TRANSMISSION

6-speed manual transmission 01X, front-wheel drive

00 TECHNICAL DATA

TRANSMISSION IDENTIFICATION

Transmission identification

The 6 Spd. Manual Transmission 01X Front Wheel Drive is installed on the AudiA42001 --> in conjunction with the 2.0liter and 3.0liter engines.

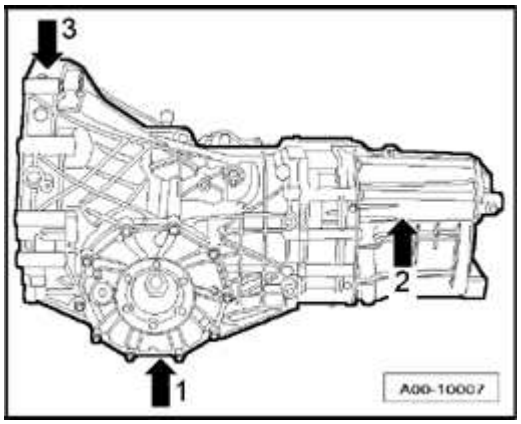


Fig. 1: Transmission Identification
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Location on transmission

- Code letters and date of manufacture - **arrow1** - or - **arrow 3** -
- Manual transmission 01X - **arrow2** -

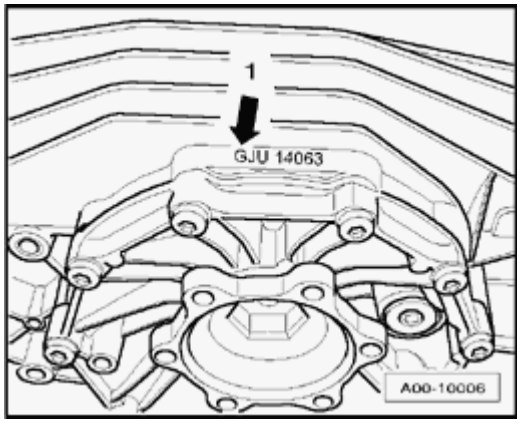


Fig. 2: Code Letters And Date Of Manufacture Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Example:	GJU	14	06	3
	I	I	I	I
	I	I	I	I
	Code letters	Day	Month	Year of manufacture (2003)

Additional data are production-related.

NOTE:

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

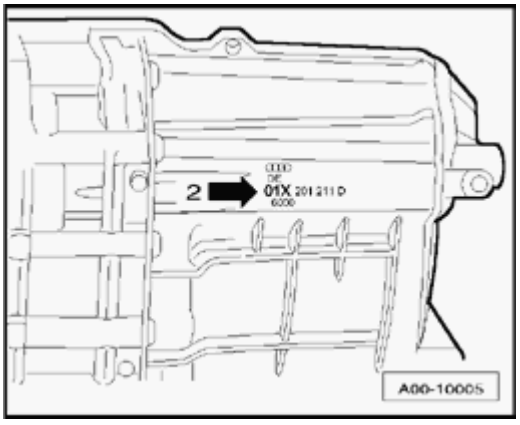


Fig. 3: Code Letters For Transmission On The Vehicle Data Stickers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Manual transmission 01X - **arrow2** -

Code letters, allocation, transmission ratios, capacities

Manual transmission		6-speed 01X (front-wheel drive)	
Code letters		HCK	GVD
Manufactured	from	11.04	11.04
	to		
Allocation	Model	A4 2001 -->	A4 2001 -->
	Engine	2.0 ltr. TDI -118kW	2.0 ltr. - 147 kW
Ratio	Final drive	30 : 8 = 3.750	30 : 8 = 3.750
$i = Z_2 : Z_1$	1st gear	33 : 9 = 3.667	33 : 9 = 3.667
	2nd gear	39 : 19 = 2.053	39 : 19 = 2.053
	3rd gear	36 : 28 = 1.286	37 : 27 = 1.370
	4th gear	31 : 33 = 0.939	32 : 31 = 1.032

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	5th gear	26 : 37 = 0.703	28 : 35 = 0.800
	6th gear	23 : 40 = 0.575	25 : 38 = 0.658
	Reverse gear	34 : 10 = 3.400	34 : 10 = 3.400
Capacity		3.0 liters	
Specification		Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)	
Clutch actuation		Hydraulic	
Clutch plate diameter		240 mm	240 mm
Drive shaft flange diameter		88 mm	88 mm
Overall ratio $i_{ov.}$ in top gear		2.156	2.467

Manual transmission		6-speed 01X (front-wheel drive)	
Code letters		GVC	GJU
Manufactured	from	06.04	04.03
	to		05.04
Allocation	Model	A4 2001 -->	A4 2001 -->
	Engine	3.0 ltr. - 162 kW	3.0 ltr. - 162 kW
Ratio	Final drive	30 : 8 = 3.750	30 : 8 = 3.750
$i = Z_2 : Z_1$	1st gear	33 : 9 = 3.667	33 : 9 = 3.667
	2nd gear	39 : 19 = 2.053	39 : 19 = 2.053
	3rd gear	37 : 26 = 1.423	37 : 26 = 1.423
	4th gear	33 : 31 = 1.065	33 : 31 = 1.065
	5th gear	29 : 34 = 0.853	29 : 34 = 0.853
	6th gear	27 : 37 = 0.730	27 : 37 = 0.730
	Reverse gear	34 : 10 = 3.400	34 : 10 = 3.400
Capacity		3.0 liters	
Specification		Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)	
Clutch actuation		Hydraulic	
Clutch plate		240 mm	240 mm
Drive shaft flange		88 mm	88 mm
Overall ratio $i_{ov.}$ in top gear		2.736	2.736

TRANSMISSION LAYOUT

Transmission layout

Identification

NOTE:

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

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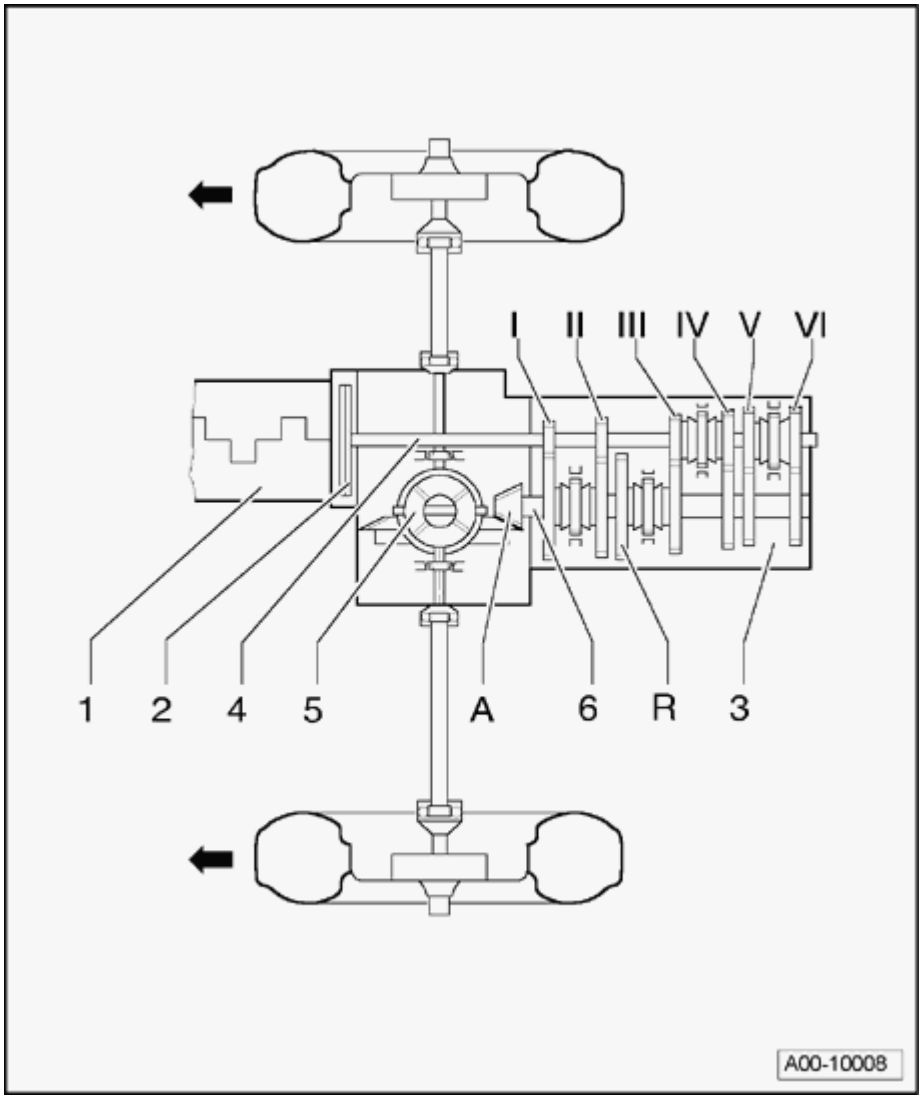


Fig. 4: Transmission Layout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Engine

2 - Clutch

3 - Manual transmission

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

4 - Input shaft (main shaft)

5 - Differential

6 - Pinion shaft (output shaft)

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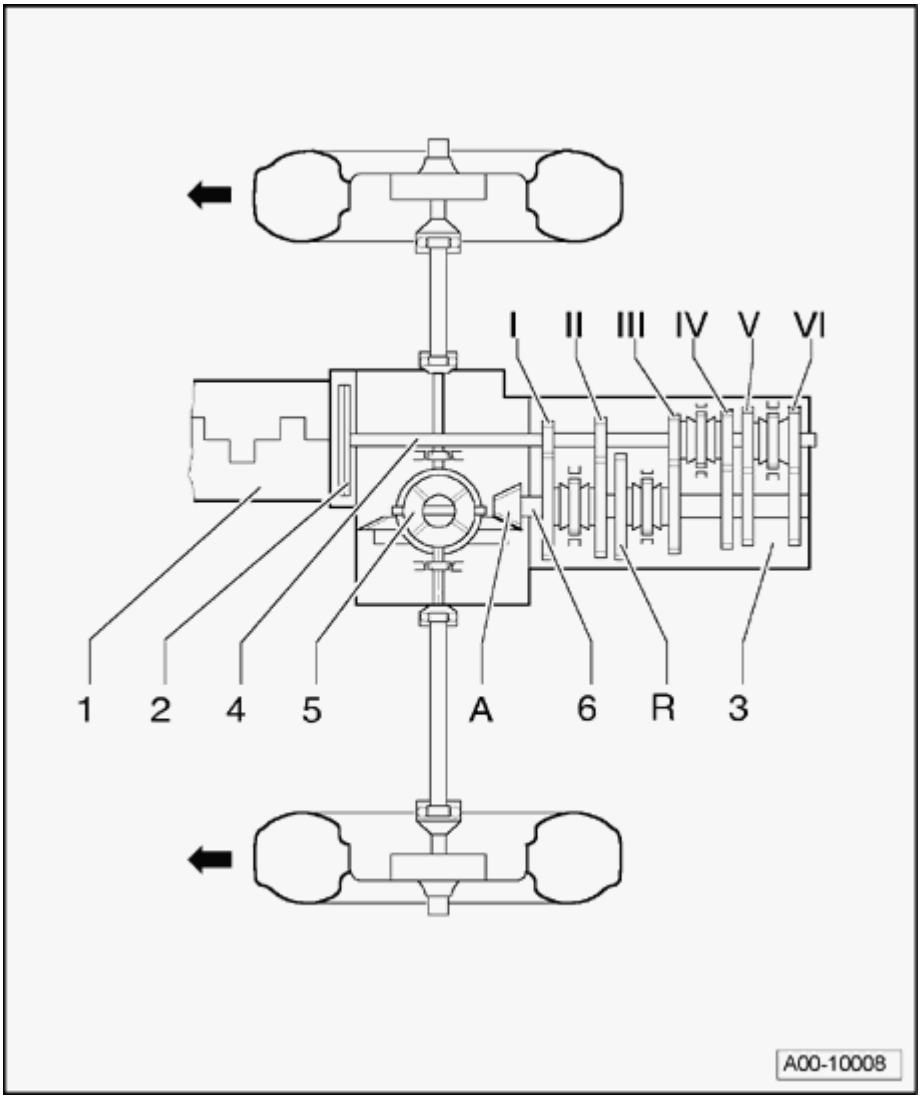


Fig. 5: Transmission Layout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - 1st gear

II - 2nd gear

III - 3rd gear

IV - 4th gear

V - 5th gear

VI - 6th gear

R - Reverse gear

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A - Final drive

CALCULATING RATIO "I"

Calculating ratio "i"

Transmission ratio

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

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

Example:		
	6th gear	Final drive
Drive gear	$ZG_1 = 38$	$ZA_1 = 8$
Driven gear	$ZG_2 = 25$	$ZA_2 = 30$

Calculations:		
i_G	=	25 : 38 = 0.658
i_A	=	30 : 8 = 3.750
i_{ov}	=	0.658 x 3.750 = 2.467

GENERAL REPAIR INSTRUCTIONS

General repair instructions

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

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"--> **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, allocation, transmission ratios, capacities**.

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- When installing a new transmission, check the oil level and fill up with oil if necessary --> **Transmission oil level, checking**.
- Capacities and specifications --> **Code letters, allocation, transmission ratios, capacities**
- Thoroughly clean all joints and surrounding areas before disassembling.
- When installing transmission make sure dowel sleeves are correctly seated.

Sealants

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

O-rings, oil seals, gaskets

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

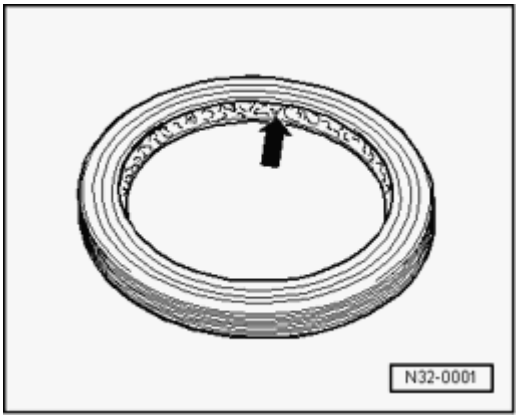


Fig. 6: Identifying Space Between Oil Seal Sealing Lips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 face the side with fluid filling.
- When installing a new oil seal, position the seal in the housing so that sealing lip does not contact the shaft in the same place as the old seal (make use of insertion depth tolerances).
- Lightly oil O-rings before installing to prevent them from being trapped and damaged when assembling.
- After replacing seals and gaskets, check and, if necessary, top off oil level in transmission --> **Transmission oil level, checking**.

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Locking elements

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

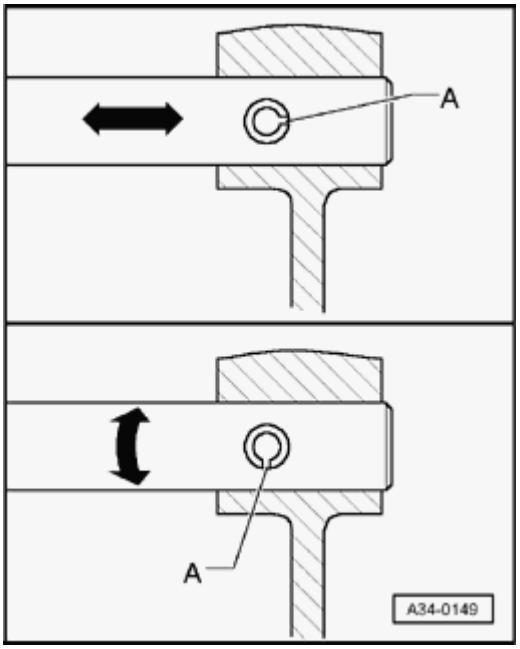


Fig. 7: Identifying Locking Elements
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace spring pins. Position: 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.
- Nuts and bolts which secure covers and housings should be loosened and tightened in diagonal sequence and in stages if no tightening sequence is specified.
- Loosen and tighten particularly sensitive parts in diagonal sequence and in stages, taking care to keep them straight.
- The tightening torques stated apply to non-oiled nuts and bolts.

- Always replace self-locking bolts and nuts.
- Clean the threads of bolts which are secured by a locking compound with a wire brush. Then lubricate bolts with **locking compound AMV185101A1** again before installing.
- Threaded holes which take self-locking bolts or bolts coated with locking compound must be cleaned (using a tap or similar). Otherwise there is a danger of the bolts shearing when subsequently being removed.

Shims

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

Bearings

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

Synchronizer rings

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

Gear wheels and synchronizing hubs

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

Selector gears

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

Clutch actuation

- 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 --> **Notes on removing and installing master cylinder and slave cylinder**).

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- The clutch system should be bled at the same intervals as the brake system.

- Make sure that the pressure plate is kept straight: loosen and tighten bolts in a diagonal sequence and in several gradual stages (does not apply to SAC pressure plates).
- Note assembly instructions for SAC pressure plate --> **Clutch with SAC pressure plate, removing and installing**.
- On vehicles with SAC pressure plate an adjuster ring has to be reset when only the clutch plate is replaced --> **Adjuster ring in SAC clutch pressure plate, adjusting**.
- If the clutch has burned out, thoroughly clean the bell housing, flywheel and parts of the engine facing the transmission in order to prevent odors.

30 CLUTCH

CLUTCH MECHANISM, SERVICING

Clutch mechanism, servicing

CAUTION:

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

.

NOTE:

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

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

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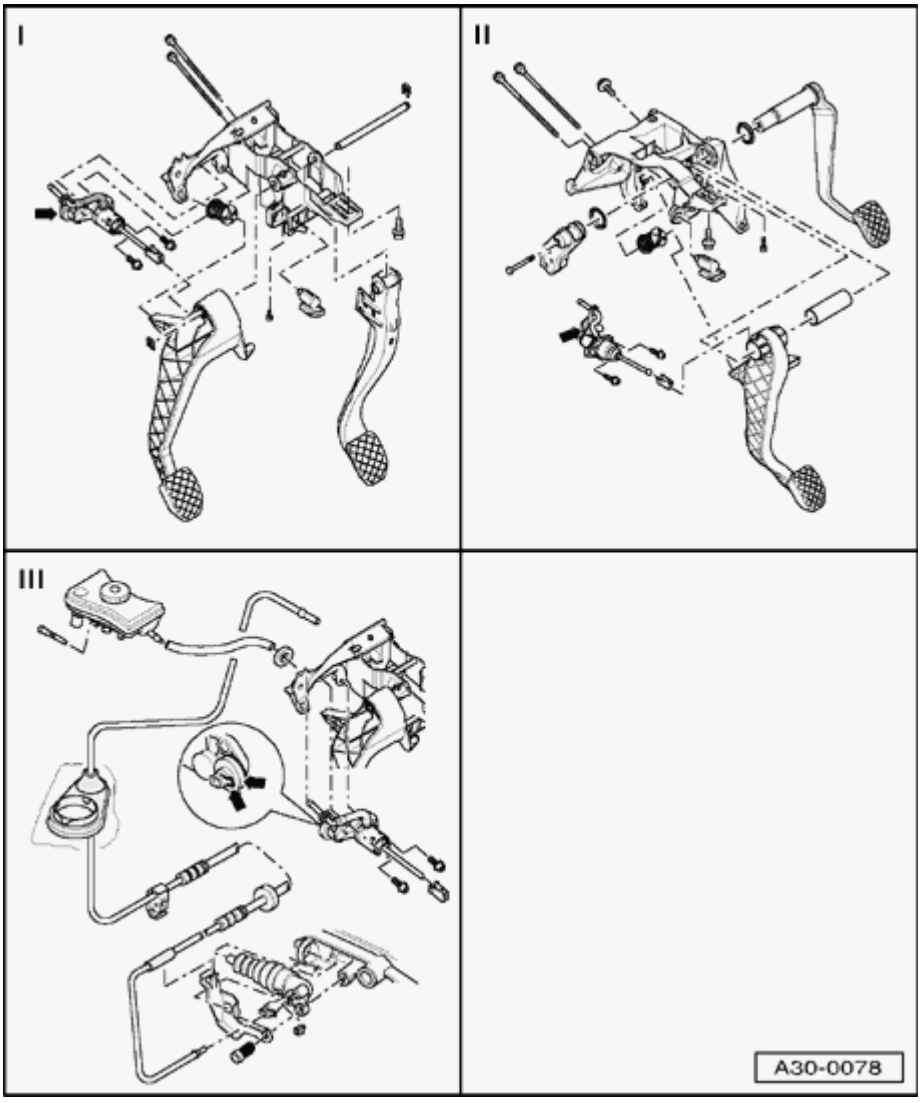


Fig. 8: Exploded View Of Pedal Cluster And Exploded View Of Hydraulic System
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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

Pedal cluster - LHD vehicles, assembly overview

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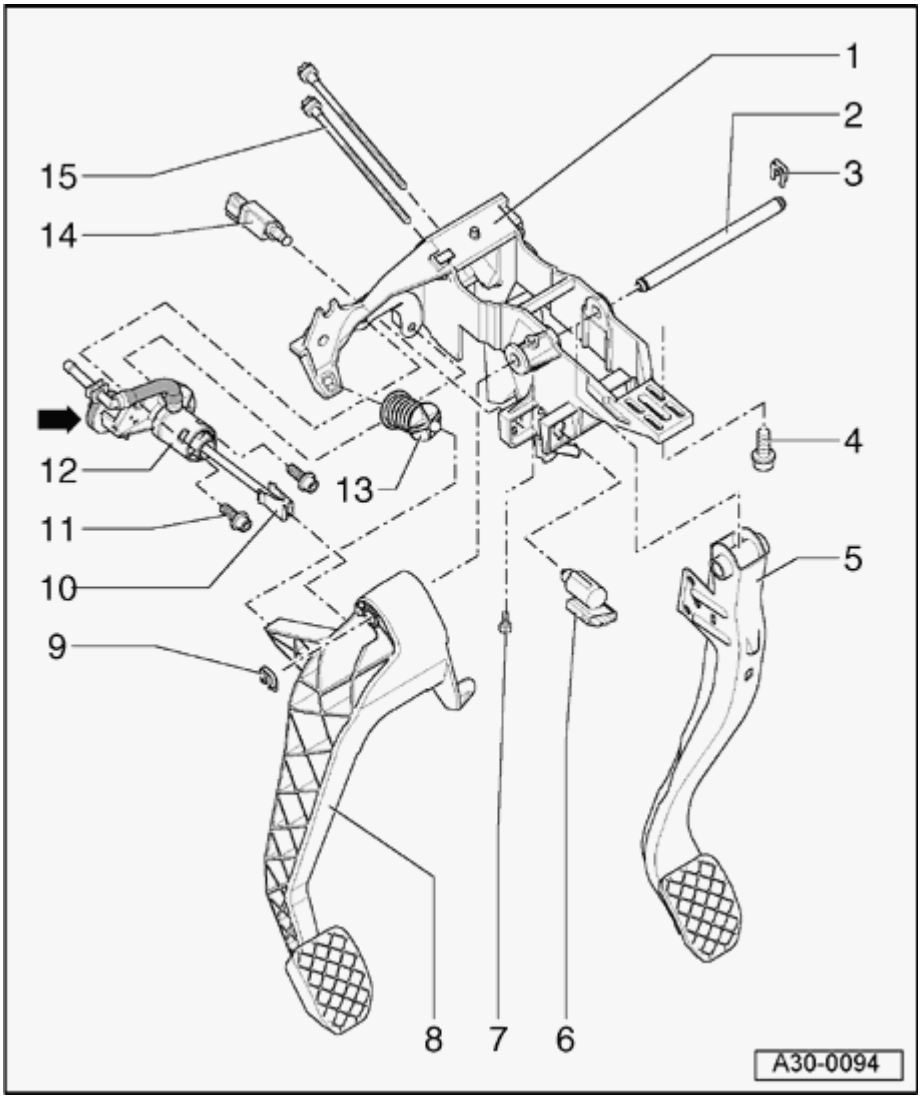


Fig. 9: Pedal Cluster, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Mounting bracket

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

2 - Pivot pin for clutch and brake pedal

3 - Retaining clip

4 - Hex socket head bolt -25 Nm-

5 - Brake pedal

- Maintenance-free bearing, do not grease

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6 - Clutch pedal switch F 36

- Removing and installing --> **Clutch pedal switch F36, removing and installing**
- Only installed one time
- Replace

7 - Hex socket head bolt -5 Nm-

- Secures clutch and brake pedal pivot pin

8 - Clutch pedal

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

9 - Retaining clip

10 - Retaining clip

11 - Hex socket head bolt -20 Nm-

12 - Master cylinder

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

13 - Over-center spring

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

14 - Clutch pedal starter interlock switch F194

- Only for USA
- Engine can only be started when clutch is fully depressed (clutch pedal starter interlock switch activated).
- Removing and installing
- Replace

- Only install one time

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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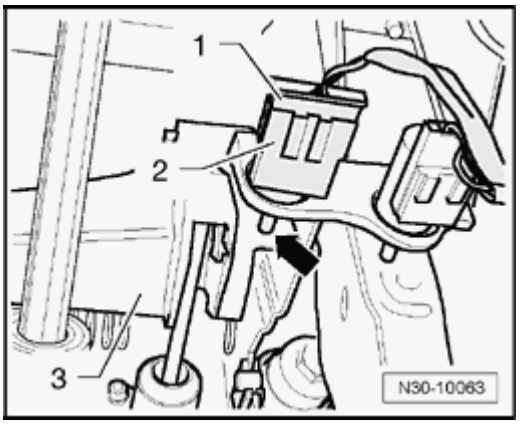


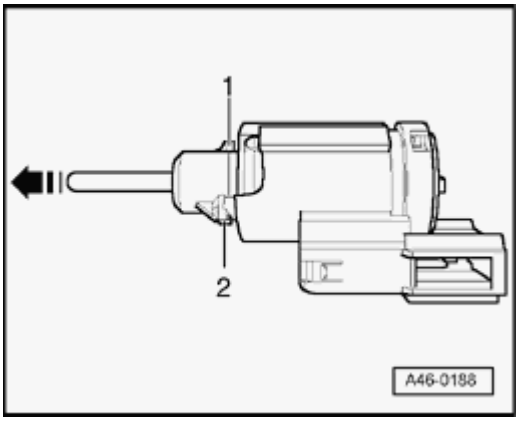
Fig. 10: Identifying Pedal Assembly And Clutch Pedal Switch F36
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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° counter-clockwise and remove from guide.

Installing



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Fig. 11: Pulling Out Switch Plunger & Identifying Retainer Tabs On Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation is perform in reverse sequence. Note the following:

- Pull out operating rod - **arrow** - all the way before installing clutch pedal switch F36.

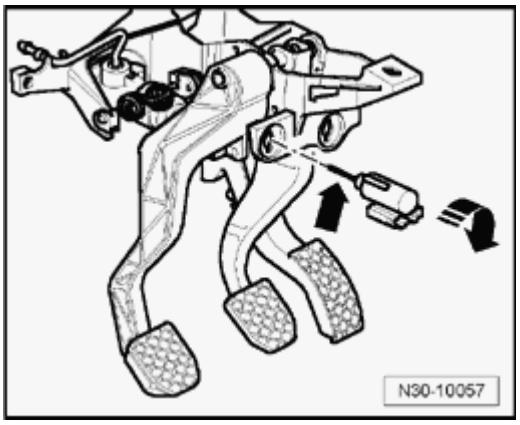


Fig. 12: Identifying Clutch Pedal Switch F36, Plunger
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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.
- Plug in connector for clutch pedal switch F36.
- Install storage compartment on drivers side -->
  - **68 - INTERIOR EQUIPMENT**
  - **68 - INTERIOR EQUIPMENT** for Cabriolet

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Removing and installing clutch pedal starter interlock switch F194

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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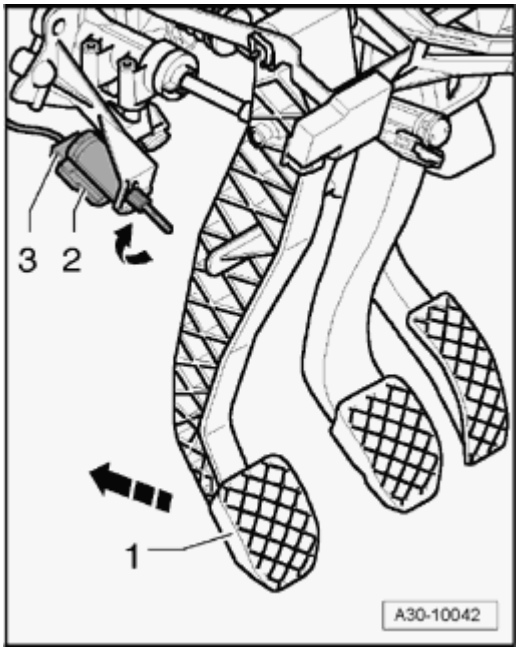


Fig. 13: Installing and Adjusting Clutch Pedal Starter Interlock Switch F194
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

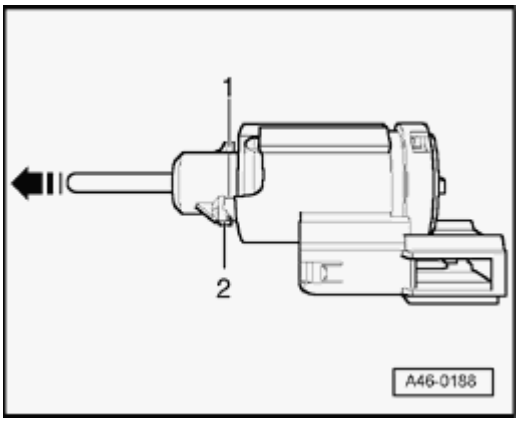


Fig. 14: Pulling Out Switch Plunger & Identifying Retainer Tabs On Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

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

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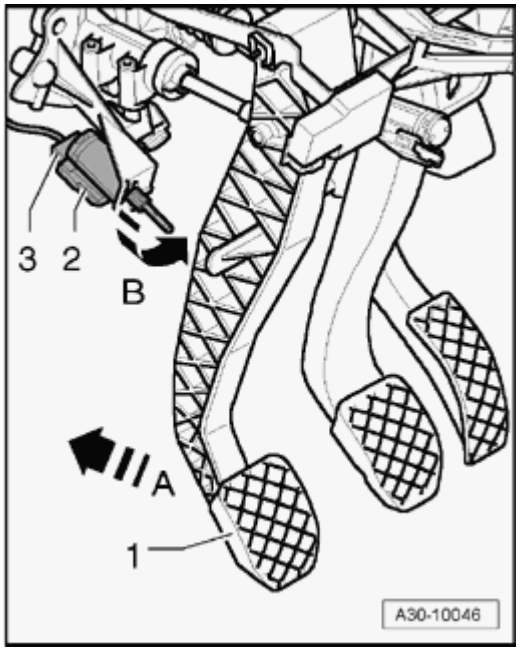


Fig. 15: Pressing Clutch Pedal All The Way Down And Pushing Operating Rod Against Clutch Pedal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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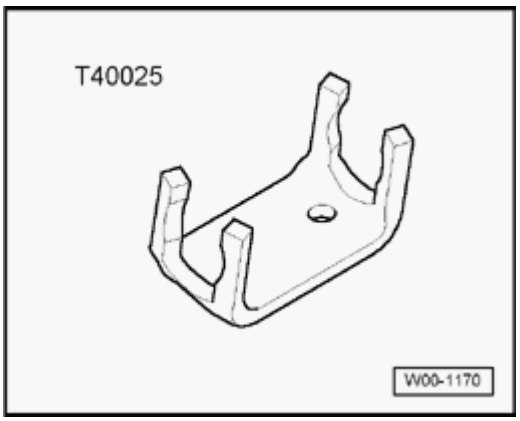


Fig. 16: T40025 Installation Clamp
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assembly clamp T40025

Removing

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

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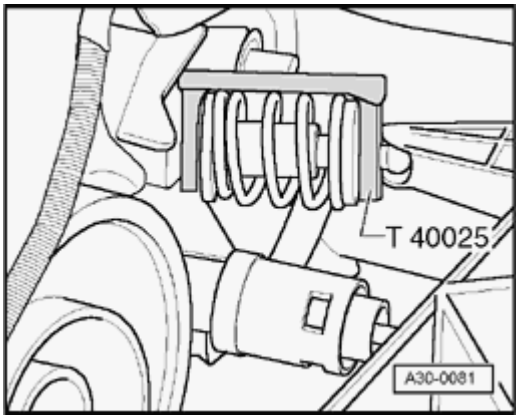


Fig. 17: Installation Clamp T40025 Installed On Over-Center Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing

- Pull clutch pedal into the passenger compartment.

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Installation position of over-center spring:

- Black side of over-center spring points toward clutch pedal.
  - Install over-center spring with assembly clamp T40025, operate clutch pedal and remove assembly clamp.

Pedal cluster - RHD vehicles, assembly overview

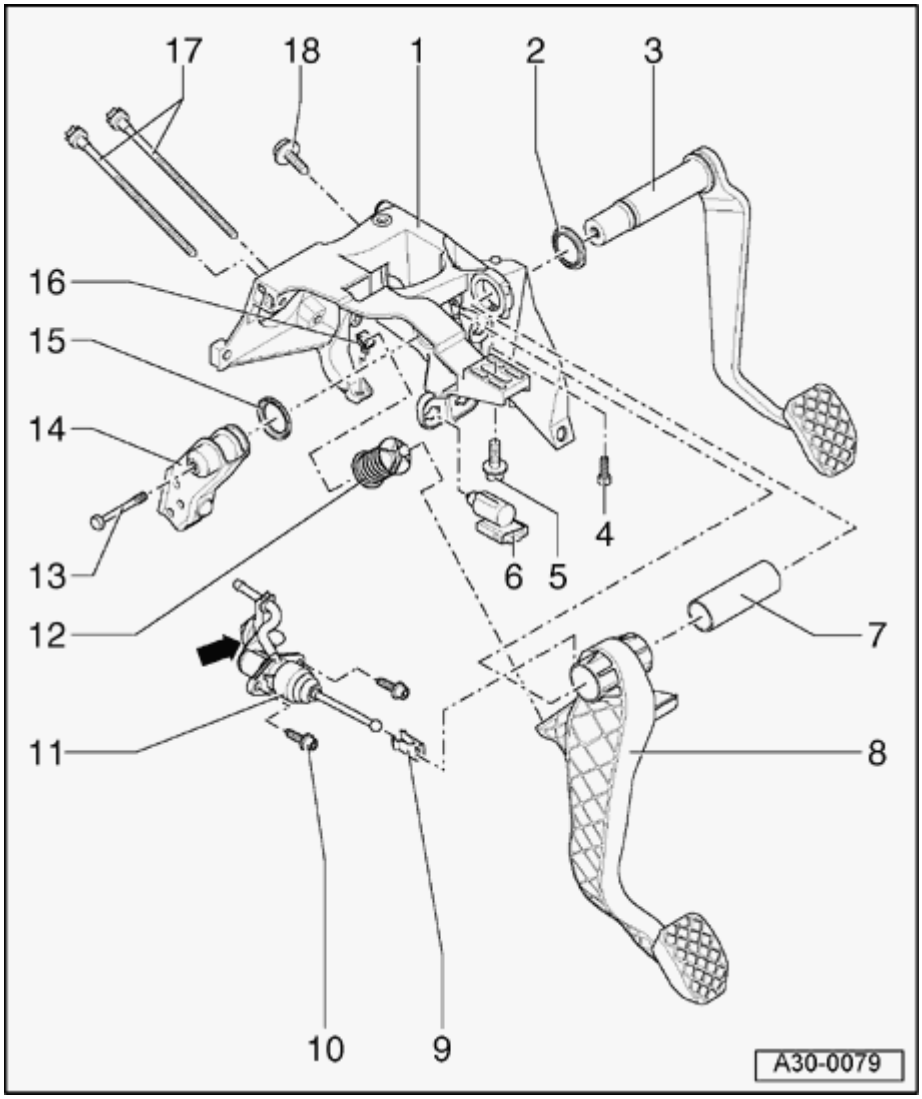


Fig. 18: Pedal Cluster - RHD Vehicles, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Mounting bracket

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

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2 - Washer

3 - Brake pedal

- Maintenance-free bearing, do not grease

4 - Hex socket head bolt -5 Nm-

- For securing the bearing sleeve

5 - Hex socket head bolt -25 Nm-

6 - Clutch pedal switch F36

- Only install one time
- Replace

7 - Bearing sleeve

- Check for freedom of movement in clutch pedal

8 - Clutch pedal

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

9 - Retaining clip

10 - Hex socket head bolt, 20 Nm

11 - Master cylinder

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

12 - Over-center spring

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

13 - Bolt -22 Nm-

- Self-locking
- Replace

14 - Lever

- Pin only fits in one position

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15 - Washer

16 - Mounting

- For over-center spring

17 - Torx bolt, 25Nm

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

18 - Bolt, 25 Nm

Hydraulic system, assembly overview

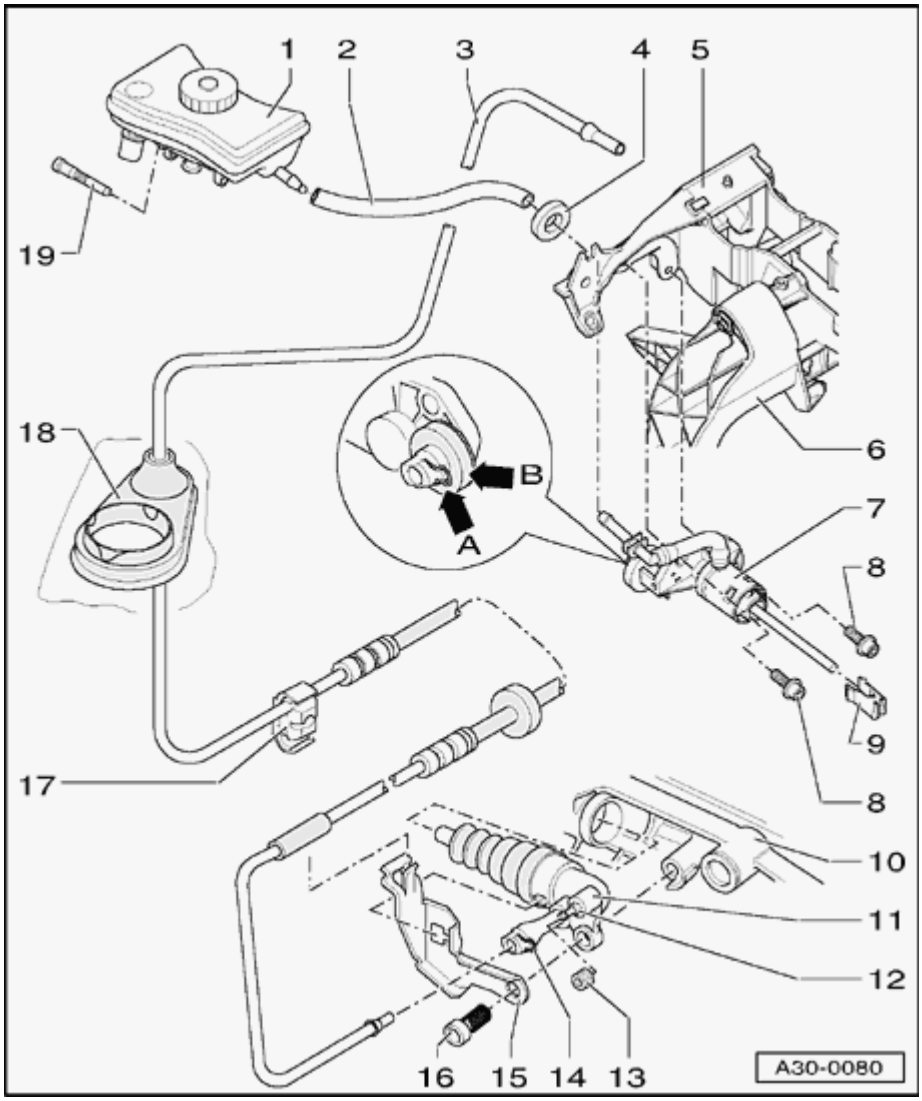


Fig. 19: Hydraulic System, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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1 - Brake fluid reservoir

2 - Supply hose

- For master cylinder

3 - Line/hose assembly

- For plug-in connections on master cylinder and slave cylinder
- Disconnecting from master cylinder and installing **Fig. 32**
- Disconnecting from clutch slave cylinder **Disconnecting slave cylinder from hose/line assembly**

4 - Grommet

5 - Mounting bracket

6 - Clutch pedal

7 - Master cylinder

- Removing and installing --> **Master cylinder, removing and installing**
- Do not remove clip - **arrow A** - or seal - **arrow B** -.
- To remove line/hose assembly, pull out clip - **arrow A** - , but only as far as limit stop **Fig. 32**.

