And Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - "30083" number of matched pair of gears

- In some cases identification number of matched pair only has four digits

2 - Deviation (tolerance) "r" is based on the master gauge used on the test machine in production. The dimension "r" is always given in 1/100mm. For example: "25" indicates r = 0.25 mm

Ro - Length of test machine master gauge

Ro - Ring gear diameter 182 mm = 59.65 mm

R - Actual distance between ring gear axis and face of pinion shaft in position of quietest running for this gear set.

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Vo - Hypoid offset

Position of shims

NOTE:

- **Table of adjustments when replacing individual components of final drive - -> Table of adjustments.**

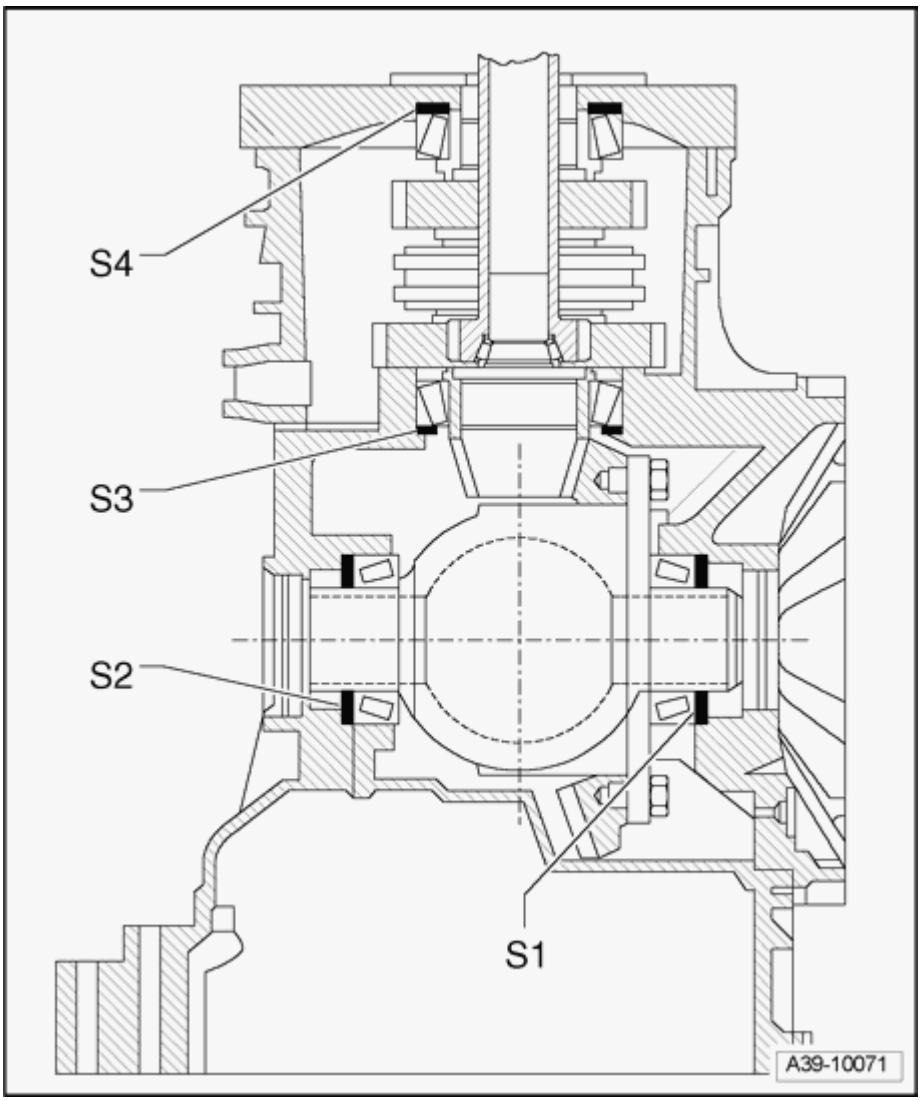

Fig. 509: Position Of Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

S1 - Shim for ring gear in cover for final drive

S2 - Adjustment shim for ring gear in transmission housing

S3 - Adjustment shim for pinion shaft in transmission housing

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S4 - Shim for pinion shaft in bearing housing

Table of adjustments

NOTE:

- **If repairs have been performed to the transmission, it is only necessary to adjust the pinion shaft, ring gear or final drive set if components have been replaced which have a direct effect on the adjustment of the final drive. Refer to the following table to avoid unnecessary adjustment work:**

Components requiring adjustment:	Ring gear	Pinion shaft	Pinion shaft	Backlash
	("S_1 " + "S_2 ")	("S_3 " + "S_4 ") via deviation (tolerance) "r"	Shim "S_4 " only	0.12 - 0.28
	--> **Ring gear, adjusting**	--> **Pinion shaft, adjusting**	--> **Re-determining shim "S4" when replacing bearing housing**	
Component replaced				
Transmission housing * See note	X	X		X
Bearing housing		X	X	
Differential cage	X			X
Tapered roller bearings for pinion shaft/hollow shaft		X		X
Tapered roller bearing for differential	X			X
Final drive gear set * See note	X	X		X
Cover for final drive	X			X

*Pinion shaft and ring gear; only replace together.

*If the transmission housing is replaced the input shaft must also be adjusted --> **Input shaft, adjusting**.

Recommended sequence for adjusting gear set

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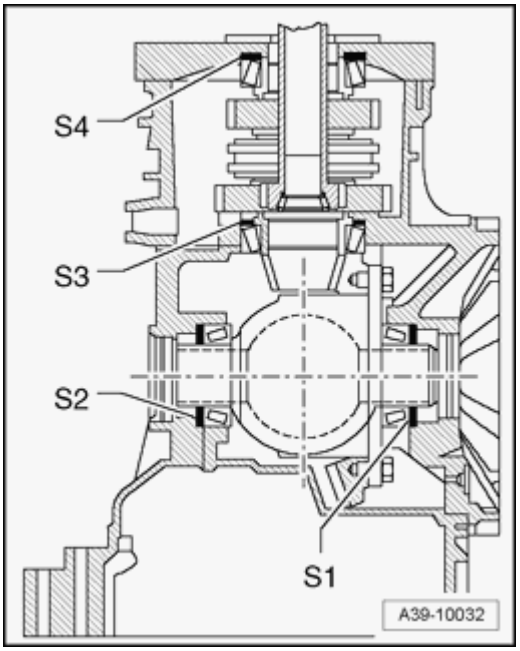

Fig. 510: Adjusting Gear Set
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The following work sequence is recommended to save time when the ring gear and pinion shaft have to be adjusted:

- Determine total shim thickness "S_{total} " (S_3 plus S_4) for the specified preload on pinion shaft tapered roller bearings.
- Distribute total shim thickness "S_{total} " (S_3 plus S_4) so that dimension from center of ring gear to end face of pinion shaft corresponds to installation dimension "R" determined during production.
- Determine total shim thickness "S_{total} " (S_1 plus S_2) for the specified preload on differential tapered roller bearings.
- Distribute total shim thickness "S_{total} " (S_1 plus S_2) so that the specified backlash between ring gear and pinion shaft is obtained.

Pinion shaft, adjusting

(Adjusting pinion shaft with hollow shaft)

Repairs after which the pinion shaft must be adjusted --> **Table of adjustments**.

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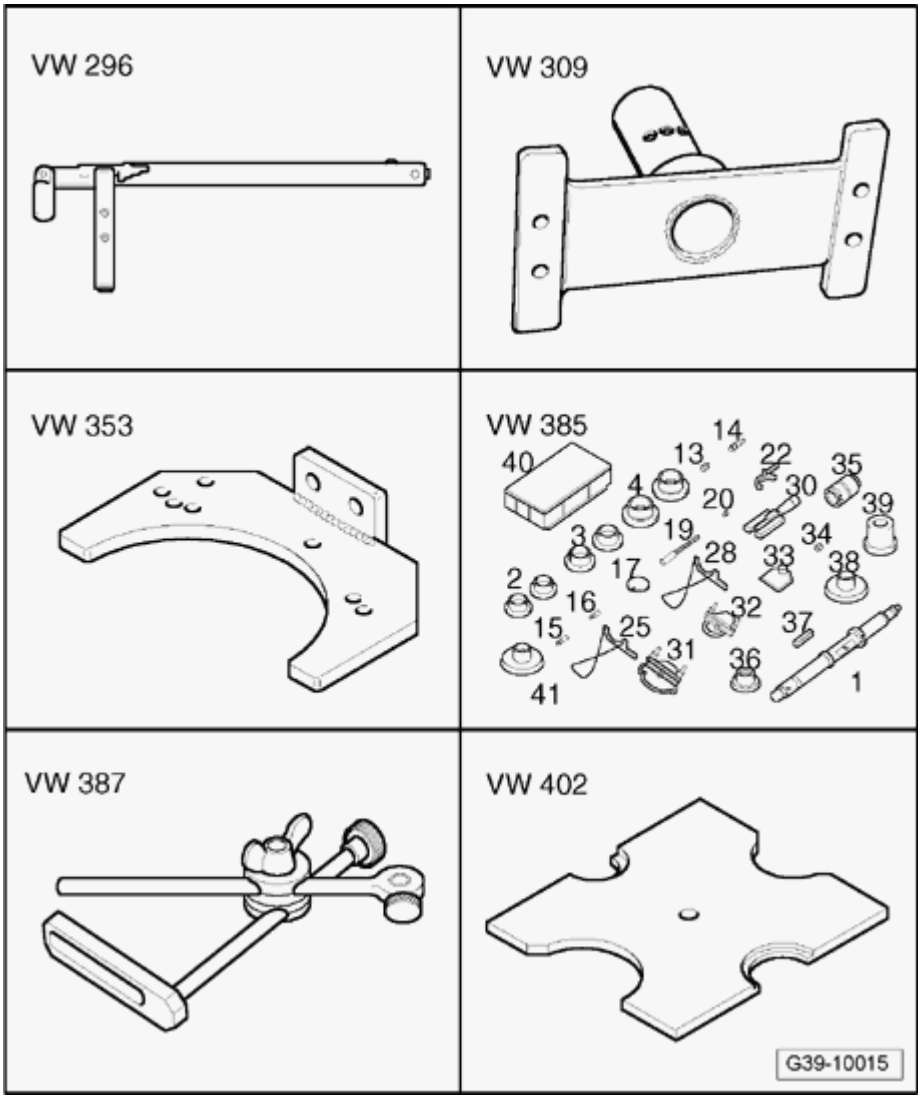

Fig. 511: Identifying Special Tools -- Pinion Shaft, Adjusting (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Removal tool VW 296
- Holding plate VW 309
- Transmission support VW 353
- Universal measuring tool VW385

- Dial gauge holder VW387
- Thrust plate VW402

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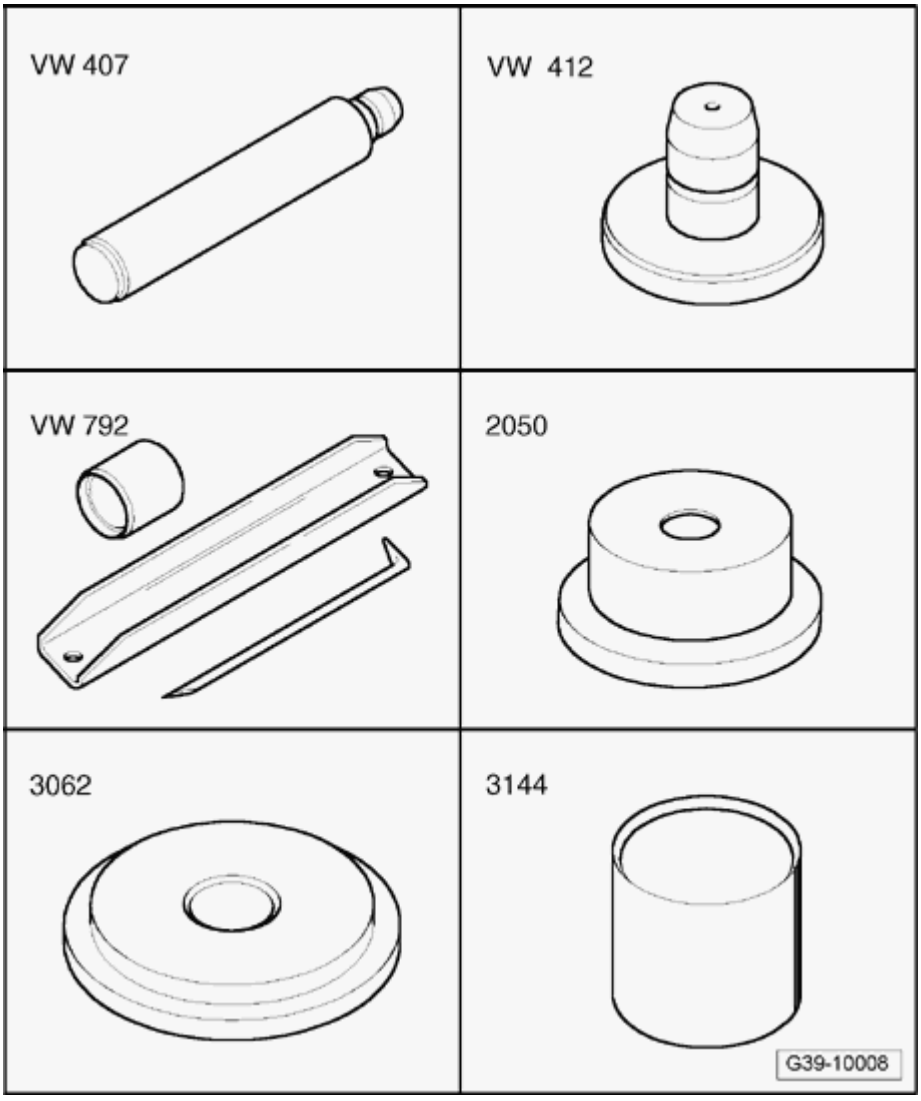

Fig. 512: Identifying Special Tools -- Pinion Shaft, Adjusting (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Punch VW407
- Thrust disc VW 412
- Installation arbor VW792
- Thrust plate 2050

- Thrust pad 3062
- Press Support-R Wheel Brgs. 3144

Special tools, testers and auxiliary items required

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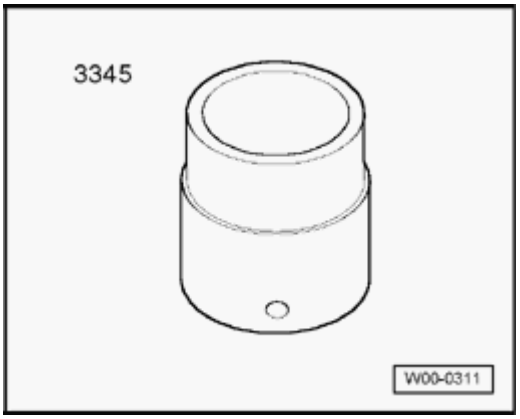

Fig. 513: Identifying Press Tool 3345
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press tool 3345

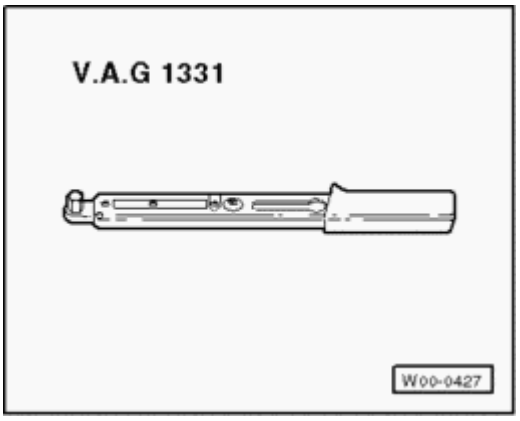

Fig. 514: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331
- Dial gauge
- Dial gauge extension, 30 mm
- Hose clip

Determining total shim thickness "Stotal" for shims "S3" plus "S4"

(Adjustment of pre-load of tapered roller bearings for pinion shaft with hollow shaft)

- Differential removed.

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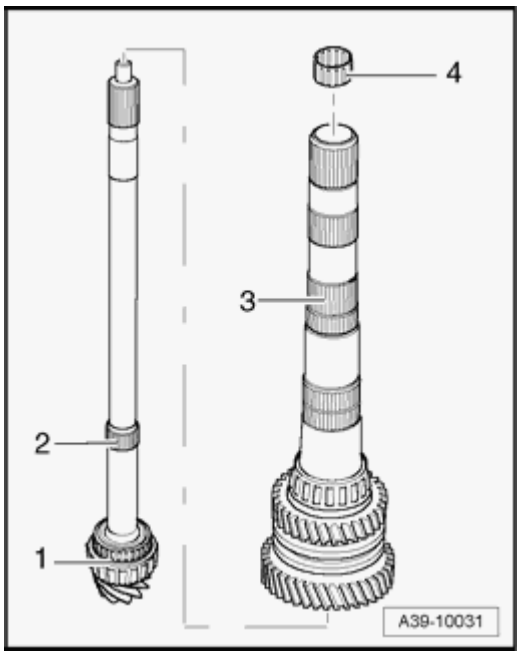

Fig. 515: Double Tapered Roller Bearing Inner Race, Large Needle Bearing, Hollow Shaft And Small Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press double tapered roller bearing inner race - **1** - onto pinion shaft and secure **Pressing on double tapered roller bearing inner race**.
- Install large needle bearing - **2** -.
- Install pinion shaft in hollow shaft - **3** -.

- Reassemble hollow shaft with selector gears and tapered roller bearing inner race.

- Install small needle bearing - **4** -.

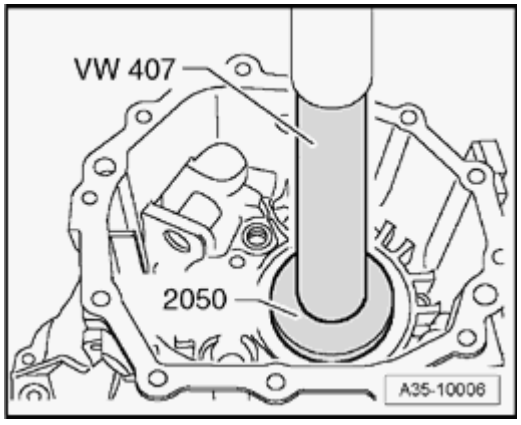

Fig. 516: Pressing Tapered Roller Bearing Outer Race For Pinion Shaft Into Transmission Housing Without Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Press double tapered roller bearing outer race for pinion shaft into transmission housing without shims.

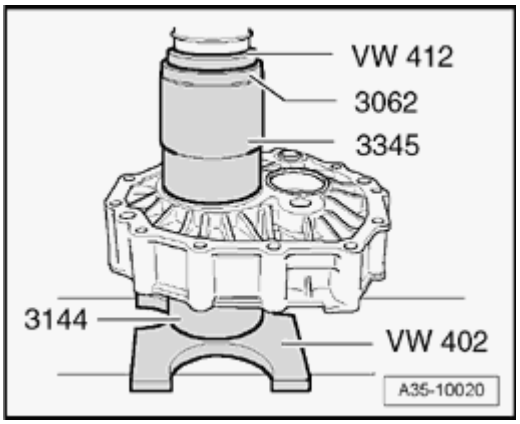

Fig. 517: Pressing In Tapered Roller Bearing Outer Race For Pinion Shaft With Shim Into Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in tapered roller bearing outer race for pinion shaft/hollow shaft with shim "S_4 *" (thickness 1.01 mm) into bearing housing.

NOTE:

- **For measurement purposes a shim "S_4 " with a thickness of 1.01 mm is inserted provisionally. This is referred to in the following as "S_4 *". "S_4 *" is exchanged with the final shim "S_4 " after determining measured value "e".**

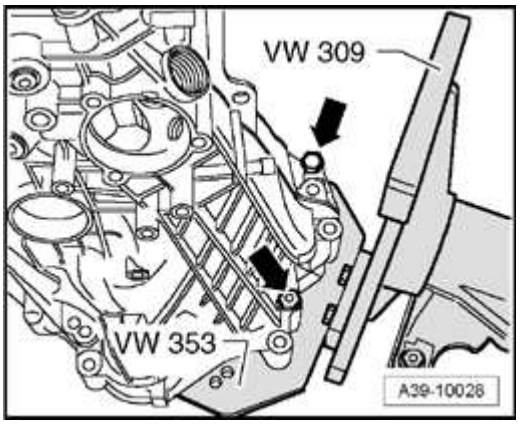

Fig. 518: Securing Transmission Housing Onto Transmission Support VW 353 With Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure transmission housing onto transmission support VW 353 with bolts - **arrows** -.
- Install fully assembled pinion shaft with hollow shaft into transmission housing.
- Install bearing housing and transmission cover and tighten bolts to 35Nm.
- Turn transmission so that the transmission cover points downward.

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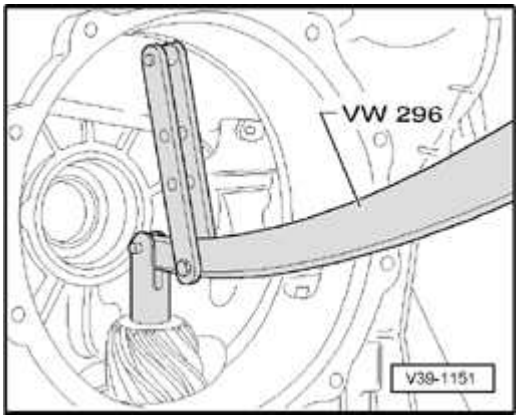

Fig. 519: Pressing Down On Drive Pinion Head Using Removal Tool VW 296
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press down on face of pinion shaft with removal tool VW 296 until tapered bearing outer race contacts bearing housing.
- While still maintaining pressure, rotate pinion shaft 5turns in each direction in relation to the hollow shaft to settle the double tapered roller bearing.
- Rotate pinion shaft together with the hollow shaft 5turns in each direction to settle the hollow shaft tapered roller bearing.
- Turn transmission so that the transmission cover points upward.

- Turn pinion shaft with hollow shaft five turns in both directions so that the double tapered roller bearing settles. Otherwise the result of the measurement will be incorrect.

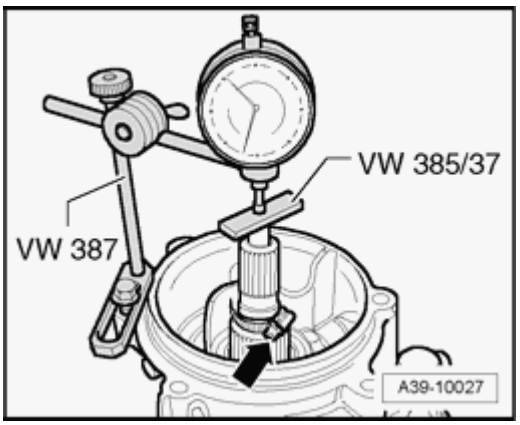

Fig. 520: Pinion Shaft Clamped Onto Hollow Shaft With A Hose Clip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up measuring tool.
- Clamp pinion shaft onto hollow shaft with a hose clip - **arrow** -.
- Set dial gauge (3 mm measuring range) to "0" with 1 mm preload.

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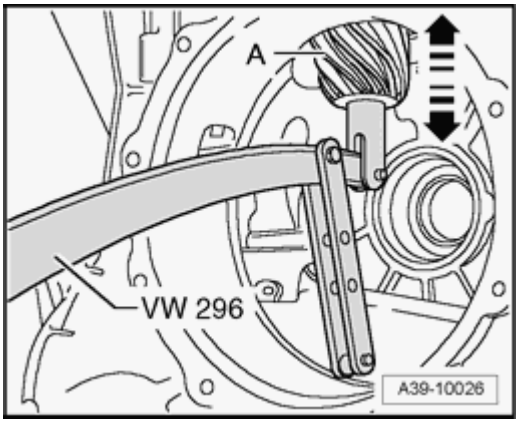

Fig. 521: Moving Pinion Shaft With Hollow Shaft Up And Down
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Then move pinion shaft - **A** - with hollow shaft up and down in direction of - **arrow** -.
- Read off play on dial gauge and note reading.

- Measurement in example: 0.46 mm

NOTE:

- **If the measurement has to be repeated, pinion shaft with hollow shaft must first be rotated another 5turns in each direction to settle the double tapered roller bearing. Preload dial gauge to 1 mm and set to "0" again.**

Formula: "S_{total} " = "S_4 *" + measured value + bearing preload

Example:		
	Inserted shim "S_4 *"	1.01 mm
+	Measured value (example)	0.46 mm
+	Bearing preload (constant value)	0.15 mm
=	Total shim thickness "S_{total} " for "S_3 " plus "S_4 "	1.62 mm

Determining thickness of shim "S_3 *"

Formula: "S_3 *" = "S_{total} " - "S_4 *"

Example:		
	Total shim thickness "S_{total} " for "S_3 " plus "S_4 "	1.62 mm
-	Inserted shim "S_4 *"	1.01 mm
=	Thickness of shim "S_3 *"	0.61 mm

- Remove double tapered roller bearing outer race, install shim "S_3 *" in transmission housing and install

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outer race again.

- Re-install fully assembled pinion shaft with hollow shaft into transmission housing.
- Install bearing housing and transmission cover and tighten bolts to 35Nm.
- To settle the tapered roller bearings: rotate pinion shaft together with hollow shaft 5turns in each direction, then rotate pinion shaft separately in relation to hollow shaft 5turns in each direction.

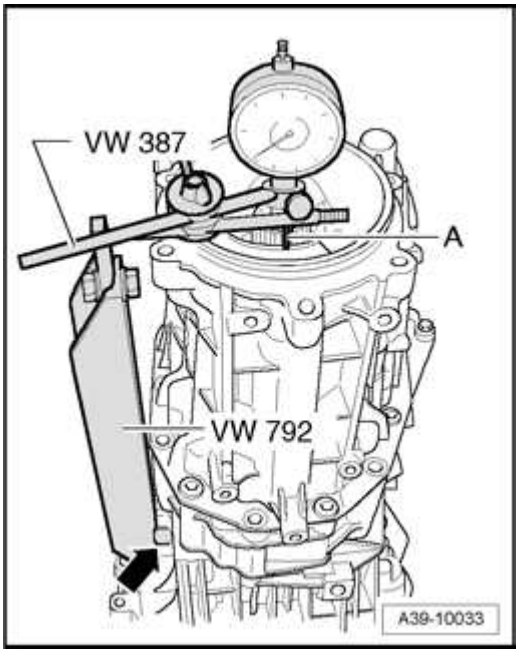

Fig. 522: Determining Thickness Of Shim S3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up measuring tools using dial gauge extension 30 mm - **A** - ; place nut M12 between VW 792 and transmission housing when securing bolt - **arrow** - to transmission housing.

NOTE:

- **Place dial gauge extension - A - onto web in transmission cover.**

- Set dial gauge (3 mm measuring range) to "0" with 1 mm preload.
- Loosen transmission cover bolts and turn pinion shaft several times.
- If correct shims have been selected the dial gauge will now indicate the following value:

- 0.09 to 0.18 mm

- Tighten transmission cover bolts again to 35 Nm.
- Take down measuring tools.
- To settle tapered roller bearings: rotate pinion shaft together with hollow shaft 5turns in each direction, then rotate pinion shaft separately in relation to hollow shaft 5turns in each direction.

Determining dimension "e"

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NOTE:

- **Measurement "e" is required to determine the final shim thickness of "S_3 " and "S_4 ".**

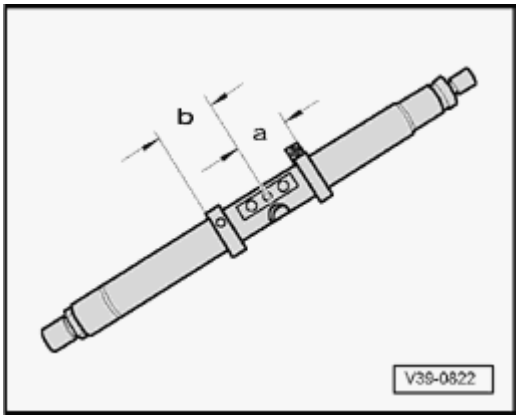

Fig. 523: Setting Adjusting Rings Of Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set adjustment rings of measuring bar VW385/1 to the following values:

- Dimension - **a** - = 45 mm
- Dimension - **b** - = 75 mm

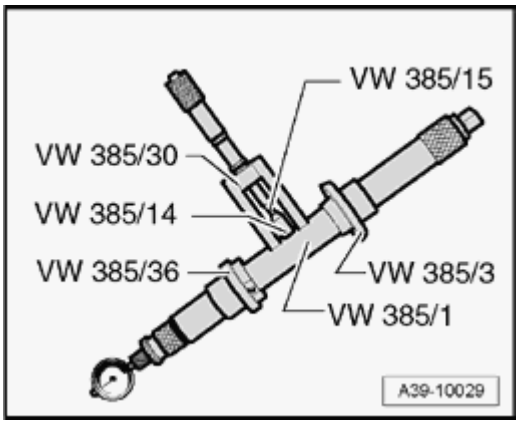

Fig. 524: Universal Measuring Tool VW385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble universal measuring tool VW385/1 as illustrated:

- Dial gauge extension - **VW 385/15** - , 6.5 mm long
- Master gauge-adjustable VW385/30

- Set master gauge-adjustable VW385/30 to Ro = 59.65 mm and install onto measuring tool.
- Set dial gauge (3 mm measuring range) to "0" with 2 mm preload.

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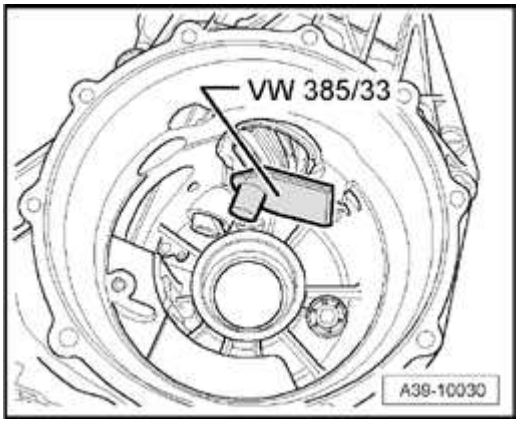

Fig. 525: Measuring Plate End Placed On Face Of Pinion Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place end measuring plate on face of pinion shaft.

NOTE:

- **Make sure plate contact surface fits exactly and is free of oil.**

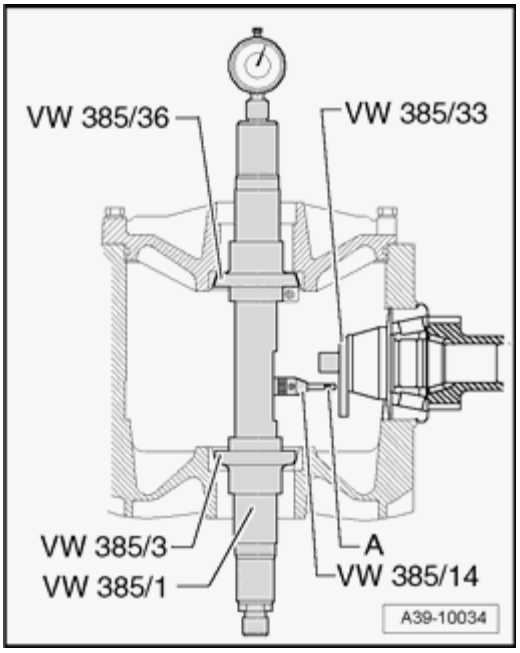

Fig. 526: Identifying Gauge Extension Installed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove master gauge and insert measuring tool into housing.

- Install gauge extension - **A** - (length = 6.5mm).
- The dial gauge faces toward final drive cover

- Install cover for final drive and tighten 4 bolts to 20 Nm.

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- Using adjustable ring, pull 2nd centering pad VW385/36 out as far as possible so that the measuring tool can still just be turned by hand.

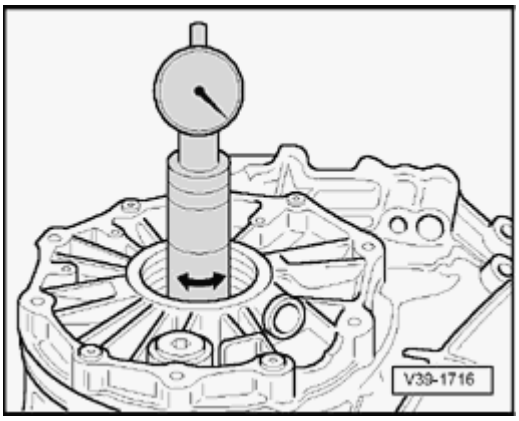

Fig. 527: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn measuring tool until dial gauge point touches the end measuring plate on pinion shaft head, then measure maximum deflection (return point).

- Measurement in following example: "e" = 0.26 mm (in red scale)

NOTE:

- **Then (after removing universal measuring tool), check once again that the dial gauge indicates "0" with 2mm preload when master gauge VW385/30 is in place.**

Determining thickness of shim "S3"

- The deviation (tolerance) "r" in relation to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the ring gear.
- Subtract value "e" if measurement is obtained on red scale.
- Add value "e" if measurement is obtained on black scale.

Formula:

"S_3 " = "S_3 *" + "r" + "e" ("e" on black scale)

"S_3 " = "S_3 *" + "r" - "e" ("e" on red scale)

Example:		
	Inserted shim "S_3 *"	0.61 mm
+	Deviation "r"	0.38 mm

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-	Determined value "e" (in red scale)	0.26 mm
=	Thickness of shim "S_3 "	0.73 mm

- Determine shim(s) according to table.

Available shims for "S_3 "

Shim thickness (mm) * See note		
0.53	0.85	1.17
0.57	0.89	1.21
0.61	0.93	1.25
0.65	0.97	1.29
0.69	1.01	1.33
0.73	1.05	1.37
0.77	1.09	1.41
0.81	1.13	

*The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Determining thickness of shim "S4"

Formula: "S_4 " = "S_{total} " - "S_3 "

Example:		
	Total shim thickness "S_{total} " for "S_3 " plus "S_4 "	1.62 mm
-	Thickness of shim "S_3 "	0.73 mm
=	Thickness of shim "S_4 "	0.89 mm

- Determine shim(s) according to table.

Shims available for "S_4 "

Shim thickness (mm) * See note		
0.33	0.73	1.13
0.37	0.77	1.17
0.41	0.81	1.21
0.45	0.85	1.25
0.49	0.89	1.29
0.53	0.93	1.33
0.57	0.91	1.37

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0.61	1.01	1.41
0.65	1.05	1.45
0.69	1.09	1.49

*The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Checking adjustment

Checking deviation (tolerance) "r "

- Install pinion shaft and hollow shaft with determined shims "S_3 " and "S_4 ".
- Turn hollow shaft against pinion shaft five turns in both directions so that the double tapered roller bearing settles.
- Turn pinion shaft with hollow shaft five turns in both directions so that the tapered roller bearings settle.

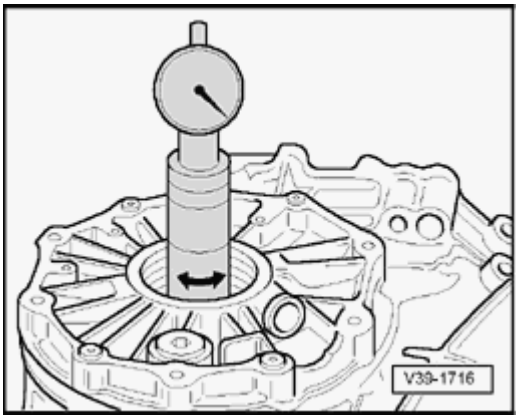

Fig. 528: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert universal measuring tool and check adjustment.
- Read off dial gauge counter-clockwise (red scale).

- If shims have been correctly selected, the deviation "r" (marked on outer circumference of ring gear) should be indicated within a tolerance of ± 0.04 mm.

Re-determining shim "S4" when replacing bearing housing

Special tools, testers and auxiliary items required

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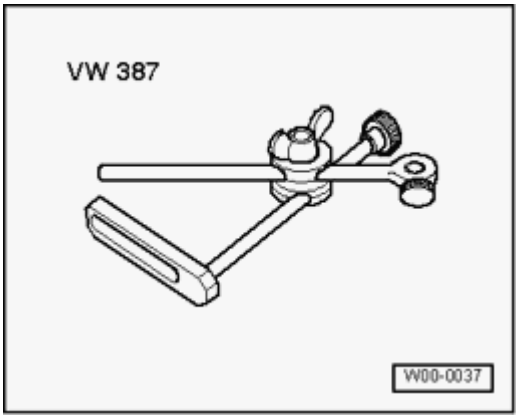

Fig. 529: Identifying Dial Gauge Holder VW 387
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dial gauge holder VW387

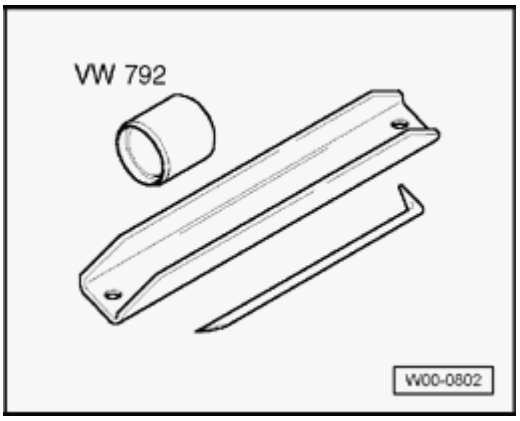

Fig. 530: Installation Arbor VW 792
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation arbor VW792
- Digital depth gauge (e..g. VAS 6087)
- Dial gauge
- Dial gauge extension, 30 mm
- Straightedge
  - Clean housing flange.

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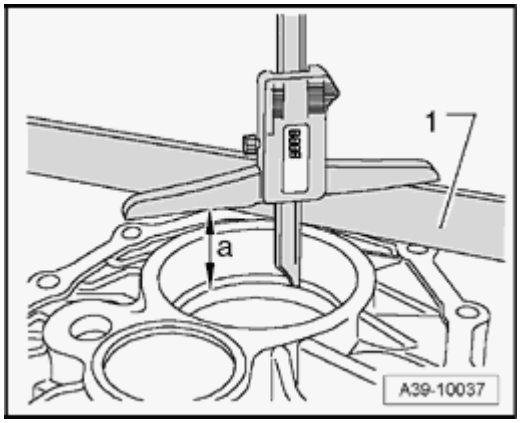

Fig. 531: Measuring Difference Between Depth On Old And New Bearing Housing With A Digital Depth Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place straightedge (e.g. 19.50 mm wide - **1** - onto housing flange.
- Measure difference between depth - **a** - on old and new bearing housing with a digital depth gauge (e.g. VAS 6087).

Example:

	Depth - **a** - of previous bearing housing (with straightedge width)	26.30 mm
	Depth - **a** - of new bearing housing (with straightedge width)	26.45 mm
=	Difference	0.15 mm

- If new bearing housing is deeper, install a thicker "S_4 " shim.
- If previous bearing housing is deeper, install a thinner "S_4 " shim.

Example:

	Previous shim "S_4 "	0.95 mm
+	Difference	0.15 mm
=	New shim "S_4 "	1.10 mm

Shims available.

- Press tapered roller bearing outer race with shim "S_4 " into bearing housing **Pressing tapered roller bearing outer race into bearing housing**.
- Re-install fully assembled pinion shaft with hollow shaft into transmission housing.
- Install bearing housing and transmission cover and tighten bolts to 35Nm.
- To settle tapered roller bearings: rotate pinion shaft together with hollow shaft 5turns in each direction, then rotate pinion shaft separately in relation to hollow shaft 5 turns in each direction.

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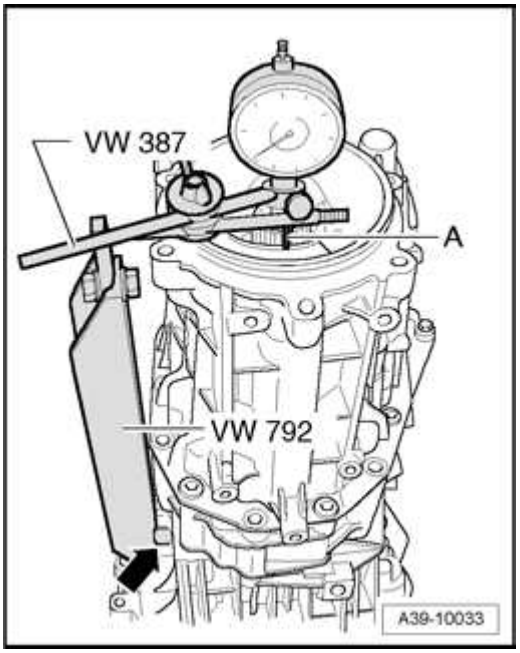

Fig. 532: Determining Thickness Of Shim S3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up measuring tools using dial gauge extension 30 mm - **A** - ; place nut M12 between VW 792 and transmission housing when securing bolt - **arrow** - to transmission housing.

NOTE:

- **Place dial gauge extension - A - onto web in transmission cover.**

- Set dial gauge (3 mm measuring range) to "0" with 1 mm preload.
- Loosen transmission cover bolts and turn pinion shaft several times.
- If correct shims have been selected the dial gauge will now indicate the following value:

- 0.09 to 0.18 mm

If this reading is not obtained, the adjustment must be corrected.

Ring gear, adjusting

(Adjusting differential)

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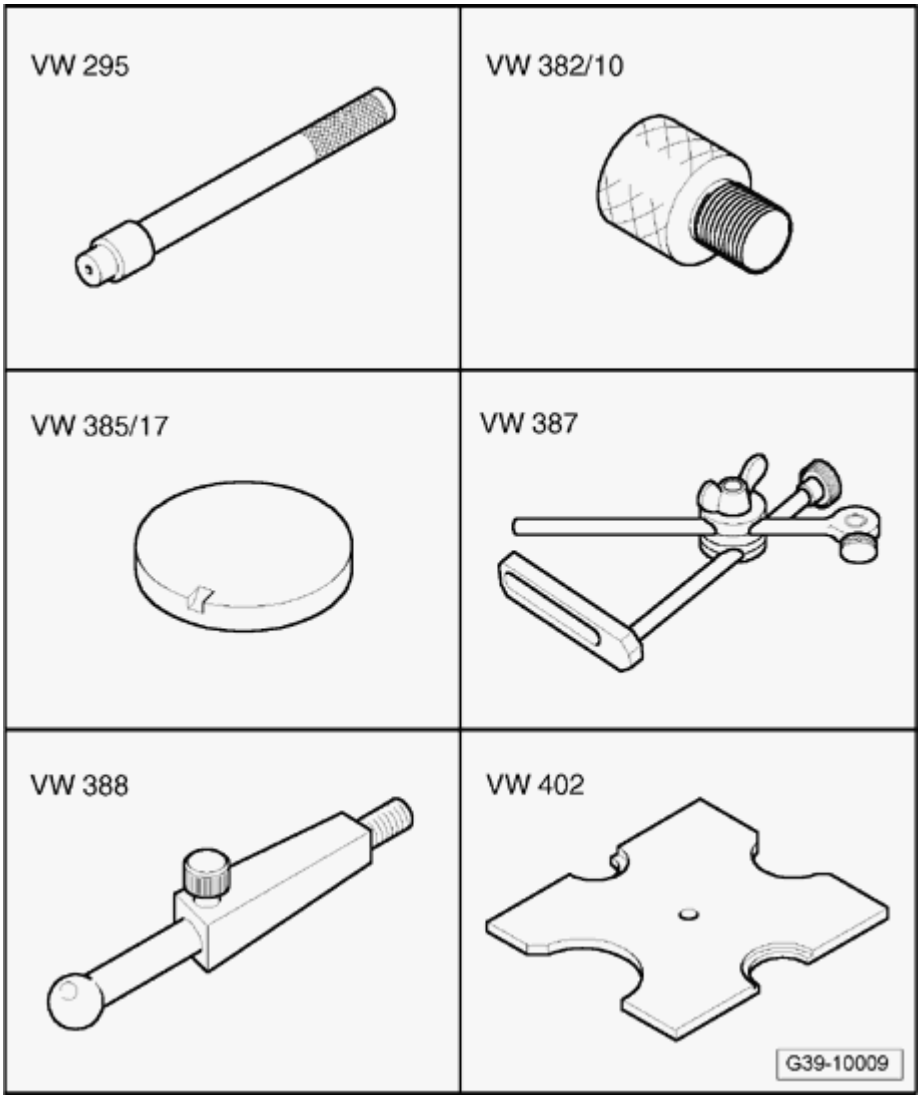

Fig. 533: Identifying Special Tools -- Crown Wheel, Adjusting (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Needle bearing drift VW 295
- Extension pin 6 mm VW382/10
- Magnetic plate 50 mm dia. VW385/17
- Dial gauge holder VW387
- Measuring lever VW 388
- Thrust plate VW402

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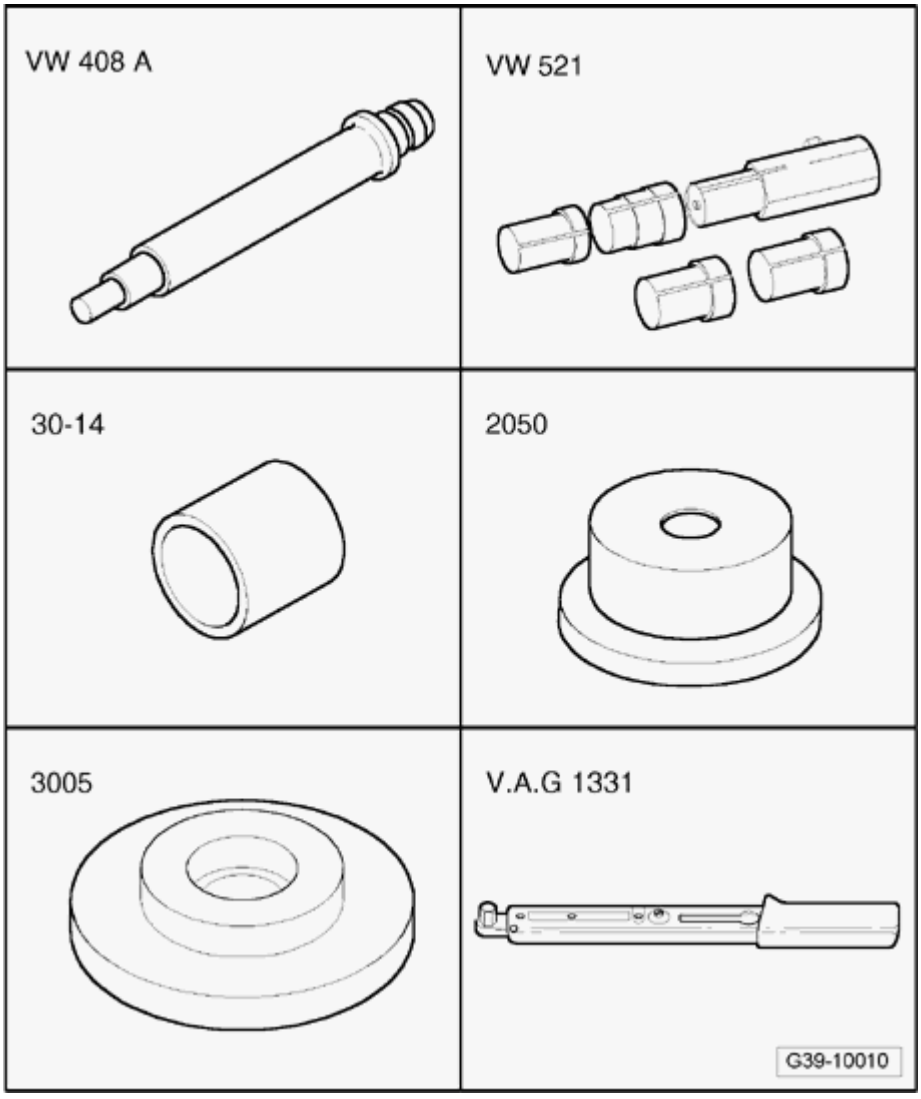

Fig. 534: Identifying Special Tools -- Crown Wheel, Adjusting (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Punch VW408A
- Ring gear adjusting tool VW 521
- Tube 30 - 14
- Thrust plate 2050

- Thrust pad 3005
- Torque wrench V.A.G1331
- Dial gauge
- Dial gauge extension, 30 mm

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It is necessary to readjust the ring gear when the following components have been replaced:

Transmission housing, final drive cover, taper roller bearings for differential, differential cage or the final drive gear set

Table of adjustments --> **Table of adjustments**

Determining total shim thickness "Stotal" for shims "S1" plus "S2"

(adjustment of pre-load of taper roller bearings for differential)

- Pinion shaft removed

- Remove flange shaft oil seals
- Remove tapered roller bearing outer races for differential and take out shims --> **Differential, disassembling and assembling**.

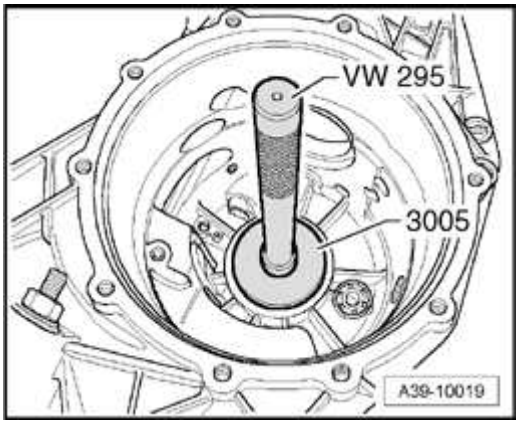

Fig. 535: Driving Outer Race For Tapered Roller Bearing With Shim Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive outer race for tapered roller bearing (right-side) with shim "S_2 " into transmission housing. For measurement purposes use a 1.30 mm thick "S_2 *" shim (or 2 shims of 0.65 mm).

NOTE:

- **For measurement purposes a 1.30mm thick shim "S_2 " is inserted provisionally. This is referred to in the following as "S_2 *". "S_2 *" is exchanged with the final shim "S_2 " after determining backlash.**

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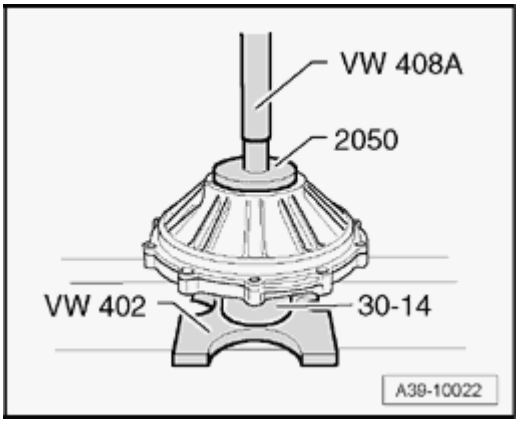

Fig. 536: Pressing Tapered Roller Bearing Outer Race (Left-Side) Into Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press tapered roller bearing outer race (left-side) without shim "S_1 " into cover for final drive.
- Install differential in transmission housing. The ring gear is positioned on the left-hand side (same side as cover for final drive).
- Install cover for final drive with 4 bolts (20 Nm).
- Turn transmission so that cover for final drive points upward.
- Turn differential 5 turns in both directions so that the tapered roller bearings settle.
- Place measuring plate VW385/17 on differential.

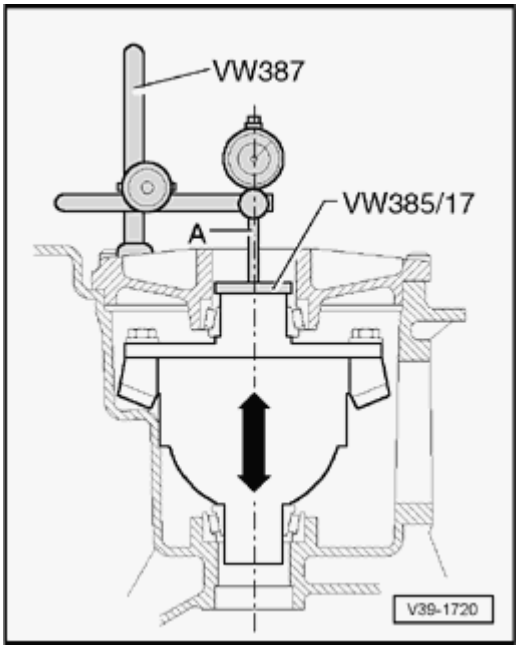

Fig. 537: Installing Magnetic Plate 50Mm Dia. VW 385/17 And Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up measuring tool using 30 mm extension.

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- Set dial gauge (3 mm measuring range) - **A** - to "0" with 2mm preload.

NOTE:

- **Tip of dial gauge must be located at center of differential.**

- Raise differential without turning, read clearance off dial gauge and write down.
- Measurement in following example: 0.62 mm

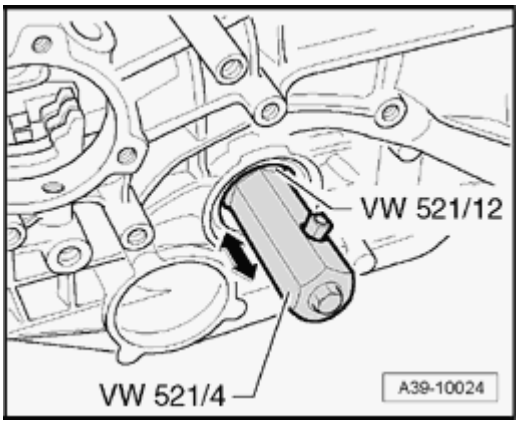

Fig. 538: Special Tools VW521/4 And VW521/12 Secured On Right Of Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Secure special tools VW521/4 and VW521/12 on right of differential (transmission side) to lift differential.**
- **If the measurement has to be repeated, the differential must again first be turned 5 turns in each direction to settle the tapered roller bearings.**

Formula: "S_{total} " = "S_2 *" + measured value + bearing preload

Example:		
	Inserted shim(s) "S_2 *"	1.30 mm
+	Measured value	0.62 mm
+	Bearing preload (constant value)	0.25 mm
=	Total shim thickness "S_{total} " for "S_1 " plus "S_2 "	2.17 mm

Determining thickness of shim "S_1 *"

NOTE:

- **Provisional shim "S_1 *" is replaced with final shim "S_1 " after determining backlash.**
- **Total shim thickness "S_{total} " remains unchanged.**

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Formula: "S_1 *" = "S_{total} " - "S_2 *"

Example:		
	Total shim thickness "S_{total} " for "S_1 " plus "S_2 "	2.17 mm
-	Inserted shim(s) "S_2 *"	1.30 mm
=	Thickness of shim "S_1 *"	0.87 mm

Measuring backlash

- Install pinion shaft with shims "S_3 " and "S_4 ".

- Install differential with ring gear: S_1 is installed on cover side, S_2 in transmission housing.
- Install cover for final drive and tighten bolts to 20 Nm.
- Insert ring gear adjusting tool VW521/4 and VW521/12.
- Turn differential 5 turns in both directions so that the taper roller bearings seat properly.

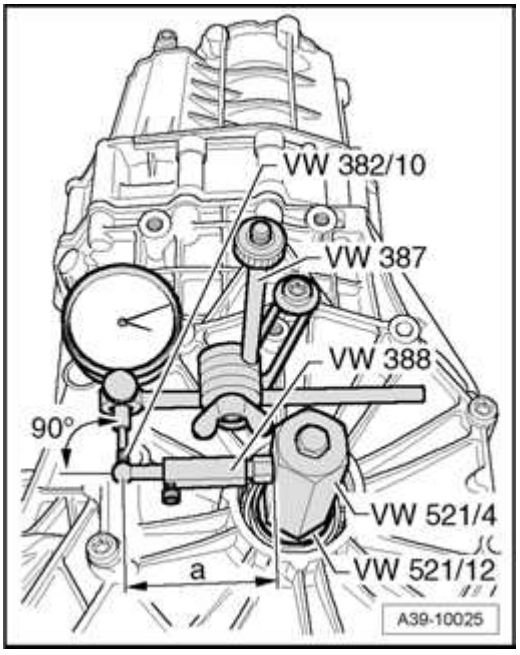

Fig. 539: Measuring Backlash
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure universal dial gauge bracket VW 387 to housing.
- Install dial gauge with dial gauge extension VW382/10 (6mm flat).
- Adjust measuring lever VW388 to distance "a" = 73mm (for 182 mm dia. ring gear).
- Measure play between teeth faces (backlash) as follows:

- Turn ring gear until it makes contact with the face of one tooth (end of backlash travel).

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- Preload dial gauge to 2 mm and set to "0".
- Turn back ring gear until it makes contact with opposite tooth face (backlash).
- Take backlash reading and write down measured value.

- Turn ring gear through 90° and repeat measurements another 3 times.

NOTE:

- **If the pinion shaft rotates during the measurements, counter-hold pinion shaft to make sure that the measured value of the backlash is correct.**

Determining average backlash

- Add the four measured values together and divide by four.

Example:		
	1st measured value	0.28 mm
+	2nd measured value	0.30 mm
+	3rd measured value	0.30 mm
+	4th measured value	0.28 mm
=	Sum of measured values	1.16 mm

- Result: the average backlash is 1.16 mm : 4 = 0.29 mm

NOTE:

- **If the individual measurements differ from each other by more than 0.06 mm, the installation of the ring gear or the final drive gear set itself is not correct. Check installation; replace final drive gear set if necessary.**

Determining thickness of shim "S2"

Formula: "S_2 " = "S_2 *" - measured backlash + specified backlash

Example:		
	Inserted shim "S_2 *"	1.30 mm
-	Measured average backlash	0.29 mm
+	Specified backlash (constant value)	0.20 mm
=	Thickness of shim "S_2 "	1.21 mm

- Determine shim(s) according to table.

Available shims for "S_2 "

Shim thickness (mm) * See note		

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0.45	0.61	0.77
0.49	0.65	0.81
0.53	0.69	0.85
0.57	0.73	

*The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Determining thickness of shim "S1"

Formula: "S_1 " = "S_{total} " - "S_2 "

Example:		
	Total shim thickness "S_{total} " for "S_1 " plus "S_2 "	2.17 mm
-	Thickness of shim "S_2 "	1.21 mm
=	Thickness of shim "S_1 "	0.96 mm

- Determine shim(s) according to table.

Available shims for "S_1 "

Shim thickness (mm) * See note		
0.45	0.61	0.77
0.49	0.65	0.81
0.53	0.69	0.85
0.57	0.73	

*The exact shim thickness required can be obtained by using the shim tolerance variations. Install two shims if necessary.

Checking adjustment

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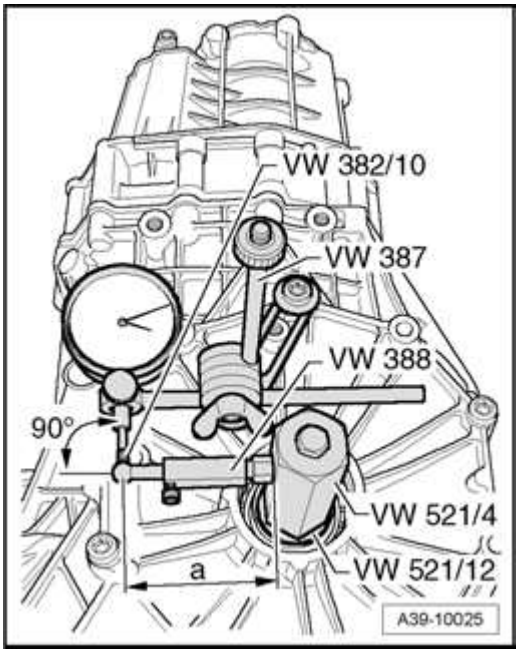

Fig. 540: Measuring Backlash
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- After installing shims "S_1 " and "S_2 ", turn differential 5 turns in both directions so that the tapered roller bearings settle.
- Measure backlash four times on circumference.

