TRANSMISSION

6-speed manual transmission 0A3, All wheel drive

00 TECHNICAL DATA

TRANSMISSION IDENTIFICATION

Transmission identification

The 6-speed manual transmission 0A3 (All-wheel drive) is installed on the AudiA42001 --> in conjunction with the 4.2ltr. V8 gasoline engine.

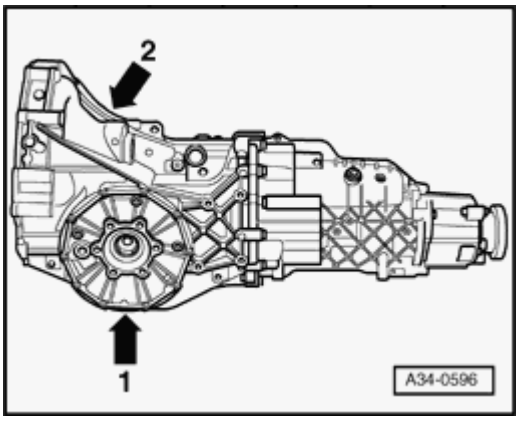

Fig. 1: Transmission Identification
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Location on transmission

- Code letters and serial number - **arrow1** -
- Manual transmission 0A3 - **arrow2** -

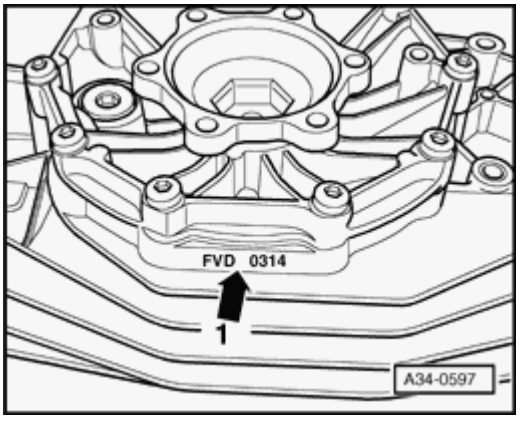

Fig. 2: Locating Code Letters And Transmission Serial Number
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Code letters and transmission serial number - **arrow1** -

Example:	FVD	0314
	I	I
	Code letters	Transmission serial number

Additional data are production-related.

NOTE:

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

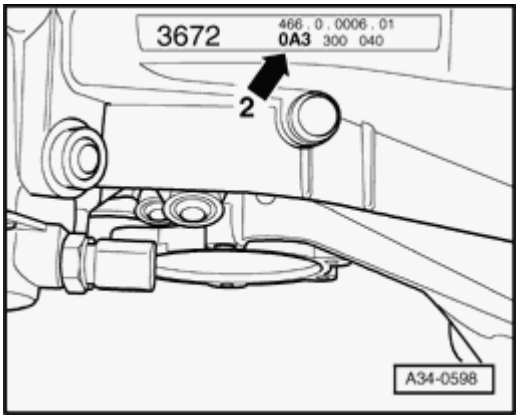

Fig. 3: Transmission Code Letters On The Vehicle Data Stickers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Manual transmission 0A3 - **arrow2** -

Code letters, assignment of mechanical units, transmission ratios, capacities

Manual transmission		6-speed 0A3, All wheel drive	
Code letters		FVD	FVD
Manufactured	from	11.02	01.04
	to	12.03	02.04
Allocation	Model	Audi A4 2001 -->	Audi A4 Cabriolet 2003-->
	Engine	4.2 ltr. - 253 kW S4	4.2 ltr. - 253 kW
Ratio	Final drive	35 : 9 = 3.889	35 : 9 = 3.889
$Z_2 : Z_1 = i$	1st gear	33 : 9 = 3.667	33 : 9 = 3.667
	2nd gear	41 : 20 = 2.050	41 : 20 = 2.050
	3rd gear	38 : 26 = 1.462	38 : 26 = 1.462
	4th gear	34 : 30 = 1.133	34 : 30 = 1.133
	5th gear	34 : 37 = 0.919	34 : 37 = 0.919
	6th gear	35 : 45 = 0.778	35 : 45 = 0.778
	Reverse gear	30 : 09 = 3.333	30 : 09 = 3.333

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Capacity	3.2 liters	
Specification	Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)	
Clutch operation	Hydraulic	
Clutch plate	240 mm	240 mm
Drive shaft flange	88 mm	88 mm
Overall ratio $i_{ov.}$ in top gear	3.025	3.025
Allocation of rear final driveCode letters	EXZ	EXZ

Rear final drive identification

Final drive 01R is assigned with manual transmission 0A3 (All wheel drive).

NOTE:

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

Location on final drive

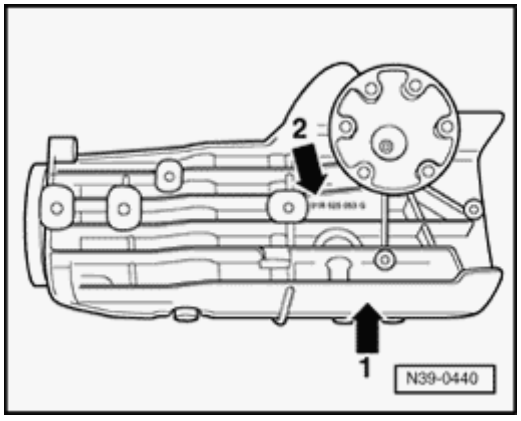

Fig. 4: Locations Of Final Drive Identification
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Final drive 01R - **arrow2** -

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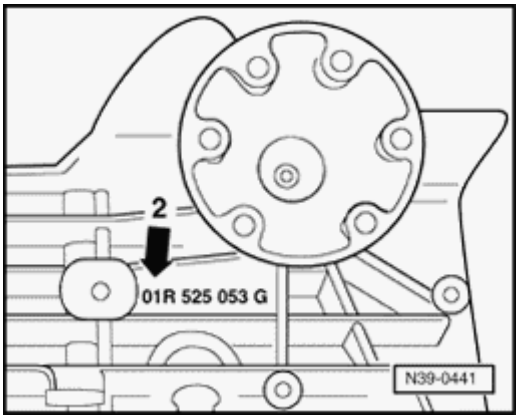

Fig. 5: Final Drive 01R
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Final drive 01R - **arrow2** -

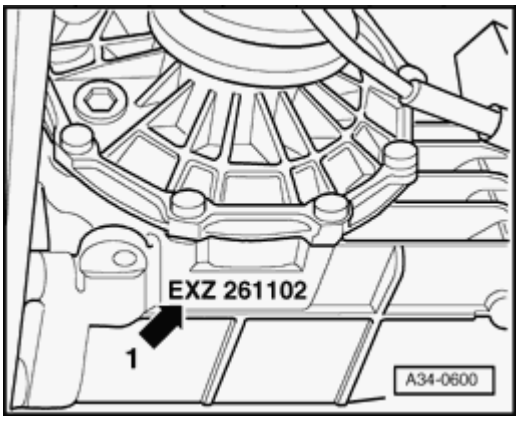

Fig. 6: Rear Final Drive Identification
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Example:	EXZ	26	11	02
	I	I	I	I
	I	I	I	I
	Code letters	Day	Month	Year of manufacture (2002)

Additional data are production-related.

Transmission layout

Identification

NOTE:

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

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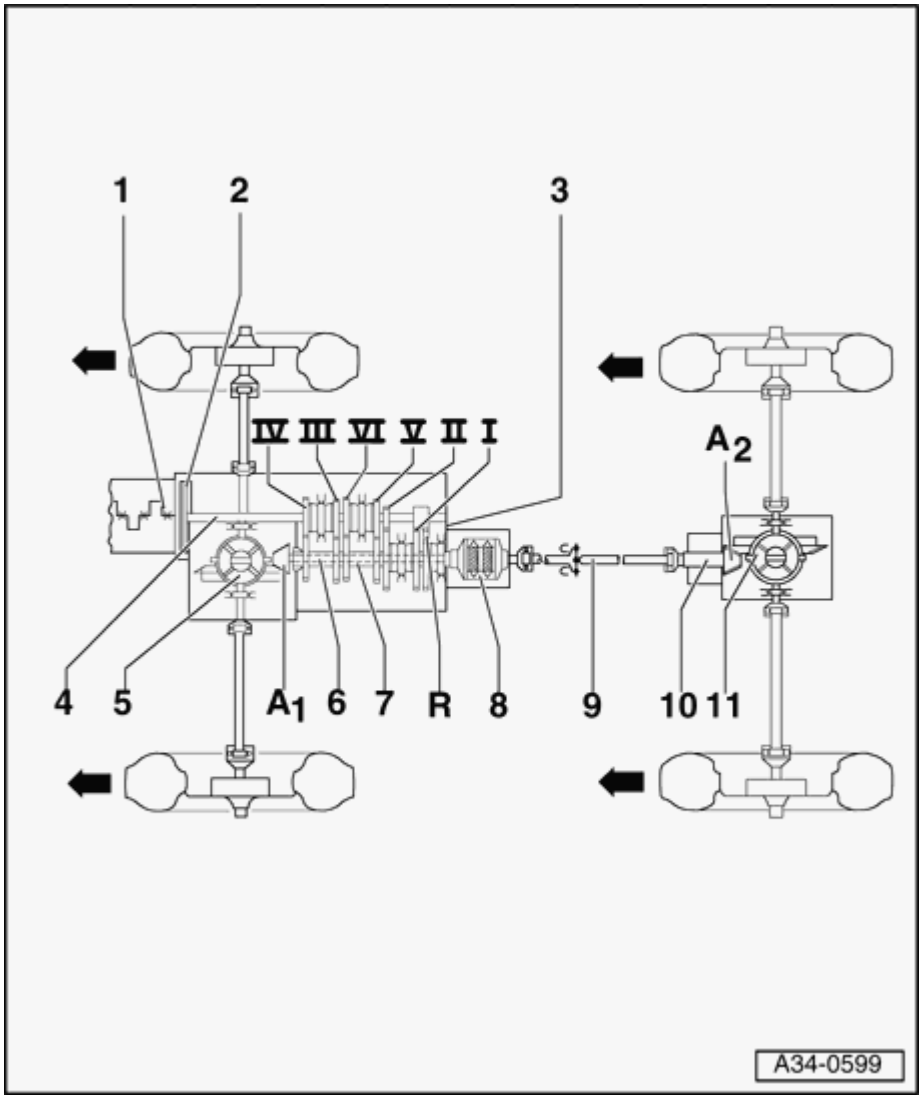

Fig. 7: Transmission Layout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Engine

2 - Clutch

3 - Manual transmission

4 - Input shaft (main shaft)

5 - Differential (front)

6 - Front pinion shaft (output shaft)

7 - Hollow shaft

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8 - Torsen differential

9 - Driveshaft

10 - Rear pinion shaft

11 - Differential (rear)

Ratio

NOTE:

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

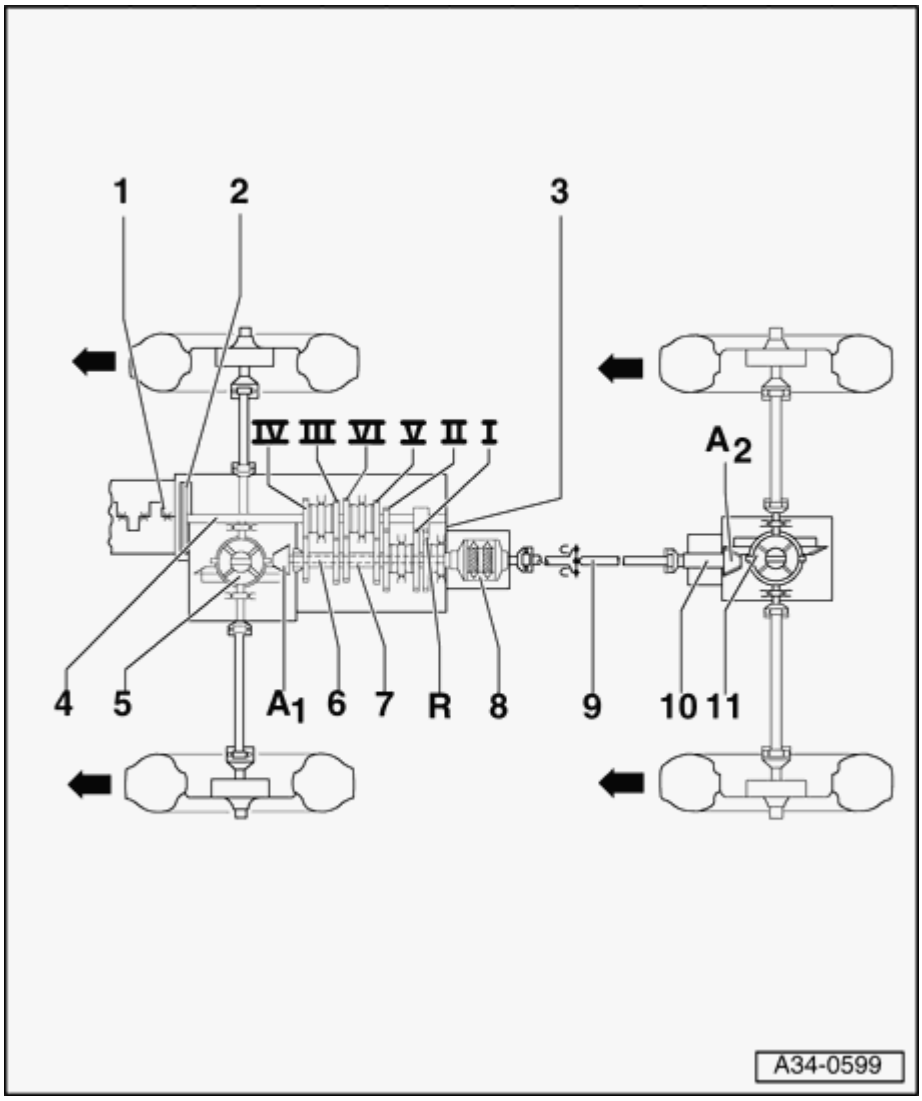

Fig. 8: Transmission Layout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - 1st gear

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II - 2nd gear

III - 3rd gear

IV - 4th gear

V - 5th gear

VI - 6th gear

R - Reverse gear

A1 - Front final drive

A2 - Rear final drive

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	$ZG_1 = 45$	$ZA_1 = 9$
Driven gear	$ZG_2 = 35$	$ZA_2 = 35$

Calculations:			
i_G	=	35 : 45 = 0.778	
i_A	=	35 : 9 = 3.889	
i_{ov}	=	0.778 x 3.889 = 3.025	

General repair instructions

Proper tools and the maximum possible care and cleanliness are essential for satisfactory transmission repairs. The usual basic safety precautions also naturally apply when carrying out repair work.

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A number of generally applicable instructions for the various repair procedures - which were previously repeated at numerous places in the article - are summarized under the designation "Components". They apply to the work described in this article.

Components

Transmission

- Select the correct bolts and other components according to transmission code letters --> **Code letters, assignment of mechanical units, transmission ratios, capacities**.
- When installing a new transmission, check the oil level and fill up with oil if necessary --> **Transmission gear oil, checking level**.
- Capacities and specifications --> **Code letters, assignment of mechanical units, transmission ratios, capacities**
- When installing a new rear final drive, check the oil level in the rear final drive and top off if necessary. Capacities and specifications --> **39 FINAL DRIVE, DIFFERENTIAL** .
- Thoroughly clean all joints and surrounding areas before dismantling.
- When installing transmission ensure 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.

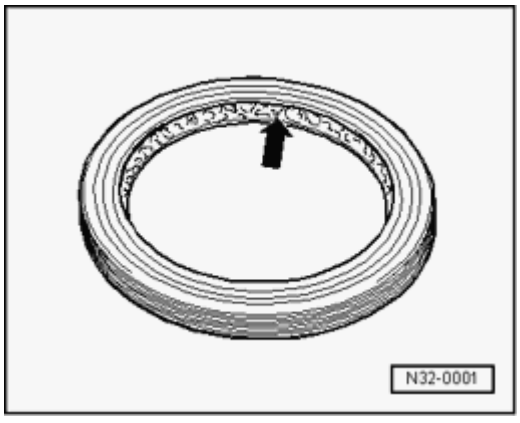

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Fig. 9: Identifying Space Between Oil Seal Sealing Lips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 being trapped and damaged when assembling.
- After replacing seals and gaskets, check and, if necessary, top off oil level in transmission --> **Transmission gear oil, checking level**.

Locking elements

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

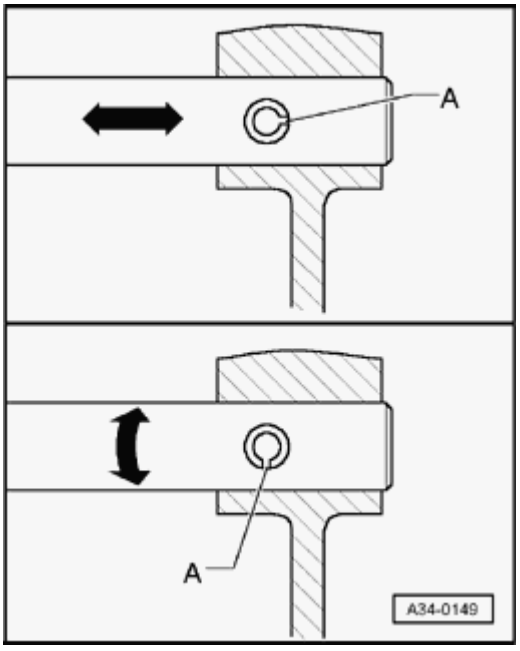

Fig. 10: Identifying Locking Elements
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Nuts, bolts

- Loosen the nuts and bolts in reverse sequence to the specified tightening sequence.

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- 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 apply **locking fluid AMV185101A1** to bolt threads before installing.
- Threaded holes which take self-locking bolts or bolts coated with locking fluid must be cleaned (using a 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.
- Do not install shims which are damaged or not in perfect condition.

Bearings

- Install needle bearings so the lettering (side with thicker metal) faces towards the installing tool.
- Grease needle bearing for transmission input shaft in rear of flywheel.
- Lubricate all bearings in transmission housing with gear oil before installing.

Clutch mechanism

- When removing transmission, remove clutch slave cylinder without disconnecting lines.
- Do not depress the clutch pedal after removing the clutch slave cylinder if the hydraulic line is still connected. Otherwise the piston will be pressed out of the clutch slave cylinder. As a result the clutch 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 --> **Clutch master cylinder and slave cylinder, notes on removing and installing**).
- The clutch system should be bled at the same intervals as the brake system.

- Note assembly instructions for SAC pressure plate --> **Clutch with SAC pressure plate, removing and installing**
- On vehicles with SAC pressure plate an adjuster ring has to be reset when only the clutch plate is replaced --> **Resetting adjuster ring in SAC clutch pressure plate**.
- If the clutch has burnt out, thoroughly clean the bell housing, flywheel and parts of the engine facing the transmission in order to prevent odors.

30 CLUTCH

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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**

  .
- **On vehicles equipped with a telematics system, activate the telematics control module service mode before disconnecting the battery. -->**
  - **91 - COMMUNICATION**
  - **91 RADIO, TELEPHONE, NAVIGATION, TRIP COMPUTER 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 brake fluid does not leak into footwell, plenum chamber or onto transmission below. If it does, area affected must be thoroughly cleaned.**
- **When working in footwell, use cloths to protect floor covering against brake fluid spillage.**

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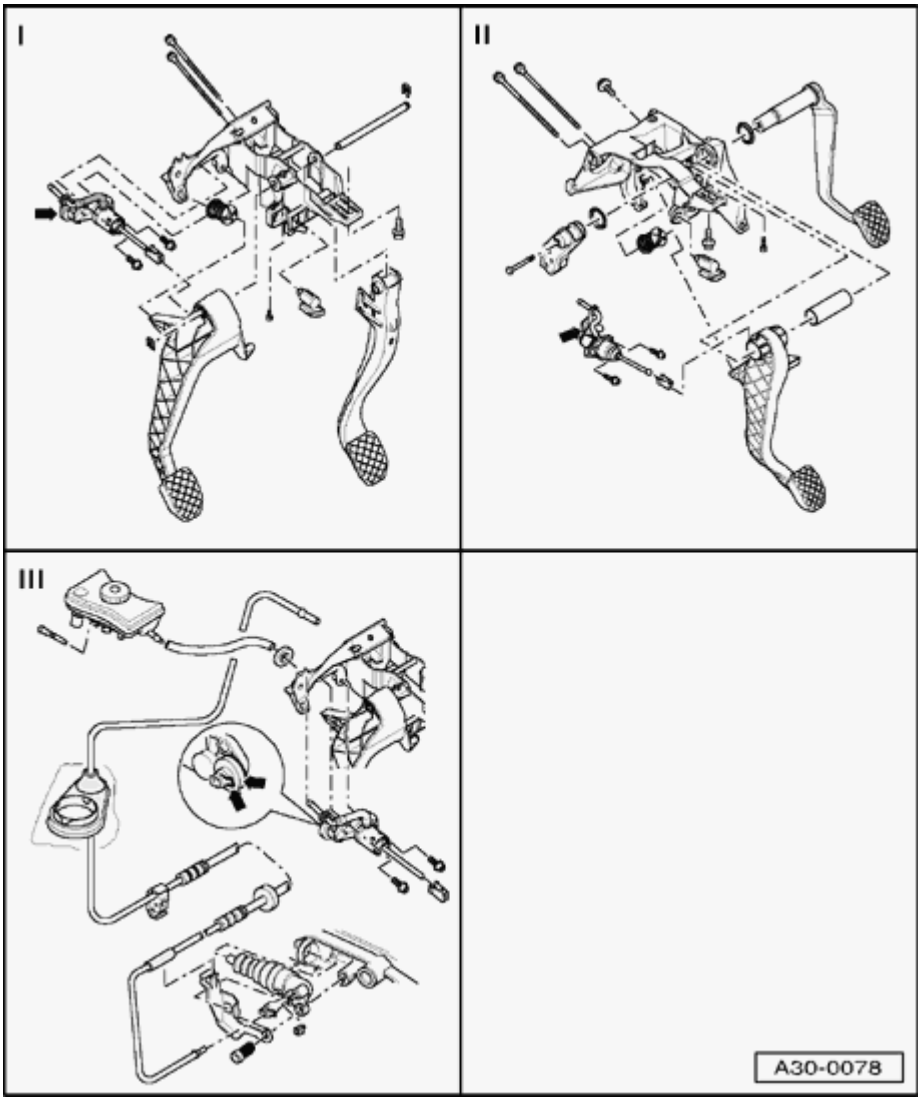

Fig. 11: Exploded View Of Pedal Cluster And Exploded View Of Hydraulic System
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - Pedal cluster - exploded view --> **Pedal cluster, assembly overview**

II - Pedal cluster (RHD vehicles) - exploded view

Not applicable for North American market

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

Pedal cluster, assembly overview

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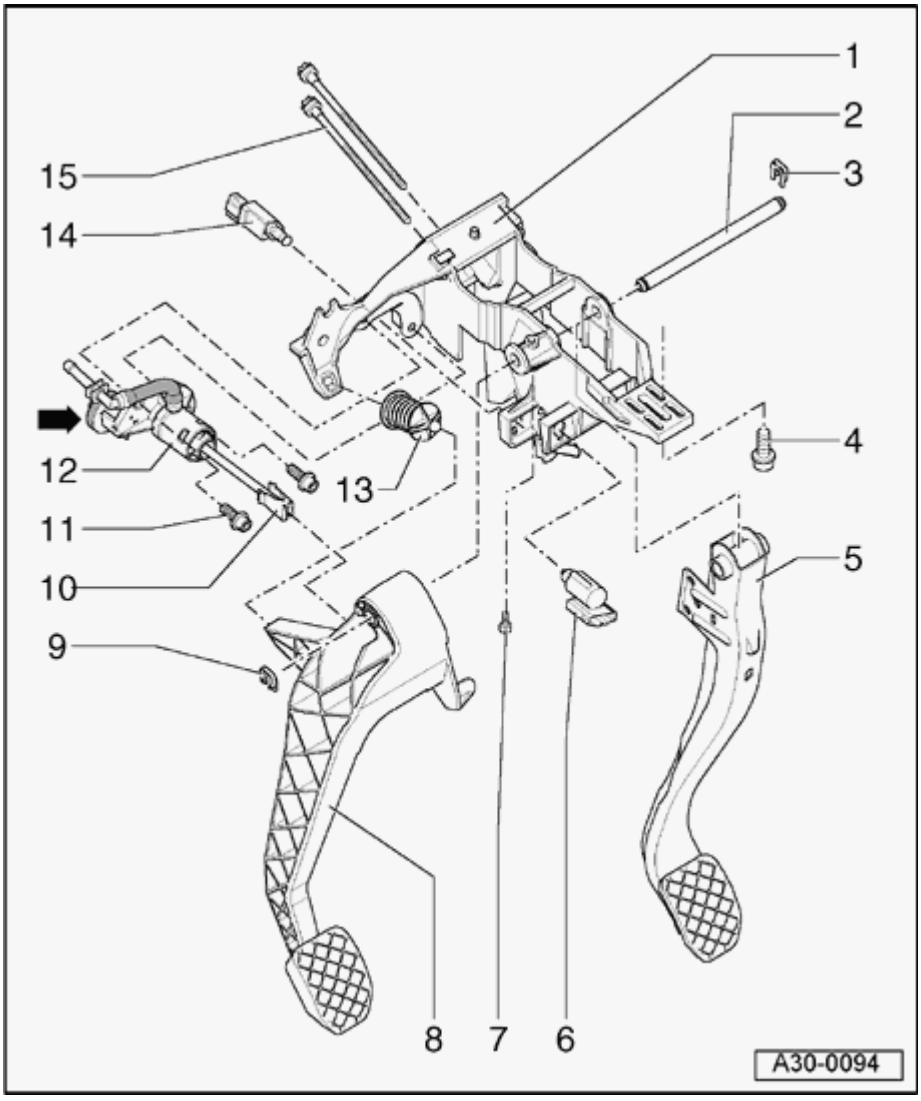

Fig. 12: Pedal Cluster, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Mounting bracket

- Removing and installing --> **Clutch master cylinder, removing and installing**

2 - Pivot pin for clutch and brake pedal

3 - Retaining clip

4 - Hexagon 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 - Hexagon socket head bolt, 5 Nm

- Secures clutch and brake pedal pivot pin

8 - Clutch pedal

- Removing and installing --> **Clutch master cylinder, removing and installing**

9 - Retaining clip

10 - Retaining clip

11 - Hexagon socket head bolt, 20 Nm

12 - Clutch master cylinder

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

13 - Over-center spring

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

14 - Clutch Pedal Starter Interlock Switch F194

- Only for USA vehicles
- Engine can only be started when clutch is fully depressed (Clutch Pedal Starter Interlock Switch F194 activated).
- Removing and installing
- Replace

- Do not re-install

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 F36 may only be installed once so as to ensure a firm fit.**

Removing

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

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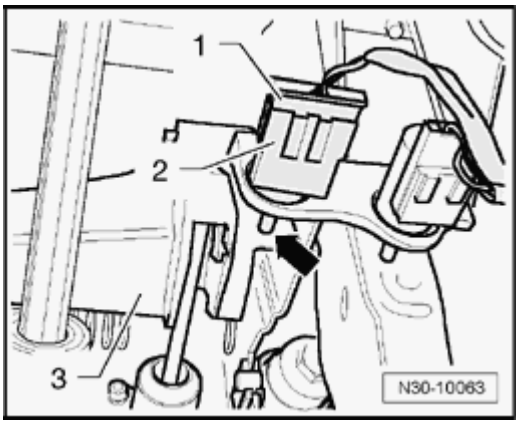

Fig. 13: Identifying Pedal Assembly And Clutch Pedal Switch F36
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 the Clutch Pedal Switch F36 should then rest against the clutch pedal.

- Release Clutch Pedal Switch F36 - **2** - by turning 45° counterclockwise and take out of guide.

Installing

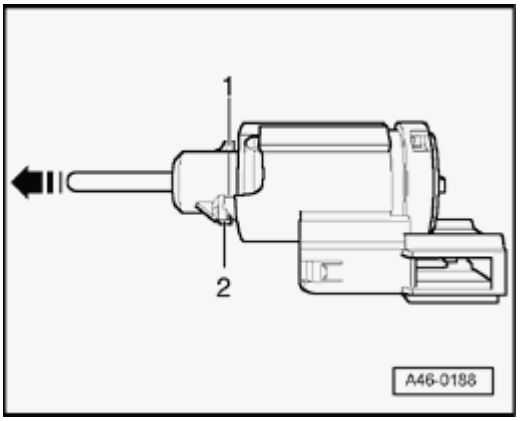

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Fig. 14: Pulling Out Switch Plunger & Identifying Retainer Tabs On Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation is performed in reverse of removal; note the following:

- Pull out operating rod - **arrow** - all the way before installing Clutch Pedal Switch F36.

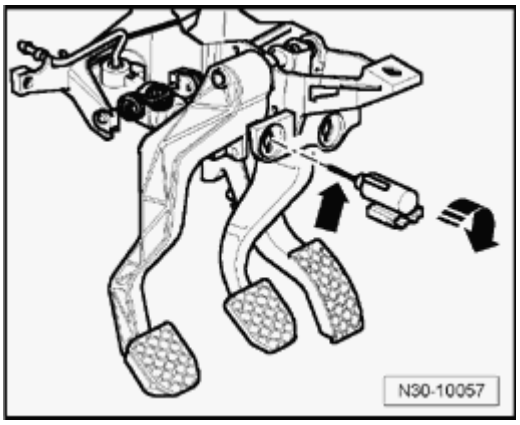

Fig. 15: Identifying Clutch Pedal Switch F36, Plunger
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Guide Clutch Pedal Switch F36 through mounting hole, press against clutch pedal and attach by turning 45° clockwise.
- Connect connector for Clutch Pedal Switch F36.
- 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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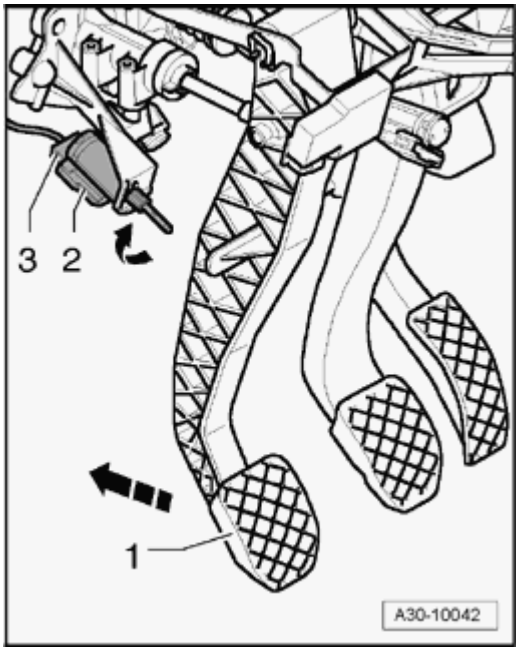

Fig. 16: Installing and Adjusting Clutch Pedal Starter Interlock Switch F194
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **3** - on clutch pedal switch for engine start.
- 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.

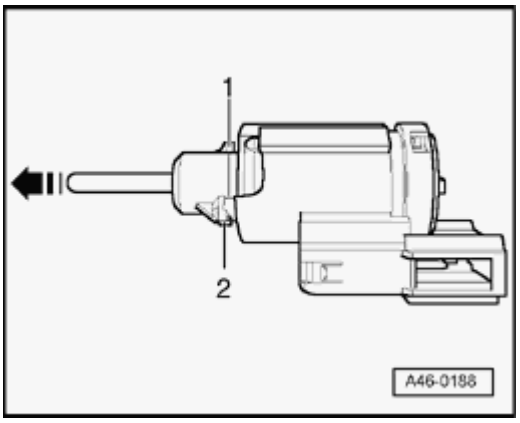

Fig. 17: Pulling Out Switch Plunger & Identifying Retainer Tabs On Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

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

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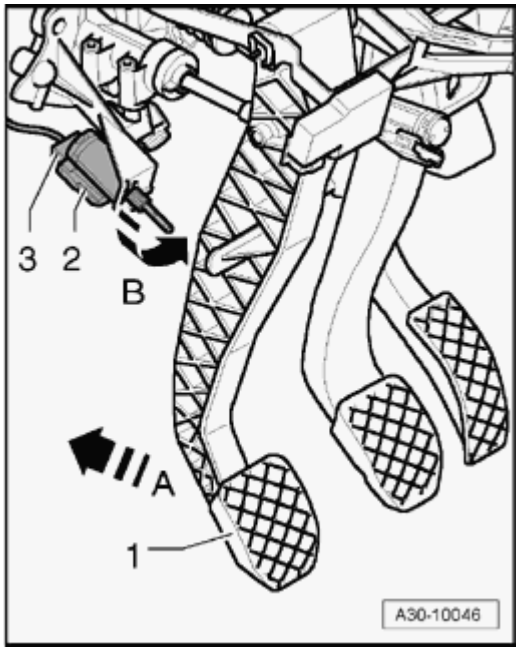

Fig. 18: Pressing Clutch Pedal All The Way Down And Pushing Operating Rod Against Clutch Pedal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing Clutch Pedal Starter Interlock Switch F194, press clutch pedal - **1** - all the way down - **arrowA** -. 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 - **arrowB** -.
- Attach electrical connector - **3** - on clutch pedal switch for engine start.
- 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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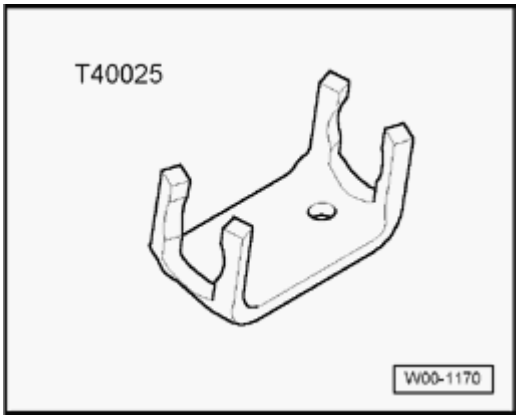

Fig. 19: T40025 Installation Clamp
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assembly clip T40025

Removing

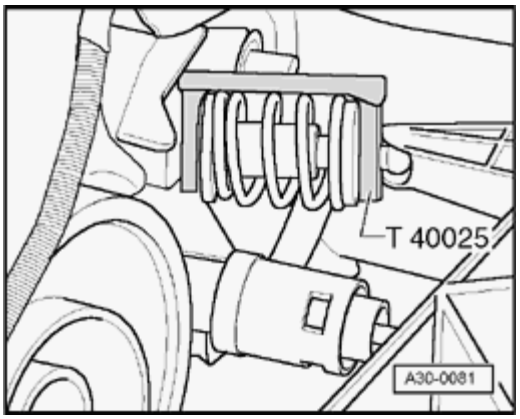

Fig. 20: Installation Clamp T40025 Installed On Over-Center Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Installing

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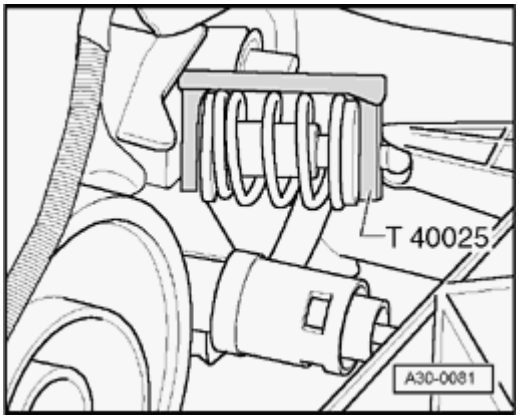

Fig. 21: Installation Clamp T40025 Installed On Over-Center Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull clutch pedal into the passenger compartment.
- Installation position of over-center spring: black side of over-center spring faces clutch pedal.
- Install over-center spring with assembly clamp T40025, operate clutch pedal and remove assembly clamp.

Hydraulic system, assembly overview

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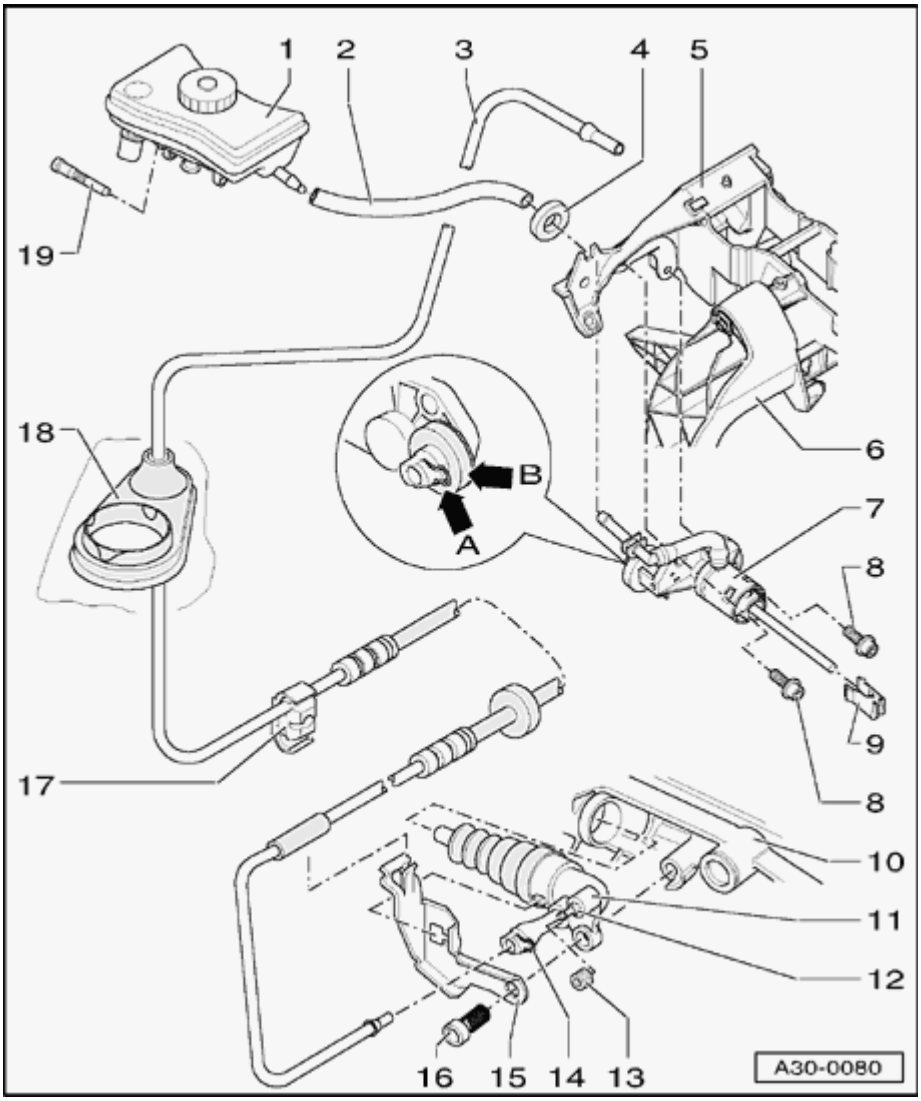

Fig. 22: Hydraulic System, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Brake fluid reservoir

2 - Supply hose

- For clutch master cylinder

3 - Line/hose assembly

- For plug-in connections on clutch master cylinder and slave cylinder
- Disconnecting from clutch master cylinder and installing --> **Clutch master cylinder, removing and installing**
- Disconnecting from clutch slave cylinder **Disconnecting clutch slave cylinder from hose/line assembly**

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4 - Grommet

5 - Mounting bracket

6 - Clutch pedal

7 - Clutch master cylinder

- Removing and installing --> **Clutch master cylinder, removing and installing**
- Do not remove clip - **arrowA** - or seal - **arrowB** -.
- To remove line/hose assembly, pull out clip - **arrowA** - , but only as far as limit stop **Clutch master cylinder, removing and installing**.

8 - Hexagon socket head bolt, 20 Nm

9 - Retaining clip

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

10 - Transmission

11 - Clutch slave cylinder

- Do not operate clutch pedal after slave cylinder has been removed.
- Removing and installing --> **Clutch slave cylinder on vehicles with 4.2 Liter V8 engine (S4), removing and installing**
- Bleed clutch slave cylinder after working on hydraulic clutch mechanism --> **Hydraulic clutch system, bleeding**
- Disconnecting hose/line assembly **Disconnecting clutch 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 --> **Hydraulic clutch system, bleeding**.
- If bleeder valve has broken off, it can be removed with 3 mm Allen key

13 - Dust cap

14 - Clip

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

15 - Bracket

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

16 - Hexagon socket head bolt, 25 Nm

- Clutch slave cylinder to transmission
- Self-locking
- Replace

17 - Retaining clip

18 - Seal

19 - Securing bolt

- For brake fluid reservoir

Removing retaining clip - A - in direction of - arrow -

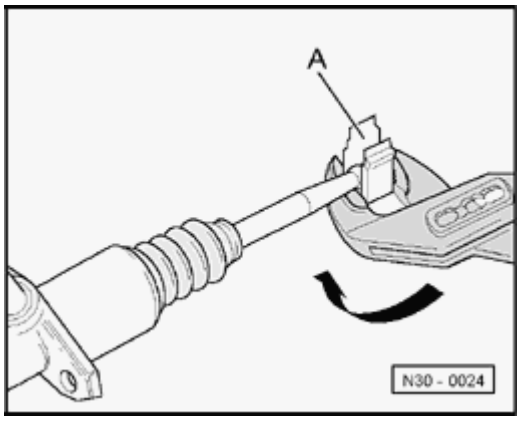

Fig. 23: Removing Retainer By Prying
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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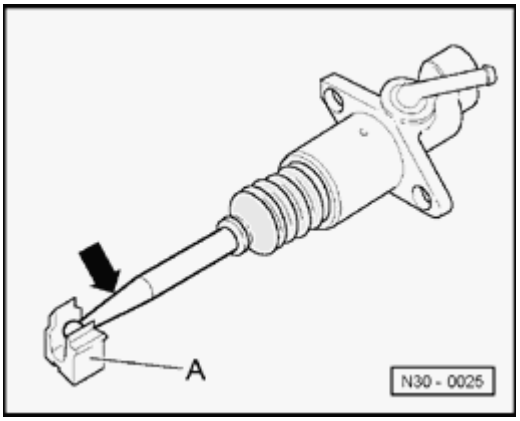

Fig. 24: Installing Clutch Master Cylinder Operating Rod In Retainer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Disconnecting clutch slave cylinder from hose/line assembly

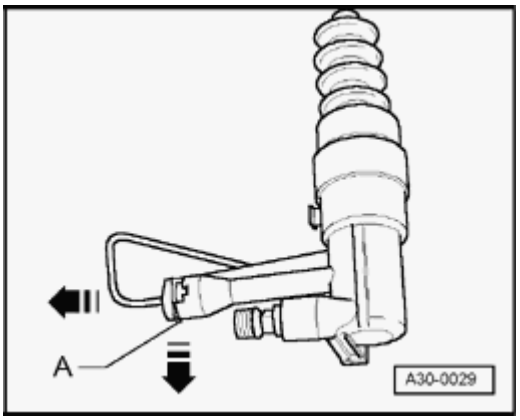

Fig. 25: Removing Hydraulic Line From Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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

Installing

- Press retaining clip - **A** - in as far as it will go.
- Push hose/line assembly into clutch slave cylinder until it engages audibly.
- Pull on line/hose assembly to check it is secure.

Clutch master cylinder and slave cylinder, notes on removing and installing

- Before replacing the clutch master cylinder or slave cylinder on the assumption that it is defective you must 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 you feel an unusually strong point of resistance when depressing the clutch pedal, you must not press it down further. The operating 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.

Clutch master cylinder and slave cylinder, function check

Before replacing the master and/or slave cylinder, perform the appropriate checks in the case of the following errors:

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 faulty 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 --> **Hydraulic clutch system, bleeding**.

High pedal force:

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

Pedal forces:

Conventional clutch:

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

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 --> **Hydraulic clutch 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) defective, replace needle bearing -->
  - **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK** for BHF
  - **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK** for BPG

  .
- Foreign material in clutch system
- Mechanically defective pressure plate/clutch plate --> **Clutch, servicing**
- Wrong components used or components forgotten when performing repair work (e.g. intermediate plate).

Clutch master cylinder, removing and installing

Special tools, testers and auxiliary items required

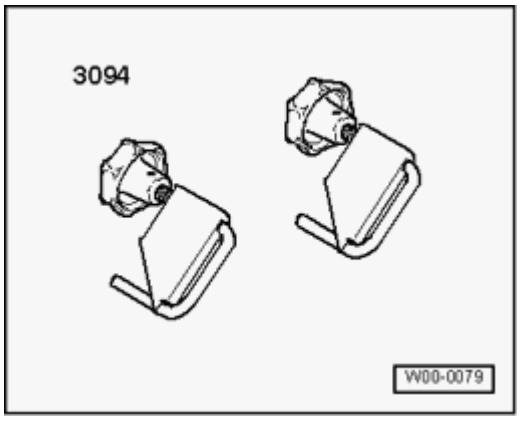

Fig. 26: Identifying Hose Clamps 3094
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamps, up to Ø 25 mm 3094

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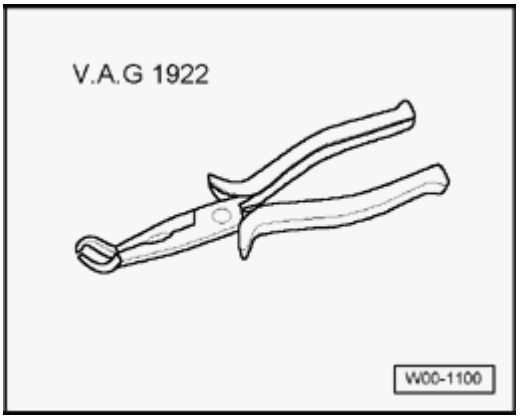

Fig. 27: Identifying Spark Plug Connector Pliers V.A.G 1922
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pliers V.A.G 1922

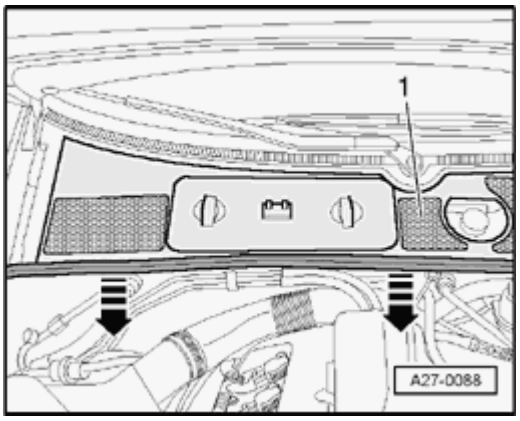

Fig. 28: Identifying Plenum Chamber Cover & Removing Rubber Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

CAUTION:

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

  .
- **On vehicles equipped with a telematics system, activate the telematics control module service mode before disconnecting the battery -->**
  - **91 - COMMUNICATION**
  - **91 RADIO, TELEPHONE, NAVIGATION, TRIP COMPUTER for Cabriolet**

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.

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

.

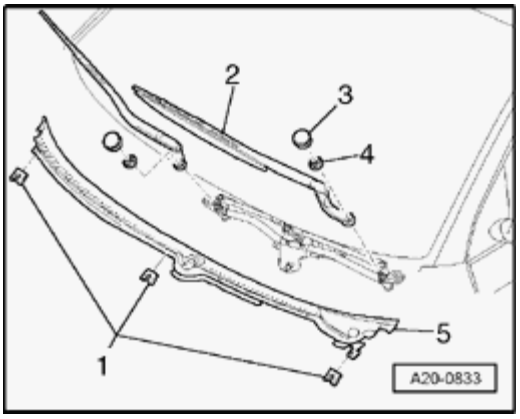

Fig. 29: Removing Securing Clips And Cowl
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry off the two caps - **3** -.
- Remove nuts - **4** - and remove the two wiper arms - **2** -.
- Remove clips - **1** - and disconnect cowl panel grille - **5** -.

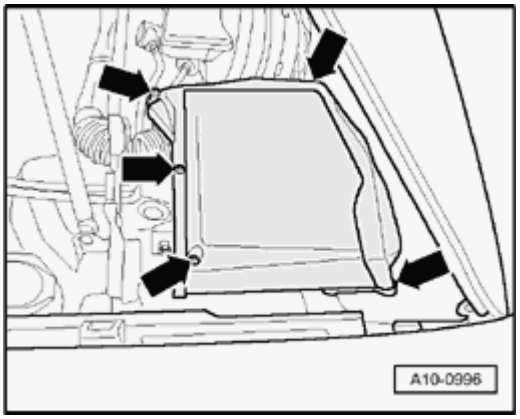

Fig. 30: Removing Screws And Cover From E-Box In Plenum Chamber
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Remove the electronics box from the plenum chamber as follows:

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- Unscrew bolts - **arrows** - and take off the cover.

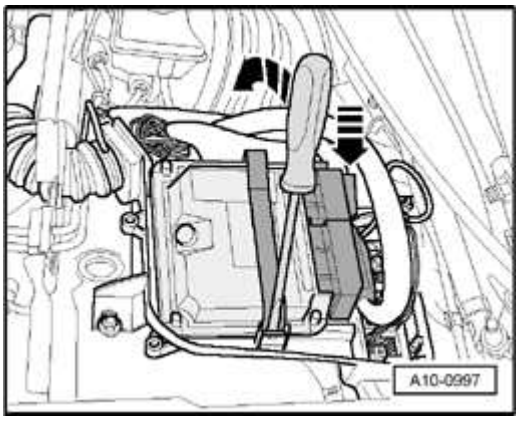

Fig. 31: Using Screwdriver To Remove Retainer Bar And Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

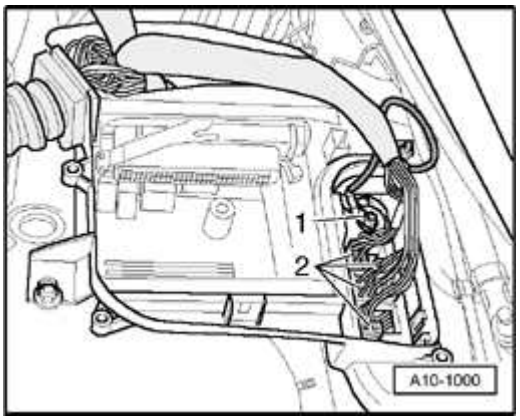

Fig. 32: Connector At Connector Rail And Wire
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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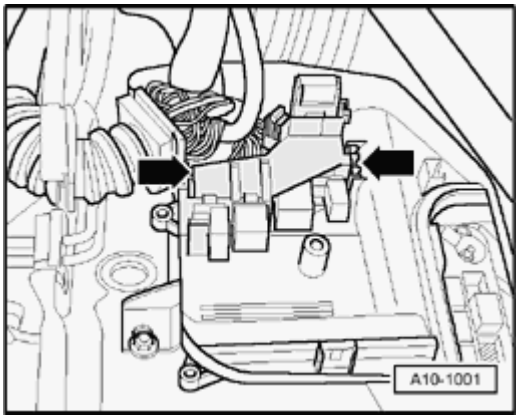

Fig. 33: Locating Auxiliary Relay Carrier Catches
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.

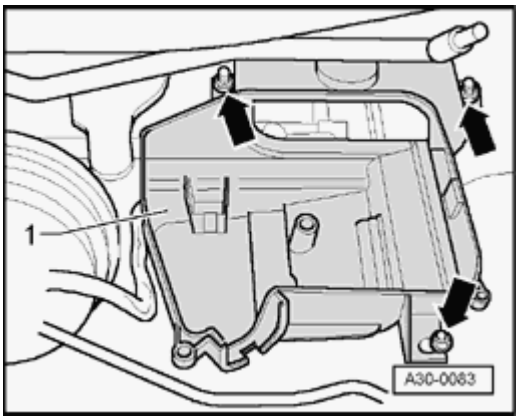

Fig. 34: Electronics Box Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.**

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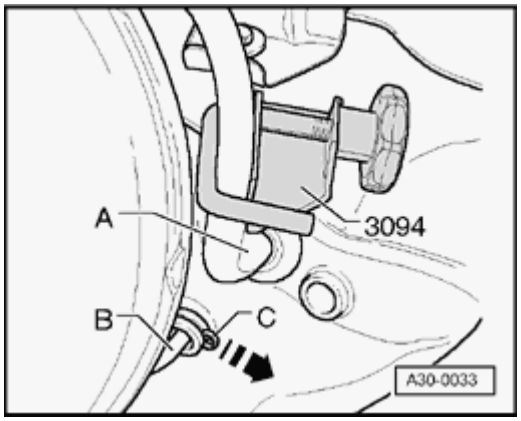

Fig. 35: Identifying Brake Fluid Reservoir Return Hose Grommet
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

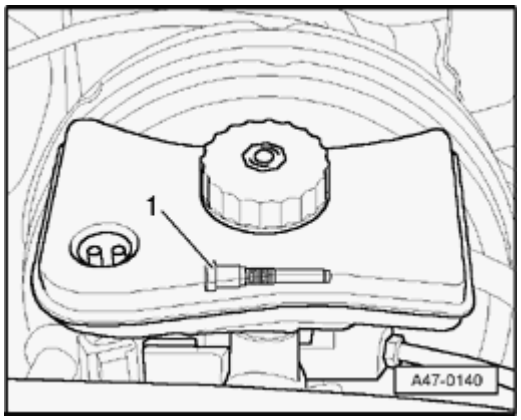

Fig. 36: Location Of Brake Fluid Reservoir Dowel Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

- **The brake fluid reservoir does not have to be removed.**

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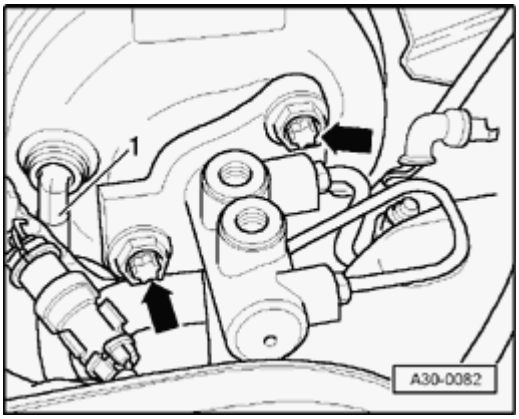

Fig. 37: Location Of Brake Servo Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

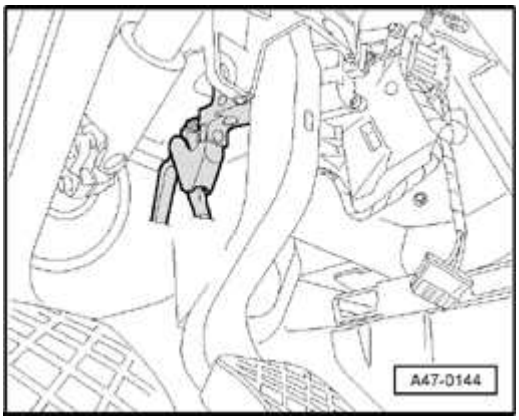

Fig. 38: Brake Pedal At Brake Servo
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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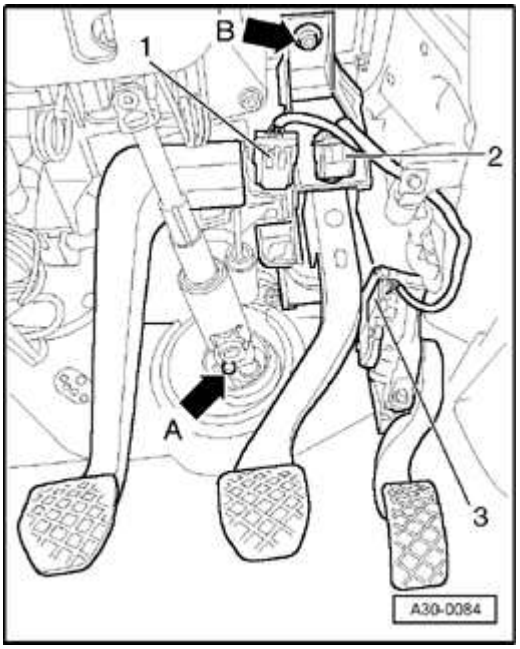

Fig. 39: Locating Steering Column At Steering Gear And Disconnecting Connector On Clutch Pedal Switch, Brake Pedal Switch And On Accelerator Pedal Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect steering column from steering box - **arrowA** - --> **48 - STEERING** .
- Disconnect connectors at clutch pedal switch - **1** - , brake pedal switch - **2** - and at accelerator pedal module - **3** -.
- If installed, disconnect connector from Clutch Pedal Starter Interlock Switch F194.
- Remove securing bolt for mounting bracket - **arrowB** - and remove entire pedal cluster.

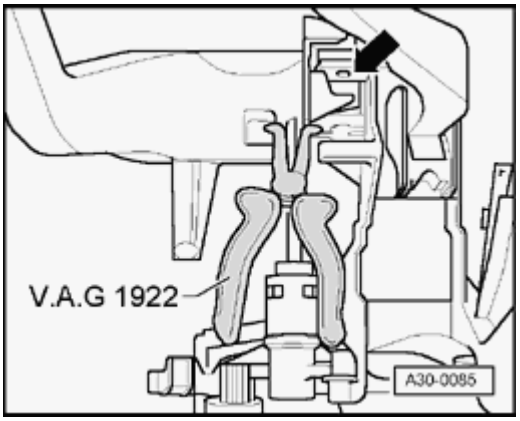

Fig. 40: Pressing Retainer Together And Detaching Clutch Pedal From Master Cylinder Using VAG 1922
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Release master cylinder operating rod from clutch pedal as follows:

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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.**

- Insert pliers V.A.G 1922 in recesses on clutch pedal, press on sides of retaining clip and Disconnect clutch pedal from master cylinder.

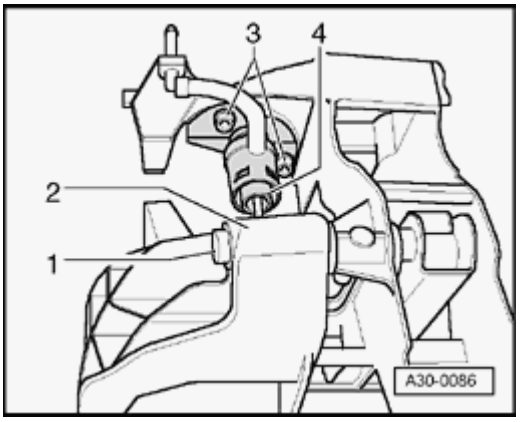

Fig. 41: Identifying Retaining Clip, Clutch Pedal, Bolts And Master Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

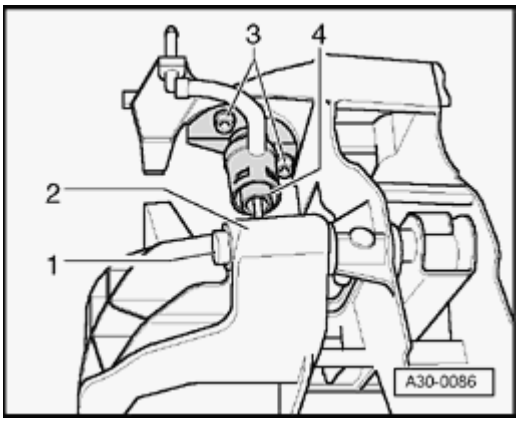

Fig. 42: Identifying Retaining Clip, Clutch Pedal, Bolts And Master Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

Installation is performed in reverse sequence; note the following:

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

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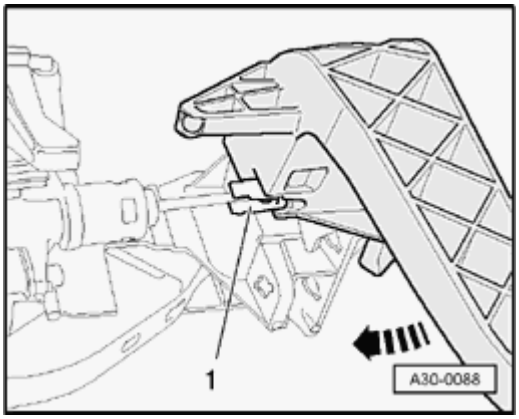

Fig. 43: Pushing Clutch Pedal To Lock Into Place, While Making Sure Mount Is Properly Secured In Clutch Pedal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install 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.

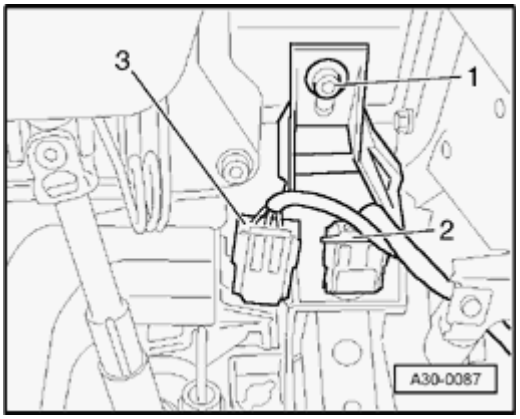

Fig. 44: Location Of Clutch Pedal Switch F36 And Pedal Assembly Securing Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A second technician is required for the next step.

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

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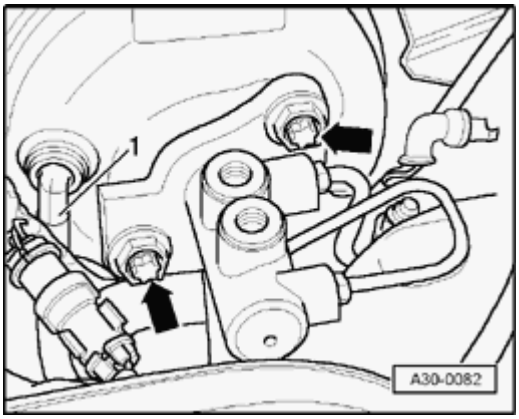

Fig. 45: Location Of Brake Servo Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

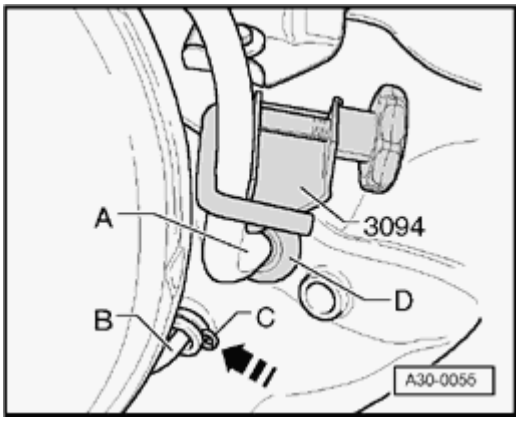

Fig. 46: Installing Rubber Grommet And After-Run Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in retaining clip - **C** - as far as it will go.
- Insert hose/line assembly - **B** - in clutch 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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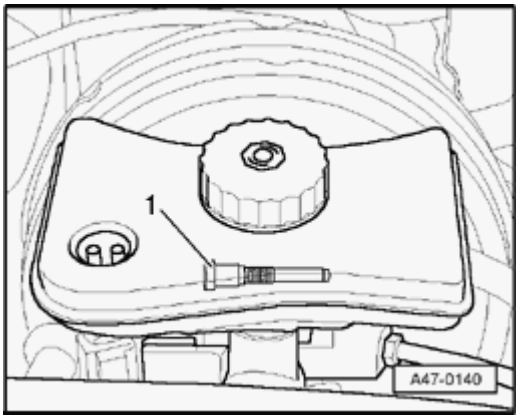

Fig. 47: Location Of Brake Fluid Reservoir Dowel Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Screw in securing bolt - **1** - for brake fluid reservoir and Connect connector at brake fluid level warning contact.

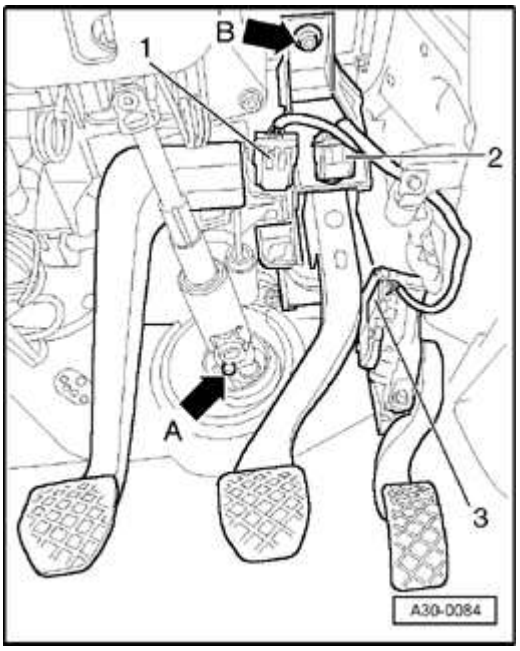

Fig. 48: Locating Steering Column At Steering Gear And Disconnecting Connector On Clutch Pedal Switch, Brake Pedal Switch And On Accelerator Pedal Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten hexagon socket head bolt - **arrowB** - for securing pedal cluster to instrument panel carrier to 25Nm.
- Connect connectors - **1** - , - **2** - and - **3** -.
- If installed, attach connector for Clutch Pedal Starter Interlock Switch F194.
- Connect brake pedal to brake servo --> **47 - BRAKES - HYDRAULIC COMPONENTS** .

- Secure steering column to steering box - **arrowA** - --> **48 - STEERING** .

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

  .
- Bleed clutch system --> **Hydraulic clutch system, bleeding**.

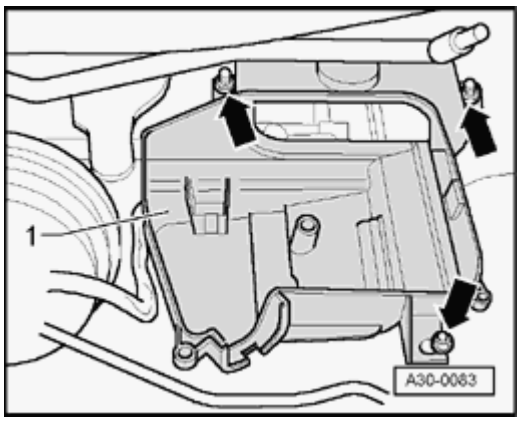

Fig. 49: Electronics Box Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install electronics box and tighten nuts -arrows- to 4Nm.
- Route engine wiring harness and Connect connector in connector console.
- Install engine control module --> **24 MULTIPORT FUEL INJECTION (MFI)** .
- 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

  .

NOTE:

- **Upon re-connecting the battery, remember to check and activate the vehicle equipment (radio, clock, convenience electrics etc.).**

Hydraulic clutch system, bleeding

Special tools, testers and auxiliary items required

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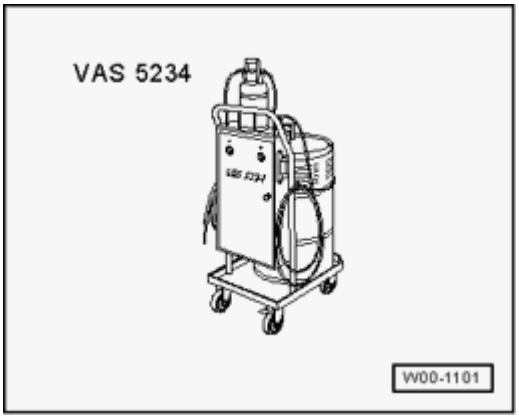

Fig. 50: Identifying Brake Filler And Bleeder Unit VAS 5234
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Brake filling and bleeding equipment VAS 5234 or brake filling and bleeding equipment V.A.G 1869
- 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 back the clutch pedal to the normal position 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 charge and bleed equipment V.A.G1869 or VAS 5234, but do not switch on at this stage.

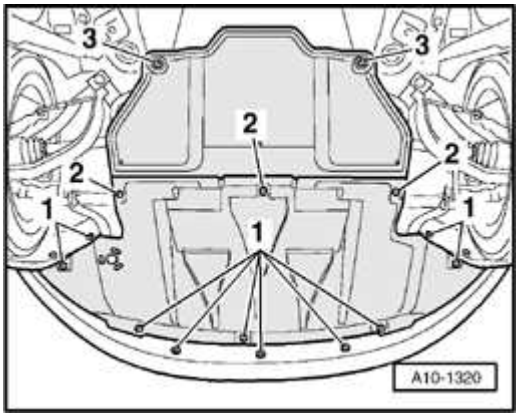

Fig. 51: Identifying Quick-Release Fasteners And Noise Insulation

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove rear part of noise insulation - **2 to 3** -.

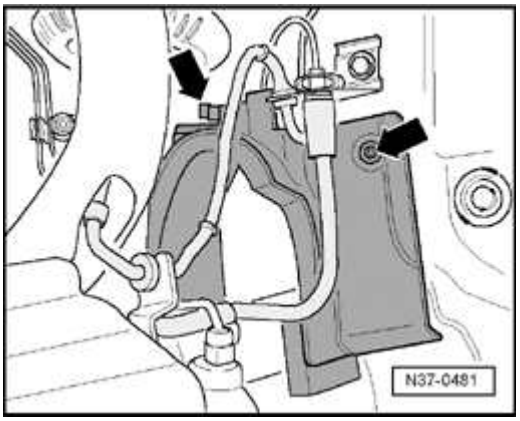

Fig. 52: Axle Shaft Noise Insulation Retainers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

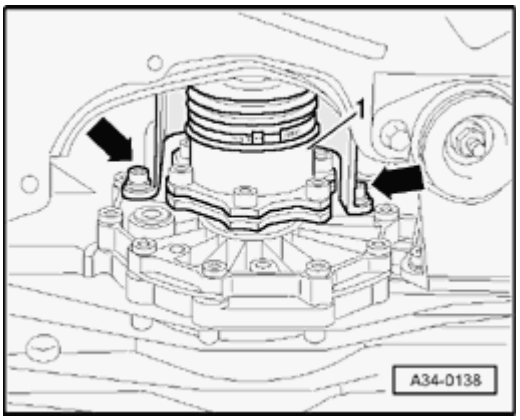

Fig. 53: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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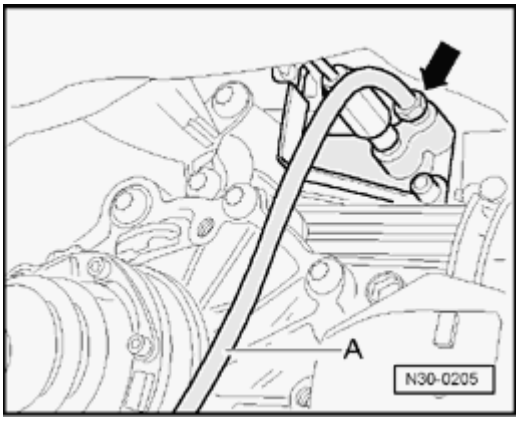

Fig. 54: Connecting Bleeder Hose To Clutch Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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:

- **Ensure 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.
- Bolt heat shield for drive shaft onto transmission.

Tightening torque

Component	Nm
Heat shield for drive shaft to transmission	23

CLUTCH RELEASE MECHANISM, SERVICING

Clutch release mechanism, servicing

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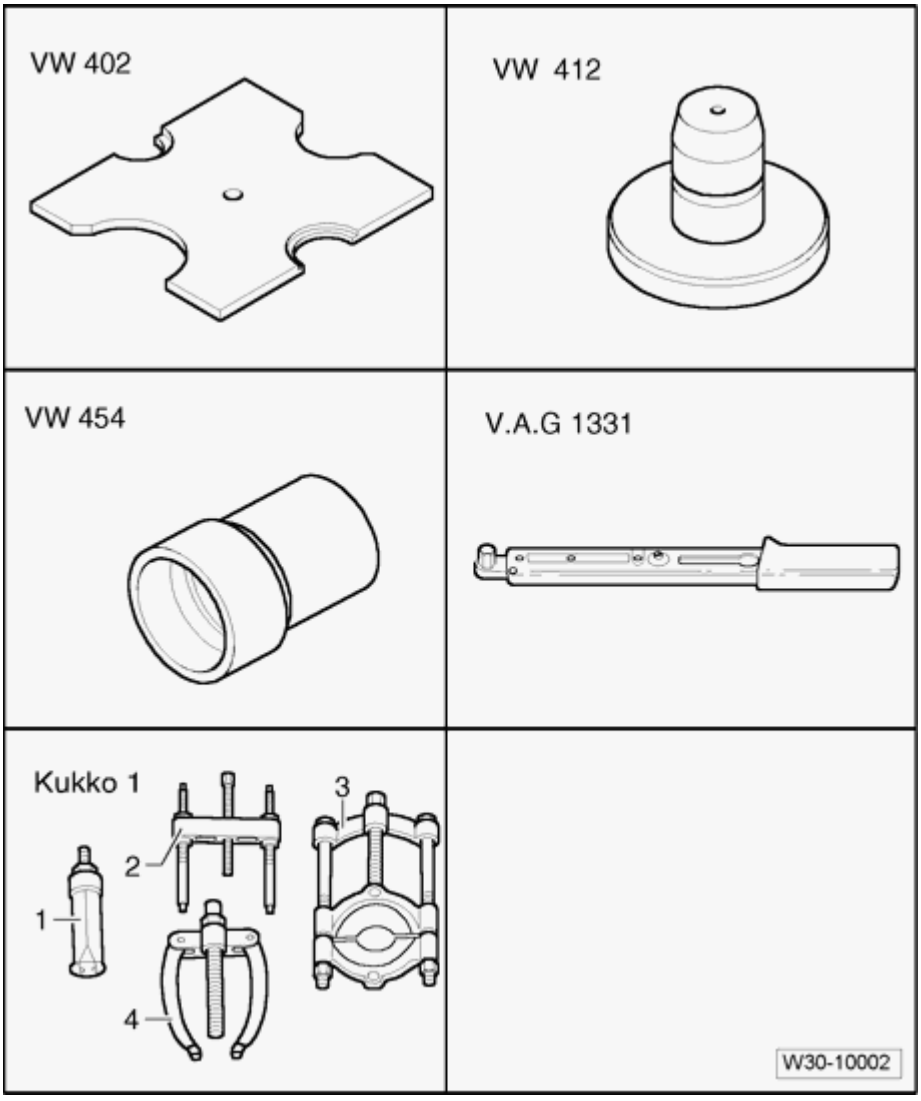

Fig. 55: Identifying Special Tools - Clutch Release Mechanism, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 402
- Press tool VW 412
- Press tool VW 454
- Torque wrench V.A.G 1331

- **- 1 -** Internal puller Kukko 21/5
- **- 4 -** Counter-support Kukko 22/1
- **Sealing grease G 052 128 A1**
- **Copper grease Z 381 351 TE**

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- **Adhesive AMV 195 KD1 01**

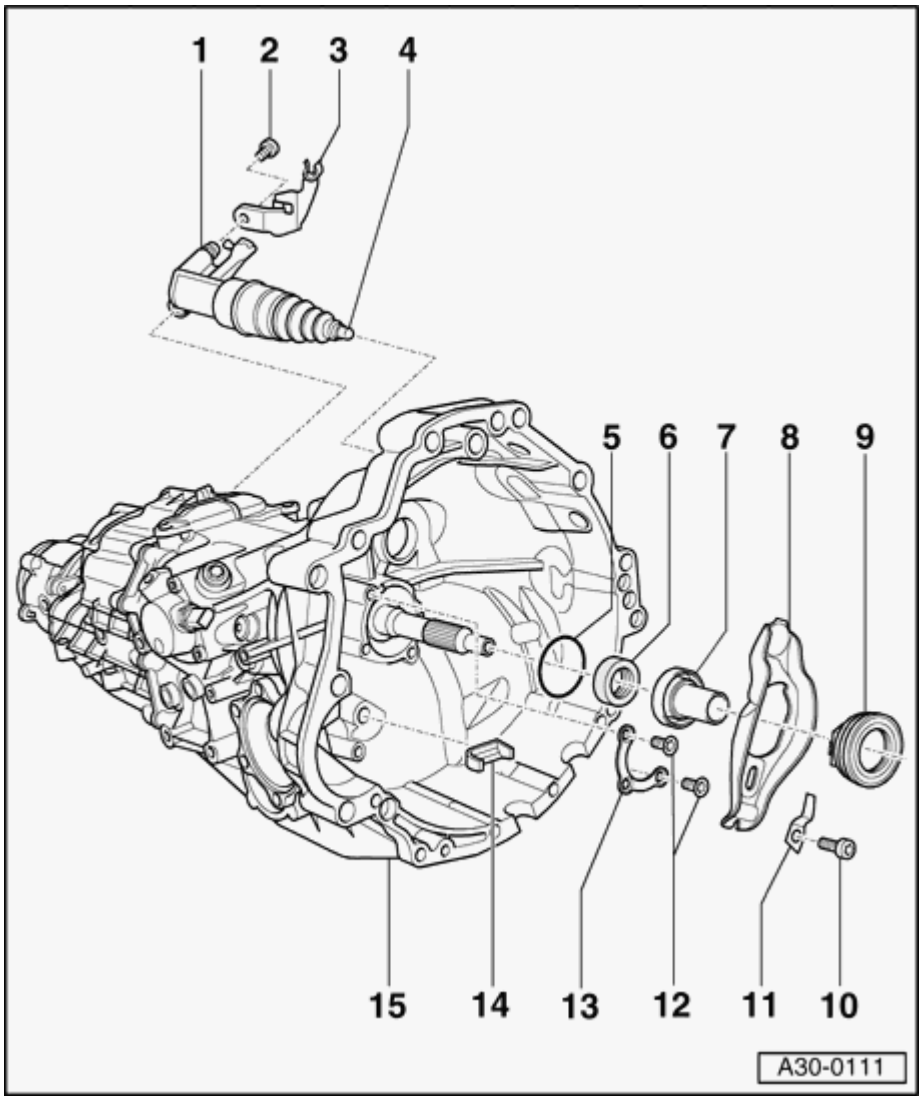

Fig. 56: Clutch Release Mechanism Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Clutch slave cylinder

- Removing and installing on vehicles with 8-cylinder engine --> **Clutch slave cylinder on vehicles with 4.2 Liter V8 engine (S4), removing and installing**
- Do not operate clutch pedal after slave cylinder has been removed.
- Follow correct procedure when bleeding --> **Hydraulic clutch system, bleeding**.
- Tighten bleeder valve to 4.5Nm.

- When installing, push in until the securing bolt can be installed.

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2 - Hexagon socket head bolt, 23 Nm

- Clutch slave cylinder to transmission
- Self-locking
- Replace

3 - Bracket

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

4 - Operating rod

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

5 - O-ring

- Always replace **Replacing O-ring**
- Lubricate with gear oil before installing

6 - Oil seal

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

7 - Guide sleeve

- Removing **Removing and installing guide sleeve**

8 - Clutch release lever

- Removing **Clutch release lever, removing and installing**
- Before installing, lubricate area which makes contact with operating rod of slave cylinder with **copper grease Z381351TE** .

9 - 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**

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mechanically attached plastic ring

- Replace if groove worn on plastic ring is too deep **Checking release bearing with mechanically attached plastic ring**
- Retainer lugs on release bearing must engage in release lever

10 - Bolt, 24 Nm

- Self-locking
- Replace

11 - Leaf spring

12 - Bolt, 24 Nm

- 2 x
- Self-locking
- Replace

13 - Retaining piece

- For guide sleeve

14 - Intermediate piece

- Replace if damaged

15 - Transmission

Clutch release lever, removing and installing

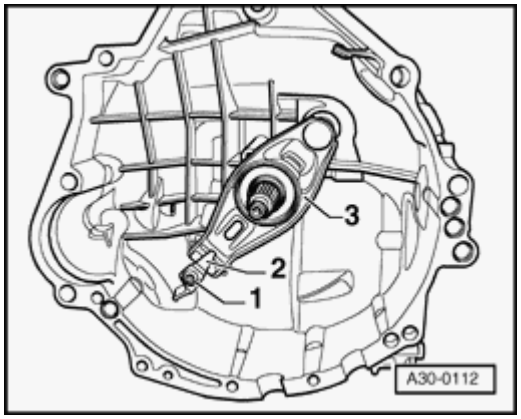

Fig. 57: Clutch Release Lever Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Removing

- Loosen bolt - **1** - and remove leaf spring - **2** -.
- Remove clutch release lever - **3** - with release bearing.
- Disengage retaining tabs of release bearing at release lever.

Installing

- Before installing clutch release lever, apply a thin coat of **copper grease Z381351TE** to contact surface for operating rod of clutch slave cylinder.
- Install clutch release lever - **3** - with release bearing onto guide sleeve.
- Install leaf spring - **2** - and tighten new bolt - **1** - to 24Nm.

Checking and servicing release bearing with glued plastic ring

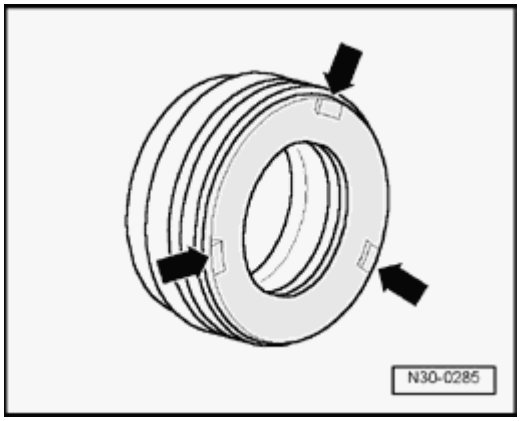

Fig. 58: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Identification: inner side of plastic ring has three lugs - **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 the loose plastic ring back onto the bearing with **adhesive AMV195KD101** .

The three square lugs - **arrows** - on the plastic ring engage in the recesses of the bearing ring.

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

Checking release bearing with mechanically attached plastic ring

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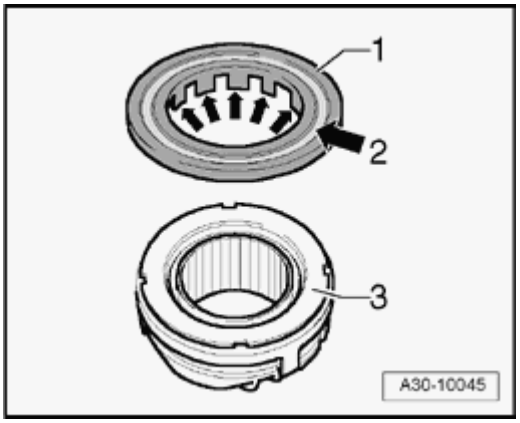

Fig. 59: Checking Release Bearing With Plastic Ring Attached
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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.

Removing and installing guide sleeve

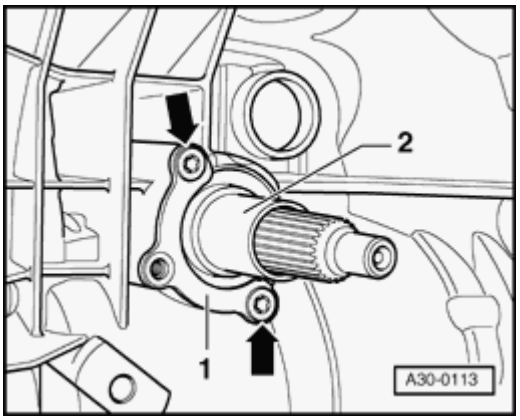

Fig. 60: Guide Sleeve Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Unscrew bolts - **arrows** - and remove retaining piece - **1** -.
- Pull guide sleeve - **2** - out of transmission housing.

Installing

- Replace O-ring in transmission housing **Replacing O-ring**.
- Install a thin insulating hose tightly over splines of input shaft.

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- Pack space between sealing lip and dust lip with **sealing grease G 052 128 A1** .
- Lightly oil outer circumference of guide sleeve.

- Push guide sleeve - **2** - over input shaft and into transmission housing.
- Remove insulating hose.
- Secure retaining piece - **1** - with new bolts - **arrows** -.

Replacing O-ring

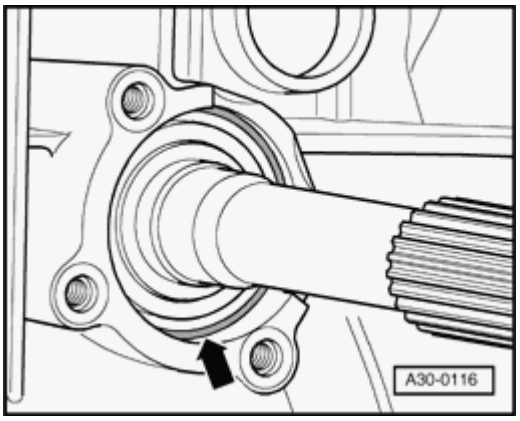

Fig. 61: O-Ring Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove O-ring - **arrow** - using a small screwdriver.
- Lubricate new O-ring with gear oil before installing.

Removing input shaft oil seal

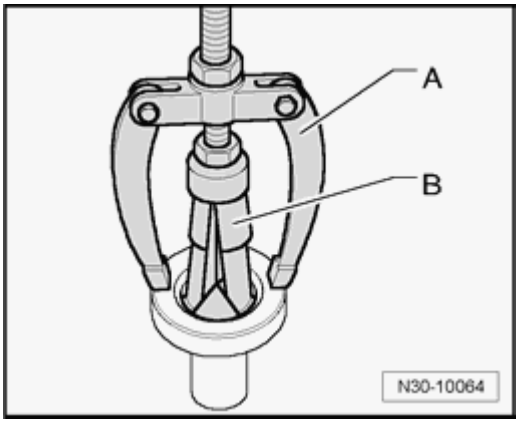

Fig. 62: Removing Input Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Internal puller 30 to 37 mm, e.g. - **Kukko 21/5** -

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Installing input shaft oil seal

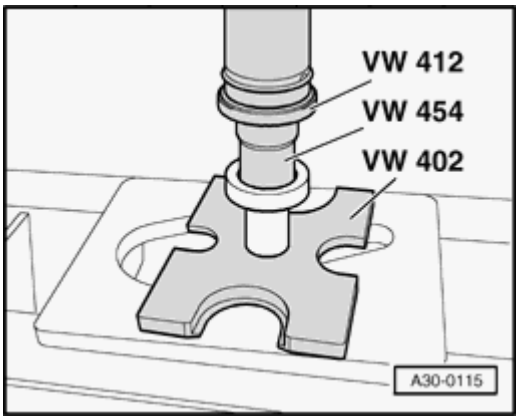

Fig. 63: Installing Input Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly lubricate outer circumference of seal with gear oil.
- Press in oil seal for input shaft as far as it will go.

- The open side of seal faces towards press tool VW 454.

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

Clutch slave cylinder on vehicles with 4.2 Liter V8 engine (S4), removing and installing

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

Special tools, testers and auxiliary items required

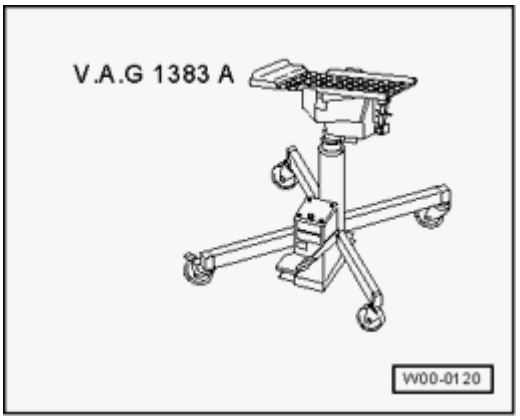

Fig. 64: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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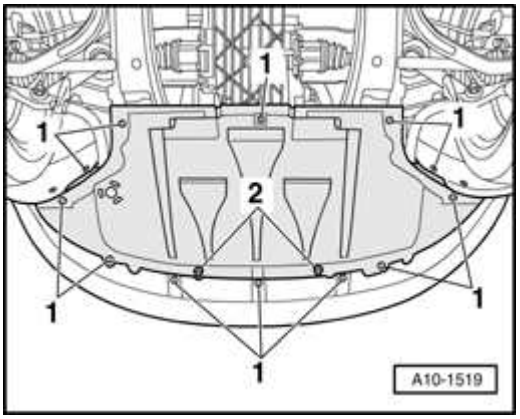

Fig. 65: Removing Quick-Release Fasteners, Screws And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Release quick release fasteners - **1** - , unscrew bolts - **2** - and remove noise insulation.

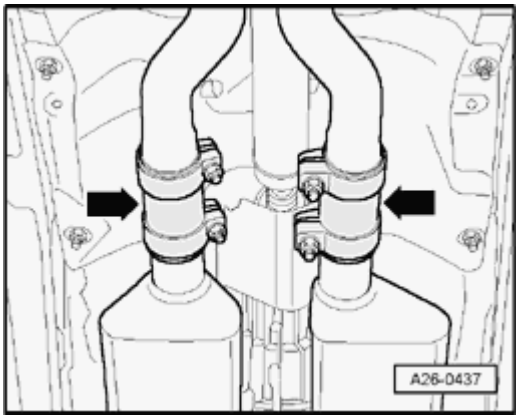

Fig. 66: Loosening Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.**

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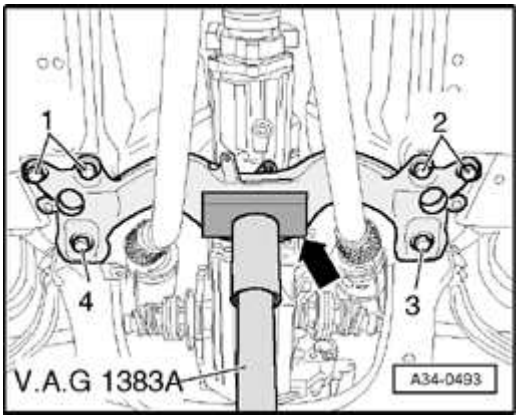

Fig. 67: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove universal mounting V.A.G 1359/2 from engine and transmission jack V.A.G 1383 A and place a wooden block - **arrow** - on the lifting column in its place.
- Support the rear cross member with engine and transmission jack V.A.G 1383 A.
- First unscrew bolts - **1** - and - **2** - , then bolts - **3** - and - **4** -.

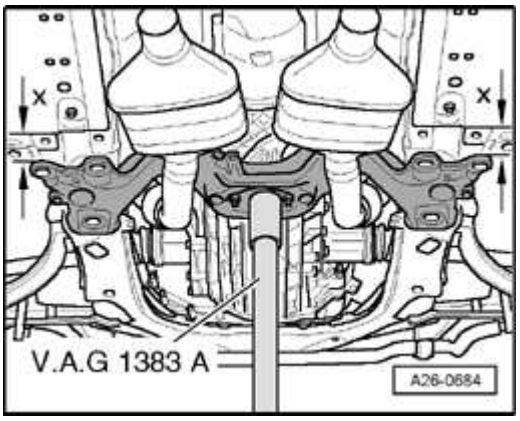

Fig. 68: Identifying Distance Between Cross Member And Body Reaches Dimension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lower rear cross member slowly with engine and transmission jack V.A.G 1383 A until distance between rear cross member and body reaches dimension - **x** -.

- Dimension - **x** - = 60 mm

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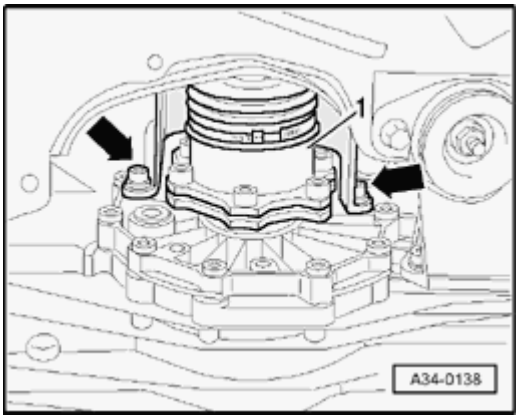

Fig. 69: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for drive shaft (left-side).
- Unbolt drive shaft - **1** - from flange shaft and move clear to the front.

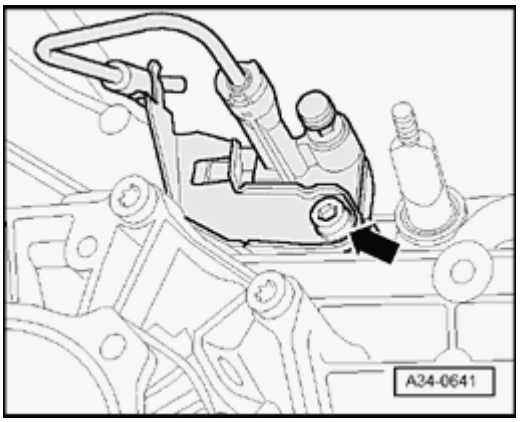

Fig. 70: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - and take out clutch slave cylinder from the 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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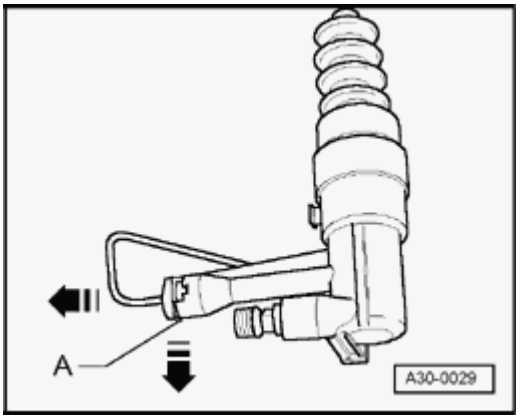

Fig. 71: Removing Hydraulic Line From Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing

Installation is performed in reverse sequence; note the following:

NOTE:

- **Do not allow brake fluid to come into contact with the transmission. If necessary, clean the transmission housing.**
- **If the clutch slave cylinder is inserted at an angle, there is a danger that the operating rod will be guided past the clutch release lever.**
- **To facilitate assembly, engage 6th gear before fitting slave cylinder.**
- **When installing, press in slave cylinder so that securing bolt can be installed easily.**

- Always replace securing bolt.

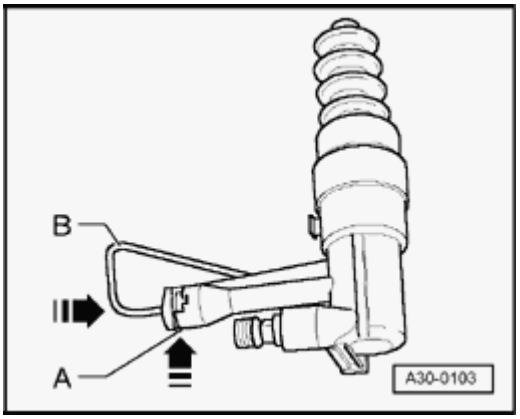

Fig. 72: Identifying Slave Cylinder Hose/Line Assembly
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- To connect line to clutch slave cylinder, press in retaining clip - **A** - as far as it will go.
- Push line - **B** - into clutch slave cylinder until it engages audibly.

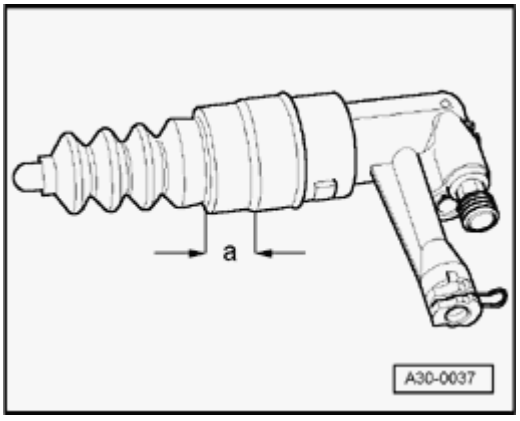

Fig. 73: Coat Boot Area Of Clutch Slave Cylinder With Lithium Grease
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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** .

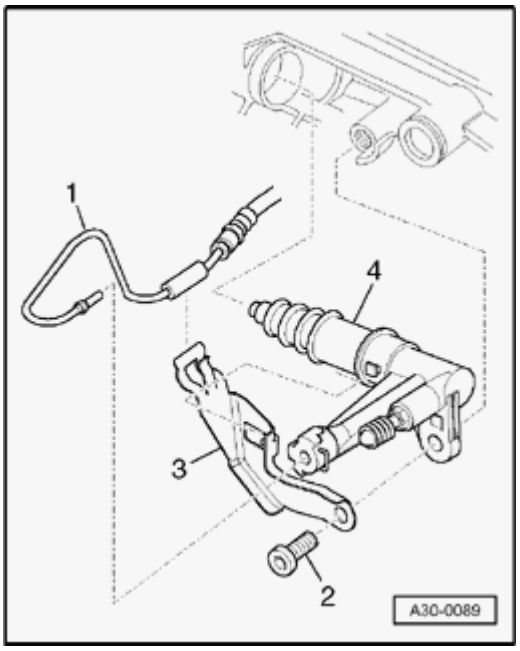

Fig. 74: Clutch Slave Cylinder, Bracket And Hose/Line Assembly
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engage bracket for hose/line assembly - **3** - at slave cylinder - **4** -.

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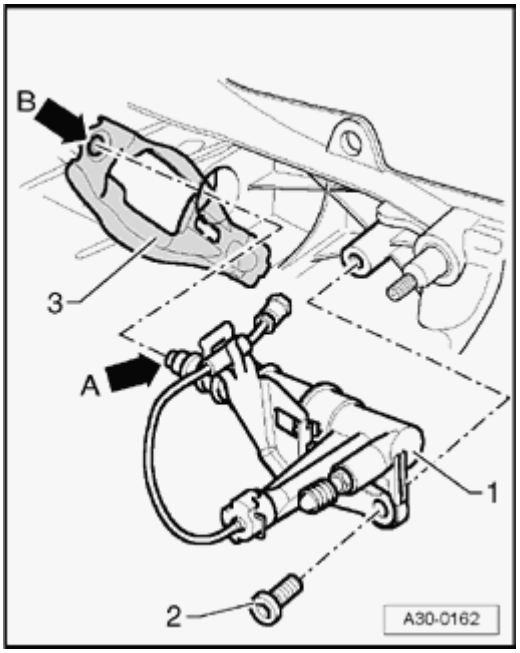

Fig. 75: Guiding Slave Cylinder Into Bore Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 hexagon 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 -.**

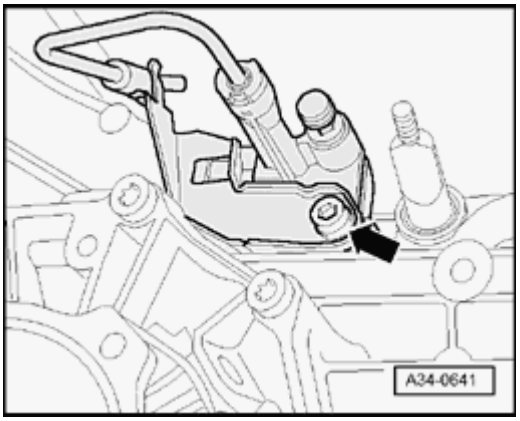

Fig. 76: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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CAUTION: 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 operating 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.

- Bolt drive shaft to flange shaft --> **40 - FRONT SUSPENSION**
- Bolt heat shield for drive shaft onto transmission.
-
- Install tunnel cross member --> **40 - FRONT SUSPENSION**
- Install exhaust system so it is free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

Tightening torques

Component	Nm
Clutch slave cylinder to transmission	23 * See note
Heat shield for drive shaft to transmission	23

* Replace bolt

CLUTCH, SERVICING

Clutch, servicing

NOTE:

- **Refer to general repair instructions --> General repair instructions.**
- **Before replacing the clutch plate and pressure plate Fault-finding No.9 - Defects on the clutch and clutch mechanism.**
- **Observe the notes on removing and installing clutch master cylinder and slave cylinder --> Clutch master cylinder and slave cylinder, notes on removing and installing.**
- **On vehicles with SAC pressure plate (self-adjusting clutch) an adjuster ring has to be reset when only the clutch plate is replaced--> Resetting adjuster ring in SAC clutch pressure plate.**

- 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 distortion, cracks and burns**.
- 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

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- 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 backwards and forwards on 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 burnt out, thoroughly clean the bell housing, flywheel and parts of the engine facing the transmission in order to prevent odors.

Clutch with SAC pressure plate (LuK version), servicing

NOTE:

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

  - Please refer to notes --> **Clutch, servicing**.

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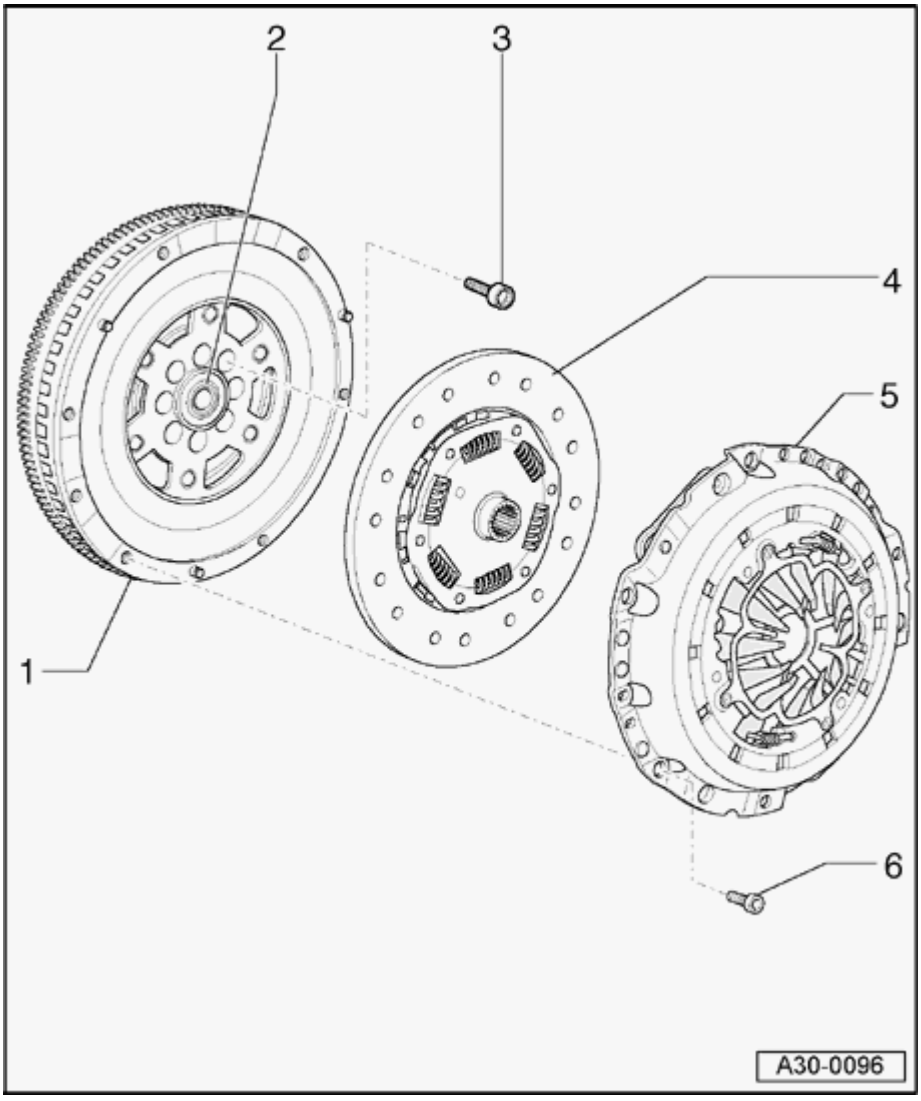

Fig. 77: Clutch With SAC Pressure Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The transmission has to be removed before working on the clutch --> **Transmission, removing and installing**.

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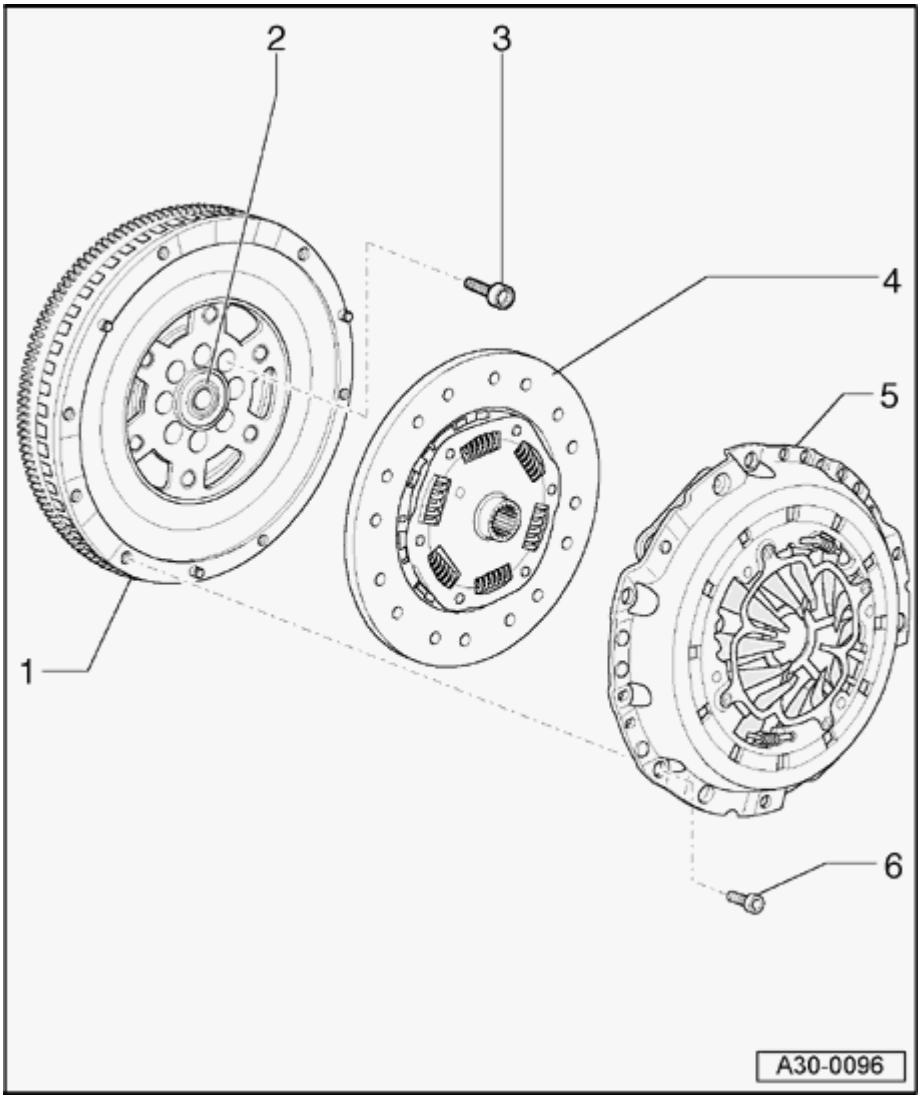

Fig. 78: Clutch With SAC Pressure Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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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- Replace
- Bolt length: 22.5 mm; 60 Nm + 90° further
- Bolt length: 43 mm; 60 Nm + 180° further
- Observe instructions for removal **Removing dual-mass flywheel**

4 - Clutch plate

- Installation position: Clutch lining must make full contact with flywheel
- The marking "Transmission end" (transmission side), if provided, faces towards pressure plate/transmission.
- Coil springs (damper assembly) point towards pressure plate and transmission
- Clutch plate diameter --> **Code letters, assignment of mechanical units, transmission ratios, capacities**

5 - SAC pressure plate

- Removing and installing --> **Clutch with SAC pressure plate, removing and installing**
- Resetting adjuster ring --> **Resetting adjuster ring in SAC clutch pressure plate**
- Check ends of diaphragm spring **Checking ends of diaphragm spring**
- Check that pressure plate is not distorted **Check SAC pressure plate for distortion, 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

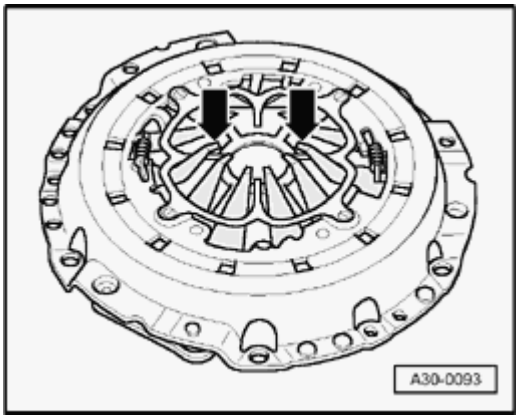

Fig. 79: Checking Ends Of The Diaphragm Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- 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

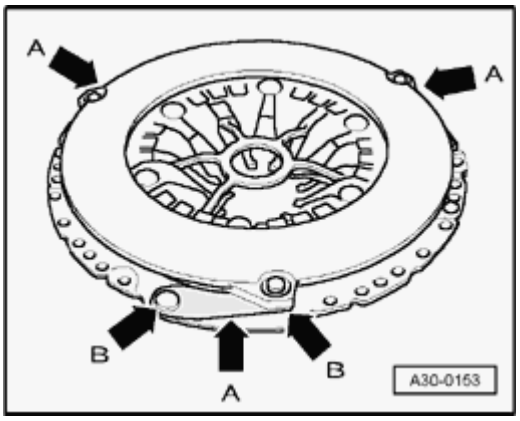

Fig. 80: Checking Spring And Rivet Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check spring connections - **arrowsA** - for damage and make sure riveted fastenings - **arrowsB** - 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 distortion, cracks and burns

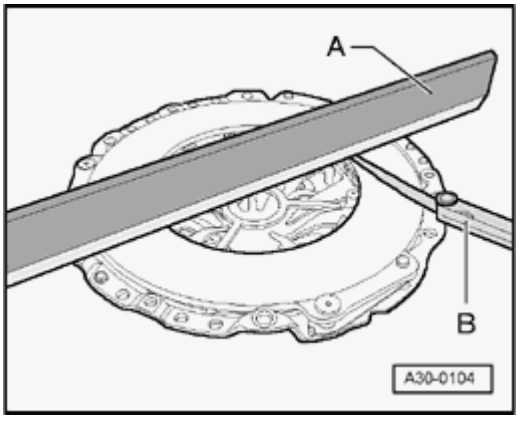

Fig. 81: Check SAC Pressure Plate For Warpage, Cracks And Burns
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Straightedge

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B - Feeler gauge

- Pressure plate distortion up to 1.0 mm is allowed

Removing dual-mass flywheel

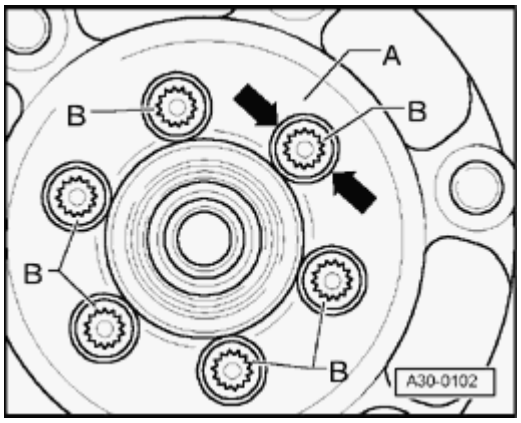

Fig. 82: Identifying Dual-Mass Flywheel & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 unscrewing 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**

Clutch with SAC pressure plate, removing and installing

Special tools, testers and auxiliary items required

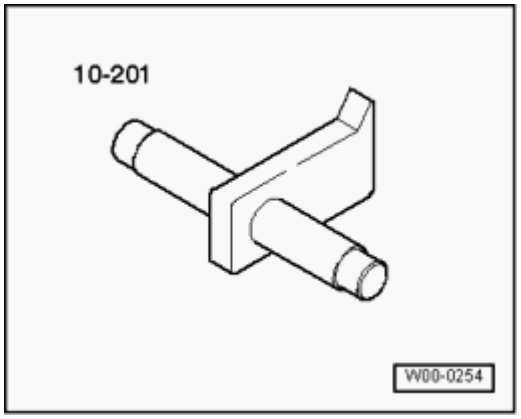

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Fig. 83: Counter-Holder Tool 10-201
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Counterhold tool 10-201

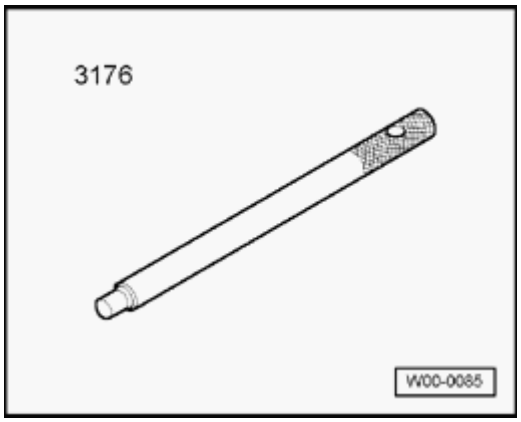

Fig. 84: Identifying Centering Mandrel 3176
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

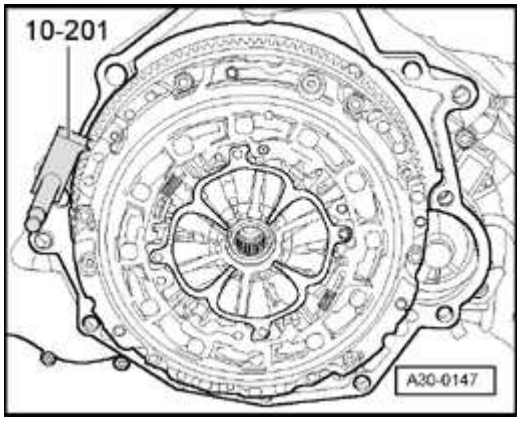

Fig. 85: Counter-Hold Tool 10 - 201 Attached Before Loosening Clutch Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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

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 6 bolts consecutively in clockwise direction and in steps of 90° ($^{1}/_{4}$ turn) until the pressure plate is released.

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Installing

NOTE:

- **Before you re-install the SAC pressure plate check that it is not distorted Check SAC pressure plate for distortion, cracks and burns.**
- **When only the clutch plate is replaced, the adjuster ring in the SAC pressure plate has to be reset before assembly --> Resetting adjuster ring in SAC clutch pressure plate.**
- **Installation position of clutch plate: coil springs (damper assembly) or marking "transmission side" point towards pressure plate and transmission.**

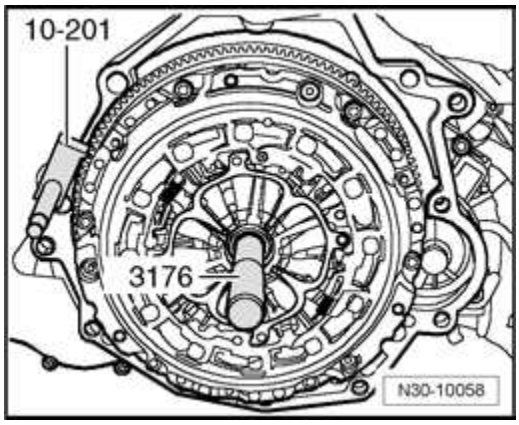

Fig. 86: Identifying 3176 And Counterhold Tool 10-201 On Clutch Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

To prevent the pressure plate from becoming 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.
- Screw in 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° ($^1/_4$ turn) until the housing makes contact with flywheel.
- Tighten all 6 bolts to final torque (22Nm) consecutively in clockwise direction.

Resetting adjuster ring in SAC clutch pressure plate

NOTE:

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

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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).

- **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

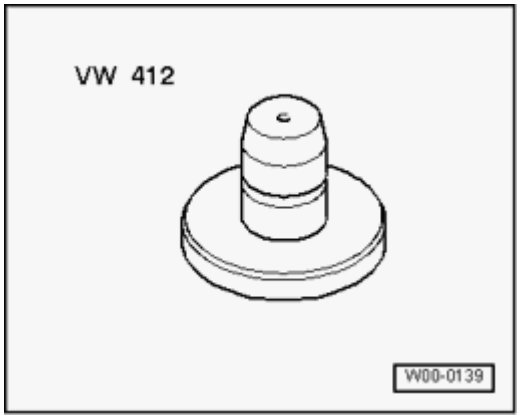

Fig. 87: Thrust Disc VW 412
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press tool VW412

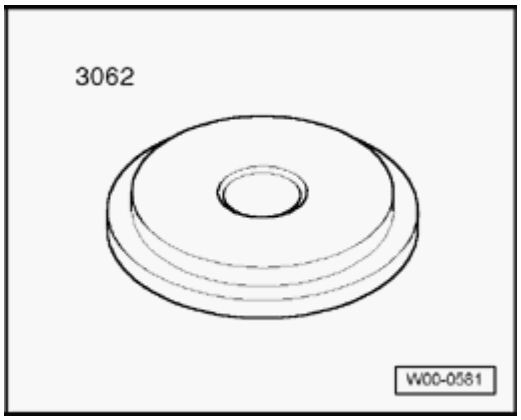

Fig. 88: Identifying Thrust Pad 3062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Thrust pad 3062

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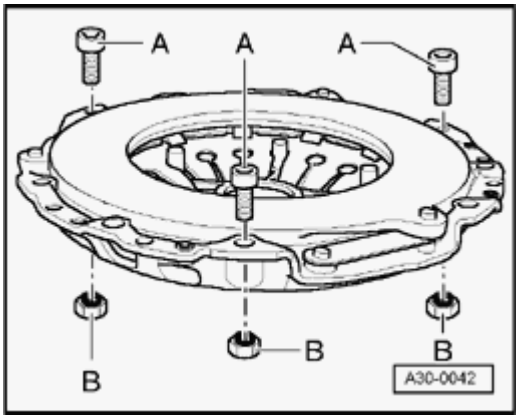

Fig. 89: Inserting Securing Bolts Into Mounting Holes On Pressure Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Procedure

- Insert 3 securing bolts for pressure plate - **A** - into the mounting holes on the pressure plate at 120° ($^{1}/_{3}$ turn) intervals, as shown in the illustration.
- Screw 3 nuts - **B** - M8 onto bolts - **A** - and tighten nuts lightly.