8 - Hex socket head bolt -20 Nm-

9 - Retaining clip

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

10 - Transmission

11 - Slave cylinder

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

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

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12 - Bleeder valve

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

13 - Dust cap

14 - Clip

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

15 - Bracket

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

16 - Hex socket head bolt -25 Nm-

- Slave cylinder to transmission
- Self-locking
- Replace

17 - Retaining clip

18 - Gasket

19 - Securing bolt

- For brake fluid reservoir

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

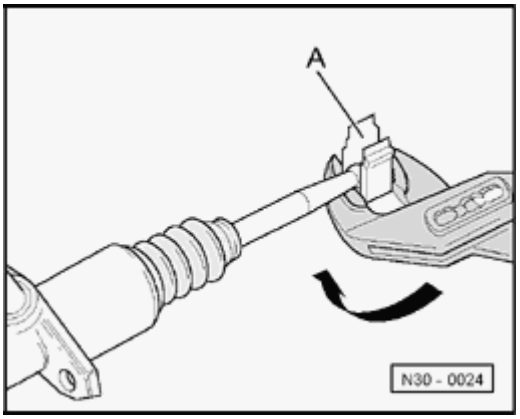


Fig. 20: Removing Retainer By Prying

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

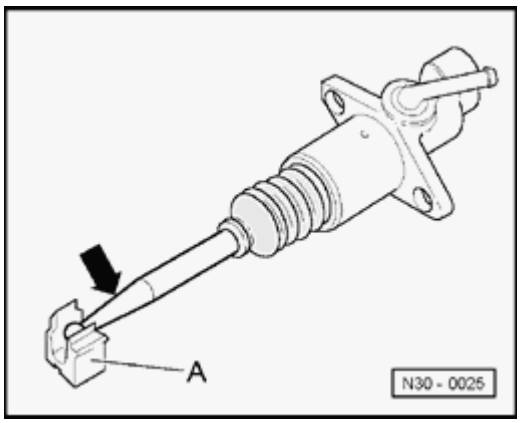


Fig. 21: Installing Clutch Master Cylinder Operating Rod In Retainer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Disconnecting slave cylinder from hose/line assembly

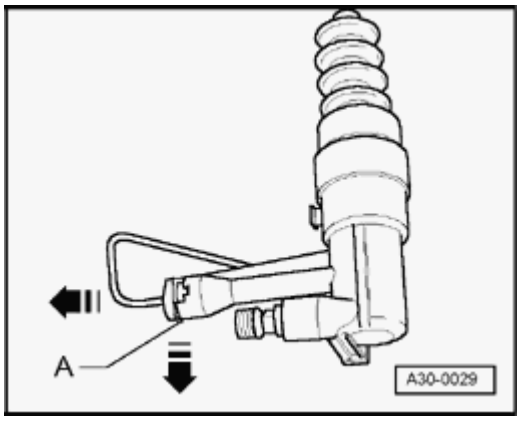


Fig. 22: Removing Hydraulic Line From Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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

Installing

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

Notes on removing and installing master cylinder and slave cylinder

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- Before replacing the master cylinder or slave cylinder on the assumption that it is faulty, first perform a function check.
- 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 resistance when depressing the clutch pedal, you must not press it down further. The push rod of the slave cylinder is likely to have been guided past the clutch release lever. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

Function check for master cylinder and slave cylinder

Before you replace the clutch master or slave cylinder you must - in the case of the following malfunctions - first carry out the appropriate checks.

Noises when operating the clutch:

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

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

- Check whether clutch pedal returns all the way to its initial position, thereby uncovering the ventilation 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 you identify any leaks you must replace the leaking component.
- Bleed clutch system --> **Clutch hydraulic system, bleeding**.

High pedal force:

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

Pedal forces:

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Conventional clutch: - 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 --> **Clutch hydraulic system, bleeding** and check hydraulic system for external and internal leaks.
- Clutch plate does not run smoothly on input shaft splines
- Needle bearing in flywheel (centering bearing for input shaft) faulty, replace needle bearing -->
  - **13 ENGINE - CRANKSHAFT, CYLINDER BLOCK** for AVK
  - **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK** for BPG

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

Master cylinder, removing and installing

Special tools, testers and auxiliary items required

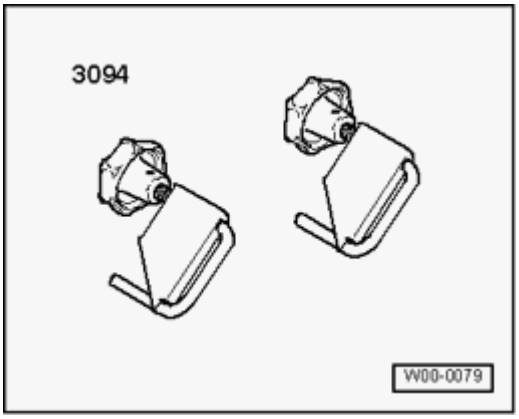


Fig. 23: Identifying Hose Clamps 3094
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clamp 3094

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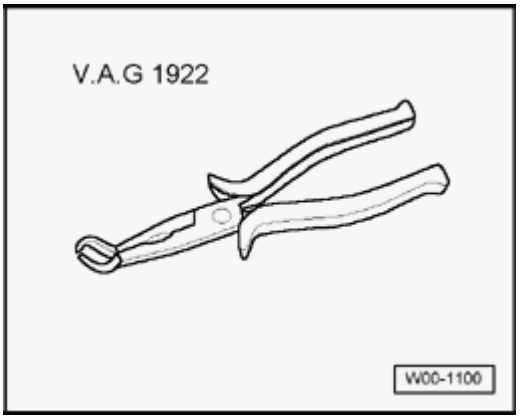


Fig. 24: Identifying Spark Plug Connector Pliers V.A.G 1922
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Spark plug connector pliers V.A.G1922

Removing

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

CAUTION:

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

.

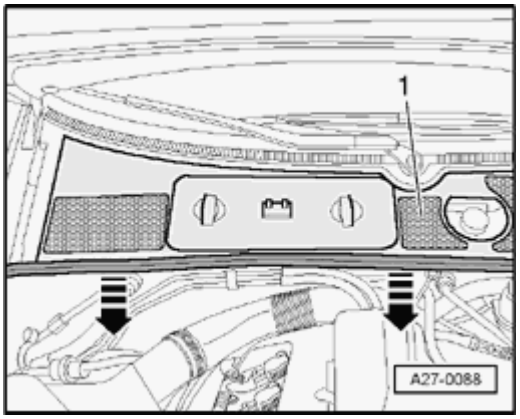


Fig. 25: Identifying Plenum Chamber Cover & Removing Rubber Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off rubber seal on plenum chamber in direction of - **arrow** -.
- Remove cover - **1** - from plenum chamber.
- With ignition switched off, disconnect battery Ground (GND) strap -->

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- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

.

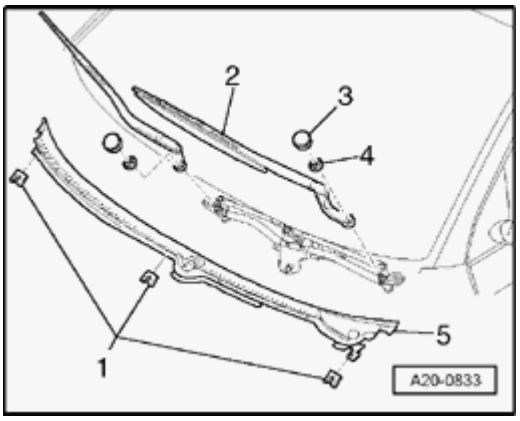


Fig. 26: Removing Securing Clips And Cowl
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

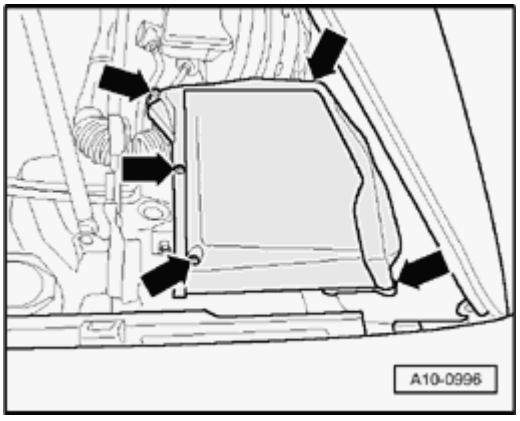


Fig. 27: Removing Screws And Cover From E-Box In Plenum Chamber
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Take the electronics box out of the plenum chamber as follows:

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

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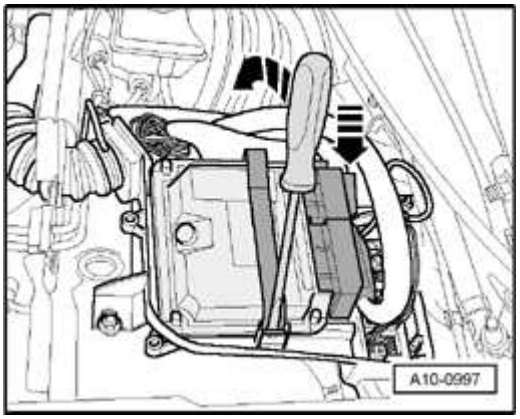


Fig. 28: Using Screwdriver To Remove Retainer Bar And Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

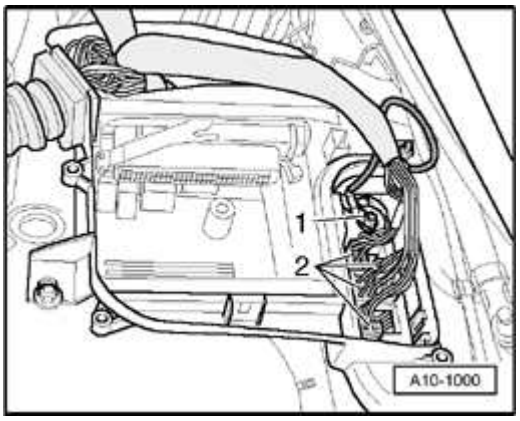
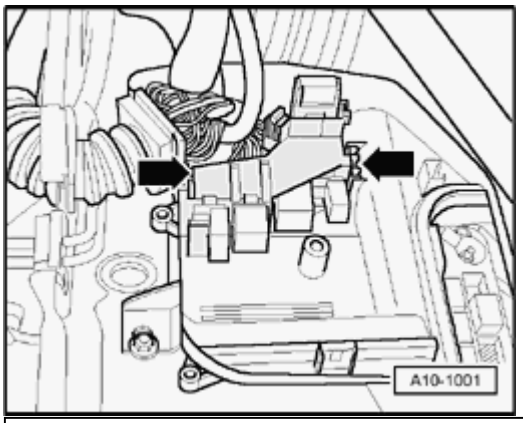


Fig. 29: Connector At Connector Rail And Wire
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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



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Fig. 30: 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.

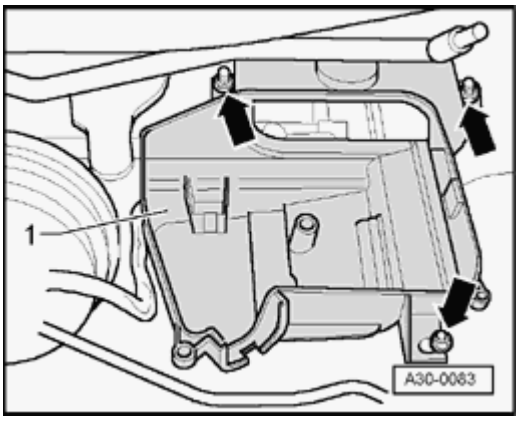


Fig. 31: Electronics Box Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

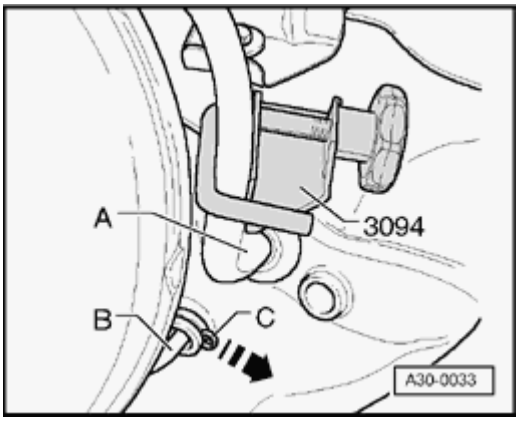


Fig. 32: Identifying Brake Fluid Reservoir Return Hose Grommet
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp supply hose - **A** - from brake fluid reservoir using hose clamp 3094. Disconnect hose from master cylinder and plug hose.

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- Remove rubber grommet from bulkhead above connection line for supply hose.
- Pry out retaining clip - **C** - using a screwdriver and pull out line/hose assembly - **B** - slightly.

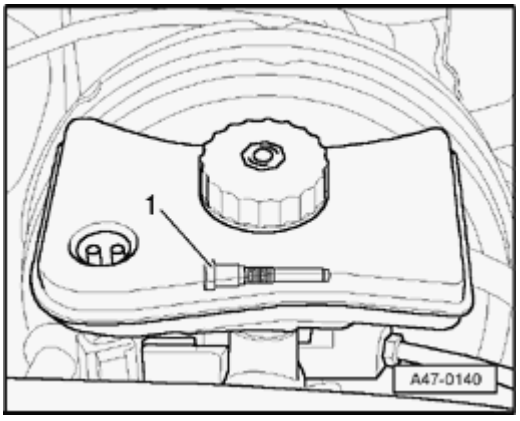


Fig. 33: Location Of Brake Fluid Reservoir Dowel Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

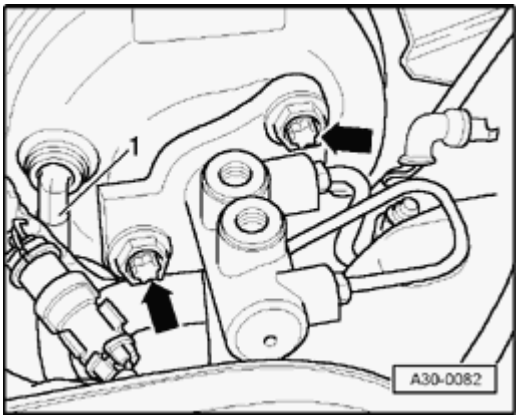


Fig. 34: Location Of Brake Servo Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

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

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

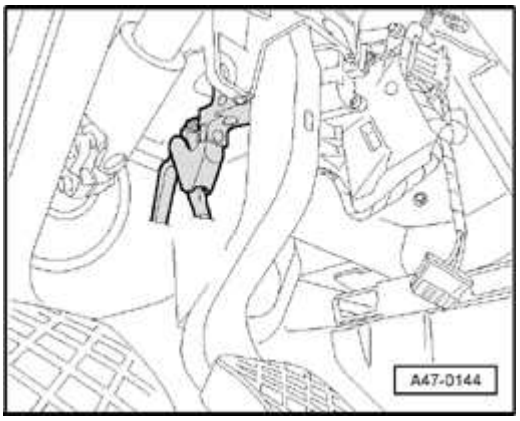


Fig. 35: Brake Pedal At Brake Servo
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

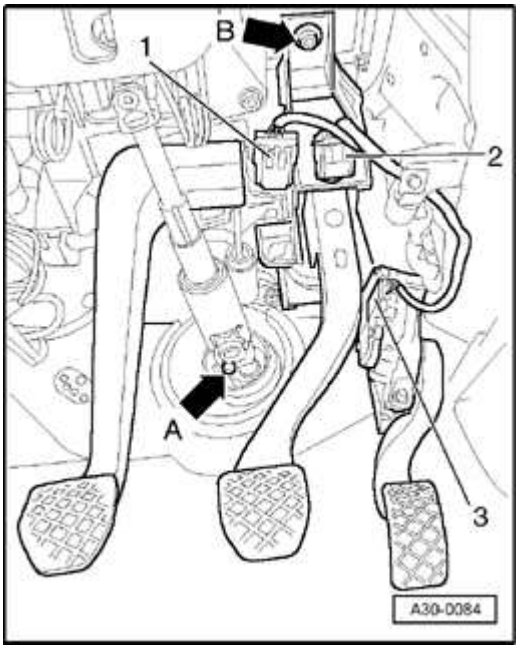


Fig. 36: Locating Steering Column At Steering Gear And Disconnecting Connector On Clutch Pedal Switch, Brake Pedal Switch And On Accelerator Pedal Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect steering column from steering gear - **arrow A** - --> **48 - STEERING** .

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- Disconnect connectors from clutch pedal switch - **1** - , brake light switch - **2** - and accelerator pedal module - **3** -.
- If installed, disconnect connector from clutch pedal starter interlock switch F194.
- Remove securing bolt for mounting bracket - **arrow B** - and remove entire pedal cluster.

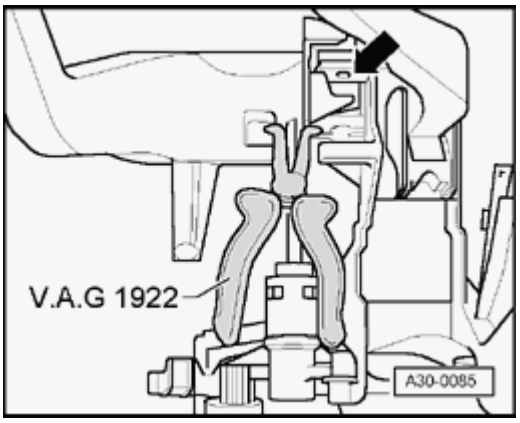


Fig. 37: Pressing Retainer Together And Detaching Clutch Pedal From Master Cylinder Using VAG 1922
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Release master cylinder operating rod from clutch pedal as follows:

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.**

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

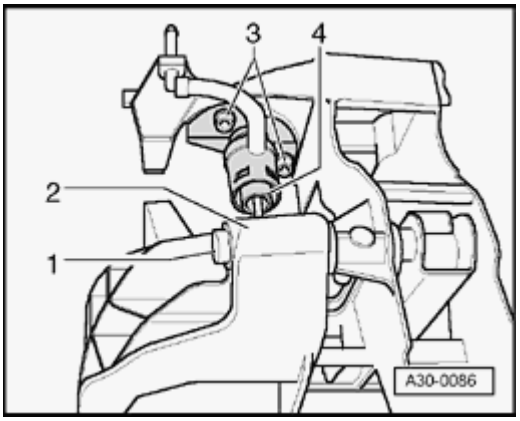


Fig. 38: Identifying Retaining Clip, Clutch Pedal, Bolts And Master Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove retaining clip - **1** - and remove clutch pedal - **2** -.

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- Remove bolts - **3** - and remove master cylinder - **4** -.

Installing

Installation is perform in reverse sequence. Note the following:

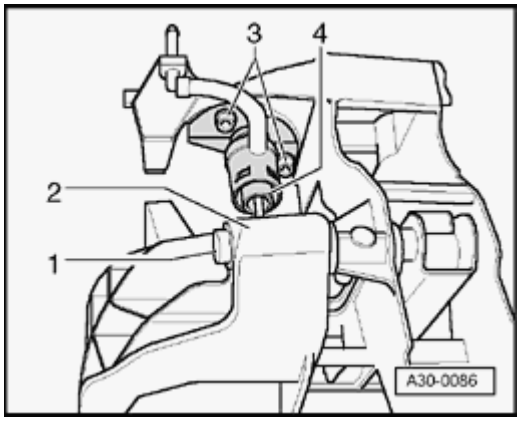


Fig. 39: Identifying Retaining Clip, Clutch Pedal, Bolts And Master Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

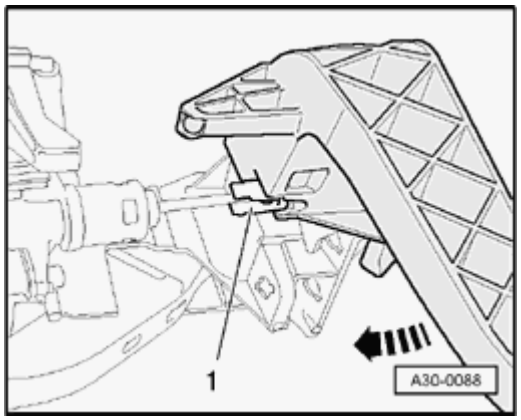


Fig. 40: Pushing Clutch Pedal To Lock Into Place, While Making Sure Mount Is Properly Secured In Clutch Pedal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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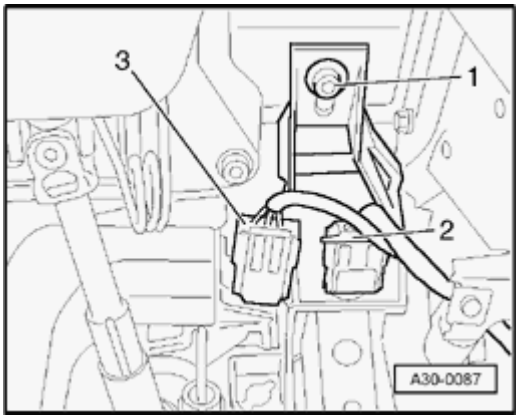


Fig. 41: Location Of Clutch Pedal Switch F36 And Pedal Assembly Securing Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 master cylinder from plenum chamber.

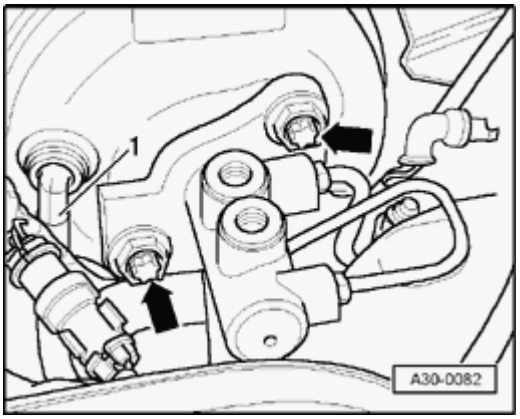


Fig. 42: Location Of Brake Servo Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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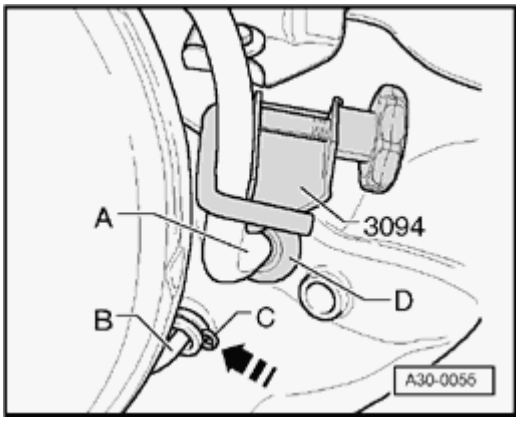


Fig. 43: Installing Rubber Grommet And After-Run Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Remove hose clamps 3094.

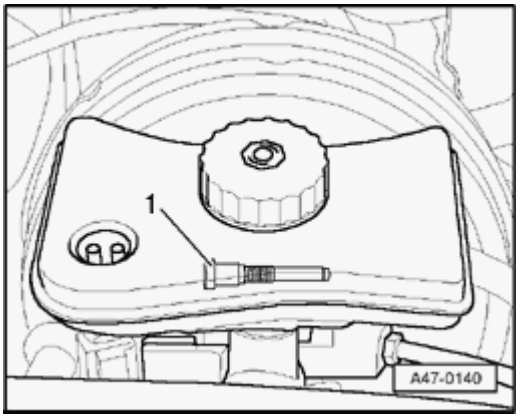


Fig. 44: Location Of Brake Fluid Reservoir Dowel Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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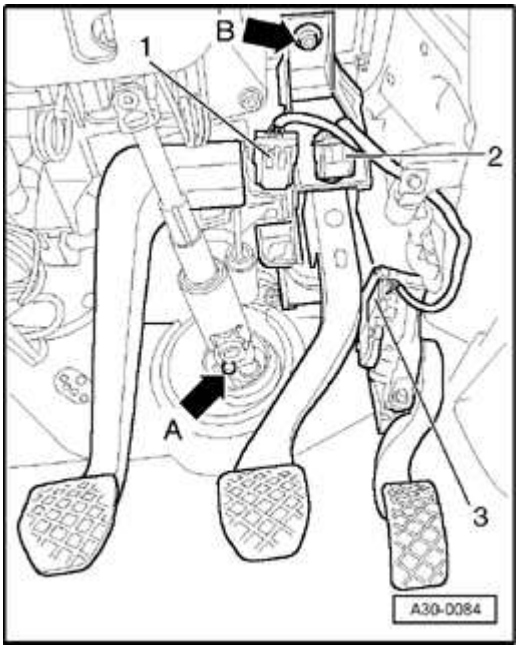


Fig. 45: Locating Steering Column At Steering Gear And Disconnecting Connector On Clutch Pedal Switch, Brake Pedal Switch And On Accelerator Pedal Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten hex socket head bolt - **arrow B** - for securing pedal cluster to instrument panel carrier to 25Nm.
- Connect connectors - **1** - , - **2** - and - **3** -.
- If installed, plug in connector for clutch pedal switch F194.
- Connect brake pedal to brake servo --> **47 - BRAKES - HYDRAULIC COMPONENTS** .

- Secure steering column to steering gear - **arrow A** - --> **48 - STEERING** .
- Install over-center spring.
- Install storage compartment on drivers side -->
  - **68 - INTERIOR EQUIPMENT**
  - **68 - INTERIOR EQUIPMENT** for Cabriolet

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

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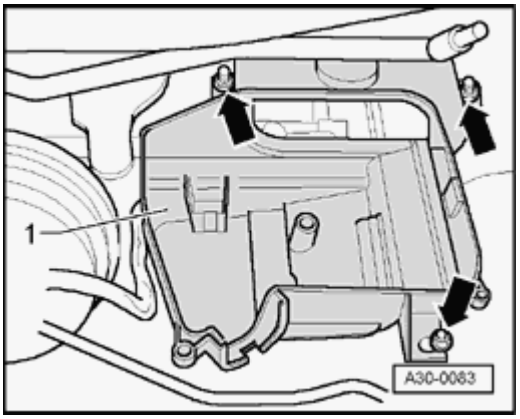


Fig. 46: Electronics Box Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert electronics box and tighten nuts - **arrows** - to 4Nm.
- Route engine wiring harness and connect connector in console.
- Install engine control module-->
  - **28 - IGNITION/GLOW PLUG SYSTEM** for AVK
  - **28 - IGNITION/GLOW PLUG SYSTEM** for BPG
- If applicable, install auxiliary relay carrier and auxiliary fuse carrier -->
  - **97 WIRING**
  - **97 WIRING** for Cabriolet

  .

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

  .

Clutch hydraulic system, bleeding

Special tools, testers and auxiliary items required

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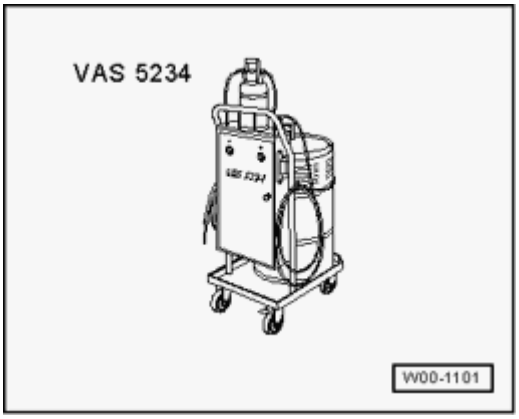


Fig. 47: Identifying Brake Filler And Bleeder Unit VAS 5234
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Brake filler bleeder unit VAS 5234

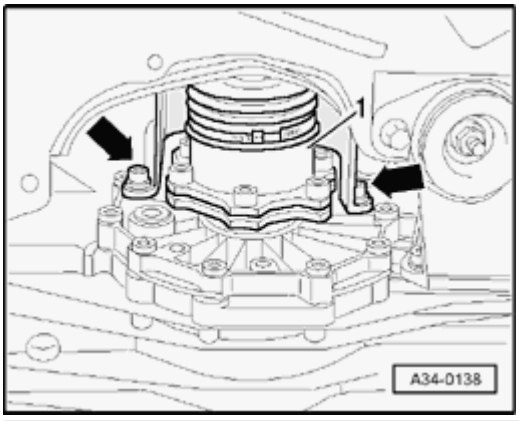
Brake fluid specification --> **47 - BRAKES - HYDRAULIC COMPONENTS** .

Procedure

NOTE:

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

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



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Fig. 48: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

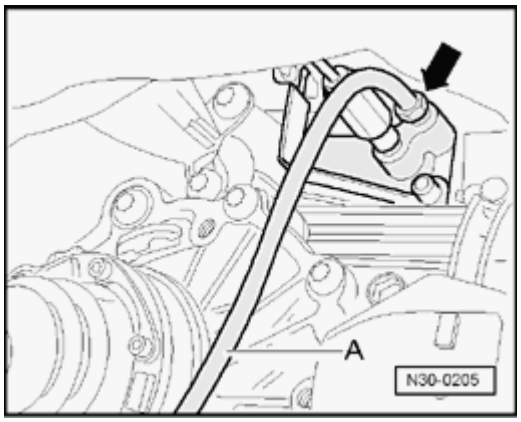


Fig. 49: Connecting Bleeder Hose To Clutch Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Operating pressure 2.5 bar

NOTE:

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

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

Tightening torques

Component		Nm
Heat shield for drive axle to transmission		23

CLUTCH RELEASE MECHANISM, SERVICING

Clutch release mechanism, servicing

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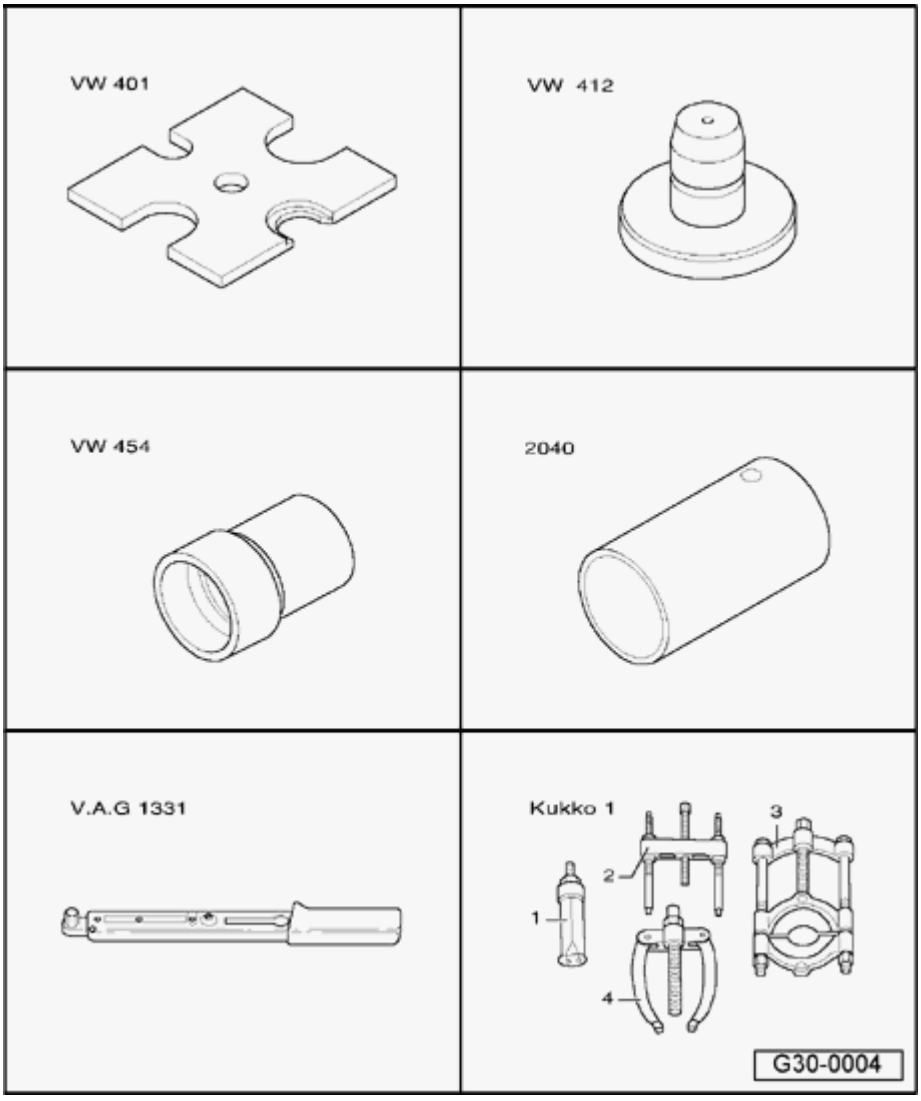


Fig. 50: Identifying Special Tools - Clutch Release Mechanism, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

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

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

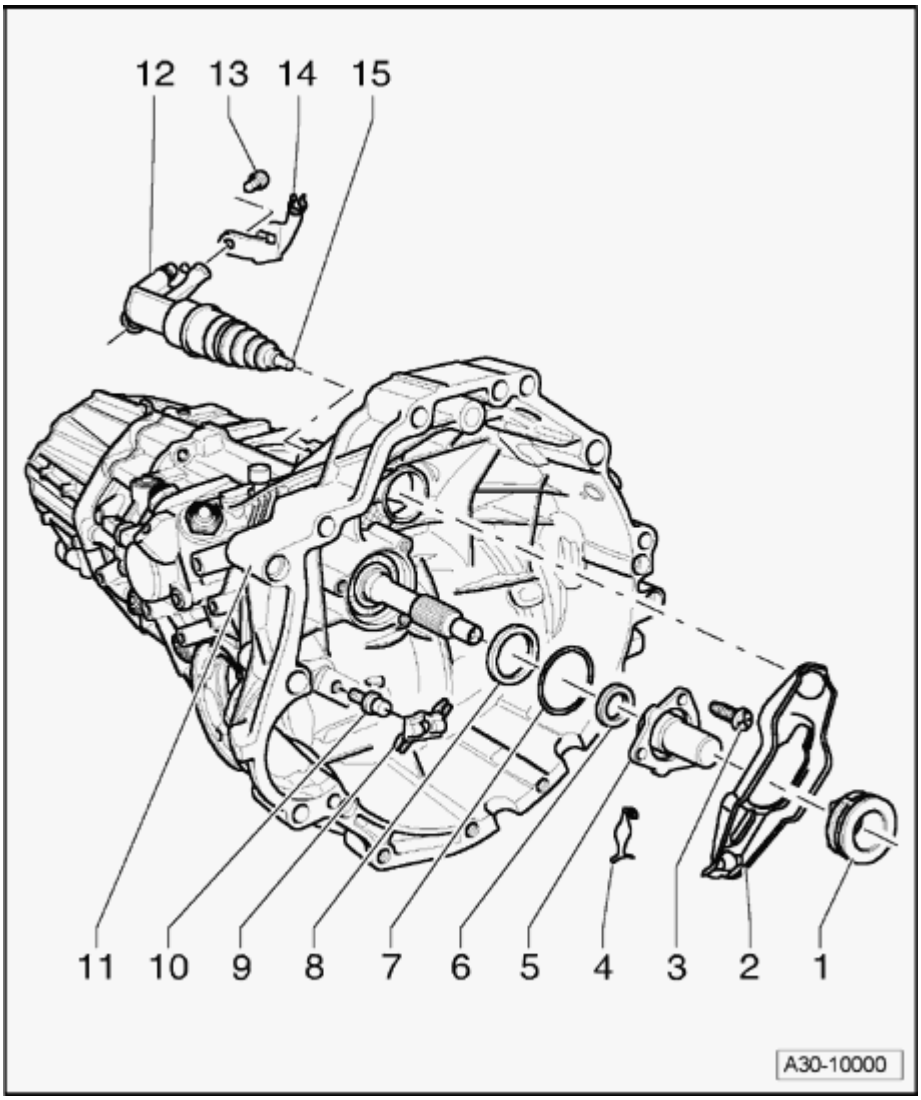


Fig. 51: Clutch Release Mechanism Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Release bearing

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

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

2 - Clutch release lever

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

3 - Torx bolt, 35Nm

- 3 (Qty.)
- Apply **locking fluid AMV 185 101 A1** when installing

4 - Retaining spring

- Secure to clutch release lever

5 - Guide sleeve

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

6 - Oil seal

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

7 - O-ring

- Always replace

8 - Convex washer

9 - Intermediate piece

- Installation position: insert locating element between ribs of housing

10 - Ball head stud

- Lubricate with MoS_2 grease.

11 - Transmission

12 - Slave cylinder

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- Removing and installing --> **Slave cylinder, removing and installing**
- Do not operate clutch pedal after slave cylinder has been removed.
- Follow correct procedure when bleeding --> **Clutch hydraulic system, bleeding**.
- Tighten bleeder valve to 4.5Nm.