- Specification: 0.12to0.28 mm

NOTE:

- **Adjustment must be repeated if backlash is outside tolerance. The total shim thickness "S_{total} " must remain unchanged.**
- **Deviation between individual measured values must not exceed 0.06 mm.**

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34 CONTROLS, HOUSING

SELECTOR MECHANISM, SERVICING

Installation position of selector mechanism

- **Arrow A** - gear selection movement

- **Arrow B** - gate selection movement

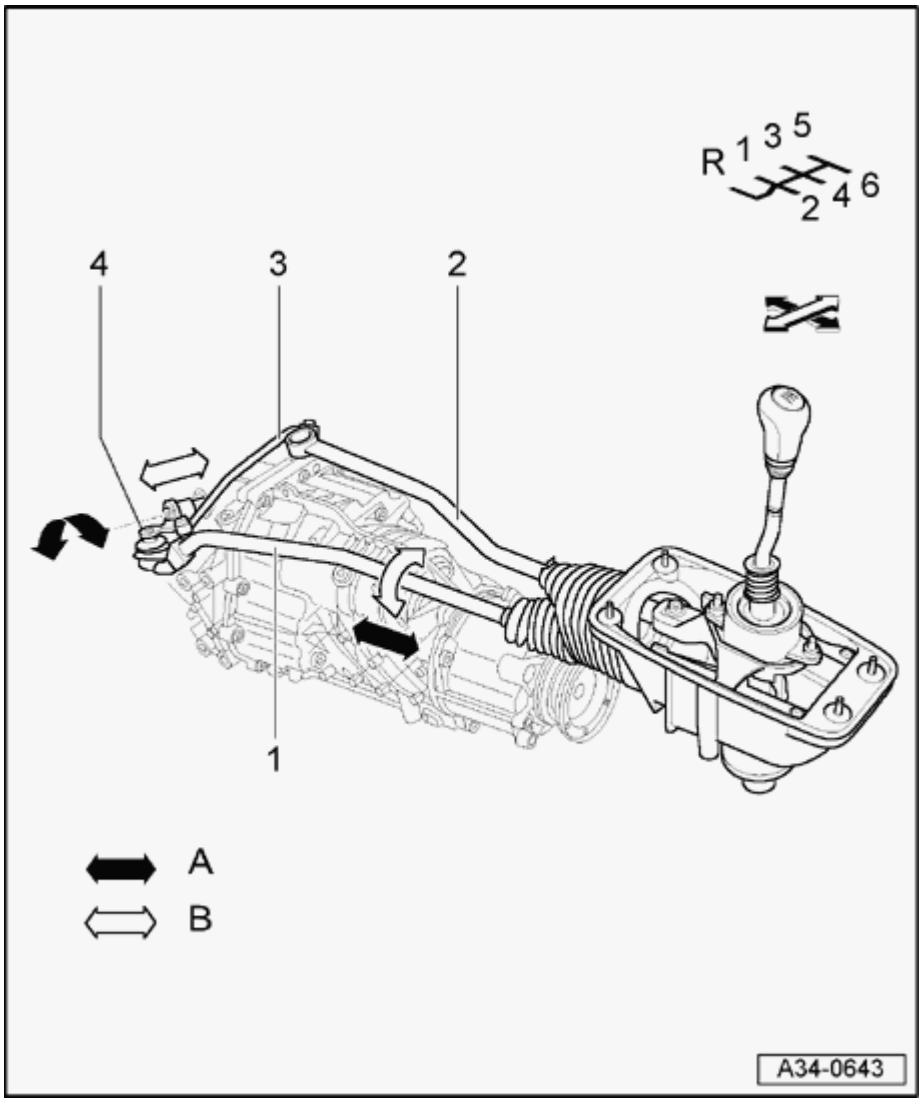

Fig. 105: Installation Position Of Selector Mechanism
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector rod

2 - Push rod

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3 - Connecting rod

4 - Transmission selector lever

Selector mechanism components, assembly overview

Part I

NOTE:

- **Lubricate all bearings and moving surfaces with polycarbamide grease G052142A2 .**

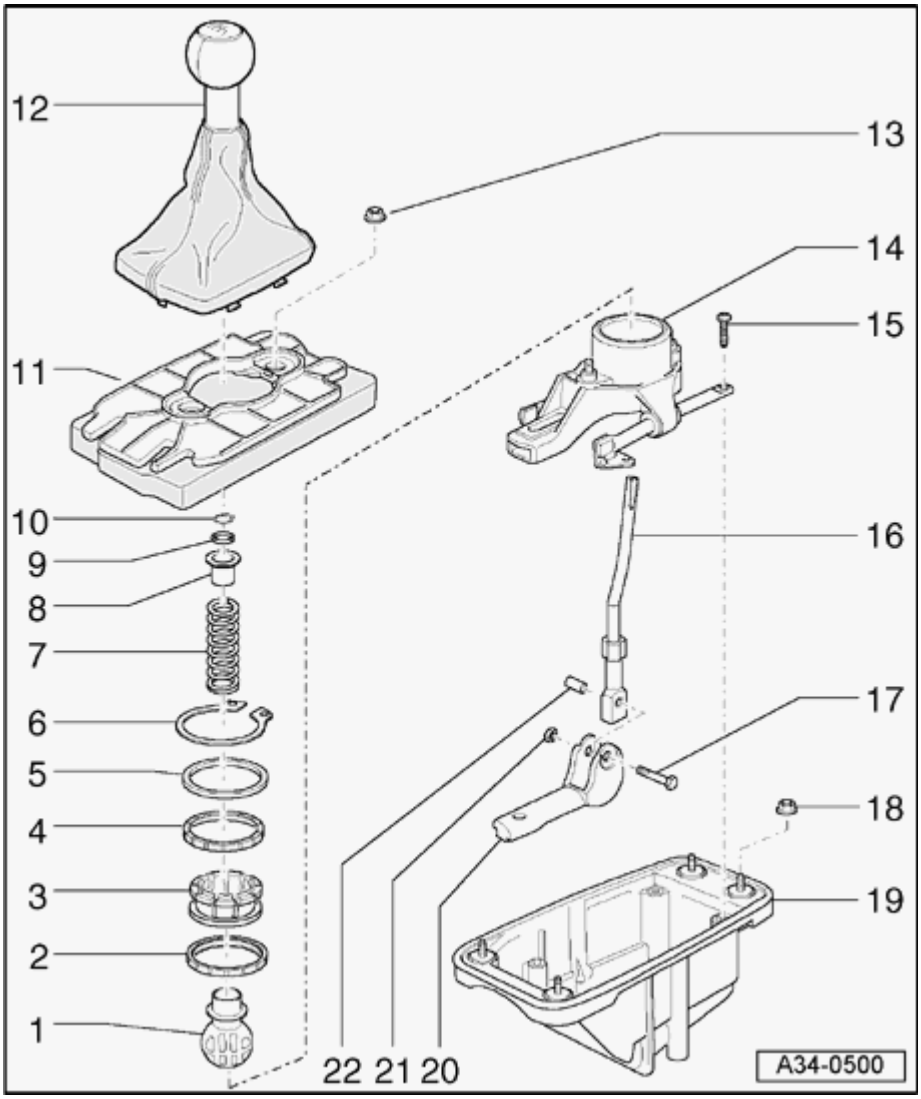

Fig. 106: Selector Mechanism Components, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Ball

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2 - Rubber ring

3 - Ball guide

4 - Rubber ring

5 - Washer

6 - Circlip

- Take out before removing ball

7 - Spring

8 - Spacer sleeve

9 - Washer

10 - Circlip

11 - Sound insulation

- - **Arrow** - marked on sound insulation points in direction of travel

12 - Gear lever knob

- With cover
- Removing and installing --> **Gear lever knob with boot, removing and installing**

13 - Nut, 10 Nm

14 - Ball housing

15 - Torx socket head bolt

16 - Gear lever

- Bend points toward rear

17 - Bolt

18 - Nut, 10 Nm

19 - Selector housing

20 - Joint for gear lever/selector rod

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21 - Nut -10 Nm-

- Self-locking
- Replace

22 - Bushing

Part II

NOTE:

- **Lubricate all bearings and moving surfaces with polycarbamide grease G052142A2 .**

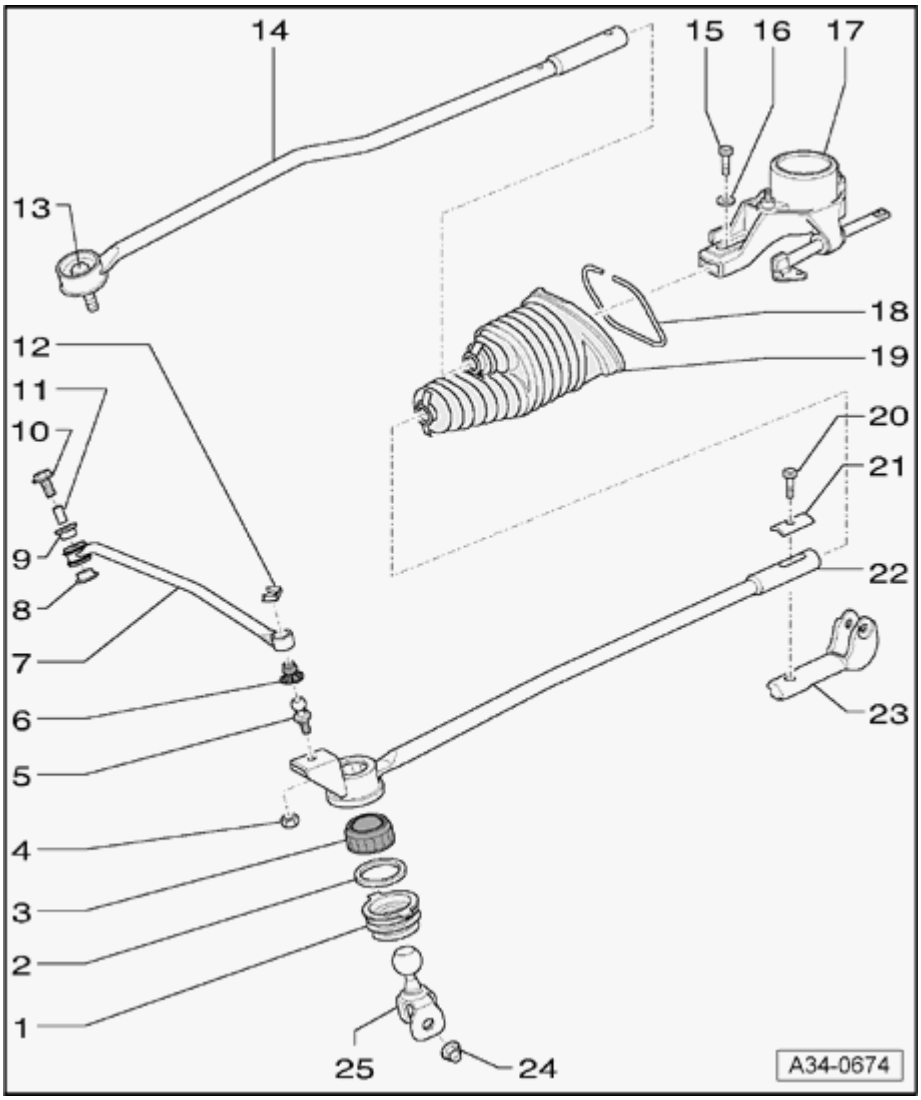

Fig. 107: Shift Mechanism Remove/Install Components -- Part II
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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1 - Boot

- Secure to selector rod with commercially available instant adhesive

2 - Washer

3 - Ball socket

4 - Cap nut, 23 Nm

5 - Ball stud

6 - Ball socket

7 - Connecting rod

8 - Bushing

9 - Bushing

10 - Bolt, 23 Nm

11 - Sleeve

12 - Retaining clip

13 - Bolt, 40 Nm

14 - Push rod

- With bushing, bolt and washers

15 - Hex socket head bolt, 23 Nm

16 - Washer

17 - Ball housing

18 - Clamping ring for boot

19 - Boot

20 - Hex socket head bolt, 23 Nm

21 - Clamp

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22 - Selector rod

23 - Joint for gear lever/selector rod

24 - Cap nut, 10 Nm

- Self-locking
- Replace

25 - Selector shaft lever

Gear lever knob with boot, removing and installing

Special tools, testers and auxiliary items required

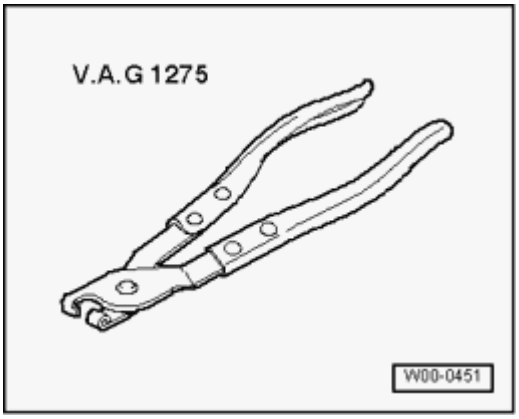

Fig. 108: Identifying Hose Clamp Pliers V.A.G 1275
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clip pliers V.A.G 1275

Removing

NOTE:

- **The gear lever knob is removed together with the gear lever boot and the cover for the center console.**

  - Open ashtray.

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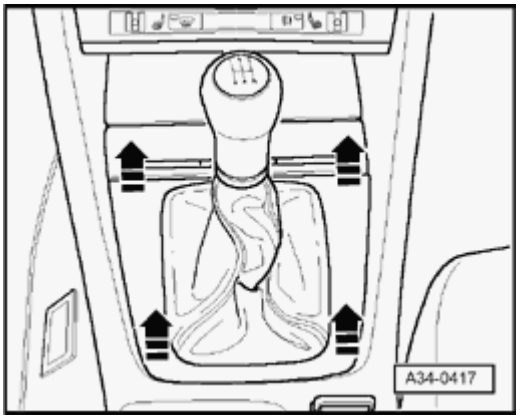

Fig. 109: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unclip cover for center console and lift it off - **arrows** -.

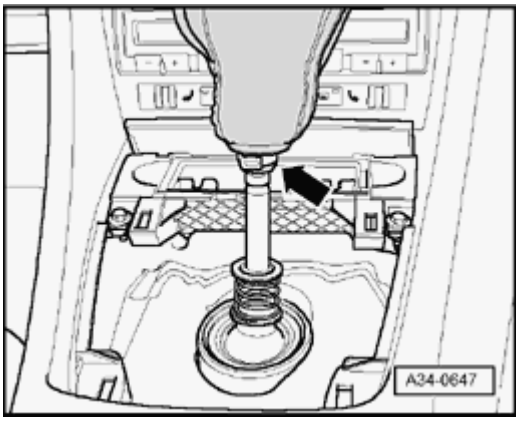

Fig. 110: Locating Clip And Pulling Off Gear Lever Knob Together With Boot
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Gear lever knob with clip:

- Pull boot up and over gear lever knob.
- Open clip - **arrow** - and pull off gear lever knob together with boot.

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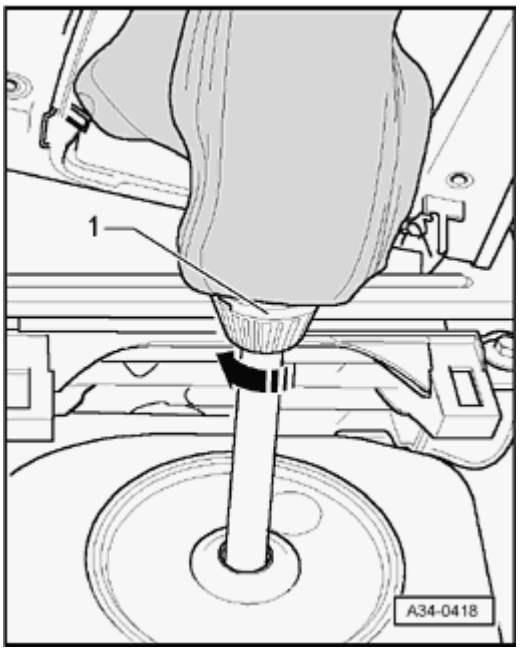

Fig. 111: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Gear lever knob with locking mechanism:

- Release connecting element - **1** - in direction of - **arrow** - and pull gear lever knob off upward together with gear lever boot.

Installing

Installation is in reverse order of removal.

Selector mechanism, removing and installing

Special tools, testers and auxiliary items required

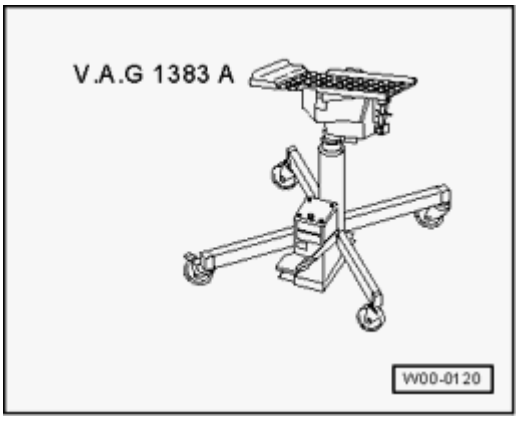

Fig. 112: Identifying Engine/Transmission Jack V.A.G. 1383 A

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine/transmission jack V.A.G 1383 A

Removing

- Remove gear lever knob together with boot --> **Gear lever knob with boot, removing and installing**.

Vehicles with large radio slot:

- Remove air conditioning operating unit --> **87 AIR CONDITIONING** .

Vehicles with small radio slot:

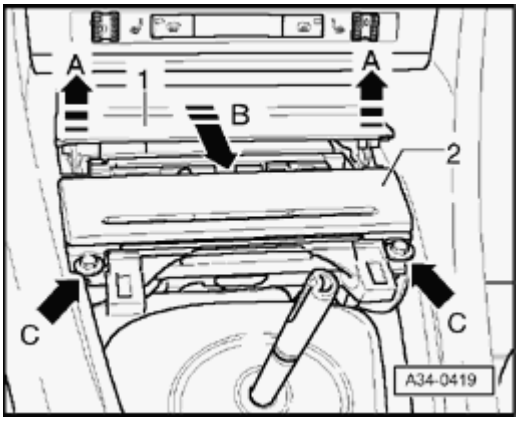

Fig. 113: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First lift trim panel - **1** - in direction of - **arrow A** - , then pull it out in direction of - **arrow B** -.

Continued for all vehicles:

- Remove bolts - **arrows C** - and then pull ashtray - **2** - out of center console.
- Disconnect electrical connector for ashtray light.
- Remove foam wedges from center console.
- Lift out sound insulation.

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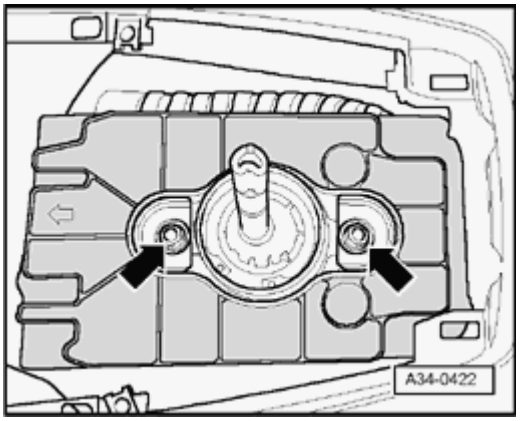

Fig. 114: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove sound insulation for gear lever housing - **arrows** -.

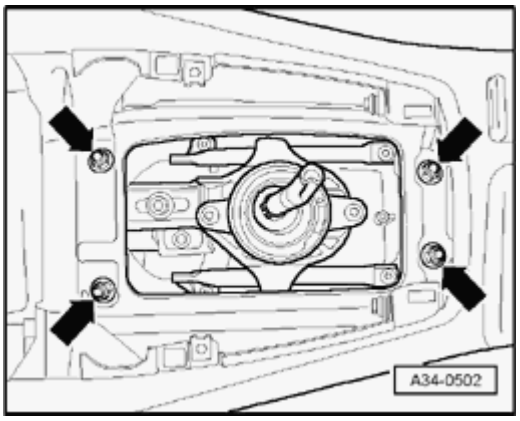

Fig. 115: Shift Lever Housing Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.
- Remove both front wheels.
- On vehicles equipped with auxiliary heater, remove bolts - **arrows** - securing exhaust pipe of auxiliary heater to sound insulation.

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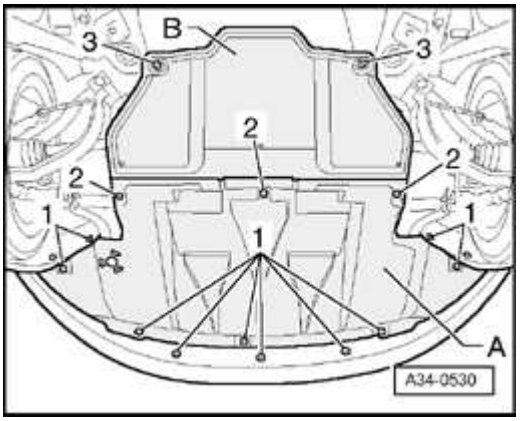

Fig. 116: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

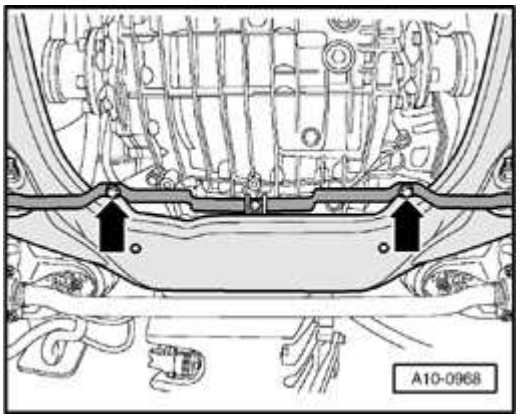

Fig. 117: Removing Bracket For Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for sound insulation - **arrows** -.

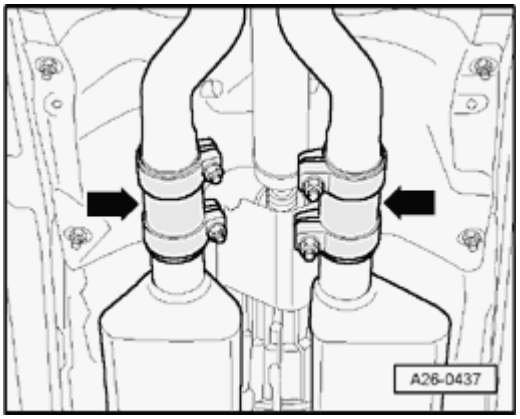

Fig. 118: Exhaust System Clamps

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamps - **arrows** -.

NOTE:

- **The flexible pipe connection (de-coupling element) in the front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.**
- **The illustration shows the exhaust system in conjunction with the 3.0 liter. V6 engine.**

- Disengage rear section of exhaust system at rubber mountings and remove.

NOTE:

- **A second technician is required for removing the rear section of the exhaust system.**

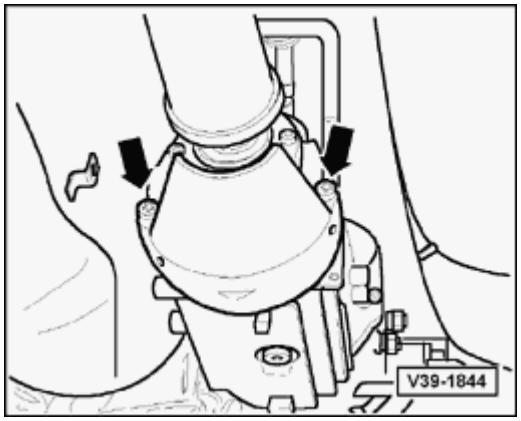

Fig. 119: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove heat shield for drive shaft - **arrows** -.

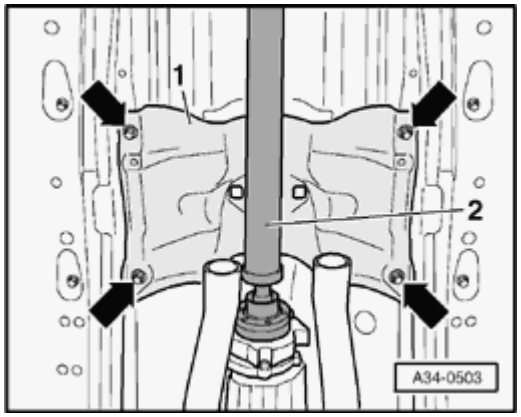

Fig. 120: Heatshield Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove heat shield - **1** - for exhaust system below selector mechanism - **arrows** -.
- Remove bolts at transmission/drive shaft flange.
- Push drive shaft - **2** - together toward rear final drive. The constant velocity joints can be moved axially.

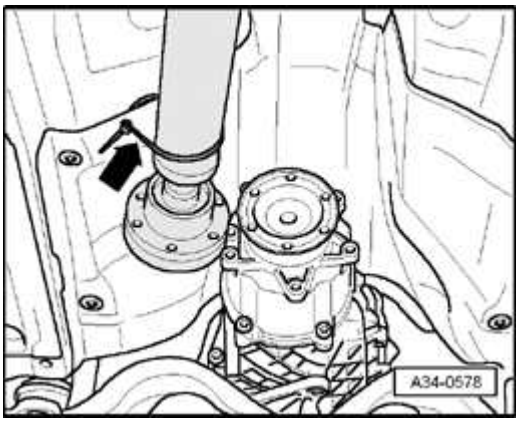

Fig. 121: Drive Shaft Tied To Side, Onto Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tie drive shaft to side, onto heat shield - **arrow** -.

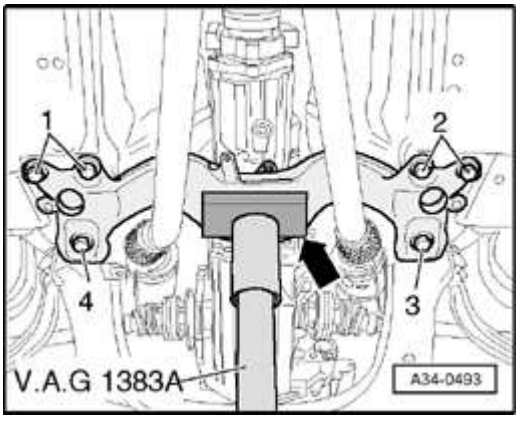

Fig. 122: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove universal transmission mounting V.A.G1359/2 from engine/transmission jack V.A.G 1383 A and place a wooden block - **arrow** - on press tool instead.
- Support rear cross member using engine and transmission jack V.A.G 1383 A.
- Remove bolts - **1** - and - **2** - , then bolts - **3** - and - **4** -.

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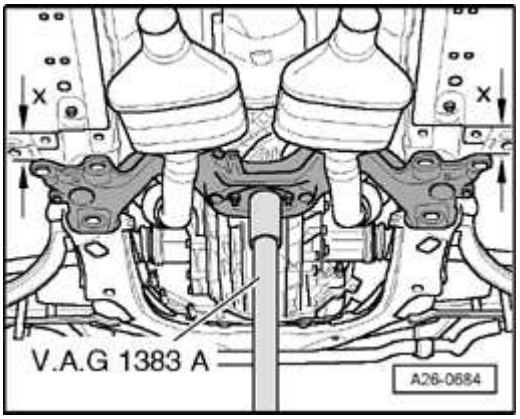

Fig. 123: Identifying Distance Between Cross Member And Body Reaches Dimension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully lower rear cross member with using engine and transmission jack V.A.G 1383 A until distance between rear cross member and body reaches dimension "x".

- Dimension x = 60 mm

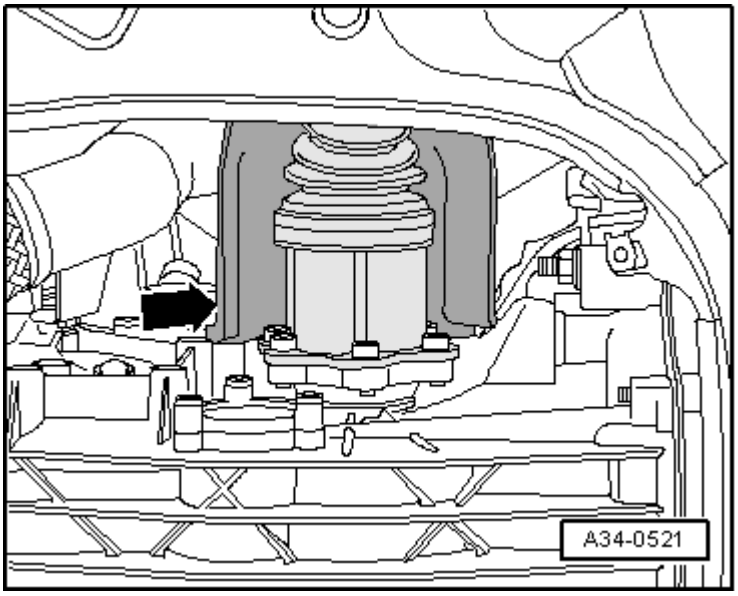

Fig. 124: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrow** - for drive axle (right side) and, if installed, also for drive axle (left-side).

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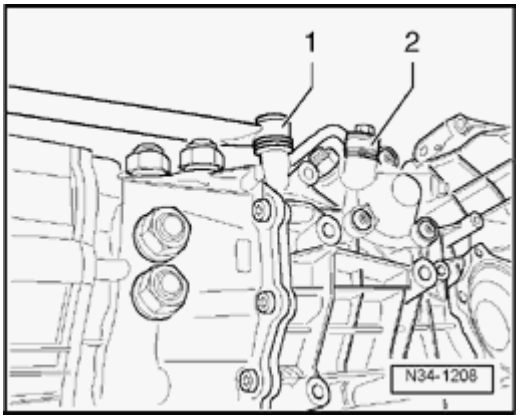

Fig. 125: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove connecting rod - **2** - for selector rod.
- Disconnect push rod - **1** - by removing hex socket head bolt.

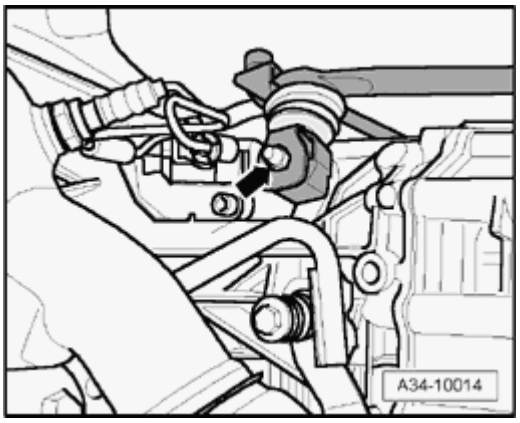

Fig. 126: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **arrow** - and detach selector shaft lever from selector shaft.
- Remove selector mechanism to rear.

Installing

Installation is in reverse order of removal. Note the following:

NOTE:

- **Always replace seals, gaskets and self-locking nuts.**

- Bolt drive shaft onto transmission --> **39 FINAL DRIVE, DIFFERENTIAL** .
- Install exhaust system free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for appropriate engine code.
- Install tunnel cross member --> **40 - FRONT SUSPENSION** .

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- Adjust selector mechanism --> **Selector mechanism, adjusting**.
- Install air conditioning operating unit --> **87 AIR CONDITIONING** .

Tightening torques

Component		Nm
Connecting rod to transmission		23
Selector shaft lever to selector shaft		23
Push rod to transmission		40
Heat shield for drive axle to transmission		23
Heat shield for drive shaft to transmission cover		25
Bracket for sound insulation to subframe		10
Selector mechanism to body		10
Sound insulation to selector mechanism		10

Selector mechanism, adjusting

The following are requirements for correct gear lever alignment:

- Gear selector linkage must be in proper condition and undamaged.
- Selector mechanism must move freely.
- Transmission, clutch and clutch mechanism must be in proper condition.
- Transmission in neutral.

Procedure

- Remove gear lever knob together with boot --> **Gear lever knob with boot, removing and installing**.

Vehicles with large radio slot:

- Remove air conditioning operating unit --> **87 AIR CONDITIONING** .

Vehicles with small radio slot:

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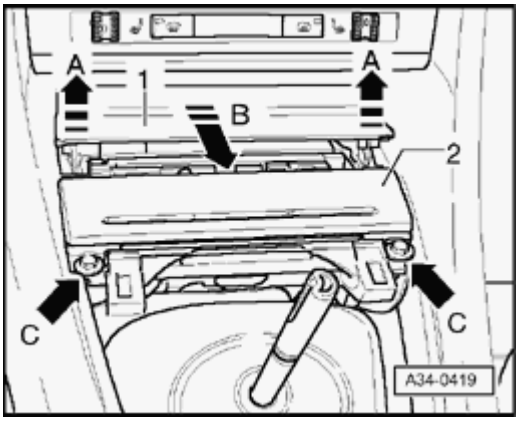

Fig. 127: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift trim panel - **1** - in direction of - **arrow A** - , then pull it out in direction of - **arrow B** -.

Continued for all vehicles:

- Remove bolts - **arrows C** - and then pull ashtray - **2** - out of center console.
- Disconnect electrical connector for ashtray light.
- Remove foam wedges from center console.
- Lift out sound insulation.

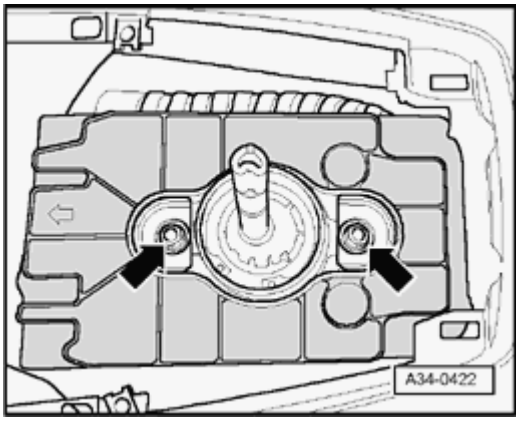

Fig. 128: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove sound insulation for gear lever housing - **arrows** -.

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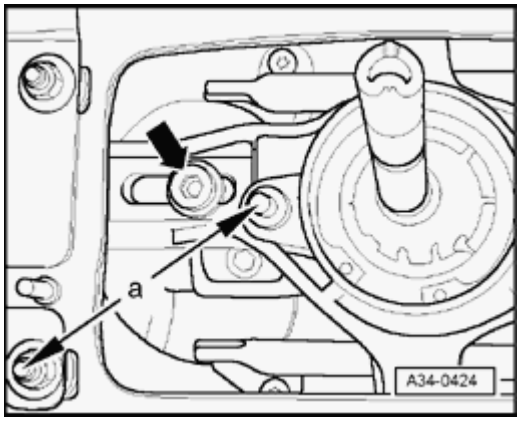

Fig. 129: Shift Mechanism Measurement And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure distance - **a** - between two studs in selector mechanism.
- Specification: distance a = 85 mm

NOTE:

- **Measure from center of one stud to center of the other.**

- If distance measured is not correct, adjust dimension - **a** - as follows:
- Loosen bolt - **arrow** - for push rod.
- Rear push rod (in selector mechanism) must move freely in both directions on slide.
- Set to distance - **a** - by moving rear push rod (in selector mechanism).
- Tighten bolt for push rod - **arrow** - to 23 Nm.

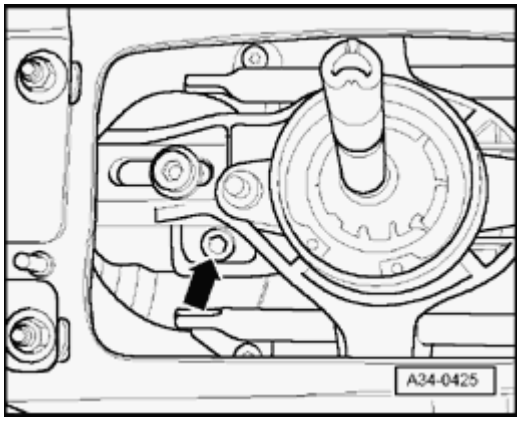

Fig. 130: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt for selector rod - **arrow** -.

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- Connection between selector rod and selector mechanism should move freely.

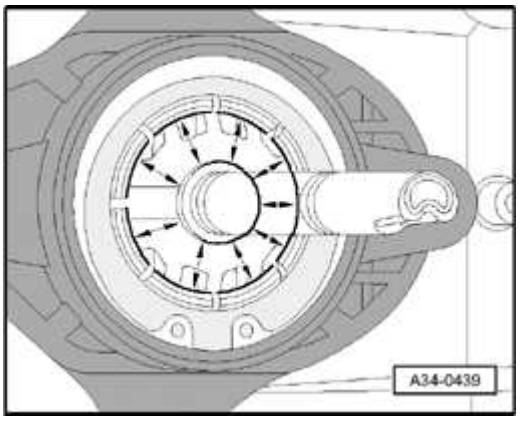

Fig. 131: Centering Bottom Of Shift Lever Centered In Ball Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Align gear lever as follows:

- Position bottom of gear lever in center of ball guide.
- Distance between ball guide and bottom of gear lever - **arrows** - must be equal at all points.

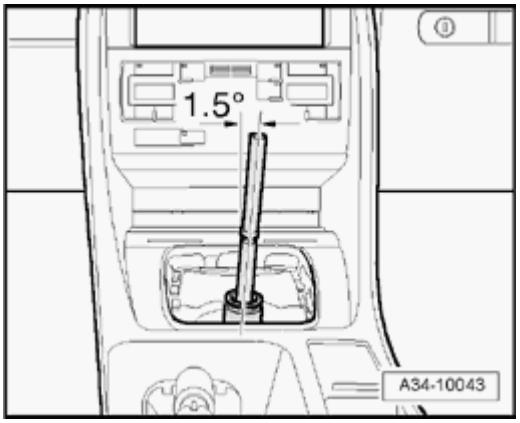

Fig. 132: Gear Lever Alignment Pointing Slightly To Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align gear lever so that it points slightly (1.5°) to the right (as seen in direction of travel).
- Hold gear lever in this position.

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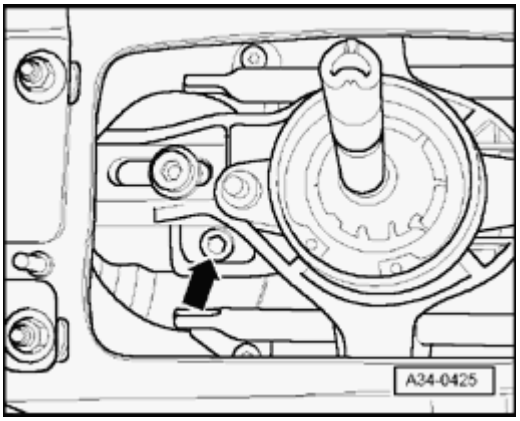

Fig. 133: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolt for push rod - **arrow** - to 23Nm.

NOTE:

- **The gear lever must remain in the same position while the bolt is being tightened.**

Checking gear lever setting

- The gear lever should rest in the 3rd/4th gear gate when the transmission is in neutral.

- Press clutch pedal.
- Check that all gears can engaged.
- Check operation of reverse gear lock.

- It should only be possible to engage reverse gear after pressing the gear lever down to overcome the reverse gear lock.
- The gear lever should return by itself from the reverse gear gate to the 3rd / 4th gear gate.

If after repeated selection of a gear it fails to engage smoothly, gear lever alignment must be repeated.

- Install trim parts and gear lever knob --> **Gear lever knob with boot, removing and installing**.

TRANSMISSION, REMOVING AND INSTALLING

Transmission, removing and installing

Removing transmission on vehicles with 4-cylinder engine --> **Transmission, removing (vehicles with 4-cylinder engine)**.

Removing transmission on vehicles with 6-cylinder engine --> **Transmission, removing (vehicles with 6-cylinder engine)**.

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Installing transmission on vehicles with 4-cylinder or 6-cylinder engine --> **Transmission, installing (vehicles with 4-cylinder or 6-cylinder engine)**.

Transmission, removing (vehicles with 4-cylinder engine)

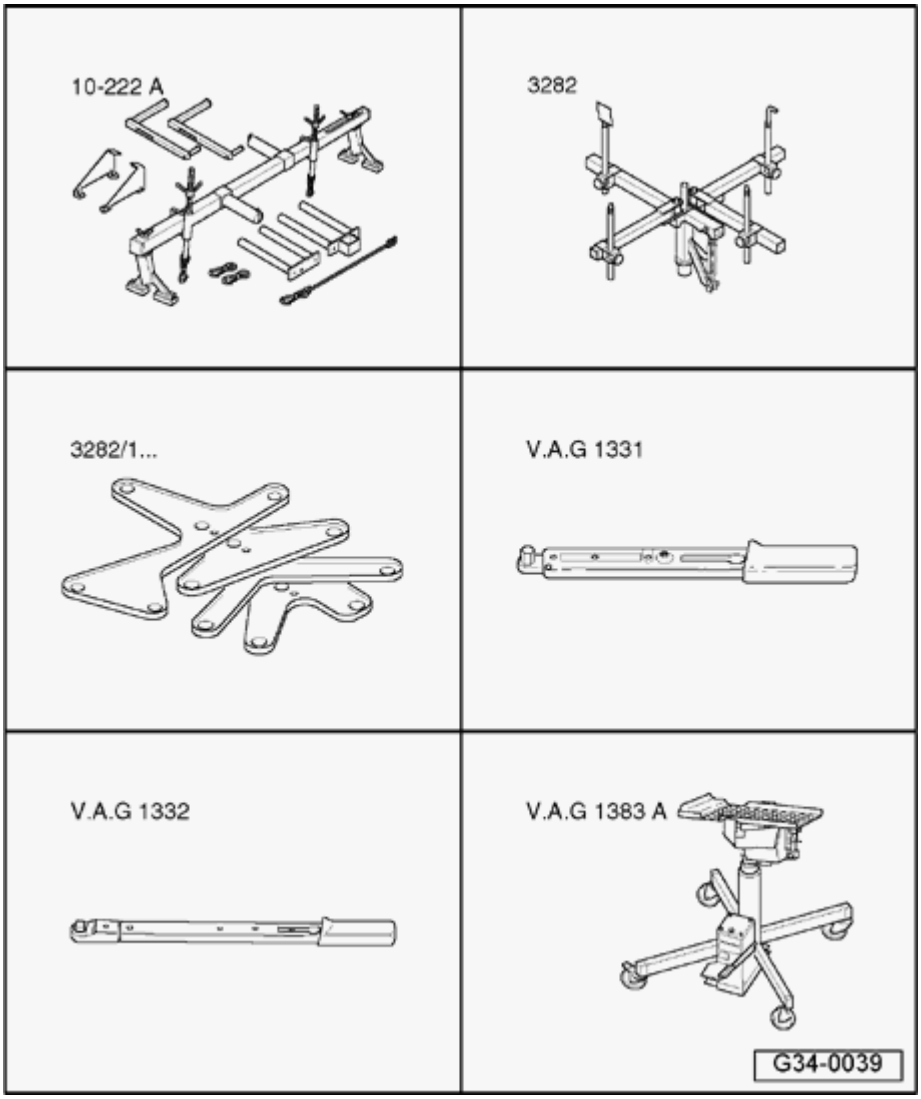

Fig. 134: Identifying Special Tools -- Transmission, Removing From Vehicles
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Support bracket 10 - 222 A
- Transmission support 3282
- Adjustment plate 3282/43
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332

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- Engine/transmission jack V.A.G 1383 A

Special tools, testers and auxiliary items required

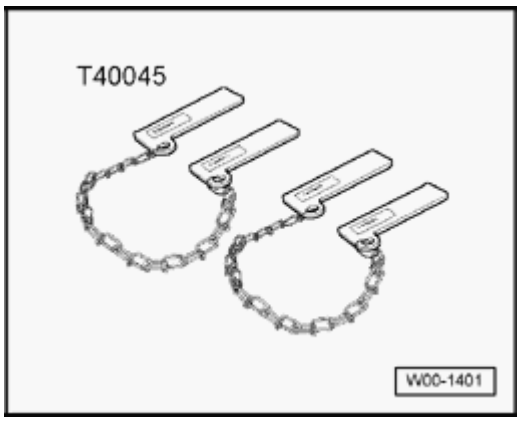

Fig. 135: Insert Pad For Front Fender T40045
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert pad for front fender T40045
- **Grease for clutch plate splines G000100**
- **Copper grease Z381351TE**

Procedure

NOTE:

- **All cable ties which are released or cut open during removal must be installed in the same position when installing.**
- **Heat insulation sleeves removed during removal of transmission must be installed in the same position when installing.**

CAUTION:

- **Follow steps required when disconnecting battery -->**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL for Cabriolet**

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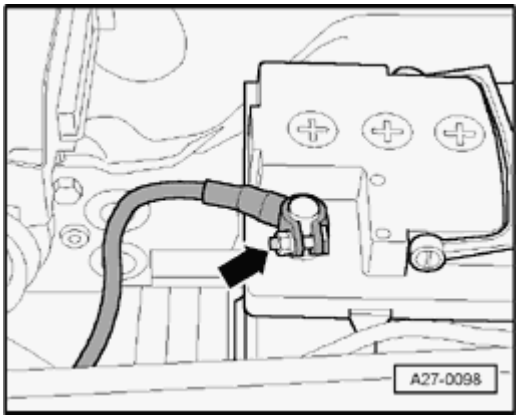

Fig. 136: Disconnecting Battery Ground (GND) Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With ignition switched off, disconnect battery Ground (GND) strap - **arrow** -.

Vehicles with 1.8 liter. turbo engine:

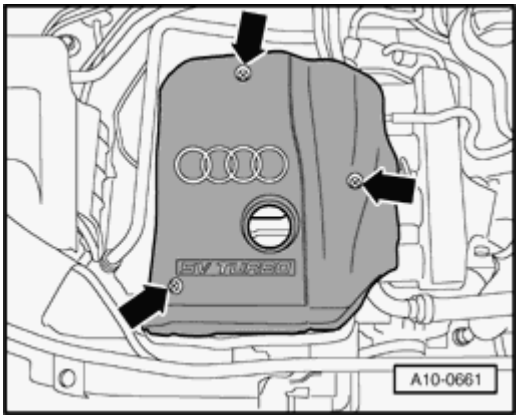

Fig. 137: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover panel - **arrows** -.

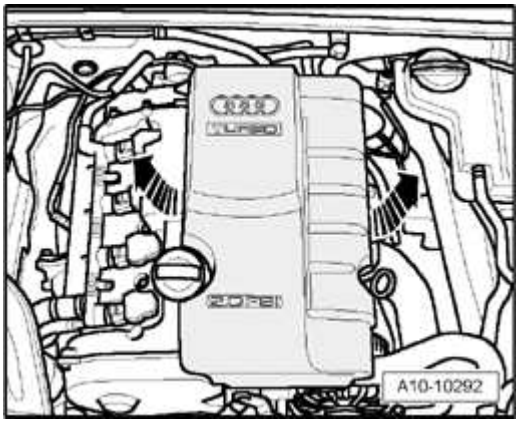

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Fig. 138: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 2.0 liter. turbo engine:

- Remove engine cover panel - **arrows** -.

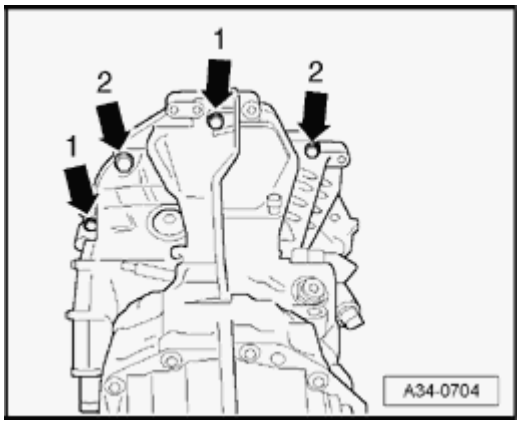

Fig. 139: Upper Engine/Transmission Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove upper engine/transmission securing bolts - **arrows 1** - and - **arrows 2** -. Please note that retaining brackets for wires/lines and coolant pipe may be secured on bolts - **arrows2** - (important for installation).

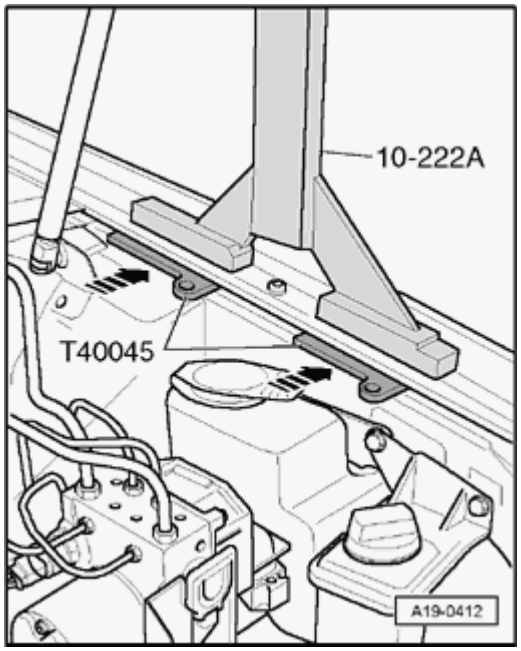

Fig. 140: Placing Insert Pad For Front Fender T40045 On Both Sides Between Fender Attachment Edge And Web Plate Lying Beneath
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove rubber seal from edges of fenders mounting flanges.
- To avoid damaging edges of the fender panels use support bracket 10-222 A, insert insert pad for front fender T40045 on both sides between the fender mounting flange and the body panel underneath.

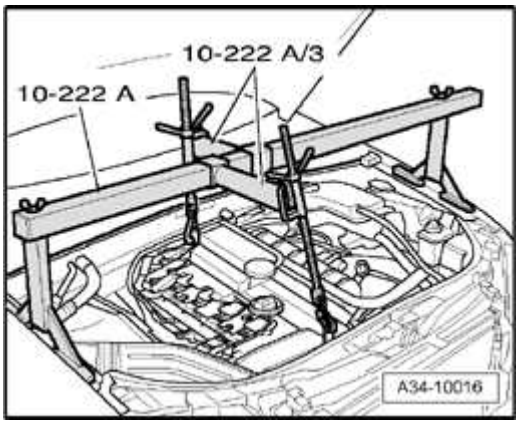

Fig. 141: Engine Support Bridge 10-222 A Set Up With Adapters 10-222/3 On Fender Mounting Flanges
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up support bracket 10-222 A with adapters 10-222/3 on fender mounting flanges.
- Engage spindles on engine lifting eyes as illustrated.
- Take up weight of engine using spindles.

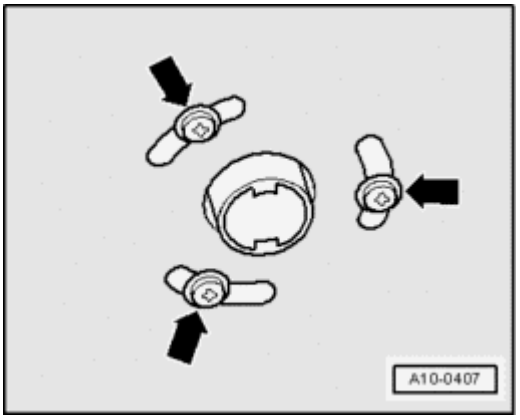

Fig. 142: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- On vehicles equipped with auxiliary heater, remove bolts - **arrows** - securing exhaust pipe of auxiliary heater to sound insulation.

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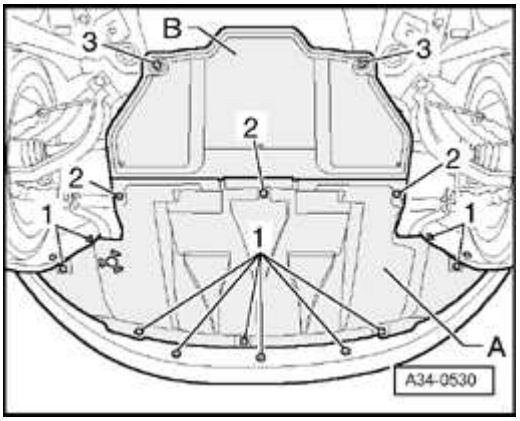

Fig. 143: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

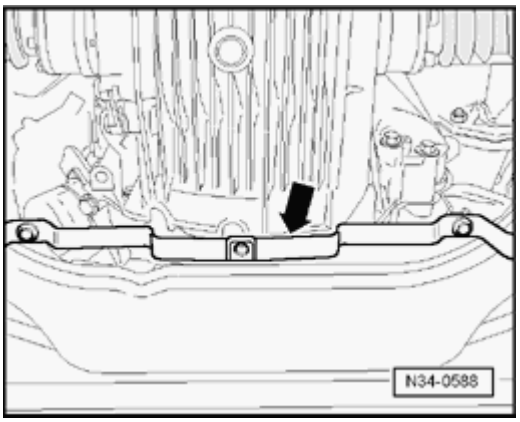

Fig. 144: Removing Noise Insulation Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach bracket - **arrow** - for sound insulation.

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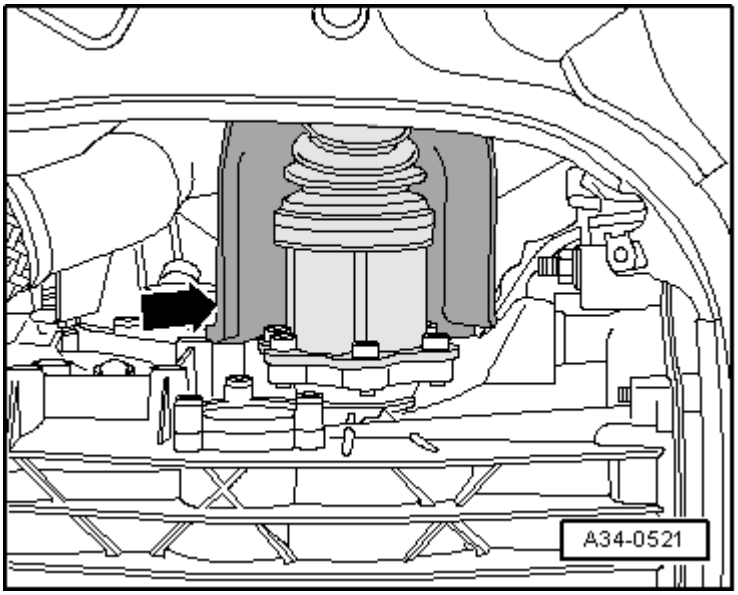

Fig. 145: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for drive axle (right-side).
- Remove drive axles (left and right) from transmission flange shafts.

Make sure you do not damage surface coating on drive axles.

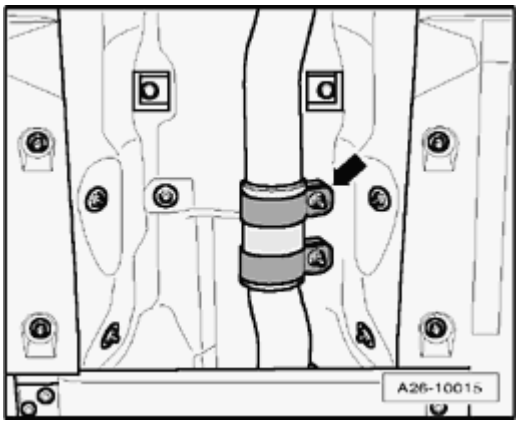

Fig. 146: Loosening Clamping Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **The flexible pipe connection (de-coupling element) on the front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.**

- Separate exhaust system at clamp - **arrow** - and slide clamp to rear.

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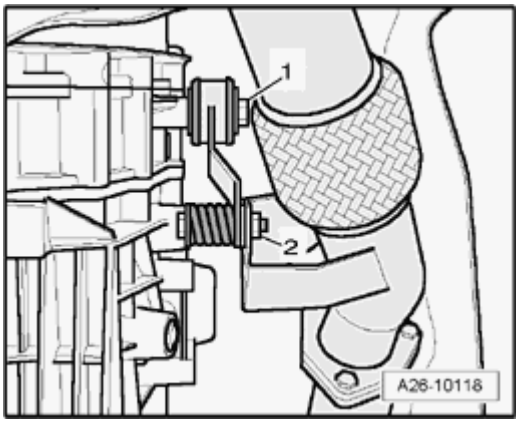

Fig. 147: Retaining Bracket For Front Exhaust Pipe, Bolt And Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **1** - and nut - **2** - and detach retaining bracket for front exhaust pipe.

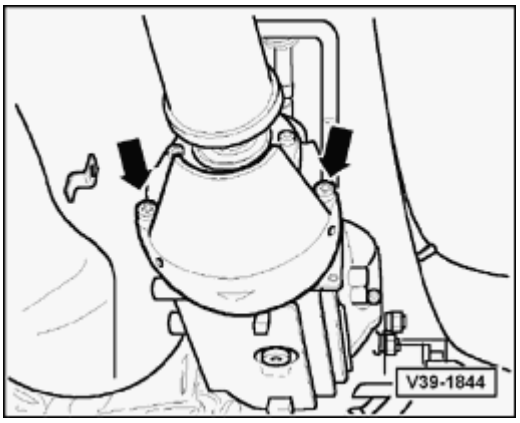

Fig. 148: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove heat shield for drive axle - **arrows** -.

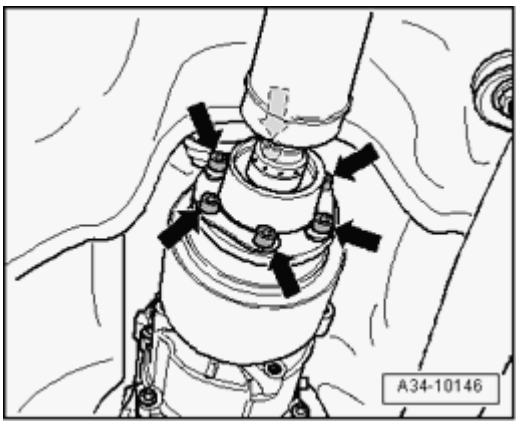

Fig. 149: Locating Bolts At Transmission/Drive Shaft Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove bolts - **arrows** - at transmission/drive shaft flange.
- Slide drive shaft together towards rear final drive. The constant velocity joints can be moved axially.
- Tie drive shaft to side.

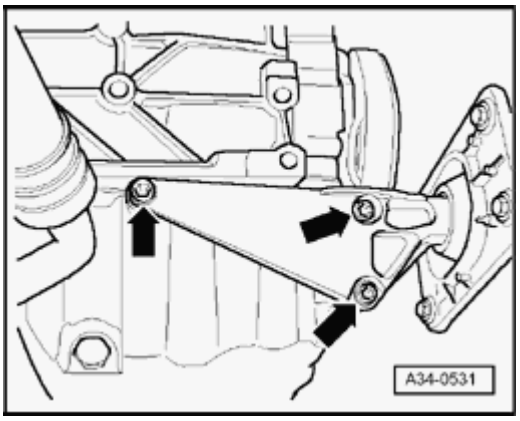

Fig. 150: Torque Reaction Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Cabriolet:

NOTE:

- **On Audi Cabriolet vehicles the following additional steps are required in order to remove the three bottom engine/transmission bolts:**

- Remove torque reaction support - **arrows** -.

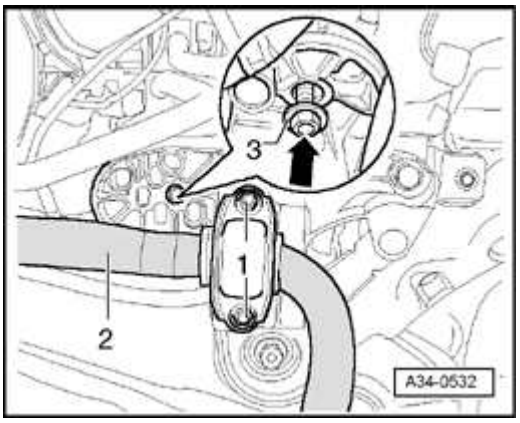

Fig. 151: Swivel Stabilizer Bar Nuts, Engine Mountings Nut And End Of Stud
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nuts - **1** - on left and right sides, and swivel anti-roll bar - **2** - downwards.
- Loosen nut - **3** - on left and right engine mountings until bottom of nut is flush with stud - **arrow** -.
- Use support bracket 10 - 222 A to lift engine just enough for nuts - **3** - to make contact with left and right console.

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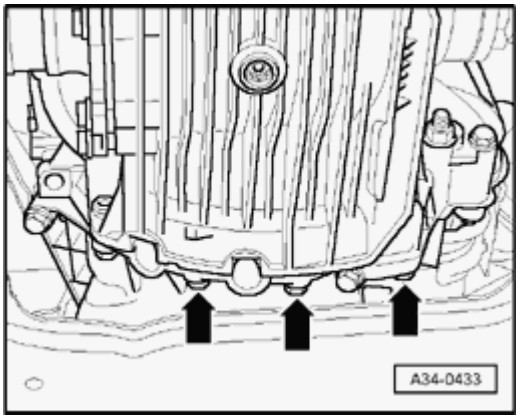

Fig. 152: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Continued for all vehicles:

- Remove three lower engine/transmission securing bolts - **arrow** -.

Cabriolet:

- Lower engine back down.

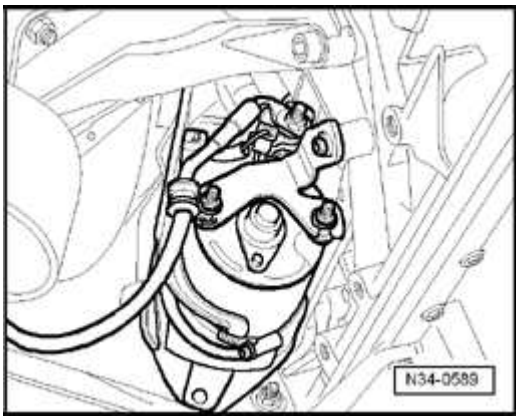

Fig. 153: Locating Starter Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Continued for all vehicles:

- Detach starter from engine/transmission and secure if necessary -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

.

NOTE:

- **Starter cables do not have to be disconnected.**

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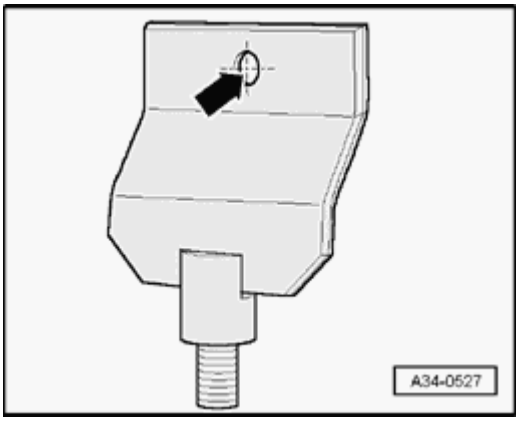

Fig. 154: Hole In Supporting Elements Of Transmission Support 3282
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drill a hole of 10.2mmdiameter - **arrow** - in supporting elements of transmission support 3282.

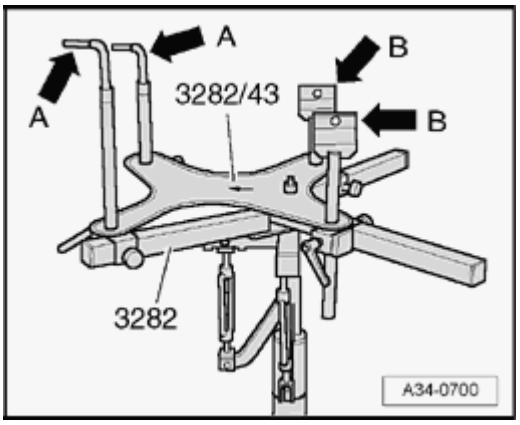

Fig. 155: Support Elements 3282/49 And 3282/52 And Arrow On The Adjustment Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove manual transmission 02X, set up transmission support 3282 with adjustment plate 3282/43 and place on engine/transmission jack V.A.G 1383 A.

NOTE:

- **The support elements 3282/49 - arrows A - and 3282/52 - arrows B - are shown in schematic form on the adjustment plate. The arrow on the adjustment plate points toward the direction of travel.**
- **Adjustment plate can only be installed in one position.**

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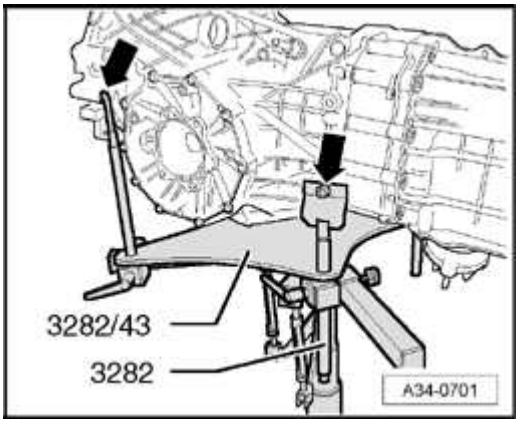

Fig. 156: Supporting Elements Secured To Left Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align adjustment plate parallel to transmission.
- Secure supporting elements to the left side of the transmission, as shown in illustration. Tighten bolt - **arrow on right side** - to 20 Nm.

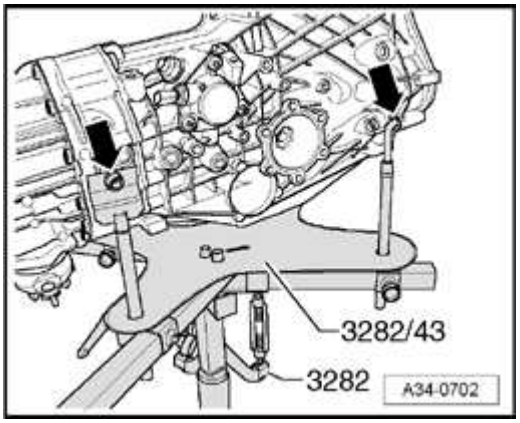

Fig. 157: Supporting Elements Secured To Right Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure supporting elements to the right side of the transmission, as shown in illustration. Tighten bolt - **arrow on left side** - to 20 Nm.

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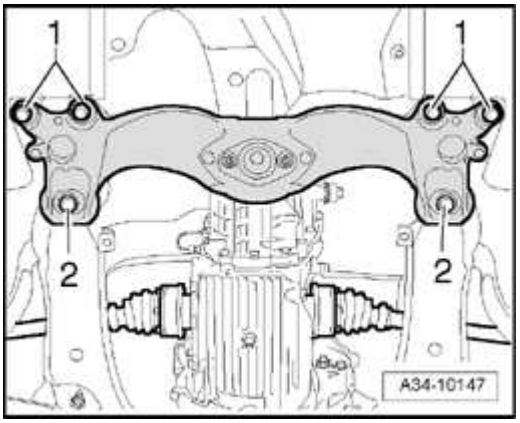

Fig. 158: Tunnel Cross Member Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First remove bolts - **1** - and then bolts - **2** -.

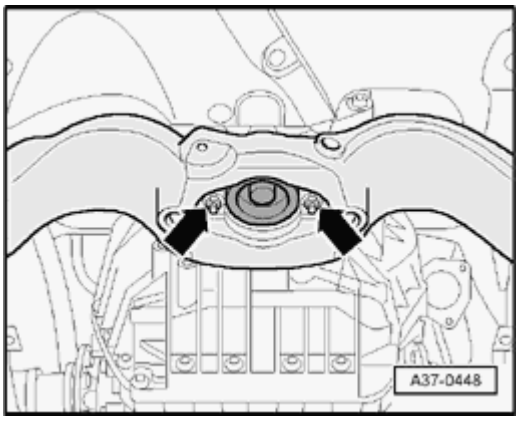

Fig. 159: Removing Nuts And Rear Crossmember
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** - and detach tunnel cross member.
- Lower transmission slightly using engine/transmission jack V.A.G 1383 A.

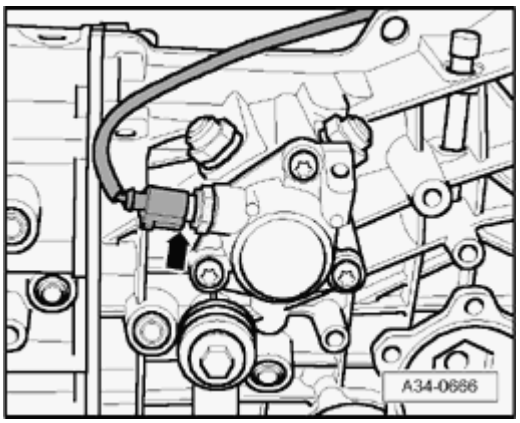

Fig. 160: Back-Up Light Switch F4 Electrical Connector

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - for back-up light switch F4 and move electrical wire clear.

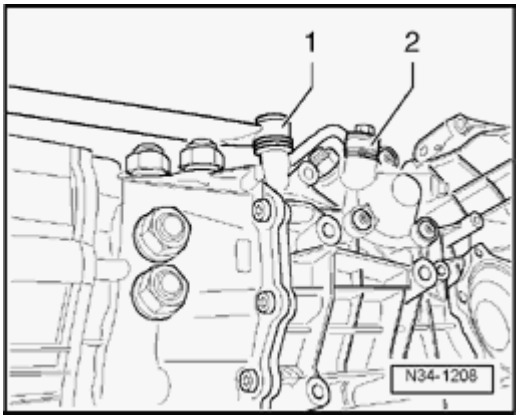

Fig. 161: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove connecting rod - **2** - for selector rod.
- Remove push rod - **1** - by using an 8 mm hex key when unscrewing bolt.

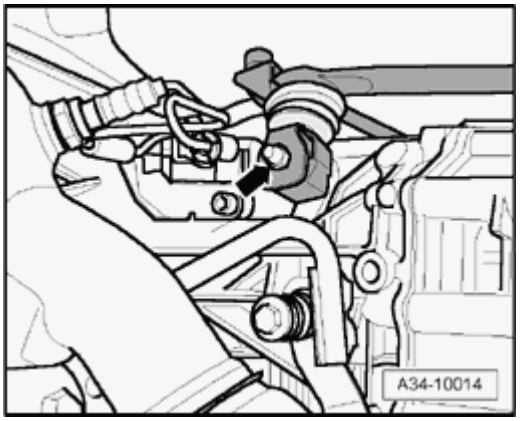

Fig. 162: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **arrow** - and detach selector shaft lever from selector shaft.

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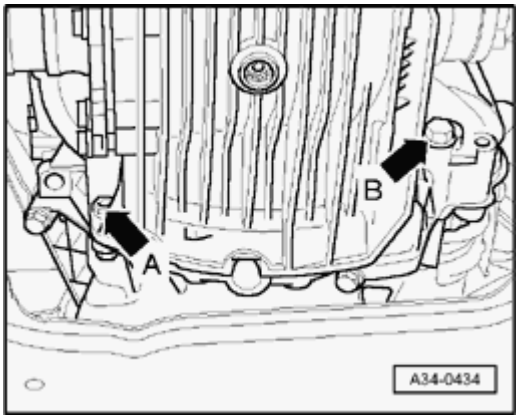

Fig. 163: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove remaining engine/transmission securing bolts - **arrow A** - and - **arrow B** -.
- Press transmission off dowel sleeves and lower carefully using engine/transmission jack V.A.G 1383 A just far enough to gain access to slave cylinder.

NOTE:

- **When lowering transmission, make sure hydraulic line to slave cylinder is not damaged.**

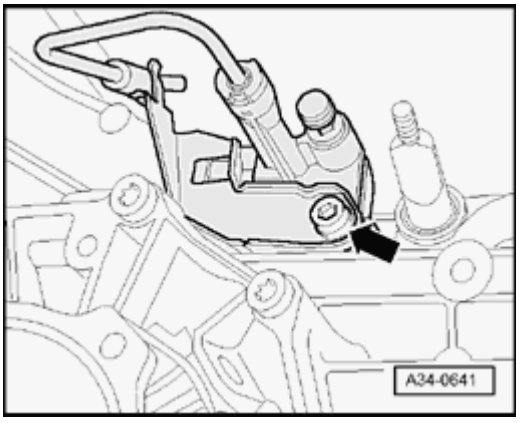

Fig. 164: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove slave cylinder from transmission - **arrow** - and secure with wire. Do not open line/hose system.

CAUTION: Do not depress clutch pedal after removing slave cylinder. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

- If installed, remove retaining clips/cable ties together with Lambda probe wires from top of transmission.
- Lower transmission.

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NOTE:

- **When lowering transmission, make sure there is sufficient clearance to drive shafts.**

- Before performing assembly work, secure transmission to assembly stand, using holding fixture VW 540 --> **Transmission, mounting on assembly stand**.