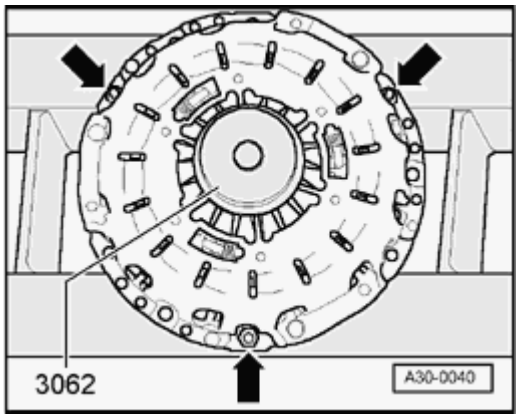

Fig. 90: Placing SAC Pressure Plate Onto Press
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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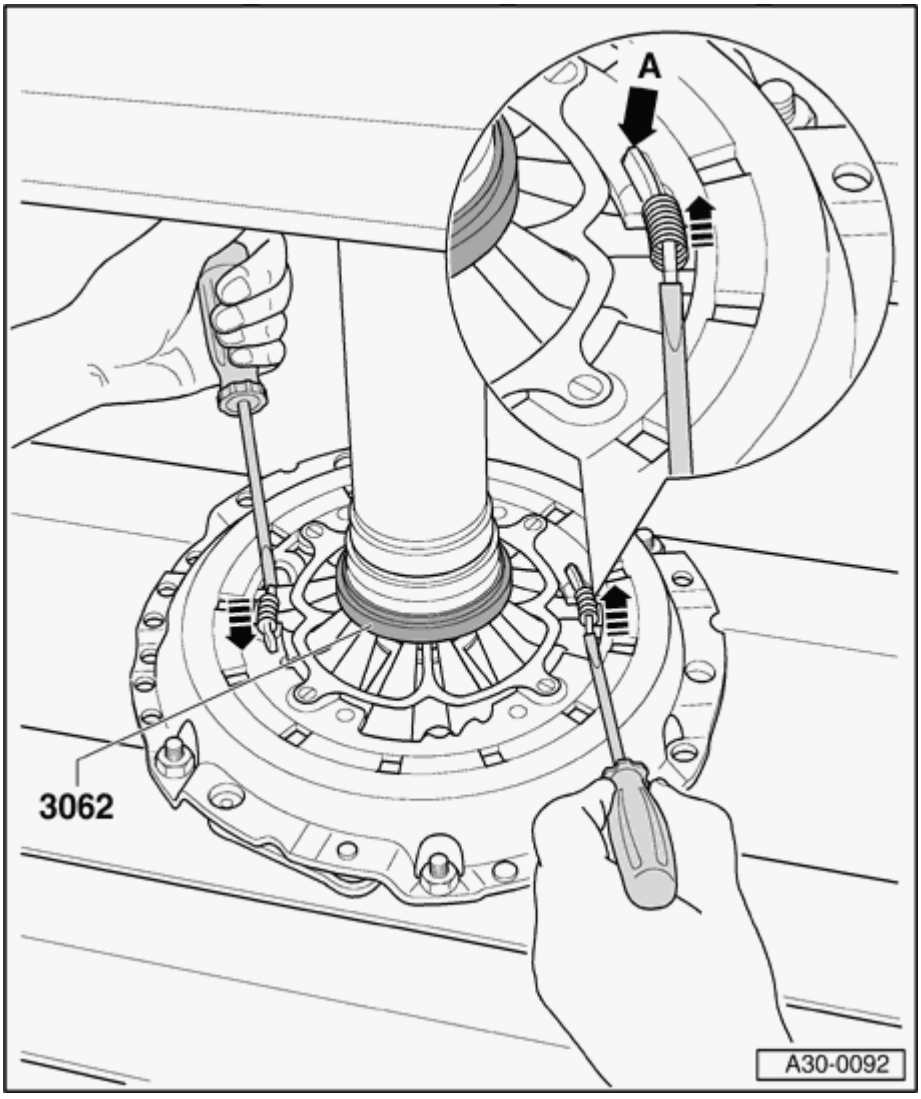

Fig. 91: Turning The Adjuster Ring Evenly Using Both Screwdrivers Until It Reaches The Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

34 CONTROLS, HOUSING

SHIFT MECHANISM, SERVICING

Installation position of shift mechanism

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- **Arrow A** - gear selection movement

- **Arrow B** - gate selection movement

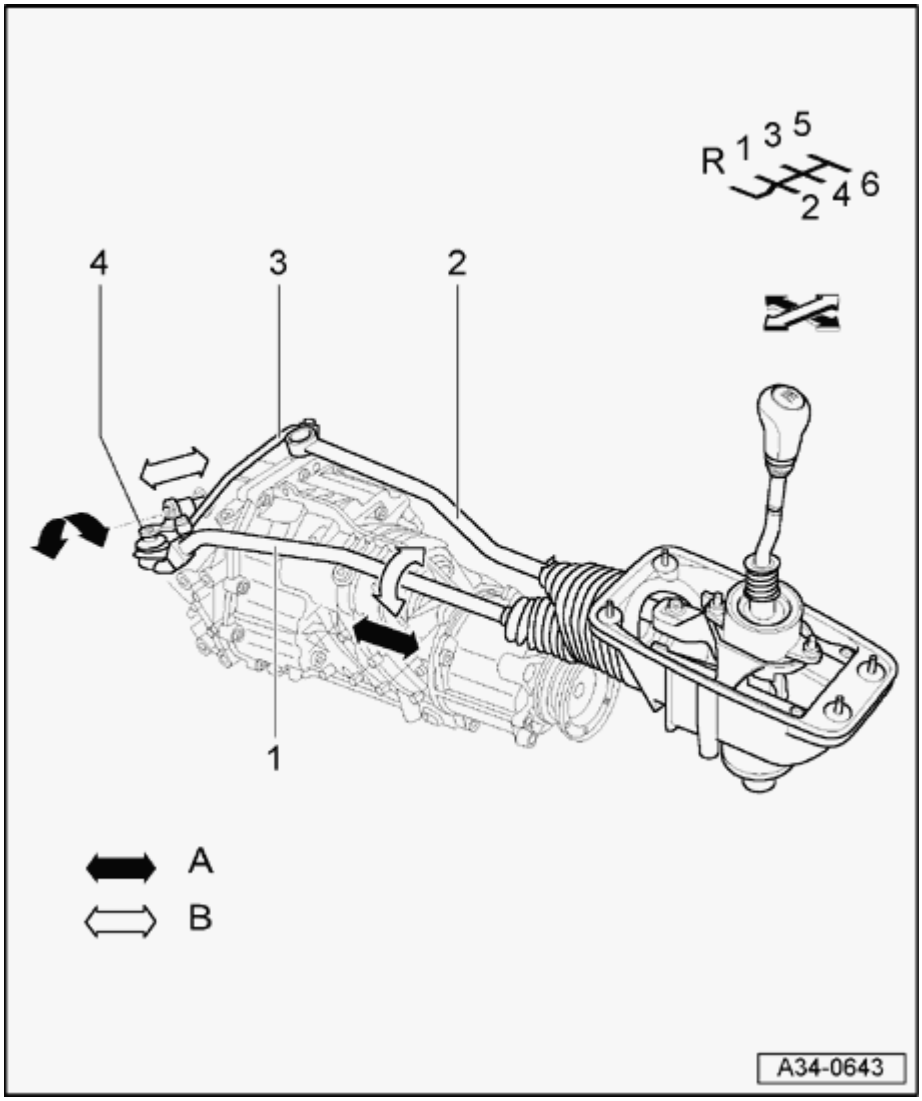

Fig. 92: Installation Position Of Selector Mechanism
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Shift rod

2 - Push rod (front)

3 - Connecting rod

4 - Shift lever

Shift mechanism, assembly overview

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NOTE:

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

Part I

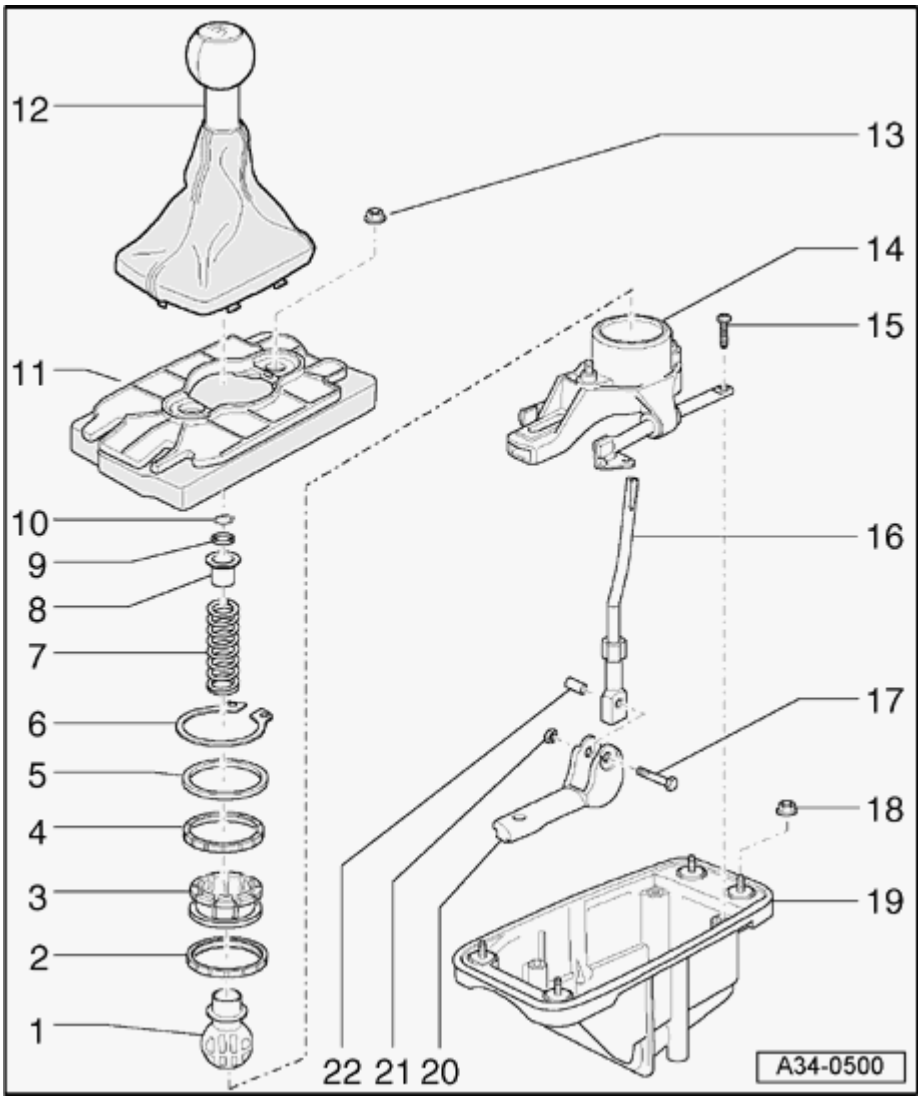

Fig. 93: Shift Mechanism Remove/Install Components -- Part 1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Ball

2 - Rubber ring

3 - Ball guide

4 - Rubber ring

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5 - Washer

6 - Circlip

- Take out before removing ball

7 - Spring

8 - Spacer sleeve

9 - Washer

10 - Circlip

11 - Noise insulation

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

12 - Gear lever knob

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

13 - Nut, 10 Nm

14 - Gear lever bearing

15 - Torx socket head bolt

16 - Gear lever

- Bend points towards rear

17 - Bolt

18 - Nut, 10 Nm

19 - Selector housing

20 - Joint for gear lever/selector rod

21 - Nut, 10 Nm

- Self-locking
- Replace

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22 - Bush

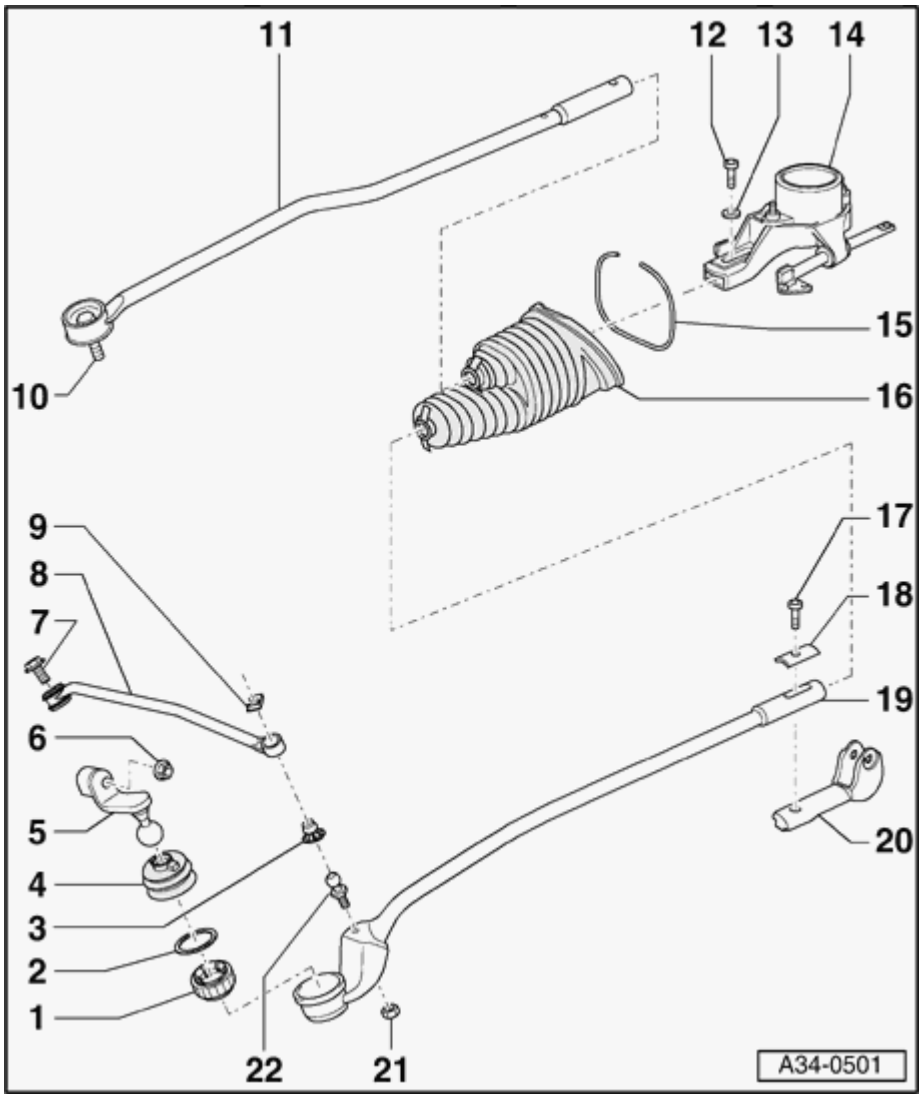

Fig. 94: Shift Mechanism Remove/Install Components -- Part 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Ball socket

2 - Washer

3 - Ball socket

4 - Bellows

5 - Selector shaft lever

6 - Nut, 23 Nm

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7 - Bolt, 23 Nm

8 - Connecting rod

9 - Retaining clip

10 - Bolt, 40 Nm

11 - Push rod

- With bearing bush, bolt and washers

12 - Hexagon socket head bolt, 23 Nm

13 - Washer

14 - Gear lever bearing

15 - Clamping ring for bellows

16 - Bellows

- Pull carefully over selector rods when removing
- Align with markings on selector rod and push rod when installing

17 - Hexagon socket head bolt, 23 Nm

18 - Clamp

19 - Selector rod

20 - Joint for gear lever/selector rod

21 - Nut, 10 Nm

22 - Ball stud

Gear shift knob with boot, removing and installing

Special tools, testers and auxiliary items required

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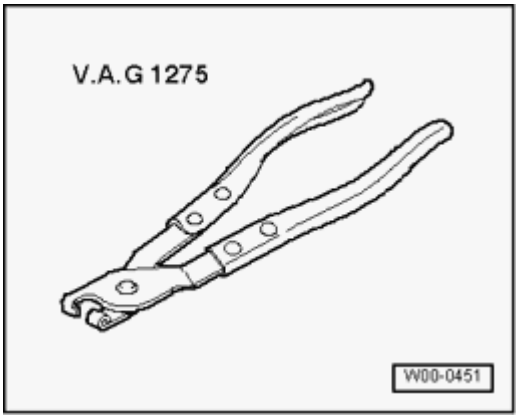

Fig. 95: Identifying Hose Clamp Pliers V.A.G 1275
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clip pliers V.A.G 1275

NOTE:

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

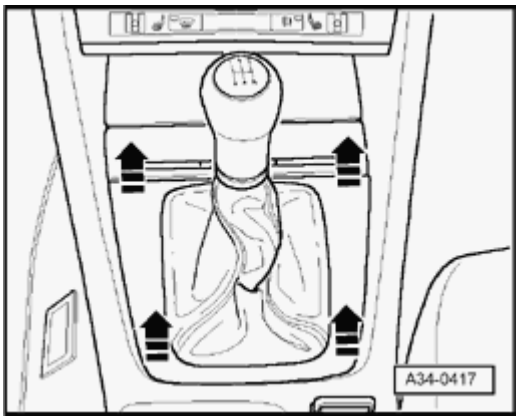

Fig. 96: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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

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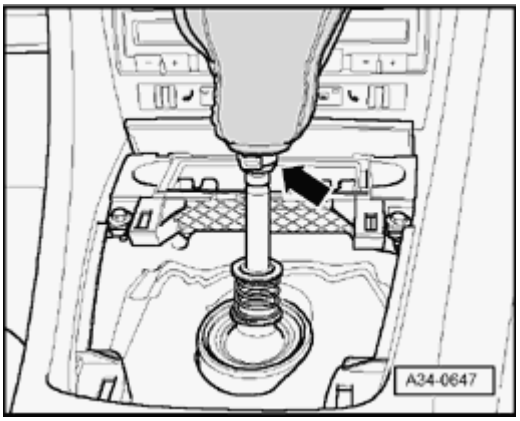

Fig. 97: Locating Clip And Pulling Off Gear Lever Knob Together With Boot
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Gear shift knob with clip:

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

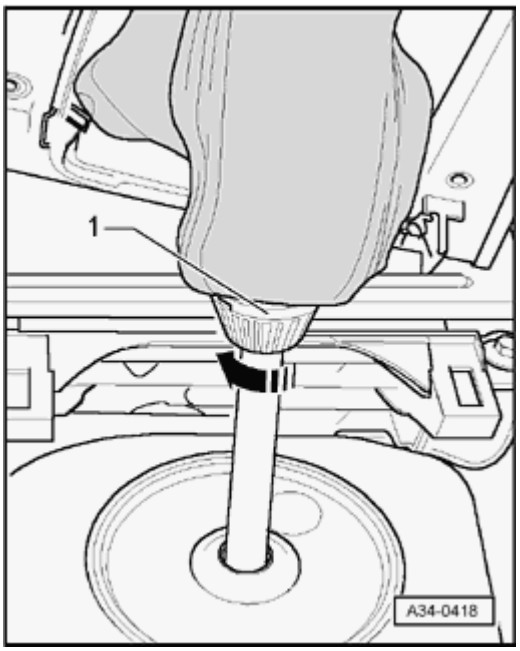

Fig. 98: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Gear shift knob with locking mechanism:

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

Installing

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Perform installation in reverse sequence of removal.

Shifter mechanism, removing and installing

Special tools, testers and auxiliary items required

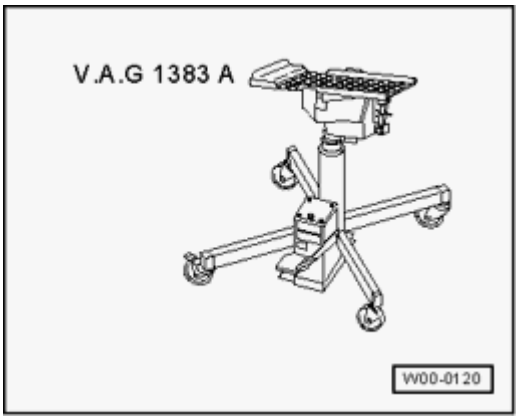

Fig. 99: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

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

Vehicles with large radio slot

- Remove operating and display unit for air conditioner --> **87 AIR CONDITIONING** .

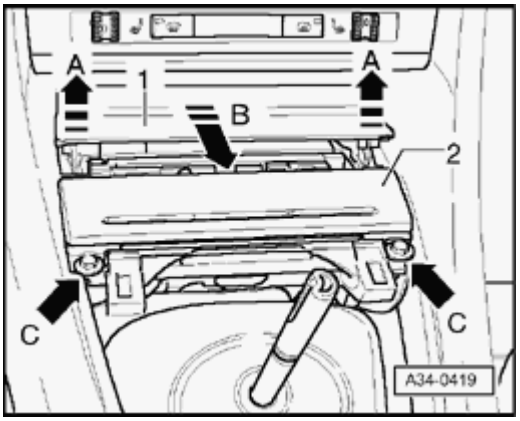

Fig. 100: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with small radio slot

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

All models:

- Unscrew bolts - **arrowsC** - and then pull ashtray - **2** - out of center console.
- Disconnect electrical connector for ashtray light.
- Remove foam wedges from center console.
- Lift out the noise insulation.

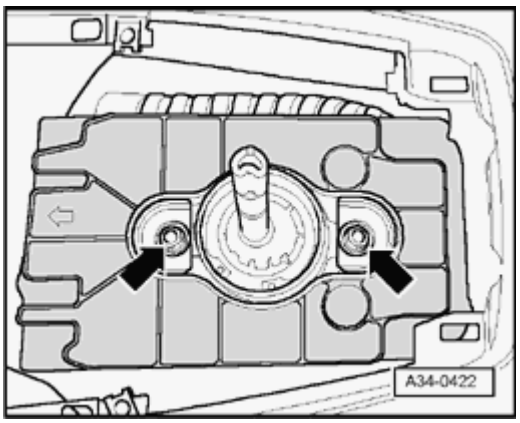

Fig. 101: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew noise insulation for gear lever housing - **arrows** -.

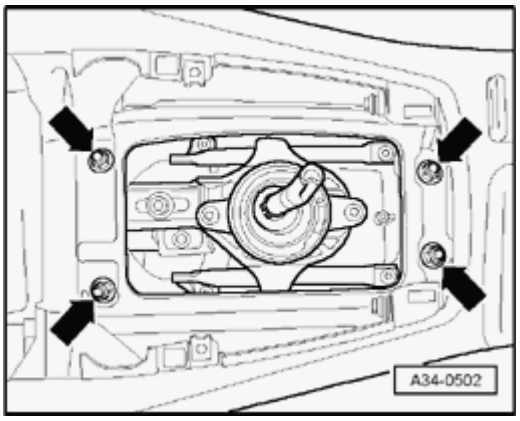

Fig. 102: Shift Lever Housing Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.

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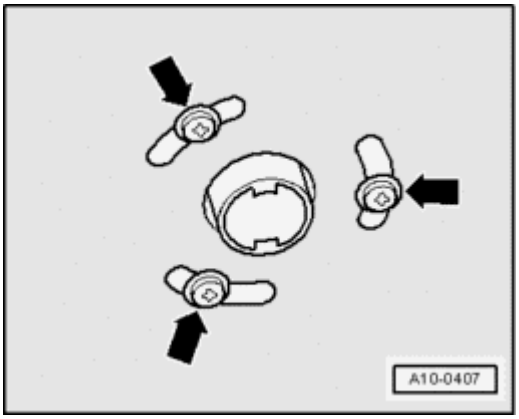

Fig. 103: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- On vehicles installed with auxiliary heater remove screws - **arrows** - securing exhaust pipe of auxiliary/additional heater to noise insulation.

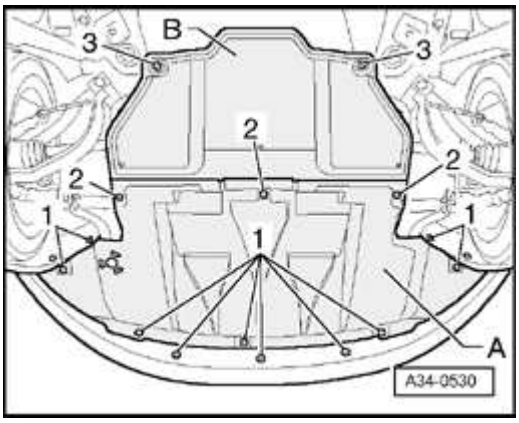

Fig. 104: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

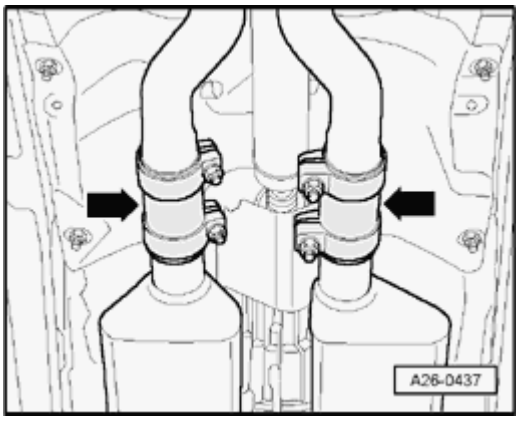

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Fig. 105: Loosening Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

- Disconnect exhaust system at clamp(s) - **arrows** -.
- 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.**

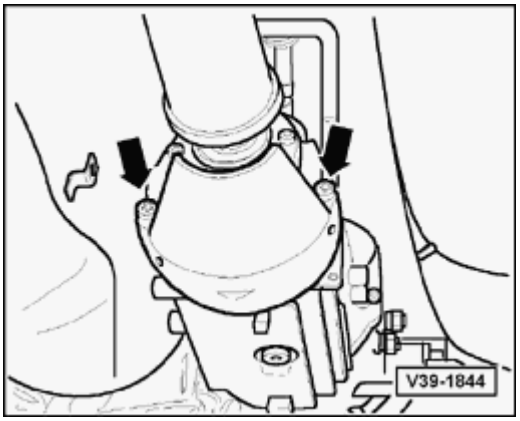

Fig. 106: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt heat shield for driveshaft - **arrows** -.

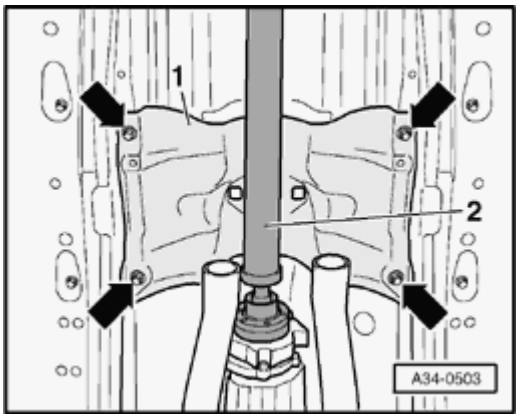

Fig. 107: Heatshield Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **1** - for exhaust system below selector mechanism - **arrows** -.

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- Unscrew bolts at transmission/driveshaft flange.
- Push driveshaft - **2** - together towards rear final drive. The constant velocity joints can be moved axially.

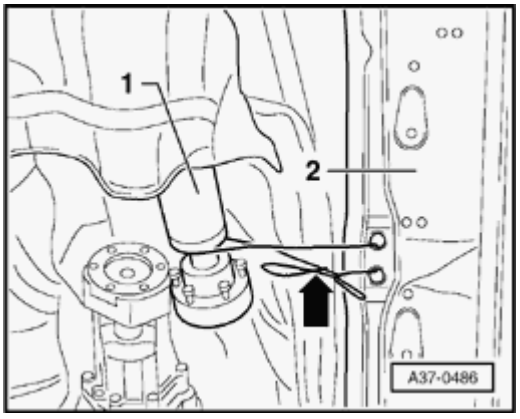

Fig. 108: Driveshaft Tied Up To One Side Onto Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tie driveshaft - **1** - up to one side onto heat shield - **arrow** -.

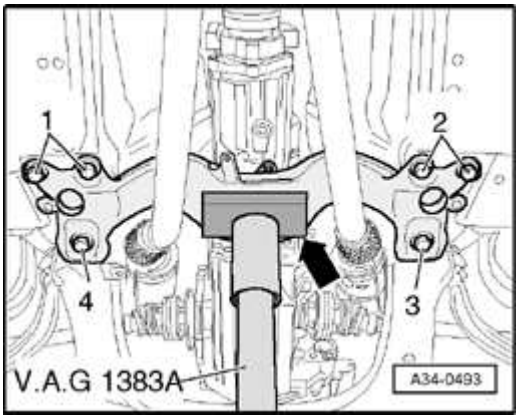

Fig. 109: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove universal mounting V.A.G1359/2 from engine and transmission jack V.A.G 1383 A and place a wooden block - **arrow** - on the lifting column in its place.
- Support rear cross member with engine and transmission jack V.A.G 1383 A.
- First unscrew bolts - **1** - and - **2** - , then bolts - **3** - and - **4** -.

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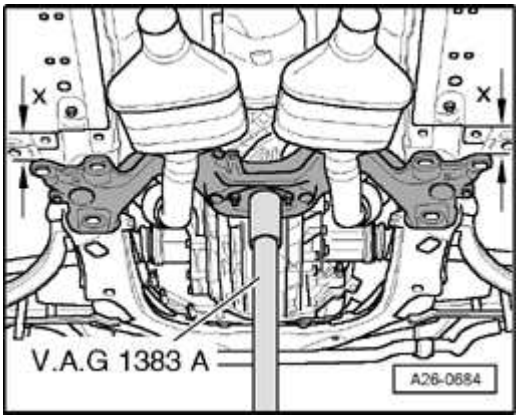

Fig. 110: Identifying Distance Between Cross Member And Body Reaches Dimension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Dimension - **x** - = 60 mm

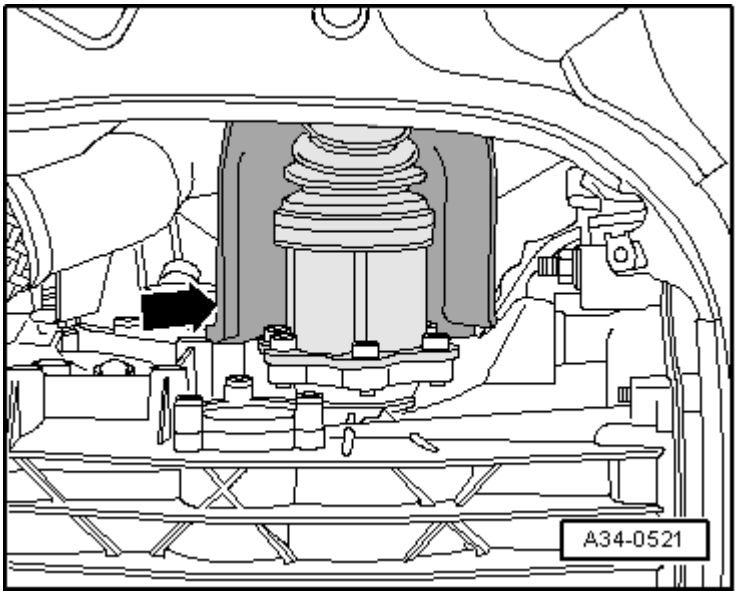

Fig. 111: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, unbolt heat shield for drive shaft (right-side) - **arrow** -.

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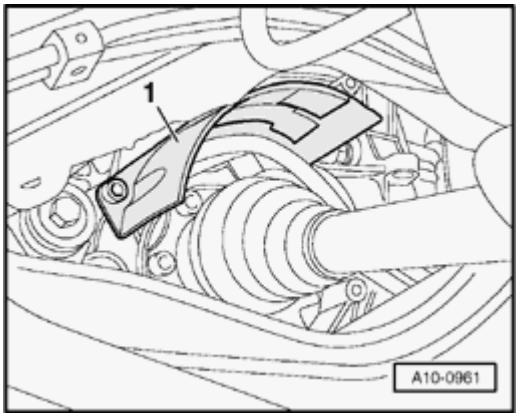

Fig. 112: Removing Left/Right Heat Shields For Drive Axles
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, unbolt heat shield for drive shaft (left-side) - **1** -.

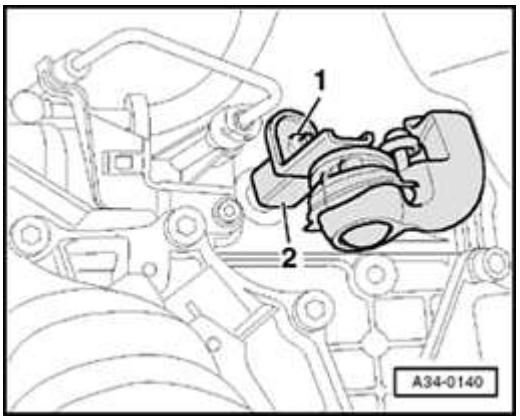

Fig. 113: Identifying Selector Mechanism Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nut - **1** - and pull selector shaft lever - **2** - off transmission selector shaft.

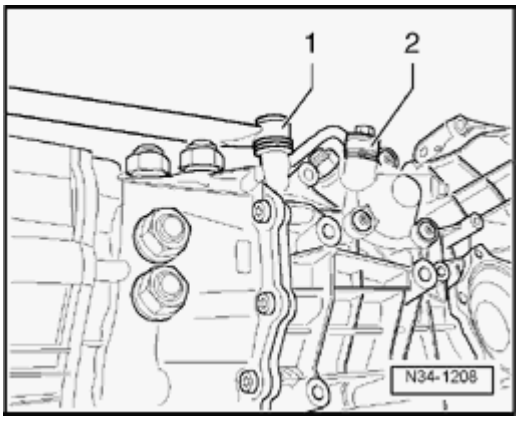

Fig. 114: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Unscrew connecting rod - **2** - for selector rod.
- Disconnect push rod - **1** - ; to do so, unscrew hexagon socket head bolt.
- Remove selector mechanism from right side of vehicle.

Installing

Installation is performed in reverse sequence; note the following:

NOTE:

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

- Install tunnel cross member --> **40 - FRONT SUSPENSION** .
- Bolt driveshaft onto transmission --> **39 FINAL DRIVE, DIFFERENTIAL** .
- Install exhaust system and perform stress-free alignment --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .
- If installed, install rear noise insulation.

- Adjust selector mechanism --> **Shift mechanism, adjusting**.
- Install operating and display unit for air conditioner --> **87 AIR CONDITIONING** .

Tightening torques

Component	Nm
Connecting rod to transmission	23
Shift lever to selector shaft	23
Push rod to transmission	40
Heat shield for drive shaft to transmission	23
Heat shield for driveshaft to transmission cover	25
Shift mechanism to body	10
Noise insulation to selector mechanism	10

Shift mechanism, adjusting

The following are prerequisites for correct gear lever alignment:

NOTE:

- **Shift linkage must be in proper condition and undamaged.**
- **Shift 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 shift knob with boot, removing and installing**.

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Vehicles with large radio slot

- Remove operating and display unit for air conditioner --> **87 AIR CONDITIONING** .

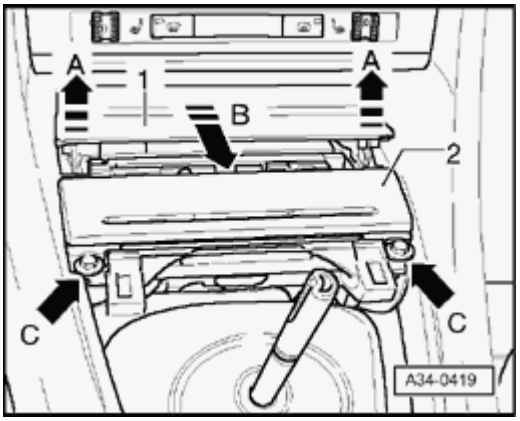

Fig. 115: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with small radio slot

- 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 - **arrowsC** - and then pull ashtray - **2** - out of center console.
- Disconnect electrical connector for ashtray light.
- Remove foam wedges from center console.
- Lift out the noise insulation.

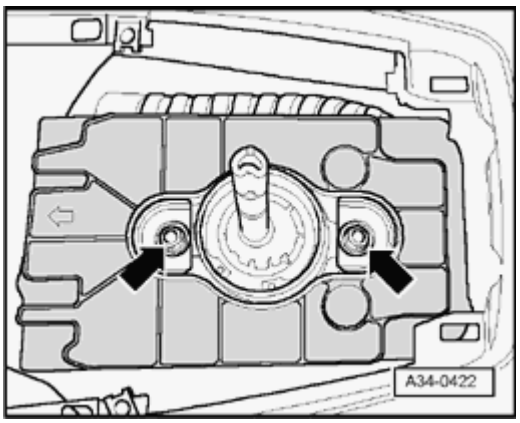

Fig. 116: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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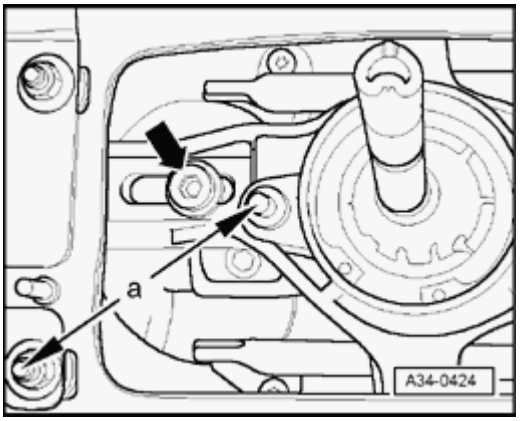

Fig. 117: Shift Mechanism Measurement And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure distance - **a** - between the two studs in the 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) should 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.

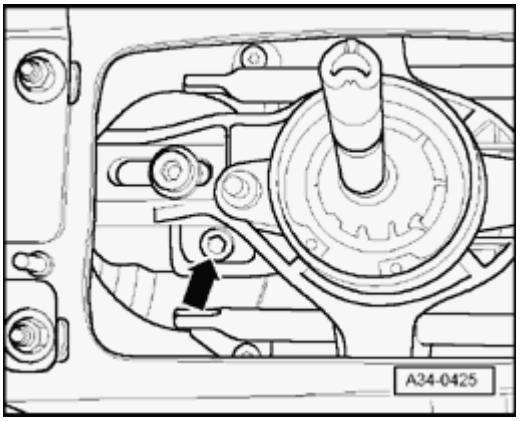

Fig. 118: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

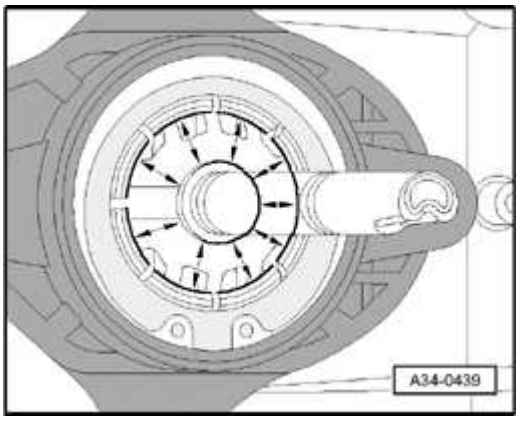

Fig. 119: Centering Bottom Of Shift Lever Centered In Ball Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Align the gear lever as follows:

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

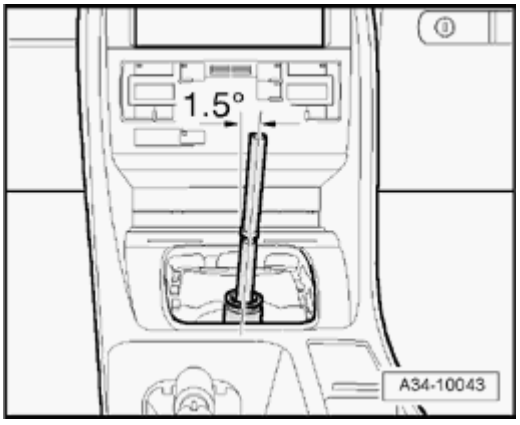

Fig. 120: Gear Lever Alignment Pointing Slightly To Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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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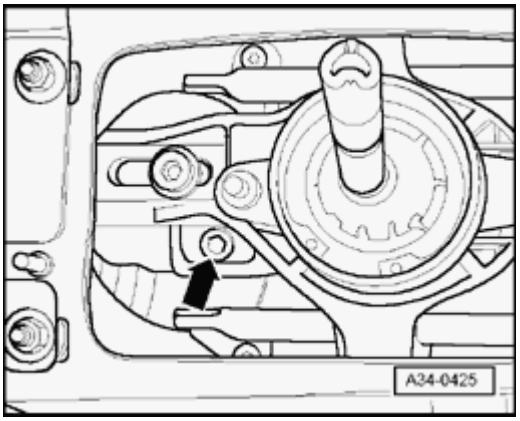

Fig. 121: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolt for selector 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.
- Select all gears several times.
- 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 the gear lever sticks or balks repeatedly when engaging a gear, perform the adjustment procedure again.

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

TRANSMISSION, REMOVING AND INSTALLING

Transmission, removing and installing

Removing transmission on vehicles with 4.2 Liter V8 engine (S4)--> **Removing transmission on vehicles with 4.2 Liter V8 engine (S4)**

Installing transmission on vehicles with 4.2 Liter V8 engine (S4) --> **Installing transmission on vehicles with 4.2 Liter V8 engine (S4)**

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Removing transmission on vehicles with 4.2 Liter V8 engine (S4)

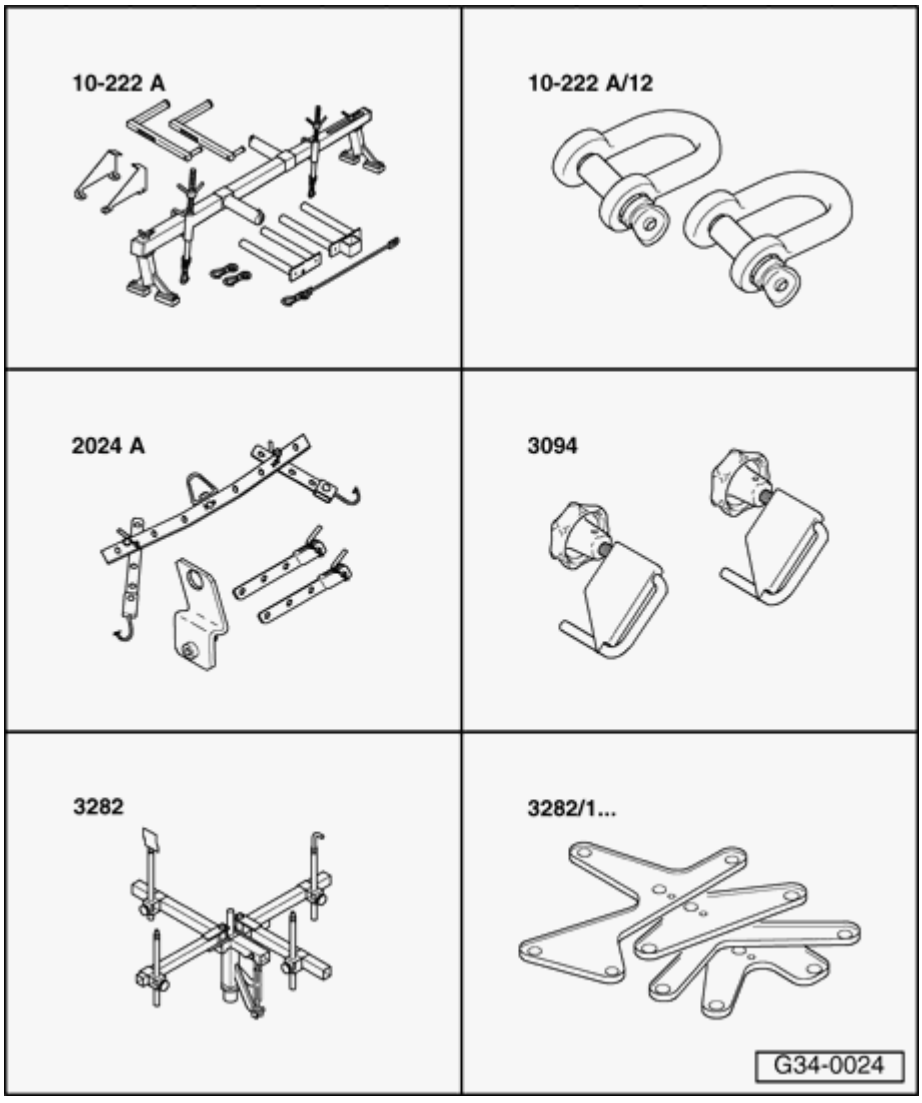

Fig. 122: Identifying Special Tools - Removing Transmission On Vehicles With 4.2 Liter V8 Engine (S4)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Support bracket 10 - 222 A
- Shackle 10 - 222 A/12
- Lifting tackle 2024 A
- Hose clamps, up to Ø 25 mm 3094

- Transmission support 3282
- Adjustment plate 3282/38

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Special tools, testers and auxiliary items required

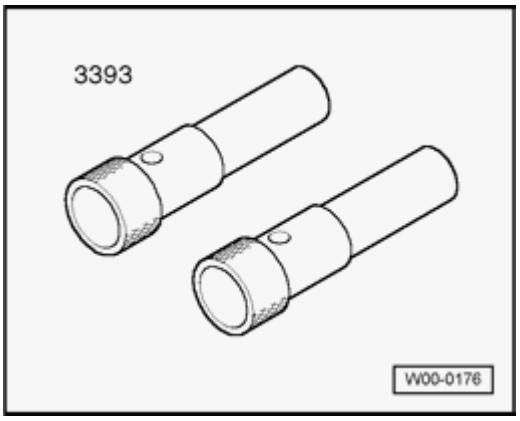

Fig. 123: Locating Pins 3393
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Locating pins 3393

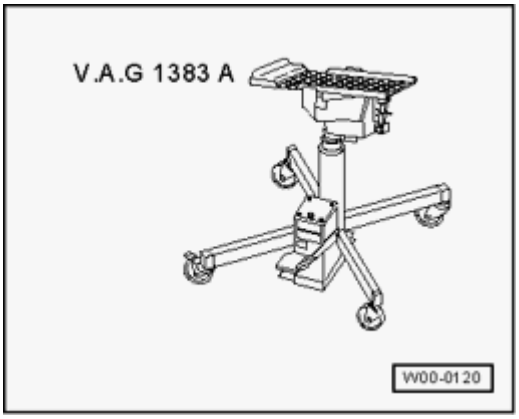

Fig. 124: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

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**

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- With the ignition switched off, disconnect battery ground (GND) strap.

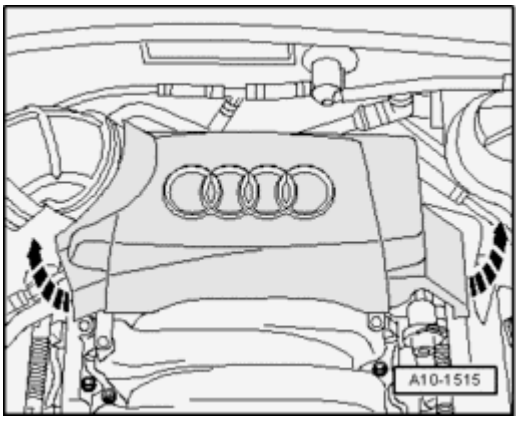

Fig. 125: Removing Rear Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off rear engine cover - **arrows** -.

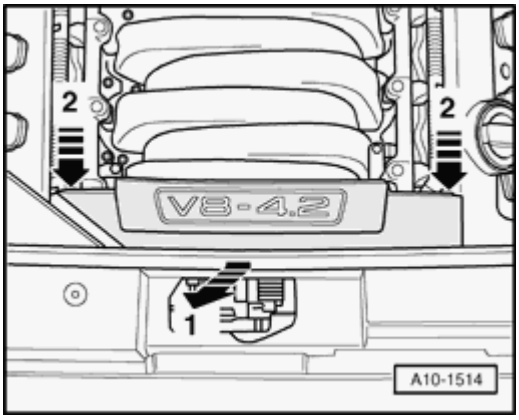

Fig. 126: Removing Front Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off front engine cover - **arrows** -.

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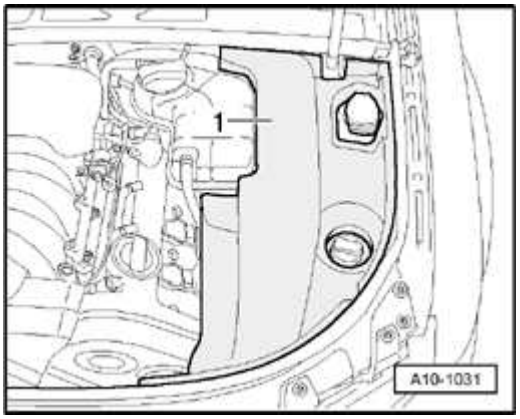

Fig. 127: Removing Cover In Engine Compartment (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - **1** - on left side of engine compartment.

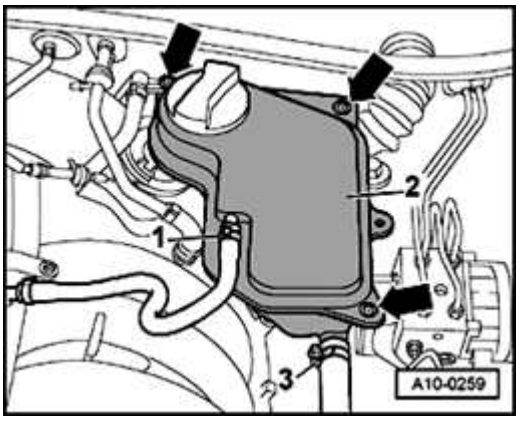

Fig. 128: Coolant Expansion Tank, Bolts And Coolant Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp off coolant hose - **1** - with hose clamp 3094 and disconnect hose at coolant expansion tank.
- Unbolt coolant expansion tank - **2** - - **arrows** -.
- Disconnect electrical wire leading to Engine Coolant Level (ECL) Warning Switch F66 at expansion tank (bottom) and move coolant expansion tank (with coolant hose - **3** - attached) clear to one side.
- If necessary, close off the connection with a suitable plug.

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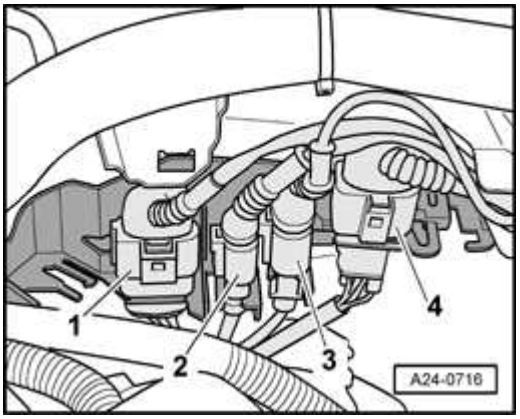

Fig. 129: Removing Bracket For Electrical Harness Connectors At Left From Bulkhead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connectors - **1 to 4** - from retainer at left of bulkhead.
- Disconnect electrical connectors - **1** - , - **3** - and - **4** -.
- Disconnect retainer at bulkhead.
- Disconnect heat insulation sleeve at wiring harness and move wiring harness clear.
- Move oxygen sensor probe wires clear (downwards).

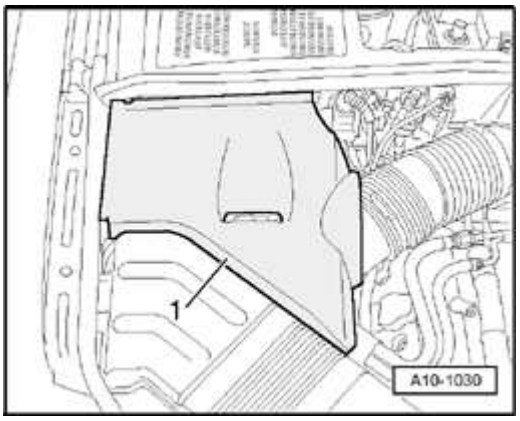

Fig. 130: Removing Cover In Engine Compartment (Right Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - **1** - on right side of engine compartment.

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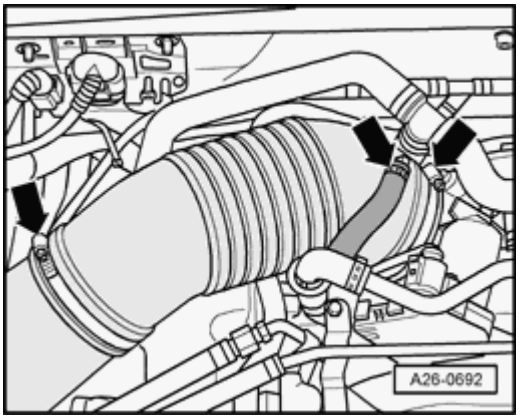

Fig. 131: Removing Air Guide Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air intake hose - **arrows** -.

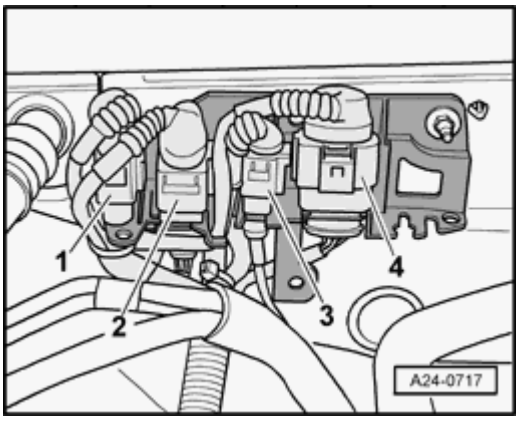

Fig. 132: Removing Bracket For Electrical Harness Connectors At Right From Bulkhead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors - **1 to 4** - from retainer at right of bulkhead.
- Disconnect electrical connectors - **2** - and - **4** -.
- Move oxygen sensor probe wires clear (downwards).

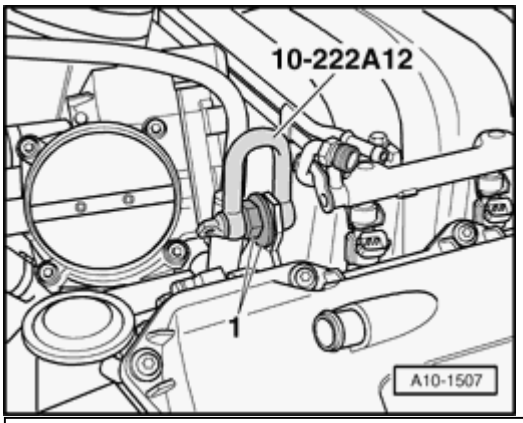

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Fig. 133: Securing Shackle 10-222 A/12 To Right Rear Engine Lifting Eyelet
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fix a shackle 10 - 222 A/12 to engine lifting eye (rear right).

NOTE:

- **- Item 1 - can be disregarded.**

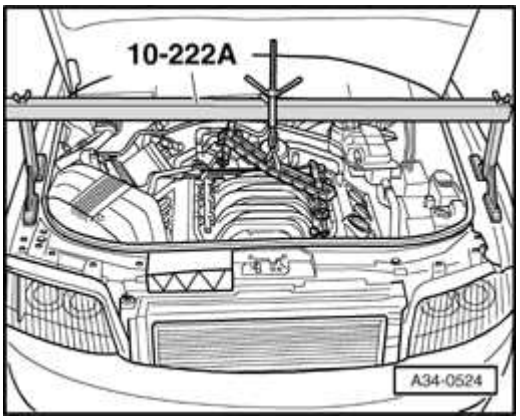

Fig. 134: Support Bracket 10 - 222 A Set Up On Wing Mounting Flanges
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up support bracket 10 - 222 A on wing mounting flanges.

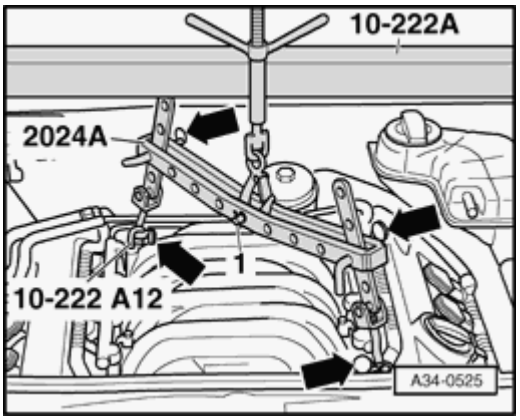

Fig. 135: Support Hooks And Locking Pins On Lifting Tackle Secured With Retainers And Pin In Lifting Tackle Center Hole
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove eye of lifting tackle 2024 A.
- Re-insert pin - **1** - in center hole of lifting tackle and secure with split pin.
- Hook pin on lifting tackle 2024 A onto spindle of support bracket 10 - 222 A.
- Hook lifting tackle 2024 A into lifting eye at front of engine and into shackle 10 - 222 A/12 at rear.

CAUTION: Support hooks and locking pins on lifting tackle must be secured with

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retainers - arrows - in illustration.

- Take up weight of engine on spindle of support bracket, but do not lift.

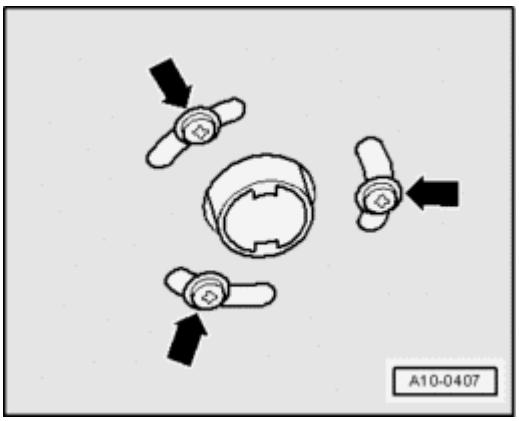

Fig. 136: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt both front wheels.
- On vehicles installed with auxiliary heater remove screws - **arrows** - securing exhaust pipe of auxiliary/additional heater to noise insulation.

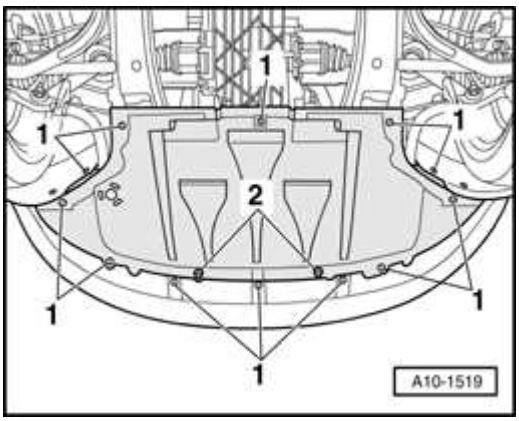

Fig. 137: Removing Quick-Release Fasteners, Screws And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release quick release fasteners - **1** - , unscrew bolts - **2** - and remove noise insulation.

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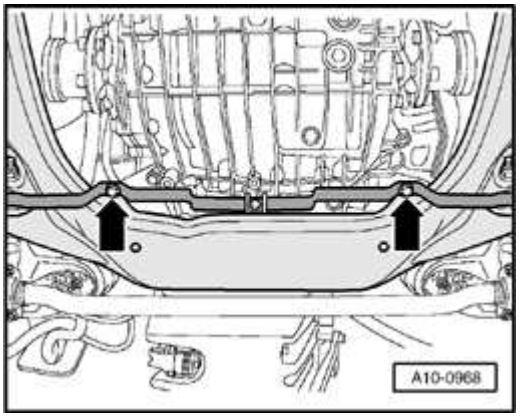

Fig. 138: Removing Bracket For Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt bracket for noise insulation - **arrows** -.

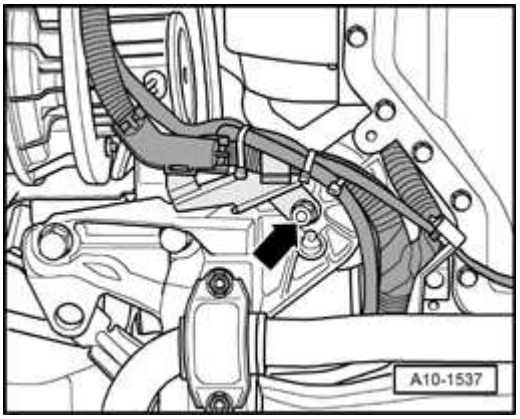

Fig. 139: Removing Wiring Harness Bracket At Right Engine Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt bracket for wiring harness at engine support (right-side) - **arrows** -.

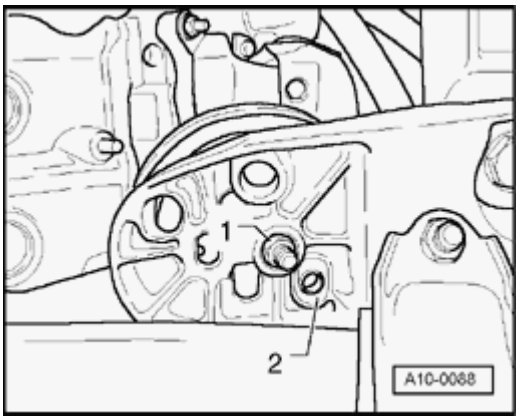

Fig. 140: Threaded Connections And Positioning Sleeves On Lower Engine Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Unscrew nuts - **1** - at bottom of engine mountings (left and right).

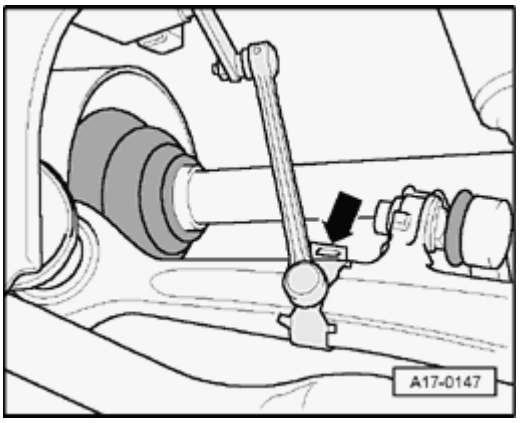

Fig. 141: Unclipping Operating Rod For Vehicle Levelling Sensor At Lower Transverse Link
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, unclip operating rod for vehicle level sender from lower transverse link - **arrow** -.

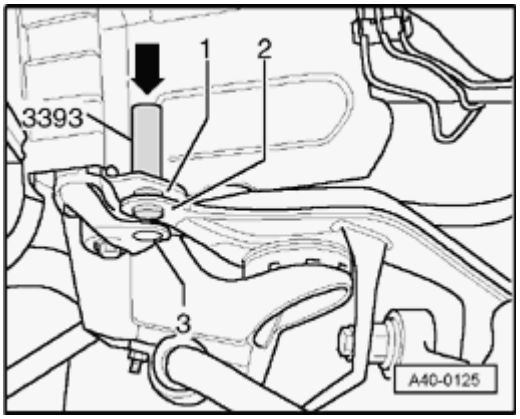

Fig. 142: Checking Holes Align Using Testing Mandrel 3393
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before slackening subframe mountings, use locating pins 3393 to check whether holes - **1...3** - are aligned.

CAUTION: If this is not the case, wheel alignment has to be performed after installing the subframe.

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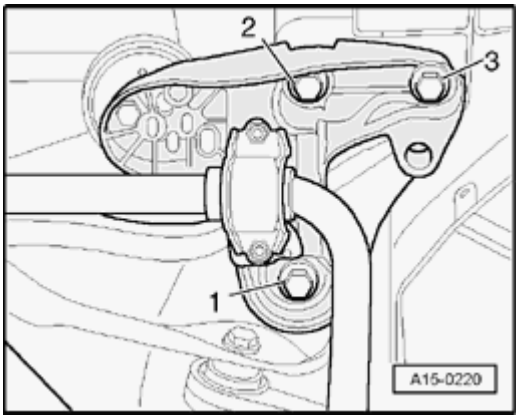

Fig. 143: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First remove front bolts - **2** - and - **3** - on subframe (left and right). Then remove bolts - **1** -.
- Lower subframe at the front.

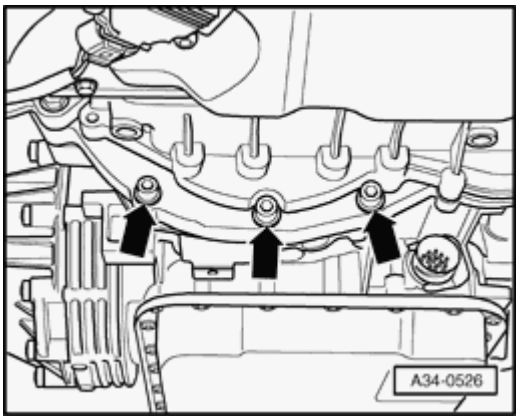

Fig. 144: Removing/Installing Bottom Engine/Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew lower engine/transmission securing bolts - **arrows** -.

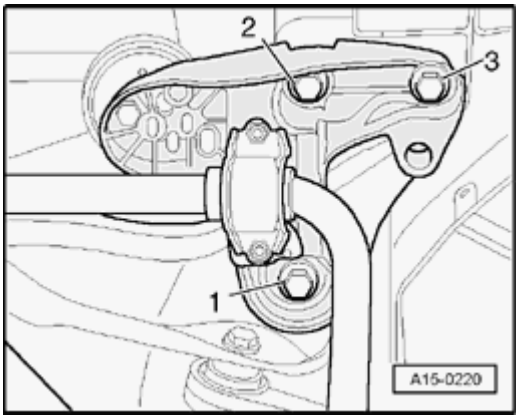

Fig. 145: Removing Front Bolts From Left And Right Subframe

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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.

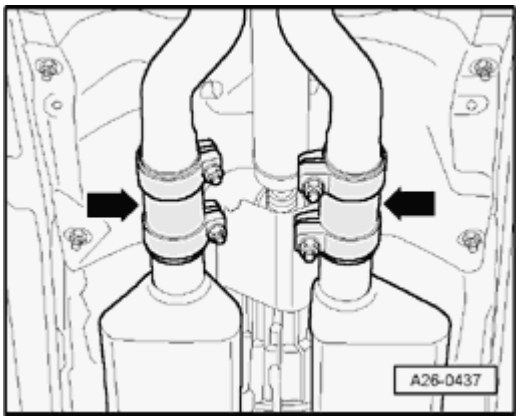

Fig. 146: Loosening Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

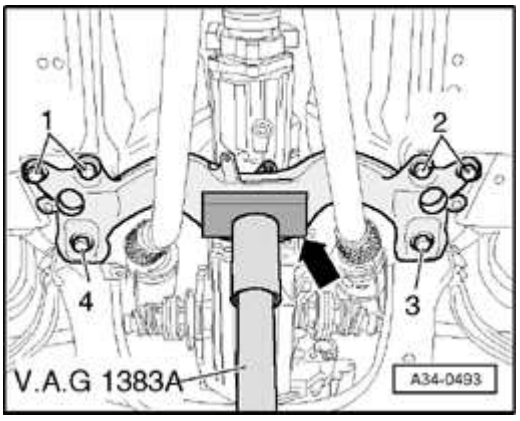

Fig. 147: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove universal mounting V.A.G1359/2 from engine and transmission jack V.A.G 1383 A and place a wooden block - **arrow** - on the lifting column in its place.
- Support the rear cross member with engine and transmission jack V.A.G 1383 A.
- First unscrew bolts - **1** - and - **2** - , then bolts - **3** - and - **4** -.

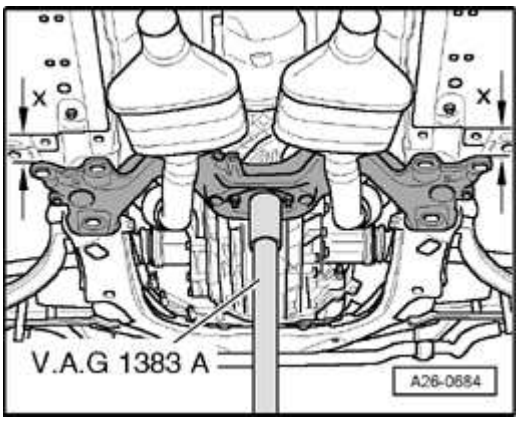

Fig. 148: Identifying Distance Between Cross Member And Body Reaches Dimension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slowly lower rear cross member with engine and transmission jack V.A.G 1383 A.

NOTE:

- **Do not lower the transmission too far: the distance between the rear cross member and the body (dimension - x -) must not be more than 60mm. Otherwise, the driveshaft joint and the flexible joint in the front exhaust pipe could be damaged. If necessary, tighten spindle of support bracket 10 - 222 A so that dimension - x - is not exceeded.**

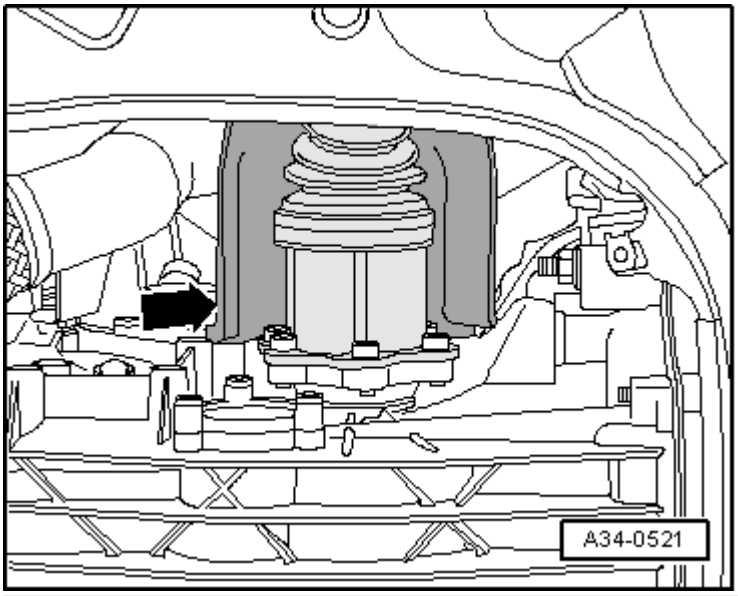

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Fig. 149: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shields - **arrow** - for drive shafts (left and right).
- Unbolt drive shafts from transmission flanges.

NOTE:

- **Make sure you do not damage surface coating on drive shafts.**

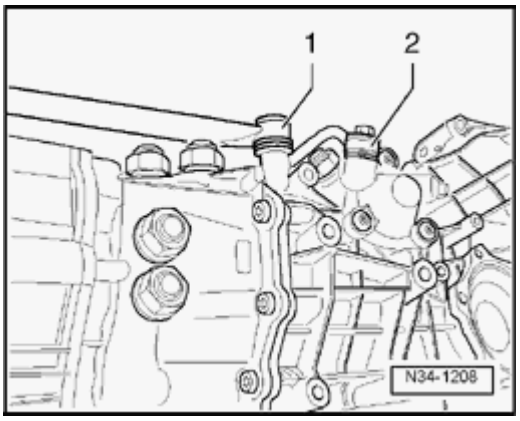

Fig. 150: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew connecting rod - **2** - for selector rod.
- Disconnect push rod - **1** - ; to do so, unscrew hexagon socket head bolt.

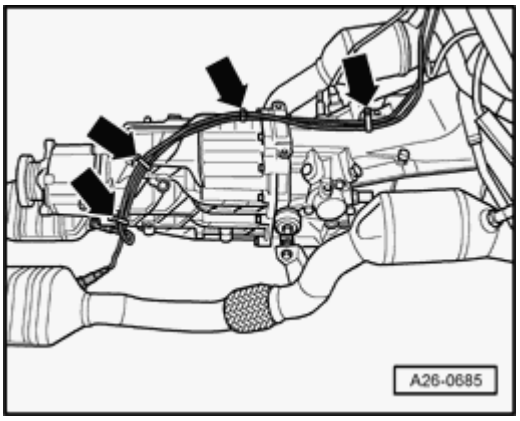

Fig. 151: Freeing Up Oxygen Sensor Wires At Areas Indicated By On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect oxygen sensor probe wiring on transmission at the points marked with - **arrows** -.

NOTE:

- **In the illustration the engine/transmission assembly has been removed.**

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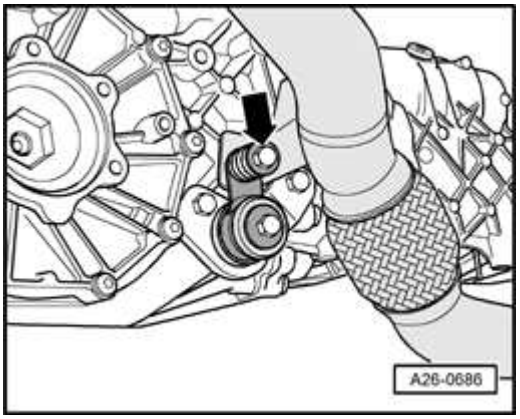

Fig. 152: Removing Bolt At Strap For Left Front Exhaust Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew bolt - **arrow** - at bracket for front exhaust pipe (left-side).

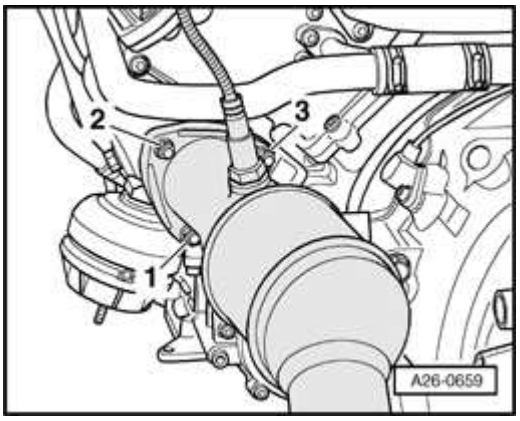

Fig. 153: Removing/Installing Nuts For Left Front Exhaust Pipe/Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nuts - **1 to 3** - connecting front exhaust pipe (left-side) to exhaust manifold.

NOTE:

- **In the illustration the engine has been removed.**

- Disconnect front exhaust pipe from exhaust manifold (left-side).
- Remove front exhaust pipe.

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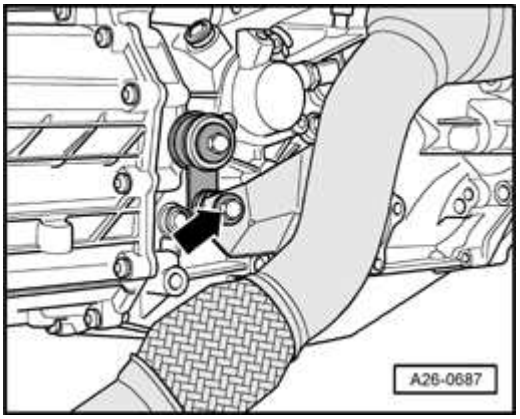

Fig. 154: Removing Bolt At Strap For Right Front Exhaust Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew bolt - **arrow** - at bracket for front exhaust pipe (right-side).

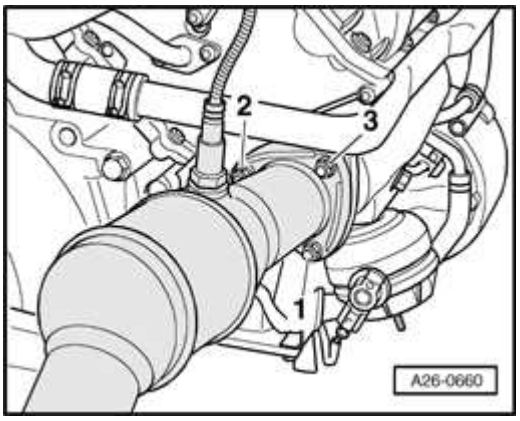

Fig. 155: Removing Nuts For Right Front Exhaust Pipe/Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nuts - **1 to 3** - connecting front exhaust pipe (right-side) with exhaust manifold.

NOTE:

- **In the illustration the engine has been removed.**

- Remove front exhaust pipe.

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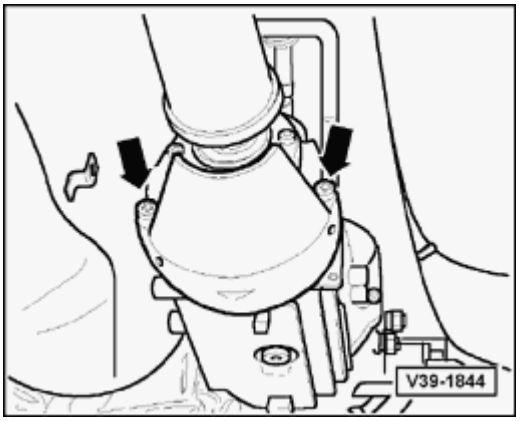

Fig. 156: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt heat shield for driveshaft - **arrows** -.
- Unscrew bolts at transmission/driveshaft flange.
- Slide driveshaft together towards rear final drive. The constant velocity joints can be moved axially.
- Allow driveshaft to rest on rear section of exhaust system.

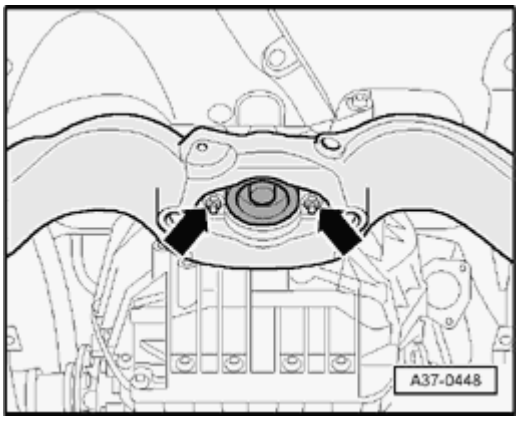

Fig. 157: Tunnel Cross Member Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew two nuts - **arrows** - and Disconnect tunnel cross member.

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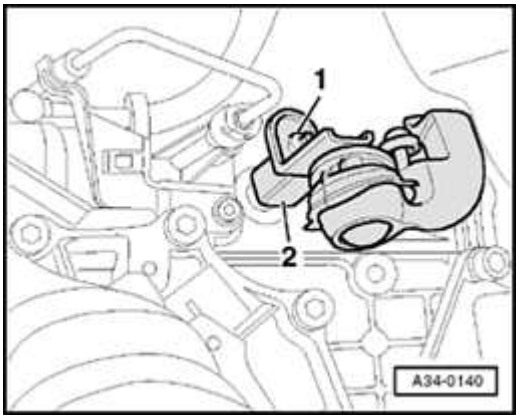

Fig. 158: Identifying Selector Mechanism Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nut - **1** - and pull transmission selector lever - **2** - off transmission selector shaft.

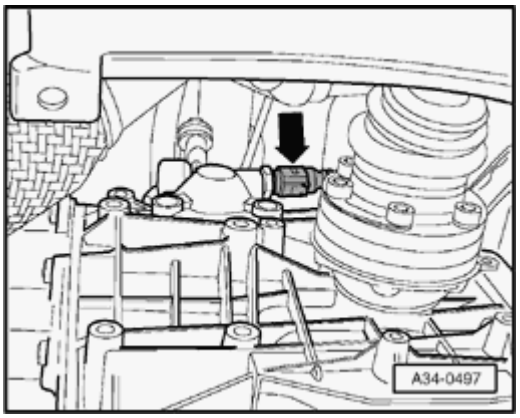

Fig. 159: Disconnecting Harness Connector For Back-Up Light Switch At Right Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector - **arrow** - for reversing light switch on right side of transmission and move wiring clear.

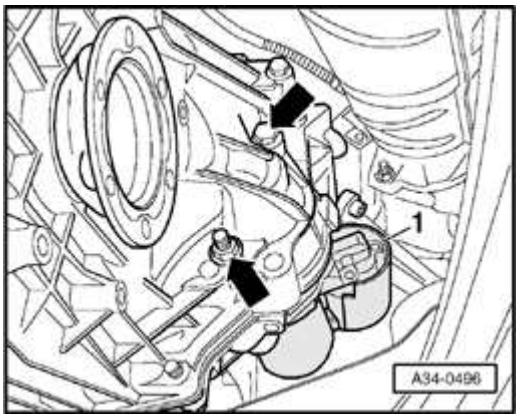

Fig. 160: Starter And Mounting Bolts

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt starter - **1** - - **arrows** - and pull it away from bell housing.
- Remove remaining engine/transmission bolts. Leave 2 bolts screwed in hand-tight.

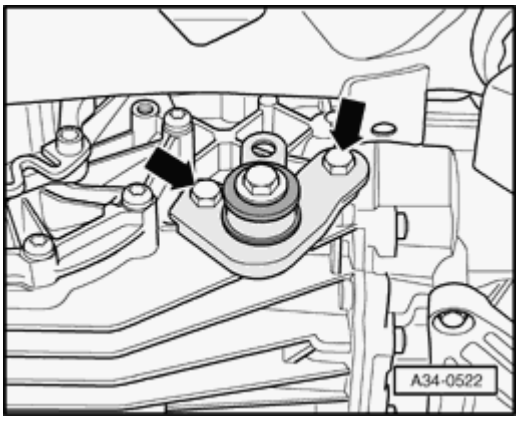

Fig. 161: Bracket For Front Exhaust Pipe (Left-Side) On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt bracket for front exhaust pipe (left-side) on transmission - **arrows** -.

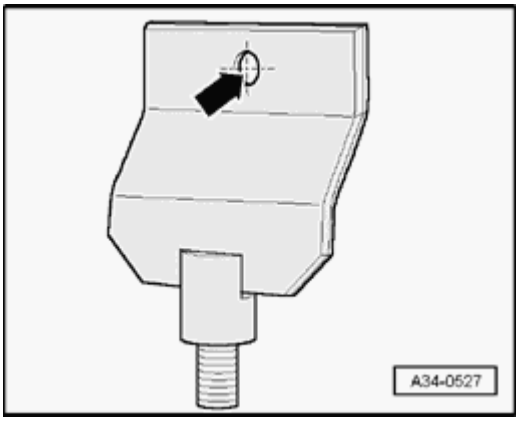

Fig. 162: Hole In Supporting Elements Of Transmission Support 3282
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drill a hole of 10.2mm - **arrow** - in supporting element of transmission support 3282.

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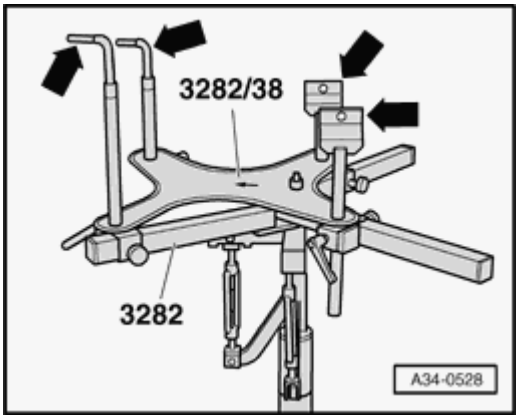

Fig. 163: Transmission Support 3282 With Adjustment Plate 3282/38 For Removing Manual Transmission 03A (All Wheel Drive) And Place On Engine And Transmission Jack V.A.G 1383 A.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up transmission support 3282 with adjustment plate 3282/38 for removing manual transmission 03A (All wheel drive) and place on engine and transmission jack V.A.G 1383 A.

NOTE:

- **The positions of the support elements - arrows - are shown on the adjustment plate in schematic form (the arrow points in direction of travel).**
- **The adjustment plate can only be installed in one position.**

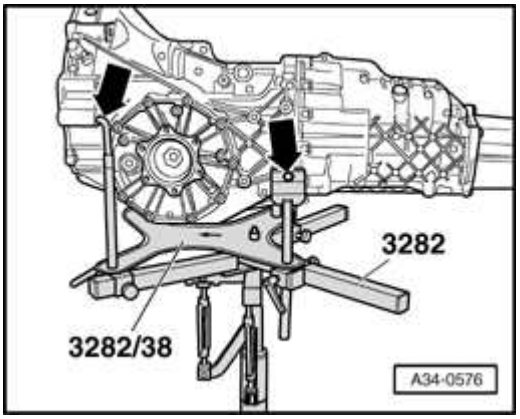

Fig. 164: Adjustment Plate Aligned Parallel To Transmission And Support Elements Secured To Left Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align adjustment plate parallel to transmission and secure support elements - **arrows** - to left side of transmission.

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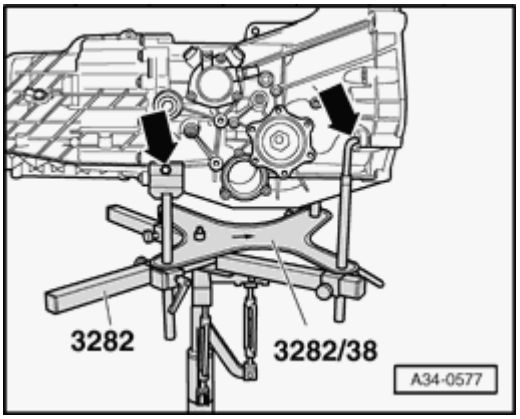

Fig. 165: Adjustment Plate Aligned Parallel To Transmission And Support Elements Secured To Right Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align adjustment plate parallel to transmission and secure support elements - **arrows** - to right side of transmission.
- Remove 2 last engine/transmission bolts.
- Press transmission off dowel sleeves and lower carefully with engine and transmission jack V.A.G 1383 A just far enough to gain access to the clutch slave cylinder.

NOTE:

- **When lowering transmission, ensure hydraulic line to clutch slave cylinder is not damaged.**

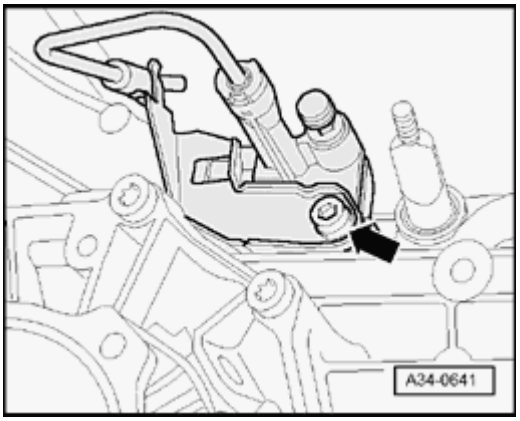

Fig. 166: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clutch slave cylinder - **arrow** - and secure with wire; do not open hydraulic 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.

- Lower transmission completely.

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NOTE:

- **When lowering transmission, make sure there is sufficient clearance to drive shafts.**

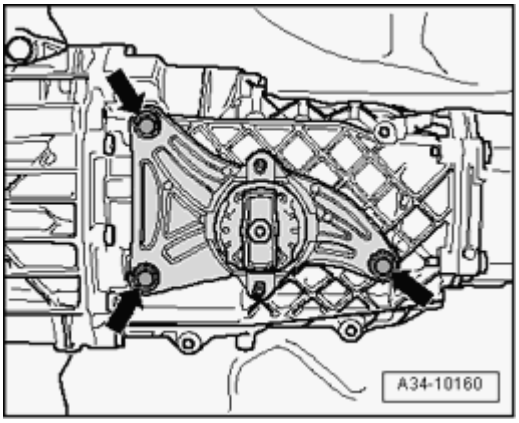

Fig. 167: Identifying Transmission Mounting Is Transferred To New Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If you will be installing a new transmission instead of the one removed, the transmission mounting has to be transferred to the new transmission - **arrows** -.

Installing transmission --> **Installing transmission on vehicles with 4.2 Liter V8 engine (S4)**.

Installing transmission on vehicles with 4.2 Liter V8 engine (S4)

Installation is performed in reverse sequence; note the following:

NOTE:

- **Re-attach all cable ties at the same locations when re-installing.**
- **Secure all hose connections with the correct hose clips (as original equipment)**
- **Re-attach heat shield sleeves at the same locations when re-installing.**
- **Replace self-locking 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 the splines. Do not grease guide sleeve.

- It should be possible to push the clutch plate back and forth slightly on the input shaft.

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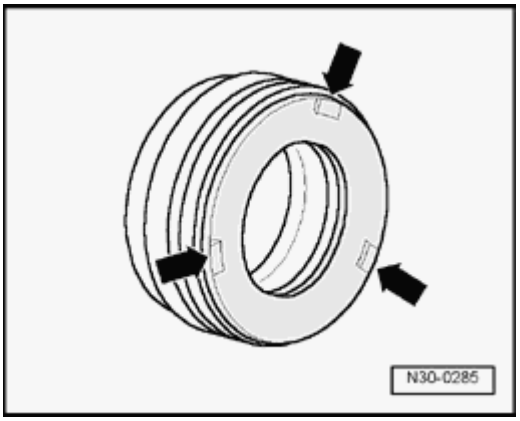

Fig. 168: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.**

- Lightly lubricate contact surface for operating rod at clutch release lever with copper grease, e.g. Z 381 351 TE.
- Use thread tap to remove any remaining locking fluid from all threaded holes which will accommodate self-locking bolts.
- 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 wiring off to one side so that it cannot be trapped between the engine and the transmission.

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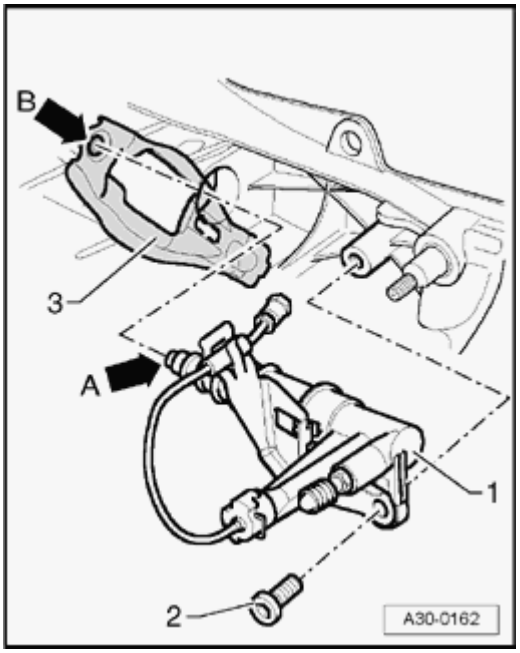

Fig. 169: Guiding Slave Cylinder Into Bore Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly lubricate surface where operating rod and clutch release lever make contact - **arrowB** - using copper grease Z381351TE.
- Raise transmission far enough to be able to install clutch slave cylinder with bracket for hose/line assembly.
- 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 resistance when depressing the clutch pedal, you must not press it down further. The operating 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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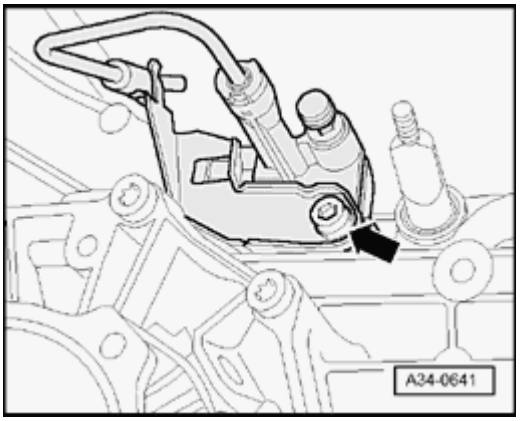

Fig. 170: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure clutch slave cylinder with new bolt - **arrow** -.

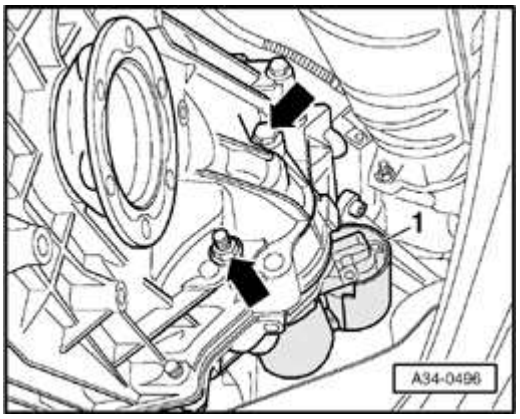

Fig. 171: Starter And Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert transmission, making sure there is sufficient clearance to drive shafts.
- Install starter - **arrows** - and tighten top left and right engine/transmission connecting bolts.

NOTE:

- **The bottom bolts are installed at a later stage.**

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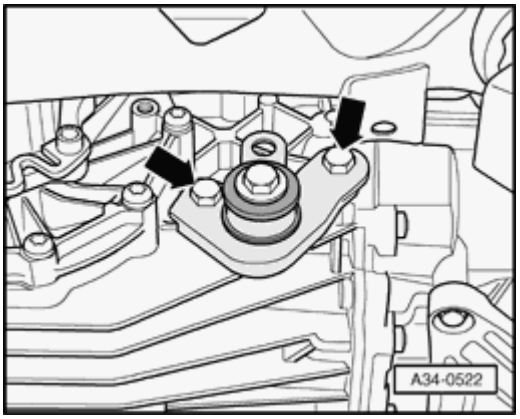

Fig. 172: Bracket For Front Exhaust Pipe (Left-Side) On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt bracket for front exhaust pipe (left-side) to transmission - **arrows** -.

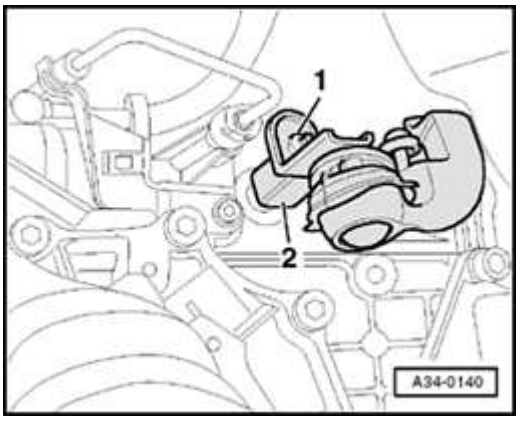

Fig. 173: Identifying Selector Mechanism Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install transmission selector lever - **2** - and tighten nut - **1** -.

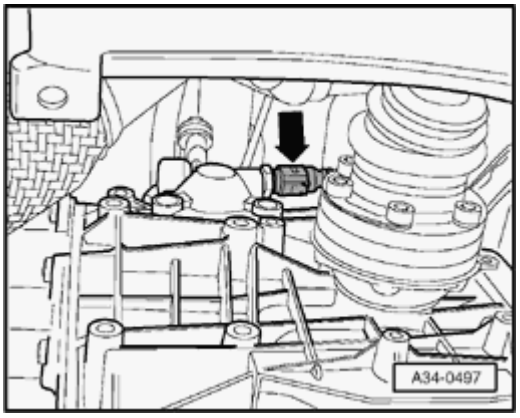

Fig. 174: Disconnecting/Connecting Harness Connector For Back-Up Light Switch At Right Of Transmission

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect connector - **arrow** - for reversing light switch on right side of transmission.

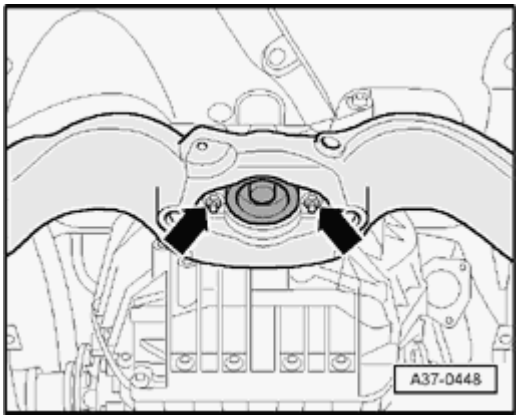

Fig. 175: Tunnel Cross Member Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt tunnel cross member onto transmission mounting - **arrows** -.
- It is important to clean the threaded holes for driveshaft bolts to remove any remaining locking fluid. The threads can be cleaned with a thread tap.
- Bolt driveshaft onto transmission --> **39 FINAL DRIVE, DIFFERENTIAL** .

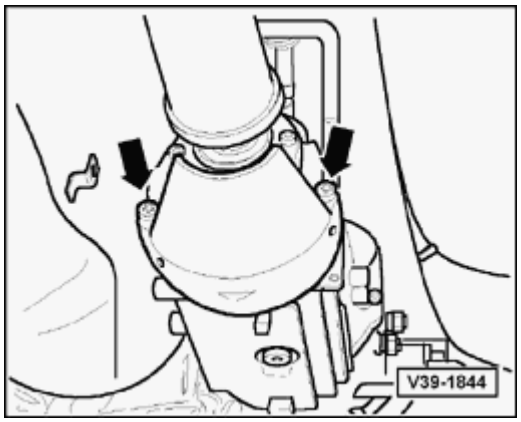

Fig. 176: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt on heat shield for driveshaft - **arrows** -.

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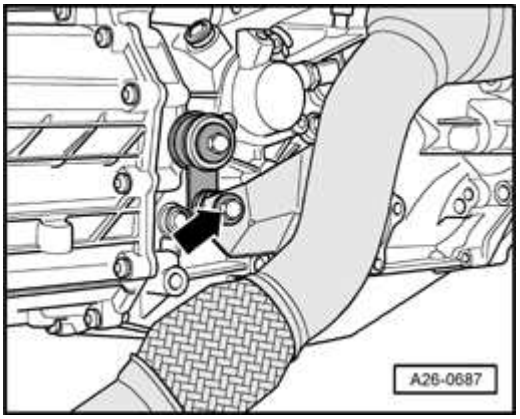

Fig. 177: Removing Bolt At Strap For Right Front Exhaust Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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.**

- Bolt front exhaust pipe (right-side) to bracket - **arrow** -.

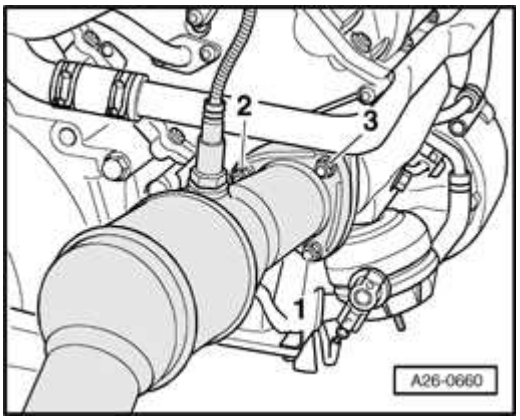

Fig. 178: Removing/Installing Nuts For Right Front Exhaust Pipe/Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten nuts - **1to3** - at front exhaust pipe/exhaust manifold connection evenly and progressively (hold catalytic converter in a horizontal position).

NOTE:

- **Shown in illustration with engine removed.**

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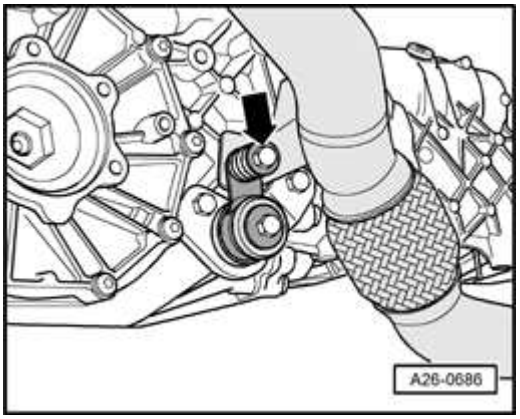

Fig. 179: Removing Bolt At Strap For Left Front Exhaust Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

- Bolt front exhaust pipe (left-side) to bracket - **arrow** -.

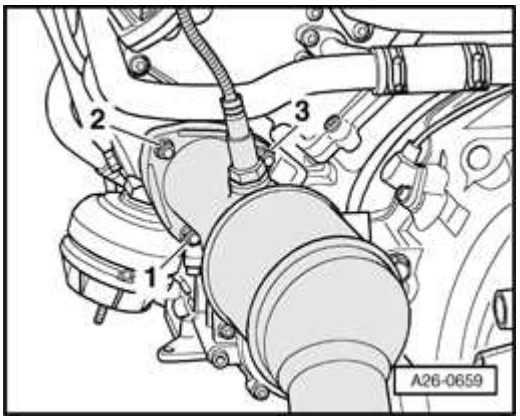

Fig. 180: Removing/Installing Nuts For Left Front Exhaust Pipe/Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten nuts - **1 to 3** - at front exhaust pipe/exhaust manifold connection evenly and progressively (hold catalytic converter in a horizontal position).

NOTE:

- **Shown in illustration with engine removed.**

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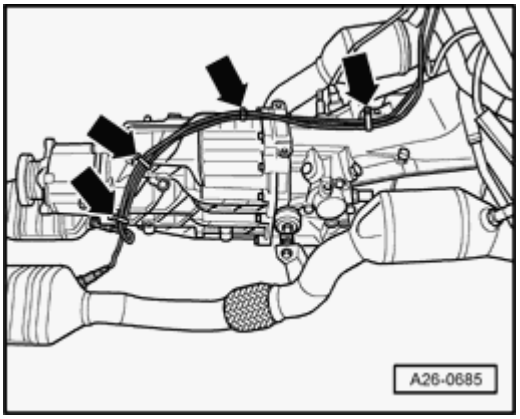

Fig. 181: Freeing Up Oxygen Sensor Wires At Areas Indicated By On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach oxygen sensor probe wiring to transmission at the points marked with - **arrows** -.

NOTE:

- **In the illustration the engine/transmission assembly has been removed.**

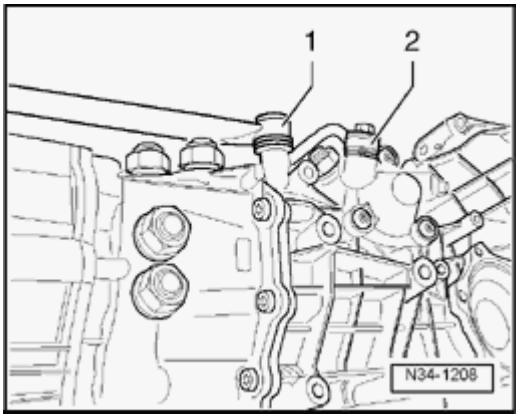

Fig. 182: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install push rod - **1** - ; to do so, tighten hexagon socket head bolt.
- Secure connecting rod - **2** - for selector rod.
- Bolt drive shafts to flange shafts --> **40 - FRONT SUSPENSION** .

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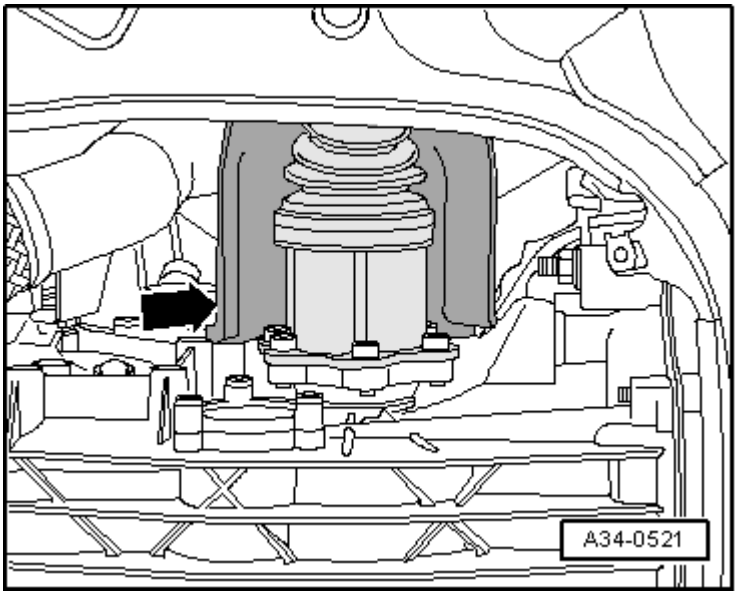

Fig. 183: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install heat shields - **arrow** - for drive shafts (left and right).

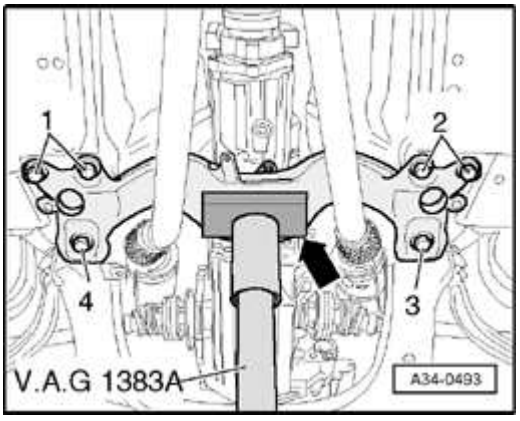

Fig. 184: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove transmission support 3282 from engine and transmission jack V.A.G 1383 A and place a wooden block - **arrow** - on the lifting column in its place.
- Push rear cross member upwards with engine and transmission jack V.A.G 1383 A.
- Replace bolts - **1 to 4** -.
- Bolt on tunnel cross member hand-tight.

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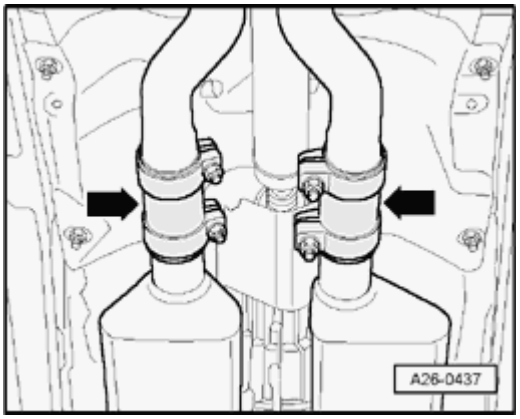

Fig. 185: Loosening Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install clamps - **arrows** - for exhaust system.
- Install exhaust system and perform stress-free alignment --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

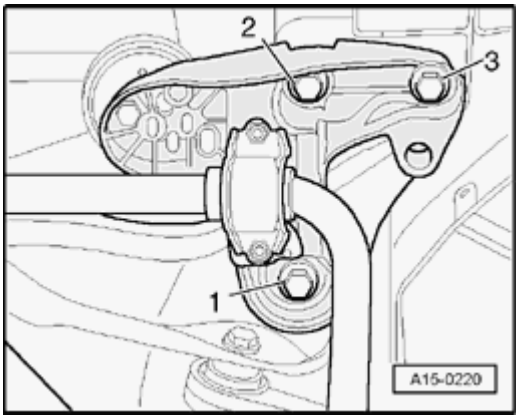

Fig. 186: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First remove front bolts - **2** - and - **3** - on subframe (left and right). Then remove bolts - **1** -.
- Lower subframe at the front.

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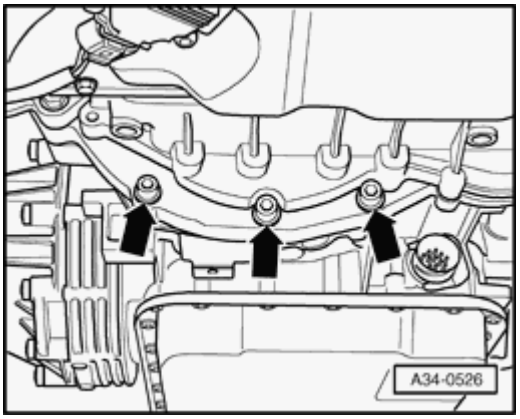

Fig. 187: Removing/Installing Bottom Engine/Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten three bottom engine/transmission securing bolts - **arrows** -.

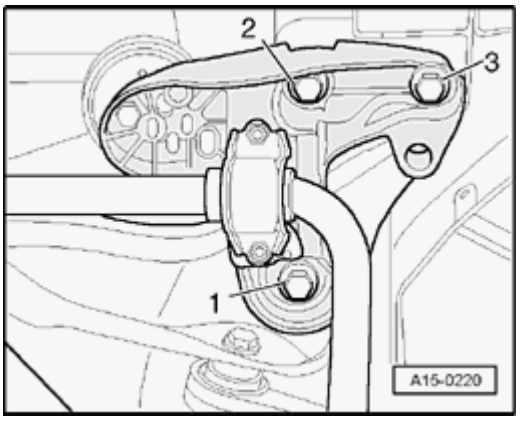

Fig. 188: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace front subframe bolts - **1...3** - on both sides of the vehicle.

Before tightening subframe, it must be aligned with body using locating pins 3393.

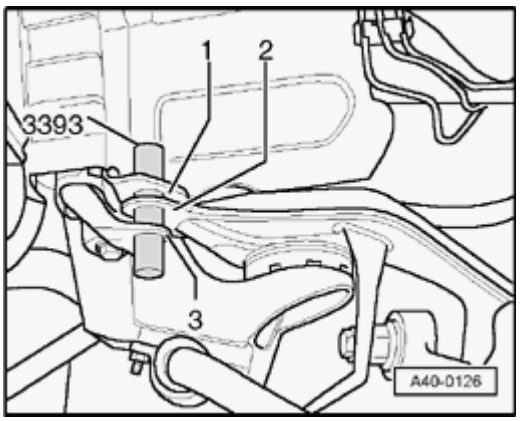

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Fig. 189: Identifying Hole, Sub-Frame Hole And Aluminum Console Hole Align On Both Sides
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hole - **1** - , hole - **2** - in subframe and hole - **3** - in aluminum bracket must be in alignment on both sides.

NOTE:

- **If this is not the case, wheel alignment will have to performed at a later stage.**

- Secure subframe and tunnel cross member --> **40 - FRONT SUSPENSION** .

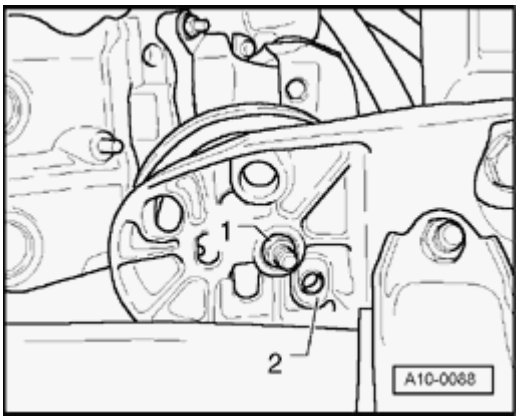

Fig. 190: Threaded Connections And Positioning Sleeves On Lower Engine Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten nuts - **1** - for engine mountings.

The remaining installation steps are performed in the reverse sequence; note the following points:

- Check selector mechanism setting and adjust if necessary --> **Shift mechanism, adjusting**.
- Check gear oil level in transmission --> **Transmission gear oil, checking level**.
- Follow steps required after connecting battery -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

  .
- Perform wheel alignment if required --> **44 - WHEELS, TIRES, VEHICLE ALIGNMENT** .

- Wheel alignment is not necessary if subframe was located in relation to body using locating pins 3393 prior to dismantling and assembly of subframe (before tightening bolts).
- Wheel alignment must, however, be performed if the subframe was not located in relation to the body using locating pins 3393 or if it was not possible to fully insert the two locating pins into the holes.

NOTE:

- **Tightening torques only apply to lightly greased, oiled, phosphated or blackened nuts and bolts.**

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- **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%.**

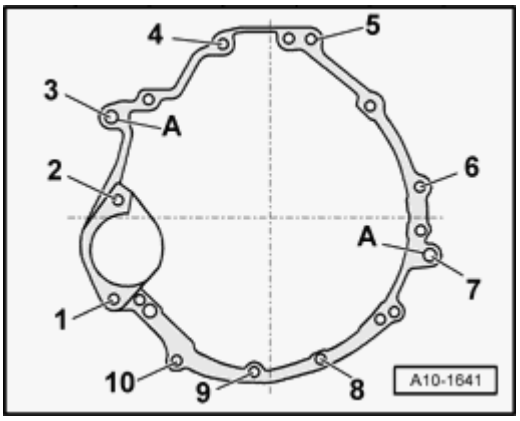

Fig. 191: Identifying Engine/Transmission Threaded Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission securing bolts

Item	Bolt	Nm
1, 2	M12x120	65
3	M12x110	65
4, 5	M12x105	65
6	M12x130	65
7	M12x170	65
8, 9, 10	M10x60	45

- **A** - = Dowel sleeves for aligning

Tightening torques

Component	Nm
Clutch slave cylinder to transmission	23 * See note
Selector shaft lever to transmission	23* See note
Push rod to transmission	40
Connecting rod for selector rod to transmission	23
Bracket for exhaust pipe lug.	23
Transmission mounting to transmission	23
Transmission mounting to tunnel cross member	23
Heat shields above drive shafts to transmission	23

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Heat shield for driveshaft to transmission cover	25
Engine mounting to engine support	23
Bracket for noise insulation to subframe	10

* Replace bolt

Transmission, transporting

Special tools, testers and auxiliary items required

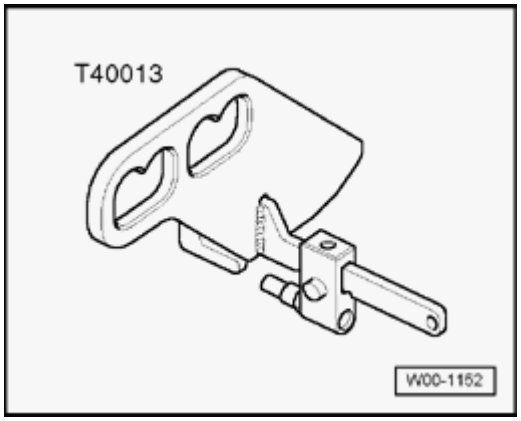

Fig. 192: Lifting Aid T40013
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lifting aid T40013

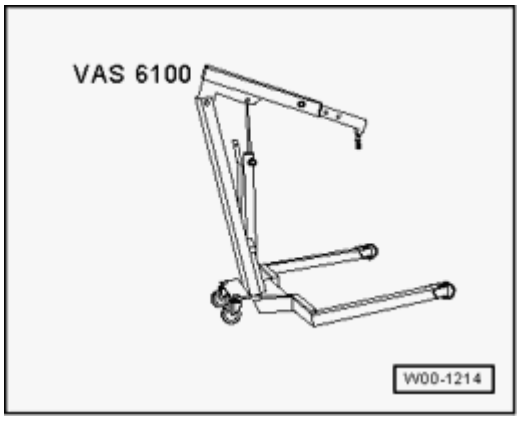

Fig. 193: Identifying Shop Crane VAS 6100
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Workshop hoist VAS 6100

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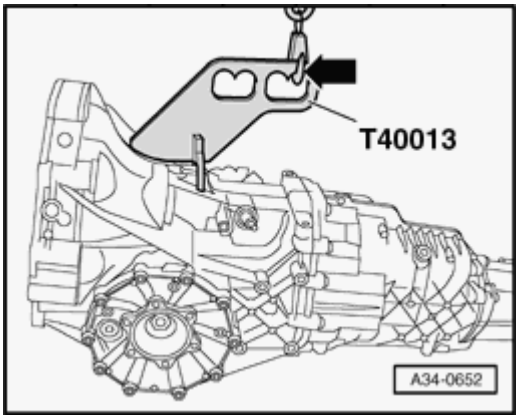

Fig. 194: Lifting Transmission With Workshop Hoist VAS 6100 And Lifting Aid T40013
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Procedure

- Insert lifting aid T40013 in lifting eye on transmission and secure.
- Engage hook of workshop hoist VAS 6100 in 4th notch - **arrow** - on lifting aid.
- Lift transmission with workshop hoist VAS 6100 and lifting aid T40013.

TRANSMISSION GEAR OIL, CHECKING LEVEL

Transmission gear oil, checking level

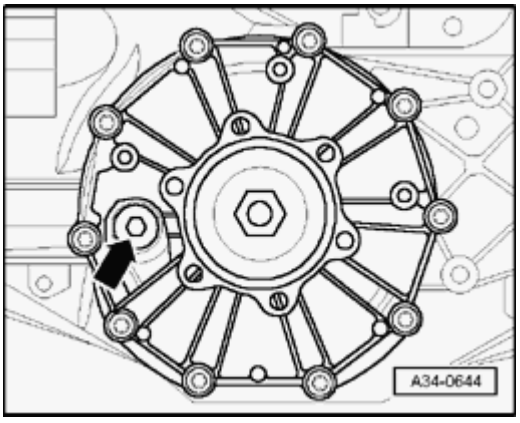

Fig. 195: Locating Oil Filler Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Procedure

NOTE:

- **The vehicle must be horizontal when checking gear oil level.**

- To check gear oil level, unscrew oil filler plug - **arrow** -.

Check oil level with a suitable tool (such as a length of wire bent to shape).