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

13 - Hex socket head bolt, 23 Nm

- Self-locking
- Replace

14 - Bracket

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

15 - Operating rod

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

Checking and servicing release bearing with glued plastic ring

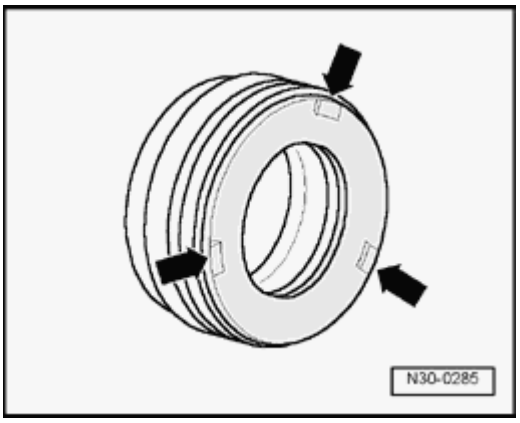


Fig. 52: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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

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

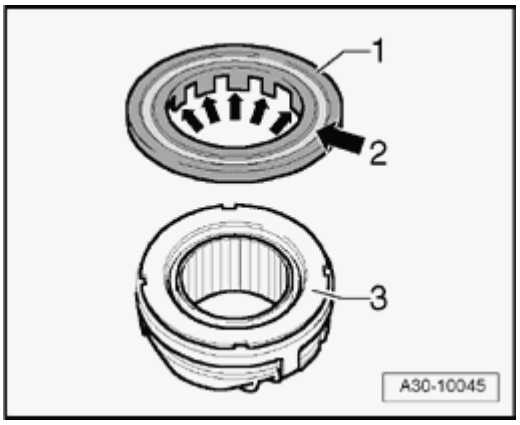


Fig. 53: Checking Release Bearing With Plastic Ring Attached
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Pulling oil seal out of guide sleeve

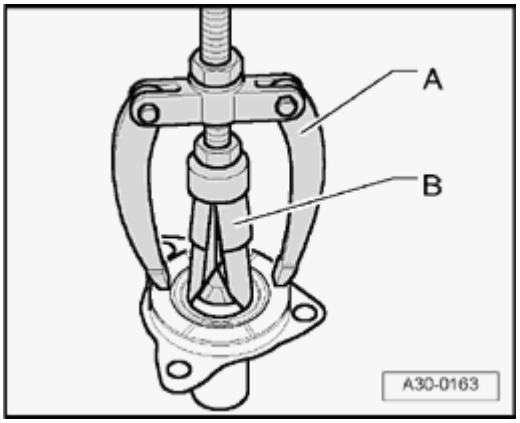


Fig. 54: Pulling Oil Seal Out Of Guide Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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

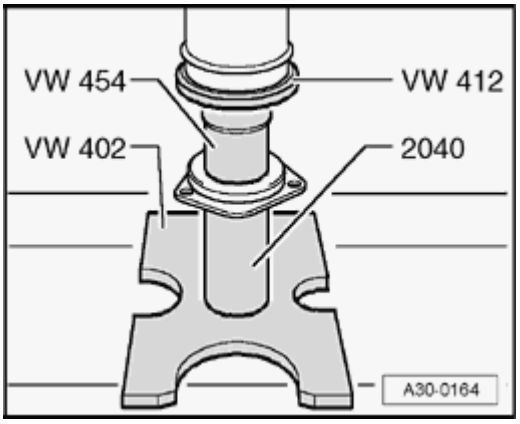


Fig. 55: Pressing Oil Seal Into Guide Sleeve (Press In Onto Stop)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

Slave cylinder, removing and installing

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

Special tools, testers and auxiliary items required

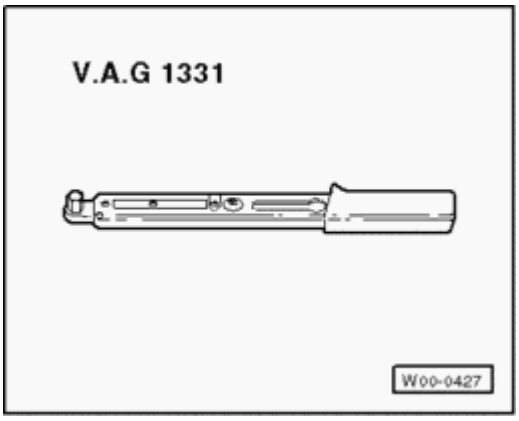


Fig. 56: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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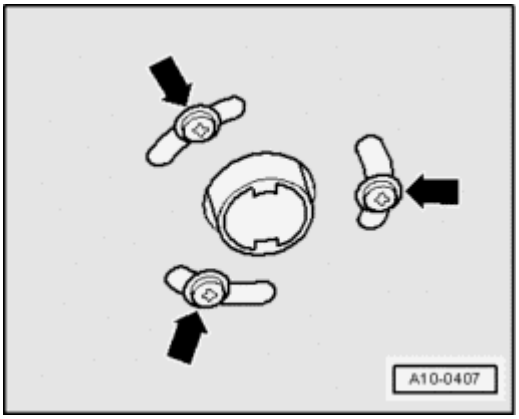


Fig. 57: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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

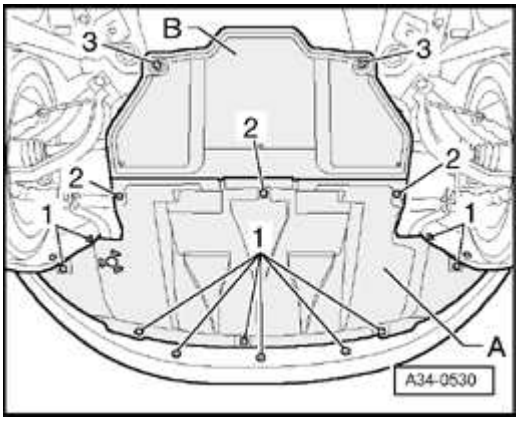


Fig. 58: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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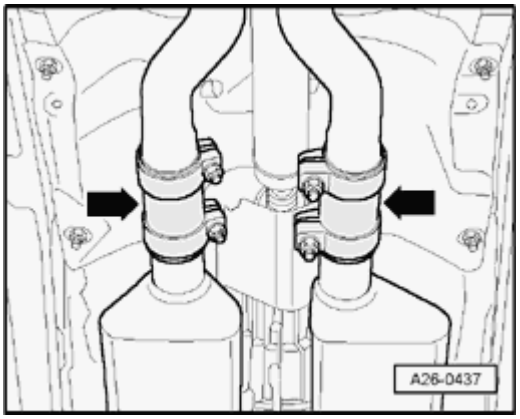


Fig. 59: Exhaust System Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 6-cylinder engine:

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

NOTE:

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

- Remove front exhaust pipe (left-side) with catalytic converter --> 3.0 Liter 6-Cyl. 5V Engine Mechanical, Engine Code(s): AVK - **26 EXHAUST SYSTEM, EMISSION CONTROLS** .

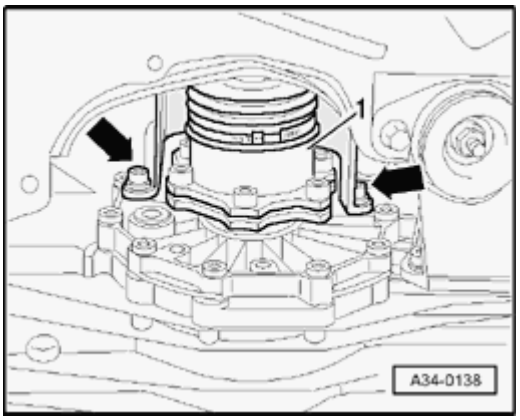


Fig. 60: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Continued for all vehicles:

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

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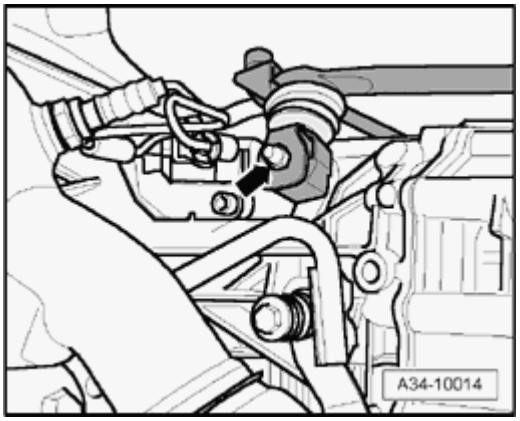


Fig. 61: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

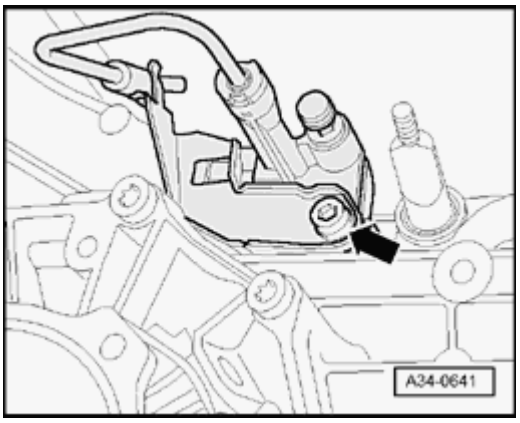


Fig. 62: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - **arrow** - and remove slave cylinder from rear.

NOTE:

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

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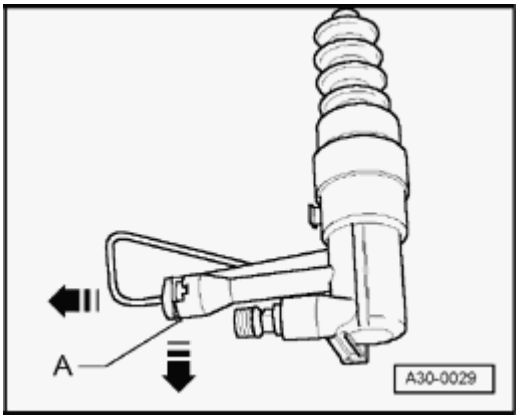


Fig. 63: Removing Hydraulic Line From Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing

Installation is perform 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 slave cylinder is inserted at an angle, there is a danger that the operating rod will be guided past the clutch release lever.**
- **When installing, press in slave cylinder so that securing bolt can be installed easily.**
- **Always replace securing bolt.**

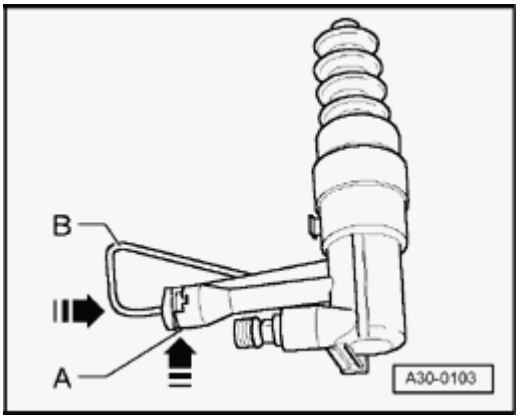


Fig. 64: Identifying Slave Cylinder Hose/Line Assembly
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

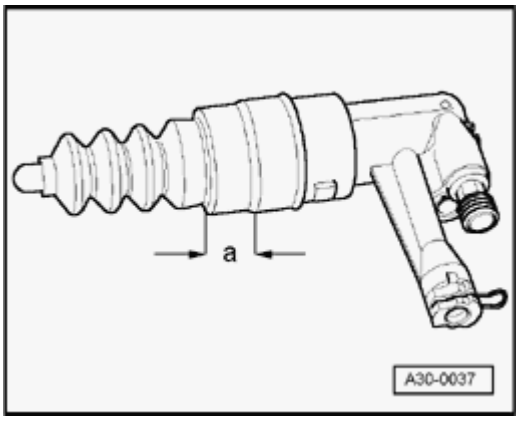


Fig. 65: Coat Boot Area Of Clutch Slave Cylinder With Lithium Grease
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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** .

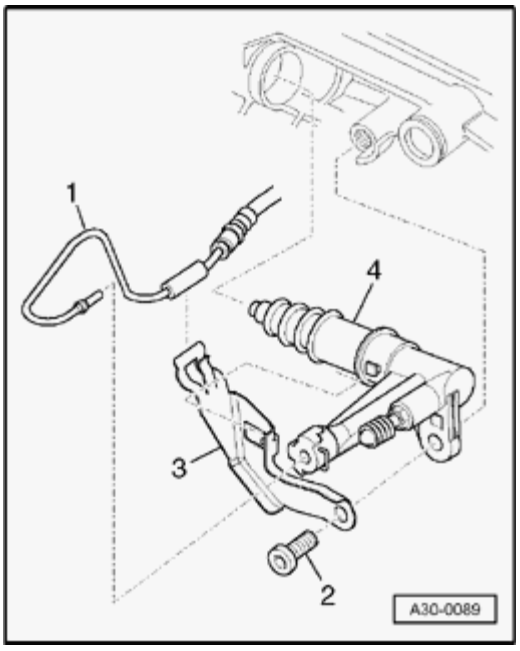


Fig. 66: Clutch Slave Cylinder, Bracket And Hose/Line Assembly
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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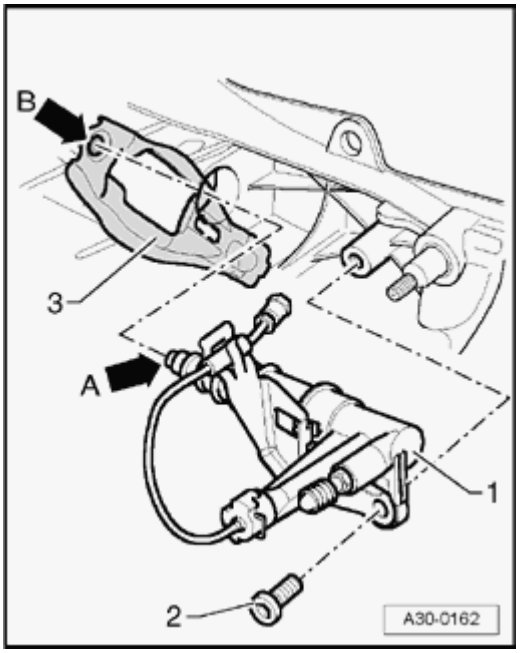


Fig. 67: Guiding Slave Cylinder Into Bore Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

- **If the slave cylinder - 1 - is inserted at an angle, there is a danger that the operating rod - arrow A - will be guided past the clutch release lever - 3 -.**

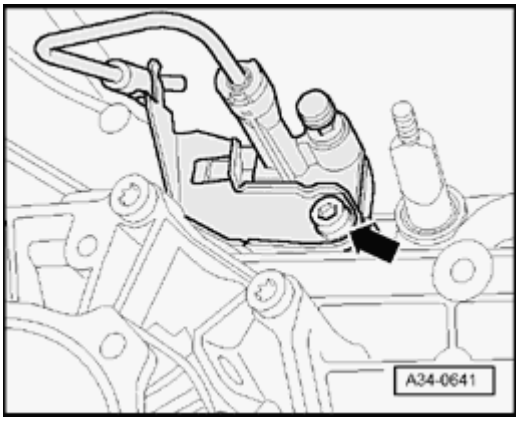


Fig. 68: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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CAUTION: After installing the slave cylinder carefully press the clutch pedal. If you feel an unusually strong resistance when depressing the clutch pedal, you must not press it down further. The push rod of the slave cylinder is likely to have been guided past the clutch release lever. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

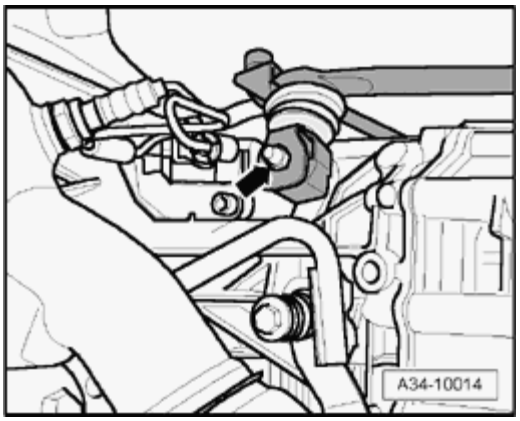


Fig. 69: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Vehicles with 6-cylinder engine:

- Screw heat shield for drive axle (left-side) onto transmission.
- Install exhaust system and perform stress-free alignment --> 3.0 Liter 6-Cyl. 5V Engine Mechanical, Engine Code(s): AVK - **26 EXHAUST SYSTEM, EMISSION CONTROLS** .

Tightening torques

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

* replace bolt

CLUTCH, SERVICING

Clutch, servicing

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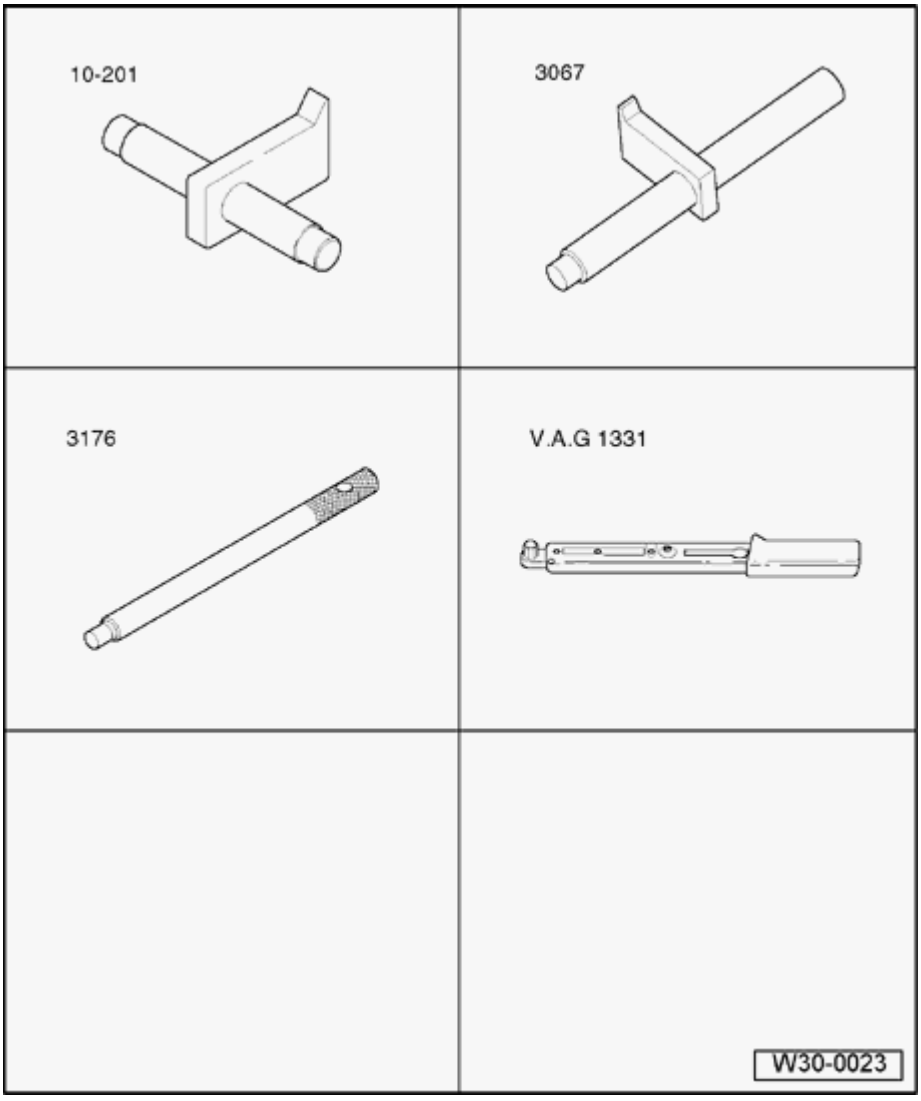


Fig. 70: Identifying Special Tools - Clutch, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

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

NOTE:

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

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cylinder.

- **On vehicles with SAC pressure plate (self-adjusting clutch, LuK version) an adjuster ring has to be reset when only the clutch plate is replaced --> Adjuster ring in SAC clutch pressure plate, adjusting.**
- **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 warped Check SAC pressure plate for warpage, cracks and burns**
- **If the vehicle is installed with a self-adjusting clutch (Sachs version), the clutch plate and pressure plate can only be replaced together --> Self-adjusting clutch (Sachs version), servicing.**
- **Replace clutch plate and pressure plate if riveted fastening is damaged or loose.**
- **Select correct clutch plate and pressure plate according to engine code**
- **To avoid damaging dual-mass flywheel during removal please observe instructions for removal Removing dual-mass flywheel**
- **Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease for clutch plate splines G000100 to the splines. Then move clutch plate backward and forward on input shaft until hub moves freely on shaft. It is important to remove excess grease.**
- **Pressure plates have an anti-corrosion coating and are greased. Only the contact surface may be cleaned, otherwise the service life of the clutch will be considerably reduced.**
- **If the clutch has burned out, thoroughly clean the bell housing, flywheel and parts of the engine facing the transmission in order to prevent odors.**

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

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

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

Conventional clutch, servicing

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

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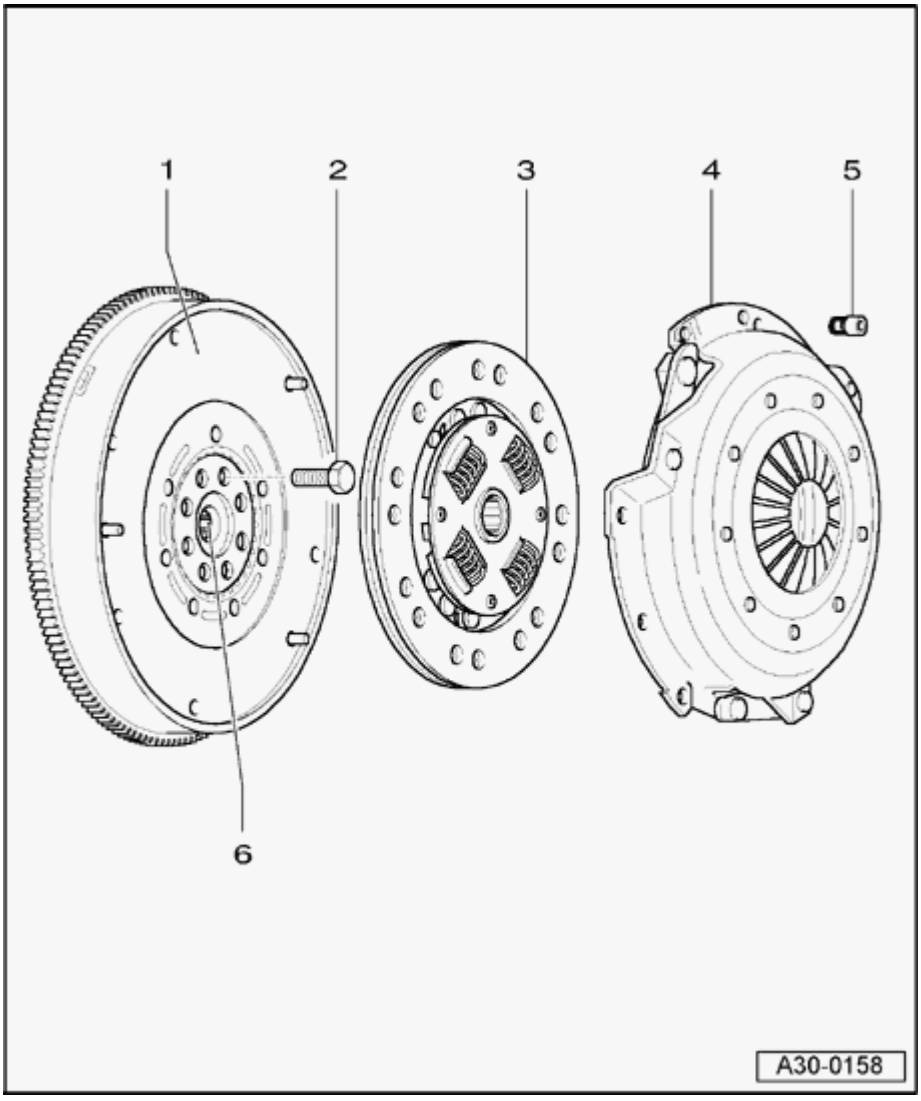


Fig. 71: Conventional Clutch Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Flywheel/dual mass flywheel

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

2 - Bolt for flywheel

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

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

3 - Clutch plate

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

4 - Pressure plate

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

5 - Bolt, 22 Nm

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

6 - Needle bearing

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

Centralizing clutch plate and removing and installing pressure plate

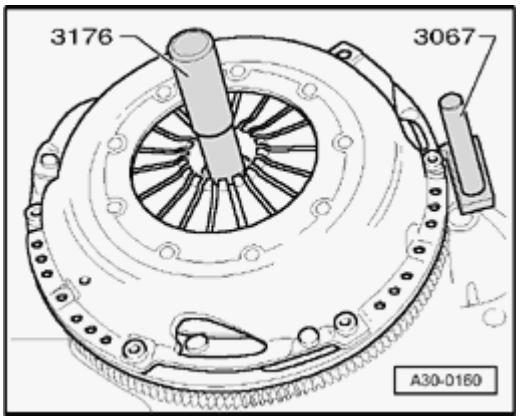


Fig. 72: Changing Over Flywheel Retainer 3067
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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

Checking ends of diaphragm spring

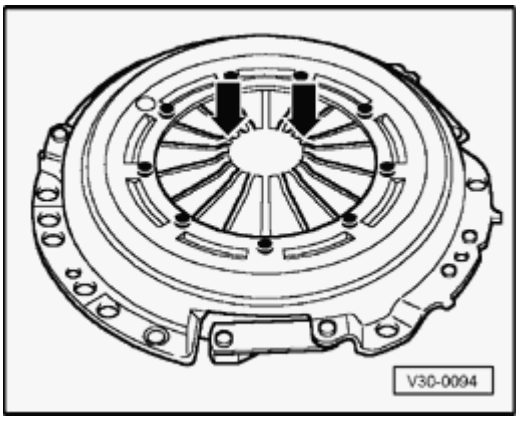


Fig. 73: Checking Ends Of Diaphragm Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

Checking spring connection and rivet

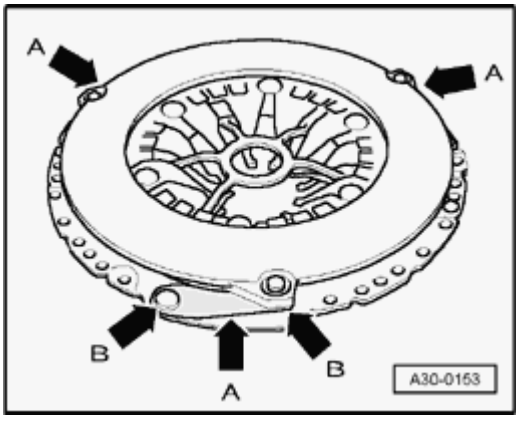


Fig. 74: Checking Spring And Rivet Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

Checking wire ring

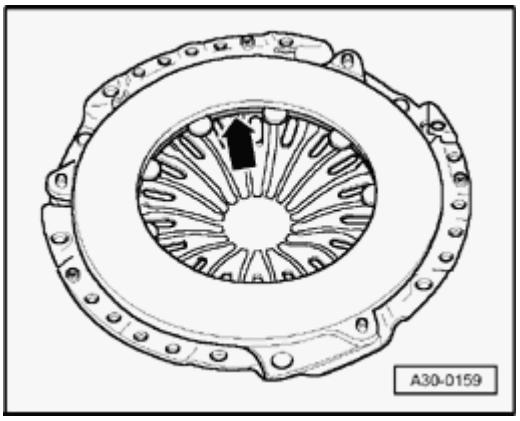


Fig. 75: Identifying Wire Ring In Thrust Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Self-adjusting clutch (Sachs version), servicing

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

- Please refer to notes --> **Clutch, servicing**.
- The transmission has to be removed before working on the clutch --> **Transmission, removing and installing**.
- Identification **Identification**
- Select correct clutch plate and pressure plate according to engine code

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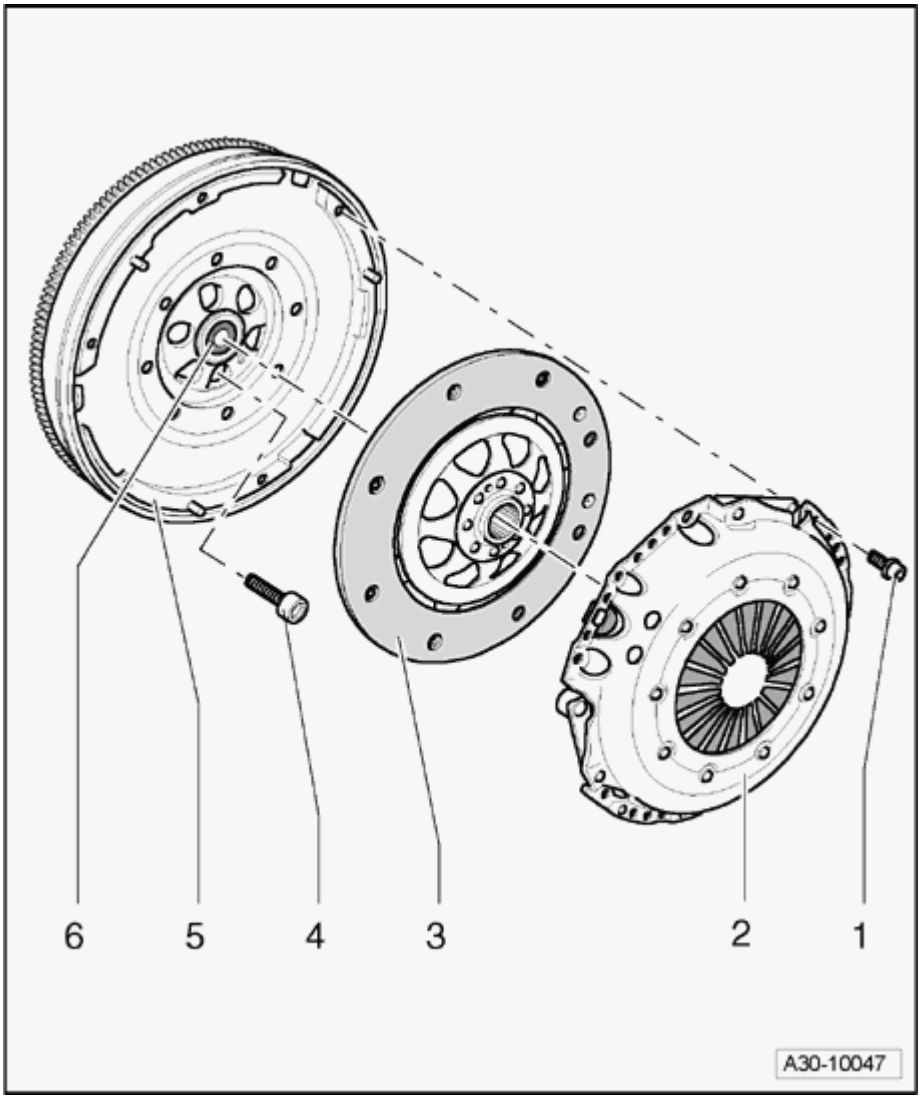


Fig. 76: Self-Adjusting Clutch Assembly Overview (Manufactured By Sachs)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bolt, 22 Nm

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

2 - Pressure plate

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

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

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

3 - Clutch plate

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

- Centralize **Fig. 86**
- Clutch plate diameter --> **Code letters, allocation, transmission ratios, capacities**

4 - Bolt for flywheel

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

5 - Dual-mass flywheel

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

6 - Needle bearing

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

Identification

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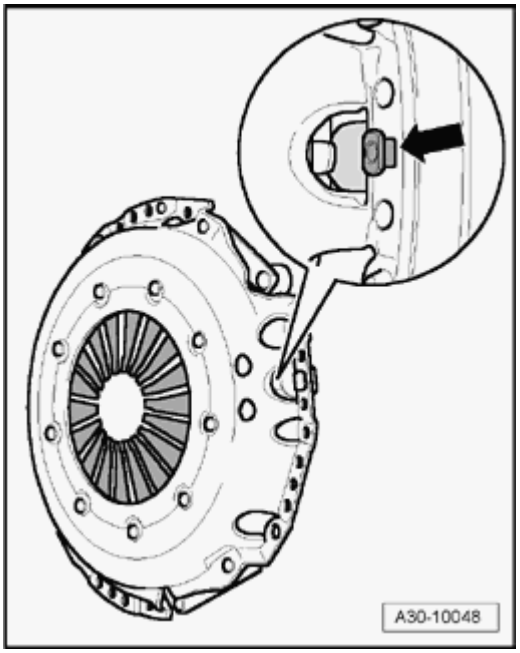


Fig. 77: Pressure Plate With Impact (Position Sensor)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Checking ends of diaphragm spring

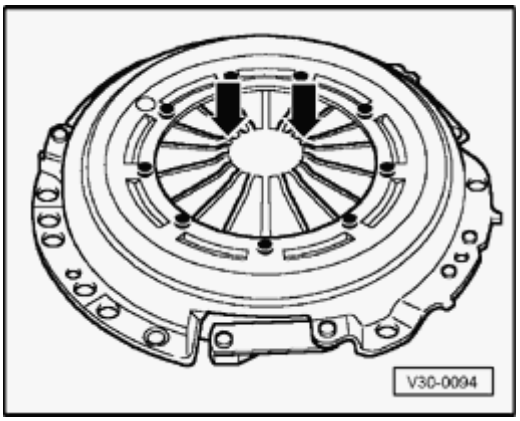


Fig. 78: Checking Ends Of Diaphragm Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

Checking spring connection and rivet

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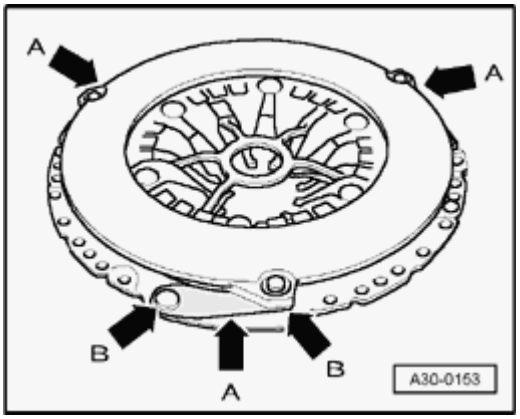


Fig. 79: Checking Spring And Rivet Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

Checking wire ring

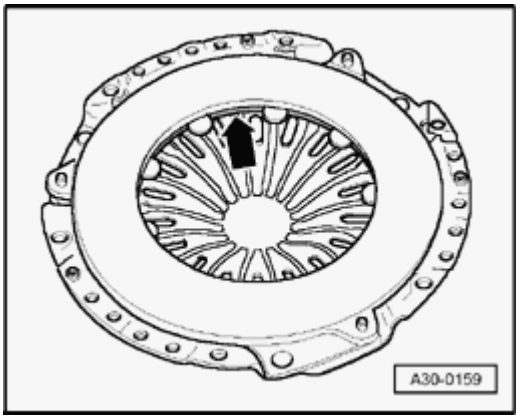


Fig. 80: Identifying Wire Ring In Thrust Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing dual-mass flywheel

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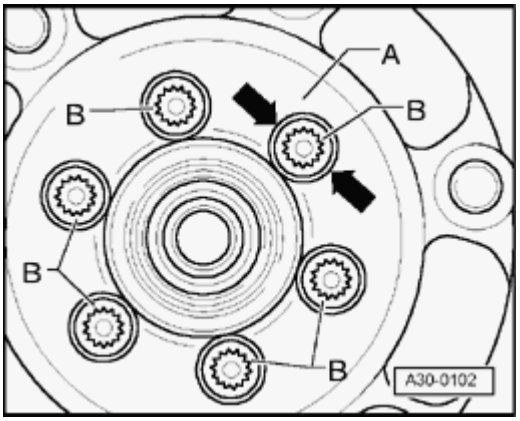


Fig. 81: Identifying Dual-Mass Flywheel & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

  for the appropriate engine code.

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

Special tools, testers and auxiliary items required

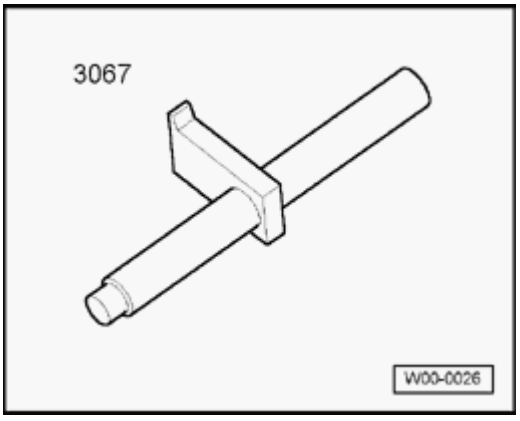


Fig. 82: Identifying Flywheel Retainer 3067
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Flywheel retainer 3067

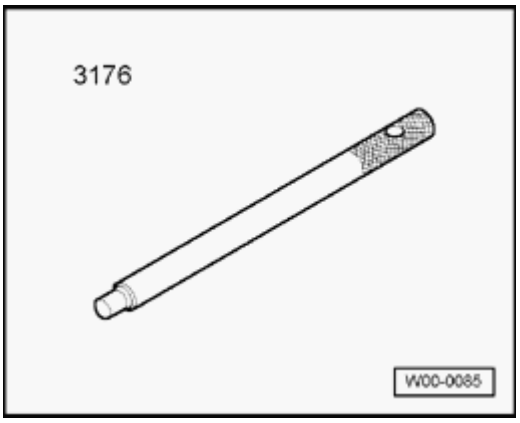


Fig. 83: Identifying Centering Mandrel 3176
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

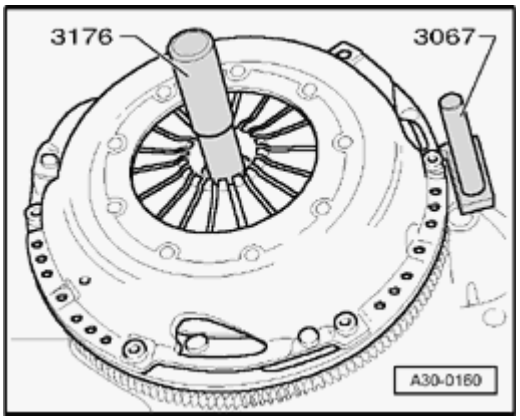


Fig. 84: Changing Over Flywheel Retainer 3067
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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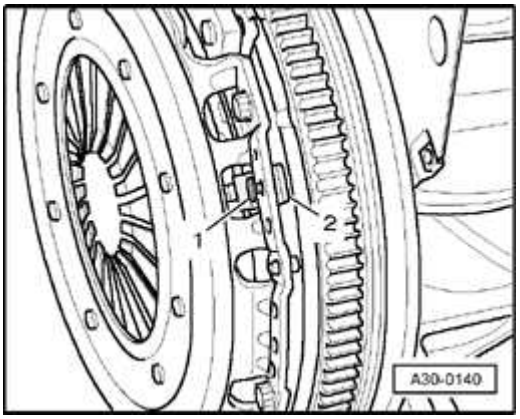


Fig. 85: Identifying Stop & Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Stop - **2** - (position sensor) with pin - **1** - should come free when bolts are loosened.

Installing

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

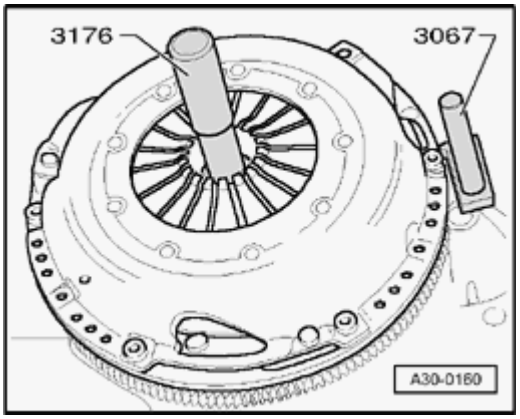


Fig. 86: Changing Over Flywheel Retainer 3067
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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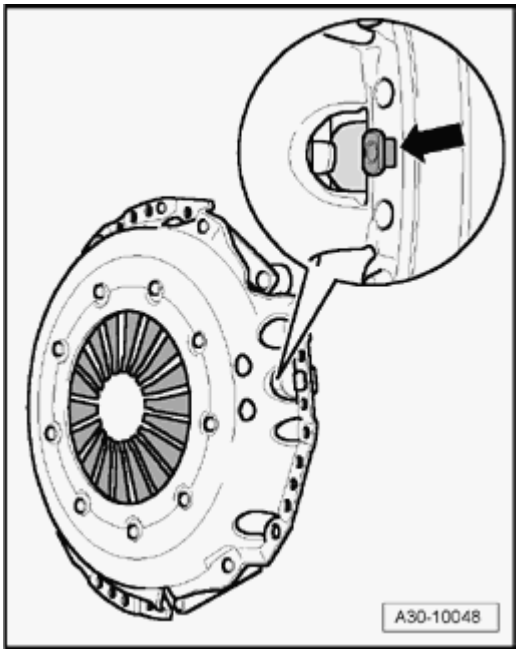


Fig. 87: Pressure Plate With Impact (Position Sensor)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Position pressure plate on dowel pins.
- Make sure that the stop mechanism (position sensor) - **arrow** - is free to move.
- 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° (14 turn) until the housing makes contact with flywheel.
- The stop pin - **arrow** - should then lift away from pressure plate.
- Tighten all 6 bolts to final torque (22Nm) consecutively in clockwise direction.