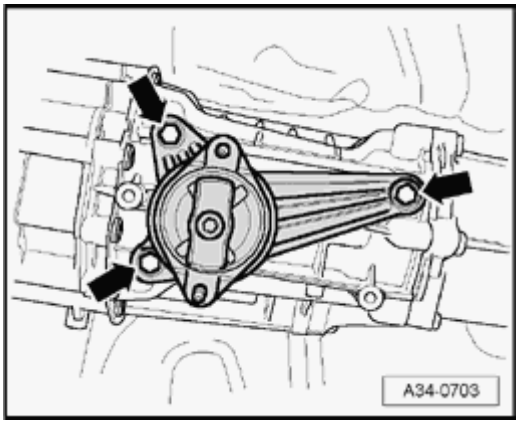

Fig. 165: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installing a new transmission instead of the one removed, the transmission mounting has to be transferred to new transmission - **arrows** -.

Installing transmission --> **Transmission, installing (vehicles with 4-cylinder or 6-cylinder engine)**

Transmission, removing (vehicles with 6-cylinder engine)

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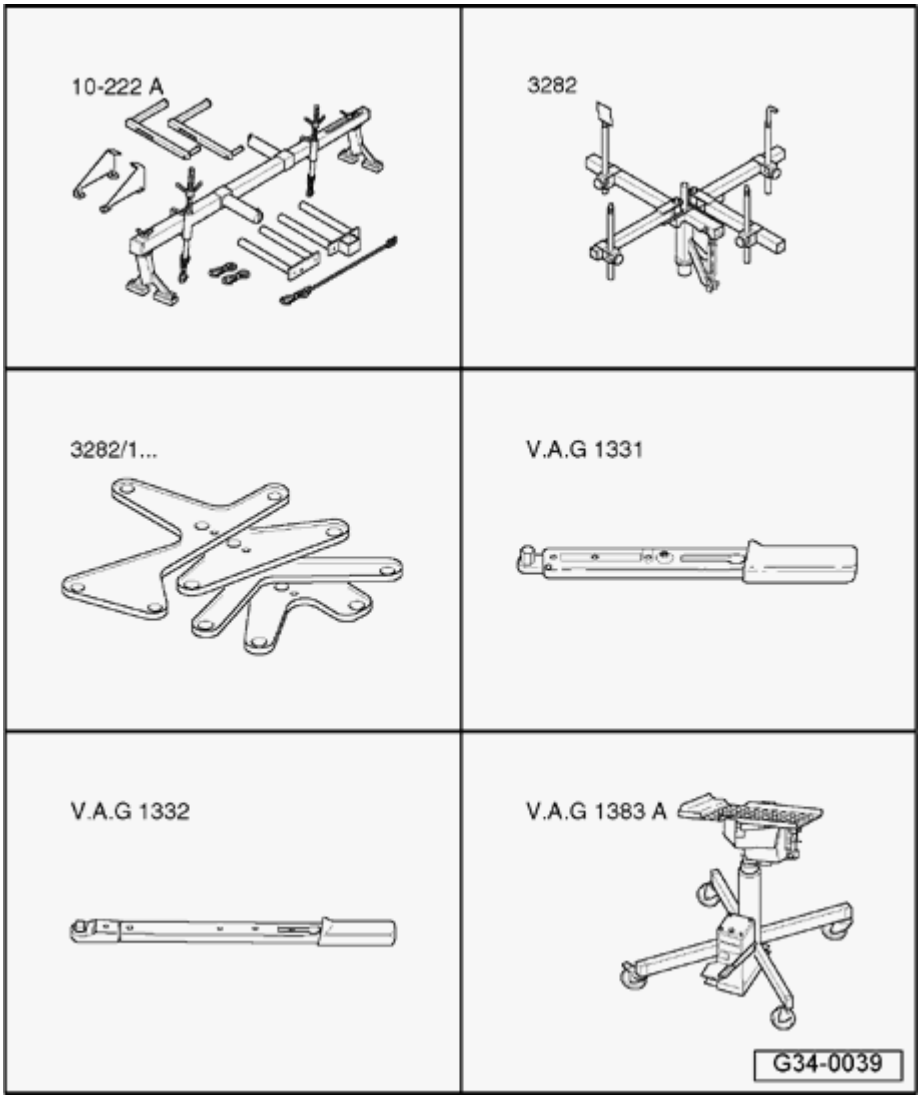

Fig. 166: Identifying Special Tools -- Transmission, Removing From Vehicles
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Support bracket 10 - 222 A
- Transmission support 3282
- Adjustment plate 3282/43
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332
- Engine/transmission jack V.A.G 1383 A

Special tools, testers and auxiliary items required

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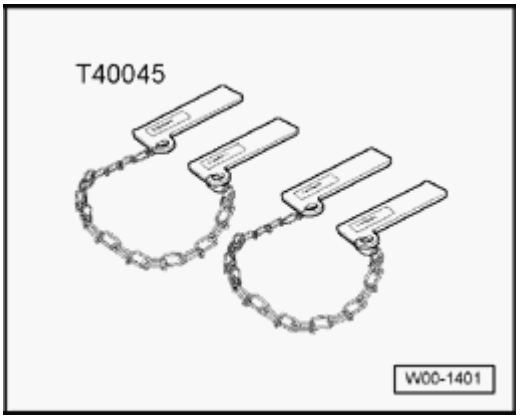

Fig. 167: Insert Pad For Front Fender T40045
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert pad for front fender T40045

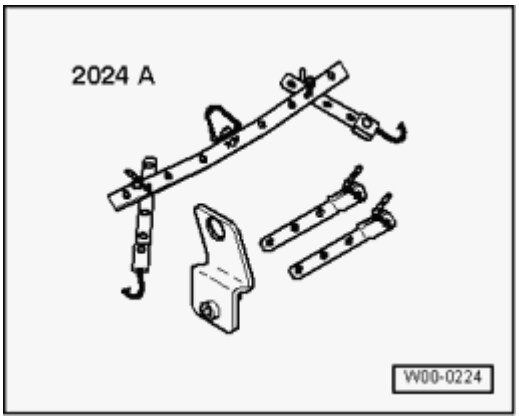

Fig. 168: Engine Sling 2024 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lifting aid 2024 A
- **Grease for clutch plate splines G000100**
- **Copper grease Z381351TE**

NOTE:

- **All cable ties which are released or cut open during removal must be installed in the same position when installing.**
- **Heat insulation sleeves removed during removal of transmission must be installed in the same position when installing.**

CAUTION: Follow steps required when disconnecting battery -->

- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL for Cabriolet**

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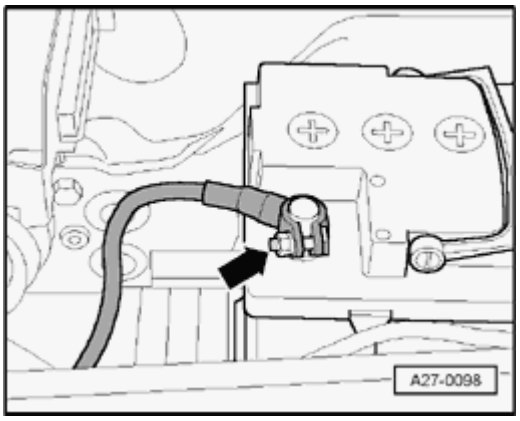

Fig. 169: Disconnecting Battery Ground (GND) Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With ignition switched off, disconnect battery Ground (GND) strap - **arrow** -.

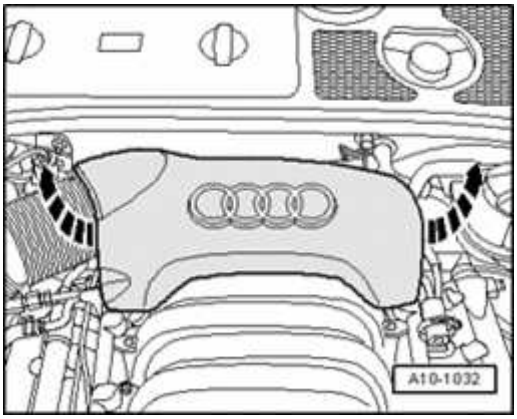

Fig. 170: Removing Rear Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover - **arrows** -.

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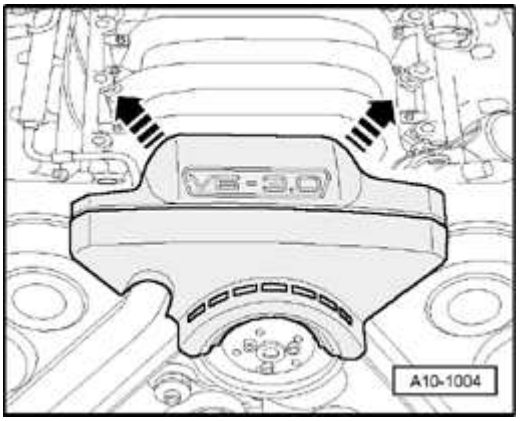

Fig. 171: Removing Front Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover - **arrows** -.

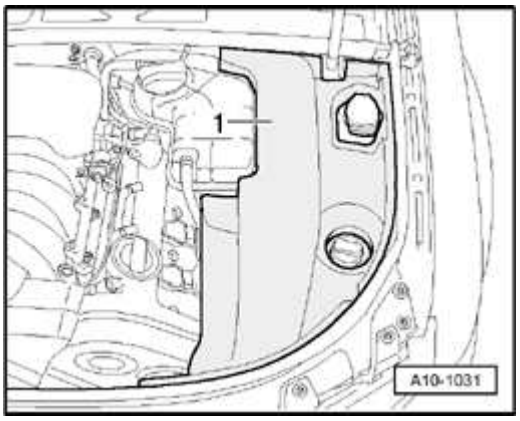

Fig. 172: Removing Cover In Engine Compartment (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - **1** - on left side of engine compartment.

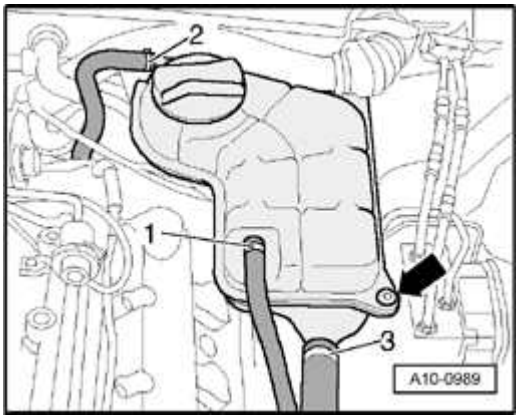

Fig. 173: Removing Coolant Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Unfasten coolant expansion tank - **arrow** -.
- Disconnect electrical wiring for Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant expansion tank.
- Tie coolant expansion tank to one side, leaving coolant hoses - **1** - , - **2** - and - **3** - connected.

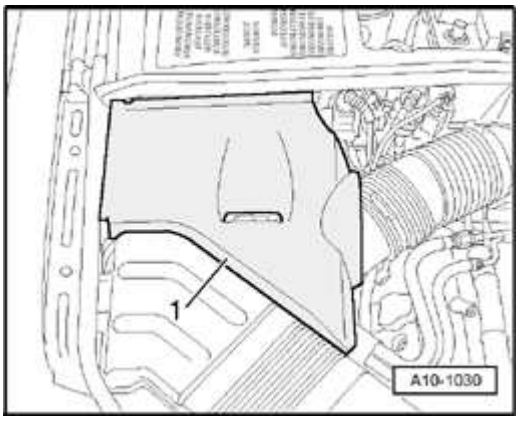

Fig. 174: Removing Cover In Engine Compartment (Right Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - **1** - on right side of engine compartment.

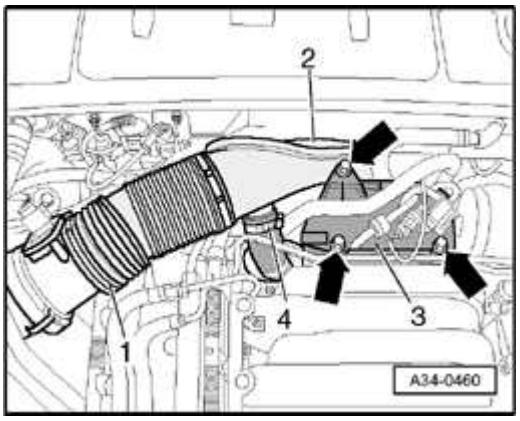

Fig. 175: Identifying Holding Plate, Intake Air Hose, Hose & Air Duct
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - from solenoid valve mounting plate - **3** -.
- Disconnect air intake hose - **1** - from mass air flow sensor.
- Pull hose - **4** - for crankcase breather system off air duct - **2** -.

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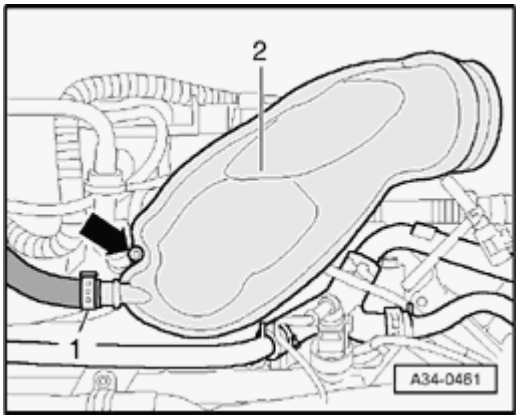

Fig. 176: Removing Bolt And Disconnect Air Duct At Throttle Valve Control Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - and disconnect air duct - **2** - from throttle valve control module.
- If installed, disconnect hose - **1** - from air duct.

NOTE:

- **In the illustration, the air duct is shown from the rear and with the engine removed.**

- Remove engine/transmission securing bolts which are accessible from above.

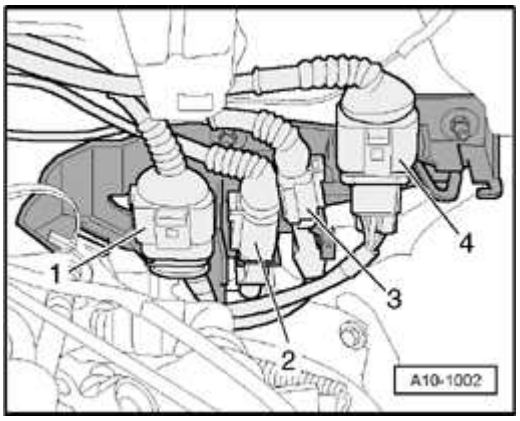

Fig. 177: Removing Harness Connectors From Bracket At Left Of Bulkhead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors - **1 to 4** - from retainer at left of bulkhead.
- Disconnect electrical connectors - **1** - and - **4** -.
- Move Lambda probe wires clear.
- Remove retainer for connectors.

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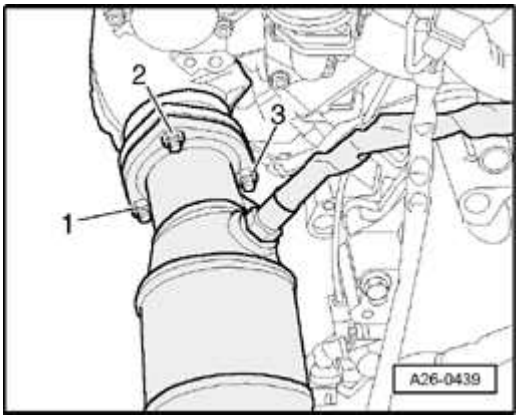

Fig. 178: Left Front Exhaust Pipe To Exhaust Manifold Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **1** - (access from above), connecting left front exhaust pipe with exhaust manifold.

NOTE:

- **In the illustration the engine has been removed.**

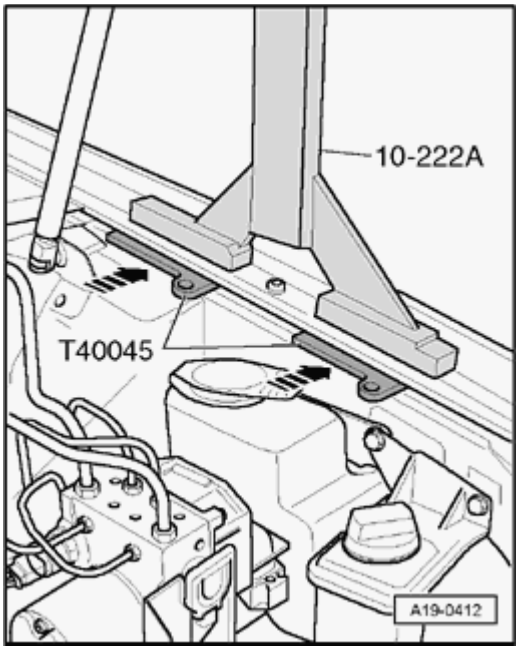

Fig. 179: Placing Insert Pad For Front Fender T40045 On Both Sides Between Fender Attachment Edge And Web Plate Lying Beneath
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal from edges of fender mounting flanges.
- To avoid damaging edges of fender panels with support bracket 10-222 A, insert insert pad for front fender T40045 on both sides between fender mounting flange and body panel underneath.

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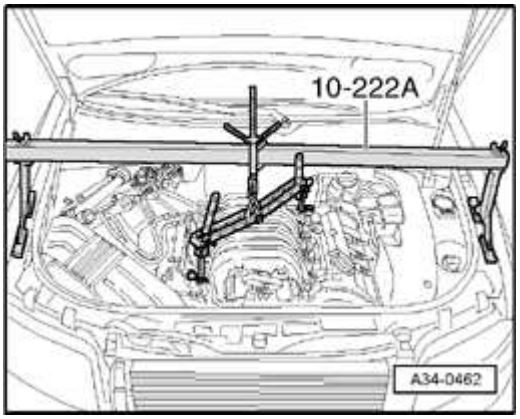

Fig. 180: Positioning 10-222A Engine Support Bridge On Bolted Flanges Of Fenders
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up support bracket 10 - 222 A on fender mounting flanges.

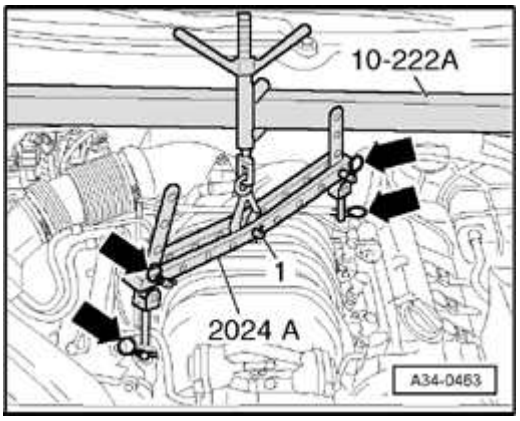

Fig. 181: Removing Eyelet For 2024A Engine Sling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove eye of lifting tackle 2024A.
- Re-insert pin - **1** - in middle hole on lifting tackle and secure it with split pin.
- Hook pin on lifting tackle 2024A onto spindle on support bracket 10 - 222 A.
- Hook lifting tackle 2024A into lifting eyes at front and rear of engine.

CAUTION: Support hooks and locking pins on lifting tackle must be secured with retainers - arrows - in illustration.

- Slightly pretension engine with spindle of support bracket.

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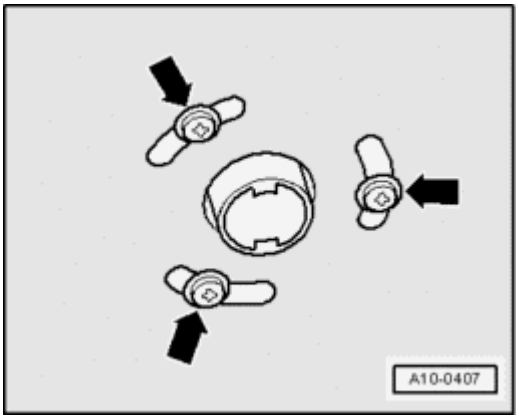

Fig. 182: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- On vehicles equipped with auxiliary heater, remove bolts - **arrows** - securing exhaust pipe of auxiliary heater to sound insulation.

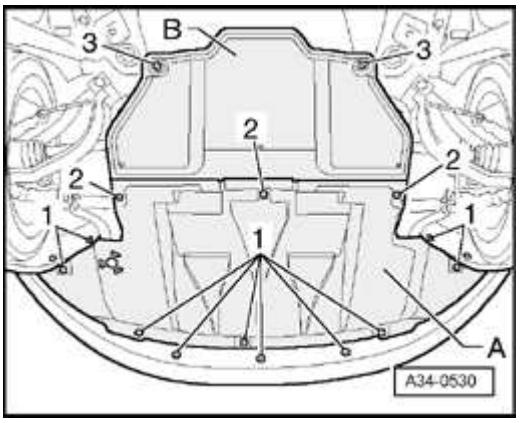

Fig. 183: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

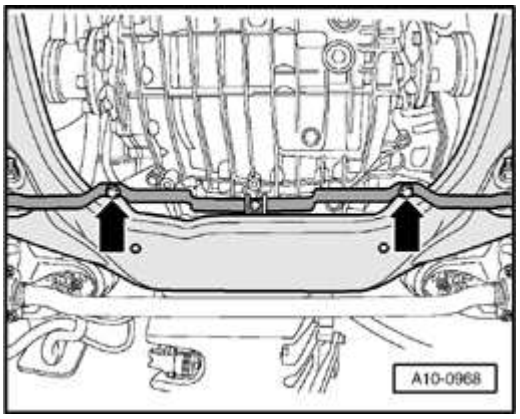

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Fig. 184: Removing Bracket For Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for sound insulation - **arrows** -.

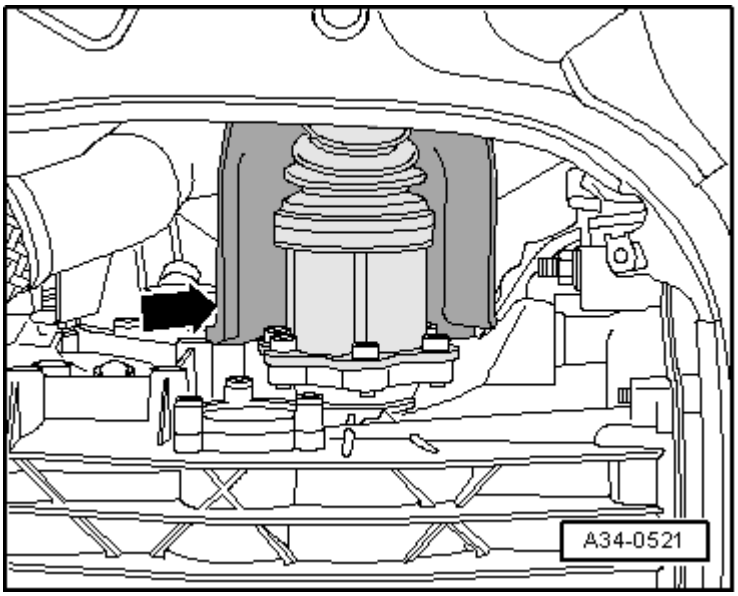

Fig. 185: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrow** - for drive axles (left and right).
- Remove drive axles from flange shafts, lift clear and secure.

NOTE:

- **Make sure you do not damage surface coating on drive axles.**

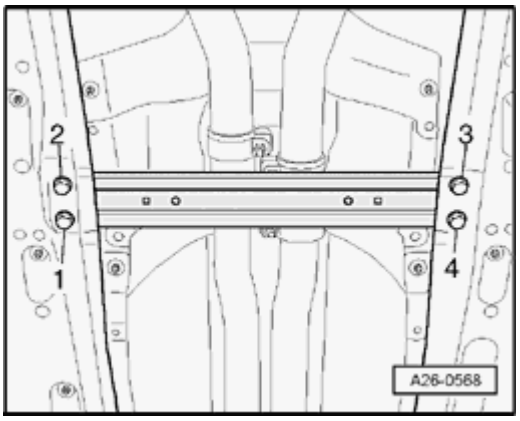

Fig. 186: Removing Bolts For Front Vehicle Floor Crossmember
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove front cross member - **1 to 4** -.

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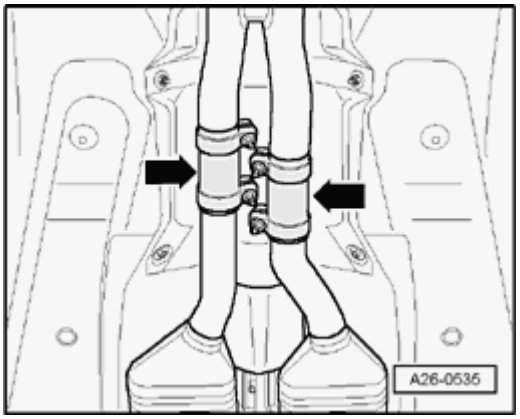

Fig. 187: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamps - **arrows** -.
- Remove front exhaust pipe with catalytic converter (left-side) --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for relevant engine code.
- Remove bracket for exhaust pipe (right front) from transmission.

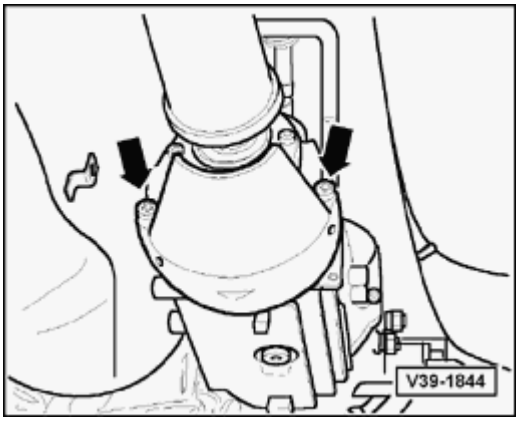

Fig. 188: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove heat shield for drive shaft - **arrows** -.

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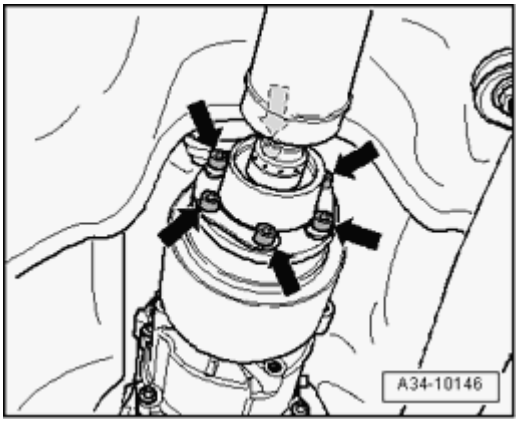

Fig. 189: Locating Bolts At Transmission/Drive Shaft Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - at transmission/drive shaft flange.
- Slide drive shaft together toward rear final drive. The constant velocity joints can be moved axially.
- Tie drive shaft to side.

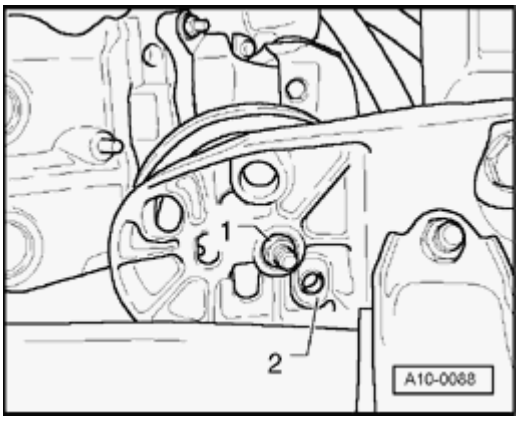

Fig. 190: Threaded Connections And Positioning Sleeves On Lower Engine Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1** - at bottom of engine mountings (left and right).

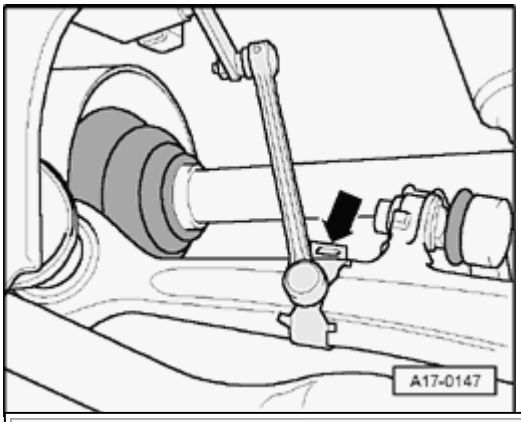

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Fig. 191: Unclipping Operating Rod For Vehicle Levelling Sensor At Lower Transverse Link
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, unclip operating rod for left front level control system sensor G78 from lower transverse link - **arrow** -.

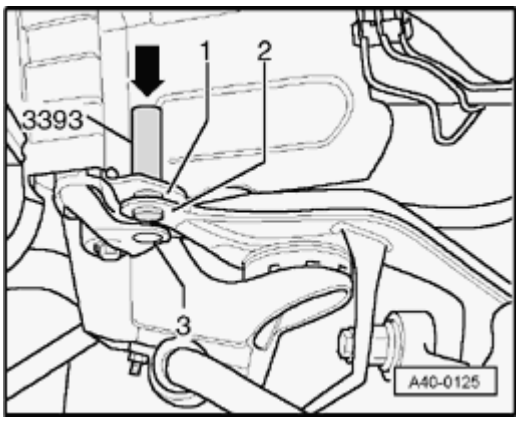

Fig. 192: Checking Holes Align Using Testing Mandrel 3393
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before loosening subframe, use testing mandrel 3393 to check whether holes - **1** - and - **2** - are aligned.

If holes are not aligned, a wheel alignment has to be performed after installing the subframe.

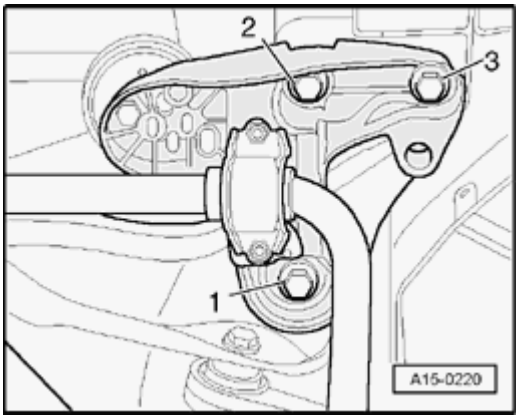

Fig. 193: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front bolts - **2** - and - **3** - on subframe (left and right). Then remove bolts - **1** -.
- Lower subframe at front.

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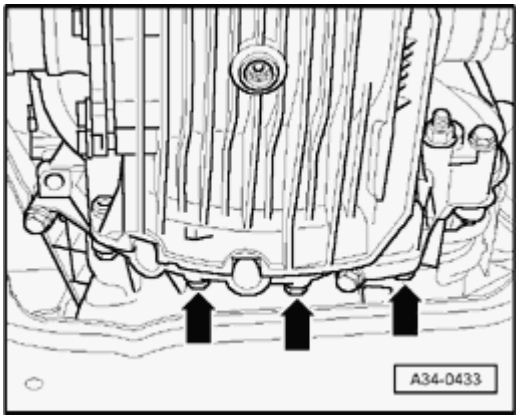

Fig. 194: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove lower engine/transmission securing bolts - **arrows** -.

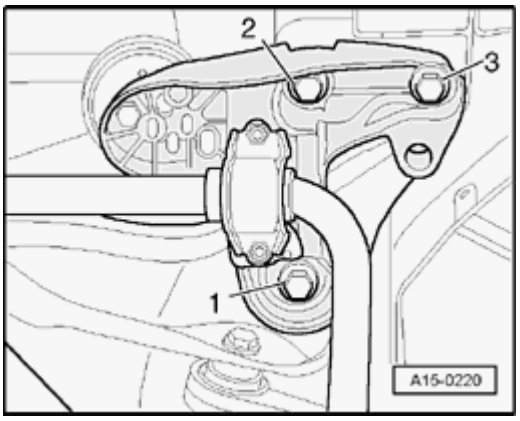

Fig. 195: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Temporarily secure subframe again.

Temporary tightening torque:

1 - approx. 100 Nm

2 - approx. 70 Nm

3 - approx. 70 Nm

CAUTION: Do not replace bolts yet or tighten to their final torque. This will be done when installing the transmission.

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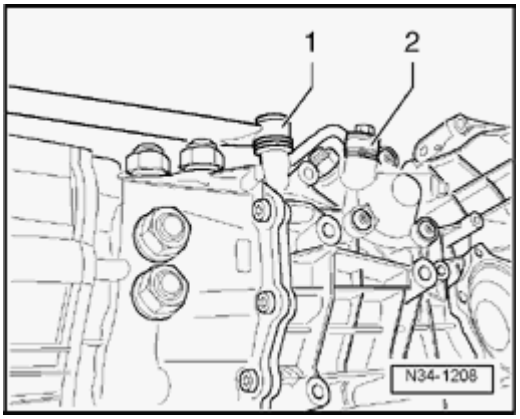

Fig. 196: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove connecting rod - **2** - for selector rod.
- Disconnect push rod - **1** - by removing hex socket head bolt.

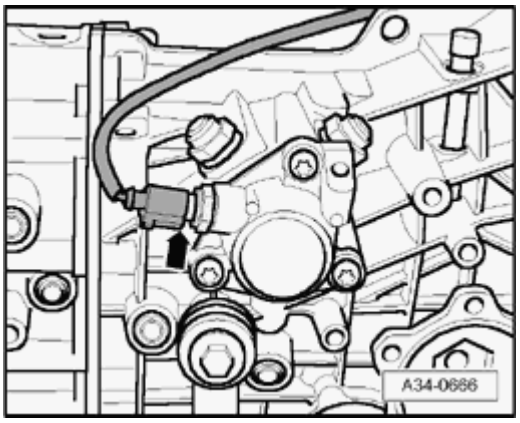

Fig. 197: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - for Back-up light switch F4 and move electrical wire clear.

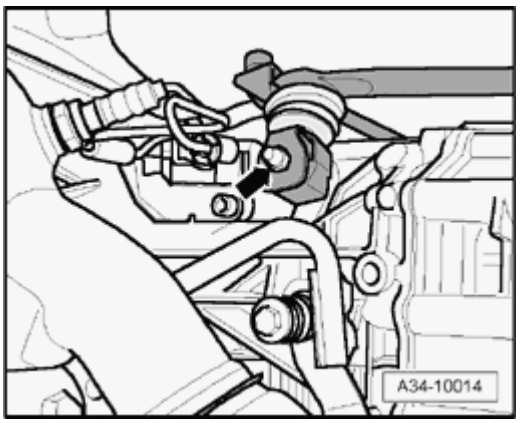

Fig. 198: Selector Shaft Lever Nut

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **arrow** - and detach selector shaft lever from selector shaft.

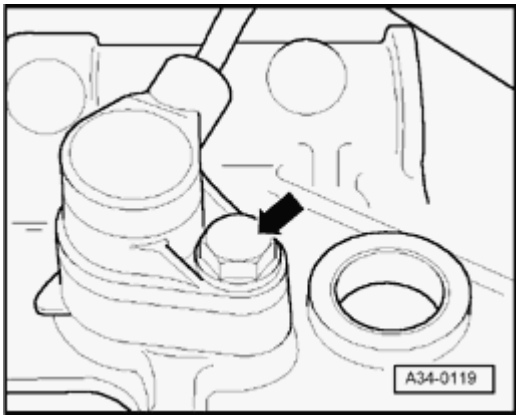

Fig. 199: Location Of Engine Speed (RPM) Sensor G28 On Coupling Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove Engine Speed (RPM) sensor G28 from left side of transmission - **arrow** - and lay aside.

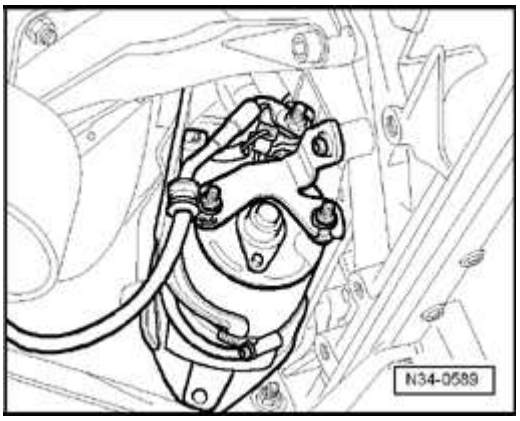

Fig. 200: Locating Starter Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove starter from engine/transmission and secure if necessary -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

.

NOTE:

- **Starter cables do not have to be disconnected.**

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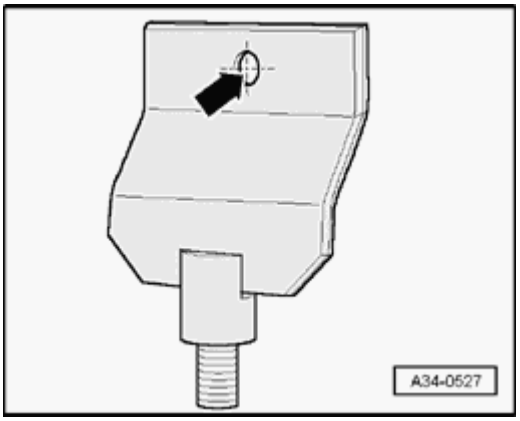

Fig. 201: Hole In Supporting Elements Of Transmission Support 3282
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drill a hole of 10.2mmdia. - **arrow** - in the supporting elements of transmission support 3282.

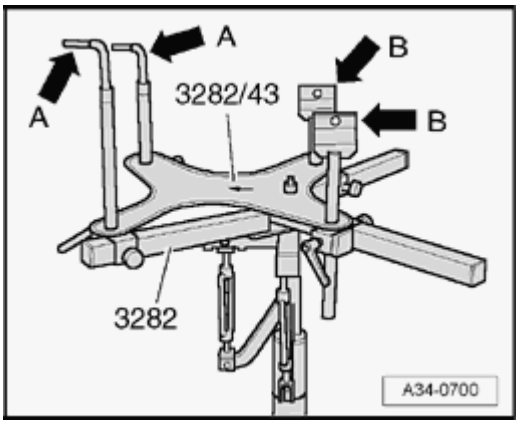

Fig. 202: Support Elements 3282/49 And 3282/52 And Arrow On The Adjustment Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove transmission set up transmission support 3282 with adjustment plate 3282 /43 and place on engine/transmission jack V.A.G 1383 A.

NOTE:

- **The support elements 3282/49 - arrows A - and 3282/52 - arrows B - are shown in schematic form on the adjustment plate. The arrow on the adjustment plate points toward the direction of travel.**
- **Adjustment plate can only be installed in one correct position.**

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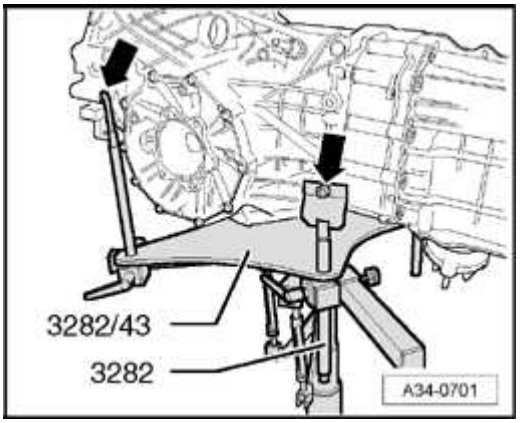

Fig. 203: Supporting Elements Secured To Left Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align adjustment plate parallel to transmission.
- Secure supporting elements to left side of transmission, as shown in illustration. Tighten bolt M10x20 - **arrow on right side** - to 20 Nm.

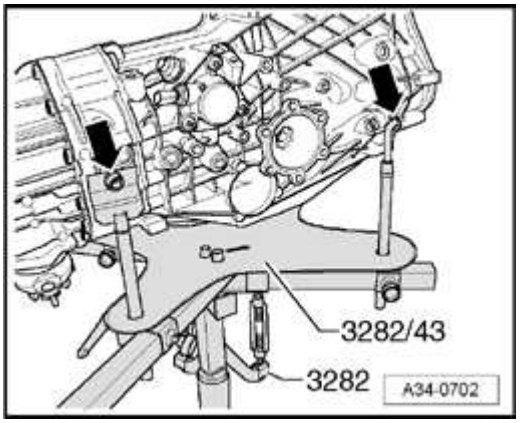

Fig. 204: Supporting Elements Secured To Right Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure supporting elements to right side of transmission, as shown in illustration. Tighten bolt M10x20 - **arrow on left side** - to 20 Nm.

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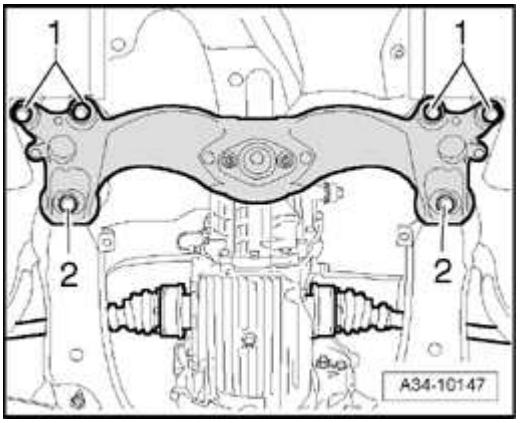

Fig. 205: Tunnel Cross Member Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and then bolts - **2** - at cross member.

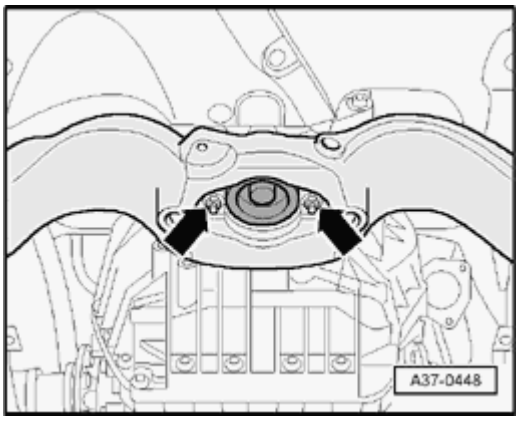

Fig. 206: Removing Nuts And Rear Crossmember
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** - and detach cross member.

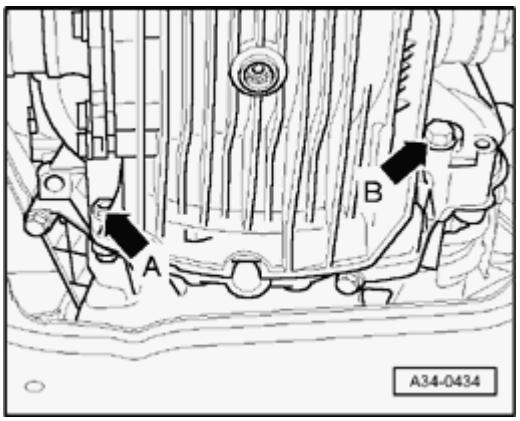

Fig. 207: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove remaining engine/transmission securing bolts - **arrow A** - and - **arrow B** -.
- Press transmission off dowel sleeves and lower carefully using engine/transmission jack V.A.G 1383 A just far enough to gain access to the slave cylinder.

NOTE:

- **When lowering transmission, make sure hydraulic line to slave cylinder is not damaged.**

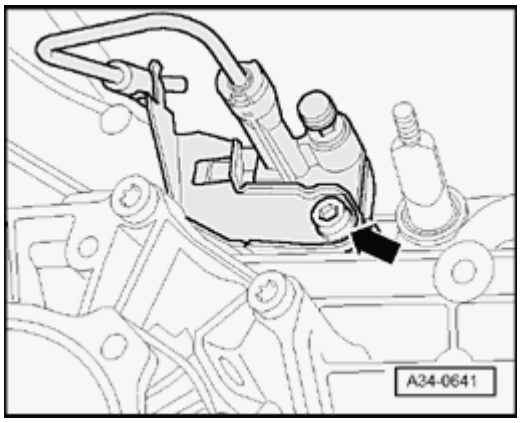

Fig. 208: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove slave cylinder from transmission - **arrow** - and secure with wire, do not open line/hose system.

CAUTION: Do not depress clutch pedal after removing slave cylinder. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

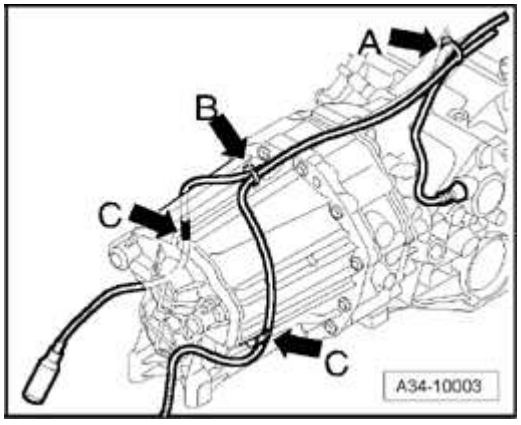

Fig. 209: Locating Cable Ties And Oxygen Sensor Wiring At Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, open cable ties - **arrows A and B** - , unclip Lambda probe cables at the side - **arrows C** - and move cables clear.
- Lower transmission.

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NOTE:

- **When lowering transmission, make sure there is sufficient clearance to drive axles.**

- Before carrying out assembly work, secure transmission to assembly stand, using engine and transmission support VW 540 --> **Transmission, mounting on assembly stand**.

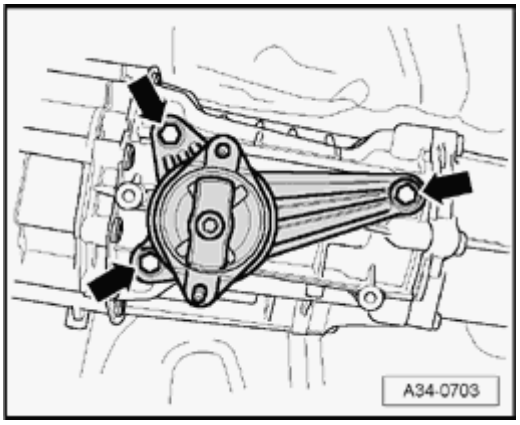

Fig. 210: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installing a new transmission instead of the one removed, the transmission mounting has to be transferred to the new transmission - **arrows** -.

Installing transmission --> **Transmission, installing (vehicles with 4-cylinder or 6-cylinder engine)**

Transmission, installing (vehicles with 4-cylinder or 6-cylinder engine)

Installation is in reverse order of removal. Note the following:

- Use thread tap to remove any remaining locking fluid from all threaded holes which will accommodate self-locking bolts.
- Always replace self-locking bolts and nuts.
- Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of **grease for clutch plate splines G000100** to splines. Do not grease guide sleeve.

It should be possible to push clutch plate back and forth slightly on input shaft.

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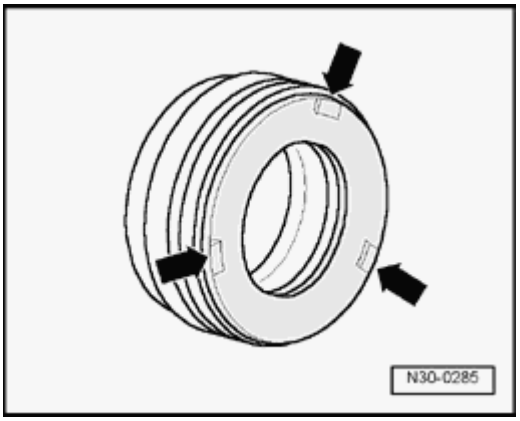

Fig. 211: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check clutch release bearing for wear and replace if necessary.
- If plastic ring - **arrows** - has come loose, service release bearing as required **Checking and servicing release bearing with glued plastic ring**

NOTE:

- **The release bearing must be replaced if the groove worn on the plastic ring is deeper than 0.8mm.**

- Check that dowel sleeves for centralizing engine/transmission are in the cylinder block, install if necessary.
- Place intermediate plate on dowel sleeves at engine flange.
- Before installing transmission, tie electrical wires and brackets off to one side so that they are not trapped between engine and transmission.
- Lightly lubricate surface where operating rod and clutch release lever make contact - **arrow B** - using copper grease Z381351TE.

- Raise transmission far enough to be able to install slave cylinder with bracket for hose/line assembly.

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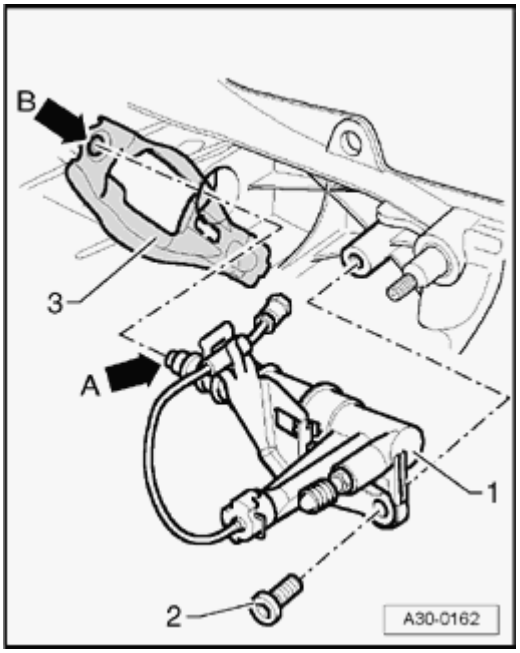

Fig. 212: Guiding Slave Cylinder Into Bore Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Guide slave cylinder - **1** - into opening in transmission housing keeping it as straight as possible (without tilting operating rod - **arrow A** -) and insert in recess - **arrow B** - on clutch release lever - **3** -.

NOTE:

- **If the slave cylinder - 1 - is inserted at an angle, there is a danger that the operating rod - arrow A - will be guided past the clutch release lever - 3 -.**

CAUTION: After installing the slave cylinder carefully press the clutch pedal. If you feel an unusually strong point of pressure when depressing the clutch pedal, do not press it down further. The push rod of the slave cylinder is likely to have been guided past the clutch release lever. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

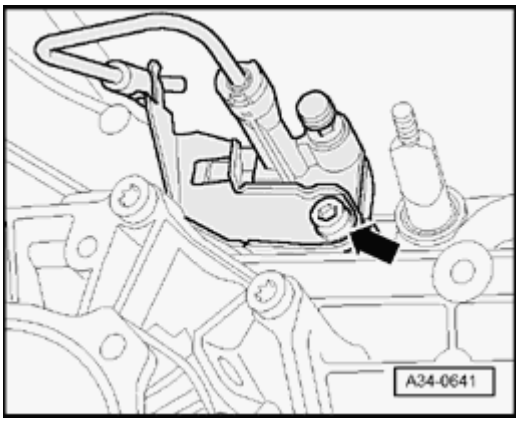

Fig. 213: Slave Cylinder Bracket And Fastener

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure slave cylinder with new bolt - **arrow** -.
- Insert transmission, making sure there is sufficient clearance to drive shafts.

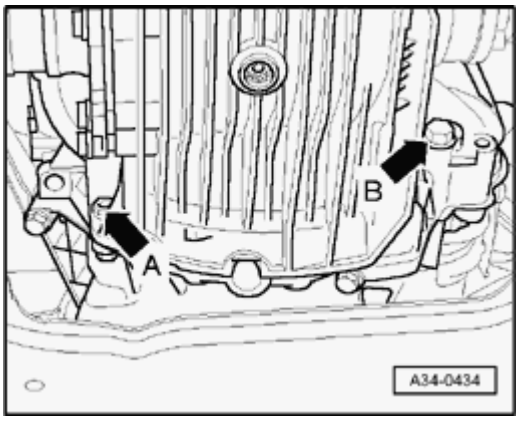

Fig. 214: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install engine/transmission securing bolts - **arrow A** - and - **arrow B** -.
- Install starter -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

.

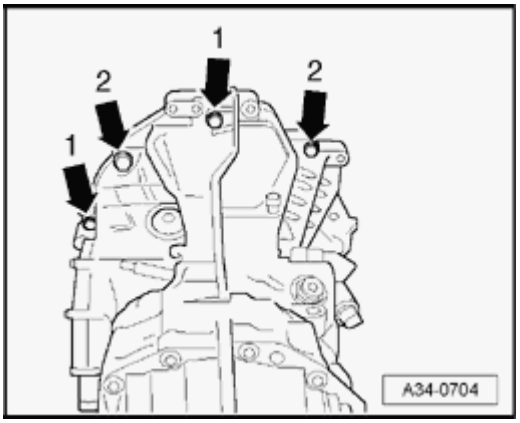

Fig. 215: Upper Engine/Transmission Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully lower transmission a short distance using engine and transmission jack V.A.G 1383 A.
- If possible, tighten upper engine/transmission securing bolts - **arrows1** - and - **arrows2** -.

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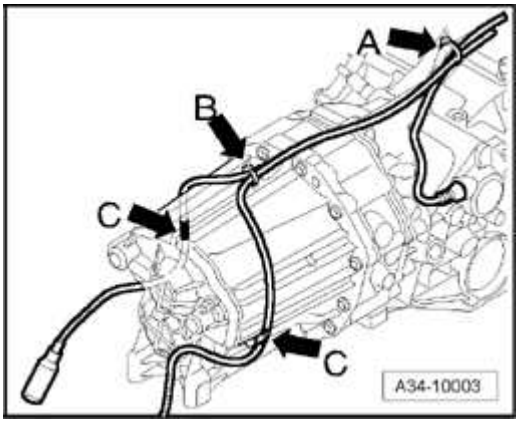

Fig. 216: Locating Cable Ties And Oxygen Sensor Wiring At Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, secure all electrical wiring to transmission again - **arrows A to C** -.

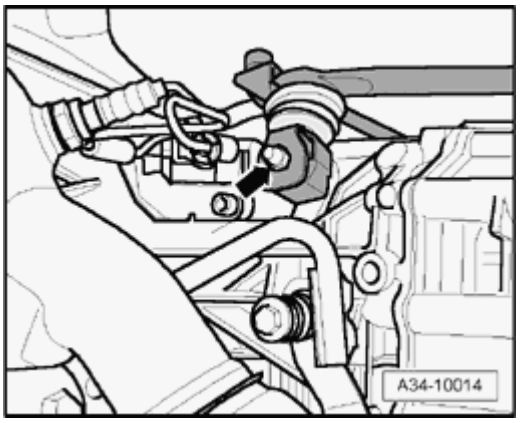

Fig. 217: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install selector shaft lever and tighten nut - **arrow** -.

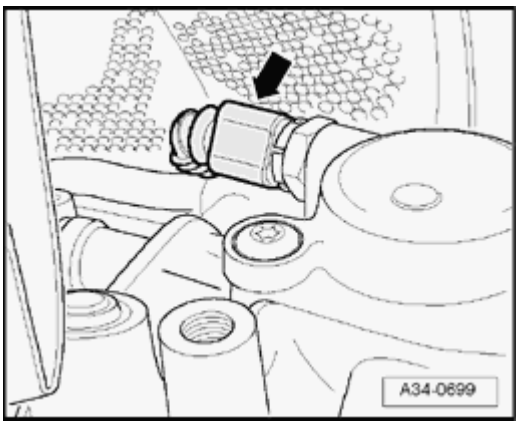

Fig. 218: Back-Up Light Switch Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Connect connector - **arrow** - for back-up light switch F 4 on right side of transmission.

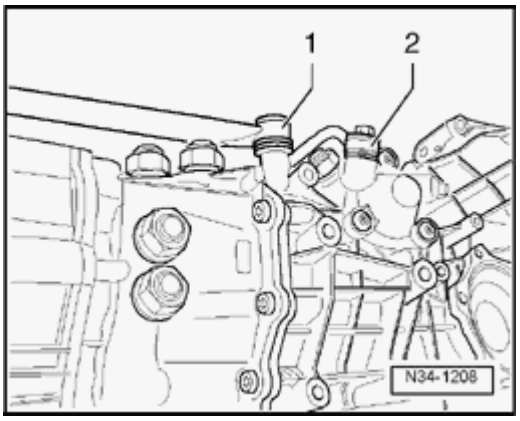

Fig. 219: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install push rod - **1** - by tightening hex socket head bolt.
- Secure connecting rod - **2** - for selector rod.

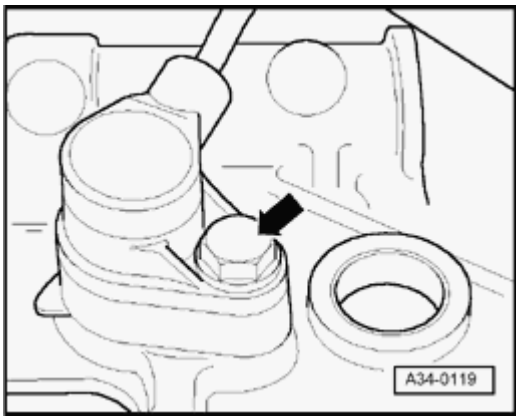

Fig. 220: Location Of Engine Speed (RPM) Sensor G28 On Coupling Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, install Engine Speed (RPM) Sensor G28 on left side of transmission.

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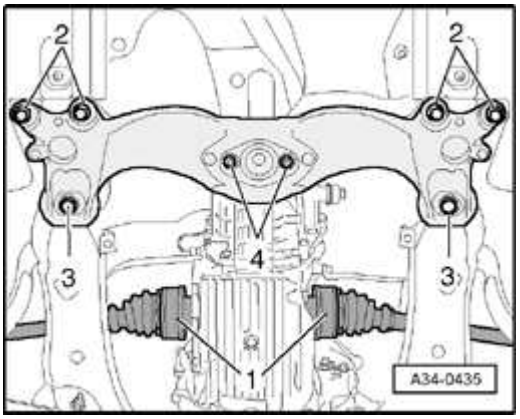

Fig. 221: Drive Shafts And Flange Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift transmission again using engine/transmission jack V.A.G 1383 A.
- Attach cross member to body with new bolts - **2** - and - **3** - (tighten hand-tight only).
- Secure cross member to transmission mounting - **4** - --> **40 - FRONT SUSPENSION** .
- Carefully lower engine/transmission jack V.A.G 1383 A and move it aside.

- Bolt drive axles - **1** - to flange shafts --> **40 - FRONT SUSPENSION** .

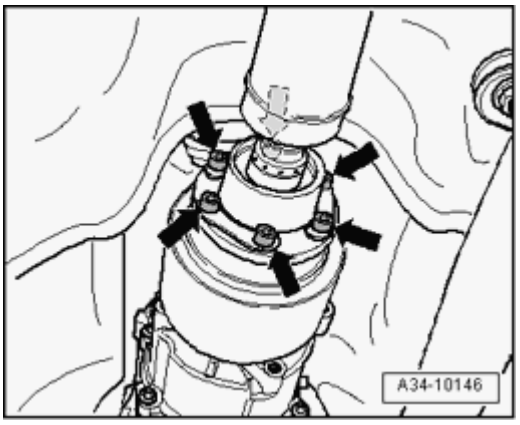

Fig. 222: Locating Bolts At Transmission/Drive Shaft Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- It is important to clean threaded holes for drive axle bolts to remove any remaining locking fluid. The threads can be cleaned with a thread tap.
- Bolt drive axle onto transmission - **arrows** - --> **39 FINAL DRIVE, DIFFERENTIAL** .

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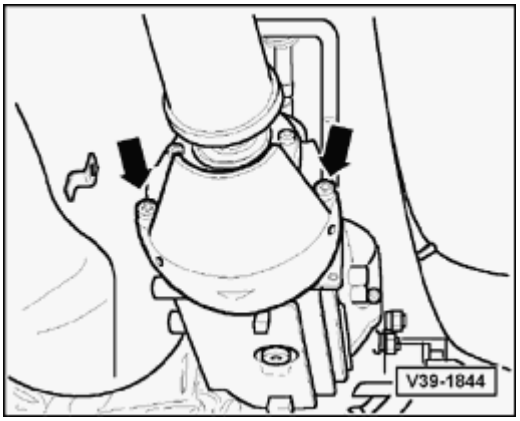

Fig. 223: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, install heat shield for drive shaft - **arrows** -.

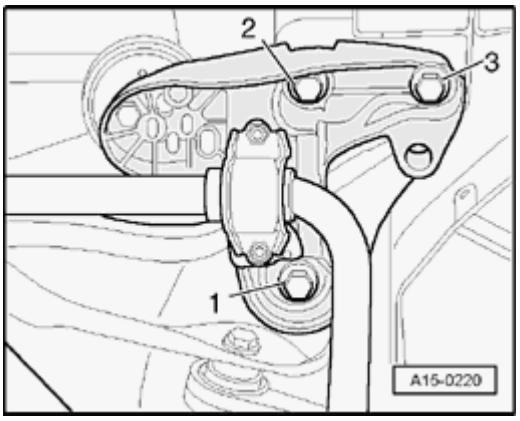

Fig. 224: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 6-cylinder engine:

- Take up weight of engine with support bracket 10 - 222 A.

- Remove front bolts - **2** - and - **3** - on subframe (left and right). Then remove bolts - **1** -.
- Lower subframe at front.

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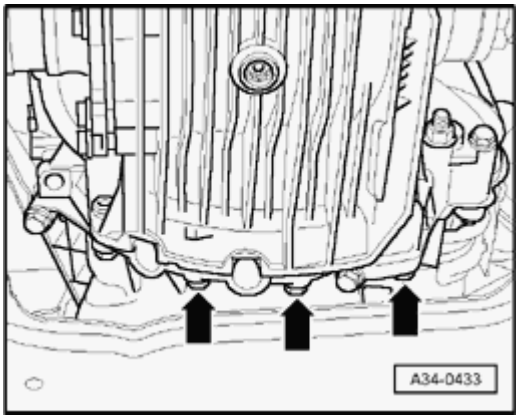

Fig. 225: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten three lower engine/transmission securing bolts at bottom - **arrows** -.

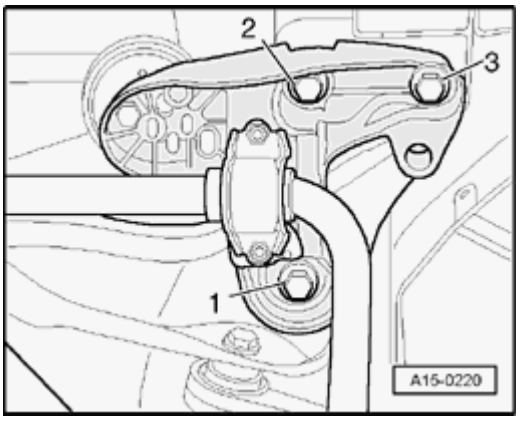

Fig. 226: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace front subframe bolts - **1** - , - **2** - and - **3** - on both sides of vehicle.

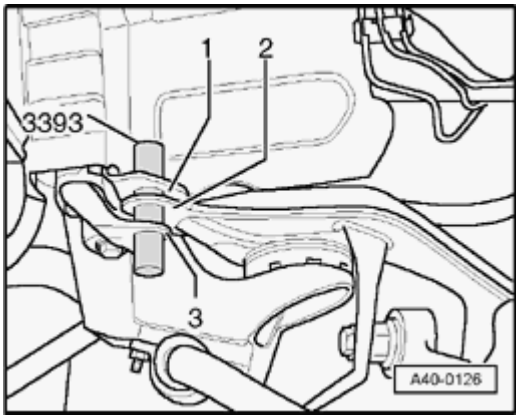

Fig. 227: Identifying Hole, Sub-Frame Hole And Aluminum Console Hole Align On Both Sides
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Before tightening subframe, it must be aligned with body using testing mandrel 3393.

- Hole - **1** - and hole - **2** - of subframe and hole - **3** - of aluminum bracket must be flush on both sides.

NOTE:

- **This alignment can only replace a subsequent wheel alignment if holes - 1 - and - 2 - coincided before the repair work was performed.**

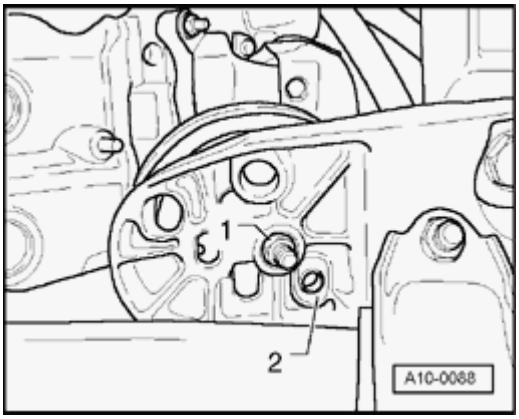

Fig. 228: Threaded Connections And Positioning Sleeves On Lower Engine Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten nuts - **1** - for engine mountings --> **10 - ENGINE - ASSEMBLY** .

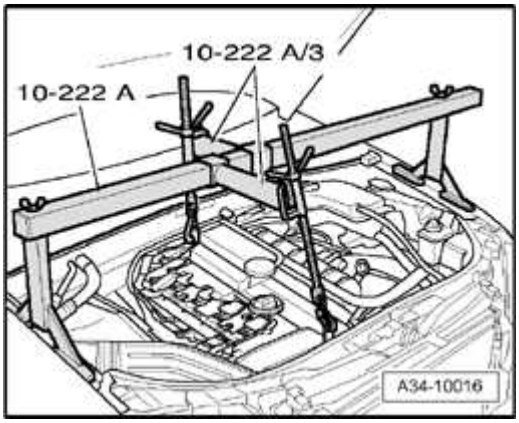

Fig. 229: Engine Support Bridge 10-222 A Set Up With Adapters 10-222/3 On Fender Mounting Flanges
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Cabriolet vehicles with 4-cylinder engine:

- Lift engine slightly using spindles.

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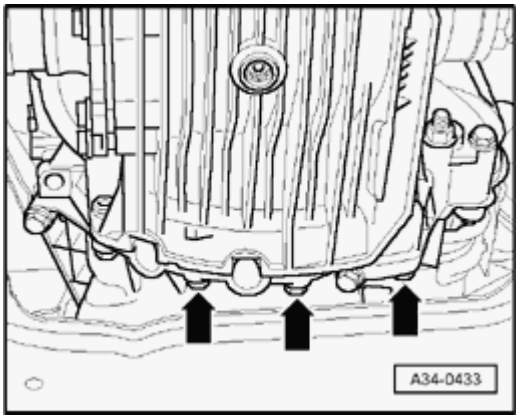

Fig. 230: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bottom engine/transmission securing bolts - **arrows** -.
- Lower engine back down.