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- Specification: Oil level 2mm +-1mm below lower edge of oil filler hole.

  - Top off with gear oil if necessary. Specification --> **Code letters, assignment of mechanical units, transmission ratios, capacities**.
  - Screw in oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	40

TRANSMISSION MOUNTING, REMOVING AND INSTALLING

Transmission mounting, removing and installing

Special tools, testers and auxiliary items required

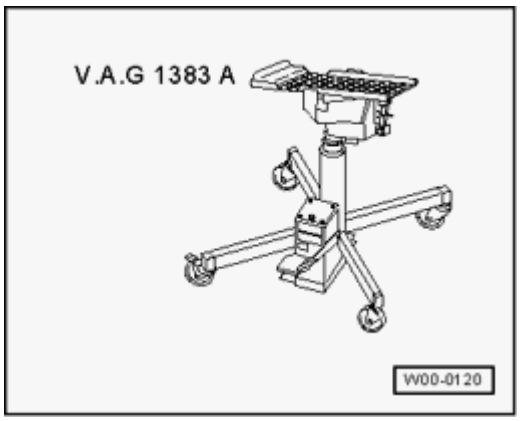

Fig. 196: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

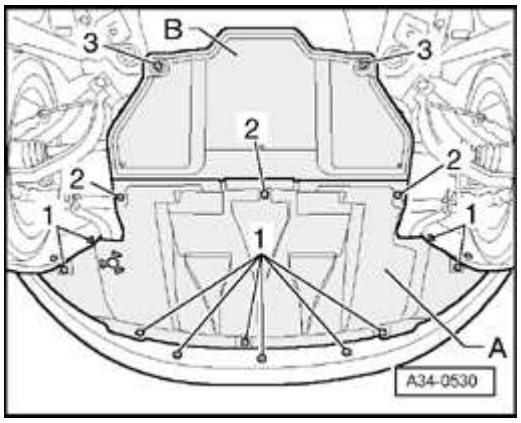

Fig. 197: Front And Rear Sound Insulation And Fasteners

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- If installed, loosen quick release fasteners - **3** - and remove rear noise insulation - **B** -.

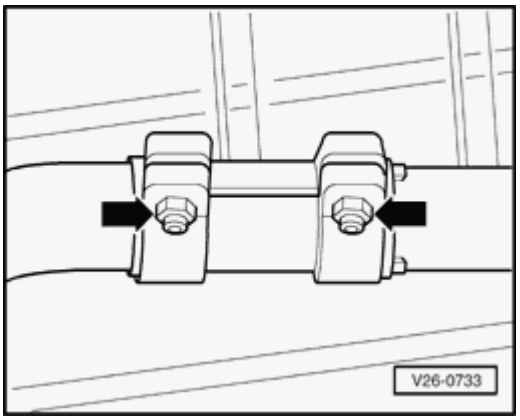

Fig. 198: Disconnecting Exhaust System At Double Clamp
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

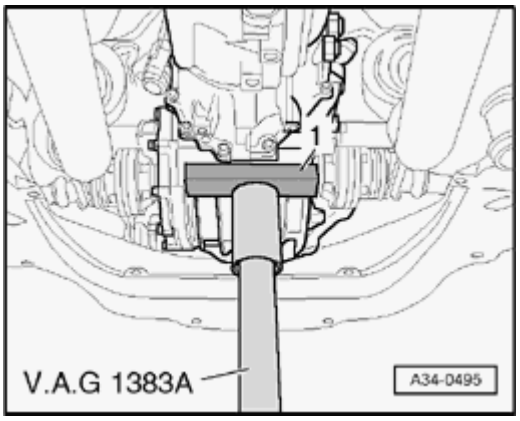

Fig. 199: Transmission Raised Using Punch Of VAG 1383 A So That A Piece Of Wood Can Be Placed In Between
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use engine and transmission jack V.A.G 1383 A to lift transmission up slightly. Insert a wooden block - **1** - between transmission and transmission jack.

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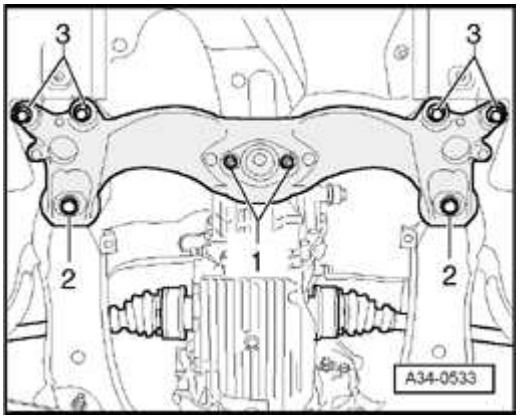

Fig. 200: Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First remove bolts - **3** - and then bolts - **2** - at tunnel cross member.
- Lower transmission slightly.
- Unscrew the two nuts - **1** - and push tunnel cross member backwards slightly.

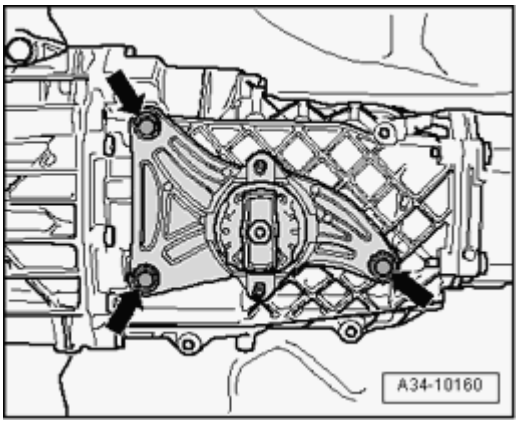

Fig. 201: Identifying Transmission Mounting Is Transferred To New Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew transmission mounting - **arrows** -.

Installing

Installation is performed in reverse sequence; note the following:

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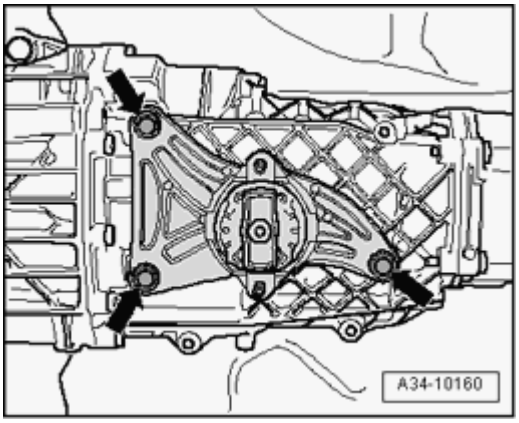

Fig. 202: Identifying Transmission Mounting Is Transferred To New Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install transmission mounting on transmission. Tighten bolts - **arrows** - to torque setting **Torque settings**.

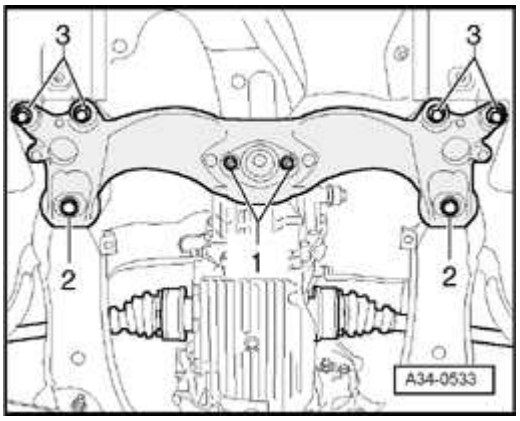

Fig. 203: Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt tunnel cross member onto transmission mounting - **1** -.
- Lift transmission far enough to be able to screw in the bolts - **2** -.
- First tighten bolts - **2** - and then bolts - **3** - --> **40 - FRONT SUSPENSION** .
- Install exhaust system so it is free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

- Install noise insulation below transmission.

Torque settings

Component		Nm
Transmission mounting to transmission		23
Tunnel cross member to transmission mounting		23
Clamp for exhaust pipe		40

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MOUNTING TRANSMISSION ON ASSEMBLY STAND

Mounting transmission on assembly stand

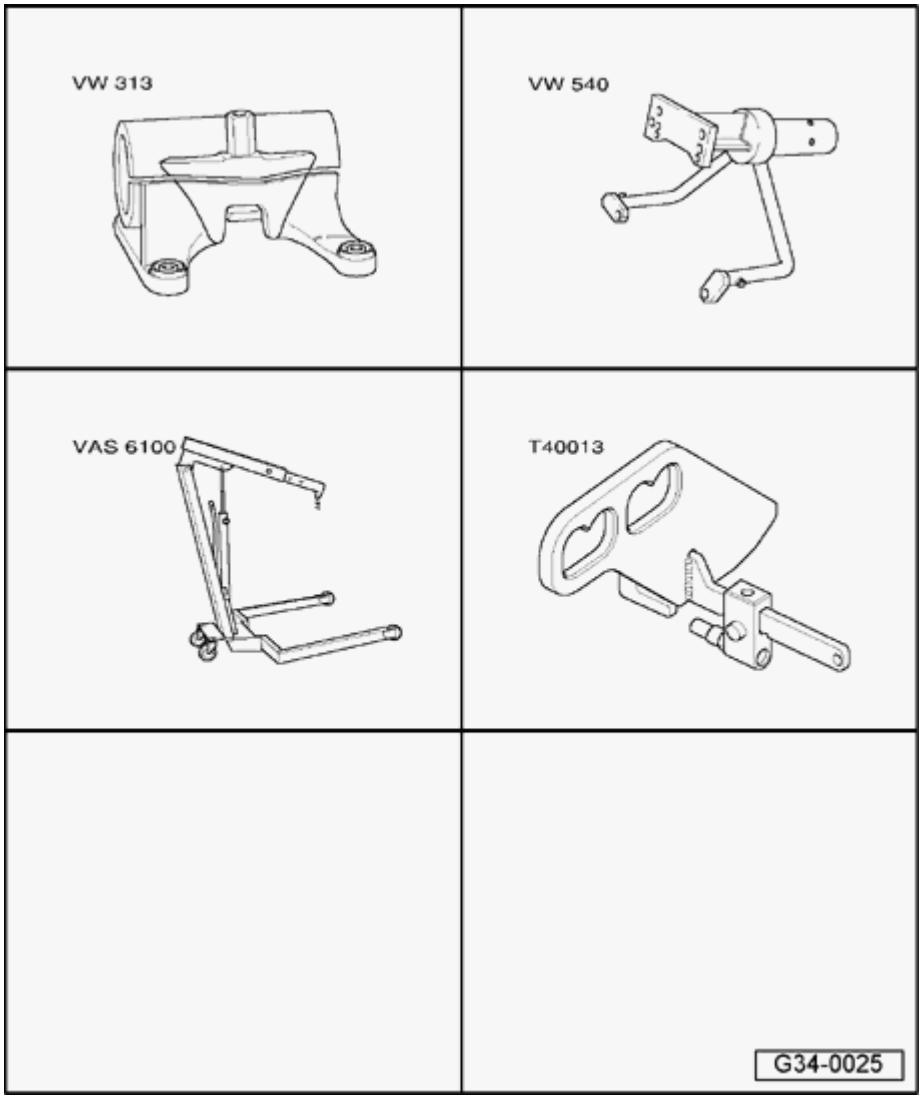

Fig. 204: Identifying Special Tools - Mounting Transmission On Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Support clamp VW 313
- Engine/transmission support VW 540
- Workshop hoist VAS 6100
- Lifting aid T40013

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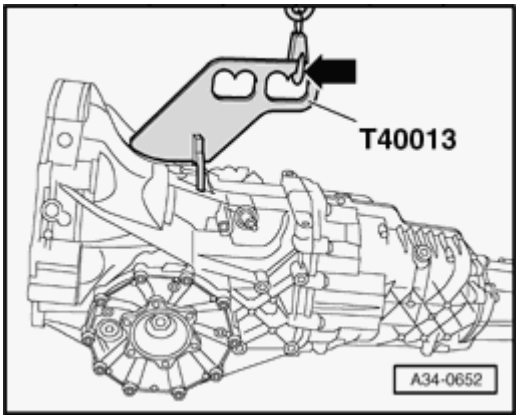

Fig. 205: Lifting Transmission With Workshop Hoist VAS 6100 And Lifting Aid T40013
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Procedure

- Insert lifting aid T40013 in lifting eye on transmission and secure.
- Engage hook of workshop hoist VAS6100 in 4th notch - **arrow** - on lifting aid T40013.
- Lift transmission with workshop hoist VAS6100 and lifting aid T40013.

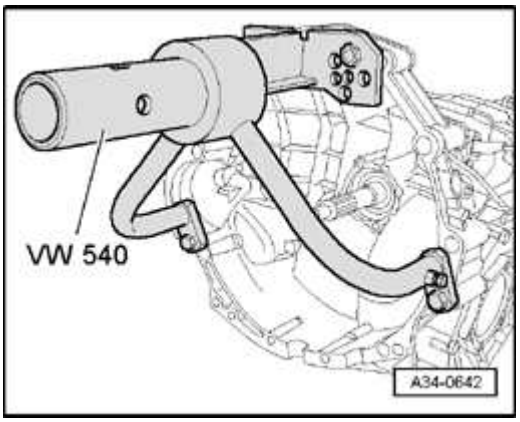

Fig. 206: Securing Engine And Transmission Support VW 540 To Transmission And Fitting Into Support Clamp VW313
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure engine and transmission support VW 540 to transmission and fit into support clamp VW313.

TRANSMISSION COVER AND TORSEN DIFFERENTIAL, REMOVING AND INSTALLING

Transmission cover and Torsen differential, assembly overview

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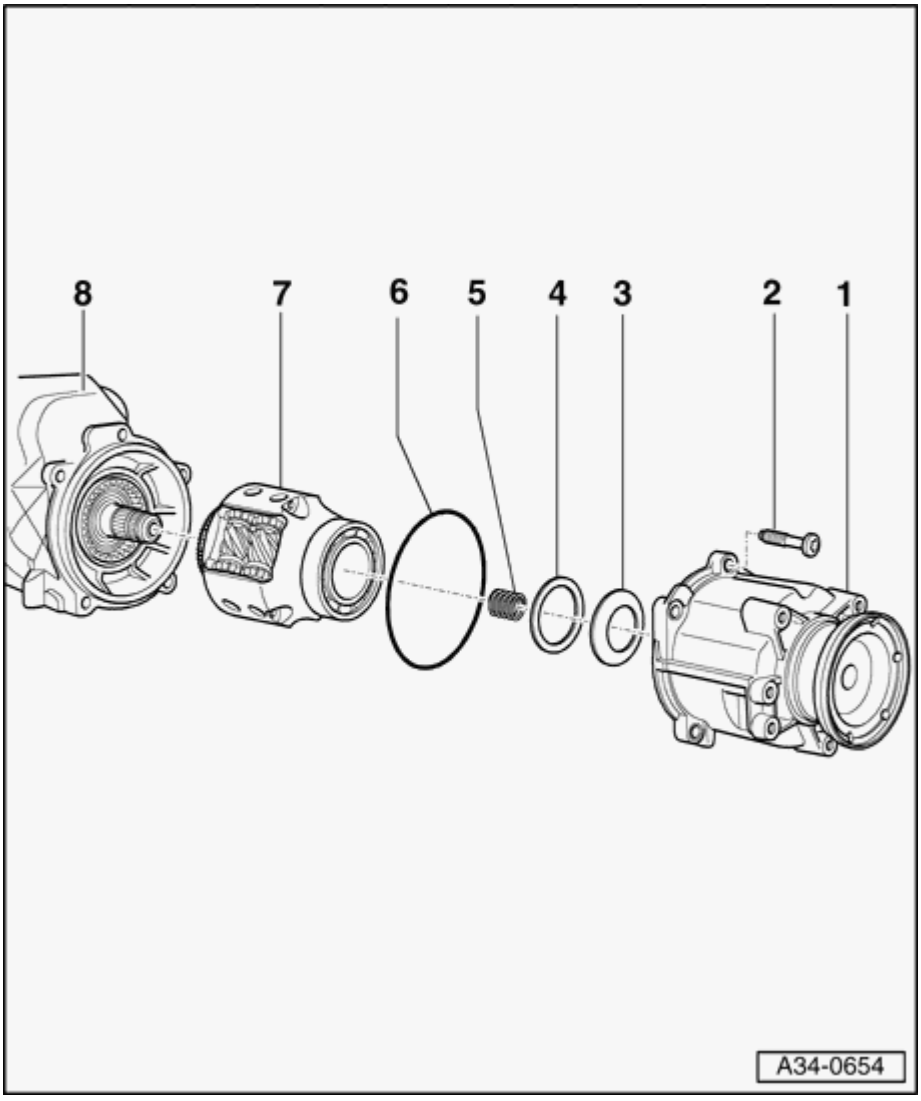

Fig. 207: Transmission Cover And Torsen Differential, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission cover

- With or without vibration damper, depending on design
- Removing and installing (transmission removed) --> **Transmission cover (transmission removed), removing and installing**
- Removing and installing (transmission installed) --> **Transmission cover (transmission installed), removing and installing**
- Dismantling and assembling --> **Transmission cover, dismantling and assembling**

2 - Bolt, 24 Nm

- 6 x

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3 - Dished spring

- Installation position: larger diameter (concave side) faces shim

4 - Shim

5 - Spring

6 - O-ring

- Always replace
- Lubricate with gear oil before installing.

7 - Torsen differential

- Can only be serviced by manufacturer

8 - Manual transmission

- Removing and installing --> **Transmission, removing and installing**
- Mounting on assembly stand --> **Mounting transmission on assembly stand**

Transmission cover (transmission removed), removing and installing

Special tools, testers and auxiliary items required

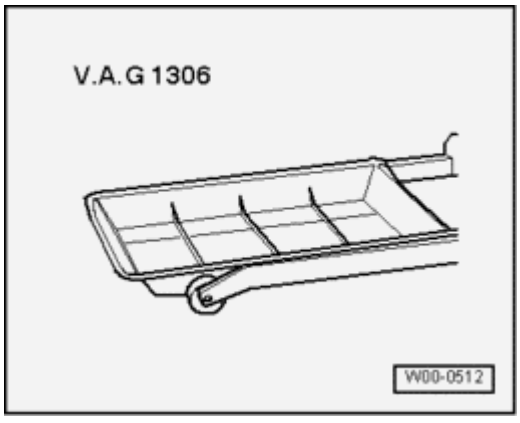

Fig. 208: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray V.A.G1306

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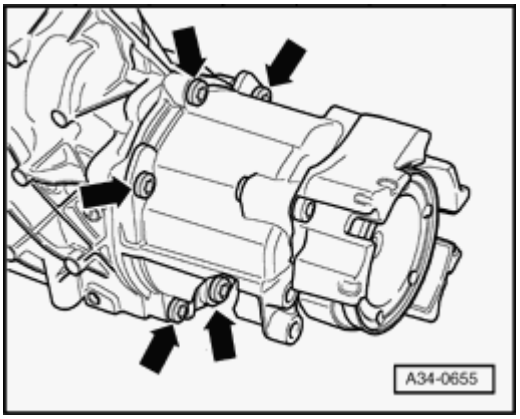

Fig. 209: Identifying Transmission Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Mount transmission on assembly stand --> **Mounting transmission on assembly stand**
- Place drip tray V.A.G1306 under transmission.
- Drain off gear oil.
- Unscrew bolts - **arrows** - and pull off transmission cover.

Installing

NOTE:

- **Replace O-rings.**

- Replace O-ring on transmission housing.
- Install transmission cover and tighten bolts - **arrows** -.
- Fill up with gear oil and check gear oil level --> **Transmission gear oil, checking level**.

Tightening torque

Component	Nm
Transmission cover to transmission	24

Transmission cover (transmission installed), removing and installing

Special tools, testers and auxiliary items required

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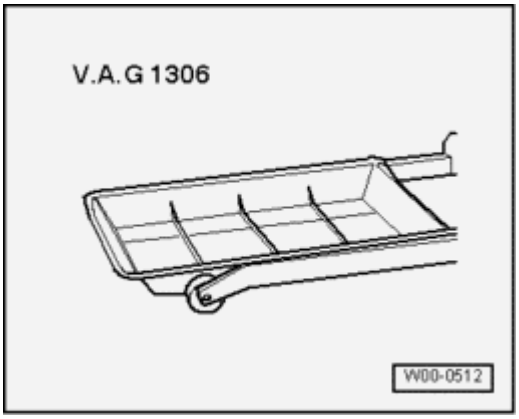

Fig. 210: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray V.A.G1306

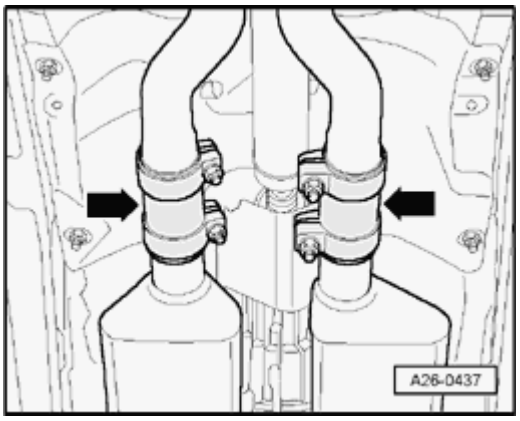

Fig. 211: Loosening Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

NOTE:

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

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

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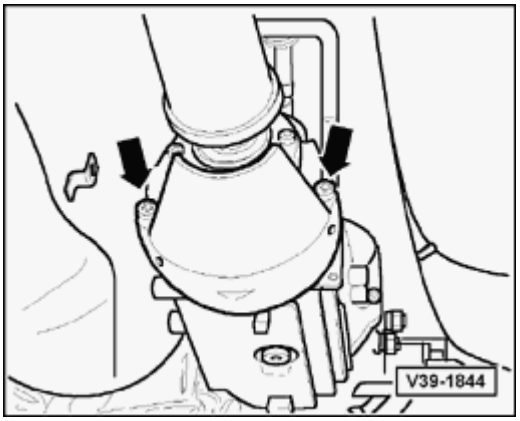

Fig. 212: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt heat shield for driveshaft - **arrows** -.

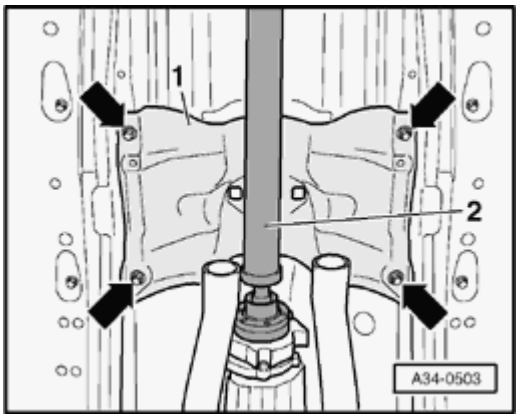

Fig. 213: Heatshield Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

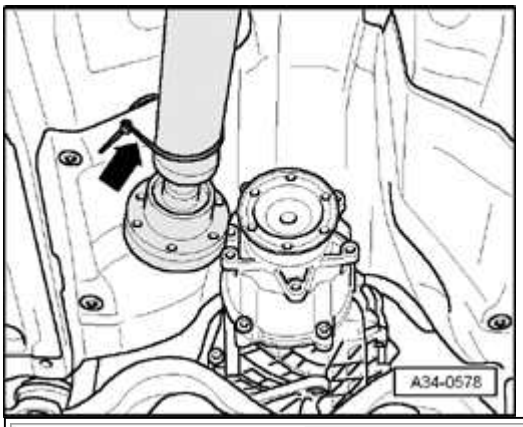

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Fig. 214: Drive Shaft Tied To Side, Onto Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tie driveshaft up to side onto heat shield - **arrow** -.
- Place drip tray V.A.G1306 under transmission.
- Drain off gear oil.

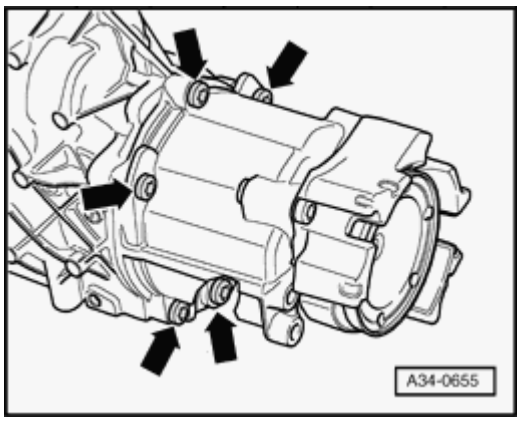

Fig. 215: Identifying Transmission Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew bolts - **arrows** - and take off transmission cover.

Installing

Installation is performed in reverse sequence; note the following:

NOTE:

- **Always replace O-rings, gaskets and self-locking nuts.**

- Install transmission cover and tighten bolts - **arrows** -.
- Fill up with gear oil and check gear oil level --> **Transmission gear oil, checking level**.
- Bolt driveshaft onto transmission --> **39 FINAL DRIVE, DIFFERENTIAL** .
- Install exhaust system and perform stress-free alignment -->
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BHF
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

.

Tightening torques

Component	Nm
Transmission cover to transmission	24
Heat shield for driveshaft to transmission cover	25

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TRANSMISSION COVER, DISMANTLING AND ASSEMBLING

Transmission cover, dismantling and assembling

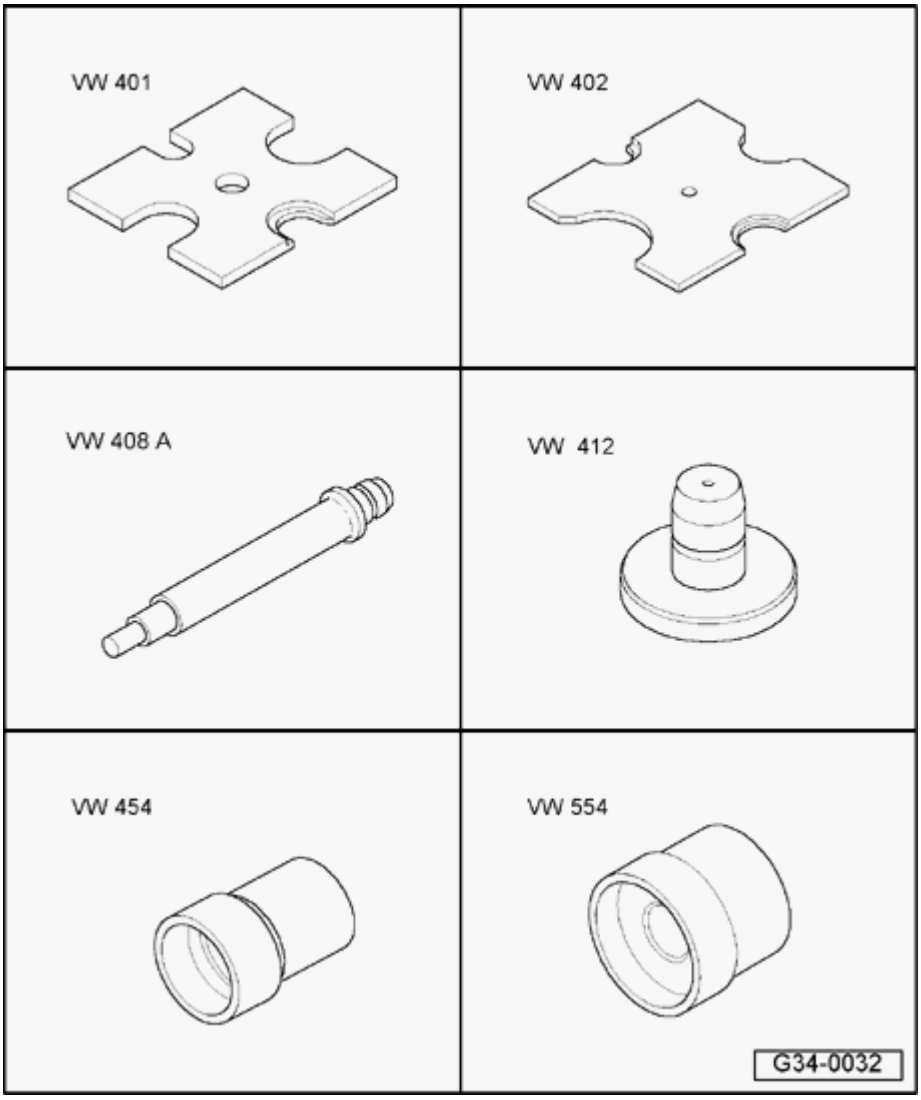

Fig. 216: Identifying Special Tools - Transmission Cover, Dismantling And Assembling (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust plate VW 402
- Press tool VW 408 A
- Press tool VW 412
- Press tool VW 454

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- Press tool VW 554

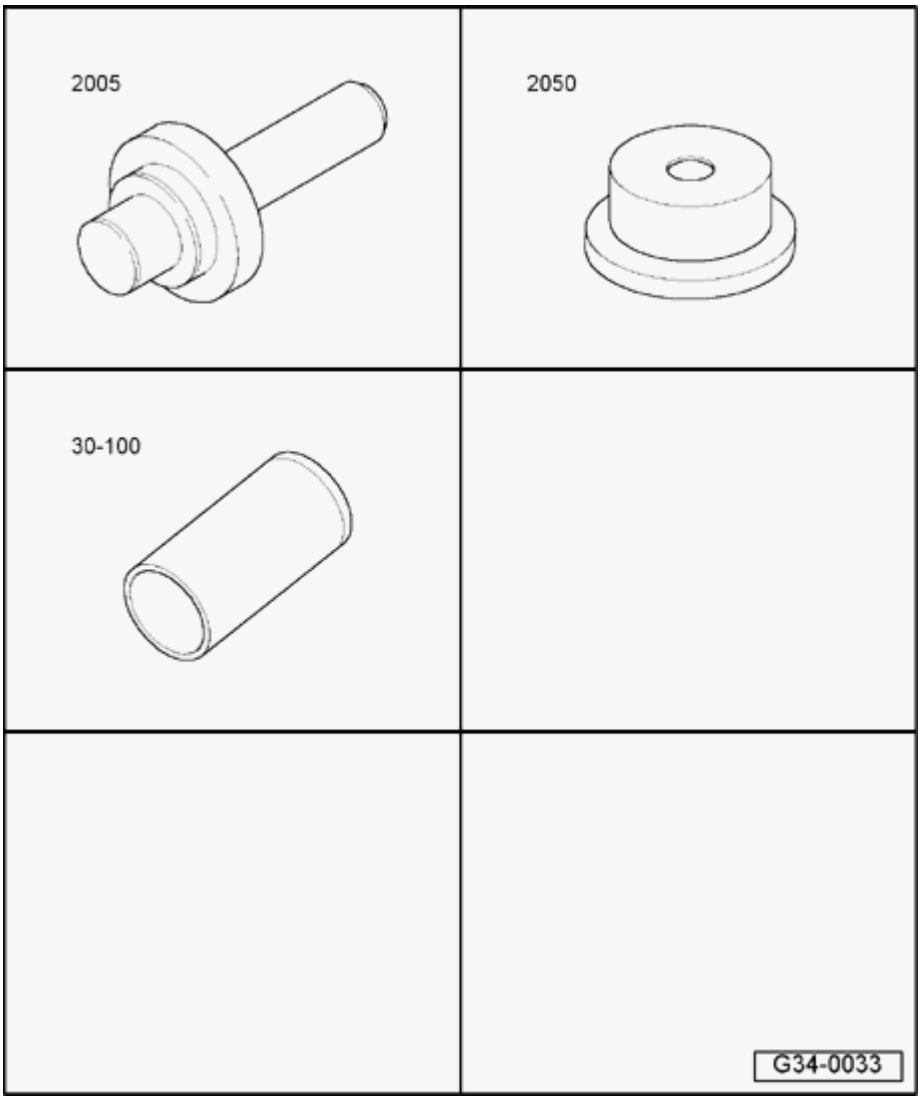

Fig. 217: Identifying Special Tools - Transmission Cover, Dismantling And Assembling (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Punch 2005
- Thrust piece 2050
- Drift sleeve 30 - 100
- **Shim 016 311 391 A**

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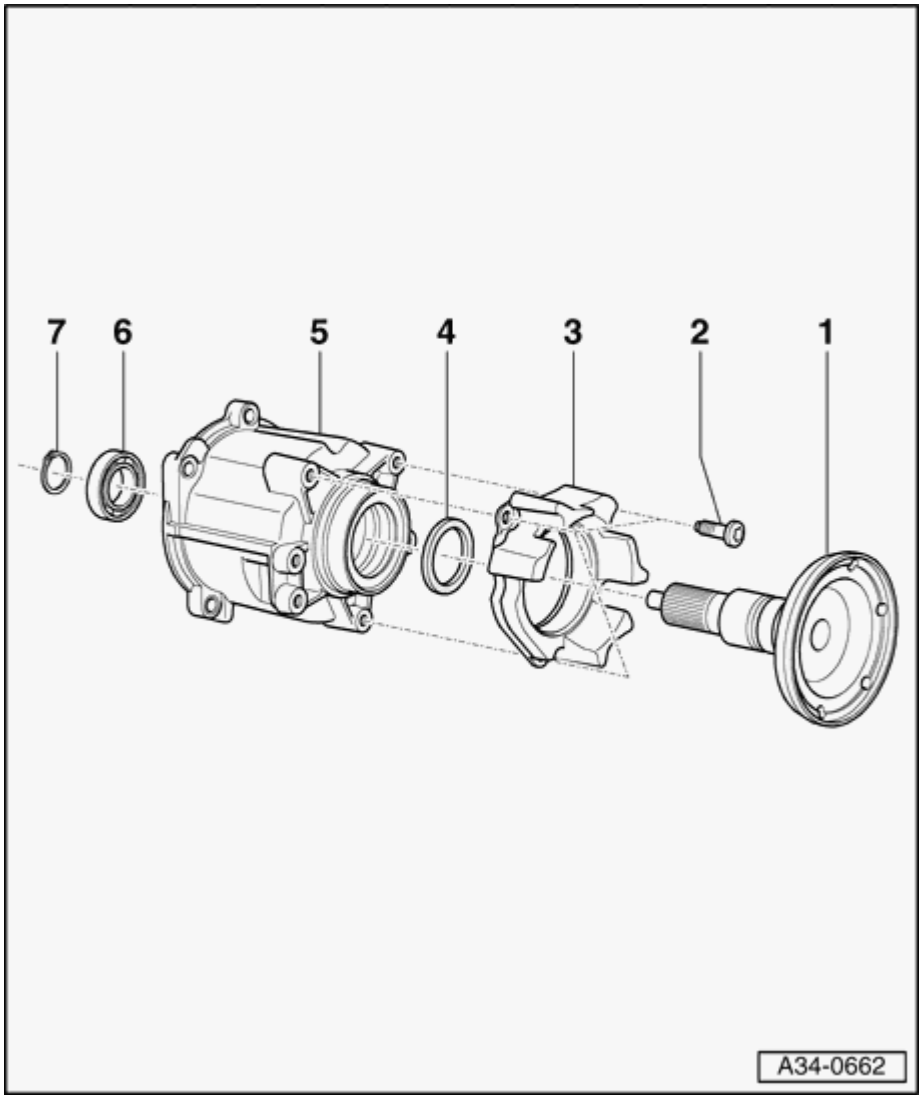

Fig. 218: Exploded View Of Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Flange shaft

- Pressing out **Pressing out flange shaft (transmission cover with vibration damper)** or **Pressing out flange shaft (transmission cover without vibration damper)**
- Pressing in **Pressing in flange shaft**

2 - Bolt, 20 Nm + 90°

- For vibration damper
- 3 x
- Self-locking
- Replace

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3 - Vibration damper

- Not installed on all versions

4 - Oil seal

- Levering out **Levering off the oil seal.**
- Preparing for installation **Preparing oil seal for installation**
- Driving in **Drive in seal onto stop.**

5 - Transmission cover

- Removing and installing --> **Transmission cover and Torsen differential, removing and installing**

6 - Ball bearing

- For flange shaft
- Pressing out **Pressing out ball bearing for flange shaft**
- Pressing in **Pressing in ball bearing for flange shaft**

7 - Circlip

Pressing out flange shaft (transmission cover with vibration damper)

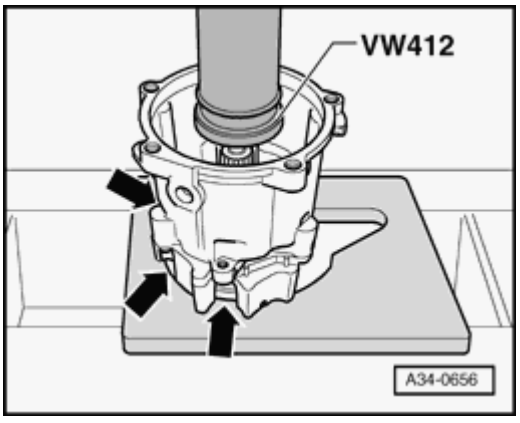

Fig. 219: Pressing Out Flange Shaft (Transmission Cover With Vibration Damper)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing out flange shaft.
- Set up transmission cover in such a way that flange shaft does not make contact with press plate - **arrows** - when it is pressed out.

Pressing out flange shaft (transmission cover without vibration damper)

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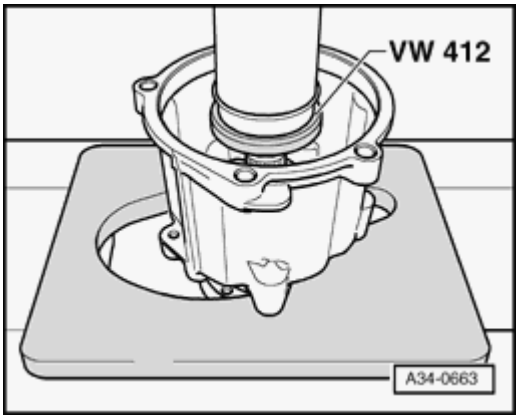

Fig. 220: Pressing Out Flange Shaft (Transmission Cover Without Vibration Damper)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing out flange shaft.

Pressing in flange shaft

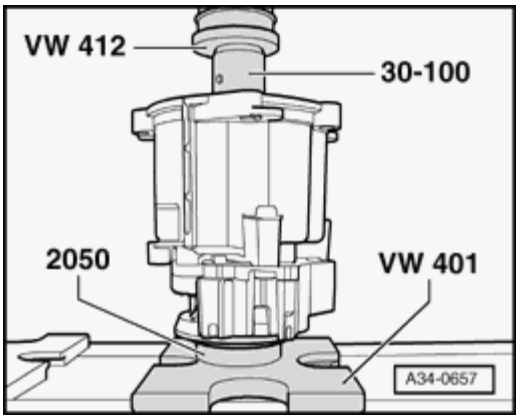

Fig. 221: Pressing In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure vibration damper before pressing in flange shaft.
- Fit circlip.

Levering off the oil seal.

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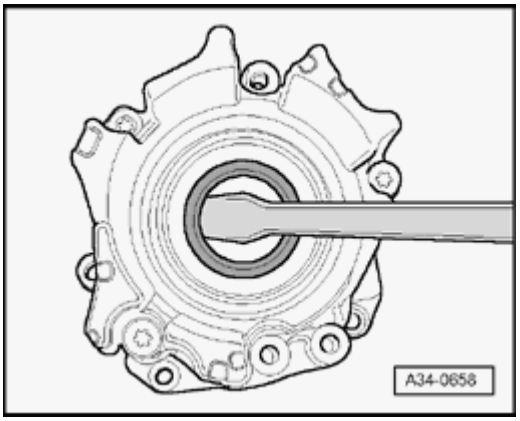

Fig. 222: Levering Off The Oil Seal.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Preparing oil seal for installation

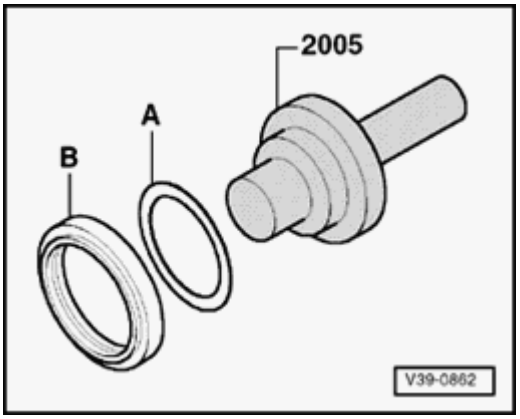

Fig. 223: Preparing Seal For Installation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - **Shim 016 311 391 A** (1.4 mm)

B - Oil seal

- Pack space between sealing lip and dust lip half-full with **sealing grease G 052 128 A1** .
- Place shim and oil seal on tool, as shown in illustration.

- Installation position: open side of seal towards bearing housing

Drive in seal onto stop.

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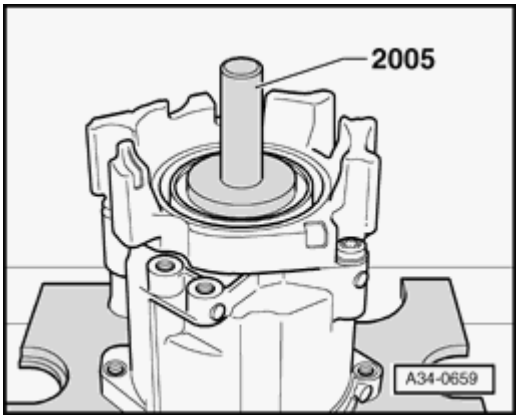

Fig. 224: Preparing Oil Seal For Installation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove shim.

Pressing out ball bearing for flange shaft

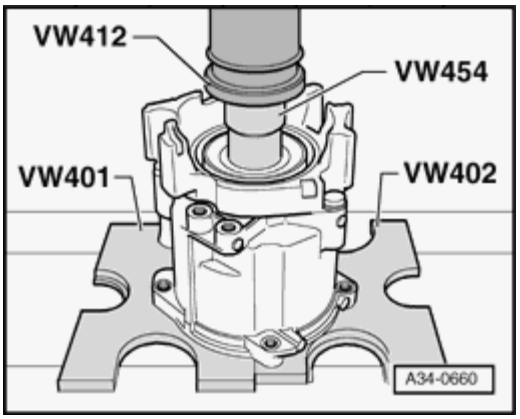

Fig. 225: Pressing Out Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing in ball bearing for flange shaft

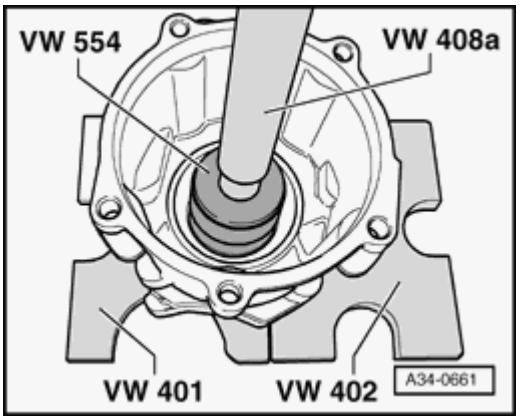

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Fig. 226: Pressing In Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

SELECTOR SHAFT WITH SELECTOR CYLINDER, SERVICING

Selector shaft with selector cylinder, removing and installing

Special tools, testers and auxiliary items required

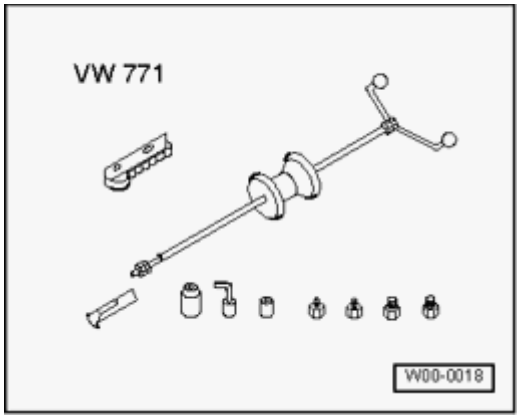

Fig. 227: Slide Hammer-Multi-Purpose Tool Set VW 771
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Multi-purpose tool VW 771/1

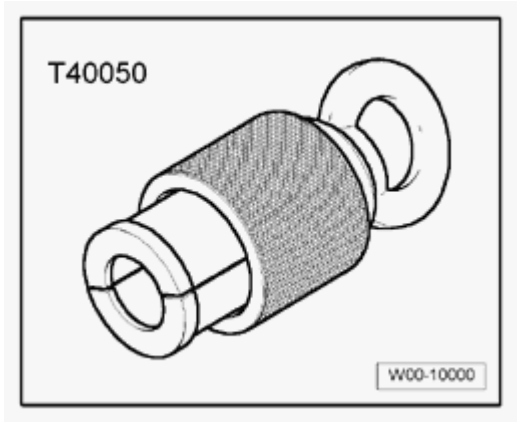

Fig. 228: Puller T40050
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Puller T40050

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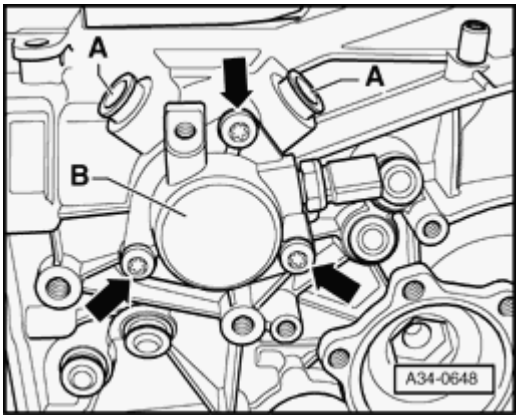

Fig. 229: Removing Bolts And Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Remove bolts - **arrows** - and remove selector shaft cover - **B** -.

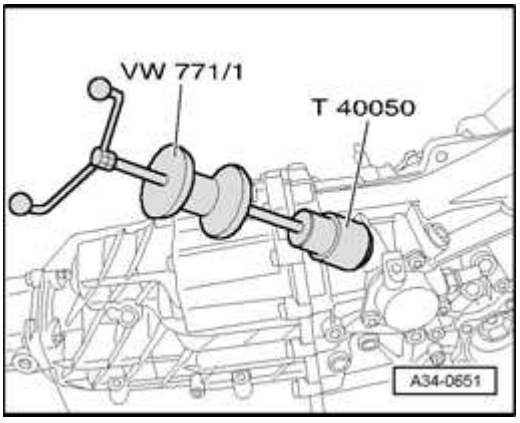

Fig. 230: Pulling Out Both Selector Shaft Locking Bushes Using Multi-Purpose Tool VW 771/1 And Puller T40050
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out both selector shaft locking bushes (- **item A** - in **Fig. 229**) using multi-purpose tool VW 771/1 and puller T40050.

- Make sure that no gear has been engaged.

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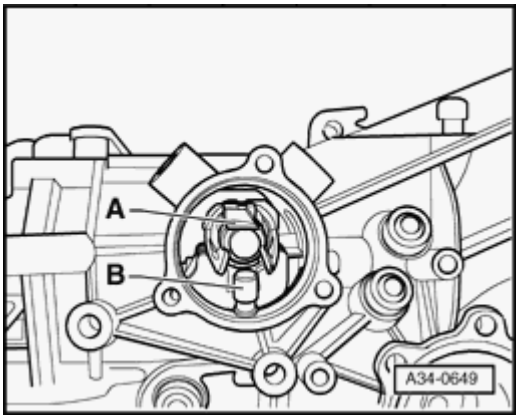

Fig. 231: Pushing Selector Shaft Into Transmission & Removing Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push selector shaft - **A** - into transmission as far as it will go, simultaneously removing pin - **B** -.
- Pull out selector shaft.

Installing

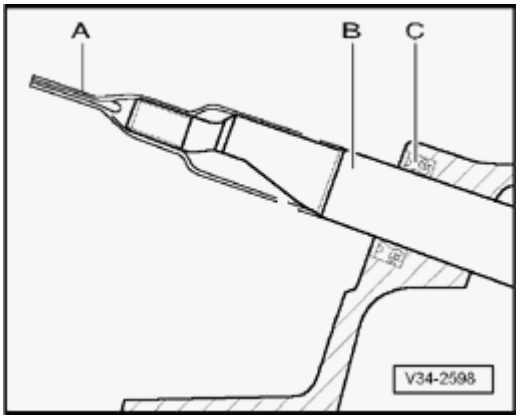

Fig. 232: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation is performed in reverse sequence; note the following:

- Push **assembly sleeve 01E 311 120** - **A** - onto selector shaft - **B** -.
- Install complete selector shaft.

- Installation position: Chamfer of selector shaft points downwards.

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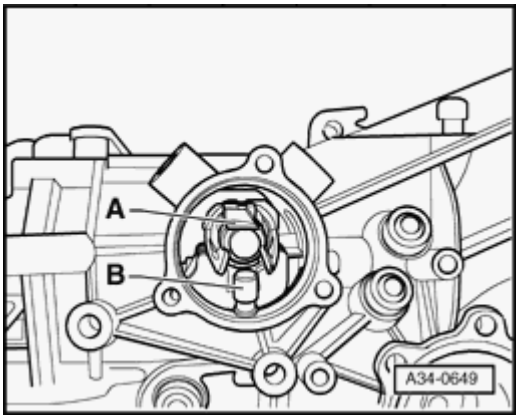

Fig. 233: Pushing Selector Shaft Into Transmission & Removing Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push selector shaft - **A** - into transmission as far as it will go, simultaneously inserting pin - **B** -.

- Installation position of pin - **B** - : lug on pin points in direction of transmission housing.

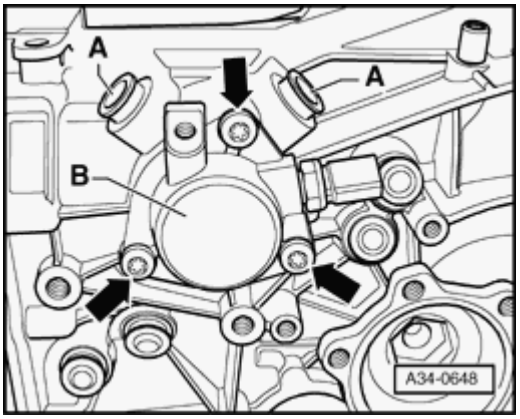

Fig. 234: Removing Bolts And Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fit cover - **B** - and tighten bolts - **arrows** -.

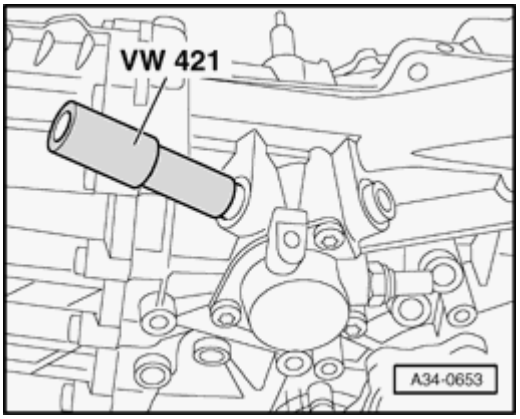

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Fig. 235: Driving In Selector Shaft Locking Bushes Onto Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive in selector shaft locking bushes onto stop.

Tightening torque

Component	Nm
Selector shaft cover to transmission	24

Selector shaft oil seal, replacing

Special tools, testers and auxiliary items required

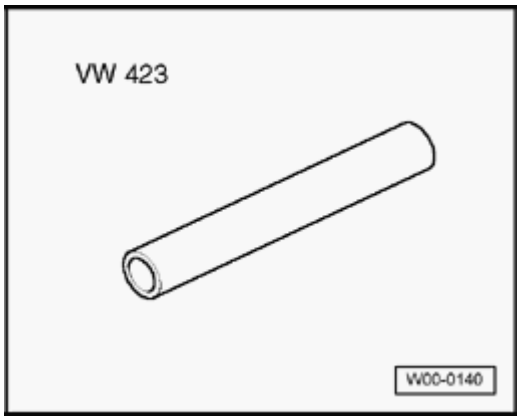

Fig. 236: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW 423

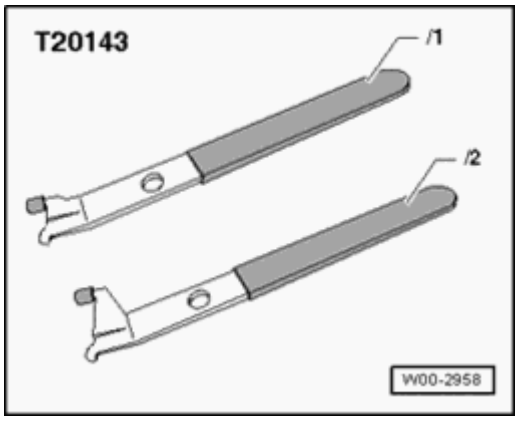

Fig. 237: Identifying Extractor Hook T20143
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Puller hook T20143/1

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Removing

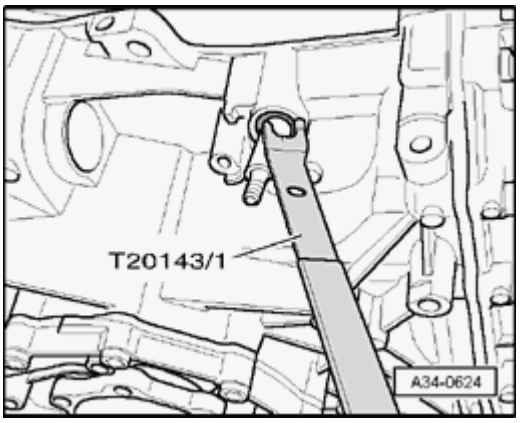

Fig. 238: Prying Out Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Selector shaft installed
  - Carefully pry out oil seal using puller hook T20143/1, taking care not to damage shaft.
- Selector shaft removed

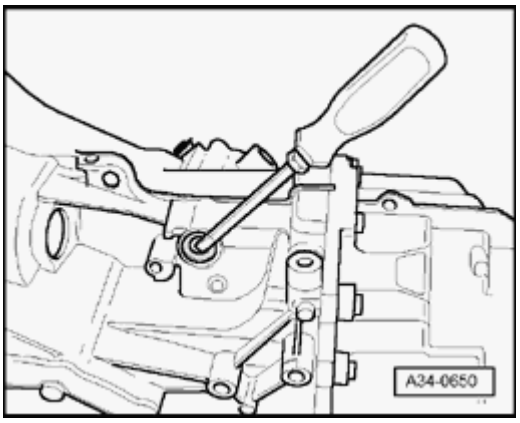

Fig. 239: Prying Out Seal With Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

  - Carefully pry out oil seal with a screwdriver.

Installing

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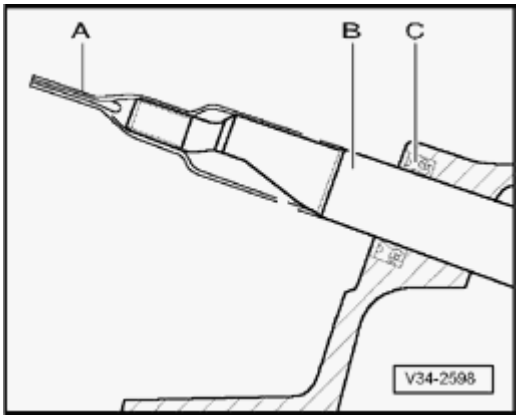

Fig. 240: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To avoid damaging oil seal - **C** - , oil seal and selector shaft must only be installed using **assembly sleeve 01E 311 120** , - **item A** -.
- Pack space between sealing lip and dust lip half-full with **sealing grease G 052 128 A1** .
- Lightly oil outer circumference of seal.

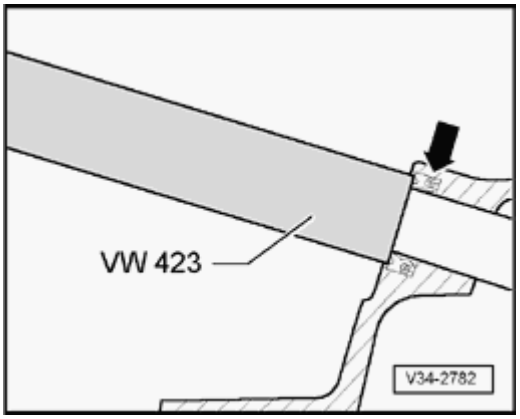

Fig. 241: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using tube VW 423, drive in oil seal to a depth of 1.1mm+-0.2mm.

REVERSING LIGHT SWITCH, REMOVING

Reversing light switch, removing

Special tools, testers and auxiliary items required

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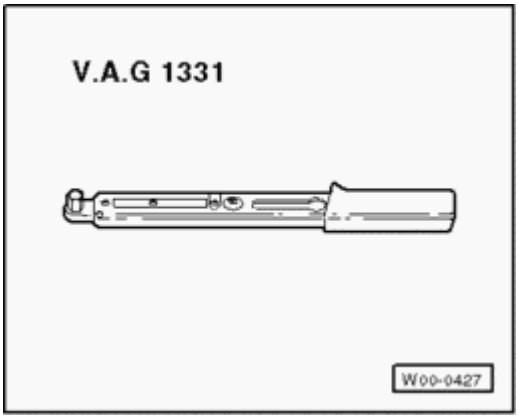

Fig. 242: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

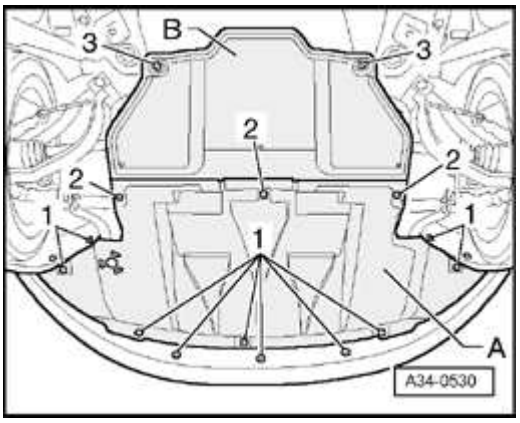

Fig. 243: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, loosen quick release fasteners - **3** - and remove rear noise insulation - **B** -.

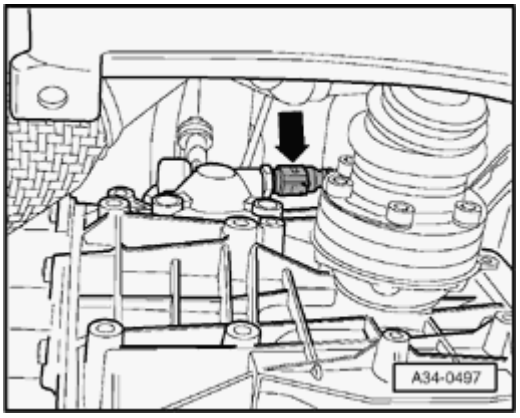

Fig. 244: Disconnecting Harness Connector For Back-Up Light Switch At Right Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Disconnect connector - **arrow** - for reversing light switch on right side of transmission.
- Unscrew reversing light switch - **arrow** - from selector shaft cover.

Reversing light switch, installing

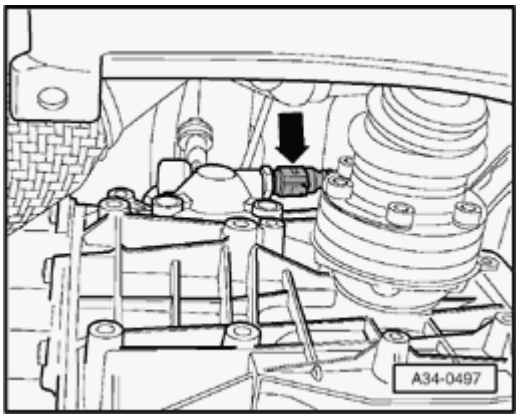

Fig. 245: Disconnecting Harness Connector For Back-Up Light Switch At Right Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Screw reversing light switch - **arrow** - into selector shaft cover (tightening torque: 20 Nm).
- Connect connector - **arrow** - for reversing light switch on right side of transmission.

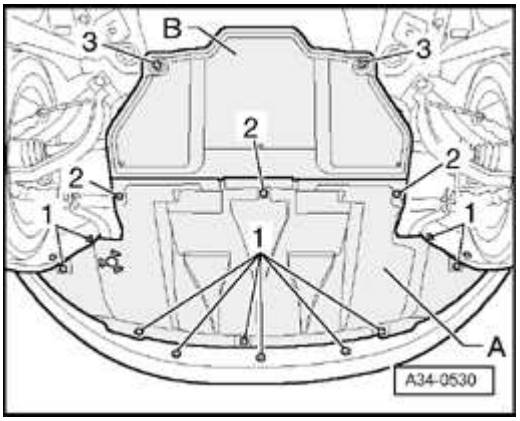

Fig. 246: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install rear noise insulation - **B** -.

35 GEARS, SHAFTS

INPUT SHAFT, DISMANTLING AND ASSEMBLING

At present there is no provision for disassembling.

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39 FINAL DRIVE, DIFFERENTIAL

FINAL DRIVE, SERVICING

Left flange shaft oil seal, replacing

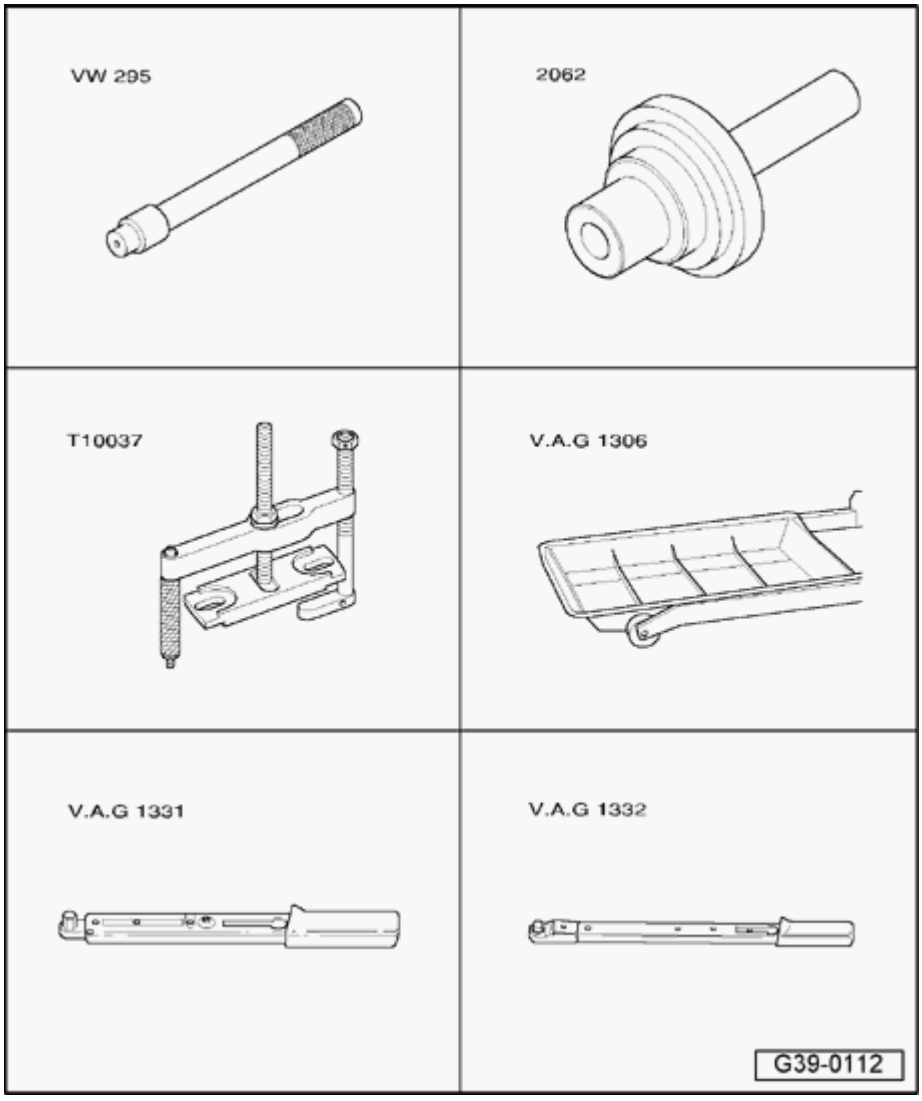

Fig. 247: Identifying Special Tools - Left Flange Shaft Oil Seal, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW 295
- Drift 2062
- Puller T10037
- Drip tray V.A.G 1306 or drip tray for workshop hoist VAS 6208

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- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332

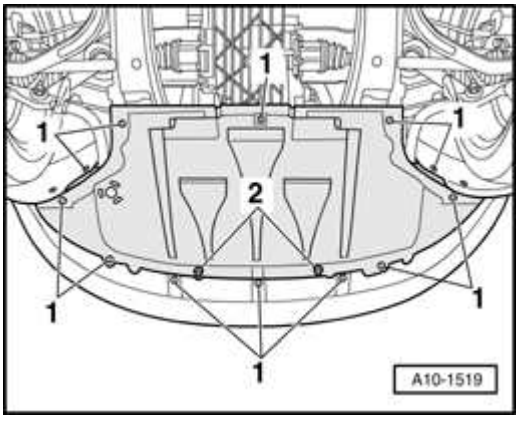

Fig. 248: Removing Quick-Release Fasteners, Screws And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Transmission is installed

- Please observe general repair instructions --> **General repair instructions**.
- Remove front left wheel.
- Release quick release fasteners - **1** - , unscrew bolts - **2** - and remove noise insulation.

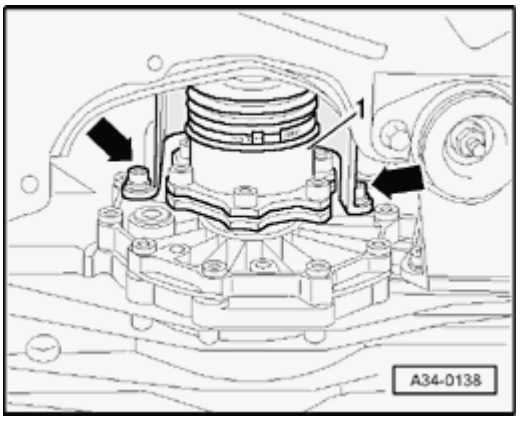

Fig. 249: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for drive shaft (left-side).
- Disconnect drive shaft - **1** - from flange shaft and tie up as far as possible to the front, taking care not to damage surface coating.

Drip tray V.A.G 1306 or drip tray for workshop hoist VAS 6208

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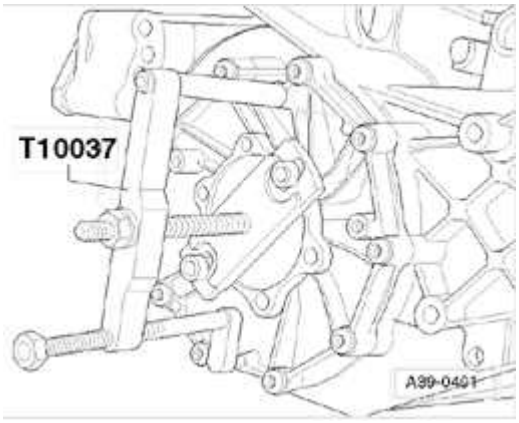

Fig. 250: Removing Flange Shaft (Left-Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft (left-side); to do so, secure puller T10037 to cover for final drive - **arrow** -.

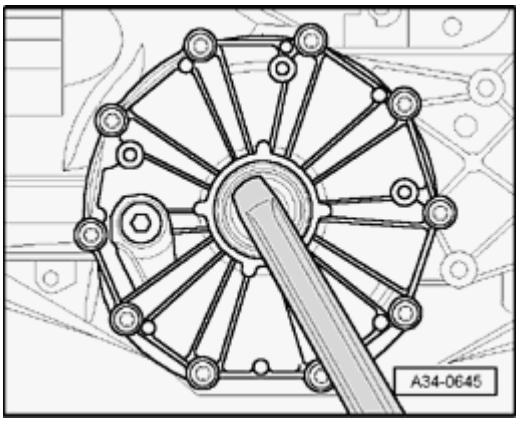

Fig. 251: Prying Out Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lever out flange shaft oil seal.

Installing

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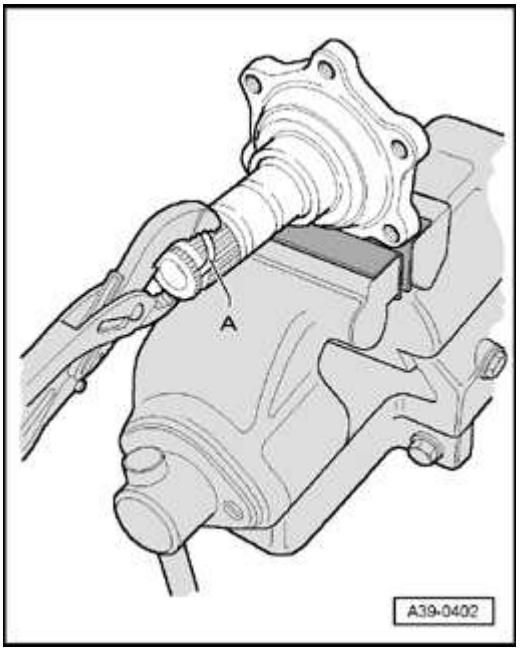

Fig. 252: Identifying Flange Shaft Clamped In Vise And Using New Circlip To Press Old Circlip Out Of Groove In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Always replace circlip for flange shaft.
- Clamp flange shaft in vice, using jaw protectors. Use new circlip - **A** - to press old circlip out of groove in flange shaft.
- Lightly oil outer circumference of new oil seal.

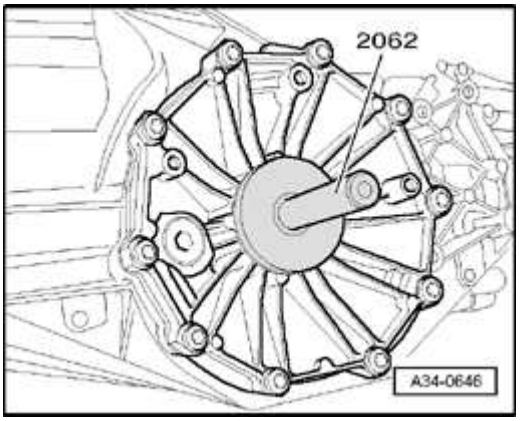

Fig. 253: Driving In New Flange Shaft Oil Seal Using Driver 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive new oil seal for flange shaft in to a depth of 5.65 ± 0.15 mm below outer surface of cover, making sure you keep seal straight.
- Pack space between sealing lip and dust lip half-full with **sealing grease G 052 128 A1** .
- Drive flange shaft in with drift VW 295.

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- Fit drive shaft heat shield.
- Bolt drive shaft to flange shaft --> **40 - FRONT SUSPENSION** .
- Fill up oil in transmission and check oil level --> **Transmission gear oil, checking level**.
- Install noise insulation.

Tightening torque

Component	Nm
Heat shields for drive shafts to transmission	23

Right flange shaft oil seal, replacing

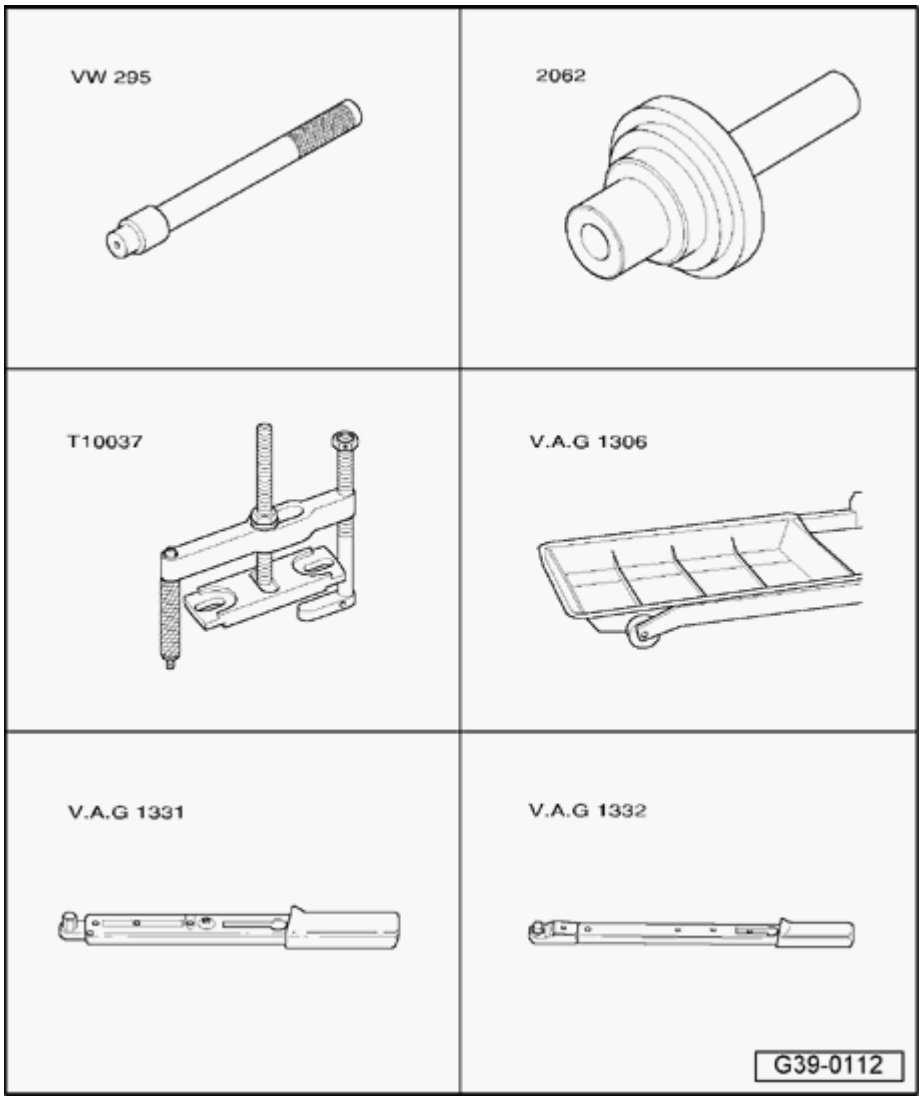

Fig. 254: Identifying Special Tools - Right Flange Shaft Oil Seal, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Special tools, testers and auxiliary items required

- Drift VW 295
- Drift 2062
- Puller T10037
- Drip tray V.A.G 1306 or drip tray for workshop hoist VAS 6208
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332

Removing

- Transmission is installed

- Please observe general repair instructions --> **General repair instructions**.
- Loosen bolt for right-side drive shaft/wheel hub.

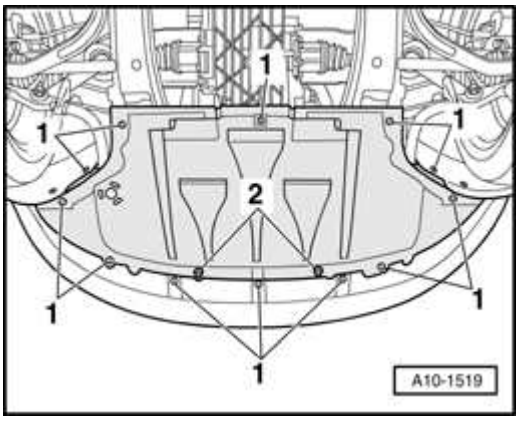

Fig. 255: Removing Quick-Release Fasteners, Screws And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front right wheel.
- Release quick release fasteners - **1** - , unscrew bolts - **2** - and remove noise insulation.

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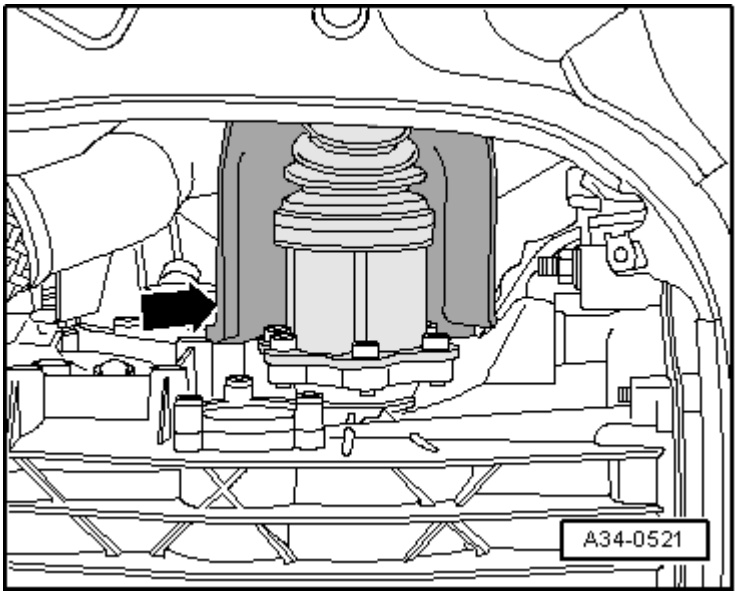

Fig. 256: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for drive shaft (right-side).
- Remove drive shaft (right-side) --> **40 - FRONT SUSPENSION** .

Drip tray V.A.G 1306 or drip tray for workshop hoist VAS 6208

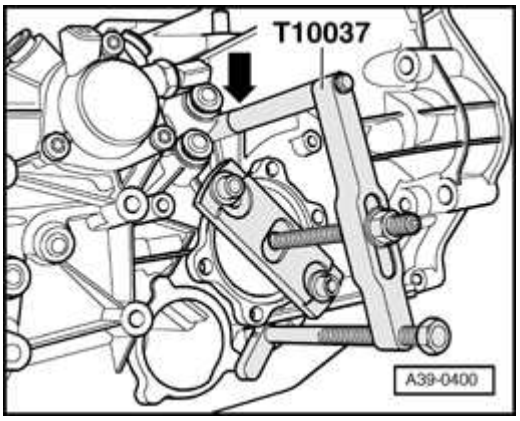

Fig. 257: Removing Flange Shaft (Right-Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft (right-side); to do so, secure puller T10037 to transmission housing - **arrow** -.

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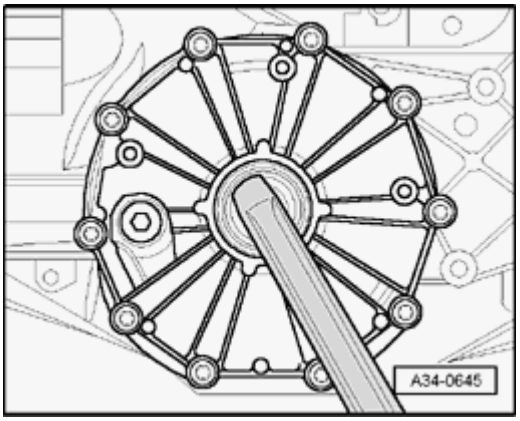

Fig. 258: Prying Out Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lever out flange shaft oil seal.

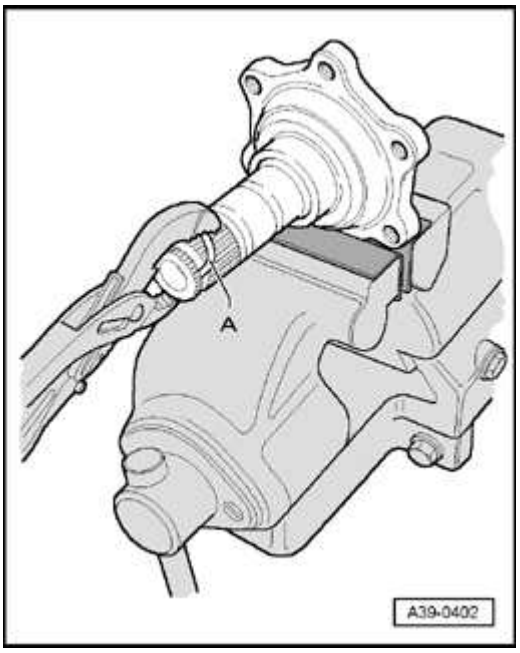

Fig. 259: Identifying Flange Shaft Clamped In Vise And Using New Circlip To Press Old Circlip Out Of Groove In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

- Always replace circlip for flange shaft.
- Clamp flange shaft in vice, using jaw protectors. Use new circlip - **A** - to press old circlip out of groove in flange shaft.
- Lightly oil outer circumference of new oil seal.

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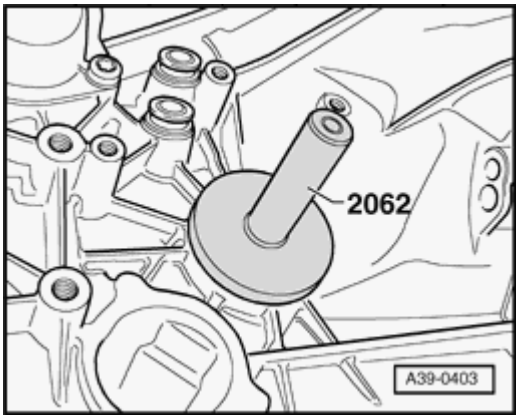

Fig. 260: Driving New Oil Seal For Flange Shaft In Below Outer Surface Of Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive new oil seal for flange shaft in to a depth of 5.65 ± 0.15 mm below outer surface of housing, making sure you keep seal straight.
- Pack space between sealing lip and dust lip half-full with **sealing grease G 052 128 A1** .
- Drive flange shaft in with drift VW 295.
- Fit drive shaft heat shield.

- Bolt drive shaft to flange shaft --> **40 - FRONT SUSPENSION** .
- Fill up oil in transmission and check oil level --> **Transmission gear oil, checking level**.
- Install noise insulation.

Tightening torque

Component	Nm
Heat shields for drive shafts to transmission	23

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34 CONTROLS, HOUSING

SHIFT MECHANISM, SERVICING

Installation position of shift mechanism

- **Arrow A** - gear selection movement

- **Arrow B** - gate selection movement

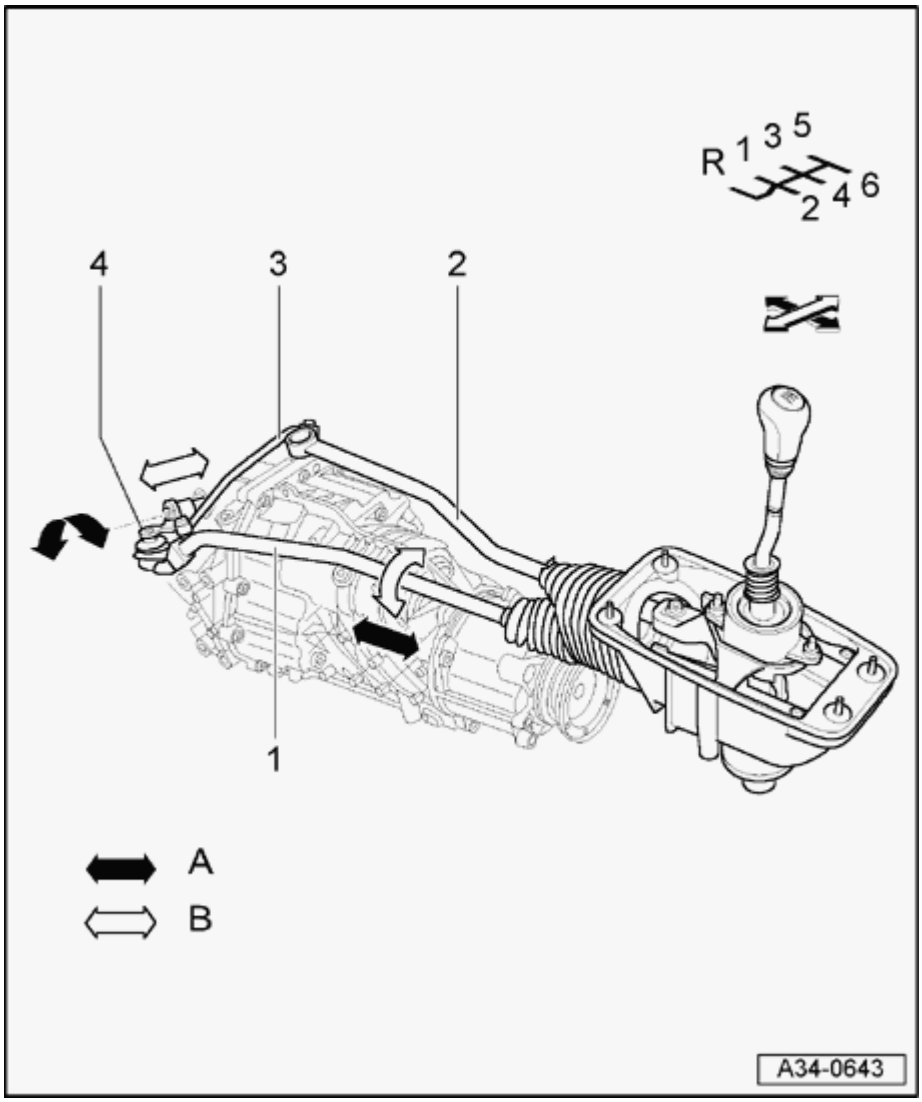

Fig. 92: Installation Position Of Selector Mechanism
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Shift rod

2 - Push rod (front)

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3 - Connecting rod

4 - Shift lever

Shift mechanism, assembly overview

NOTE:

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

Part I

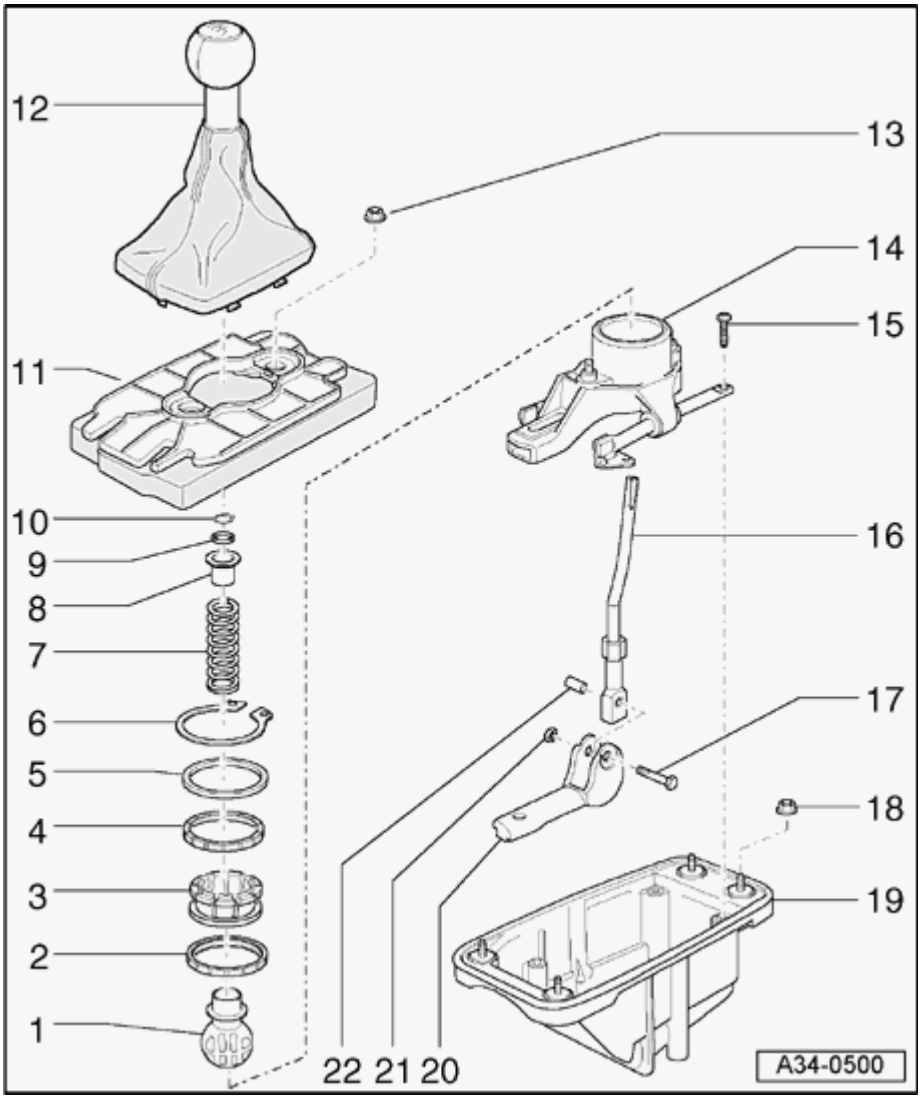

Fig. 93: Shift Mechanism Remove/Install Components -- Part 1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 - Noise insulation

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

12 - Gear lever knob

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

13 - Nut, 10 Nm

14 - Gear lever bearing

15 - Torx socket head bolt

16 - Gear lever

- Bend points towards 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 - Bush

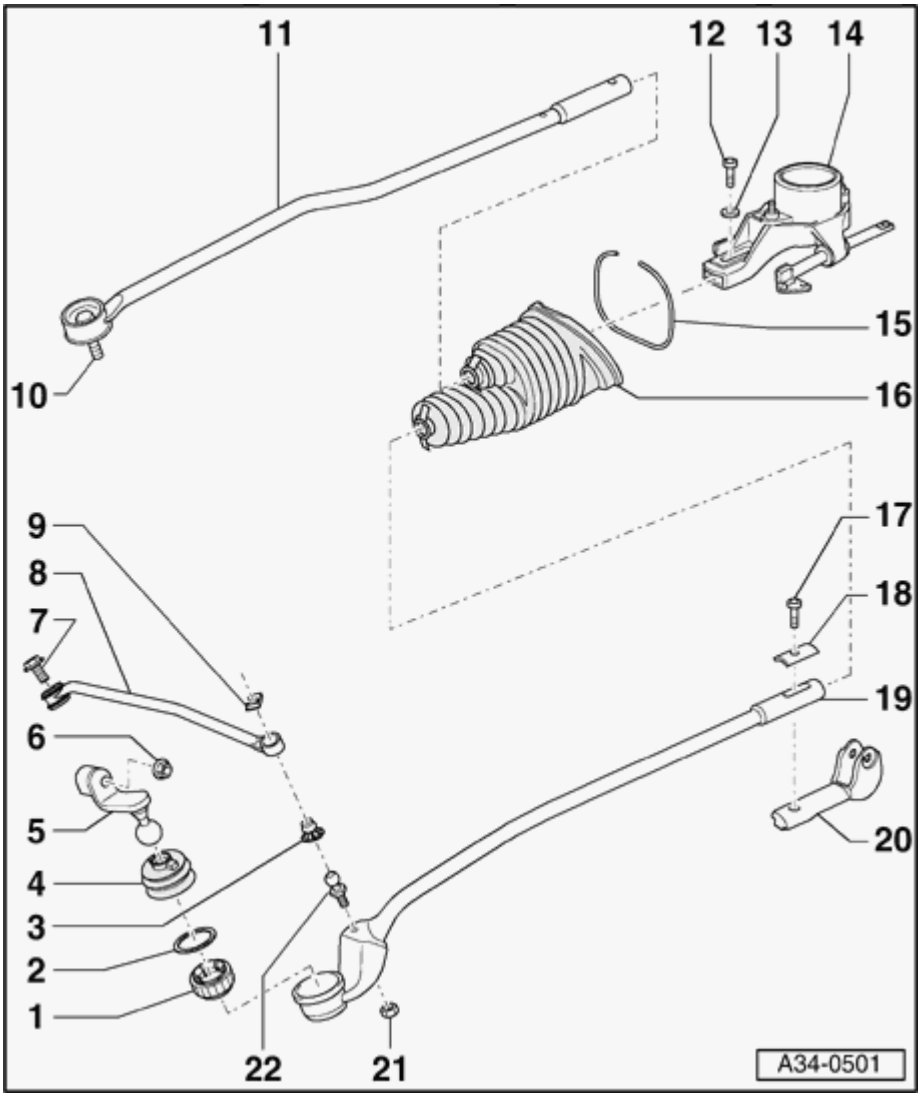

Fig. 94: Shift Mechanism Remove/Install Components -- Part 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Ball socket

2 - Washer

3 - Ball socket

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4 - Bellows

5 - Selector shaft lever

6 - Nut, 23 Nm

7 - Bolt, 23 Nm

8 - Connecting rod

9 - Retaining clip

10 - Bolt, 40 Nm

11 - Push rod

- With bearing bush, bolt and washers

12 - Hexagon socket head bolt, 23 Nm

13 - Washer

14 - Gear lever bearing

15 - Clamping ring for bellows

16 - Bellows

- Pull carefully over selector rods when removing
- Align with markings on selector rod and push rod when installing

17 - Hexagon socket head bolt, 23 Nm

18 - Clamp

19 - Selector rod

20 - Joint for gear lever/selector rod

21 - Nut, 10 Nm

22 - Ball stud

Gear shift knob with boot, removing and installing

Special tools, testers and auxiliary items required

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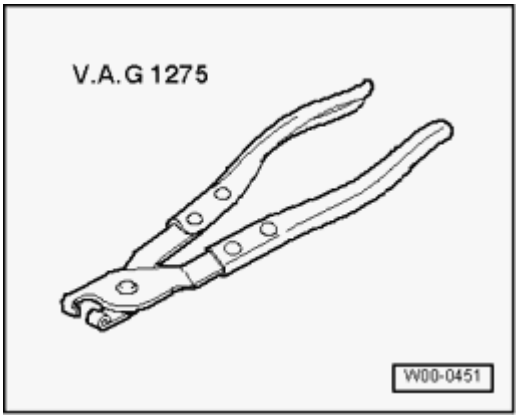

Fig. 95: Identifying Hose Clamp Pliers V.A.G 1275
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clip pliers V.A.G 1275

NOTE:

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

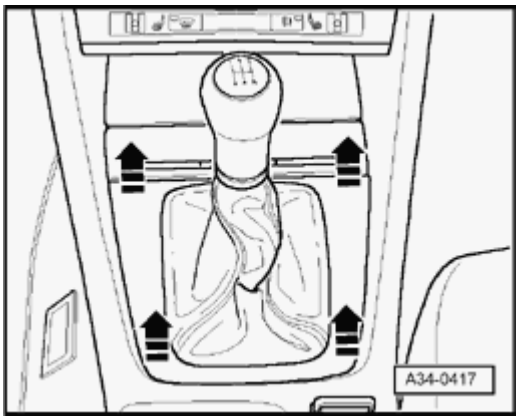

Fig. 96: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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

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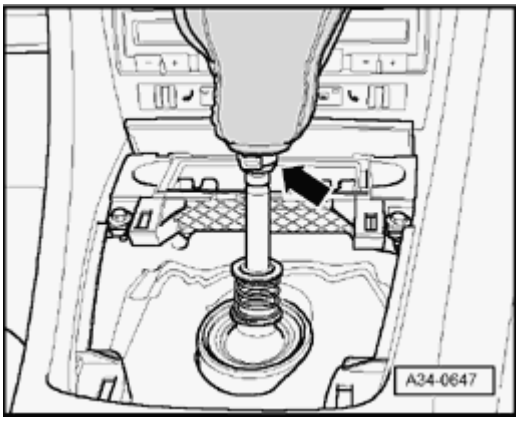

Fig. 97: Locating Clip And Pulling Off Gear Lever Knob Together With Boot
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Gear shift knob with clip:

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

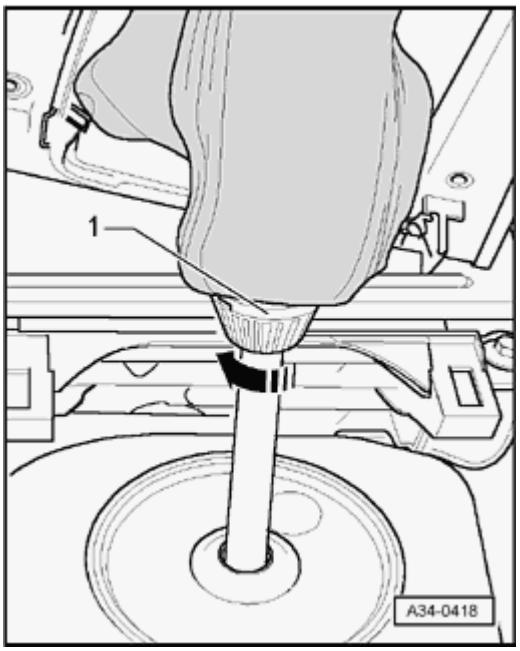

Fig. 98: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Gear shift knob with locking mechanism:

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

Installing

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Perform installation in reverse sequence of removal.

Shifter mechanism, removing and installing

Special tools, testers and auxiliary items required

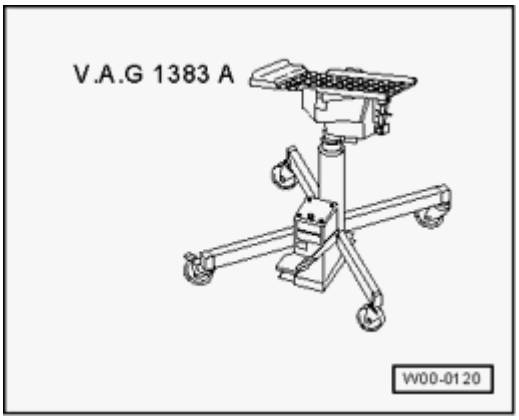

Fig. 99: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

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

Vehicles with large radio slot

- Remove operating and display unit for air conditioner --> **87 AIR CONDITIONING** .

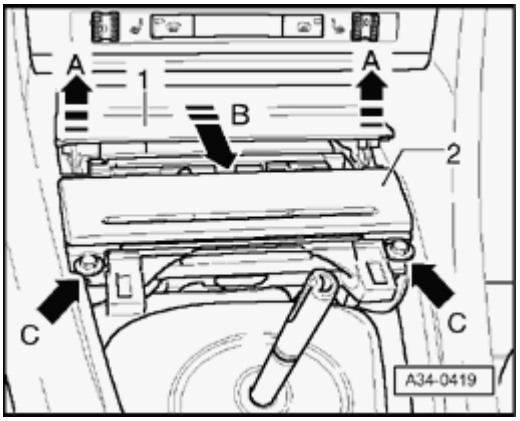

Fig. 100: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with small radio slot

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

All models:

- Unscrew bolts - **arrowsC** - and then pull ashtray - **2** - out of center console.
- Disconnect electrical connector for ashtray light.
- Remove foam wedges from center console.
- Lift out the noise insulation.

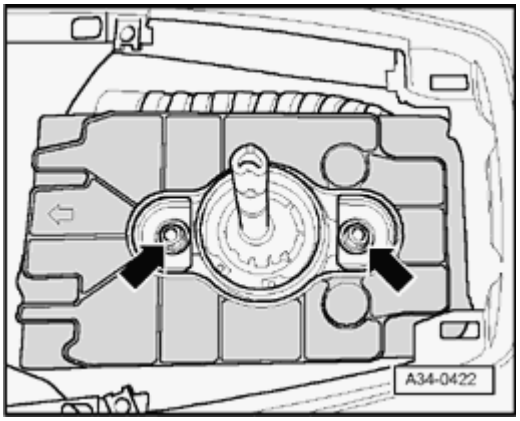

Fig. 101: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew noise insulation for gear lever housing - **arrows** -.

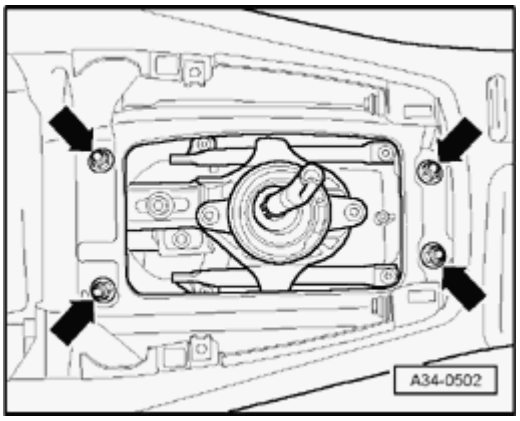

Fig. 102: Shift Lever Housing Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.

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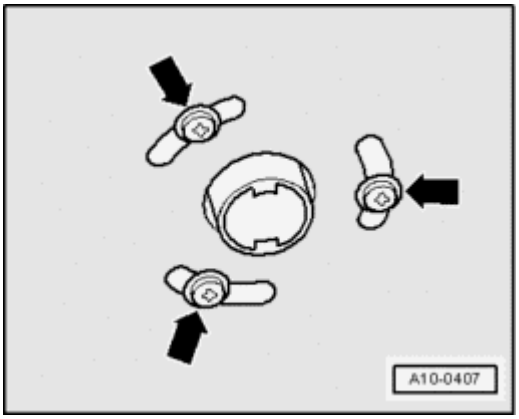

Fig. 103: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- On vehicles installed with auxiliary heater remove screws - **arrows** - securing exhaust pipe of auxiliary/additional heater to noise insulation.

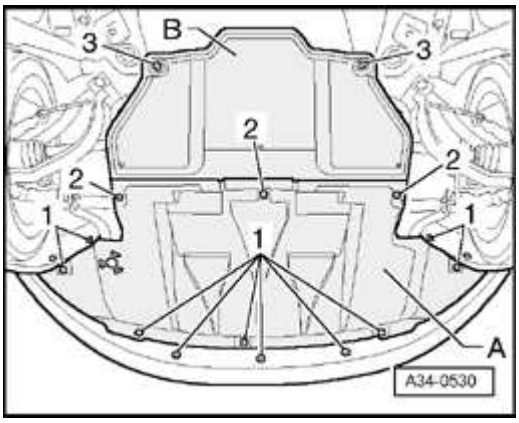

Fig. 104: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

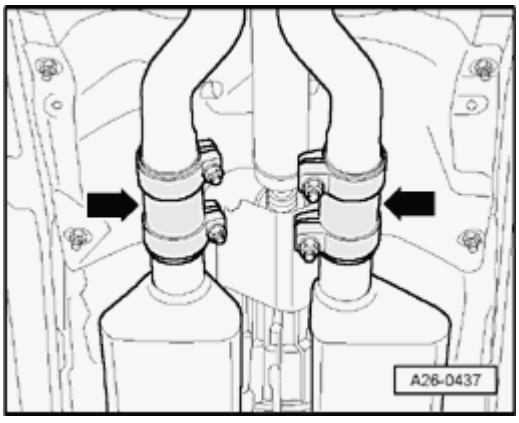

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Fig. 105: Loosening Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

- Disconnect exhaust system at clamp(s) - **arrows** -.
- 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.**

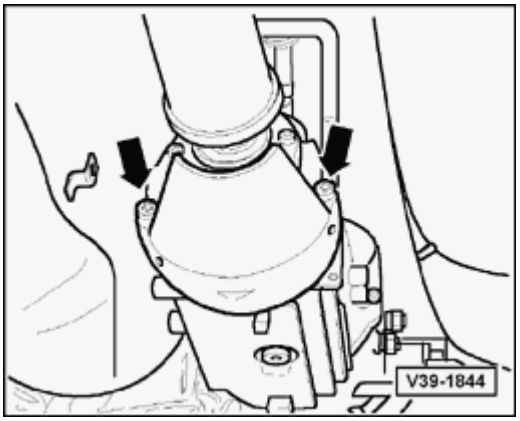

Fig. 106: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt heat shield for driveshaft - **arrows** -.

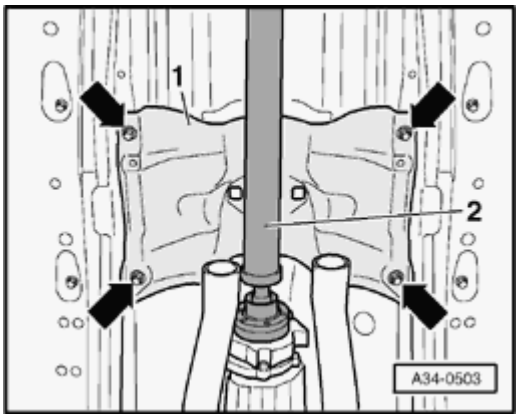

Fig. 107: Heatshield Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **1** - for exhaust system below selector mechanism - **arrows** -.

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- Unscrew bolts at transmission/driveshaft flange.
- Push driveshaft - **2** - together towards rear final drive. The constant velocity joints can be moved axially.

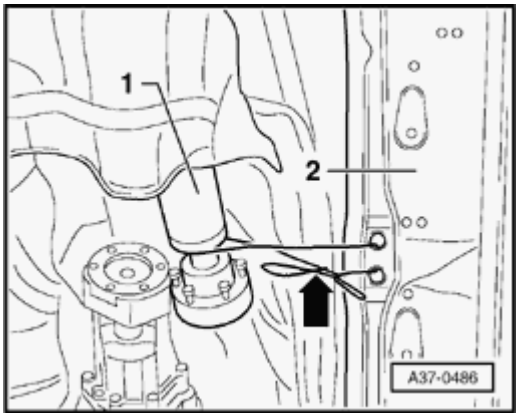

Fig. 108: Driveshaft Tied Up To One Side Onto Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tie driveshaft - **1** - up to one side onto heat shield - **arrow** -.

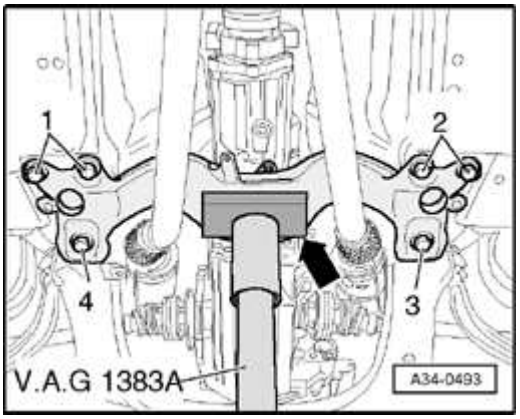

Fig. 109: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove universal mounting V.A.G1359/2 from engine and transmission jack V.A.G 1383 A and place a wooden block - **arrow** - on the lifting column in its place.
- Support rear cross member with engine and transmission jack V.A.G 1383 A.
- First unscrew bolts - **1** - and - **2** - , then bolts - **3** - and - **4** -.

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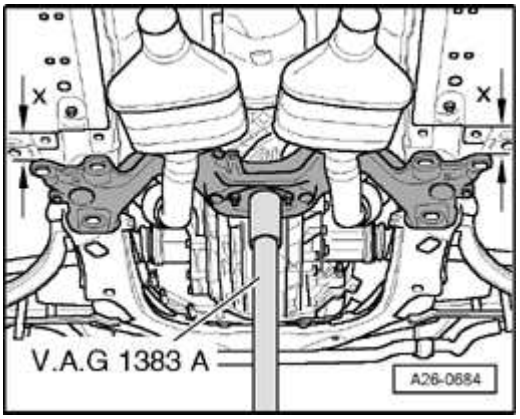

Fig. 110: Identifying Distance Between Cross Member And Body Reaches Dimension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Dimension - **x** - = 60 mm

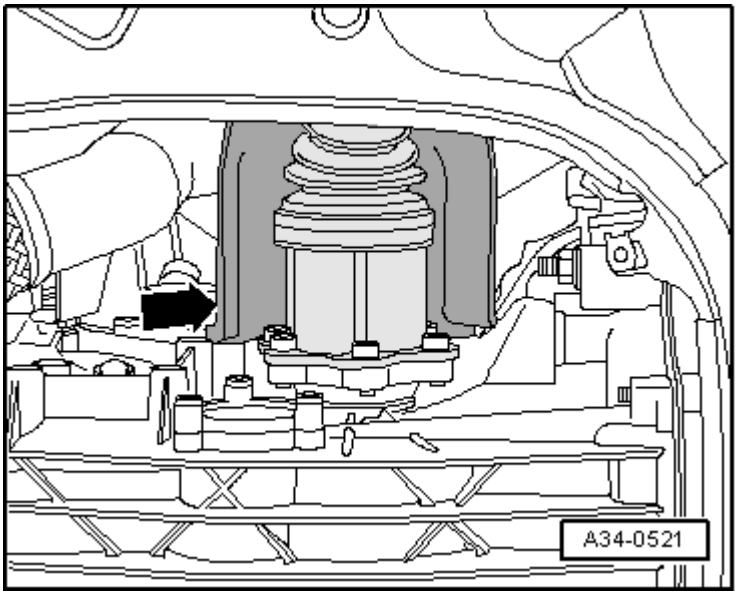

Fig. 111: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, unbolt heat shield for drive shaft (right-side) - **arrow** -.

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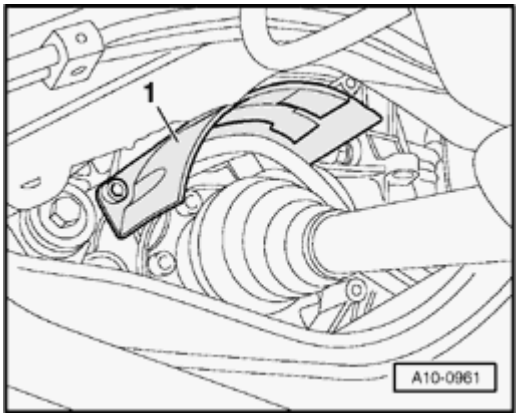

Fig. 112: Removing Left/Right Heat Shields For Drive Axles
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, unbolt heat shield for drive shaft (left-side) - **1** -.

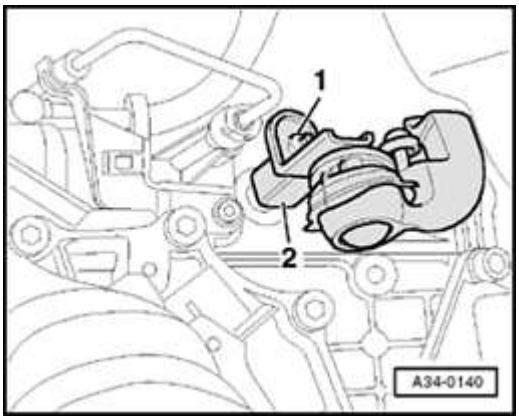

Fig. 113: Identifying Selector Mechanism Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nut - **1** - and pull selector shaft lever - **2** - off transmission selector shaft.

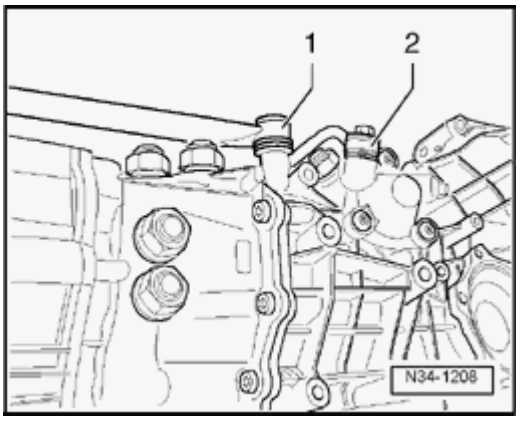

Fig. 114: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Unscrew connecting rod - **2** - for selector rod.
- Disconnect push rod - **1** - ; to do so, unscrew hexagon socket head bolt.
- Remove selector mechanism from right side of vehicle.

Installing

Installation is performed in reverse sequence; note the following:

NOTE:

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

- Install tunnel cross member --> **40 - FRONT SUSPENSION** .
- Bolt driveshaft onto transmission --> **39 FINAL DRIVE, DIFFERENTIAL** .
- Install exhaust system and perform stress-free alignment --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .
- If installed, install rear noise insulation.

- Adjust selector mechanism --> **Shift mechanism, adjusting**.
- Install operating and display unit for air conditioner --> **87 AIR CONDITIONING** .

Tightening torques

Component	Nm
Connecting rod to transmission	23
Shift lever to selector shaft	23
Push rod to transmission	40
Heat shield for drive shaft to transmission	23
Heat shield for driveshaft to transmission cover	25
Shift mechanism to body	10
Noise insulation to selector mechanism	10

Shift mechanism, adjusting

The following are prerequisites for correct gear lever alignment:

NOTE:

- **Shift linkage must be in proper condition and undamaged.**
- **Shift 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 shift knob with boot, removing and installing**.

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Vehicles with large radio slot

- Remove operating and display unit for air conditioner --> **87 AIR CONDITIONING** .

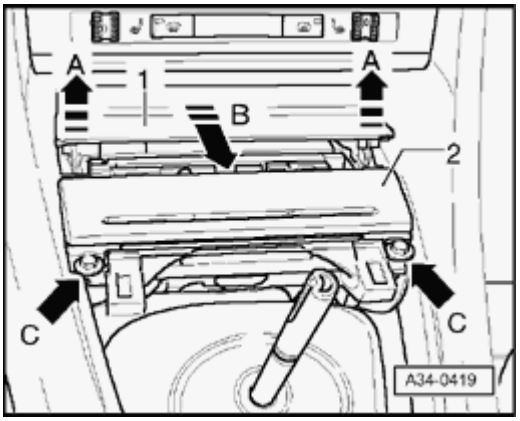

Fig. 115: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with small radio slot

- 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 - **arrowsC** - and then pull ashtray - **2** - out of center console.
- Disconnect electrical connector for ashtray light.
- Remove foam wedges from center console.
- Lift out the noise insulation.

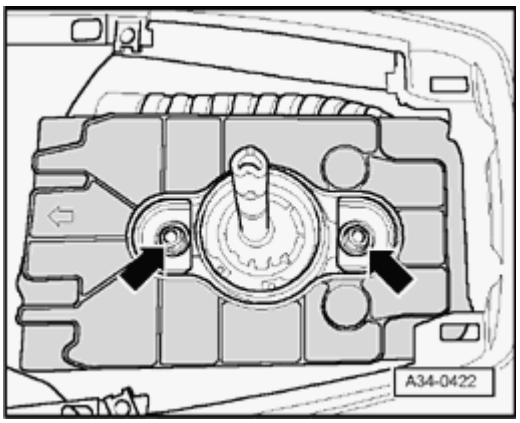

Fig. 116: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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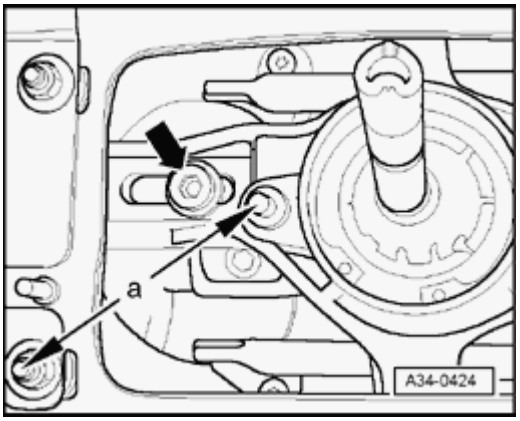

Fig. 117: Shift Mechanism Measurement And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure distance - **a** - between the two studs in the 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) should 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.

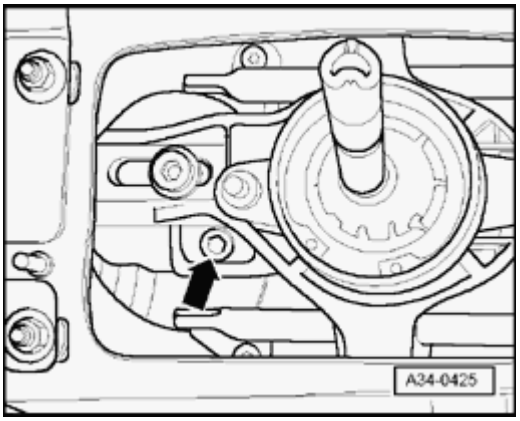

Fig. 118: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

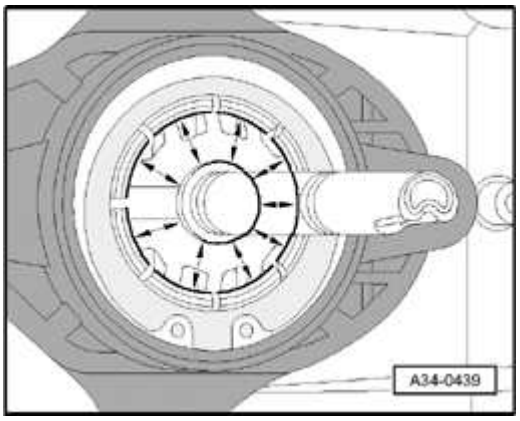

Fig. 119: Centering Bottom Of Shift Lever Centered In Ball Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Align the gear lever as follows:

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

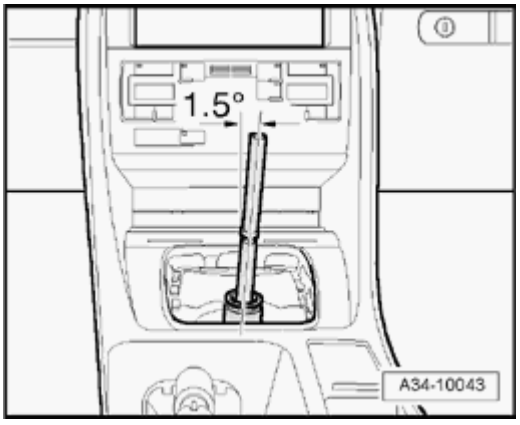

Fig. 120: Gear Lever Alignment Pointing Slightly To Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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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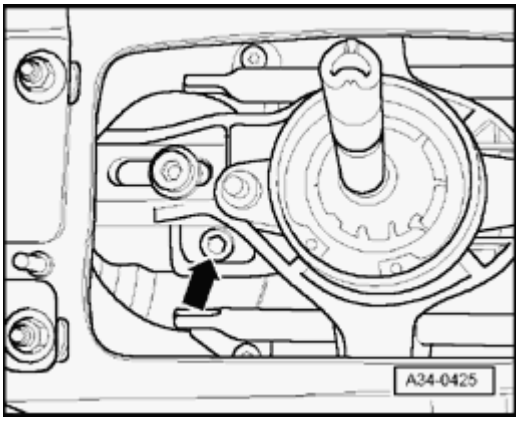

Fig. 121: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolt for selector 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.
- Select all gears several times.
- 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 the gear lever sticks or balks repeatedly when engaging a gear, perform the adjustment procedure again.