Clutch with SAC pressure plate (LuK version), servicing

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

NOTE:

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

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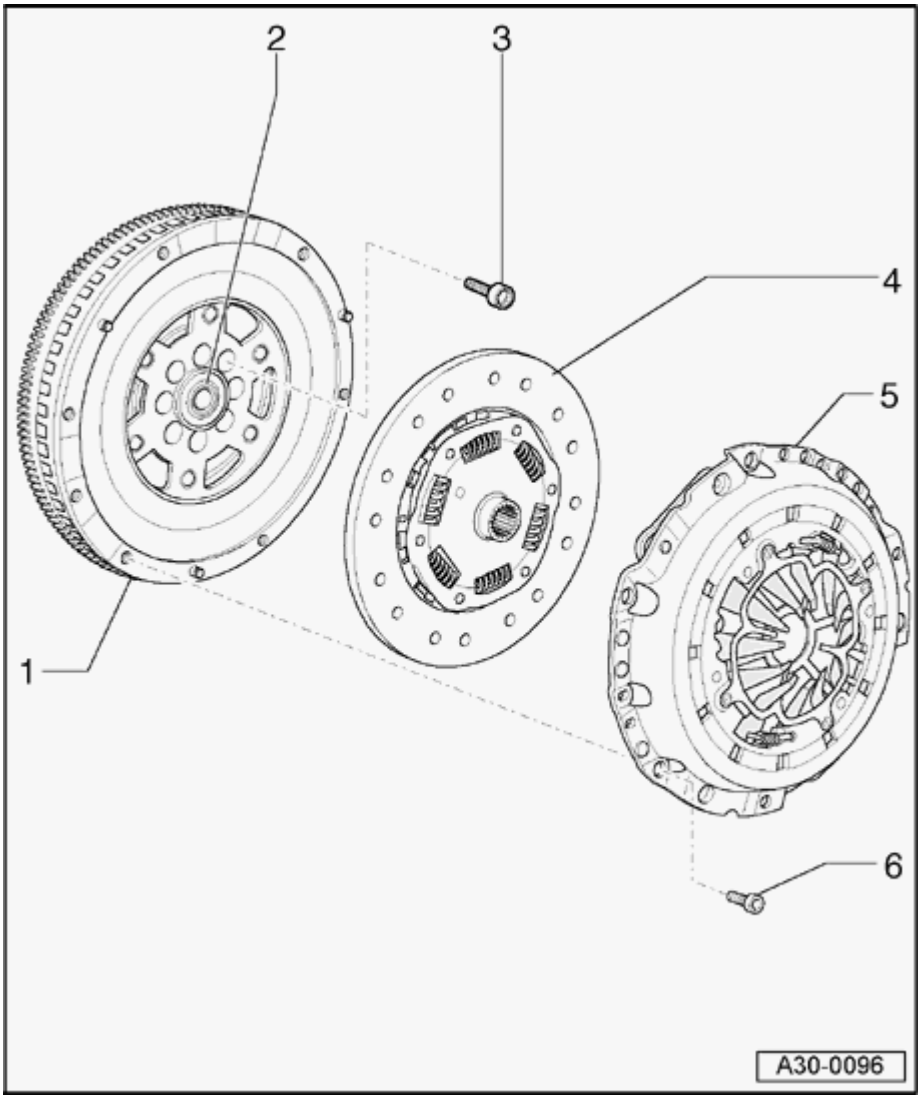


Fig. 88: Clutch With SAC Pressure Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Dual-mass flywheel

- Make sure 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** for AVK
  - **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK** for BPG

2 - Needle bearing

- Removing and installing -->

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- **13 ENGINE - CRANKSHAFT, CYLINDER BLOCK** for AVK
- **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK** for BPG

3 - Bolt for flywheel

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

4 - Clutch plate

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

5 - SAC pressure plate

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

6 - Bolt -22 Nm-

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

Checking ends of diaphragm spring

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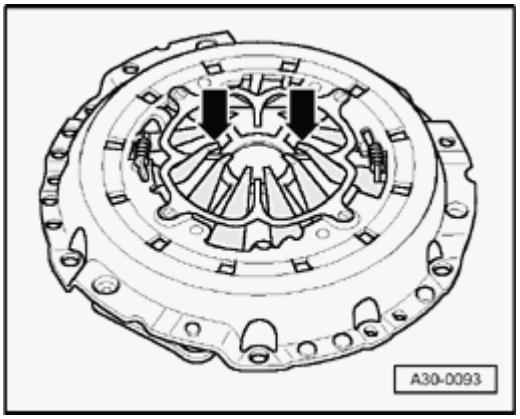


Fig. 89: Checking Ends Of The Diaphragm Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

Checking spring connection and rivet

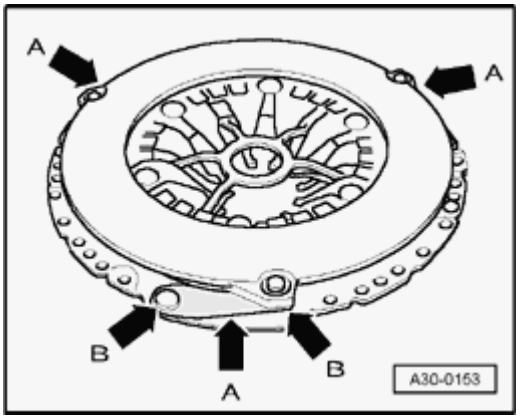


Fig. 90: Checking Spring And Rivet Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

Check SAC pressure plate for warpage, cracks and burns

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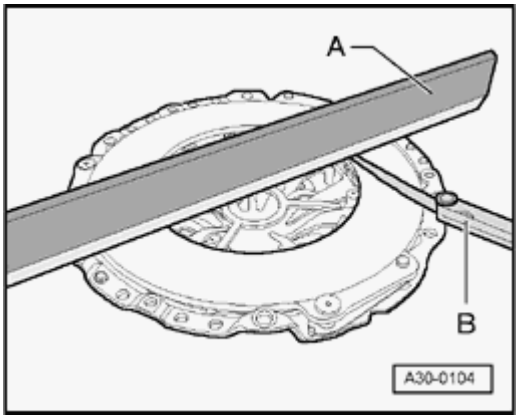


Fig. 91: Check SAC Pressure Plate For Warpage, Cracks And Burns
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Straightedge

B - Feeler gauge

- Pressure plate warpage up to 1.0 mm is allowed

Removing dual-mass flywheel

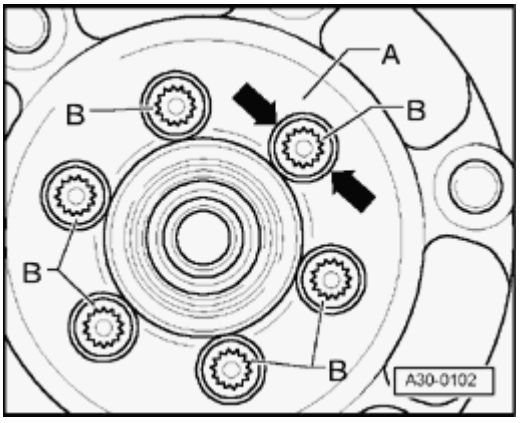


Fig. 92: Identifying Dual-Mass Flywheel & Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

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- **13 ENGINE - CRANKSHAFT, CYLINDER BLOCK** for AVK
- **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK** for BPG

.

Clutch with SAC pressure plate, removing and installing

Special tools, testers and auxiliary items required

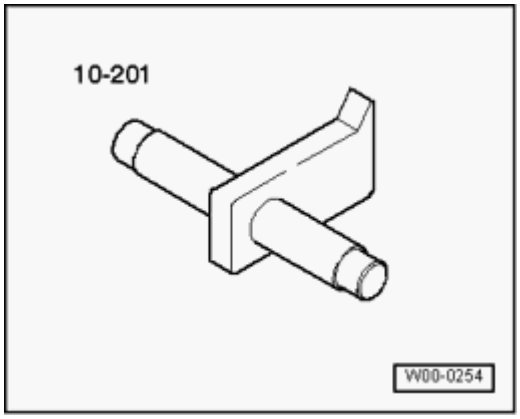


Fig. 93: Counterhold 10-201
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Counterhold tool 10 - 201

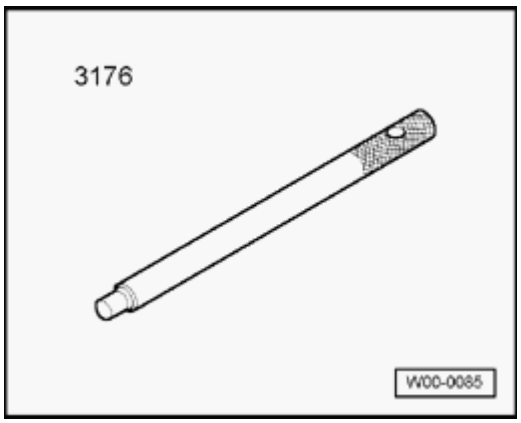


Fig. 94: Identifying Centering Mandrel 3176
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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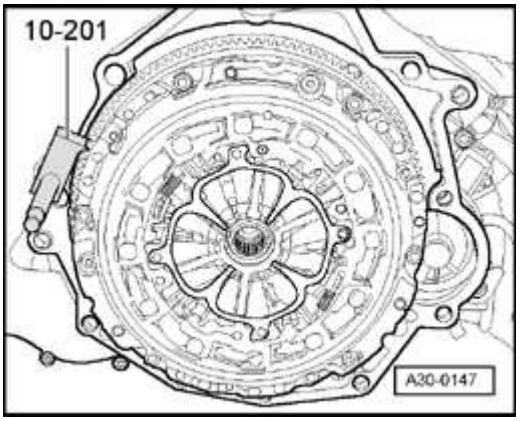


Fig. 95: Counter-Hold Tool 10 - 201 Attached Before Loosening Clutch Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Loosen all six bolts consecutively in clockwise direction and in steps of 90° (14 turn) until the pressure plate is released.

Installing

NOTE:

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

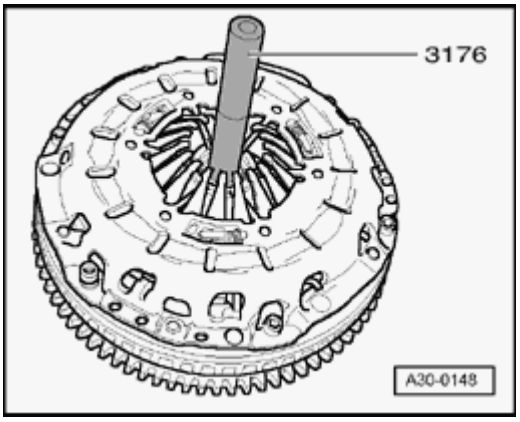


Fig. 96: Using Centering Mandrel 3176 To Centralize Clutch Plate

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Position pressure plate on dowel pins.
- 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° (14 turn) until the housing makes contact with flywheel.
- Tighten all 6 bolts to final torque (22Nm) consecutively in clockwise direction.

Adjuster ring in SAC clutch pressure plate, adjusting

NOTE:

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

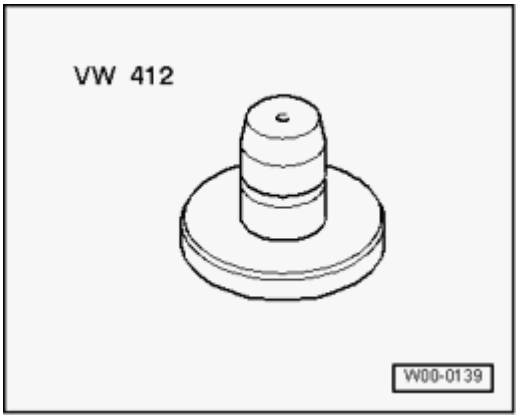


Fig. 97: Thrust Disc VW 412
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Thrust disc VW412

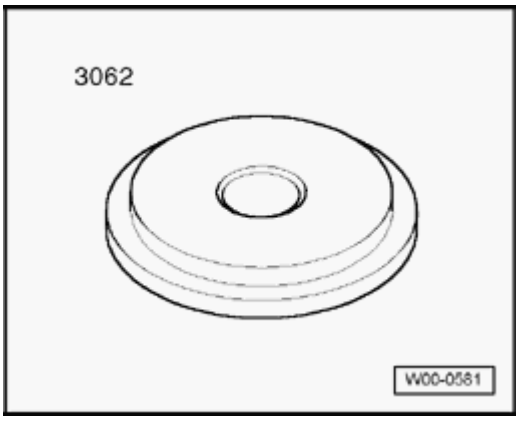


Fig. 98: Identifying Thrust Pad 3062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Thrust pad 3062

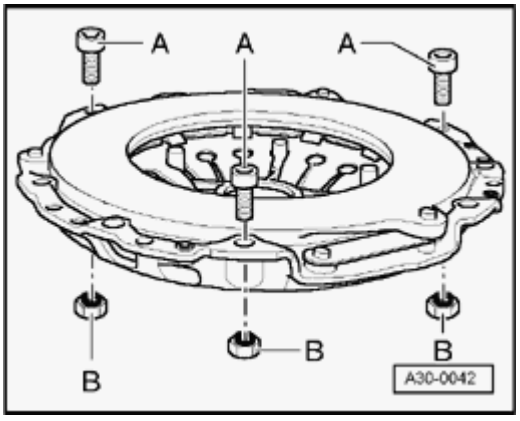


Fig. 99: Inserting Securing Bolts Into Mounting Holes On Pressure Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Procedure

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

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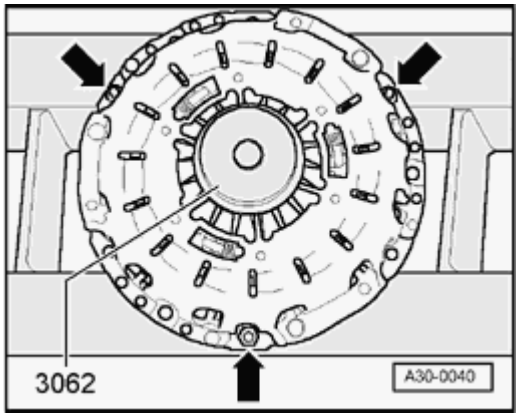


Fig. 100: Placing SAC Pressure Plate Onto Press
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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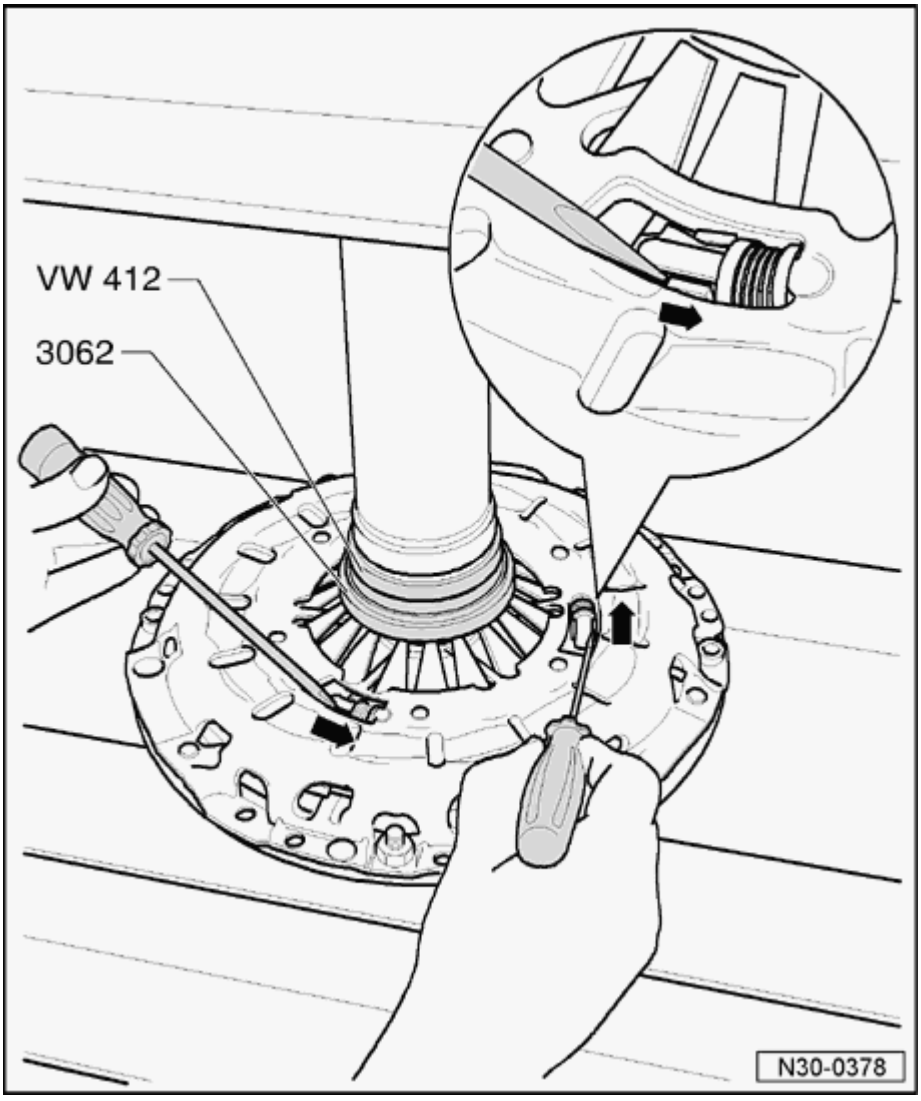


Fig. 101: Positioning Two Screwdrivers On Adjusting Ring Forks
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

34 CONTROLS, HOUSING

SELECTOR MECHANISM, SERVICING

Installation position of selector mechanism

- **Arrow A** - gear selection movement

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- **Arrow B** - gate selection movement

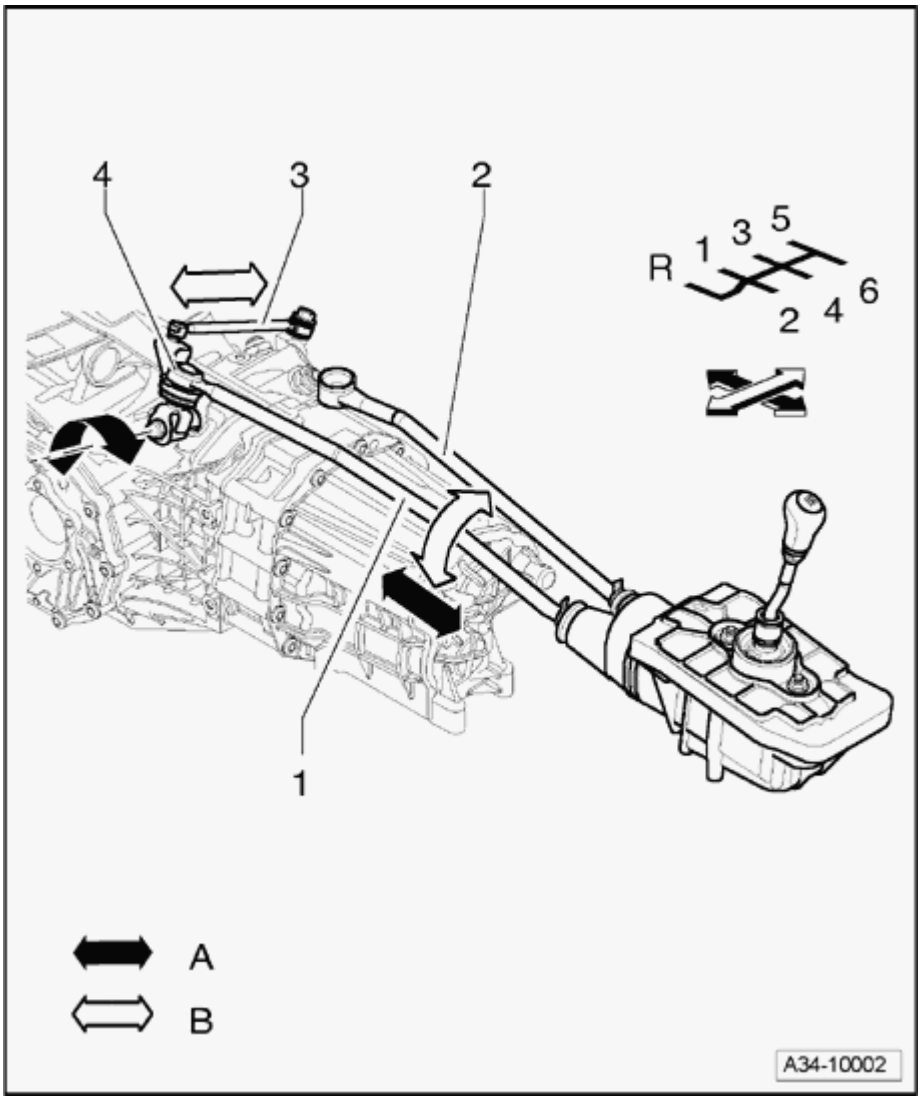


Fig. 102: Installation Position Of Selector Mechanism, Gear Selection Movement And Gate Selection Movement
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector rod

2 - Push rod

3 - Connecting rod

4 - Selector shaft lever

Selector mechanism components, assembly overview

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Part I

NOTE:

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

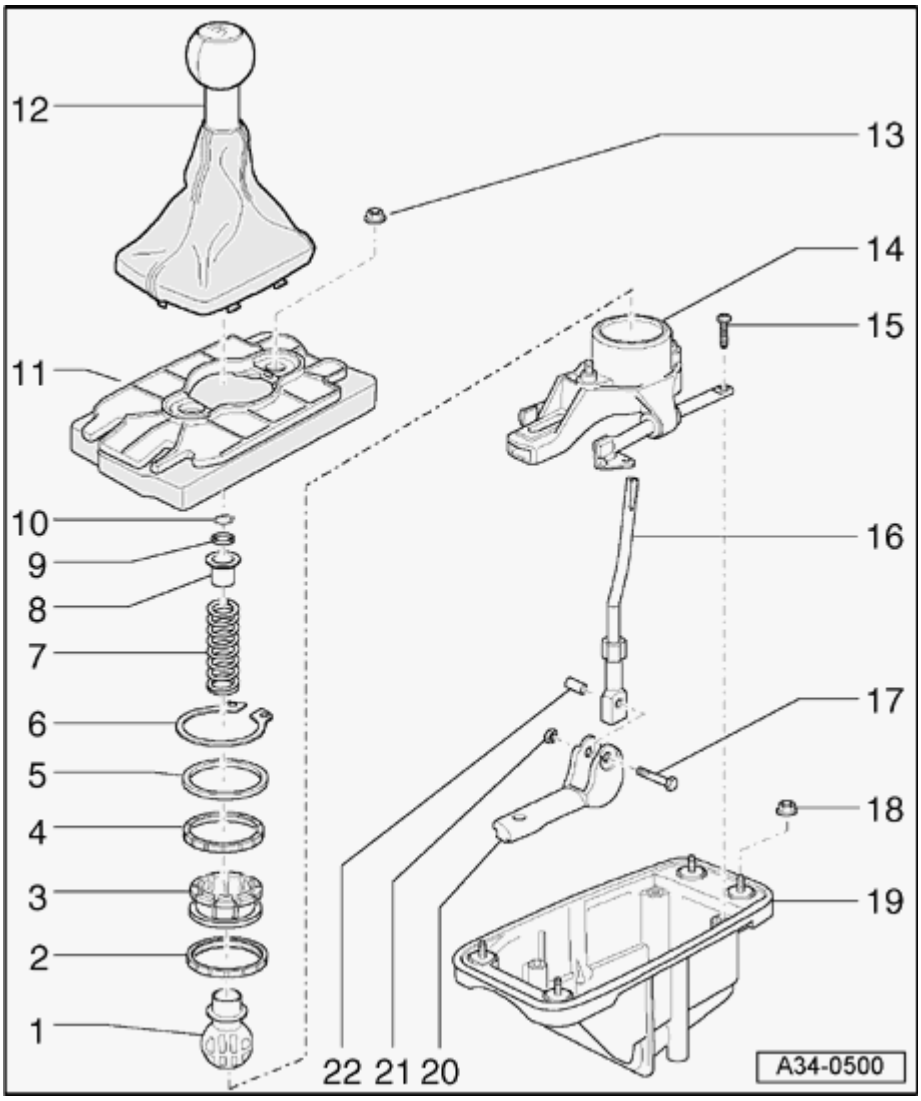


Fig. 103: Shift Mechanism Remove/Install Components -- Part I
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 - Sound insulation

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

12 - Gear lever knob

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

13 - Nut -10 Nm-

14 - Ball housing

15 - Torx socket head bolt

16 - Gear lever

- Bend points 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 - Bushing

Part II

NOTE:

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

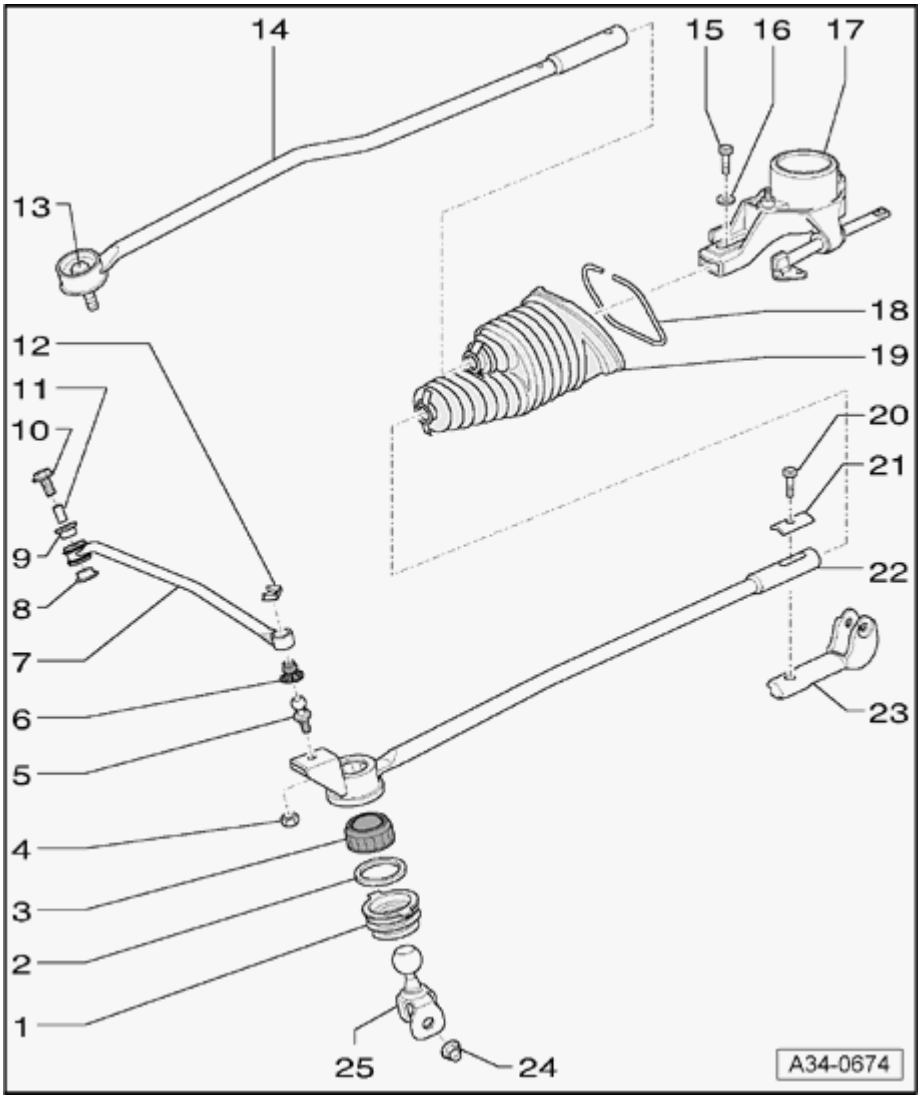


Fig. 104: Shift Mechanism Remove/Install Components -- Part II
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Boot

- Secure to selector rod with commercially available instant adhesive

2 - Washer

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3 - Ball socket

4 - Cap nut, 23 Nm

5 - Ball stud

6 - Ball socket

7 - Connecting rod

8 - Bushing

9 - Bushing

10 - Bolt, 23 Nm

11 - Sleeve

12 - Retaining clip

13 - Bolt, 40 Nm

14 - Push rod

- With bushing, bolt and washers

15 - Hex socket head bolt, 23 Nm

16 - Washer

17 - Gear lever bearing

18 - Clamping ring for boot

19 - Boot

20 - Hex socket head bolt, 23 Nm

21 - Clamp

22 - Selector rod

23 - Joint for gear lever/selector rod

24 - Cap nut, 10 Nm

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- Self-locking
- Replace

25 - Selector shaft lever

Gear lever knob with boot, removing and installing

Special tools, testers and auxiliary items required

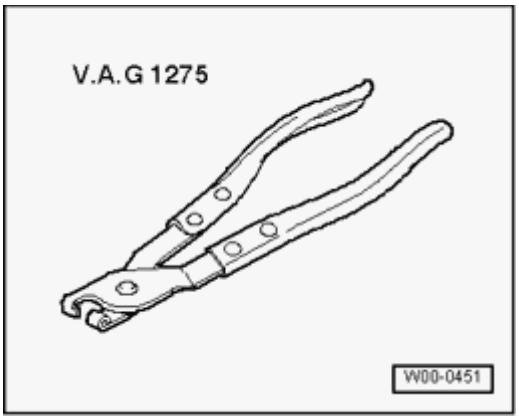


Fig. 105: Identifying Hose Clamp Pliers V.A.G 1275
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clip pliers V.A.G 1275

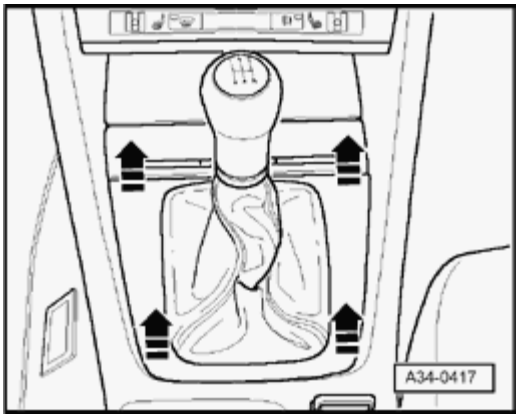


Fig. 106: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

NOTE:

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

- Open ashtray.

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

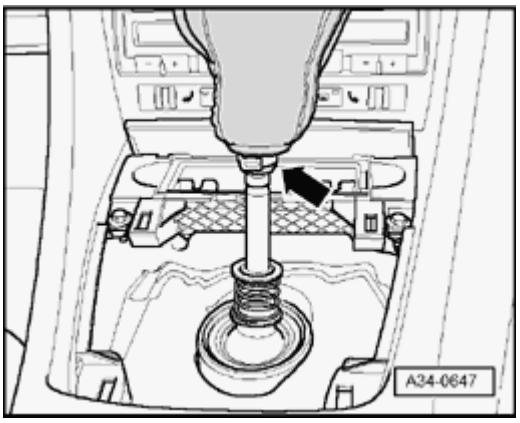


Fig. 107: Locating Clip And Pulling Off Gear Lever Knob Together With Boot
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Gear lever knob with clip:

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

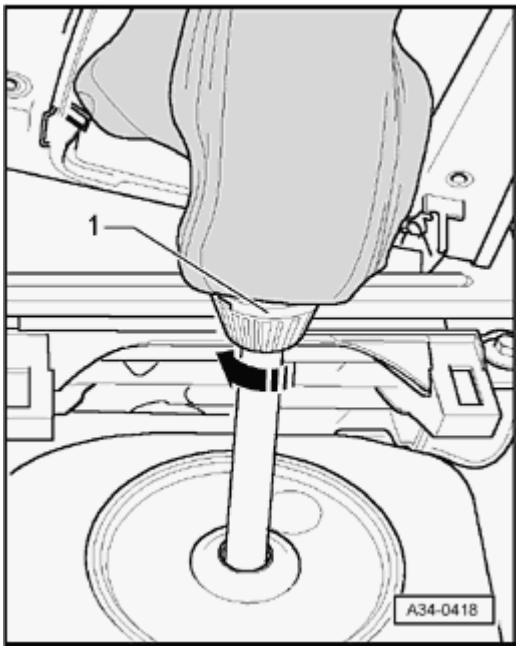


Fig. 108: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Gear lever knob with locking mechanism:

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

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Installing

Perform installation in reverse sequence of removal.

Selector mechanism, removing and installing

Special tools, testers and auxiliary items required

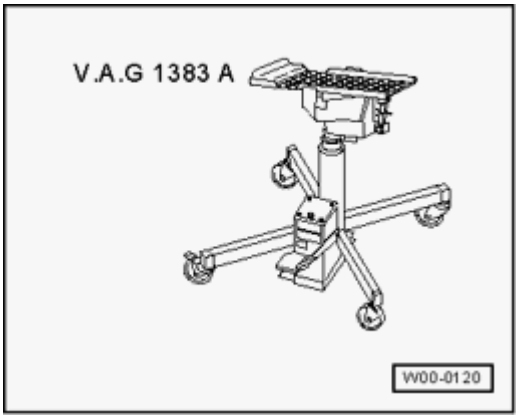


Fig. 109: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

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

Vehicles with large radio slot:

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

Vehicles with small radio slot:

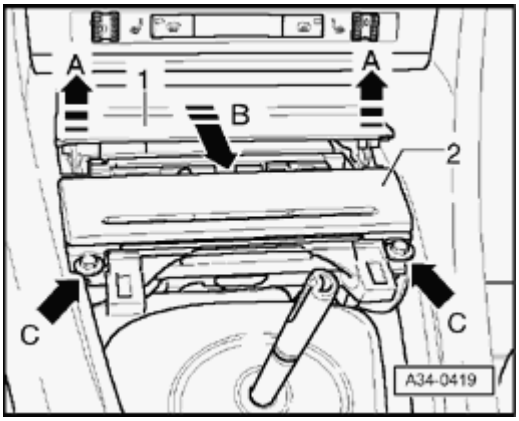


Fig. 110: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Continued for all vehicles:

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

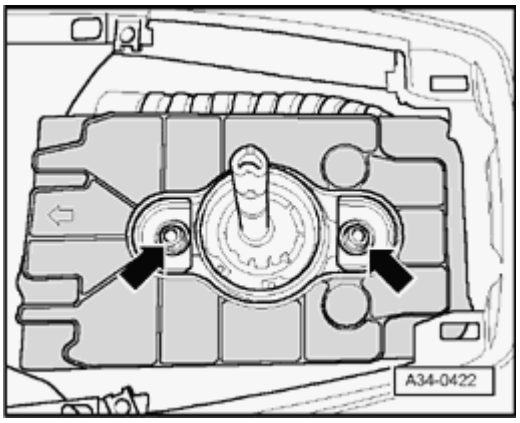


Fig. 111: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

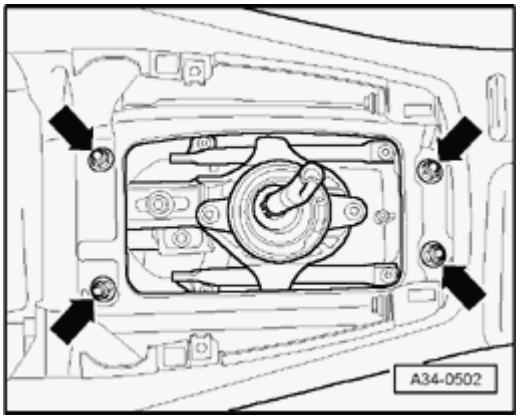


Fig. 112: Shift Lever Housing Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.

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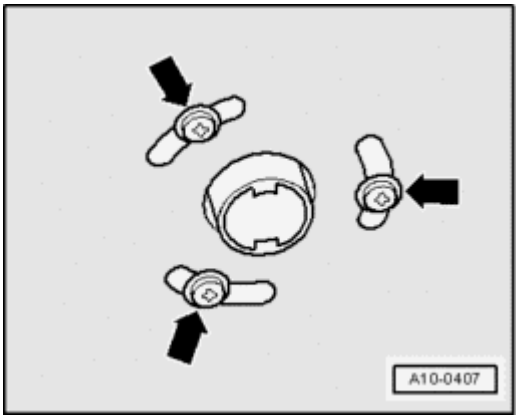


Fig. 113: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

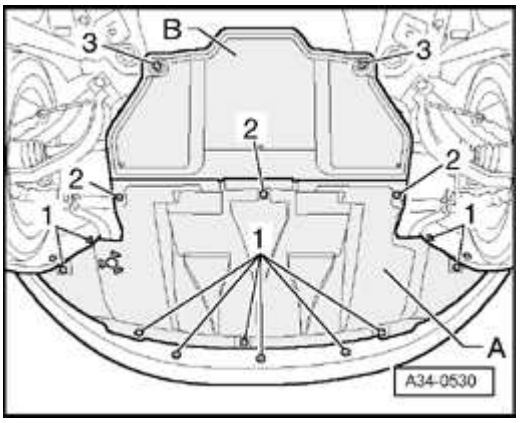
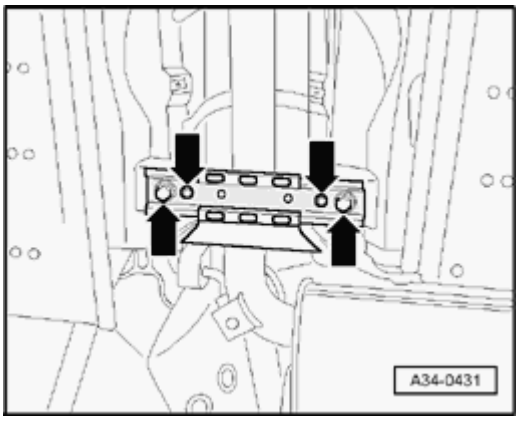


Fig. 114: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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



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Fig. 115: Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 6-cylinder engine:

Remove tunnel cross piece (rear) - **arrows** -.

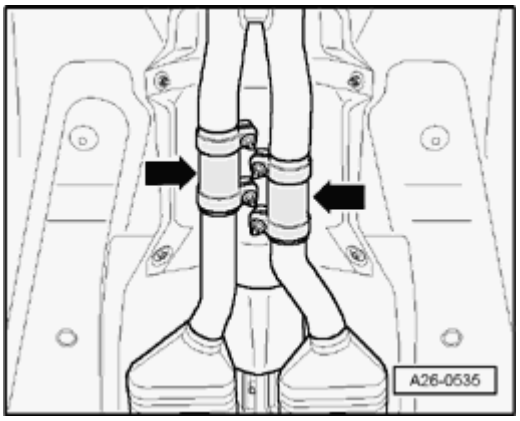


Fig. 116: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamps - **arrows** -.
- Remove rear section of exhaust system -->
  - **26 EXHAUST SYSTEM, EMISSION CONTROLS** for AVK
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

.

NOTE:

- **The flexible pipe connection (de-coupling element) on the front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.**
- **A second technician is required for removing the rear section of the exhaust system.**

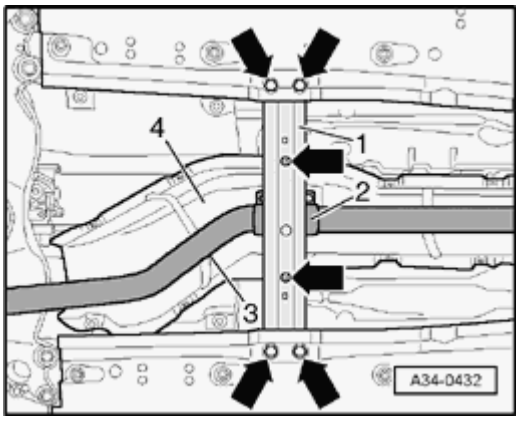


Fig. 117: Rear Section Of Exhaust System And Front Cross Member

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 4-cylinder engine:

- Disconnect exhaust system at clamp - **2** -.

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.**

Continued for all vehicles:

- Remove tunnel cross piece (front) - **1** - - **arrows** -.
- Remove heat shield for exhaust system - **4** - from below selector mechanism.