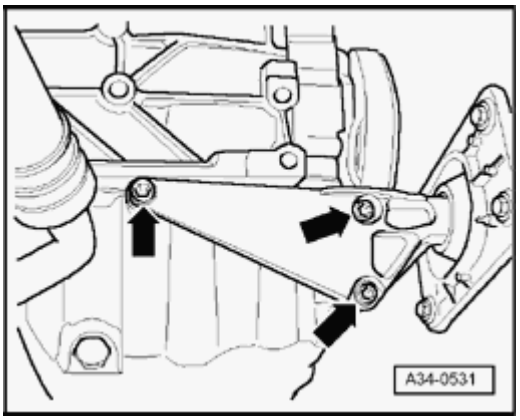

Fig. 231: Torque Reaction Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure torque reaction support - **arrows** -.

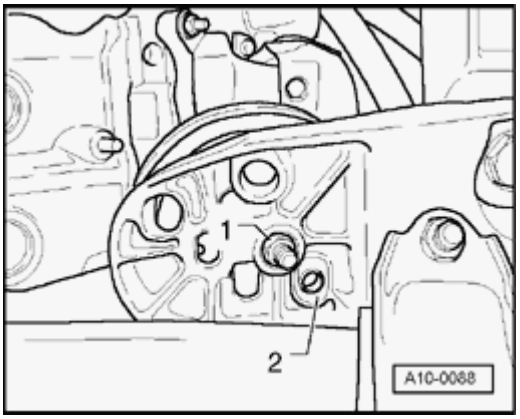

Fig. 232: Threaded Connections And Positioning Sleeves On Lower Engine Mounts

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten nuts - **1** - for engine mountings --> **10 - ENGINE - ASSEMBLY** .

Continued for all vehicles:

- Secure subframe and cross member --> **40 - FRONT SUSPENSION** .
- Install exhaust system so it is free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for the relevant engine code.
- Check selector mechanism setting and adjust if necessary --> **Selector mechanism, adjusting**.
- Check gear oil level in transmission --> **Transmission oil level, checking** .
- Follow steps required after connecting battery. -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

  .
- If necessary, perform wheel alignment --> **44 - WHEELS, TIRES, VEHICLE ALIGNMENT** .

- Wheel alignment is not necessary if subframe was secured to body using testing mandrel 3393 prior to disassembling and assembly of subframe (before tightening bolts).
- Wheel alignment must, however, be performed, if the subframe was not secured to body using testing mandrel 3393 or if it was not possible to fully insert the two drifts into holes.

Tightening torques

NOTE:

- **Tightening torques only apply to lightly greased, oiled, phosphated or blackened nuts and bolts.**
- **Additional lubricant such as engine or transmission oil may be used, but do not use graphite lubricant.**
- **Do not use parts which have been degreased.**
- **Tolerance for tightening torques ±15%.**

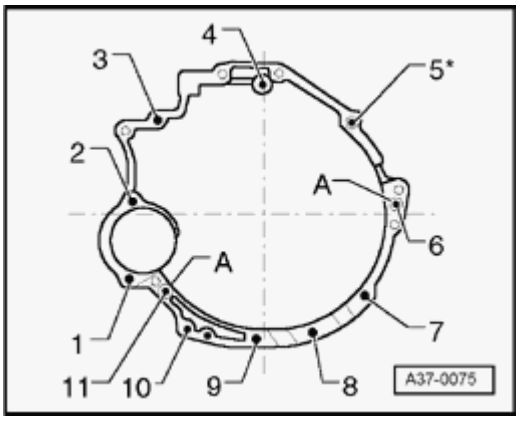

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Fig. 233: Identifying Engine/Transmission Mountings (Automatic/Manual Transmission)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission attachment (1.8 liter engine)

Item	Bolt	Nm
1* See note	M12 x 75	65
2* See note	M12 x 90	65
3* See note	M12 x 75	65
4, 6	M12 x 90	65
5* See note	M12 x 110	65
7* See note	M10 x 50	45
8, 9, 10	M10 x 45	45
11* See note	M12 x 110	65

* For securing starter to transmission

* With bracket for wiring harness

* Hammer head bolt with nut

* With nut

A: dowel sleeves for centralizing

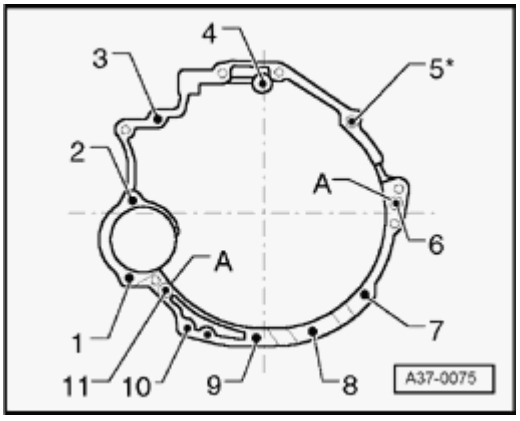

Fig. 234: Identifying Engine/Transmission Mountings (Automatic/Manual Transmission)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission attachment (2.0 liter engine)

Item	Bolt	Nm
1 * See note	M12x75	65
2 * See note	M12x90	65

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3 * See note	M12x75	65
4, 6	M12x90	65
5 * See note	M12x110	65
7 * See note	M10x50	45
8, 9, 10	M10x45	45
11 * See note	M12x110	65
A	Dowel sleeves for centralizing	

*For securing starter to transmission

*With bracket for wiring harness

*Hammer head bolt with nut

*With nut

A: dowel sleeves for centralizing

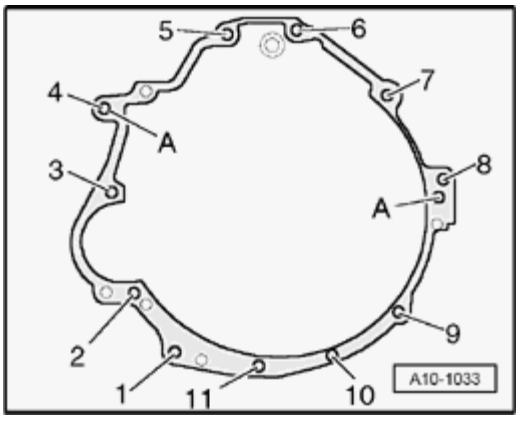

Fig. 235: Identifying Engine/Transmission Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission attachment (6-cylinder 3.0 liter engine)

Item	Bolt	Nm
1, 10, 11	M10 x 60	45
2* See note	M10 x 150	65
3* See note	M12 x 130	65
4	M12 x 85	65
5, 6	M12 x 90	65
7	M12 x 100	65
8	M12 x 95	65
9* See note	M10 x 60	45

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* For securing starter to transmission

* Hammer head bolt with nut

A: dowel sleeves for centralizing

Component	Nm
Slave cylinder to transmission	23* See note
Selector shaft lever to transmission	23
Push rod to transmission	40
Connecting rod for selector rod to transmission	23
Cross member to transmission mounting	23
Heat shields above drive axles to transmission	23
Heat shield for drive axle to transmission cover	25
Engine mounting to engine support	23
Bracket for sound insulation to subframe	10

*Replace bolt

Transmission, transporting

Special tools, testers and auxiliary items required

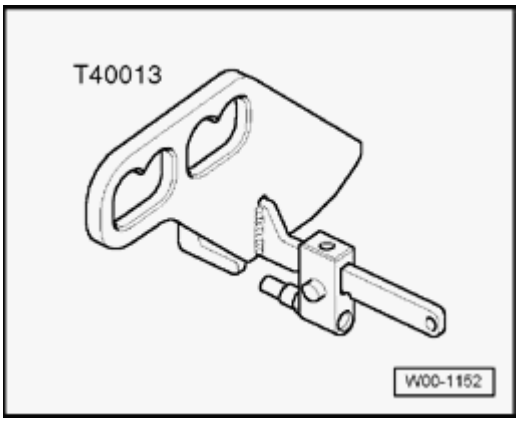

Fig. 236: Transmission Lift Hook T40013
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lifting aid T40013

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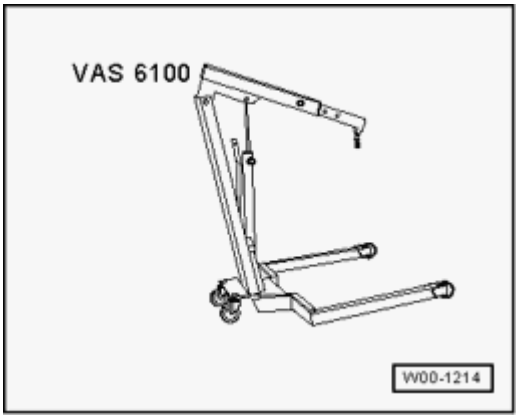

Fig. 237: Identifying Shop Crane VAS 6100
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Workshop crane VAS 6100

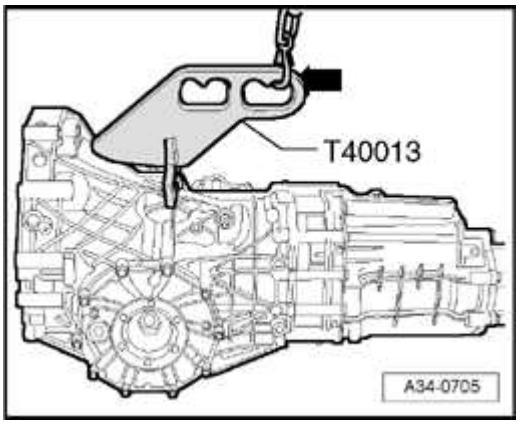

Fig. 238: Hook Of Workshop Crane Fastened In 4th Notch On Lifting Tackle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert lifting tackle T40013 in lifting eye on transmission and secure.
- Fasten hook of workshop crane in 4th notch - **arrow** - on lifting tackle.
- Lift transmission using workshop crane and lifting tackle T40013.

TRANSMISSION MOUNTS, REMOVING AND INSTALLING

Transmission mounts, removing and installing

Special tools, testers and auxiliary items required

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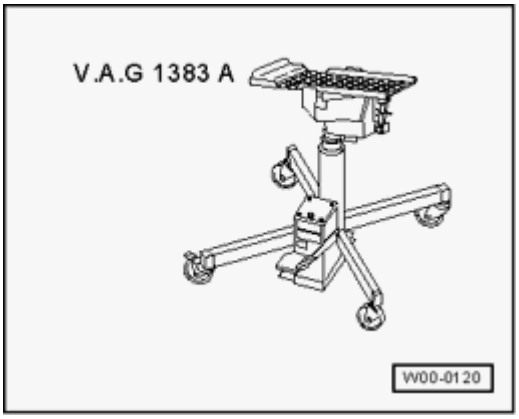

Fig. 239: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine/transmission jack V.A.G 1383 A

Removing

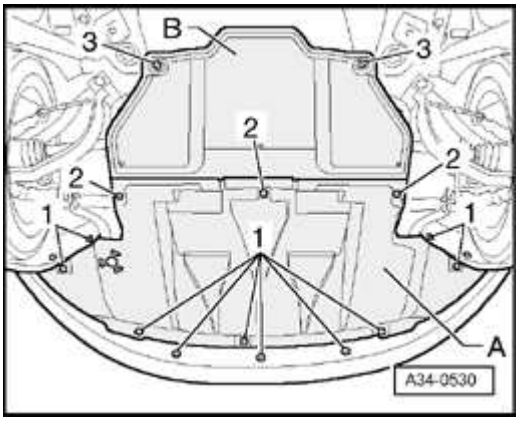

Fig. 240: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, loosen quick-release fasteners - **3** - and remove rear sound insulation - **B** -.

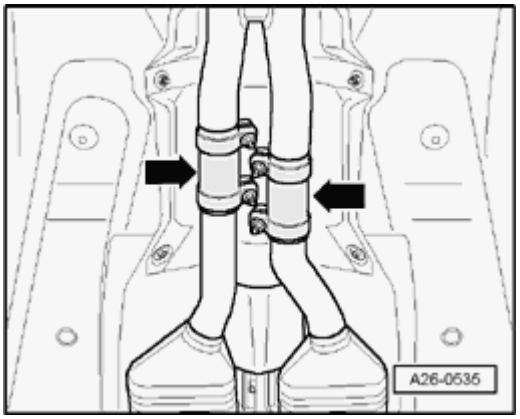

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Fig. 241: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamps - **arrows** -.

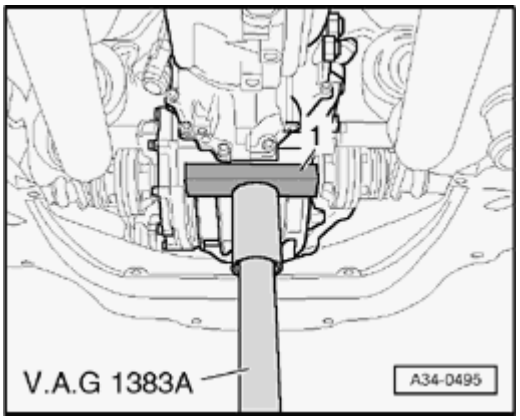

Fig. 242: Transmission Raised Using Punch Of VAG 1383 A So That A Piece Of Wood Can Be Placed In Between
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use engine/transmission jack V.A.G 1383 A to lift transmission up slightly. Insert a wooden block - **1** - between transmission and transmission jack.

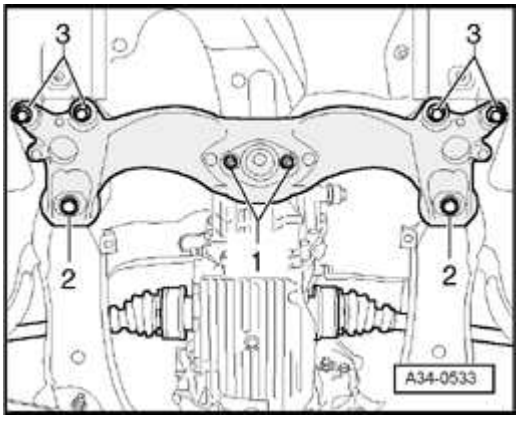

Fig. 243: Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **3** - and then bolts - **2** - at cross member.
- Lower transmission slightly.
- Remove two nuts - **1** - and push cross member backward slightly.

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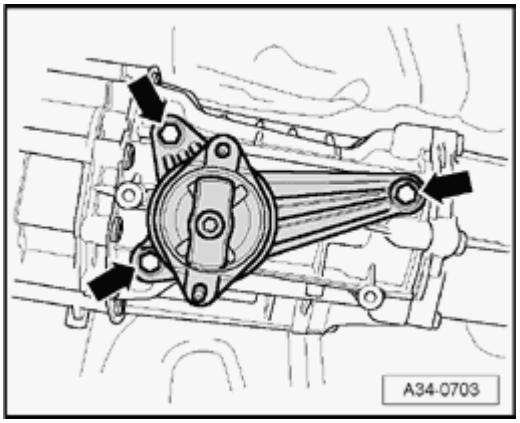

Fig. 244: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove transmission mounts - **arrows** -.

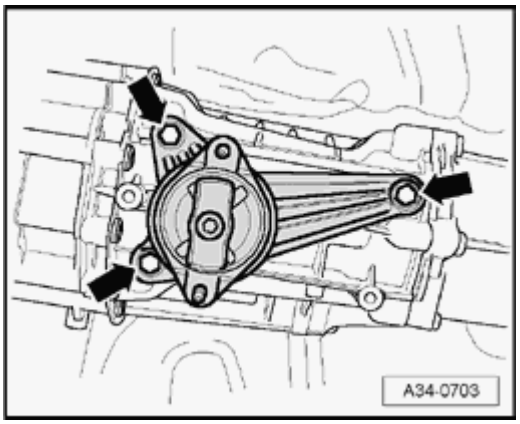

Fig. 245: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

Installation is in reverse order or removal. Note the following:

- Secure transmission mount to transmission - **arrows** - (tightening torque: 23 Nm).

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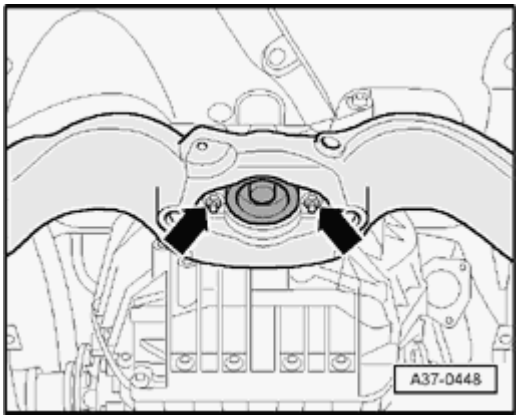

Fig. 246: Removing Nuts And Rear Crossmember
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt tunnel cross member onto transmission mount - **arrows** -.

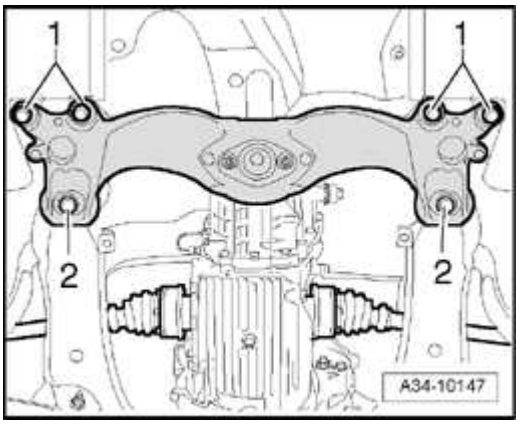

Fig. 247: Tunnel Cross Member Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift transmission far enough to be able to tighten bolts - **2** -.
- Tighten bolts - **2** - and then bolts - **1** - --> **40 - FRONT SUSPENSION** .

NOTE:

- **Replace bolts - 1 - and - 2 -.**

- Install exhaust system free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

Tightening torques

Component	Nm
Transmission mount to transmission	23
Cross member to transmission mounting	23
Clamp for exhaust pipe	40

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TRANSMISSION OIL

Transmission oil level, checking

Special tools, testers and auxiliary items required

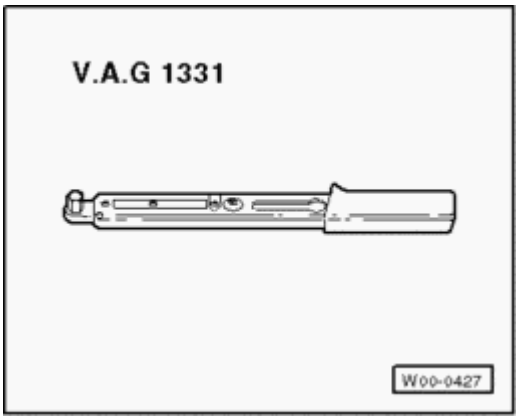

Fig. 248: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

NOTE:

- **The vehicle must be horizontal when checking gear oil level.**

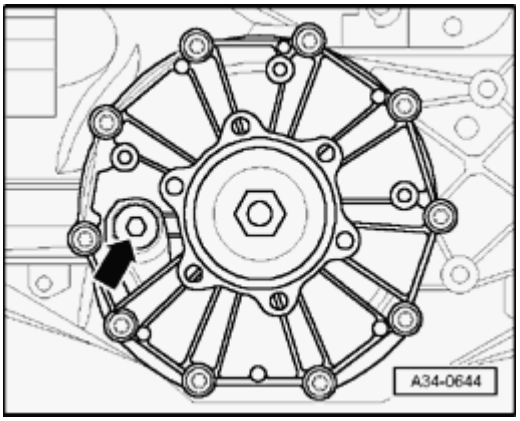

Fig. 249: Locating Oil Filler Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To check gear oil level, remove oil filler plug - **arrow** -.

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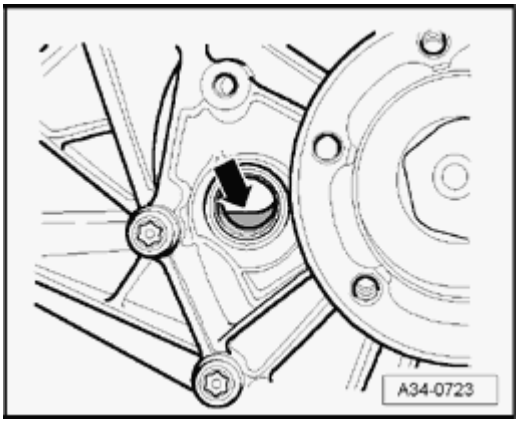

Fig. 250: Identifying Correct Oil Level
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The oil level is correct when transmission is filled up to edge of housing - **arrow** -.

- Top off with gear oil if necessary. Specification --> **Code letters, allocation, transmission ratios, capacities**.
- Install oil filler plug and tighten.

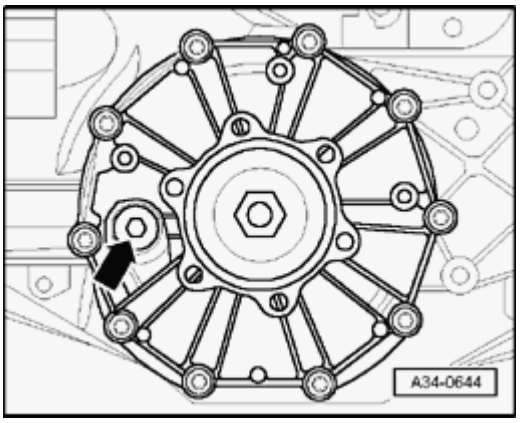

Fig. 251: Locating Oil Filler Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Note the following when filling with new oil:

- Remove oil filler plug - **arrow** -.

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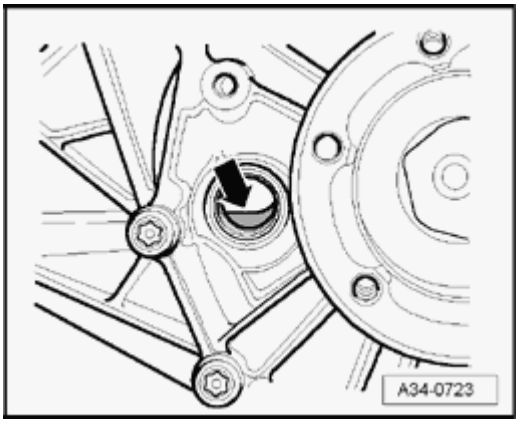

Fig. 252: Identifying Correct Oil Level
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fill with gear oil up to edge of housing - **arrow** -.
- Install oil filler plug.
- Start engine, engage a gear and allow transmission to turn for approx. 2 minutes.
- Switch off engine and remove oil filler plug.

Once more, fill with gear oil up to edge of housing - **arrow** -.

- Install oil filler plug and tighten.

Tightening torque

Component	Nm
Oil filler plug	45

TRANSMISSION, MOUNTING ON ASSEMBLY STAND

Transmission, mounting on assembly stand

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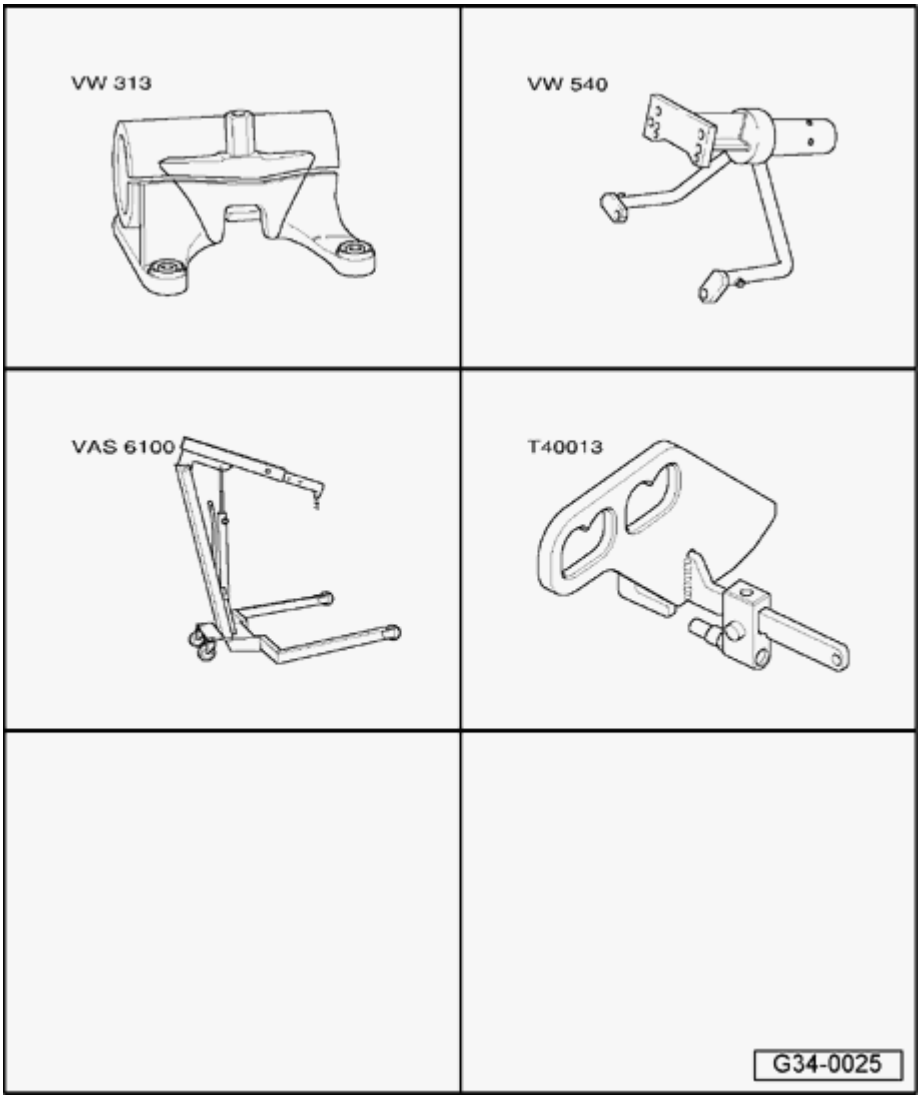

Fig. 253: Identifying Special Tools -- Transmission, Mounting On Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Support clamp VW313
- Engine/transmission support VW540
- Workshop crane VAS6100
- Lifting aid T40013

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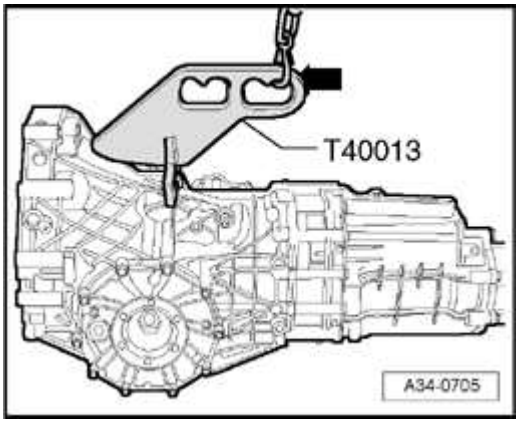

Fig. 254: Hook Of Workshop Crane Fastened In 4th Notch On Lifting Tackle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert lifting tackle T40013 in lifting eye on transmission and secure.
- Fasten hook of workshop crane VAS6100 in 4th notch - **arrow** - on lifting tackle T40013.
- Lift transmission using workshop crane VAS6100 and lifting tackle T40013.

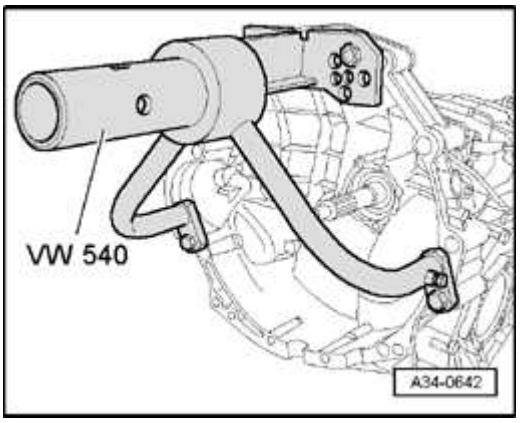

Fig. 255: Holding Fixture VW 540 Secured To Transmission And Installed Into Support Clamp VW313
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure holding fixture VW 540 to transmission and fit into support clamp VW313.

TRANSMISSION, DISASSEMBLING AND ASSEMBLING

Transmission, general layout

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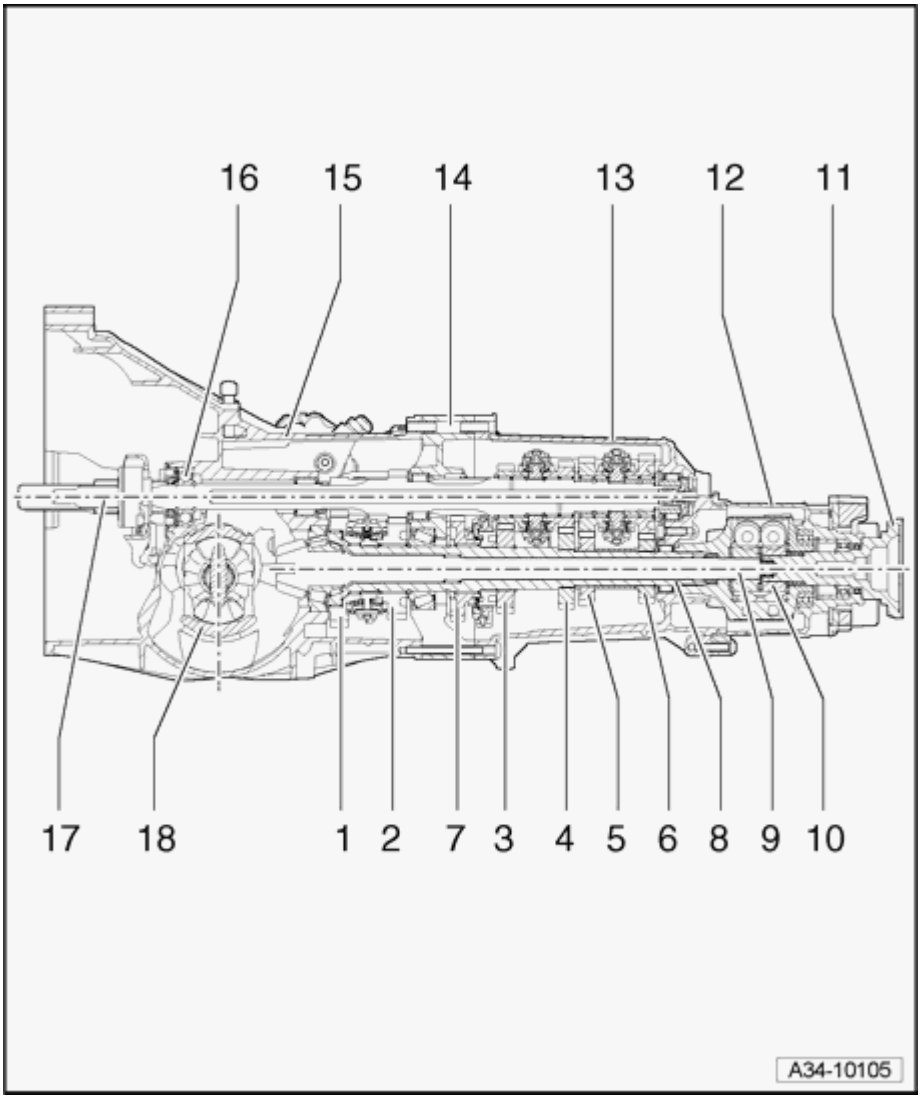

Fig. 256: Transmission, General Layout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 1st gear

2 - 2nd gear

3 - 3rd gear

4 - 4th gear

5 - 5th gear

6 - 6th gear

7 - Reverse gear

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8 - Hollow shaft

9 - Pinion shaft (output shaft)

10 - Torsen differential

11 - Flange shaft

12 - Torsen housing

13 - Transmission cover

14 - Bearing housing

15 - Transmission housing

16 - Ball bearing

- For input shaft

17 - Input shaft

18 - Differential

Assembly overview

Sequence for disassembling and assembling --> **Disassembling and assembling sequence**

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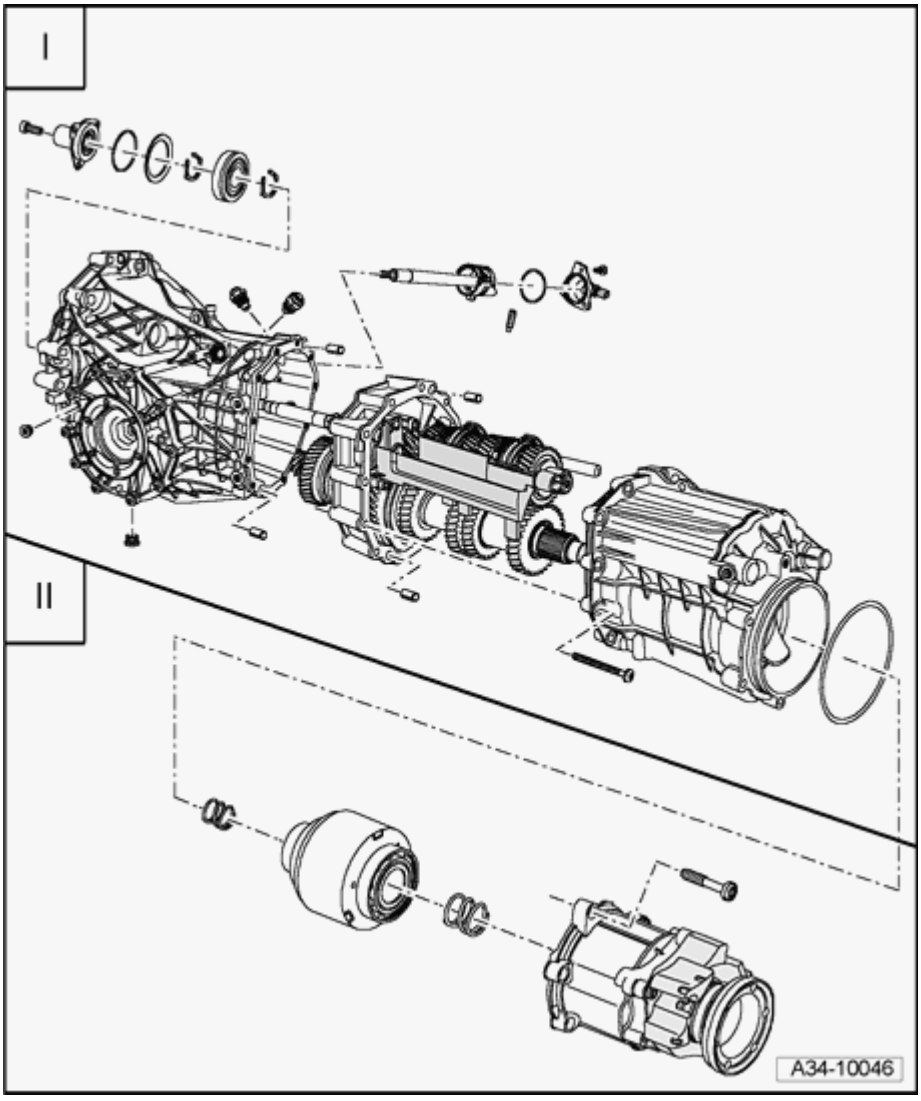

Fig. 257: Transmission Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - Removing and installing ball bearing for input shaft, transmission cover, bearing housing and selector shaft --> **Ball bearing for input shaft, transmission cover, bearing housing and selector shaft, removing and installing**

- Removing and installing 3rd to 6th gear --> **3rd to 6th gear, removing and installing**
- Removing and installing input shaft, pinion shaft/hollow shaft, reverse gear wheel and reverse selector gear --> **Input shaft, pinion shaft/hollow shaft, reverse gear wheel and reverse selector gear, removing and installing**

II - Removing and installing Torsen housing and Torsen differential with transmission removed --> **Torsen housing and Torsen differential, removing and installing**

- Removing and installing Torsen housing with transmission installed --> **Torsen housing, removing and**

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installing (with transmission installed)

- Disassembling and assembling Torsen housing --> **Torsen housing, disassembling and assembling**

Ball bearing for input shaft, transmission cover, bearing housing and selector shaft, removing and installing

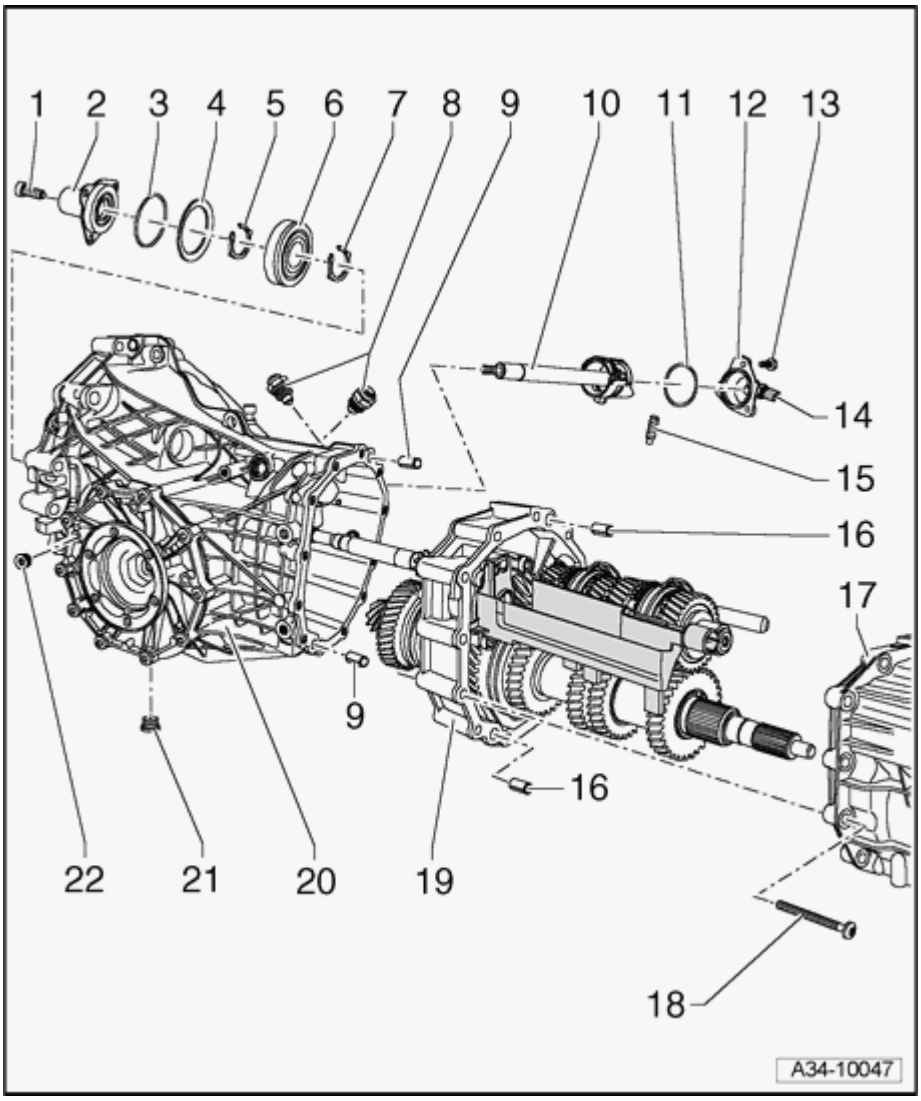

Fig. 258: Ball Bearing For Input Shaft, Transmission Cover, Bearing Housing And Selector Shaft, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - TORX bolt, 35 Nm

- 3 x
- Apply **locking fluid AMV 185 101 A1** when installing

2 - Guide sleeve

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- With seal
- Removing and installing --> **Disassembling and assembling sequence**

3 - O-ring

- Always replace

4 - Dished spring

5 - Circlip

- Note thickness
- Re-determining thickness

6 - Ball bearing

- Removing and installing --> **Disassembling and assembling sequence**

7 - Circlip

- Note thickness
- Re-determining thickness

8 - Locking bolt, 45 Nm

- 2 x
- Apply **locking fluid AMV185101A1** when installing

9 - Dowel sleeve

- 2 x
- Insert in transmission housing
- Remove and install with drift 3121

10 - Selector shaft with selector cylinder

- Removing and installing --> **Disassembling and assembling sequence**

11 - O-ring

- For selector shaft cover
- Always replace
- Lubricate with gear oil

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12 - Cover for selector shaft

- With back-up light switch F4
- Removing and installing --> **Disassembling and assembling sequence**

13 - Bolt -24 Nm-

- 3 x
- Apply **locking fluid AMV185101A1** when installing

14 - Back-up light switch F4, 20 Nm

15 - Pin

- For selector shaft stop
- Insert in transmission housing
- Installation position: groove on threaded pin points toward selector shaft cover

16 - Dowel sleeve

- 2 x
- Insert in bearing housing
- Remove and install with drift 3121

17 - Transmission cover

- Servicing --> **Transmission cover, servicing**

18 - Bolt, 35 Nm plus an additional $90° {}^{1}/_{4}$ turn

- 12 x

19 - Bearing housing

- Removing and installing 3rd to 6th gear --> **3rd to 6th gear, removing and installing**
- Removing and installing input shaft, pinion shaft/hollow shaft, reverse gear wheel and reverse selector gear --> **Input shaft, pinion shaft/hollow shaft, reverse gear wheel and reverse selector gear, removing and installing**
- Servicing --> **Bearing housing, servicing**

20 - Transmission housing

- With differential and flange shafts
- Removing and installing differential --> **Differential, removing and installing**

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- Servicing transmission housing --> **Transmission housing, servicing**

21 - Oil drain plug, 45 Nm

22 - Oil filler plug, 45 Nm

Torsen housing and Torsen differential, removing and installing

NOTE:

- **The Torsen housing can also be removed when the transmission is in the vehicle --> Torsen housing, removing and installing (with transmission installed).**

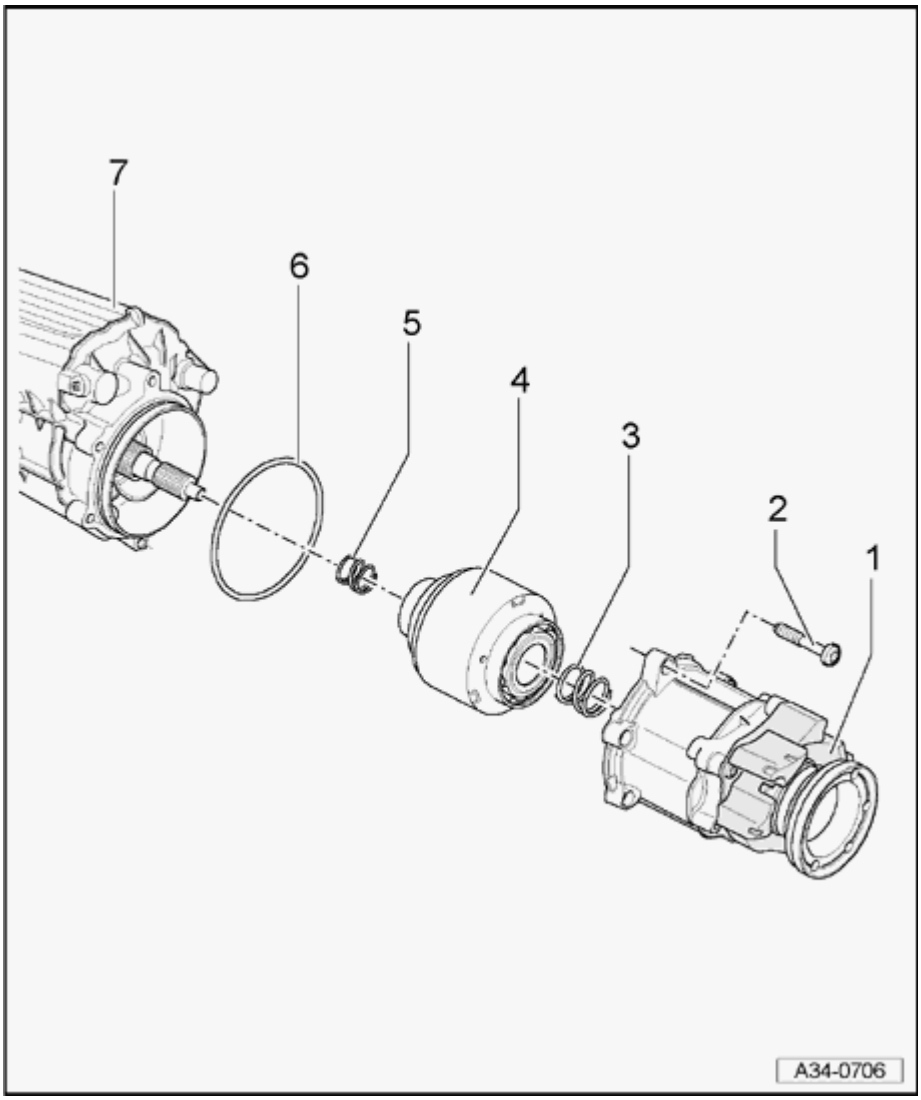

Fig. 259: Torsen Housing And Torsen Differential Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Torsen housing

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- With or without vibration damper, depending on design
- Removing and installing --> **Disassembling and assembling sequence**
- Disassembling and assembling --> **Torsen housing, disassembling and assembling**

2 - Bolt, 10 Nm plus an additional 45° $^{1}/_{8}$ turn

- 6x

3 - Spring

- Fit onto flange shaft in Torsen housing
- Outside diameter: approx. 35 mm

4 - Torsen differential

- Can only be serviced by manufacturer
- Pressing off ball bearing from Torsen differential **Pressing ball bearing off Torsen differential**
- Pressing ball bearing onto Torsen differential **Pressing ball bearing onto Torsen differential**

5 - Spring

- Fit onto pinion shaft/hollow shaft
- Outside diameter: approx. 31 mm

6 - O-ring

- Always replace
- Lubricate with gear oil

7 - Transmission

- Mounting on assembly stand --> **Disassembling and assembling sequence**

Pressing ball bearing off Torsen differential

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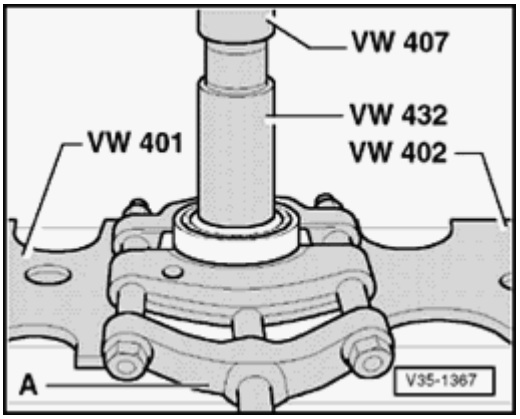

Fig. 260: Pressing Off Grooved Ball Bearing From Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Splitter 22 to 115 mm, e.g. Kukko 17/2

Pressing ball bearing onto Torsen differential

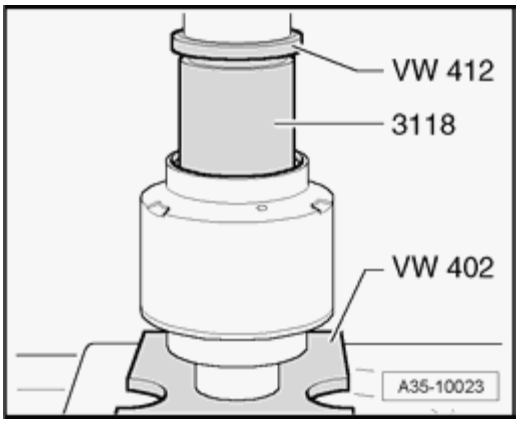

Fig. 261: Pressing Ball Bearing Onto Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The collar of press tool 3118 points toward thrust disc VW 412.

3rd to 6th gear, removing and installing

NOTE:

- **3rd to 6th speed selector gears should have an axial play of 0.20to0.50mm after installing.**

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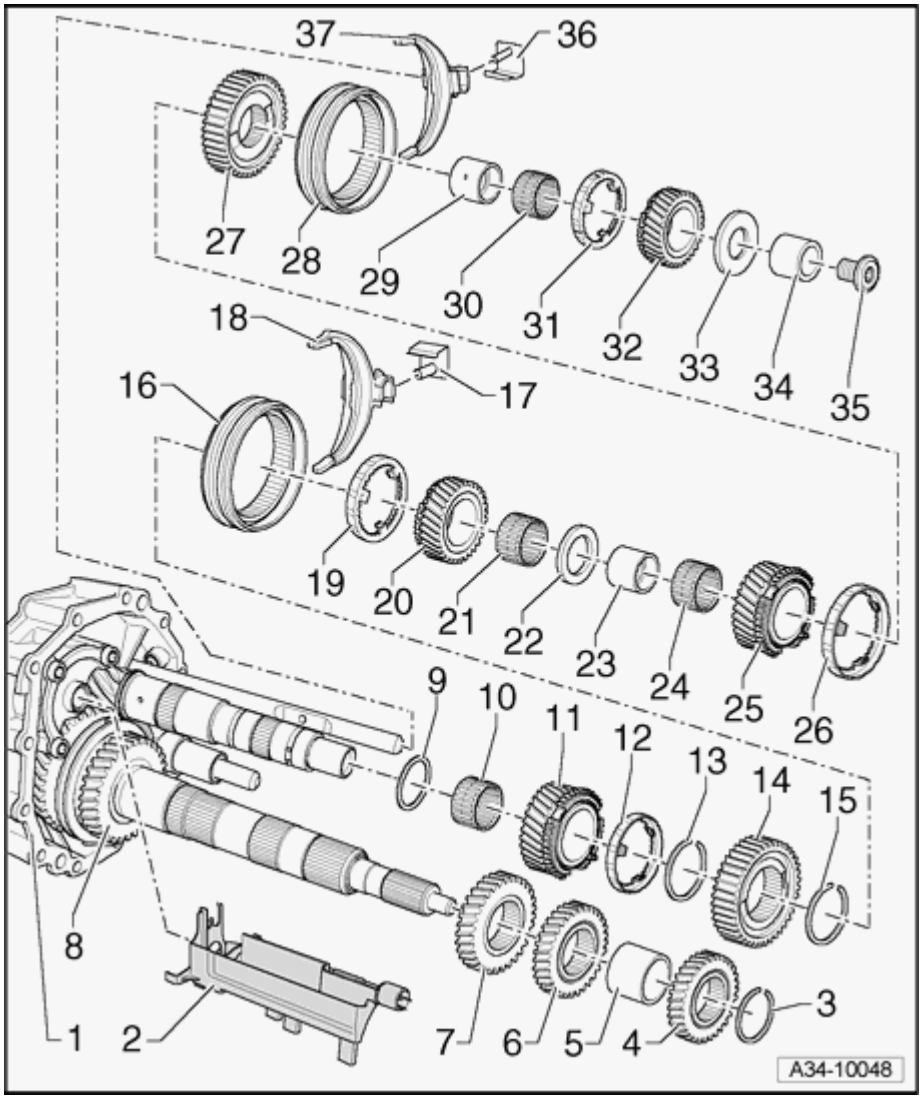

Fig. 262: 3rd To 6th Gear Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

2 - Oil collector

- With magnet
- Clipped into reverse shaft support.

3 - Circlip

- Install thickest circlip that will still just fit.
- Re-determining thickness --> **Disassembling and assembling sequence**

4 - 6th gear wheel

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5 - Spacer sleeve

6 - 5th gear wheel

- Installation position: high inside collar faces 4th gear wheel

7 - 4th gear wheel

- Installation position: high inside collar faces 5th gear wheel

8 - 3rd gear wheel

- Detach bearing housing from transmission housing and remove pinion shaft prior to removing and installing --> **Disassembling and assembling sequence**

9 - Thrust washer

- For 3rd speed selector gear

10 - Needle bearing

- For 3rd gear

11 - 3rd speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

12 - 3rd gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

13 - Circlip

- Mark

14 - Synchronizing hub for 3rd and 4th gear

- Installation position: high inside collar faces 3rd speed selector gear

15 - Circlip

- Re-determining thickness --> **Disassembling and assembling sequence**

16 - Locking collar for 3rd and 4th gear

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- Mark position in relation to synchronizing hub prior to removing

17 - Pin with clip

- For securing selector fork for 3rd and 4th gear to selector rod

18 - Selector fork for 3rd and 4th gear

19 - 4th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

20 - 4th speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

21 - Needle bearing

- For 4th gear

22 - Thrust washer

- For 4th speed and 5th speed selector gears

23 - Needle bearing inner race

- For 5th gear

24 - Needle bearing

- For 5th gear

25 - 5th speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

26 - 5th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

27 - Synchronizing hub for 5th and 6th gear

28 - Locking collar for 5th and 6th gear

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- Mark position in relation to synchronizing hub prior to removing

29 - Needle bearing inner race

- For 6th gear

30 - Needle bearing

- For 6th gear

31 - 6th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

32 - 6th speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

33 - Thrust washer

- For 6th speed selector gear

34 - Inner race

- For needle roller bearing

35 - Multi-point socket head bolt, 150Nm

36 - Pin with clip

- For securing selector fork for 5th and 6th gear to selector rod

37 - Selector fork for 5th and 6th gear

Input shaft, pinion shaft/hollow shaft, reverse gear wheel and reverse selector gear, removing and installing

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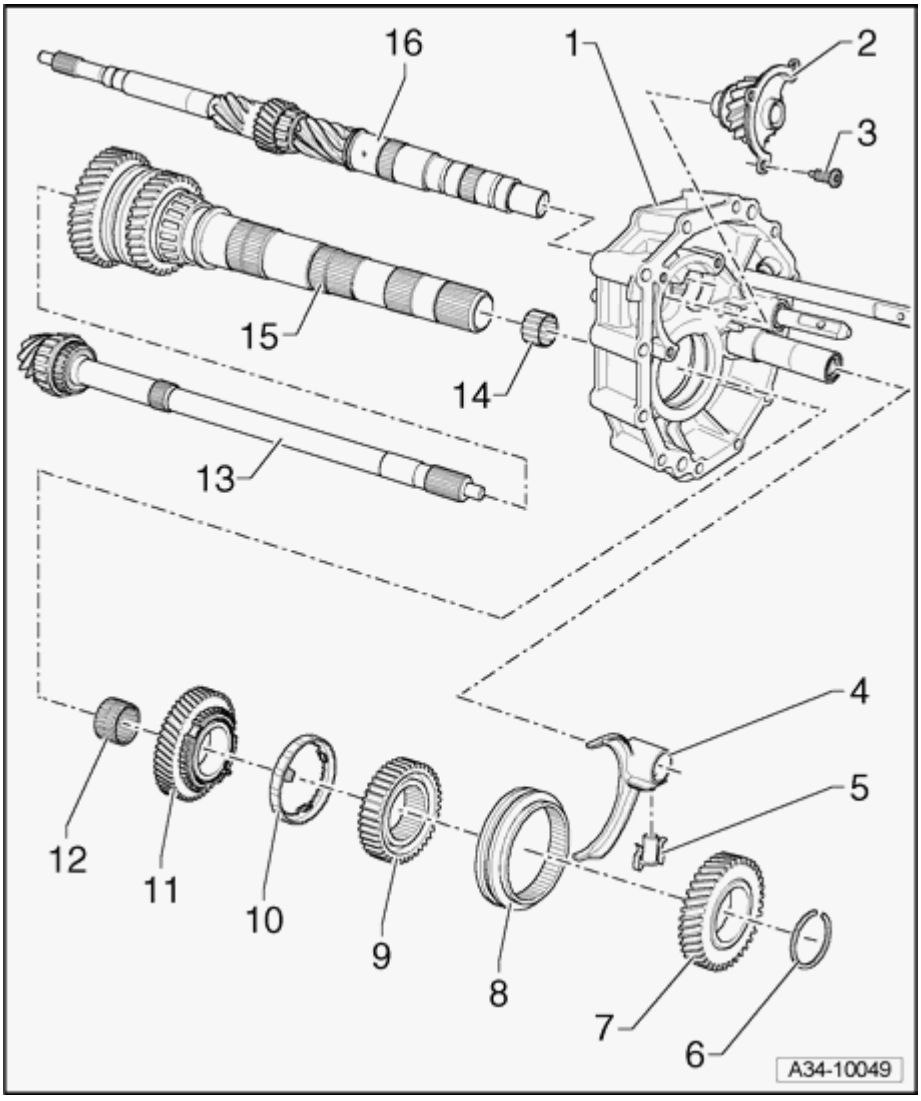

Fig. 263: Input Shaft, Pinion Shaft/Hollow Shaft, Reverse Gear Wheel And Reverse Selector Gear Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

2 - Reverse gear wheel

- With support for reverse shaft
- Exploded view - reverse gear wheel **Exploded view - reverse gear wheel**

3 - Bolt -30 Nm-

- 3 x

4 - Reverse gear selector fork

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5 - Pin with clip

- For securing reverse gear selector fork to selector rod

6 - Circlip

- Install thickest circlip that will still just fit.
- Re-determining thickness --> **Disassembling and assembling sequence**

7 - 3rd gear wheel

- Installation position: machined side faces reverse gear synchronizing hub

8 - Reverse gear locking collar

- Mark position in relation to synchronizing hub prior to removing
- Installation position: taper faces reverse gear synchro-ring

9 - Reverse gear synchronizing hub

- Installation position: high inside collar faces 3rd gear wheel

10 - Synchronizing ring for reverse gear

- Checking for wear **Checking synchro-ring for wear**

11 - Reverse selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

12 - Needle bearing

- For reverse gear

13 - Pinion shaft

- With inner race/double tapered roller bearing and needle bearing
- Disassembling and assembling --> **Pinion shaft and hollow shaft**

14 - Needle bearing

- For pinion shaft/hollow shaft
- Remove needle bearing prior to pulling pinion shaft out of hollow shaft

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15 - Hollow shaft

- With 1st speed and 2nd speed selector gears
- Disassembling and assembling

16 - Input shaft

- Disassembling and assembling --> **Input shaft**

Exploded view - reverse gear wheel

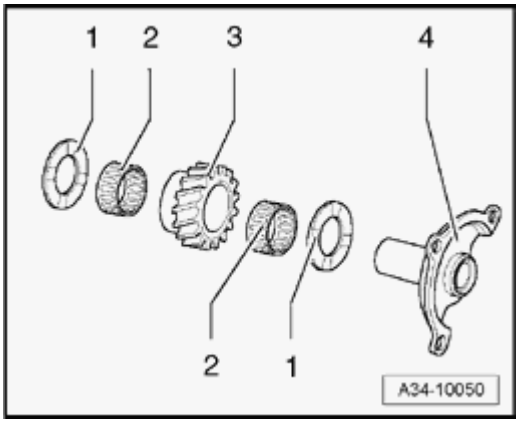

Fig. 264: Assembly Overview - Reverse Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Thrust washer
2. Needle bearing
3. Reverse gear wheel

Installation position: collar points toward bearing housing

4 - Reverse shaft support

Disassembling and assembling sequence

Removing and installing ball bearing for input shaft, end cover, Torsen differential, transmission cover, selector shaft and bearing housing with input shaft and pinion shaft/hollow shaft.