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

TRANSMISSION, REMOVING AND INSTALLING

Transmission, removing and installing

Removing transmission on vehicles with 4.2 Liter V8 engine (S4)--> **Removing transmission on vehicles with 4.2 Liter V8 engine (S4)**

Installing transmission on vehicles with 4.2 Liter V8 engine (S4) --> **Installing transmission on vehicles with 4.2 Liter V8 engine (S4)**

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Removing transmission on vehicles with 4.2 Liter V8 engine (S4)

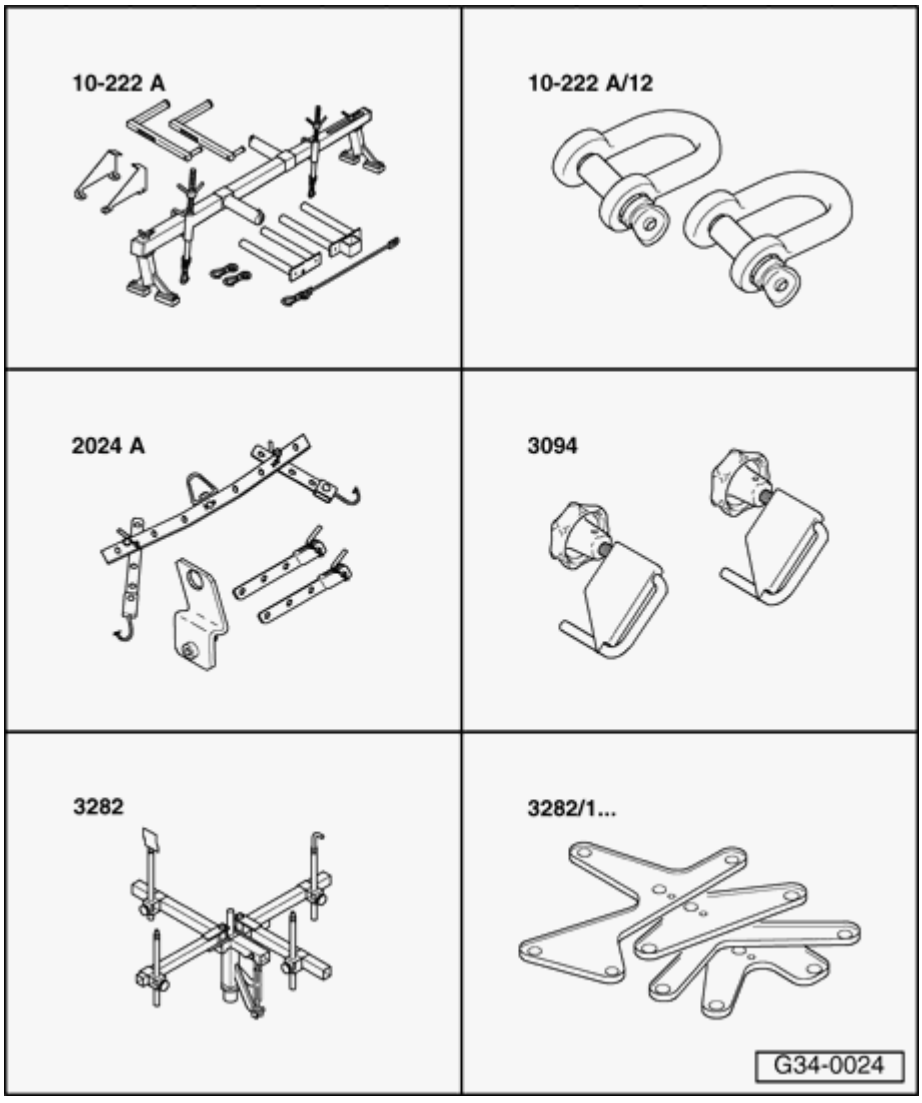

Fig. 122: Identifying Special Tools - Removing Transmission On Vehicles With 4.2 Liter V8 Engine (S4)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Support bracket 10 - 222 A
- Shackle 10 - 222 A/12
- Lifting tackle 2024 A
- Hose clamps, up to Ø 25 mm 3094

- Transmission support 3282
- Adjustment plate 3282/38

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Special tools, testers and auxiliary items required

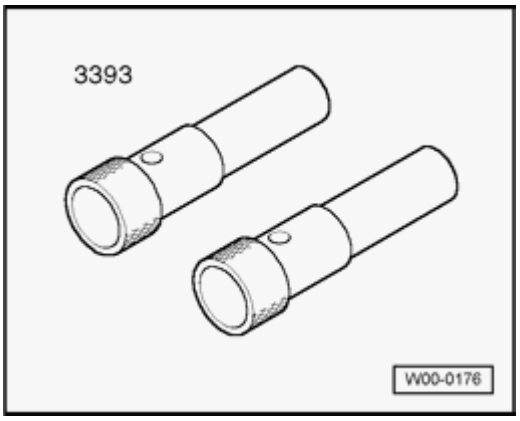

Fig. 123: Locating Pins 3393
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Locating pins 3393

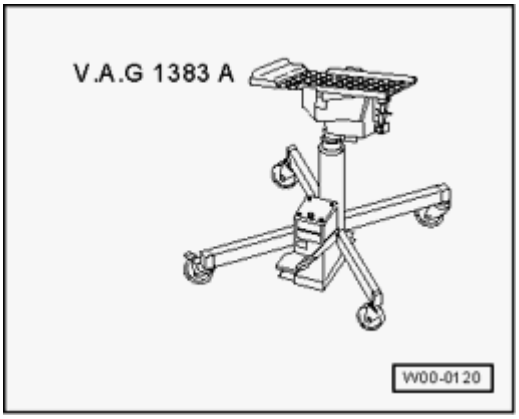

Fig. 124: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

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**

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Cabriolet

.

- With the ignition switched off, disconnect battery ground (GND) strap.

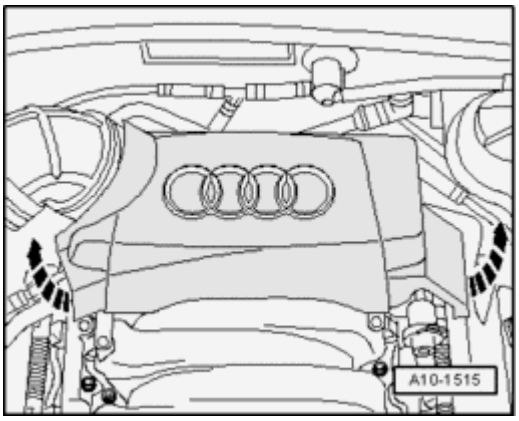

Fig. 125: Removing Rear Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off rear engine cover - **arrows** -.

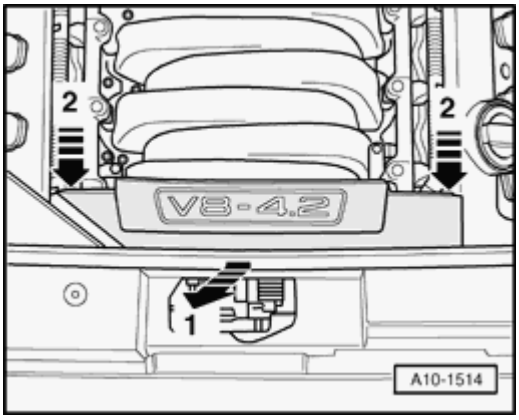

Fig. 126: Removing Front Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off front engine cover - **arrows** -.

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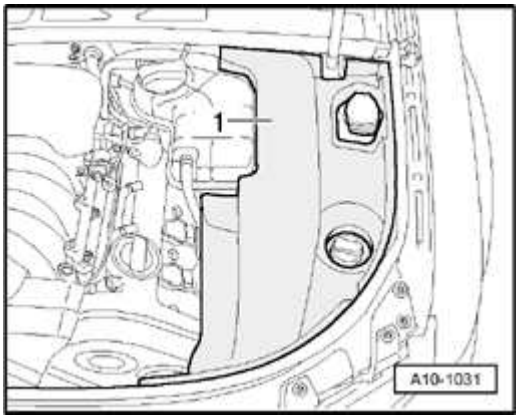

Fig. 127: Removing Cover In Engine Compartment (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - **1** - on left side of engine compartment.

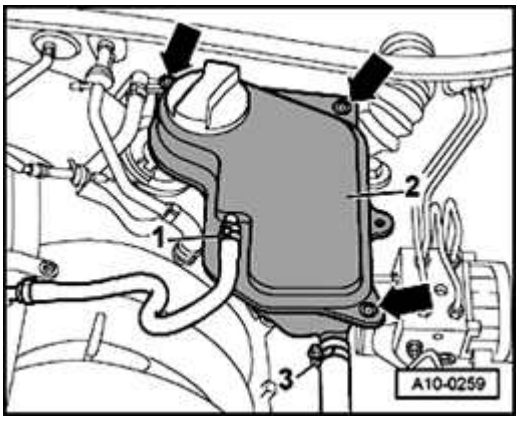

Fig. 128: Coolant Expansion Tank, Bolts And Coolant Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp off coolant hose - **1** - with hose clamp 3094 and disconnect hose at coolant expansion tank.
- Unbolt coolant expansion tank - **2** - - **arrows** -.
- Disconnect electrical wire leading to Engine Coolant Level (ECL) Warning Switch F66 at expansion tank (bottom) and move coolant expansion tank (with coolant hose - **3** - attached) clear to one side.
- If necessary, close off the connection with a suitable plug.

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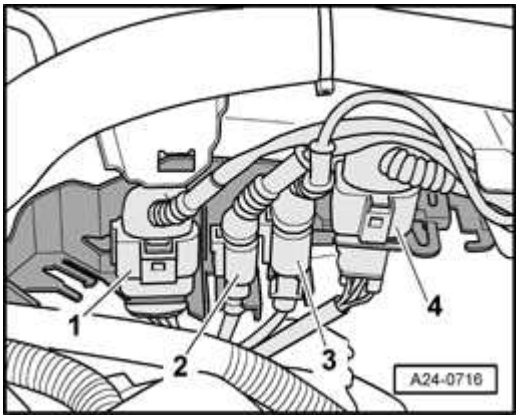

Fig. 129: Removing Bracket For Electrical Harness Connectors At Left From Bulkhead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connectors - **1 to 4** - from retainer at left of bulkhead.
- Disconnect electrical connectors - **1** - , - **3** - and - **4** -.
- Disconnect retainer at bulkhead.
- Disconnect heat insulation sleeve at wiring harness and move wiring harness clear.
- Move oxygen sensor probe wires clear (downwards).

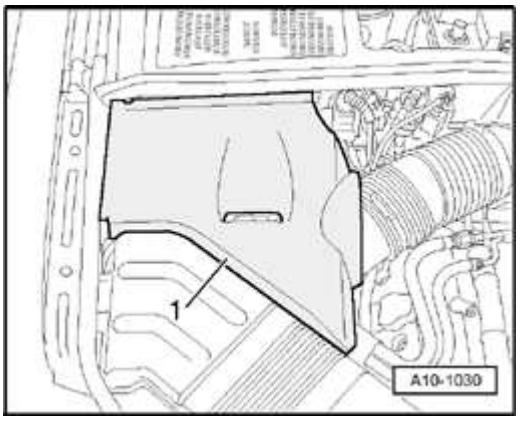

Fig. 130: Removing Cover In Engine Compartment (Right Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover - **1** - on right side of engine compartment.

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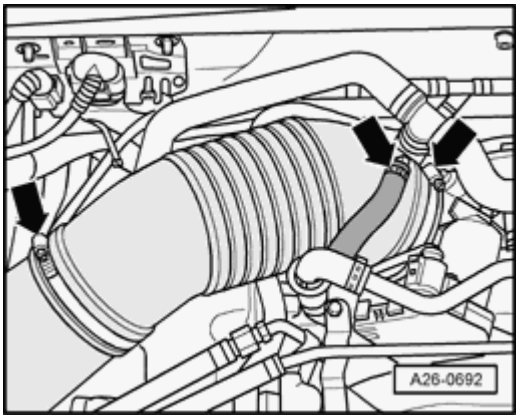

Fig. 131: Removing Air Guide Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove air intake hose - **arrows** -.

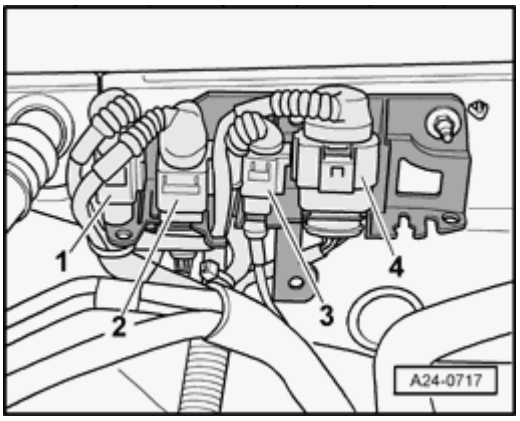

Fig. 132: Removing Bracket For Electrical Harness Connectors At Right From Bulkhead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors - **1 to 4** - from retainer at right of bulkhead.
- Disconnect electrical connectors - **2** - and - **4** -.
- Move oxygen sensor probe wires clear (downwards).

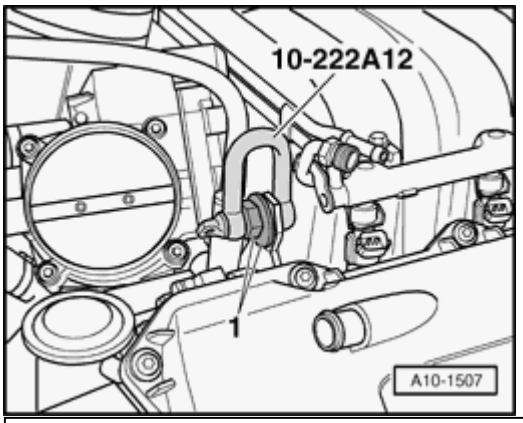

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Fig. 133: Securing Shackle 10-222 A/12 To Right Rear Engine Lifting Eyelet
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fix a shackle 10 - 222 A/12 to engine lifting eye (rear right).

NOTE:

- **- Item 1 - can be disregarded.**

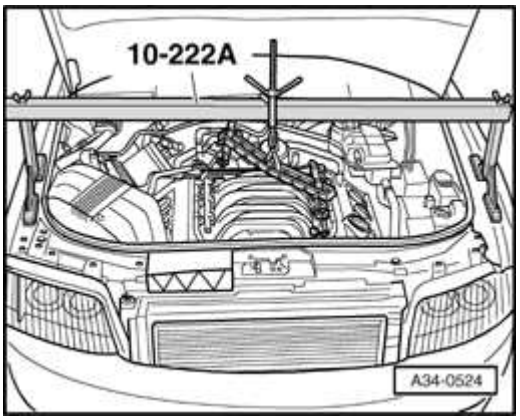

Fig. 134: Support Bracket 10 - 222 A Set Up On Wing Mounting Flanges
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up support bracket 10 - 222 A on wing mounting flanges.

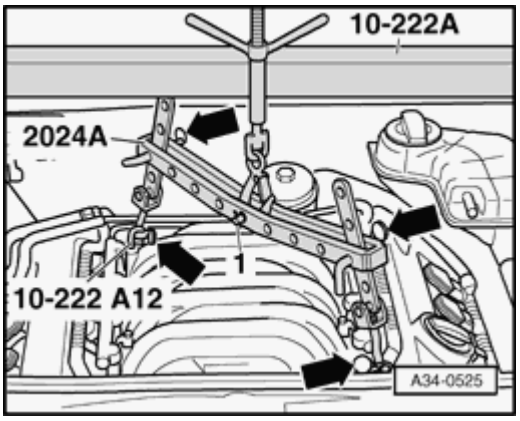

Fig. 135: Support Hooks And Locking Pins On Lifting Tackle Secured With Retainers And Pin In Lifting Tackle Center Hole
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove eye of lifting tackle 2024 A.
- Re-insert pin - **1** - in center hole of lifting tackle and secure with split pin.
- Hook pin on lifting tackle 2024 A onto spindle of support bracket 10 - 222 A.
- Hook lifting tackle 2024 A into lifting eye at front of engine and into shackle 10 - 222 A/12 at rear.

CAUTION: Support hooks and locking pins on lifting tackle must be secured with

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retainers - arrows - in illustration.

- Take up weight of engine on spindle of support bracket, but do not lift.

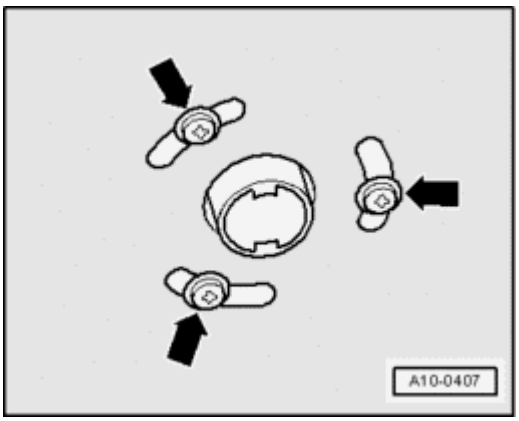

Fig. 136: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt both front wheels.
- On vehicles installed with auxiliary heater remove screws - **arrows** - securing exhaust pipe of auxiliary/additional heater to noise insulation.

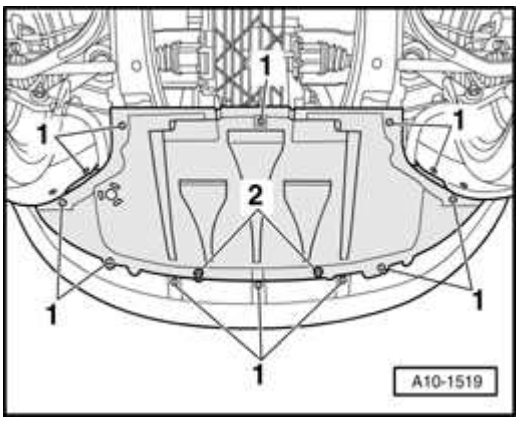

Fig. 137: Removing Quick-Release Fasteners, Screws And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release quick release fasteners - **1** - , unscrew bolts - **2** - and remove noise insulation.

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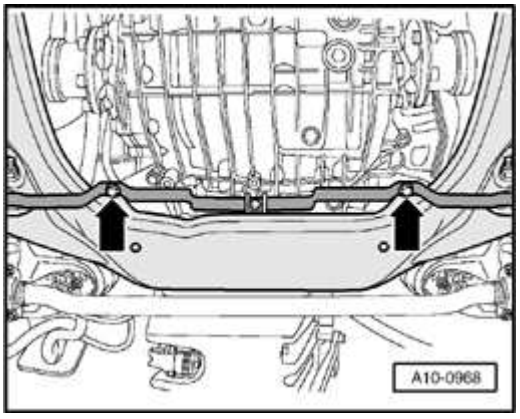

Fig. 138: Removing Bracket For Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt bracket for noise insulation - **arrows** -.

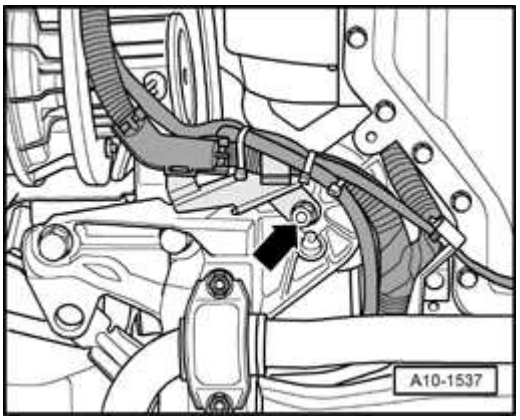

Fig. 139: Removing Wiring Harness Bracket At Right Engine Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt bracket for wiring harness at engine support (right-side) - **arrows** -.

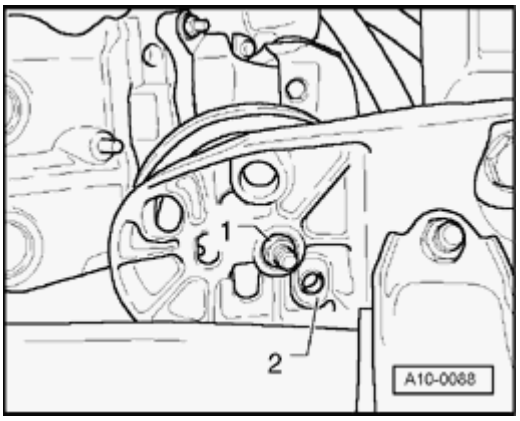

Fig. 140: Threaded Connections And Positioning Sleeves On Lower Engine Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Unscrew nuts - **1** - at bottom of engine mountings (left and right).

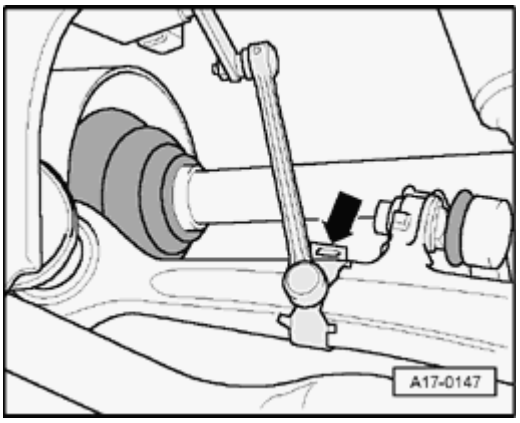

Fig. 141: Unclipping Operating Rod For Vehicle Levelling Sensor At Lower Transverse Link
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, unclip operating rod for vehicle level sender from lower transverse link - **arrow** -.

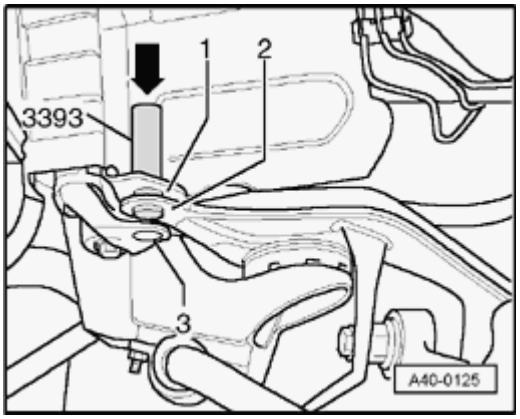

Fig. 142: Checking Holes Align Using Testing Mandrel 3393
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before slackening subframe mountings, use locating pins 3393 to check whether holes - **1...3** - are aligned.

CAUTION: If this is not the case, wheel alignment has to be performed after installing the subframe.

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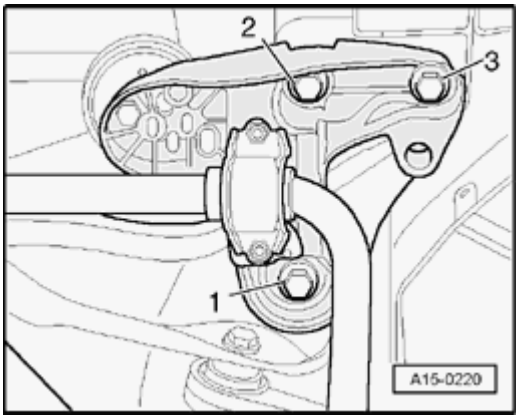

Fig. 143: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First remove front bolts - **2** - and - **3** - on subframe (left and right). Then remove bolts - **1** -.
- Lower subframe at the front.

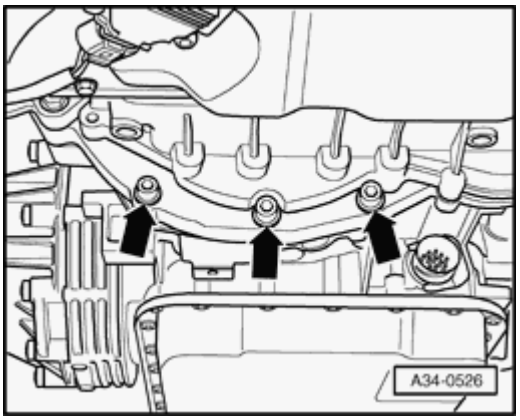

Fig. 144: Removing/Installing Bottom Engine/Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew lower engine/transmission securing bolts - **arrows** -.

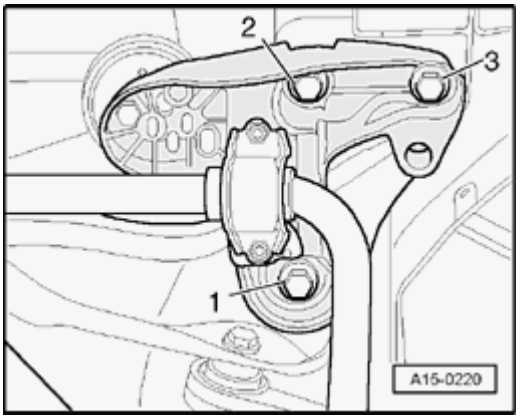

Fig. 145: Removing Front Bolts From Left And Right Subframe

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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.

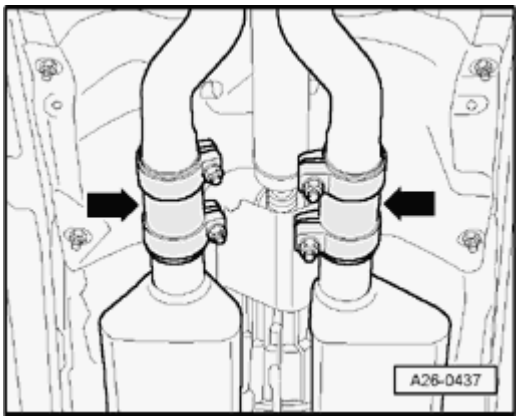

Fig. 146: Loosening Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

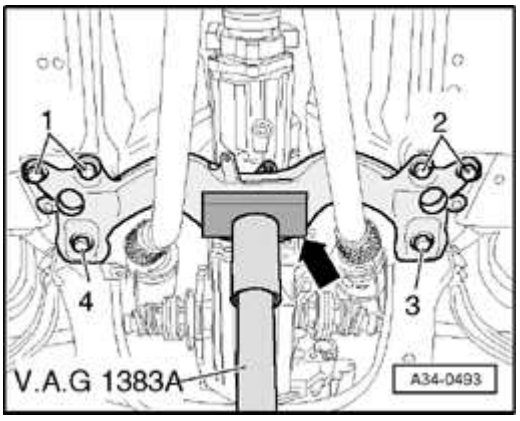

Fig. 147: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove universal mounting V.A.G1359/2 from engine and transmission jack V.A.G 1383 A and place a wooden block - **arrow** - on the lifting column in its place.
- Support the rear cross member with engine and transmission jack V.A.G 1383 A.
- First unscrew bolts - **1** - and - **2** - , then bolts - **3** - and - **4** -.

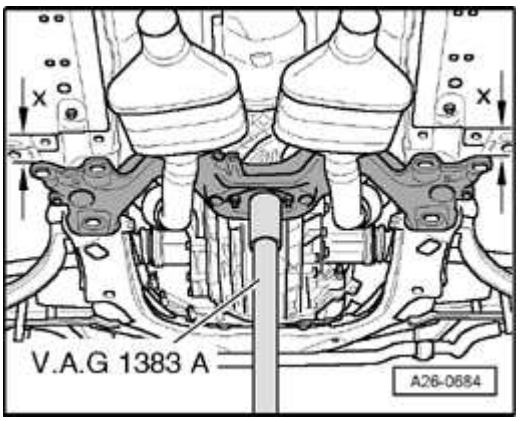

Fig. 148: Identifying Distance Between Cross Member And Body Reaches Dimension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slowly lower rear cross member with engine and transmission jack V.A.G 1383 A.

NOTE:

- **Do not lower the transmission too far: the distance between the rear cross member and the body (dimension - x -) must not be more than 60mm. Otherwise, the driveshaft joint and the flexible joint in the front exhaust pipe could be damaged. If necessary, tighten spindle of support bracket 10 - 222 A so that dimension - x - is not exceeded.**

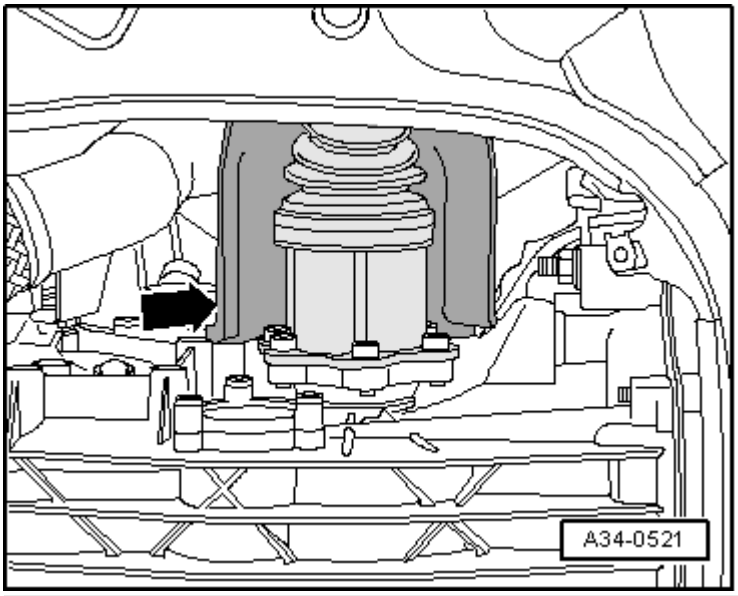

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Fig. 149: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shields - **arrow** - for drive shafts (left and right).
- Unbolt drive shafts from transmission flanges.

NOTE:

- **Make sure you do not damage surface coating on drive shafts.**

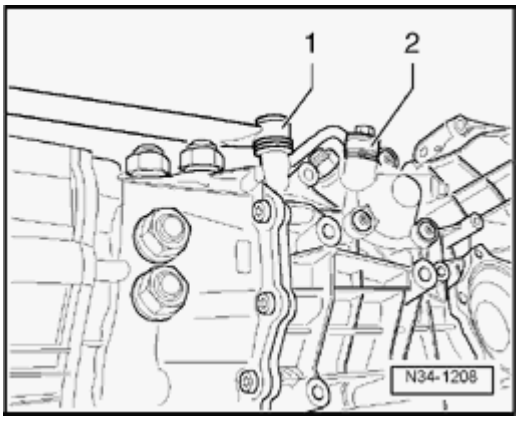

Fig. 150: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew connecting rod - **2** - for selector rod.
- Disconnect push rod - **1** - ; to do so, unscrew hexagon socket head bolt.

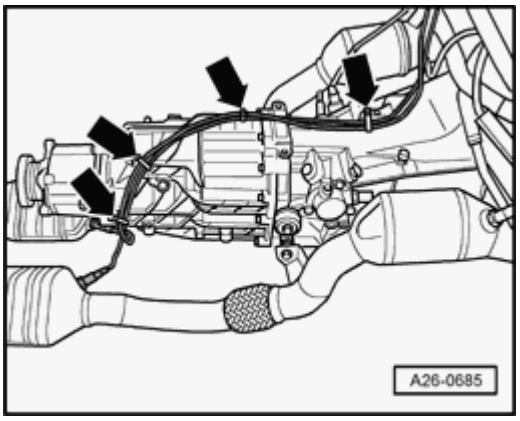

Fig. 151: Freeing Up Oxygen Sensor Wires At Areas Indicated By On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect oxygen sensor probe wiring on transmission at the points marked with - **arrows** -.

NOTE:

- **In the illustration the engine/transmission assembly has been removed.**

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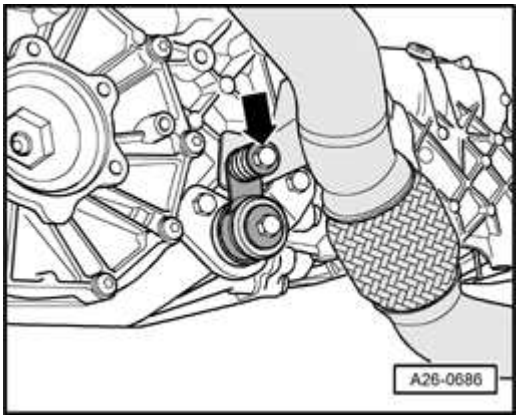

Fig. 152: Removing Bolt At Strap For Left Front Exhaust Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew bolt - **arrow** - at bracket for front exhaust pipe (left-side).

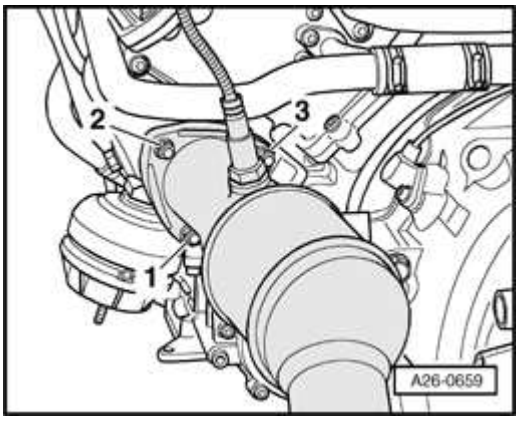

Fig. 153: Removing/Installing Nuts For Left Front Exhaust Pipe/Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nuts - **1 to 3** - connecting front exhaust pipe (left-side) to exhaust manifold.

NOTE:

- **In the illustration the engine has been removed.**

- Disconnect front exhaust pipe from exhaust manifold (left-side).
- Remove front exhaust pipe.

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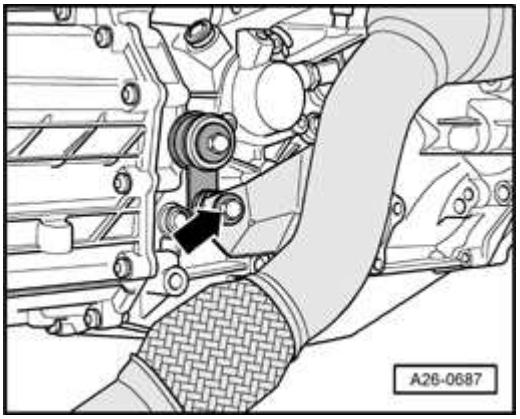

Fig. 154: Removing Bolt At Strap For Right Front Exhaust Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew bolt - **arrow** - at bracket for front exhaust pipe (right-side).

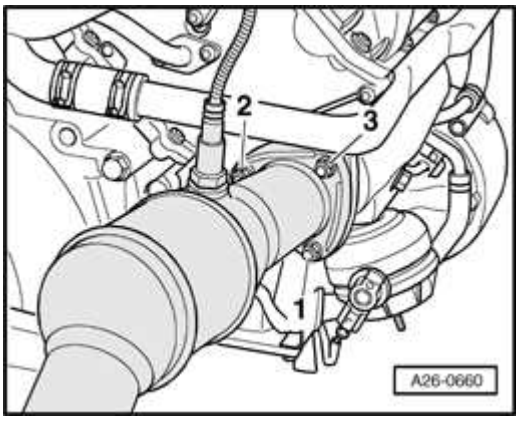

Fig. 155: Removing Nuts For Right Front Exhaust Pipe/Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nuts - **1 to 3** - connecting front exhaust pipe (right-side) with exhaust manifold.

NOTE:

- **In the illustration the engine has been removed.**

- Remove front exhaust pipe.

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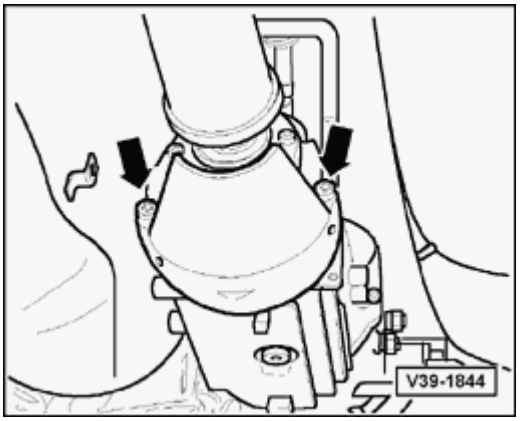

Fig. 156: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt heat shield for driveshaft - **arrows** -.
- Unscrew bolts at transmission/driveshaft flange.
- Slide driveshaft together towards rear final drive. The constant velocity joints can be moved axially.
- Allow driveshaft to rest on rear section of exhaust system.

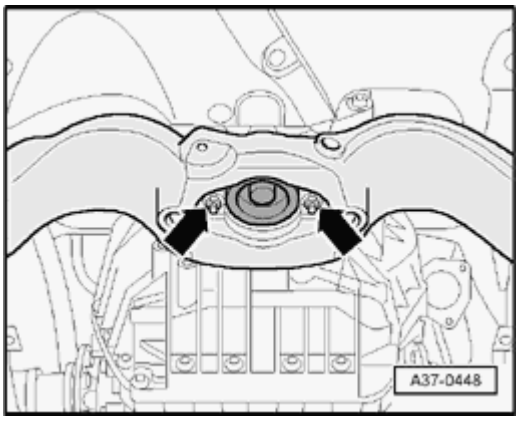

Fig. 157: Tunnel Cross Member Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew two nuts - **arrows** - and Disconnect tunnel cross member.

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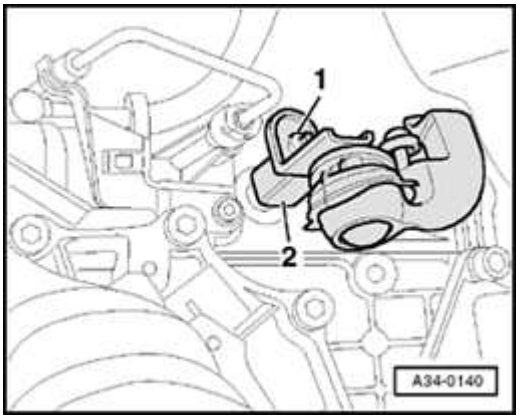

Fig. 158: Identifying Selector Mechanism Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nut - **1** - and pull transmission selector lever - **2** - off transmission selector shaft.

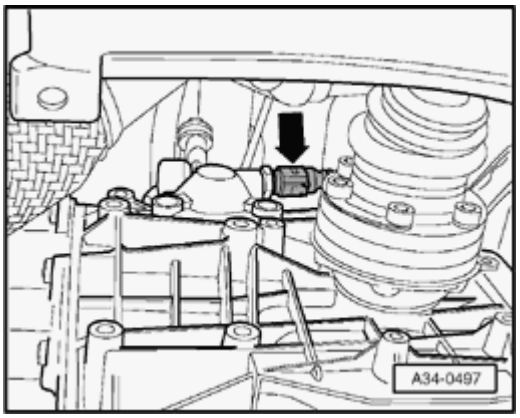

Fig. 159: Disconnecting Harness Connector For Back-Up Light Switch At Right Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector - **arrow** - for reversing light switch on right side of transmission and move wiring clear.

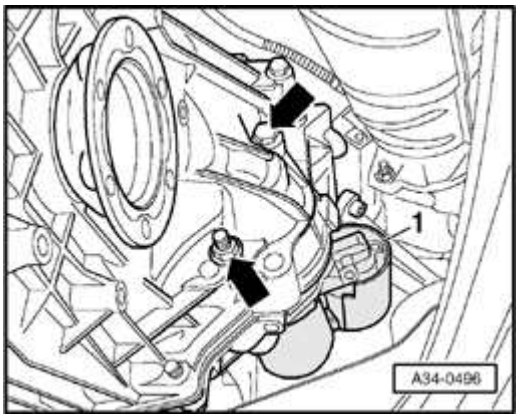

Fig. 160: Starter And Mounting Bolts

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt starter - **1** - - **arrows** - and pull it away from bell housing.
- Remove remaining engine/transmission bolts. Leave 2 bolts screwed in hand-tight.

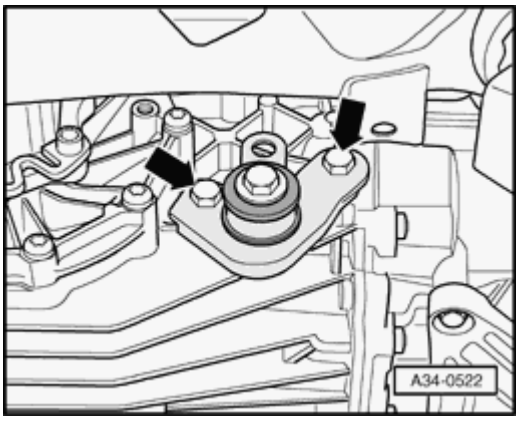

Fig. 161: Bracket For Front Exhaust Pipe (Left-Side) On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt bracket for front exhaust pipe (left-side) on transmission - **arrows** -.

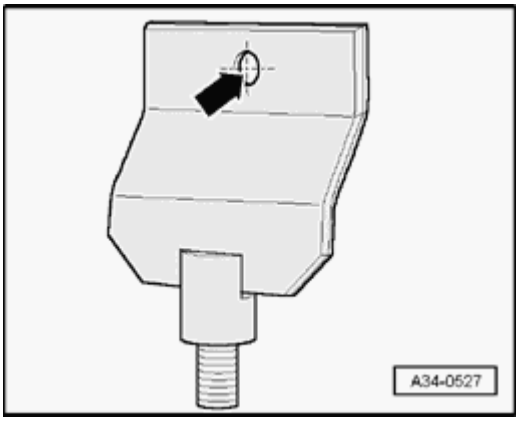

Fig. 162: Hole In Supporting Elements Of Transmission Support 3282
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drill a hole of 10.2mm - **arrow** - in supporting element of transmission support 3282.

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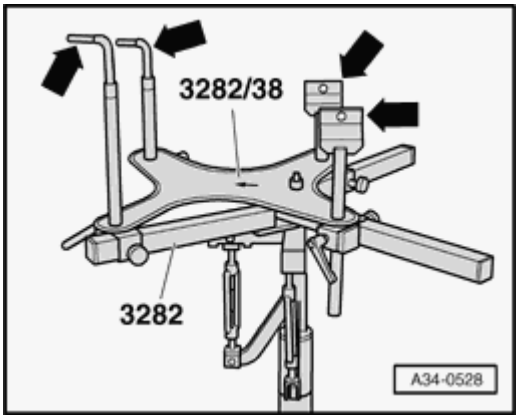

Fig. 163: Transmission Support 3282 With Adjustment Plate 3282/38 For Removing Manual Transmission 03A (All Wheel Drive) And Place On Engine And Transmission Jack V.A.G 1383 A.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up transmission support 3282 with adjustment plate 3282/38 for removing manual transmission 03A (All wheel drive) and place on engine and transmission jack V.A.G 1383 A.

NOTE:

- **The positions of the support elements - arrows - are shown on the adjustment plate in schematic form (the arrow points in direction of travel).**
- **The adjustment plate can only be installed in one position.**

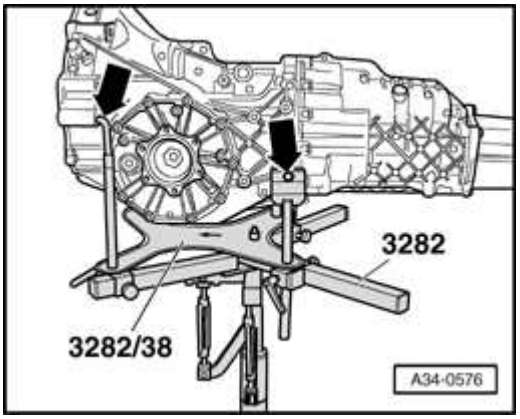

Fig. 164: Adjustment Plate Aligned Parallel To Transmission And Support Elements Secured To Left Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align adjustment plate parallel to transmission and secure support elements - **arrows** - to left side of transmission.

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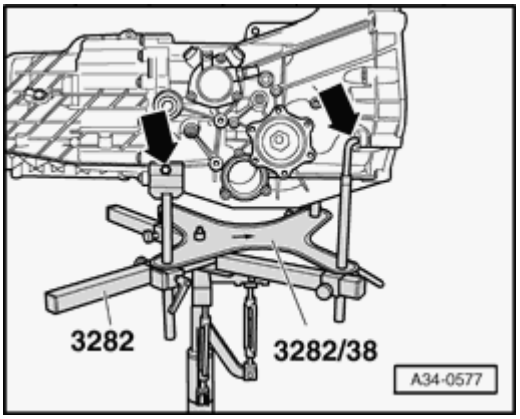

Fig. 165: Adjustment Plate Aligned Parallel To Transmission And Support Elements Secured To Right Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align adjustment plate parallel to transmission and secure support elements - **arrows** - to right side of transmission.
- Remove 2 last engine/transmission bolts.
- Press transmission off dowel sleeves and lower carefully with engine and transmission jack V.A.G 1383 A just far enough to gain access to the clutch slave cylinder.

NOTE:

- **When lowering transmission, ensure hydraulic line to clutch slave cylinder is not damaged.**

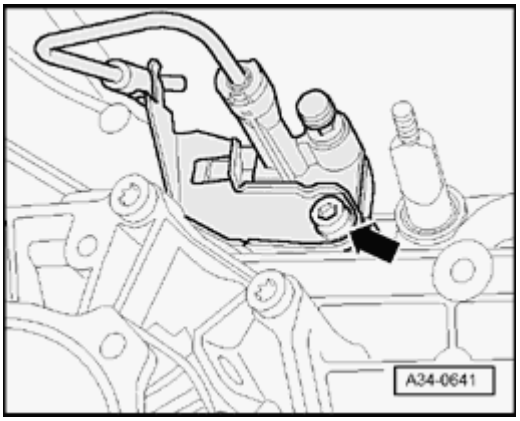

Fig. 166: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clutch slave cylinder - **arrow** - and secure with wire; do not open hydraulic 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.

- Lower transmission completely.

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NOTE:

- **When lowering transmission, make sure there is sufficient clearance to drive shafts.**

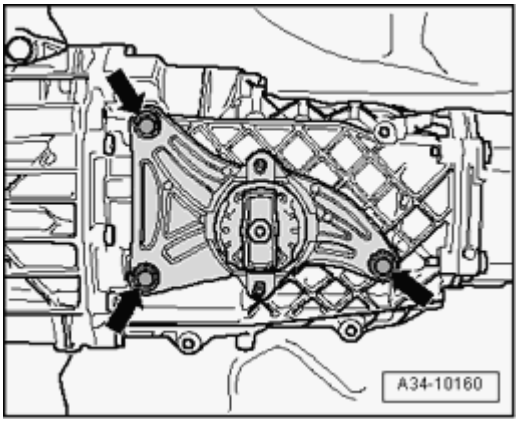

Fig. 167: Identifying Transmission Mounting Is Transferred To New Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If you will be installing a new transmission instead of the one removed, the transmission mounting has to be transferred to the new transmission - **arrows** -.

Installing transmission --> **Installing transmission on vehicles with 4.2 Liter V8 engine (S4)**.

Installing transmission on vehicles with 4.2 Liter V8 engine (S4)

Installation is performed in reverse sequence; note the following:

NOTE:

- **Re-attach all cable ties at the same locations when re-installing.**
- **Secure all hose connections with the correct hose clips (as original equipment)**
- **Re-attach heat shield sleeves at the same locations when re-installing.**
- **Replace self-locking 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 the splines. Do not grease guide sleeve.

- It should be possible to push the clutch plate back and forth slightly on the input shaft.

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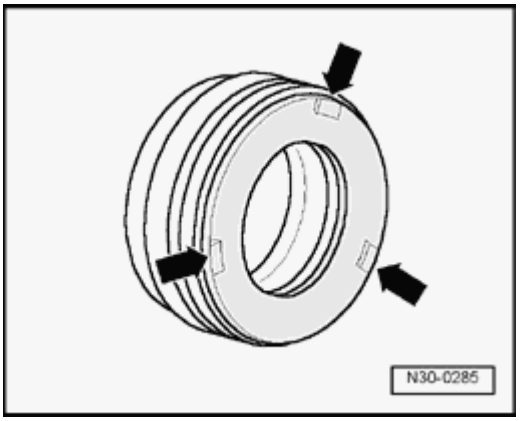

Fig. 168: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.**

- Lightly lubricate contact surface for operating rod at clutch release lever with copper grease, e.g. Z 381 351 TE.
- Use thread tap to remove any remaining locking fluid from all threaded holes which will accommodate self-locking bolts.
- 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 wiring off to one side so that it cannot be trapped between the engine and the transmission.

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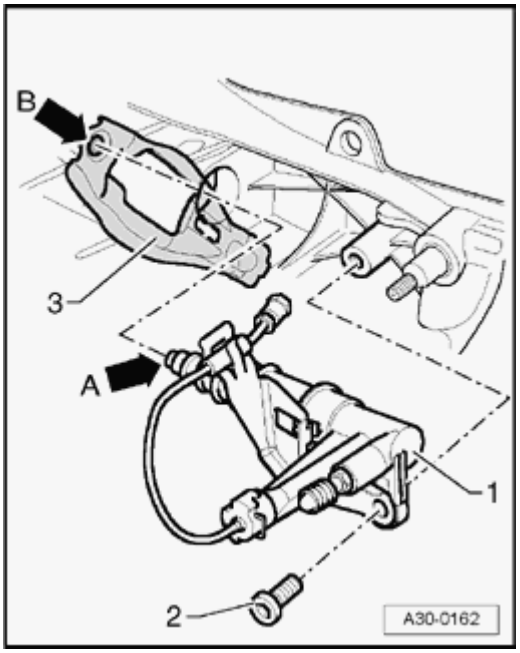

Fig. 169: Guiding Slave Cylinder Into Bore Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly lubricate surface where operating rod and clutch release lever make contact - **arrowB** - using copper grease Z381351TE.
- Raise transmission far enough to be able to install clutch slave cylinder with bracket for hose/line assembly.
- 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 resistance when depressing the clutch pedal, you must not press it down further. The operating 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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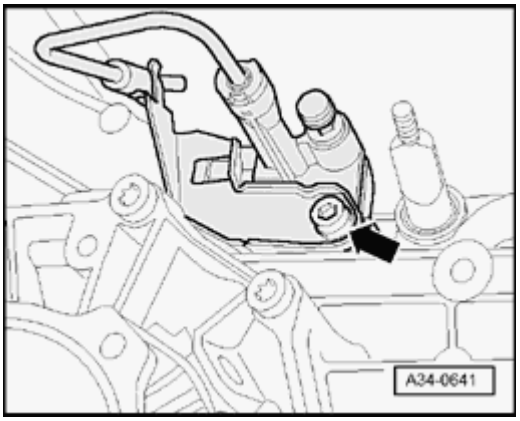

Fig. 170: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure clutch slave cylinder with new bolt - **arrow** -.

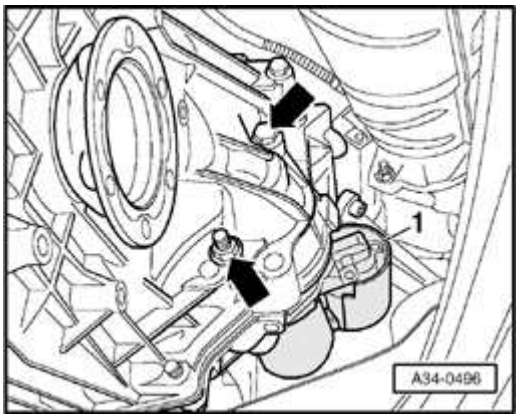

Fig. 171: Starter And Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert transmission, making sure there is sufficient clearance to drive shafts.
- Install starter - **arrows** - and tighten top left and right engine/transmission connecting bolts.

NOTE:

- **The bottom bolts are installed at a later stage.**

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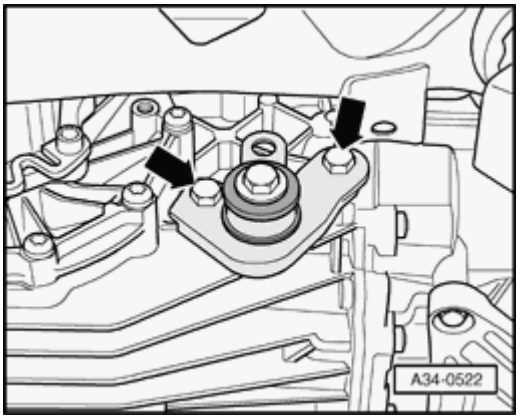

Fig. 172: Bracket For Front Exhaust Pipe (Left-Side) On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt bracket for front exhaust pipe (left-side) to transmission - **arrows** -.

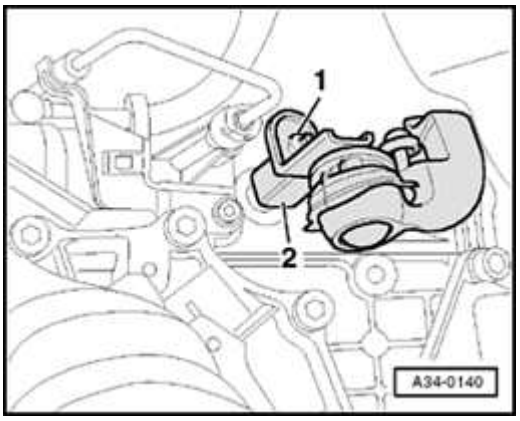

Fig. 173: Identifying Selector Mechanism Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install transmission selector lever - **2** - and tighten nut - **1** -.

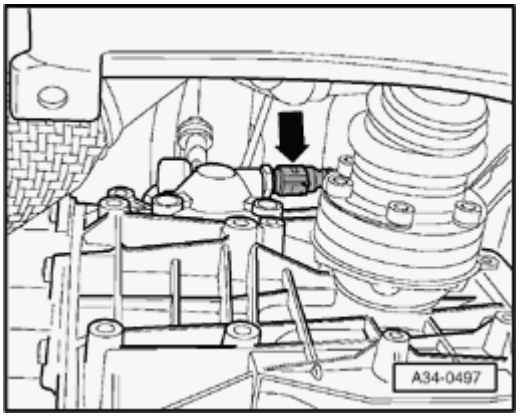

Fig. 174: Disconnecting/Connecting Harness Connector For Back-Up Light Switch At Right Of Transmission

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect connector - **arrow** - for reversing light switch on right side of transmission.

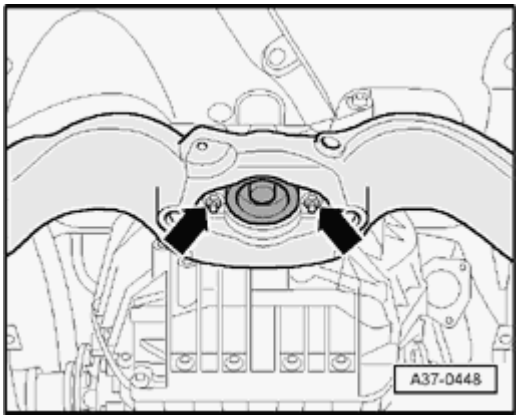

Fig. 175: Tunnel Cross Member Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt tunnel cross member onto transmission mounting - **arrows** -.
- It is important to clean the threaded holes for driveshaft bolts to remove any remaining locking fluid. The threads can be cleaned with a thread tap.
- Bolt driveshaft onto transmission --> **39 FINAL DRIVE, DIFFERENTIAL** .

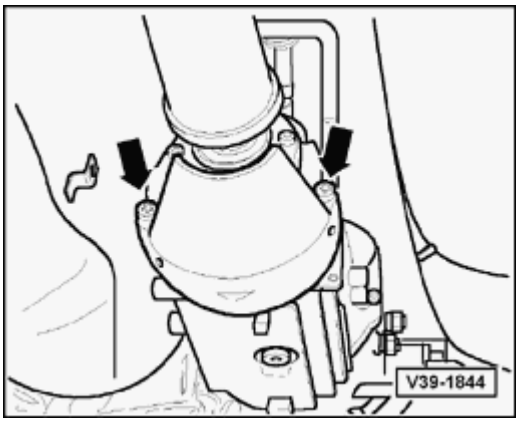

Fig. 176: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt on heat shield for driveshaft - **arrows** -.

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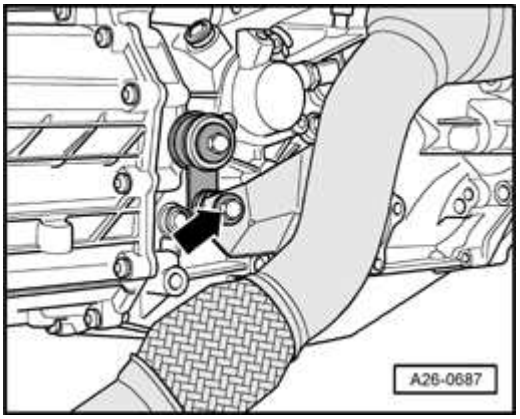

Fig. 177: Removing Bolt At Strap For Right Front Exhaust Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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.**

- Bolt front exhaust pipe (right-side) to bracket - **arrow** -.

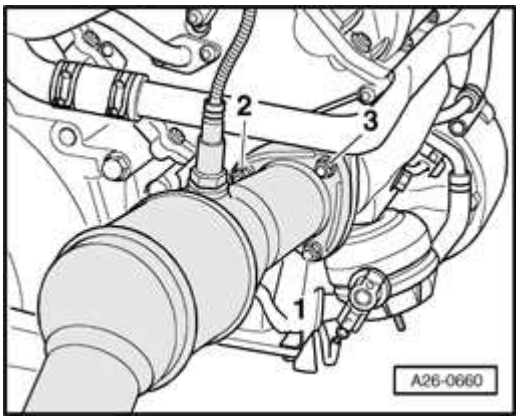

Fig. 178: Removing/Installing Nuts For Right Front Exhaust Pipe/Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten nuts - **1to3** - at front exhaust pipe/exhaust manifold connection evenly and progressively (hold catalytic converter in a horizontal position).

NOTE:

- **Shown in illustration with engine removed.**

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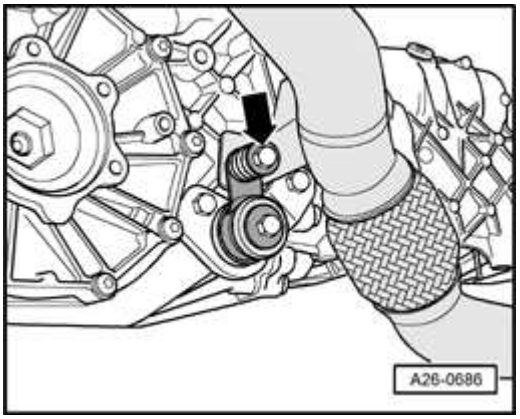

Fig. 179: Removing Bolt At Strap For Left Front Exhaust Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

- Bolt front exhaust pipe (left-side) to bracket - **arrow** -.

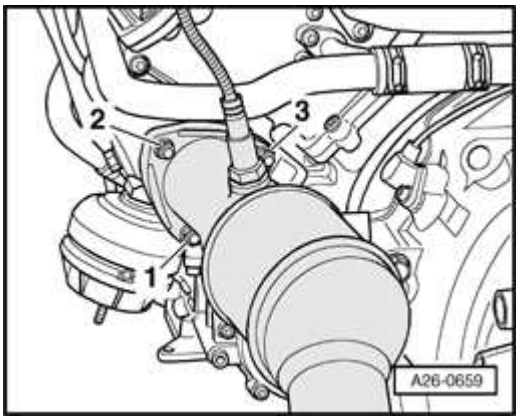

Fig. 180: Removing/Installing Nuts For Left Front Exhaust Pipe/Exhaust Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten nuts - **1 to 3** - at front exhaust pipe/exhaust manifold connection evenly and progressively (hold catalytic converter in a horizontal position).

NOTE:

- **Shown in illustration with engine removed.**

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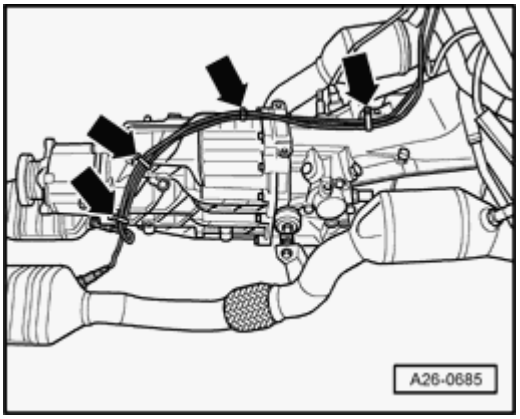

Fig. 181: Freeing Up Oxygen Sensor Wires At Areas Indicated By On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach oxygen sensor probe wiring to transmission at the points marked with - **arrows** -.

NOTE:

- **In the illustration the engine/transmission assembly has been removed.**

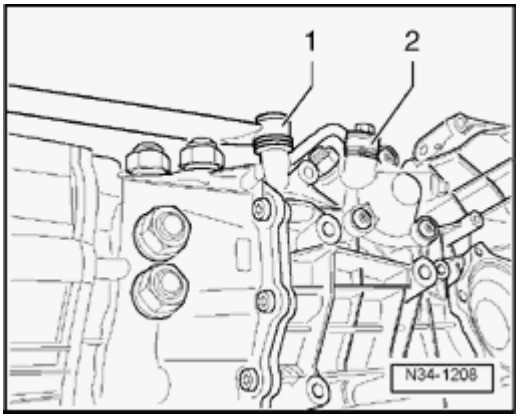

Fig. 182: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install push rod - **1** - ; to do so, tighten hexagon socket head bolt.
- Secure connecting rod - **2** - for selector rod.
- Bolt drive shafts to flange shafts --> **40 - FRONT SUSPENSION** .

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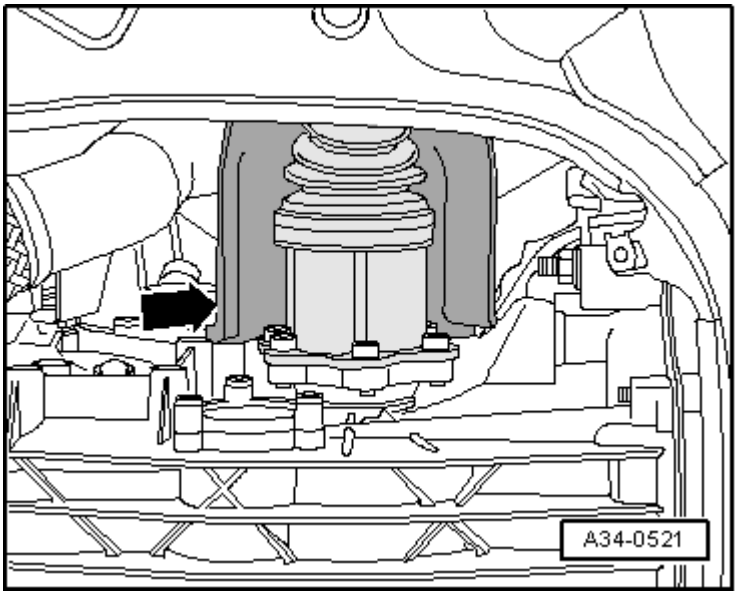

Fig. 183: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install heat shields - **arrow** - for drive shafts (left and right).

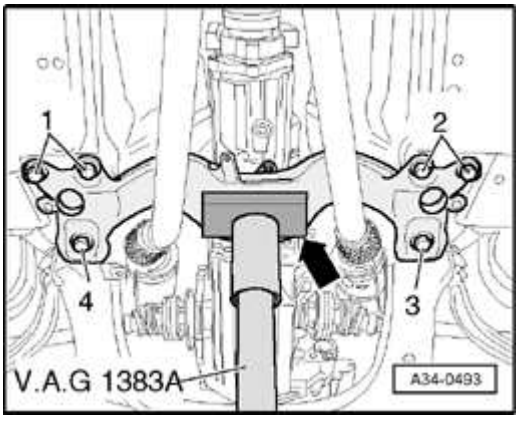

Fig. 184: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove transmission support 3282 from engine and transmission jack V.A.G 1383 A and place a wooden block - **arrow** - on the lifting column in its place.
- Push rear cross member upwards with engine and transmission jack V.A.G 1383 A.
- Replace bolts - **1 to 4** -.
- Bolt on tunnel cross member hand-tight.

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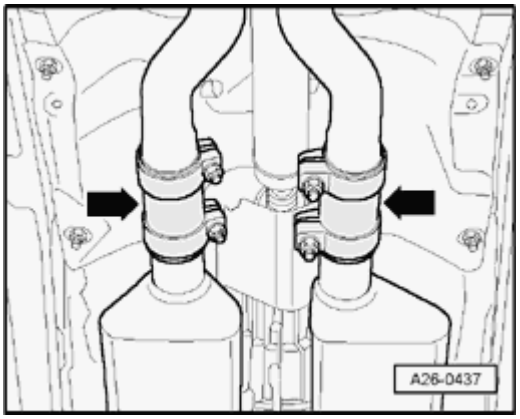

Fig. 185: Loosening Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install clamps - **arrows** - for exhaust system.
- Install exhaust system and perform stress-free alignment --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

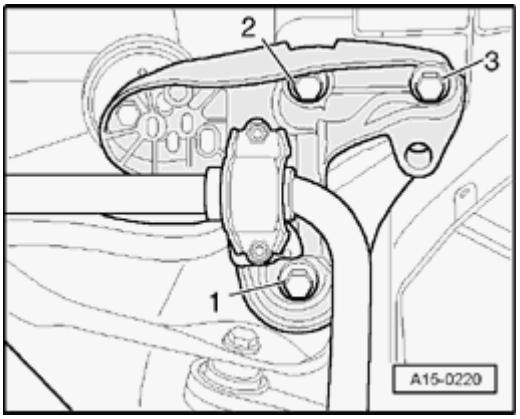

Fig. 186: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First remove front bolts - **2** - and - **3** - on subframe (left and right). Then remove bolts - **1** -.
- Lower subframe at the front.

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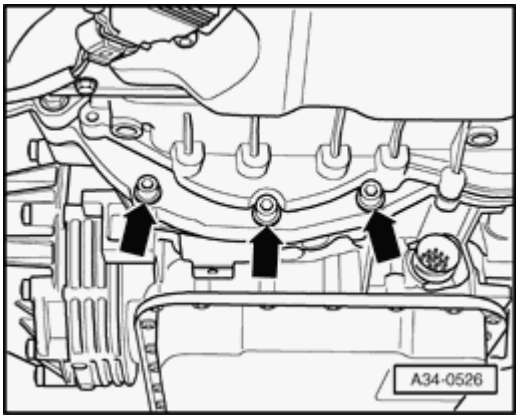

Fig. 187: Removing/Installing Bottom Engine/Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten three bottom engine/transmission securing bolts - **arrows** -.

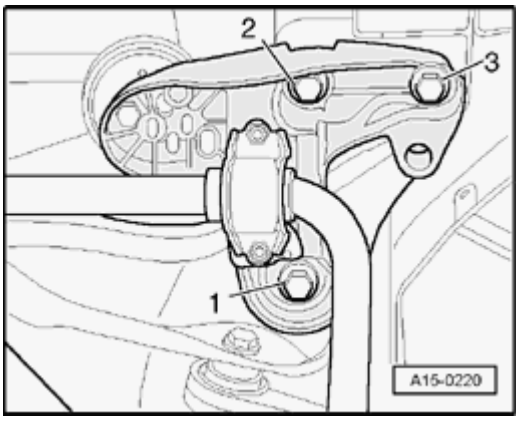

Fig. 188: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace front subframe bolts - **1...3** - on both sides of the vehicle.

Before tightening subframe, it must be aligned with body using locating pins 3393.

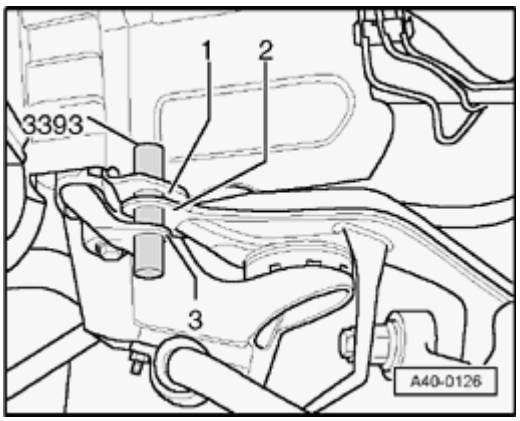

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Fig. 189: Identifying Hole, Sub-Frame Hole And Aluminum Console Hole Align On Both Sides
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hole - **1** - , hole - **2** - in subframe and hole - **3** - in aluminum bracket must be in alignment on both sides.

NOTE:

- **If this is not the case, wheel alignment will have to performed at a later stage.**

- Secure subframe and tunnel cross member --> **40 - FRONT SUSPENSION** .

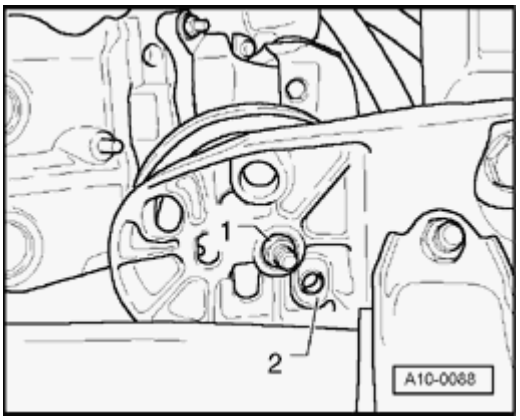

Fig. 190: Threaded Connections And Positioning Sleeves On Lower Engine Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten nuts - **1** - for engine mountings.

The remaining installation steps are performed in the reverse sequence; note the following points:

- Check selector mechanism setting and adjust if necessary --> **Shift mechanism, adjusting**.
- Check gear oil level in transmission --> **Transmission gear oil, checking level**.
- Follow steps required after connecting battery -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

  .
- Perform wheel alignment if required --> **44 - WHEELS, TIRES, VEHICLE ALIGNMENT** .

- Wheel alignment is not necessary if subframe was located in relation to body using locating pins 3393 prior to dismantling and assembly of subframe (before tightening bolts).
- Wheel alignment must, however, be performed if the subframe was not located in relation to the body using locating pins 3393 or if it was not possible to fully insert the two locating pins into the holes.

NOTE:

- **Tightening torques only apply to lightly greased, oiled, phosphated or blackened nuts and bolts.**

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- **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%.**

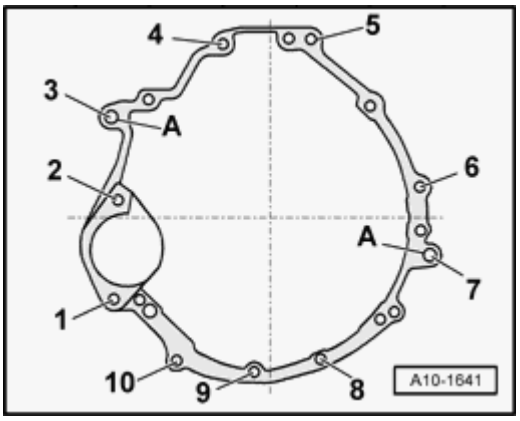

Fig. 191: Identifying Engine/Transmission Threaded Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission securing bolts

Item	Bolt	Nm
1, 2	M12x120	65
3	M12x110	65
4, 5	M12x105	65
6	M12x130	65
7	M12x170	65
8, 9, 10	M10x60	45

- **A** - = Dowel sleeves for aligning

Tightening torques

Component	Nm
Clutch slave cylinder to transmission	23 * See note
Selector shaft lever to transmission	23* See note
Push rod to transmission	40
Connecting rod for selector rod to transmission	23
Bracket for exhaust pipe lug.	23
Transmission mounting to transmission	23
Transmission mounting to tunnel cross member	23
Heat shields above drive shafts to transmission	23

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Heat shield for driveshaft to transmission cover	25
Engine mounting to engine support	23
Bracket for noise insulation to subframe	10

* Replace bolt

Transmission, transporting

Special tools, testers and auxiliary items required

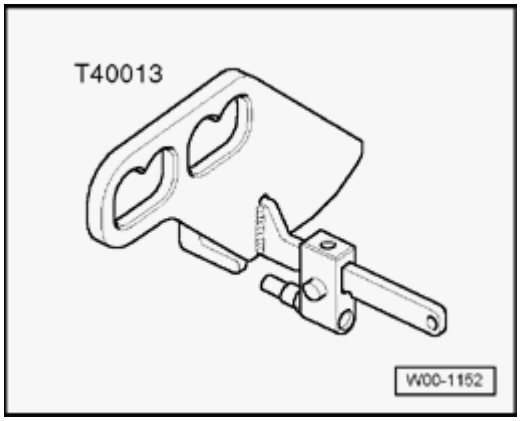

Fig. 192: Lifting Aid T40013
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lifting aid T40013

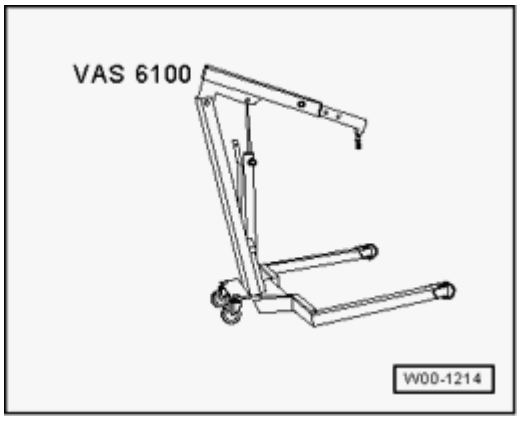

Fig. 193: Identifying Shop Crane VAS 6100
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Workshop hoist VAS 6100

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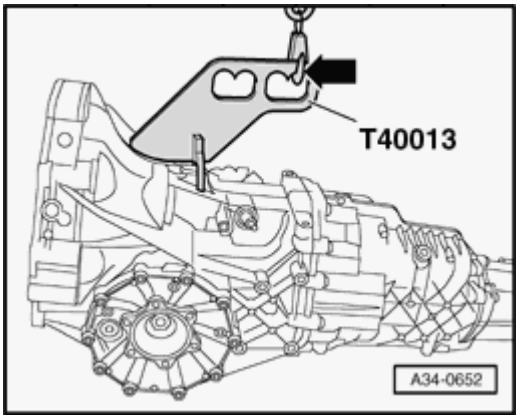

Fig. 194: Lifting Transmission With Workshop Hoist VAS 6100 And Lifting Aid T40013
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Procedure

- Insert lifting aid T40013 in lifting eye on transmission and secure.
- Engage hook of workshop hoist VAS 6100 in 4th notch - **arrow** - on lifting aid.
- Lift transmission with workshop hoist VAS 6100 and lifting aid T40013.

TRANSMISSION GEAR OIL, CHECKING LEVEL

Transmission gear oil, checking level

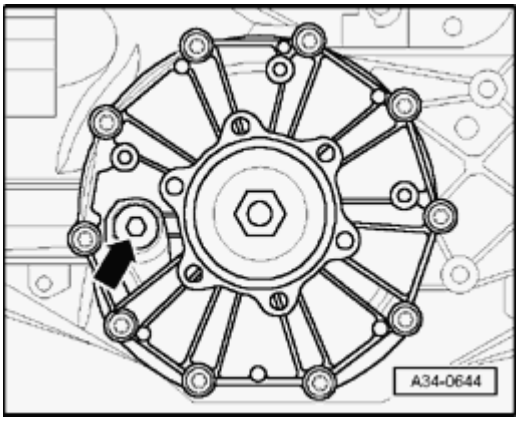

Fig. 195: Locating Oil Filler Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Procedure

NOTE:

- **The vehicle must be horizontal when checking gear oil level.**

- To check gear oil level, unscrew oil filler plug - **arrow** -.

Check oil level with a suitable tool (such as a length of wire bent to shape).

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- Specification: Oil level 2mm +-1mm below lower edge of oil filler hole.

  - Top off with gear oil if necessary. Specification --> **Code letters, assignment of mechanical units, transmission ratios, capacities**.
  - Screw in oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	40

TRANSMISSION MOUNTING, REMOVING AND INSTALLING

Transmission mounting, removing and installing

Special tools, testers and auxiliary items required

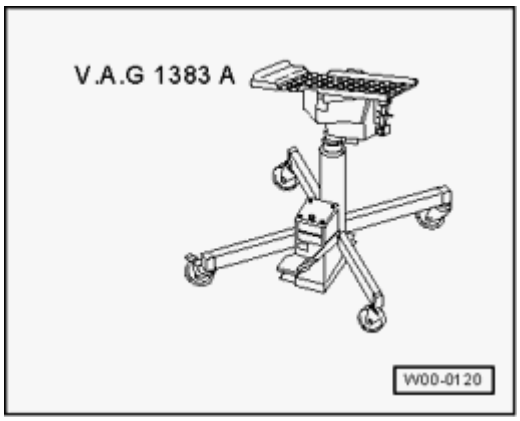

Fig. 196: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

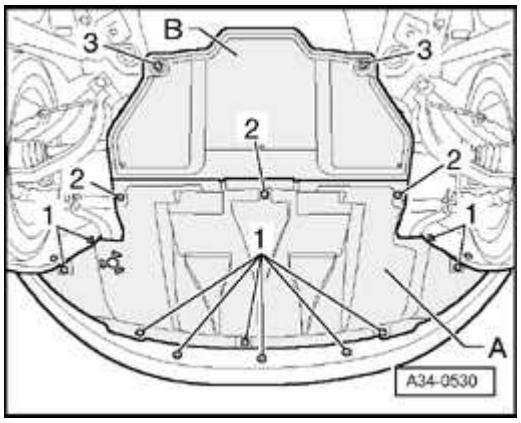

Fig. 197: Front And Rear Sound Insulation And Fasteners

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- If installed, loosen quick release fasteners - **3** - and remove rear noise insulation - **B** -.

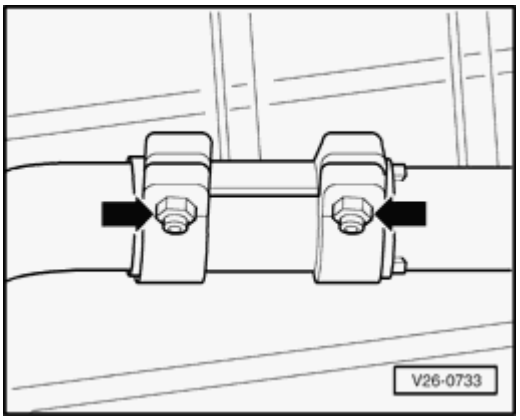

Fig. 198: Disconnecting Exhaust System At Double Clamp
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

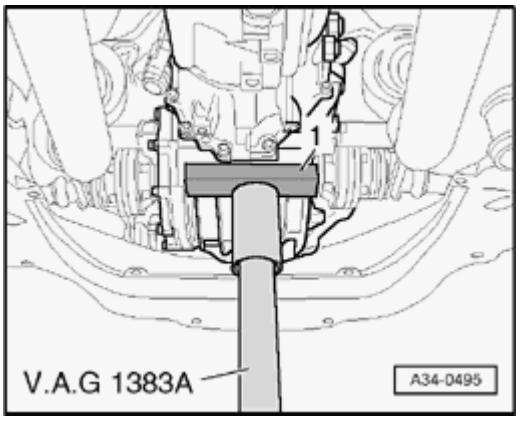

Fig. 199: Transmission Raised Using Punch Of VAG 1383 A So That A Piece Of Wood Can Be Placed In Between
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use engine and transmission jack V.A.G 1383 A to lift transmission up slightly. Insert a wooden block - **1** - between transmission and transmission jack.

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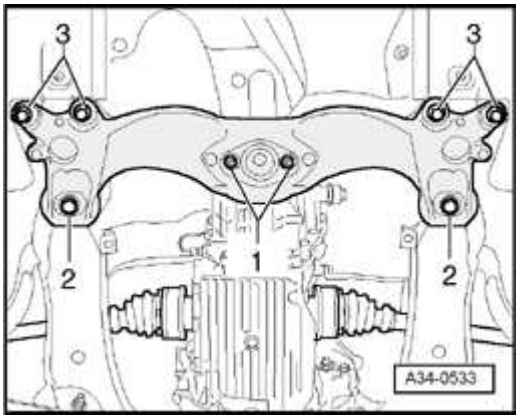

Fig. 200: Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First remove bolts - **3** - and then bolts - **2** - at tunnel cross member.
- Lower transmission slightly.
- Unscrew the two nuts - **1** - and push tunnel cross member backwards slightly.

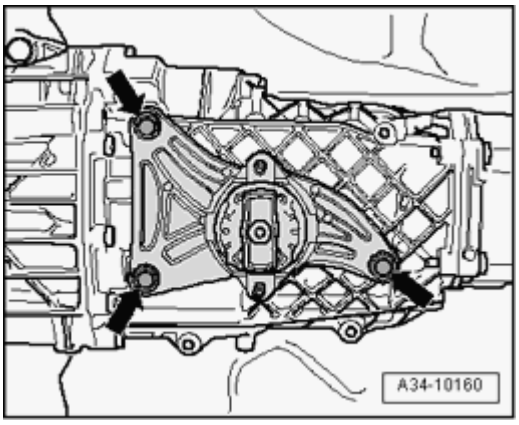

Fig. 201: Identifying Transmission Mounting Is Transferred To New Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew transmission mounting - **arrows** -.

Installing

Installation is performed in reverse sequence; note the following:

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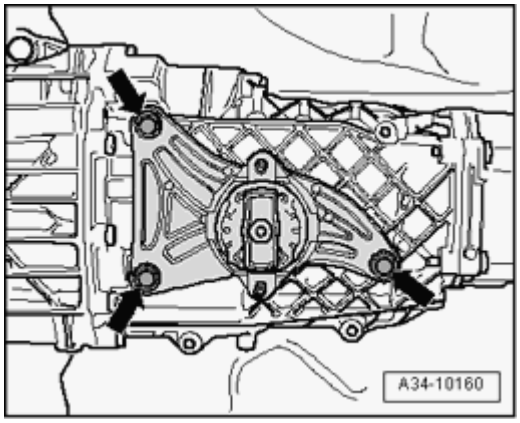

Fig. 202: Identifying Transmission Mounting Is Transferred To New Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install transmission mounting on transmission. Tighten bolts - **arrows** - to torque setting **Torque settings**.

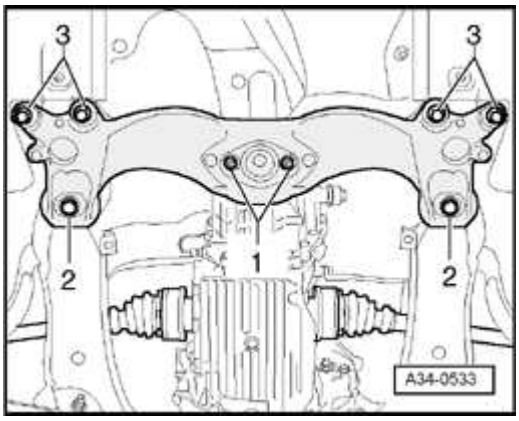

Fig. 203: Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt tunnel cross member onto transmission mounting - **1** -.
- Lift transmission far enough to be able to screw in the bolts - **2** -.
- First tighten bolts - **2** - and then bolts - **3** - --> **40 - FRONT SUSPENSION** .
- Install exhaust system so it is free of stress --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .

- Install noise insulation below transmission.

Torque settings

Component		Nm
Transmission mounting to transmission		23
Tunnel cross member to transmission mounting		23
Clamp for exhaust pipe		40

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MOUNTING TRANSMISSION ON ASSEMBLY STAND

Mounting transmission on assembly stand

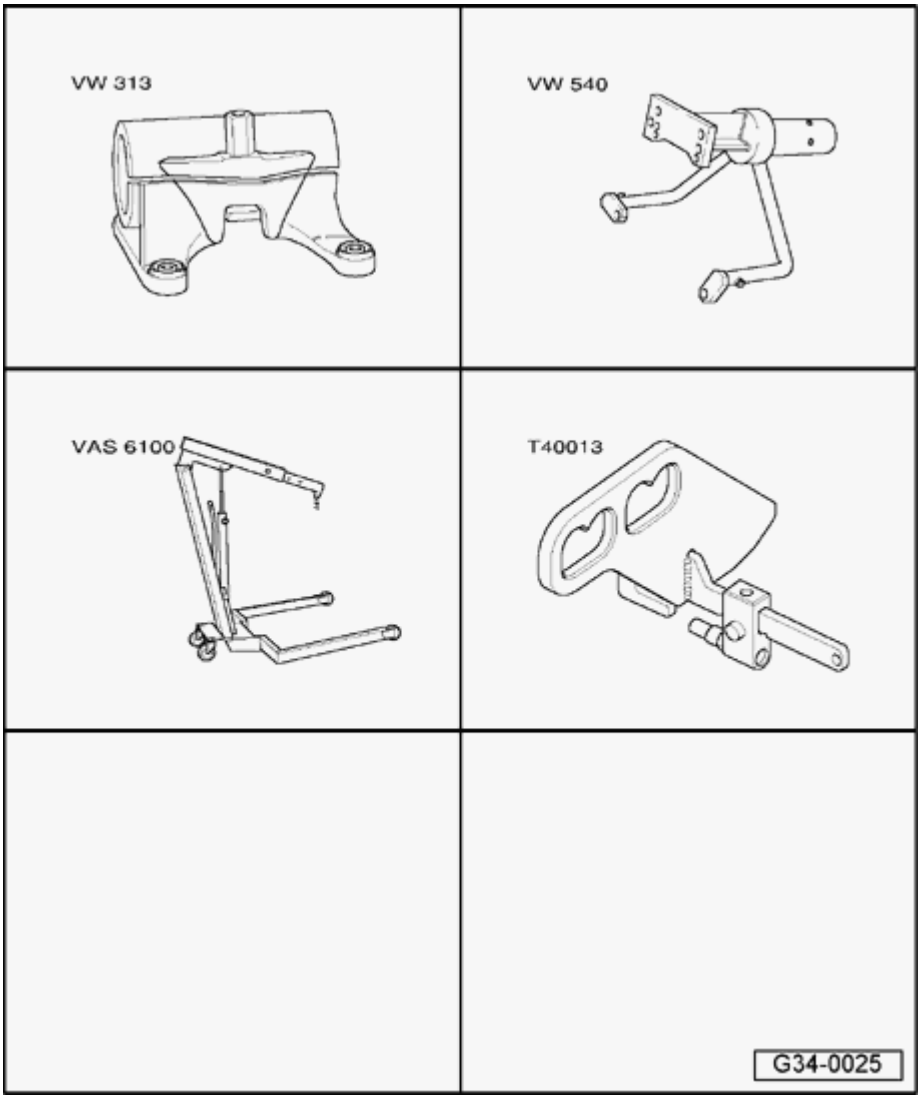

Fig. 204: Identifying Special Tools - Mounting Transmission On Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Support clamp VW 313
- Engine/transmission support VW 540
- Workshop hoist VAS 6100
- Lifting aid T40013

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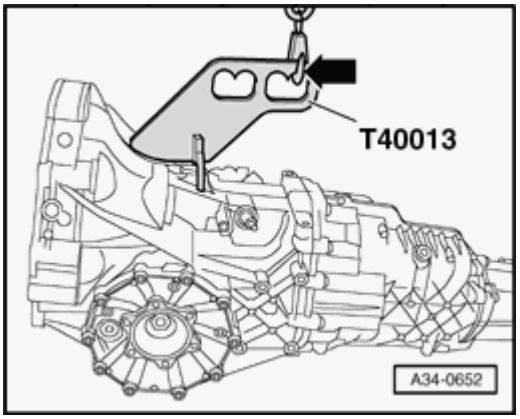

Fig. 205: Lifting Transmission With Workshop Hoist VAS 6100 And Lifting Aid T40013
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Procedure

- Insert lifting aid T40013 in lifting eye on transmission and secure.
- Engage hook of workshop hoist VAS6100 in 4th notch - **arrow** - on lifting aid T40013.
- Lift transmission with workshop hoist VAS6100 and lifting aid T40013.

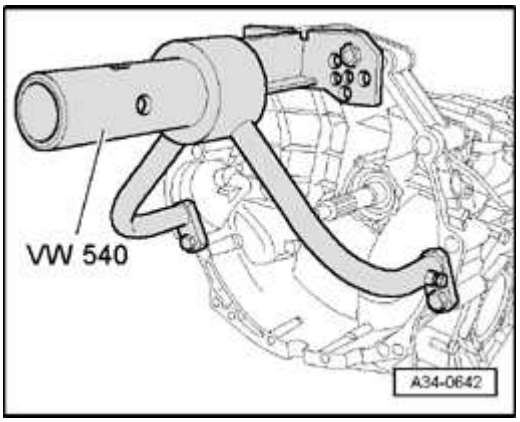

Fig. 206: Securing Engine And Transmission Support VW 540 To Transmission And Fitting Into Support Clamp VW313
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure engine and transmission support VW 540 to transmission and fit into support clamp VW313.

TRANSMISSION COVER AND TORSEN DIFFERENTIAL, REMOVING AND INSTALLING

Transmission cover and Torsen differential, assembly overview

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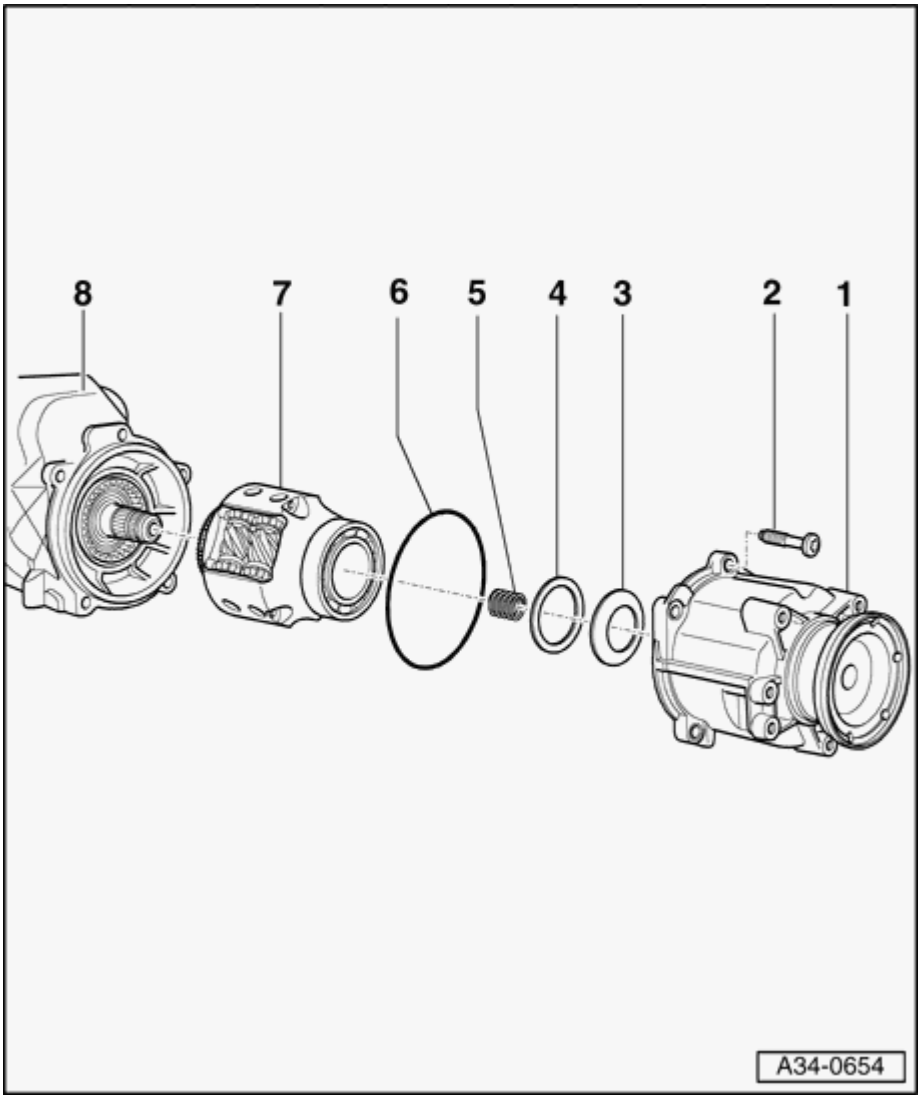

Fig. 207: Transmission Cover And Torsen Differential, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission cover

- With or without vibration damper, depending on design
- Removing and installing (transmission removed) --> **Transmission cover (transmission removed), removing and installing**
- Removing and installing (transmission installed) --> **Transmission cover (transmission installed), removing and installing**
- Dismantling and assembling --> **Transmission cover, dismantling and assembling**

2 - Bolt, 24 Nm

- 6 x

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3 - Dished spring

- Installation position: larger diameter (concave side) faces shim

4 - Shim

5 - Spring

6 - O-ring

- Always replace
- Lubricate with gear oil before installing.

7 - Torsen differential

- Can only be serviced by manufacturer

8 - Manual transmission

- Removing and installing --> **Transmission, removing and installing**
- Mounting on assembly stand --> **Mounting transmission on assembly stand**

Transmission cover (transmission removed), removing and installing

Special tools, testers and auxiliary items required

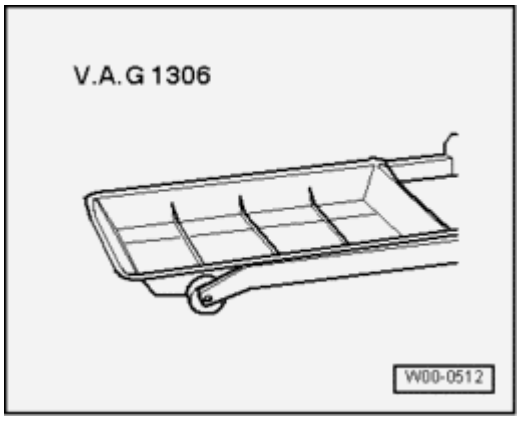

Fig. 208: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray V.A.G1306

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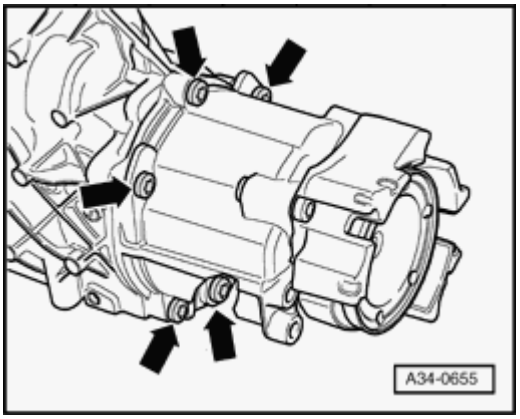

Fig. 209: Identifying Transmission Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Mount transmission on assembly stand --> **Mounting transmission on assembly stand**
- Place drip tray V.A.G1306 under transmission.
- Drain off gear oil.
- Unscrew bolts - **arrows** - and pull off transmission cover.

Installing

NOTE:

- **Replace O-rings.**

- Replace O-ring on transmission housing.
- Install transmission cover and tighten bolts - **arrows** -.
- Fill up with gear oil and check gear oil level --> **Transmission gear oil, checking level**.

Tightening torque

Component	Nm
Transmission cover to transmission	24

Transmission cover (transmission installed), removing and installing

Special tools, testers and auxiliary items required

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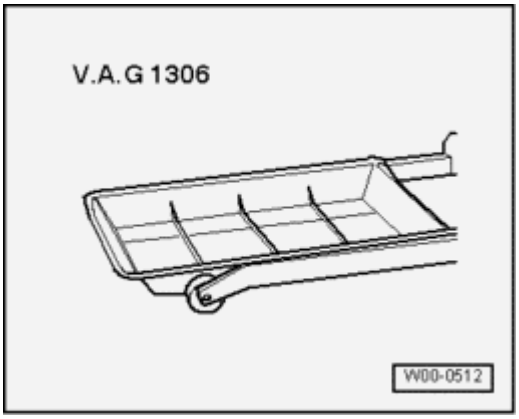

Fig. 210: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drip tray V.A.G1306

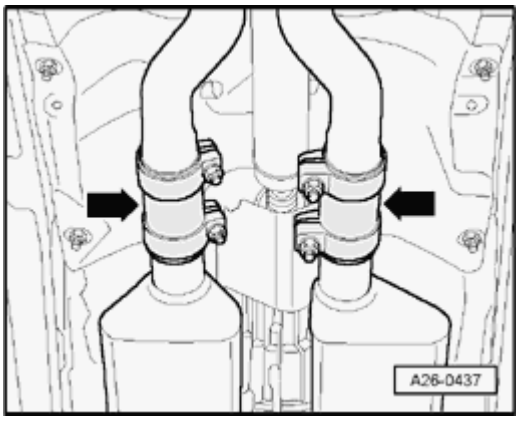

Fig. 211: Loosening Clamping Sleeves
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

NOTE:

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

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

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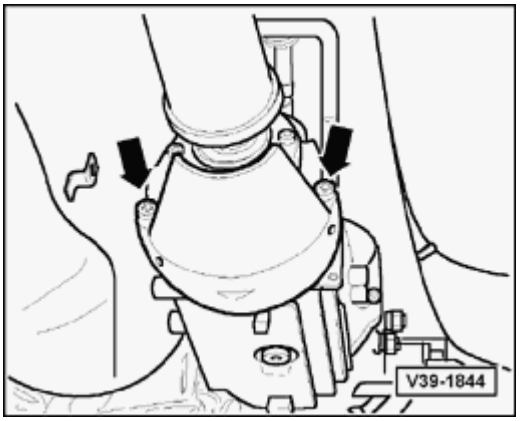

Fig. 212: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt heat shield for driveshaft - **arrows** -.

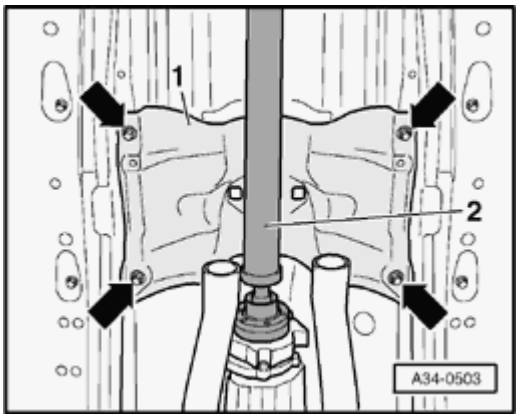

Fig. 213: Heatshield Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

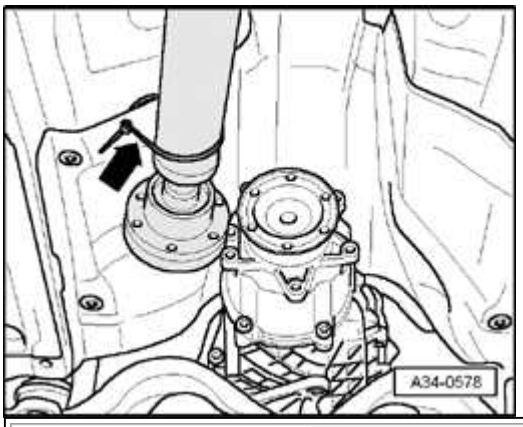

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Fig. 214: Drive Shaft Tied To Side, Onto Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tie driveshaft up to side onto heat shield - **arrow** -.
- Place drip tray V.A.G1306 under transmission.
- Drain off gear oil.

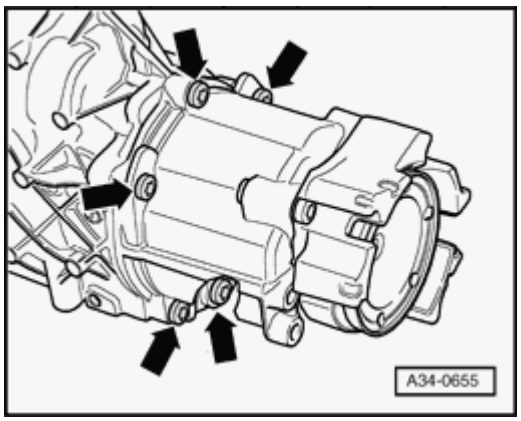

Fig. 215: Identifying Transmission Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew bolts - **arrows** - and take off transmission cover.

Installing

Installation is performed in reverse sequence; note the following:

NOTE:

- **Always replace O-rings, gaskets and self-locking nuts.**

- Install transmission cover and tighten bolts - **arrows** -.
- Fill up with gear oil and check gear oil level --> **Transmission gear oil, checking level**.
- Bolt driveshaft onto transmission --> **39 FINAL DRIVE, DIFFERENTIAL** .
- Install exhaust system and perform stress-free alignment -->
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BHF
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

.

Tightening torques

Component	Nm
Transmission cover to transmission	24
Heat shield for driveshaft to transmission cover	25

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TRANSMISSION COVER, DISMANTLING AND ASSEMBLING

Transmission cover, dismantling and assembling

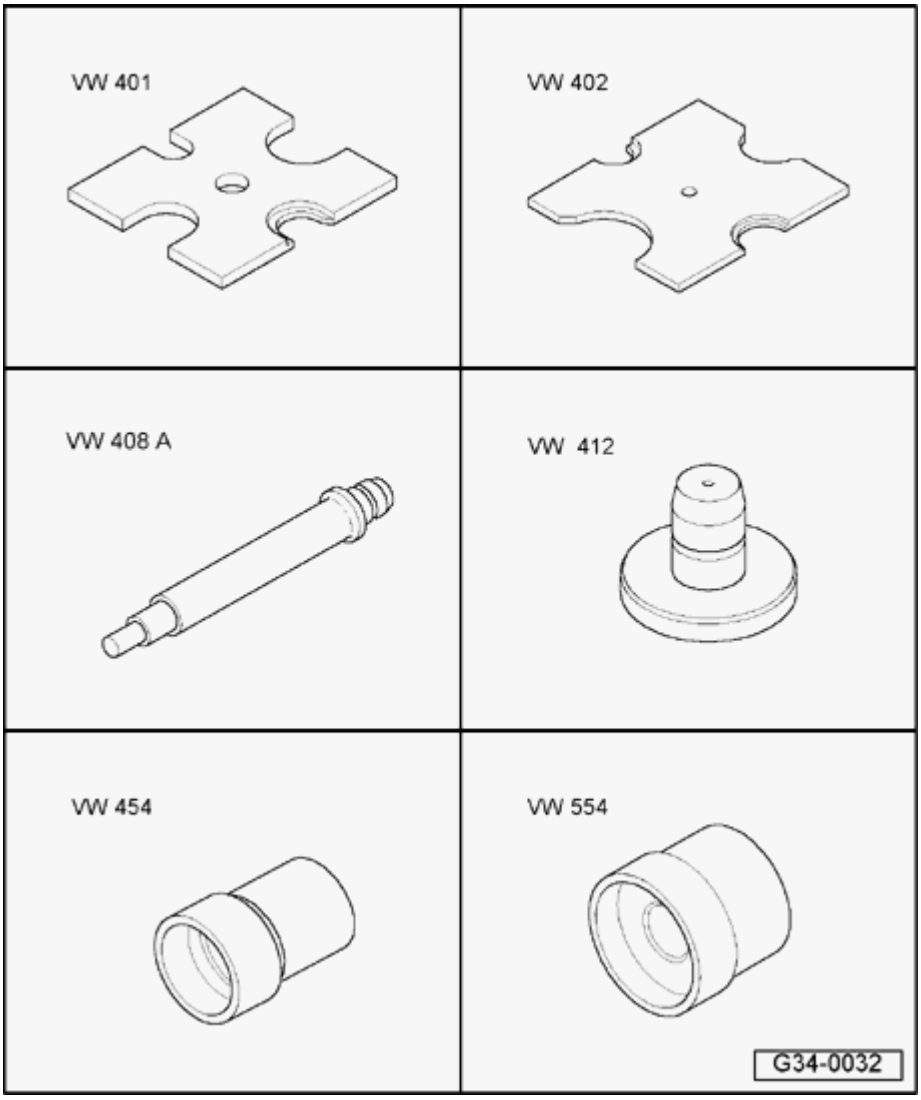

Fig. 216: Identifying Special Tools - Transmission Cover, Dismantling And Assembling (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust plate VW 402
- Press tool VW 408 A
- Press tool VW 412
- Press tool VW 454

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- Press tool VW 554

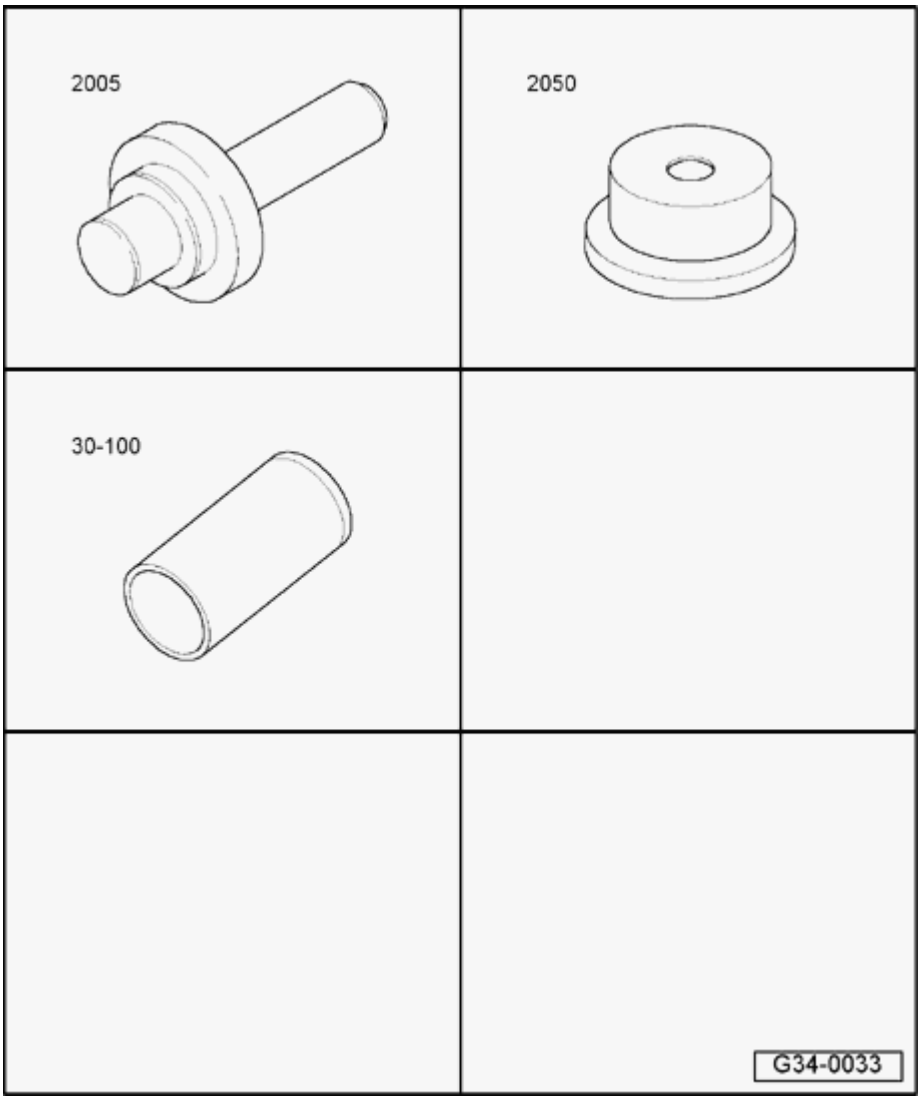

Fig. 217: Identifying Special Tools - Transmission Cover, Dismantling And Assembling (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Punch 2005
- Thrust piece 2050
- Drift sleeve 30 - 100
- **Shim 016 311 391 A**

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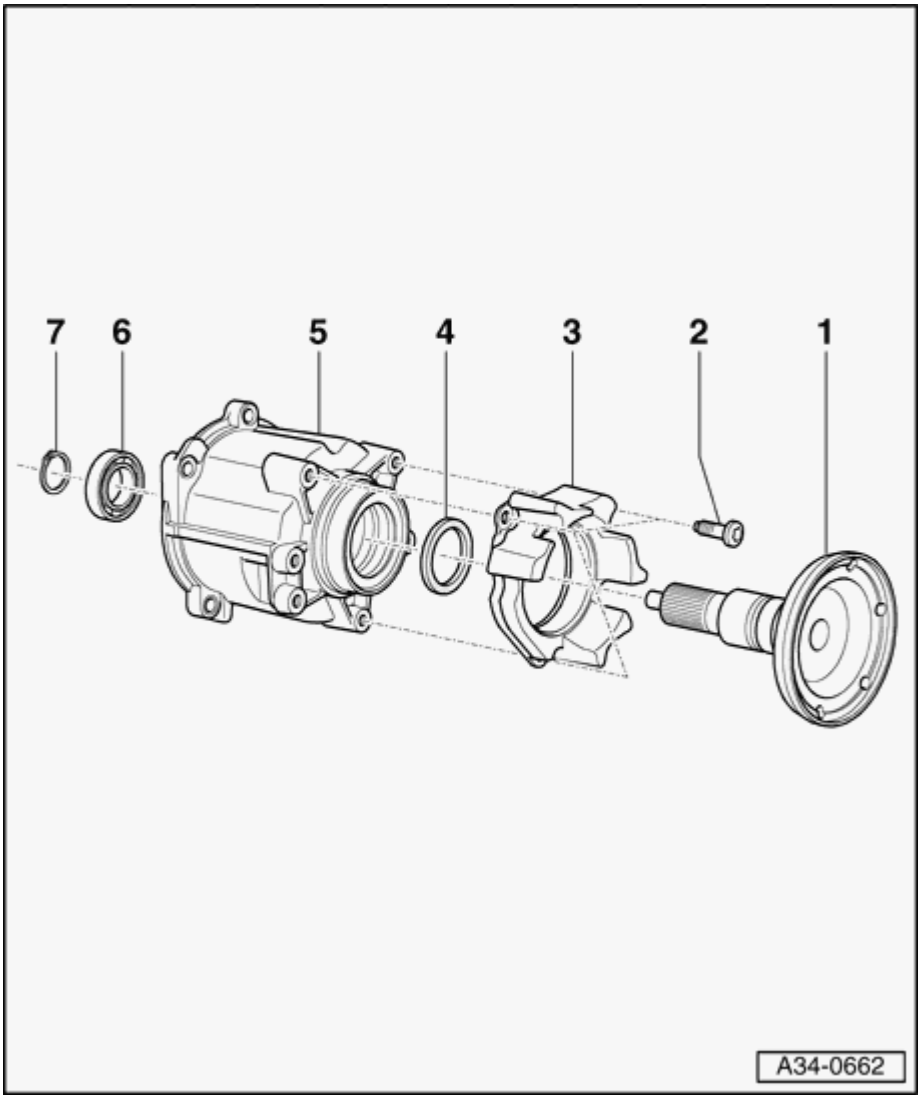

Fig. 218: Exploded View Of Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Flange shaft

- Pressing out **Pressing out flange shaft (transmission cover with vibration damper)** or **Pressing out flange shaft (transmission cover without vibration damper)**
- Pressing in **Pressing in flange shaft**

2 - Bolt, 20 Nm + 90°

- For vibration damper
- 3 x
- Self-locking
- Replace

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3 - Vibration damper

- Not installed on all versions

4 - Oil seal

- Levering out **Levering off the oil seal.**
- Preparing for installation **Preparing oil seal for installation**
- Driving in **Drive in seal onto stop.**

5 - Transmission cover

- Removing and installing --> **Transmission cover and Torsen differential, removing and installing**

6 - Ball bearing

- For flange shaft
- Pressing out **Pressing out ball bearing for flange shaft**
- Pressing in **Pressing in ball bearing for flange shaft**

7 - Circlip

Pressing out flange shaft (transmission cover with vibration damper)

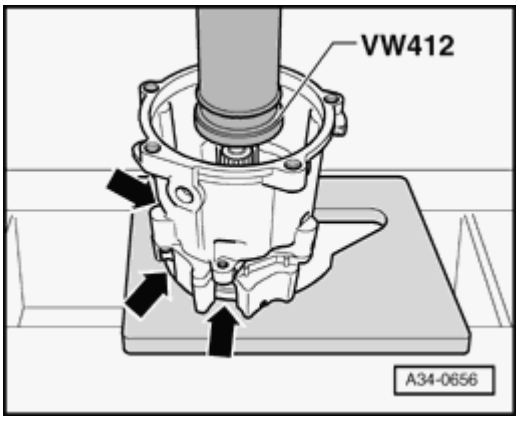

Fig. 219: Pressing Out Flange Shaft (Transmission Cover With Vibration Damper)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing out flange shaft.
- Set up transmission cover in such a way that flange shaft does not make contact with press plate - **arrows** - when it is pressed out.

Pressing out flange shaft (transmission cover without vibration damper)

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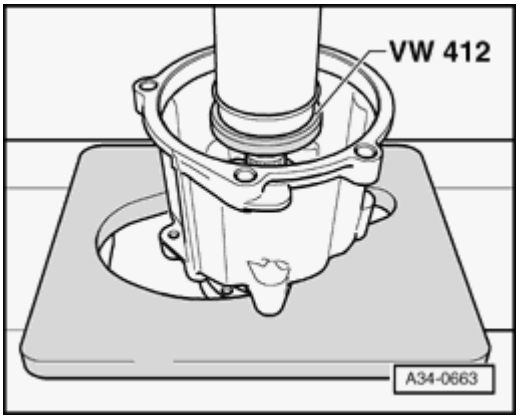

Fig. 220: Pressing Out Flange Shaft (Transmission Cover Without Vibration Damper)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing out flange shaft.

Pressing in flange shaft

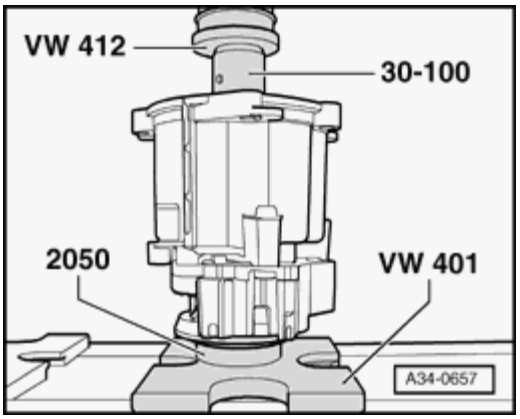

Fig. 221: Pressing In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure vibration damper before pressing in flange shaft.
- Fit circlip.

Levering off the oil seal.

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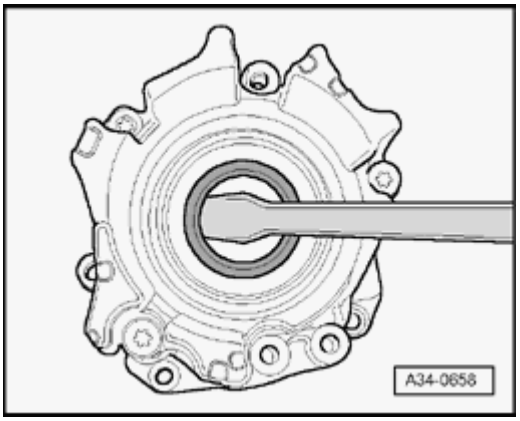

Fig. 222: Levering Off The Oil Seal.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Preparing oil seal for installation

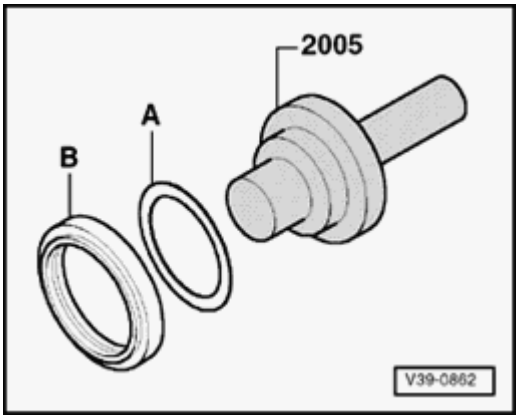

Fig. 223: Preparing Seal For Installation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - **Shim 016 311 391 A** (1.4 mm)

B - Oil seal

- Pack space between sealing lip and dust lip half-full with **sealing grease G 052 128 A1** .
- Place shim and oil seal on tool, as shown in illustration.

- Installation position: open side of seal towards bearing housing

Drive in seal onto stop.