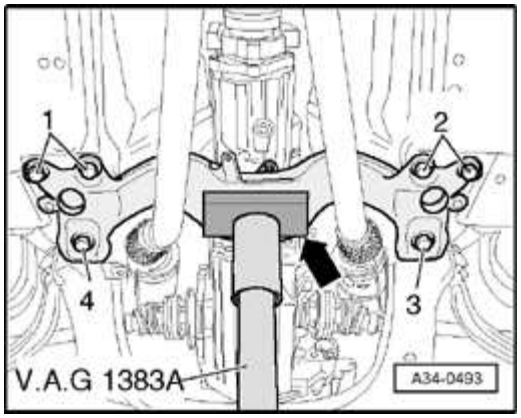


Fig. 118: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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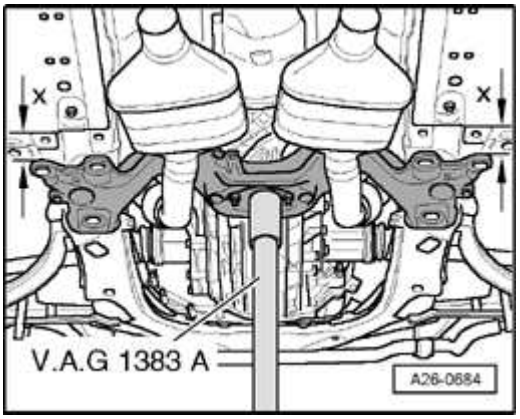


Fig. 119: Identifying Distance Between Cross Member And Body Reaches Dimension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Dimension x = 60 mm

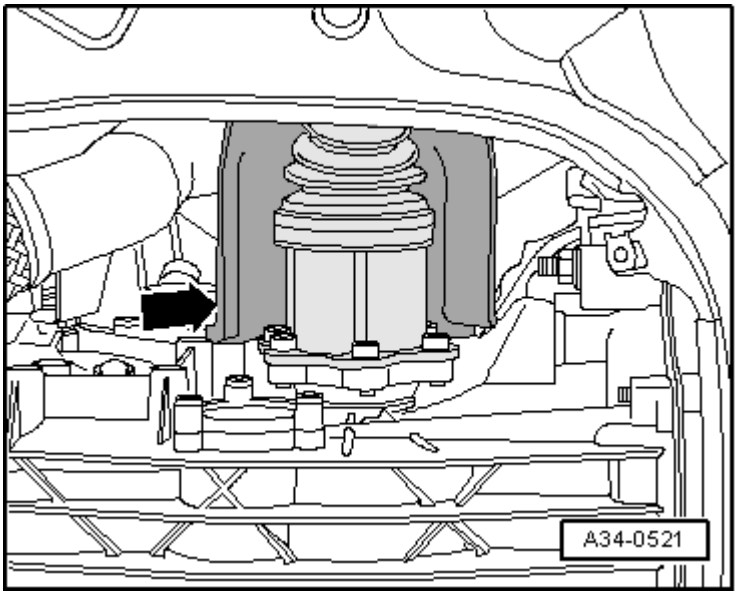


Fig. 120: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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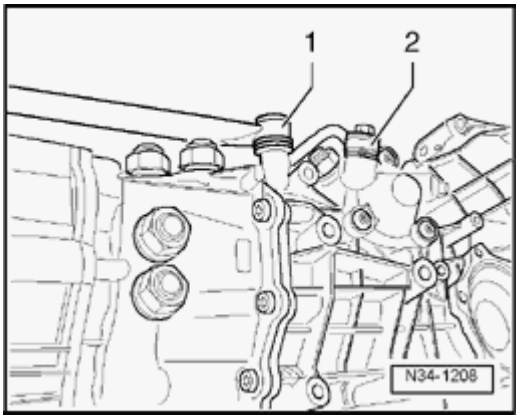


Fig. 121: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove connecting rod - **2** - for selector rod.
- Detach push rod - **1** - ; to do so, unscrew hex socket head bolt.

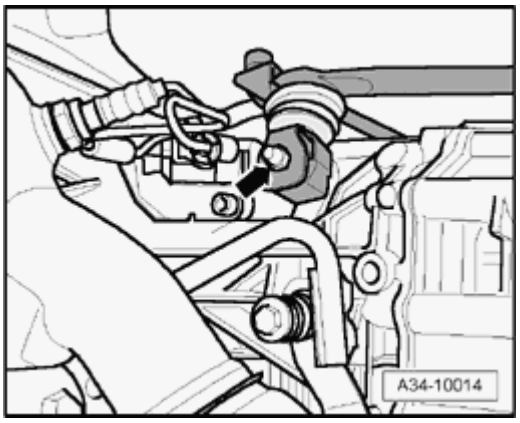


Fig. 122: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing

Installation is perform in reverse sequence. Note the following:

NOTE:

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

- Install tunnel cross member --> **40 - FRONT SUSPENSION** .
- Install exhaust system and perform stress-free alignment -->
  - **26 EXHAUST SYSTEM, EMISSION CONTROLS** for AVK
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

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.

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

Tightening torques

Component	Nm
Connecting rod to transmission	23
Selector shaft lever to selector shaft	23
Push rod to transmission	40
Heat shield for drive shaft to transmission	23
Tunnel cross member (front) to body	55
Tunnel cross member (rear) to body	60
Selector mechanism to body	10
sound insulation to selector mechanism	10

Selector mechanism, adjusting

The following are requirements for correct gear lever alignment:

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

Procedure

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

Vehicles with large radio slot:

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

Vehicles with small radio slot:

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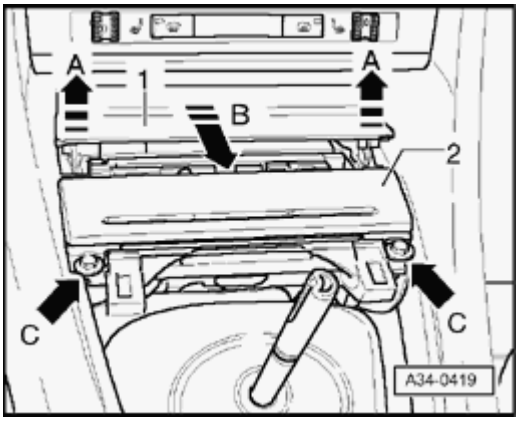


Fig. 123: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Continued for all vehicles:

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

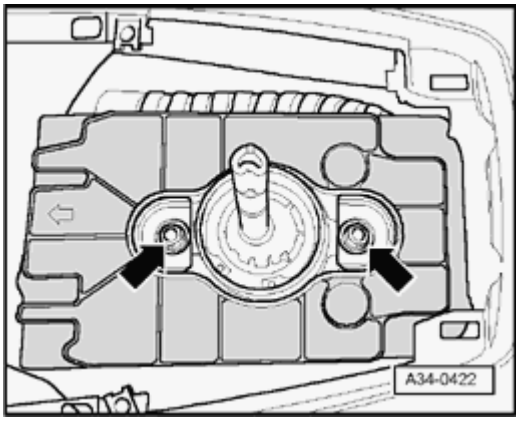


Fig. 124: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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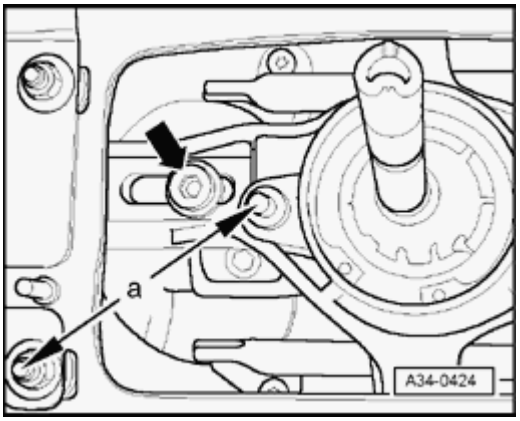


Fig. 125: Shift Mechanism Measurement And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

- If distance measured is not correct, adjust dimension - **a** - as follows:
- Loosen bolt - **arrow** - for push rod.
- Rear push rod (in selector mechanism) 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.

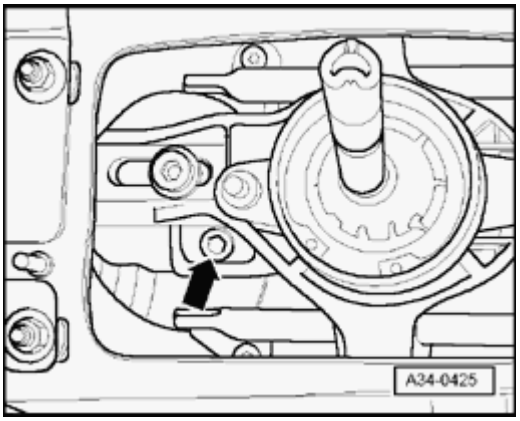


Fig. 126: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

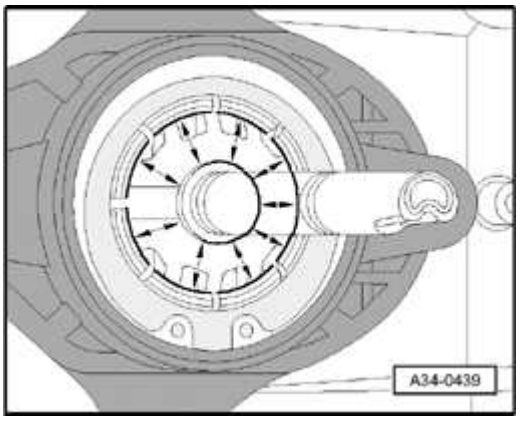


Fig. 127: Centering Bottom Of Shift Lever Centered In Ball Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Align gear lever

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

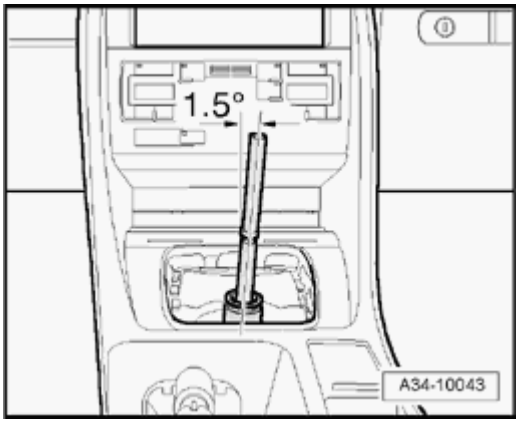


Fig. 128: Gear Lever Alignment Pointing Slightly To Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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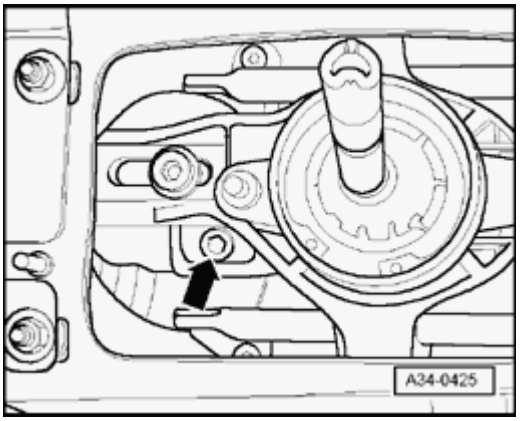


Fig. 129: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

Checking gear lever setting

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

- Press clutch pedal.
- Select all gears several times.
- Check operation of reverse gear lock.

- The gear lever should return by itself from reverse gear gate to 3rd / 4th gear gate.

If gear lever sticks or bauks repeatedly when engaging a gear, perform adjustment procedure again.

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

TRANSMISSION, REMOVING AND INSTALLING

Transmission, removing and installing

- Transmission, removing from vehicles with 4-cylinder engine --> **Transmission, removing from vehicles with 4-cylinder engine**.
- Transmission, removing from vehicles with 6-cylinder engine --> **Transmission, removing from vehicles with 6-cylinder engine**.
- Transmission, installing in vehicles with 4-cylinder or 6-cylinder engine --> **Transmission, installing in vehicles with 4-cylinder or 6-cylinder engine**.

Transmission, removing from vehicles with 4-cylinder engine

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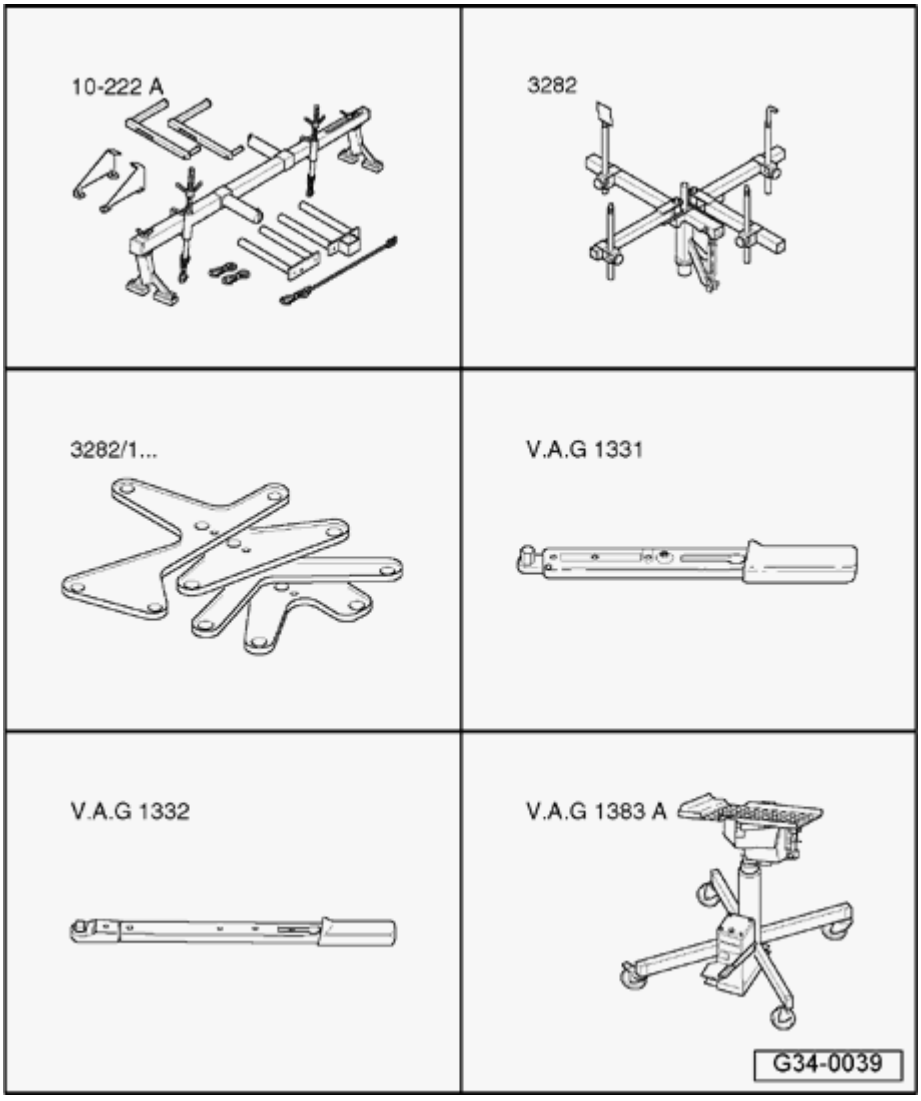


Fig. 130: Identifying Special Tools - Transmission, Removing From Vehicles
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Engine support bridge 10-222 A
- Transmission support 3282
- Adjustment plate 3282/43
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332
- Engine/transmission jack V.A.G 1383 A

Special tools, testers and auxiliary items required

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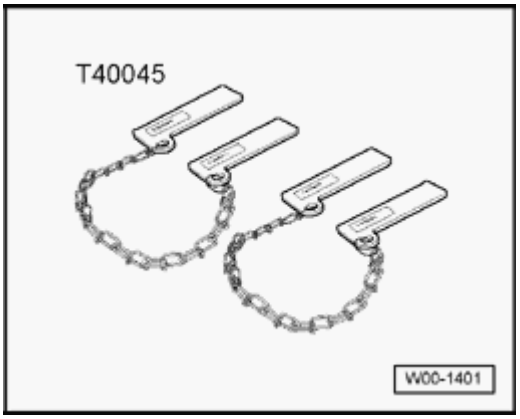


Fig. 131: Insert Pad For Front Fender T40045
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Procedure

NOTE:

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

CAUTION:

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

.

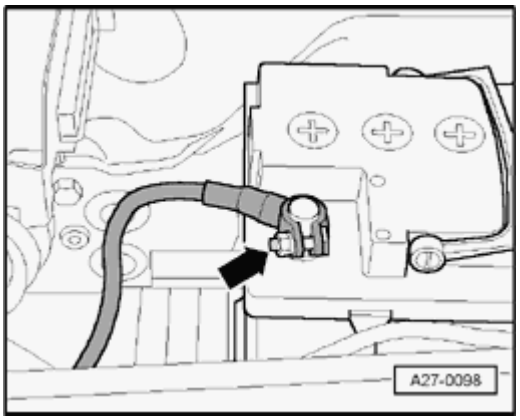


Fig. 132: Disconnecting Battery Ground (GND) Strap

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

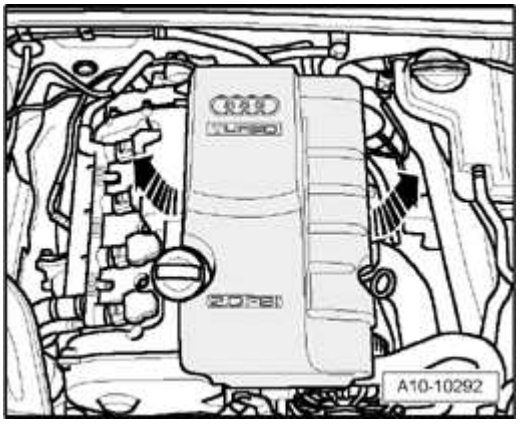


Fig. 133: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

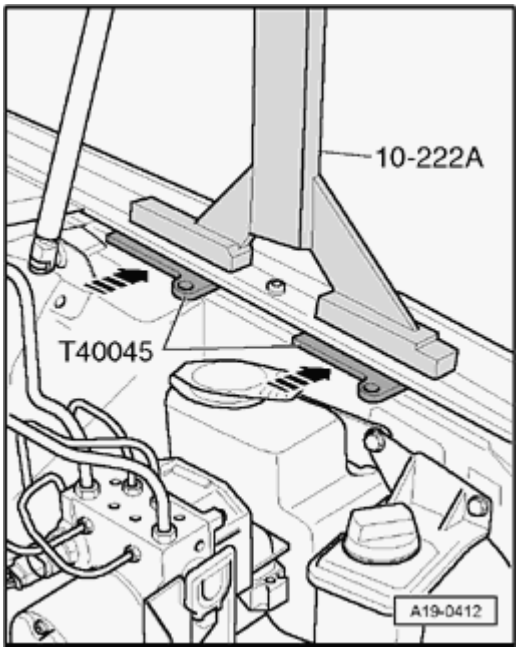


Fig. 134: Placing Insert Pad For Front Fender T40045 On Both Sides Between Fender Attachment Edge And Web Plate Lying Beneath
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach rubber seal from edges of wing mounting flanges.
- To avoid damaging edges of fenders with engine support bridge 10-222 A, insert wing compensation plates T40045 on both sides between fender mounting flange and body panel underneath.

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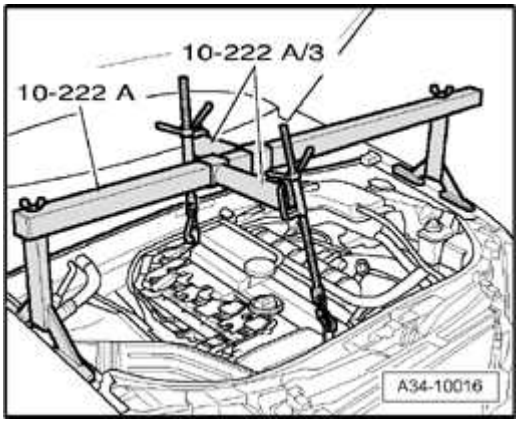


Fig. 135: Engine Support Bridge 10-222 A Set Up With Adapters 10-222/3 On Fender Mounting Flanges
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

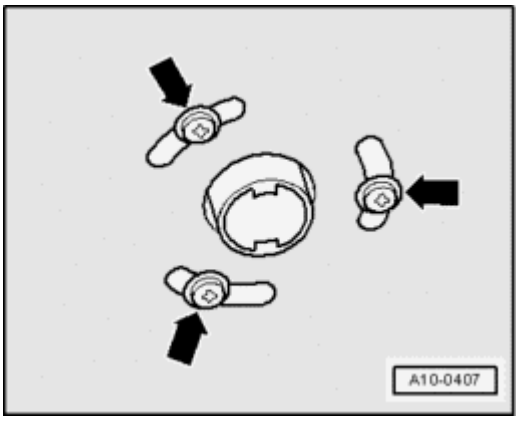


Fig. 136: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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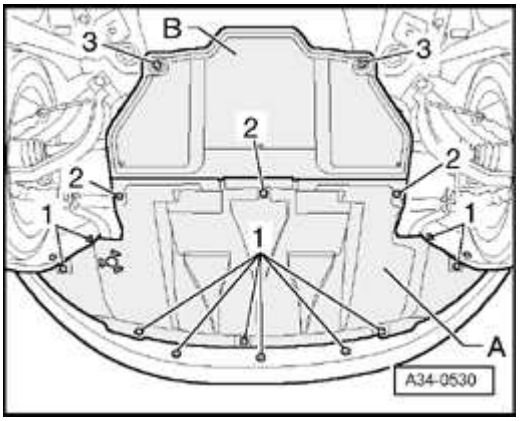


Fig. 137: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.

NOTE:

- **- Item 3 - and - item B - can be disregarded.**

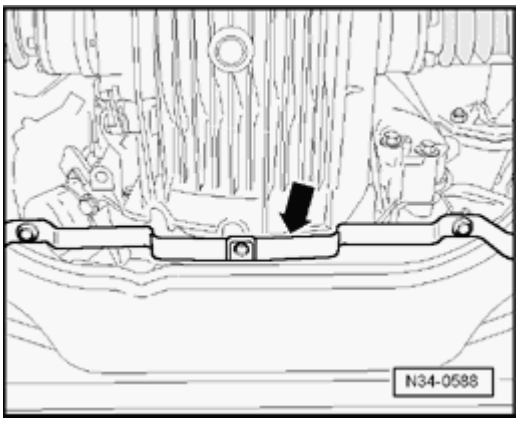


Fig. 138: Removing Noise Insulation Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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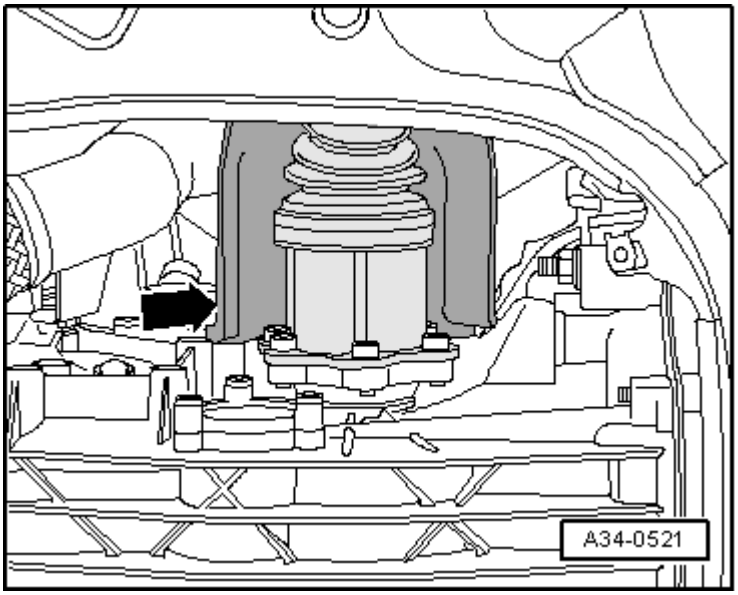


Fig. 139: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

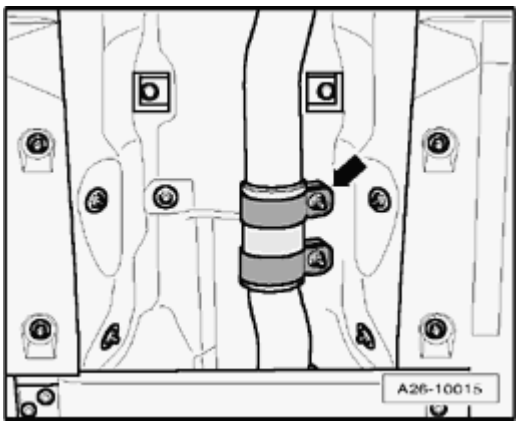


Fig. 140: Loosening Clamping Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

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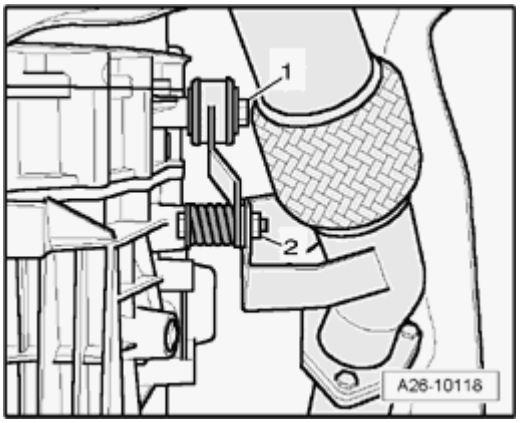


Fig. 141: Retaining Bracket For Front Exhaust Pipe, Bolt And Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

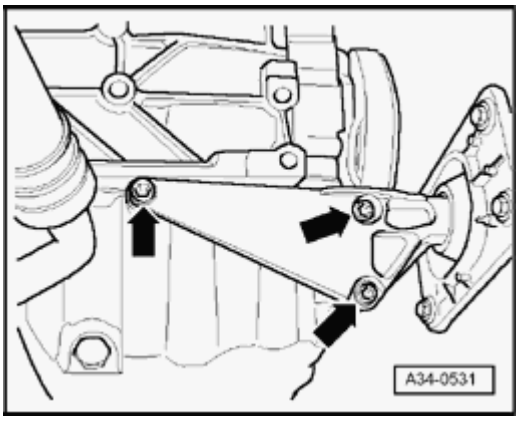


Fig. 142: Torque Reaction Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Cabriolet:

NOTE:

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

- Unbolt torque reaction support - **arrows** -.

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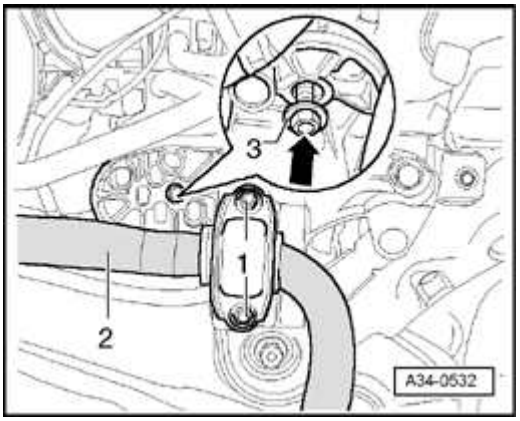


Fig. 143: Swivel Stabilizer Bar Nuts, Engine Mountings Nut And End Of Stud
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1** - on left and right sides, and swivel stabilizer bar - **2** - downward.
- Remove nut - **3** - on left and right engine mountings until bottom of nut is flush with end of stud - **arrow** -.
- Use engine support bridge 10-222 A to lift engine just enough for nuts - **3** - to make contact with bottom surface of left and right consoles.

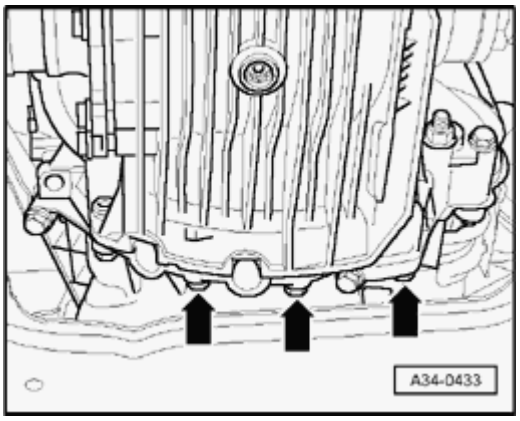


Fig. 144: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Continued for all vehicles:

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

Cabriolet:

- Lower engine back down.

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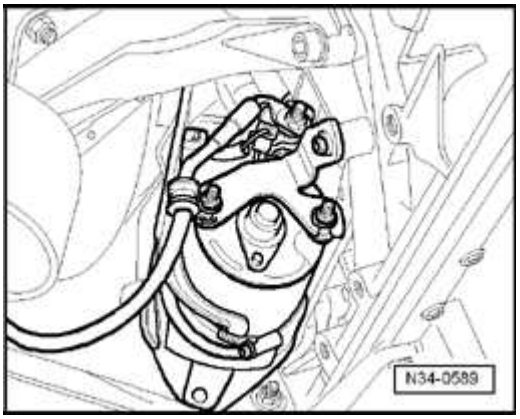


Fig. 145: Locating Starter Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Continued for all vehicles:

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

.

NOTE:

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

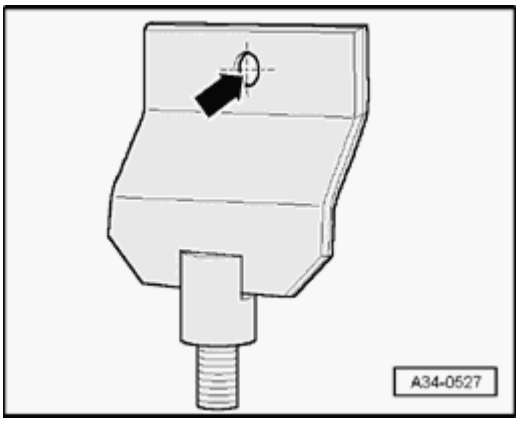


Fig. 146: Hole In Supporting Elements Of Transmission Support 3282
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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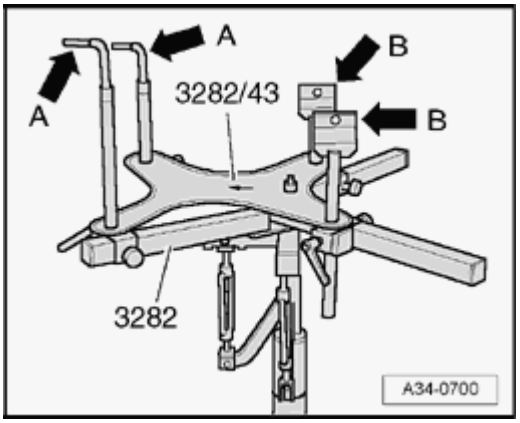


Fig. 147: Support Elements 3282/49 And 3282/52 And Arrow On The Adjustment Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove manual transmission 01X, set up transmission support 3282 with adjustment plate 3282/43 and place on engine/transmission jack V.A.G 1383 A.

NOTE:

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

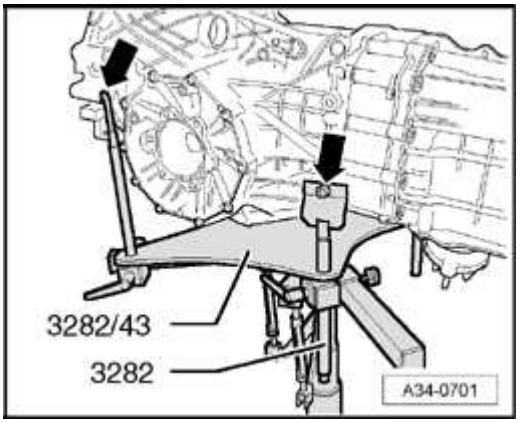


Fig. 148: Supporting Elements Secured To Left Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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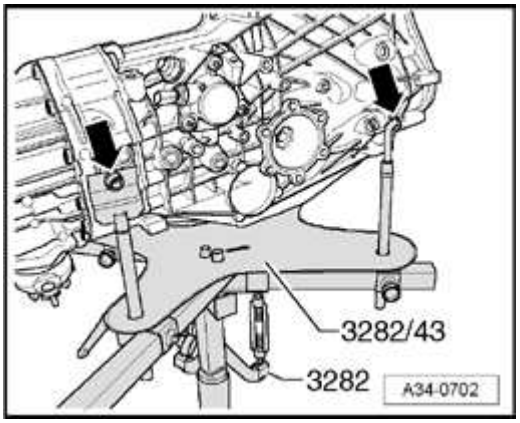


Fig. 149: Supporting Elements Secured To Right Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

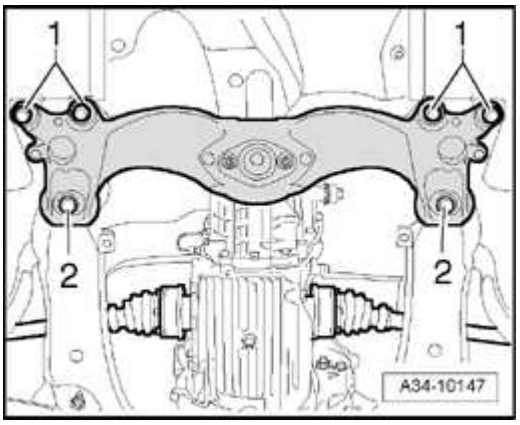


Fig. 150: Tunnel Cross Member Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and bolts - **2** -.

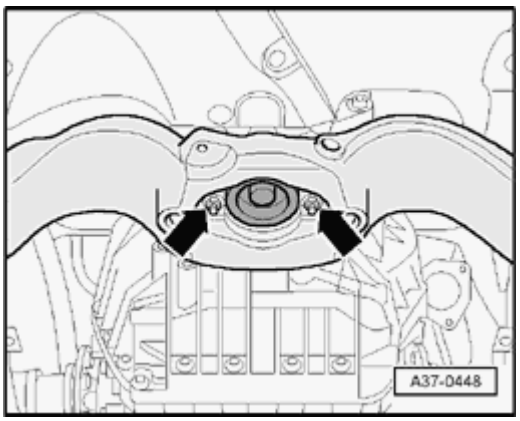


Fig. 151: Tunnel Cross Member Nuts

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

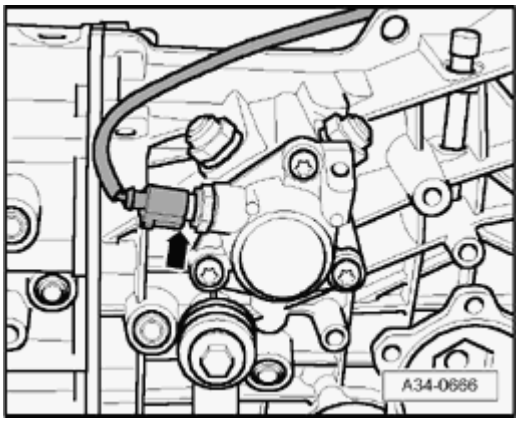


Fig. 152: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

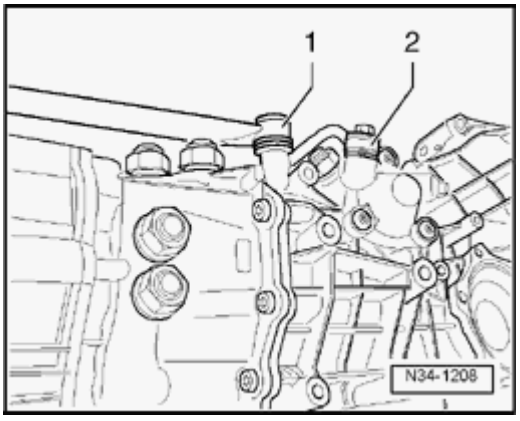


Fig. 153: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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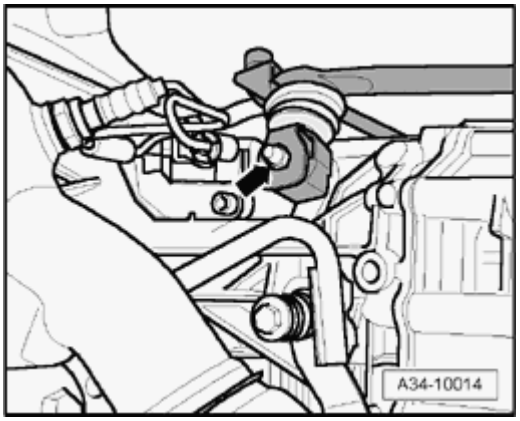


Fig. 154: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

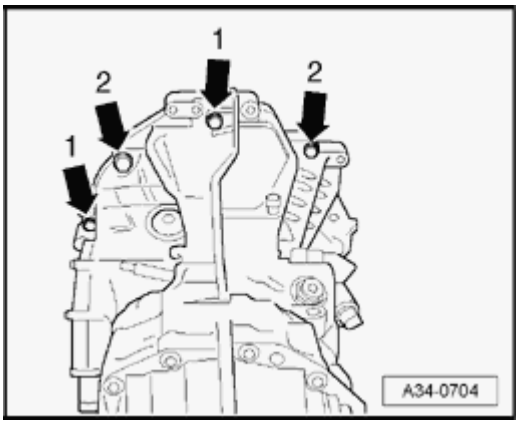


Fig. 155: Upper Engine/Transmission Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove upper engine/transmission securing bolts - **arrows 1** - and - **arrows 2** -. Please note that retaining brackets for wires/lines and coolant pipe may be secured on bolts - **arrows2** - (important for installation).
- If installed, remove retaining clips/cable ties together with Lambda probe wiring from transmission.

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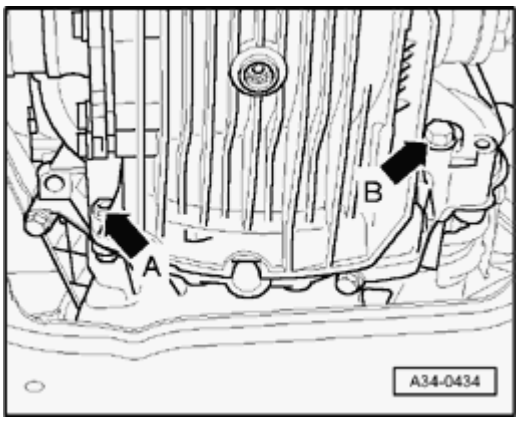


Fig. 156: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

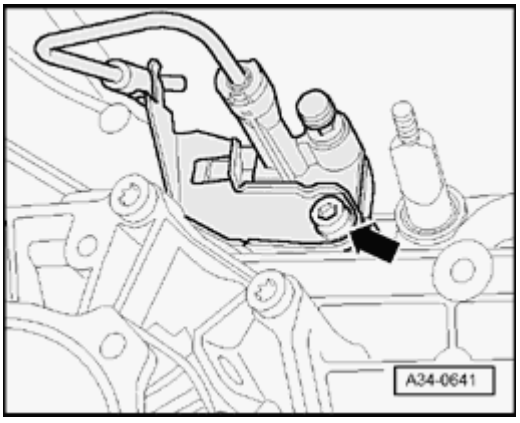


Fig. 157: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove slave cylinder from transmission - **arrow** - and secure with wire; do not open line/hose system.

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

- Lower transmission completely with engine/transmission jack V.A.G 1383 A.

NOTE:

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

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drive axles.

- Before carrying out assembly work, secure transmission to assembly stand, using holding fixture VW 540 --> **Transmission, mounting on assembly stand**.

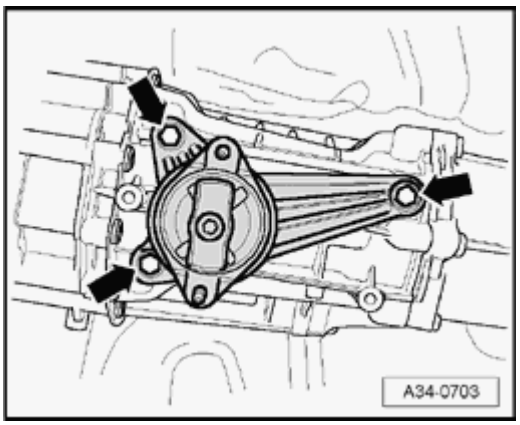


Fig. 158: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 --> **Transmission, installing in vehicles with 4-cylinder or 6-cylinder engine**.