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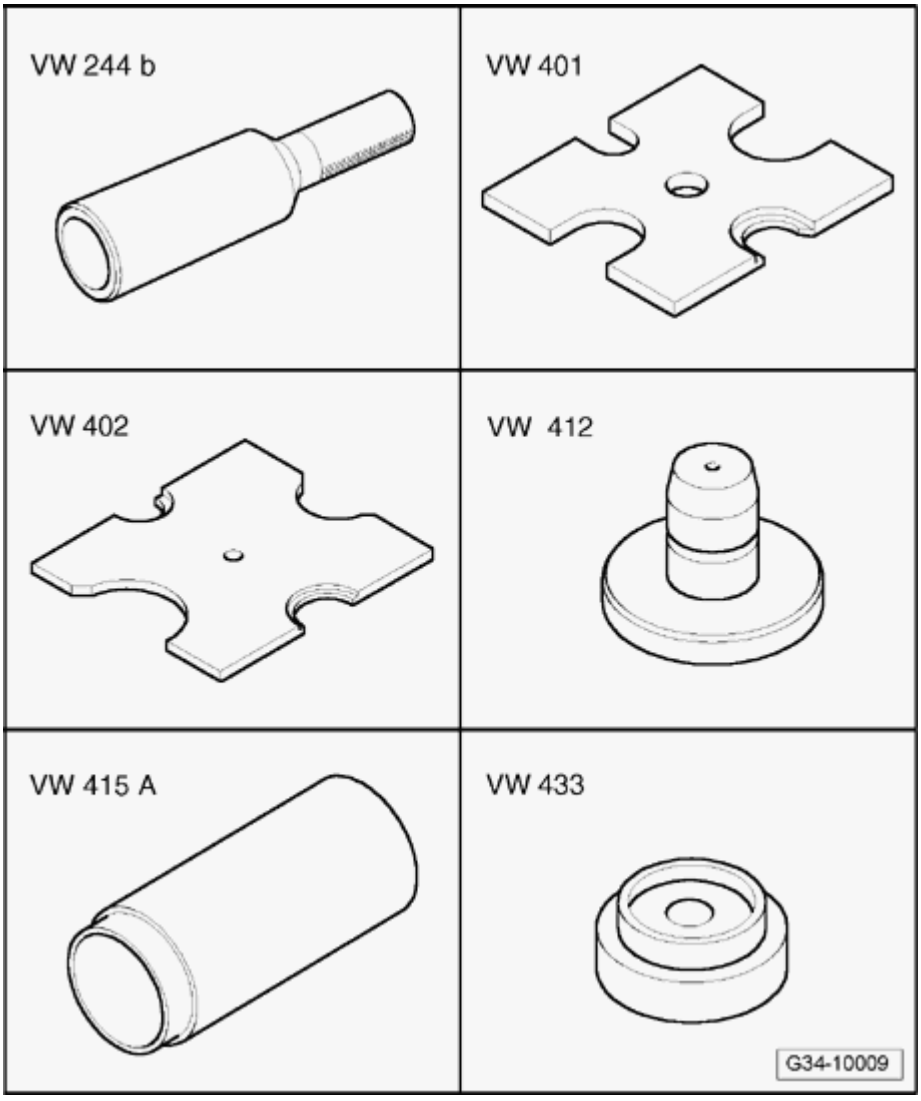

Fig. 265: Identifying Special Tools -- Transmission Disassembling And Assembling Sequence (1 Of 4)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift sleeve VW 244 B
- Thrust plate VW 401
- Thrust plate VW 402
- Thrust disc VW 412

- Tube 60 mm dia. VW 415 A
- Thrust pad con. 8/65 VW 433

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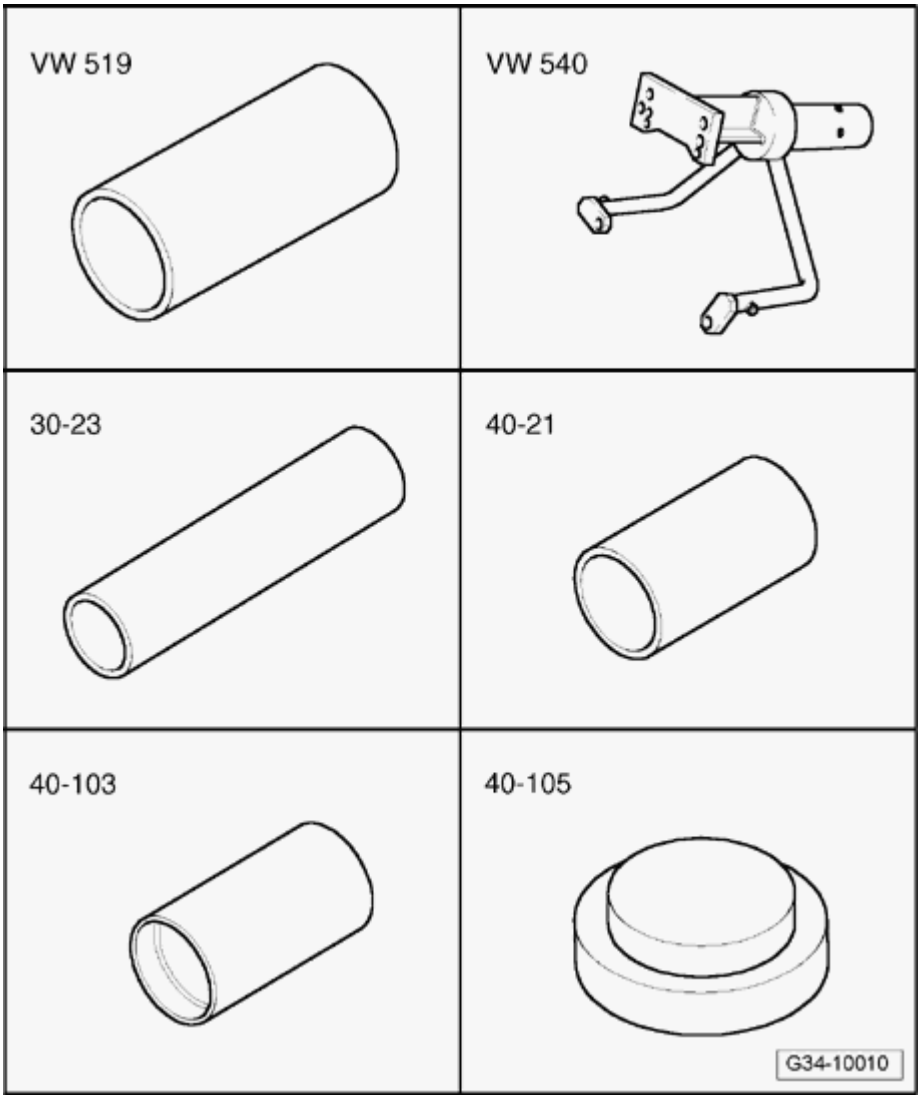

Fig. 266: Identifying Special Tools -- Transmission Disassembling And Assembling Sequence (2 Of 4)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Sleeve VW 519
- Holding fixture VW 540
- Extension 30 - 23
- Press tool 40 - 21

- Sleeve 40 - 103
- Thrust piece 40 - 105

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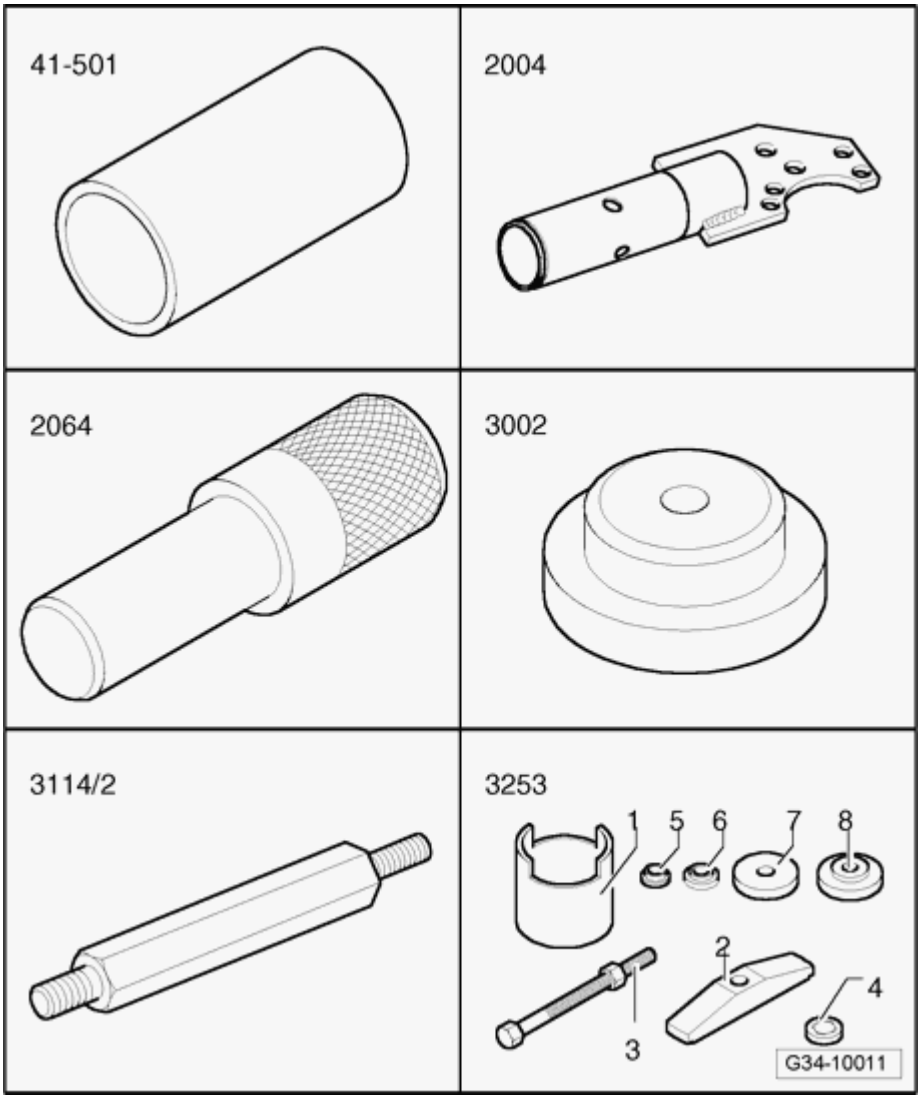

Fig. 267: Identifying Special Tools -- Transmission Disassembling And Assembling Sequence (3 Of 4)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift sleeve 41 - 501
- Transmission holder 2004
- Lock pin 2064
- Thrust piece 3002

- Replacement stud (M8 and M10) 3114/2
- Wheel bearing assembly set 3253

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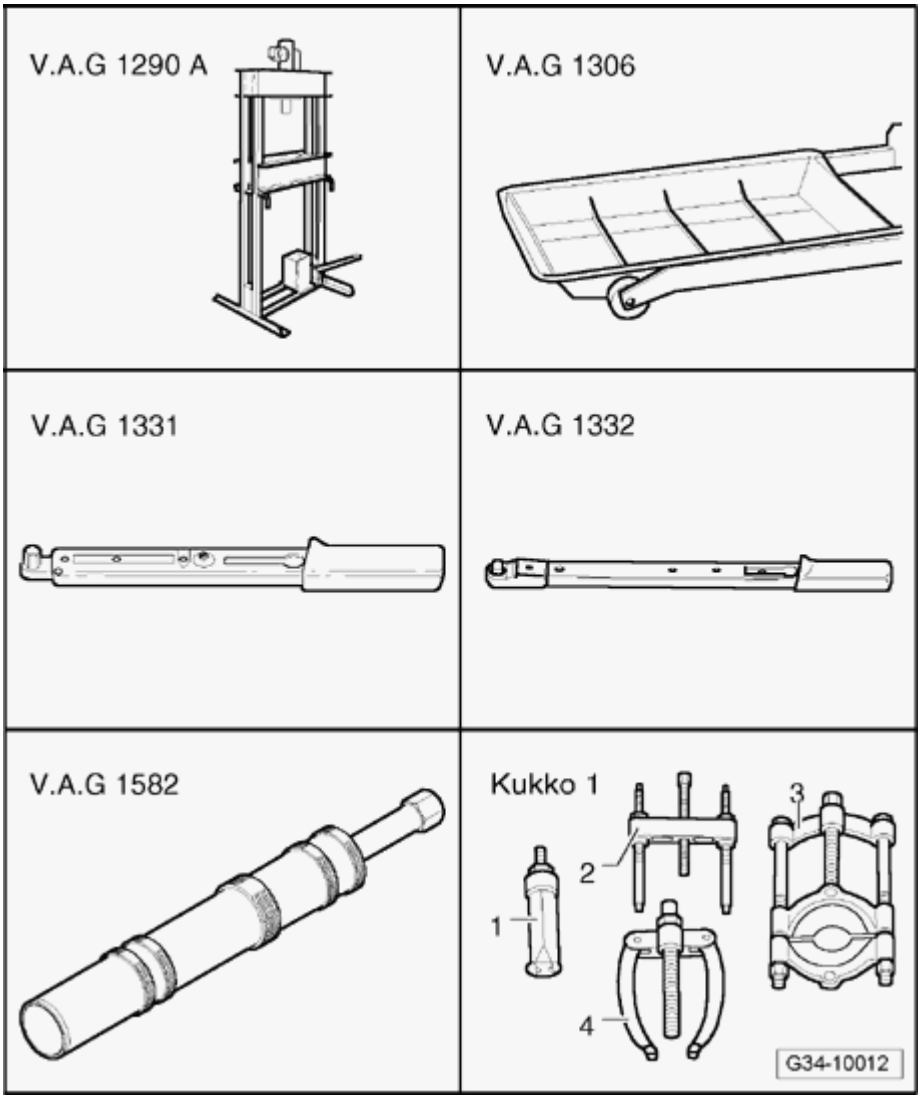

Fig. 268: Identifying Special Tools -- Transmission Disassembling And Assembling Sequence (4 Of 4)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Workshop press V.A.G 1290 A
- Drip tray V.A.G 1306
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332

- Taper roller bearing puller V.A.G 1582
- Adapter V.A.G 1582/12
- **- 1 -** Internal puller Kukko 21/2
- **- 2 -** Puller Kukko 18/2

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Special tools, testers and auxiliary items required

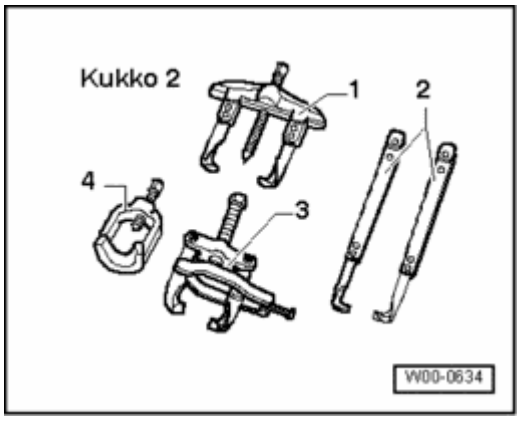

Fig. 269: Identifying Special Tools - Kukko 20/10 Puller Set
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **- 1** - Two-arm puller Kukko 20/10
- **- 2** - Puller hook, length 200 mm
- **- 2** - Puller hook, length 250 mm
- Fitting tool T10246

- Holding plate T40086
- Holding plate T40088/1
- Sleeve T40088/2
- Feeler gauge

- 2 bolts M8 (length 70 mm) with washers
- **Sealing paste AMV 188 001 02**
- **Assembly sleeve 01E311120**
- **Locking fluid AMV185101A1**

Disassembling transmission

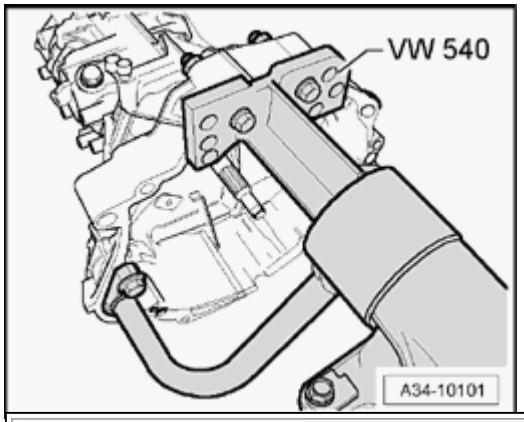

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Fig. 270: Transmission Mounted On Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mount transmission on assembly stand.
- Place drip tray V.A.G 1306 under transmission.
- Drain gear oil.

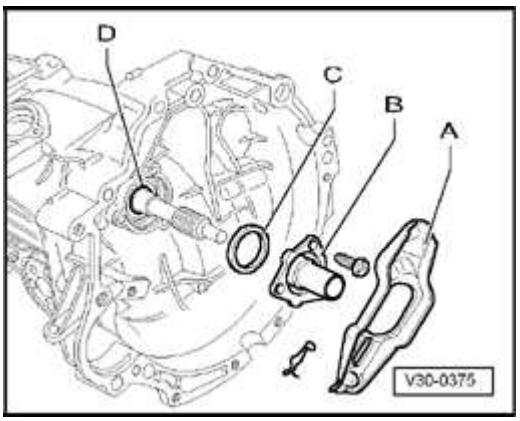

Fig. 271: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clutch release lever - **A** - together with release bearing.
- Remove guide sleeve - **B** -
- Remove dished spring - **C** -.
- Then remove circlip - **D** - in front of ball bearing for input shaft.

- If input shaft or transmission housing is not to be replaced, note thickness of circlip.

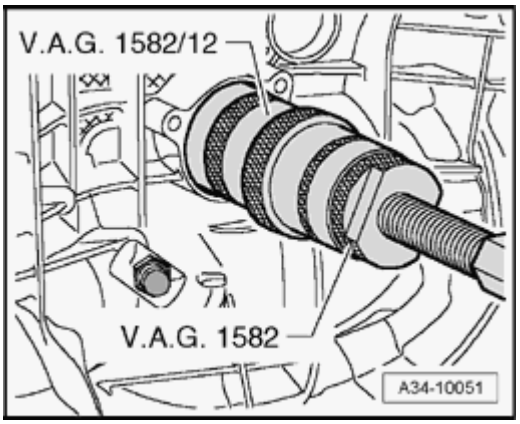

Fig. 272: Pulling Ball Bearing For Input Shaft Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull input shaft ball bearing out of transmission housing.

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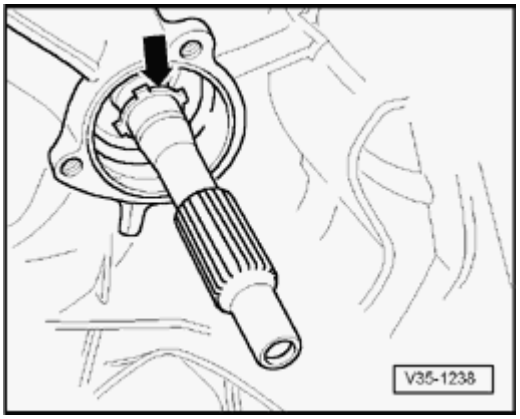

Fig. 273: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip - **arrow** - behind ball bearing for input shaft.
- If input shaft or transmission housing is not to be replaced, note the thickness of circlip.

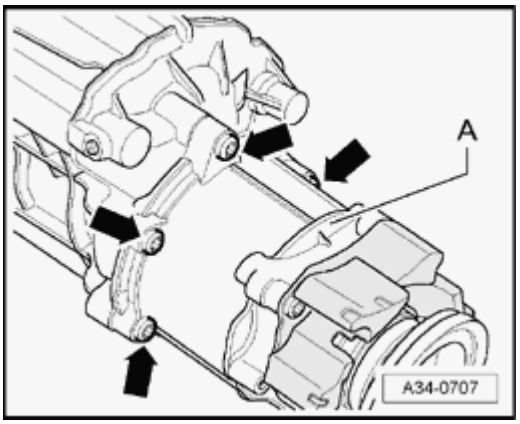

Fig. 274: Locating Torsen Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and detach Torsen housing - **A** -.

NOTE:

- **The illustration shows only 4 of the 6 securing bolts.**

- Remove Torsen differential and spring from pinion shaft/hollow shaft.

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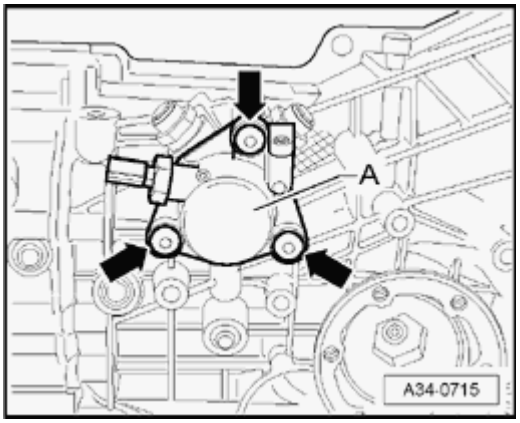

Fig. 275: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove selector shaft cover - **A** -.

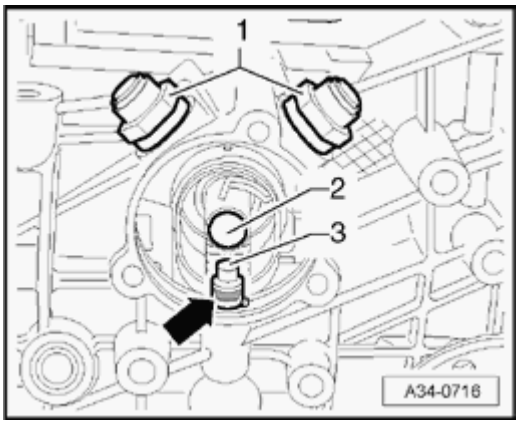

Fig. 276: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove two locking bolts - **1** - for selector shaft.

- Make sure gear has not been engaged.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously removing pin - **3** -.
- Pull out selector shaft.

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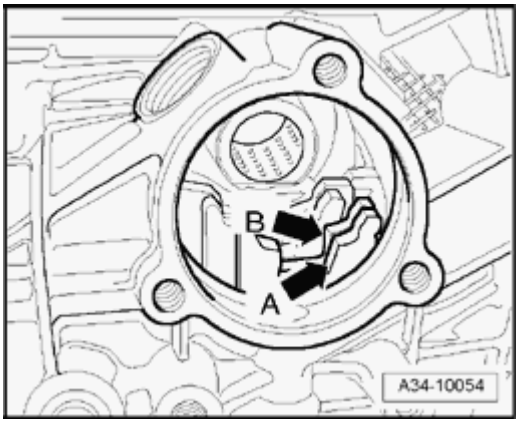

Fig. 277: Locating Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Move two selector rods - **arrow A** - and - **arrow B** - to lock input shaft by selecting two gears (e.g. reverse gear and 1st gear).

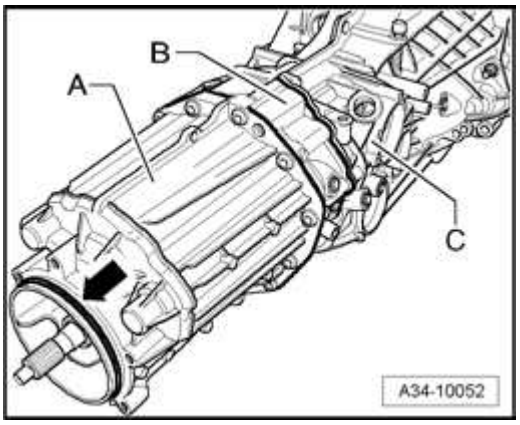

Fig. 278: Removing Bolts Securing Transmission Cover And Bolts Securing Bearing Housing To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts securing transmission cover - **A** - and bolts securing bearing housing - **B** - to transmission housing - **C** -.
- Carefully remove transmission cover toward rear. The bearing housing remains installed to transmission housing.

NOTE:

- **Always replace transmission cover O-ring - arrow -.**

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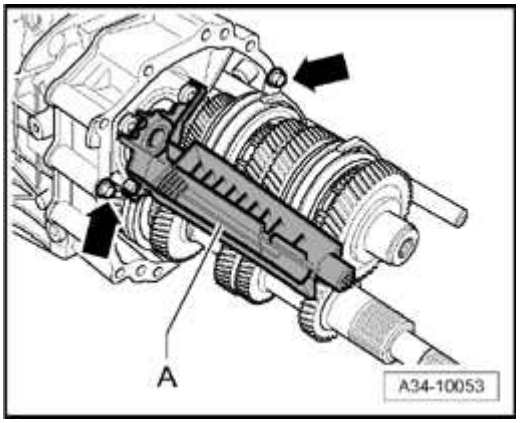

Fig. 279: Bearing Housing Secured To Transmission Housing With Two Bolts M8 And Washers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure bearing housing to transmission housing - **arrows** - with two bolts M8 (length approx. 70 mm) and washers.
- Tighten two bolts to max. 10 Nm.
- Remove oil collector - **A** -.

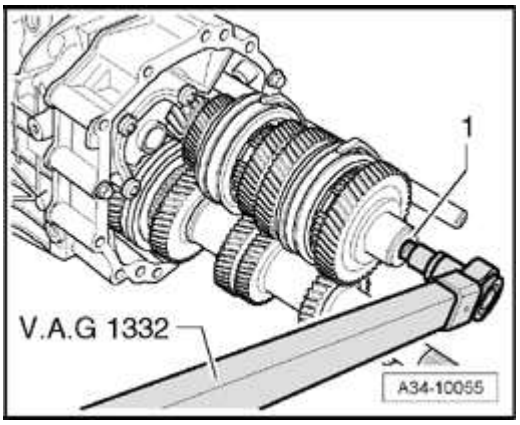

Fig. 280: Removing/Installing Multi-Point Socket Head Bolt For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove multi-point socket head bolt - **1** - for input shaft.

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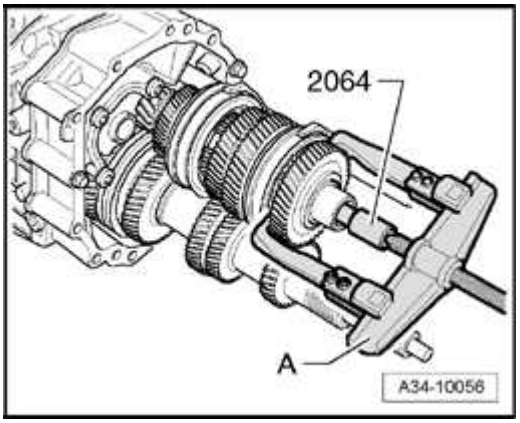

Fig. 281: Detaching 6th Speed Selector Gear With Inner Race For Roller Bearing And Thrust Washer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach 6th speed selector gear with inner race for roller bearing and thrust washer.

A - Two-arm puller, e.g. Kukko 20/10

NOTE:

- **Check the gear teeth on the selector gears and gear wheels for damage after pulling them off.**

- Remove synchro-ring and needle bearing for 6th speed selector gear.

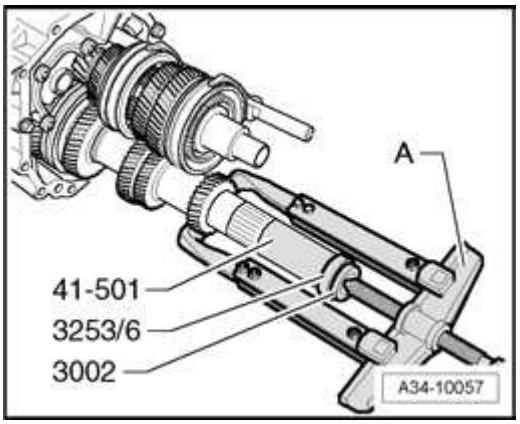

Fig. 282: Pulling Off 6th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 6th gear wheel.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 200 mm

- Remove spacer sleeve from hollow shaft.

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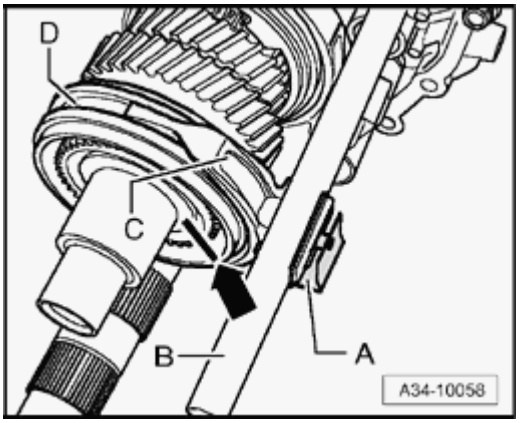

Fig. 283: Identifying Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pin with clip - **A** - for securing selector fork for 5th and 6th gear from selector rod - **B** -.
- Mark installation position of locking collar in relation to synchronizing hub - **arrow** -.
- Move selector fork - **C** - downward and detach with locking collar - **D** -.

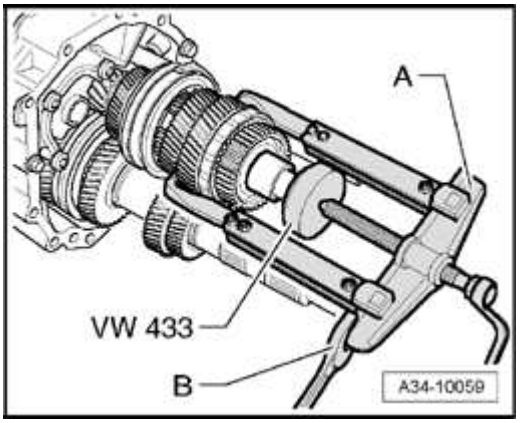

Fig. 284: Removing 5th Speed Selector Gear Together With Needle Bearing Inner Race For 6th Gear And Synchronizing Hub For 5th And 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 5th speed selector gear together with needle bearing inner race for 6th gear and synchronizing hub for 5th and 6th gear.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 200 mm

NOTE:

- **Counter-hold two-arm puller using e.g. open end wrench - B -.**
- **If the needle bearing inner race for 6th gear is in contact with thrust pad con. 8/65 VW 433, insert lock pin 2064 into hole in input shaft to pull off the components all the way.**

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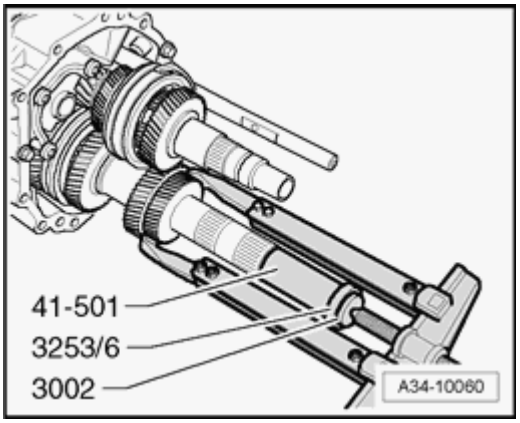

Fig. 285: Pulling Off 5th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 5th gear wheel.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 250 mm

NOTE:

- **The 5th gear wheel can also be pulled off together with the 4th gear wheel Fig. 286.**

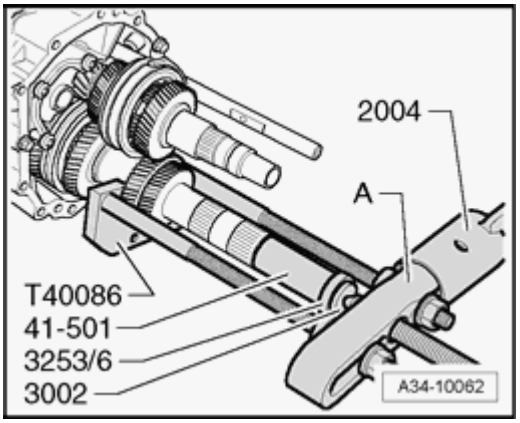

Fig. 286: Pulling Off 5th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 4th gear wheel.

A - Puller, e.g. Kukko 18/2

NOTE:

- **Counter-hold puller - A - using e.g. transmission holder 2004.**

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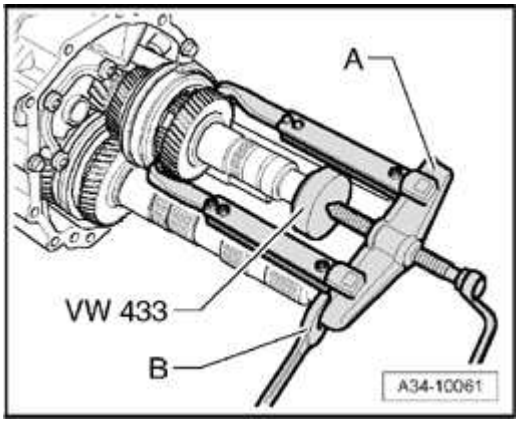

Fig. 287: Removing 4th Speed Selector Gear With Needle Bearing Inner Race For 5th Gear And Thrust Washer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 4th speed selector gear with needle bearing inner race for 5th gear and thrust washer.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 200 mm

- Counter-hold two-arm puller using e.g. open end wrench - **B** -.
- Remove synchro-ring and needle bearing for 4th speed selector gear.

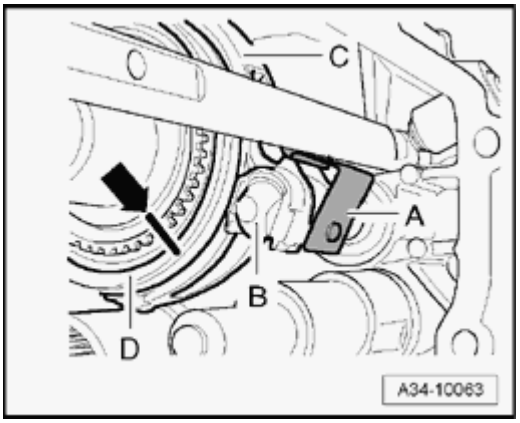

Fig. 288: Pulling Pin With Clip Securing Selector Fork For 3rd And 4th Gear Out From Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pin with clip - **A** - securing selector fork for 3rd and 4th gear out from selector rod - **B** -.

- Mark installation position of locking collar in relation to synchronizing hub - **arrow** -.

- Remove selector fork - **C** - with locking collar - **D** -.
- Remove circlip for 3rd gear and 4th gear synchronizing hub and note thickness of circlip.

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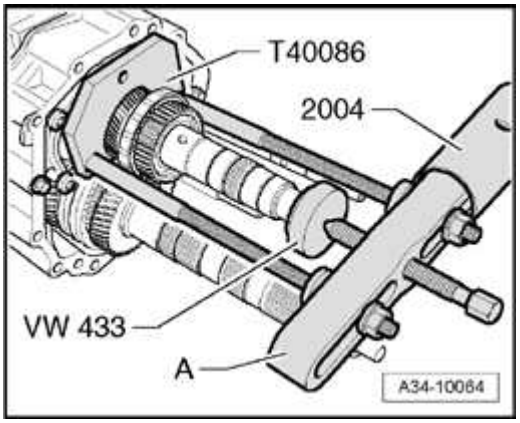

Fig. 289: Pulling Off 3rd Speed Selector Gear With Synchronizing Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Remove 3rd speed selector gear with synchronizing hub for 3rd and 4th gear.

A - Puller, e.g. Kukko 18/2

NOTE:

- **Counter-hold puller - A - using e.g. transmission holder 2004 to prevent plate T40086 from making contact with 3rd gear wheel or selector rod for 5th and 6th gear.**

- Remove circlip for 3rd speed selector gear needle bearing and detach 3rd gear needle bearing.

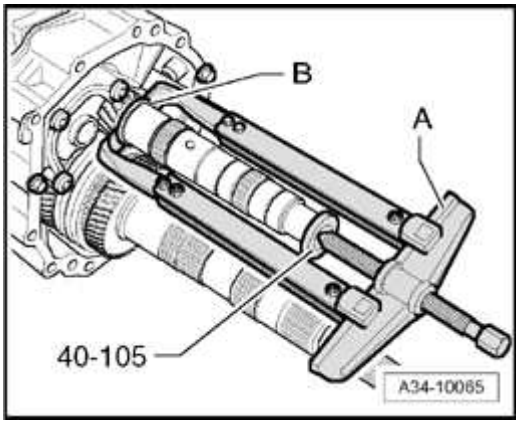

Fig. 290: Pulling Off Thrust Washer For 3rd Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off thrust washer - **B** - for 3rd speed selector gear.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 250 mm

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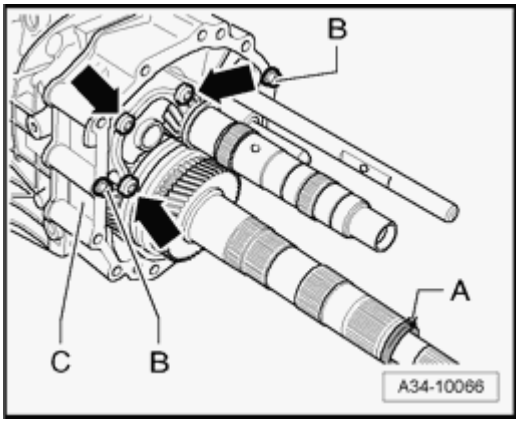

Fig. 291: Identifying Reverse Shaft Support Bolts, Hose Clip And Bolts Securing Bearing Housing To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for reverse shaft support.
- Prevent pinion shaft from falling out and secure onto hollow shaft using e.g. a hose clip - **A** -.
- Remove two bolts - **B** - securing bearing housing to transmission housing and detach bearing housing.
- Remove hose clip from pinion shaft.

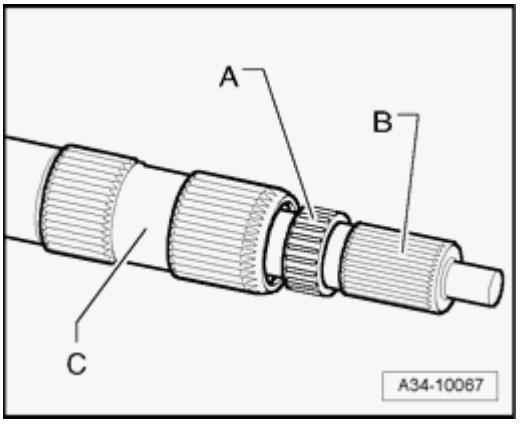

Fig. 292: Identifying Needle Bearing For Pinion Shaft And Hollow Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove needle bearing - **A** - for pinion shaft - **B** - and pull out pinion shaft from hollow shaft - **C** -.

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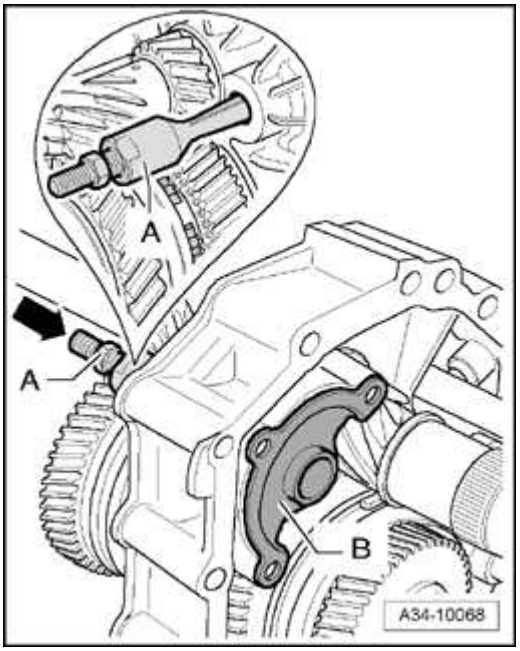

Fig. 293: Driving Reverse Shaft Support Carefully Out Of Bearing Housing And Removing With Reverse Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert an internal puller - **A** - e.g. Kukko 21/2 into hole for reverse shaft support.
- Spread open internal puller far enough for it to make contact with reverse shaft support - **B** -.
- Drive reverse shaft support carefully out of bearing housing direction of - **arrow** - and remove with reverse gear wheel.

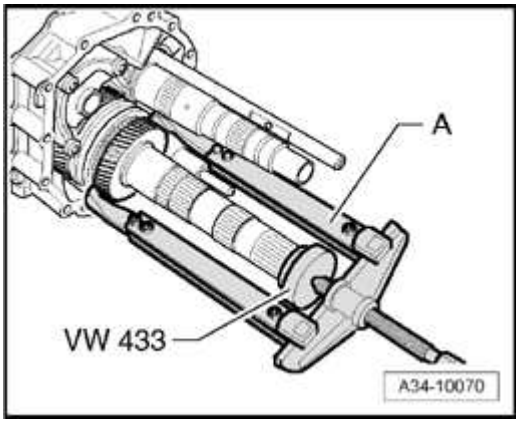

Fig. 294: Removing Circlip For 3rd Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip for 3rd gear wheel and note thickness of circlip.
- Pull off 3rd gear wheel.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 250 mm

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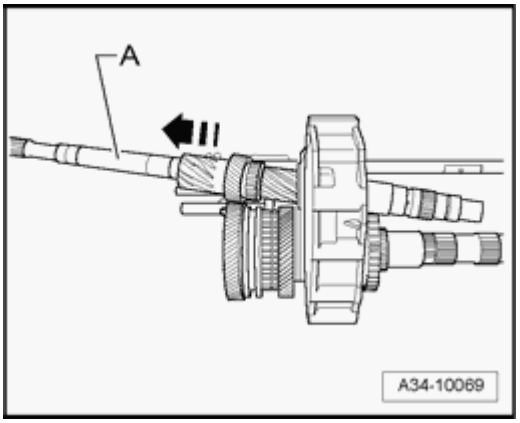

Fig. 295: Pulling Out Input Shaft From Bearing Housing At An Angle From The Front
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out input shaft - **A** - carefully from bearing housing at an angle from the front direction of - **arrow** -.

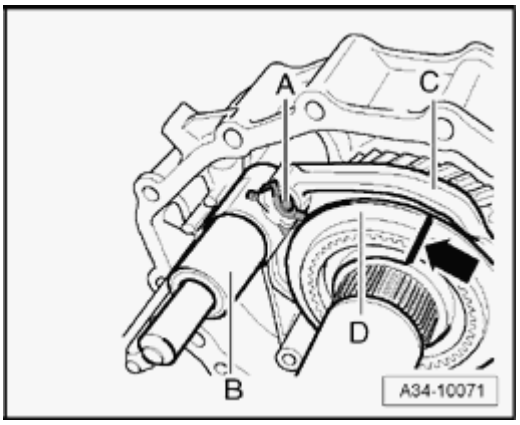

Fig. 296: Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove pin with clip - **A** - for securing selector fork for reverse gear out from selector rod - **B** -.
- Mark installation position of locking collar in relation to synchronizing hub - **arrow** -.
- Remove selector fork - **C** - with locking collar - **D** -.

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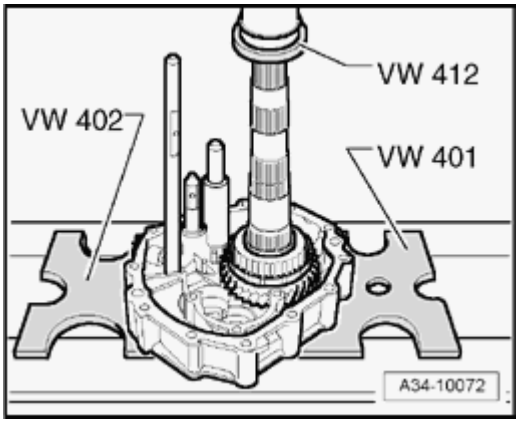

Fig. 297: Pressing Off Synchronizing Hub For Reverse Gear From Output Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press off synchronizing hub for reverse gear from hollow shaft.

NOTE:

- **Place the bearing housing onto thrust plates VW 401 and VW 402 so that the hollow shaft and selector rods are not damaged when pressing off the synchronizing hub.**

- Remove reverse selector gear, needle bearing for reverse selector gear and reverse gear synchronizing hub.
- Guide hollow shaft out of selector fork for 1st and 2nd gear and bearing housing.

Assembling transmission

If the input shaft or the transmission housing have been replaced, you must first re-determine the thickness of the input shaft circlips --> **Circlips for input shaft ball bearing, determining**.

NOTE:

- **Lubricate all needle bearings with gear oil before installing.**
- **Check synchro-rings for wear Checking synchro-ring for wear**
- **Insert spring in selector gear Inserting spring in selector gear**
- **Heat gear wheels, needle bearing inner races and synchronizing hubs to 130° C (max.) before pressing on (wear protective gloves).**

- Insert hollow shaft in bearing housing and selector fork for 1st and 2nd gear.
- Place reverse gear selector gear with needle bearing, spring and synchro-ring onto hollow shaft.

- The tabs on synchro-ring should engage into recesses in selector gear.

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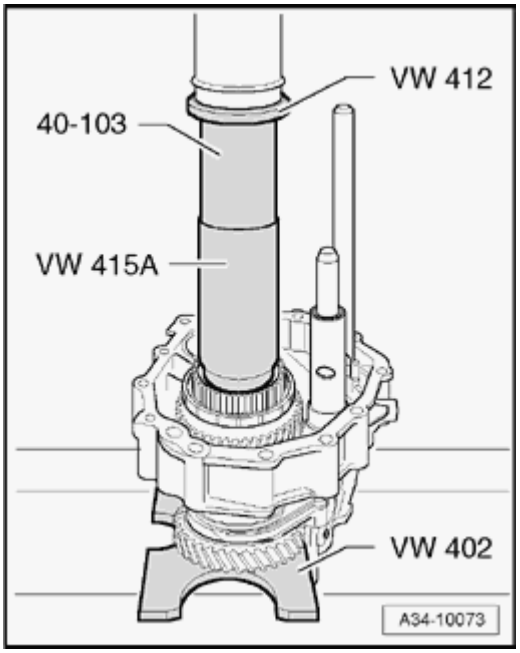

Fig. 298: Pressing On Reverse Gear Synchronizing Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on reverse gear synchronizing hub.
- Installation position: high inside collar faces 3rd gear wheel.
- Check axial clearance of reverse selector gear.

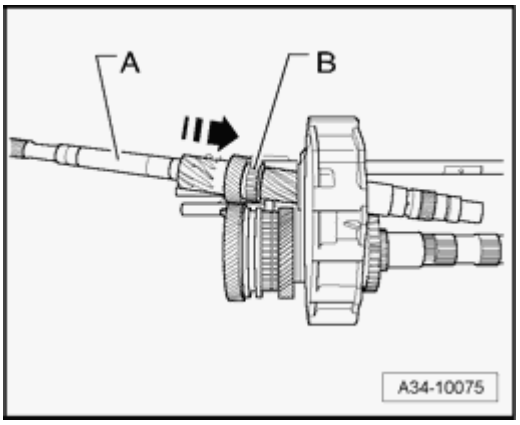

Fig. 299: Inserting Input Shaft With Needle Roller Bearing Into Bearing Housing At An Angle Toward Rear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert input shaft - **A** - with needle roller bearing - **B** - into bearing housing in direction of - **arrow** - at an angle toward rear.
- Install reverse gear wheel and tighten 3 bolts for reverse shaft support to 30 Nm.

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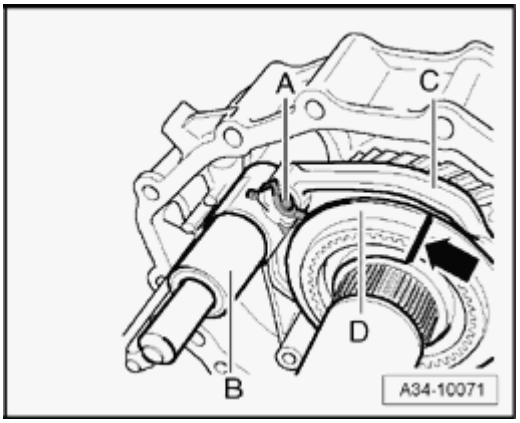

Fig. 300: Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide reverse gear selector fork - **C** - together with locking collar - **D** - onto selector rod - **B** - and reverse gear synchronizing hub.

- The markings on locking collar and synchronizing hub - **arrow** - must coincide.
- The chamfer on locking collar faces reverse selector gear.

- If the holes of selector fork and selector rod coincide, clip in pin with clip - **A** -.

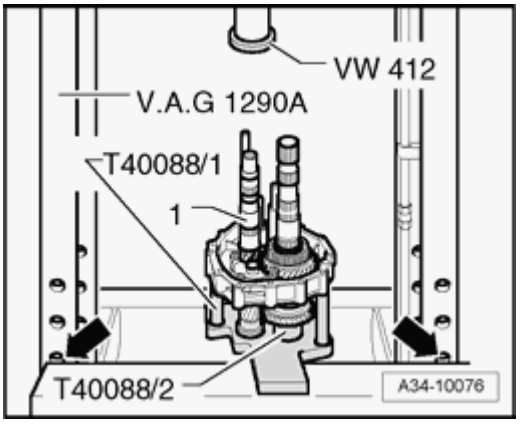

Fig. 301: Work Surface Of Workshop Press V.A.G 1290 A Aligned So That The 3rd Hole Is Visible Above Work Surface
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align work surface of workshop press V.A.G 1290 A so that the 3rd hole - **arrow** - is visible above work surface.
- Place holding plate T40088/1 with sleeve T40088/2 onto work surface.
- Insert bearing housing with shafts and selector rods into holding plate T40088/1.

The distance between input shaft - **1** - and thrust disc VW 412 should be approx. 210 mm, so that it is possible to perform the following work steps without changing the position of the work surface.

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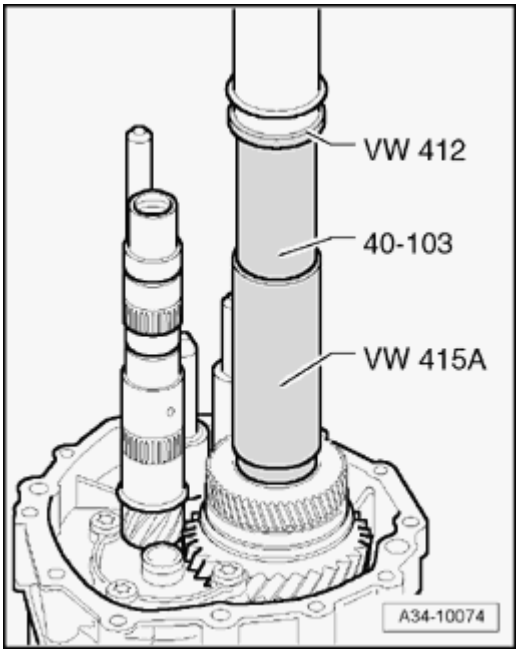

Fig. 302: Pressing On 3rd Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on 3rd gear wheel.
- Installation position: machined side faces reverse gear synchronizing hub.
- Insert circlip for 3rd gear wheel.
- When replacing gear wheel or hollow shaft:

Re-determine thickness of circlip for 3rd gear wheel:

- Determine thickest circlip that will just fit and install it.

The following circlips are available:

Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	2.10

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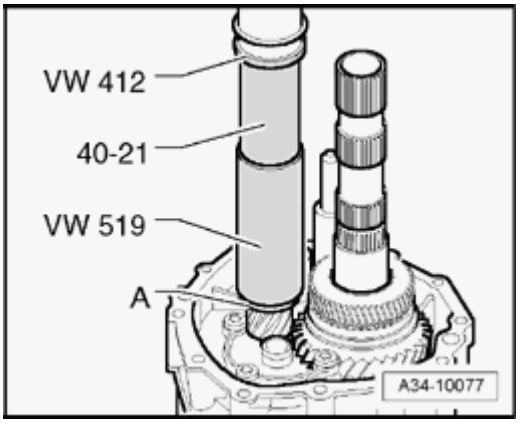

Fig. 303: Pressing On Thrust Washer For 3rd Speed Selector Gear Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on thrust washer - **A** - for 3rd speed selector gear until limit stop.

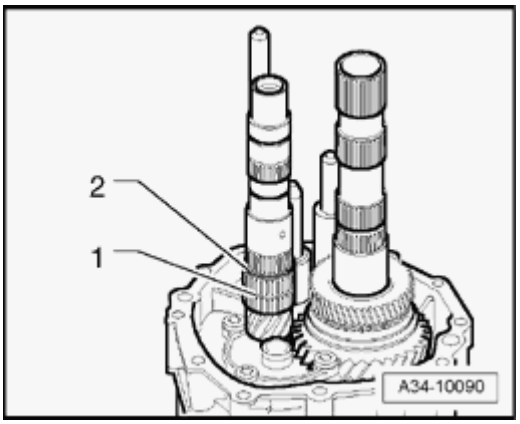

Fig. 304: Installing Needle Bearing For 3rd Speed Selector Gear And Circlip For 3rd Gear Needle Bearing Onto Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install needle bearing for 3rd speed selector gear - **1** - and circlip - **2** - for 3rd gear needle bearing onto input shaft.
- Install 3rd speed selector gear with spring and synchro-ring.

- The tabs on synchro-ring should engage into recesses in selector gear.

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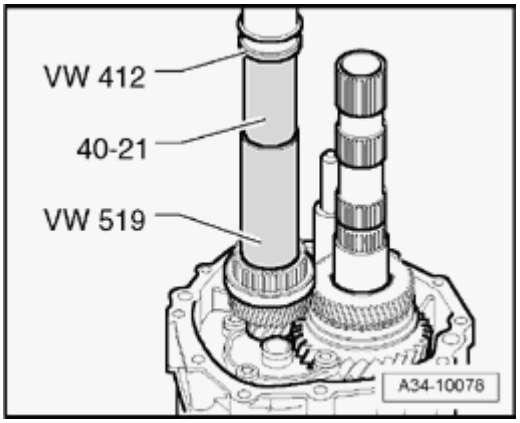

Fig. 305: Pressing On Heated Synchronizing Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on heated synchronizing hub for 3rd and 4th gear
- Installation position: high inside collar faces 3rd speed selector gear.

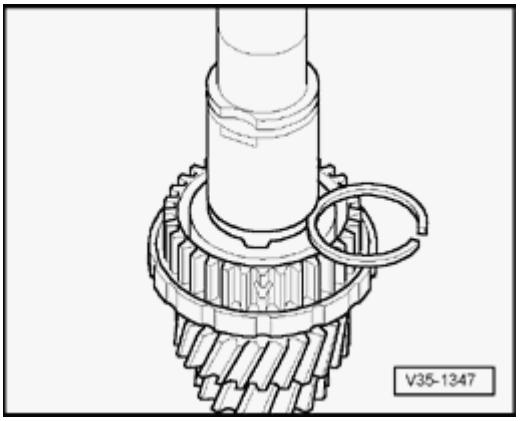

Fig. 306: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert circlip for synchronizing hub for 3rd and 4th gear.
- When replacing synchronizing hub or input shaft:

Re-determine thickness of circlip for synchronizing hub for 3rd and 4th gear:

- Determine thickest circlip that will just fit and install it.

The following circlips are available:

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

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- Check axial clearance of 3rd speed selector gear.

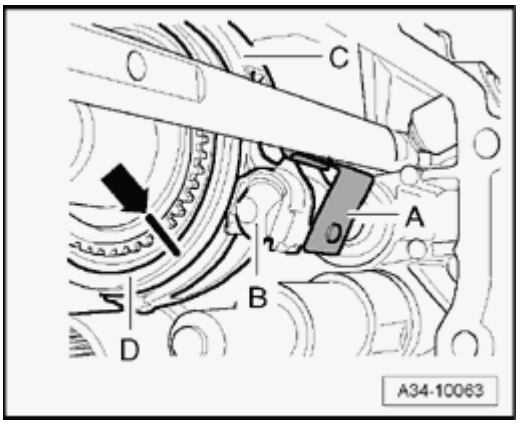

Fig. 307: Pulling Pin With Clip Securing Selector Fork For 3rd And 4th Gear Out From Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide selector fork for 3rd and 4th gear - **C** - together with locking collar - **D** - onto selector rod - **B** - and synchronizing hub for 3rd and 4th gear.

- The markings on locking collar and synchronizing hub - **arrow** - must coincide.

- If the holes of selector fork and selector rod coincide, clip in pin with clip - **A** -.

NOTE:

- **Do not insert pin with clip for 5th/6th gear selector fork (diameter 6 mm) into selector fork for 3rd and 4th gear.**

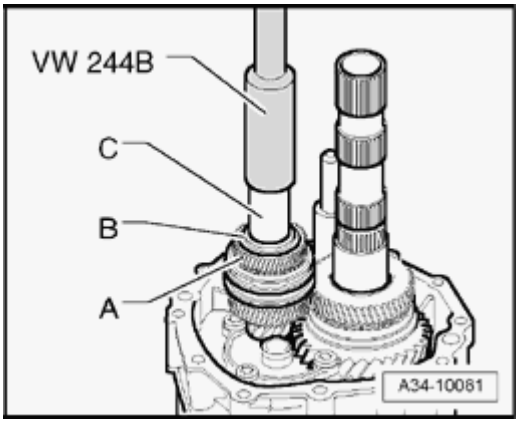

Fig. 308: Installing 4th Speed Selector Gear With Spring, Synchro-Ring, Needle Bearing And Thrust Washer For 3rd And 4th Gear And Pressing On Heated Inner Race For Needle Bearing For 5th Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install 4th speed selector gear - **A** - with spring, synchro-ring, needle bearing and thrust washer for 3rd and 4th gear - **B** -.

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- Press on heated inner race - **C** - for needle bearing for 5th speed selector gear.
- Check axial clearance of 4th speed selector gear.

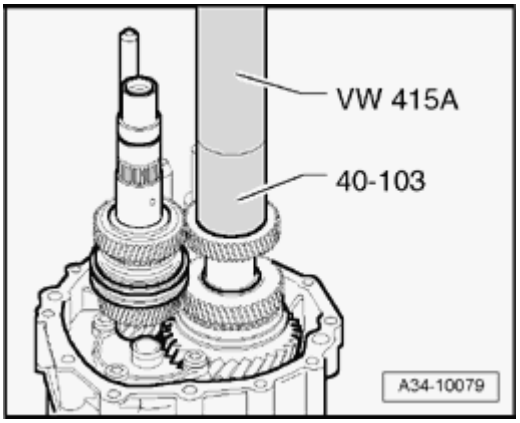

Fig. 309: Pressing On 4th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 4th gear wheel and press on.
- Installation position: high inside collar faces 5th gear wheel.

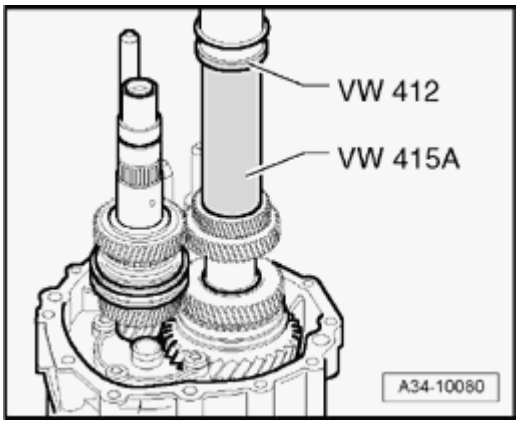

Fig. 310: Pressing On 5th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 5th gear wheel and press on.
- Installation position: high inside collar faces 4th gear wheel.
- Place 5th speed selector gear with spring, synchro-ring and needle bearing onto input shaft.
- The lugs on synchro-ring should engage into recesses in selector gear.

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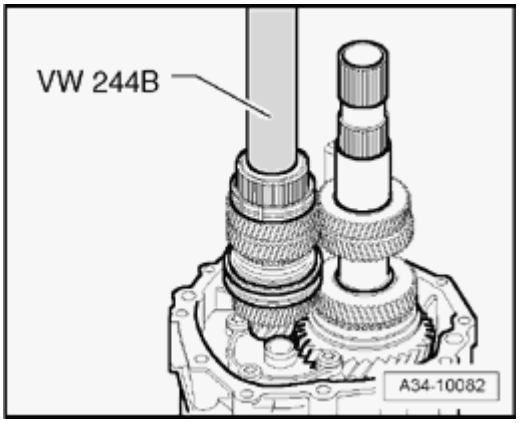

Fig. 311: Pressing On Heated Synchronizing Hub For 5th And 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install and press on heated synchronizing hub for 5th and 6th gear.
- Check axial clearance of 5th speed selector gear.

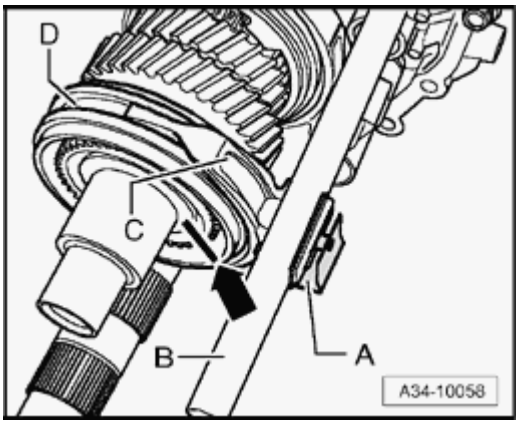

Fig. 312: Identifying Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide selector fork for 5th and 6th gear - **C** - together with locking collar - **D** - onto synchronizing hub for 5th and 6th gear.

- The markings on locking collar and synchronizing hub - **arrow** - must coincide.

- Move selector fork for 5th and 6th gear - **C** - into selector rod - **B** -.
- If the holes of selector fork and selector rod coincide, clip in pin with clip - **A** -.

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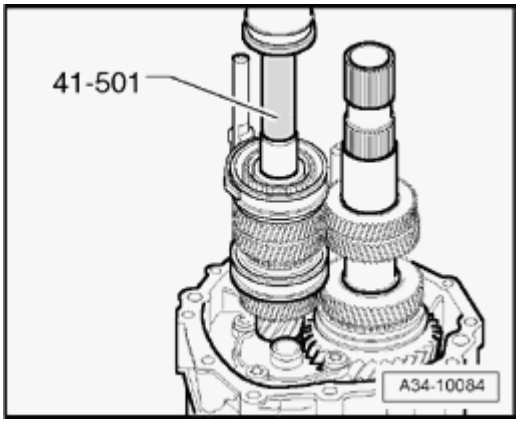

Fig. 313: Pressing On Heated Inner Race For Needle Bearing For 5th Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on heated inner race for needle bearing for 5th speed selector gear.

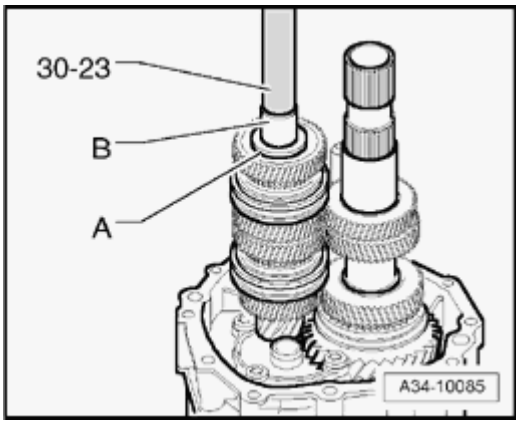

Fig. 314: Pressing On 6th Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install 6th speed selector gear with spring, synchro-ring, needle bearing and thrust washer for 6th gear - **A** -.
- Heat inner race - **B** - for needle roller bearing and press on.
- Check axial clearance of 6th speed selector gear.

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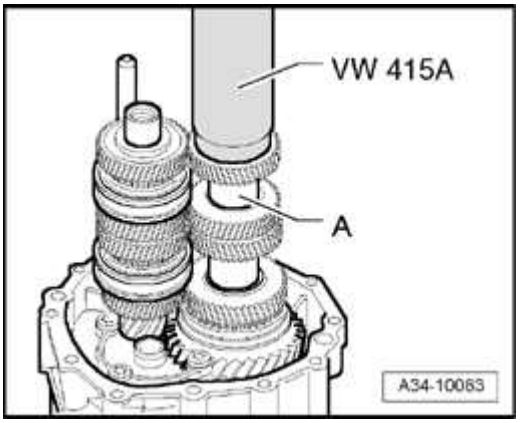

Fig. 315: Pressing On 6th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install spacer sleeve - **A** - onto hollow shaft.
- Heat 6th gear wheel and press on.

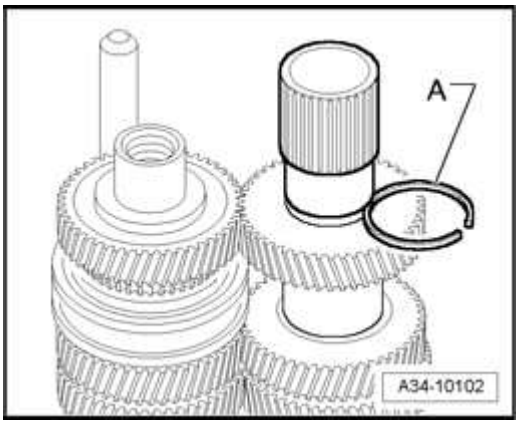

Fig. 316: Circlip For 6th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Insert circlip - **A** - for 6th gear wheel.

- When replacing gear wheel or hollow shaft:

Re-determine circlip - **A** - for 6th gear wheel:

- Determine thickest circlip that will just fit and install it.

The following circlips are available:

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17

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1.96	2.08	2.20
1.99	2.11	

- Remove bearing housing from holding plate T40088/1.

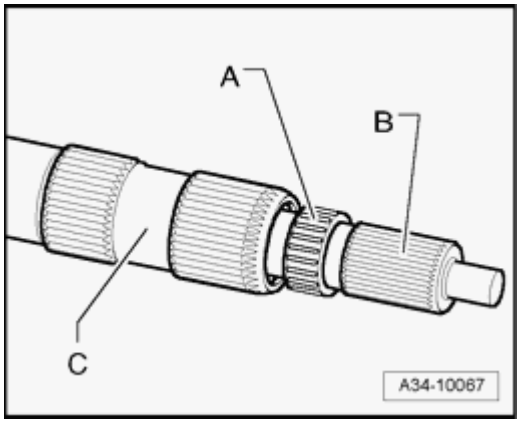

Fig. 317: Identifying Needle Bearing For Pinion Shaft And Hollow Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push pinion shaft - **B** - with large needle bearing into hollow shaft - **C** - and fit small needle bearing - **A** -.
- Prevent pinion shaft from falling out and secure on hollow shaft using e.g. a hose clip **Fig. 291**.

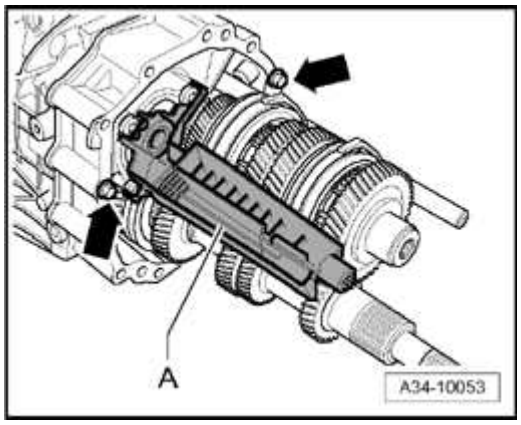

Fig. 318: Bearing Housing Secured To Transmission Housing With Two Bolts M8 And Washers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure bearing housing to transmission housing with two bolts M8 (length approx. 70 mm) - **arrows** - and washers.
- Tighten two bolts to max. 10 Nm.

NOTE:

- **Do not install oil collector - A - at this stage.**

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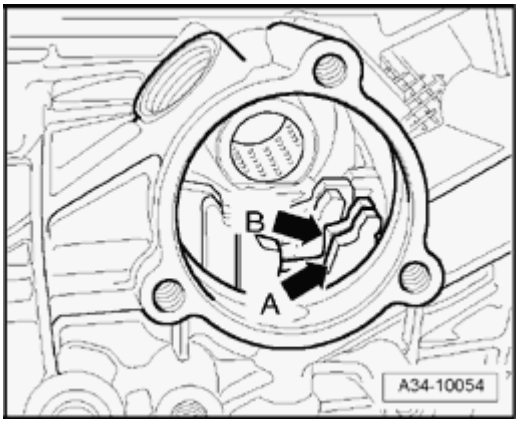

Fig. 319: Locating Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Move two selector rods - **arrow A** - and - **arrow B** - to lock input shaft by selecting two gears (e.g. reverse gear and 1st gear).

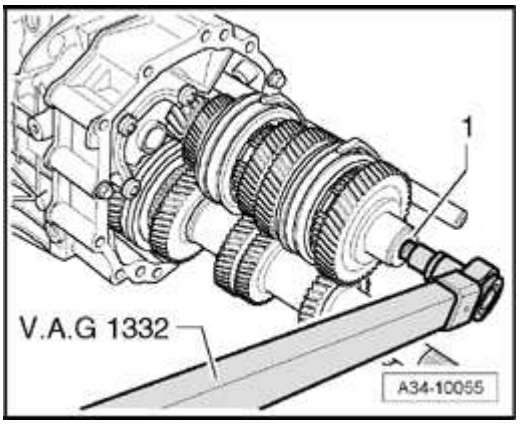

Fig. 320: Removing/Installing Multi-Point Socket Head Bolt For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten multi-point socket head bolt - **1** - for input shaft to 150 Nm.
- Remove complete bearing housing from transmission housing.
- Check that the two dowel sleeves for centralizing bearing housing are installed in transmission housing.
- Apply **sealing paste AMV 188 001 01** evenly and not too thickly onto contact surfaces between transmission housing and bearing housing.

- Install bearing housing onto transmission housing.

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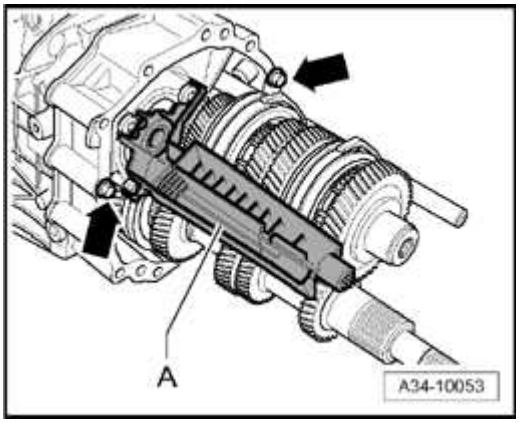

Fig. 321: Bearing Housing Secured To Transmission Housing With Two Bolts M8 And Washers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clip oil collector - **A** - into reverse shaft support.

NOTE:

- **Make sure that the bolts - arrows - are removed.**

- Remove hose clip from pinion shaft **Fig. 291**.
- Check that the two dowel sleeves for centralizing the transmission cover are installed in bearing housing.
- Apply **sealing paste AMV 188 001 02** evenly and not too thick onto contact surfaces between bearing housing and transmission cover.

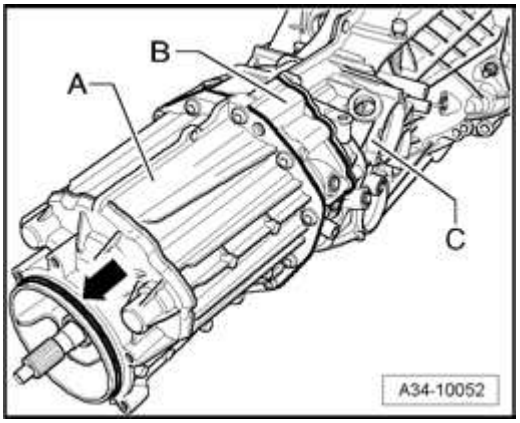

Fig. 322: Removing Bolts Securing Transmission Cover And Bolts Securing Bearing Housing To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten securing bolts for transmission cover - **A** - and bearing housing - **B** - to transmission housing - **C** - to 35 Nm plus an additional 90° $^{1}/_{4}$ turn.
- Lubricate new O-ring - **arrow** - with gear oil.

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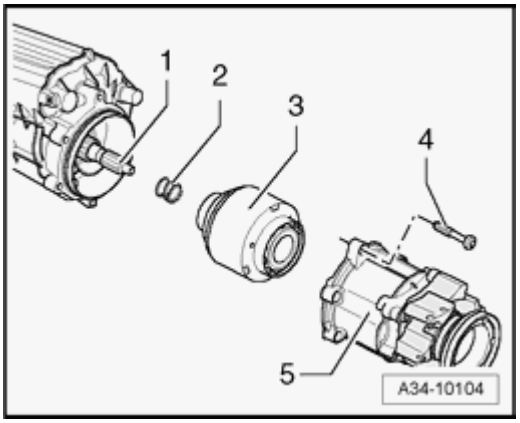

Fig. 323: Torsen Differential, Spring, Pinion Shaft/Hollow Shaft, Torsen Housing And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place spring - **2** - and Torsen differential - **3** - onto pinion shaft/hollow shaft - **1** -.
- Install Torsen housing - **5** - onto transmission cover.
- Tighten bolts - **4** - to 10 Nm plus an additional 45° $^{1}/_{8}$.

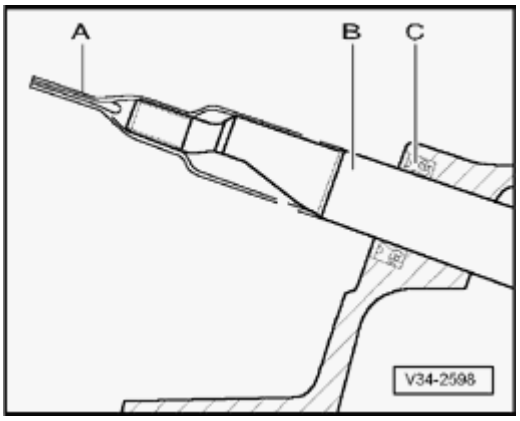

Fig. 324: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push **assembly sleeve 01E311120** - **A** - onto selector shaft - **B** -.