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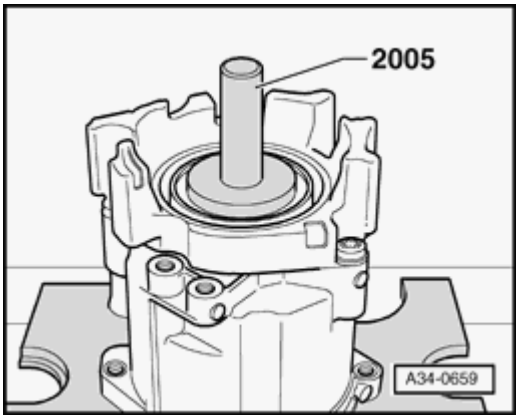

Fig. 224: Preparing Oil Seal For Installation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove shim.

Pressing out ball bearing for flange shaft

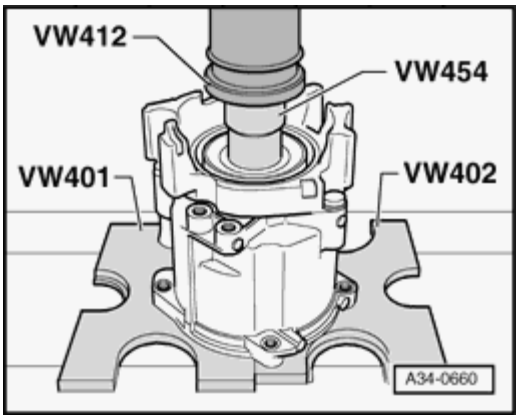

Fig. 225: Pressing Out Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing in ball bearing for flange shaft

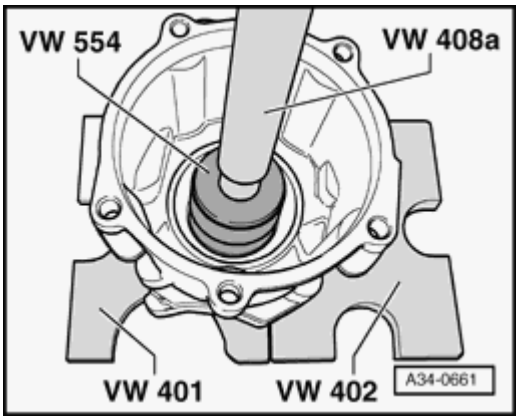

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Fig. 226: Pressing In Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

SELECTOR SHAFT WITH SELECTOR CYLINDER, SERVICING

Selector shaft with selector cylinder, removing and installing

Special tools, testers and auxiliary items required

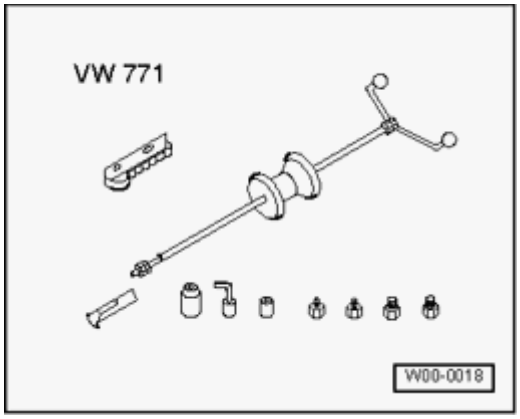

Fig. 227: Slide Hammer-Multi-Purpose Tool Set VW 771
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Multi-purpose tool VW 771/1

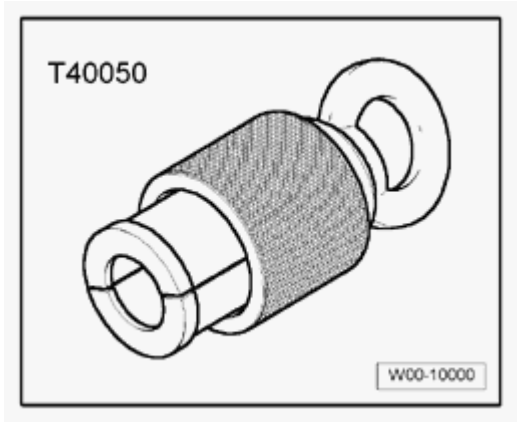

Fig. 228: Puller T40050
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Puller T40050

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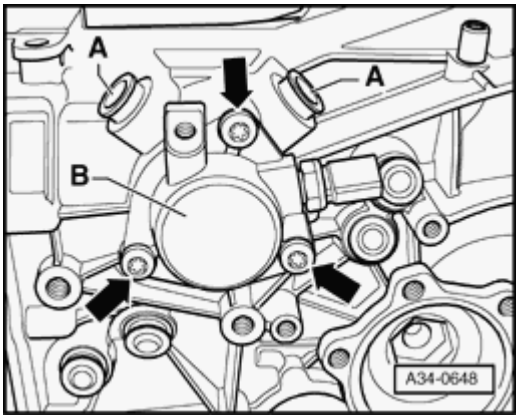

Fig. 229: Removing Bolts And Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Remove bolts - **arrows** - and remove selector shaft cover - **B** -.

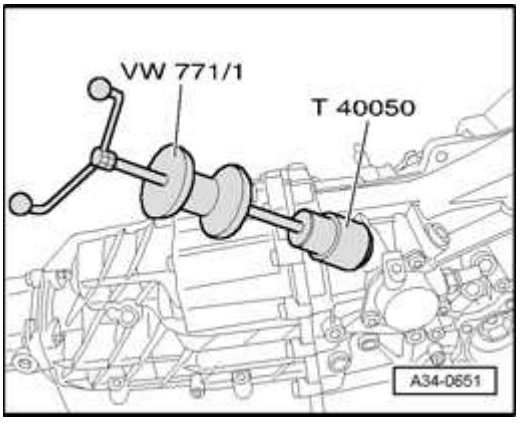

Fig. 230: Pulling Out Both Selector Shaft Locking Bushes Using Multi-Purpose Tool VW 771/1 And Puller T40050
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out both selector shaft locking bushes (- **item A** - in **Fig. 229**) using multi-purpose tool VW 771/1 and puller T40050.

- Make sure that no gear has been engaged.

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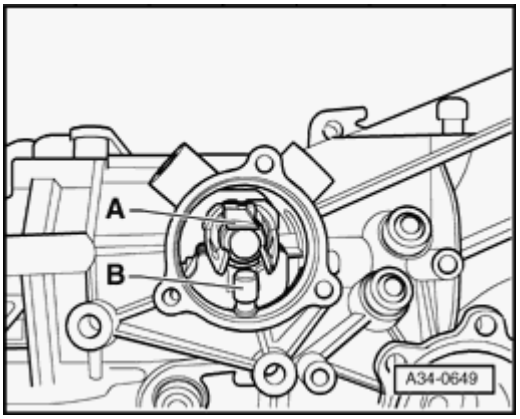

Fig. 231: Pushing Selector Shaft Into Transmission & Removing Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push selector shaft - **A** - into transmission as far as it will go, simultaneously removing pin - **B** -.
- Pull out selector shaft.

Installing

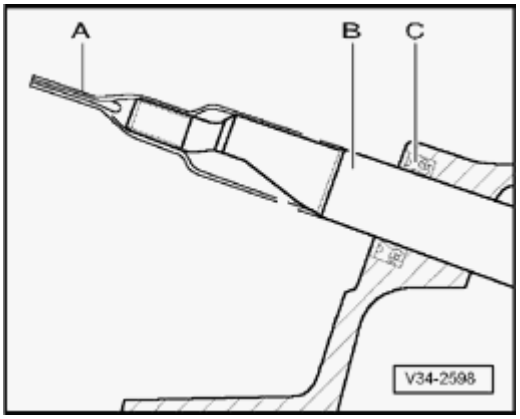

Fig. 232: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation is performed in reverse sequence; note the following:

- Push **assembly sleeve 01E 311 120** - **A** - onto selector shaft - **B** -.
- Install complete selector shaft.

- Installation position: Chamfer of selector shaft points downwards.

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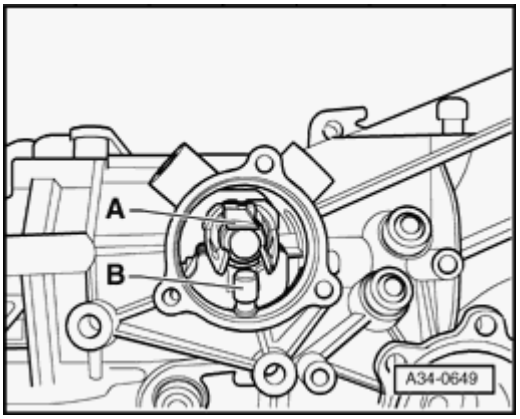

Fig. 233: Pushing Selector Shaft Into Transmission & Removing Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push selector shaft - **A** - into transmission as far as it will go, simultaneously inserting pin - **B** -.

- Installation position of pin - **B** - : lug on pin points in direction of transmission housing.

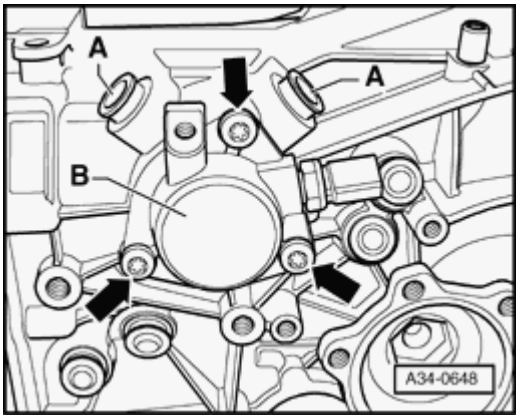

Fig. 234: Removing Bolts And Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fit cover - **B** - and tighten bolts - **arrows** -.

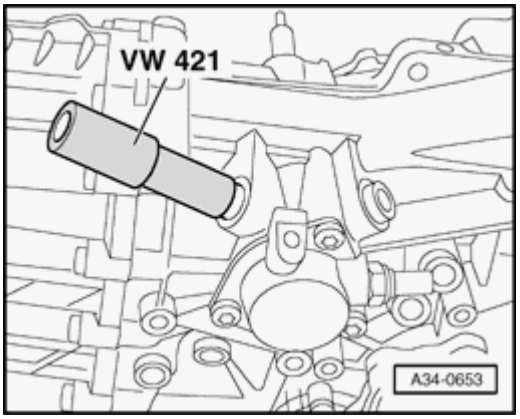

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Fig. 235: Driving In Selector Shaft Locking Bushes Onto Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive in selector shaft locking bushes onto stop.

Tightening torque

Component	Nm
Selector shaft cover to transmission	24

Selector shaft oil seal, replacing

Special tools, testers and auxiliary items required

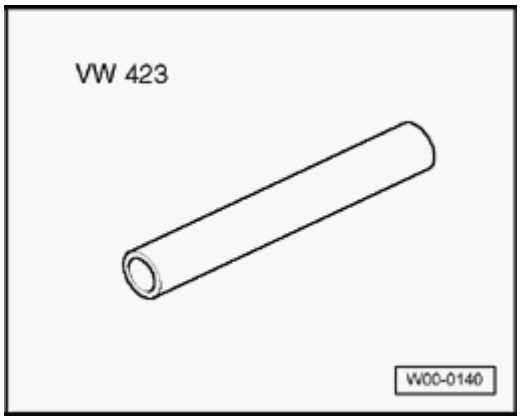

Fig. 236: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW 423

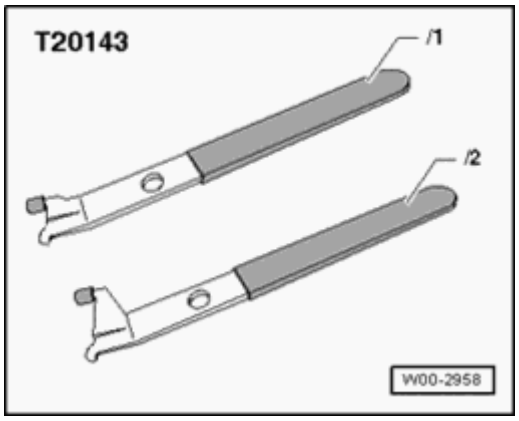

Fig. 237: Identifying Extractor Hook T20143
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Puller hook T20143/1

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Removing

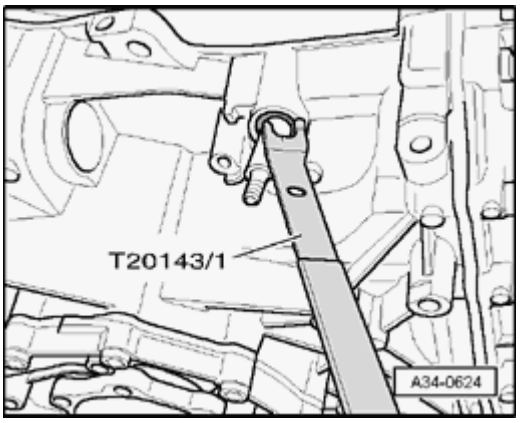

Fig. 238: Prying Out Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Selector shaft installed
  - Carefully pry out oil seal using puller hook T20143/1, taking care not to damage shaft.
- Selector shaft removed

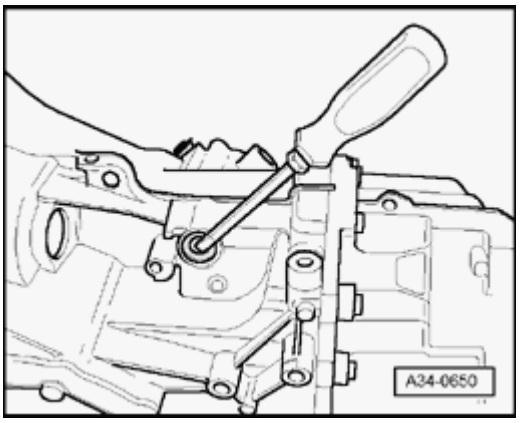

Fig. 239: Prying Out Seal With Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

  - Carefully pry out oil seal with a screwdriver.

Installing

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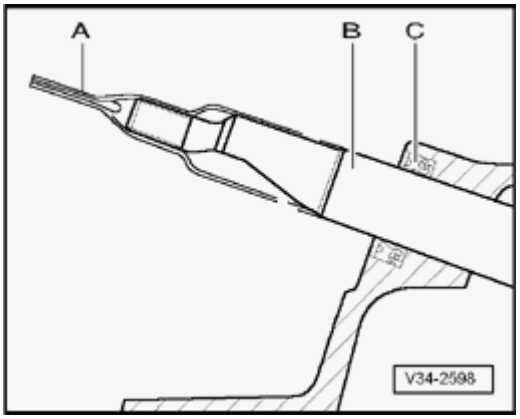

Fig. 240: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To avoid damaging oil seal - **C** - , oil seal and selector shaft must only be installed using **assembly sleeve 01E 311 120** , - **item A** -.
- Pack space between sealing lip and dust lip half-full with **sealing grease G 052 128 A1** .
- Lightly oil outer circumference of seal.

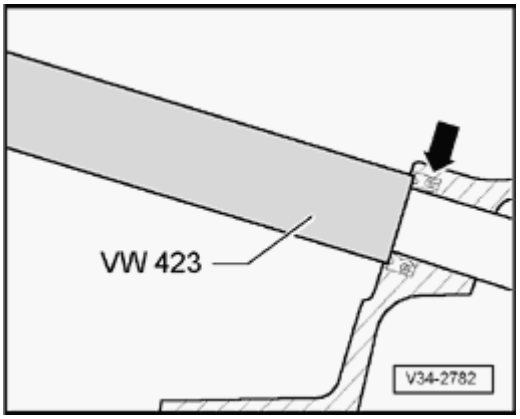

Fig. 241: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using tube VW 423, drive in oil seal to a depth of 1.1mm+-0.2mm.

REVERSING LIGHT SWITCH, REMOVING

Reversing light switch, removing

Special tools, testers and auxiliary items required

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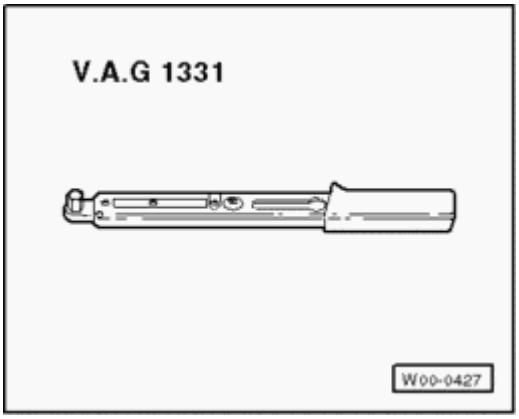

Fig. 242: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

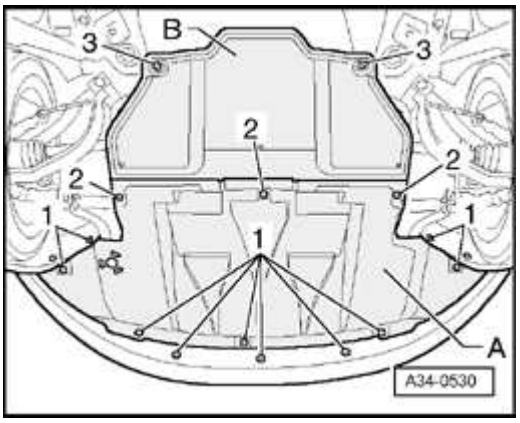

Fig. 243: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, loosen quick release fasteners - **3** - and remove rear noise insulation - **B** -.

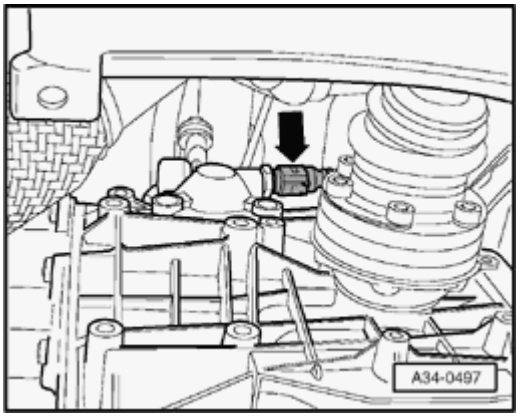

Fig. 244: Disconnecting Harness Connector For Back-Up Light Switch At Right Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Disconnect connector - **arrow** - for reversing light switch on right side of transmission.
- Unscrew reversing light switch - **arrow** - from selector shaft cover.

Reversing light switch, installing

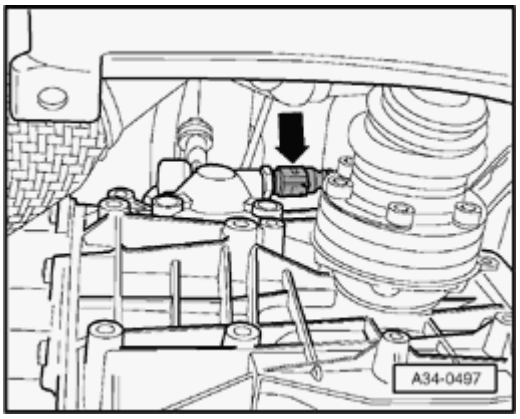

Fig. 245: Disconnecting Harness Connector For Back-Up Light Switch At Right Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Screw reversing light switch - **arrow** - into selector shaft cover (tightening torque: 20 Nm).
- Connect connector - **arrow** - for reversing light switch on right side of transmission.

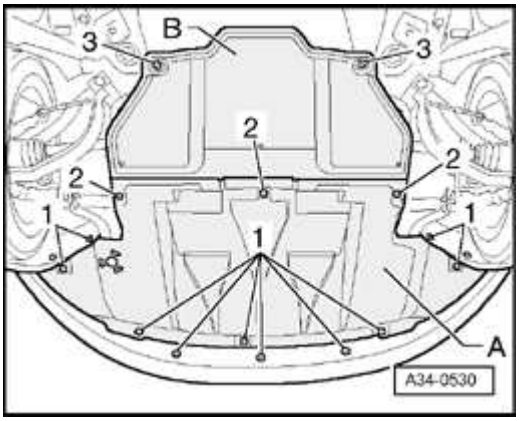

Fig. 246: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install rear noise insulation - **B** -.

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35 GEARS, SHAFTS

INPUT SHAFT, DISMANTLING AND ASSEMBLING

At present there is no provision for disassembling.

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TRANSMISSION

6 Spd. Manual Transmission 0A3 All Wheel Drive, Internal Component Servicing

00 - TECHNICAL DATA

TRANSMISSION IDENTIFICATION

Transmission identification

NOTE:

- **You can find information about code letters, aggregate allocation, gear ratios and capacities in --> 00 TECHNICAL DATA .**

Location on transmission

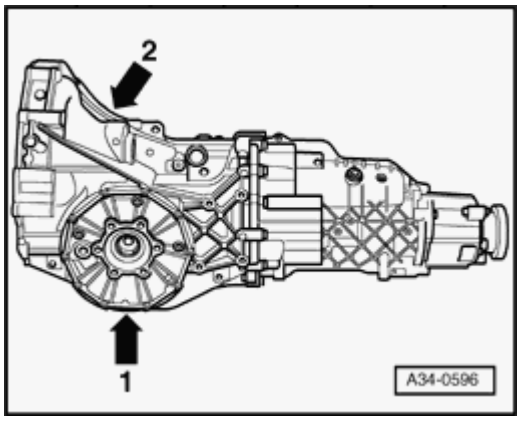

Fig. 1: Locating Code Letters, Serial Number And Possible Transmission Part Number
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Code letters, serial number and possible transmission part number - **arrow 1** -
- Manual transmission 0A3 - **arrow 2** -

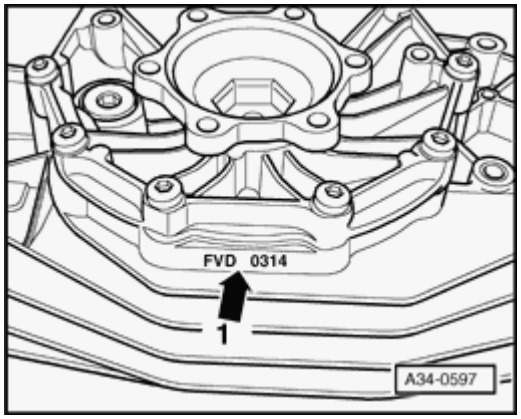

Fig. 2: Locating Code Letters And Transmission Serial Number
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Transmission code letters and serial number - arrow 1 -

Example:	FVD	0314
	I	I
	Code	Transmission serial number

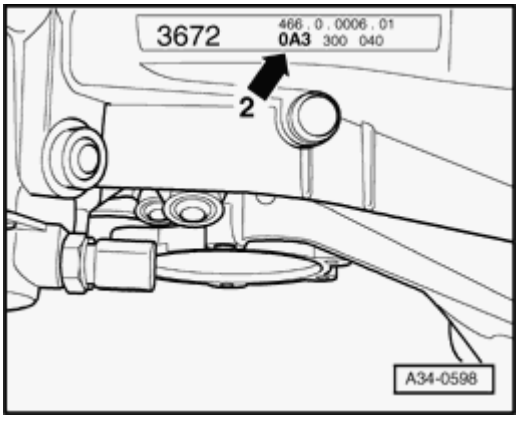

Fig. 3: Transmission Code Letters On Vehicle Data Stickers (Manual Transmission 0A3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Manual transmission 0A3 - arrow 2 -

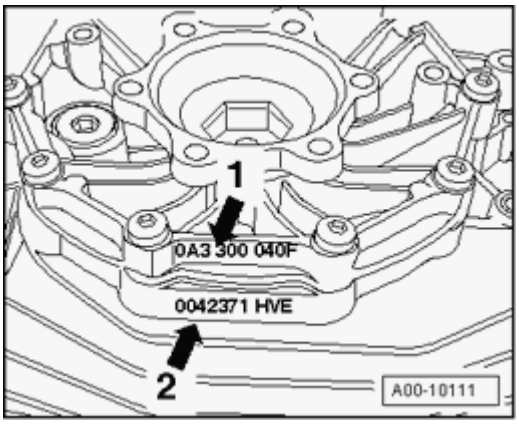

Fig. 4: Identification As Of Serial Number 2097
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Identification as of serial number 2097

- Manual transmission 0A3 - **arrow 1** - with transmission part number (e.g. 0A3 300 040 F) on the final drive cover.
- Transmission serial number and code letters - **arrow 2** -

GENERAL REPAIR NOTES

General Repair Notes

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To ensure flawless and successful transmission repairs, the greatest care and cleanliness as well as the use of good and proper tools is essential. The usual basic safety precautions also, naturally apply when carrying out vehicle repairs.

A number of generally applicable instructions for individual repair procedures, which are otherwise mentioned at various points in the article, are summarized here under the topic "Components" --> **Components**. They apply to this article.

Special tools and equipment

For a complete list of special tools used in the article see AESIS; Library; Special Tools.

Components

Transmission

- You can find information about code letters, aggregate allocation, gear ratios and capacities in --> **00 TECHNICAL DATA** .
- Allocate bolts and other components according to transmission code via .
- Carefully clean all joints and adjacent areas before disconnecting.
- When exchanging or repairing a manual transmission, check oil level and top off if necessary --> **34 CONTROLS, HOUSING** .
- Determine capacities and specifications using the respective code letters --> **00 TECHNICAL DATA** .

Sealant

- Thoroughly clean housing joint surfaces before applying sealing compounds.
- Apply *sealing paste AMV 188 001 02* evenly and not too thick.
- Do not allow sealing compound to enter ventilation openings.

O-rings, seals, gaskets

- Always replace O-rings, gaskets and seals.
- After removing gaskets, examine contact surface on housing/shaft for burr resulting from removal or for other signs of damage.
- Thoroughly clean housing joint surfaces before assembling.

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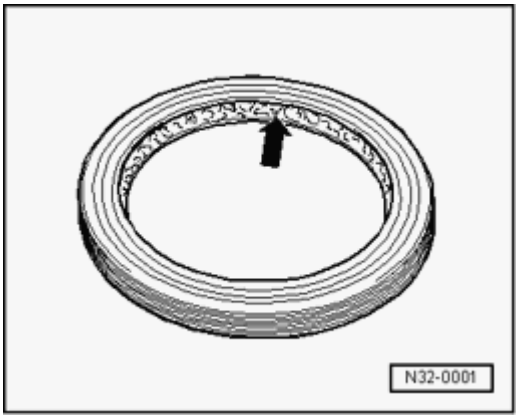

Fig. 5: Identifying Space Between Oil Seal Sealing Lips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before installing radial shaft seals, lightly oil outer circumference and fill space between sealing lips - **arrow** - halfway with *sealing grease G 052 128 A1* .
- Open sides of oil seals face fluid side.
- When pressing in new gaskets, make sure sealing lip does not run on the same point as the sealing lip of the old seal (use insertion depth tolerances).
- Lightly oil O-rings before installing; this prevents the rings from being crushed when inserting.
- The procedure for removing and installing shaft seals in an installed transmission is described in --> **34 CONTROLS, HOUSING** and -->
  - **39 FINAL DRIVE, DIFFERENTIAL** for REAR FINAL DRIVE
  - **39 - FINAL DRIVE, DIFFERENTIAL** for REAR FINAL DRIVE 0AR

  .
- After replacing seals and sealing rings, check transmission fluid level and top off if necessary --> **34 CONTROLS, HOUSING** .

Locking elements

- Do not over-stretch circlips.
- Always replace circlips which have been damaged or overtensioned.
- Circlips must be properly seated in base of the groove.

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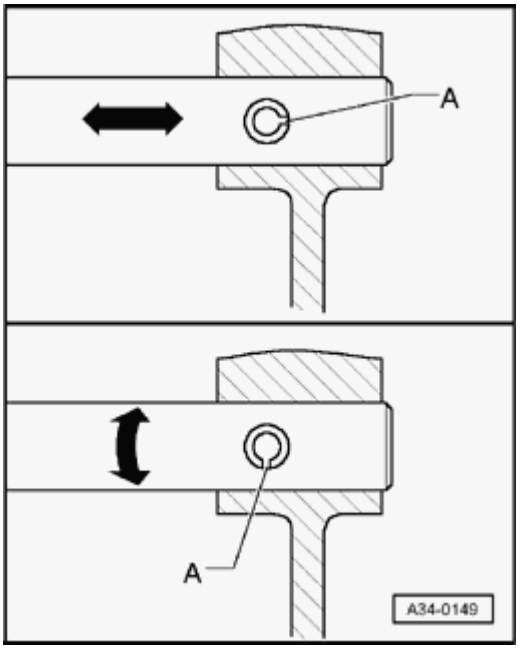

Fig. 6: Identifying Locking Elements
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace spring pins. Installation position: Slit - **A** - should be in line with the line of force - **arrow** -.

Bolts and nuts

- Loosen bolts and nuts in reverse of tightening sequence.
- Loosen and tighten bolts and nuts for securing covers and housings in a diagonal sequence and in stages, when no tightening sequence is specified.
- Delicate parts must not be cross-threaded. Loosen and tighten in stages in a diagonal sequence.
- Tightening torques stated apply to unoiled bolts and nuts.

- Replace self-locking bolts and nuts.
- Clean threads of bolts that were applied with locking fluid using a wire brush. Apply *locking fluid AMV 185 101 A1* before reinstalling.
- Threaded holes into which self-locking bolts or bolts coated with locking fluid are screwed, must be cleaned (e.g. tap). Otherwise there is a risk that the bolts will shear the next time they are removed.

Adjustment shims

- Use a micrometer to measure the shims at several points. Varying tolerances make it possible to measure the required shim thickness exactly.
- Inspect for burrs and signs of damage.
- Do not install shims which are damaged or not in perfect condition.

Bearings

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- Set needle bearings, ball sleeves and roller sleeves with the inscribed side (greater thickness) facing toward drift.
- Install new tapered roller bearing as supplied and do not use additional oil.
- Install various bearings (removed tapered roller bearings) into transmission, lubricated with gear oil.
- Heat inner races of taper roller bearings to approx. 100°C before installing. Press on to the stop when installing, so there is no axial clearance.

- Warm inner race for needle and roller bearings to 130°C max.
- Do not interchange inner and outer bearing races with those from other bearings of the same size, bearings are paired.
- Taper roller bearings installed on a shaft must be replaced as a set and use same make of bearings.
- If gear set is replaced, then always replace double angular contact ball bearing on drive pinion with it.

Synchronizer rings

- Do not interchange. When reusing synchronizer rings, always install to the same gear.
- Check for wear and replace if necessary.

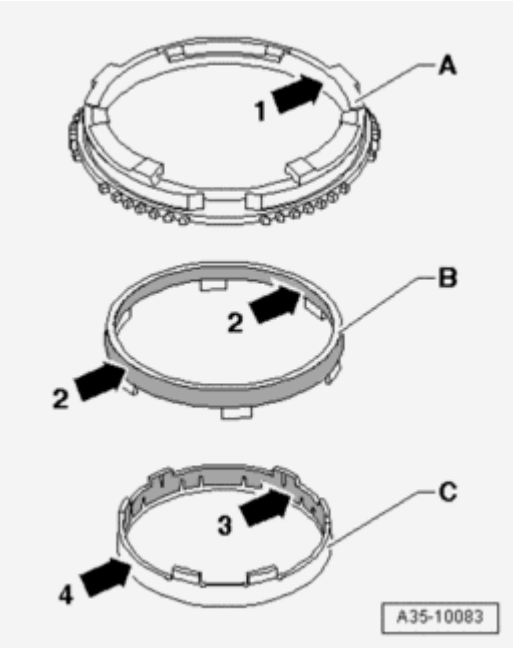

Fig. 7: Checking Synchronizer Rings
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check coated friction surfaces - **arrows 2** - from intermediate ring - **B** - for damage (flat areas, disintegrating areas or carbon layer).
- Check inner friction surface - **arrow 1** - of synchronizer ring - **A** - and outer friction surface - **arrow 4** - of inner race - **C** - for grooves and scoring.
- On inner race - **C** - with coated friction surfaces - **arrow 3** - , check coating for damage (disintegrating

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carbon layer).

- Coat with gear oil before installing.

Gears and synchronizer hub

- Before pressing on, clean and heat to max. 100°C on a heater.
- When installing, press onto stop so there is no axial play.
- Temperature can be check using temperature tester V.A.G 1558 , ignition tester V.A.G 1767 or diesel tester V.A.G 1743.
- Observe installation position.

Selector gears

- After installing, check 1st through 6th gear for minimal amount of axial clearance of at least 0.10 mm and for ease of movement.

34 - CONTROLS, HOUSING

TRANSMISSION, DISASSEMBLING AND ASSEMBLING

Overview

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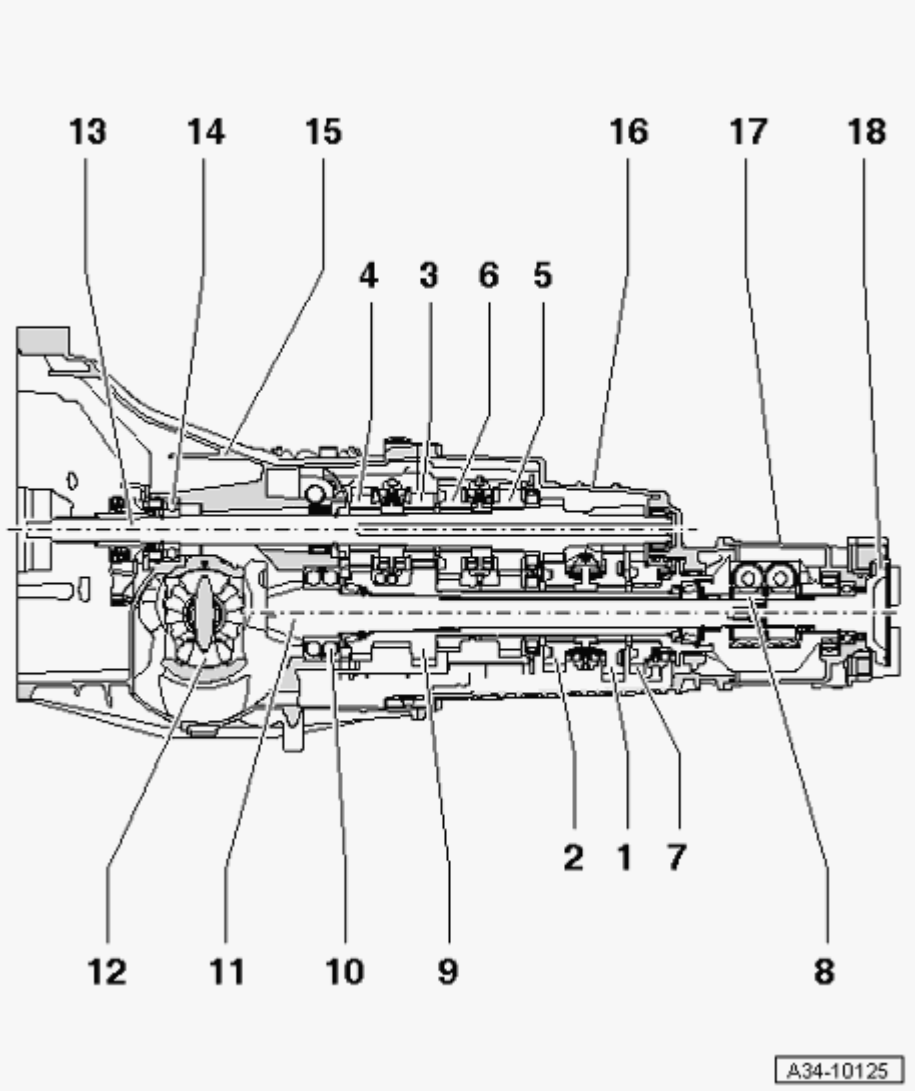

Fig. 8: Transmission, Disassembling And Assembling Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 - Torsen differential

9 - Hollow shaft

10 - Double angular contact ball bearing

11 - Drive pinion (output shaft)

12 - Differential

13 - Input shaft

14 - Grooved ball bearing

- For input shaft

15 - Transmission housing

16 - Transmission cover

17 - Torsen housing

18 - Flange shaft

Assembly overview

Assembly sequence --> **Assembly sequence**

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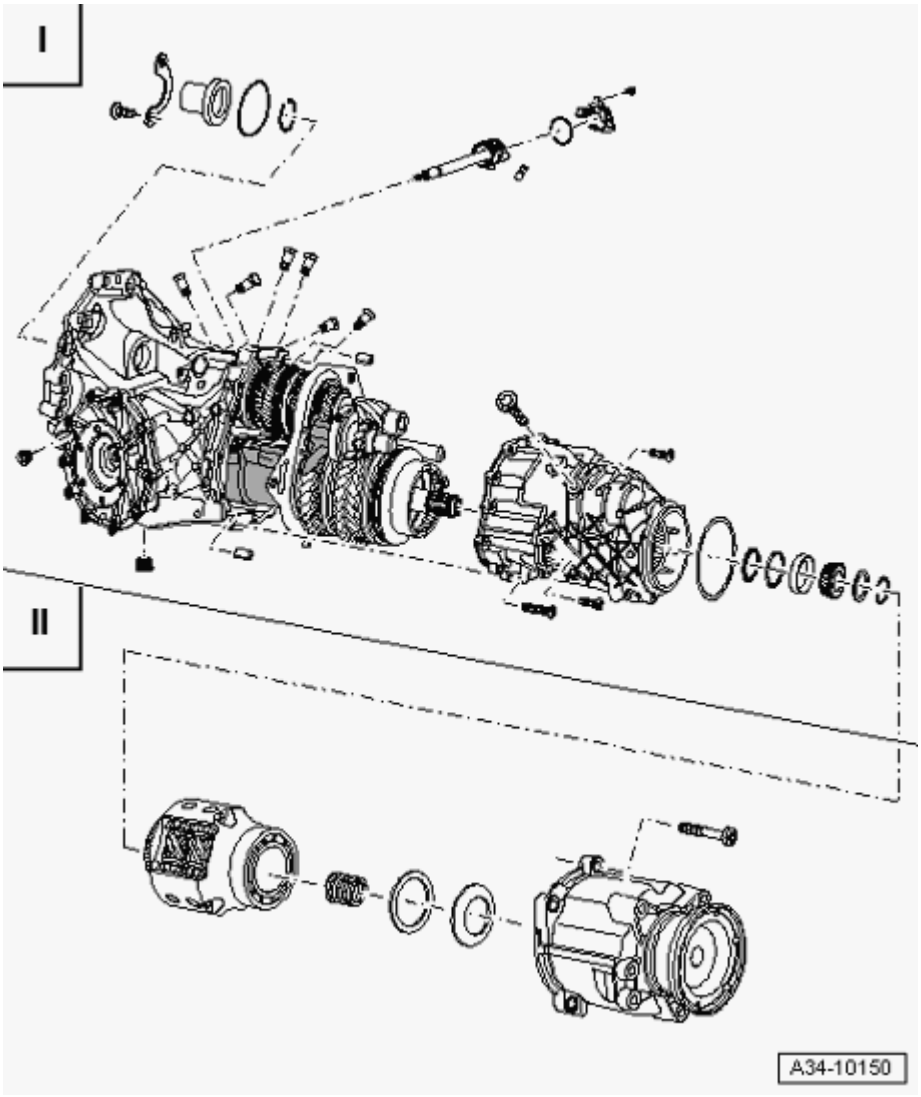

Fig. 9: Transmission Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - Transmission cover and selector shaft, removing and installing --> **Transmission cover and selector shaft, removing and installing**

- First, second and reverse gear with selector rod, removing and installing --> **First, second and reverse gears, removing and installing - assembly overview**
- Input shaft, hollow shaft, drive pinion and selector rods, removing and installing --> **Input shaft, hollow shaft, drive pinion and selector rods, removing and installing - assembly overview**

II - Torsen housing and torsen differential, removing and installing --> **Torsen housing and torsen differential, removing and installing - assembly overview**

Torsen housing and torsen differential, removing and installing - assembly overview

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NOTE:

- **Removal can also be carried out with transmission installed --> 34 CONTROLS, HOUSING .**

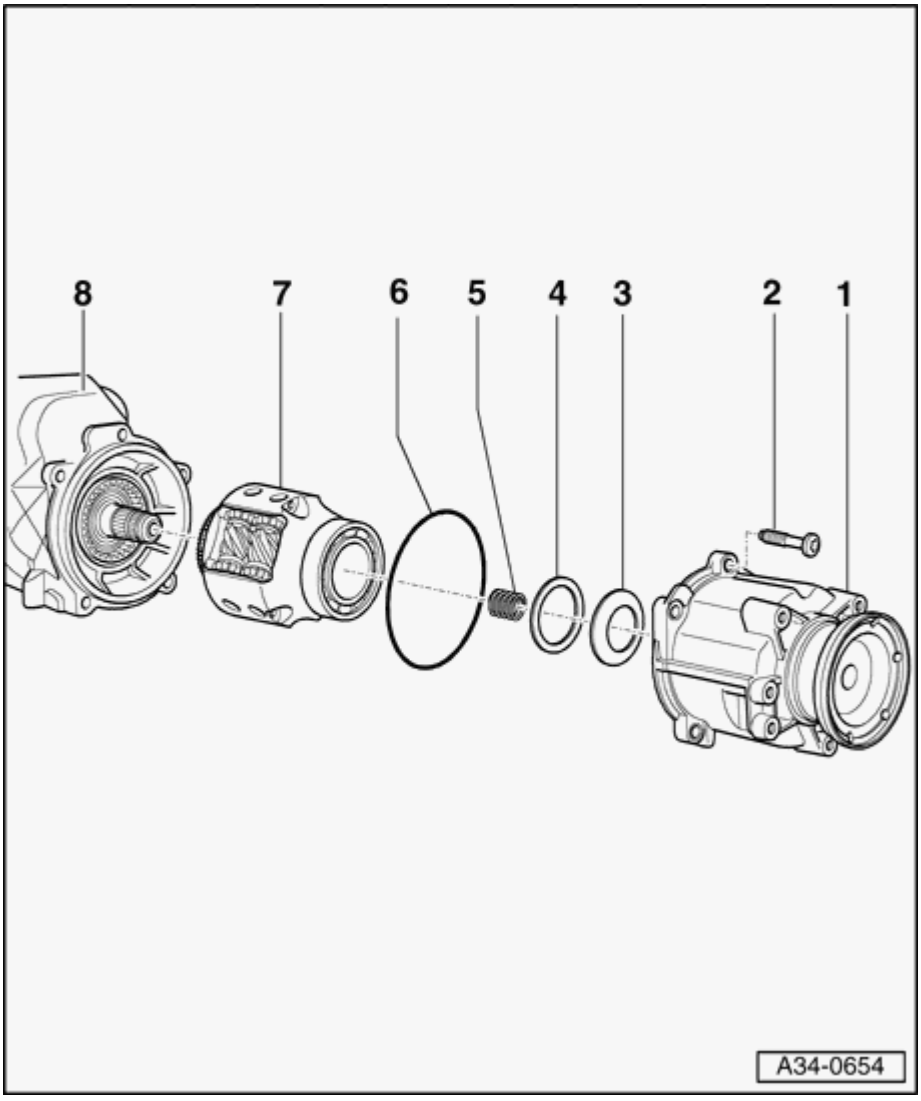

Fig. 10: Transmission Cover And Torsen Differential, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Torsen housing

- With or without vibration dampener, depending on version
- Removing **Torsen housing, removing**
- Installing **Torsen housing, installing**
- Disassembling and assembling --> **Torsen housing, disassembling and assembling**

2 - Bolt -24 Nm

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- Qty. 6

3 - Plate spring

- Installation position: The inner diameter camber faces toward flange shaft in torsen housing **Plate spring and shim, inserting in torsen housing**

4 - Adjustment shim

- Determine thickness

5 - Spring

- Place on flange shaft in torsen housing

6 - O-ring

- Always replace
- Coat with transmission fluid
- Insert in surrounding groove in transmission cover

7 - Torsen differential

- Service by manufacturer only
- Torsen differential bearing, servicing --> **Torsen differential bearing, servicing**

8 - Transmission

- Secure at assembly bracket --> **Assembly sequence**

Torsen housing, removing

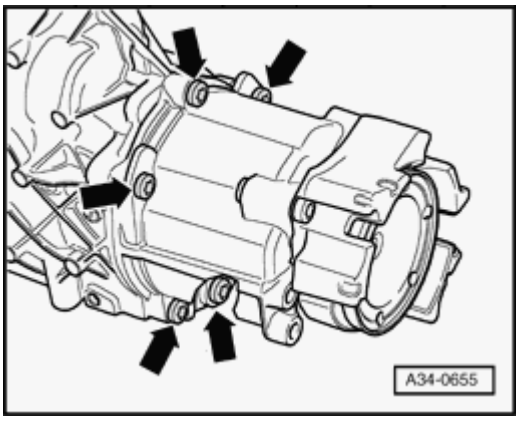

Fig. 11: Identifying Transmission Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Place oil receptacle underneath transmission.
- Drain gear oil.
- Remove screws - **arrows** - and remove torsen housing.

Plate spring and shim, inserting in torsen housing

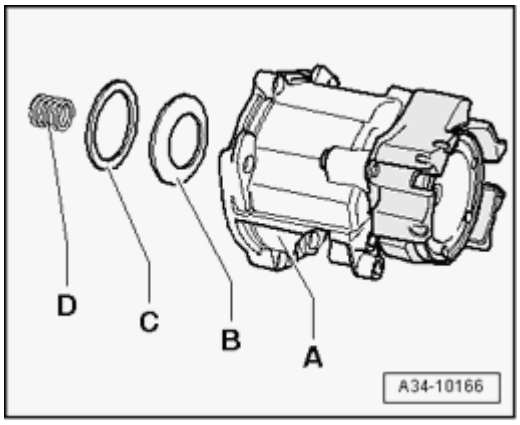

Fig. 12: Identifying Plate Spring, Torsen Housing, Determined Shim, Shim & Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place plate spring - **B** - in torsen housing - **A** -.

- Plate spring installation location: The inner diameter camber faces toward flange shaft in torsen housing.

NOTE:

- **Redetermine thickness of shim - C -.**

- Place shim - **C** - on plate spring - **B** -.
- Place spring - **D** - on flange shaft in torsen housing.

Torsen housing, installing

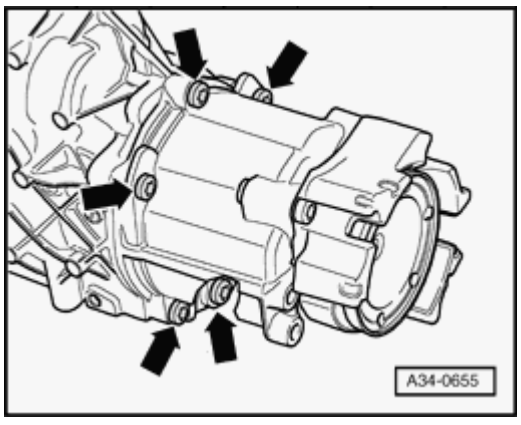

Fig. 13: Identifying Transmission Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Coat new O-ring with transmission fluid and insert in surrounding groove in transmission cover.
- Place torsen housing on transmission cover.
- Tighten bolt - **arrow** - to 24 Nm.
- Top off transmission fluid and check transmission fluid level in manual transmission --> **34 CONTROLS, HOUSING** .

Transmission cover and selector shaft, removing and installing

NOTE:

- **First, second and reverse gears, removing and installing --> First, second and reverse gears, removing and installing - assembly overview.**
- **Input shaft, drive pinion, hollow shaft and selector rods, removing and installing --> Input shaft, hollow shaft, drive pinion and selector rods, removing and installing - assembly overview.**
- **Do not interchange securing bushings for selector shaft and selector rods. Identify before removing.**

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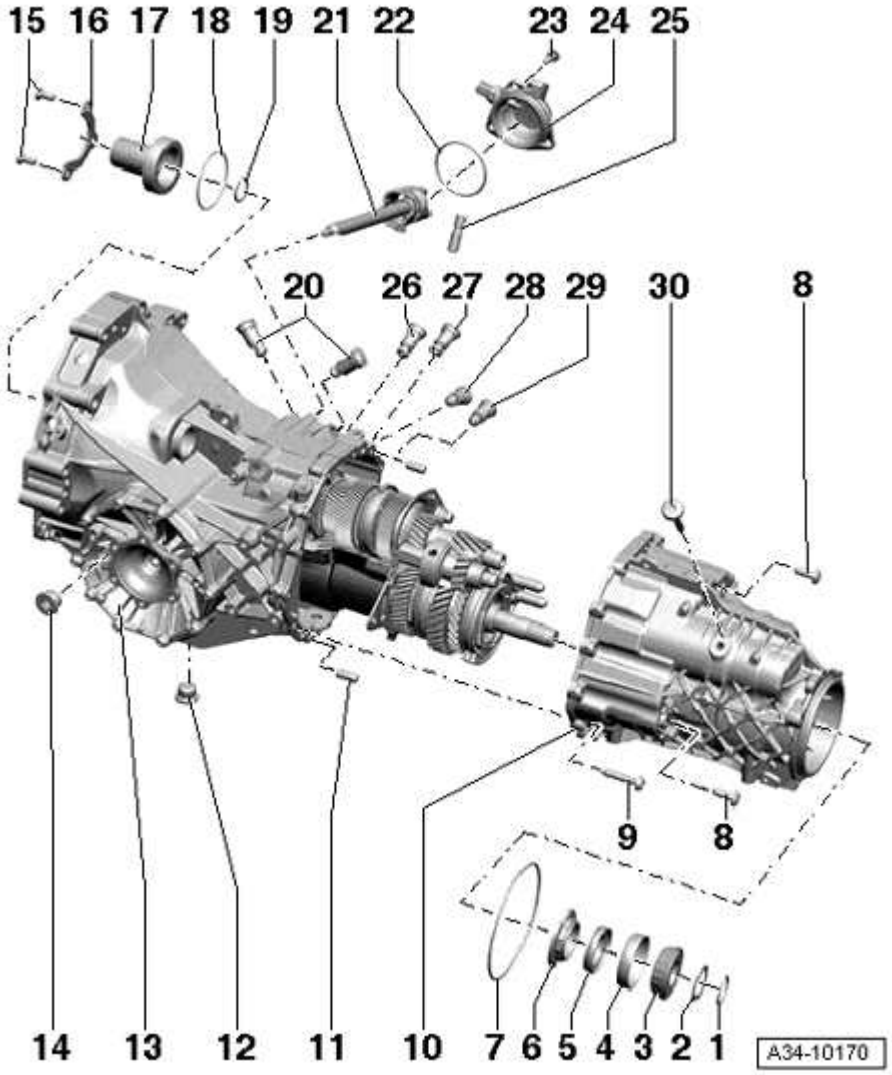

Fig. 14: Transmission Cover And Selector Shaft, Removing And Installing Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Circlip

- Note thickness
- Determine thickness **Determine thickness of circlip and shim(s) as follows:**

2 - Washer

- Note thickness
- Determine thickness **Determine thickness of circlip and shim(s) as follows:**

3 - Tapered roller bearing inner race

- Can be installed and removed by hand

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4 - Tapered roller bearing outer race

- Can be installed and removed by hand

5 - Spacer ring

6 - Twelve-point nut, 75 Nm

7 - O-ring

- Always replace
- Coat with transmission fluid
- Insert in surrounding groove in transmission cover

8 - Bolt, 27 Nm

- Qty. 2
- Self-locking
- Replace

9 - Bolt, 24 Nm

- Qty. 13

10 - Transmission cover

- Servicing --> **Transmission cover, servicing**

11 - Alignment pin

- Qty. 2
- Place in transmission cover

12 - Oil drain bore screw, 40 Nm

13 - Transmission housing

- Differential, removing and installing --> **Differential, removing and installing**
- Transmission housing, servicing --> **Transmission housing, servicing**

14 - Oil filler hole screw, 40 Nm

15 - Bolt, 24 Nm

- Qty. 2

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- Insert with *locking fluid AMV 185 101 A1*

16 - Securing plate

- For guide sleeve

17 - Guide sleeve

- With seal

18 - O-ring

- Always replace
- Coat with transmission fluid
- Insert in transmission housing surrounding groove

19 - Circlip

- Insert in input shaft surrounding groove

20 - Securing bushing

- For selector shaft
- Qty. 2
- Do not interchange securing bushings for selector shaft and selector rods
- Change: with edged collar for ball sleeve **Selector shaft securing bushings changed**

21 - Selector shaft with selector cylinder

- Removing and installing --> **Assembly sequence**

22 - O-ring

- For selector shaft cover
- Always replace
- Coat with transmission fluid
- Insert in selector shaft cover surrounding groove

23 - Bolt -24 Nm

- Qty. 3
- Insert with *locking fluid AMV 185 101 A1*

24 - Selector shaft cover

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- With Back-Up Light Switch F4
- Back-Up Light Switch F4 , removing and installing --> **34 CONTROLS, HOUSING**
- Back-Up Light Switch F4 tightening torque - 20 Nm

25 - Dowel pin

- For selector shaft retainer
- Insert in transmission housing bore

NOTE:

- **There are dowel pins with and without pins, when replacing, allocate via .**
- **Installation location of dowel pin with pins: Insert pin side in transmission housing.**

26 - Securing bushing

- For 5th/6th gear selector rod

27 - Securing bushing

- For 3rd/4th gear selector rod

28 - Securing bushing

- For 1st/2nd gear selector rod

29 - Securing bushing

- For reverse gear selector rod

30 - Screw, 24 Nm

Selector shaft securing bushings changed

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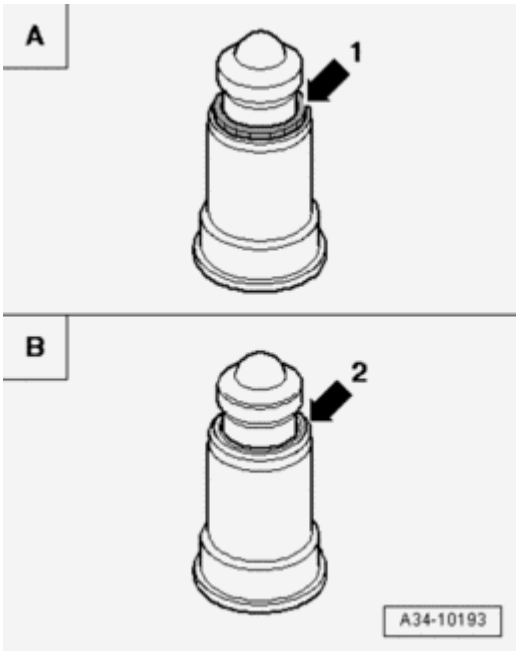

Fig. 15: Identifying Selector Shaft Versions
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Previous selector shaft securing bushings without edged ball sleeve collar - **arrow 1** -. This securing bushing must always be replaced, except for when version - **B** - is already installed.

B - New securing bushing for selector shaft with edged ball sleeve collar - **arrow 2** - , can be reinstalled.

NOTE:

- **On transmission with version - A - selector shaft securing bushings installed, these must always be replaced with version - B -.**
- **If version - B - is installed, this can be reused.**
- **Selector shaft securing bushings can also be replaced with transmission installed --> 34 CONTROLS, HOUSING .**

First, second and reverse gears, removing and installing - assembly overview

NOTE:

- **Items 8 and 11 to 18 were changed in the version with selector rod for 1st/2nd gear with spring-loaded shift fork --> 1st/2nd gear selector rod with spring-loaded shift fork .**
- **After installing, the selector gears must have an axial clearance of at least 0.10 mm.**

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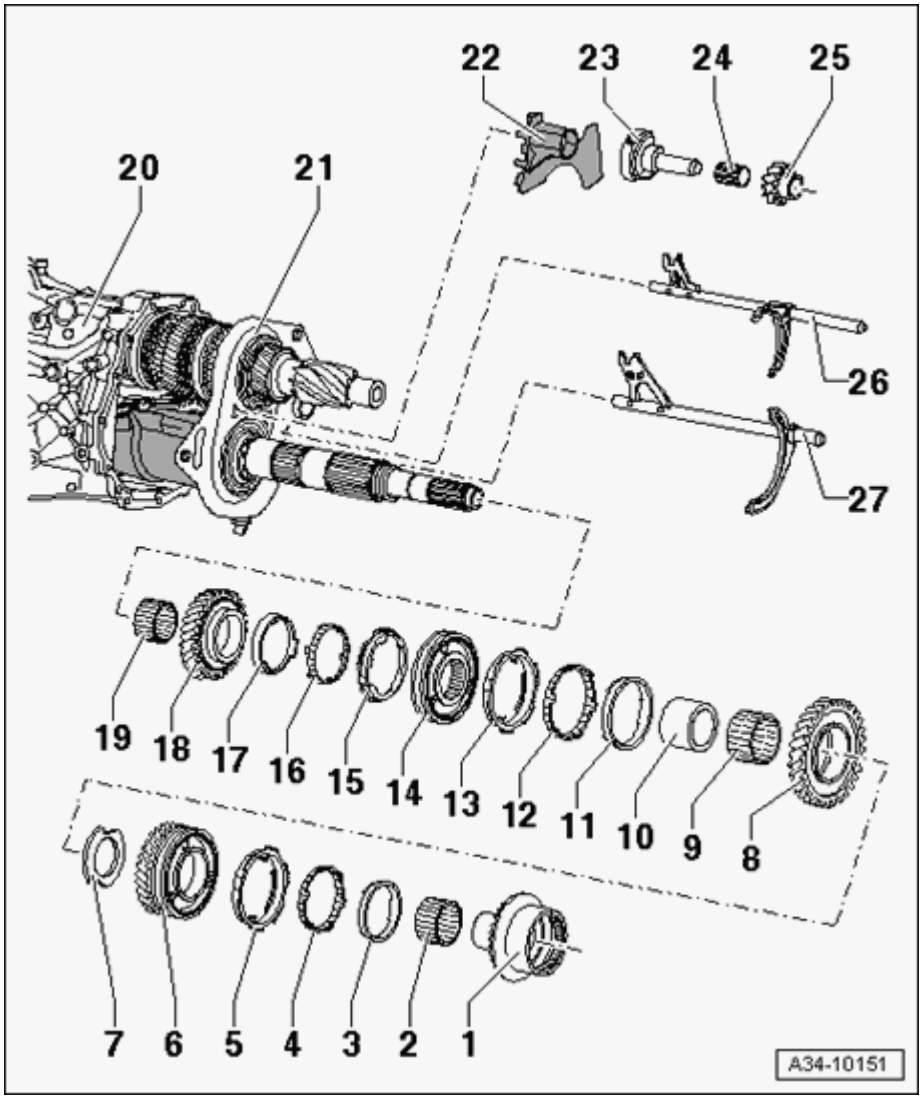

Fig. 16: First, Second And Reverse Gears, Removing And Installing - Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Clutch hub

- Removing and installing --> **Assembly sequence**

2 - Needle bearing

- For reverse gear selector gear

3 - Reverse gear inner race

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Replace if grooved or scored

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4 - Reverse gear intermediate ring

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**

5 - Synchronizer ring for reverse gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**
- Replace if grooved or scored

6 - Gear wheel for reverse gear

- With reverse gear locking collar
- Assemble locking collar and reverse gear selector gear **Assemble locking collar and reverse gear selector gear**

7 - Thrust washer

- For 1st gear and reverse gear selector gears

8 - Drive gear for 1st gear

9 - Needle bearing

- For 1st gear

10 - Inner race/needle bearing

- For 1st gear selector gear

11 - Inner race for 1st gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**
- Replace if grooved or scored

12 - Intermediate ring for 1st gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**

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13 - Synchronizer ring for 1st gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**
- Replace if grooved or scored

14 - Locking collar/synchronizer hub for 1st and 2nd gear

- Note locking collar installation location **1st and 2nd gear locking collar installation location**
- Assembling locking collar/synchronizer hub **Assembly of locking collar/synchronizer hub for 1st and 2nd gear**

15 - Synchronizer ring for 2nd gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**
- Replace if grooved or scored

16 - Intermediate ring for 2nd gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**

17 - Inner race for 2nd gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**
- Replace if grooved or scored

18 - Selector gear for 2nd gear

19 - Needle bearing

- For 2nd gear

20 - Transmission housing

- Input shaft, hollow shaft and drive pinion, removing and installing --> **Input shaft, hollow shaft, drive pinion and selector rods, removing and installing - assembly overview**

21 - Bearing bracket

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- Supports input shaft and hollow shaft in transmission cover

22 - Reverse shaft mount

23 - Reverse shaft

- With support/reverse shaft
- Assembly of support/reverse shaft and reverse shaft **Assembly of support/reverse shaft and reverse shaft**

24 - Needle bearing

- For reverse gear

25 - Reverse drive gear

- Installation position: Splines face toward reverse shaft mount

26 - Selector rod for 1st/2nd gear

- Installed location **Installation location of selector rods in transmission**
- Replace complete with selector fork for 1st/2nd gear with pins
- Change: with spring-loaded shift fork --> **1st/2nd gear selector rod with spring-loaded shift fork**

27 - Reverse gear selector rod

- Installation location **Installation location of selector rods in transmission**
- Only complete with reverse gear selector fork with pins

Assembly of support/reverse shaft and reverse shaft

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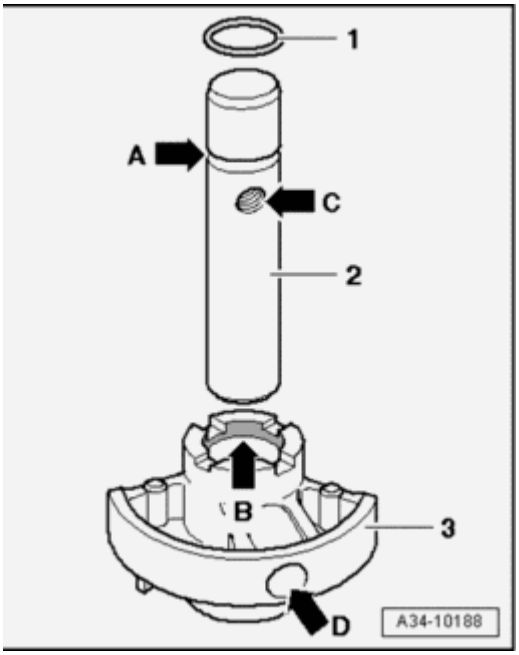

Fig. 17: Assembly Of Support/Reverse Shaft And Reverse Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert O-ring - **1** - in surrounding groove - **arrow A** - in reverse shaft - **2** -.
- Coat O-ring with transmission fluid and then slide reverse shaft into side of support/reverse shaft - **3** - with chamfer - **arrow B** -.

To do this, threaded hole - **arrow C** - and hole - **arrow D** - must line up.

1st/2nd gear selector rod with spring-loaded shift fork

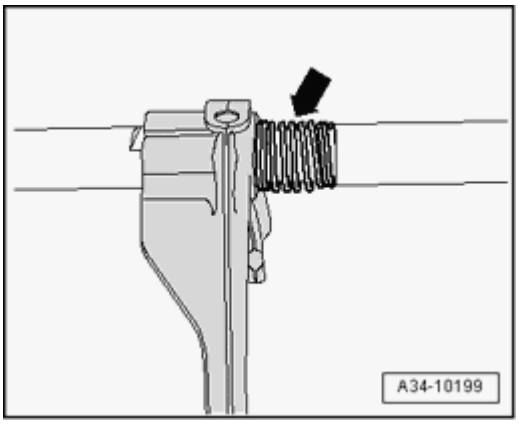

Fig. 18: 1st/2nd Gear Selector Rod With Spring-Loaded Shift Fork
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Input shaft, hollow shaft, drive pinion and selector rods, removing and installing - assembly overview

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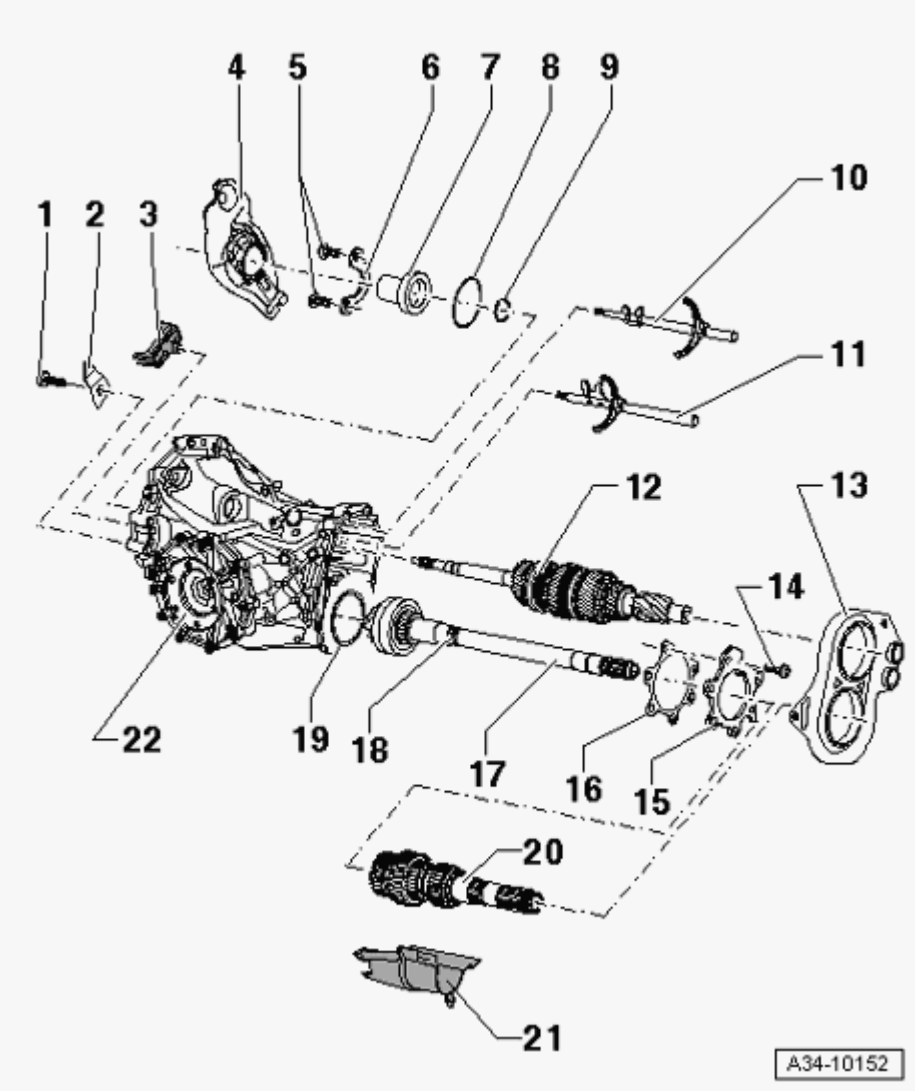

Fig. 19: Input Shaft, Hollow Shaft, Drive Pinion And Selector Rods, Removing And Installing - Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bolt -24 Nm

- Insert with *locking fluid AMV 185 101 A1*

2 - Leaf spring

3 - Intermediate piece

- Insert in hole in transmission housing

4 - Clutch release lever

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- With release bearing

5 - Bolt, 24 Nm

- Qty. 2
- Insert with *locking fluid AMV 185 101 A1*

6 - Securing plate

- For guide sleeve

7 - Guide sleeve

- With seal
- Input shaft seal, removing **Removing seal for input shaft**
- Input shaft seal, installing **Input shaft seal, installing**

8 - O-ring

- Always replace
- Coat with transmission fluid
- Insert in transmission housing surrounding groove

9 - Circlip

- Insert in input shaft surrounding groove

10 - Selector rod for 5th/6th gear

- Installed location **Installation location of selector rods in transmission**
- Replace only complete with selector fork for 5th/6th gear with pins

11 - Selector rod for 3rd/4th gear

- Installed location **Installation location of selector rods in transmission**
- Replace only complete with selector fork for 3rd/4th gear with pins
- Change: with spring-loaded shift fork --> **3rd/4th gear selector rod with spring-loaded shift fork**

12 - Input shaft

- Disassembling and assembling --> **Input shaft, assembly overview**

13 - Bearing bracket

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- Clean threaded holes of locking compound, e.g. with a thread cutter
- Selector rod ball sleeves, pressing off and on **Selector rod ball sleeves, pressing off and on**

NOTE:

- **Outer roller bearing races on input shaft and hollow shaft cannot be replaced individually.**
- **Roller bearing outer races must not have any radial clearance in bearing bracket.**

14 - Bolt, 30 Nm

- Qty. 6
- Clean threads and insert with *locking compound AMV 185 101 A1*

15 - Plate

- Installation position: sanded side faces toward transmission housing, fits only in one position

16 - Adjustment shim " S_4 "

- Adjustment overview --> **Adjustment overview**

17 - Pinion

- With double angular contact ball bearing and inner race/tapered roller bearing
- Disassembling and assembling --> **Drive pinion and hollow shaft, assembly overview**

18 - Needle bearing

- For pinion/hollow shaft

19 - Adjustment shim " S_3 "

- Adjustment overview --> **Adjustment overview**

20 - Hollow shaft

- With gears for 5th and 6th gear pressed off
- Disassembling and assembling --> **Drive pinion and hollow shaft, assembly overview**

21 - Oil pan

22 - Transmission housing

- With differential and flange shafts

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Removing seal for input shaft

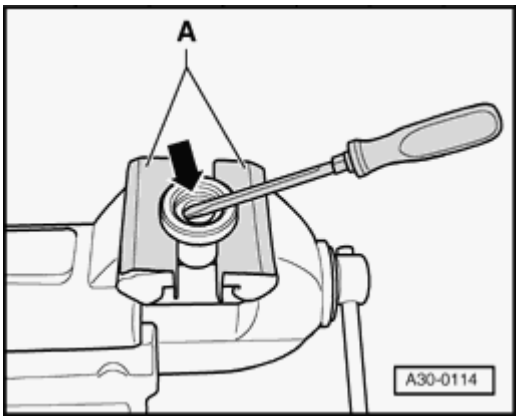

Fig. 20: Removing Seal For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry of sealing ring - **arrow** - with a screwdriver.

A - Jaw protectors

NOTE:

- **You can also remove the sealing ring with the puller hook T20143.**

Input shaft seal, installing

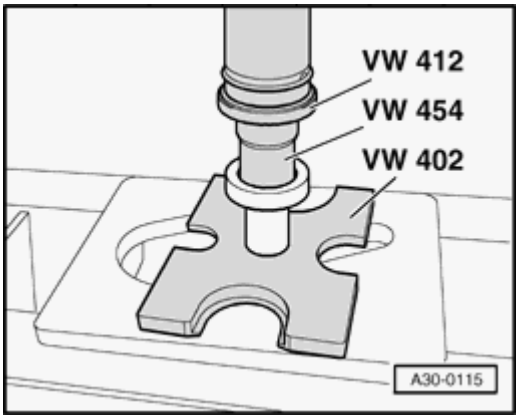

Fig. 21: Input Shaft Seal, Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil outer circumference of seal.
- Fill area between sealing lip and dust lip halfway with *sealing grease G 052 128 A1* .
- Carefully press input shaft sealing ring on up to stop.

3rd/4th gear selector rod with spring-loaded shift fork - arrow -

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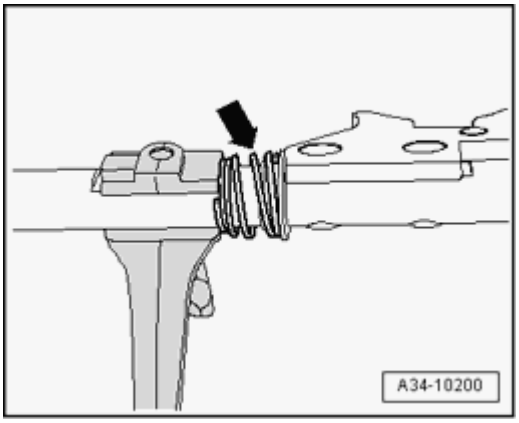

Fig. 22: 3rd/4th Gear Selector Rod With Spring-Loaded Shift Fork
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Selector rod ball sleeves, pressing off and on

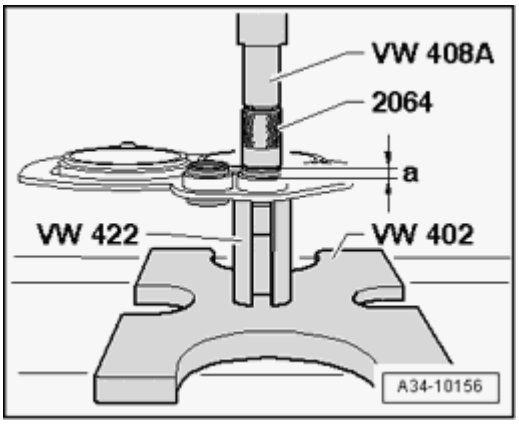

Fig. 23: Selector Rod Ball Sleeves, Pressing Off And On
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Support bearing bracket with tube split VW 422.

Place small dia. from the lock pin 2064 in ball sleeve.

- Press off previous ball sleeve.
- Press new ball sleeve onto dimension - **a** - approx. 4 mm.

NOTE:

- **Set ball sleeve in place with inscribed side (thicker wall) facing toward lock pin 2064.**

Installation location of selector rods in transmission

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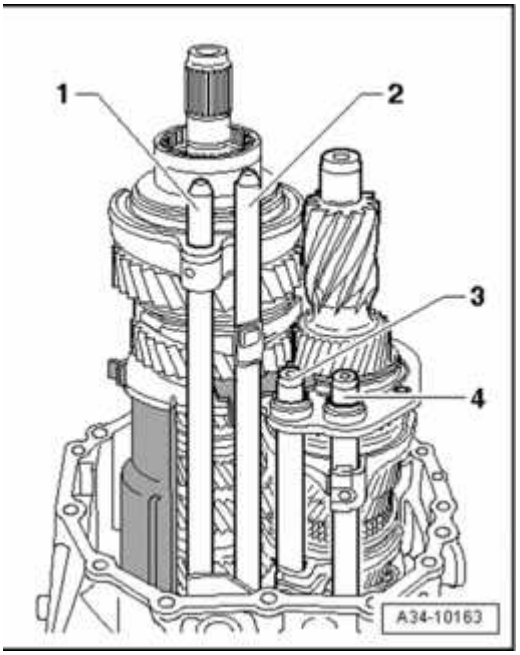

Fig. 24: Installation Location Of Selector Rods In Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Selector rod with reverse gear shifter fork
2. Selector rod with shift fork for 1st and 2nd gear
3. Selector rod with shift fork for 3rd and 4th gear
4. Selector rod with shift fork for 5th and 6th gear

Assembly sequence

Torsen housing, torsen differential, transmission cover, transmission-side shift mechanism, input shaft, drive pinion and hollow shaft, removing and installing.

NOTE:

- **You do not need to remove the differential when removing the components listed above.**
- **Removal is only necessary when adjustments have to be performed --> Adjustment overview.**

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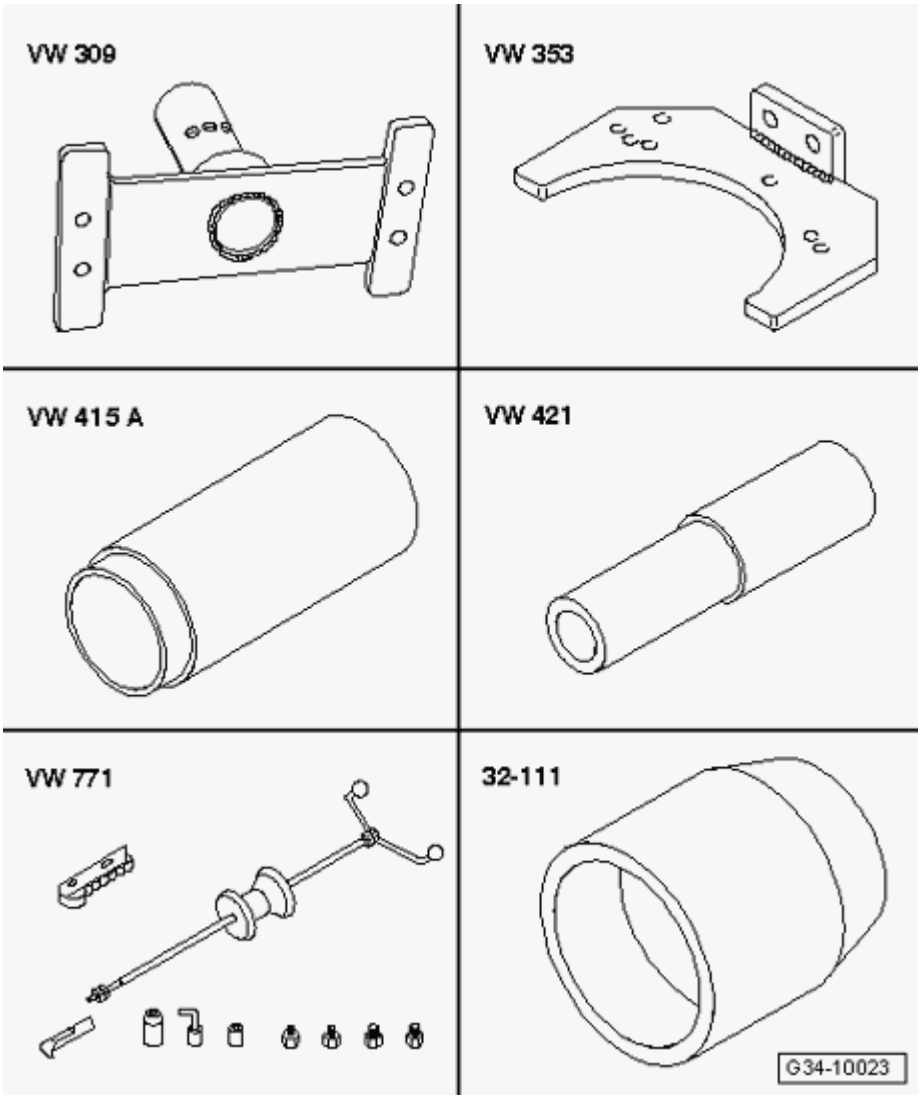

Fig. 25: Identifying Special Tools - Torsen Housing, Torsen Differential, Transmission Cover, Transmission-Side Shift Mechanism, Input Shaft, Drive Pinion And Hollow Shaft, Removing And Installing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Holding plate VW 309
- Transmission support VW 353
- Tube VW 415 A
- Tube VW 421
- Slide Hammer-Complete Set VW 771
- Driver 32 - 111

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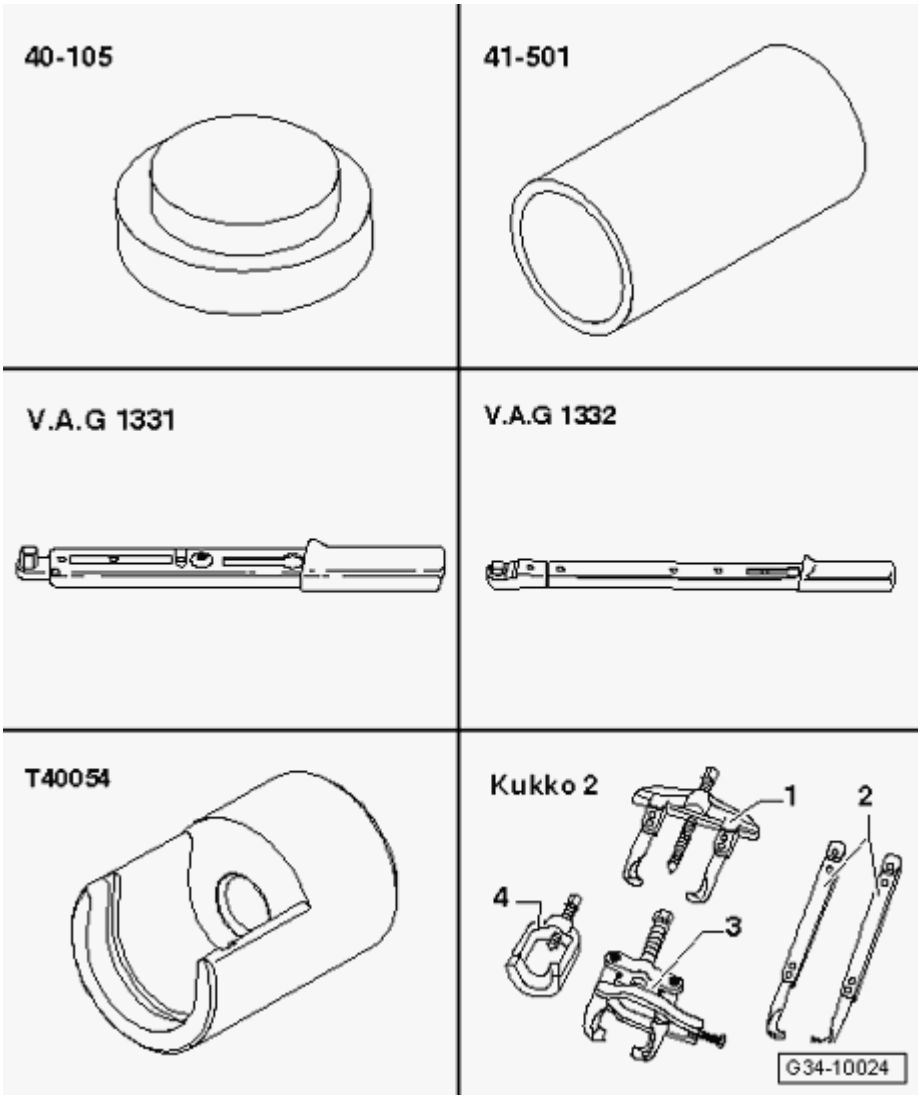

Fig. 26: Identifying Special Tools - Torsen Housing, Torsen Differential, Transmission Cover, Transmission-Side Shift Mechanism, Input Shaft, Drive Pinion And Hollow Shaft, Removing And Installing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust piece 40 - 105
- Drive bushing 41 - 501
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332

- Puller T40054
- - **1** - Two arm puller Kukko 20/10
- - **2** - Puller hooks, 250 mm long

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- Feeler gauge
- *Sealing paste AMV 188 001 02*
- *Assembly sleeve 01E 311 120*
- *Thread locking compound AMV 185 101 A1*
- *Sealing grease G 052 128 A1*
- Depth gauge, e.g. Digital Depth Gauge VAS 6087
- Oil receptacle

Special tools, testers and auxiliary items required

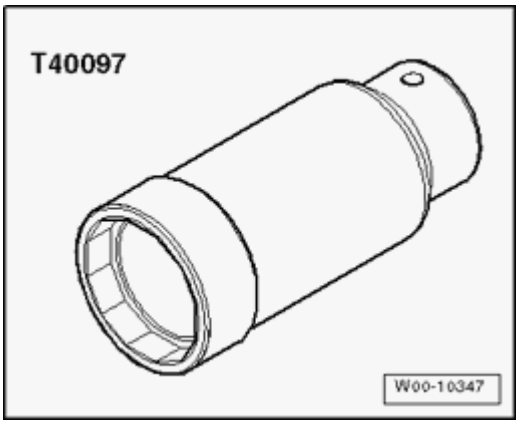

Fig. 27: Socket And Key T40097
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Socket and key T40097

Transmission, disassembling

- Place an oil receptacle underneath transmission.
- Drain gear oil.

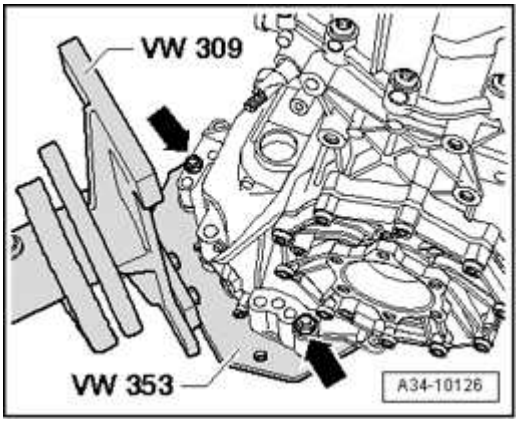

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Fig. 28: Securing Transmission To Assembly Stand With Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure transmission to assembly stand with bolts - **arrows** -.
- Tilt transmission on assembly stand to horizontal position.

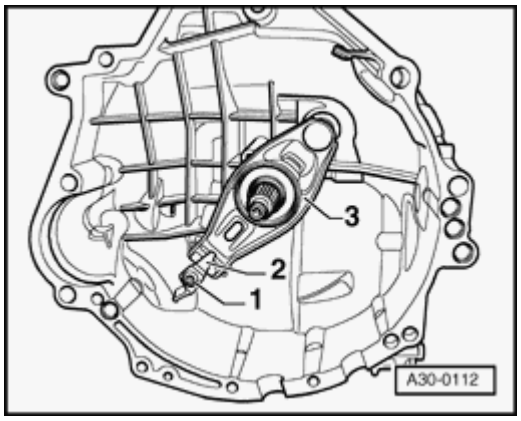

Fig. 29: Identifying Bolt, Leaf Spring & Clutch Release Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt - **1** - and remove leaf spring - **2** -.
- Remove clutch release lever - **3** - with release bearing.

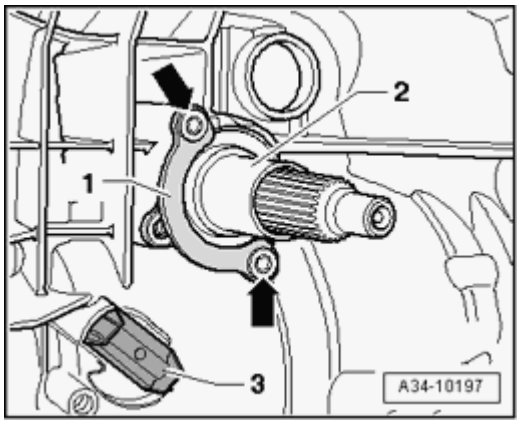

Fig. 30: Identifying Bolts, Securing Plate, Guide Sleeve & Intermediate Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove securing plate - **1** -.
- Pull guide sleeve - **2** - out of transmission housing.
- Remove intermediate piece - **3** - from transmission housing.

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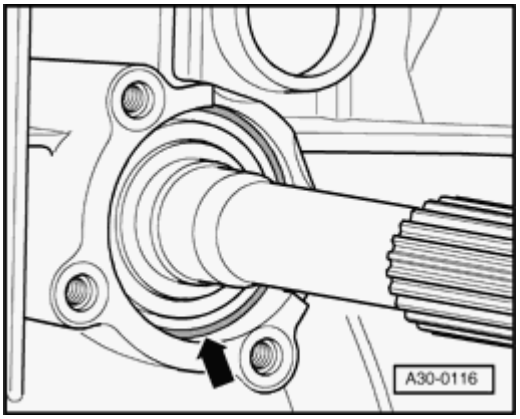

Fig. 31: O-Ring Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out O-ring - **arrow** - with a small screwdriver.

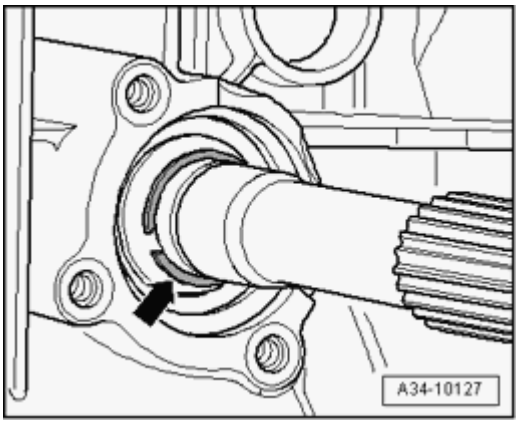

Fig. 32: Removing Input Shaft Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlip - **arrow** - in front of grooved ball bearing of input shaft must then be removed.

NOTE:

- **To disassemble transmission, you do not need to remove the input shaft grooved ball bearing.**
- **A faulty input shaft grooved ball bearing can be released in a removed but not disassembled transmission according to the procedure --> Input shaft grooved ball bearing, replacing in uninstalled but not disassembled transmission.**

- Move shift shaft to neutral position.

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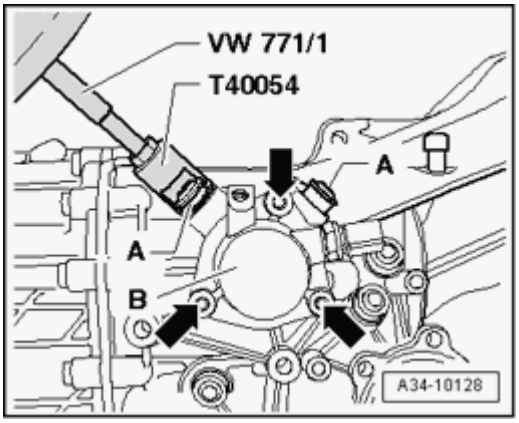

Fig. 33: Removing Both Securing Bushings For Selector Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both securing bushings - **A** - for selector shaft.

NOTE:

- **Identify these securing bushings so that they are not interchanged with the securing bushings for the selector rods.**
- **The securing bushings were changed shortly after series production Selector shaft securing bushings changed.**

- Remove bolts - **arrows** - and remove selector shaft cover - **B** -.

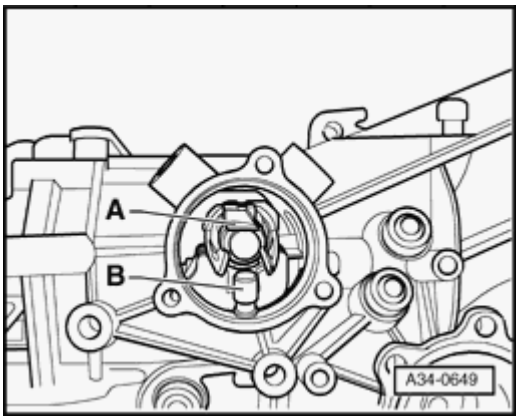

Fig. 34: Identifying Selector Shaft & Dowel Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide selector shaft - **A** - into transmission up to stop and pull out dowel pin - **B** -.
- Pull out selector shaft.

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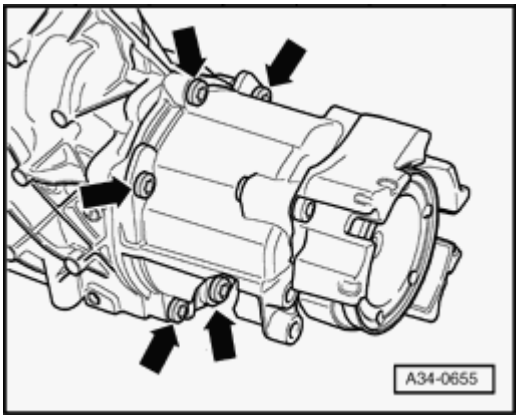

Fig. 35: Identifying Transmission Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and remove torsen housing.
- Remove torsen differential from drive pinion/hollow shaft.

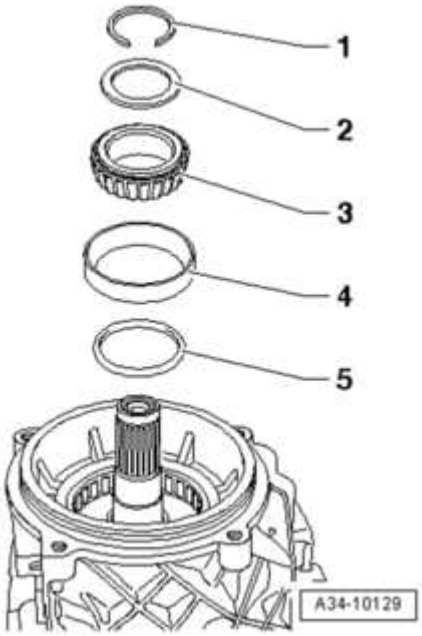

Fig. 36: Removing Circlip, Shim(s), Inner Race, Outer Race & Spacer Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip - **1** - and shim(s) - **2** - from drive pinion

NOTE:

- **Note the thickness of the circlip and shim(s).**

- Remove inner race - **3** - and outer race - **4** -. These components are push fit and can be installed by hand.
- Remove spacer ring - **5** - from twelve-point nut on hollow shaft.

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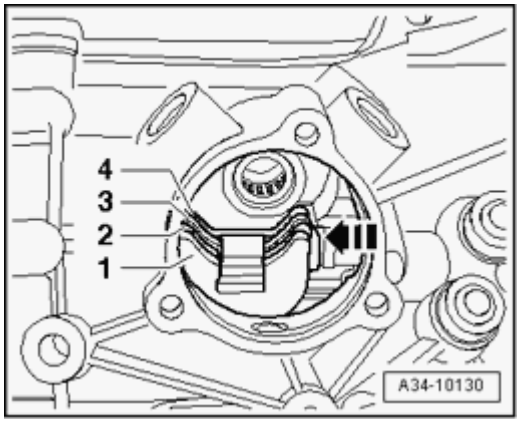

Fig. 37: Securing Hollow Shaft By Moving Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure hollow shaft by moving selector rods - **1** - to - **4** - in direction of - **arrow** -.

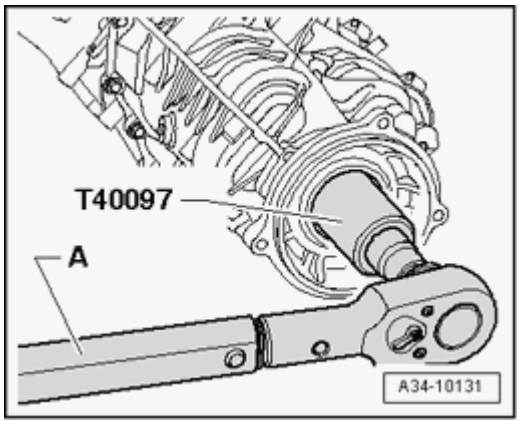

Fig. 38: Loosening Twelve-Point Nut On Hollow Shaft With Socket And Key T40097
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen twelve-point nut on hollow shaft with socket and key T40097.

A - Torque wrench.

- Shift selector rods into neutral position.
- Turn transmission in assembly bracket so transmission cover faces up.

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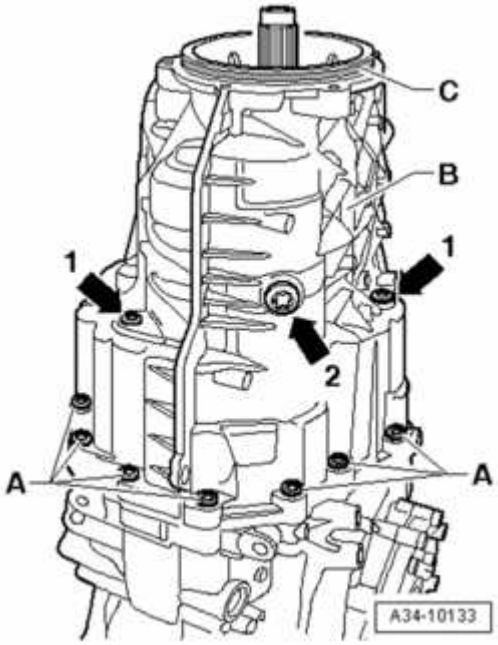

Fig. 39: Identifying Bolts For Securing Bearing Bracket, Bolt For Securing Reverse Shaft, Connection Screws & O-Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrow 1** - (for securing bearing bracket), bolt - **arrow 2** - (for securing reverse shaft) and connection screws - **A** - for transmission cover on transmission housing.

NOTE:

- **Always replace the O-ring - C -.**

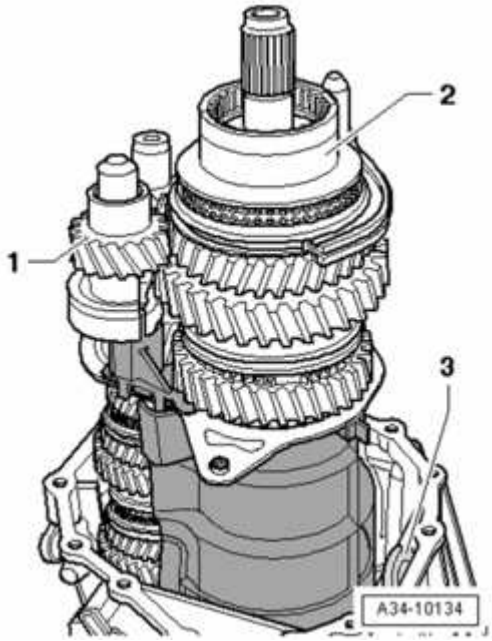

Fig. 40: Identifying Reverse Gear, Clutch Hub & Magnet

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove reverse gear - **1** - and reverse shaft.
- Remove clutch hub - **2** - with synchronizer ring for reverse gear by hand.

Remove magnet - **3** - from transmission housing.

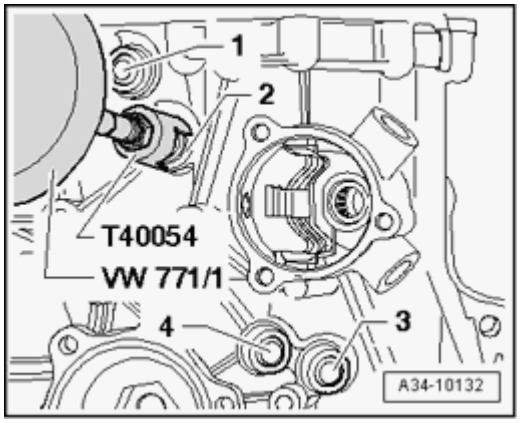

Fig. 41: Removing Securing Bushings For Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove securing bushings - **1** - to - **4** - for selector rods.

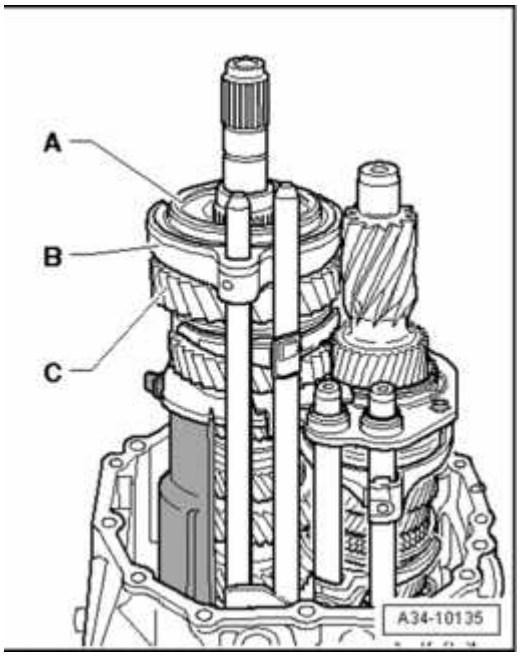

Fig. 42: Removing Locking Collar With Shifter Fork And Reverse Gear Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking collar - **A** - with shifter fork - **B** - and reverse gear selector gear - **C** -.

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- Remove thrust washer and selector gears for reverse gear and 1st gear.
- Remove 1st gear selector gear with needle bearing and synchronizer rings.

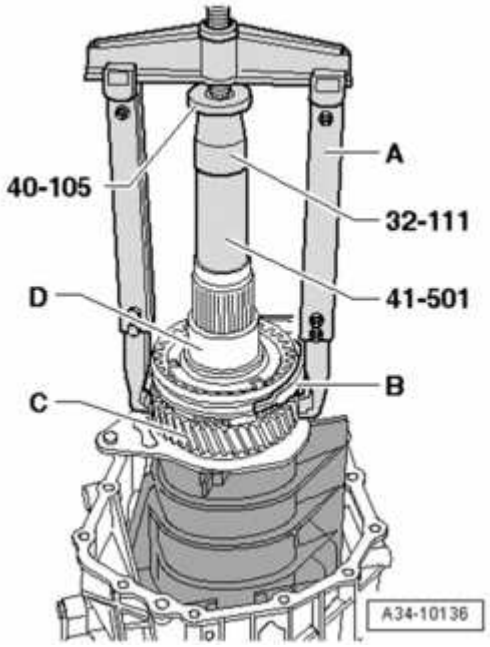

Fig. 43: Removing 2nd Gear Selector Gear Together With Inner Race For 1st Gear Selector Gear And Shifter Fork For 1st/2nd Gear From Hollow Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 2nd gear selector gear - **C** - together with inner race for 1st gear selector gear - **D** - and shifter fork for 1st/2nd gear - **B** - from hollow shaft.

A - Two arm puller , e.g. Kukko 20/10 with puller hook 250 mm

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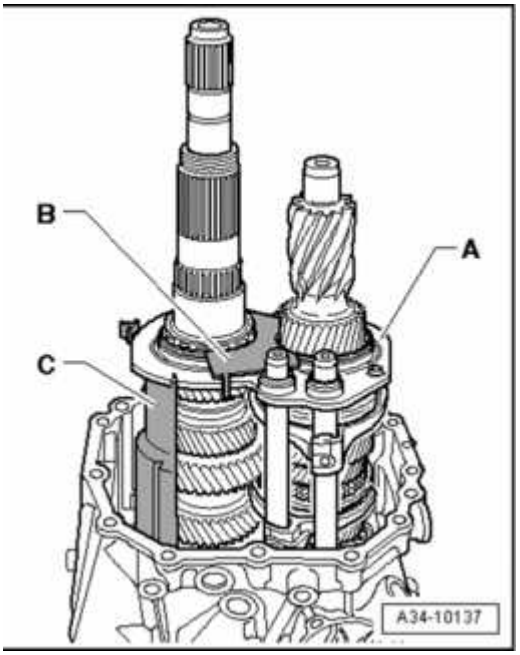

Fig. 44: Removing/Installing Bearing Bracket With Reverse Shaft Mount & Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bearing bracket - **A** - with reverse shaft mount - **B** -.
- Remove oil pan - **C** - from transmission housing.

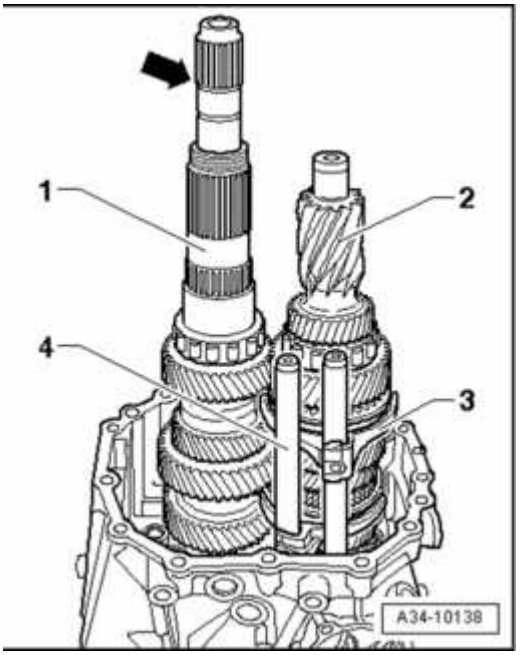

Fig. 45: Guiding Hollow Shaft Together With Input Shaft And Selector Rods Upward Over Drive Pinion
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Then guide hollow shaft - **1** - together with input shaft - **2** - and selector rods - **3** - and - **4** - upward over

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the drive pinion - **arrow** -.

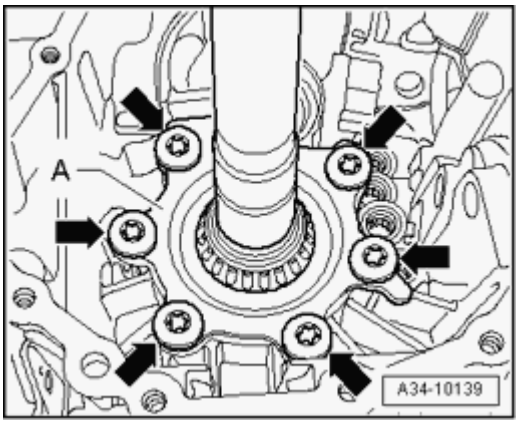

Fig. 46: Identifying Bolts & Retainer Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and retainer plate - **A** - with shim lying below " S_4 ".

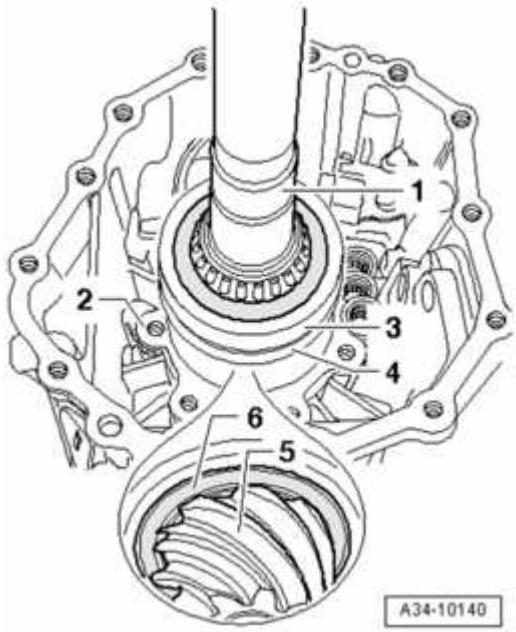

Fig. 47: Removing Drive Pinion From Bore In Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully remove drive pinion - **1** - from bore in transmission housing - **2** -.

Double angular contact ball bearing outer races - **3** - and - **4** - must not be pulled apart, otherwise the double angular contact ball bearing seal - **6** - can be damaged by the drive pinion face - **5** -. In this case, double angular contact ball bearing must be replaced.

Transmission, assembling

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If transmission housing, gear set or hollow shaft was replaced, you must first redetermine the thickness of the shim " S_6 " --> **Shim " S 6 " for positioning 2nd gear selector gear, redetermining**. It is located on the hollow shaft and is responsible for position 2nd gear selector gear.

If gear set is replaced, then always replace double angular contact ball bearing on drive pinion with it.

To check double angular contact ball bearing for wear (running noise), differential must be removed. When turning the installed drive pinion, the bearing must not catch and must run smoothly.

NOTE:

- **All threaded bores in which self-locking bolts are threaded must be carefully cleaned of remaining locking fluid using a tap.**
- **Clean threads on hollow shaft for twelve-point nut.**
- **Lubricate all needle bearings and synchronizer rings with transmission fluid before inserting.**
- **Housing joint surfaces must be cleaned.**
- **Checking synchronizer rings for wear --> Drive pinion and hollow shaft, assembly overview.**

- Place shim " S_3 " in transmission housing.

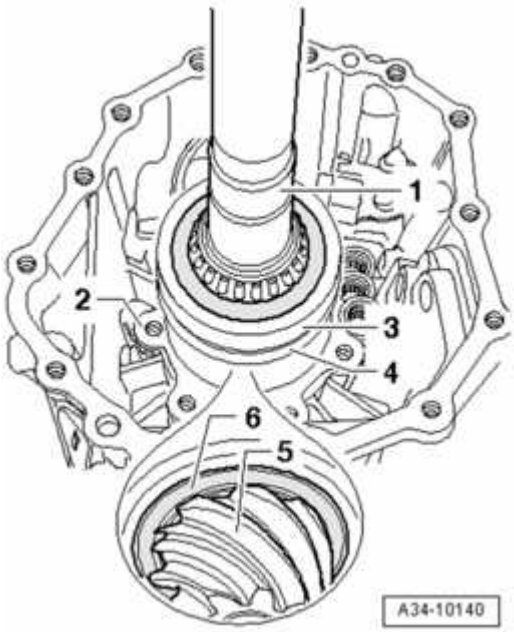

Fig. 48: Removing Drive Pinion From Bore In Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Coat outer races - **3** - and - **4** - with transmission fluid.
- Carefully slide drive pinion - **1** - with double angular contact ball bearing by hand into transmission housing - **2** - and press onto upper outer race - **3** - at the same time.

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NOTE:

- **Warm transmission housing beforehand with a hot air gun in bearing seat area, if necessary.**

Outer races - **3** - and - **4** - must not tilt when inserting, they must remain together. Otherwise, the seal - **6** - can be damaged by the pinion face - **5** -.

If the double angular contact ball bearing seal is damaged, the bearing must be replaced.

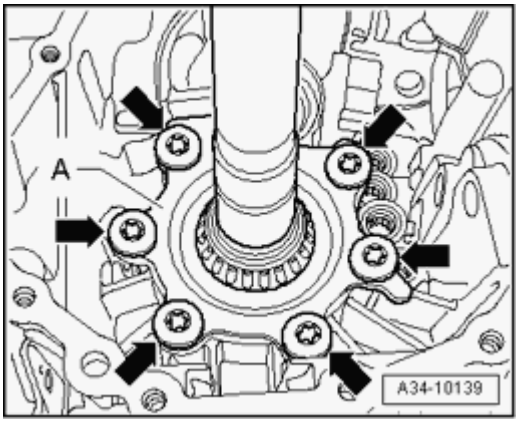

Fig. 49: Identifying Bolts & Retainer Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert shim " S_4 " and retainer plate - **A** - , only fits in one position.
- Clean threads of previous screws - **arrows** - with a wire brush. Then insert screws with *locking compound AMV 185 101 A1* and tighten in diagonal sequence to 30 Nm.
- Place hollow shaft needle bearing on drive pinion.

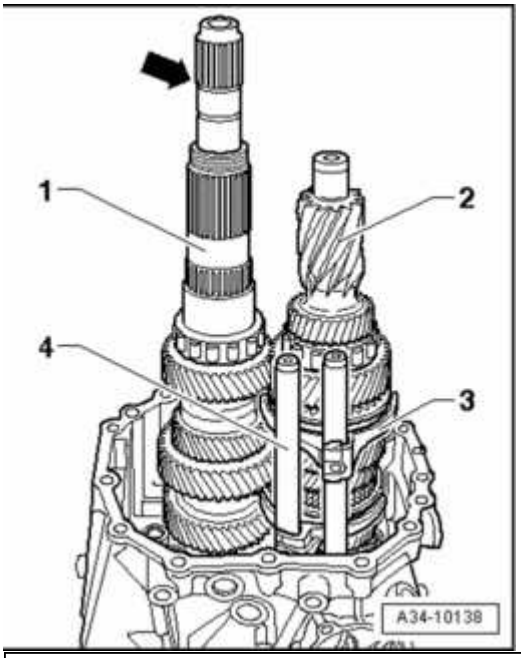

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Fig. 50: Guiding Hollow Shaft Together With Input Shaft And Selector Rods Upward Over Drive Pinion
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert hollow shaft - **1** - together with input shaft - **2** - and selector rods - **3** - and - **4** - in transmission housing and at the same time, guide hollow shaft over drive pinion - **arrow** -.

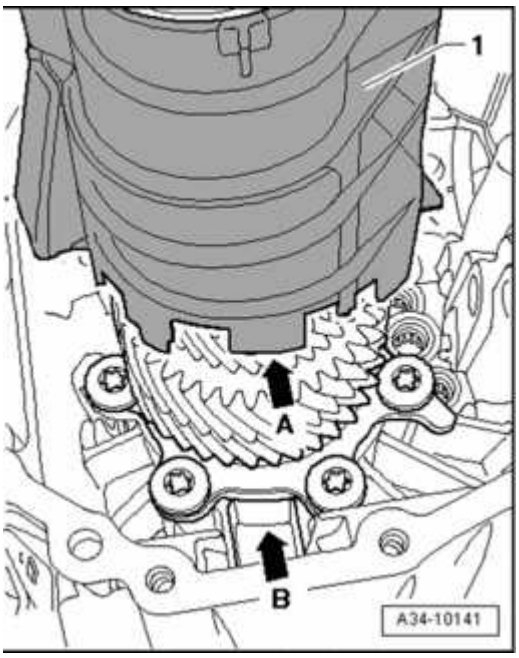

Fig. 51: Placing Oil Pan With Ridge In Notch In Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place oil pan - **1** - with ridge - **arrow A** - in notch - **arrow B** - in transmission housing.

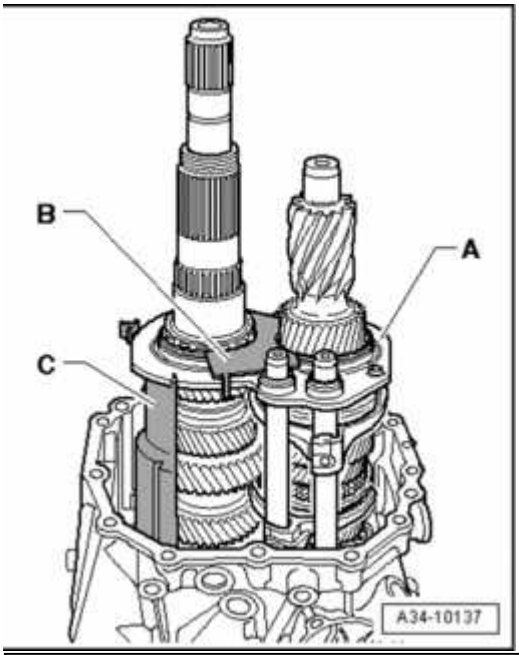

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Fig. 52: Removing/Installing Bearing Bracket With Reverse Shaft Mount & Oil Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Guide bearing bracket - **A** - over input shaft and hollow shaft and place on oil pan - **C** -.

Reverse shaft mount - **B** - must be installed on bearing bracket.

Synchronizer rings for 1st, 2nd and reverse gears, checking for wear

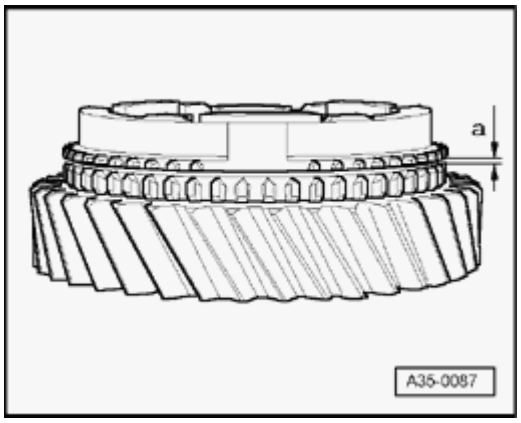

Fig. 53: Checking Synchronizer Ring For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check inner race on outer friction surface arrow for scoring or signs of wear, replace if necessary.
- Check synchronizer ring on inner friction surface arrow for scoring or signs of wear, replace if necessary.
- Place inner race, intermediate ring and synchronizer ring on selector gear taper or clutch hub taper and screw in.

NOTE:

- **Screw in means: Turn synchronizer ring approx. one turn while pressing on the ring at the same time.**

- Then measure gap - **a** - with a feeler gauge.

Gap dimension - a -	Wear limit
1st and 2nd gear	0.7 mm
Reverse gear	0.7 mm

NOTE:

- **Replace inner race, intermediate ring and synchronizer ring for the respective gear together.**

Differentiation of reverse gear synchronization rings - A - and 1st/2nd gear - B -

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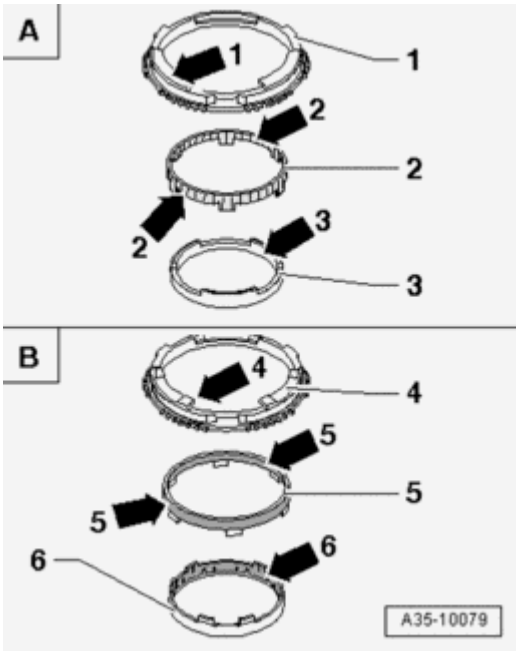

Fig. 54: Differentiation Of Reverse Gear Synchronization Rings And 1st/2nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Synchronizer ring for reverse gear: tabs arrow 1 have a smooth surface.
2. Reverse gear intermediate ring: friction surfaces arrow 2 are coated with centered linings (brass colored).
3. Reverse gear inner race: has no inner friction surface arrow 3.
4. Synchronizer ring for 1st and 2nd gear: tabs have 2 ridges each arrow 4.
5. Intermediate ring for 1st and 2nd gear: friction surfaces arrow 5 are coated with carbon (black).
6. Inner race for 1st and 2nd gear: inner race arrow 6 is coated with carbon (black).

Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear

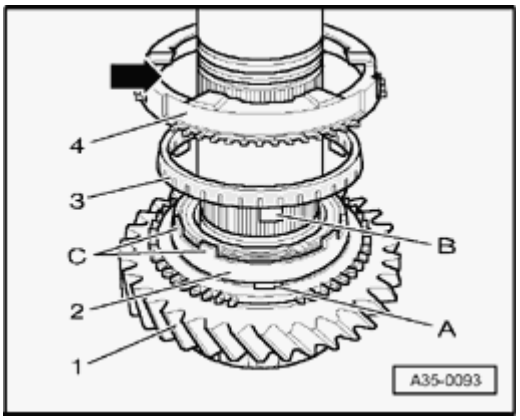

Fig. 55: Installation Position Of Synchronizer Rings For 1st And 2nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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- **If the components are not to be replaced, make sure they are reallocated to their original gear.**
- **Do not interchange reverse gear synchronizer rings with 1st and 2nd gear synchronizer rings --> Differentiation of reverse gear synchronization rings and 1st/2nd gear**

- Place inner race - **2** - on selector gear - **1** - or clutch hub.
- Install intermediate ring - **3** -. Tab - **B** - must be inserted into recess - **A** -.
- Insert synchronizer ring - **4** -. Guide tabs - **C** - through recess - **arrow** -.
- Place 2nd gear selector gear together with needle bearing and synchronizer rings on hollow shaft.
- Then attach 1st and 2nd gear synchronizer hub.