Transmission, removing from vehicles with 6-cylinder engine

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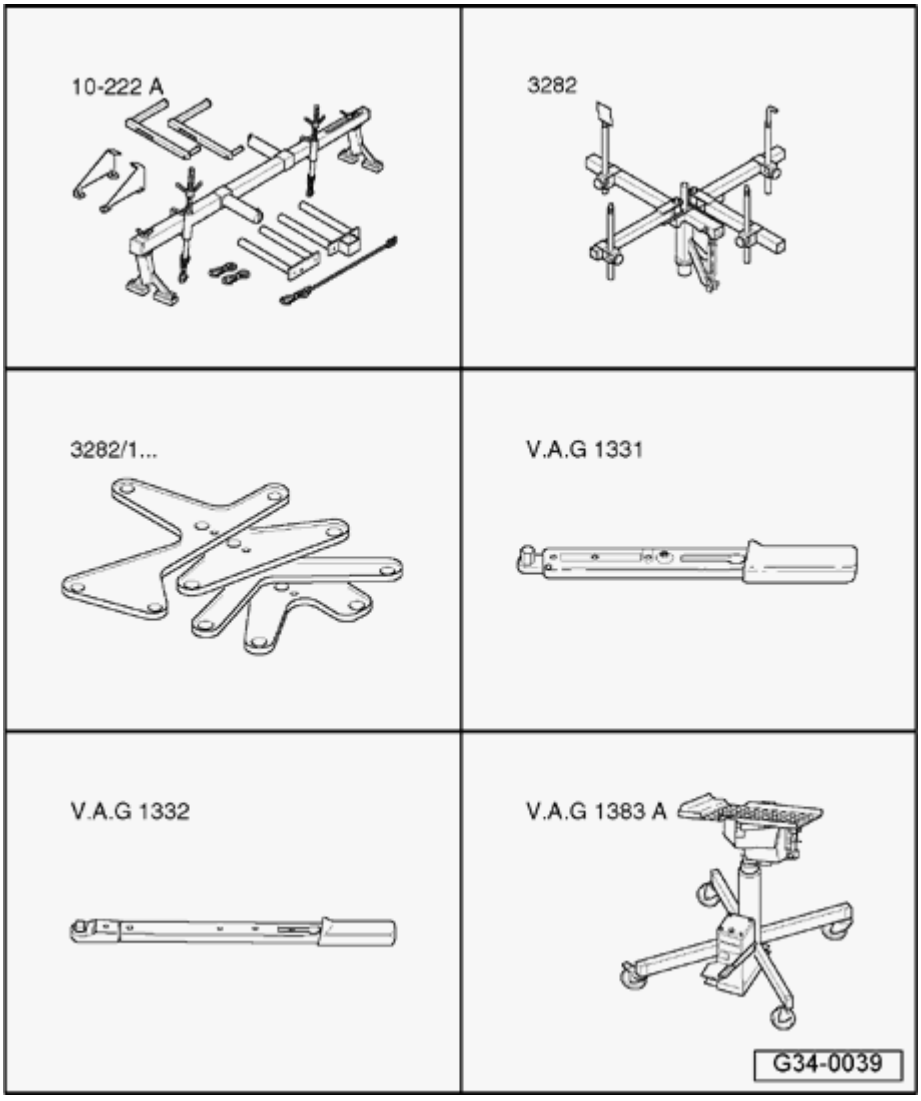


Fig. 159: Identifying Special Tools - Transmission, Removing From Vehicles
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Engine support bridge 10-222 A
- Transmission support 3282
- Adjustment plate 3282/43
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332
- Engine/transmission jack V.A.G 1383 A

Special tools, testers and auxiliary items required

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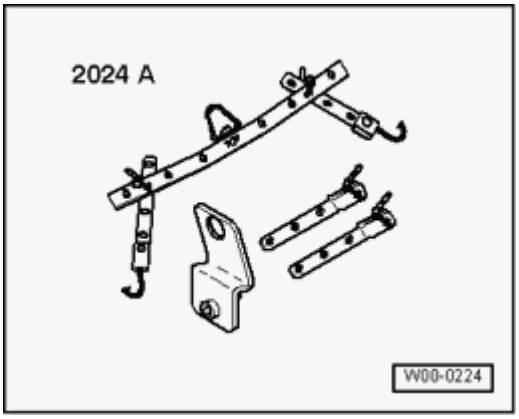


Fig. 160: Engine Sling 2024 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine sling 2024 A
- **Grease for clutch plate splines G000100**
- **Copper grease Z381351TE**

Procedure

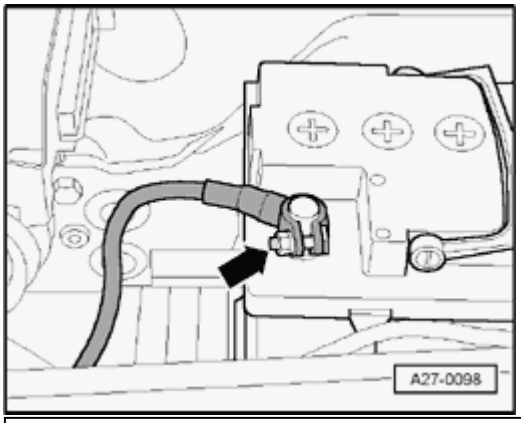
NOTE:

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

CAUTION: Follow steps required when disconnecting battery -->

- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL for Cabriolet**

.



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Fig. 161: Disconnecting Battery Ground (GND) Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

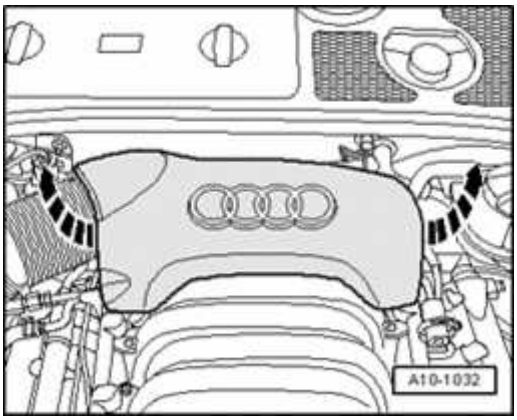


Fig. 162: Removing Rear Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

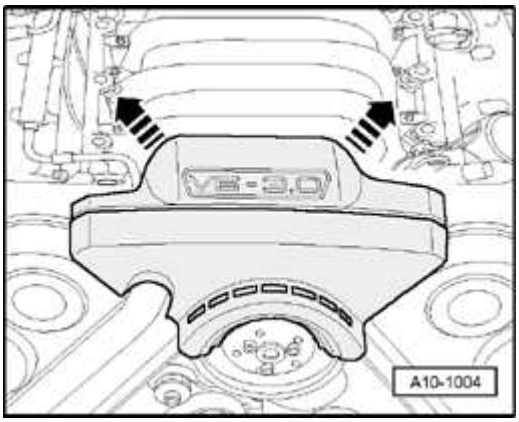


Fig. 163: Removing Front Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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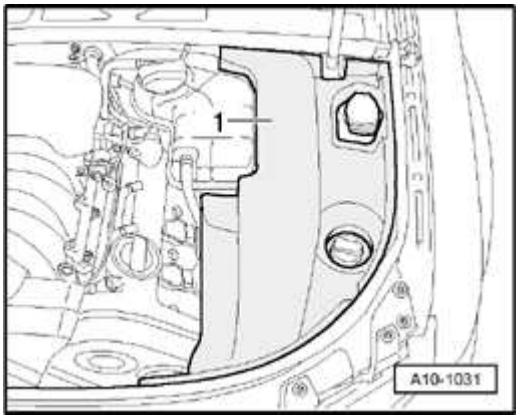


Fig. 164: Removing Cover In Engine Compartment (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

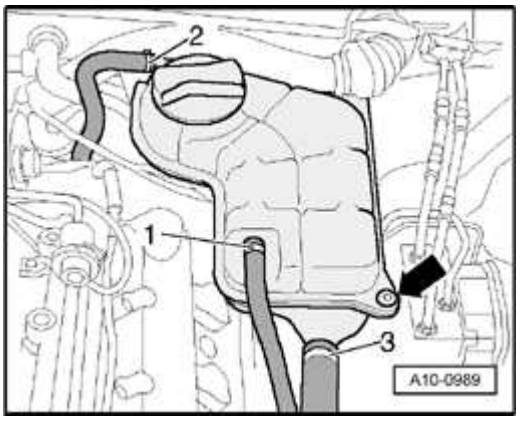


Fig. 165: Removing Coolant Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unfasten coolant expansion tank - **arrow** -.
- Disconnect electrical connector for Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant expansion tank. Move coolant expansion tank (with coolant hoses - **1to 3** - attached) clear to one side.

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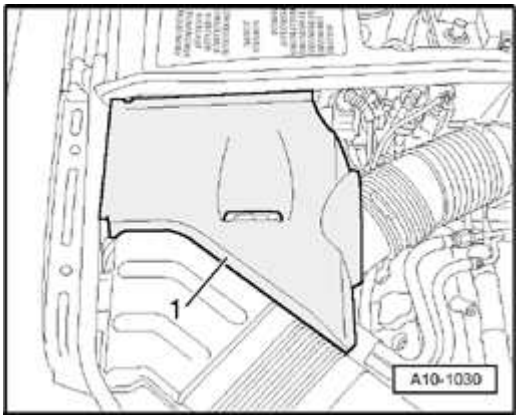


Fig. 166: Removing Cover In Engine Compartment (Right Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

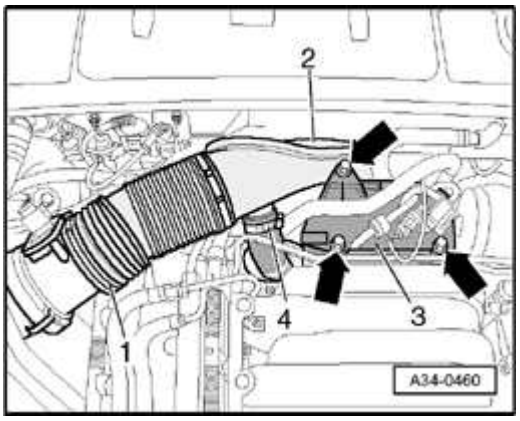
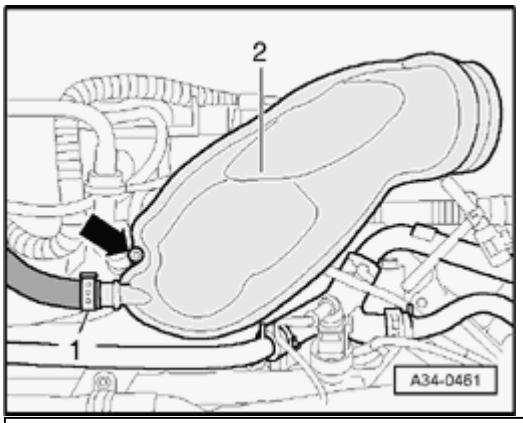


Fig. 167: Identifying Holding Plate, Intake Air Hose, Hose & Air Duct
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - from solenoid valve mounting plate - **3** -.
- Disconnect air intake hose - **1** - from mass air flow sensor.
- Pull hose - **4** - for crankcase breather system off air duct - **2** -.



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Fig. 168: Removing Bolt And Disconnect Air Duct At Throttle Valve Control Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt - **arrow** - and disconnect air duct - **2** - from throttle valve module.
- If installed, disconnect hose - **1** - from air duct.

NOTE:

- **In the illustration, the air duct is shown from the rear and with the engine removed.**

- Remove engine/transmission securing bolts which are accessible from above.

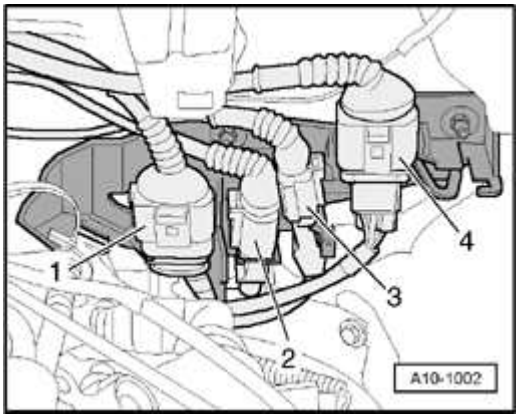


Fig. 169: Removing Harness Connectors From Bracket At Left Of Bulkhead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors - **1 to 4** - from retainer at left of bulkhead.
- Disconnect electrical connectors - **1** - and - **4** -.
- Move oxygen sensor wires clear.
- Remove retainer for connectors.

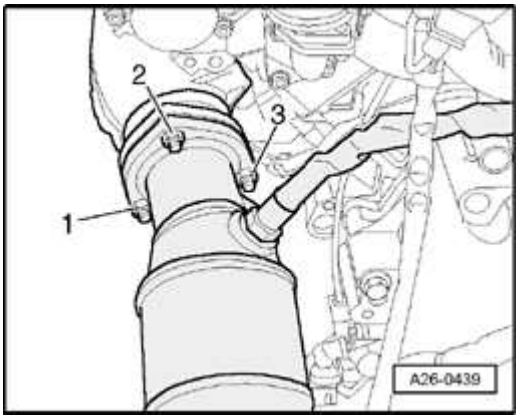


Fig. 170: Left Front Exhaust Pipe To Exhaust Manifold Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove nut - **1** - (access from above), connecting left front exhaust pipe with exhaust manifold.

NOTE:

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

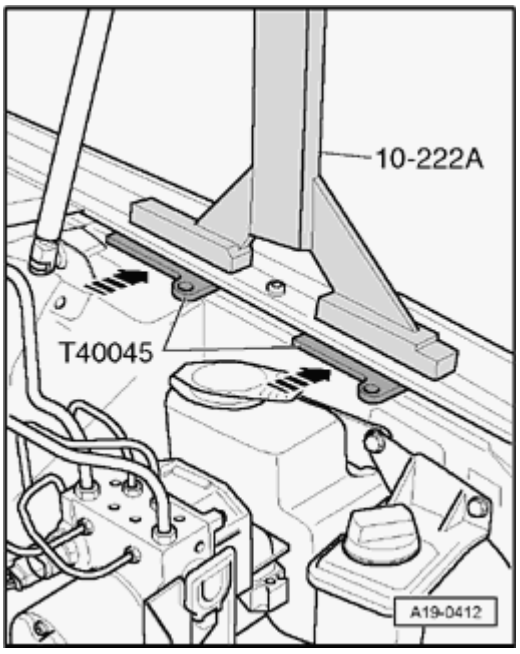


Fig. 171: Placing Insert Pad For Front Fender T40045 On Both Sides Between Fender Attachment Edge And Web Plate Lying Beneath
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

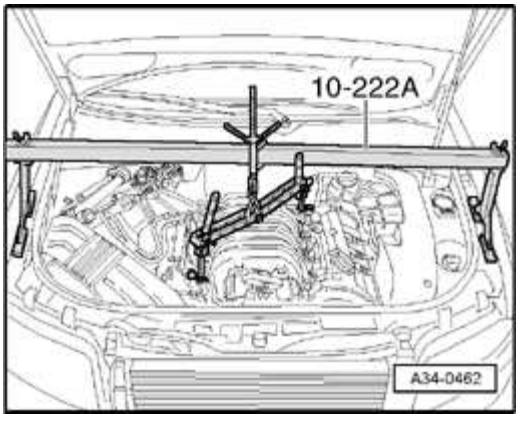


Fig. 172: Positioning 10-222A Engine Support Bridge On Bolted Flanges Of Fenders
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up Engine support bridge 10-222 A on fender mounting flanges.

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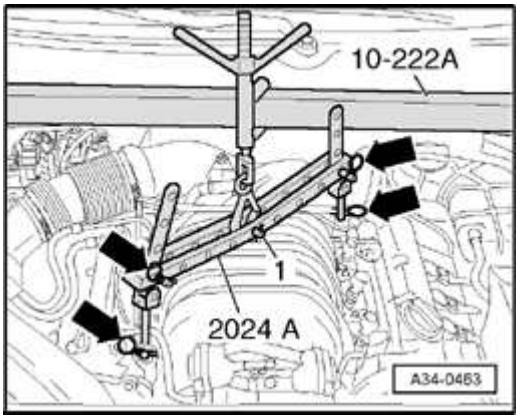


Fig. 173: Removing Eyelet For 2024A Engine Sling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove eye of lifting tackle 2024A.
- Re-insert pin - **1** - in middle hole on lifting tackle and secure it with split pin.
- Hook pin on lifting tackle 2024A onto spindle on Engine support bridge 10-222 A.
- Hook lifting tackle 2024A into lifting eyes at front and rear of engine.

CAUTION: Support hooks and locking pins on lifting tackle must be secured with retainers - arrows - in illustration.

- Slightly pretension engine with spindle of Engine support bridge.

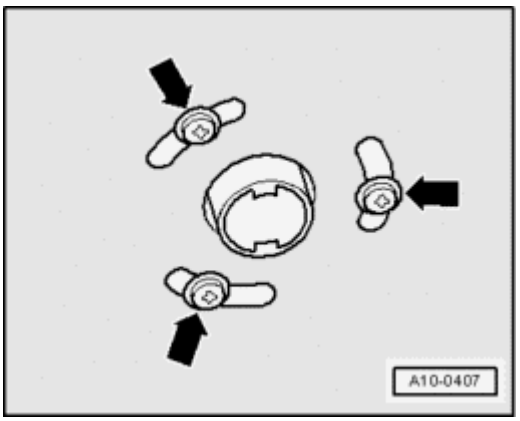


Fig. 174: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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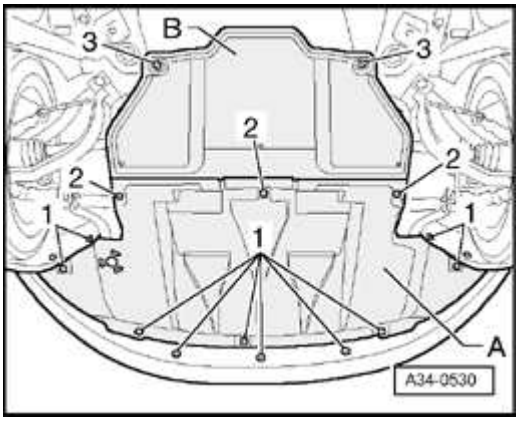


Fig. 175: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

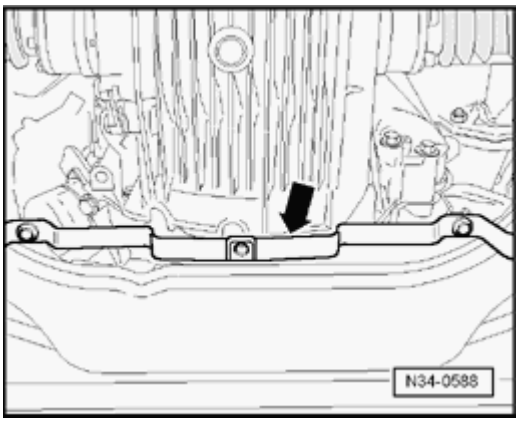


Fig. 176: Removing Noise Insulation Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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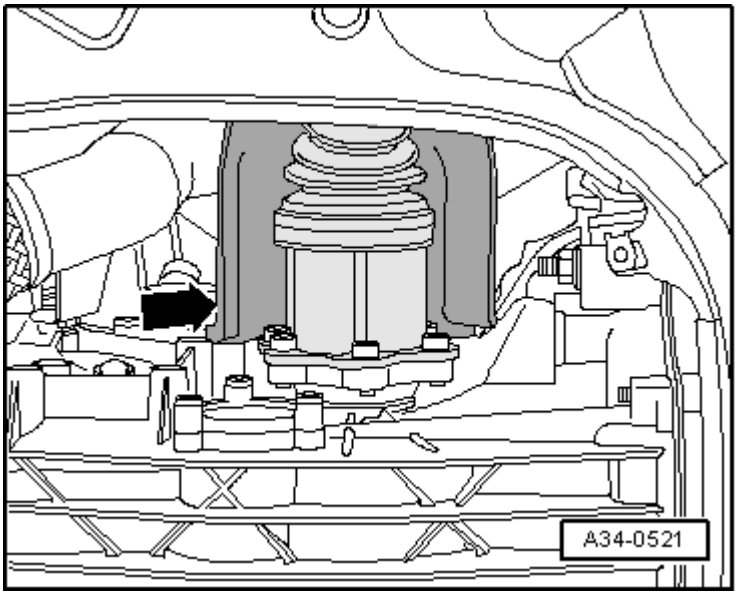


Fig. 177: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrow** - for drive axles (left and right).

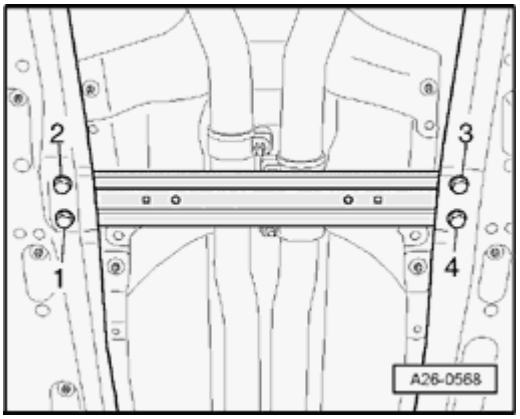


Fig. 178: Removing Bolts For Front Vehicle Floor Crossmember
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove tunnel cross member (front) - **1 to 4** -.

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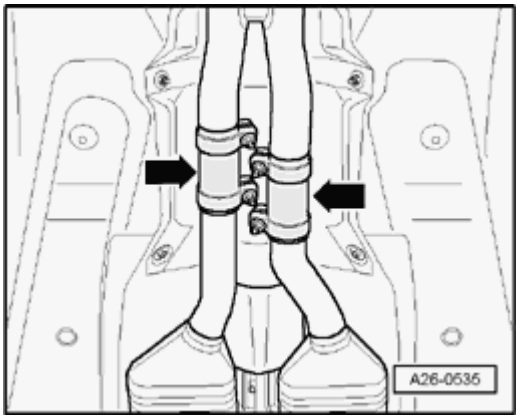


Fig. 179: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamps - **arrows** -.
- Remove front exhaust pipe (left-side) with catalytic converter --> 3.0 Liter 6-Cyl. 5V Engine Mechanical, Engine Code(s): AVK - **26 EXHAUST SYSTEM, EMISSION CONTROLS** .
- Remove bracket for exhaust pipe (front right) from transmission.

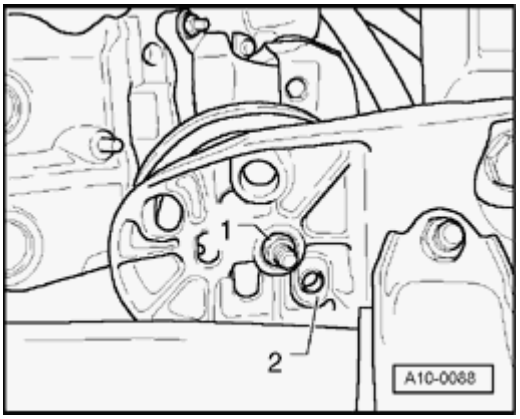


Fig. 180: Threaded Connections And Positioning Sleeves On Lower Engine Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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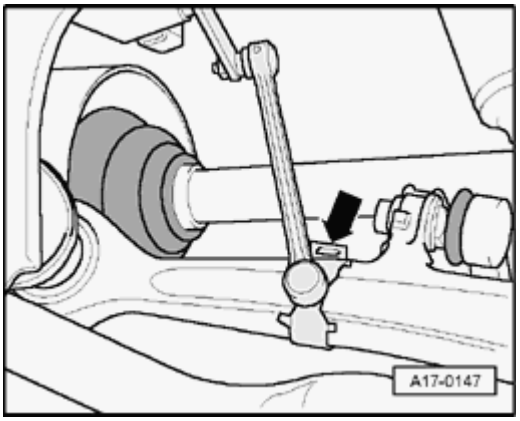


Fig. 181: Unclipping Operating Rod For Vehicle Levelling Sensor At Lower Transverse Link
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, unclip operating rod for Left Front Level Control System Sensor G78 from lower transverse link - **arrow** -.

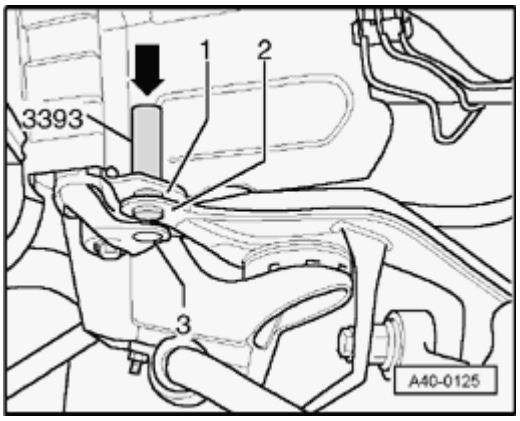


Fig. 182: Checking Holes Align Using Testing Mandrel 3393
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before loosening subframe, use testing mandrel 3393 to check whether holes - **1** - and - **2** - are aligned.

If holes are not aligned, a wheel alignment has to be performed after installing the subframe.

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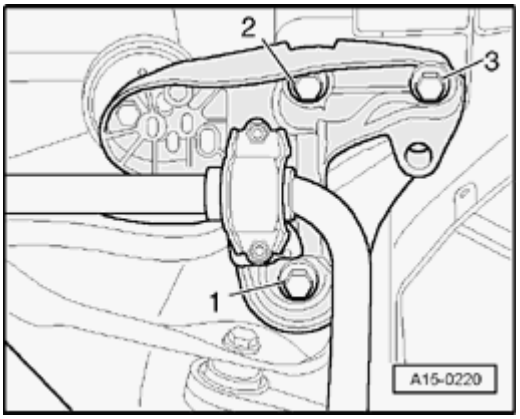


Fig. 183: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

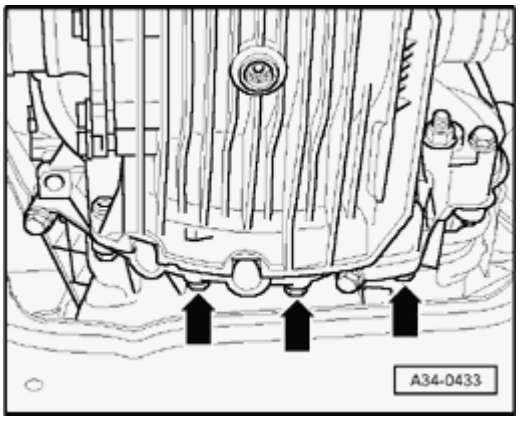


Fig. 184: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

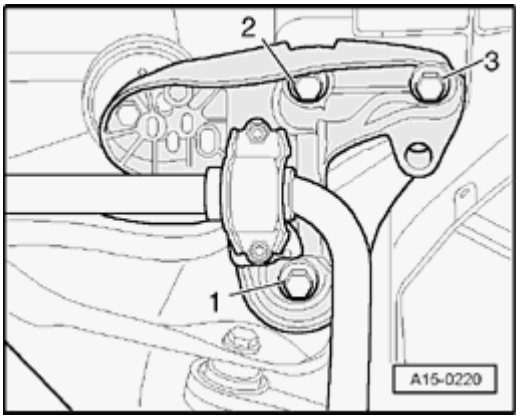


Fig. 185: Removing Front Bolts From Left And Right Subframe

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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.

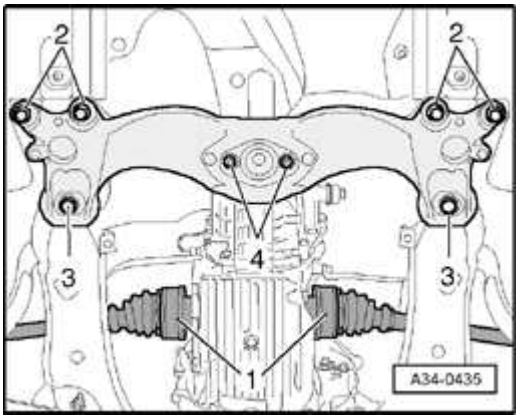


Fig. 186: Drive Shafts And Flange Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove drive axles - **1** - from flange shafts and tie up to side.

NOTE:

- **Do not damage surface coating on drive axles.**

- Support transmission with engine/transmission jack V.A.G 1383 A.
- Remove bolts - **2** - and then bolts - **3** - at tunnel cross member.
- Remove two nuts - **4** - and detach tunnel cross member.
- Carefully lower engine/transmission jack V.A.G 1383 A and move it aside.

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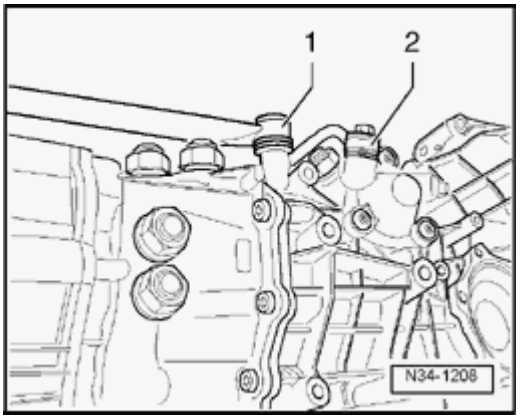


Fig. 187: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

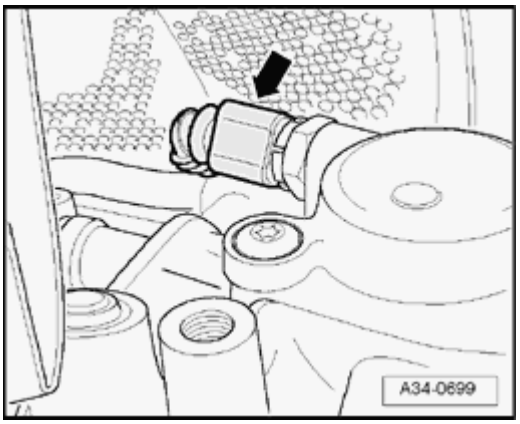


Fig. 188: Back-Up Light Switch Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector - **arrow** - for back-up light switch on right side of transmission.

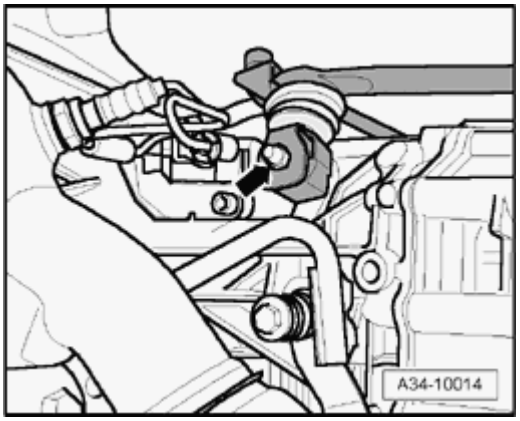


Fig. 189: Selector Shaft Lever Nut

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

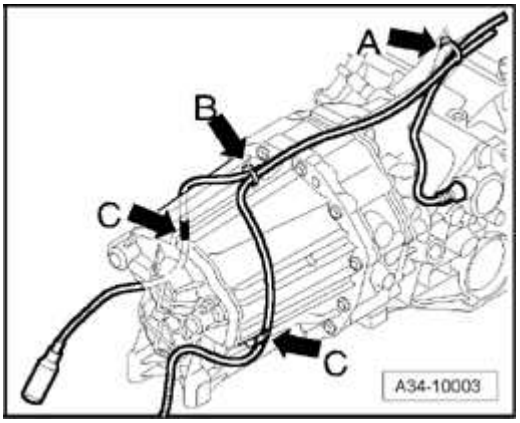


Fig. 190: Locating Cable Ties And Oxygen Sensor Wiring At Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open cable ties - **arrows A and B** - , unclip oxygen sensor wiring at side - **arrows C** - and move wiring clear.

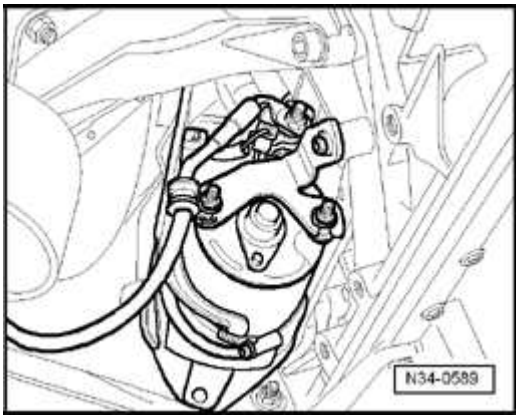


Fig. 191: Locating Starter Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

.

NOTE:

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

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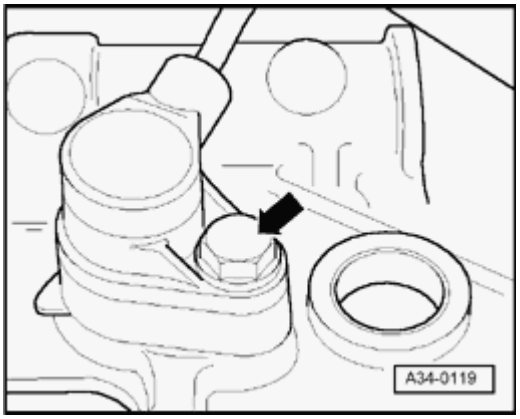


Fig. 192: Location Of Engine Speed (RPM) Sensor G28 On Coupling Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove engine speed (RPM) sensor G28 from left side of transmission - **arrow** - and lay aside.

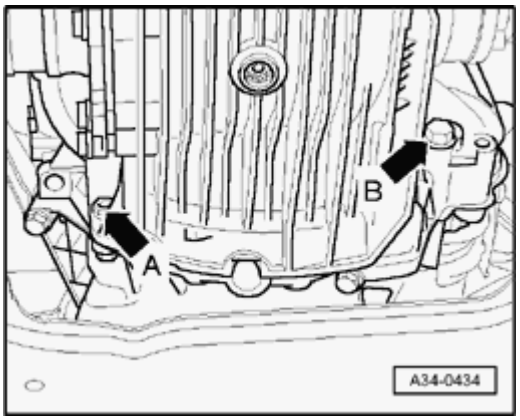
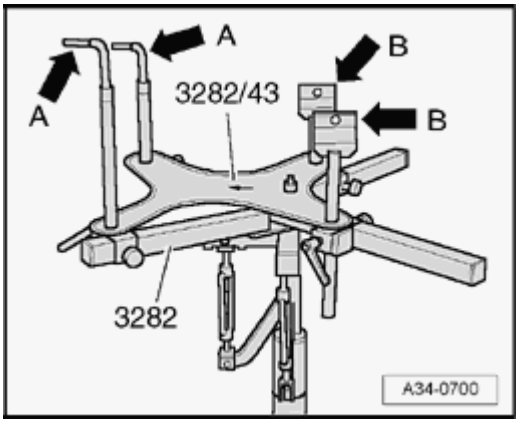


Fig. 193: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove upper engine/transmission securing bolts as well as those on the side, except for bolts marked with - **arrow A** - and - **arrow B** -.



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Fig. 194: Support Elements 3282/49 And 3282/52 And Arrow On The Adjustment Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove manual transmission 01X set up transmission support 3282 with adjustment plate 3282 /43 and place on engine/transmission jack V.A.G 1383 A.

NOTE:

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

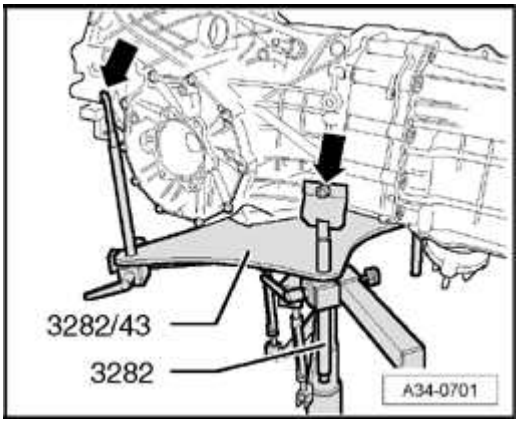


Fig. 195: Supporting Elements Secured To Left Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

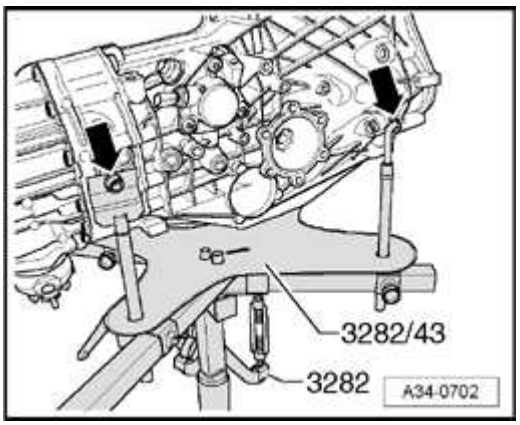


Fig. 196: Supporting Elements Secured To Right Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure supporting elements to right side of transmission, as shown in illustration. Tighten bolt - **arrow** -

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on left side to 20 Nm.

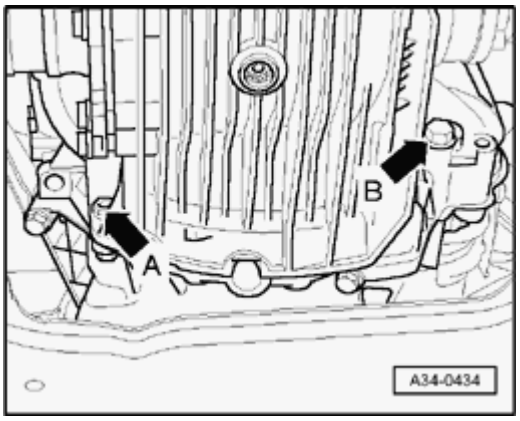


Fig. 197: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

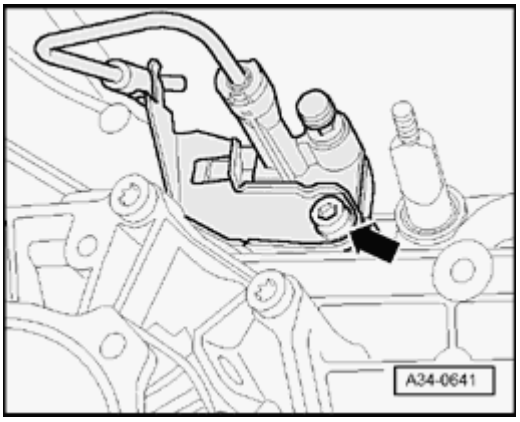


Fig. 198: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove slave cylinder from transmission - **arrow** - and secure with wire; do not open line/hose system.

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

- Lower transmission.

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NOTE:

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

- Before carrying out assembly work, secure transmission to assembly stand, using holding fixture VW 540 --> **Transmission, mounting on assembly stand**.

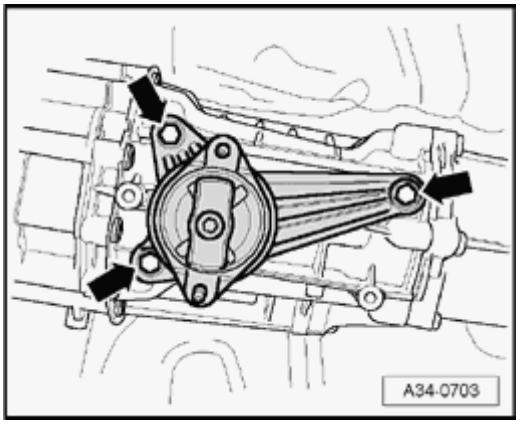


Fig. 199: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Transmission, installing in vehicles with 4-cylinder or 6-cylinder engine

Installation is perform in reverse sequence; note the following:

- Use a thread tap to remove any remaining locking fluid from all threaded holes which will accommodate self-locking bolts.
- Always replace self-locking bolts and nuts.
- Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of **grease for clutch plate splines G000100** to splines. Do not grease guide sleeve.

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

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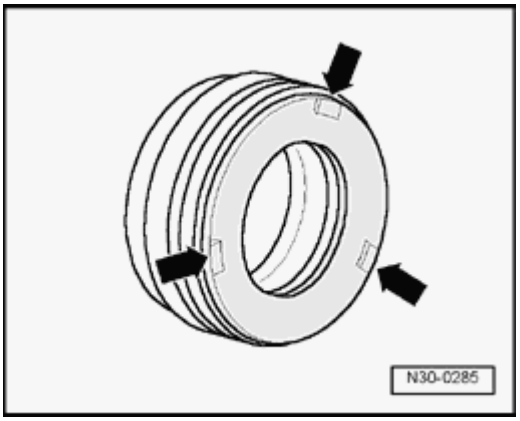


Fig. 200: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check clutch release bearing for wear and replace if necessary.
- If plastic ring - **arrows** - has come loose, service release bearing as required **Checking and servicing release bearing with glued plastic ring**.

NOTE:

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

- Check that dowel sleeves for centralizing engine/transmission are in cylinder block, install if necessary.
- Place intermediate plate on dowel sleeves at engine flange.
- Before installing transmission, tie electrical wires and brackets off to one side so that they are not trapped between engine and the transmission.