NOTE:

- **Avoid damaging oil seal - C - by only installing oil seal and selector shaft using assembly sleeve assembly sleeve 01E311120 - A -.**

- Move selector rods to neutral.
- Install complete selector shaft.

- Installation position: Chamfer of selector shaft points downward.

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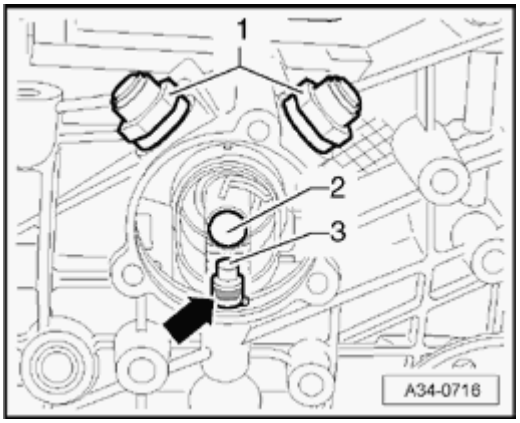

Fig. 325: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously inserting pin - **3** -.
- Installation position for pin - **3** - : The groove - **arrow** - on pin points toward selector shaft cover.
- Clean bolt threads of locking fluid - **1** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 45 Nm.

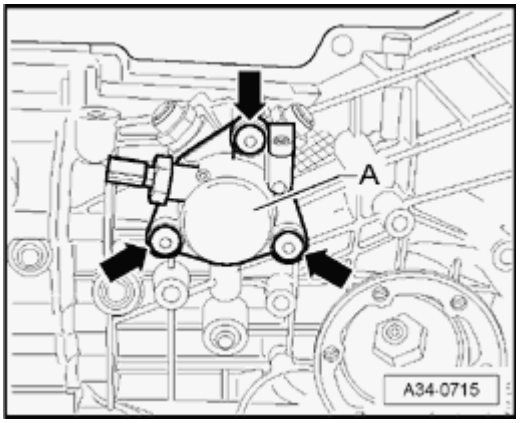

Fig. 326: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install cover - **A** - with new O-ring.
- Clean threads of bolts - **arrows** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 24 Nm.

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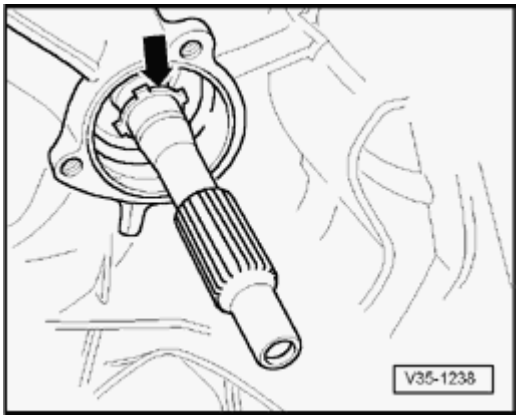

Fig. 327: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install rear circlip - **arrow** - for input shaft ball bearing.
- Push ball bearing onto input shaft.

Installation position:

The sealed side of ball cage faces transmission housing.

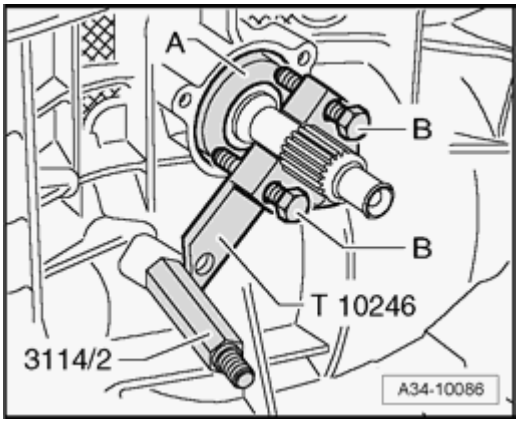

Fig. 328: Pressing In Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing in ball bearing:

Screw replacement stud (M8 and M10) 3114/2 into tapped hole for ball head stud.

Slide thrust plate - **A** - of fitting tool T10246 onto input shaft.

Position fitting tool T10246 behind splines for clutch plate. Tighten bolts - **B** - lightly. The bolts locate in the recess in thrust plate - **A** -.

Press in ball bearing onto stop by tightening bolts alternately (1/2 turn at a time).

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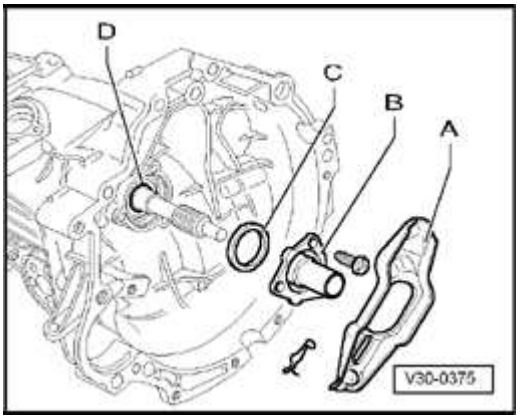

Fig. 329: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install front circlip - **D** - for input shaft ball bearing.
- Install dished spring - **C** -.

Installation position:

The curved side faces guide sleeve - **B** -.

- Install a shrink hose onto input shaft splines.
- Install guide sleeve - **B** - for release bearing.
- Remove shrink hose.
- Install clutch release lever - **A** - with release bearing.

- Select all gears.

TORSEN HOUSING, DISASSEMBLING AND ASSEMBLING

Torsen housing, disassembling and assembling

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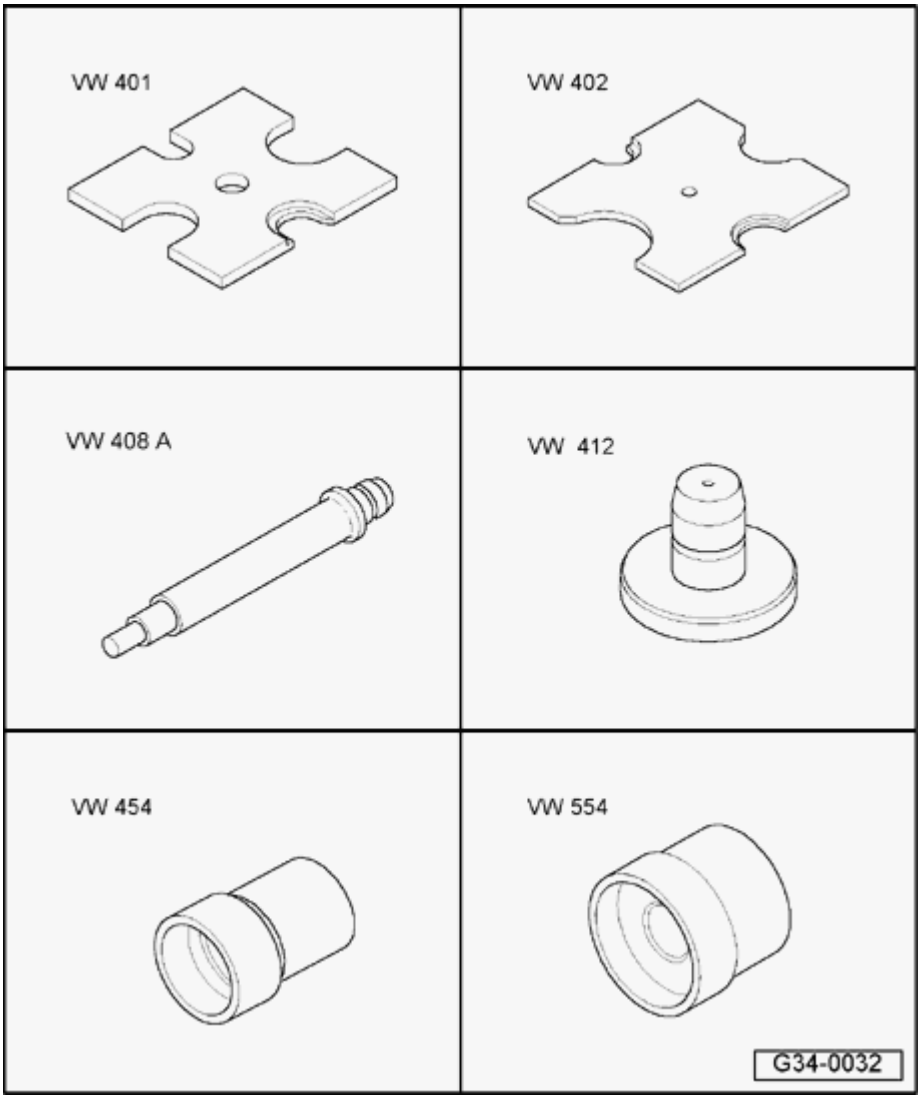

Fig. 330: Identifying Special Tools - Torsen Housing, Disassembling And Assembling (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW401
- Thrust plate VW402
- Punch VW408A
- Thrust disc VW412

- Thrust tube VW454
- Arbor thrust piece VW554

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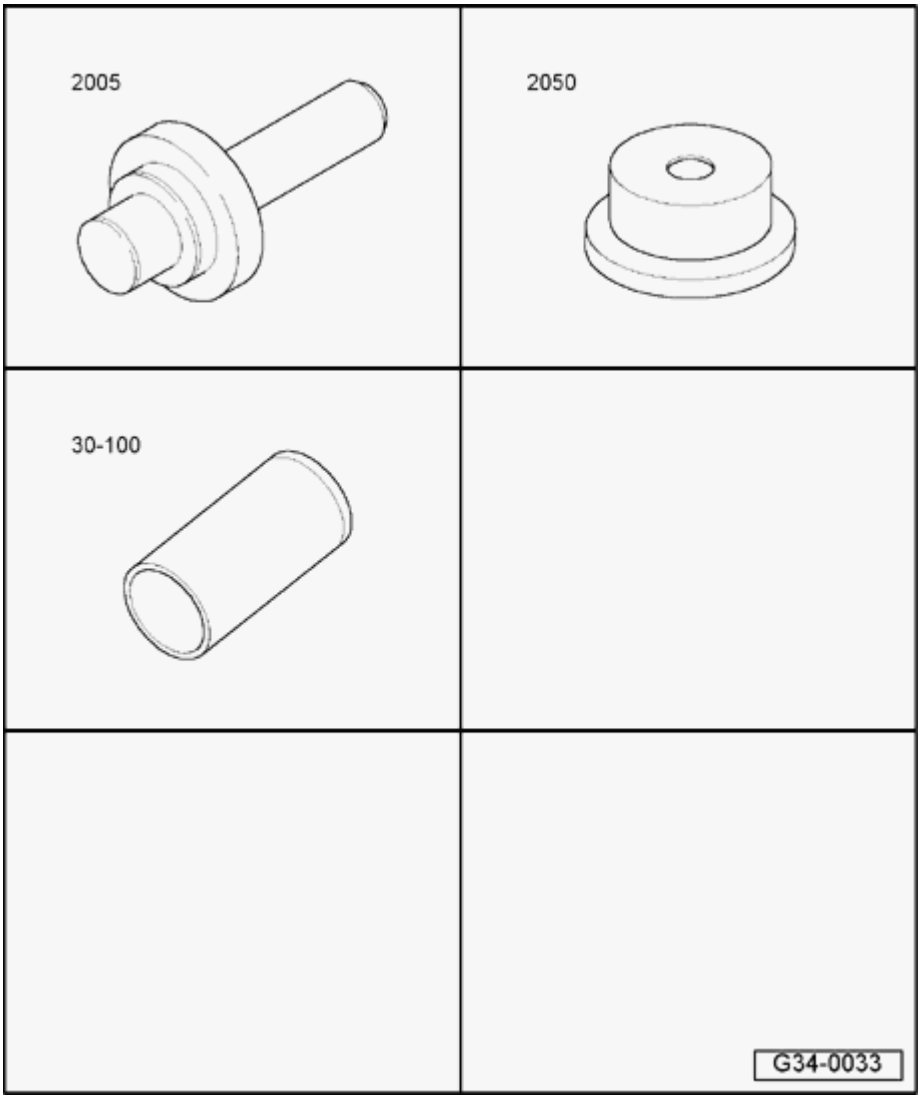

Fig. 331: Identifying Special Tools - Torsen Housing, Disassembling And Assembling (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Punch 2005
- Thrust piece 2050
- Drift sleeve 30 - 100
- Torque wrench V.A.G 1331

- **Shim 016311391A**
- **Locking fluid AMV 185 101 A1**
- **Sealing grease G 052 128 A1**

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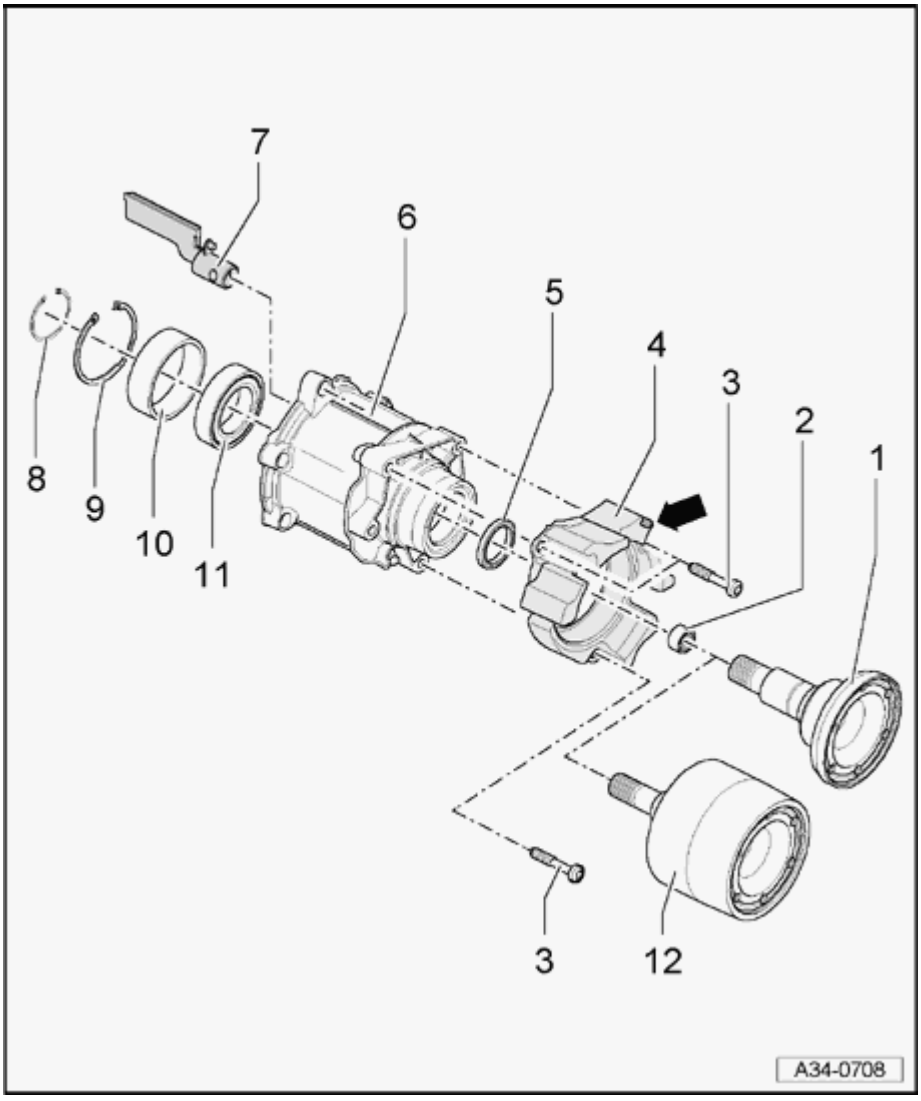

Fig. 332: Torsen Housing Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Flange shaft

- Without vibration damper
- Pressing out **Pressing out flange shaft**
- Pressing in **Pressing in flange shaft**

2 - Needle bearing

- Pull out of flange shaft using internal puller Kukko 21/1 and counter-support Kukko 22/1.
- Press into flange shaft as far as it will go using punch VW 408 A.

3 - Bolt - 15 Nm plus an additional $90° {}^{1}/_{4}$ turn

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- For vibration damper
- 3x
- Apply **locking fluid AMV 185 101 A1** when installing

4 - Vibration damper

- Not installed on all versions
- Select correct version according to color coding - **arrow** - or transmission code

5 - Oil seal

- Prying out **Prying off oil seal.**
- Preparing for installation **Preparing oil seal for installation**
- Driving in **Drive in seal onto stop.**

6 - Torsen housing

- Removing and installing (transmission removed) --> **Disassembling and assembling sequence**
- Removing and installing (transmission installed) --> **Torsen housing, removing and installing (with transmission installed)**

7 - Oil collector

- Insert in hole on transmission cover

8 - Circlip

- For flange shaft
- Installation position **Installation position of circlips - A - and - B -**

9 - Circlip

- For ball bearing and sleeve
- Installation position **Installation position of circlips - A - and - B -**

10 - Sleeve

11 - Ball bearing

- For flange shaft
- Pressing out **Pressing out ball bearing for flange shaft**
- Pressing in **Pressing in ball bearing for flange shaft**

12 - Flange shaft with vibration damper

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- Only replace as complete unit
- Pressing out **Pressing out flange shaft**
- Pressing in **Pressing in flange shaft**

Pressing out flange shaft

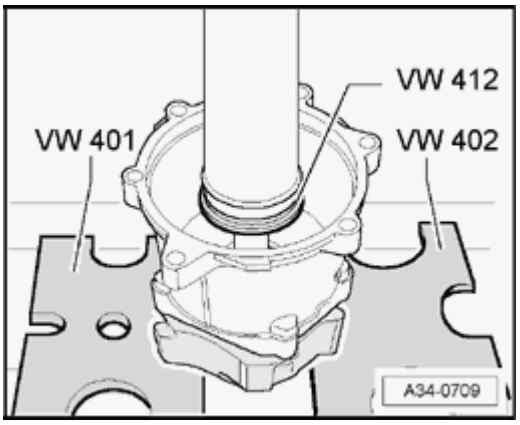

Fig. 333: Pressing Out Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before pressing out flange shaft remove circlip from flange shaft **Installation position of circlips - A - and - B -**
- Position Torsen housing in such a way that the flange shaft does not make contact with thrust plates VW 401 and thrust plates VW 402 when it is pressed out.

Pressing in flange shaft

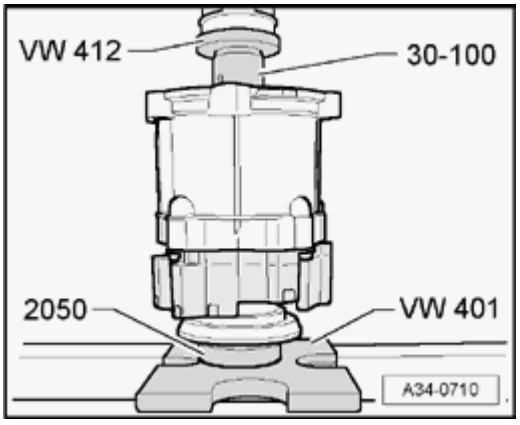

Fig. 334: Pressing In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before pressing in flange shaft, tighten vibration damper (if installed).
- Support flange shaft with thrust piece 2050.
- Install circlip onto flange shaft **Installation position of circlips - A - and - B -**

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Prying off oil seal.

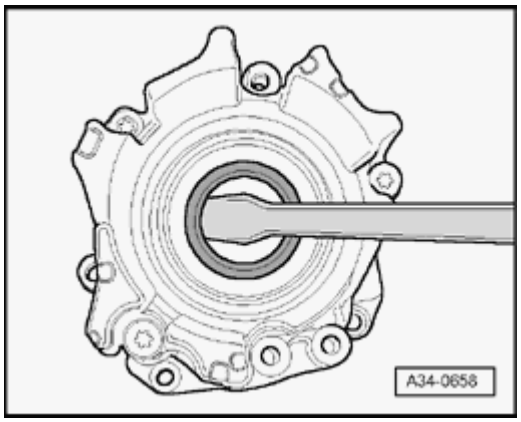

Fig. 335: Prying Off Oil Seal.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Preparing oil seal for installation

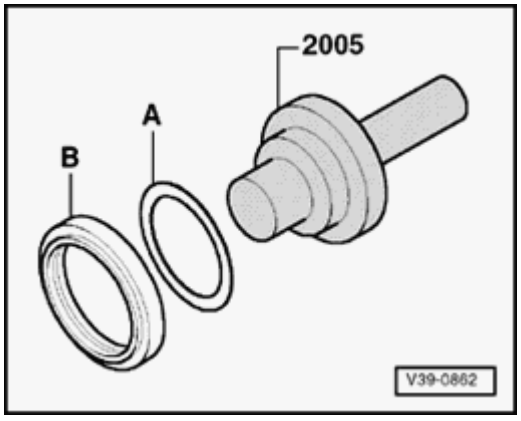

Fig. 336: Preparing Seal For Installation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - **Shim 016311391A** (1.4 mm thick)

B - Oil seal

- Pack space between sealing lip and dust lip half full with **sealing grease G052128A1** .
- Place shim and oil seal on tool, as shown in illustration.

- Installation position: open side of oil seal points toward Torsen housing

Drive in seal onto stop.

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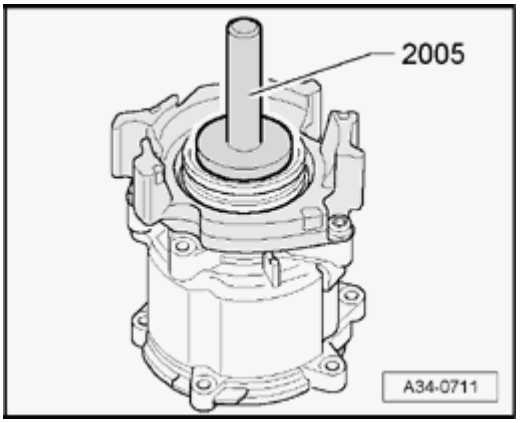

Fig. 337: Driving In Seal Onto Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove shim.

Pressing out ball bearing for flange shaft

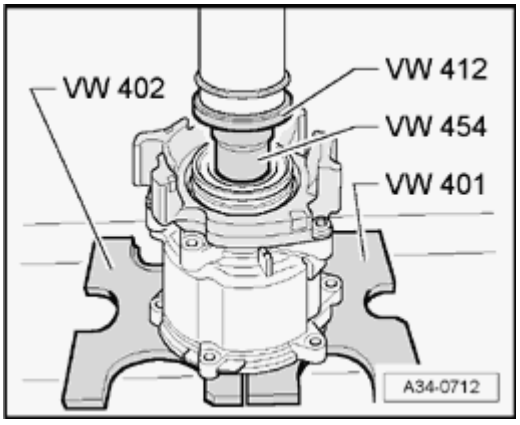

Fig. 338: Pressing Out Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before pressing out ball bearing, remove circlip **Installation position of circlips - A - and - B -** and sleeve.

Pressing in ball bearing for flange shaft

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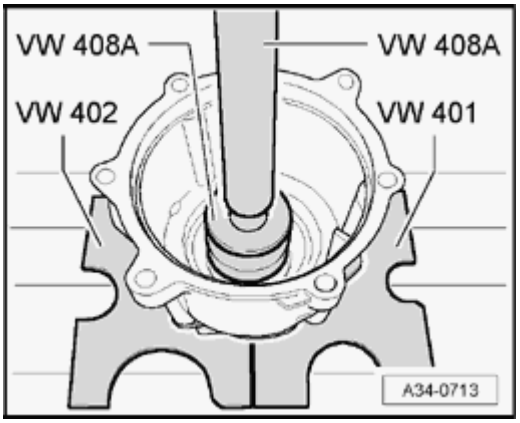

Fig. 339: Pressing In Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert sleeve.
- Install circlip for ball bearing and sleeve **Installation position of circlips - A - and - B -**

Installation position of circlips - A - and - B -

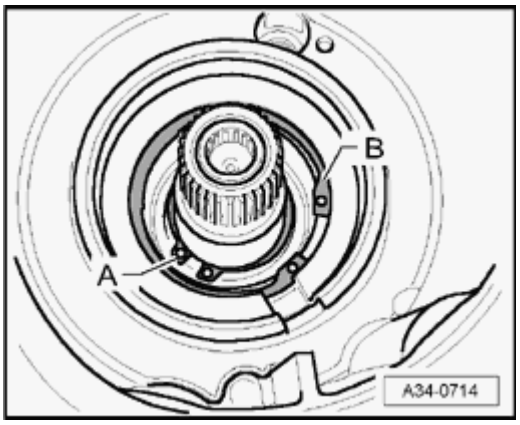

Fig. 340: Installation Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Circlip for flange shaft

B - Circlip for ball bearing and sleeve

Torsen housing, removing and installing (with transmission installed)

Special tools, testers and auxiliary items required

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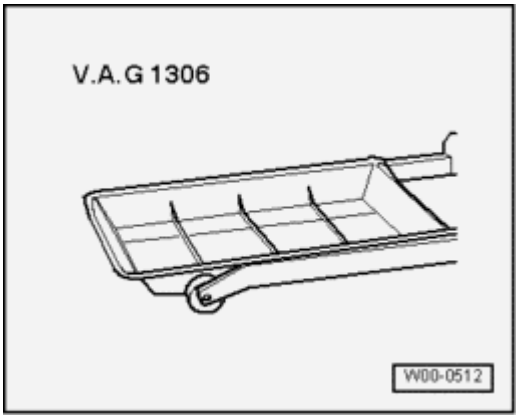

Fig. 341: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray V.A.G1306

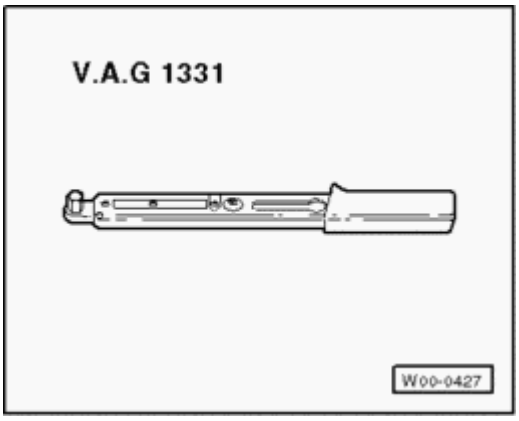

Fig. 342: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

Removing

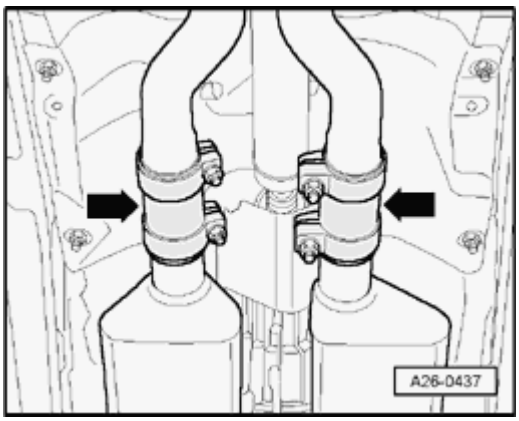

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Fig. 343: Exhaust System Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamps - **arrows** -.

NOTE:

- **The flexible pipe connection (de-coupling element) in the front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.**
- **The illustration shows the exhaust system in conjunction with the 3.0 liter. V6 engine.**

- Disengage rear section of exhaust system at rubber mountings and remove.

NOTE:

- **A second technician is required for removing the rear section of the exhaust system.**

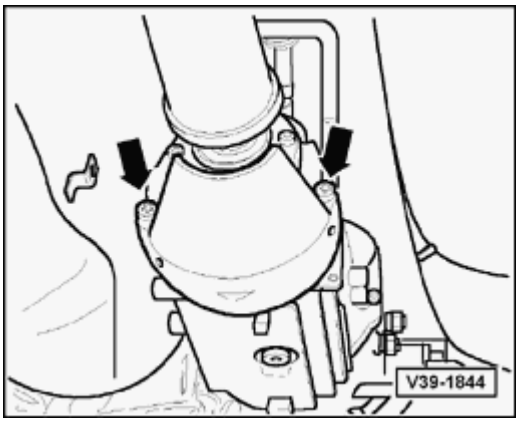

Fig. 344: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove heat shield for drive shaft - **arrows** -.

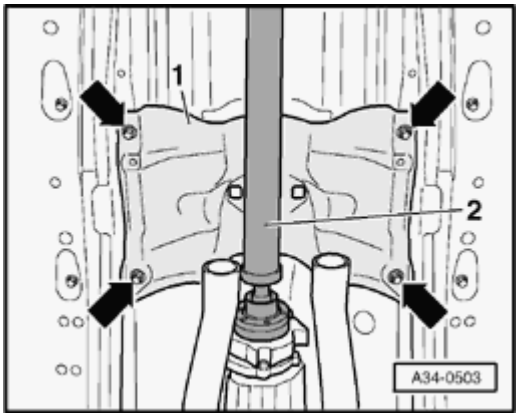

Fig. 345: Heatshield Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove heat shield - **1** - for exhaust system below selector mechanism - **arrows** -.

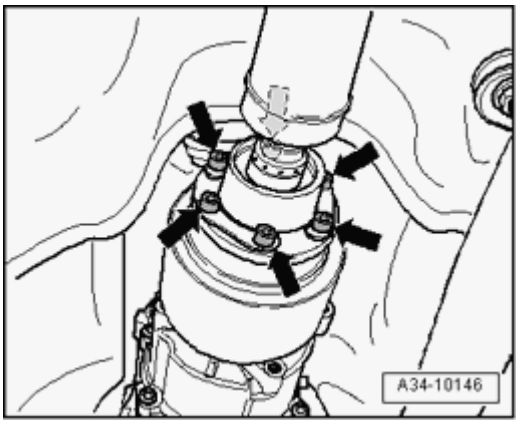

Fig. 346: Locating Bolts At Transmission/Drive Shaft Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - at transmission/drive shaft flange.
- Slide drive shaft together toward rear final drive. The constant velocity joints can be moved axially.

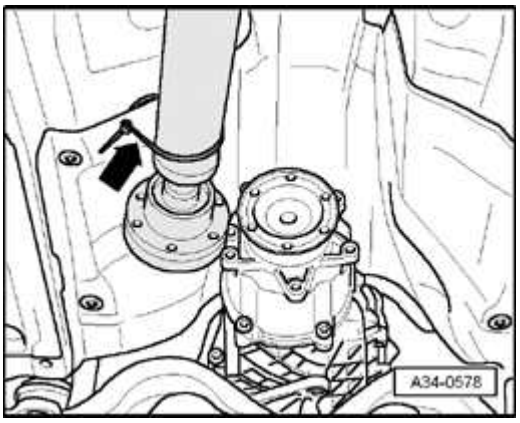

Fig. 347: Drive Shaft Tied To Side, Onto Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tie drive shaft to side, onto heat shield - **arrow** -.
- Place drip tray V.A.G1306 under transmission.
- Drain off gear oil.

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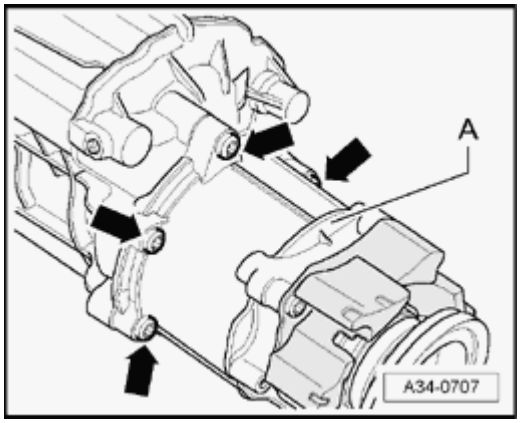

Fig. 348: Locating Torsen Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and carefully detach Torsen housing - **A** -.

NOTE:

- **The illustration shows only 4 of the 6 securing bolts.**

Installing Torsen housing

Installation is in reverse order of removal. Note the following:

- Replace O-ring on Torsen housing.
- It is important to clean threaded holes for drive shaft bolts to remove any remaining locking fluid. The threads can be cleaned with a thread tap.

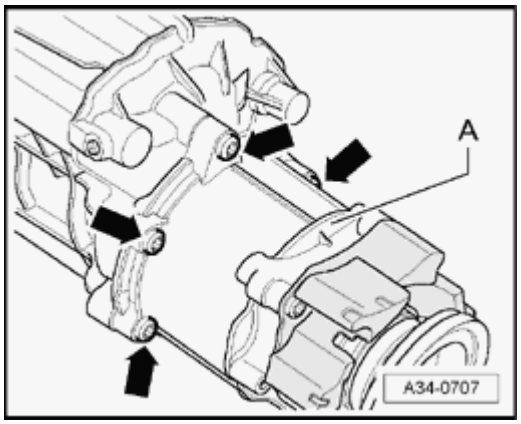

Fig. 349: Locating Torsen Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install Torsen housing - **A** - onto transmission and tighten bolts - **arrows** - to 10Nmplus an additional 45° (18 turn).

NOTE:

- **The illustration shows only 4 of the 6 securing bolts.**

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- Fill up with gear oil and check gear oil level --> **Transmission oil level, checking** .
- Bolt drive shaft onto transmission --> **39 FINAL DRIVE, DIFFERENTIAL** .
- Install exhaust system so it is free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for relevant engine code.

Tightening torques

Component	Nm
Torsen housing to transmission housing	10 Nm plus an additional 45° $^{1}/_{8}$ turn
Heat shield for drive shaft to Torsen housing	25

TRANSMISSION COVER, SERVICING

Transmission cover, servicing

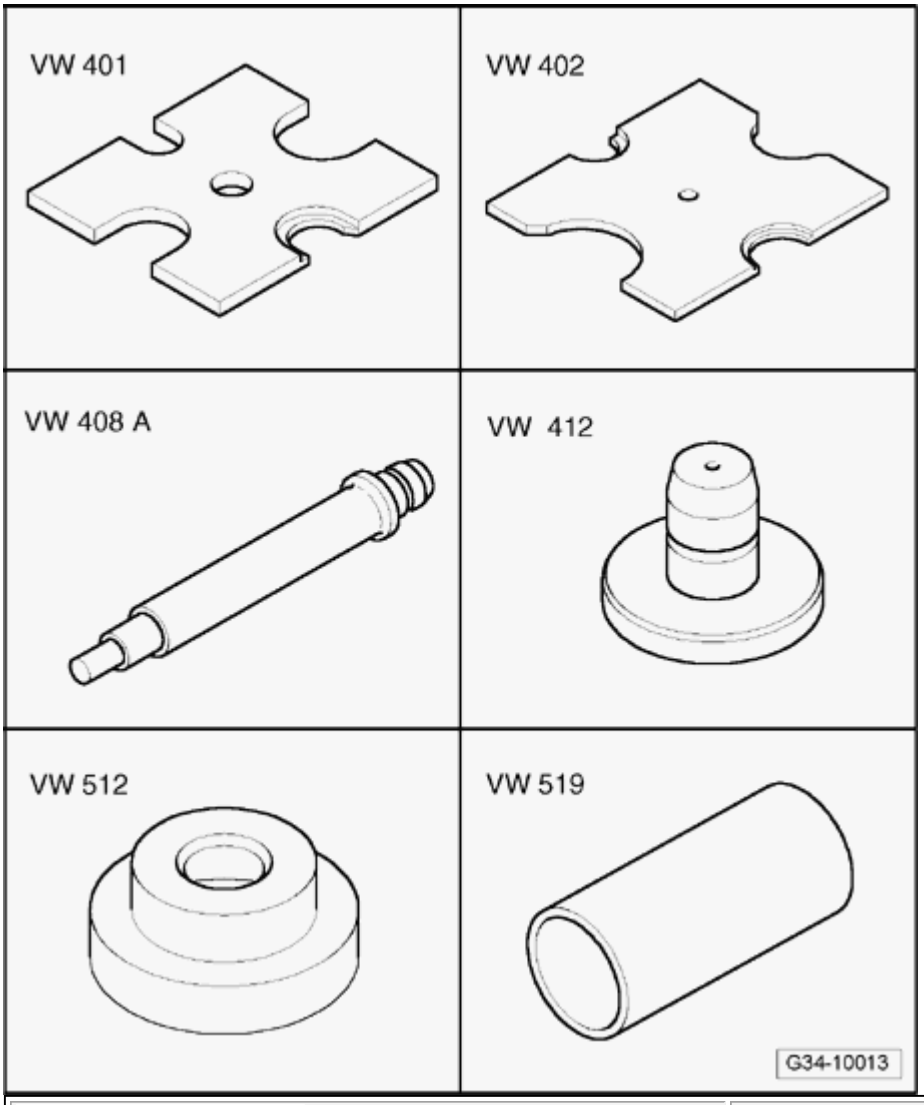

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Fig. 350: Identifying Special Tools -- Transmission Cover, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust plate VW 402
- Punch VW 408 A
- Thrust disc VW 412
- Thrust pad VW 512
- Sleeve VW 519

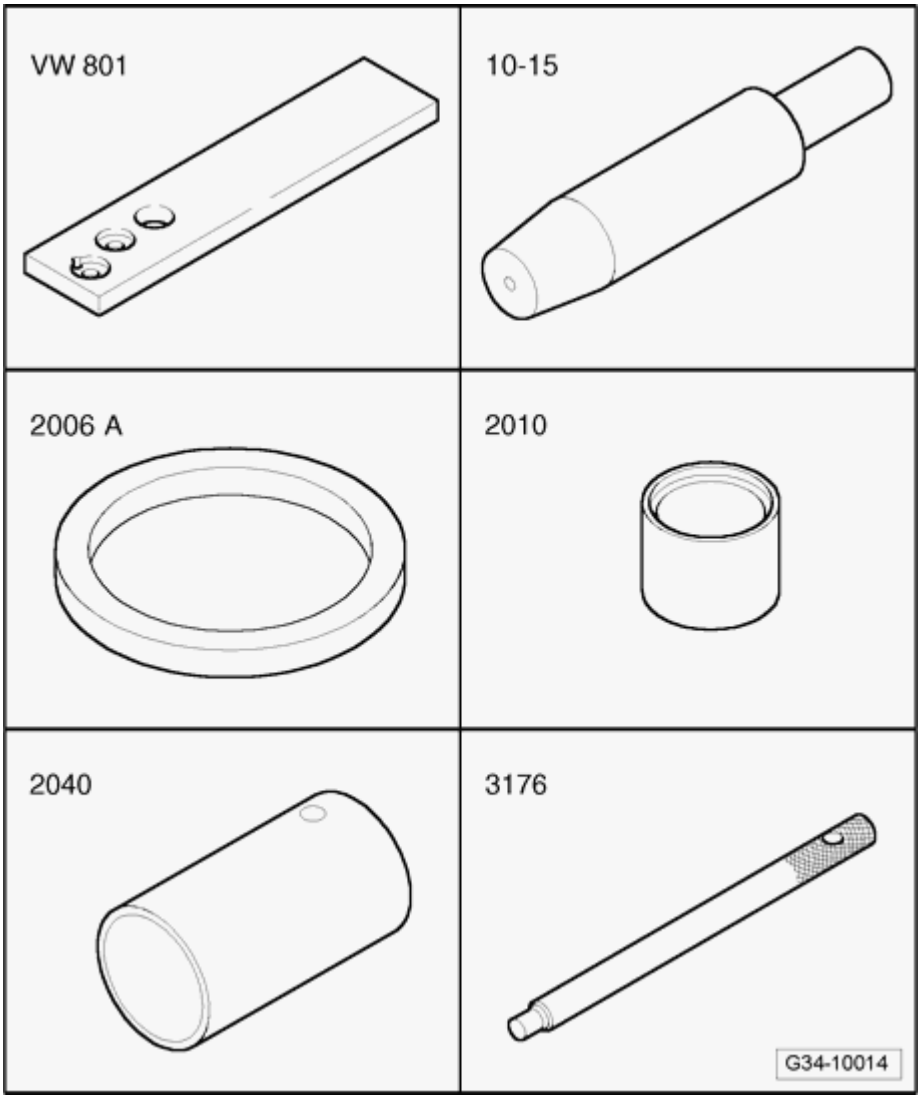

Fig. 351: Identifying Special Tools -- Transmission Cover, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Special tools, testers and auxiliary items required

- Holding fixture VW 801
- Guide pin 10 - 15
- Thrust ring 2006 A
- Tube 2010
- Tube 2040
- Centering mandrel 3176

Special tools, testers and auxiliary items required

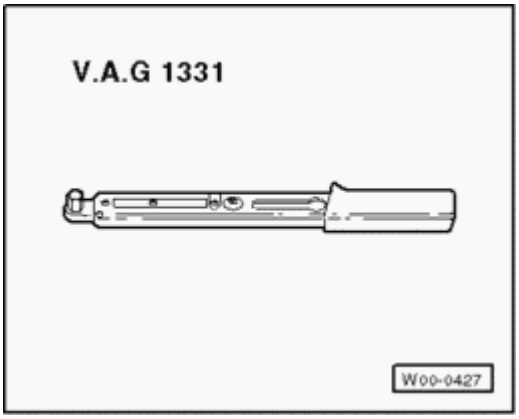

Fig. 352: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

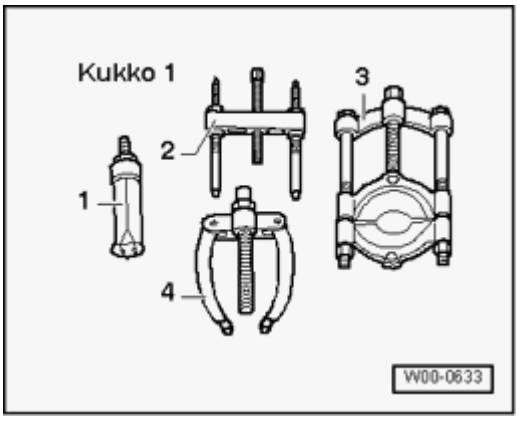

Fig. 353: Kukko 21/2 Internal puller, Kukko 21/4 Internal puller, Kukko 22/2 Counter support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **- 1 -** Internal puller Kukko 21/2
- **- 1 -** Internal puller Kukko 21/5

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- **- 4 -** Counter-support Kukko 22/2

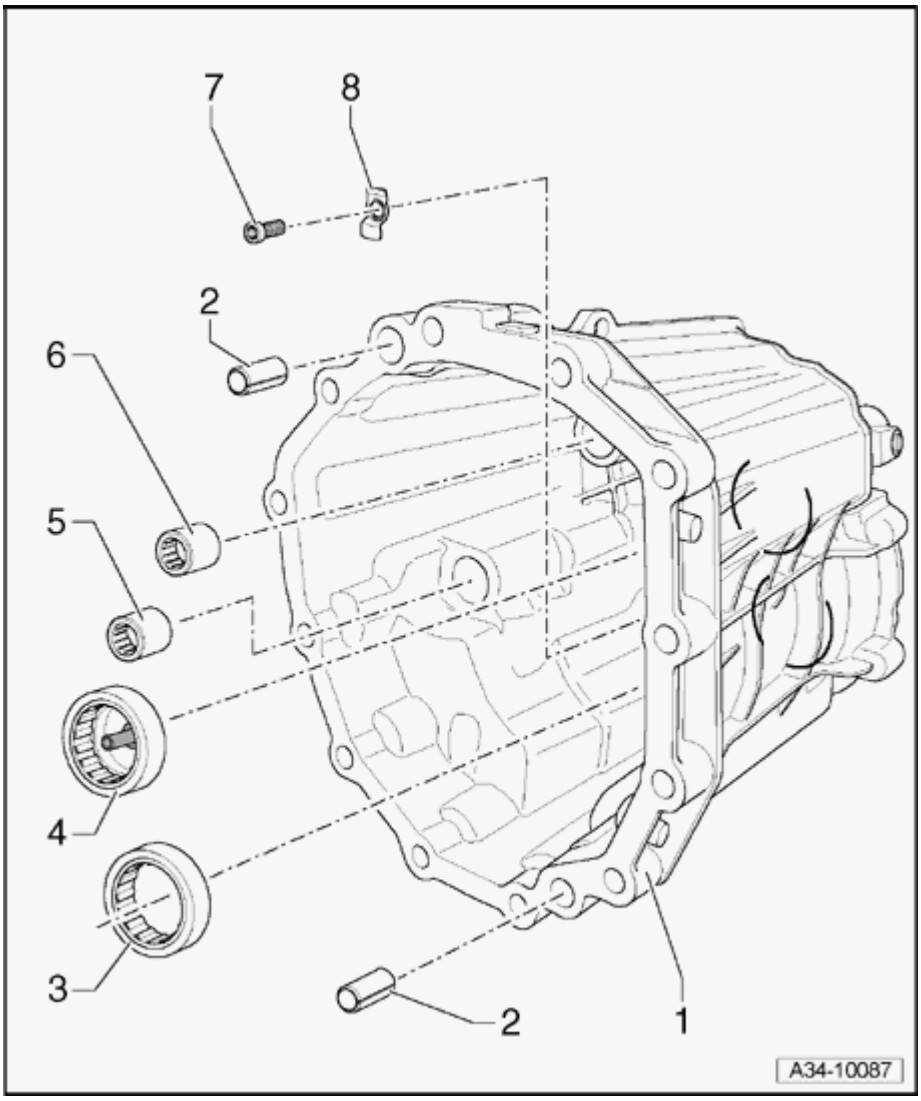

Fig. 354: Transmission Cover Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission cover

2 - Dowel sleeve

- 2 x
- For centralizing transmission cover on bearing housing
- Drive out and in with drift 3121

3 - Needle bearing

- Bearing for hollow shaft in transmission cover

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- Pressing out **Pressing needle bearing out of transmission cover**
- Pressing in **Pressing needle bearing into transmission cover**

4 - Roller bearing

- Bearing for input shaft in transmission cover
- With lubricating unit
- Always replace
- Pulling out **Pulling out needle roller bearing from transmission cover**
- Pressing in **Carefully press in new needle roller bearing into transmission cover until limit stop.**

5 - Ball sleeve

- For selector rod for 1st and 2nd gear
- Pulling out **Pulling out ball sleeve - C - from transmission cover**
- Driving in **Driving ball sleeve into transmission cover until flush**

6 - Ball sleeve

- For selector rod for 5th and 6th gear
- Pulling out **Pulling out ball sleeve - C - from transmission cover**
- Driving in **Driving ball sleeve into transmission cover until flush**

7 - Multi-point socket head bolt, 24Nm

8 - Retaining plate

- Installation position **Securing needle roller bearing and needle bearing in transmission cover.**

Pressing needle bearing out of transmission cover

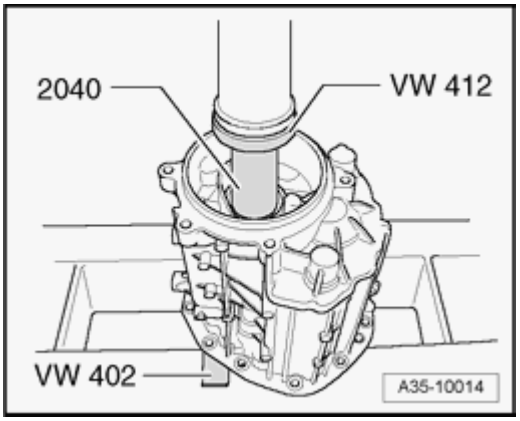

Fig. 355: Pressing Needle Bearing Out Of Transmission Cover

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing needle bearing into transmission cover

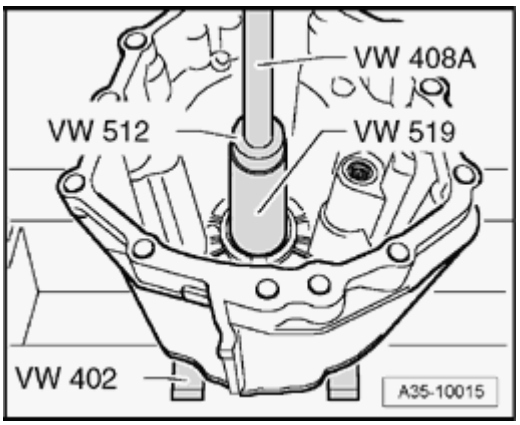

Fig. 356: Pressing Needle Bearing Into Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Support transmission cover with tube 2010 directly below bearing mounting.

Pulling out ball sleeve - C - from transmission cover

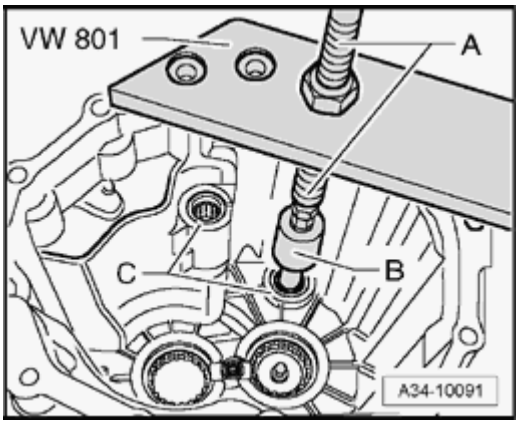

Fig. 357: Pulling Out Ball Sleeve From Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/2

B - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving ball sleeve into transmission cover until flush

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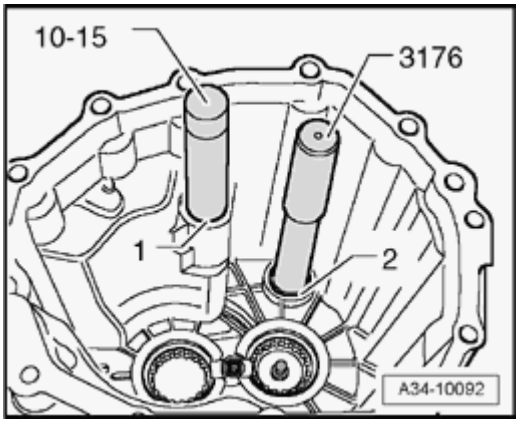

Fig. 358: Driving Ball Sleeve Into Transmission Cover Until Flush
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve - **1** - and - **2** - so that side with lettering (thicker metal) faces guide pin 10 - 15 or centering mandrel 3176.

NOTE:

- **Due to the housing depth use centering mandrel 3176 for driving in ball sleeve - 2 -.**

Pulling out needle roller bearing from transmission cover

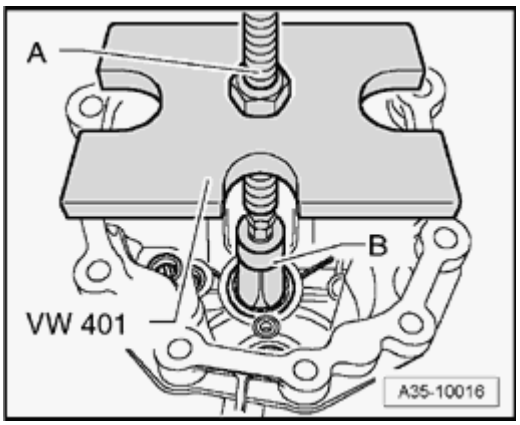

Fig. 359: Pulling Out Needle Roller Bearing From Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Shorten (cut off) lubricating unit in needle roller bearing in order to insert internal puller - **B** -.

A - Counter-support, e.g. Kukko 22/2

B - Internal puller 30 to 37 mm, e.g. Kukko 21/5

NOTE:

- **Always replace needle roller bearing after pulling out.**

Carefully press in new needle roller bearing into transmission cover until limit stop.

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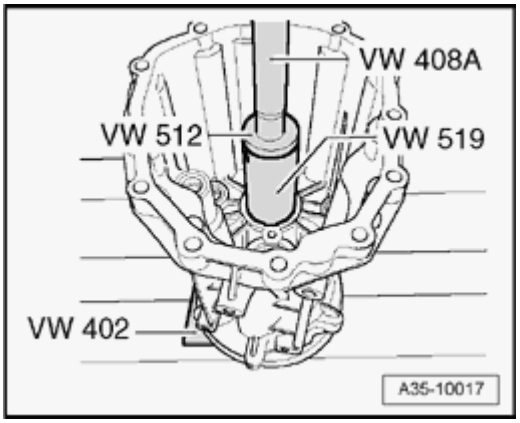

Fig. 360: Pressing New Roller Bearing For Input Shaft Into Transmission Cover As Far As Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Support transmission cover below bearing mounting using thrust ring 2006 A.

Securing needle roller bearing and needle bearing in transmission cover.

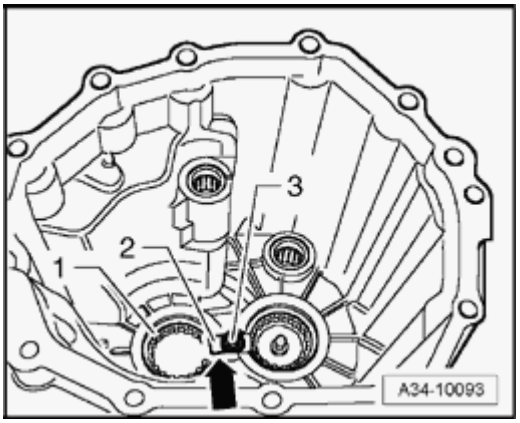

Fig. 361: Securing Needle Roller Bearing And Needle Bearing In Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert retaining plate - **2** - with the high shoulder - **arrow** - facing needle bearing - **1** - into transmission cover.
- Tighten hex socket head bolt - **3** - to 24 Nm.

BEARING HOUSING, SERVICING

Bearing housing, servicing

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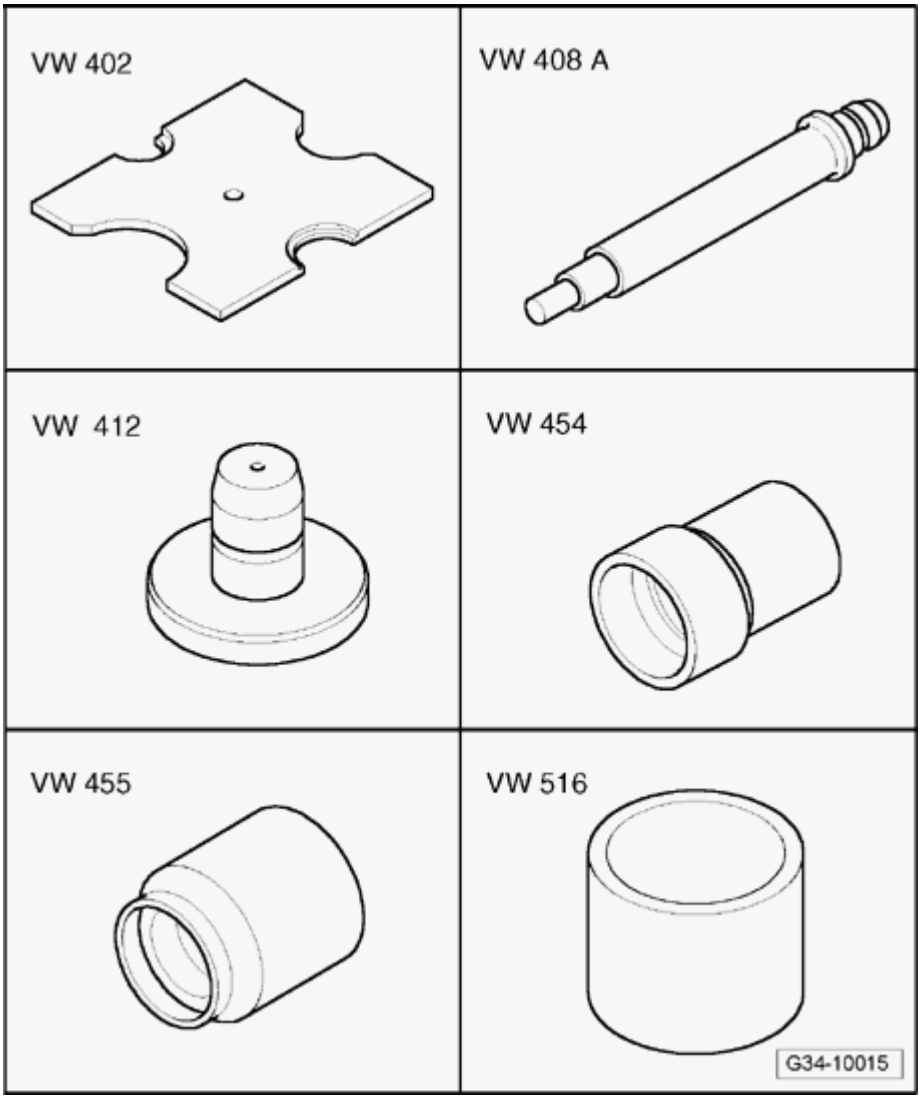

Fig. 362: Identifying Special Tools -- Bearing Housing, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 402
- Punch VW 408 A
- Thrust disc VW 412
- Thrust tube VW 454

- Installing sleeve VW 455
- Tube VW 516

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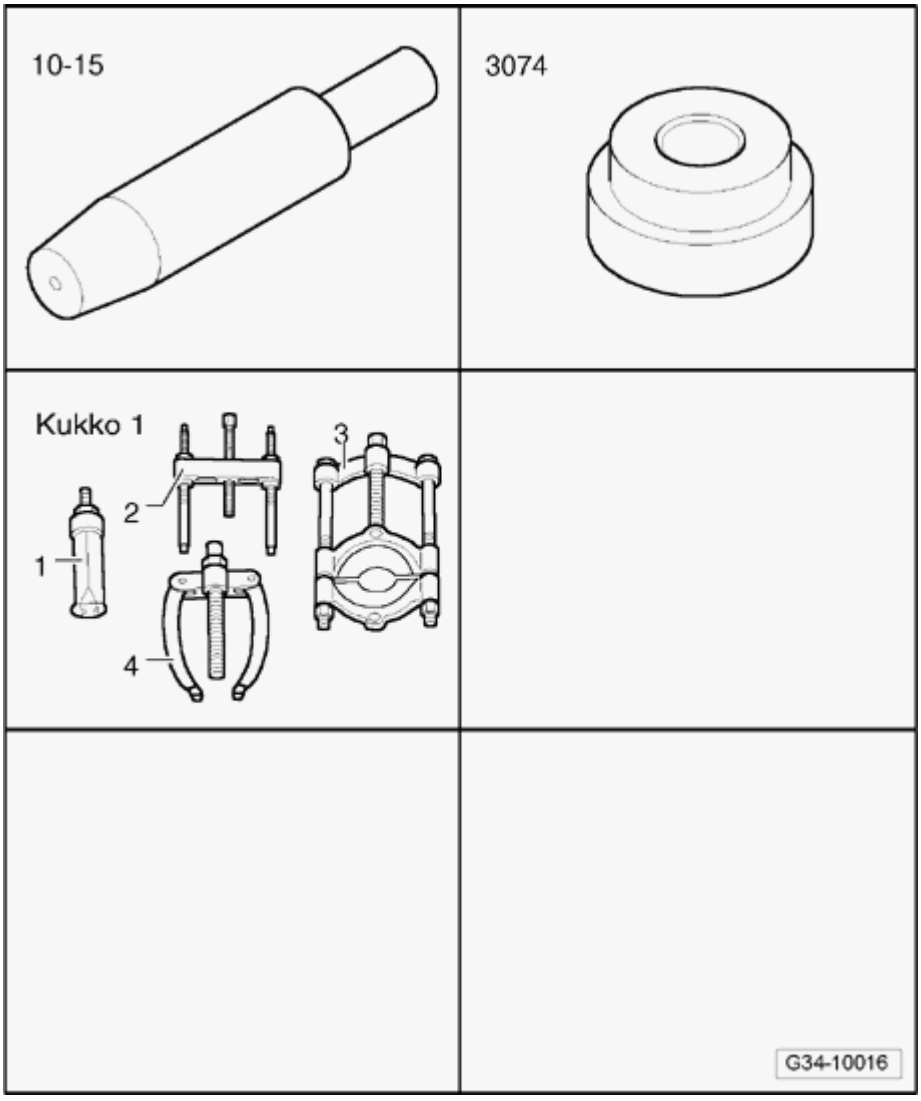

Fig. 363: Identifying Special Tools -- Bearing Housing, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Guide pin 10 - 15
- Thrust pad 3074
- **- 1 -** Internal puller Kukko 21/2
- **- 4 -** Counter-support Kukko 22/1
- Drift T40085

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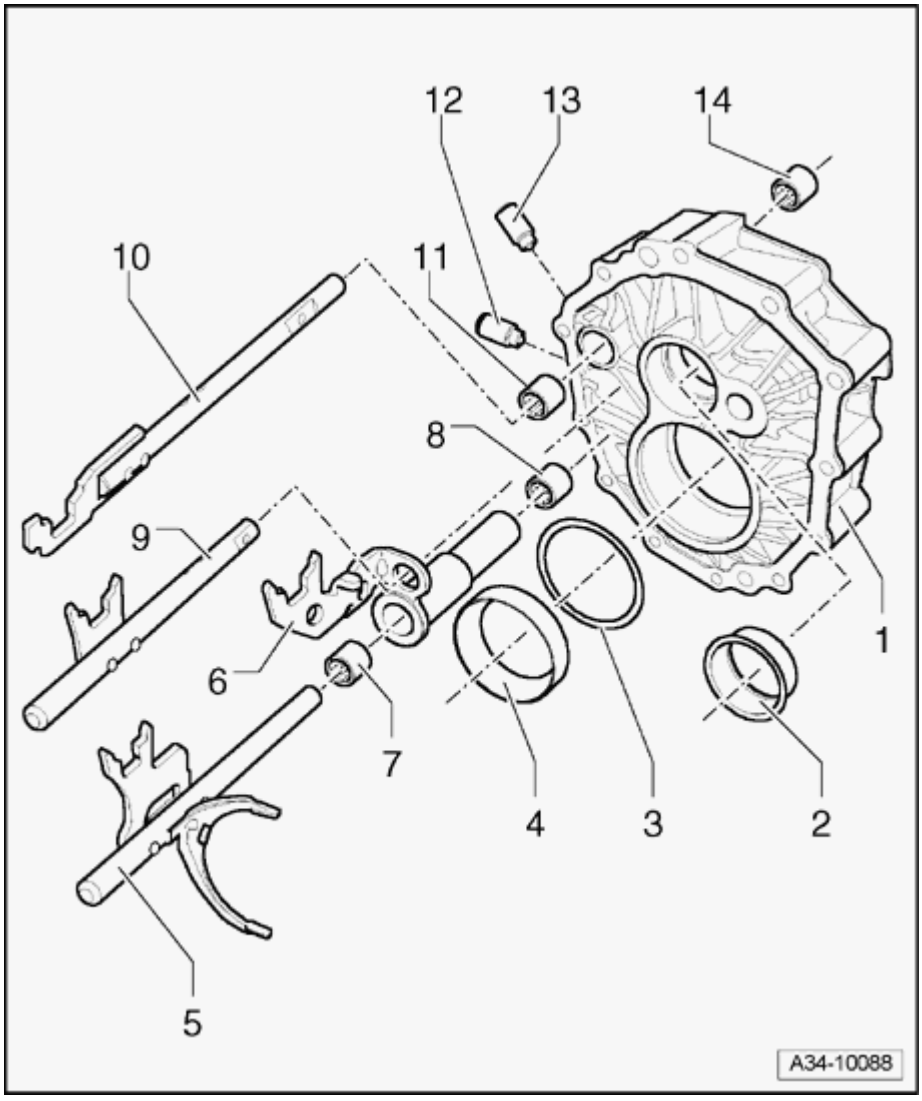

Fig. 364: Bearing Housing Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

- Re-determine shim "S_4 " when replacing --> **Re-determining shim "S4" when replacing bearing housing**

2 - Outer race

- For needle roller bearing on input shaft
- Driving out **Driving outer race for needle roller bearing out of bearing housing**
- Pressing in **Pressing outer race for needle roller bearing into bearing housing until limit stop**

3 - Shim "S_4 "

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- Table of adjustments --> **Table of adjustments**
- Re-determine when replacing bearing housing --> **Re-determining shim "S4" when replacing bearing housing**

4 - Tapered roller bearing outer race

- For pinion shaft/hollow shaft

5 - Selector rod for 1st and 2nd gear

- Only replace together with selector fork for 1st and 2nd gear (secured together by means of a pin)

6 - Reverse gear selector rod

7 - Ball sleeve

- (Front) for reverse gear selector rod
- Pulling out **Pulling front ball sleeve out of reverse gear selector rod**
- Pressing in **Pressing front ball sleeve into reverse gear selector rod until limit stop.**

8 - Ball sleeve

- (Rear) for reverse gear selector rod
- Pulling out **Pulling out rear ball sleeve for reverse gear selector rod**
- Pressing in **Pressing in rear ball sleeve - A - for reverse gear selector rod**

9 - Selector rod for 3rd and 4th gear

10 - Selector rod for 5th and 6th gear

- Remove burrs and scoring after removing from bearing housing

11 - Ball sleeve

- For selector rod for 5th and 6th gear
- Pull out with internal puller Kukko 21/2
- Drive in until flush using guide pin 10 - 15

12 - Locking bushing

- For selector rod for 3rd and 4th gear
- Removing and installing **Removing and installing locking bushing for selector rod**

13 - Locking bushing

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- For selector rod for 5th and 6th gear
- Removing and installing **Removing and installing locking bushing for selector rod**

14 - Ball sleeve

- For selector rod for 3rd and 4th gear
- Pull out with internal puller Kukko 21/2
- Driving in **Driving in ball sleeve for selector rod for 3rd and 4th gear**

Driving outer race for needle roller bearing out of bearing housing

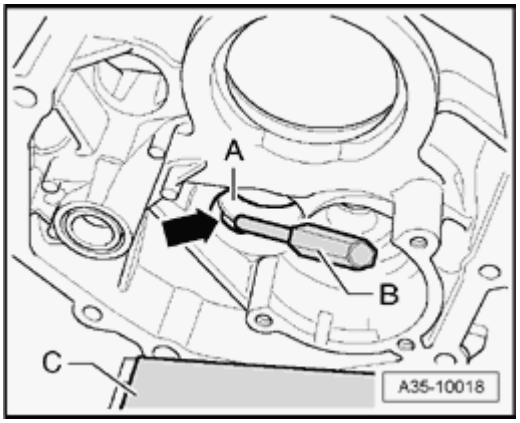

Fig. 365: Driving Outer Race For Needle Roller Bearing Out Of Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp bearing housing in vise, using jaw protectors - **C** -.
- Drive out outer race - **A** - using drift - **B** - by alternately applying drift to the bearing housing recesses located opposite each other - **arrow** -.