1st and 2nd gear locking collar installation location

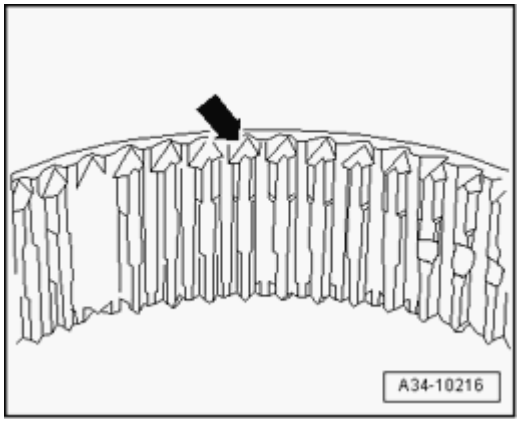

Fig. 56: 1st And 2nd Gear Locking Collar Installation Location
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Side with asymmetrical splines - **arrow** - must face toward 2nd gear.

Assembly of locking collar/synchronizer hub for 1st and 2nd gear

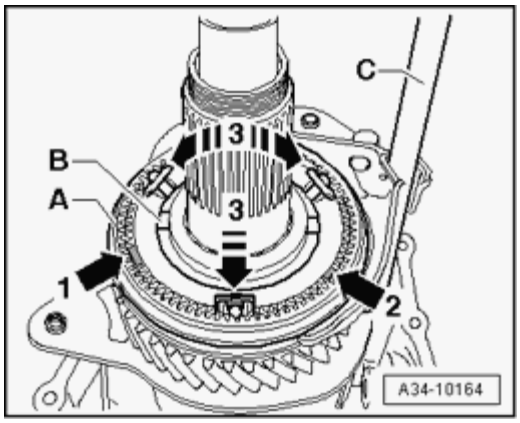

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Fig. 57: Assembly Of Locking Collar/Synchronizer Hub For 1st And 2nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place locking collar - **A** - (in installation location **1st and 2nd gear locking collar installation location**) together with shifter fork for 1st/2nd gear - **C** - over synchronizer hub - **B** -.

NOTE:

- **The locking collar only fits in one position over the synchronizer hub, the splines - arrow 1 - and - arrow 2 - have different widths. Remove synchronizer hub - B - from hollow shaft and rotate, if necessary.**

- Then place thrust piece in synchronizer hub notches and push thrust piece in direction of - **arrow 3** - into locking collar notches. Locking collar must be held in middle position.

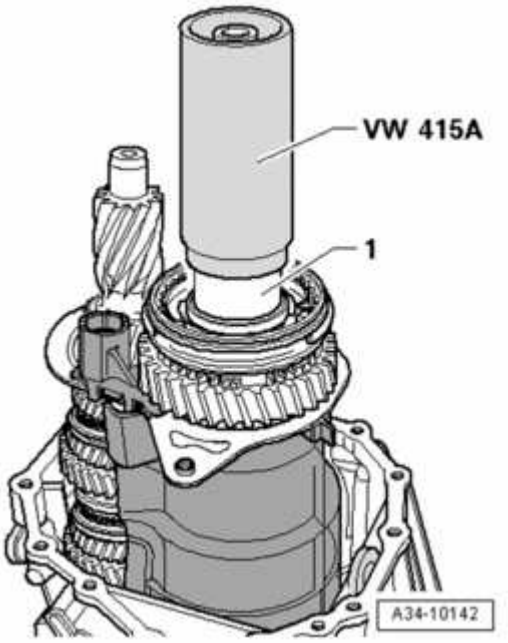

Fig. 58: Warming 1st Gear Selector Gear Inner Race/Needle Bearing & Attaching And Drive On To Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Warm 1st gear selector gear inner race/needle bearing - **1** - to approx. 100°C, attach and drive on to stop.

Assemble locking collar and reverse gear selector gear

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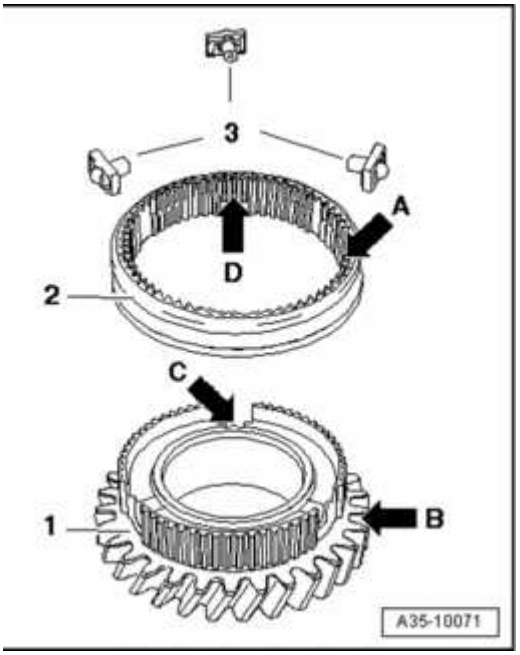

Fig. 59: Assembling Locking Collar And Reverse Gear Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Gear wheel for reverse gear
2. Locking collar
3. Thrust piece

- Slide locking collar over reverse gear selector gear.

Installation position:

- Pointed teeth - **arrow A** - in locking collar point opposite reverse gear selector gear drive splines - **arrow B** -.
- Thrust piece notches - **3** - in reverse gear selector gear - **arrow C** - and locking collar - **arrow D** - must align.

- Then place thrust piece in reverse gear selector gear notches and press thrust piece in locking collar notches.

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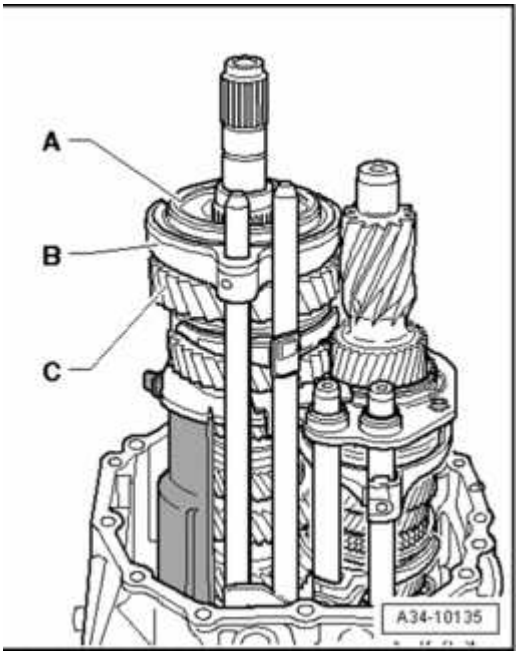

Fig. 60: Placing 1st Gear Selector Gear With Needle Bearing And Synchronizer Rings On Inner Race/Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Then place 1st gear selector gear - **C** - with needle bearing and synchronizer rings on inner race/needle bearing.
- Place thrust washer for 1st gear and reverse gear on hollow shaft.
- Attach reverse gear selector gear - **A** - (with locking collar mounted) together with reverse gear selector rod - **B** -.

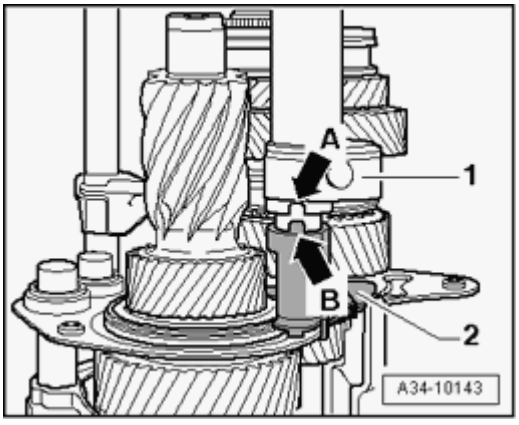

Fig. 61: Placing Reverse Shaft With Notch On Tab On Reverse Shaft Mount
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place reverse shaft - **1** - with notch - **arrow A** - on tab - **arrow B** - on reverse shaft mount - **2** -.

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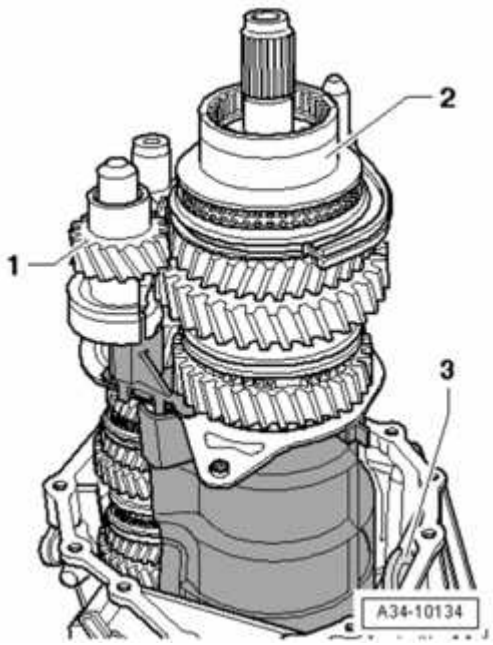

Fig. 62: Identifying Reverse Gear, Clutch Hub & Magnet
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place reverse gear - **1** - with needle bearing in reverse shaft, when doing so, reverse gear splines must face toward reverse gear selector gear.
- Place clutch hub - **2** - with needle bearing and synchronizer rings on hollow shaft.
- Place magnet - **3** - in transmission housing rib.

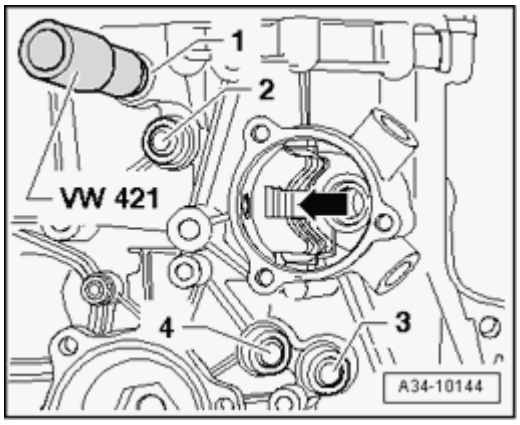

Fig. 63: Driving On Selector Rod Securing Bushings With Tube VW 421 To Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bring selector rods into neutral position - **arrow** -.
- Drive on selector rod securing bushings - **1** - to - **4** - with tube VW 421 to stop.

NOTE:

- **Do not interchange securing bushings for selector rods and selector shaft.**

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- Check whether or not there are 2 alignment pins in transmission cover for centering transmission cover/housing.
- Apply *sealing paste AMV 188 001 02* evenly and not to thick on transmission housing joint surfaces at transmission cover.

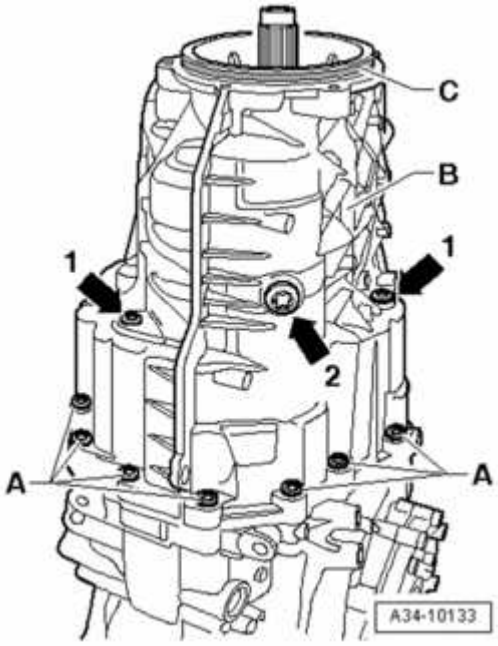

Fig. 64: Identifying Bolts For Securing Bearing Bracket, Bolt For Securing Reverse Shaft, Connection Screws & O-Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place transmission cover - **B** - on transmission housing. Do not screw in screws - **A** - yet.
- Hand-tighten bolt - **arrow 2** - in reverse shaft.
- Hand-tighten new bolts - **arrow 1** - in bearing bracket.
- Then tighten the 13 bolts - **A** - to 24 Nm.

- Then tighten bolts - **arrows 1** - to 27 Nm and bolt - **arrow 2** - to 24 Nm.
- Coat new O-ring - **C** - with transmission fluid and insert in surrounding groove in transmission cover.
- Then rotate transmission horizontally in assembly bracket.

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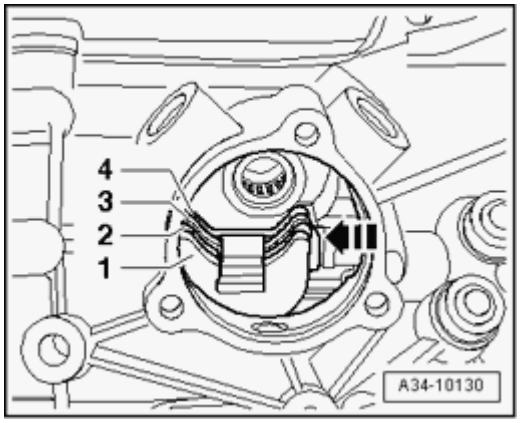

Fig. 65: Securing Hollow Shaft By Moving Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure hollow shaft by moving selector rods - **1** - to - **4** - in direction of - **arrow** -.

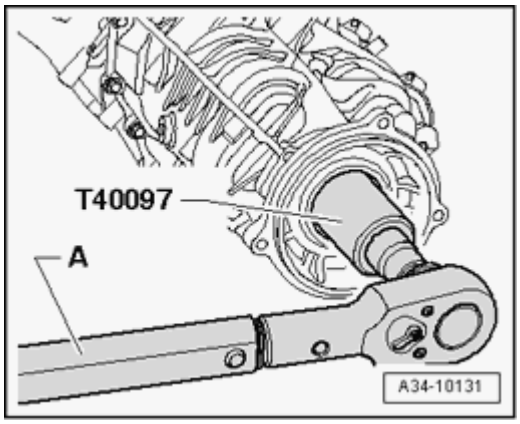

Fig. 66: Loosening Twelve-Point Nut On Hollow Shaft With Socket And Key T40097
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Then tighten twelve-point nut hollow shaft to 75 Nm.

A - Torque wrench

- Then shift selector rods into neutral position.
- Turn transmission in assembly bracket with transmission cover upward.

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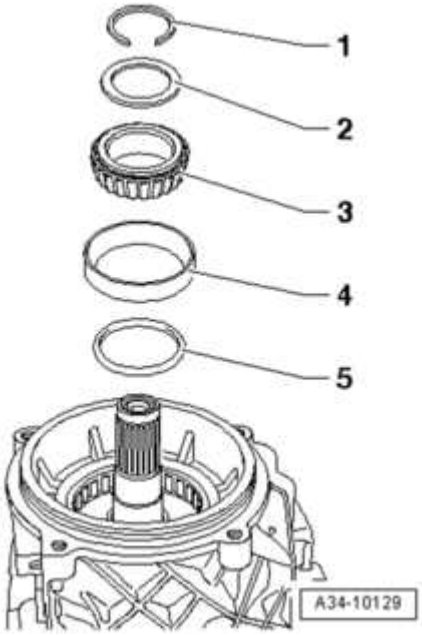

Fig. 67: Removing Circlip, Shim(S), Inner Race, Outer Race & Spacer Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place spacer ring - **5** - on hollow shaft twelve-point nut.
- Install inner race - **4** - and outer race - **3** -. These components are push fit and can be removed by hand.

If you have replaced the drive pinion (gear set), you must redetermine the thickness of the circlip - 1 - and shim(s) - 2 - for tapered roller bearing on drive pinion --> Determine thickness of circlip and shim(s) as follows:.

Determine thickness of circlip - 1 - and shim(s) - 2 - as follows:

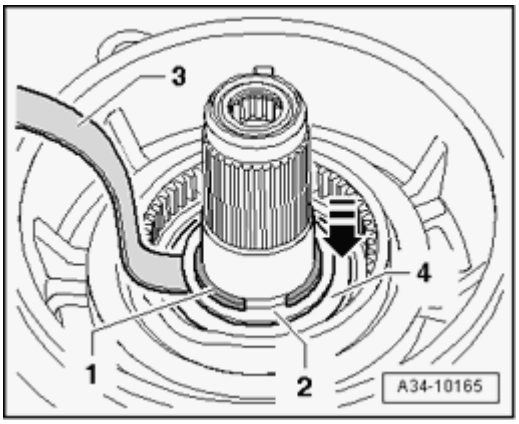

Fig. 68: Determining Thickness Of Circlip And Shim(s)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure a gap of 0.10 mm max. between the shim available as a replacement part and circlips, measured between shim - **2** - and inner race/tapered ball bearing - **4** -.

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- Check gap with a feeler gauge - **3** -.

NOTE:

- **When measuring, the circlip - 1 - must be fully seated in groove and inner race/tapered ball bearing - 4 - pushed in direction of - arrow -.**

The following shims are available:

Shim thickness (mm) * See note		
0.7	1.1	1.5
0.8	1.2	1.6
0.9	1.3	
1.0	1.4	

*Using shim tolerances it is possible to find the exact shim thickness required, insert two shims if necessary.

The following circlips are available:

Circlip thickness (mm)		
1.70	1.80	1.90
1.75	1.85	

- Install determined shim(s) and circlip.

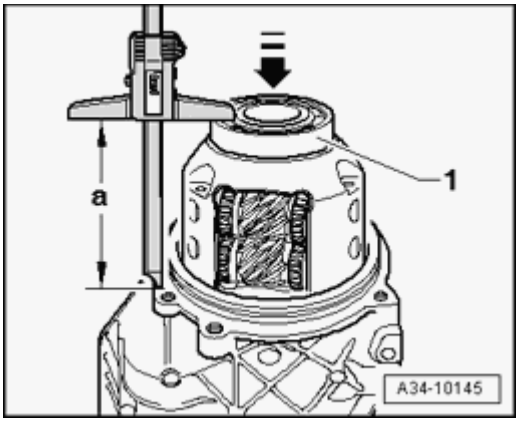

Fig. 69: Sliding Torsen Differential On Hollow Shaft Splines
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide torsen differential on hollow shaft splines and press in direction of - **arrow** -.
- When doing so, measure distance - **a** - from flat surface of outer race/tapered ball bearing - **1** - to flat surface of flange/transmission cover.

The following shims are available:

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Measuring range	Adjustment shim
Measured value (mm)	Thickness (mm)
109.88 to 110.00	1.65
109.91 to 110.15	1.45
110.16 to 110.45	1.20
110.41 to 110.70	0.95
110.66 to 110.95	0.70
110.91 to 111.20	0.45

NOTE:

- **Turn transmission horizontally in assembly bracket.**

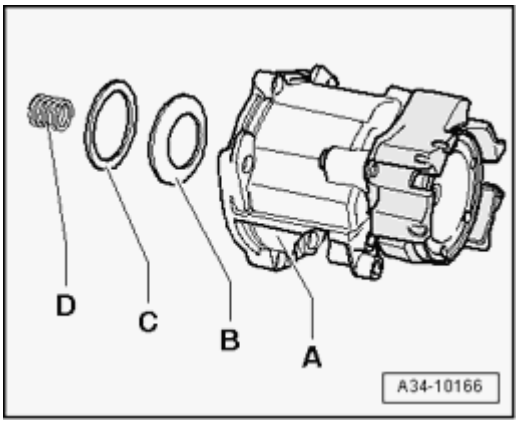

Fig. 70: Identifying Plate Spring, Torsen Housing, Determined Shim, Shim & Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place plate spring - **B** - in torsen housing - **A** -.

- Plate spring installation location: The inner diameter camber faces toward flange shaft in torsen housing.

- Place determined shim - **C** - on plate spring - **B** -.
- Place spring - **D** - on flange shaft in torsen housing.
- Then place torsen housing on transmission cover.

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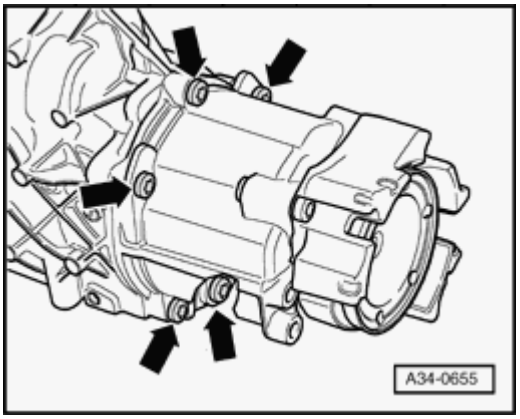

Fig. 71: Identifying Transmission Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolt - **arrow** - to 24 Nm.

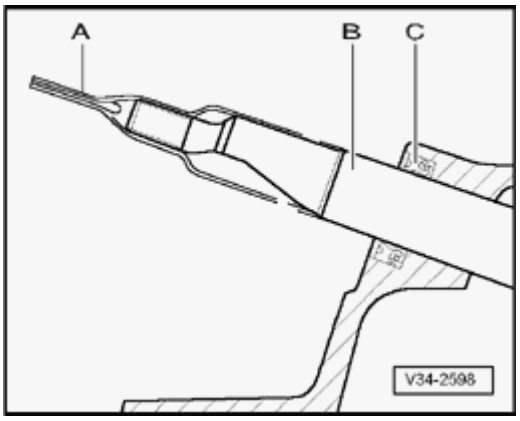

Fig. 72: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push *assembly sleeve 01E 311 120* - **A** - onto selector shaft - **B** -.

NOTE:

- **To prevent damage to the seal - C - , the installation of the seal and selector shaft must only be performed with the *assembly sleeve 01E 311 120* - A -.**
- **Selector rods must be in neutral position.**

- Install complete selector shaft.

- Installation position: Flattened part of selector shaft faces downward.

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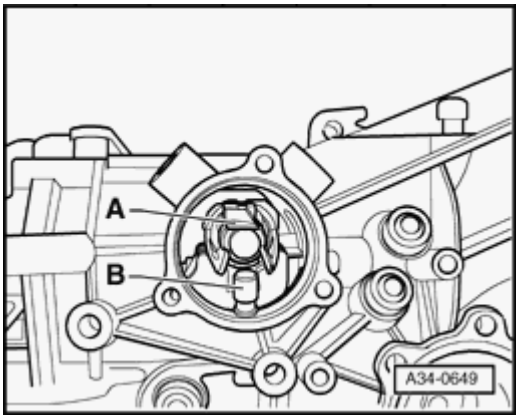

Fig. 73: Identifying Selector Shaft & Dowel Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide selector shaft - **A** - into transmission up to stop and insert dowel pin - **B** - at the same time.

NOTE:

- **On dowel pin version with pins, pin side must be inserted into hole in transmission housing.**

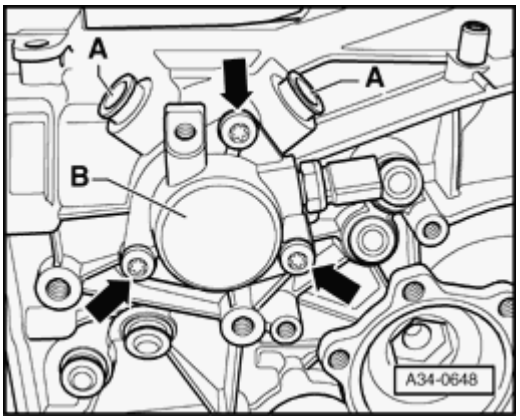

Fig. 74: Removing/Installing Bolts And Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install cover - **B** - with new O-ring.
- Clean screw threads - **arrows** - with a wire brush. Then insert screws with *locking compound AMV 185 101 A1* and tighten to 24 Nm.

A - Selector shaft securing bushings

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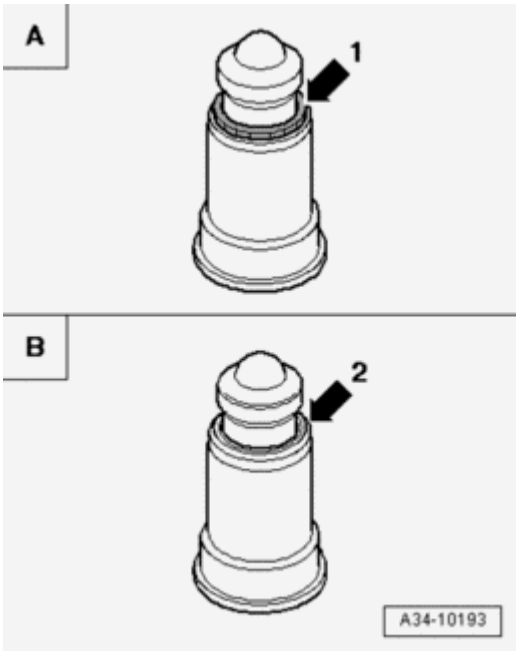

Fig. 75: Identifying Selector Shaft Versions
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Only install version - B - selector shaft securing bushings with edged collar - arrow 2 -.**
- **On transmission with version - A - selector shaft securing bushings installed, these must always be replaced with version - B -.**
- **If version - B - is installed, this can be reused.**

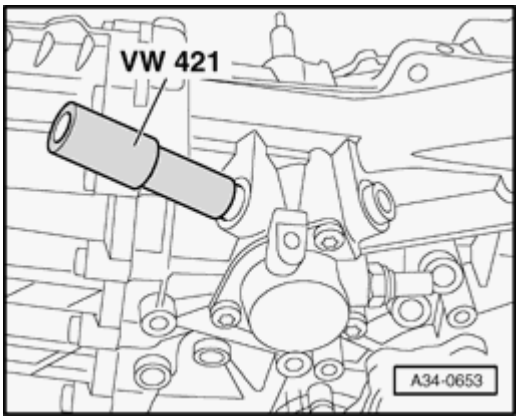

Fig. 76: Driving In Selector Shaft Locking Bushes Onto Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive in selector shaft securing bushings with tube VW 421 until stop.

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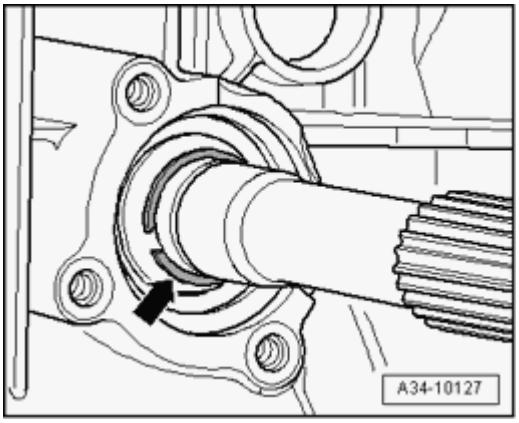

Fig. 77: Removing/Installing Input Shaft Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlip - **arrow** - in front of grooved ball bearing of input shaft must then be installed.

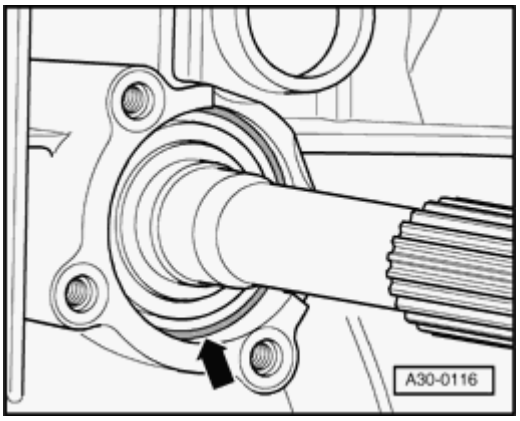

Fig. 78: O-Ring Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Coat new O-ring - **arrow** - with transmission fluid before installing in surrounding groove in transmission housing.
- Pull a thin insulating hose or heat-shrinkable hose over input shaft splines.
- Fill space between sealing lip and dust lip on sealing ring in guide sleeve halfway with *grease G 052 128 A1* .
- Lightly lubricate outer circumference of guide sleeve.

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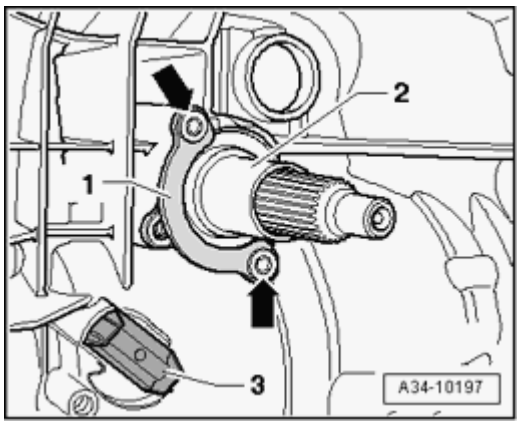

Fig. 79: Identifying Bolts, Securing Plate, Guide Sleeve & Intermediate Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide guide sleeve - **2** - over input shaft in transmission housing.
- Remove insulating hose or heat-shrinkable hose.
- Attach securing plate - **1** -.
- Clean bolt threads - **arrows** - with a wire brush. Then insert bolts with *locking compound AMV 185 101 A1* and tighten to 24 Nm.

- Insert intermediate piece - **3** - in transmission housing.

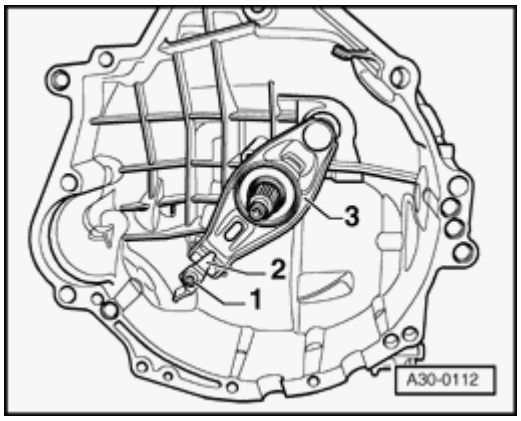

Fig. 80: Identifying Bolt, Leaf Spring & Clutch Release Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- You must lightly coat contact surface of clutch slave cylinder plunger with copper paste before installing clutch release lever - **3** -.
- Install clutch release lever with release bearing.
- Clean bolt threads - **1** - with a wire brush.
- Place leaf spring - **2** - on screws - **1** -.

- Then insert bolts - **1** - with *locking compound AMV 185 101 A1* and tighten to 24 Nm.
- Shift through all gears.

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Input shaft grooved ball bearing, replacing in uninstalled but not disassembled transmission

Special tools, testers and auxiliary items required

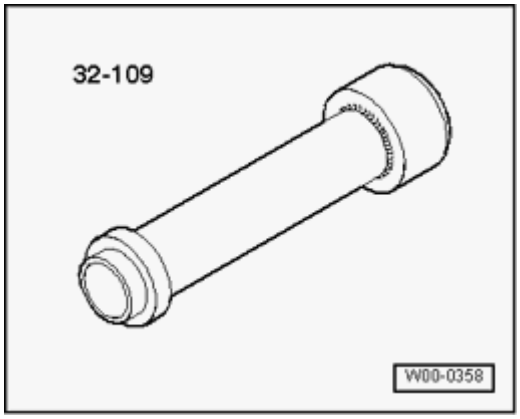

Fig. 81: Driving Sleeve 32 - 109
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Driving sleeve 32 - 109

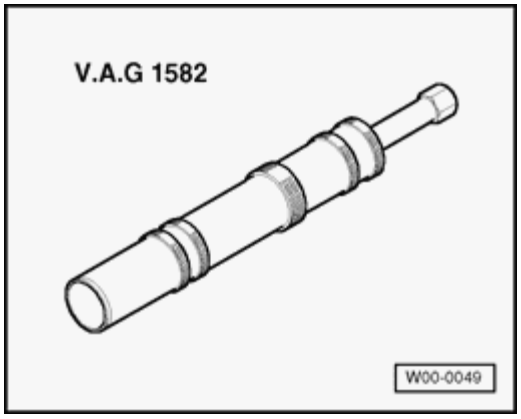

Fig. 82: Tapered Roller Bearing Puller V.A.G 1582
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Taper roller bearing puller V.A.G 1582
- Attachment V.A.G 1582/12

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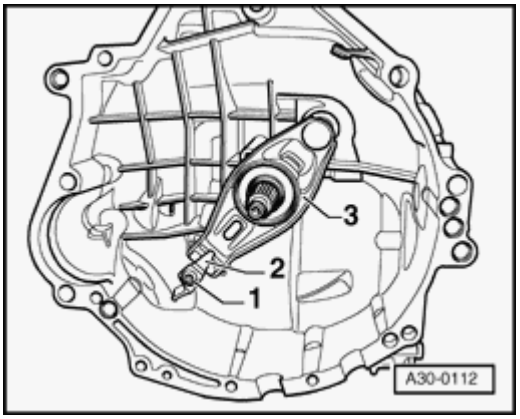

Fig. 83: Identifying Bolt, Leaf Spring & Clutch Release Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt - **1** - and remove leaf spring - **2** -.
- Remove clutch release lever - **3** - with release bearing.

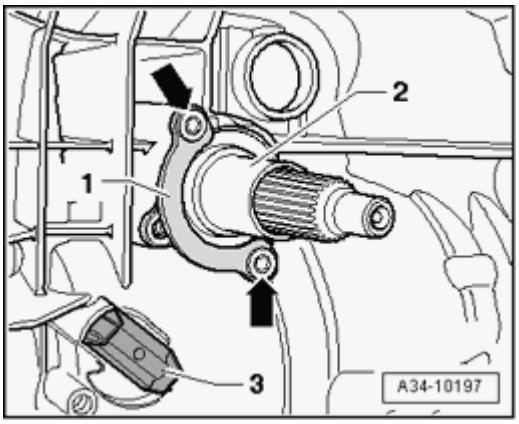

Fig. 84: Identifying Bolts, Securing Plate, Guide Sleeve & Intermediate Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and securing plate - **1** -.
- Pull a thin insulating hose or heat-shrinkable hose over input shaft splines.
- Pull guide sleeve - **2** - out of transmission housing.
- Remove intermediate piece - **3** - from transmission housing.

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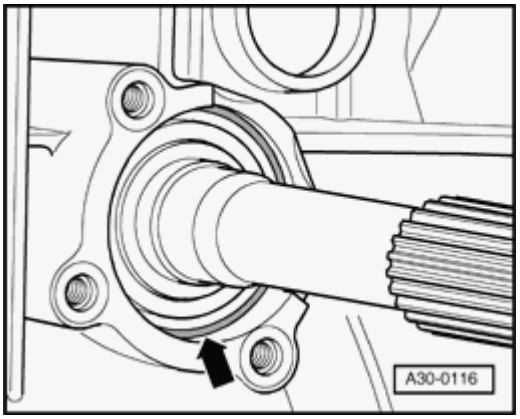

Fig. 85: O-Ring Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out O-ring - **arrow** - with a small screwdriver.

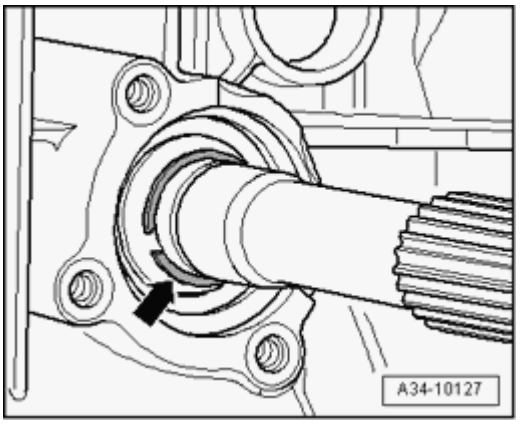

Fig. 86: Removing Input Shaft Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlip - **arrow** - in front of grooved ball bearing of input shaft must then be removed.

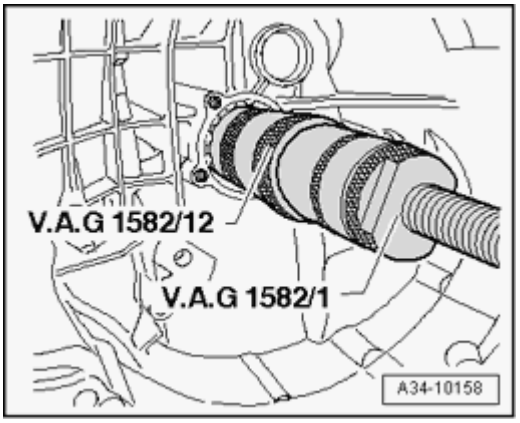

Fig. 87: Removing Input Shaft Grooved Ball Bearing From Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove input shaft grooved ball bearing from transmission housing.
- Then slide new grooved ball bearing on input shaft.

Installation position:

Closed side of cage for balls points toward transmission housing.

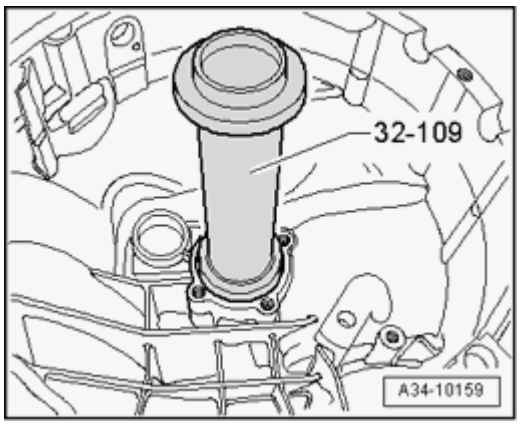

Fig. 88: Driving Grooved Ball Bearing In Transmission Housing To Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive grooved ball bearing in transmission housing to stop.

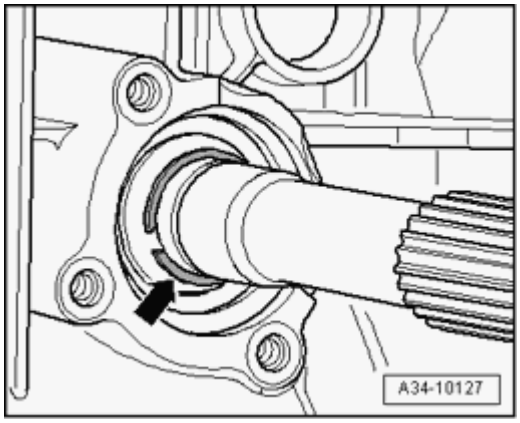

Fig. 89: Removing Input Shaft Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlip - **arrow** - in front of grooved ball bearing of input shaft must then be installed.

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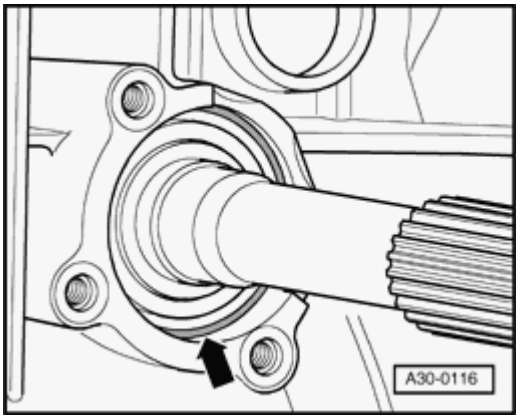

Fig. 90: O-Ring Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Coat new O-ring - **arrow** - with transmission fluid before installing in surrounding groove in transmission housing.
- Fill space between sealing lip and dust lip on sealing ring in guide sleeve halfway with *grease G 052 128 A1* .
- Lightly lubricate outer circumference of guide sleeve.

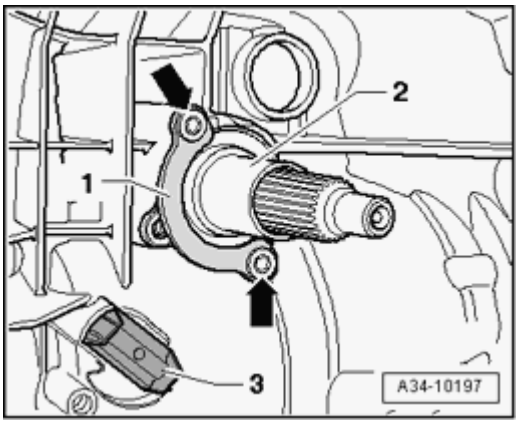

Fig. 91: Identifying Bolts, Securing Plate, Guide Sleeve & Intermediate Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide guide sleeve - **2** - over input shaft in transmission housing.
- Remove insulating hose or heat-shrinkable hose.
- Attach securing plate - **1** -.
- Clean bolt threads - **arrows** - with a wire brush. Then insert screws with *locking compound AMV 185 101 A1* and tighten to 24 Nm.

- Insert intermediate piece - **3** - in transmission housing.

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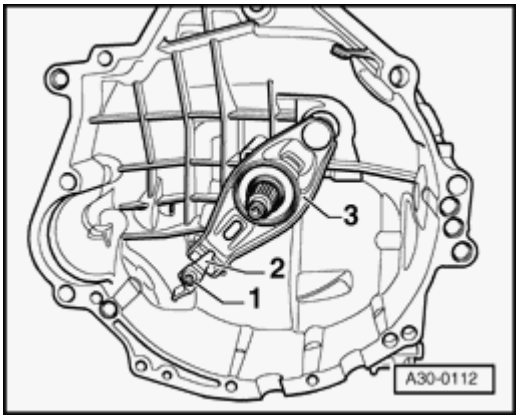

Fig. 92: Identifying Bolt, Leaf Spring & Clutch Release Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- You must lightly coat contact surface of clutch slave cylinder plunger with copper paste before installing clutch release lever - **3** -.
- Install clutch release lever with release bearing.
- Clean bolt threads - **1** - with a wire brush.
- Place leaf spring - **2** - on bolts - **1** -.
- Then insert bolts - **1** - with *locking compound AMV 185 101 A1* and tighten to 24 Nm.

TORSEN HOUSING, DISASSEMBLING AND ASSEMBLING

Torsen housing, disassembling and assembling

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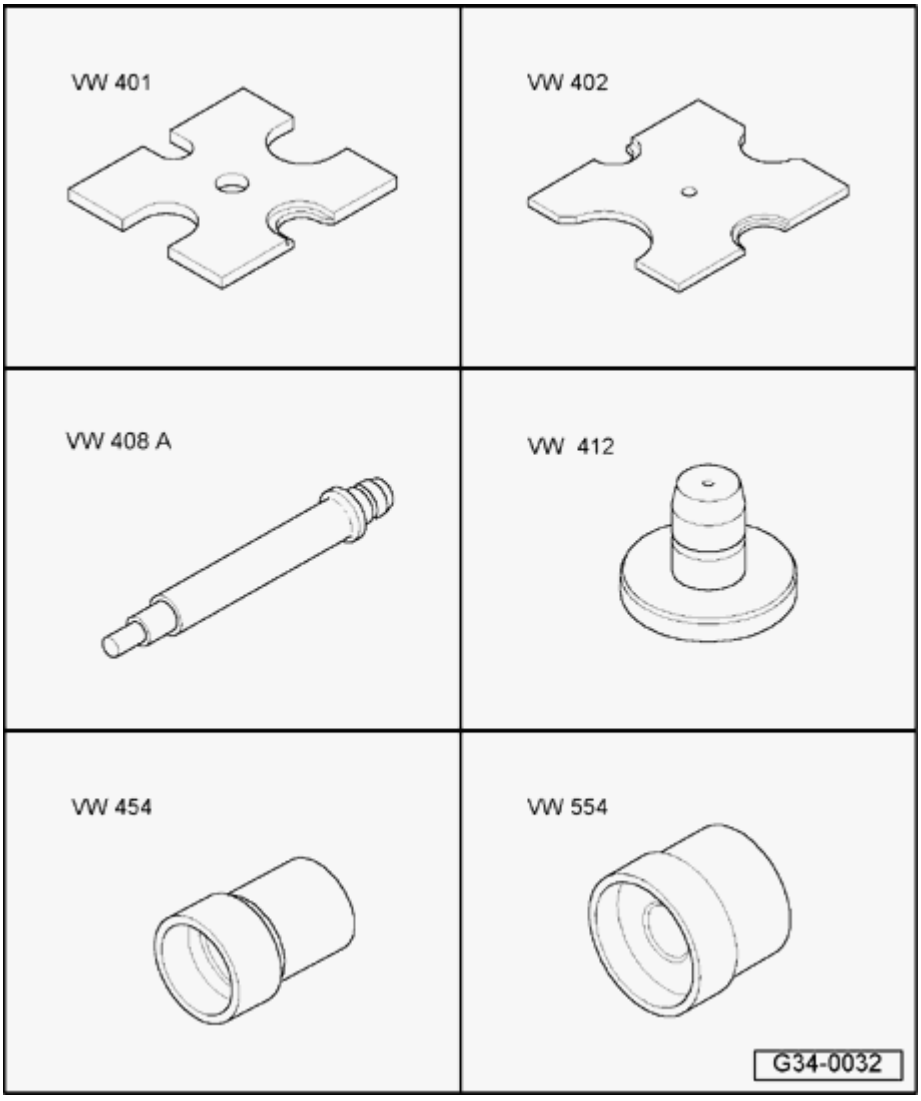

Fig. 93: Identifying Special Tools - Torsen Housing, Disassembling And Assembling (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust plate VW 402
- Punch VW 408 A
- Punch VW 412

- Thrust plate VW 454
- Thrust plate VW 554

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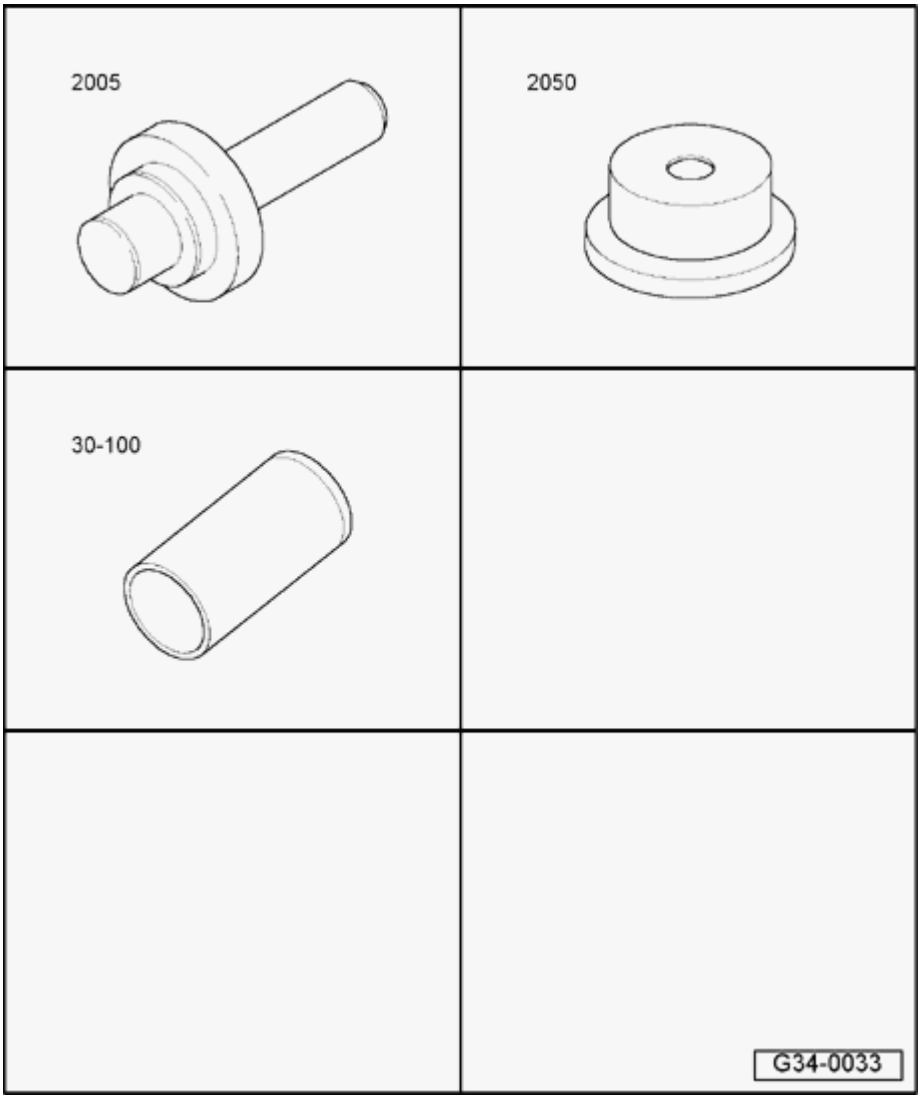

Fig. 94: Identifying Special Tools - Torsen Housing, Disassembling And Assembling (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Punch 2005
- Thrust plate 2050
- Seal driver-frt wheel bearing 30 - 100
- Torque wrench V.A.G 1331

- Pulling hook T20143
- Thrust plate T40106
- *Adjustment shim 016 311 391 A*
- *Thread locking compound AMV 185 101 A1*

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- *Sealing grease G 052 128 A1*

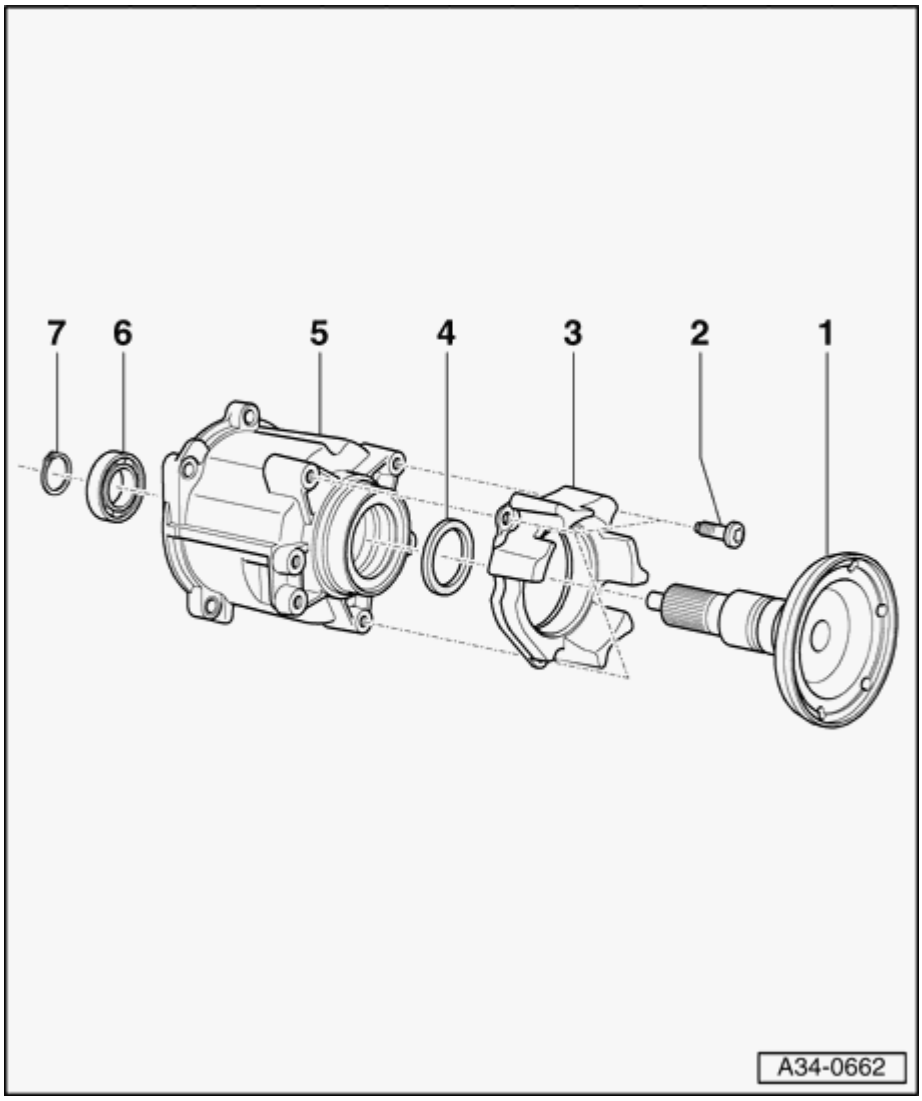

Fig. 95: Exploded View Of Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Flange shaft

- Press off **Press off flange shaft (torsen housing with vibration dampener)** or **Press off flange shaft (torsen housing without vibration dampener)**
- Pressing in **Pressing in flange shaft**
- Change: as of serial number 42987 with groove --> **As of serial number 42987 - Flange shaft with nut and sealing ring with additional dust lip**

2 - Screw - 20 Nm plus an additional 90°

- For vibration dampener

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- Qty. 3
- Self-locking
- Replace

3 - Vibration dampener

- Not present on all versions

4 - Seal

- Removing **Pry off sealing ring**
- Installing up to serial number 42986 **Sealing ring - up to serial number 42986 - installing**
- Change: as of serial number with additional dust lip **Differentiation of sealing rings**
- Installing as of serial number 42987 **Sealing ring - as of serial number 42987 - with additional dust lip, installing**

5 - Torsen housing

- Removing and installing with transmission removed --> **Torsen housing and torsen differential, removing and installing - assembly overview**
- Removing and installing with transmission installed --> **34 CONTROLS, HOUSING**

6 - Ball bearing

- For flange shaft
- Pressing out **Pressing out ball bearing for flange shaft**
- Pressing in **Pressing in ball bearing for flange shaft**

7 - Circlip

Press off flange shaft (torsen housing with vibration dampener)

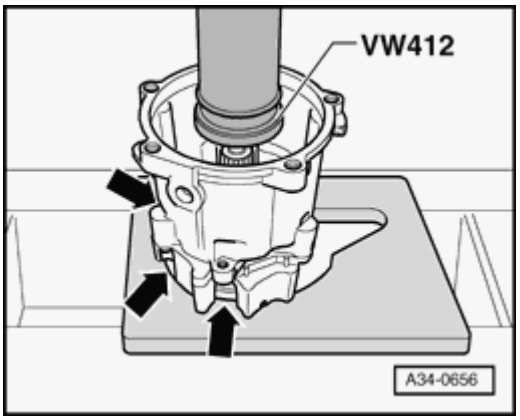

Fig. 96: Press Off Flange Shaft (Torsen Housing With Vibration Dampener)

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing out flange shaft.
- Position torsen housing so that flange shaft does not come in contact with assembly plate when pressing off - **arrows** -.

Press off flange shaft (torsen housing without vibration dampener)

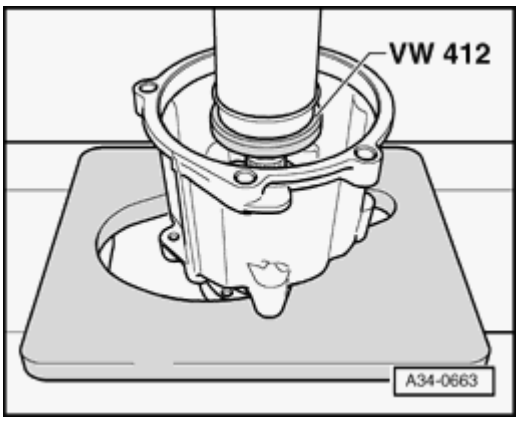

Fig. 97: Press Off Flange Shaft (Torsen Housing Without Vibration Dampener)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing out flange shaft.

Pressing in flange shaft

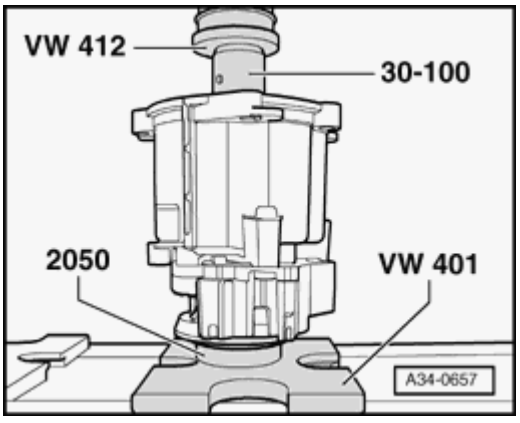

Fig. 98: Pressing In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before pressing in flange shaft, tighten damper.

NOTE:

- **If a sealing ring is installed with additional dust lip Differentiation of sealing rings , a flange shaft must be installed with a groove --> As of serial number 42987 - Flange shaft with nut and sealing ring with**

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additional dust lip

- Install securing ring.

As of serial number 42987 - Flange shaft with nut - arrow A - and sealing ring with additional dust lip - arrow B -

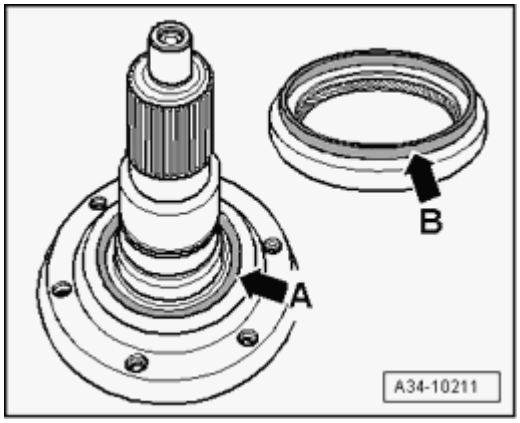

Fig. 99: Identifying Flange Shaft With Nut And Sealing Ring With Additional Dust Lip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Sealing ring with additional dust lip - arrow B - must be installed in connection with flange shaft with groove - arrow A -.**

Pry off sealing ring

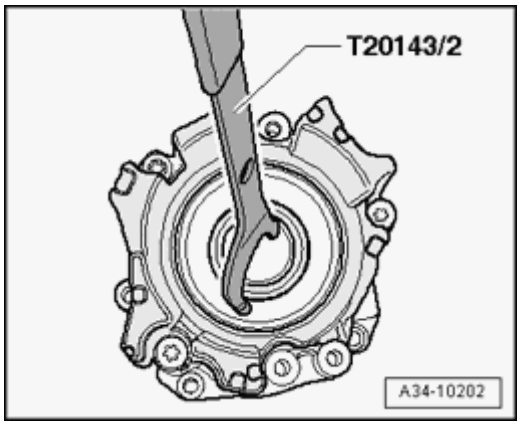

Fig. 100: Pry Off Sealing Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Differentiation of sealing rings

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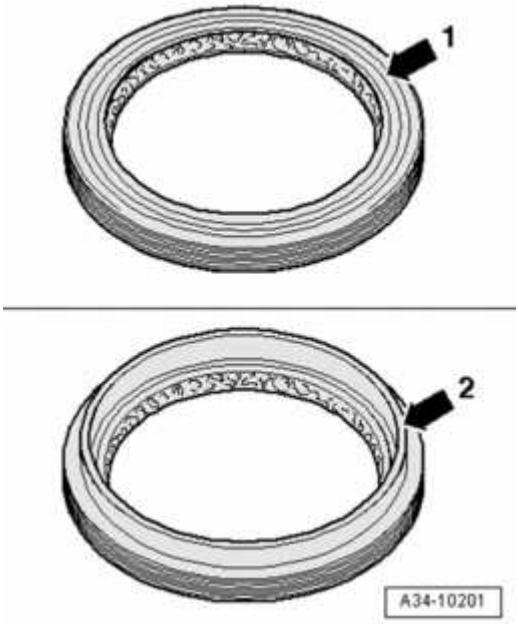

Fig. 101: Differentiation Of Sealing Rings
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Sealing ring - up to serial number 42986 - without additional dust lip - **arrow 1** -.

B - Sealing ring - as of serial number 42987 - with additional dust lip - **arrow 2** -.

Sealing ring - up to serial number 42986 - installing

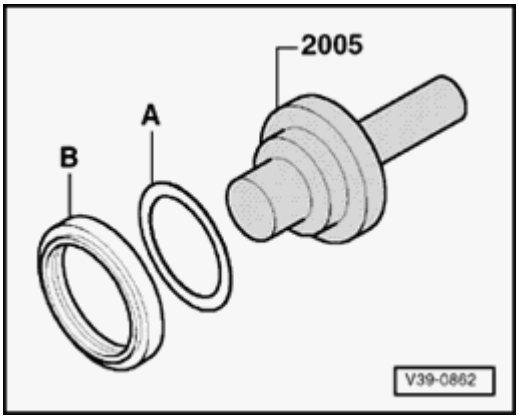

Fig. 102: Preparing Seal For Installation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - *Shim 016 311 391 A* (1.4 mm thick)

B - Seal

- Set shim and seal onto tool as shown.

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- Installation position: Open side of sealing ring faces towards torsen housing.

  - Lightly oil new sealing ring on outer circumference.

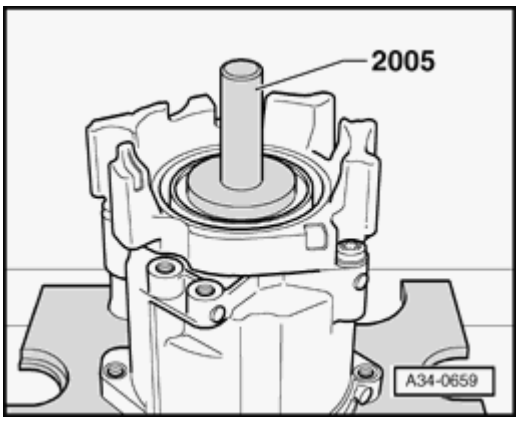

Fig. 103: Driving On New Flange Shaft Sealing Ring To Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive on new flange shaft sealing ring to stop, when doing so, do not tilt.
- Fill area between sealing lip and dust lip halfway with *sealing grease G 052 128 A1* .
- Remove tool and shim.

Sealing ring - as of serial number 42987 - with additional dust lip, installing

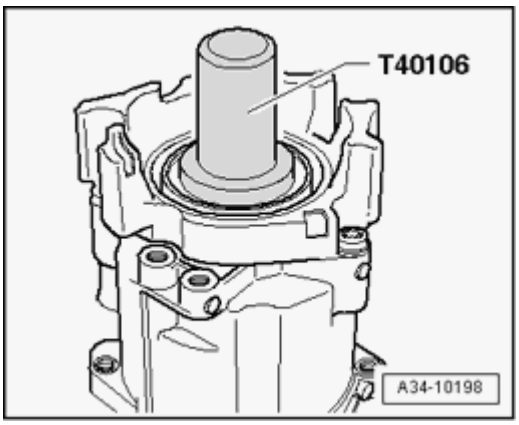

Fig. 104: Identifying Sealing Ring With Additional Dust Lip, Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position: Open side of sealing ring faces towards torsen housing.

  - Lightly oil new sealing ring on outer circumference.
  - Drive on new flange shaft sealing ring to stop, when doing so, do not tilt.
  - Fill area between sealing lip and dust lip halfway with *sealing grease G 052 128 A1* .

Pressing out ball bearing for flange shaft

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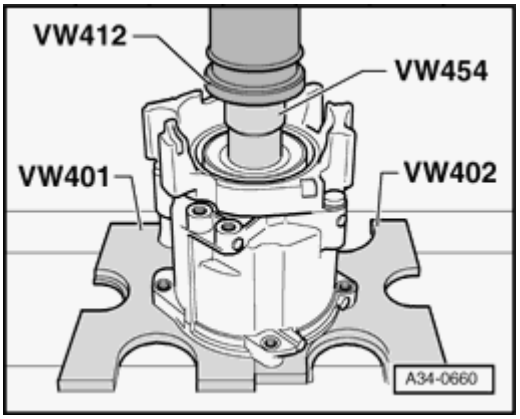

Fig. 105: Pressing Out Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing in ball bearing for flange shaft

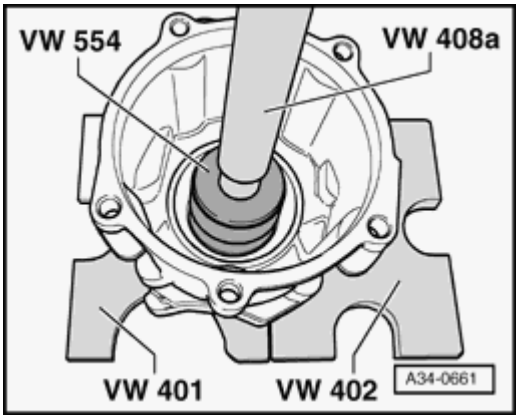

Fig. 106: Pressing In Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

TRANSMISSION COVER, SERVICING

Transmission cover, servicing

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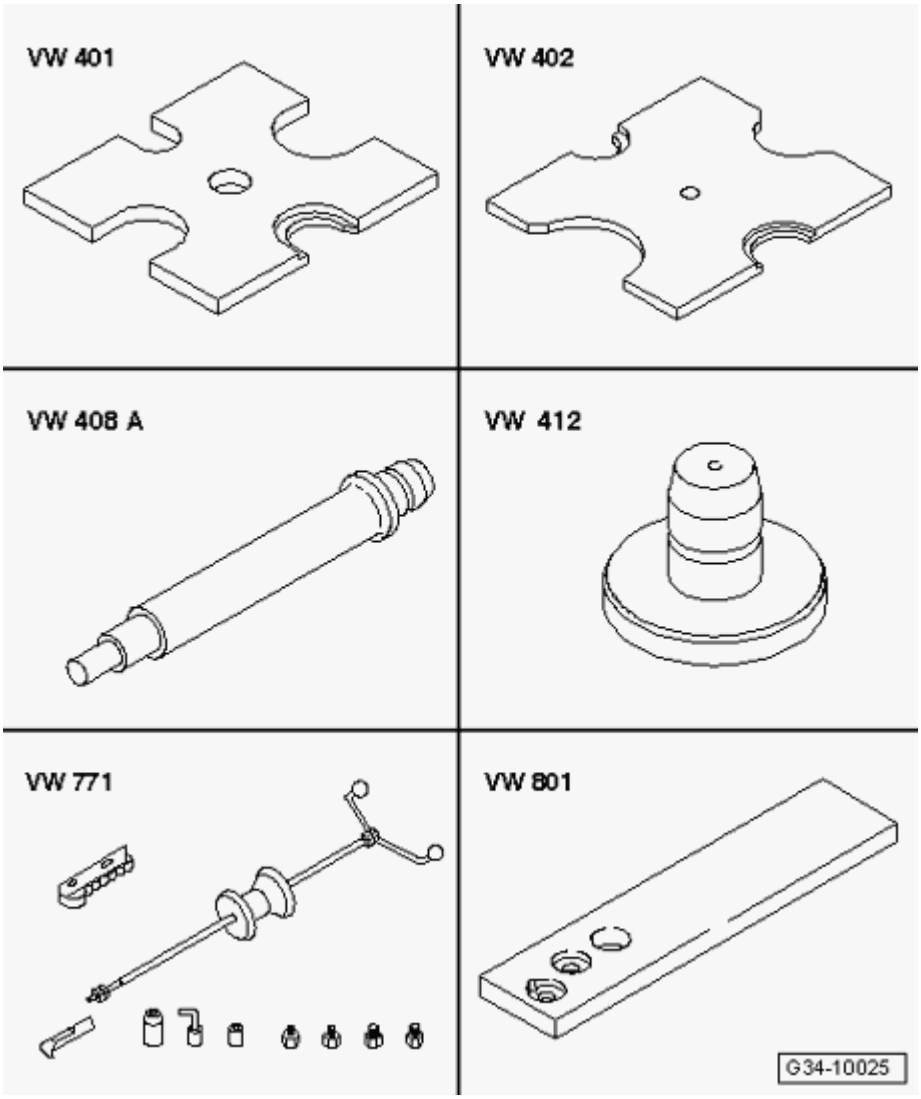

Fig. 107: Identifying Special Tools - Transmission Cover, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust plate VW 402
- Punch VW 408 A
- Punch VW 412

- Slide Hammer-Complete Set VW 771
- Holding plate VW 801

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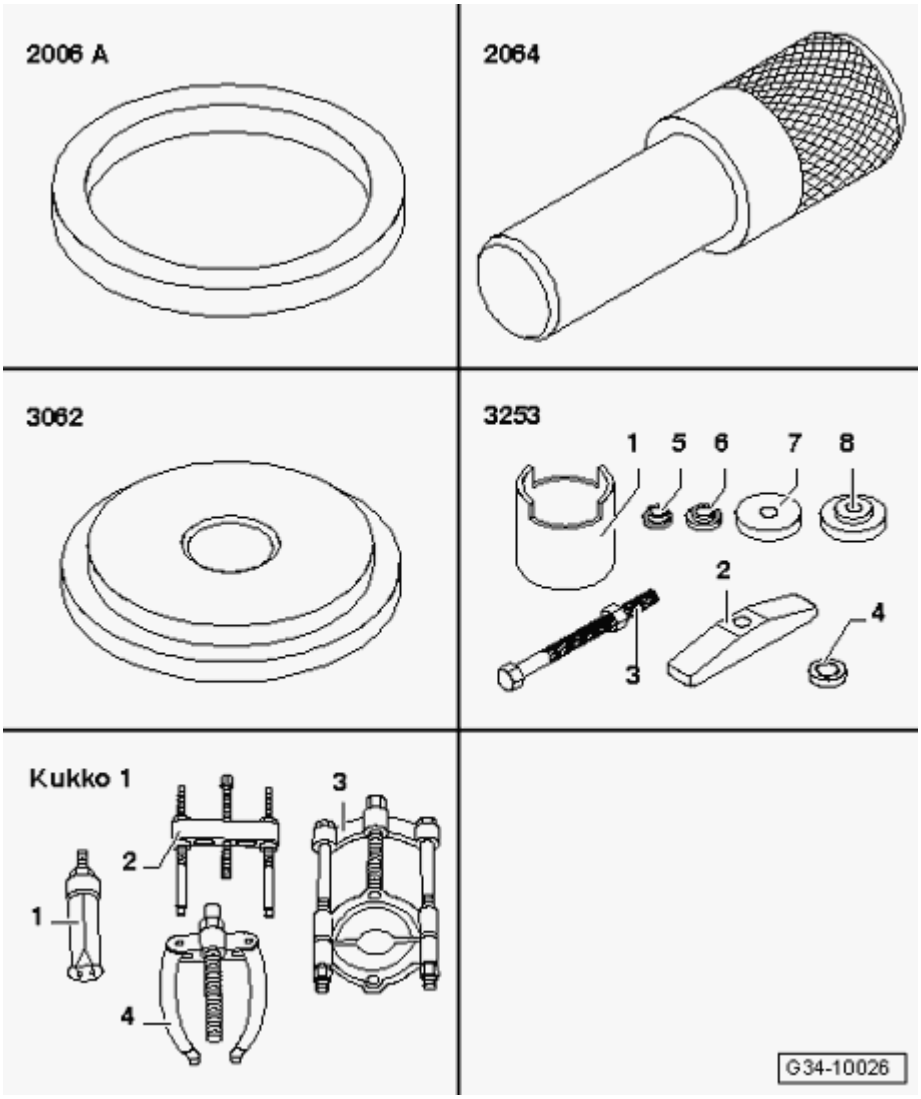

Fig. 108: Identifying Special Tools - Transmission Cover, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust ring 2006 A
- Lock pin 2064
- Thrust pad 3062
- Alignment fixture 3253

- - **1** - Internal extractor Kukko 21/2
- - **1** - Internal extractor Kukko 21/4
- - **4** - Support Kukko 22/2
- Depth gauge

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- Stud M10

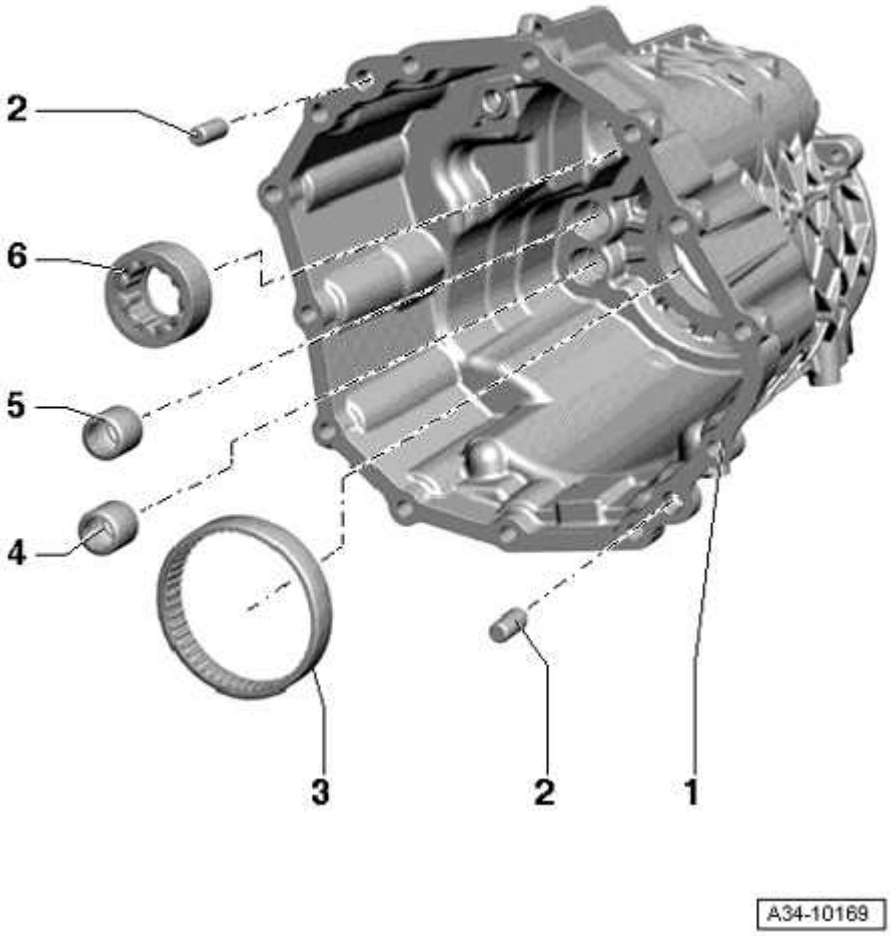

Fig. 109: Exploded View Of Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission cover

2 - Alignment pin

- Qty. 2
- Place in transmission cover
- Drive in flush to rear side of housing joint surface

3 - Needle bearing

- For hollow shaft mounting in transmission cover

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- Pressing out **Press needle bearing out of transmission cover**
- Pressing in **Press needle bearing into transmission cover**
- Secure after installing with peen **Secure needle bearing and roller housing in transmission cover with peen**

4 - Ball sleeve

- For reverse gear selector rod
- Pulling out **Remove ball sleeve from transmission housing**
- Pressing in **Press ball sleeve into transmission cover**
- Measure press-in depth **Ball sleeve press-in depth in transmission cover**

5 - Ball sleeve

- For selector rod for 1st and 2nd gear
- Pulling out **Remove ball sleeve from transmission housing**
- Pressing in **Press ball sleeve into transmission cover**
- Measure press-in depth **Ball sleeve press-in depth in transmission cover**

6 - Roller sleeve

- For input shaft mounting in transmission cover
- Always replace
- Pulling out **Remove roller sleeve from transmission cover**
- Pressing in **Carefully press new roller sleeve into transmission cover to stop.**
- Secure after installing with peen **Secure needle bearing and roller housing in transmission cover with peen**

Press needle bearing out of transmission cover

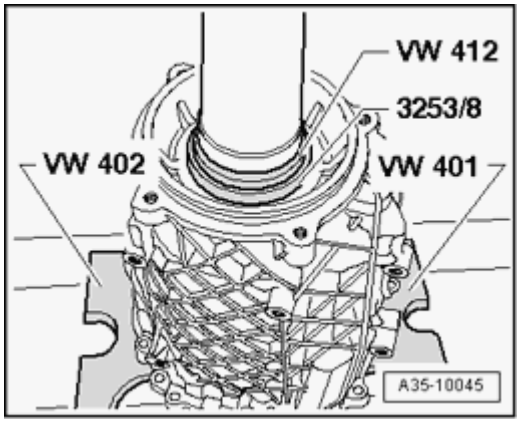

Fig. 110: Press Needle Bearing Out Of Transmission Cover

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove peening indentations, if present.

Press needle bearing into transmission cover

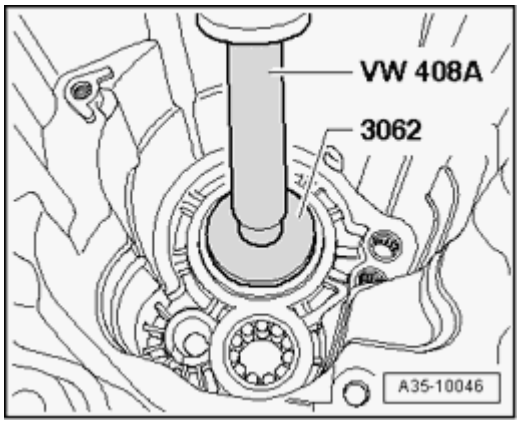

Fig. 111: Press Needle Bearing Into Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install needle bearings with lettering on bearing (the side with thicker metal) facing towards thrust pad 3062.

- Press in needle bearing to a depth of 262 ± 0.5 mm, measured from housing joint surface to needle bearing (similar to Ill. A34-10190 **Ball sleeve press-in depth in transmission cover**).
- Secure needle bearing after pressing into transmission cover with peen **Secure needle bearing and roller housing in transmission cover with peen**.

Remove ball sleeve from transmission housing

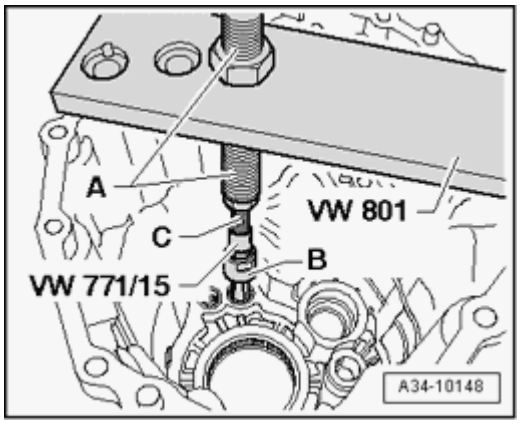

Fig. 112: Remove Ball Sleeve From Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Support , e.g. Kukko 22/2

B - Internal puller 14.5 to 18.5 mm , e.g. Kukko 21/2

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C - Stud M10

NOTE:

- **You can also use adapter VW 771/44 in place of stud M10 and VW 771/15.**

Press ball sleeve into transmission cover

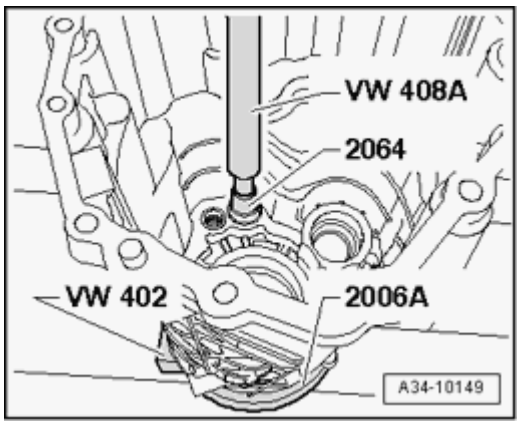

Fig. 113: Press Ball Sleeve Into Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set ball sleeve in place with inscribed side (thicker wall) facing toward lock pin 2064. To do this, insert smaller dia. of lock pin 2064 in ball sleeve.
- Support transmission cover under bearing mount with thrust ring 2006 A.

Ball sleeve press-in depth **Ball sleeve press-in depth in transmission cover**

Ball sleeve press-in depth in transmission cover

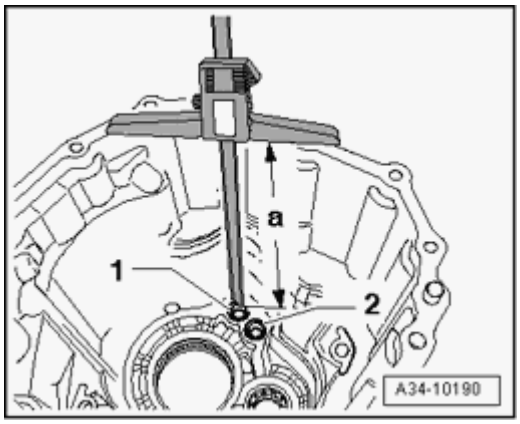

Fig. 114: Ball Sleeve Press-In Depth In Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in ball sleeve for reverse gear selector rod - **1** - and 1st/2nd gear selector rod - **2** - to dimension - **a** - = 250.5 ± 0.5 mm.

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Remove roller sleeve from transmission cover

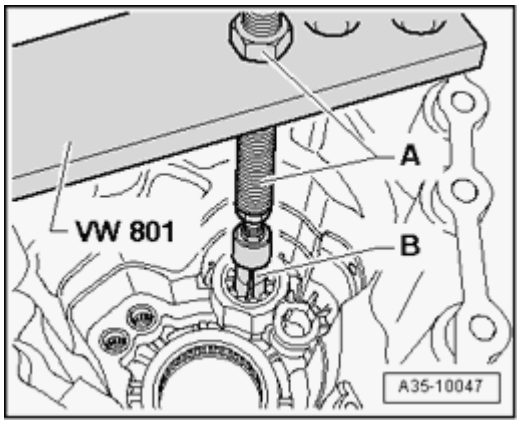

Fig. 115: Remove Roller Sleeve From Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Support , e.g. Kukko 22/2

B - Internal puller 30 to 37 mm , e.g. Kukko 21/4

- Remove peening indentations, if present.

NOTE:

- **Always replace roller sleeve after removing.**

Carefully press new roller sleeve into transmission cover to stop.

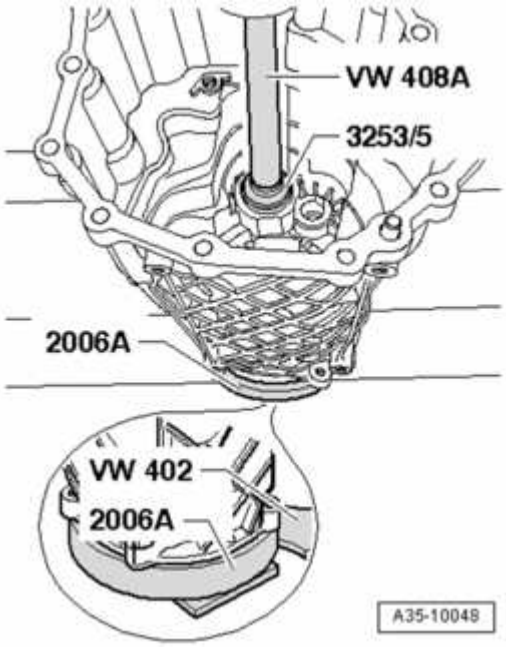

Fig. 116: Carefully Press New Roller Sleeve Into Transmission Cover To Stop.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Support transmission cover under bearing mount with thrust ring 2006 A.

- Secure roller sleeve after pressing into transmission cover with peen **Secure needle bearing and roller housing in transmission cover with peen**

Secure needle bearing and roller housing in transmission cover with peen

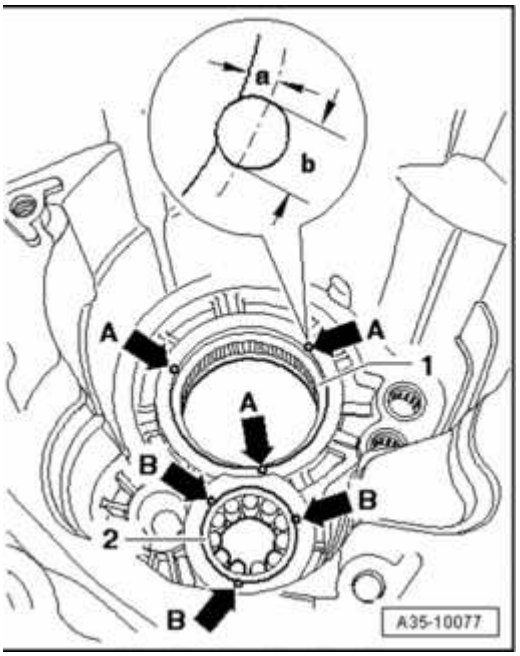

Fig. 117: Secure Needle Bearing And Roller Housing In Transmission Cover With Peen
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To peen, use blunt center punch with ball-shaped end (ball dia. 5 mm).
- Needle bearings - **1** - or roller sleeves - **2** - are secured with three peen marks each on the circumference every 120°- **arrow A** - or - **arrow B** -.

Observe position and dia. of peening points:

- Dimension - **a** - = 2 mm
- Dimension - **b** - = 3 mm

TRANSMISSION HOUSING, SERVICING

Transmission housing, servicing

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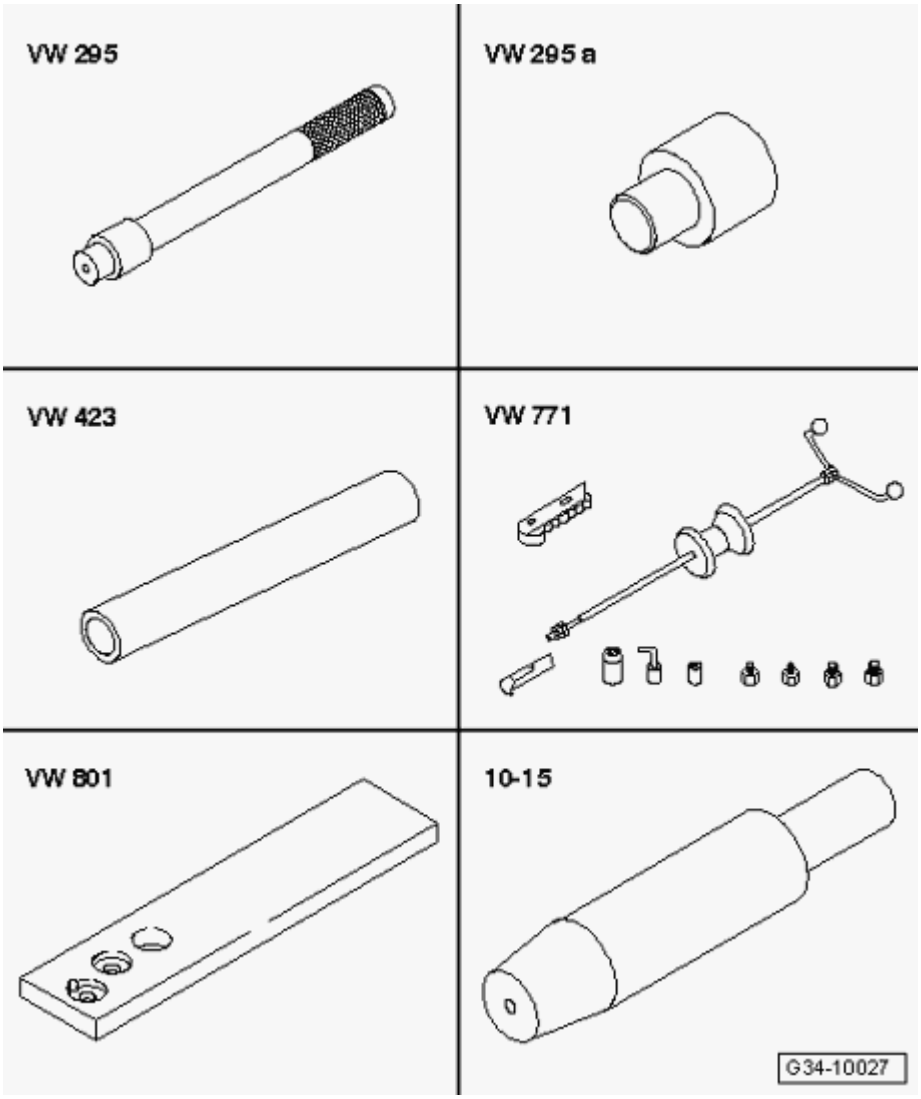

Fig. 118: Identifying Special Tools - Transmission Housing, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW 295
- Adapter VW 295 A
- Tube VW 423
- Slide Hammer-Complete Set VW 771

- Holding plate VW 801
- Guide pin 10 - 15

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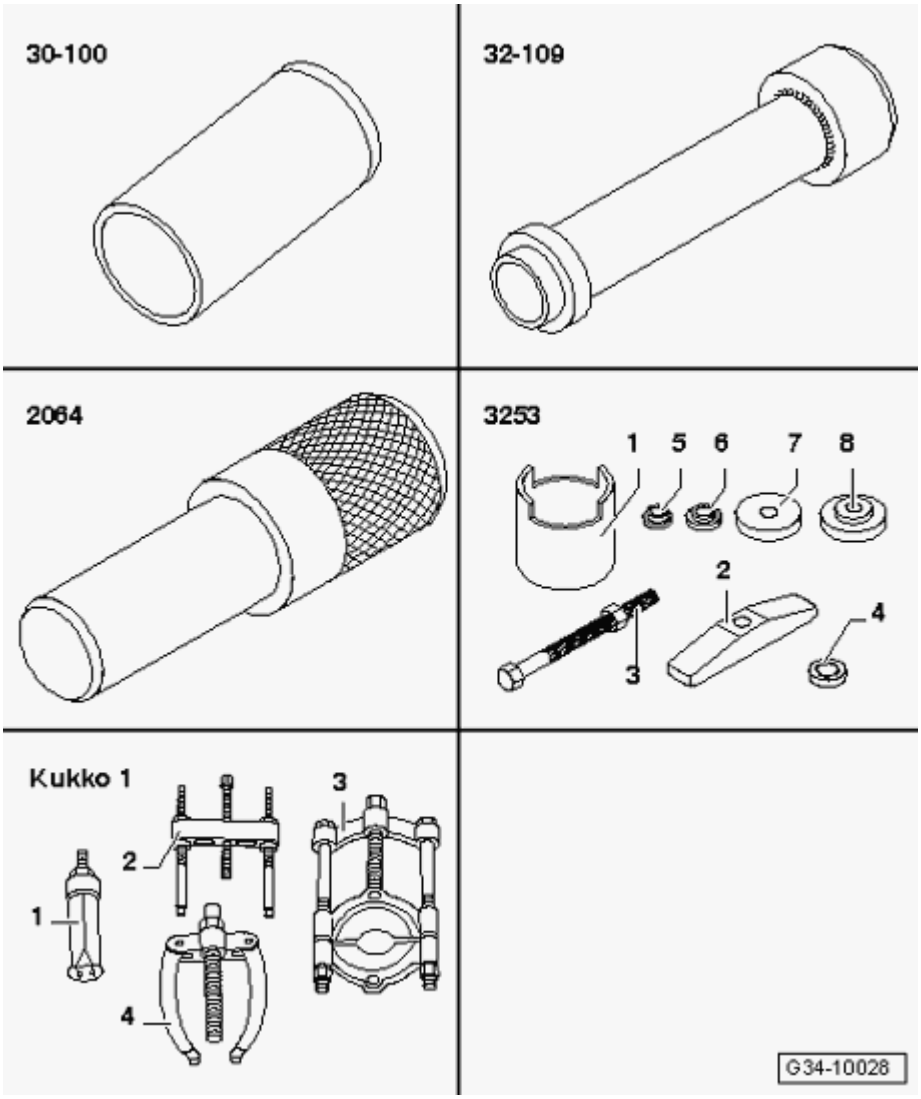

Fig. 119: Identifying Special Tools - Transmission Housing, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Seal driver-frt wheel bearing 30 - 100
- Driving sleeve 32 - 109
- Lock pin 2064
- Alignment fixture 3253

- Internal puller 3275
- - **1** - Internal extractor Kukko 21/2
- - **4** - Support Kukko 22/1
- - **4** - Support Kukko 22/2

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- Depth gauge

Special tools, testers and auxiliary items required

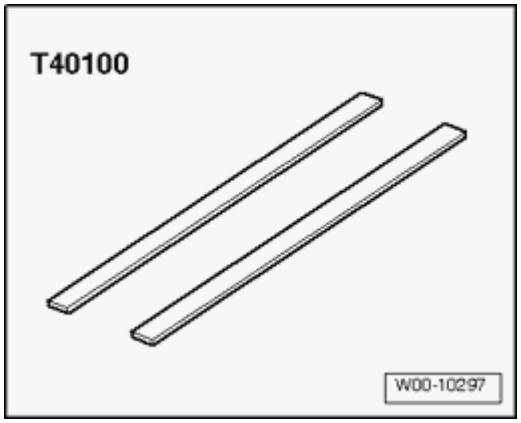

Fig. 120: Straight-Edge T 40100
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Straight-edge T 40100

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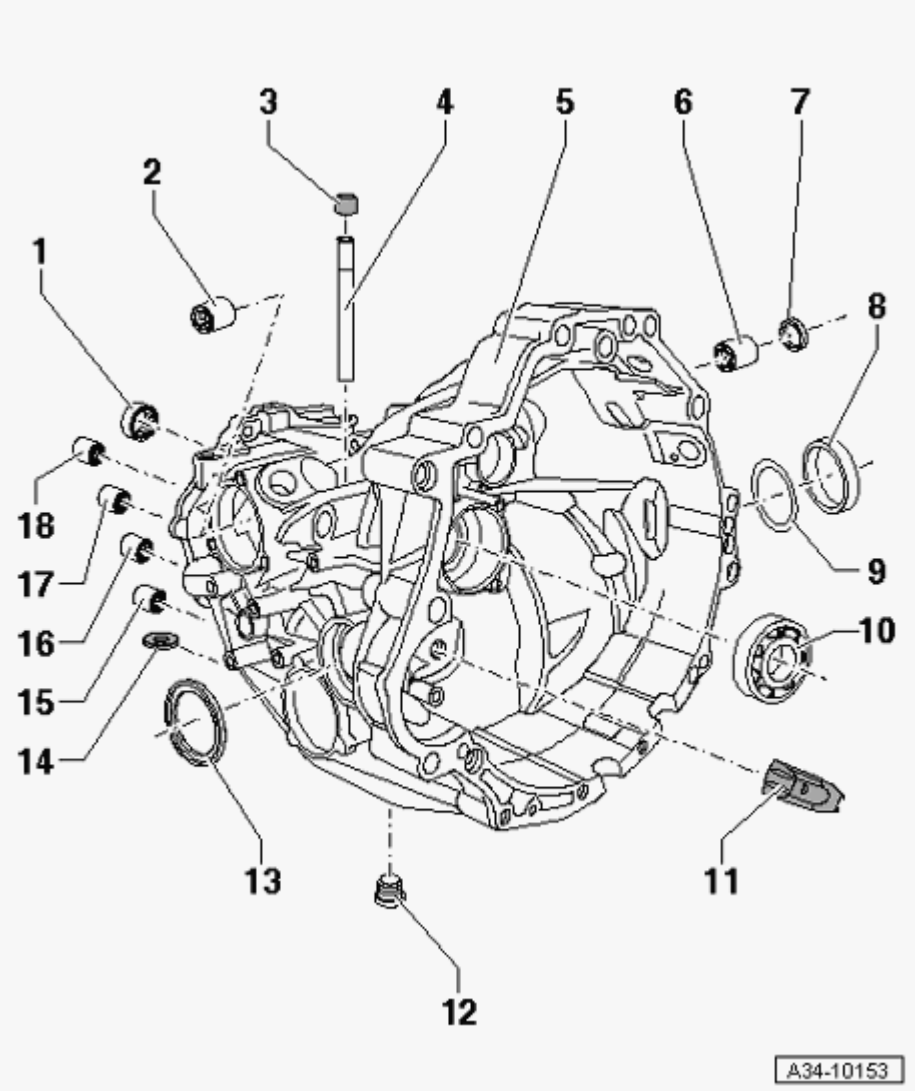

Fig. 121: Exploded View Of Transmission housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Needle bearing

- For input shaft
- Always replace
- Pulling out **Remove input shaft needle bearing from transmission housing**
- Driving in **Drive input shaft needle bearing into transmission housing**

- Measure drive-in depth **Measure needle bearing drive-in depth and secure needle bearing with peening**
- Secure after installing with peen **Measure needle bearing drive-in depth and secure needle bearing with peening**

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2 - Ball sleeve

- For selector shaft
- Pulling out **Remove selector shaft ball sleeve**
- Driving in and securing **Drive on selector shaft ball sleeve and secure with peening**

3 - Cap

- For transmission breather

4 - Breather pipe

- Installation dimension **Breather tube installation dimension**

5 - Transmission housing

- If replacing: Redetermine 2nd gear selector gear position --> **Shim " S 6 " for positioning 2nd gear selector gear, redetermining** , adjusting drive pinion and differential (gear set) --> **Adjustment overview**

6 - Ball sleeve

- For selector shaft
- Pulling out **Remove selector shaft ball sleeve**
- Driving in **Selector shaft ball sleeve, driving on**

7 - Sealing ring for selector shaft

- Can be replaced with transmission installed --> **34 CONTROLS, HOUSING**
- Always replace
- Removing with transmission removed **Selector shaft sealing ring, removing from disassembled transmission**
- Removing with transmission installed **Selector shaft sealing ring, removing from assembled transmission**
- Driving in **Driving in selector shaft seal**
- Only install with assembly sleeve 01E 311 120 with selector shaft installed

8 - Outer race/right tapered roller bearing

- For differential
- If replacing: Adjust differential (ring gear) --> **Ring gear, adjusting**

9 - Adjustment shim " S_2 "

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- Note thickness
- Adjustment overview --> **Adjustment overview**

10 - Grooved ball bearing

- For input shaft
- Removing off with transmission disassembled **Input shaft grooved ball bearing, removing from disassembled transmission**
- Removing with transmission removed, not disassembled --> **Input shaft grooved ball bearing, replacing in uninstalled but not disassembled transmission**
- Installing **Drive input shaft grooved ball bearing in to stop**

11 - Intermediate piece

- Replace if damaged

12 - Oil drain bore screw, 40 Nm

13 - Seal

- For right flange shaft
- Replace --> **Flange shaft seals, replacing**

14 - Magnet

- Clean
- Insert in housing rib

15 - Ball sleeve

- For reverse gear selector rod
- Pulling out --> **Remove selector rod ball sleeve - C -**
- Driving in **Drive in selector rod ball sleeve**
- Measure drive-in depth **Drive-in depth for ball sleeves in transmission housing**

16 - Ball sleeve

- For selector rod for 1st and 2nd gear
- Pulling out --> **Remove selector rod ball sleeve**
- Driving in **Drive in selector rod ball sleeve**
- Measure drive-in depth **Drive-in depth for ball sleeves in transmission housing**

17 - Ball sleeve

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- For selector rod for 3rd and 4th gear
- Pulling out --> **Remove selector rod ball sleeve**
- Driving in **Drive in selector rod ball sleeve**
- Measure drive-in depth **Drive-in depth for ball sleeves in transmission housing**

18 - Ball sleeve

- For selector rod for 5th and 6th gear
- Pulling out --> **Remove selector rod ball sleeve**
- Driving in **Drive in selector rod ball sleeve**
- Measure drive-in depth **Drive-in depth for ball sleeves in transmission housing**

Remove input shaft needle bearing from transmission housing

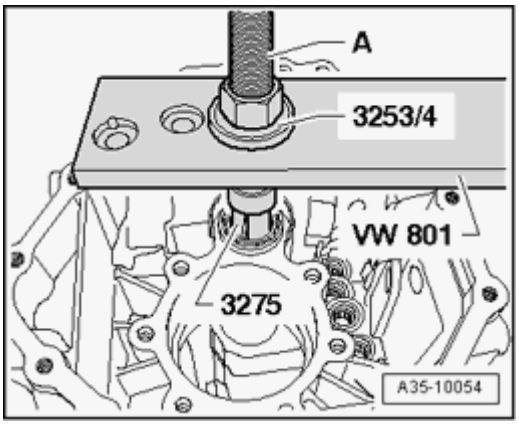

Fig. 122: Removing Input Shaft Needle Bearing From Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Support , e.g. Kukko 22/2

- Remove peening indentations, if present.

Drive input shaft needle bearing into transmission housing

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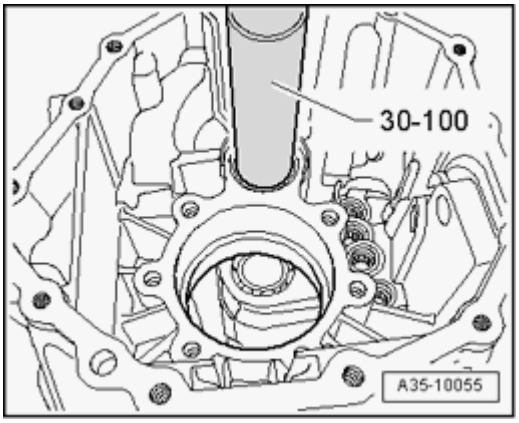

Fig. 123: Drive Input Shaft Needle Bearing Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install needle bearing with lettering on bearing (the side with thicker metal) facing towards sleeve 30 - 100.

Needle bearing drive-in depth **Measure needle bearing drive-in depth and secure needle bearing with peening**

Measure needle bearing drive-in depth and secure needle bearing with peening

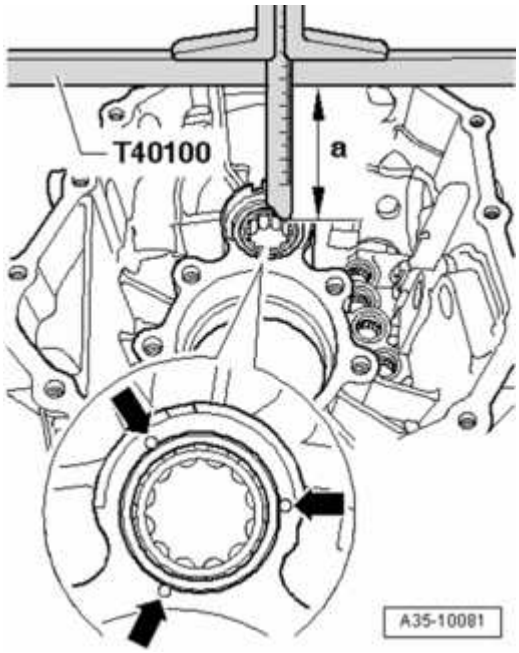

Fig. 124: Measure Needle Bearing Drive-In Depth And Secure Needle Bearing With Peening
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive-in dimension - **a** - = 88.0 ± 0.5 mm

- To peen, use blunt center punch with ball-shaped end (ball dia. 5 mm).
- Needle bearing is secured with three peening marks on circumference every 120°- **arrows** -.

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Remove selector shaft ball sleeve

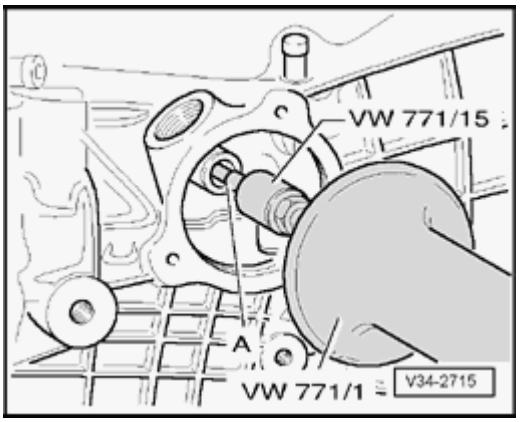

Fig. 125: Remove Selector Shaft Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal puller 14.5 to 18.5 mm , e.g. Kukko 21/2

- Remove peening indentations, if present.

Drive on selector shaft ball sleeve and secure with peening

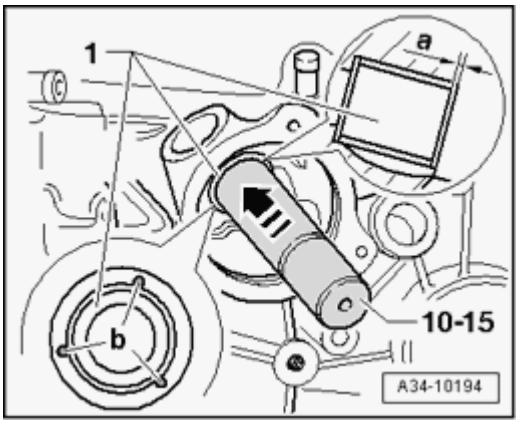

Fig. 126: Drive On Selector Shaft Ball Sleeve And Secure With Peening
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Set ball sleeve in place with inscribed side (thicker wall) facing toward guide pin 10 - 15.

- Drive in ball sleeve - **1** - to installation dimension - **a** - = 1.5 ± 0.5 mm below housing surface.

After driving on, secure ball sleeve with peening as follows:

- To peen, use blunt center punch with ball-shaped end.
- Secure ball sleeve with 3 peening marks - **b** - on circumference spaced every 120°.

Breather tube installation dimension

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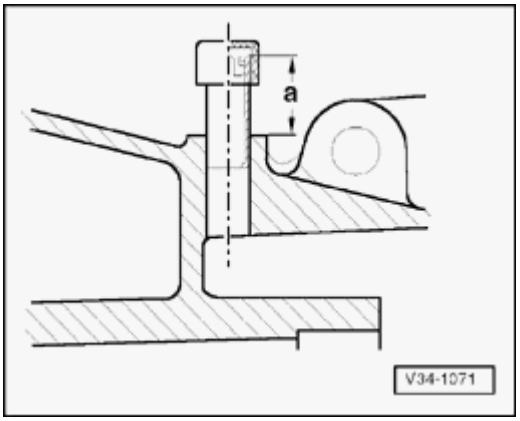

Fig. 127: Breather Tube Installation Dimension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Dimension - **a** - = 16.8 mm

Selector shaft sealing ring, removing from disassembled transmission

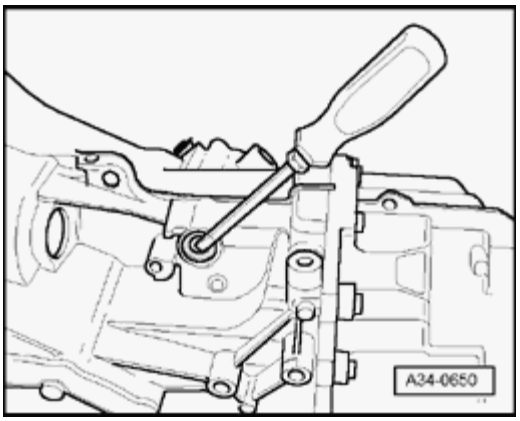

Fig. 128: Selector Shaft Sealing Ring, Removing From Disassembled Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry off sealing ring without damaging shaft.

Selector shaft sealing ring, removing from assembled transmission

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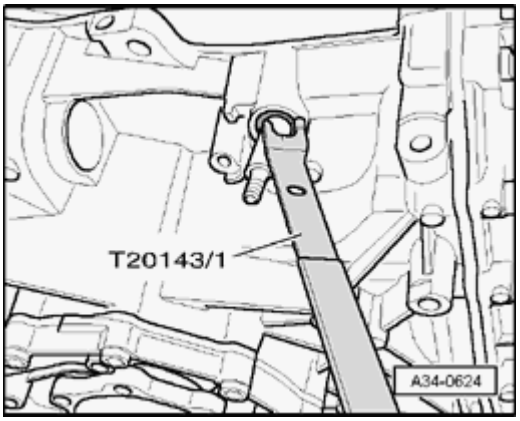

Fig. 129: Selector Shaft Sealing Ring, Removing From Assembled Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry out seal using a screwdriver.

Remove selector shaft ball sleeve

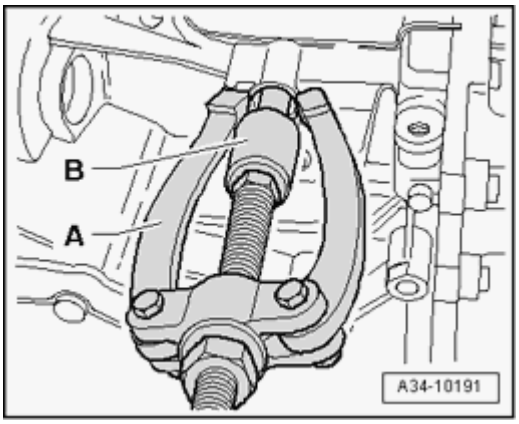

Fig. 130: Remove Selector Shaft Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Remove selector shaft sealing ring first **Selector shaft sealing ring, removing from disassembled transmission**

A - Support , e.g. Kukko 22/1

B - Internal puller 14.5 to 18.5 mm , e.g. Kukko 21/2

Selector shaft ball sleeve, driving on

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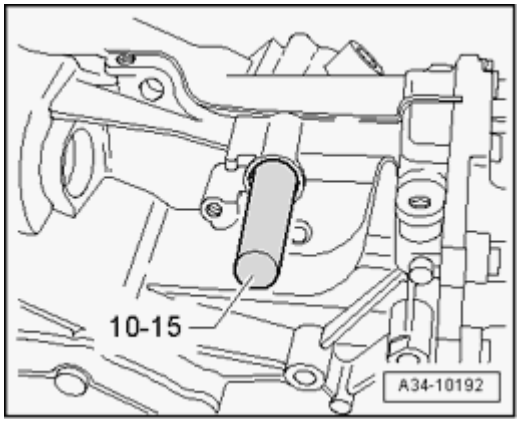

Fig. 131: Selector Shaft Ball Sleeve, Driving On
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive-in depth: 8.5 ± 0.5 mm below housing surface.

Driving in selector shaft seal

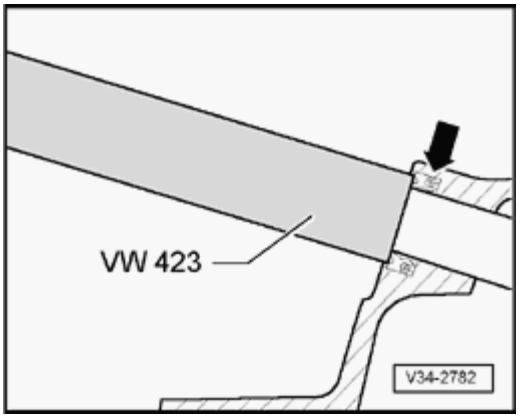

Fig. 132: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fill area between sealing lip and dust lip halfway with *sealing grease G 052 128 A1* .
- Lightly oil outer circumference of seal.
- Drive sealing ring - **arrow** - in 1.0 ± 0.2 mm below housing surface, do not tilt when doing so.

Input shaft grooved ball bearing, removing from disassembled transmission

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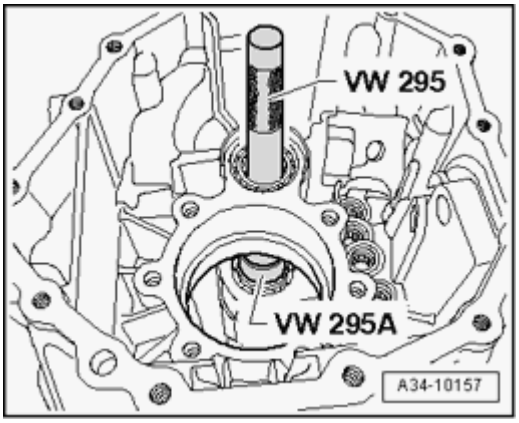

Fig. 133: Input Shaft Grooved Ball Bearing, Removing From Disassembled Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place adapter VW 295 A with small dia. in grooved ball bearing.
- Drive out grooved ball bearing.

Drive input shaft grooved ball bearing in to stop

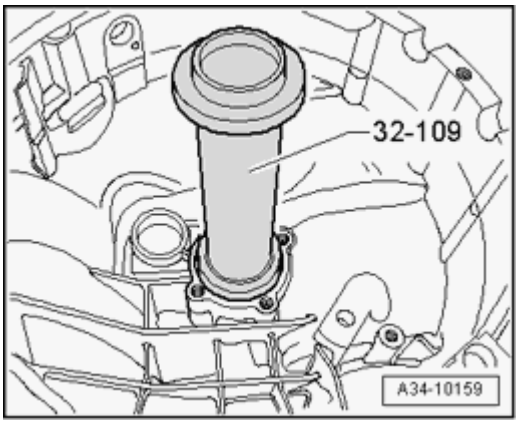

Fig. 134: Input Shaft Grooved Ball Bearing, Removing From Disassembled Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position:

Closed side of cage for balls points toward transmission housing.

- Drive grooved ball bearing in transmission housing to stop.

Remove selector rod ball sleeve - C -

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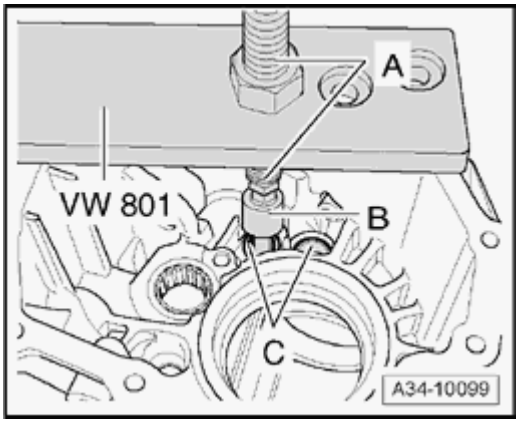

Fig. 135: Remove Selector Rod Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Support , e.g. Kukko 22/2

B - Internal puller 14.5 to 18.5 mm , e.g. Kukko 21/2

Drive in selector rod ball sleeve

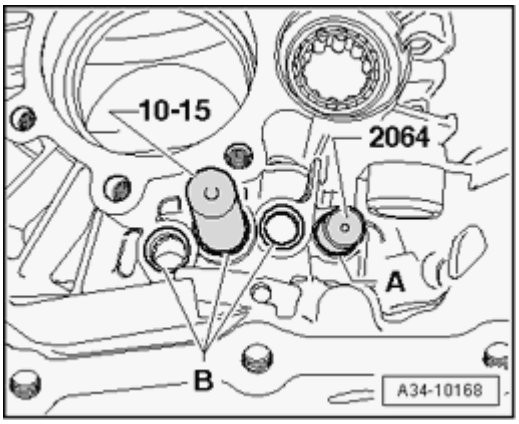

Fig. 136: Drive In Selector Rod Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive in ball sleeve - **A** - for 5th/6th gear selector rod with lock pin 2064 to installation dimension **Drive-in depth for ball sleeves in transmission housing**
- Drive in remaining 3 ball sleeves - **B** - with guide pin 10 - 15 to installation dimension **Drive-in depth for ball sleeves in transmission housing**.

Insert bearing sleeve in inscribed side (greater thickness) facing toward guide pin 10 - 15 or lock pin 2064.

Drive-in depth for ball sleeves in transmission housing

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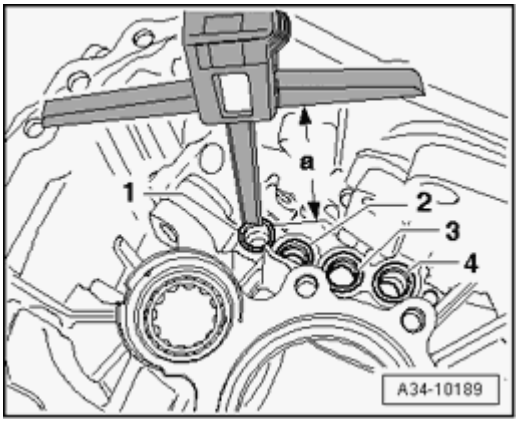

Fig. 137: Drive-In Depth For Ball Sleeves In Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive in 5th/6th gear selector rod ball sleeve - **1** - to dimension - **a** - = 143.5 ± 0.5 mm.
- Drive in 5th/6th gear selector rod ball sleeve - **2** - to dimension - **a** - = 133.5 ± 0.5 mm.
- Drive in 1st/2nd gear selector rod ball sleeve - **3** - to dimension - **a** - = 116.5 ± 0.5 mm.
- Drive in ball sleeve for reverse gear selector rod - **4** - to dimension - **a** - = 116.5 ± 0.5 mm.