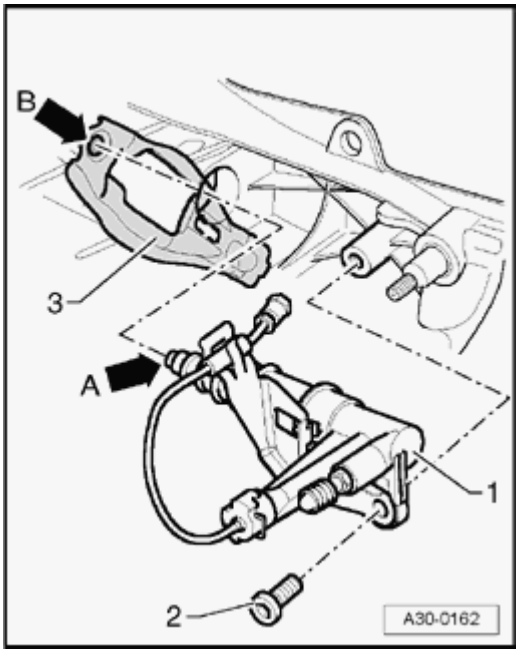


Fig. 201: Guiding Slave Cylinder Into Bore Of Transmission Housing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly lubricate surface where operating rod and clutch release lever make contact - **arrow B** - using copper grease Z381351TE.
- Raise transmission far enough to be able to install slave cylinder with bracket for hose/line assembly.
- 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 resistance when depressing the clutch pedal, you must not press it down further. The push rod of the slave cylinder is likely to have been guided past the clutch release lever. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

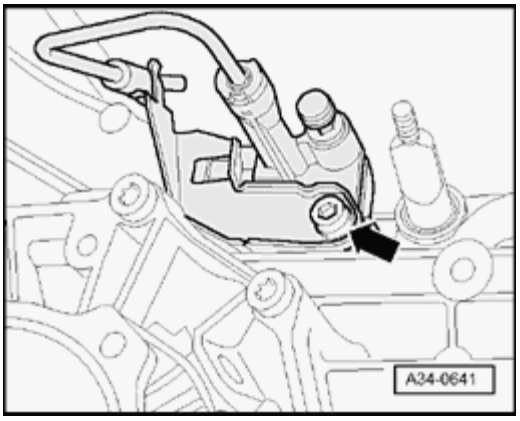


Fig. 202: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure slave cylinder with new bolt - **arrow** -.
- Insert transmission, making sure there is sufficient clearance to drive axles.

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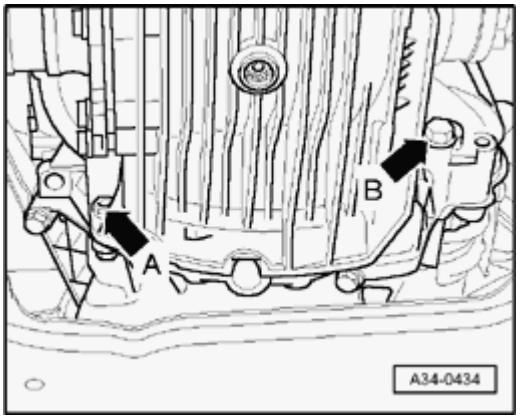


Fig. 203: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install engine/transmission securing bolts - **arrow A** - and - **arrow B** -.

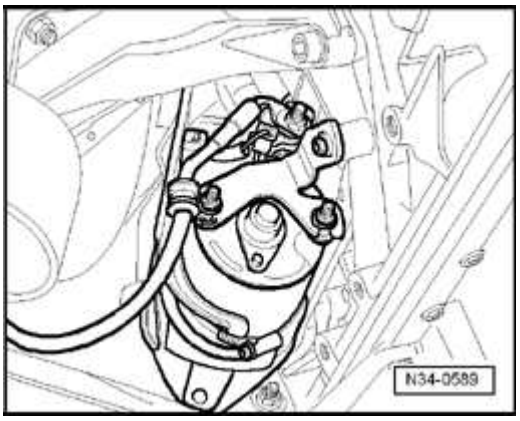


Fig. 204: Locating Starter Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install starter -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

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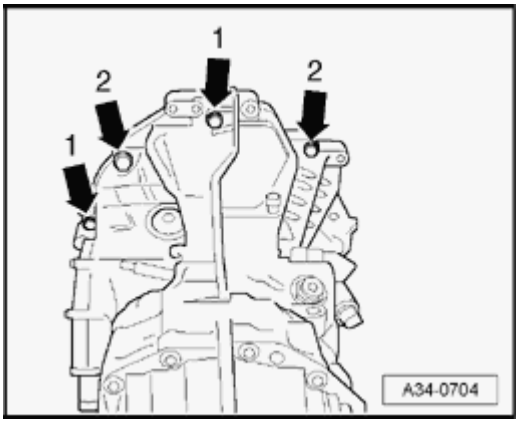


Fig. 205: Upper Engine/Transmission Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully lower transmission a short distance using engine/transmission jack V.A.G 1383 A.
- If possible, tighten upper engine/transmission securing bolts - **arrows1** - and - **arrows2** -.

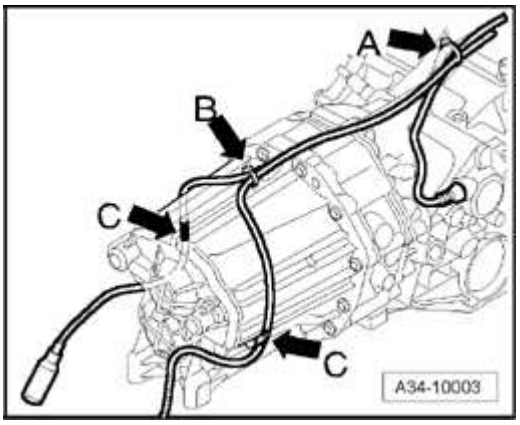


Fig. 206: Locating Cable Ties And Oxygen Sensor Wiring At Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, secure all electrical wiring to transmission again - **arrows A to C** -.

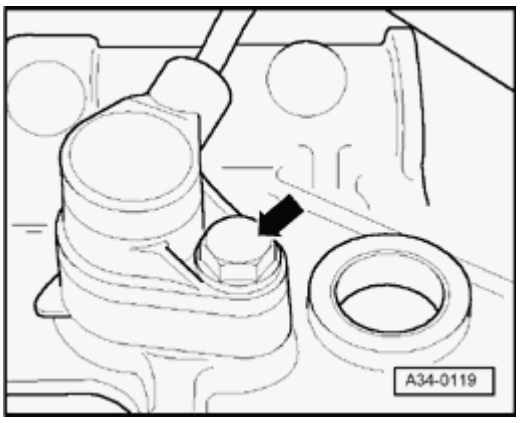


Fig. 207: Location Of Engine Speed (RPM) Sensor G28 On Coupling Housing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, install engine speed (RPM) sensor G28 on left side of transmission.

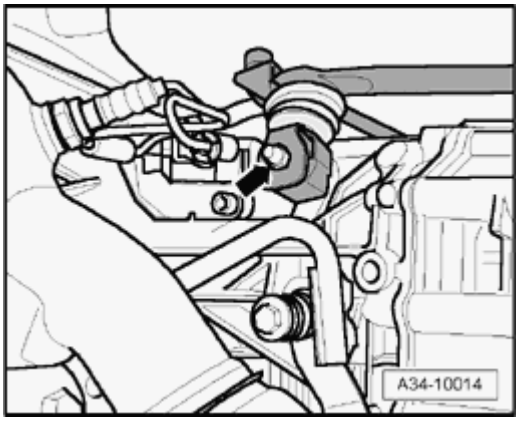


Fig. 208: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install selector shaft lever and tighten nut - **arrow** -.

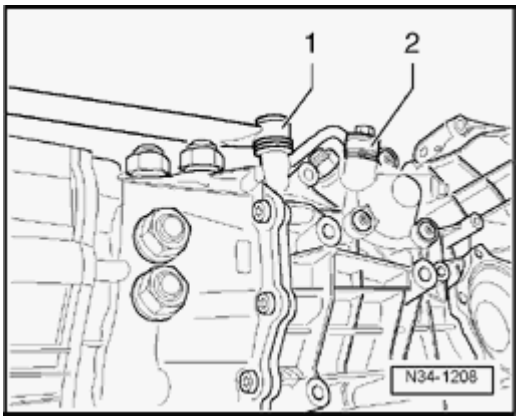


Fig. 209: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install push rod - **1** - ; by tightening hex socket-head bolt.
- Secure connecting rod - **2** - for selector rod.

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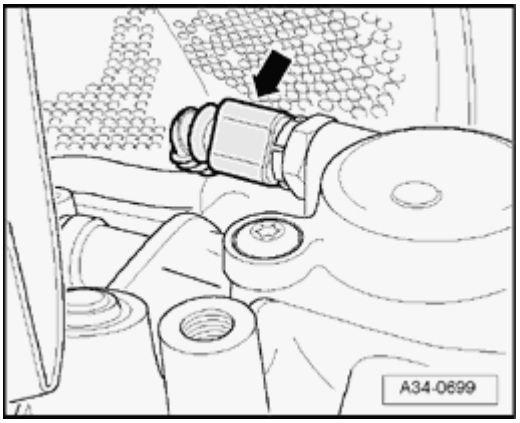


Fig. 210: Back-Up Light Switch Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect electrical connector - **arrow** - for reversing light switch on transmission (right side).

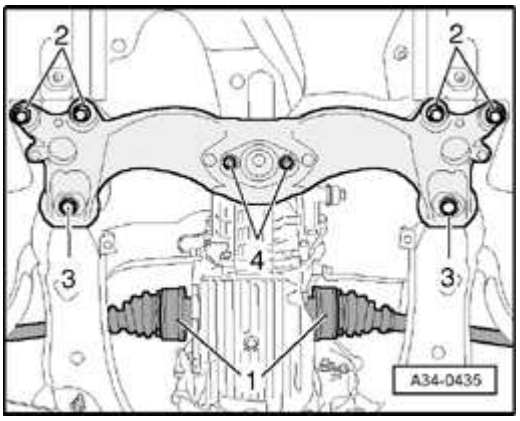


Fig. 211: Drive Shafts And Flange Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift transmission again using engine/transmission jack V.A.G 1383 A.
- Attach tunnel cross member to body with new bolts - **2** - and - **3** - (tighten hand-tight only).
- Secure tunnel cross member to transmission mounting - **4** - --> **40 - FRONT SUSPENSION** .
- Carefully lower engine/transmission jack V.A.G 1383 A and move it aside.

- Bolt drive axles - **1** - to flange shafts --> **40 - FRONT SUSPENSION** .

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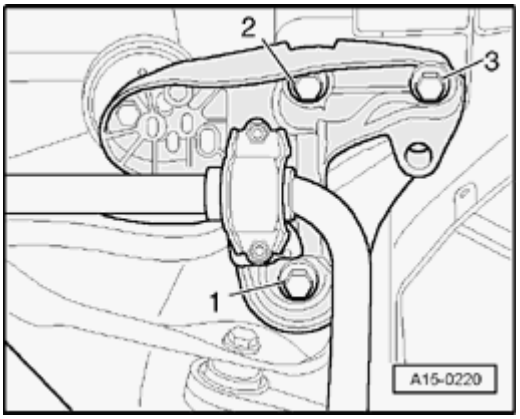


Fig. 212: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 6-cylinder engine:

- Weight of engine is supported with engine support bridge **Fig. 172**.

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

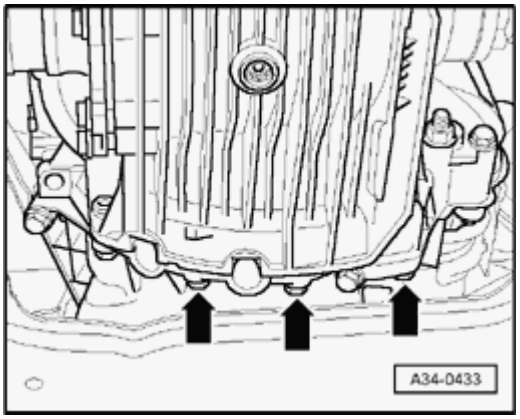


Fig. 213: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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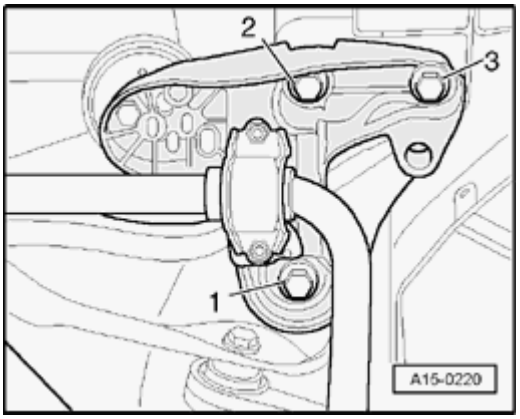


Fig. 214: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace front subframe bolts - **1** - , - **2** - and - **3** - on both sides of vehicle.

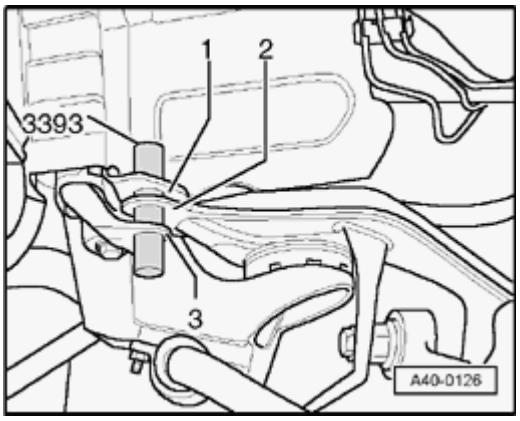


Fig. 215: Identifying Hole, Sub-Frame Hole And Aluminum Console Hole Align On Both Sides
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Before tightening subframe, it must be aligned with body using testing mandrel 3393.

- Hole - **1** - and hole - **2** - of subframe and hole - **3** - of aluminum bracket must be flush on both sides.

NOTE:

- **This alignment can only replace a subsequent wheel alignment if holes - 1 - and - 2 - coincided before the repair work was perform.**

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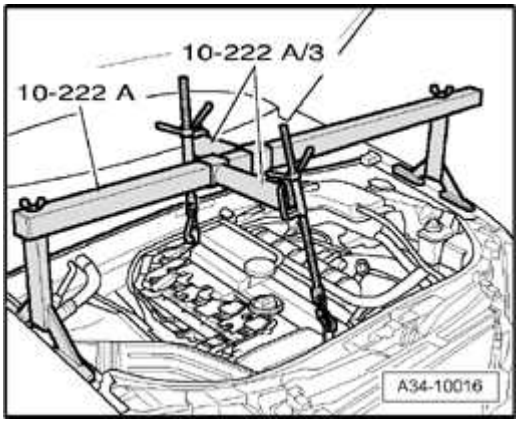


Fig. 216: Engine Support Bridge 10-222 A Set Up With Adapters 10-222/3 On Fender Mounting Flanges
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Cabriolet vehicles with 4-cylinder engine:

- Lift engine slightly using spindles.

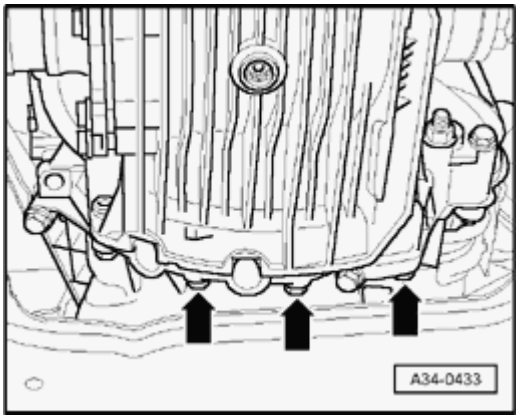


Fig. 217: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bottom engine/transmission securing bolts - **arrows** -.
- Lower engine back down.

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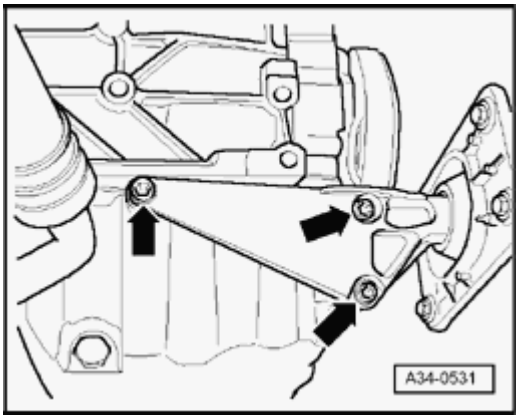


Fig. 218: Torque Reaction Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure torque reaction support - **arrows** -.

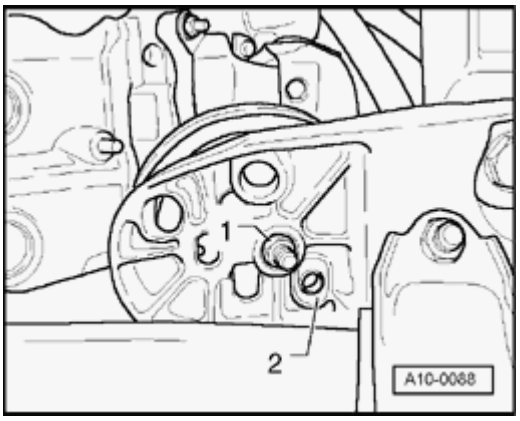


Fig. 219: Threaded Connections And Positioning Sleeves On Lower Engine Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten nuts - **1** - for engine mountings -->
  - **10 ENGINE - ASSEMBLY** for AVK
  - **10 - ENGINE - ASSEMBLY** for BPG

  .

Continued for all vehicles:

- Secure subframe and tunnel cross member --> **40 - FRONT SUSPENSION** .
- Install exhaust system and align stress free -->
  - **26 EXHAUST SYSTEM, EMISSION CONTROLS** for AVK
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

  .
- Check selector mechanism setting and adjust if necessary --> **Selector mechanism, adjusting**.

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- Check fluid level in transmission --> **Transmission oil level, checking**.
- Follow steps required after connecting battery -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

  .
- If necessary, carry out wheel alignment --> **44 - WHEELS, TIRES, VEHICLE ALIGNMENT** .

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

Tightening torques

NOTE:

- **Tightening torques only apply to lightly greased, oiled, phosphated or blackened nuts and bolts.**
- **Additional lubricant such as engine or transmission oil may be used, but do not use graphite lubricant.**
- **Do not use parts which have been degreased.**
- **Tolerance for tightening torques ±15%.**

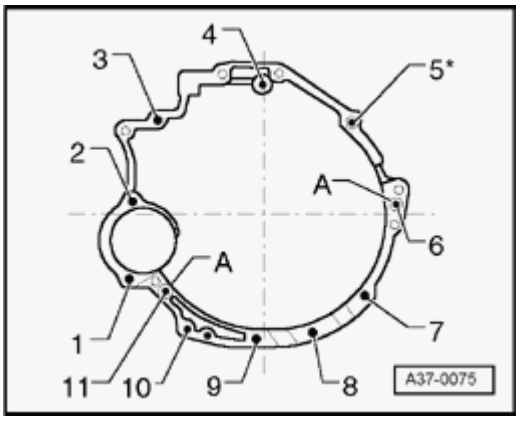


Fig. 220: Identifying Engine/Transmission Mountings (Automatic/Manual Transmission)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission attachment (2.0 ltr. engine)

Item	Bolt	Nm
1 * See note	M12x75	65
2 * See note	M12x90	65
3 * See note	M12x75	65

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4, 6	M12x90	65
5 * See note	M12x110	65
7 * See note	M10x50	45
8, 9, 10	M10x45	45
11 * See note	M12x110	65
A	Dowel sleeves for centralizing	

*For securing starter to transmission

*With bracket for wiring harness

*Hammer head bolt with nut

*With nut

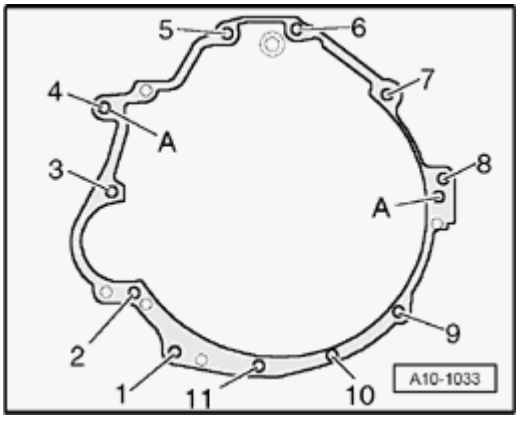


Fig. 221: Identifying Engine/Transmission Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission attachment (6-cylinder 3.0 ltr. engine)

Item	Bolt	Nm
1, 10, 11	M10x60	45
2 * See note	M10x150	65
3 * See note	M12x130	65
4	M12x85	65
5, 6	M12x90	65
7	M12x100	65
8	M12x95	65
9 * See note	M10x60	45
A	Dowel sleeves for centralizing	

*For securing starter to transmission

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*Hammer head bolt with nut

Component	Nm
Slave cylinder to transmission	23 * See note
Transmission selector lever to transmission	23
Push rod to transmission	40
Connecting rod for selector rod to transmission	23
Transmission mounting to transmission	23
Tunnel cross member to transmission mounting	23
Heat shields above drive axles to transmission	23
Engine mounting to engine support	23
Tunnel cross member (front) to body	55
Bracket for sound insulation to subframe	10

*replace bolt

Transporting the transmission

Special tools, testers and auxiliary items required

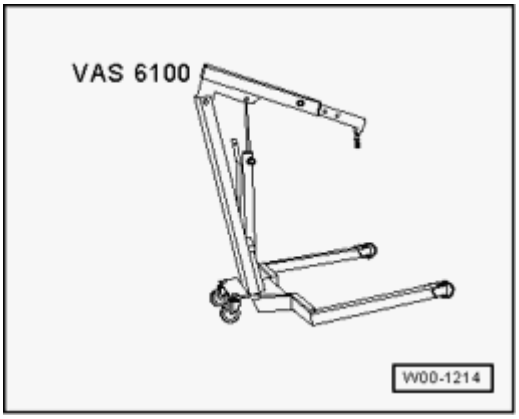


Fig. 222: Identifying Shop Crane VAS 6100
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Workshop crane VAS 6100

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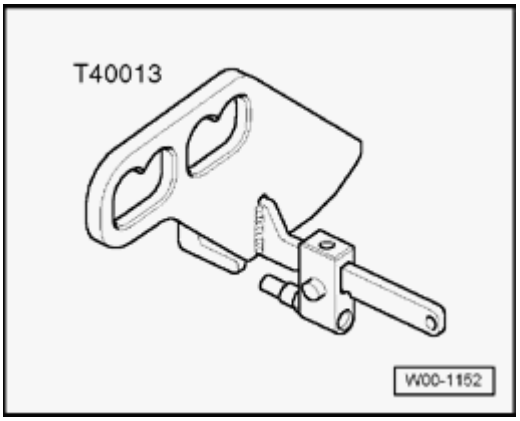


Fig. 223: Transmission Lift Hook T40013
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Transmission lift hook T40013

Procedure

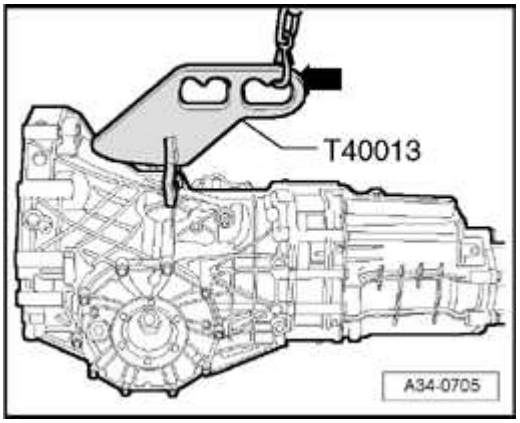


Fig. 224: Hook Of Workshop Crane Fastened In 4th Notch On Lifting Tackle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert transmission lift hook T40013 in lifting eye on transmission and secure.
- Fasten hook of workshop crane in 4th notch - **arrow** - on lifting tackle.
- Lift transmission with workshop crane and transmission lift hook T40013.

TRANSMISSION MOUNTING, REMOVING AND INSTALLING

Transmission mounting, removing and installing

Special tools, testers and auxiliary items required

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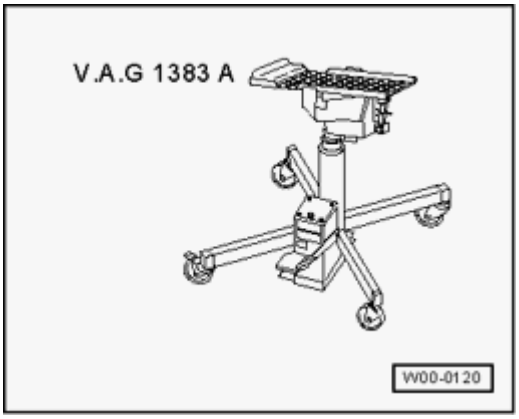


Fig. 225: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

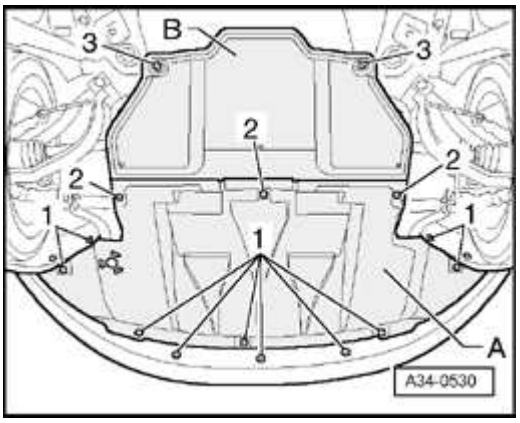
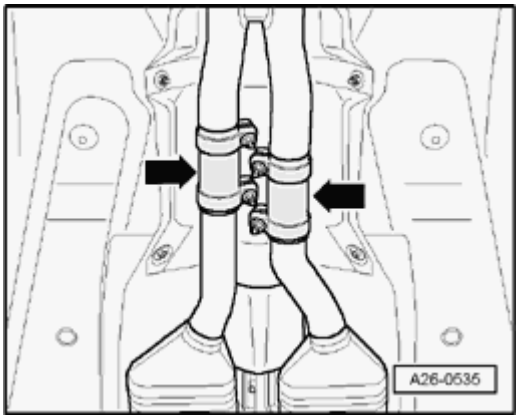


Fig. 226: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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



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Fig. 227: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

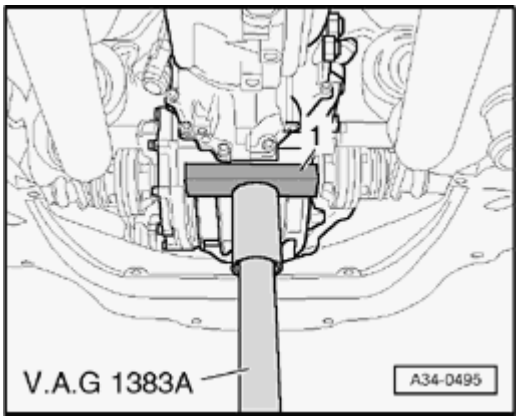


Fig. 228: Transmission Raised Using Punch Of VAG 1383 A So That A Piece Of Wood Can Be Placed In Between
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

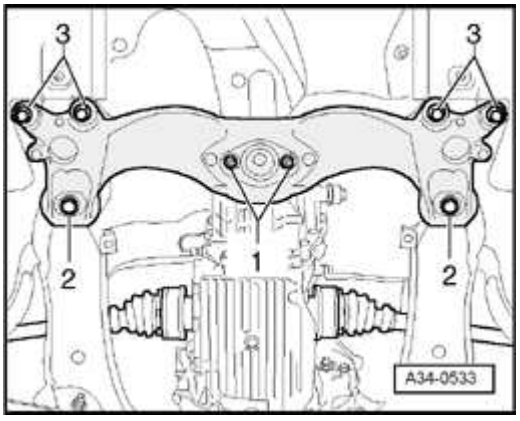


Fig. 229: Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **3** - and then bolts - **2** - at tunnel cross member.
- Lower transmission slightly.
- Remove two nuts - **1** - and push tunnel cross member backward slightly.

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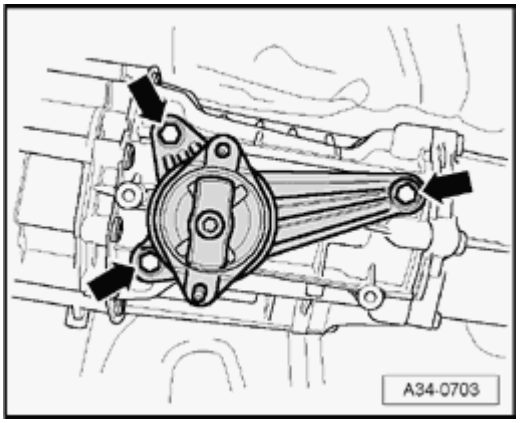


Fig. 230: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove transmission mounting - **arrows** -.

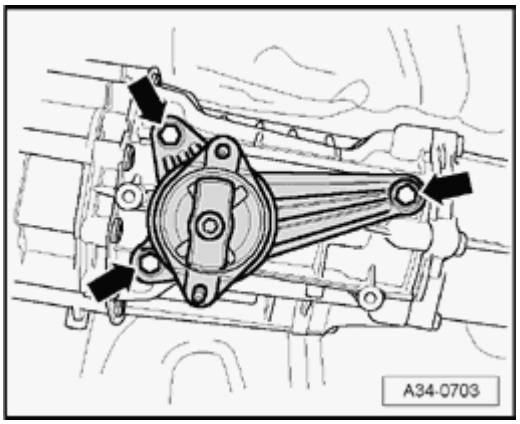


Fig. 231: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

Installation is in reverse sequence. Note the following:

- Secure transmission mounting to transmission - **arrows** - (tightening torque: 23 Nm).

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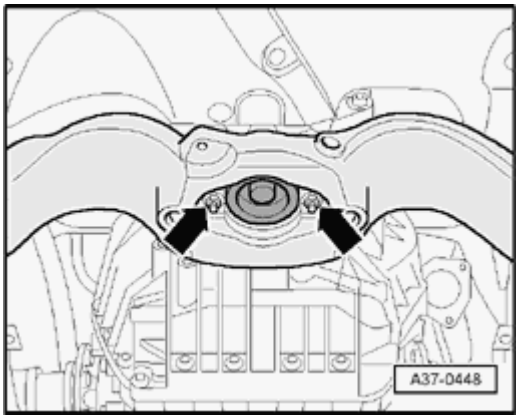


Fig. 232: Tunnel Cross Member Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt tunnel cross member onto transmission mounting - **arrows** -.

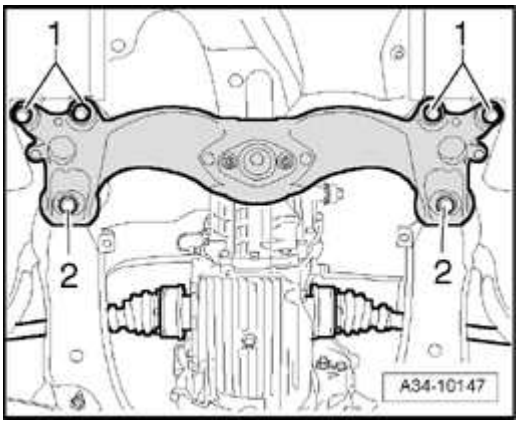


Fig. 233: Tunnel Cross Member Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift transmission far enough to be able to screw in bolts - **2** -.
- Tighten bolts - **2** - and then bolts - **1** - --> **40 - FRONT SUSPENSION** .

NOTE:

- **Replace bolts - 1 - and - 2 -.**

- Install exhaust system so it is free of stress -->
  - **26 EXHAUST SYSTEM, EMISSION CONTROLS** for AVK
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

.

Tightening torques

Component	Nm

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

TRANSMISSION OIL LEVEL, CHECKING

Transmission oil level, checking

Special tools, testers and auxiliary items required

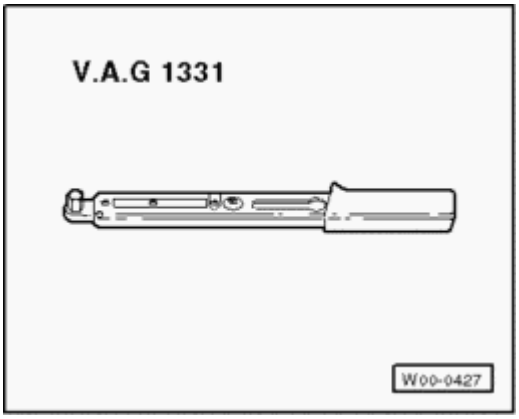


Fig. 234: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

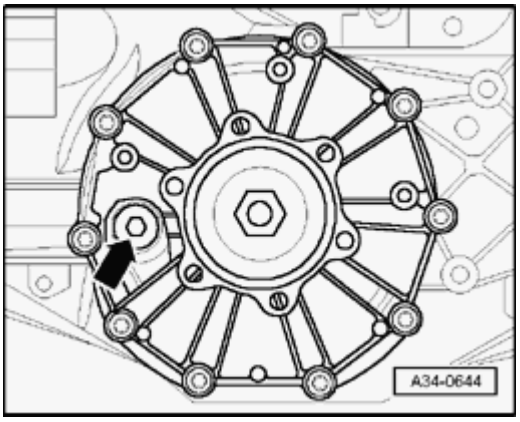


Fig. 235: Locating Oil Filler Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Procedure

NOTE:

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

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

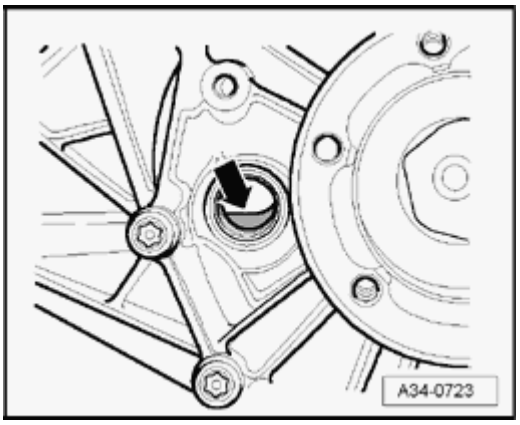


Fig. 236: Identifying Correct Oil Level
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Oil level is correct when transmission is filled up to edge of housing - **arrow** -.

- Top off with gear oil if necessary. Specification --> **Code letters, allocation, transmission ratios, capacities**.
- Install oil filler plug and tighten.

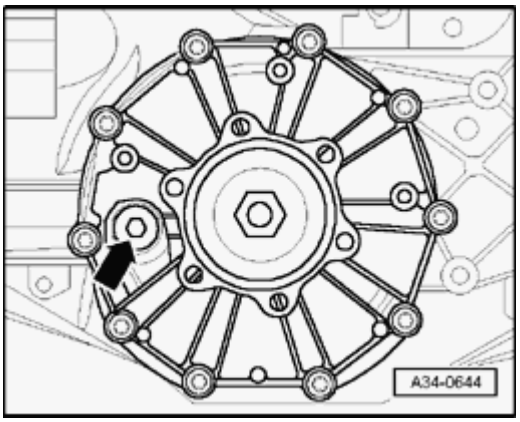


Fig. 237: Locating Oil Filler Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Note the following when filling with new oil:

- Remove oil filler plug - **arrow** -.

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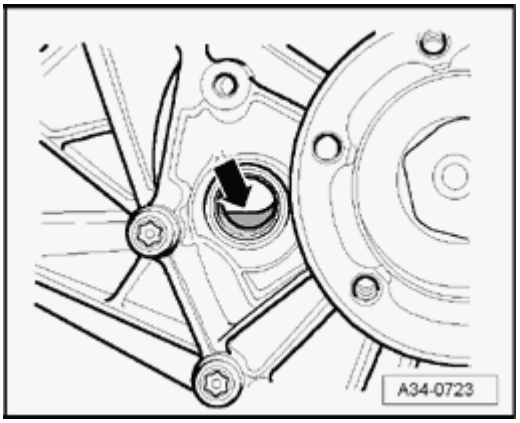


Fig. 238: Identifying Correct Oil Level
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fill with gear oil up to edge of housing - **arrow** -.
- Install oil filler plug.
- Start engine, engage a gear and allow transmission to turn for approx. 2 minutes.
- Switch off engine and remove oil filler plug.

Once more, fill with gear oil up to edge of housing - **arrow** -.

- Screw in oil filler plug and tighten.

Tightening torque

Component	Nm
Oil filler plug	45

TRANSMISSION, MOUNTING ON ASSEMBLY STAND

Transmission, mounting on assembly stand

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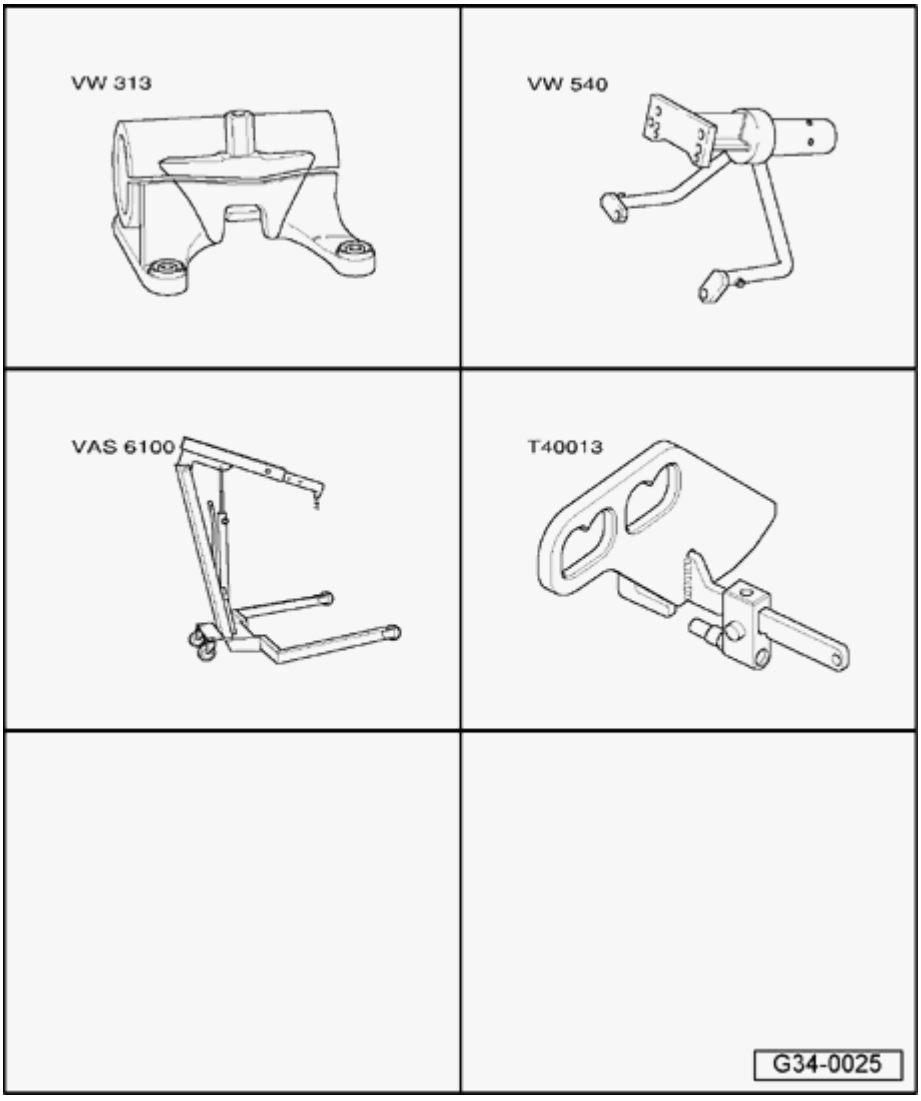


Fig. 239: Identifying Special Tools - Transmission, Mounting On Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Support clamp VW313
- Engine/transmission support VW540
- Workshop crane VAS6100
- Transmission lift hook T40013

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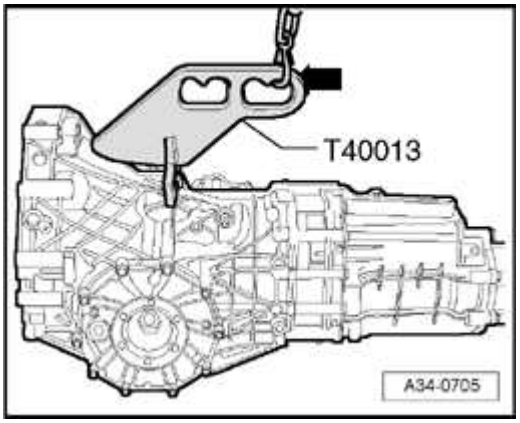


Fig. 240: Hook Of Workshop Crane Fastened In 4th Notch On Lifting Tackle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Procedure

- Insert transmission lift hook T40013 in lifting eye on transmission and secure.
- Fasten hook of workshop crane VAS6100 in 4th notch - **arrow** - on transmission lift hook T40013.
- Lift transmission with workshop crane VAS6100 and transmission lift hook T40013.