Pressing outer race for needle roller bearing into bearing housing until limit stop

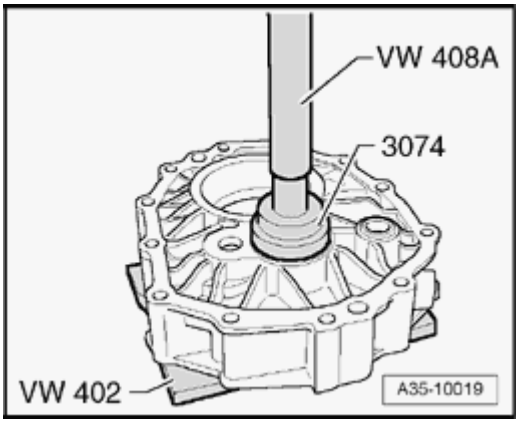

Fig. 366: Pressing Outer Race For Needle Roller Bearing Into Bearing Housing Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Pulling front ball sleeve out of reverse gear selector rod

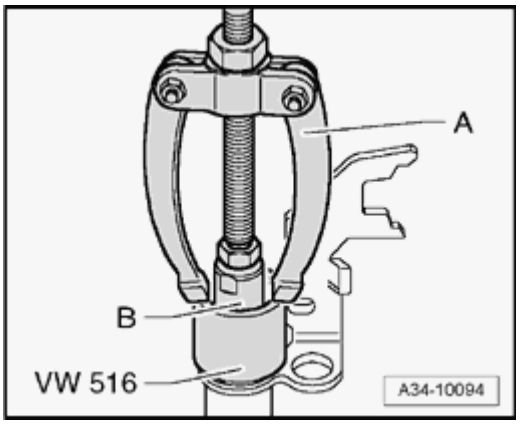

Fig. 367: Pulling Front Ball Sleeve Out Of Reverse Gear Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/1

B - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Pressing front ball sleeve into reverse gear selector rod until limit stop.

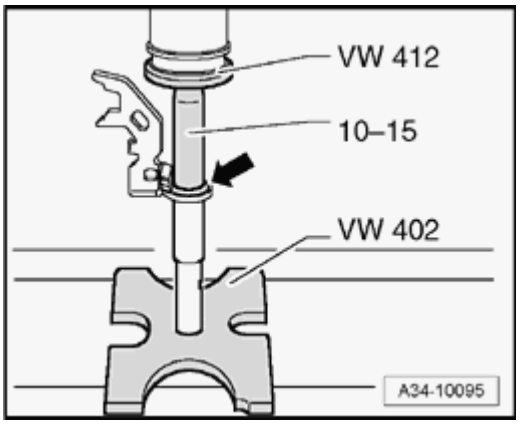

Fig. 368: Pressing Front Ball Sleeve Into Reverse Gear Selector Rod Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve - **arrow** - so that side with lettering (thicker metal) faces guide pin 10 - 15.

Pulling out rear ball sleeve for reverse gear selector rod

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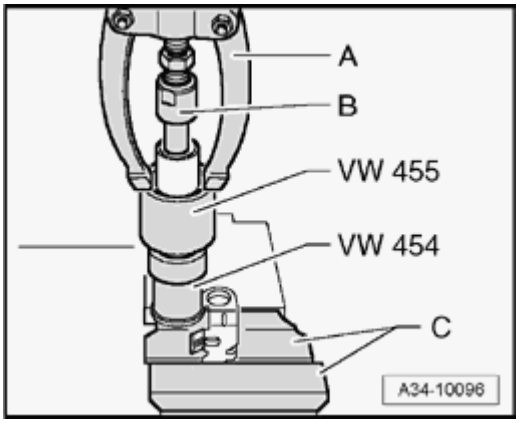

Fig. 369: Pulling Out Rear Ball Sleeve For Reverse Gear Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp actuating arm of selector rod in vise, using jaw protectors - **C** -.
- Install thrust tube VW 454 and installing sleeve VW 455 onto selector rod.

A - Counter-support, e.g. Kukko 22/1

B - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Pressing in rear ball sleeve - A - for reverse gear selector rod

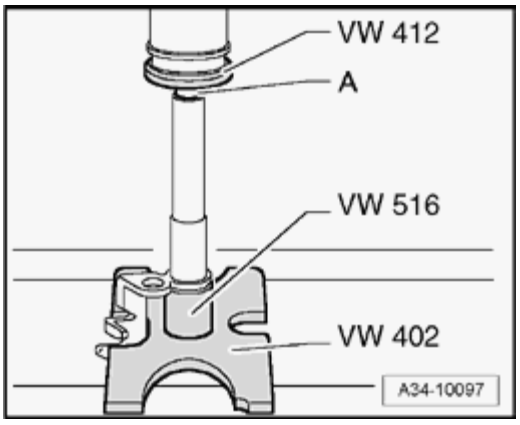

Fig. 370: Pressing In Rear Ball Sleeve For Reverse Gear Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving in ball sleeve for selector rod for 3rd and 4th gear

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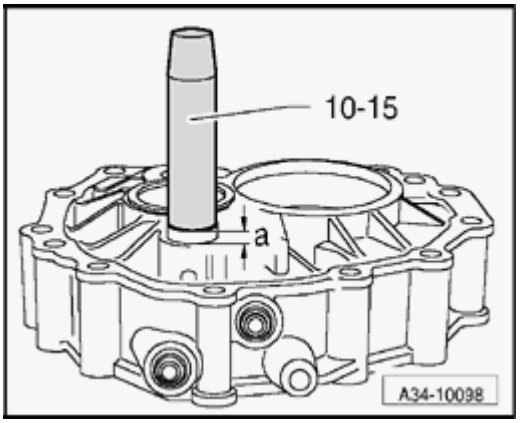

Fig. 371: Driving In Ball Sleeve For Selector Rod For 3Rd And 4Th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve so that side with lettering (thicker metal) faces guide pin 10 - 15.

- Dimension for pressing in - **a** - = 2.5 mm

Removing and installing locking bushing for selector rod

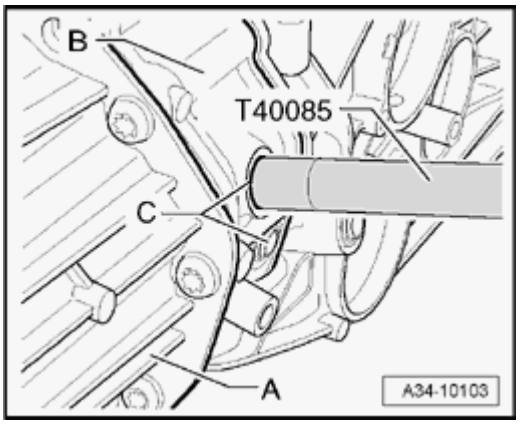

Fig. 372: Removing And Installing Locking Bushing For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove relevant selector rod (for 3rd and 4th gear or for 5th and 6th gear).
- Bolt bearing housing - **B** - with transmission cover - **A** - onto transmission housing prior to driving out and driving in locking bushings - **C** -.

- Drive out old locking bushing inward into bearing housing.
- Drive in new locking bushing until flush.

TRANSMISSION HOUSING, SERVICING

Transmission housing, servicing

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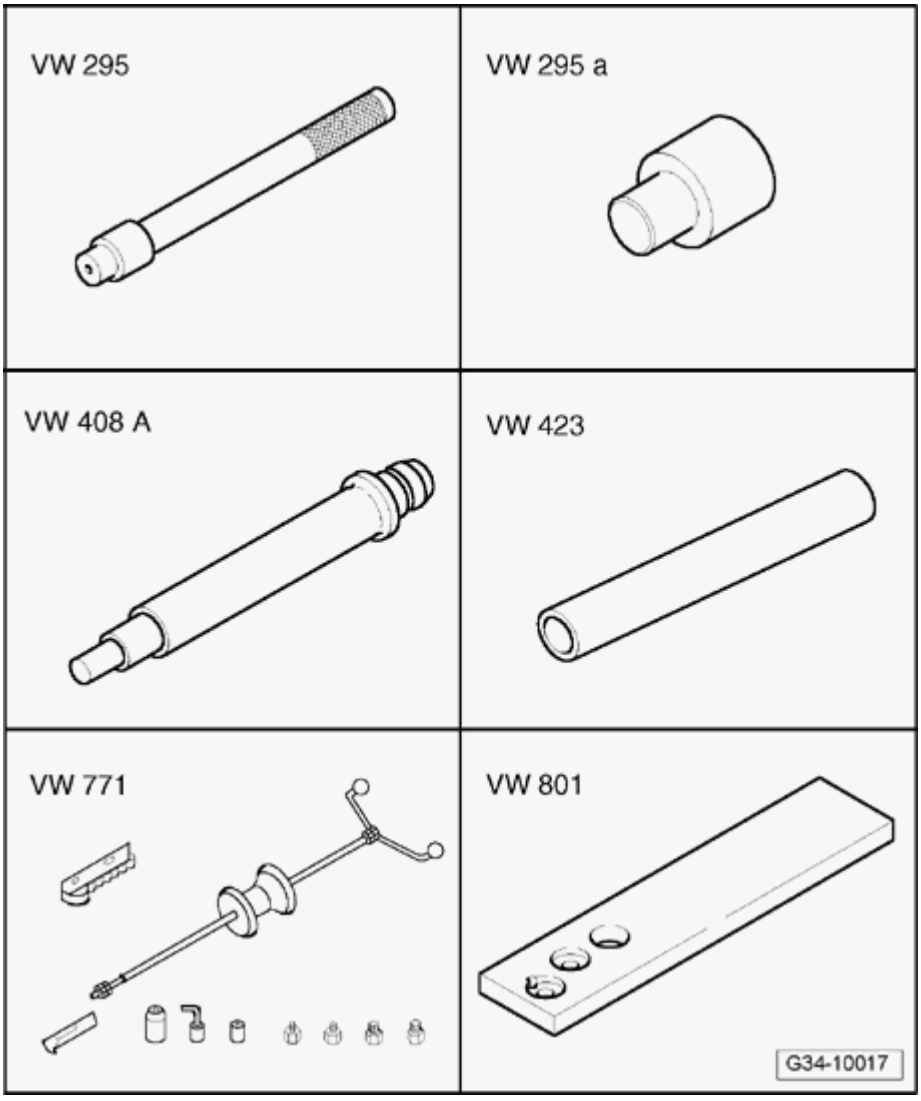

Fig. 373: Identifying Special Tools -- Transmission Housing, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW 295
- Adapter VW 295 A
- Punch VW 408 A
- Tube VW 423

- Slide hammer-complete set VW 771
- Holding fixture VW 801

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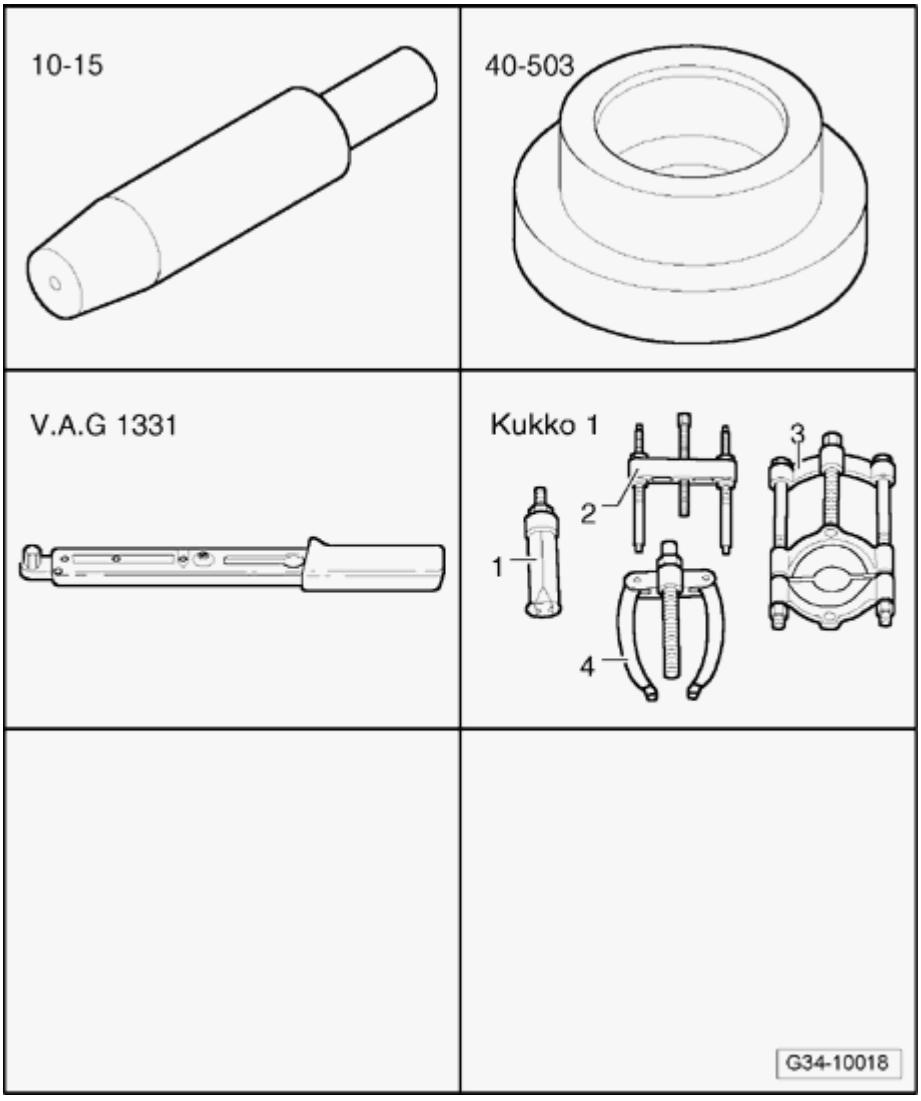

Fig. 374: Identifying Special Tools -- Transmission Housing, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Guide pin 10 - 15
- Installing tool 40 - 503
- Torque wrench V.A.G 1331
- - **1** - Internal puller Kukko 21/2
- - **4** - Counter-support Kukko 22/2
- Drift T40085

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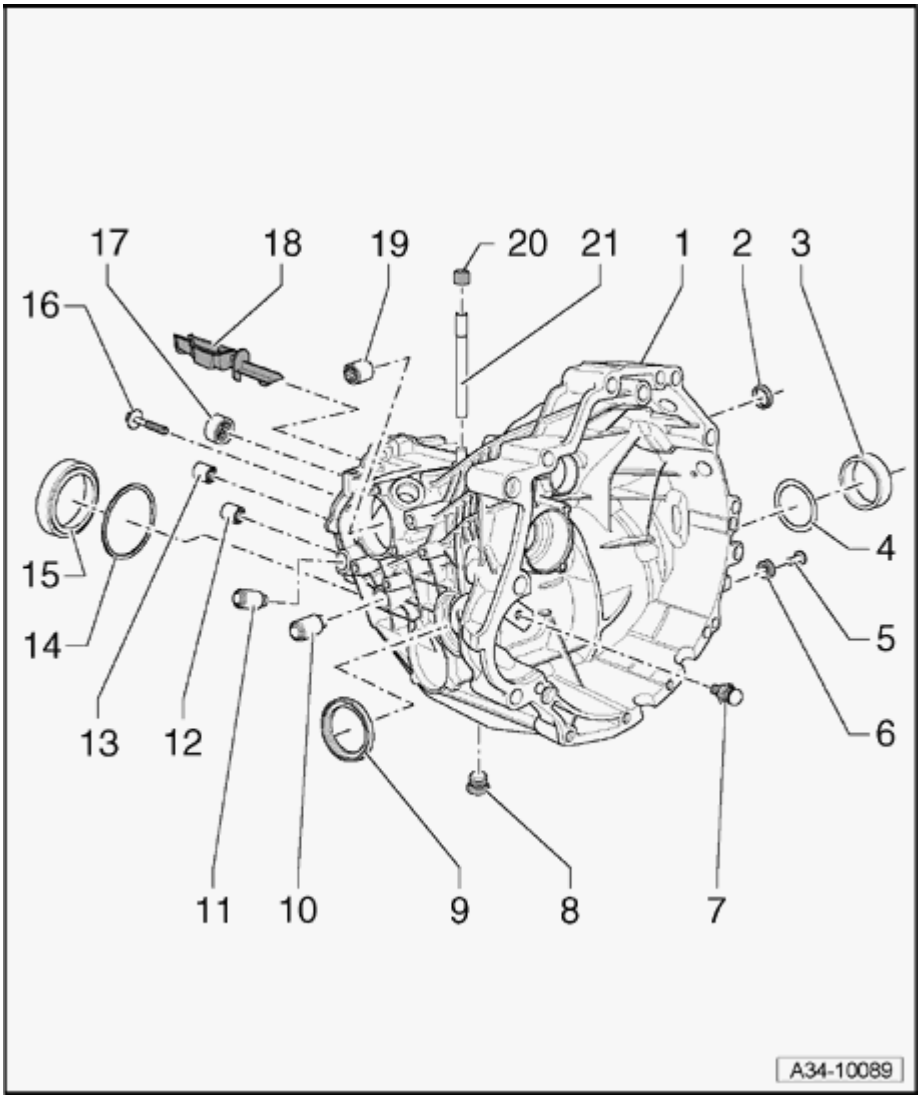

Fig. 375: Transmission Housing Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing

- When replacing: adjust input shaft --> **Input shaft, adjusting**, adjust pinion shaft/hollow shaft and differential (final drive gear set) --> **Table of adjustments**

2 - Oil seal for selector shaft

- Replacing with transmission installed --> **Selector shaft oil seal, replacing (with transmission installed)**
- Can be replaced with transmission removed (transmission remains assembled) --> **Selector shaft oil seal, replacing (with transmission removed) (transmission remains assembled)**
- Always replace
- Pulling out **Pulling out oil seal for selector shaft with transmission disassembled**

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- Driving in **Driving in seal for selector shaft**
- Use assembly sleeve to install (selector shaft remains installed) **Installing oil seal - C - with selector shaft installed**

3 - Tapered roller bearing outer race (right-side)

- For differential
- If replaced: adjust differential (ring gear) --> **Ring gear, adjusting**

4 - Shim "S_2 "

- Note thickness
- Table of adjustments --> **Table of adjustments**

5 - Bush

- Drive in (for example, with punch VW 408 A when replacing transmission

6 - Magnet

- Clean

7 - Ball head stud, 25 Nm

- Grease with **MoS2** grease

8 - Oil drain plug, 45 Nm

9 - Oil seal

- For flange shaft (right-side)
- Removing and installing --> **Flange shaft oil seal (right-side), replacing**

10 - Locking bushing

- For selector rod for 1st and 2nd gear
- Removing and installing **Removing and installing locking bushing for selector rod**

11 - Locking bushing

- For reverse gear selector rod
- Removing and installing **Removing and installing locking bushing for selector rod**

12 - Ball sleeve

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- For selector rod for 1st and 2nd gear
- Pulling out **Pulling front ball sleeve out of reverse gear selector rod**
- Drive in until flush using guide pin 10 - 15

13 - Ball sleeve

- For selector rod for 3rd and 4th gear
- Pulling out **Pulling front ball sleeve out of reverse gear selector rod**
- Drive in until flush using guide pin 10 - 15

14 - Shim "S_3 "

- Note thickness
- Table of adjustments --> **Table of adjustments**

15 - Outer race of double tapered roller bearing

- For pinion shaft

16 - Bolt, 24 Nm

17 - Needle bearing

- For input shaft
- Driving out **Driving out input shaft needle bearing from transmission housing**
- Driving in **Pressing in input shaft needle bearing until limit stop**

18 - Oil collector

- With magnet
- Installation position in transmission housing **Securing input shaft needle bearing**

19 - Ball sleeve

- For selector shaft
- Pulling out **Removing selector shaft ball sleeve**
- Driving in **Driving in ball sleeve for selector shaft**

20 - Cap

- For transmission breather

21 - Breather tube

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- Drive in onto stop
- Clip in cap for transmission breather

Pulling out oil seal for selector shaft with transmission disassembled

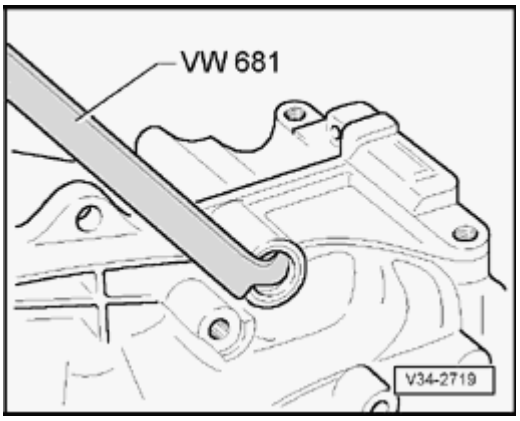

Fig. 376: Removing Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing oil seal - C - with selector shaft installed

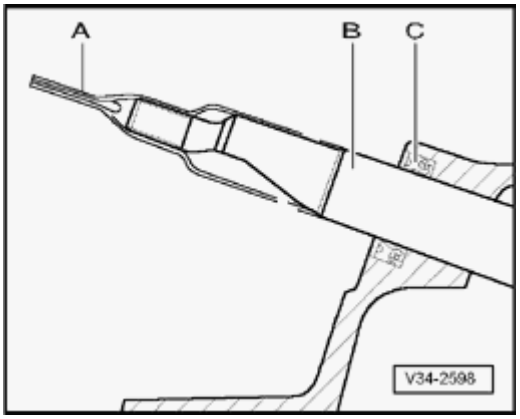

Fig. 377: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push **assembly sleeve 01E311120** - **A** - onto selector shaft - **B** -.

Driving in seal for selector shaft

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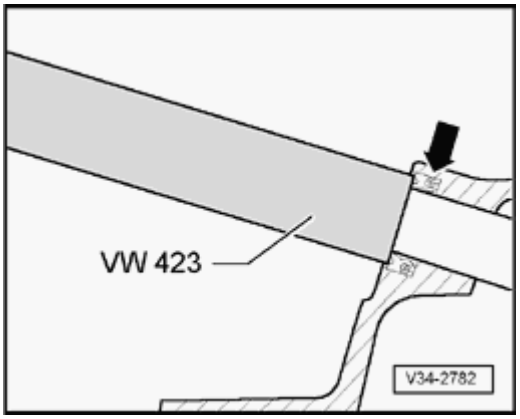

Fig. 378: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .
- Lightly oil outer circumference of seal.
- Drive oil seal - **arrow** - into housing as far as it will go.

Removing and installing locking bushing for selector rod

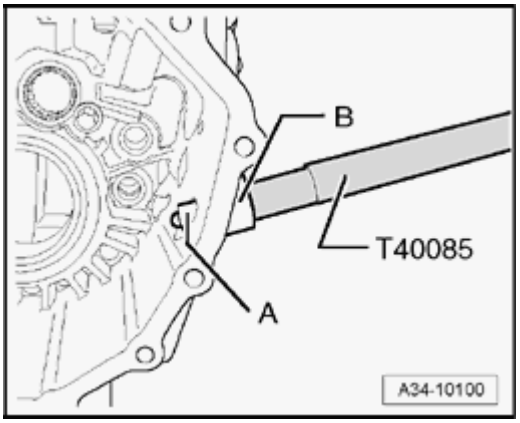

Fig. 379: Removing And Installing Locking Bushing For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive out used locking bushing - **A** - inward into transmission housing.
- Drive in new locking bushing into transmission housing - **B** - until flush.

Pulling out ball sleeve - C - from transmission housing.

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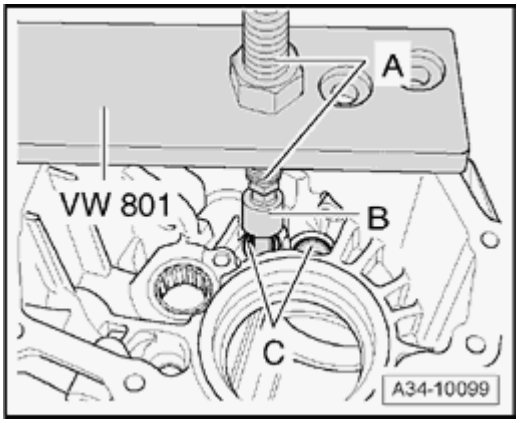

Fig. 380: Pulling Out Ball Sleeve From Transmission Housing.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/2

B - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving out input shaft needle bearing from transmission housing

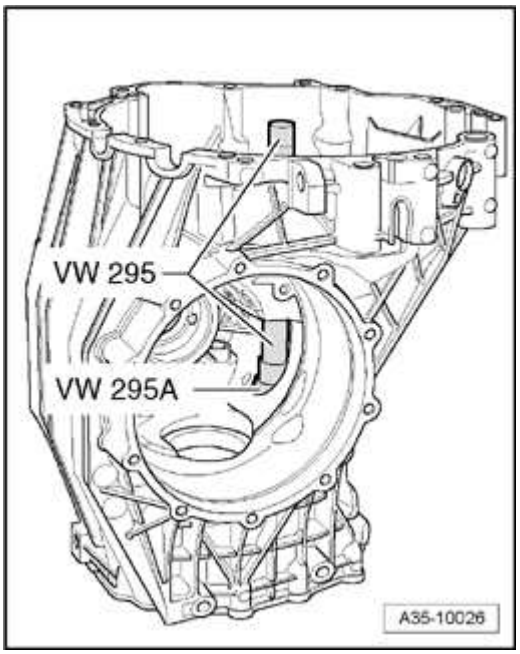

Fig. 381: Driving Out Input Shaft Needle Bearing From Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt for securing needle bearing **Securing input shaft needle bearing**.
- Install adapter VW 295 A with smaller outside diameter into needle bearing.
- Drive out needle bearing with drift VW 295.

Pressing in input shaft needle bearing until limit stop

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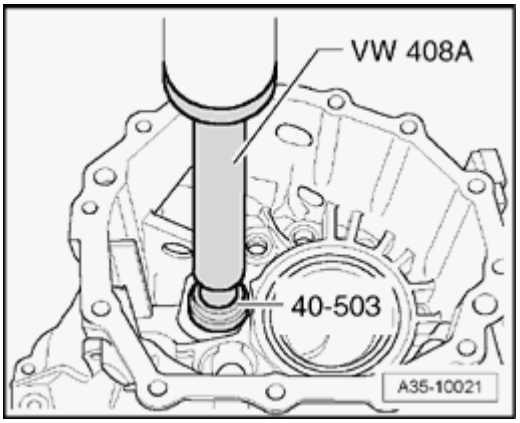

Fig. 382: Pressing In Input Shaft Needle Bearing Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure needle bearing after pressing in **Securing input shaft needle bearing**

Securing input shaft needle bearing

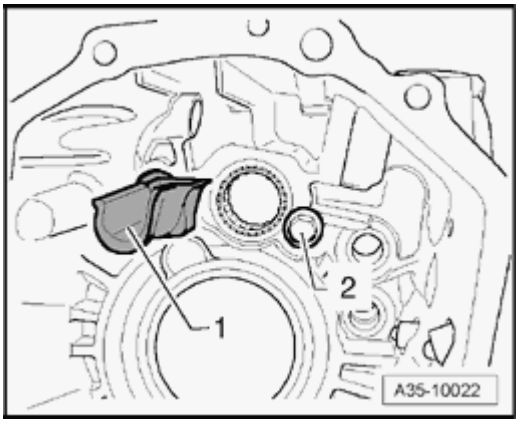

Fig. 383: Securing Input Shaft Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure input shaft needle bearing with bolt - **2** -.
- Insert oil collector - **1** - into transmission housing.

Removing selector shaft ball sleeve

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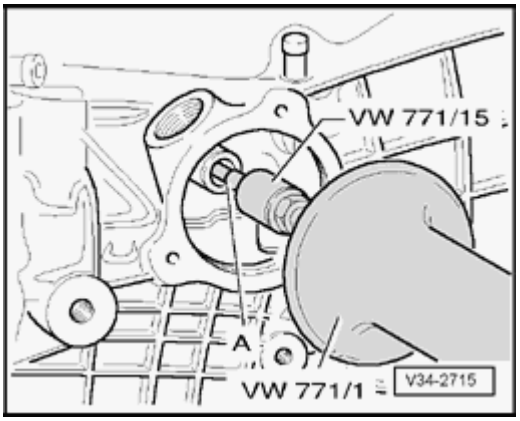

Fig. 384: Pulling Out Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving in ball sleeve for selector shaft

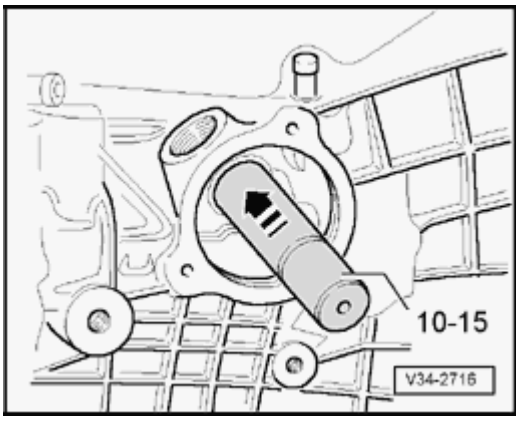

Fig. 385: Driving In Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve so that side with lettering (thicker metal) faces guide pin 10 - 15.

- Drive in ball sleeve until flush.

SELECTOR SHAFT, OIL SEAL AND BACK-UP LIGHT SWITCH F4, SERVICING

Selector shaft, oil seal and back-up light switch F4, servicing

Removing and installing selector shaft with transmission installed --> **Selector shaft, removing and installing (with transmission installed)**

Replacing oil seal for selector shaft with transmission removed (transmission remains assembled) --> **Selector shaft oil seal, replacing (with transmission removed) (transmission remains assembled)**

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Replacing oil seal for selector shaft with transmission installed --> **Selector shaft oil seal, replacing (with transmission installed)**

Removing and installing back-up light switch F4 --> **Back-up light switch F4, removing and installing**

Selector shaft, removing and installing (with transmission installed)

Special tools, testers and auxiliary items required

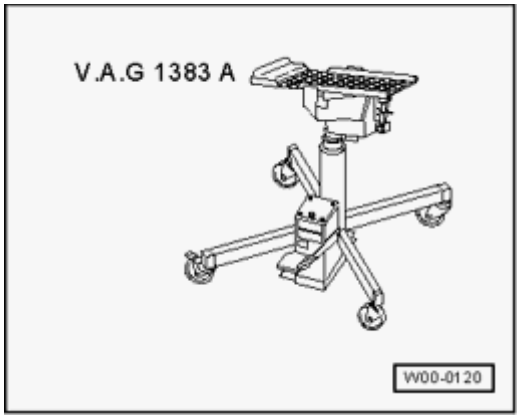

Fig. 386: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine/transmission jack V.A.G 1383 A

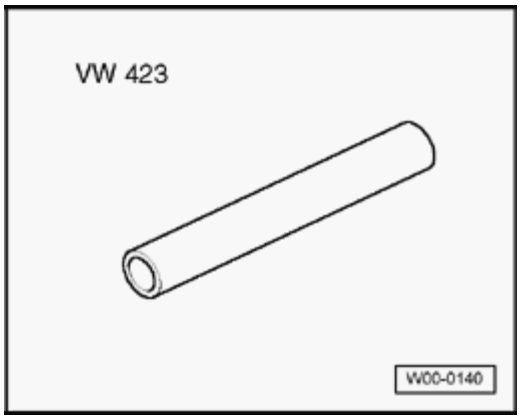

Fig. 387: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW423

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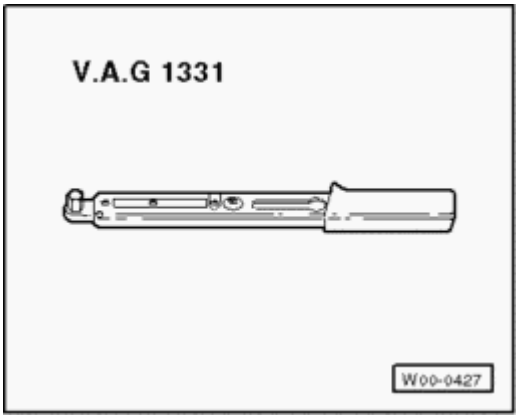

Fig. 388: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331
- **Assembly sleeve 01E 311 120**
- **Locking fluid AMV 185 101 A1**

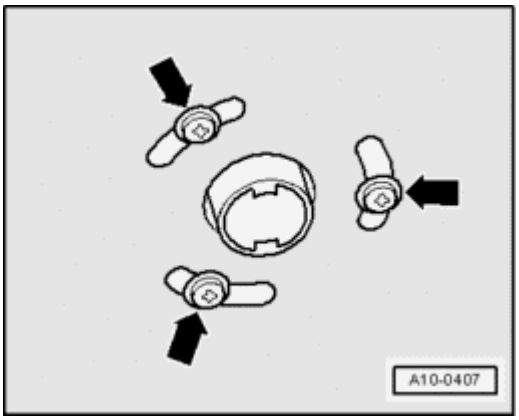

Fig. 389: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- On vehicles installed with auxiliary heater, remove bolts - **arrows** - securing exhaust pipe of auxiliary heater to sound insulation.

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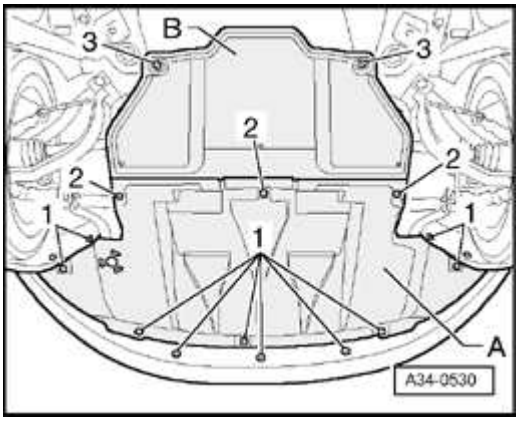

Fig. 390: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.
- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

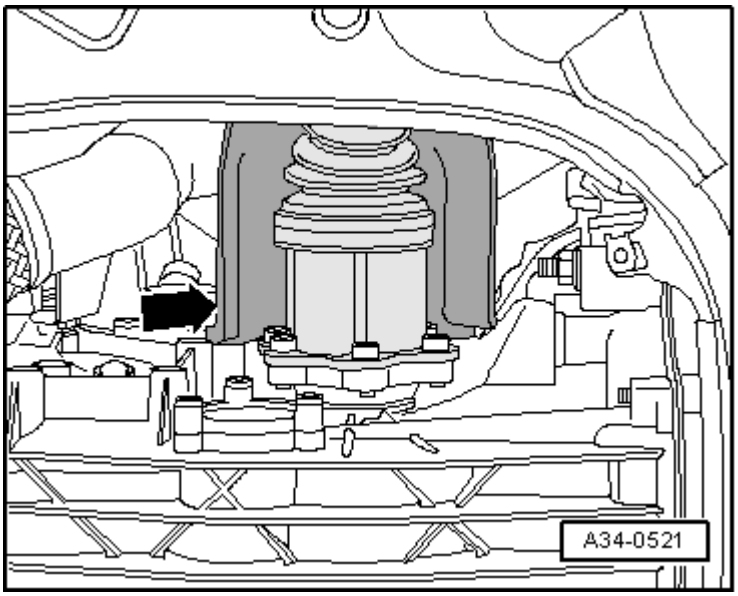

Fig. 391: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrow** - for drive axle (right side) and, if installed, also for drive axle (left-side).
- Remove front exhaust pipe (right side) --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

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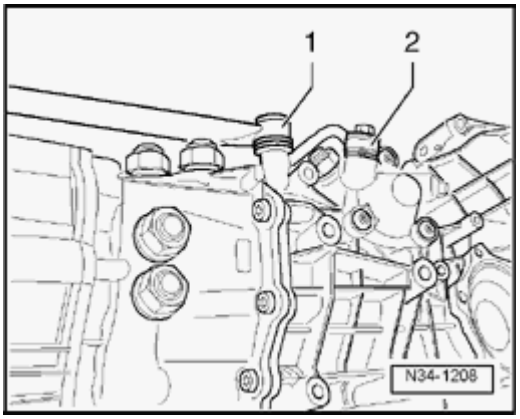

Fig. 392: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove connecting rod - **2** - for selector rod.

NOTE:

- **- Item 1 - can be disregarded.**

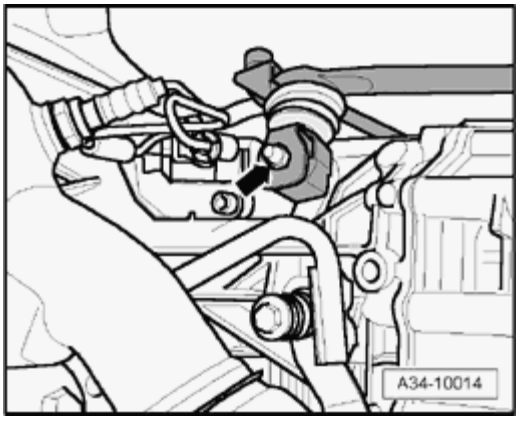

Fig. 393: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **arrow** - and detach selector shaft lever from selector shaft.

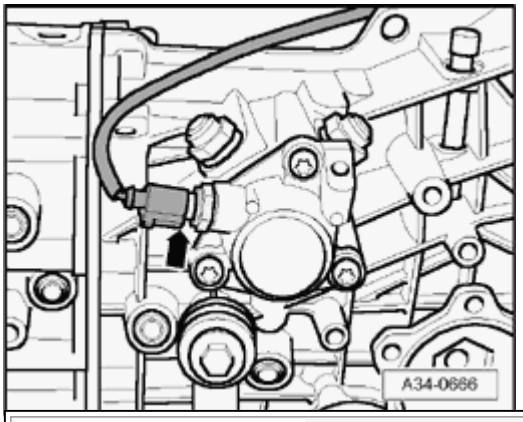

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Fig. 394: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - for back-up light switch F4.

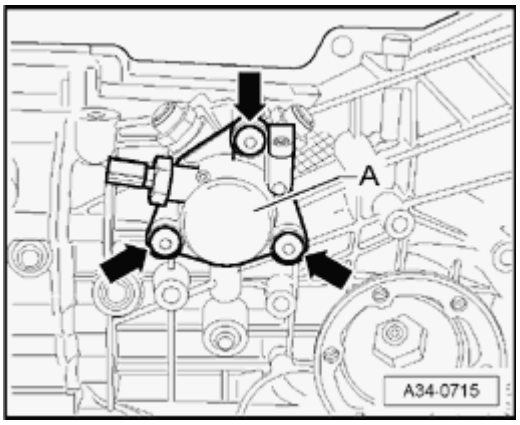

Fig. 395: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove selector shaft cover - **A** -.

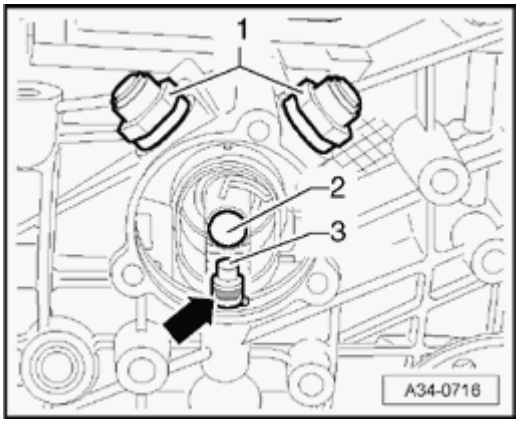

Fig. 396: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove two locking bolts - **1** - for selector shaft.

- Make sure gear has not been engaged.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously removing pin - **3** -.
- Remove selector shaft.

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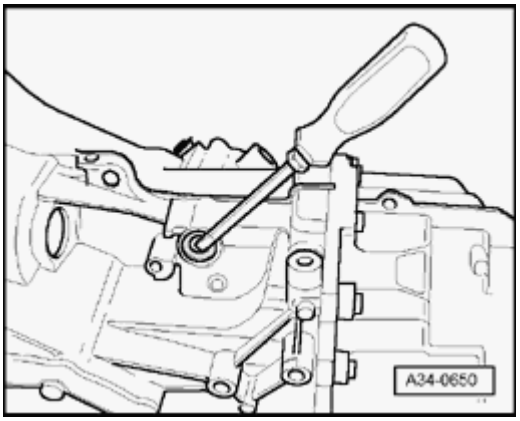

Fig. 397: Prying Out Seal With A Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry out seal with a screwdriver.

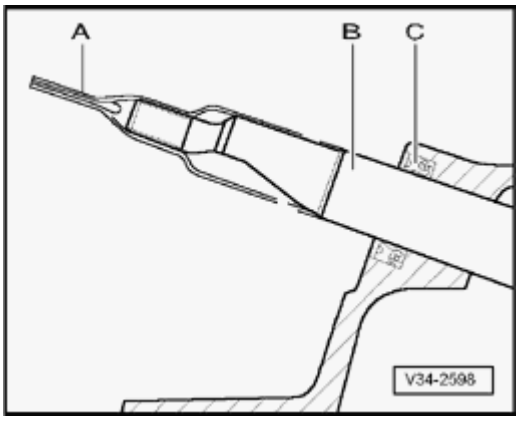

Fig. 398: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

NOTE:

- **Replace seals and O-rings.**

- Install selector shaft.
- Installation position: Chamfer of selector shaft - **B** - points downward.

NOTE:

- **Ignore - item A - and - item C -.**

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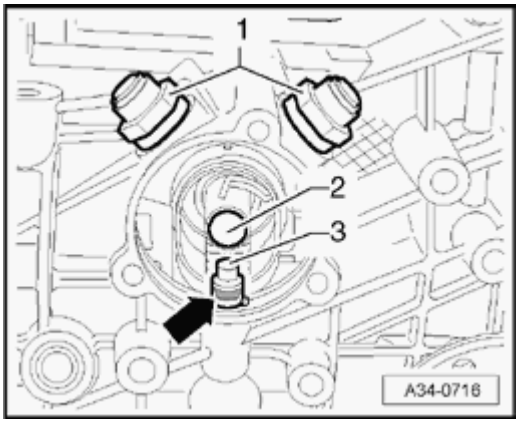

Fig. 399: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously inserting pin - **3** -.
- Installation position: groove - **arrow** - on pin - **3** - faces toward selector shaft cover.
- Clean bolt threads of locking fluid - **1** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 45 Nm.

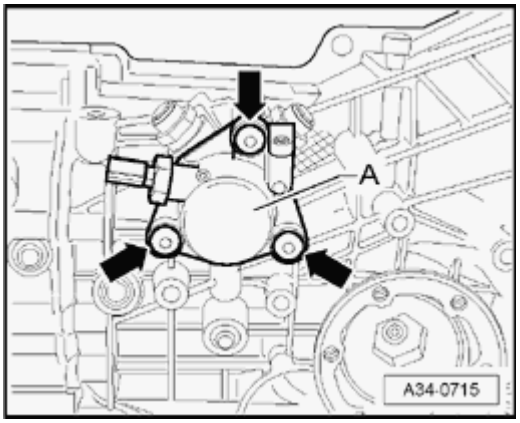

Fig. 400: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install cover - **A** - with new O-ring.
- Clean bolt threads of locking fluid - **arrows** - with a wire brush. Then apply **locking fluid AMV185101A1** to bolts and tighten.

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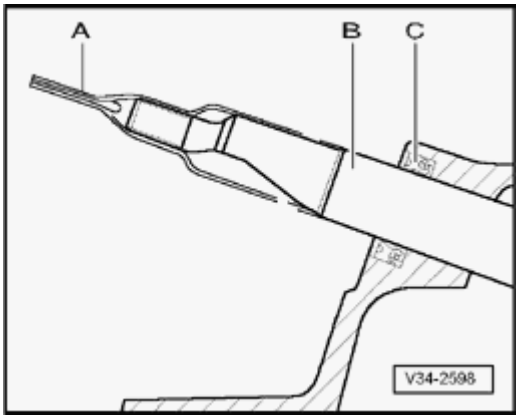

Fig. 401: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Use mounting sleeve 01E311120 - item A - to prevent damaging the seal - C - when installing.**

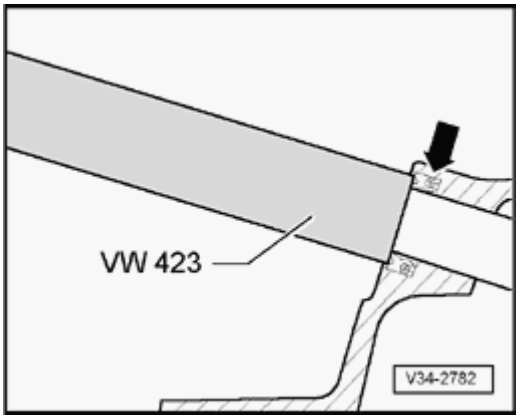

Fig. 402: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil outer circumference of seal - **arrow** -.
- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .
- Drive oil seal - **arrow** - into housing as far as it will go.

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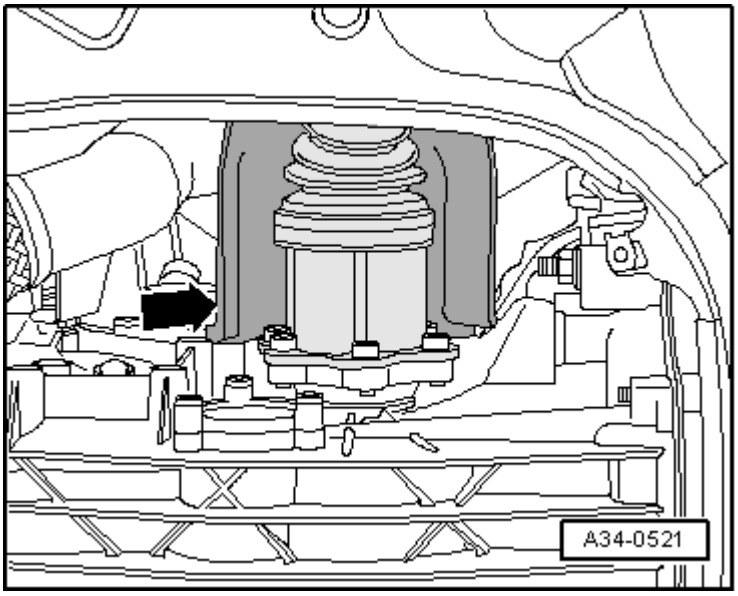

Fig. 403: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install front exhaust pipe align exhaust system free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .
- Remove heat shield - **arrow** - for drive axle (right side) and, if installed, also for drive axle (left-side).

Tightening torques

Component	Nm
Locking bolts for selector shaft	45
Cover for selector shaft	24
Connecting rod to transmission	23
Selector shaft lever to selector shaft	23
Heat shield for drive shaft to transmission	23

Selector shaft oil seal, replacing (with transmission removed) (transmission remains assembled)

NOTE:

- **Removal is also possible with transmission installed in vehicle --> Selector shaft oil seal, replacing (with transmission installed).**

Special tools, testers and auxiliary items required

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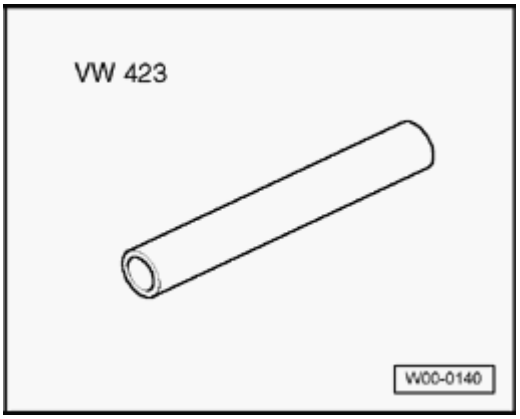

Fig. 404: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW423

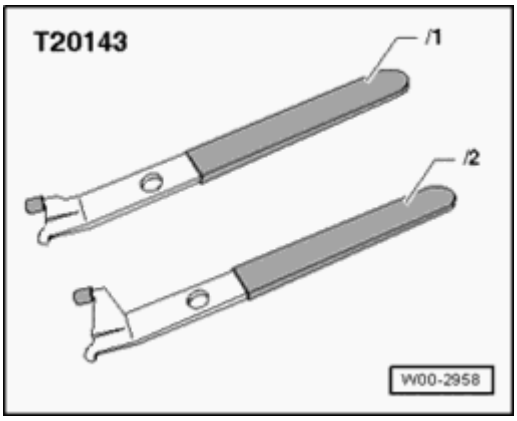

Fig. 405: Identifying Extractor Hook T20143
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor lever T20143/1
- **Assembly sleeve 01E 311 120**
- **Sealing grease G 052 128 A1**

Removing

- With selector shaft installed

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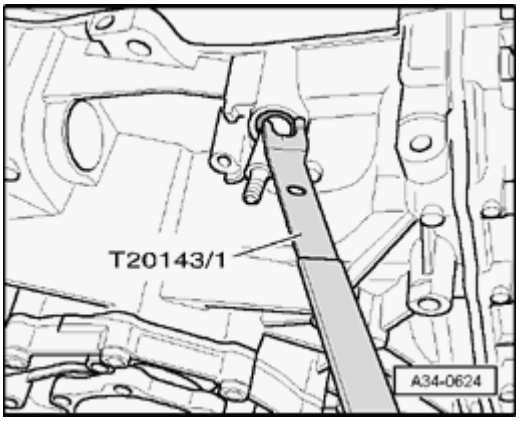

Fig. 406: Prying Out Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry out oil seal, making sure shaft is not damaged.

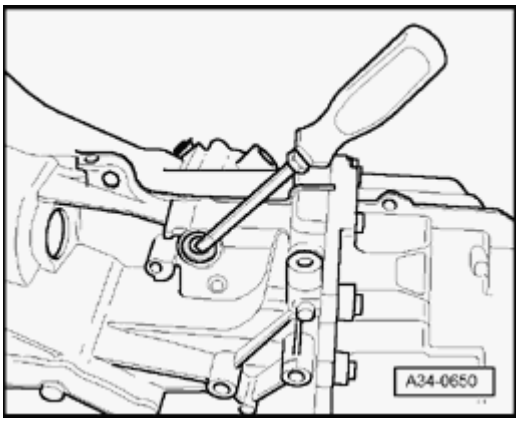

Fig. 407: Prying Out Seal With A Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With selector shaft removed

- Carefully pry out oil seal using a screwdriver or oil seal extractor lever VW 681.

Installing

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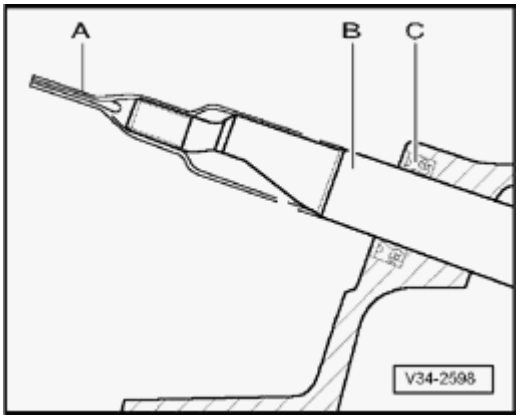

Fig. 408: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Avoid damaging oil seal - **C** - by only installing oil seal and selector shaft using assembly sleeve **assembly sleeve 01E311120** - **A** -.
- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .
- Lightly oil outer circumference of seal.

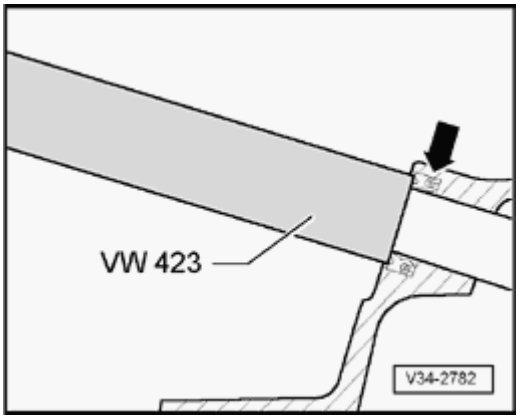

Fig. 409: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive oil seal - **arrow** - into housing as far as it will go.

Selector shaft oil seal, replacing (with transmission installed)

Special tools, testers and auxiliary items required

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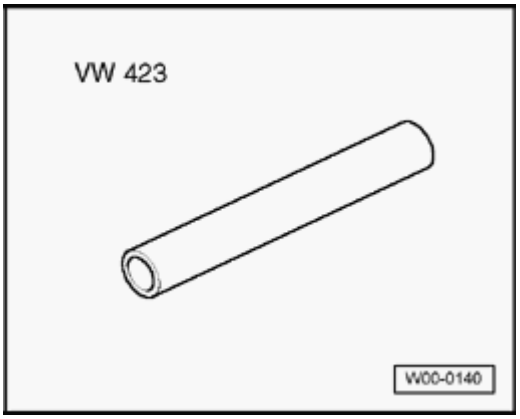

Fig. 410: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW423

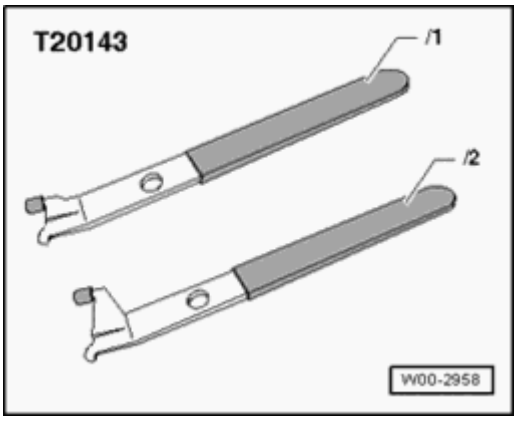

Fig. 411: Identifying Extractor Hook T20143
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor lever T20143/1

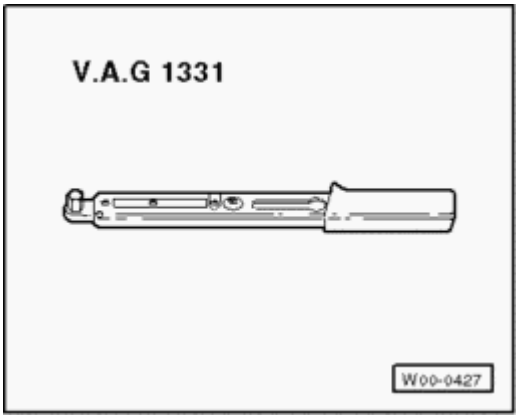

Fig. 412: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Torque wrench V.A.G 1331
- **Assembly sleeve 01E 311 120**
- **Sealing grease G 052 128 A1**

Removing

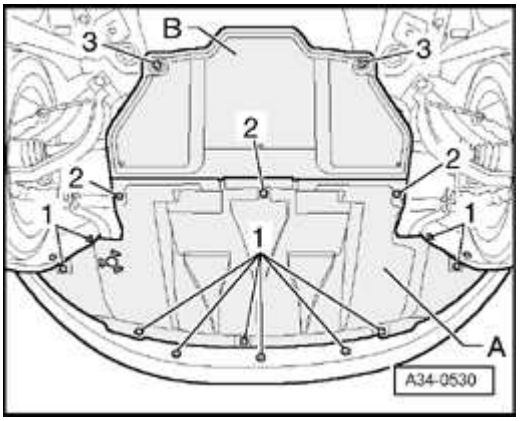

Fig. 413: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

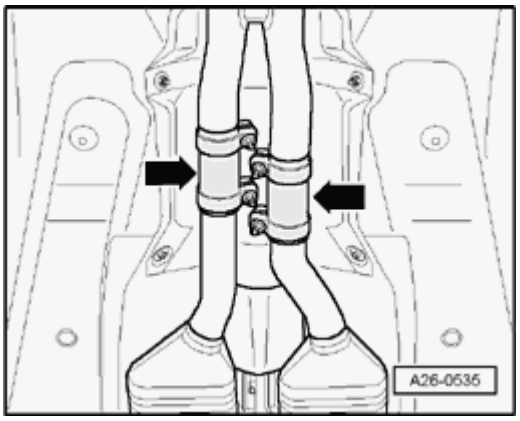

Fig. 414: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 6-cylinder engine:

- Remove heat shield for drive axle (left-side).
- Disconnect exhaust system at clamp (left-side) - **left arrow** -.
- Remove front exhaust pipe (left-side) with catalytic converter --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

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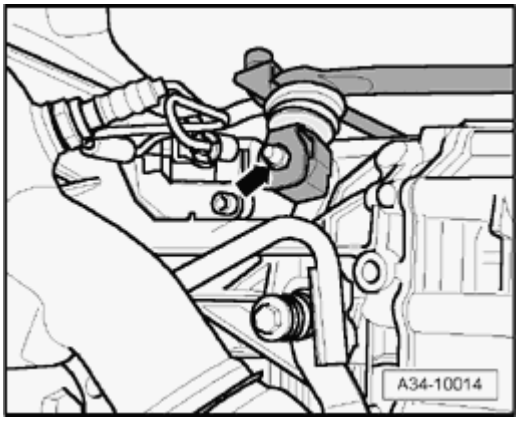

Fig. 415: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Continued for all vehicles:

- Remove nut - **arrow** - and detach selector shaft lever from selector shaft.

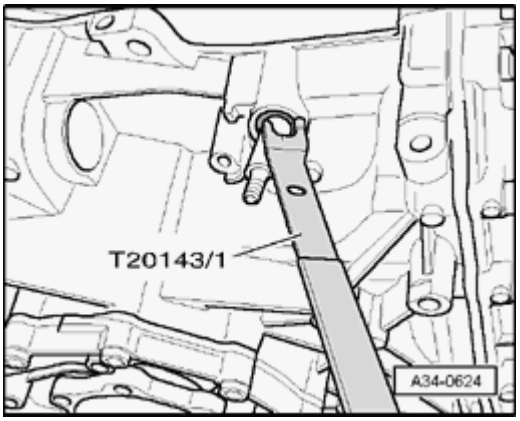

Fig. 416: Prying Out Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry out oil seal, making sure shaft is not damaged.

Installing

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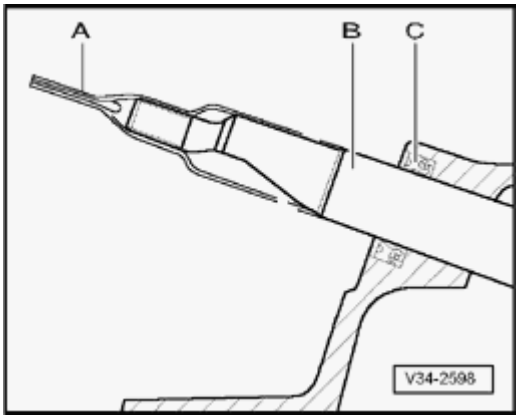

Fig. 417: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Avoid damaging oil seal - **C** - by only installing oil seal and selector shaft using assembly sleeve **assembly sleeve 01E311120** - **A** -.
- Pack space between sealing lip and dust lip half full with **sealing grease G052128A1** .
- Lightly oil outer circumference of seal.

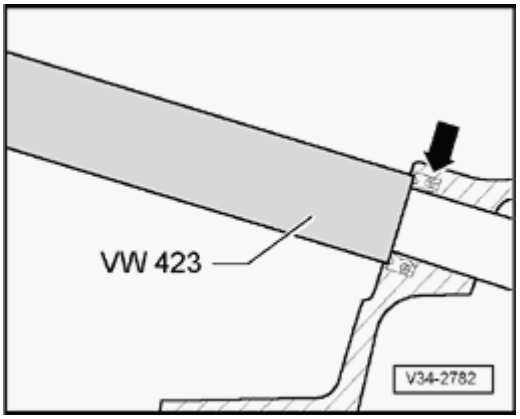

Fig. 418: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive oil seal - **arrow** - into housing as far as it will go.

The remaining installation steps are in reverse order of removal. Note the following:

Vehicles with 6-cylinder engine:

- Install exhaust system and perform stress-free alignment --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .
- Install heat shield for drive shaft (left-side).

Continued for all vehicles:

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- Check gear oil level in transmission --> **Transmission oil level, checking** .

Tightening torques

Component		Nm
Transmission selector lever to transmission		23
Heat shields above drive shafts to transmission		23

Back-up light switch F4, removing and installing

Special tools, testers and auxiliary items required

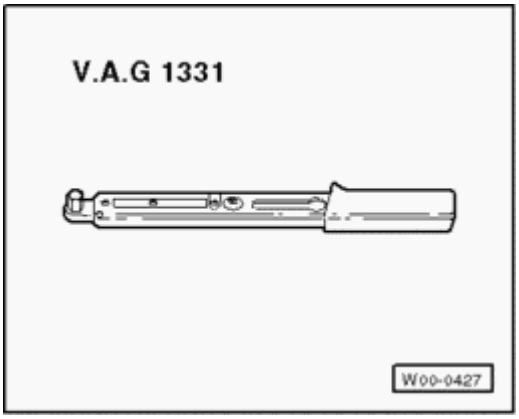

Fig. 419: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

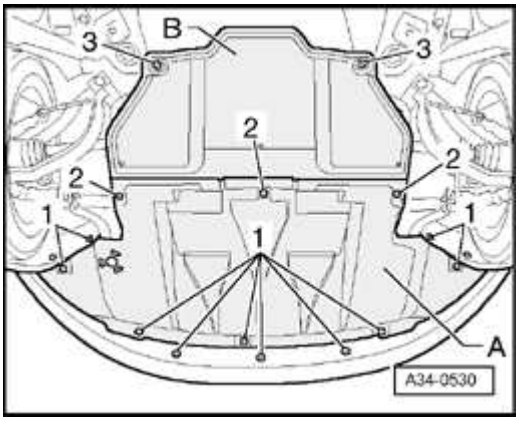

Fig. 420: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- If installed, loosen quick release fasteners - **3** - and remove rear sound insulation - **B** -.

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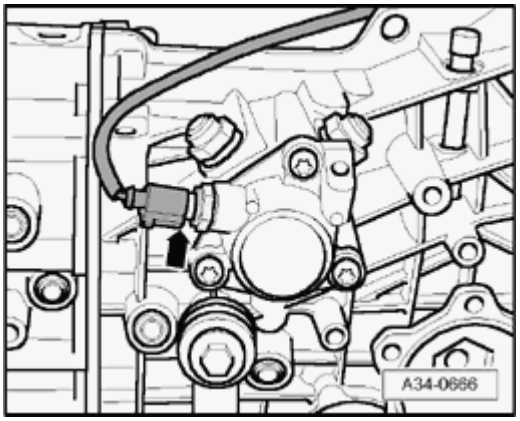

Fig. 421: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - for back-up light switch F4 on transmission (right side).

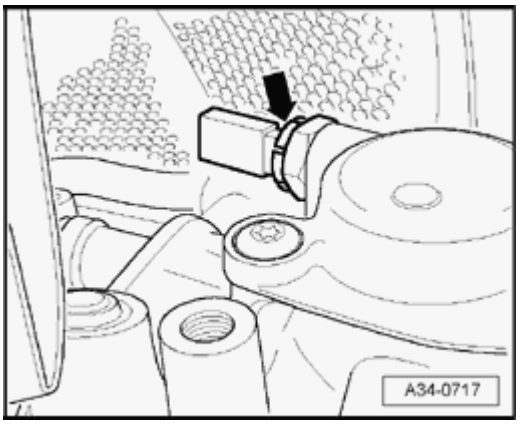

Fig. 422: Removing Back-Up Light Switch F4 From Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Back-up light switch F4 - **arrow** - from selector shaft cover.

Installing

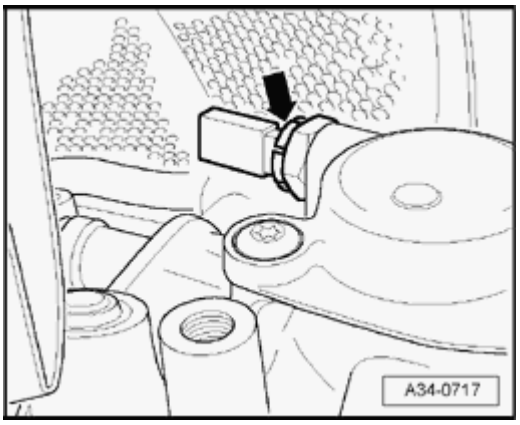

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Fig. 423: Removing Back-Up Light Switch F4 From Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Screw Back-up light switch F4 - **arrow** - into selector shaft cover.

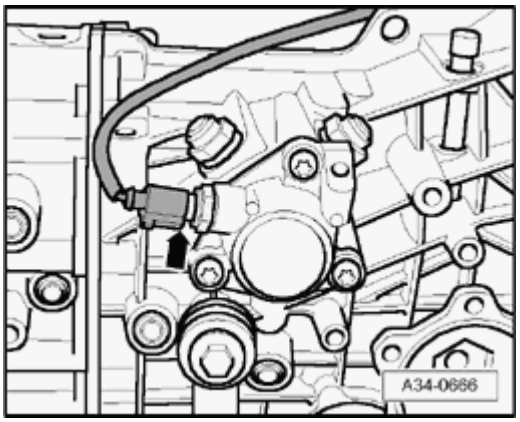

Fig. 424: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect electrical connector - **arrow** - for back-up light switch F4 on transmission (right side).