NOTE:

- **Measure with a depth gauge from housing joint surface to respective ball sleeve.**

35 - GEARS, SHAFTS

INPUT SHAFT

Input shaft, assembly overview

Disassembling and assembling input shaft, assembly sequence --> **Input shaft, disassembling and assembling - assembly sequence**

NOTE:

- **When installing new gears, note technical data --> 00 TECHNICAL DATA .**
- **When replacing synchronizer rings, the intermediate ring and synchronizer ring for the respective gear must be replaced together.**
- **Insert all bearings and synchronizer rings on input shaft with transmission fluid.**
- **On transmissions with spring-loaded shifter forks --> 3rd/4th gear selector rod with spring-loaded shift fork - arrow - , items 8, 11 to 14, 18 to 21, 25, 28 to 31 and 34 to 37 were changed.**

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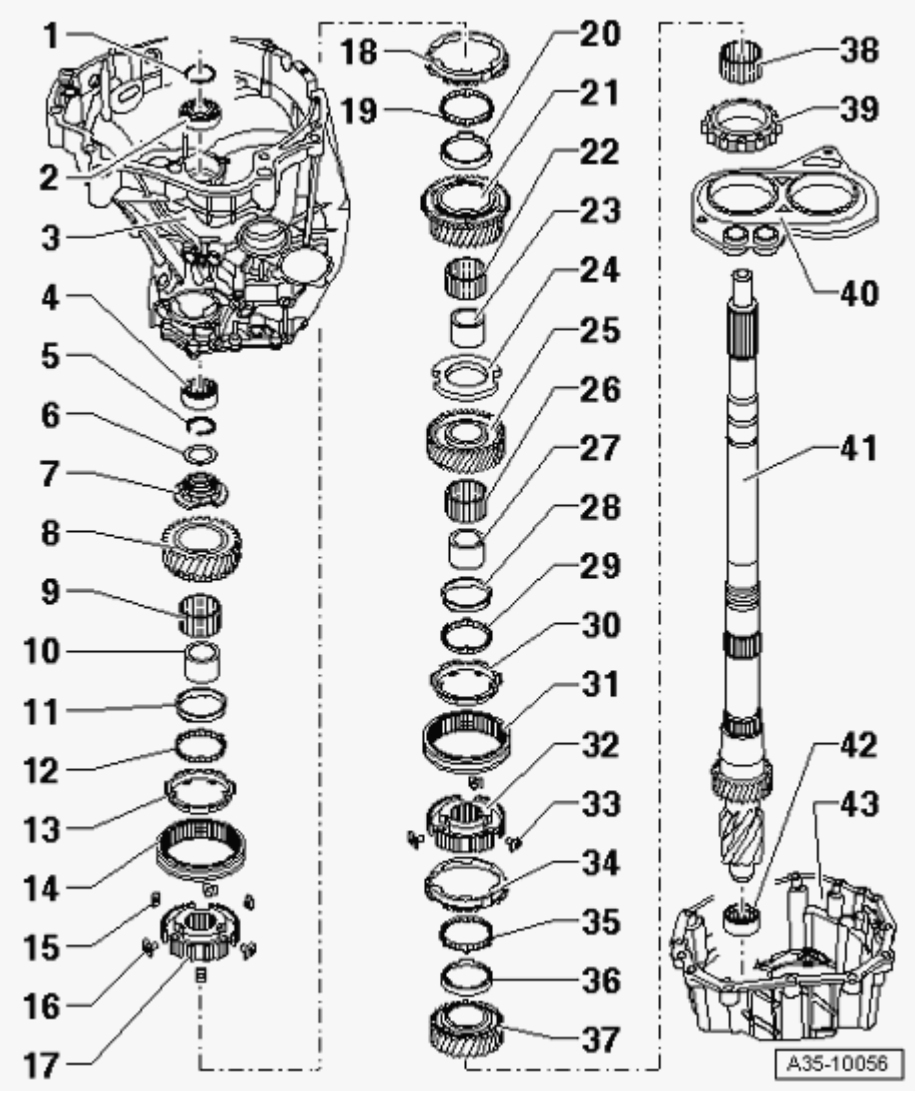

Fig. 138: Input Shaft, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Circlip

2 - Grooved ball bearing

- Replacing with transmission removed, not disassembled --> **Input shaft grooved ball bearing, replacing in uninstalled but not disassembled transmission**

3 - Transmission housing

4 - Needle bearing

5 - Circlip

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- Determine thickness --> **Determine thickness of circlip and shim as follows:**

6 - Washer

- Determine thickness --> **Determine thickness of circlip and shim as follows:**

7 - Twelve-point nut, 75 Nm

- Has left threads

8 - Drive gear for 4th gear

9 - Needle bearing

- For 4th gear

10 - Inner race/needle bearing

- For 4th gear selector gear

11 - Inner race for 4th gear

- Installed location **Installation location of synchronizer rings for 3rd to 6th gears**
- Replace if grooved or scored

12 - Intermediate ring for 4th gear

- Installed location **Installation location of synchronizer rings for 3rd to 6th gears**
- Checking for wear **Synchronizer rings for 3rd to 6th gears, checking for wear**

13 - Synchronizer ring for 4th gear

- Installed location **Installation location of synchronizer rings for 3rd to 6th gears**
- Checking for wear **Synchronizer rings for 3rd to 6th gears, checking for wear**
- Replace if grooved or scored

14 - Locking collar for 3rd and 4th gear

- Assembling locking collar/synchronizer hub **Assembly of locking collar/synchronizer hub for 3rd and 4th gear**

15 - Locking piece

- Installation position: insert with convex side in locking collar **Assembly of locking collar/synchronizer hub for 3rd and 4th gear**

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- Installing locking pieces (qty. 3) **Assembly of locking collar/synchronizer hub for 3rd and 4th gear**

16 - Thrust plate

- Installing thrust pieces (3x) **Assembly of locking collar/synchronizer hub for 3rd and 4th gear**

17 - Synchronizer hub for 3rd and 4th gears

- Pressing off
- Pressing on
- Installation position: small shoulder on collar faces toward 3rd gear **3rd/4th gear synchronizer hub installation location**
- Assembling locking collar/synchronizer hub **Assembly of locking collar/synchronizer hub for 3rd and 4th gear**

18 - Synchronizer ring for 3rd gear

- Installed location **Installation location of synchronizer rings for 3rd to 6th gears**
- Checking for wear **Synchronizer rings for 3rd to 6th gears, checking for wear**
- Replace if grooved or scored

19 - Intermediate ring for 3rd gear

- Installed location **Installation location of synchronizer rings for 3rd to 6th gears**
- Checking for wear **Synchronizer rings for 3rd to 6th gears, checking for wear**

20 - Inner race for 3rd gear

- Installed location **Installation location of synchronizer rings for 3rd to 6th gears**
- Replace if grooved or scored

21 - Drive gear for 3rd gear

22 - Needle bearing

- For 3rd gear

23 - Inner race/needle bearing

- For 3rd gear selector gear

24 - Thrust washer

- For 3rd and 6th gear selector gears

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25 - Selector gear for 6th gear

26 - Needle bearing

- For 6th gear

27 - Inner race/needle bearing

- For 6th gear selector gear

28 - Inner race for 6th gear

- Installed location **Installation location of synchronizer rings for 3rd to 6th gears**
- Replace if grooved or scored

29 - Intermediate ring for 6th gear

- Installed location **Installation location of synchronizer rings for 3rd to 6th gears**
- Checking for wear **Synchronizer rings for 3rd to 6th gears, checking for wear**

30 - Synchronizer ring for 6th gear

- Installed location **Installation location of synchronizer rings for 3rd to 6th gears**
- Checking for wear **Synchronizer rings for 3rd to 6th gears, checking for wear**
- Replace if grooved or scored

31 - Locking collar for 5th and 6th gear

- Assembling locking collar/synchronizer hub **Assembly of locking collar/synchronizer hub for 5th and 6th gear**

32 - Synchronizer hub for 5th and 6th gears

- Installation position: High inner collar faces 5th gear gear-wheel
- Pressing off
- Pressing on
- Assembling locking collar/synchronizer hub **Assembly of locking collar/synchronizer hub for 5th and 6th gear**

33 - Thrust plate

- Installing thrust pieces (3x) **Assembly of locking collar/synchronizer hub for 5th and 6th gear**

34 - Synchronizer ring for 5th gear

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- Installed location **Installation location of synchronizer rings for 3rd to 6th gears**
- Checking for wear **Synchronizer rings for 3rd to 6th gears, checking for wear**
- Replace if grooved or scored

35 - Intermediate ring for 5th gear

- Installed location **Installation location of synchronizer rings for 3rd to 6th gears**
- Checking for wear **Synchronizer rings for 3rd to 6th gears, checking for wear**

36 - Inner race for 5th gear

- Installed location **Installation location of synchronizer rings for 3rd to 6th gears**
- Replace if grooved or scored

37 - Drive gear for 5th gear

38 - Needle bearing

- For 5th gear

39 - Roller bearing

- For input shaft
- Do not interchange with hollow shaft roller bearing
- Pressing off
- Pressing on

40 - Bearing bracket

- Roller bearing outer race must not have any radial play in bearing bracket

41 - Input shaft

- Differentiation of input shafts **Differentiation of input shafts**
- Change: with additional PTFE washer for 5th gear needle bearing system **Differentiation of input shafts**

42 - Roller sleeve

- For input shaft mounting in transmission cover
- Always replace

43 - Transmission cover

Differentiation of input shafts

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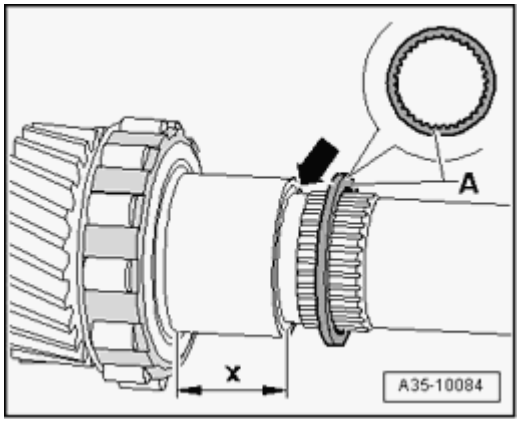

Fig. 139: Differentiation Of Input Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Dimension x = 31 mm on an input shaft without PTFE washer

Dimension x = 29 mm on an input shaft with PTFE washer - **A** -

NOTE:

- **After removing 5th gear needle bearing, slide PTFE washer - A - onto input shaft - arrow - to stop.**

Input shaft, disassembling and assembling - assembly sequence

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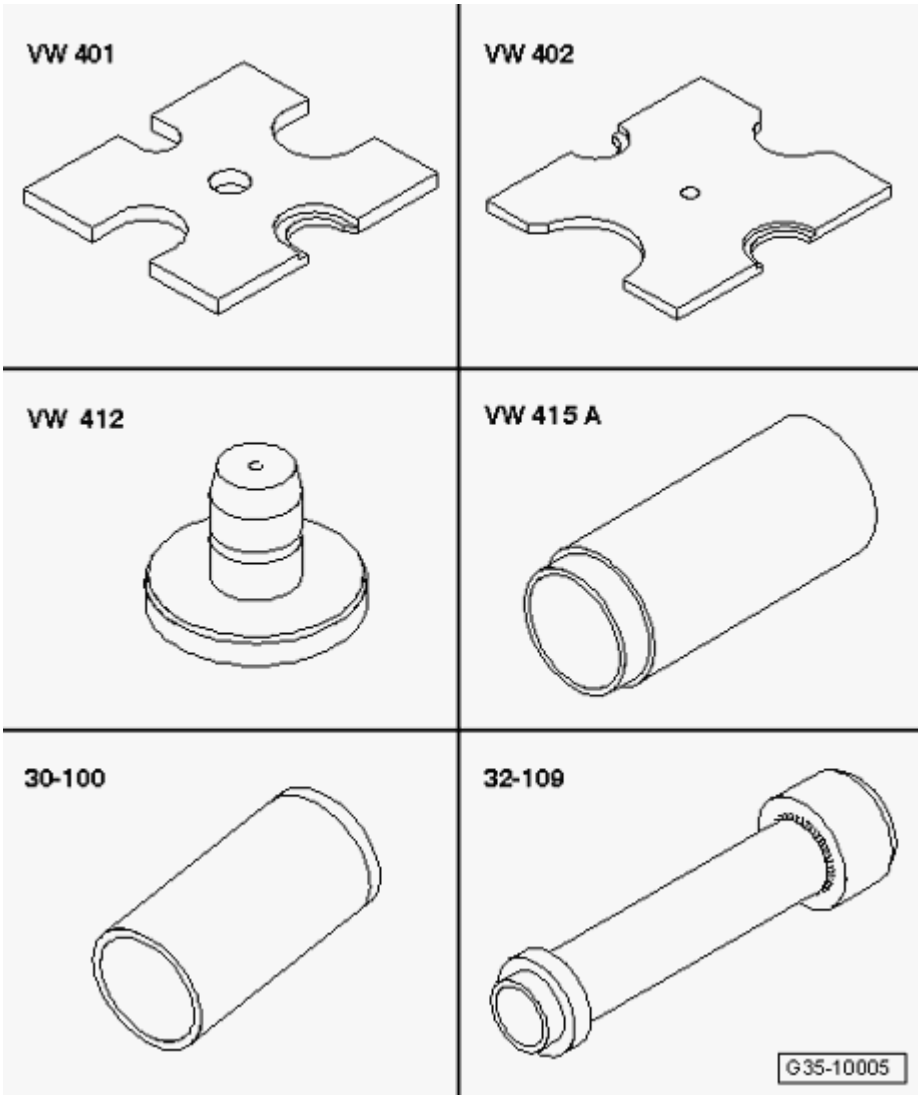

Fig. 140: Identifying Special Tools - Input Shaft, Disassembling And Assembling - Assembly Sequence (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust plate VW 402
- Punch VW 412
- Tube VW 415 A

- Seal driver-frt wheel bearing 30 - 100
- Driving sleeve 32 - 109

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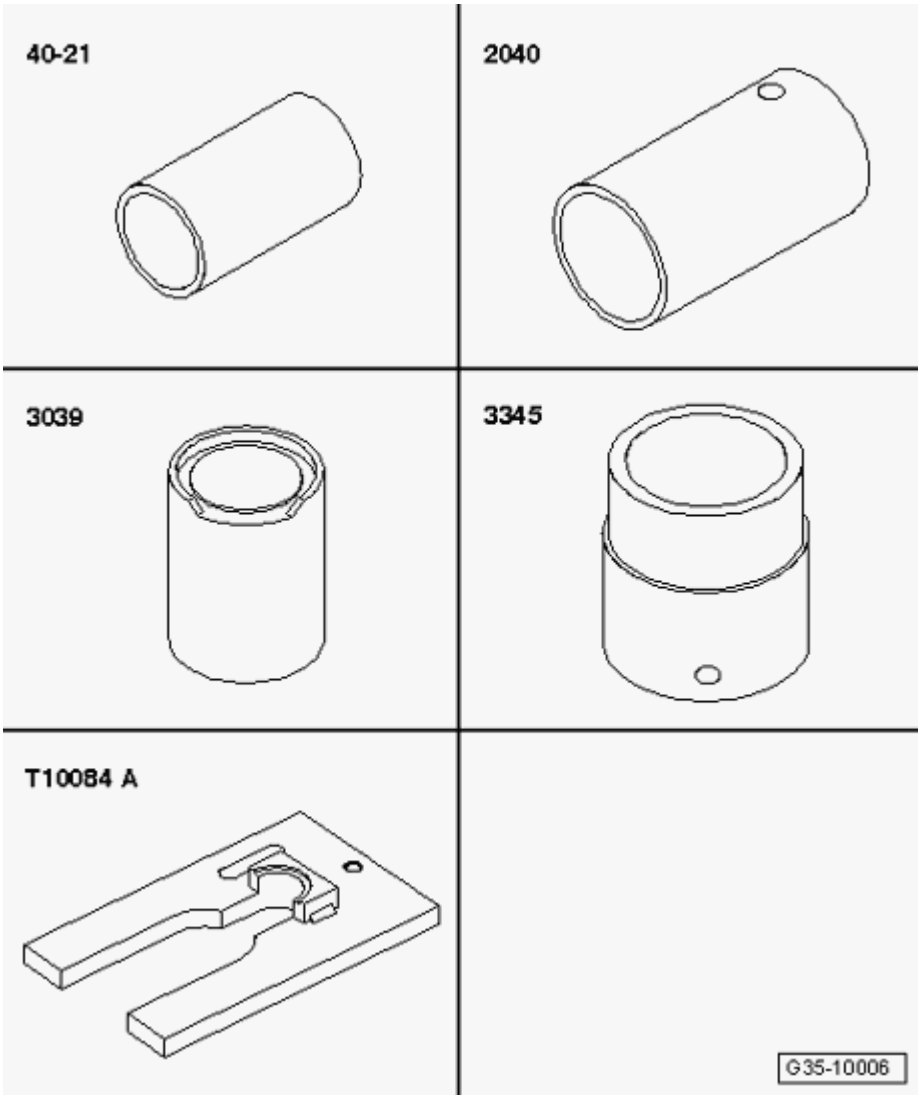

Fig. 141: Identifying Special Tools - Input Shaft, Disassembling And Assembling - Assembly Sequence (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Seal driver-frt wheel bearing 40 - 21
- Tube 2040
- Guide sleeve 3039
- Tube for wheel bearing 3345
- Thrust plate T10084 A
- Feeler gauge

Special tools, testers and auxiliary items required

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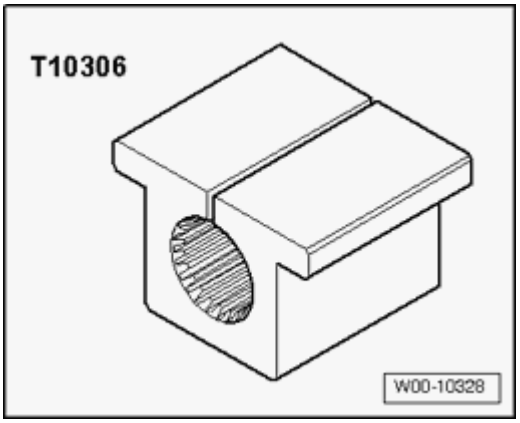

Fig. 142: Clamp T10306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp T10306

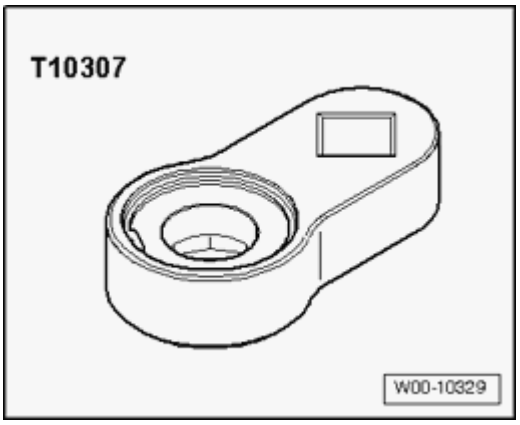

Fig. 143: Wrench T10307
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Wrench T10307

Input shaft, disassembling

- With input shaft removed, you must first remove circlip and washer in front of twelve-point nut.

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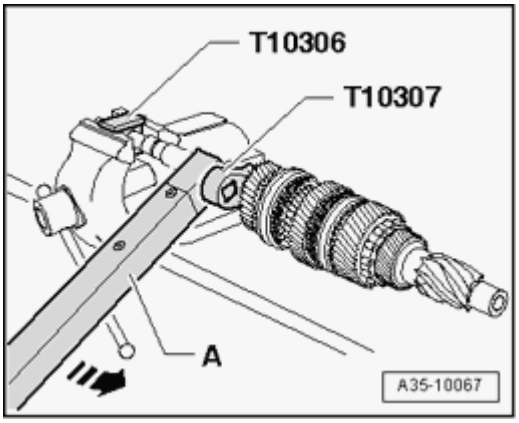

Fig. 144: Placing Key T10307 On Twelve-Point Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place key T10307 on twelve-point nut.
- For the following step, the input shaft must be inserted in the clamp T10306 with clutch plate splines and clamped into a vise.

A - Torque wrench

NOTE:

- **Due to the input shafts center of gravity, it must be supported, e.g. by a second technician.**
- **The twelve-point nut has left threads and it must be turned clockwise to loosen.**

- Remove twelve-point nut in direction of - **arrow** -.
- Then remove 4th gear selector gear with needle bearing and synchronizer ring.

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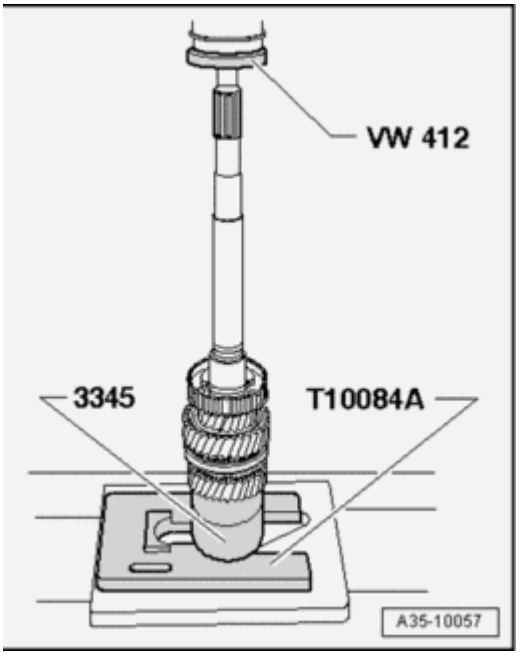

Fig. 145: Pressing Of 3rd, 5th And 6th Gear Selector Gears Together With Synchronizer Hub And Inner Races/Needle Bearings
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press of 3rd, 5th and 6th gear selector gears together with synchronizer hub and inner races/needle bearings.

NOTE:

- **Pressing force may be up to 200 kN (20 t).**

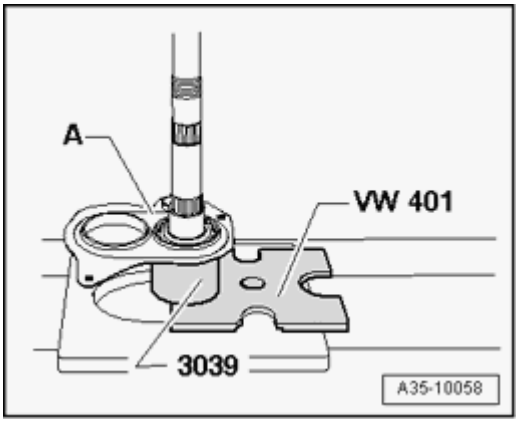

Fig. 146: Placing Bearing Bracket Over Roller Bearing On Input Shaft So That Rollers Are Not Pressed Out Of Bearing Cage
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place bearing bracket - **A** - over roller bearing on input shaft so that the rollers are not pressed out of the bearing cage.
- Press roller bearing off input shaft.

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- Clean twelve-point nut threads on input shaft from locking compound residue.

Input shaft, assembling

NOTE:

- **Clean thread on input shaft.**
- **Lubricate all needle bearings and synchronizer rings with transmission fluid before inserting.**
- **Before pressing needle bearing inner races off, warm to a maximum of 130°C while wearing protective gloves.**
- **Warm synchronizer ring before pressing off to a maximum of 100°C while wearing protective gloves.**
- **Always press roller bearing, needle bearing inner races and synchronizer body to stop so that selector gears have the recommended axial clearance.**

Synchronizer rings for 3rd to 6th gears, checking for wear

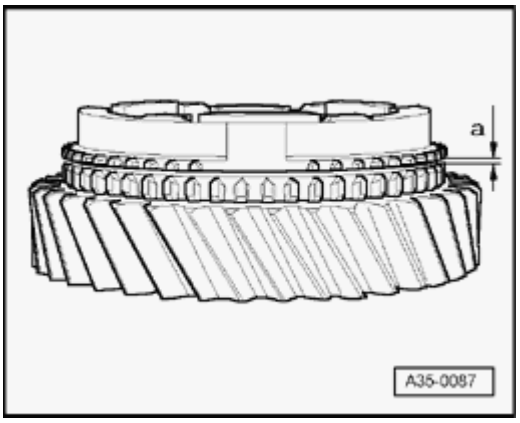

Fig. 147: Checking Synchronizer Ring For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check inner race on outer friction surface arrow for scoring or signs of wear, replace if necessary.
- Check synchronizer ring on inner friction surface arrow for scoring or signs of wear, replace if necessary.
- Place inner race, intermediate ring and synchronizer ring on selector gear taper and screw in.

NOTE:

- **Screw in means: Turn synchronizer ring approx. one turn while pressing on the ring at the same time.**

- Then measure gap - **a** - with a feeler gauge.

Gap dimension - a -	Wear limit
3rd to 6th gears	0.7 mm

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NOTE:

- **Replace inner race, intermediate ring and synchronizer ring for the respective gear together.**

Installation location of synchronizer rings for 3rd to 6th gears

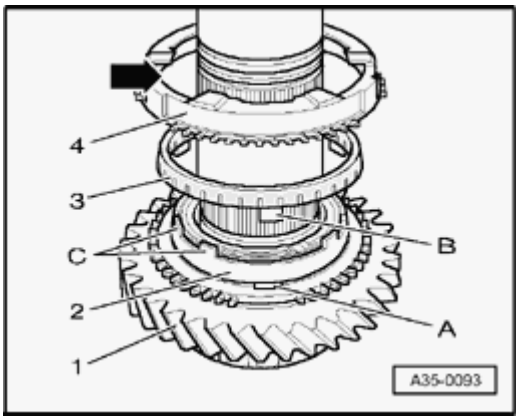

Fig. 148: Installation Position Of Synchronizer Rings For 1st And 2nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **If the components are not to be replaced, make sure they are reallocated to their original gear.**

- Place inner race - **2** - on sliding gear - **1** -.
- Install intermediate ring - **3** -. Tab - **B** - must be inserted into recess - **A** -.
- Insert synchronizer ring - **4** -. Guide tabs - **C** - through recess - **arrow** -.

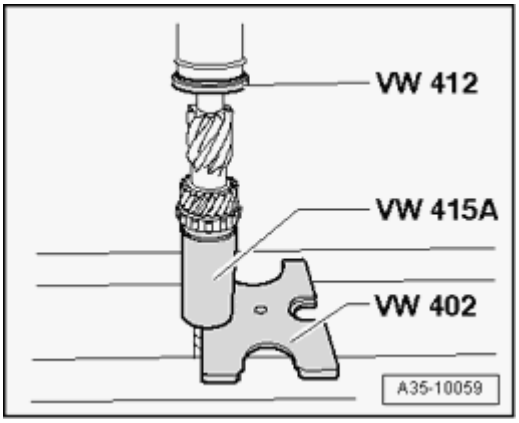

Fig. 149: Pressing Roller Bearing Onto Input Shaft To Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press roller bearing onto input shaft to stop, shoulder of tube VW 415 A faces toward roller bearing when doing so.
- Insert 5th gear selector gear together with needle bearing and synchronizer ring.

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With an input shaft with additional PTFE washer **Differentiation of input shafts** you must now insert PTFE washer.

Assembly of locking collar/synchronizer hub for 5th and 6th gear

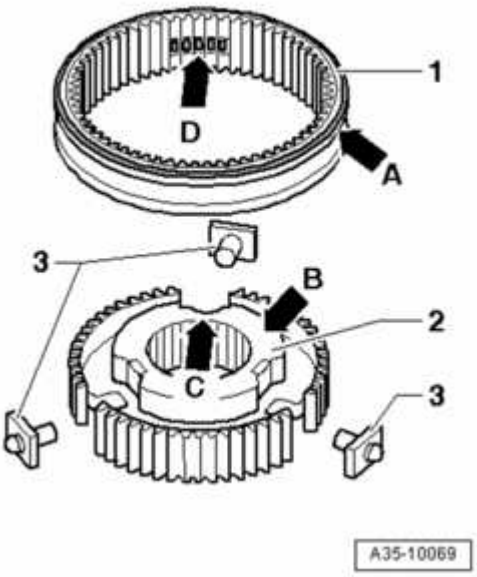

Fig. 150: Assembly Of Locking Collar/Synchronizer Hub For 5th And 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide locking collar - **1** - over synchronizer hub - **2** -.

- Groove - **arrow A** - on locking collar and high inner shoulder - **arrow B** - on synchronizer hub must face toward 5th gear selector gear.
- Recesses - **arrow C** - for thrust pieces - **3** - in synchronizer hub and notches - **arrow D** - in locking collar must align.

- Then place thrust pieces - **3** - in synchronizer hub and press thrust pieces into notches in locking collar.

Pressing on synchronizer hub with locking collar for 5th and 6th gears

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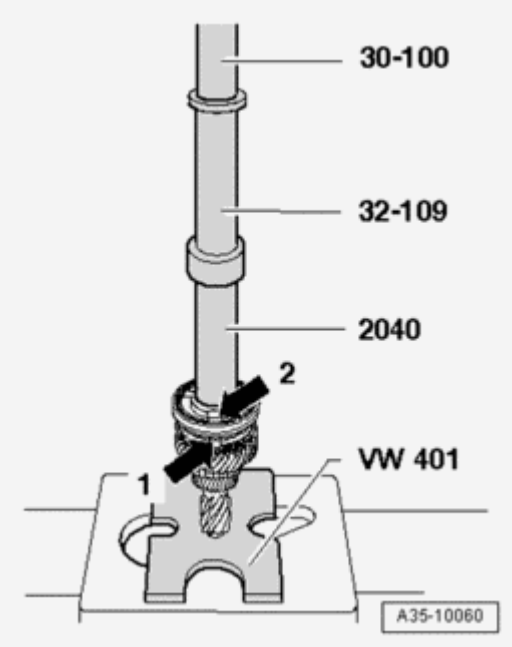

Fig. 151: Pressing On Synchronizer Hub With Locking Collar For 5th And 6th Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Note the follow when performing the next steps:

- Synchronizer hub installation location: High inner collar faces 5th gear gear-wheel

  - Place input shaft in hole in pressure plate VW 401.
  - Place pressing tool in center of warmed components (synchronizer hub and needle bearing inner races).
  - After pressing briefly on components, stop and align pressing tool again at center and press to stop.

- On an input shaft with PTFE washer , washer must be inserted before pressing 5th/6th gear synchronizer hub.
- When pressing, synchronizer ring tabs - **arrow 1** - and notches - **arrow 2** - on synchronizer hub must align.

Inner race/needle bearing - arrow A - for 6th gear selector gear, pressing on

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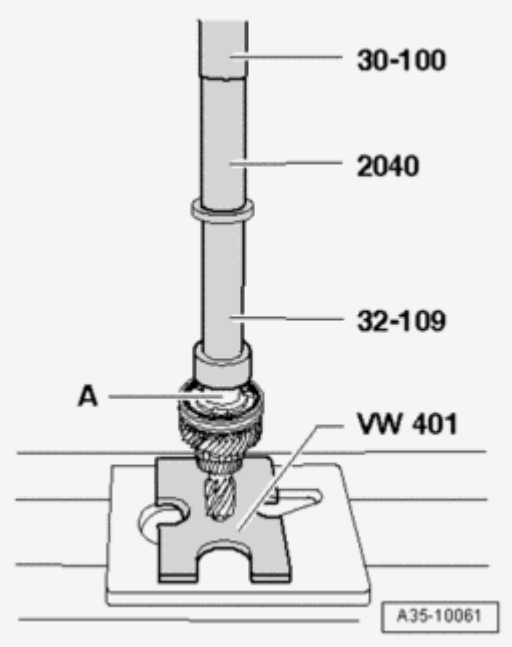

Fig. 152: Inner Race/Needle Bearing For 6th Gear Selector Gear, Pressing On
Courtesy of VOLKSWAGEN UNITED STATES, INC.

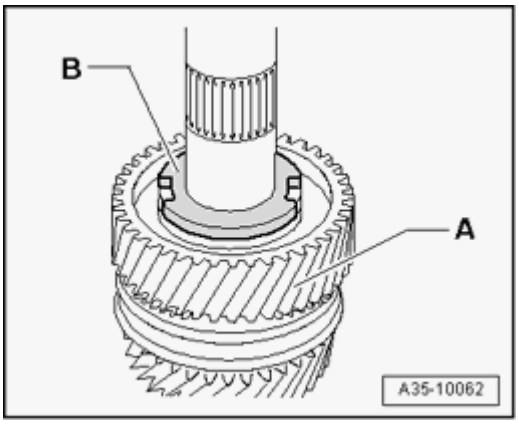

Fig. 153: Removing 6th Gear Selector Gear Together With Needle Bearing And Synchronizer Rings
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 6th gear selector gear - **A** - together with needle bearing and synchronizer rings.
- Place 3rd and 6th gear selector gears thrust washer - **B** - on 6th gear selector gear.

Inner race/needle bearing - arrow A - for 3rd gear selector gear, pressing on

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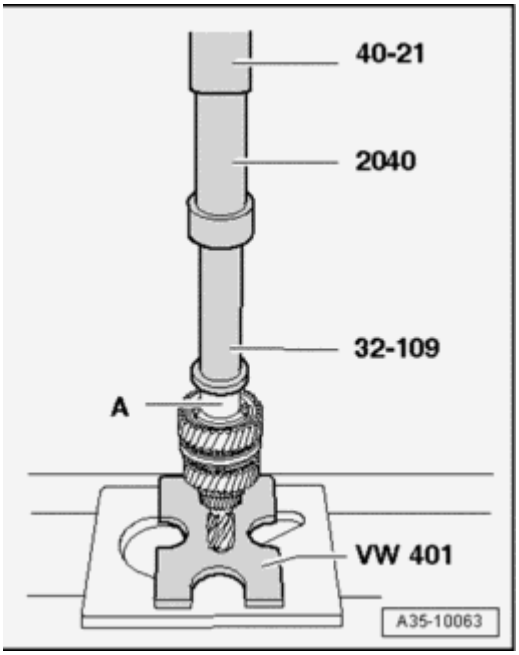

Fig. 154: Inner Race/Needle Bearing For 3rd Gear Selector Gear, Pressing On
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 3rd gear selector gear together with needle bearing and synchronizer ring.

3rd/4th gear synchronizer hub installation location

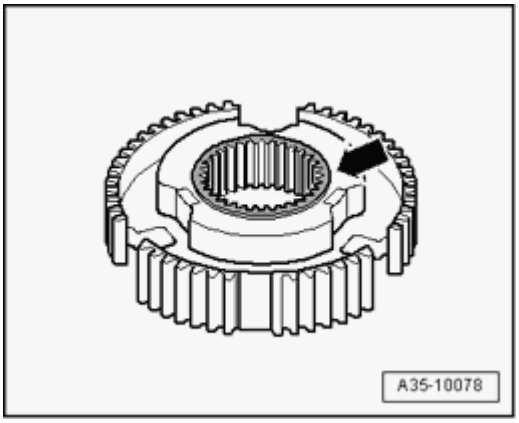

Fig. 155: 3rd/4th Gear Synchronizer Hub Installation Location
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Synchronizer hub shoulder - **arrow** - must face toward 3rd gear selector gear.

Pressing on synchronizer hub for 3rd and 4th gears

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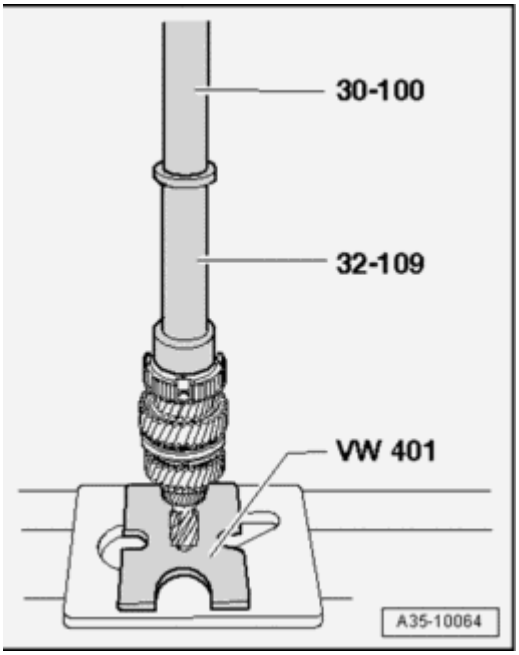

Fig. 156: Pressing On Synchronizer Hub For 3rd And 4th Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Note installation location of synchronizer hub **3rd/4th gear synchronizer hub installation location**
- When pressing on, synchronizer ring tabs and synchronizer hub recesses must align.

3rd/4th gear locking collar installation location

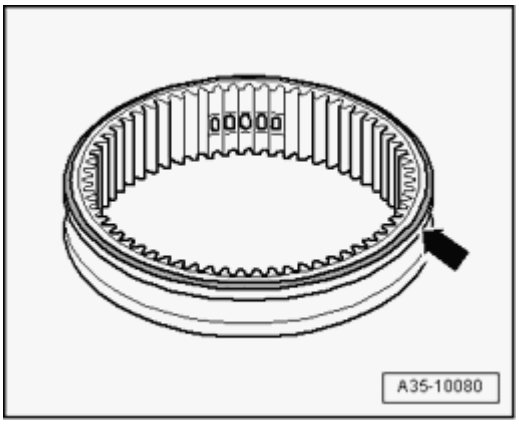

Fig. 157: 3rd/4th Gear Locking Collar Installation Location
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Groove - **arrow** - on locking collar must face toward 3rd gear selector gear.

Assembly of locking collar/synchronizer hub for 3rd and 4th gear

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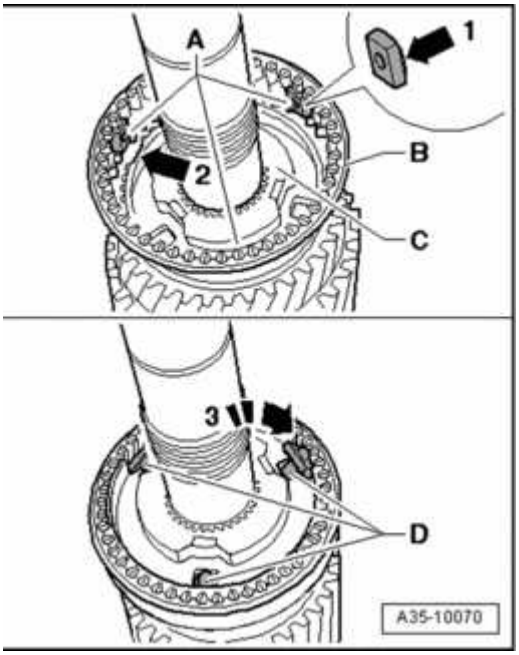

Fig. 158: Assembly Of Locking Collar/Synchronizer Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3rd and 4th gear synchronizer hub is pressed on.

  - Coat 3 locking pieces - **A** - with some grease on convex side - **arrow 1** -.
  - Insert 3 locking pieces with convex side in recesses in locking collar - **B** -.

- Note locking collar installation location **3rd/4th gear locking collar installation location**

  - Then place locking collar over synchronizer hub - **C** - so that the synchronizer hub recesses - **arrow 2** - align with locking pieces.
  - Then place thrust pieces - **D** - in synchronizer hub and press them in direction of - **arrow 3** - into recesses in locking collar. When doing so, locking collar must be held in middle position.

Inner race/needle bearing for 4th gear selector gear, pressing on

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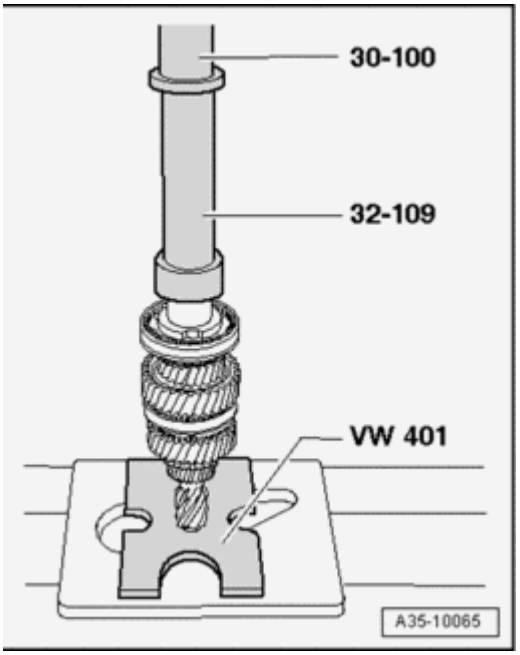

Fig. 159: Inner Race/Needle Bearing For 4th Gear Selector Gear, Pressing On
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 4th gear selector gear together with needle bearing and synchronizer ring.
- Clean threads of twelve-point nut that was removed.
- Hand-tighten twelve-point nut on input shaft.

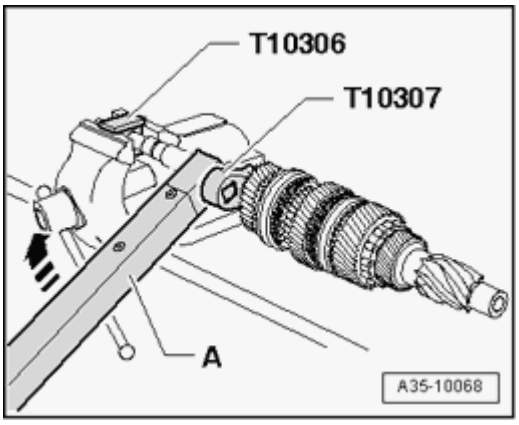

Fig. 160: Place Key T10307 On Twelve-Point Nut.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place key T10307 on twelve-point nut.
- For the following step, the input shaft must be inserted in clamp T10306 with clutch plate splines and clamped into a vise.

NOTE:

- **Due to the input shafts center of gravity, it must be supported, e.g. by a second technician.**

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- **Twelve-point nut has left threads and so must be turned counterclockwise to tighten.**

A - Torque wrench

- Tighten twelve-point nut in direction of - **arrow** - to 75 Nm.
- Check all selector gears for ease of movement and axial play.

- Selector gear axial play must be at least 0.10 mm.

Determine thickness of circlip - 1 - and shim - 2 - as follows:

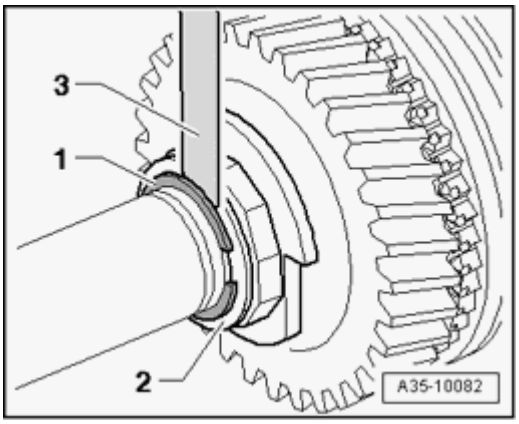

Fig. 161: Determine Thickness Of Circlip And Shim -
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure a gap of 0.10 mm max. between the shim available as a replacement part and circlips, measured between circlip and shim.
- Check gap with a feeler gauge - **3** -.

NOTE:

- **When measuring, circlip - 1 - must be fully seated in groove.**

The following circlips are available:

Circlip thickness (mm)		
1.70	1.80	1.90
1.75	1.85	

The following shims are available:

Shim thickness (mm)		
0.9	1.1	1.3
1.0	1.2	

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- Install shim and circlip.

DRIVE PINION AND HOLLOW SHAFT

Drive pinion and hollow shaft, assembly overview

Drive pinion, disassembling and assembling --> **Drive pinion, disassembling and assembling**

Hollow shaft, disassembling and assembling --> **Hollow shaft, disassembling and assembling**

NOTE:

- **When installing new gears or gear set, note technical data --> 00 TECHNICAL DATA .**
- **Insert all needle bearings and synchronizer rings with transmission fluid.**
- **When replacing synchronizer rings, the intermediate ring and synchronizer ring for the respective gear must be replaced together.**
- **If the synchronizer rings are not to be replaced, make sure they are reallocated to their original gear. Do not interchange reverse gear synchronizer rings with 1st and 2nd gear synchronizer rings --> Differentiation of reverse gear synchronization rings and 1st/2nd gear.**
- **Items 22 to 29, 32 and 49 were changed in the version with selector rod for 1st/2nd gear with spring-loaded shift fork --> 1st/2nd gear selector rod with spring-loaded shift fork.**
- **Adjustments are required when replacing components marked with 1) . List of adjustments --> Adjustment overview.**

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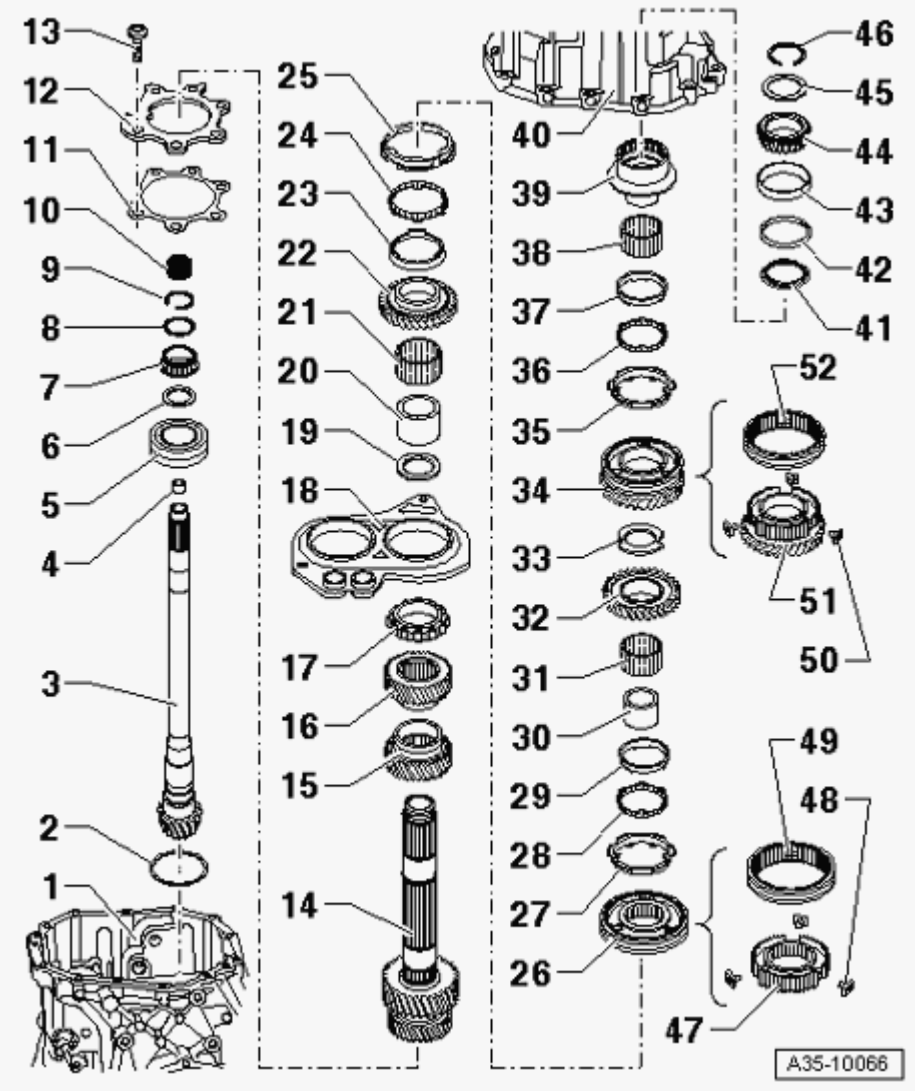

Fig. 162: Drive Pinion And Hollow Shaft, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing [1)]

2 - Adjustment shim " S_3 "

- Adjustment overview --> **Adjustment overview**

3 - Drive pinion [1)]

- Is mated with ring gear, always replace together as a set
- Disassembling and assembling --> **Drive pinion, disassembling and assembling**
- Drive pinion and ring gear, adjusting --> **Pinion and ring gear, adjusting**

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4 - Needle bearing

- For flange shaft mounting in drive pinion
- Pulling out **Flange shaft mounting needle bearing, removing from drive pinion**
- Driving in **Flange shaft mounting needle bearing, driving in flush in drive pinion**

5 - Double angular contact ball bearing

- No adjustment is needed if only this bearing is replaced
- Pressing off **Double angular contact ball bearing, pressing off**
- Pressing on **Double angular contact ball bearing, pressing on**
- Installation position: shoulder on outer race faces toward pinion face

6 - Adjustment shim " S_5 "

- Determine thickness --> **Shim " S 5 " for positioning inner race/tapered ball bearing, redetermining**

7 - Tapered roller bearing inner race

- Pressing off **Pressing off inner race/tapered roller bearing**
- Pressing on **Pressing on inner race/tapered roller bearing**

8 - Washer

9 - Circlip

- Determine thickness

10 - Needle bearing

- For drive pinion in hollow shaft
- Coat with transmission fluid

11 - Adjustment shim " S_4 "

- Adjustment overview --> **Adjustment overview**

12 - Holding plate

- Installation position: sanded side faces toward transmission housing, fits only in one position

13 - Bolt, 30 Nm

- Qty. 6

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- Insert with *locking fluid AMV 185 101 A1*

14 - Hollow shaft

- With 3rd and 4th gears
- Disassembling and assembling --> **Hollow shaft, disassembling and assembling**

15 - Drive gear for 6th gear

- Pressing off **6th gear selector gear, pressing off**
- Pressing on **6th gear drive gear, pressing on**
- Installation position: High inner collar faces 5th gear drive gear

16 - Drive gear for 5th gear

- Pressing off **Pressing off 5th-gear gear wheel**
- Pressing on **Pressing on 5th-gear gear wheel**
- Installation position: High inner collar faces 6th gear drive gear

17 - Roller bearing

- For hollow shaft
- Do not exchange with input shaft roller bearing
- Press off together with drive gear for 5th gear **Pressing off 5th-gear gear wheel**
- Pressing on **Hollow shaft roller bearing, pressing on**

18 - Bearing bracket

- Roller bearing outer race must not have any radial play in bearing bracket.

19 - Adjustment shim " S_6 "

- For positioning 2nd gear selector gear
- Determine thickness --> **Shim " S 6 " for positioning 2nd gear selector gear, redetermining**

20 - Inner race/needle bearing

- For selector gear of 2nd gear
- Press off together with drive gear for 5th gear **Pressing off 5th-gear gear wheel**
- Pressing on **Inner race/needle bearing for 2nd gear selector gear, pressing on**

21 - Needle bearing

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- For 2nd gear

22 - Selector gear for 2nd gear

23 - Inner race for 2nd gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**
- Replace if grooved or scored

24 - Intermediate ring for 2nd gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**

25 - Synchronizer ring for 2nd gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**
- Replace if grooved or scored

26 - Locking sleeve with synchronizer hub for 1st and 2nd gears

- Removing and installing --> **Assembly sequence**
- Assembling locking collar/synchronizer hub **Assembly of locking collar/synchronizer hub for 1st and 2nd gear**

27 - Synchronizer ring for 1st gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**
- Replace if grooved or scored

28 - Intermediate ring for 1st gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**

29 - Inner race for 1st gear

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- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**
- Replace if grooved or scored

30 - Inner race/needle bearing

- For 1st gear selector gear

31 - Needle bearing

- For 1st gear

32 - Drive gear for 1st gear

33 - Thrust washer

- For 1st gear and reverse gear selector gears

34 - Gear wheel for reverse gear

- With reverse gear locking collar
- Removing and installing --> **Assembly sequence**
- Locking collar and reverse gear selector gear, disassembling and assembling **Assemble locking collar and reverse gear selector gear**

35 - Synchronizer ring for reverse gear

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**
- Replace if grooved or scored

36 - Reverse gear intermediate ring

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Checking for wear **Synchronizer rings for 1st, 2nd and reverse gears, checking for wear**

37 - Reverse gear inner race

- Installed location **Installation location of synchronizer rings for 1st and 2nd gear as well as reverse gear**
- Replace if grooved or scored

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38 - Needle bearing

- For reverse gear selector gear

39 - Clutch hub

- Removing and installing --> **Assembly sequence**

40 - Transmission cover

41 - Twelve-point nut, 75 Nm

42 - Spacer ring

43 - Tapered roller bearing outer race

- Can be installed and removed by hand

44 - Tapered roller bearing inner race

- Can be installed and removed by hand

45 - Washer

- Note thickness
- Determine thickness --> **Determine thickness of circlip and shim(s) as follows:**

46 - Circlip

- Note thickness
- Determine thickness --> **Determine thickness of circlip and shim(s) as follows:**

47 - Synchronizer hub for 1st and 2nd gear

48 - Thrust plate

- Installing thrust pieces (3x) **Assembly of locking collar/synchronizer hub for 1st and 2nd gear**

49 - Locking collar for 1st and 2nd gear

50 - Thrust plate

- Installing thrust pieces (3x) **Assemble locking collar and reverse gear selector gear**

51 - Gear wheel for reverse gear

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52 - Reverse gear selector gear locking collar

Drive pinion, disassembling and assembling

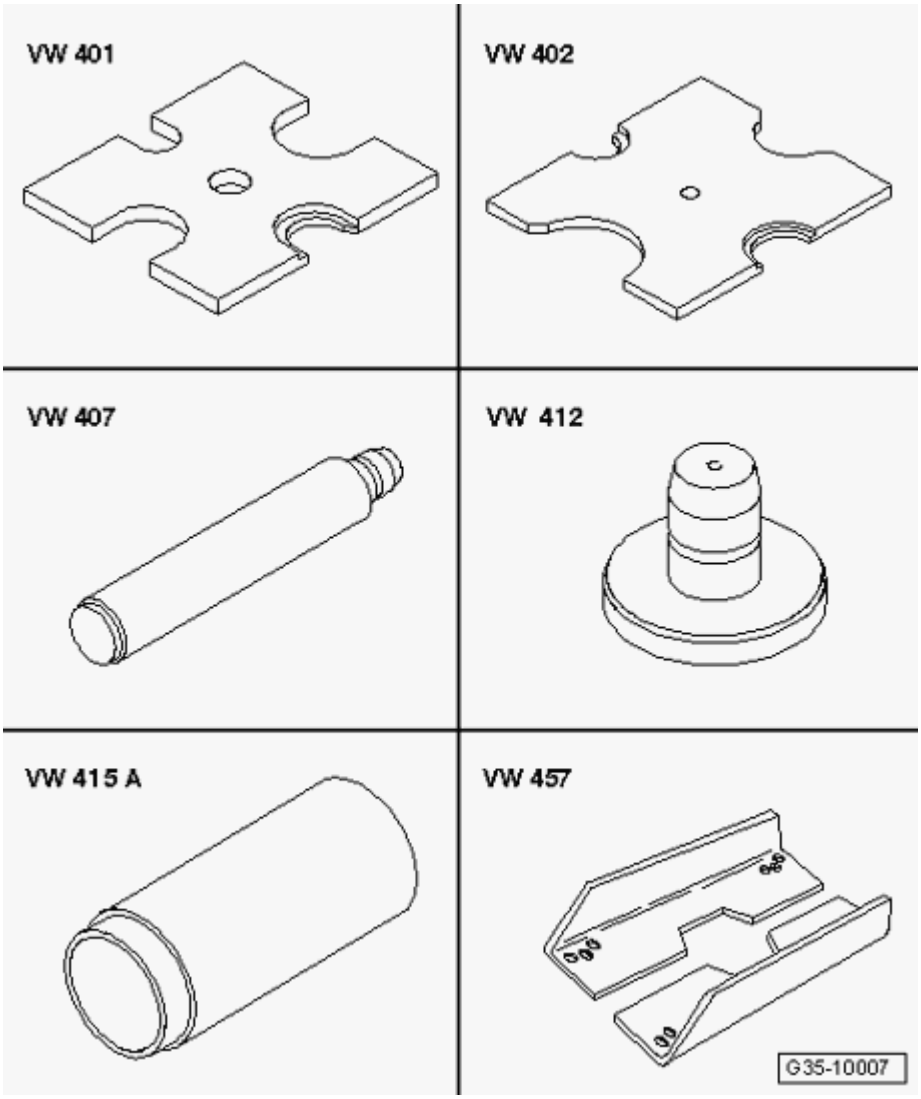

Fig. 163: Identifying Special Tools - Drive Pinion, Disassembling And Assembling (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust plate VW 402
- Punch VW 407
- Punch VW 412

- Tube VW 415 A

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- Support channels VW 457

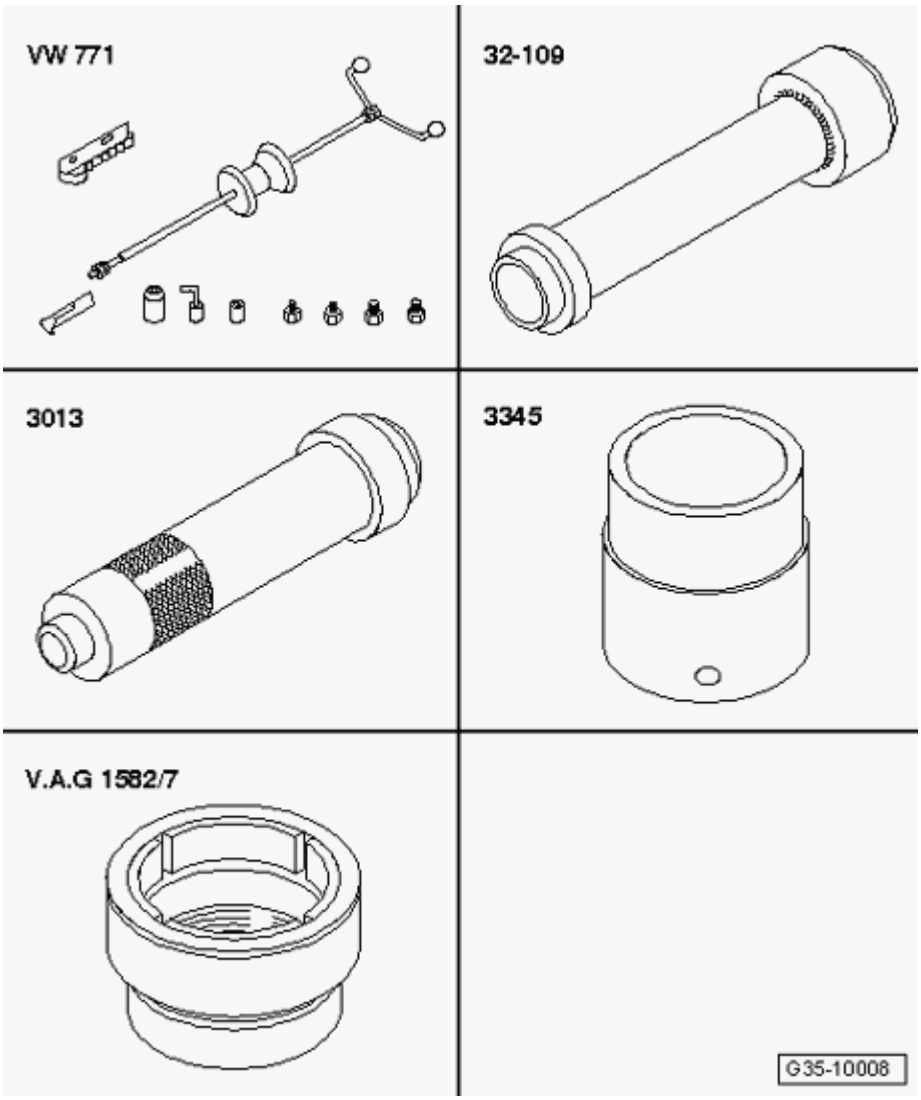

Fig. 164: Identifying Special Tools - Drive Pinion, Disassembling And Assembling (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Slide Hammer-Complete Set VW 771
- Driving sleeve 32 - 109
- Seal driver-frt wheel bearing 40 - 21
- Driver 3013

- Tube for wheel bearing 3345
- Attachment V.A.G 1582/7

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Special tools, testers and auxiliary items required

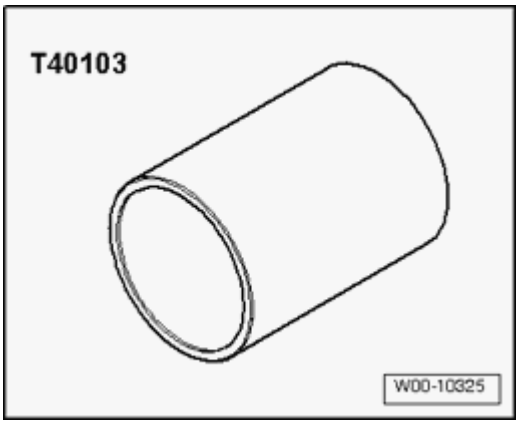

Fig. 165: Sleeve T40103
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Sleeve T40103

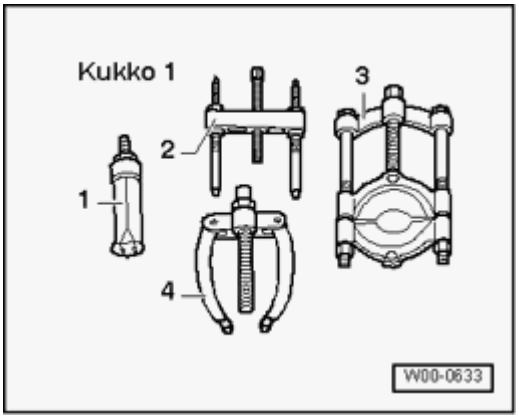

Fig. 166: Kukko 21/2 Internal puller, Kukko 21/4 Internal puller, Kukko 22/2 Counter support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **- 1 -** Internal extractor Kukko 21/2

Flange shaft mounting needle bearing, removing from drive pinion

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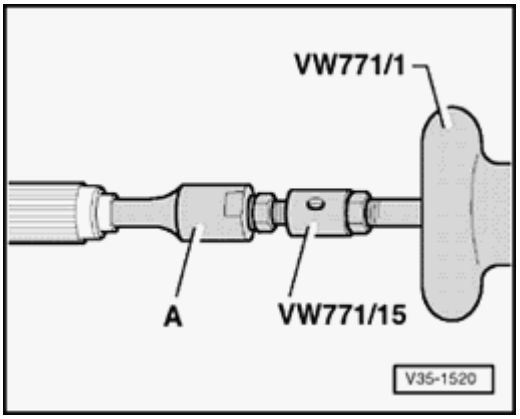

Fig. 167: Pulling Out Flange Shaft/Pinion Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal puller 12 to 14.5 mm , e.g. Kukko 21/1

Flange shaft mounting needle bearing, driving in flush in drive pinion

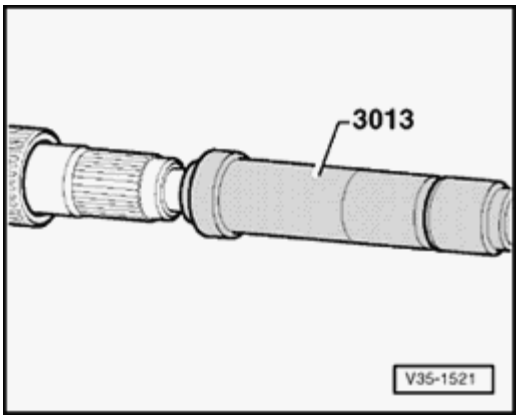

Fig. 168: Driving In Flange Shaft/Pinion Needle Bearing Flush
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install needle bearings with lettering on bearing (the side with thicker metal) facing towards drift 3013.

Pressing off inner race/tapered roller bearing

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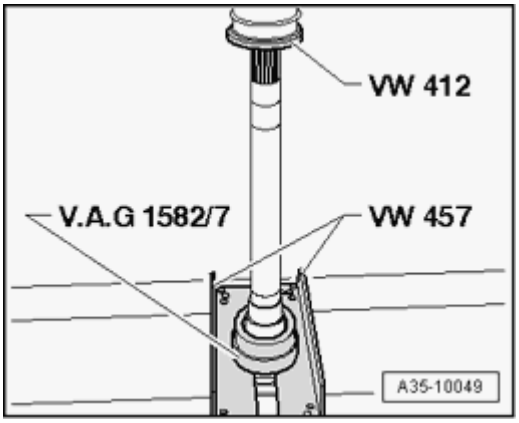

Fig. 169: Pressing Off Inner Race/Tapered Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip and washer before pressing off.
- Attach grip V.A.G 1582/7 and clamp behind bearing rollers.
- Then carefully press inner race/tapered roller bearing out.
- Remove shim " S_5 " from drive pinion.

NOTE:

- **You can also press the inner race/tapered roller bearing out together with the double angular contact ball bearing Double angular contact ball bearing, pressing off**

Double angular contact ball bearing, pressing off

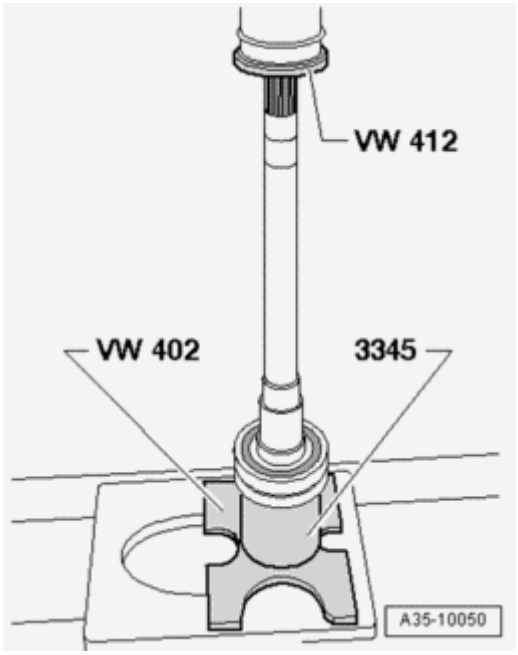

Fig. 170: Double Angular Contact Ball Bearing, Pressing Off
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Double angular contact ball bearing, pressing on

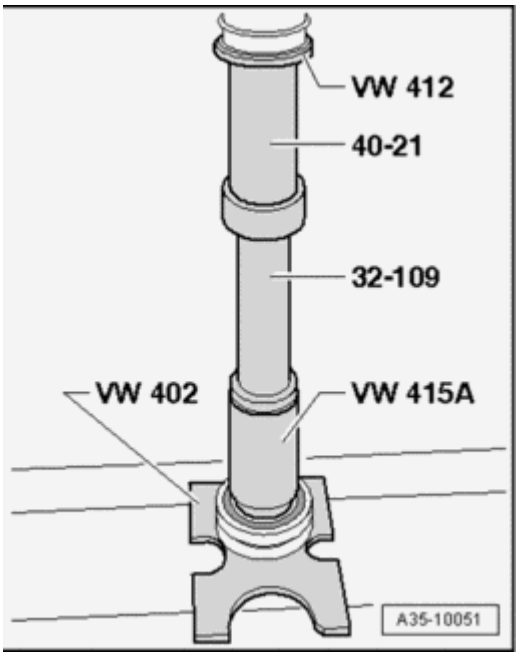

Fig. 171: Double Angular Contact Ball Bearing, Pressing On
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position: Shoulder on bearing outer race faces toward drive pinion face.
  - Place tube VW 415 A smaller outer diameter on bearing inner race.
  - Press double angular contact ball bearing on down to stop.
- When replacing drive pinion (gear set), you must redetermine the shim " S_5 " --> **Shim " S 5 " for positioning inner race/tapered ball bearing, redetermining**.

Pressing on inner race/tapered roller bearing

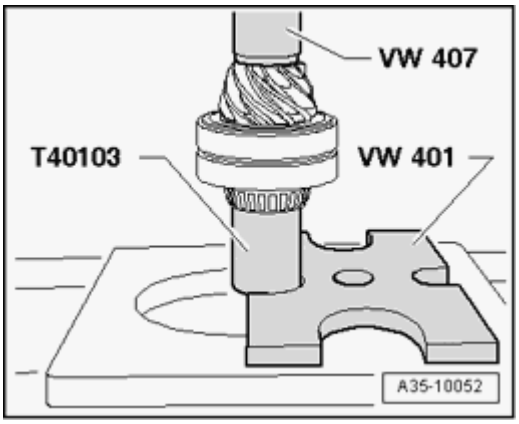

Fig. 172: Pressing On Inner Race/Tapered Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Place shim " S_5 " on drive pinion double angular contact ball bearing beforehand.
- Warm inner race to approx. 100°C and press on.
- Lay washer - **A** - on inner race.
- Determine circlip - **B** - and insert.

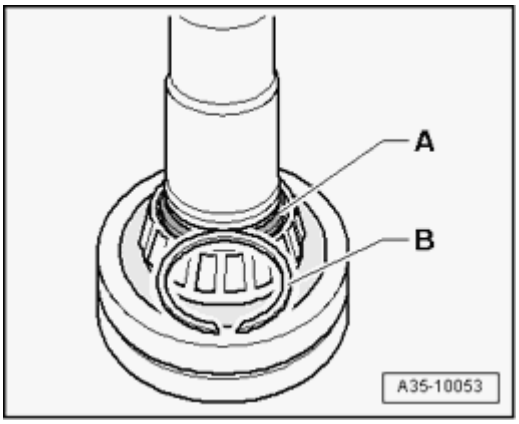

Fig. 173: Identifying Washer & Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Circlip - B - , determining

- Determine thickest circlip that can still be installed and insert, part no.

The following circlips are available:

Circlip thickness (mm)		
1.50	1.90	2.30
1.55	1.95	2.35
1.60	2.00	2.40
1.65	2.05	2.45
1.70	2.10	2.50
1.75	2.15	2.55
1.80	2.20	2.60
1.85	2.25	

Shim " S 5 " for positioning inner race/tapered ball bearing, redetermining

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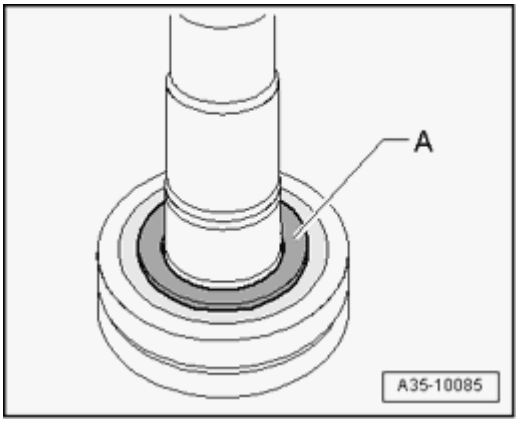

Fig. 174: Positioning Of Inner Race/Tapered Ball Bearing (On Drive Pinion) For Location Of Hollow Shaft In Transmission Is Determined With This Shim
Courtesy of VOLKSWAGEN UNITED STATES, INC.

This is necessary when replacing gear set.

- A -.

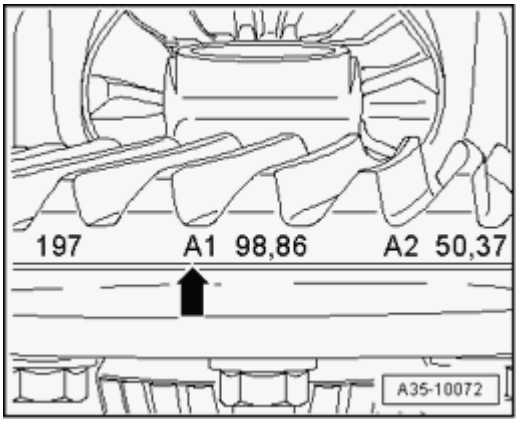

Fig. 175: Identifying Shim Actual Dimension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The actual dimension "A1" - arrow - that you need for this shim " S_5 " is inscribed on gear set ring gear. In the example, dimension "A1" = 98.86 mm

Determine shim needed according to table.

The following shims are available:

Actual dimension "A1"	Adjustment shim " S_5 "
Inscribed value (mm)	Thickness (mm)
99.30 to 99.21	2.30
99.20 to 99.11	2.40

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99.10 to 99.01	2.50
99.00 to 98.91	2.60
98.90 to 98.81	2.70
98.80 to 98.70	2.80

NOTE:

- **In the example, shim " S_5 " determined is 2.70 mm.**

Hollow shaft, disassembling and assembling

NOTE:

- **The removal and installation of 1st, 2nd and reverse gear selector gears is described in Transmission, disassembling and assembling --> Assembly sequence.**

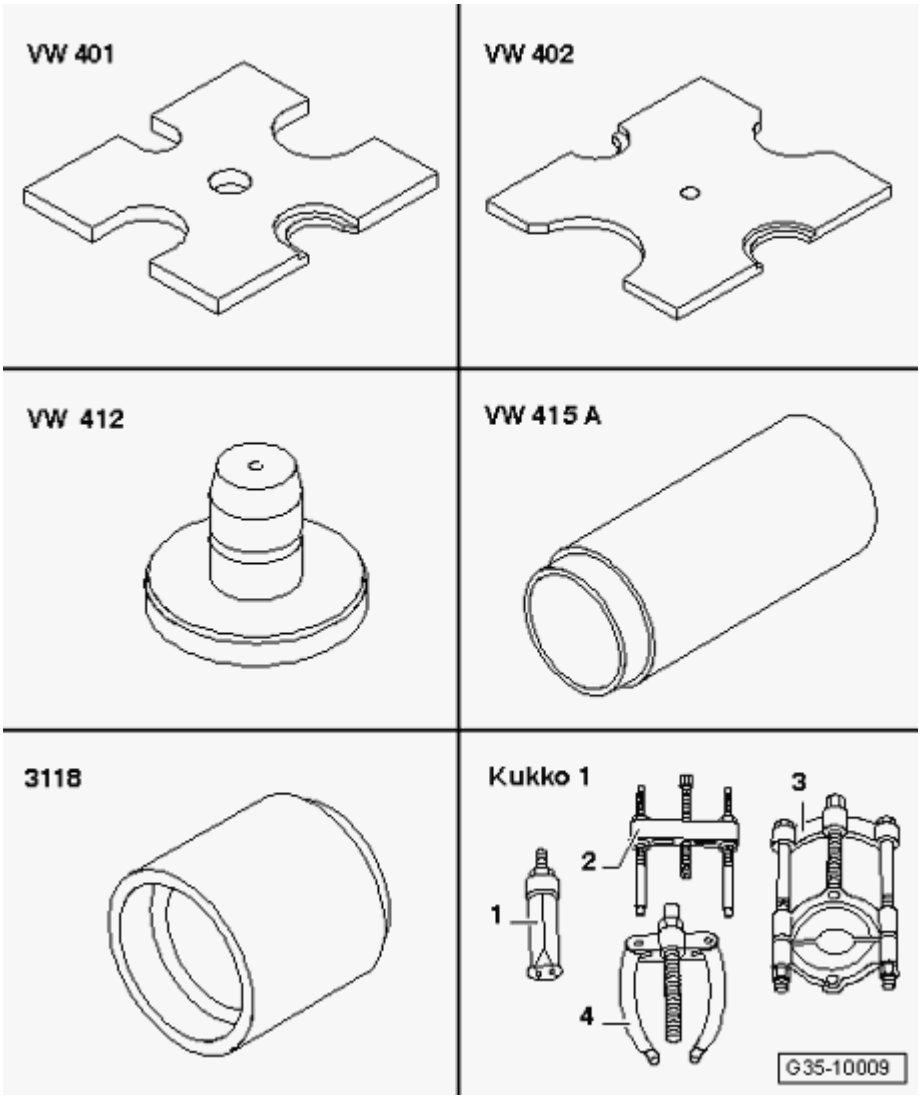

Fig. 176: Identifying Special Tools - Hollow Shaft, Disassembling And Assembling

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Pressure plate VW 401
- Pressure plate VW 402
- Punch VW 412
- Tube VW 415 A

- Thrust piece 3118
- **- 3 -** Separating tool Kukko 17/2
- Feeler gauge

Pressing off 5th-gear gear wheel

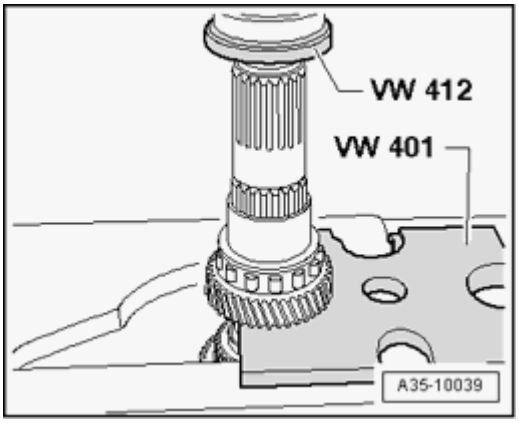

Fig. 177: Pressing Off 5th-Gear Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press 5th gear drive gear together with roller bearing and 2nd gear selector gear inner race/needle bearing off of hollow shaft.

6th gear selector gear, pressing off

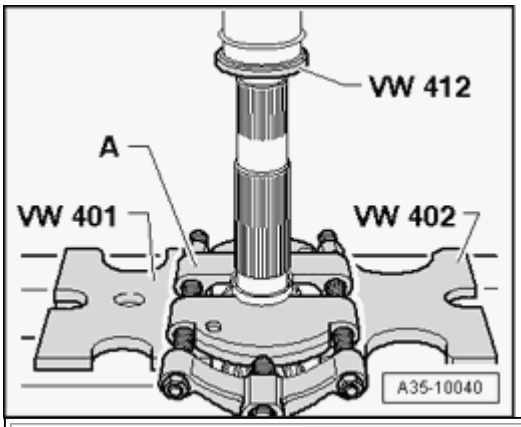

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Fig. 178: 6th Gear Selector Gear, Pressing Off
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Separating device 22 to 115 mm , e.g. Kukko 17/2

6th gear drive gear, pressing on

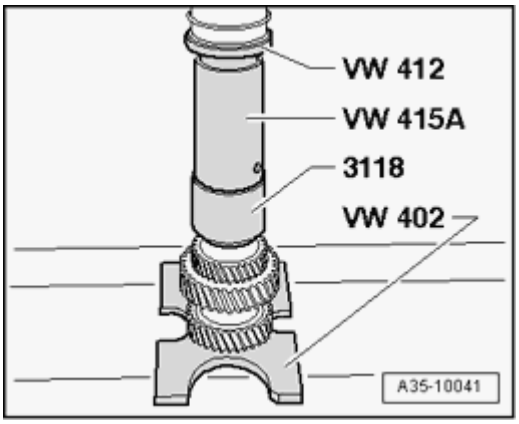

Fig. 179: 6th Gear Drive Gear, Pressing On
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inner collar faces 5th gear.

- Thrust piece 3118 shoulder faces toward 6th gear drive gear.

Pressing on 5th-gear gear wheel

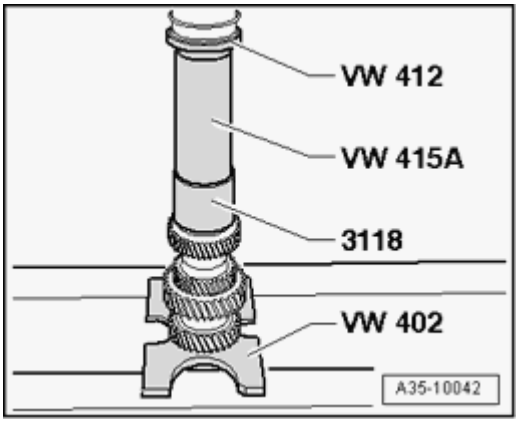

Fig. 180: Pressing On 5th-Gear Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inner collar faces 6th gear.

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Hollow shaft roller bearing, pressing on

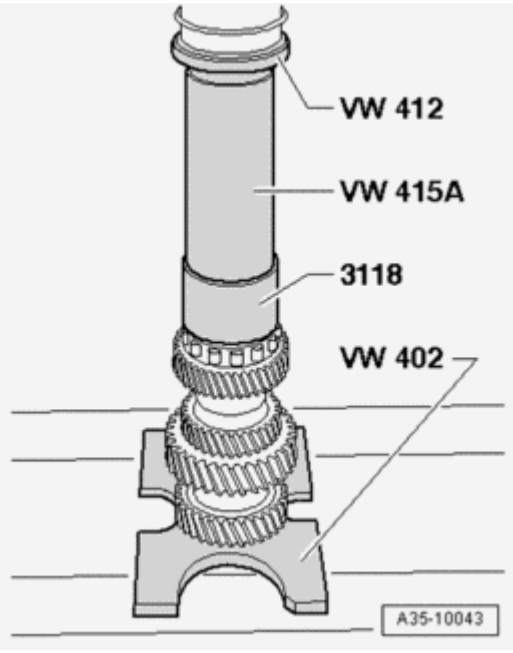

Fig. 181: Hollow Shaft Roller Bearing, Pressing On
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Thrust piece 3118 shoulder faces toward roller bearing.

If you have replaced the transmission housing, gear set, hollow shaft or gears on hollow shaft, you must now redetermine the shim " S_6 " for positioning 2nd gear selector gear --> **Shim " S 6 " for positioning 2nd gear selector gear, redetermining**.

Inner race/needle bearing for 2nd gear selector gear, pressing on

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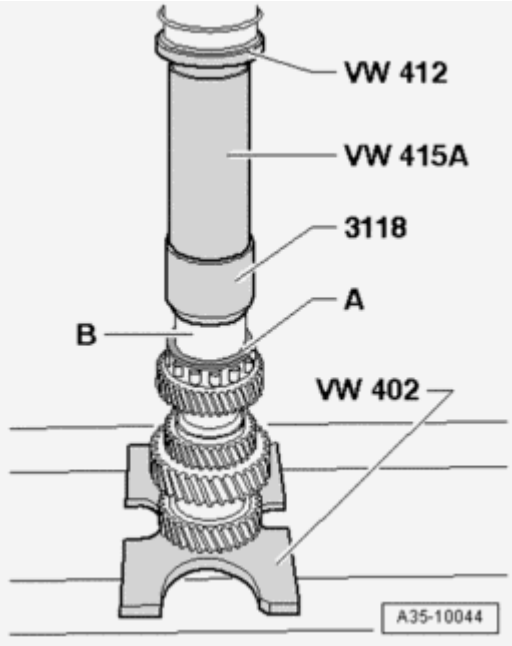

Fig. 182: Inner Race/Needle Bearing For 2nd Gear Selector Gear, Pressing On
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place shim " S_6 " - **A** - on roller bearing beforehand.
- Then press on 2nd gear selector gear inner race/needle bearing - **B** -.

Shim " S 6 " for positioning 2nd gear selector gear, redetermining

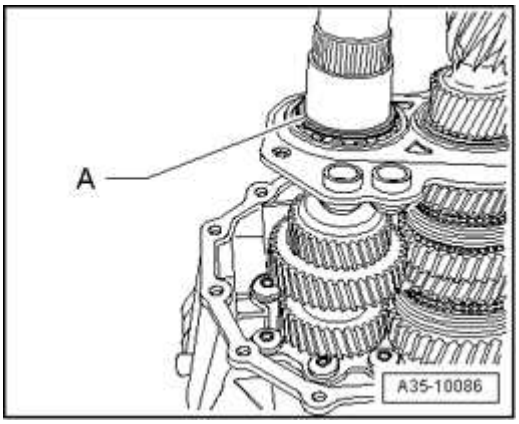

Fig. 183: Positioning Of 2nd Gear Selector Gear And Of Gear Set In Transmission Is Determined With This Shim
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Positioning of 2nd gear selector gear and of gear set in transmission is determined with this shim - **A** -.

This adjustment is required when the following components are replaced:

- Transmission housing

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- Gear set
- Hollow shaft

Or

- Gears on hollow shaft

Special tools, testers and auxiliary items required

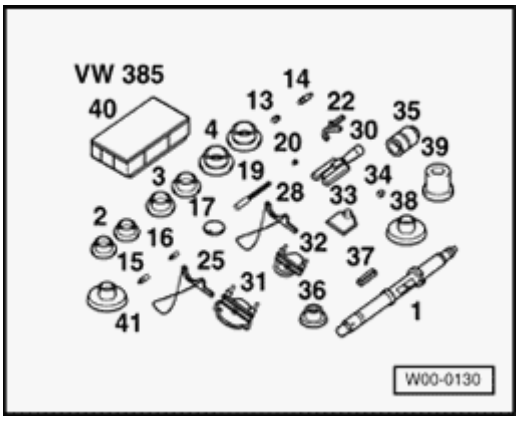

Fig. 184: Universal Measuring Device VW 385
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Universal measuring device VW 385

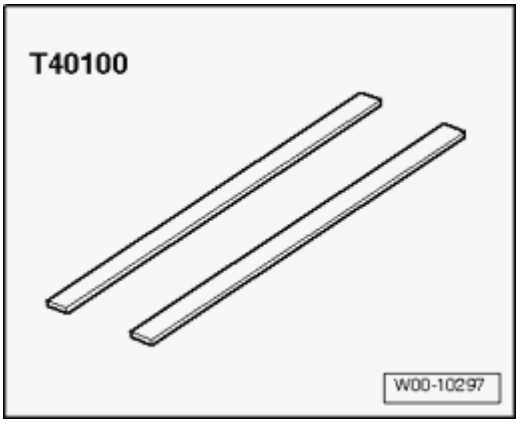

Fig. 185: Straight-Edge T 40100
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Straight-edge T 40100
- Digital depth gauge (e.g. VAS 6087)

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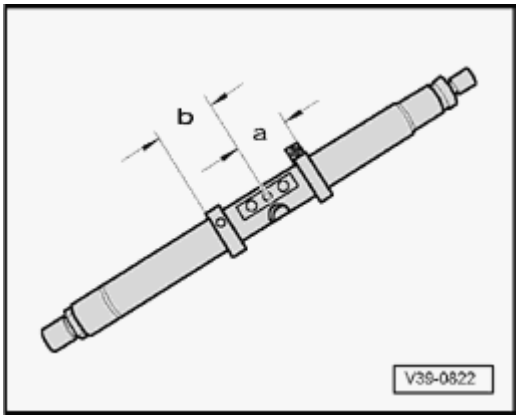

Fig. 186: Setting Adjusting Rings Of Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set adjustment rings of universal mandrel VW 385/1 to the following values:

- Dimension - **a** - = 45 mm
- Dimension - **b** - = 60 mm

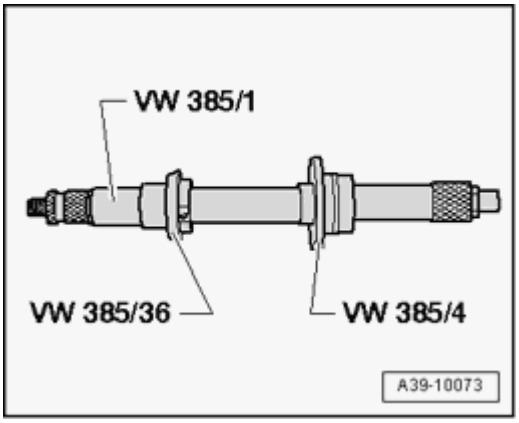

Fig. 187: Assemble Universal Mandrel VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble universal mandrel VW 385/1 as shown in the illustration:

Dimension -A-, determining

- Outer races/tapered roller bearings for differential mounting are installed in transmission housing and final drive cover.

- Insert universal mandrel VW 385/1 with centering disc VW 385/4 facing toward transmission housing.
- Insert final drive cover with integrated O-ring and tighten 4 screws to 24 Nm.
- Using adjustable ring, pull centering disc outward until universal mandrel can no longer be turned by hand.

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- Round side of universal mandrel must face upward toward depth gauge.

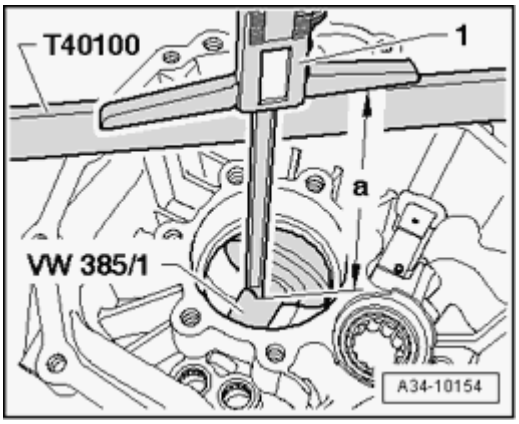

Fig. 188: Using Digital Depth Gauge, Measuring At Highest Point Of Universal Mandrel VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place straight edge T 40100 on cleaned transmission housing join surface.
- Using a digital depth gauge - **1** - (e.g. Digital Depth Gauge VAS 6087), measure at highest point of universal mandrel VW 385/1.

In the example, dimension - **a** - = 143.80 mm

- Subtract height of straight edge T 40100 from this dimension and add half of universal mandrel VW 385/1 diameter to it. This value is 16 mm.

Example:		
	Value reading on digital depth gauge	143.80 mm
-	Height of straight edge T 40100	40.00 mm
+	Half of diameter of universal mandrel VW 385/1	16.00 mm
=	Dimension -A-	119.80 mm

Dimension -B-, determining

- Drive pinion is installed with shim " S_3 " and " S_4 ".

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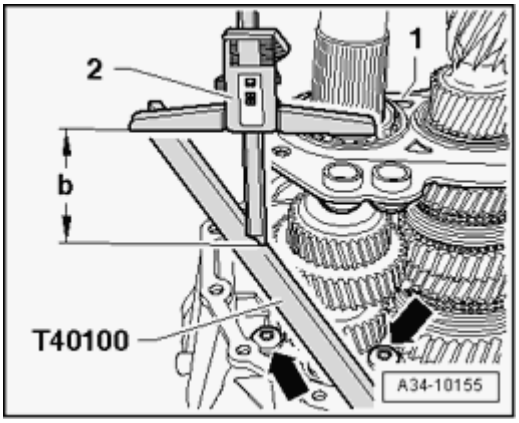

Fig. 189: Measuring From Inner Race/Roller Bearing To Straight Edge Using Digital Depth Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Retaining plate connecting screws - **arrows** - are tightened to 30 Nm.

- Install input shaft, hollow shaft with roller bearing pressed on and bearing bracket - **1** -.
- Place straight edge T 40100 on cleaned transmission housing join surface.
- Measure from inner race/roller bearing to straight edge using a digital depth gauge - **2** - (e.g. Digital Depth Gauge VAS 6087).

In the example, dimension - **b** - = 172.00 mm

- Add height of straight edge T 40100 to this dimension.

Example:		
	Value reading on digital depth gauge	172.00 mm
+	Height of straight edge T 40100	40.00 mm
=	Dimension -B-	212.00 mm

Determining thickness of adjustment shim " S_6 "

Formula: Measuring range (total dimension) = Dimension -A- + Dimension -B-

Example:		
	Dimension -A-	119.80 mm
+	Dimension -B-	212.00 mm
=	Measuring range (total dimension)	331.80 mm

Measuring range (total dimension)	**Adjustment shim " S_6 "**
Measured value (mm)	Thickness (mm)
331.38 to 331.43	4.70

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331.44 to 331.53	4.60
331.54 to 331.63	4.50
331.64 to 331.73	4.40
331.74 to 331.83	4.30
331.84 to 331.93	4.20
331.94 to 332.03	4.10
332.04 to 332.08	4.00

NOTE:

- **The thickness of shim " S_6 " in this example is 4.30 mm.**

Torsen differential bearing, servicing

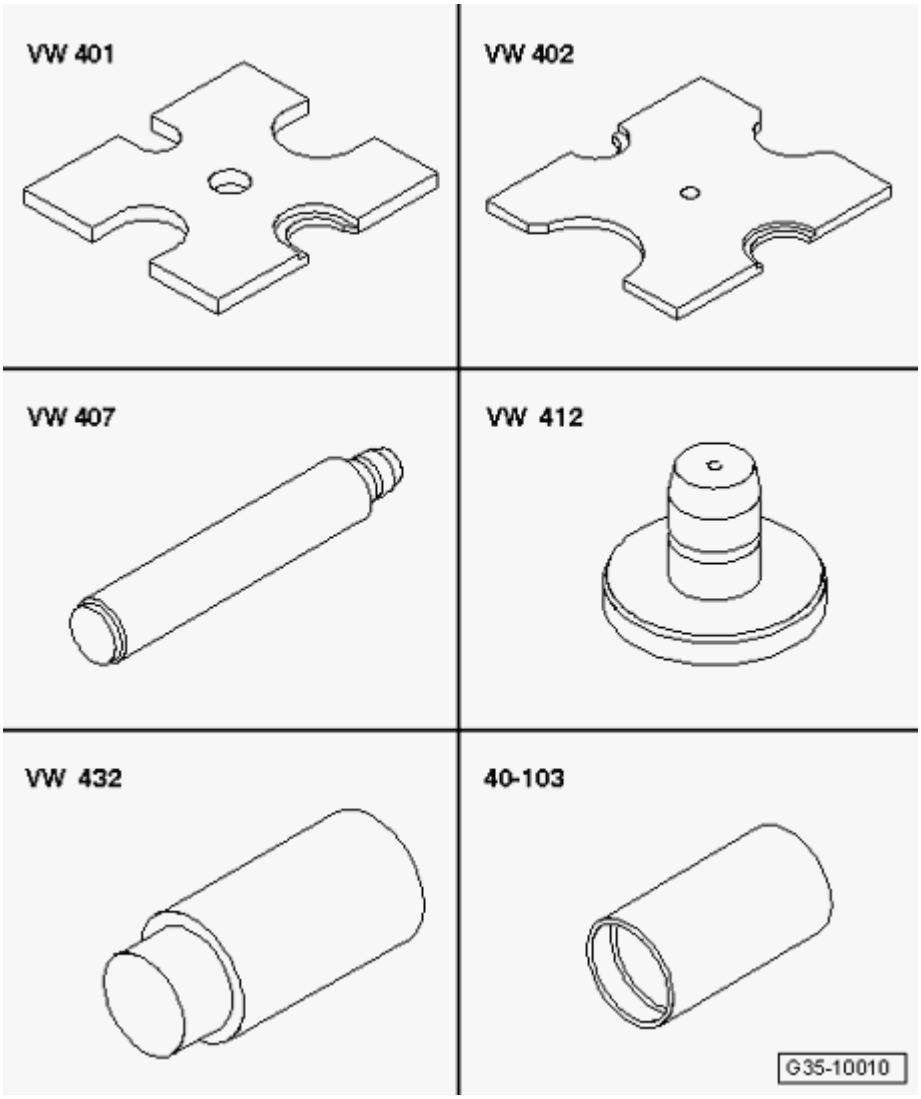

Fig. 190: Identifying Special Tools - Torsen Differential Bearing, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Special tools, testers and auxiliary items required

- Pressure plate VW 401
- Pressure plate VW 402
- Punch VW 407
- Punch VW 412
- Thrust piece VW 432
- Sleeve 40 - 103

Special tools, testers and auxiliary items required

- **- 1 -** Internal extractor Kukko 21/5
- **- 3 -** Separating tool Kukko 17/2

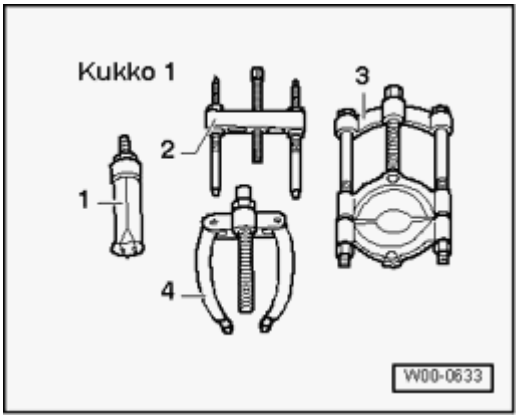

Fig. 191: Kukko 21/2 Internal puller, Kukko 21/4 Internal puller, Kukko 22/2 Counter support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **- 4 -** Support Kukko 22/1

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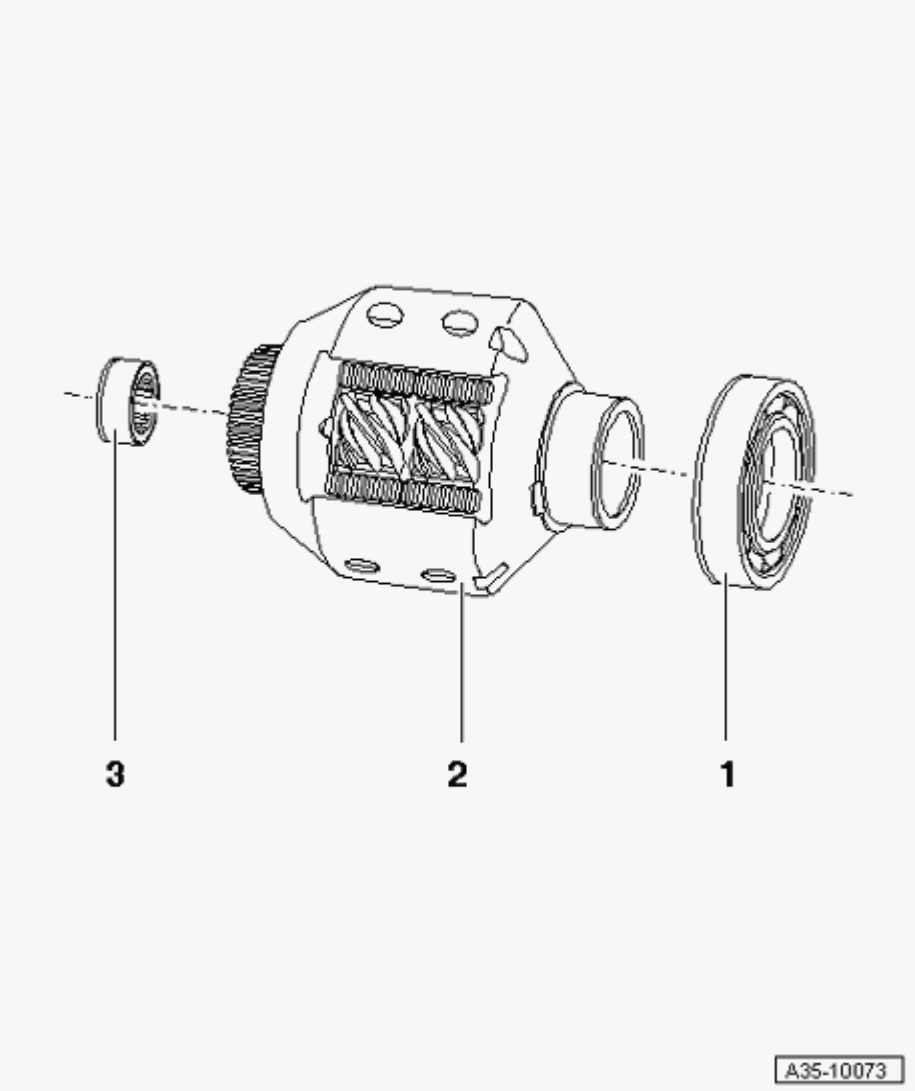

Fig. 192: Identifying Grooved ball bearing,
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Grooved ball bearing

- Pressing off **Pressing off grooved ball bearing from Torsen differential**
- Pressing on **Pressing grooved ball bearing onto Torsen differential**

2 - Torsen differential

- Do not disassemble
- Service by manufacturer only
- Replace if damaged

3 - Needle bearing

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- For drive pinion in torsen differential
- Pulling out **Pulling out needle bearing**
- Pressing in **Needle bearing, pressing in**

Pressing off grooved ball bearing from Torsen differential

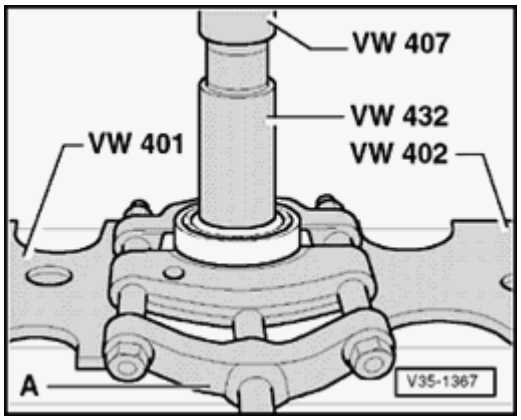

Fig. 193: Pressing Off Grooved Ball Bearing From Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Separating device 22 to 115 mm , e.g. Kukko 17/2

Pressing grooved ball bearing onto Torsen differential

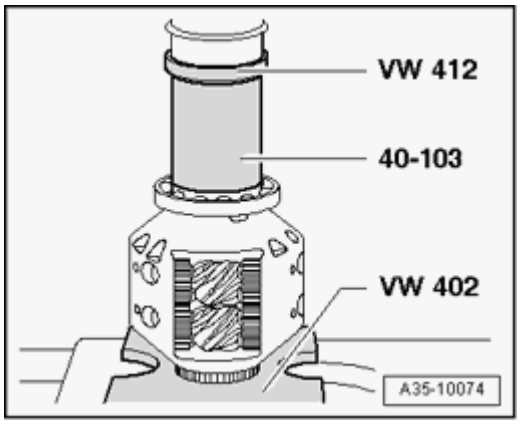

Fig. 194: Pressing Grooved Ball Bearing Onto Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pulling out needle bearing

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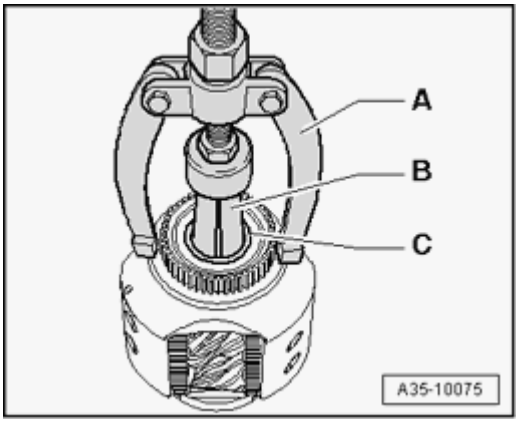

Fig. 195: Pulling Out Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Support , e.g. Kukko 22/1

B - Internal puller 30 to 37 mm , e.g. Kukko 21/5

- Remove needle bearing - **C** - for drive pinion mounting in torsen differential.

Needle bearing, pressing in

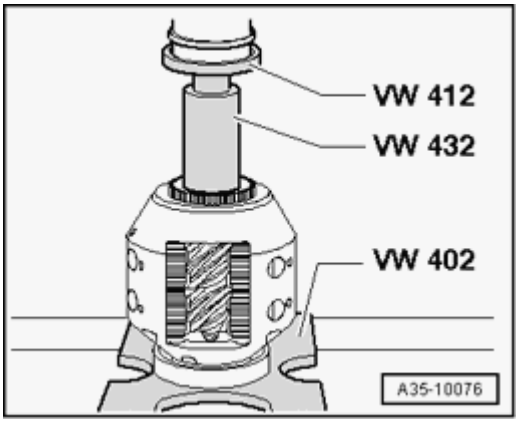

Fig. 196: Needle Bearing, Pressing In
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press needle bearing in flush up to thrust piece VW 432 stop.

39 - FRONT FINAL DRIVE, DIFFERENTIAL

FLANGE SHAFT SEALS, REPLACING

Replacing left and right flange shaft sealing ring with transmission installed --> **39 FINAL DRIVE, DIFFERENTIAL** .

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Replacing left and right flange shaft sealing ring with transmission removed --> **Differential, removing and installing**.

DIFFERENTIAL, REMOVING AND INSTALLING

Differential, removing and installing

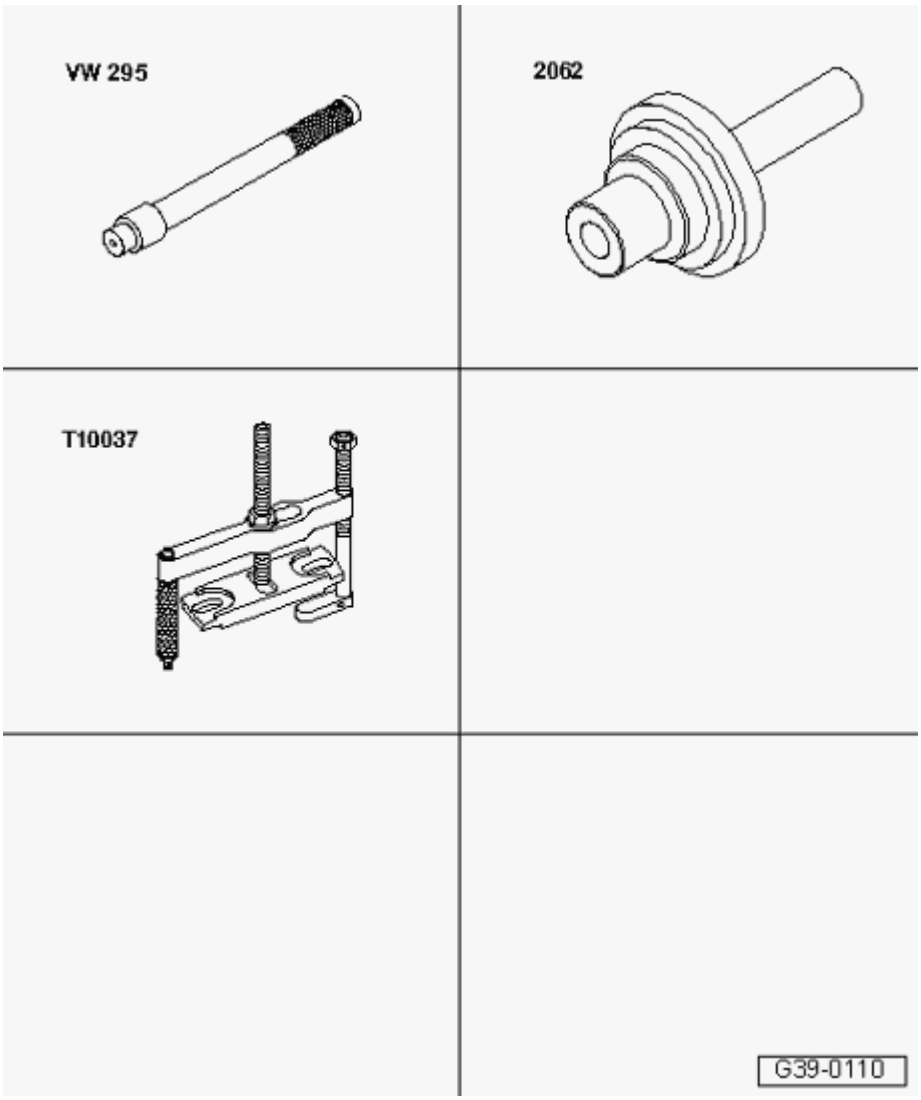

Fig. 197: Identifying Special Tools - Differential, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW 295
- Driver 2062
- Puller T10037
- *Sealing grease G 052 128 A1*

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NOTE:

- **Removal and installation is also possible with transmission installed.**
- **Differential can be removed and installed without removing shifter, input shaft, drive pinion/hollow shaft and transmission cover. The removal of the above-mentioned parts is necessary when the differential must be adjusted.**
- **Adjustments are required when replacing components marked with 1) . List of adjustments --> Adjustment overview.**

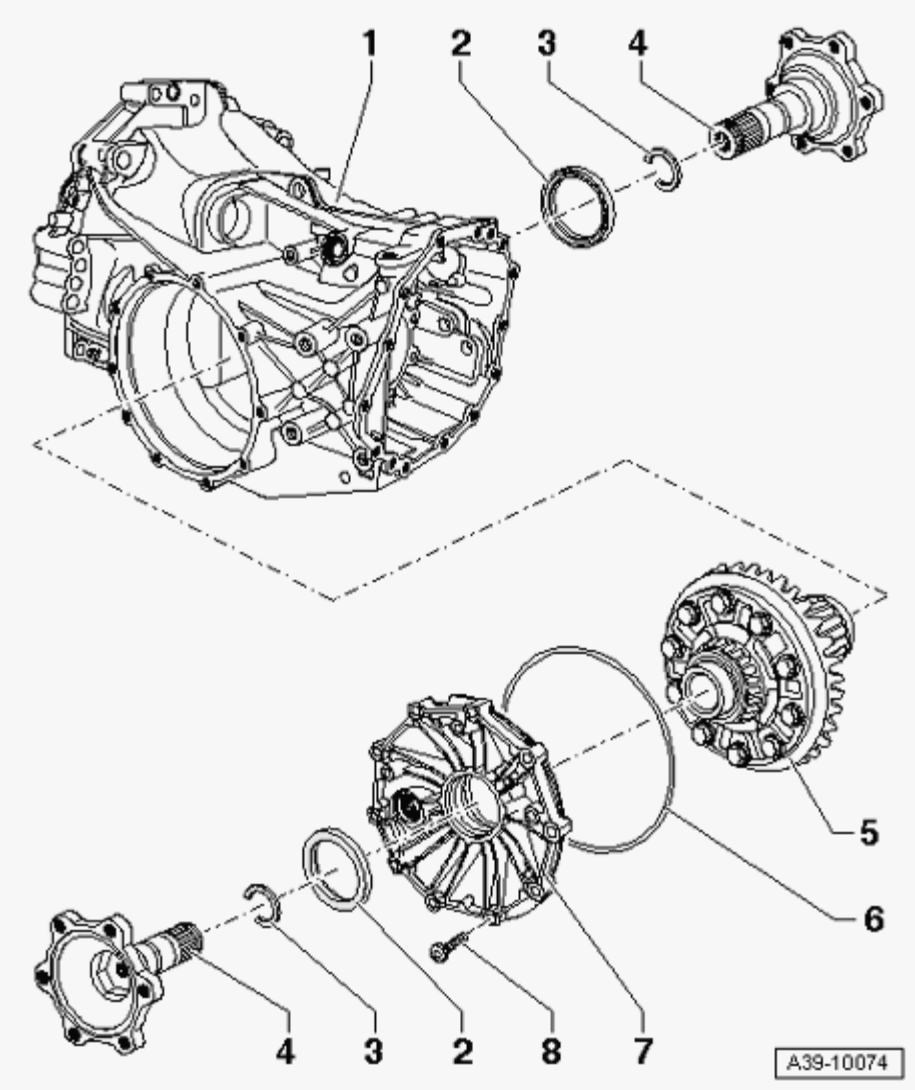

Fig. 198: Differential, Removing And Installing Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing 1)

2 - Seal

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- Removing **Flange shaft sealing ring, removing**
- Installing left **Left flange shaft sealing ring, installing**
- Installing right **Right flange shaft sealing ring, installing**

3 - Circlip

- Replace
- Removing and installing **Removing and installing securing ring**

4 - Flange shaft

- Removing left **Left flange shaft, removing**
- Removing right **Removing flange shaft (right side)**
- Driving in using drift VW 295

5 - Differential with ring gear [1)]

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

6 - O-ring

- Always replace
- Coat with transmission fluid

7 - Final drive cover [1)]

8 - Torx bolt, 24 Nm

Left flange shaft, removing

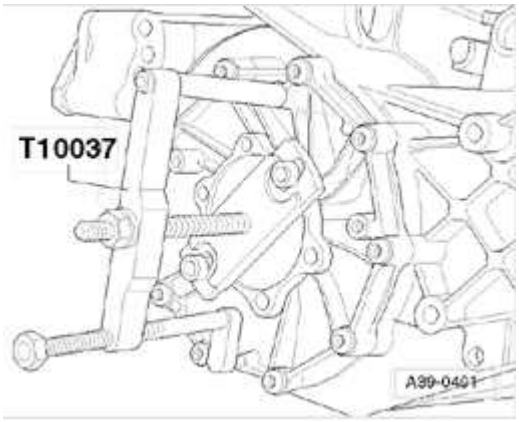

Fig. 199: Left Flange Shaft, Removing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove left flange shaft by fastening puller T10037 to final drive cover - **arrow** -.

Removing flange shaft (right side)

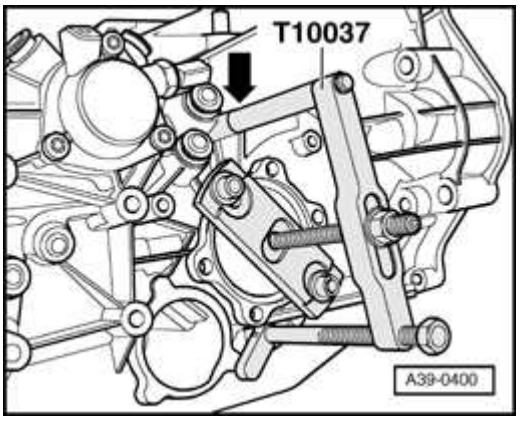

Fig. 200: Removing Flange Shaft (Right Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove right flange shaft by fastening puller T10037 to transmission housing - **arrow** -.

Removing and installing securing ring

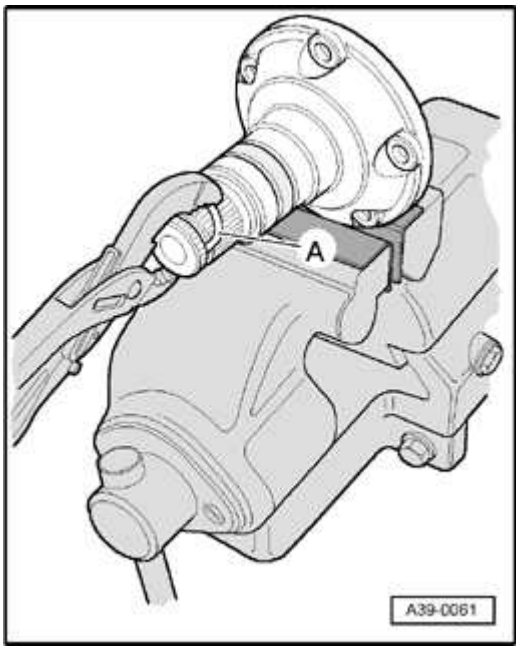

Fig. 201: Removing And Installing Securing Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp flange shaft in vise, using jaw protectors. Press previous circlip out of flange shaft grooved with new circlip - **A** -.

Flange shaft sealing ring, removing

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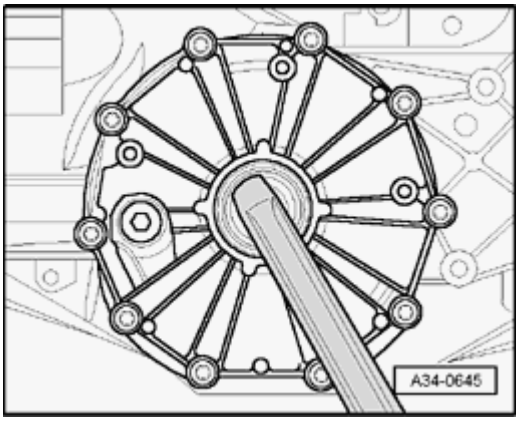

Fig. 202: Flange Shaft Sealing Ring, Removing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out flange shaft seal using a lever.

Left flange shaft sealing ring, installing

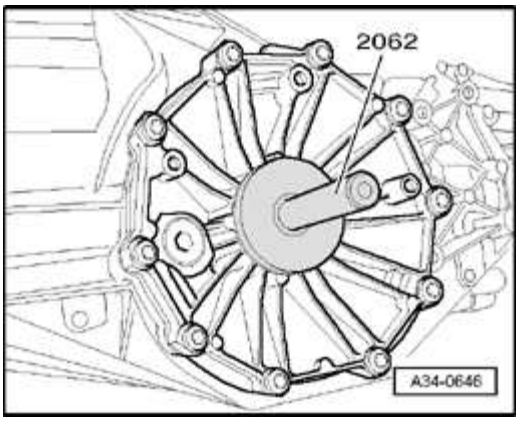

Fig. 203: Left Flange Shaft Sealing Ring, Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil new sealing ring on outer circumference.
- Drive in new flange shaft sealing ring with drift 2062 without tilting seal.

- Drive-in depth: 5.65 ± 0.15 mm under surface of cover.

- Fill area between sealing lip and dust lip halfway with *sealing grease G 052 128 A1* .

Right flange shaft sealing ring, installing

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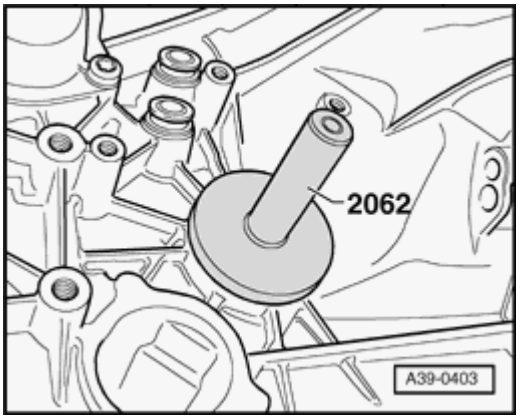

Fig. 204: Right Flange Shaft Sealing Ring, Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil new sealing ring on outer circumference.
- Drive in new flange shaft sealing ring with drift 2062 without tilting seal.

- Drive-in depth: 5.65 ± 0.15 mm below housing surface.

- Fill area between sealing lip and dust lip halfway with *sealing grease G 052 128 A1* .