Component	Nm
Back-up light switch F4 to selector shaft cover	20

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35 GEARS, SHAFTS

INPUT SHAFT

Input shaft, assembly overview

NOTE:

- **Refer to technical data when installing new gears --> Transmission identification.**
- **Lubricate all bearings on input shaft with gear oil before installing.**

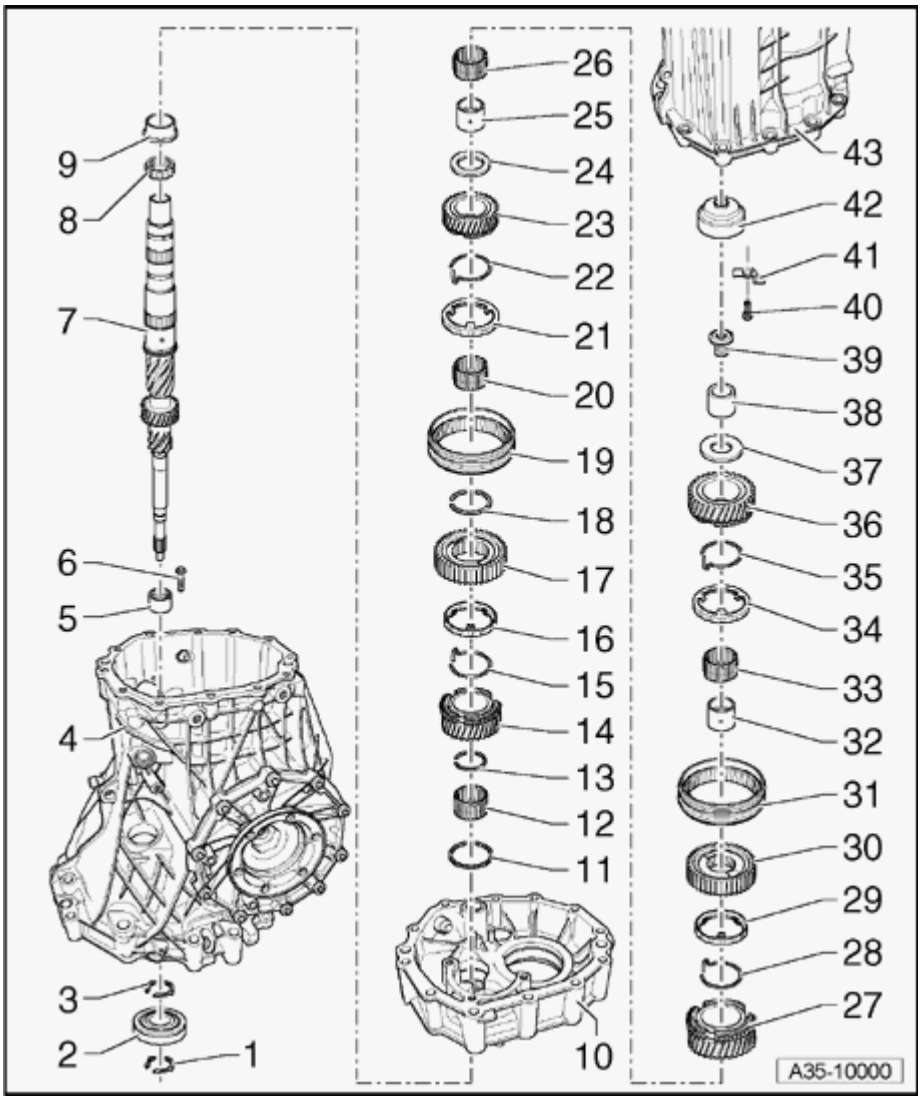

Fig. 425: Input Shaft, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Circlip

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- Mark
- Installation position **Installation position of circlips**, - **item 1** -
- Determining thickness

2 - Ball bearing

- Removing and installing --> **Disassembling and assembling sequence**

3 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 2** -
- Determining thickness

4 - Transmission housing

5 - Needle bearing

- For input shaft

6 - Bolt, 24 Nm

7 - Input shaft

- Adjusting --> **Input shaft, adjusting**

8 - Roller bearing

- Detaching and installing **Detaching needle roller bearing from input shaft and installing needle roller bearing onto input shaft**
- Installation position: collar faces splines for 2nd gear

9 - Outer race

- For needle roller bearing

10 - Bearing housing

11 - Thrust washer

- For 3rd speed selector gear

12 - Needle bearing

- For 3rd gear

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13 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 3** -

14 - 3rd speed selector gear

15 - Spring

- Insert in 3rd speed selector gear --> **Inserting spring in selector gear**

16 - 3rd gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

17 - Synchronizing hub for 3rd and 4th gear

- Installation position: high inside collar faces 3rd speed selector gear

18 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 4** -
- Re-determining thickness **Determining thickness of circlip for synchronizing hub for 3rd and 4th gear**

19 - Locking collar for 3rd and 4th gear

- Mark position in relation to synchronizing hub prior to removing

20 - Needle bearing

- For 4th gear

21 - 4th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

22 - Spring

- Insert in 4th speed selector gear --> **Inserting spring in selector gear**

23 - 4th speed selector gear

24 - Thrust washer

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- For 4th speed and 5th speed selector gears

25 - Needle bearing inner race

- For 5th gear

26 - Needle bearing

- For 5th gear

27 - 5th speed selector gear

28 - Spring

- Insert in 5th speed selector gear --> **Inserting spring in selector gear**

29 - 5th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

30 - Synchronizing hub for 5th and 6th gear

31 - Locking collar for 5th and 6th gear

- Mark position in relation to synchronizing hub prior to removing

32 - Needle bearing inner race

- For 6th gear

33 - Needle bearing

- For 6th gear

34 - 6th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

35 - Spring

- Insert in 6th speed selector gear **Inserting spring in selector gear**

36 - 6th speed selector gear

37 - Thrust washer

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- For 6th speed selector gear

38 - Inner race

39 - Multi-point socket head bolt, 150Nm

40 - Multi-point socket head bolt, 24Nm

41 - Retaining plate

42 - Roller bearing

- Bearing for input shaft in transmission cover
- With lubricating unit
- Always replace

43 - Transmission cover

Input shaft, disassembling and assembling

NOTE:

- **Removing and installing 3rd to 6th speed selector gears is described in chapter on disassembling and assembling transmission --> Disassembling and assembling sequence.**

Special tools, testers and auxiliary items required

- Feeler gauge

Detaching needle roller bearing from input shaft and installing needle roller bearing onto input shaft

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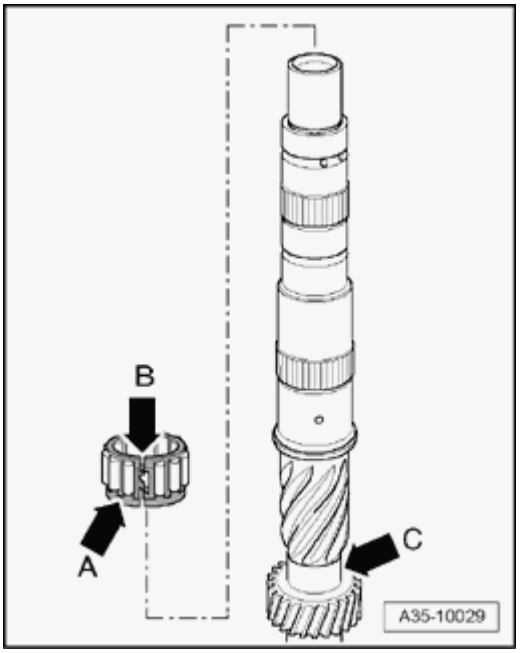

Fig. 426: Detaching Needle Roller Bearing From Input Shaft And Installing Needle Roller Bearing Onto Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Detaching needle roller bearing:

- Bend open needle roller bearing at separating point - **arrow B** - far enough for it to be detached from input shaft (do not bend open more than necessary).

Installing needle roller bearing:

- The shoulder - **arrow A** - faces toward splines for 2nd gear.
- Only bend open needle roller bearing at separating point - **arrow B** - far enough for it to be guided over the input shaft and onto its seat - **arrow C** -.

Inserting spring in selector gear

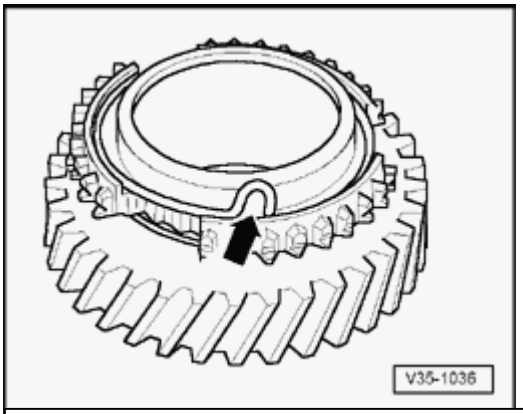

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Fig. 427: Inserting Spring Into Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The bent end of spring - **arrow** - must be hooked into hole in selector gear.

Checking synchro-ring for wear

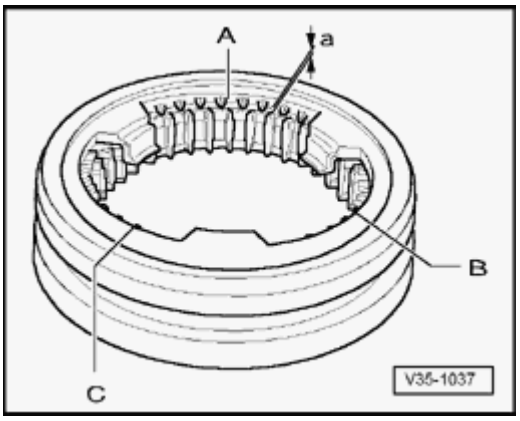

Fig. 428: Checking Synchronizer For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchro-ring into locking collar and measure gap - **a** - at positions - **A** - , - **B** - and - **C** - using feeler gauge.
- Add measured values and divide by 3.

- The determined value should not exceed 0.45 mm.

Installation position of circlips

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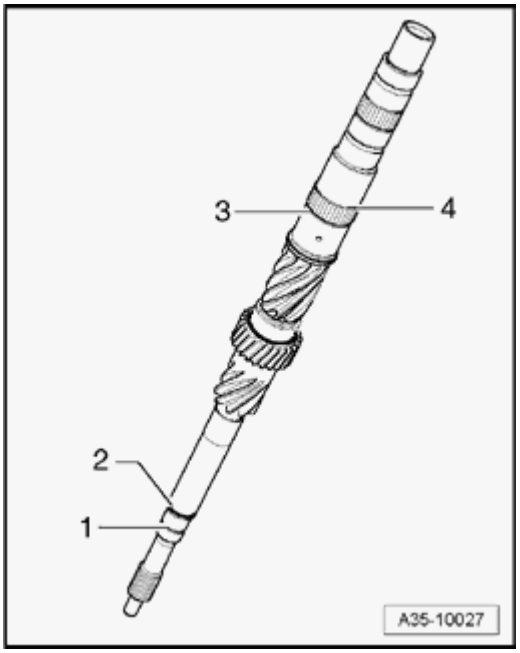

Fig. 429: Installation Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlips - **1** - and - **2** - secure input shaft ball bearing.

Determining thickness --> **Circlips for input shaft ball bearing, determining**.

- Circlip - **3** - secures needle bearing for 3rd speed selector gear and 3rd and 4th gear synchronizing hub.

Thickness: 2.00 mm.

- Circlip - **4** - secures 3rd and 4th gear synchronizing hub.

Determining thickness **Determining thickness of circlip for synchronizing hub for 3rd and 4th gear**.

Determining thickness of circlip for synchronizing hub for 3rd and 4th gear

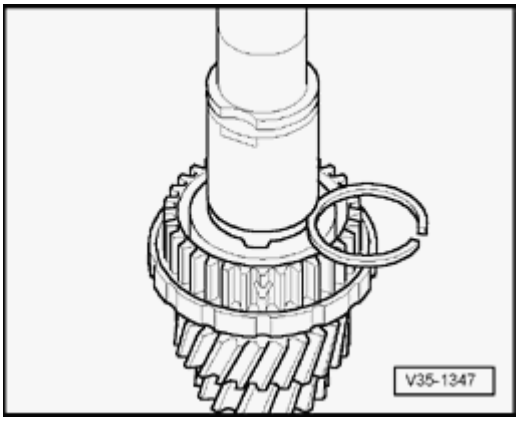

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Fig. 430: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchronizing hub onto stop.
  - Determine thickest circlip that will just fit and install it.

The following circlips are available:

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

INPUT SHAFT, ADJUSTING

Circlips for input shaft ball bearing, determining

It is necessary to readjust the input shaft when:

- Transmission housing

or the

- Input shaft

are replaced.

Special tools, testers and auxiliary items required

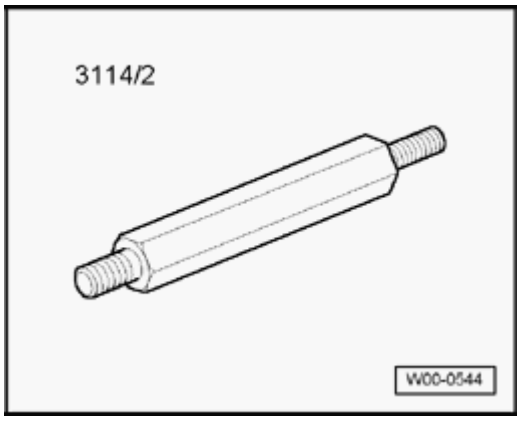

Fig. 431: 3114/2 Straightening Tool
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replacement stud (M8 and M10) 3114/2

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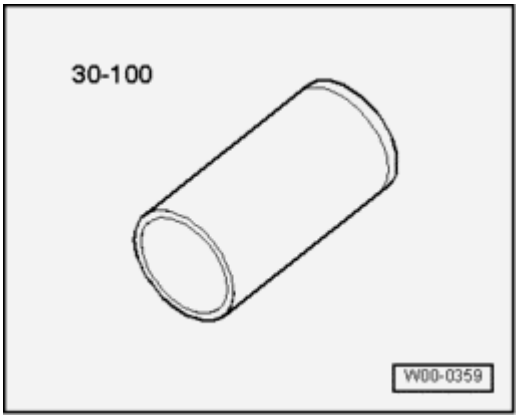

Fig. 432: Press Tube 30-100Identifying Special Tools - Oil Pump/Front Sealing Flange, Drive Chain And Chain Sprocket For Oil Pump, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drift sleeve 30 - 100
- Fitting tool T10246
- Digital depth gauge e.g. VAS 6087

Determining thickness for circlip behind the input shaft ball bearing

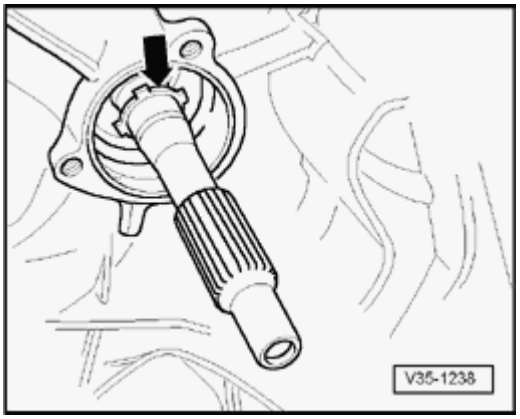

Fig. 433: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install a provisional circlip - **arrow** - in rear groove on input shaft.
- Then push ball bearing onto input shaft.

Installation position:

The sealed side of the ball cage faces transmission housing.

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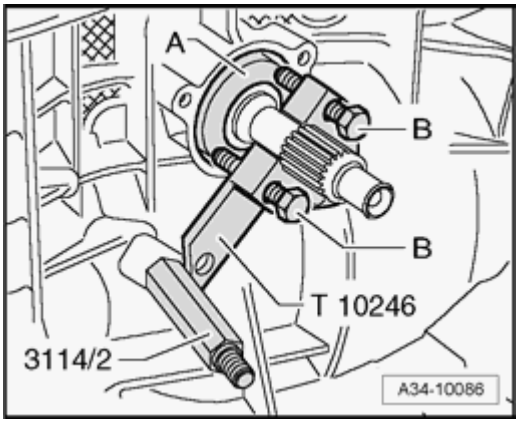

Fig. 434: Pressing In Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing in ball bearing:

Screw replacement stud (M8 and M10) 3114/2 into tapped hole for ball head stud.

Slide thrust plate - **A** - of fitting tool T10246 onto input shaft.

Position fitting tool behind splines for clutch plate. Tighten bolts - **B** - lightly. The bolts locate in the recess in the thrust plate - **A** -.

Press in ball bearing onto stop by tightening bolts alternately (1/2 turn at a time).

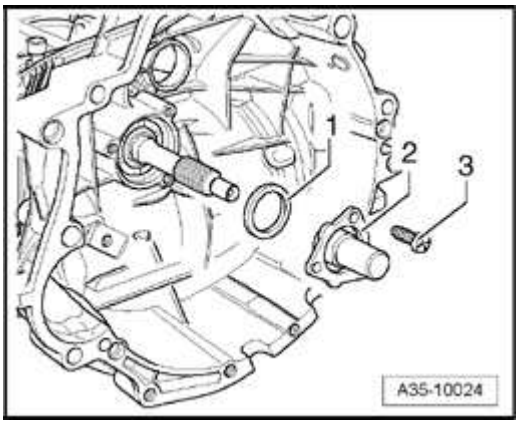

Fig. 435: Dished Spring, Guide Sleeve And Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install dished spring - **1** -.

Installation position:

The convex side faces guide sleeve - **2** -.

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- Install a shrink hose onto input shaft splines.
- Bolt guide sleeve to transmission housing - **2** - with bolts - **3** -.
- Turn the transmission housing so the joint flange for the bearing housing points upward.

- The contact surface must be cleaned to remove **sealing paste** .

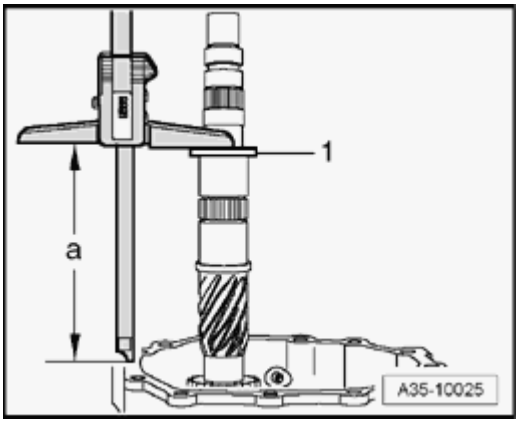

Fig. 436: Measuring From Thrust Washer To Contact Surface Of Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place thrust washer - **1** - for 4th and 5th speed selector gears onto input shaft.
- Place a digital depth gauge (e. g. VAS 6087) onto thrust washer and measure the distance to the contact surface of housing. The measuring point on the housing contact surface must be as close to the input shaft as possible.

NOTE:

- **When measuring, lift the input shaft with e.g. support bridge 30-211A or the help of a second technician until the play in the ball bearing is taken up.**

Specification: distance "a" = 164.14 mm

NOTE:

- **If the measured value exceeds the specification, use a thinner circlip than the circlip installed so that the specification is attained.**
- **If the measured value is below the specification, use a thicker circlip than the circlip installed so that the specification is attained.**
- **Determine the circlip thickness to meet the specification as exactly as possible (164.14 mm).**

The following circlips are available:

Circlip thickness (mm)		
1.54	2.08	2.62
1.63	2.17	2.71

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1.72	2.26	2.80
1.81	2.35	2.89
1.90	2.44	
1.99	2.53	

- Select circlip from table.

Checking adjustment and checking distance "a"

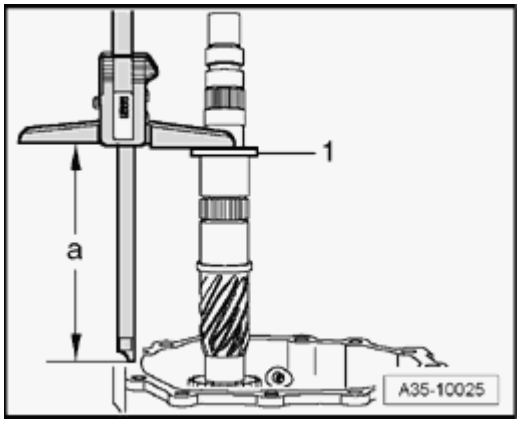

Fig. 437: Measuring From Thrust Washer To Contact Surface Of Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determined circlip is installed.

The distance "a" should be 164.14mm +- 0.04 mm if correct circlip has been selected.

Determining thickness for circlip in front of input shaft ball bearing

- Knock rear circlip (as determined) and ball bearing onto input shaft using drift sleeve 30 - 100.

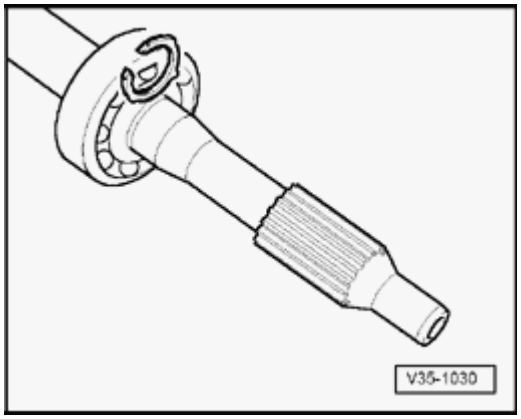

Fig. 438: Input Shaft And Thickest Circlip Which Can Still Just Be Installed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Determine thickest circlip which will still fit.
- Refer to table **The following circlips are available:** to determine correct circlip.

PINION SHAFT AND HOLLOW SHAFT

Pinion shaft and hollow shaft, assembly overview

NOTE:

- **When installing new gear wheels or the final drive set consult technical data --> Transmission identification.**
- **Observe technical data when installing new gear wheels**
- **Lubricate all needle bearings on hollow shaft with gear oil before installing.**
- **Adjustment work is required when replacing the parts marked with 1) . Table of adjustments --> Table of adjustments**

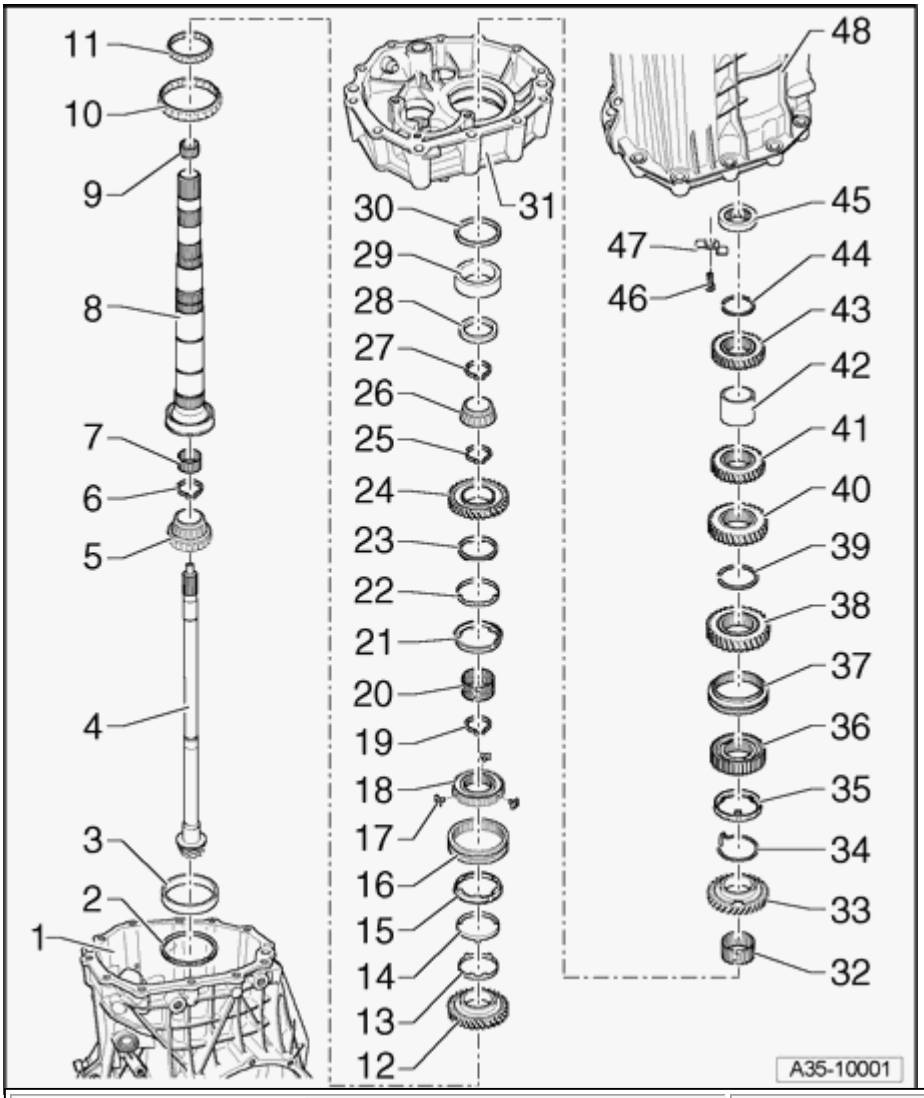

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Fig. 439: Pinion Shaft And Hollow Shaft, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing [1)]

2 - Shim "S3"

- Table of adjustments --> **Table of adjustments**

3 - Double tapered roller bearing outer race [1)]

- Pulling out **Pulling out double tapered roller bearing outer race**
- Pressing in **Heating transmission housing in order to install double tapered roller bearing outer race** and **Pressing in double tapered roller bearing outer race**

4 - Pinion shaft [1)]

- Is mated with ring gear, always replace together as a set
- Adjusting ring gear and pinion shaft --> **Pinion shaft and ring gear, adjusting**

5 - Double tapered roller bearing inner race [1)]

- Will be damaged during removal
- Replace
- Pressing off **Pressing off double tapered roller bearing inner race**
- Pressing on **Pressing on double tapered roller bearing inner race**

6 - Circlip

- Redetermine thickness if double tapered roller bearing is replaced **Determining thickness of circlip**

7 - Large needle bearing

- For pinion shaft in hollow shaft
- Lubricate with gear oil

8 - Hollow shaft

- Disassembling and assembling

9 - Small needle bearing

- For pinion shaft in hollow shaft
- Lubricate with gear oil

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10 - Large needle bearing for 1st gear

11 - Small needle bearing for 1st gear

12 - 1st speed selector gear

- Check axial clearance after installing using feeler gauge **Checking axial play of selector gears** (0.20 to 0.50 mm)

13 - Inner ring for 1st gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st gear inner ring for wear**
- Replace if scored or if there are visible traces of wear

14 - Intermediate ring for 1st gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**

15 - Synchro-ring for 1st gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**
- Replace if scored or if there are visible traces of wear

16 - Locking collar for 1st and 2nd gear

- Mark position in relation to synchronizing hub prior to removing
- Assembling locking collar/synchronizing hub **Assembling 1st and 2nd gear locking collar/synchronizing hub**

17 - Locking piece

- Install locking pieces (3x) **Assembling 1st and 2nd gear locking collar/synchronizing hub**

18 - Synchronizing hub for 1st and 2nd gear

- Installation position: high inside collar faces 2nd speed selector gear
- Pressing off **Pressing off 1st and 2nd gear synchronizing hub**
- Pressing on **Pressing on 1st and 2nd gear synchronizing hub**
- Assembling locking collar/synchronizing hub **Assembling 1st and 2nd gear locking collar/synchronizing hub**

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19 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 1** -
- Re-determine thickness when replacing 1st and 2nd gear synchronizing hub or hollow shaft **Determining thickness of circlip**

20 - Needle bearing

- For 2nd gear

21 - Synchro-ring for 2nd gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**
- Replace if scored or if there are visible traces of wear

22 - Intermediate ring for 2nd gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**

23 - Inner ring for 2nd gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**
- Replace if scored or if there are visible traces of wear

24 - 2nd speed selector gear

- Check axial clearance after installing using feeler gauge **Checking axial play of selector gears** (0.20 to 0.50 mm)

25 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 2** -

26 - Tapered roller bearing inner race[1)]

- Pressing off **Pressing off tapered roller bearing inner race with 2nd speed selector gear**
- Pressing on **Pressing on tapered roller bearing inner race**

27 - Circlip

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- Mark
- Installation position **Installation position of circlips**, - **item 3** -

28 - Thrust washer

- For reverse selector gear
- Pressing off **Pressing off thrust washer for reverse selector gear**
- Pressing on **Pressing on thrust washer for reverse selector gear**

29 - Tapered roller bearing outer race 1)

- Pulling out **Pulling tapered roller bearing outer race out of bearing housing**
- Pressing in **Pressing tapered roller bearing outer race into bearing housing**

30 - Shim "S_4 "

- Table of adjustments --> **Table of adjustments**

31 - Bearing housing 1)

32 - Needle bearing

- For reverse selector gear

33 - Reverse selector gear

- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

34 - Spring

- Insert into reverse selector gear **Inserting spring in selector gear**

35 - Synchronizing ring for reverse gear

- Checking for wear **Checking synchro-ring for wear**

36 - Reverse gear synchronizing hub

- Installation position: high inside collar faces 3rd gear wheel

37 - Reverse gear locking collar

- Mark position in relation to synchronizing hub prior to removing
- Installation position: taper faces reverse gear synchro-ring

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38 - 3rd gear wheel

- Installation position: machined side faces reverse gear synchronizing hub

39 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 4** -
- Re-determine thickness when replacing 3rd gear wheel, reverse gear synchronizing hub or hollow shaft **Determining thickness of circlip**

40 - 4th gear wheel

- Installation position: high inside collar faces 5th gear wheel

41 - 5th gear wheel

- Installation position: high inside collar faces 4th gear wheel

42 - Spacer sleeve

43 - 6th gear wheel

44 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 5** -
- Re-determine thickness when replacing gear wheels for 4th to 6th gear, the spacer sleeve or the hollow shaft **Determining thickness of circlip**

45 - Needle bearing

- Bearing for hollow shaft in transmission cover

46 - Multi-point socket head bolt, 24Nm

47 - Retaining plate

48 - Transmission cover

Inserting spring in selector gear

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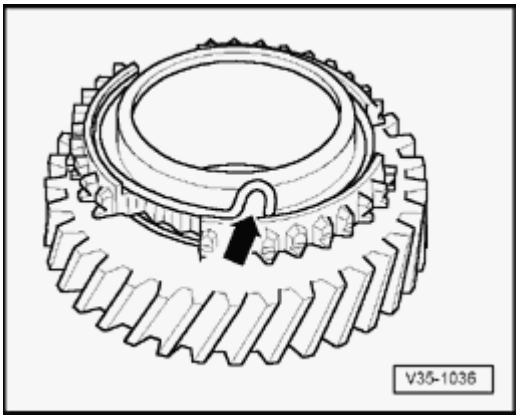

Fig. 440: Inserting Spring Into Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The bent end of spring - **arrow** - must be hooked into hole in selector gear.

Checking synchro-ring for wear

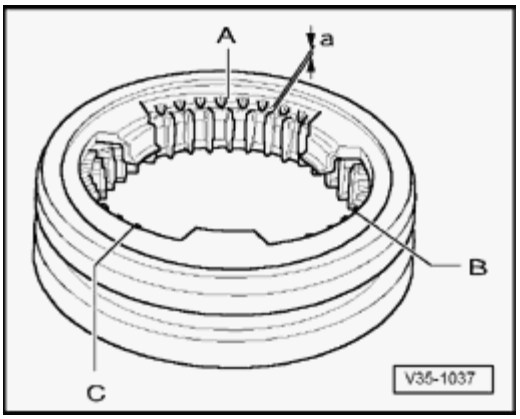

Fig. 441: Checking Synchronizer For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchro-ring into locking collar and measure gap - **a** - at positions - **A** - , - **B** - and - **C** - using feeler gauge.
- Add measured values and divide by 3.

The determined value should not exceed 0.45 mm.

Pinion shaft and hollow shaft, disassembling and assembling

NOTE:

- **Removing and installing gear wheels for 3rd to 6th gear and the reverse selector gear is described in chapter on disassembling and assembling transmission --> Disassembling and assembling sequence.**

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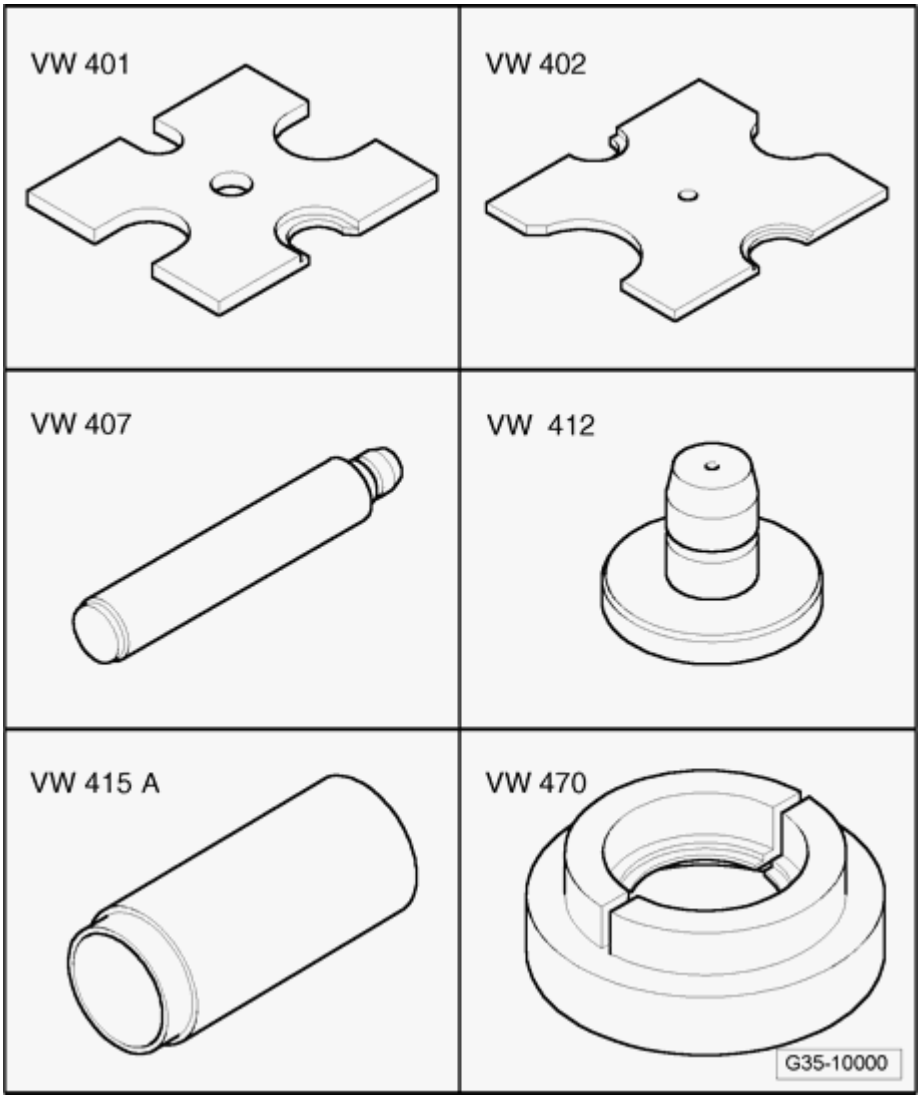

Fig. 442: Identifying Special Tools - Pinion Shaft And Hollow Shaft, Disassembling And Assembling (1 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust plate VW 402
- Punch VW 407
- Thrust disc VW 412

- Tube VW 415 A
- Thrust ring VW 470

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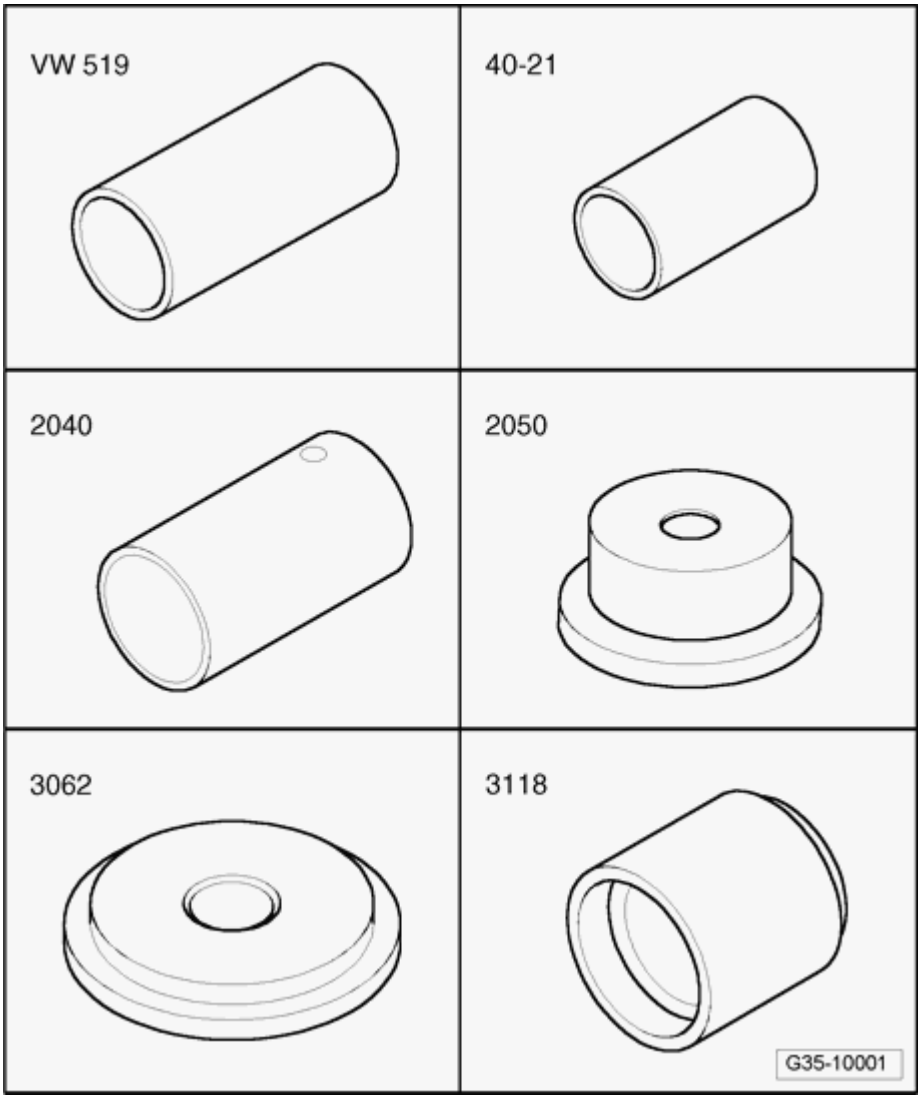

Fig. 443: Identifying Special Tools - Pinion Shaft And Hollow Shaft, Disassembling And Assembling (2 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Sleeve VW 519
- Press tool 40 - 21
- Tube 2040
- Thrust piece 2050
- Thrust pad 3062
- Press tool 3118

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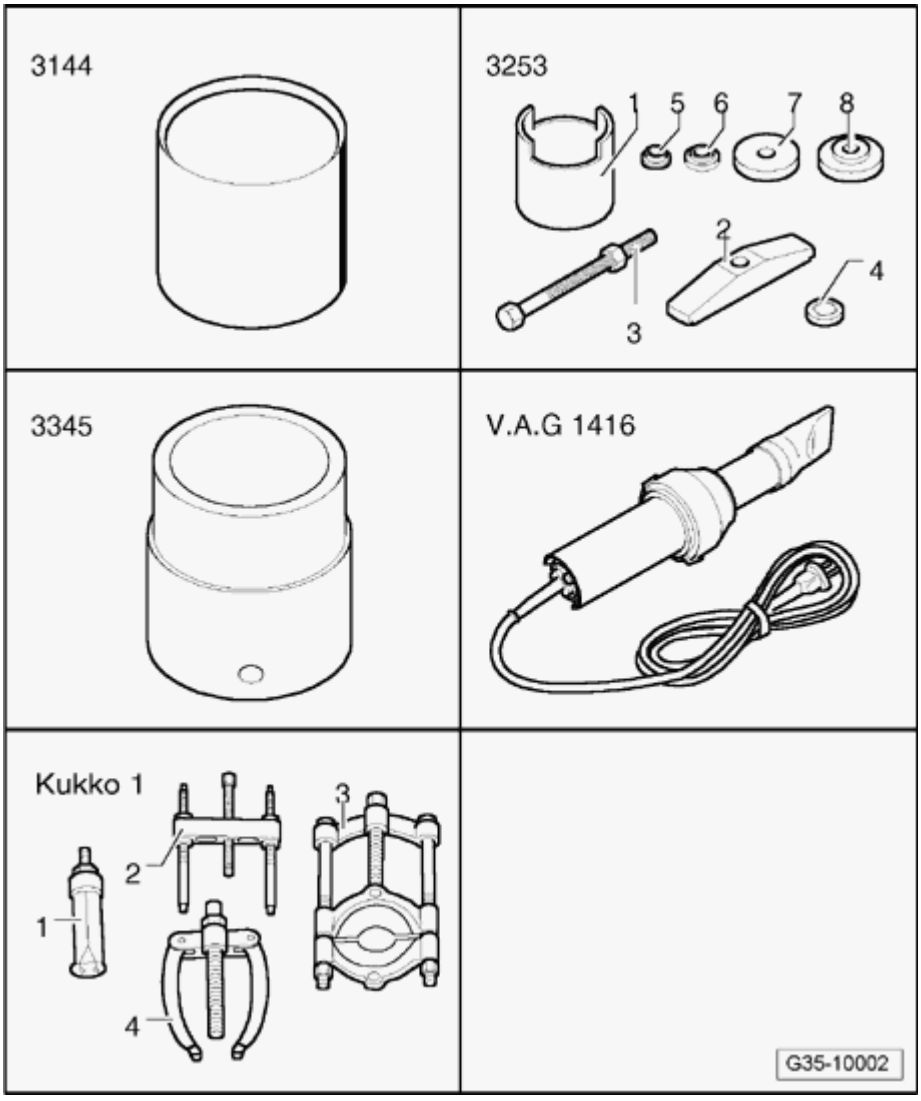

Fig. 444: Identifying Special Tools - Pinion Shaft And Hollow Shaft, Disassembling And Assembling (3 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Sleeve 3144
- Wheel bearing assembly set 3253
- Tube for wheel bearing 3345
- Hot air blower V.A.G 1416

- **- 1 -** Internal puller Kukko 21/8
- **- 3 -** Splitter Kukko 17/2
- **- 4 -** Counter-support Kukko 22/2
- Feeler gauge

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Pulling out double tapered roller bearing outer race

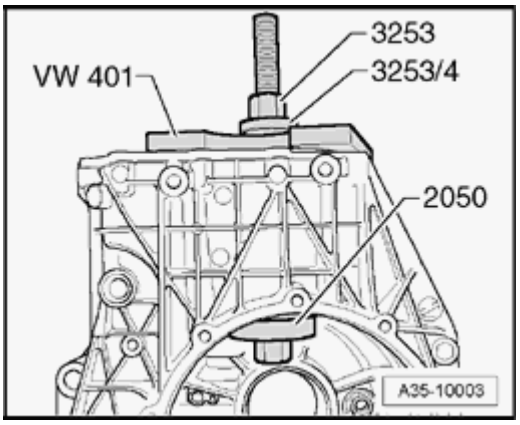

Fig. 445: Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Removing differential --> **Differential, removing and installing**.
- Install thrust piece 2050 with large diameter pointing toward outer race.
- Install threaded spindle and thrust pad of wheel bearing assembly set 3253 with thrust plate VW 401 onto transmission housing.

The outer race will be pulled out of transmission housing when nut is tightened.

Pressing off double tapered roller bearing inner race

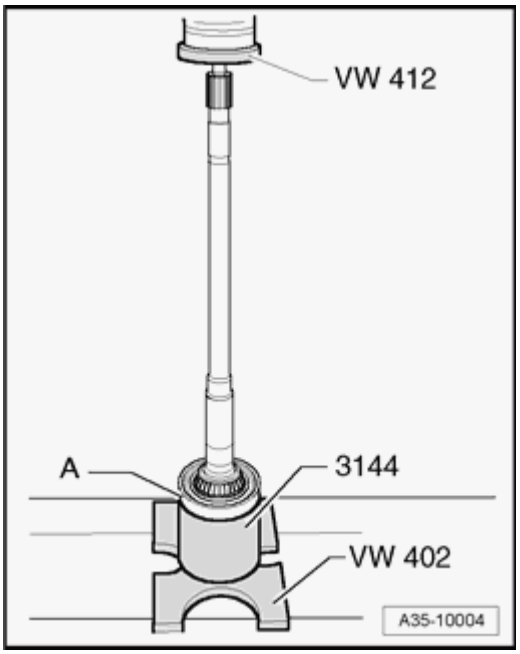

Fig. 446: Pressing Off Double Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove circlip before pressing off.
- The outer race of double tapered roller bearing - **A** - must be installed prior to pressing off inner race.

Pressing on double tapered roller bearing inner race

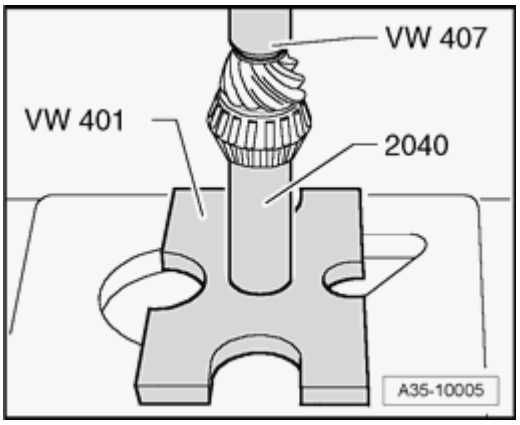

Fig. 447: Pressing On Double Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat inner race to approx. 100° C and press on.
- Determine thickness of required circlip **Determining thickness of circlip** and install circlip.

Determining thickness of circlip

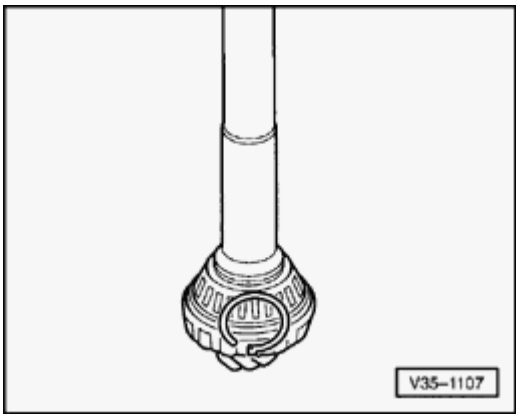

Fig. 448: Determining Circlip To Be Installed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine thickest circlip that will just fit and install it.

NOTE:

- **The circlips for the synchronizing hubs and individual gear wheels should also be determined as shown for the double tapered roller bearing.**

The following circlips are available:

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Circlip thickness (mm)		
2.00	2.06	2.12
2.03	2.09	2.15

Heating transmission housing in order to install double tapered roller bearing outer race

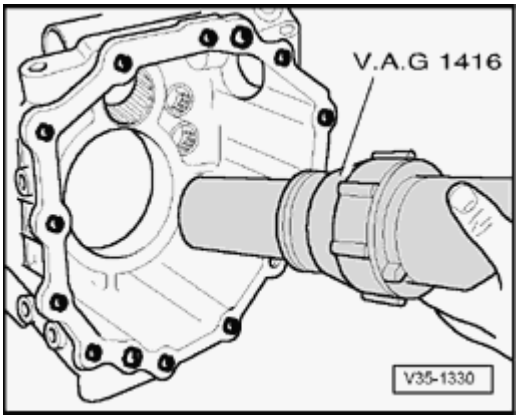

Fig. 449: Heating Transmission Housing To Insert Outer Race Of Large Taper Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat transmission housing in area of bearing seat for approx. 15 minutes, to approx. 100° C, with hot air blower V.A.G 1416.

Pressing in double tapered roller bearing outer race

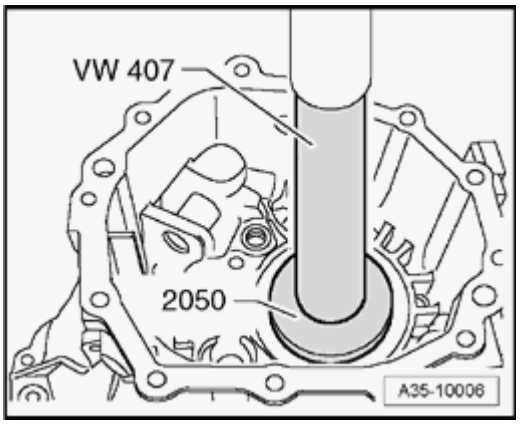

Fig. 450: Pressing Tapered Roller Bearing Outer Race For Pinion Shaft Into Transmission Housing Without Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert outer race only after heating transmission housing and push into position under workshop press until heat exchange has taken place.

Pulling tapered roller bearing outer race out of bearing housing

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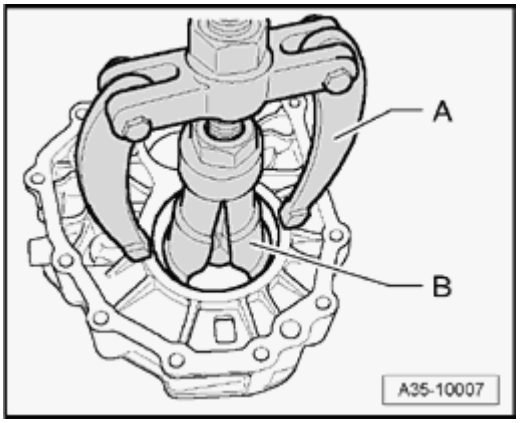

Fig. 451: Pulling Tapered Roller Bearing Outer Race Out Of Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Counter-support, e.g. Kukko 22/2

B - Internal puller 56 to 70 mm, e.g. Kukko 21/8

Pressing tapered roller bearing outer race into bearing housing

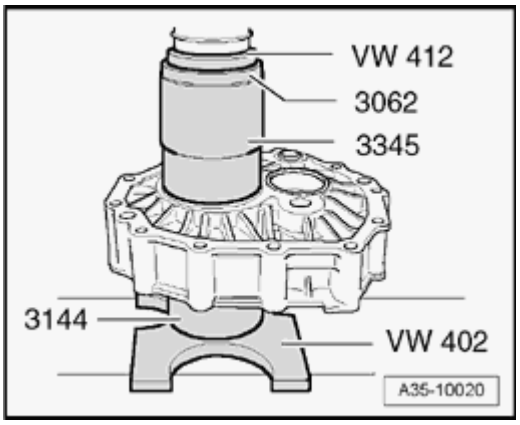

Fig. 452: Pressing In Tapered Roller Bearing Outer Race For Pinion Shaft With Shim Into Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Support bearing housing with sleeve 3144 directly below bearing mounting.

- Press in outer race until limit stop.

Disassembling and assembling hollow shaft

Pressing off thrust washer for reverse selector gear

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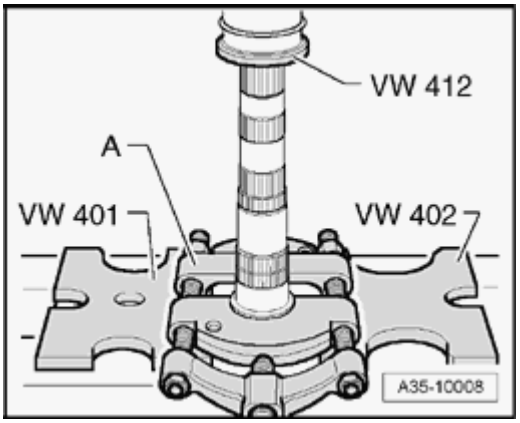

Fig. 453: Pressing Off Thrust Washer For Reverse Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Splitter 22 to 115 mm, e.g. Kukko 17/2

NOTE:

- **Install splitter - A - below thrust washer, and not below circlip.**
  - Then detach circlip below thrust washer.

Pressing off tapered roller bearing inner race with 2nd speed selector gear

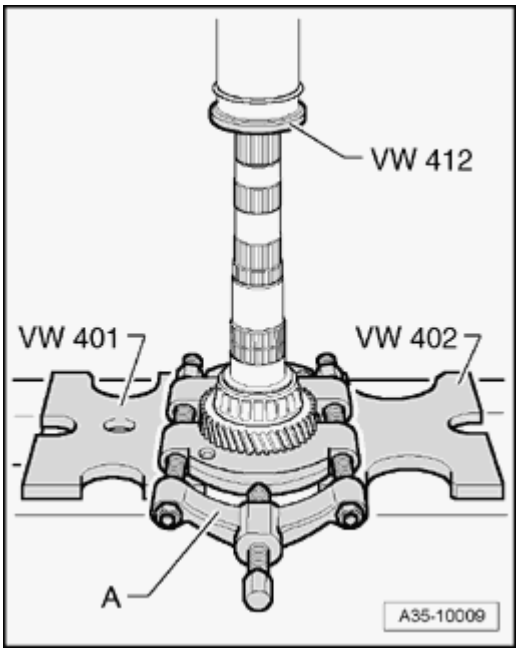

Fig. 454: Pressing Off Tapered Roller Bearing Inner Race With 2Nd Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Splitter 22 to 115 mm, e.g. Kukko 17/2

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NOTE:

- **When pressing off, make sure that only the gear teeth of the selector gear and not the gear shift splines contact the splitter - A -. Otherwise the gear shift splines will be damaged.**

- Remove circlip for tapered roller bearing inner race.

Pressing off 1st and 2nd gear synchronizing hub

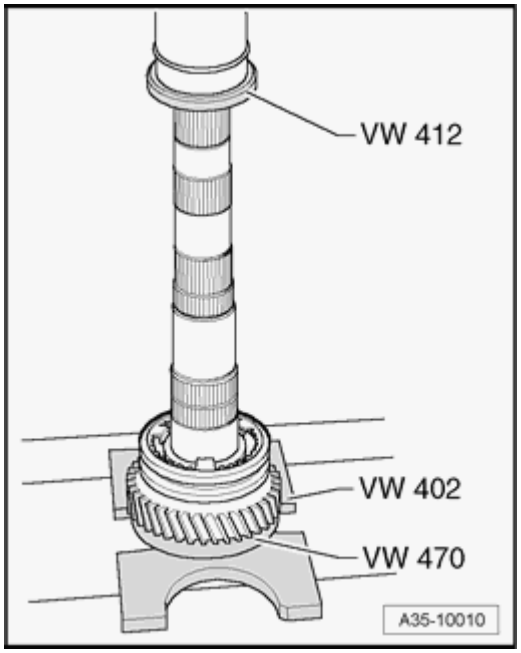

Fig. 455: Pressing Off 1st And 2nd Gear Synchronizing Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- Place selector gear in center of thrust ring VW 470 to press off synchronizing hub with 1st speed selector gear.

Installation position of circlips

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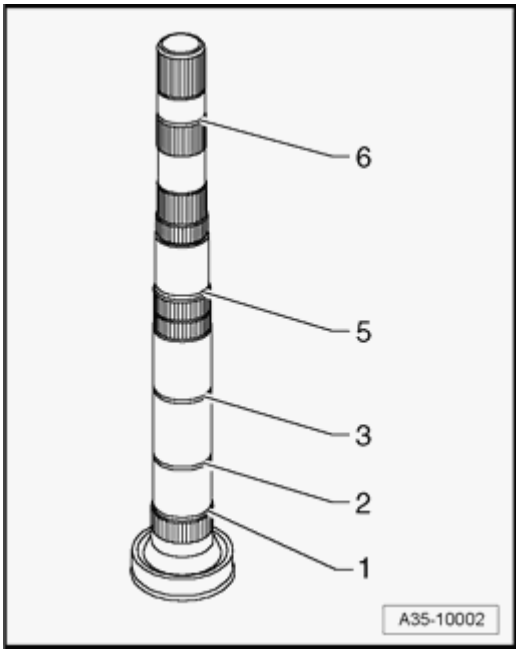

Fig. 456: Installation Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The required circlips for synchronizing hubs, needle bearings and individual gear wheels should be selected as shown in **Determining thickness of circlip**

- Circlip - **1** - secures the 1st and 2nd gear synchronizing hub.

Identification: blue color

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17
1.96	2.08	
1.99	2.11	

- Circlip - **2** - secures tapered roller bearing inner race.

Circlip thickness (mm)
3.50

- Circlip - **3** - secures thrust washer for reverse selector gear.

Circlip thickness (mm)
3.50

- Circlip - **4** - secures the 3rd gear wheel.

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Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	2.10

- Circlip - **5** - secures the 6th gear wheel.

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17
1.96	2.08	2.20
1.99	2.11	

- Determine circlips according to table.

Installation position of synchronizing rings for 1st and 2nd gear:

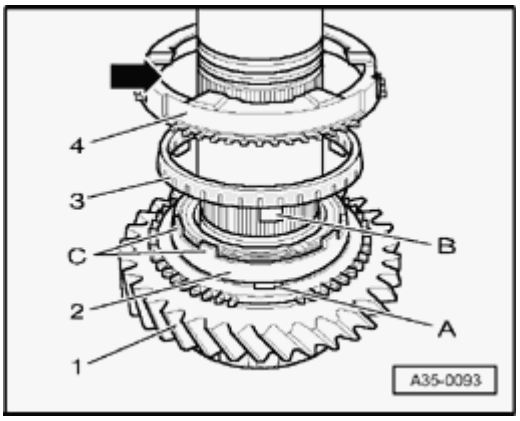

Fig. 457: Installation Position Of Synchronizer Rings For 1St And 2Nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **If components are not being replaced, make sure they are re-installed on same gear.**

- Install inner ring - **2** - onto selector gear - **1** -.
- Install intermediate ring - **3** -. Lug - **B** - must be inserted into recess - **A** -.
- Synchro-ring - **4** - installed. Guide tabs - **C** - through recess - **arrow** -.

Checking 1st gear inner ring for wear

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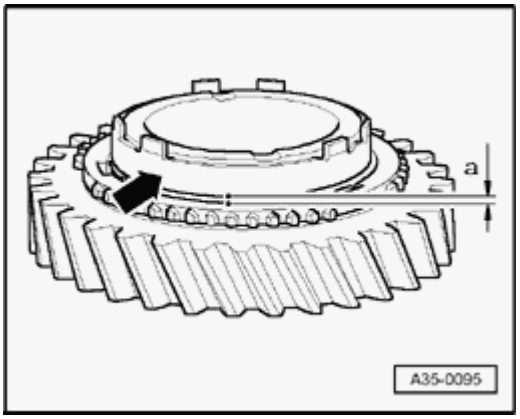

Fig. 458: Checking Inner Race Of 1st Gear For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check outer contact surface - **arrow** - for scoring or visible traces of wear and replace if necessary.
- Press inner ring onto chamfer on selector gear and measure gap - **a** - using a feeler gauge.

Gap - **a** -	As-new installation value	Wear limit
Inner ring for 1st gear	1.2 to 2.0 mm	0.6 mm

Checking 1st and 2nd gear intermediate ring for wear

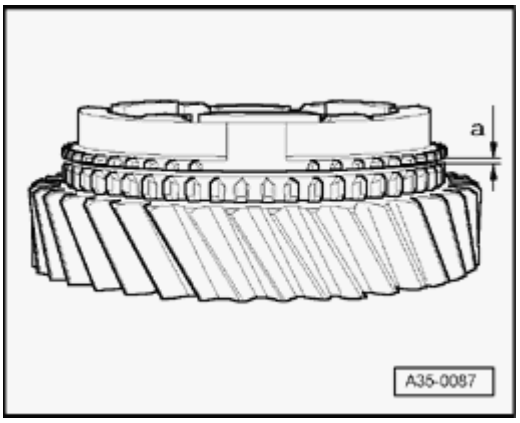

Fig. 459: Checking Synchronizer Ring For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check inner contact surface of synchro-ring for scoring or visible traces of wear and replace if necessary.
- Press inner ring, intermediate ring and synchro-ring onto chamfer on selector gear and measure gap - **a** - using a feeler gauge.

Gap - **a** -	As-new installation value	Wear limit
1st and 2nd gear	1.4to2.0 mm	0.8 mm

Pressing on 1st and 2nd gear synchronizing hub

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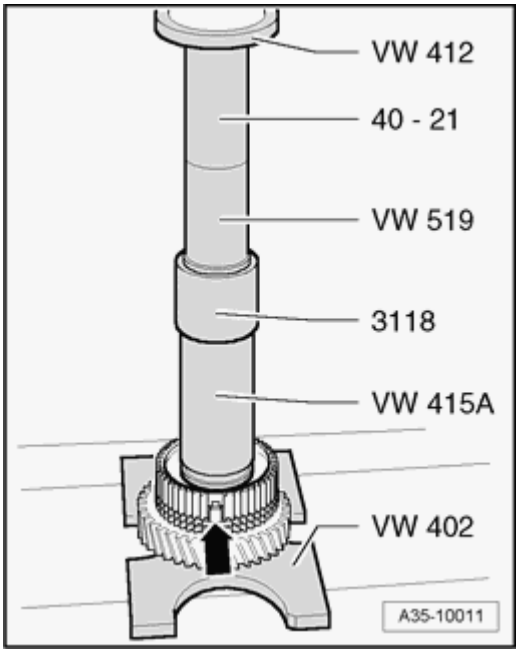

Fig. 460: Pressing On 1st And 2nd Gear Synchronizing Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inside collar faces 2nd gear.

- The tabs of 1st gear synchro-ring and recesses on synchronizing hub must align - **arrow** - when pressing on.

Assembling 1st and 2nd gear locking collar/synchronizing hub

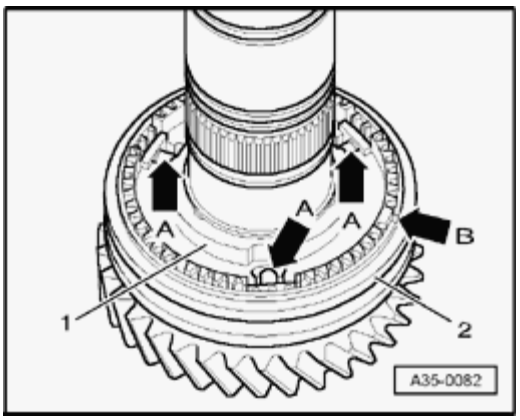

Fig. 461: Assembly Of Operating Sleeve/Synchronizers For 1st And 2nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install locking pieces - **arrows A** - into mounted synchronizing hub - **1** -.
- Install locking collar - **2** - onto synchronizing hub so that the wide splines of locking collar and

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synchronizing hub - **arrow B** - coincide.

- Install circlip for 1st and 2nd gear synchronizing hub.
- Install 2nd speed selector gear with needle bearing and synchro-rings.
- Install circlip for tapered roller bearing inner race onto hollow shaft.

Pressing on tapered roller bearing inner race

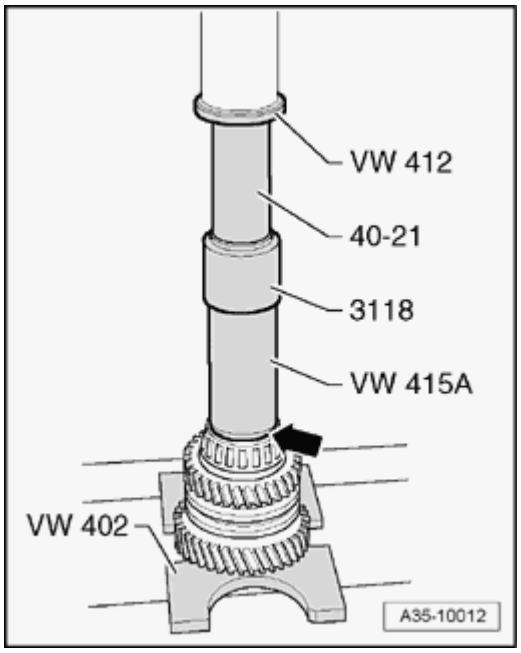

Fig. 462: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Shoulder of tube VW 415 A faces inner race - **arrow** -.

Then check axial play of 1st speed and 2nd speed selector gears **Checking axial play of selector gears**.

Checking axial play of selector gears

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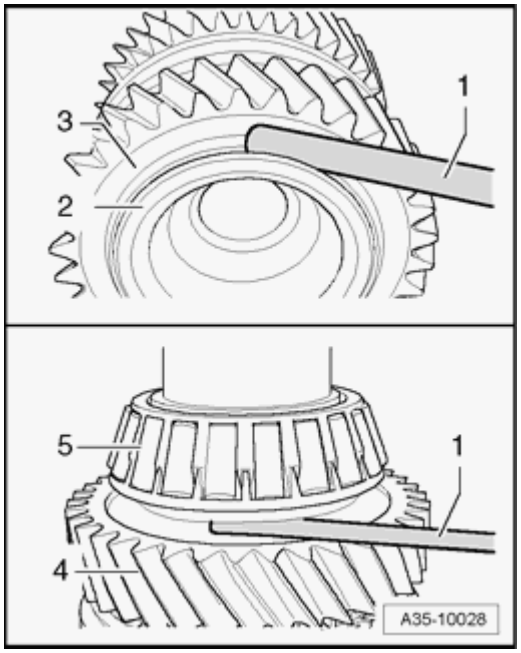

Fig. 463: Checking Axial Play Of Selector Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check axial play of selector gears between hollow shaft - **2** - and 1st speed selector gear - **3** - and also between 2nd speed selector gear - **4** - and tapered roller bearing inner race - **5** - using feeler gauge - **1** -.

- The play must be 0.20 to 0.50 mm.

Pressing on thrust washer for reverse selector gear

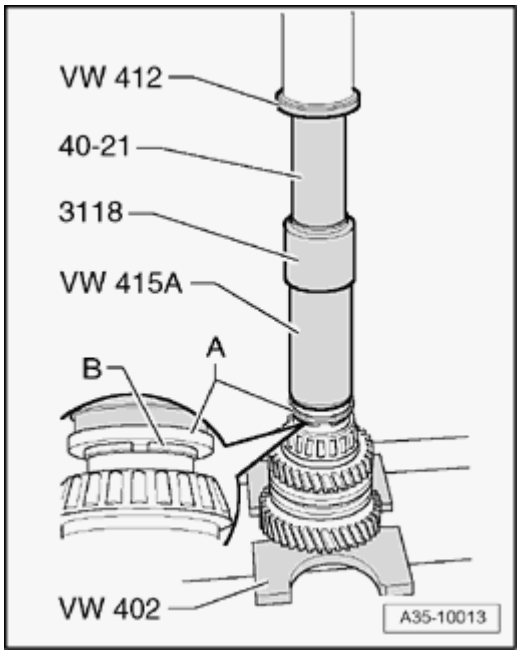

Fig. 464: Pressing On Thrust Washer For Reverse Selector Gear

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install circlip - **B** - onto hollow shaft.
- Press on thrust washer - **A** - until it makes contact with circlip.

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