DIFFERENTIAL, DISASSEMBLING AND ASSEMBLING

Differential, disassembling and assembling

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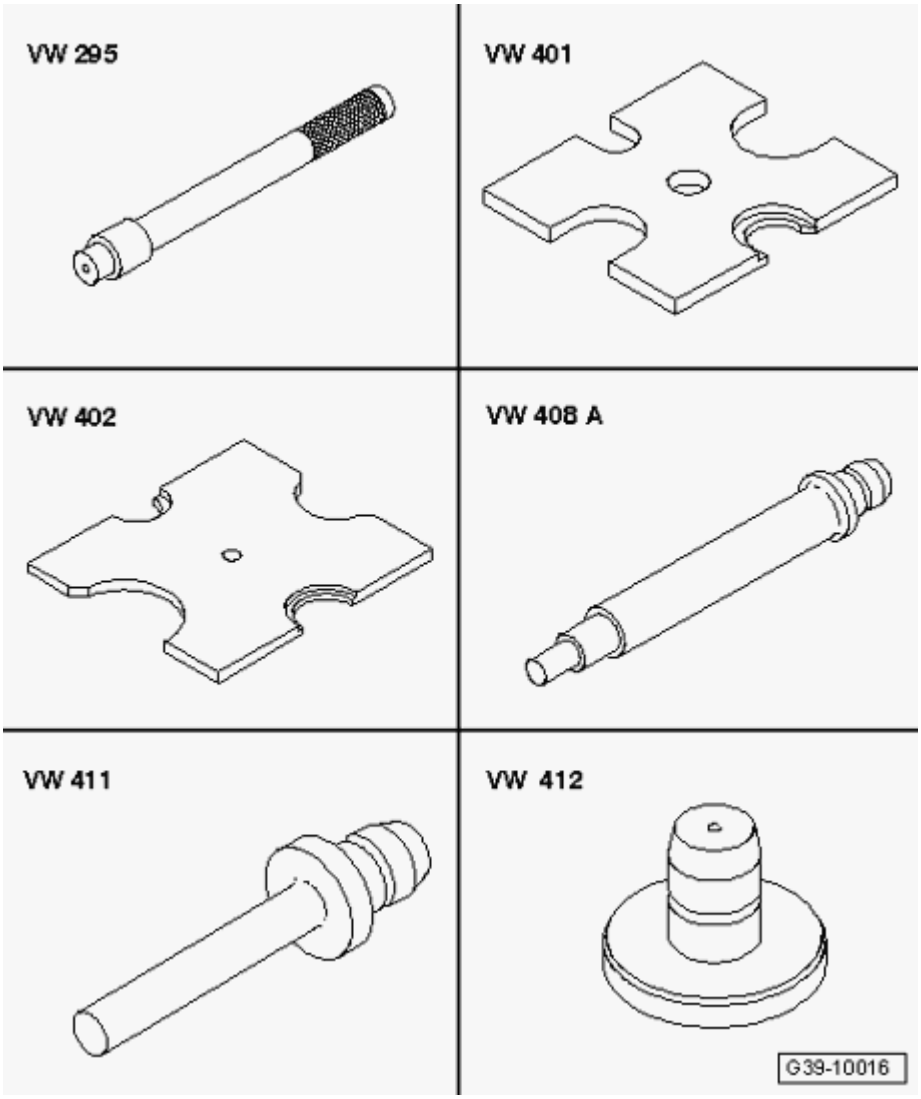

Fig. 205: Identifying Special Tools - Differential, Disassembling And Assembling (1 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW 295
- Pressure plate VW 401
- Pressure plate VW 402
- Punch VW 408 A
- Punch VW 411
- Punch VW 412

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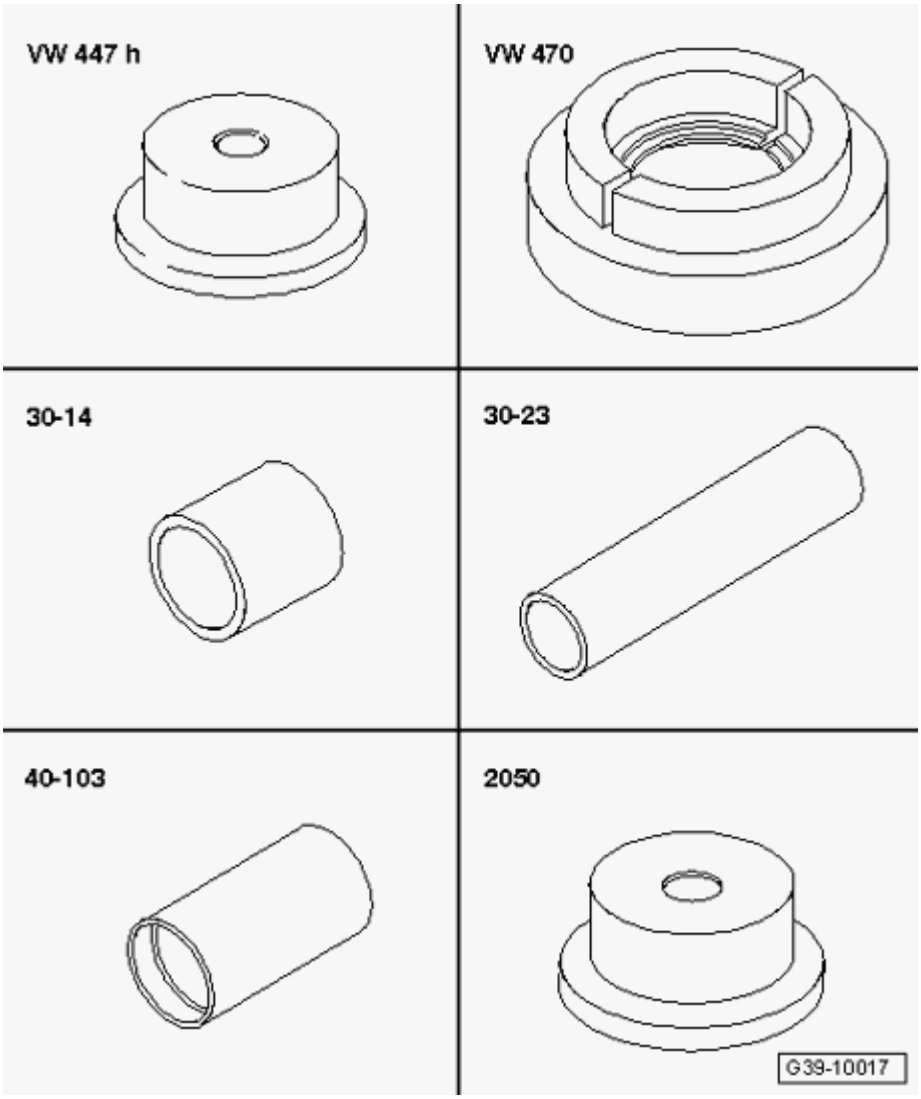

Fig. 206: Identifying Special Tools - Differential, Disassembling And Assembling (2 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust pad VW 447 H
- Thrust shell for drive pinion bearing VW 470
- Sleeve 30 - 14
- Press tube 30 - 23

- Sleeve 40 - 103
- Thrust piece 2050

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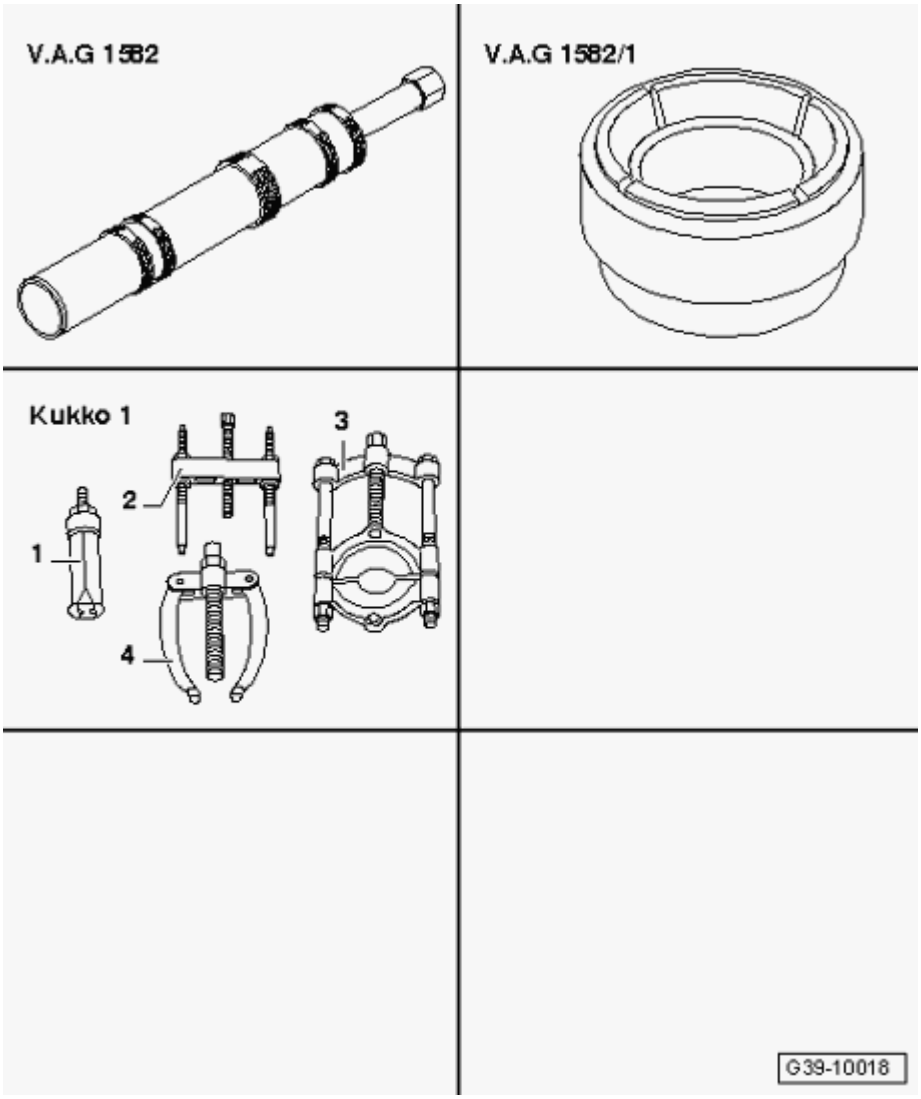

Fig. 207: Identifying Special Tools - Differential, Disassembling And Assembling (3 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Taper roller bearing puller V.A.G 1582
- Attachment V.A.G 1582/1
- **- 1 -** Internal extractor Kukko 21/8
- **- 4 -** Support Kukko 22/2

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

NOTE:

- **Always replace both taper roller bearings together as a set.**
- **Adjustments are required when replacing components marked with 1) . List of adjustments --> Adjustment overview.**

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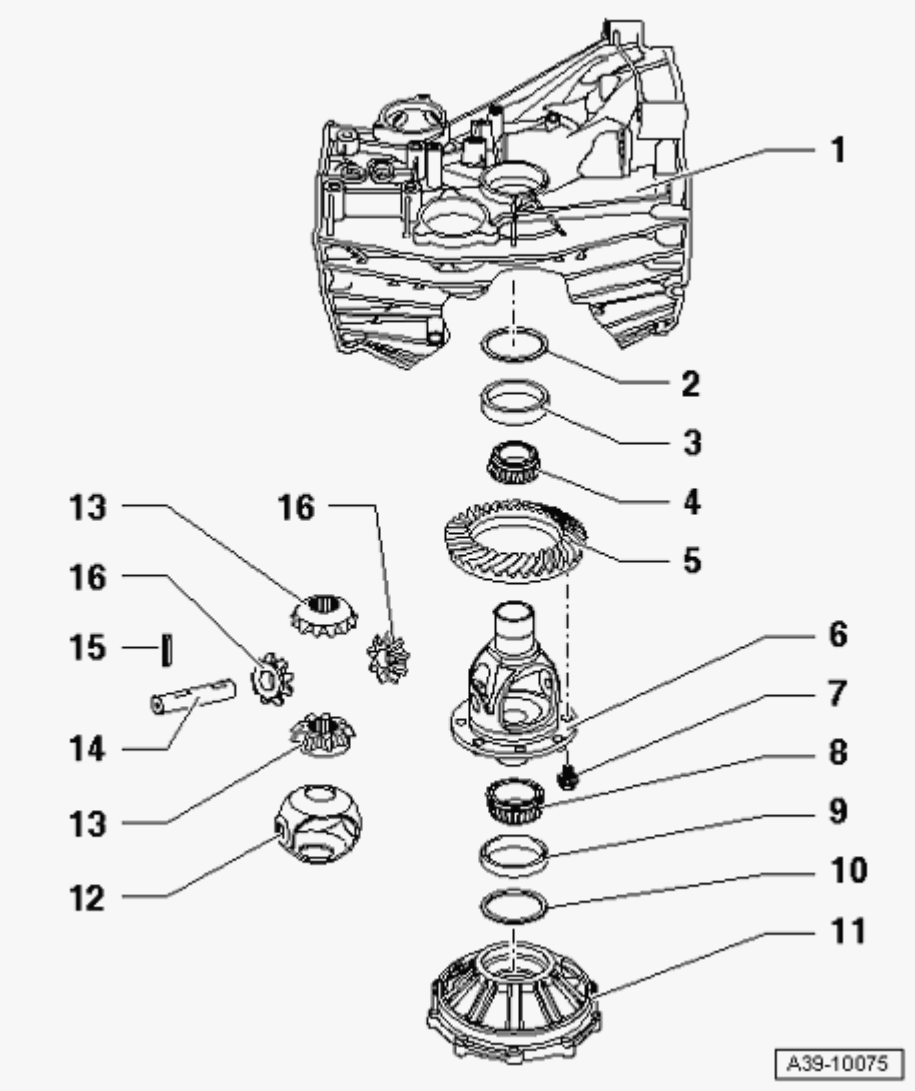

Fig. 208: Exploded View Of Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing [1)]

2 - Adjustment shim " S_2 "

- Note thickness
- Adjustment overview --> **Adjustment overview**

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

- Pulling out **Pulling outer race for right tapered roller bearing out of transmission housing**
- Driving in **Right tapered roller bearing outer race, driving into transmission housing**

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

- Pulling off **Tapered roller bearing inner races, removing**
- Pressing on **Pressing off left and right tapered roller bearing inner race**

5 - Ring gear [1)]

- Mated with drive pinion (final drive set)
- Press off of housing using drift **Driving ring gear from housing**
- Install on differential housing --> **Heat Ring Gear To Approx. 100°C And Install**

6 - Differential housing [1)]

7 - Bolt, 60 Nm plus an additional 45°turn

- Always replace
- Lightly fasten bolts, then tighten in a diagonal sequence to torque specification

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

- Pulling off **Tapered roller bearing inner races, removing**
- Pressing on **Pressing off left and right tapered roller bearing inner race**

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

- Pulling out **Left tapered roller bearing outer race, removing from final drive cover**
- Pressing in **Left tapered roller bearing outer race, pressing into final drive cover**

10 - Adjustment shim " S_1 "

- Note thickness
- Adjustment overview --> **Adjustment overview**

11 - Final drive cover [1)]

- With O-ring

12 - Thrust washer union

- Install coated with gear oil

13 - Large differential bevel gear

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- Installing **Differential planetary gears, installing**

14 - Axle for differential bevel gears

- Drive out with drift after removing spring pin

15 - Roll pin

- For securing axle for differential bevel gears
- Sheared off at removal **Differential planetary gear axle, removing**
- Drive in flush

16 - Small differential bevel gear

- Installing **Differential planetary gears, installing**

Pulling outer race for right tapered roller bearing out of transmission housing

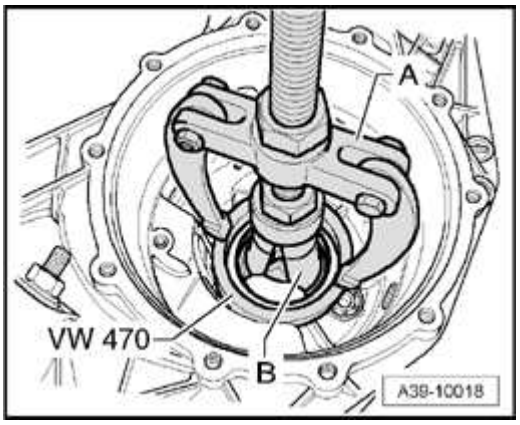

Fig. 209: Pulling Outer For Right Tapered Roller Bearing Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Support , e.g. Kukko 22/2

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

- After removing, check shims for damage.

Right tapered roller bearing outer race, driving into transmission housing

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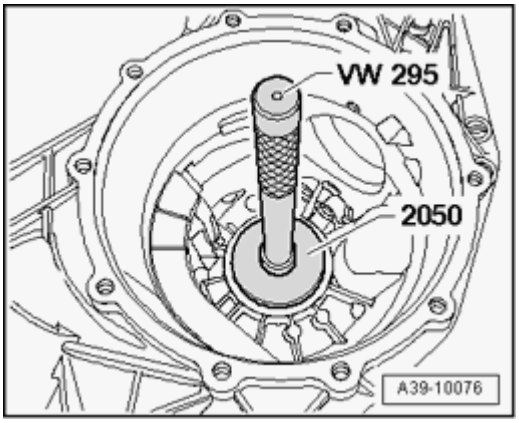

Fig. 210: Driving Outer Race For Right Tapered Roller Bearing Together With Shim Into Differential Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Tapered roller bearing inner races, removing

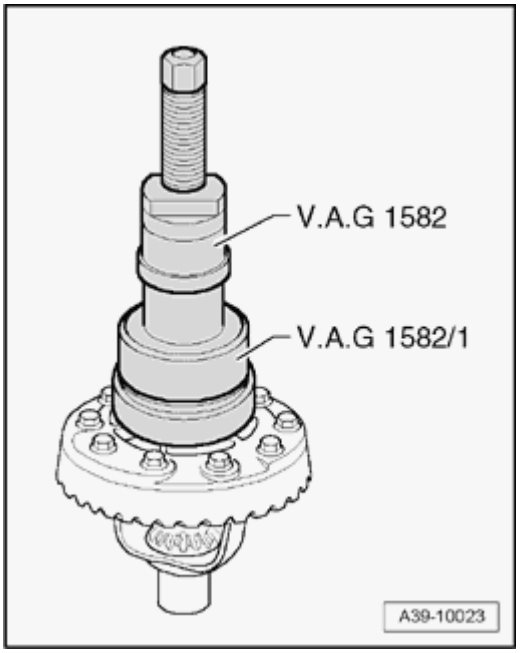

Fig. 211: Tapered Roller Bearing Inner Races, Removing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before installing puller, set thrust pad VW 447 H onto differential housing.

NOTE:

- **Removing differential left and right tapered roller bearing inner race is identical.**

Pressing off left and right tapered roller bearing inner race

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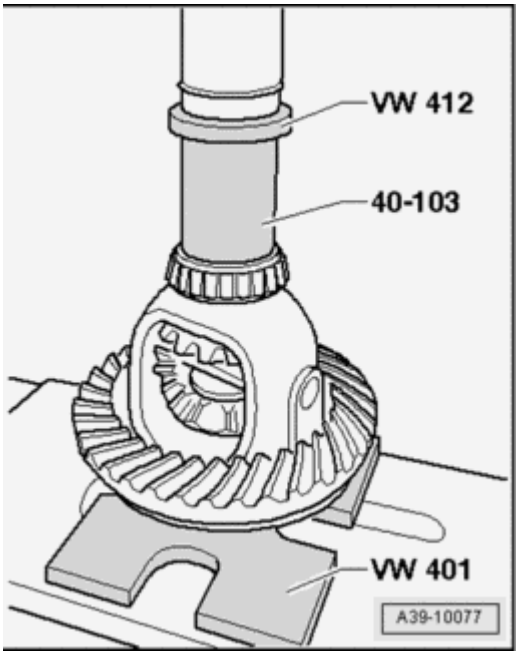

Fig. 212: Pressing Off Left And Right Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Left and right tapered roller bearing inner races are pressed off with the same tools.**

CAUTION: Wear protective gloves!

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

Left tapered roller bearing outer race, removing from final drive cover

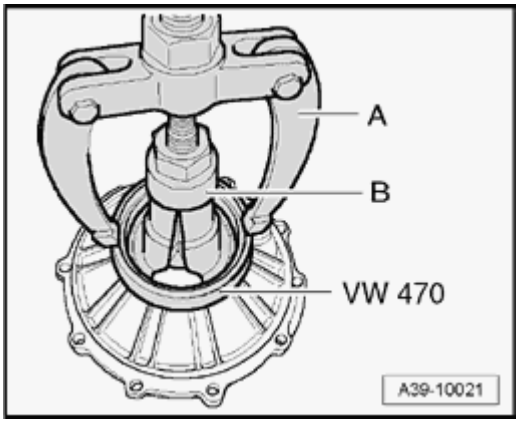

Fig. 213: Left Tapered Roller Bearing Outer Race, Removing From Final Drive Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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A - Support , e.g. Kukko 22/2

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

- After removing, check shims for damage.

Left tapered roller bearing outer race, pressing into final drive cover

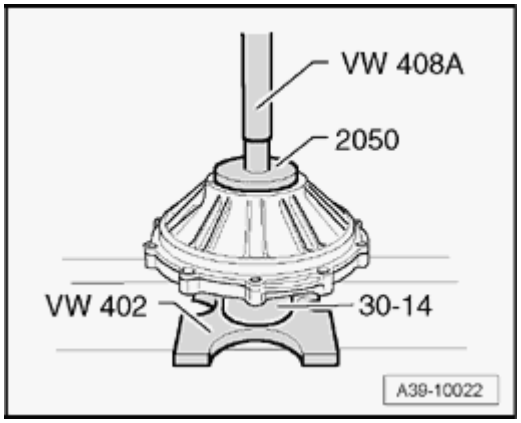

Fig. 214: Pressing Tapered Roller Bearing Outer Race (Left-Side) Into Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving ring gear from housing

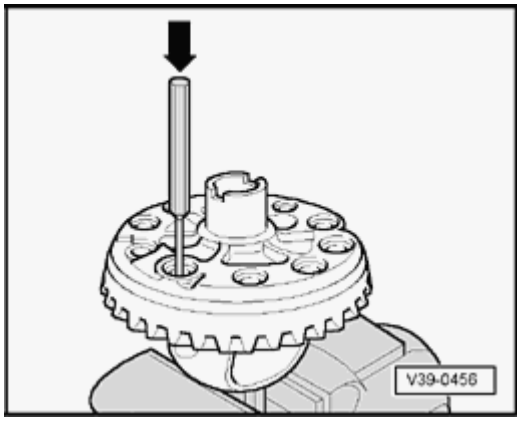

Fig. 215: Driving Out Ring Gear From Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Heat ring gear to approx. 100°C and install

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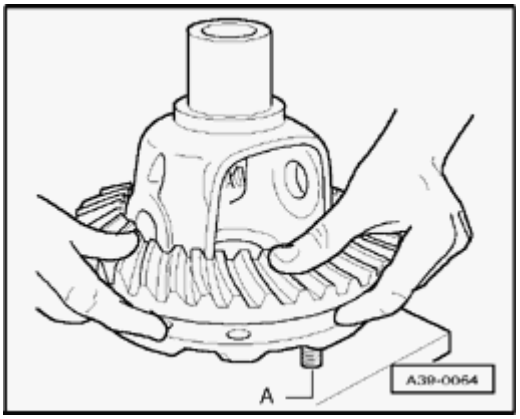

Fig. 216: Installing Ring Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing ring gear, guide with centering pins - **A** - (self-made).

CAUTION: Wear protective gloves!

- Before installing new screws, allow to cool off somewhat. Then tighten to specified torque.

Differential planetary gear axle, removing

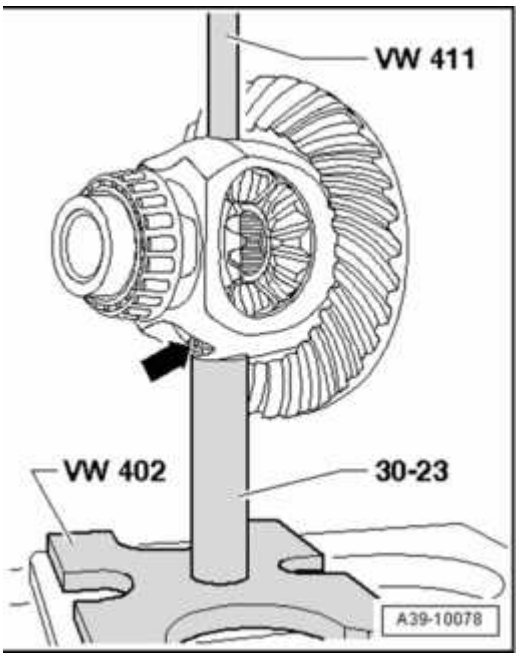

Fig. 217: Differential Planetary Gear Axle, Removing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Spring pin is sheared off when pressing out.

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- Drive remaining spring pin parts out of differential housing and differential planetary gear axle.

Differential planetary gears, installing

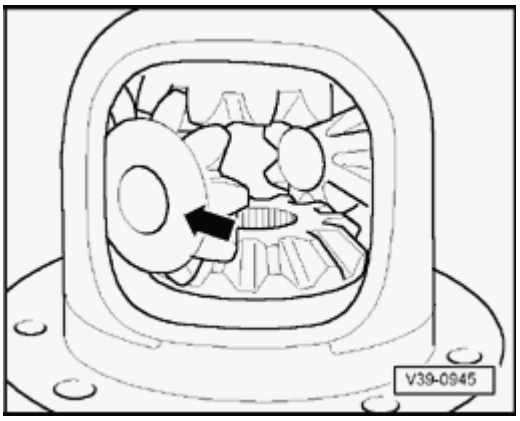

Fig. 218: Installing Small Differential Bevel Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert thrust washer union with transmission fluid.
- Insert large differential planetary gears.
- Install small differential bevel gears at 180° from their final position and rotate into place - **arrow** -.
- Align holes of thrust washer union, small planetary gears and differential housing.

- Drive axle for differential bevel gears into final position and secure.

PINION AND RING GEAR, ADJUSTING

Pinion and ring gear, adjusting

NOTE:

- **Careful adjustment of pinion and ring gear is important for service life and smooth running of final drive. For this reason, the drive pinion 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 location for the smoothest running is determined by moving drive pinion axially whereby ring gear is moved far enough out of the backlash-free position so that the backlash is within specified tolerances.**
- **The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production.**
- **The final drive set (drive pinion and ring gear) may only be replaced together as a matched pair.**
- **Observe the general repair instructions for bearings and shims.**
- **If gear set is replaced, then always replace double angular contact ball bearing on drive pinion with it.**

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Gear sets, adjustments and markings

There are 2 versions of gear seat adjustments and markings.

1. Gear seats where dimension E is indicated on outer circumference of ring gear.
2. Gear seats where dimension e is indicated on outer circumference of ring gear.

Adjustment and marking gear set, dimension "E" indicated

NOTE:

- **Dimension - E - is the length for this gear seat that must be adjusted on the master gauge VW 385/30.**

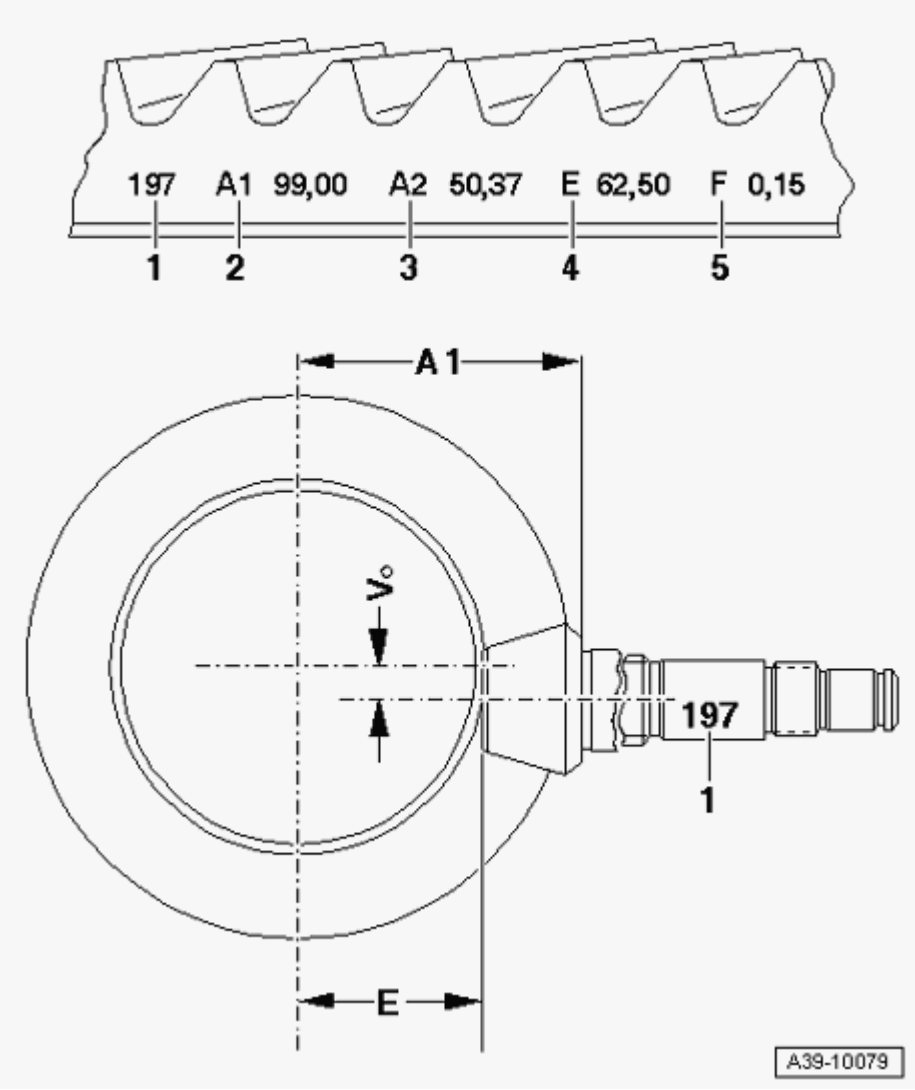

Fig. 219: Adjustment And Marking Gear Set, Dimension "E" Indicated
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Pairing number "197" for gearing set

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2 - Dimension "A1" is dimension between ring gear axle and rear side of pinion face. This dimension is needed for shim " S_5 " and positioning of inner race/tapered roller bearing --> **Shim " S 5 " for positioning inner race/tapered ball bearing, redetermining**.

3 - Dimension "A2" is not needed for adjusting gear set.

4 - Dimension "E" is the actual dimension between ring gear axle and drive pinion facing side in position of quietest running for this gear set; dimension "E" in this example = 62.50 mm. Dimension "E" is adjusted on the master gauge VW 385/30.

5 - Dimension "F" is not needed for adjusting gear set.

Vo - Hypoid offset

Adjustment and marking gear set, dimension "e" indicated

NOTE:

- **That length that must be adjusted on the master gauge VW 385/30 is always 62.17 mm (= Eo - dimension) with this gear set**

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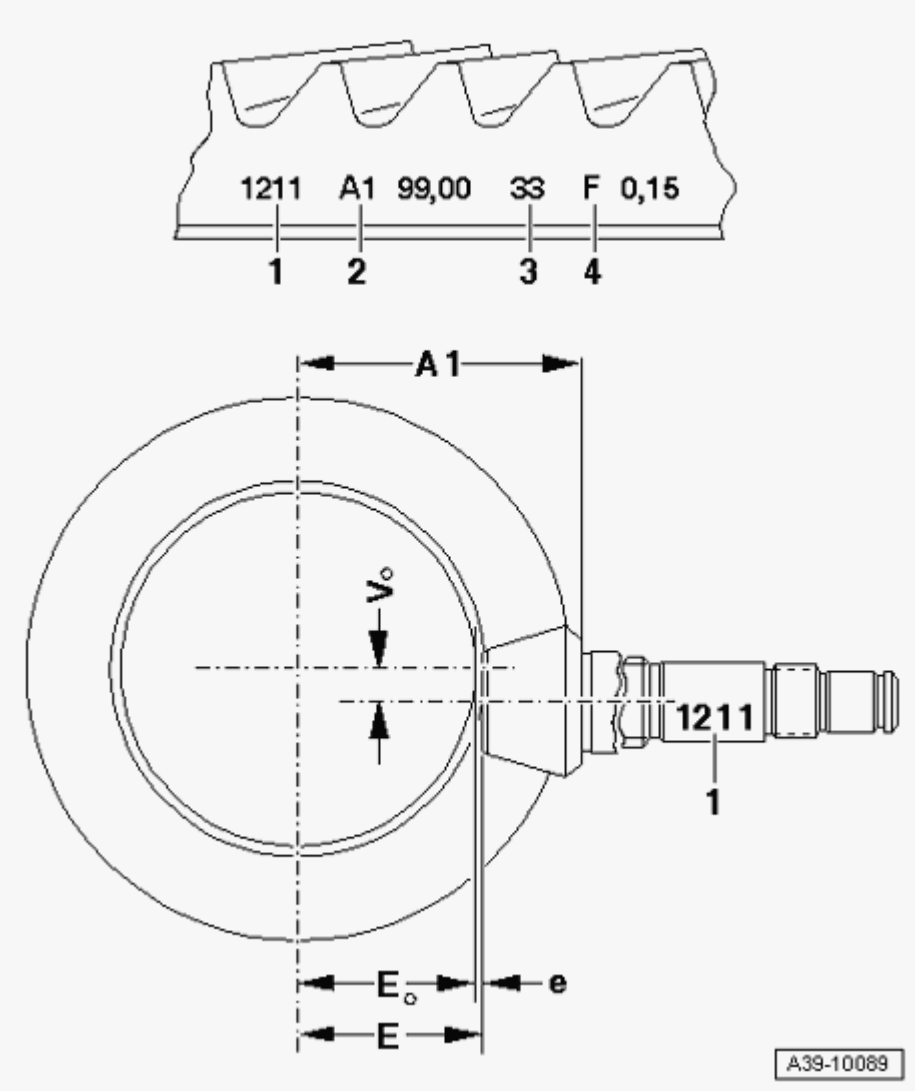

Fig. 220: Adjustment And Marking Gear Set, Dimension "E" Indicated
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Pairing number "1211" for gearing set

2 - Dimension "A1" is the dimension between ring gear axle and rear side of pinion face. This dimension is needed for the shim " S_5 " and positioning of inner race/tapered roller bearing --> **Shim " S 5 " for positioning inner race/tapered ball bearing, redetermining**.

3 - Dimension "e" is based on the master gauge used on the test bench during production. Dimension "e" is always given in 1/100 mm. Example: "33" means "e" = 0.33 mm

4 - Dimension "F" is not always present, is not needed for adjusting gear set

Eo - Length of master gauge used on the test bench; dimension "Eo" = 62.17 mm.

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E - Actual dimension between ring gear axis and face of drive pinion in position of quietest running for this gear set.

Vo - Hypoid offset

Location of shims

NOTE:

- **Adjustment overview when replacing individual components of differential --> Adjustment overview.**

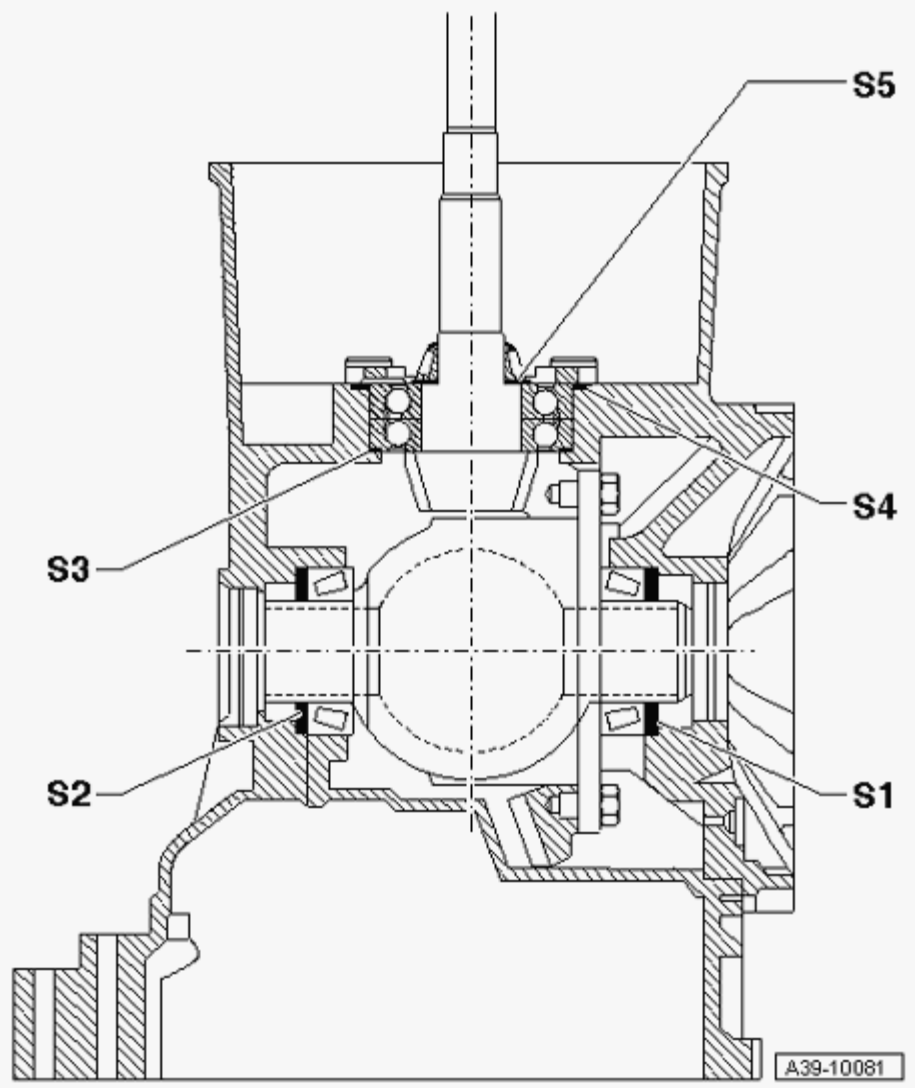

Fig. 221: Location Of Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

S1 - Ring gear adjustment shim in final drive cover

S2 - Shim for ring gear in transmission housing

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S3 - Shim for positioning drive pinion in transmission housing

S4 - Shim for pre-load of double angular contact ball bearing on drive pinion

S5 - Shim for positioning inner race/tapered roller bearing on drive pinion

- Shim, determining --> **Shim " S 5 " for positioning inner race/tapered ball bearing, redetermining**.

Adjustment overview

NOTE:

- **When working on transmission, drive pinion, ring gear or gear set only need to be replaced if components were replaced which directly influence the final drive.**
- **No adjustment is needed when replacing drive pinion double angular contact ball bearing.**
- **Refer to the following table to avoid unnecessary adjustments:**

To be adjusted:	Pinion	Ring gear	Torsional backlash
	(" S_3 " + " S_4 ")	(" S_1 " + " S_2 ")	0,12 - 0,22
	--> **Pinion, adjusting**	--> **Ring gear, adjusting**	
Replaced component			
Transmission housing	X	X	X
Differential housing		X	X
Taper roller bearing for differential		X	X
Gear set * See note	X	X	X
Cover for final drive		X	X

*Drive pinion and ring gear; only replace together.

Recommended sequence for adjusting gear set

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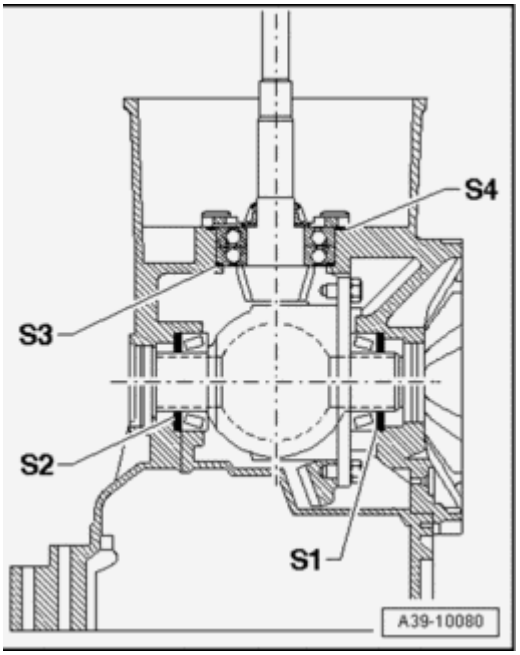

Fig. 222: Recommended Sequence For Adjusting Gear Set
Courtesy of VOLKSWAGEN UNITED STATES, INC.

If drive pinion and gear ring have to be adjusted, the following sequence is recommended for maximum efficiency:

- Determine shim " S_3 " so that the dimension from center of ring gear to facing drive of drive pinion corresponds to the installation dimension determined during production.
- Determine shim " S_4 " for double angular contact ball bearing preload.
- Total shim thickness " S_{total} " Determine (S_1 plus S_2) for specified preload of tapered roller bearing/differential.
- Total shim thickness " S_{total} " Distribute (S_1 plus S_2) so that the specified torsional backlash is present between ring gear and drive pinion.

Pinion, adjusting

Procedures after which the drive pinion must be adjusted --> **Adjustment overview**.

There are 2 procedures when adjusting drive pinions.

1. Adjusting gear seats where dimension E is indicated on the outer circumference of ring gear.
2. Adjusting gear seats where dimension e is indicated on outer circumference of ring gear.

Adjusting gear seats where dimension "E" is indicated on outer circumference of ring gear

Special tools, testers and auxiliary items required

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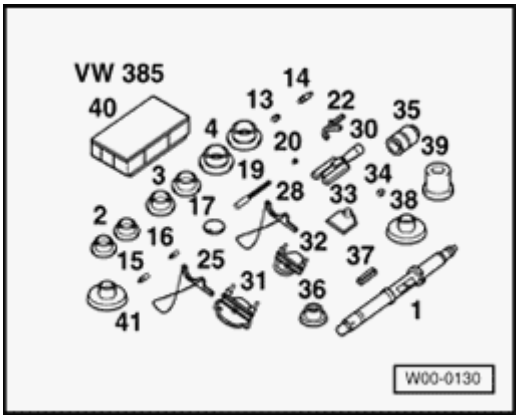

Fig. 223: Universal Measuring Device VW 385
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Universal measuring device VW 385

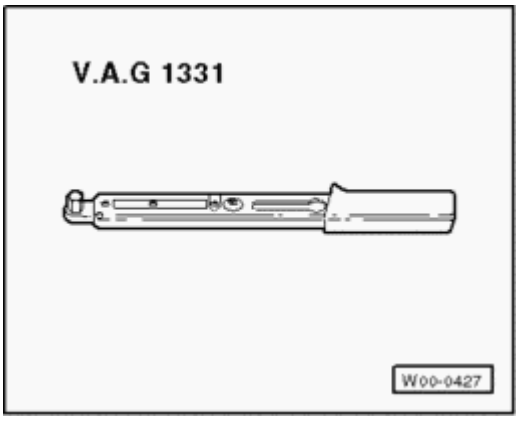

Fig. 224: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331
- Depth gauge, e.g. Digital Depth Gauge VAS 6087
- Dial gauge

Determine thickness of previous shim " S_3 " and " S_4 "

- Differential removed.
- Double angular contact ball bearing is pressed onto drive pinion.

NOTE:

- **For the initial measurement, an adjustment shim " S_3 " of 1.00 mm is inserted. It is designated as " S_3 * " in the following. After adjusting dimension "E" , " S_3 * " is replaced by the final shim " S_3 ".**

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- Secure transmission housing to transmission mounting VW 353. To do so, transmission housing must be vertical.
- Place shim " S_3 * " in transmission housing.

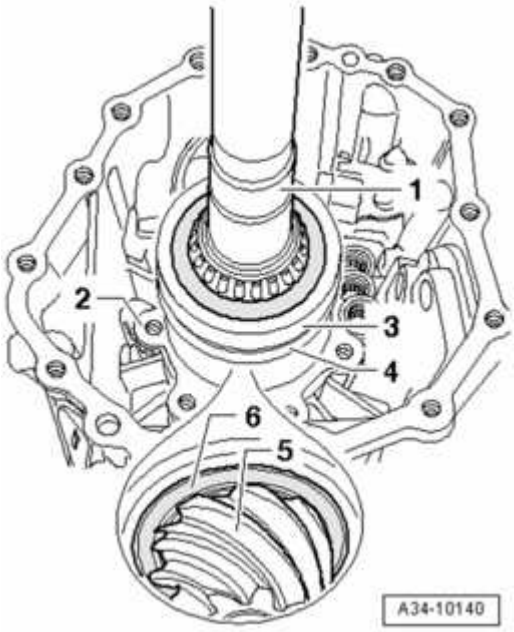

Fig. 225: Removing Drive Pinion From Bore In Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Coat outer races - **3** - and - **4** - of double angular contact ball bearing with transmission fluid.
- Carefully slide drive pinion - **1** - with double angular contact ball bearing by hand into transmission housing - **2** - and press onto upper outer race - **3** - at the same time.

NOTE:

- **Warm transmission housing beforehand with a hot air gun in bearing seat area, if necessary.**

Outer races - **3** - and - **4** - must not tilt when inserting, they must remain together. Otherwise, seal - **6** - can be damaged by pinion face - **5** -.

If double angular contact ball bearing seal is damaged, the bearing must be replaced.

Determine previous shim " S_4 " as follows:

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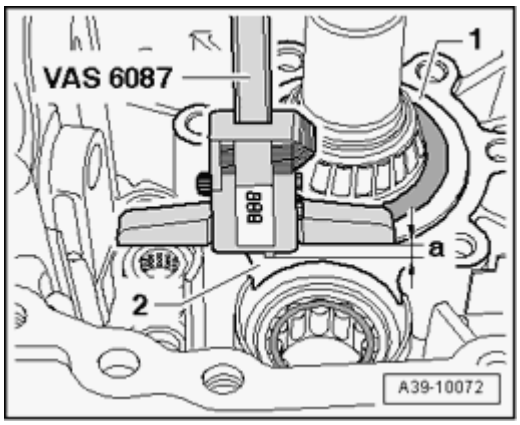

Fig. 226: Using Digital Depth Gauge To Measure From Outer Race/Double Angular Contact Ball Bearing To Retaining Plate Bolting Surface
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a digital depth gauge (e.g Digital Depth Gauge VAS 6087), measure from outer race/double angular contact ball bearing - **1** - to retaining plate bolting surface - **2** -.

In the example, gap dimension - **a** - = 1.14 mm. Determine previous shim " S_4 " according to --> **Available adjustment shims for " S 4 "**.

NOTE:

- **For the initial measurement, an adjustment shim " S_4 " of 0.95 mm is inserted. It is designated as " S_4 * " in the following. After adjusting dimension "E" , " S_4 * " is replaced by the final shim " S_4 ".**

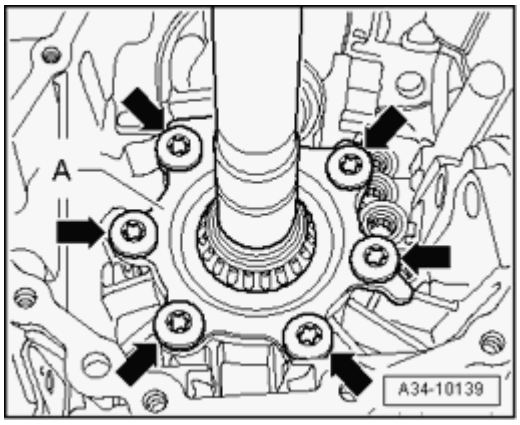

Fig. 227: Identifying Bolts & Retainer Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place previous shim " S_4 * " (0.95 mm in example) and retaining plate - **A** - (only fits in one position) on transmission housing bolting surface.
- Clean threads of previous screws - **arrows** - with a wire brush. Then tighten screws diagonally to 30 Nm.

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Dimension "E" , adjusting

NOTE:

- **Dimension "E" must be adjusted at master gauge VW 385/30 to determine final shim thickness of " S_3 " and " S_4 ".**

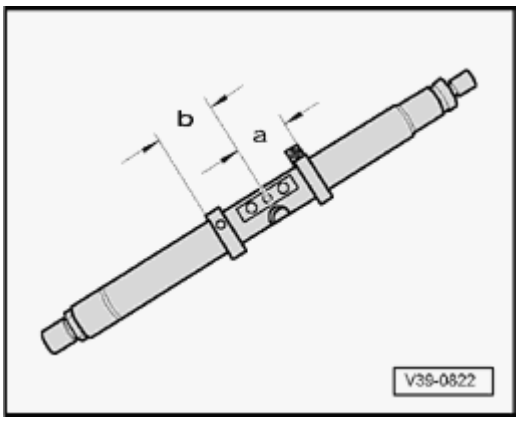

Fig. 228: Setting Adjusting Rings Of Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set adjustment rings of universal mandrel VW 385/1 to the following values:

- Dimension - **a** - = 45 mm
- Dimension - **b** - = 60 mm

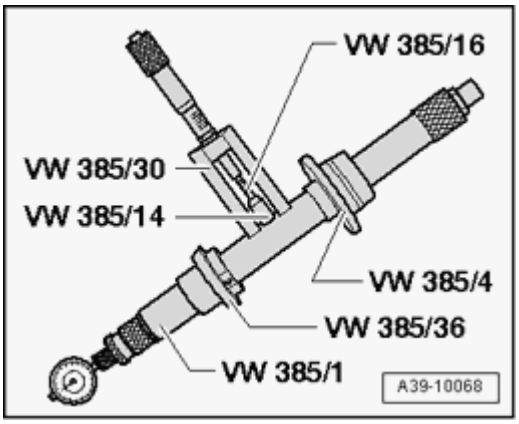

Fig. 229: Assembling Universal Mandrel VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble universal mandrel VW 385/1 as shown in the illustration:

- Dial gauge extension VW 385/16 , 12.3 mm long

- Set master gauge VW 385/30 to dimension "E" in example = 62.50 mm and place on universal mandrel VW 385/1.

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- Set gauge (3 mm measuring range) to "0" with 2 mm pre-load.

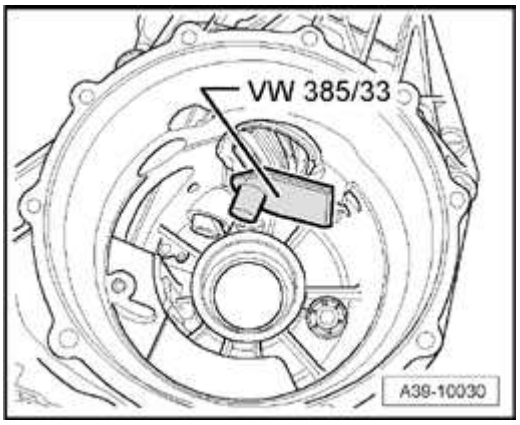

Fig. 230: Placing Magnetic Plate VW 385/33 Onto Head Of Drive Pinion
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place magnetic plate VW 385/33 onto head of drive pinion.

NOTE:

- **Make sure magnetic plate VW 385/33 is precisely installed and free of oil.**

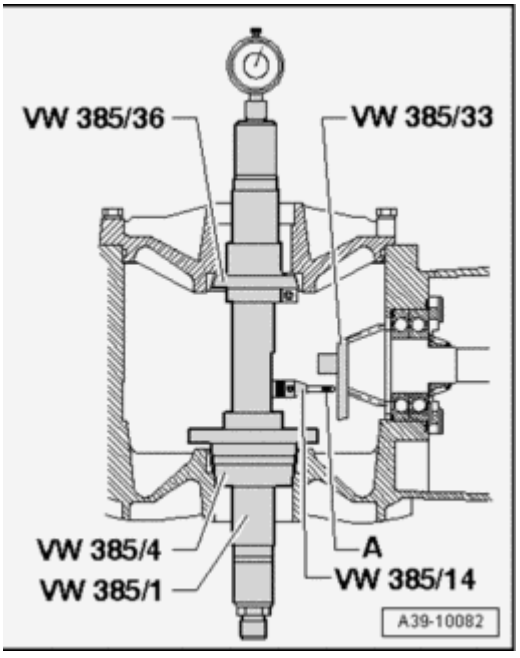

Fig. 231: Removing Master Gauge VW 385/30 And Inserting Universal Mandrel In Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove master gauge VW 385/30 and insert universal mandrel in transmission housing.

- A dial gauge extension - **A** - = 12.3 mm long must be screwed in.

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- Dial gauge faces final drive cover.
- O-ring is inserted in final drive cover.

- Install final drive cover and tighten 4 bolts to 24 Nm.
- Using adjustable ring, pull 2nd centering disc VW 385/36 out far enough, so that the universal mandrel can only just be turned by hand.

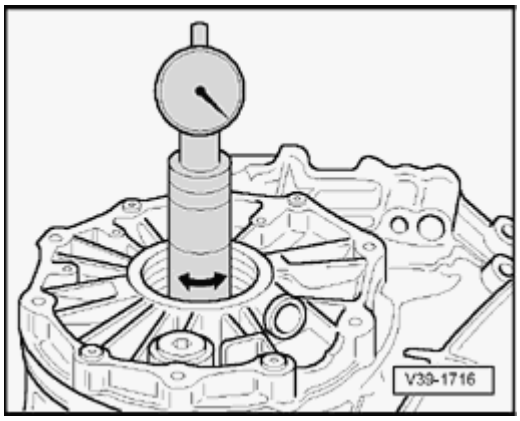

Fig. 232: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn universal mandrel until dial gauge tip touches magnetic plate on head of pinion and indicates max. runout (return point).

- Measured value in following example: = 0.15 mm (red number range)

NOTE:

- **After removing universal mandrel - check again whether dial gauge stands at "0" with 2 mm pre-load when adjustable master gauge VW 385/30 is attached.**

Determining thickness of adjustment shim " S_3 "

- If measured in red numbered area, measured value must be subtracted.
- If measured in black numbered area, measured value must be added.

Example:		
	Inserted shim " S_3 * "	1.00 mm
-	Value determined (red number range)	0.15 mm
=	Thickness of adjustment shim " S_3 "	0.85 mm

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Available adjustment shims for " S_3 "

Shim thickness (mm) * See note		
0.55	0.75	0.95
0.60	0.80	1.00
0.65	0.85	1.05
0.70	0.90	

*Using shim tolerances it is possible to find the exact shim thickness required, insert two shims if necessary.

- Remove previous shims " S_3 * " and " S_4 * ".
- Insert determined shim " S_3 " , 0.85 mm in example, in transmission housing.

Determining thickness of adjustment shim " S_4 "

- Determined shim " S_3 " is installed in transmission housing.

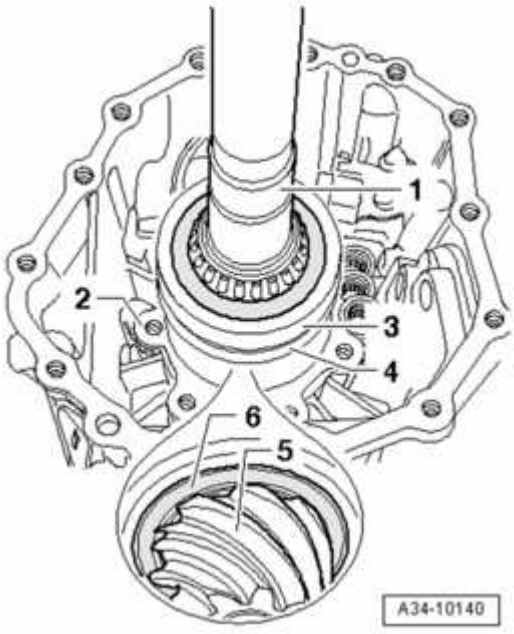

Fig. 233: Removing Drive Pinion From Bore In Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Coat outer races - **3** - and - **4** - of double angular contact ball bearing with transmission fluid.
- Carefully slide drive pinion - **1** - with double angular contact ball bearing by hand into transmission housing - **2** - and press onto upper outer race - **3** - at the same time.

NOTE:

- **Warm transmission housing beforehand with a hot air gun in bearing seat**

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area, if necessary.

Outer races - **3** - and - **4** - must not tilt when inserting, they must remain together. Otherwise, the seal - **6** - can be damaged by the pinion face - **5** -.

If the double angular contact ball bearing seal is damaged, the bearing must be replaced.

Determine shim " S_4 " as follows:

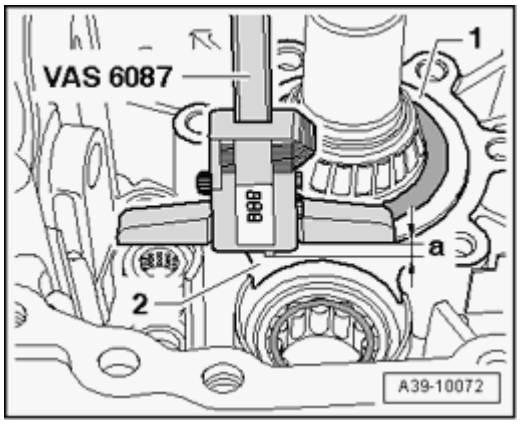

Fig. 234: Using Digital Depth Gauge To Measure From Outer Race/Double Angular Contact Ball Bearing To Retaining Plate Bolting Surface
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a digital depth gauge (e.g Digital Depth Gauge VAS 6087), measure from outer race/double angular contact ball bearing - **1** - to retaining plate bolting surface - **2** -.

In the example, gap dimension - **a** - = 0.99 mm. Determine shim " S_4 " according to --> **Available adjustment shims for " S 4 "**.

Available adjustment shims for " S 4 "

Gap dimension - a -	Adjustment shim " S_4 " * See note
Measured value (mm)	Thickness (mm)
0.67 to 0.71 0.72 to 0.76 0.77 to 0.81	0.50 0.55 0.60
0.82 to 0.86 0.87 to 0.91 0.92 to 0.96	0.65 0.70 0.75
0.97 to 1.01 1.02 to 1.06 1.07 to 1.11	0.80 0.85 0.90
1.12 to 1.16 1.17 to 1.21 1.22 to 1.26	0.95 1.00 1.05
1.27 to 1.31 1.32 to 1.36 1.37 to 1.41	1.10 1.15 1.20
1.42 to 1.46 1.47 to 1.51 1.52 to 1.56	1.25 1.30 1.35
1.57 to 1.61	1.40

*Using shim tolerances it is possible to find the exact shim thickness required, insert two shims if necessary.

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NOTE:

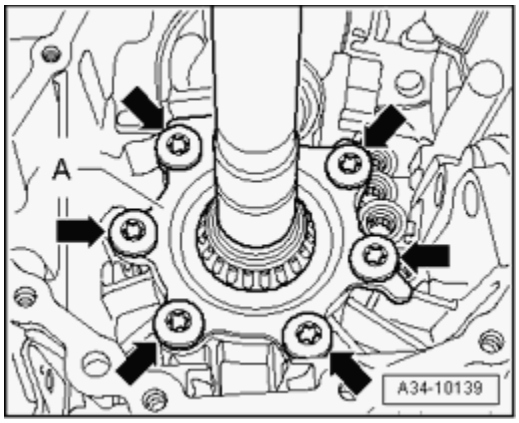

Fig. 235: Identifying Bolts & Retainer Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **Place determined shim " S_4 " (0.80 mm in example) and retaining plate - A - (only fits in one position) on transmission housing bolting surface.**
- **Then tighten bolts - arrows - diagonally to 30 Nm.**

Performing measuring check, checking dimension "E"

- Install drive pinion with measured adjustment shims " S_3 " and " S_4 ".

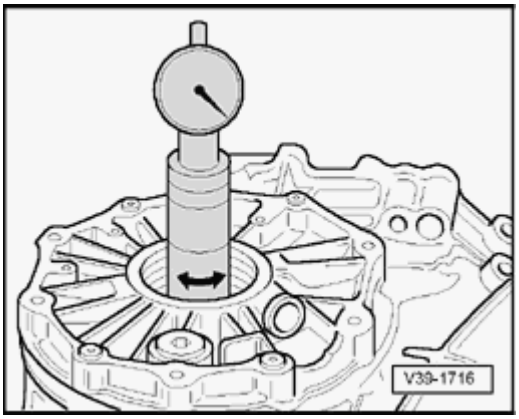

Fig. 236: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install universal mandrel and perform measurement check.
- Read dial indicator counterclockwise (red numbered area).

- If adjustment shims were determined correctly, dimension "E" must have a clearance of ± 0.04 mm.

NOTE:

- **After removing universal mandrel - check again whether dial gauge stands**

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at "0" with 2 mm pre-load when adjustable master gauge VW 385/30 is attached.

Adjusting gear seats where dimension "e" is indicated on outer circumference of ring gear

Special tools, testers and auxiliary items required

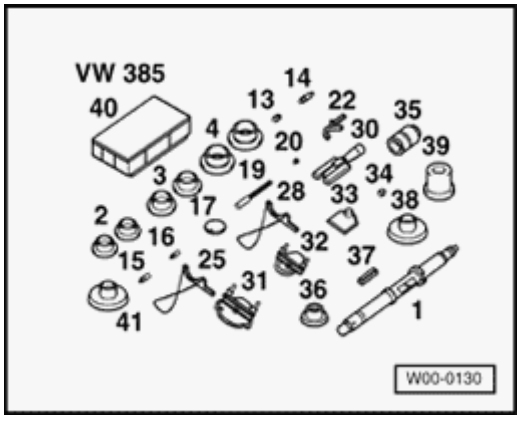

Fig. 237: Universal Measuring Device VW 385
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Universal measuring device VW 385

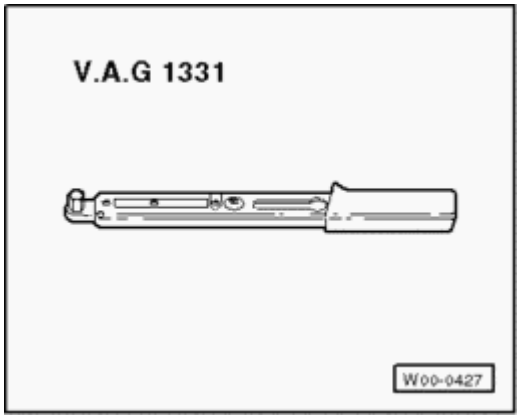

Fig. 238: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331
- Depth gauge, e.g. Digital Depth Gauge VAS 6087
- Dial gauge

Determining thickness of previous shims " S_3 " and " S_4 "

- Differential removed.

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- Double angular contact ball bearing is pressed onto drive pinion.

NOTE:

- **For the initial measurement, an adjustment shim " S_3 " of 1.00 mm is inserted. It is designated as " S_3 * " in the following. After adjusting dimension "e" , " S_3 * " is replaced by the final shim " S_3 ".**

  - Secure transmission housing to transmission mounting VW 353. To do so, transmission housing must be vertical.
  - Place shim " S_3 * " in transmission housing.

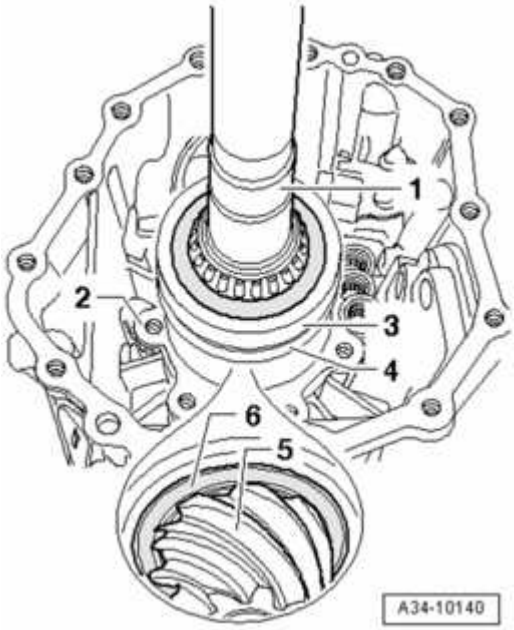

Fig. 239: Removing Drive Pinion From Bore In Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

  - Coat outer races - **3** - and - **4** - of double angular contact ball bearing with transmission fluid.
  - Carefully slide drive pinion - **1** - with double angular contact ball bearing by hand into transmission housing - **2** - and press onto upper outer race - **3** - at the same time.

NOTE:

- **Warm transmission housing beforehand with a hot air gun in bearing seat area, if necessary.**

Outer races - **3** - and - **4** - must not tilt when inserting, they must remain together. Otherwise, the seal - **6** - can be damaged by the pinion face - **5** -.

If the double angular contact ball bearing seal is damaged, the bearing must be replaced.

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Determine previous shim " S_4 " as follows:

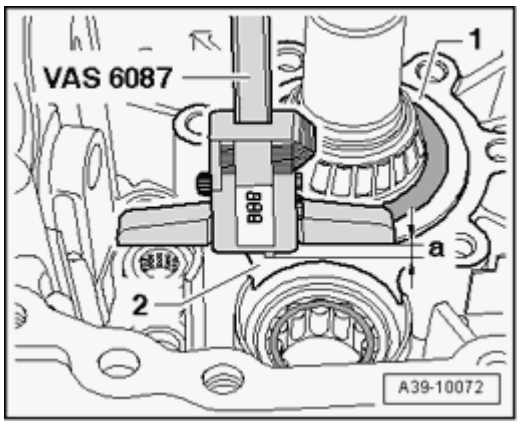

Fig. 240: Using Digital Depth Gauge To Measure From Outer Race/Double Angular Contact Ball Bearing To Retaining Plate Bolting Surface
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a digital depth gauge (e.g Digital Depth Gauge VAS 6087), measure from outer race/double angular contact ball bearing - **1** - to retaining plate bolting surface - **2** -.

In the example, gap dimension - **a** - = 1.14 mm. Determine previous shim " S_4 " according to --> **Available adjustment shims for " S 4 "**.

NOTE:

- **For the initial measurement, an adjustment shim " S_4 " of 0.95 mm is inserted. It is designated as " S_4 * " in the following. After adjusting dimension "e" , " S_4 * " is replaced by the final shim " S_4 ".**

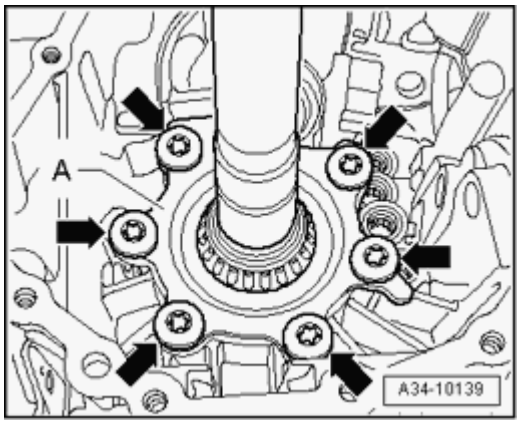

Fig. 241: Identifying Bolts & Retainer Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place previous shim " S_4 * " (0.95 mm in example) and retaining plate - **A** - (only fits in one position) on transmission housing bolting surface.

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- Clean threads of previous bolts - **arrows** - with a wire brush. Then tighten bolts diagonally to 30 Nm.

Dimension "e" , adjusting

NOTE:

- **Dimension "e" must be adjusted to determine final shim thickness of " S_3 " and " S_4 " for this gear set.**

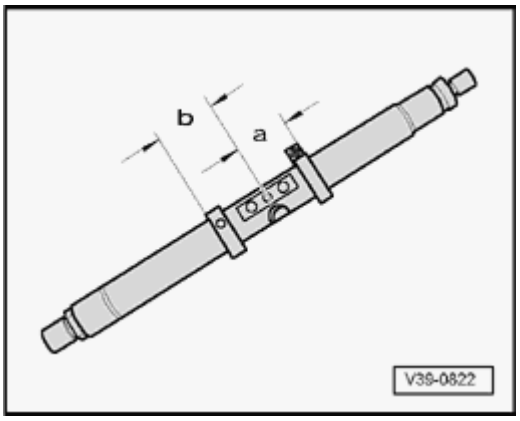

Fig. 242: Setting Adjusting Rings Of Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set adjustment rings of universal mandrel VW 385/1 to the following values:

- Dimension - **a** - = 45 mm
- Dimension - **b** - = 60 mm

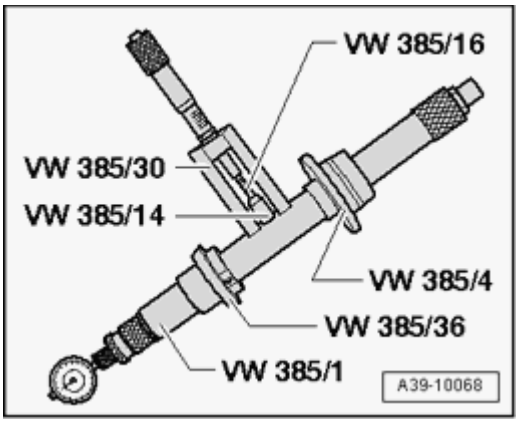

Fig. 243: Assembling Universal Mandrel VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble universal mandrel VW 385/1 as shown in illustration:

- Dial gauge extension VW 385/16 , 12.3 mm long

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- Set master gauge VW 385/30 to dimension "Eo" = 62.50 mm and place on universal mandrel VW 385/1.
- Set gauge (3 mm measuring range) to "0" with 2 mm pre-load.

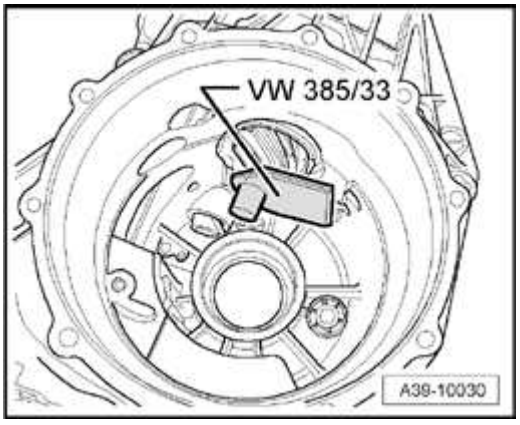

Fig. 244: Placing Magnetic Plate VW 385/33 Onto Head Of Drive Pinion
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place magnetic plate VW 385/33 onto head of drive pinion.

NOTE:

- **Make sure magnetic plate VW 385/33 is precisely installed and free of oil.**

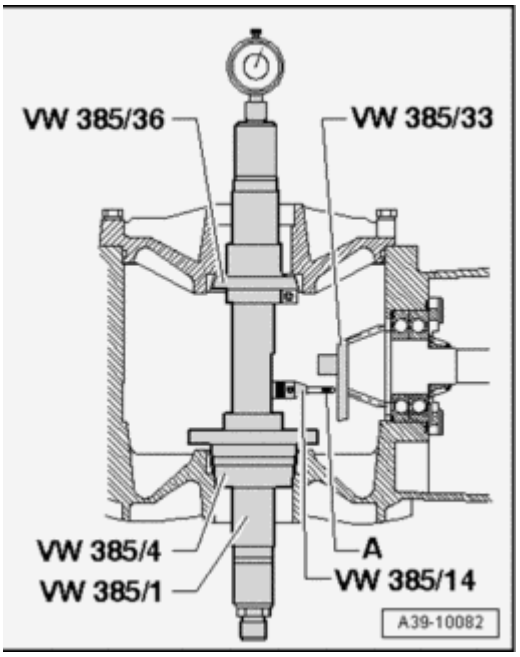

Fig. 245: Removing Master Gauge VW 385/30 And Inserting Universal Mandrel In Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove master gauge VW 385/30 and insert universal mandrel in transmission housing.

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- A dial gauge extension - **A** - = 12.3 mm long must be screwed in.
- Dial gauge faces final drive cover.
- O-ring is inserted in final drive cover.

- Install final drive cover and tighten 4 bolts to 24 Nm.
- Using adjustable ring, pull 2nd centering disc VW 385/36 out far enough, so that the universal mandrel can only just be turned by hand.

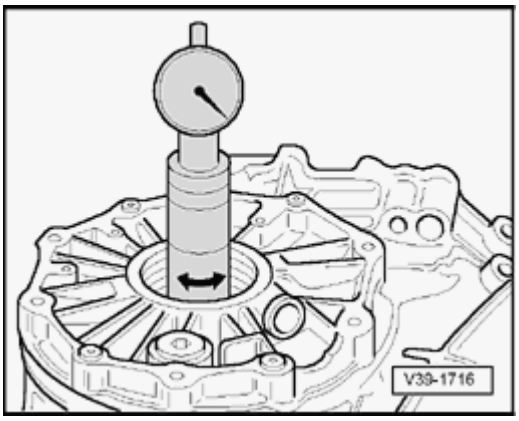

Fig. 246: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn universal mandrel until dial gauge tip touches magnetic plate on head of pinion and indicates max. runout (return point).

- Measured value in following example: = 0.43 mm (red number range)

NOTE:

- **After removing universal mandrel - check again whether dial gauge stands at "0" with 2 mm pre-load when adjustable master gauge VW 385/30 is attached.**

Determining thickness of adjustment shim " S_3 "

- Dimension "e" which is based on the master gauge "Eo" is measured for the final drive sets supplied as replacement parts and marked on outer circumference of ring gear.
- If measured in red numbered area, measured value must be subtracted.
- If measured in black numbered area, measured value must be added.

Formula:

" S_3 " = " S_3 * " + "e" + "measured value" ("measured value" in black numbered area)

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" S_3 " = " S_3 * " + "e" - "measured value" ("measured value" in red numbered area)

Example:		
	Inserted shim " S_3 * "	1.00 mm
+	Dimension "e"	0.33 mm
-	Determined value (red numbered area)	0.43 mm
=	Thickness of adjustment shim " S_3 "	0.90 mm

Available adjustment shims for " S_3 "

Shim thickness (mm) * See note		
0.55	0.75	0.95
0.60	0.80	1.00
0.65	0.85	1.05
0.70	0.90	

*Using shim tolerances it is possible to find the exact shim thickness required, insert two shims if necessary.

- Remove previous shims " S_3 * " and " S_4 * ".
- Insert determined shim " S_3 " , 0.90 mm in example, in transmission housing.

Determining thickness of adjustment shim " S_4 "

- Determined shim " S_3 " is installed in transmission housing.

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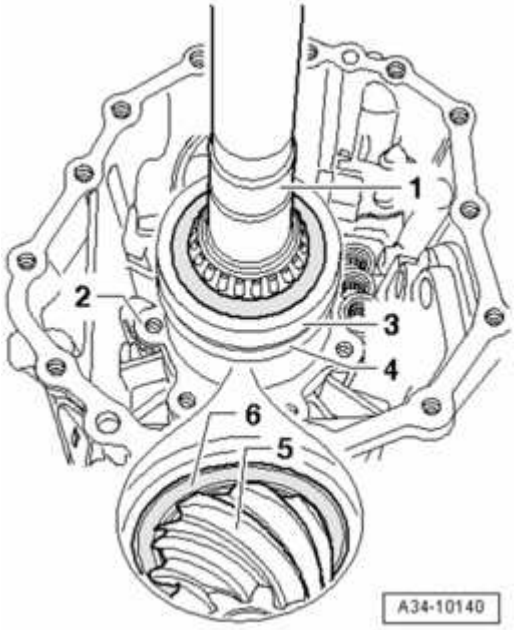

Fig. 247: Removing Drive Pinion From Bore In Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Coat outer races - **3** - and - **4** - of double angular contact ball bearing with transmission fluid.
- Carefully slide drive pinion - **1** - with double angular contact ball bearing by hand into transmission housing - **2** - and press onto upper outer race - **3** - at the same time.

NOTE:

- **Warm transmission housing beforehand with a hot air gun in bearing seat area, if necessary.**

Outer races - **3** - and - **4** - must not tilt when inserting, they must remain together. Otherwise, the seal - **6** - can be damaged by the pinion face - **5** -.

If the double angular contact ball bearing seal is damaged, the bearing must be replaced.

Determine shim " S_4 " as follows:

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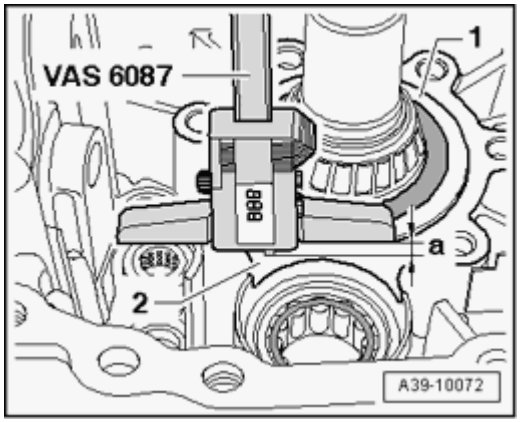

Fig. 248: Using Digital Depth Gauge To Measure From Outer Race/Double Angular Contact Ball Bearing To Retaining Plate Bolting Surface
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a digital depth gauge (e.g Digital Depth Gauge VAS 6087), measure from outer race/double angular contact ball bearing - **1** - to retaining plate bolting surface - **2** -.

In the example, gap dimension - **a** - = 1.04 mm. Determine shim " S_4 " according to --> **Available adjustment shims for " S 4 "**.

Available adjustment shims for " S 4 "

Gap dimension - a -	Adjustment shim " S_4 " * See note
Measured value (mm)	Thickness (mm)
0.67 to 0.71 0.72 to 0.76 0.77 0.81	0.50 0.55 0.60
0.82 to 0.86 0.87 to 0.91 0.92 to 0.96	0.65 0.70 0.75
0.97 to 1.01 1.02 to 1.06 1.07 to 1.11	0.80 0.85 0.90
1.12 to 1.16 1.17 to 1.21 1.22 to 1.26	0.95 1.00 1.05
1.27 to 1.31 1.32 to 1.36 1.37 to 1.41	1.10 1.15 1.20
1.42 to 1.46 1.47 to 1.51 1.52 to 1.56	1.25 1.30 1.35
1.57 to 1.61	1.40

*Using shim tolerances it is possible to find the exact shim thickness required, insert two shims if necessary.

NOTE:

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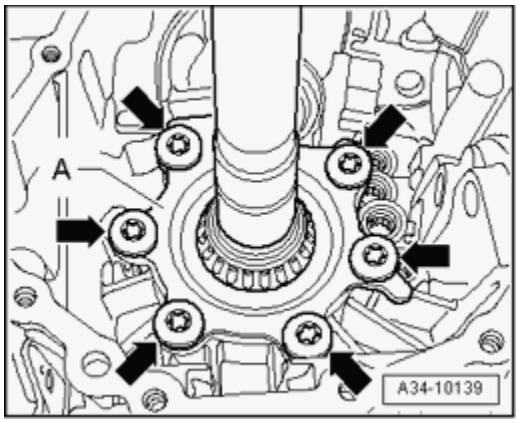

Fig. 249: Identifying Bolts & Retainer Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **Place determined shim " S_4 " (0.85 mm in example) and retaining plate - A - (only fits in one position) on transmission housing bolting surface.**
- **Then tighten screws - arrows - diagonally to 30 Nm.**

Performing measuring check, checking dimension "E"

- Install drive pinion with measured adjustment shims " S_3 " and " S_4 ".

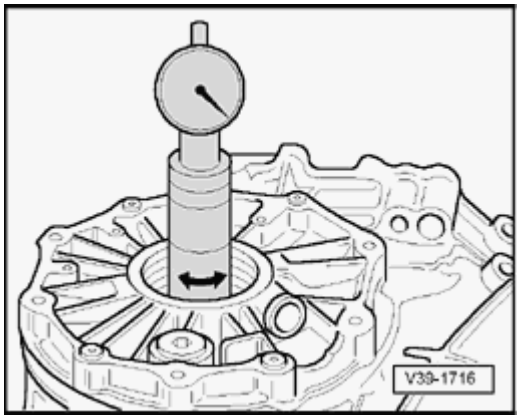

Fig. 250: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install universal mandrel and perform measurement check.
- Read dial indicator counterclockwise (red numbered area).

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

NOTE:

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- **After removing universal mandrel - check again whether dial gauge stands at "0" with 2 mm pre-load when adjustable master gauge VW 385/30 is attached.**

Ring gear, adjusting

(Adjusting differential)

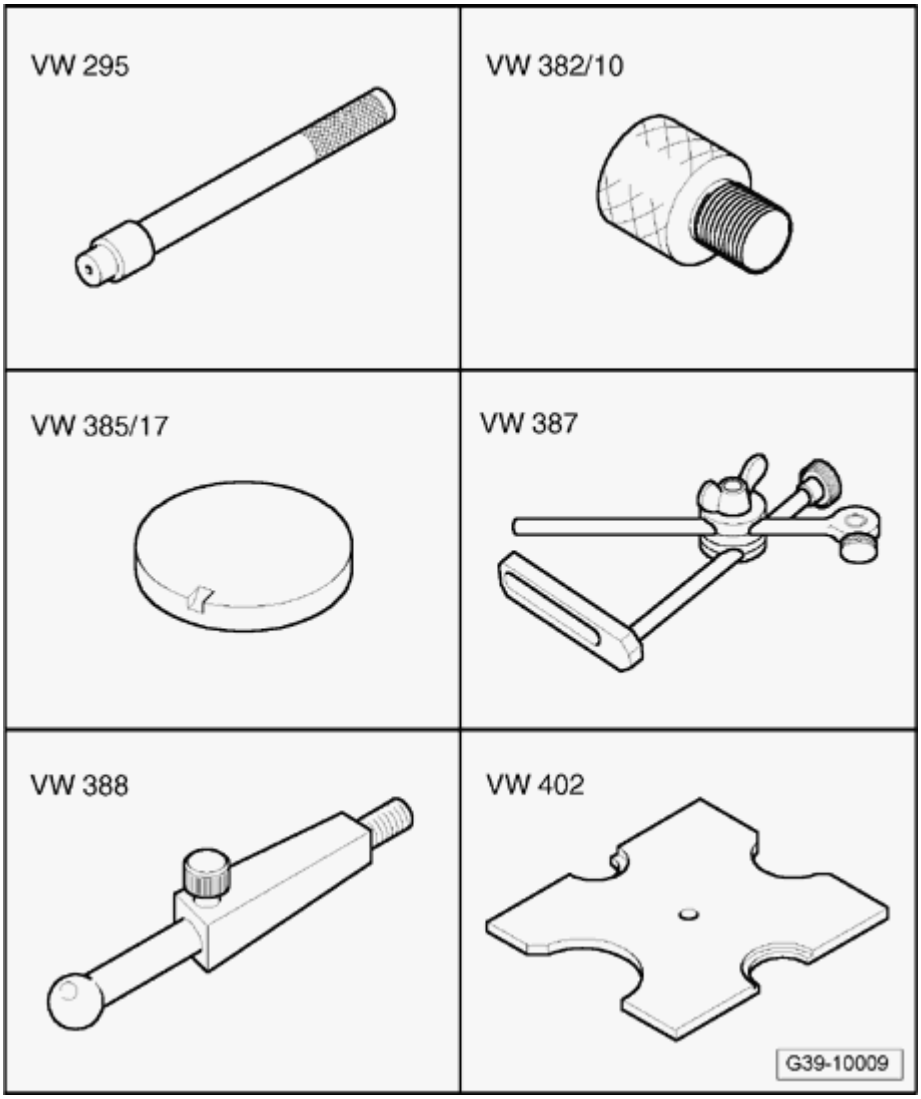

Fig. 251: Identifying Special Tools - Ring Gear, Adjusting (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW 295
- Dial gauge extension VW 382/10

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- Magnetic plate VW 385/17
- Dial gauge holder VW 387
- Measuring lever, adjustable VW 388
- Pressure plate VW 402

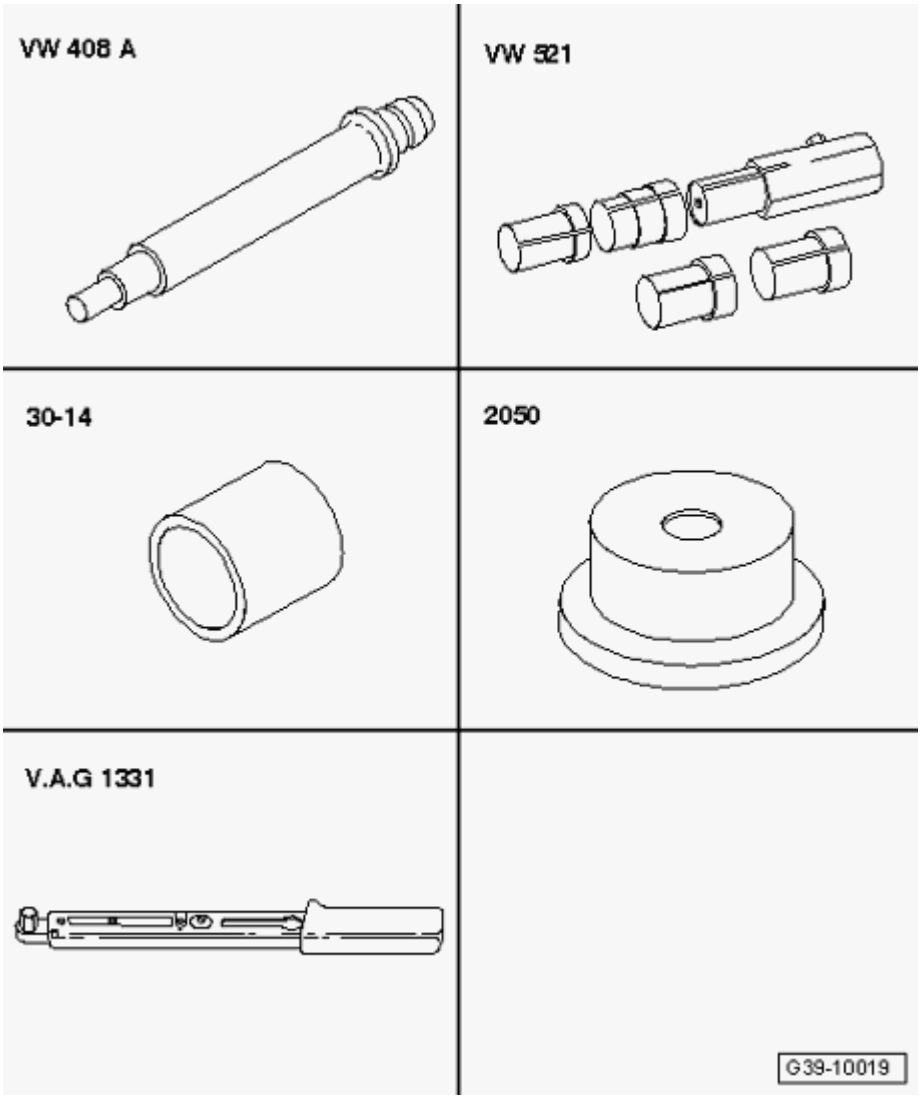

Fig. 252: Identifying Special Tools - Ring Gear, Adjusting (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Punch VW 408 A
- Ring gear adjustment device VW 521
- Sleeve 30 - 14
- Thrust piece 2050

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

A new ring gear adjustment is required when the following components have been replaced:

Transmission housing, final drive cover, differential tapered roller bearings, differential housing or the gear set

Adjustment overview --> **Adjustment overview**

Determine total shim thickness " S_{total} " for adjustment shims " S_1 " + " S_2 "

(Setting preload of taper roller bearing for differential)

- Drive pinion removed.
- If only the tapered roller bearing for differential has been replaced, ring gear can be removed from differential housing. Drive pinion then does not need to be removed.

- Remove flange shaft sealing rings.
- Remove outer races/tapered roller bearings for differential and remove adjustment shims --> **Differential, disassembling and assembling**.

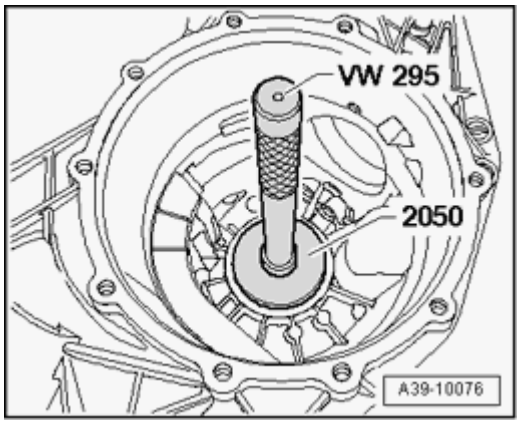

Fig. 253: Driving Outer Race For Right Tapered Roller Bearing Together With Shim Into Differential Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive outer race for right tapered roller bearing together with shim " S_2 " into differential housing. Use a shim " S_2 * " with a 1.30 mm thickness for measurement purposes (2 shims with 0.65 mm).

NOTE:

- **For the initial measurement, an adjustment shim " S_2 " with a thickness of 1.30 mm is inserted. It is designated as " S_2 * " in the following. After**

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determining backlash, " S_2 * " is replaced by final " S_2 ".

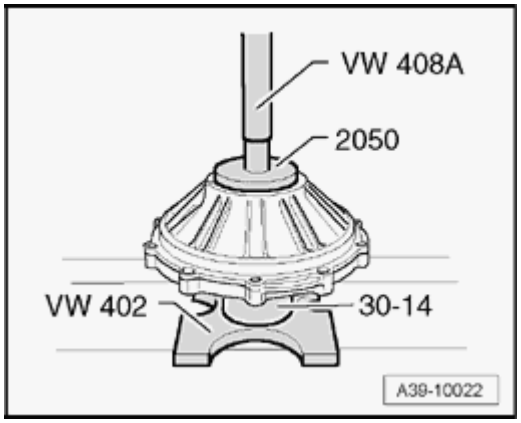

Fig. 254: Pressing Tapered Roller Bearing Outer Race (Left-Side) Into Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing outer race for tapered roller bearing without shim " S_1 " into final drive cover.
- Insert differential into transmission housing. Ring gear is located on left side in front of final drive cover.

- O-ring is inserted in final drive cover.

- Install final drive cover with 4 screws (24 Nm).
- Turn transmission so that final drive cover faces upward.
- Turn differential 5 turns in both directions so that the taper roller bearings settle.
- Place magnetic plate VW 385/17 on differential.

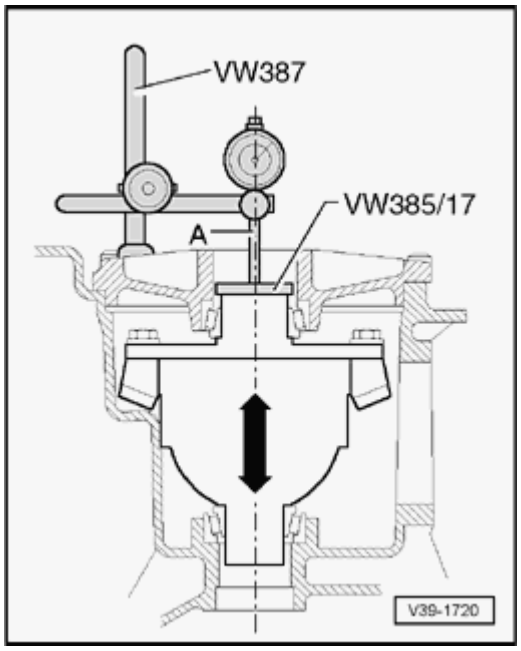

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Fig. 255: Installing Magnetic Plate 50mm Dia. VW 385/17 And Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble measuring tool, use 30 mm dial gauge extension.
- Set gauge (3 mm measuring range) - **A** - to "0" with 2 mm pre-load.

NOTE:

- **Tip of dial indicator must be positioned on the center of the differential.**

- Lift differential without turning it, read backlash on dial indicator and note.

- Measured value in following example: 0.62 mm

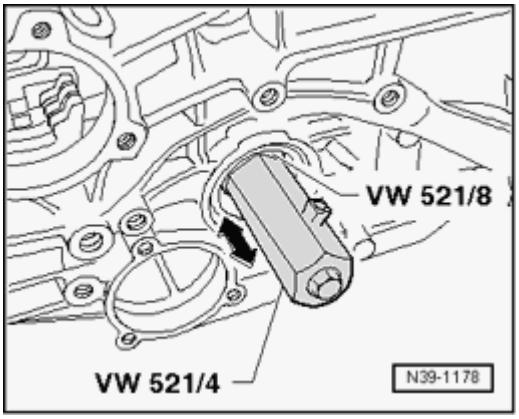

Fig. 256: Securing Special Tools VW 521/4 And VW 521/8 At Right On Differential (Housing Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **To raise differential, secure special tools VW 521/4 and VW 521/8 at right on differential (housing side).**
- **If measurement is repeated, differential must first be rotated 5 complete revolutions in both directions again to seat tapered roller bearing.**

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)	0.30 mm
=	Total shim thickness " S_{total} " for " S_1 " + " S_2 "	2.22 mm

Determining thickness of adjustment shim " S_1 * "

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NOTE:

- **Initial shim " S_1 * " is replaced with final shim " S_1 " after backlash has been determined.**
- **The total shim thickness " S_{total} " remains unchanged.**

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

Example:		
	Total shim thickness " S_{total} " for " S_1 " + " S_2 "	2.22 mm
-	Inserted shim(s) " S_2 * "	1.30 mm
=	Thickness of adjustment shim " S_1 * "	0.92 mm

Torsional backlash, measuring

- Drive shaft installed with shims " S_3 " and " S_4 ".
- O-ring is inserted in final drive cover.

- Install differential with ring gear: " S_1 " is on cover side, " S_2 " is installed in transmission housing.
- Install cover for final drive and tighten bolts to 24 Nm.
- Insert locking sleeve VW 521/4 and VW 521/8.
- Turn differential 5 turns in both directions so that the taper roller bearings settle.

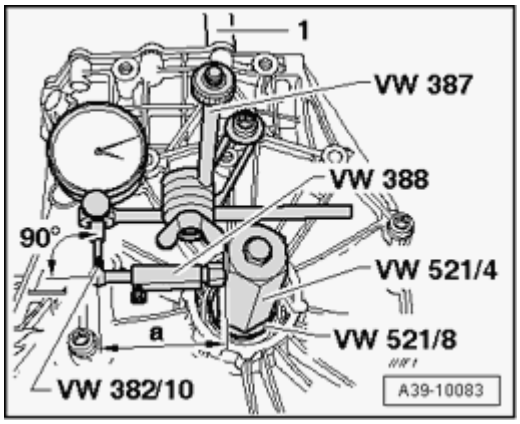

Fig. 257: Securing Dial Gauge Holder VW 387 To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure dial gauge holder VW 387 to transmission housing.
- Insert dial gauge with extension pin VW 382/10 (6 mm).
- Set measuring lever VW 388 to dimension "a" = 75 mm (for ring gear dia. 186 mm).

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- Determine play between teeth flanks as follows:

- Turn ring gear until it makes contact with a tooth flank (end of backlash travel).
- Set dial gauge to "0" with 2 mm pre-load.
- Turn ring gear back until lying against an opposite tooth flank (backlash).
- Read off backlash and note measured value.

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

NOTE:

- **If drive pinion - 1 - turns when measuring, counter hold drive pinion so that an exact torsional backlash can be measured.**

Determining average backlash

- Add four measured values together and divide total by 4 to determine average.

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
=	Total of measurements	1.16 mm

- Result: Average backlash is 1.16: 4 = 0.29 mm

NOTE:

- **If measurements vary more than 0.06 mm from each other, ring gear or gear set is not installed correctly. Check installation, replace final drive set if necessary.**

Determining thickness of adjustment shim " S_2 "

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

Example:		
	Inserted adjustment shim " S_2 * "	1.30 mm
-	Measured torsional backlash	0.29 mm
+	Specified torsional backlash	0.15 mm
=	Thickness of adjustment shim " S_2 "	1.16 mm

Available adjustment shims for " S_2 "

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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	

*Using shim tolerances it is possible to find the exact shim thickness required, insert two shims if necessary.

Determining thickness of adjustment shim " S_1 "

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

Example:		
	Total shim thickness " S_{total} " for " S_1 " + " S_2 "	2.22 mm
-	Thickness of adjustment shim " S_2 "	1.16 mm
=	Thickness of adjustment shim " S_1 "	1.06 mm

Available adjustment 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	

*Using shim tolerances it is possible to find the exact shim thickness required, insert two shims if necessary.

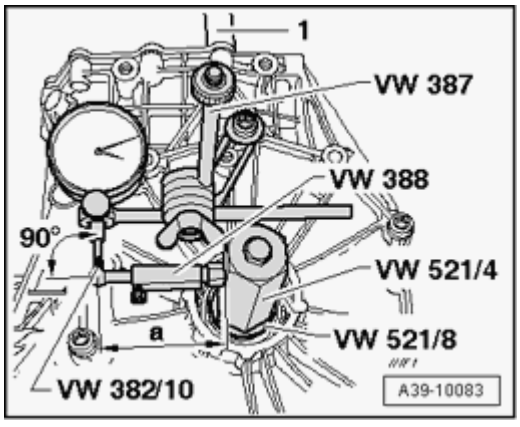

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Fig. 258: Securing Dial Gauge Holder VW 387 To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Measurement check

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

- Specified value: 0.12 to 0.22 mm

NOTE:

- **If drive pinion - 1 - turns when measuring, counter hold drive pinion so that an exact torsional backlash can be measured.**
- **If backlash is outside tolerance, repeat adjustments. Do not change total shim thickness " S_{total} " while doing so.**
- **The individual measurement values can deviate a maximum of 0.06 mm from each other**

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39 FINAL DRIVE, DIFFERENTIAL

FINAL DRIVE, SERVICING

Left flange shaft oil seal, replacing

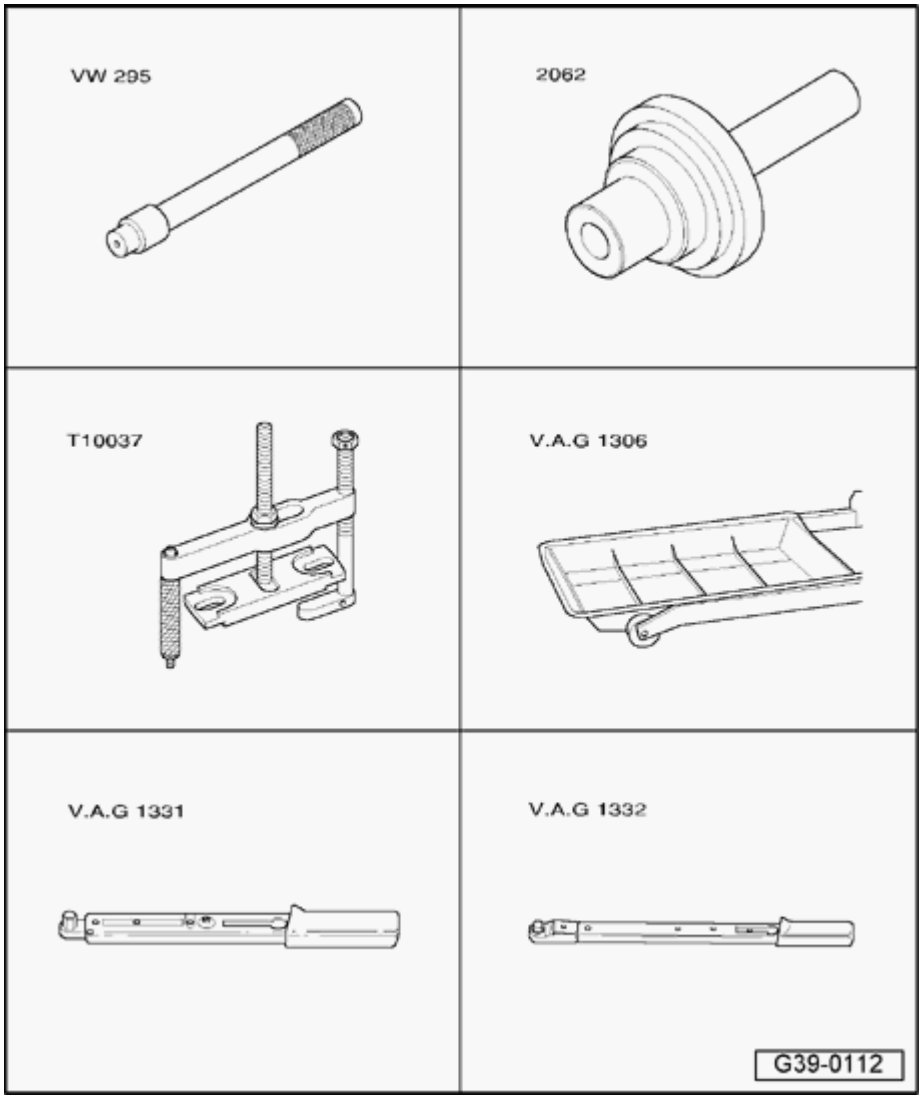

Fig. 247: Identifying Special Tools - Left Flange Shaft Oil Seal, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW 295
- Drift 2062
- Puller T10037
- Drip tray V.A.G 1306 or drip tray for workshop hoist VAS 6208

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- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332

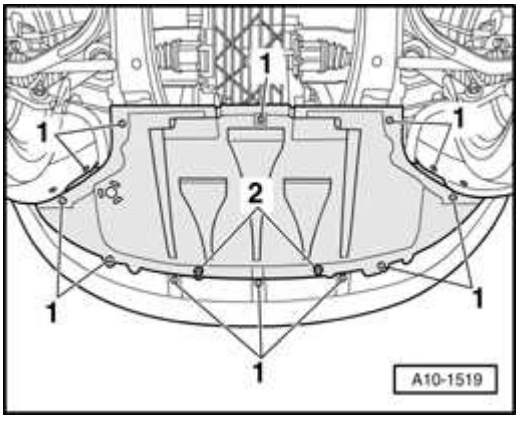

Fig. 248: Removing Quick-Release Fasteners, Screws And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Transmission is installed

- Please observe general repair instructions --> **General repair instructions**.
- Remove front left wheel.
- Release quick release fasteners - **1** - , unscrew bolts - **2** - and remove noise insulation.

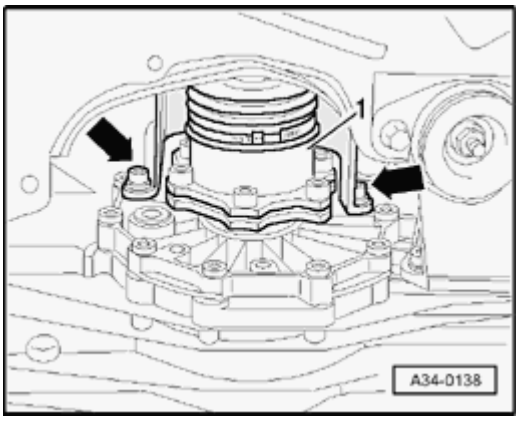

Fig. 249: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for drive shaft (left-side).
- Disconnect drive shaft - **1** - from flange shaft and tie up as far as possible to the front, taking care not to damage surface coating.

Drip tray V.A.G 1306 or drip tray for workshop hoist VAS 6208

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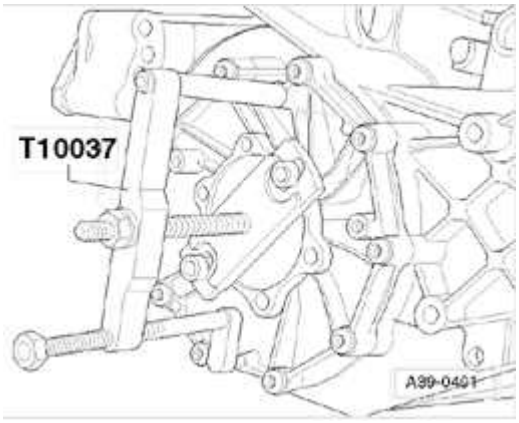

Fig. 250: Removing Flange Shaft (Left-Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft (left-side); to do so, secure puller T10037 to cover for final drive - **arrow** -.

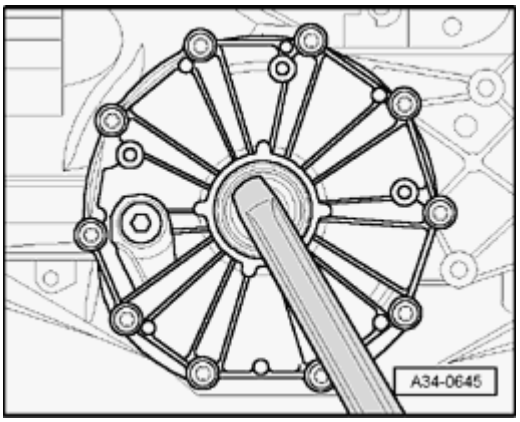

Fig. 251: Prying Out Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lever out flange shaft oil seal.

Installing

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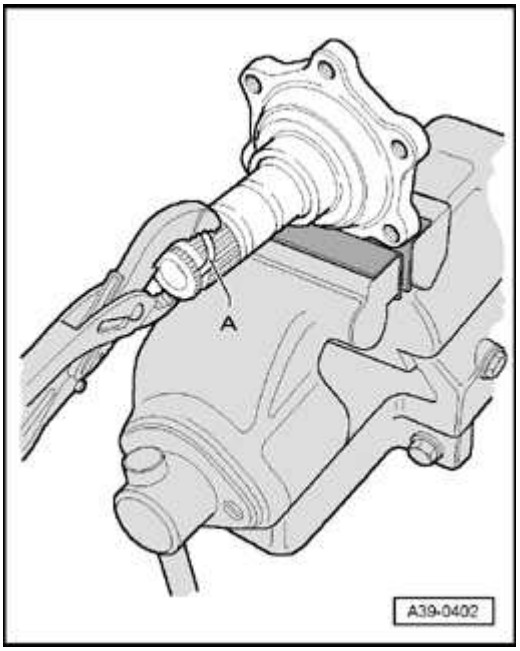

Fig. 252: Identifying Flange Shaft Clamped In Vise And Using New Circlip To Press Old Circlip Out Of Groove In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Always replace circlip for flange shaft.
- Clamp flange shaft in vice, using jaw protectors. Use new circlip - **A** - to press old circlip out of groove in flange shaft.
- Lightly oil outer circumference of new oil seal.

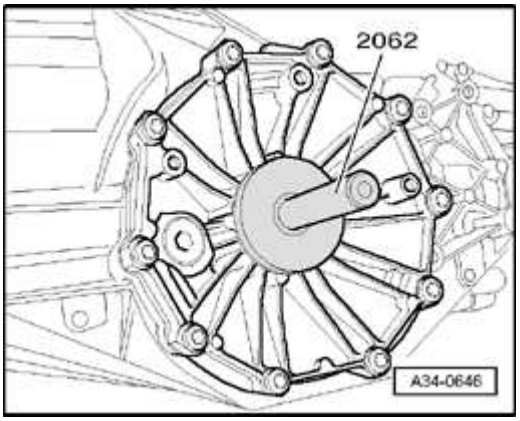

Fig. 253: Driving In New Flange Shaft Oil Seal Using Driver 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive new oil seal for flange shaft in to a depth of 5.65 ± 0.15 mm below outer surface of cover, making sure you keep seal straight.
- Pack space between sealing lip and dust lip half-full with **sealing grease G 052 128 A1** .
- Drive flange shaft in with drift VW 295.

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- Fit drive shaft heat shield.
- Bolt drive shaft to flange shaft --> **40 - FRONT SUSPENSION** .
- Fill up oil in transmission and check oil level --> **Transmission gear oil, checking level**.
- Install noise insulation.

Tightening torque

Component	Nm
Heat shields for drive shafts to transmission	23

Right flange shaft oil seal, replacing

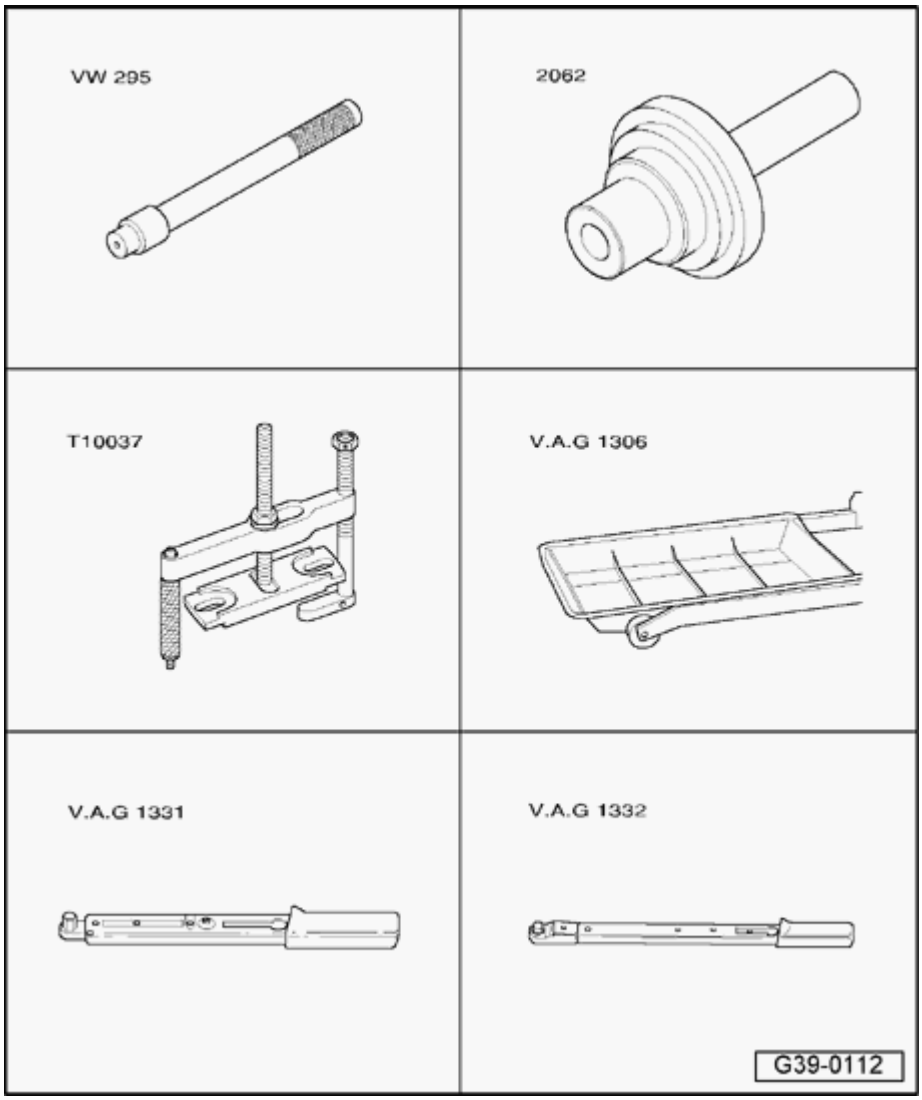

Fig. 254: Identifying Special Tools - Right Flange Shaft Oil Seal, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Special tools, testers and auxiliary items required

- Drift VW 295
- Drift 2062
- Puller T10037
- Drip tray V.A.G 1306 or drip tray for workshop hoist VAS 6208
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332

Removing

- Transmission is installed

- Please observe general repair instructions --> **General repair instructions**.
- Loosen bolt for right-side drive shaft/wheel hub.

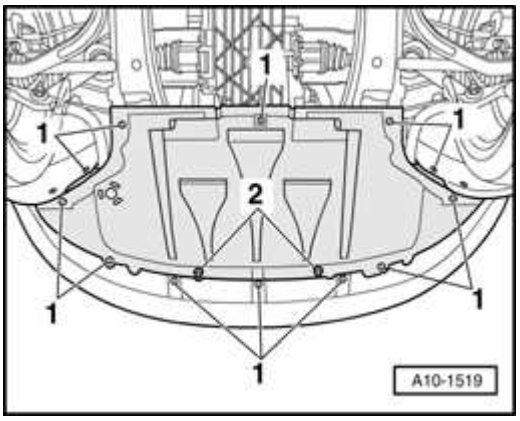

Fig. 255: Removing Quick-Release Fasteners, Screws And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front right wheel.
- Release quick release fasteners - **1** - , unscrew bolts - **2** - and remove noise insulation.

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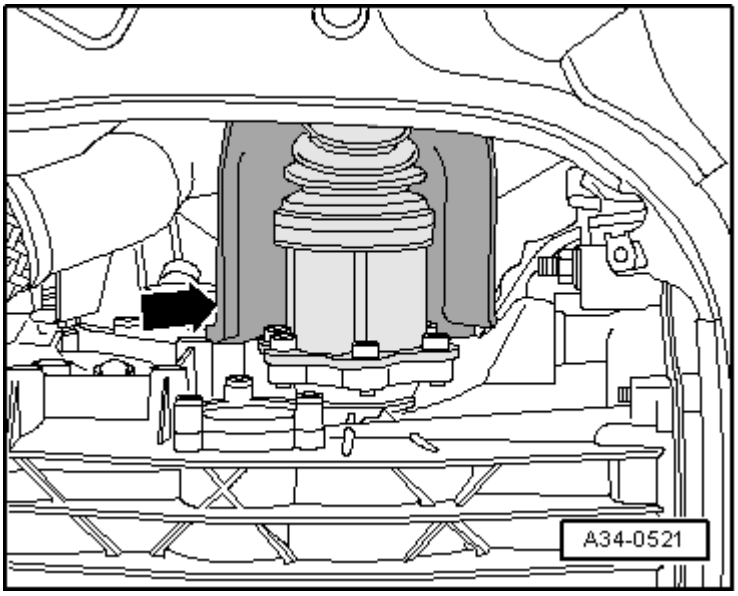

Fig. 256: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrows** - for drive shaft (right-side).
- Remove drive shaft (right-side) --> **40 - FRONT SUSPENSION** .

Drip tray V.A.G 1306 or drip tray for workshop hoist VAS 6208

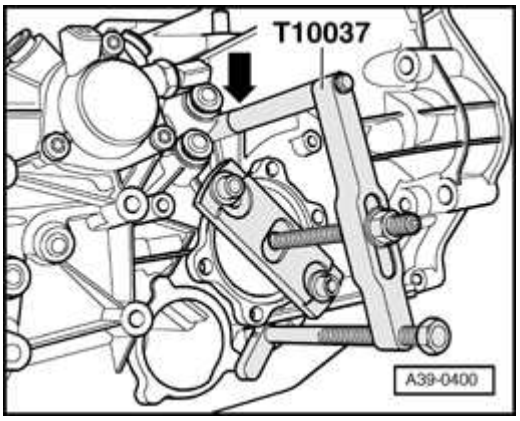

Fig. 257: Removing Flange Shaft (Right-Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft (right-side); to do so, secure puller T10037 to transmission housing - **arrow** -.

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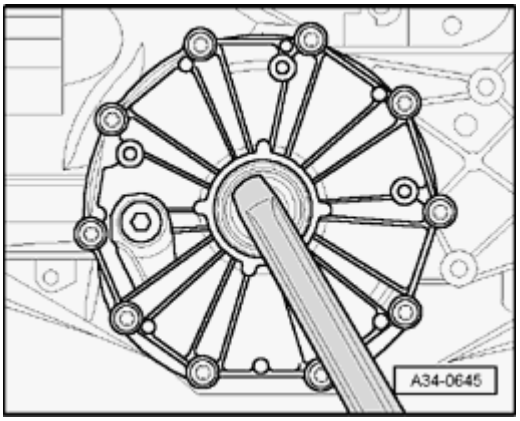

Fig. 258: Prying Out Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lever out flange shaft oil seal.

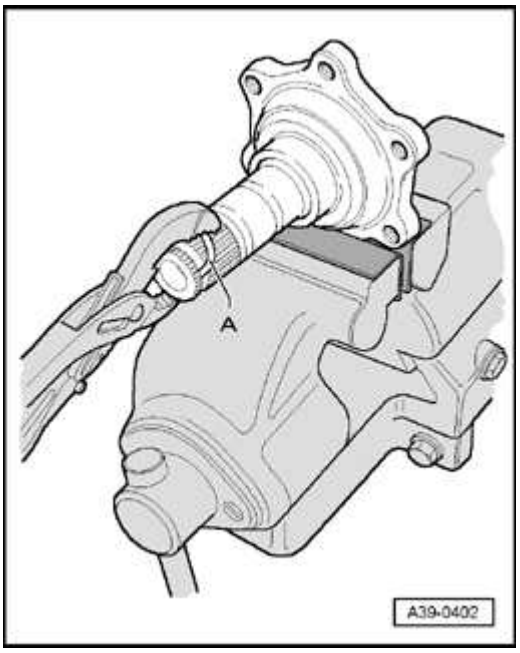

Fig. 259: Identifying Flange Shaft Clamped In Vise And Using New Circlip To Press Old Circlip Out Of Groove In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

- Always replace circlip for flange shaft.
- Clamp flange shaft in vice, using jaw protectors. Use new circlip - **A** - to press old circlip out of groove in flange shaft.
- Lightly oil outer circumference of new oil seal.

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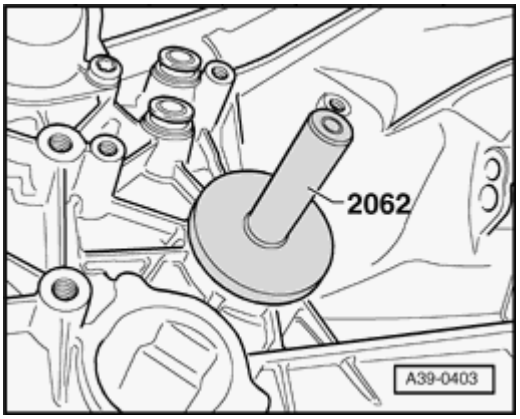

Fig. 260: Driving New Oil Seal For Flange Shaft In Below Outer Surface Of Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive new oil seal for flange shaft in to a depth of 5.65 ± 0.15 mm below outer surface of housing, making sure you keep seal straight.
- Pack space between sealing lip and dust lip half-full with **sealing grease G 052 128 A1** .
- Drive flange shaft in with drift VW 295.
- Fit drive shaft heat shield.

- Bolt drive shaft to flange shaft --> **40 - FRONT SUSPENSION** .
- Fill up oil in transmission and check oil level --> **Transmission gear oil, checking level**.
- Install noise insulation.

Tightening torque

Component	Nm
Heat shields for drive shafts to transmission	23

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