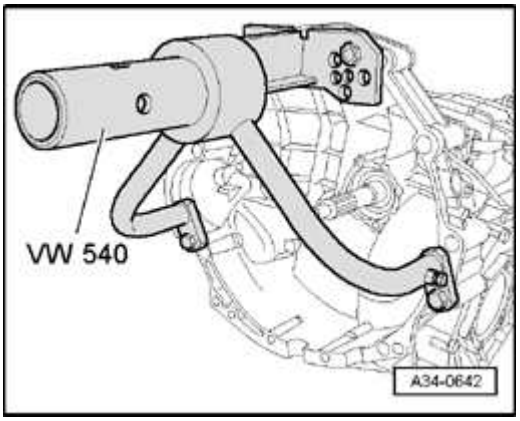


Fig. 241: Holding Fixture VW 540 Secured To Transmission And Installed Into Support Clamp VW313
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure holding fixture VW 540 to transmission and install into support clamp VW313.

TRANSMISSION, DISASSEMBLING AND ASSEMBLING

Transmission, overview

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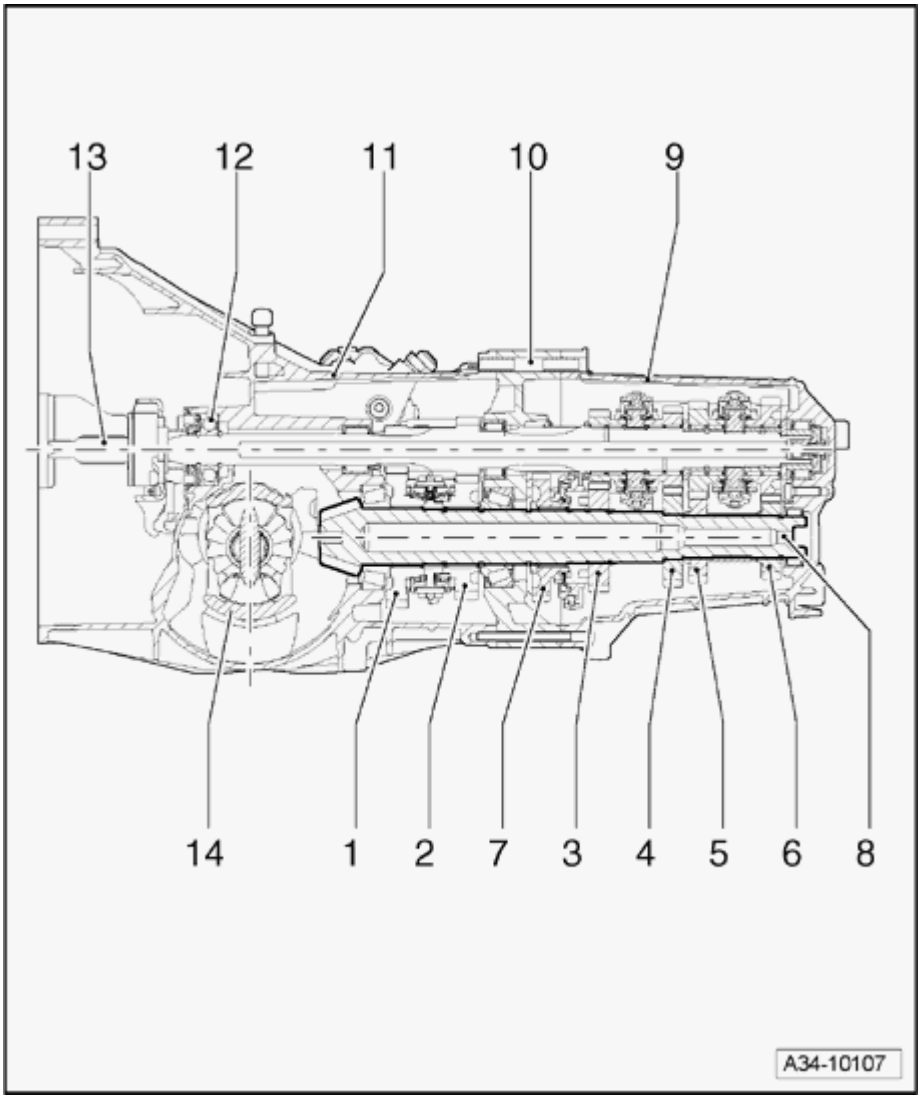


Fig. 242: Transmission, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 - Pinion shaft (output shaft)

9 - Transmission cover

10 - Bearing housing

11 - Transmission housing

12 - Ball bearing

- For input shaft

13 - Input shaft (main shaft)

14 - Differential

Assembly overview

Sequence for disassembling and assembling --> **Disassembling and assembling sequence**

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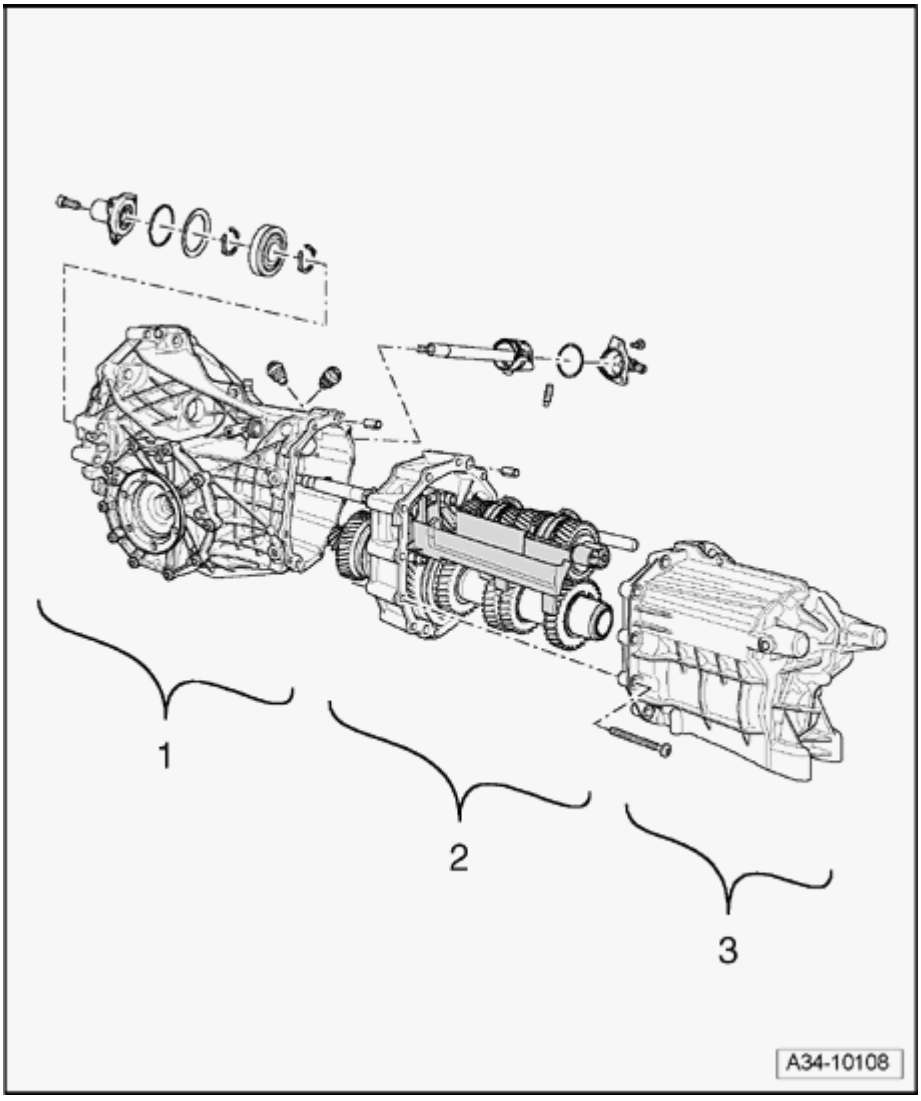


Fig. 243: Transmission Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing with differential, ball bearing for input shaft and selector shaft

- Removing and installing ball bearing for input shaft, transmission cover, bearing housing and selector shaft --> **Ball bearing for input shaft, transmission cover, bearing housing and selector shaft, removing and installing, assembly overview**
- Removing and installing differential --> **Differential, removing and installing**
- Servicing transmission housing --> **Transmission housing, servicing**

2 - Bearing housing with gear assembly

- Removing and installing 3rd to 6th gear --> **3rd to 6th gear assembly overview, removing and installing**
- Removing and installing input shaft, output shaft with selector gear for 1st and 2nd gear, reverse gear

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wheel and reverse selector gear --> **Input shaft, output shaft, reverse gear wheel and reverse selector gear, assembly overview, removing and installing**

3 - Transmission cover

- Servicing --> **Transmission cover, servicing**

Ball bearing for input shaft, transmission cover, bearing housing and selector shaft, removing and installing, assembly overview

Sequence for disassembling and assembling --> **Disassembling and assembling sequence**

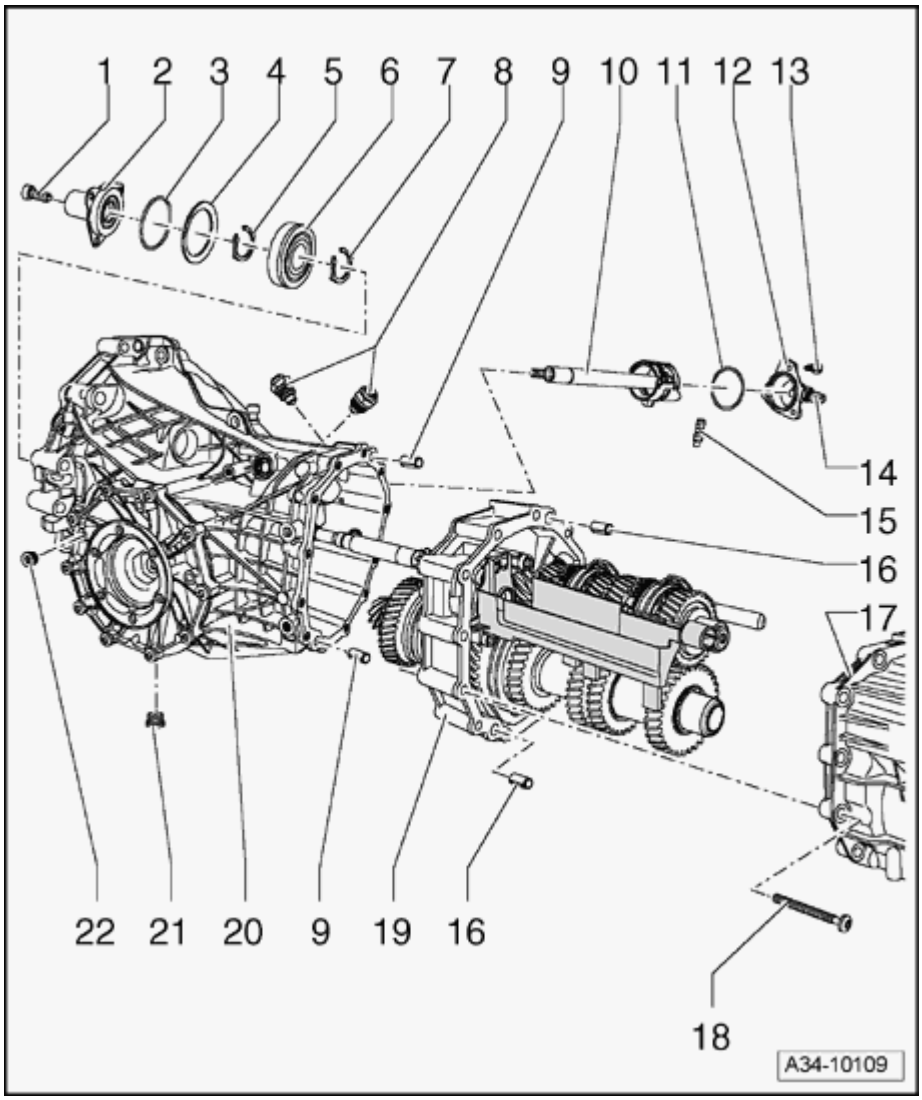


Fig. 244: Ball Bearing For Input Shaft, Transmission Cover, Bearing Housing And Selector Shaft, Removing And Installing, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Torx bolt, 35Nm

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- 3 (Qty.)
- Apply **locking fluid AMV 185 101 A1** when installing

2 - Guide sleeve

- With seal
- Removing and installing --> **Disassembling and assembling sequence**

3 - O-ring

- Always replace

4 - Dished spring

5 - Circlip

- Note thickness
- Re-determining thickness

6 - Ball bearing

- Removing and installing --> **Disassembling and assembling sequence**

7 - Circlip

- Note thickness
- Re-determining thickness

8 - Locking bolt, 45 Nm

- 2 (Qty.)
- Apply **locking fluid AMV185101A1** when installing

9 - Dowel sleeve

- 2 (Qty.)
- Insert in transmission housing
- Remove and install with drift 3121

10 - Selector shaft with selector cylinder

- Removing and installing --> **Disassembling and assembling sequence**

11 - O-ring

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- For selector shaft cover
- Always replace
- Lubricate with gear oil

12 - Cover for selector shaft

- With Back-up light switch F4
- Removing and installing --> **Disassembling and assembling sequence**

13 - Bolt, 24 Nm

- 3 (Qty.)
- Apply **locking fluid AMV185101A1** when installing

14 - Back-up light switch F4 -20 Nm-

15 - Pin

- For selector shaft stop
- Insert in transmission housing
- Installation position: groove on threaded pin points toward selector shaft cover

16 - Dowel sleeve

- 2 (Qty.)
- Insert in bearing housing
- Remove and install with drift 3121

17 - Transmission cover

- Servicing --> **Transmission cover, servicing**

18 - Bolt, 35 Nm plus an additional 90° $^{1}/_{4}$ turn

- 12 (Qty.)

19 - Bearing housing

- Removing and installing 3rd to 6th gear --> **3rd to 6th gear assembly overview, removing and installing**
- Removing and installing input shaft, output shaft with selector gear for 1st and 2nd gear, reverse gear wheel and reverse selector gear --> **Input shaft, output shaft, reverse gear wheel and reverse selector gear, assembly overview, removing and installing**

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- Servicing --> **Bearing housing, servicing**

20 - Transmission housing

- With differential and flange shafts
- Removing and installing differential --> **Differential, removing and installing**
- Servicing transmission housing --> **Transmission housing, servicing**

21 - Oil drain plug, 45 Nm

22 - Oil filler plug, 45 Nm

3rd to 6th gear assembly overview, removing and installing

Sequence for disassembling and assembling --> **Disassembling and assembling sequence**

NOTE:

- **3rd to 6th speed selector gears should have an axial play of 0.20to 0.50mm after installing.**

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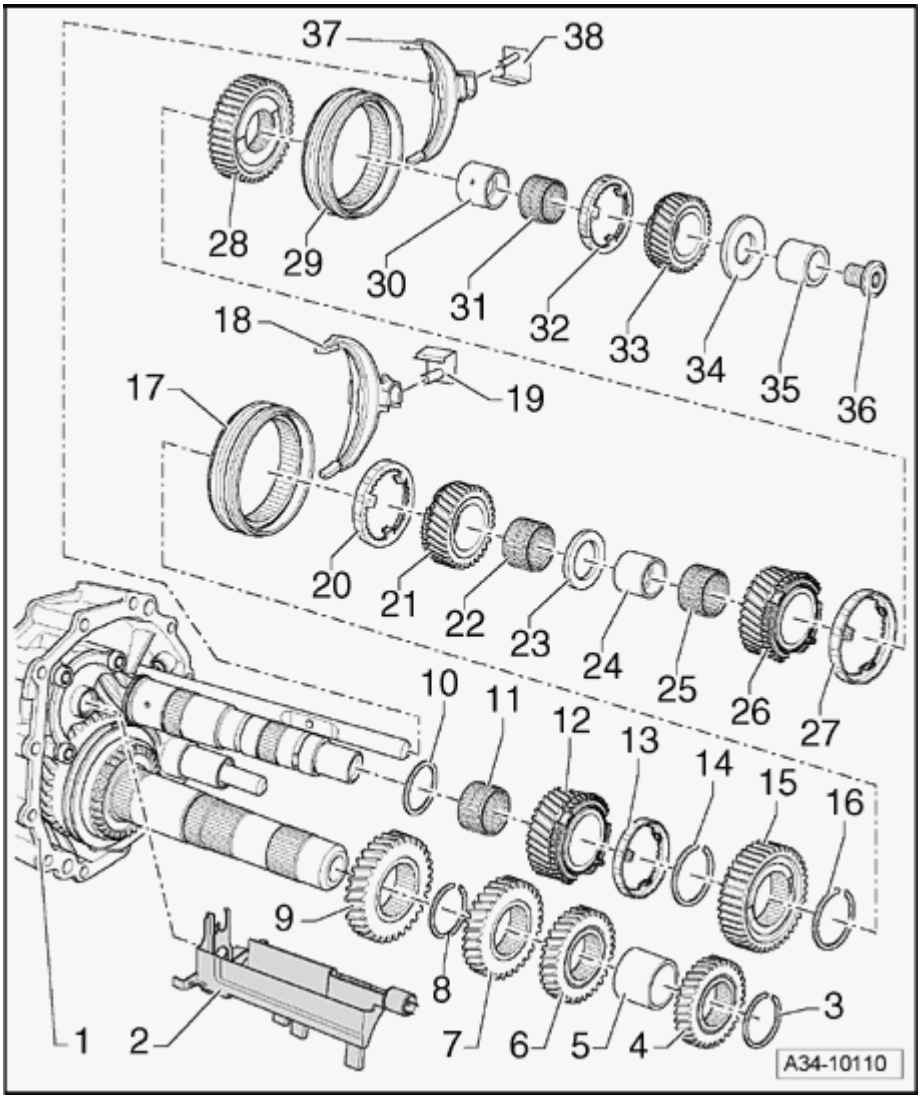


Fig. 245: 3rd To 6th Gear Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

- With input shaft and output shaft

2 - Oil collector

- With magnet
- Clipped into reverse shaft support.

3 - Circlip

- Install thickest circlip that will still just fit.
- Re-determining thickness --> **Disassembling and assembling sequence**

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4 - 6th gear wheel

5 - Spacer sleeve

6 - 5th gear wheel

- Installation position: high inside collar faces 4th gear wheel

7 - 4th gear wheel

- Installation position: high inside collar faces 5th gear wheel

8 - Circlip

- Install thickest circlip that will still just fit.
- Re-determining thickness --> **Disassembling and assembling sequence**

9 - 3rd gear wheel

- Installation position: machined side faces reverse gear synchronizing hub

10 - Thrust washer

- For 3rd speed selector gear

11 - Needle bearing

- For 3rd gear

12 - 3rd speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

13 - 3rd gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

14 - Circlip

- Mark

15 - Synchronizing hub for 3rd and 4th gear

- Installation position: high inside collar faces 3rd speed selector gear

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16 - Circlip

- Re-determining thickness --> **Disassembling and assembling sequence**

17 - Locking collar for 3rd and 4th gear

- Mark position in relation to synchronizing hub prior to removing

18 - Selector fork for 3rd and 4th gear

19 - Pin with clip

- For securing selector fork for 3rd and 4th gear to selector rod

20 - 4th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

21 - 4th speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

22 - Needle bearing

- For 4th gear

23 - Thrust washer

- For 4th speed and 5th speed selector gears

24 - Needle bearing inner race

- For 5th gear

25 - Needle bearing

- For 5th gear

26 - 5th speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

27 - 5th gear synchro-ring

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- Checking for wear **Checking synchro-ring for wear**

28 - Synchronizing hub for 5th and 6th gear

29 - Locking collar for 5th and 6th gear

- Mark position in relation to synchronizing hub prior to removing

30 - Needle bearing inner race

- For 6th gear

31 - Needle bearing

- For 6th gear

32 - 6th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

33 - 6th speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

34 - Thrust washer

- For 6th speed selector gear

35 - Inner race

- For needle roller bearing

36 - Multi-point socket head bolt, 150Nm

37 - Selector fork for 5th and 6th gear

38 - Pin with clip

- For securing selector fork for 5th and 6th gear to selector rod

Input shaft, output shaft, reverse gear wheel and reverse selector gear, assembly overview, removing and installing

Sequence for dismantling and assembling --> **Disassembling and assembling sequence**

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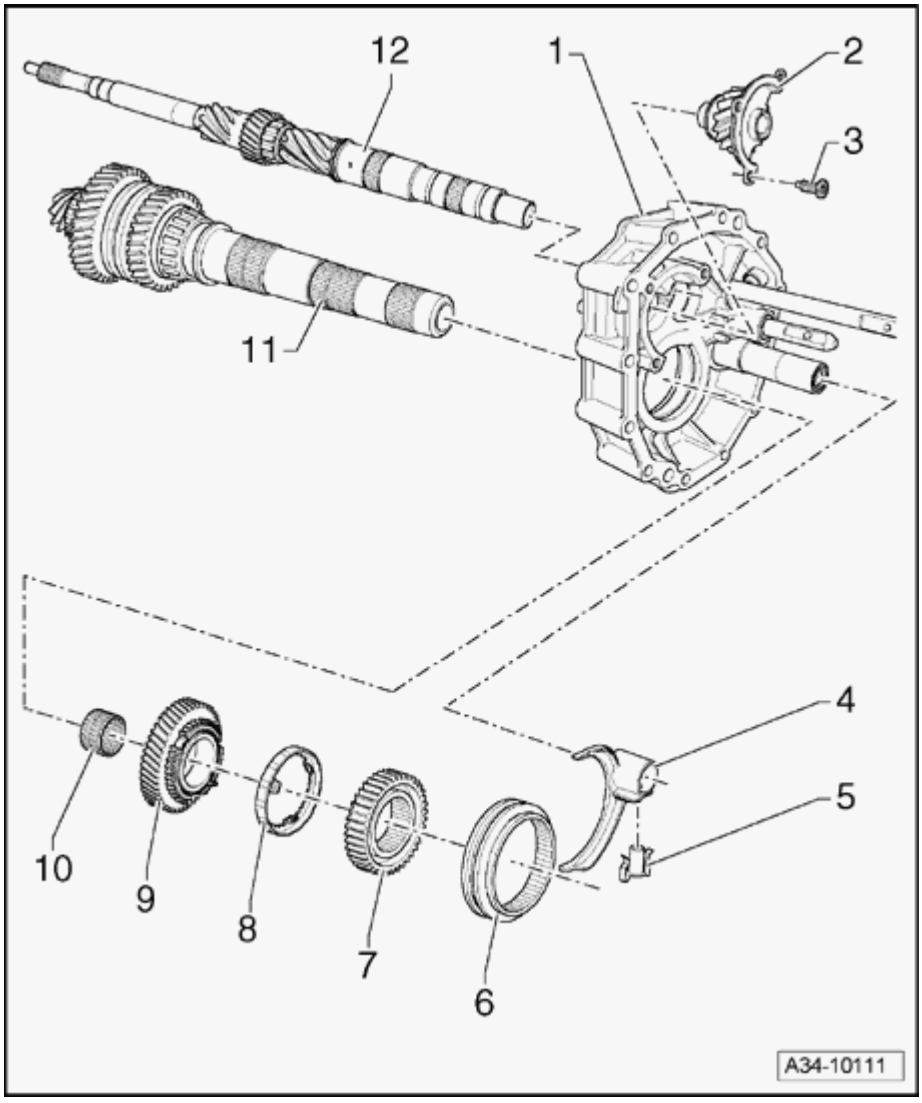


Fig. 246: Input Shaft, Output Shaft, Reverse Gear Wheel And Reverse Selector Gear, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

2 - Reverse gear wheel

- With support for reverse shaft
- Assembly overview - reverse gear wheel **Assembly overview - reverse gear wheel**

3 - Bolt, 30 Nm

- 3 (Qty.)

4 - Reverse gear selector fork

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5 - Pin with clip

- For securing reverse gear selector fork to selector rod

6 - Reverse gear locking collar

- Mark position in relation to synchronizing hub prior to removing
- Installation position: taper faces reverse gear synchro-ring

7 - Reverse gear synchronizing hub

- Installation position: high inside collar faces 3rd gear wheel

8 - Synchronizing ring for reverse gear

- Checking for wear **Checking synchro-ring for wear**

9 - Reverse selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

10 - Needle bearing

- For reverse gear

11 - Pinion shaft (output shaft)

- With tapered roller bearing and selector gears for 1st and 2nd speed
- Disassembling and assembling --> **Pinion shaft, disassembling and assembling**

12 - Input shaft

- Disassembling and assembling --> **Input shaft, disassembling and assembling**

Assembly overview - reverse gear wheel

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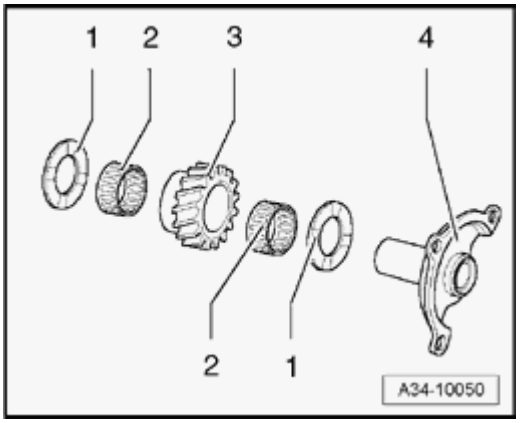


Fig. 247: Assembly Overview - Reverse Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Thrust washer
2. Needle bearing
3. Reverse gear wheel

Installation position: collar points toward bearing housing

4 - Reverse shaft support

Disassembling and assembling sequence

Removing and installing ball bearing for input shaft, selector shaft, transmission cover and bearing housing with input shaft and pinion shaft.

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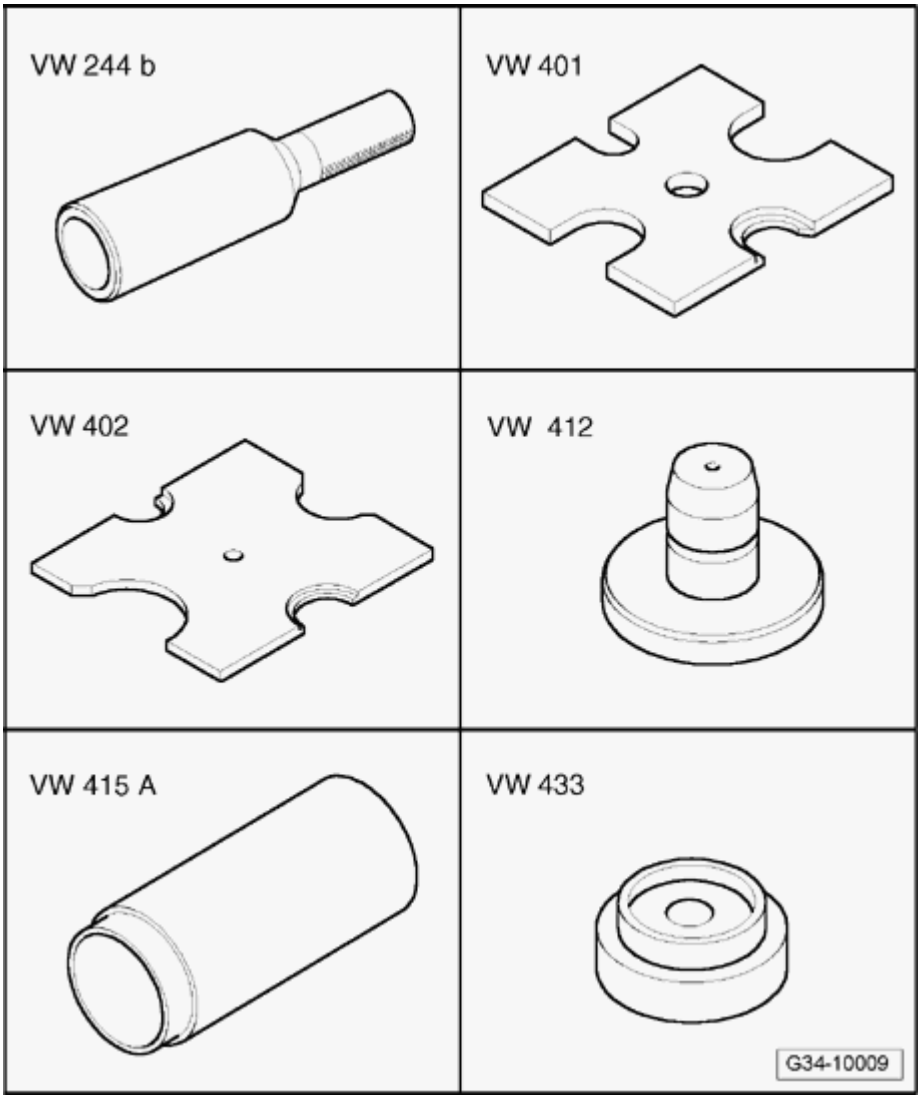


Fig. 248: Identifying Special Tools - Transmission Disassembling And Assembling Sequence (1 Of 5)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift sleeve VW 244 B
- Thrust plate VW 401
- Thrust plate VW 402
- Thrust disc VW 412

- Tube 60 mm dia. VW 415 A
- Thrust pad con. VW 433

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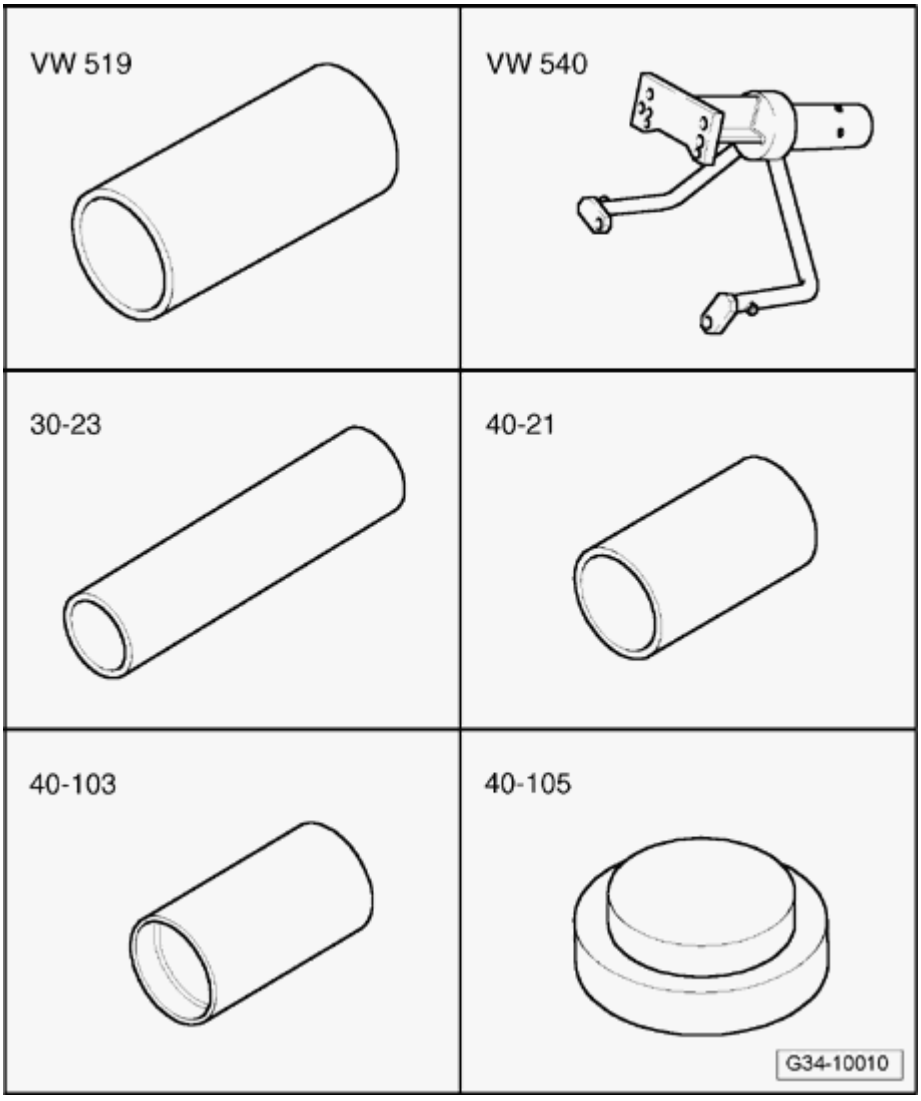


Fig. 249: Identifying Special Tools - Transmission Disassembling And Assembling Sequence (2 Of 5)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Sleeve VW 519
- Holding fixture VW 540
- Press tube 30 - 23
- Press tool 40 - 21

- Sleeve 40 - 103
- Thrust piece 40 - 105

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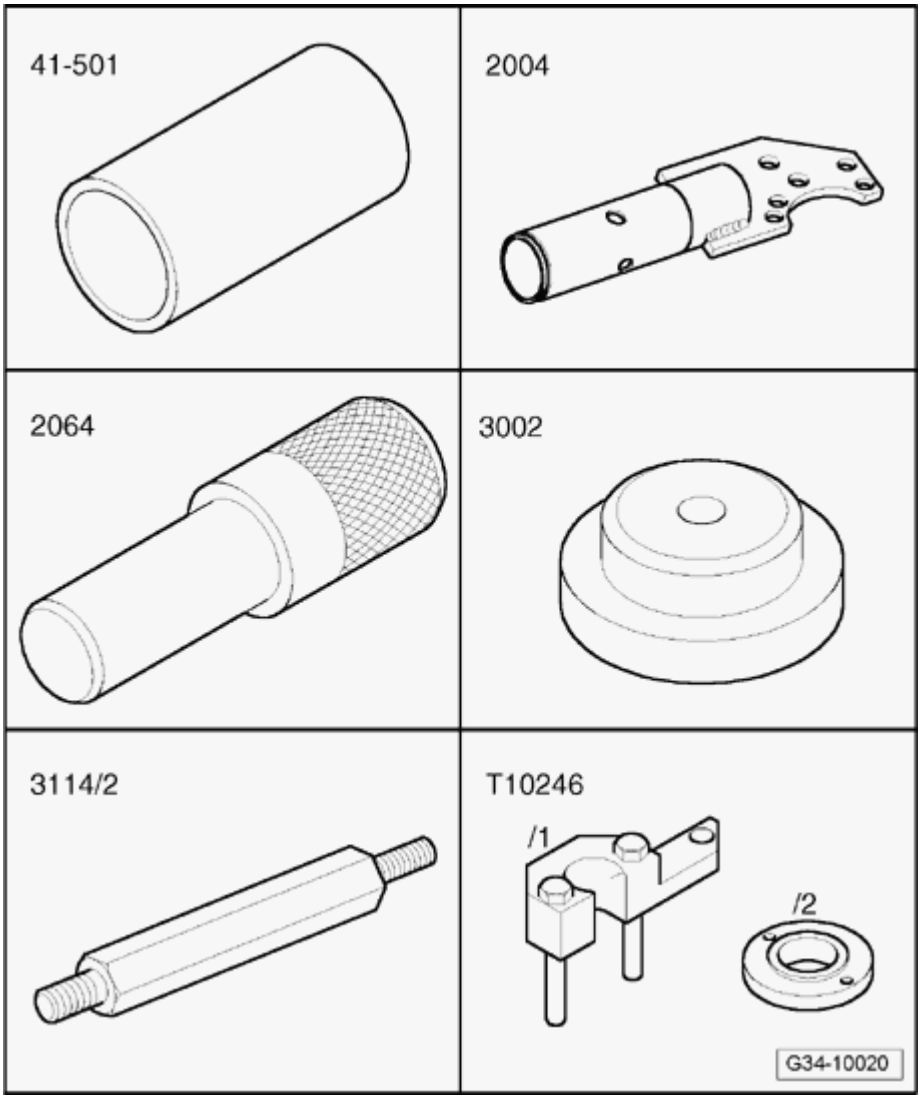


Fig. 250: Identifying Special Tools - Transmission Disassembling And Assembling Sequence (3 Of 5)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift sleeve 41 - 501
- Transmission support 2004
- Mandrel 2064
- Thrust piece 3002

- Door hinge alignment tool (M8 and M10) 3114/2
- Fitting tool T10246

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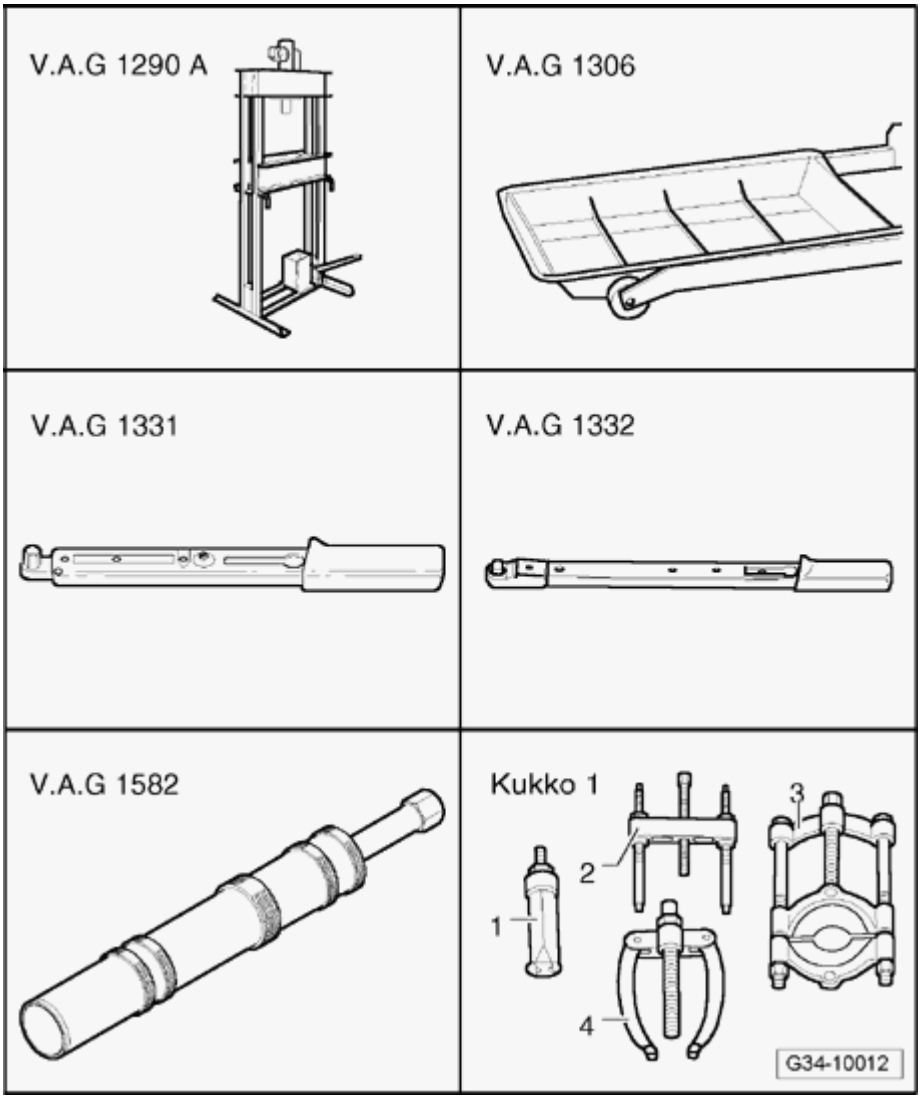


Fig. 251: Identifying Special Tools - Transmission Disassembling And Assembling Sequence (4 Of 5)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Repair press V.A.G 1290 A
- Drip tray V.A.G 1306
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332

- Taper roller bearing puller V.A.G 1582
- Adapter V.A.G 1582/12
- **- 1 -** Internal puller Kukko 21/2
- **- 2 -** Puller Kukko 18/2

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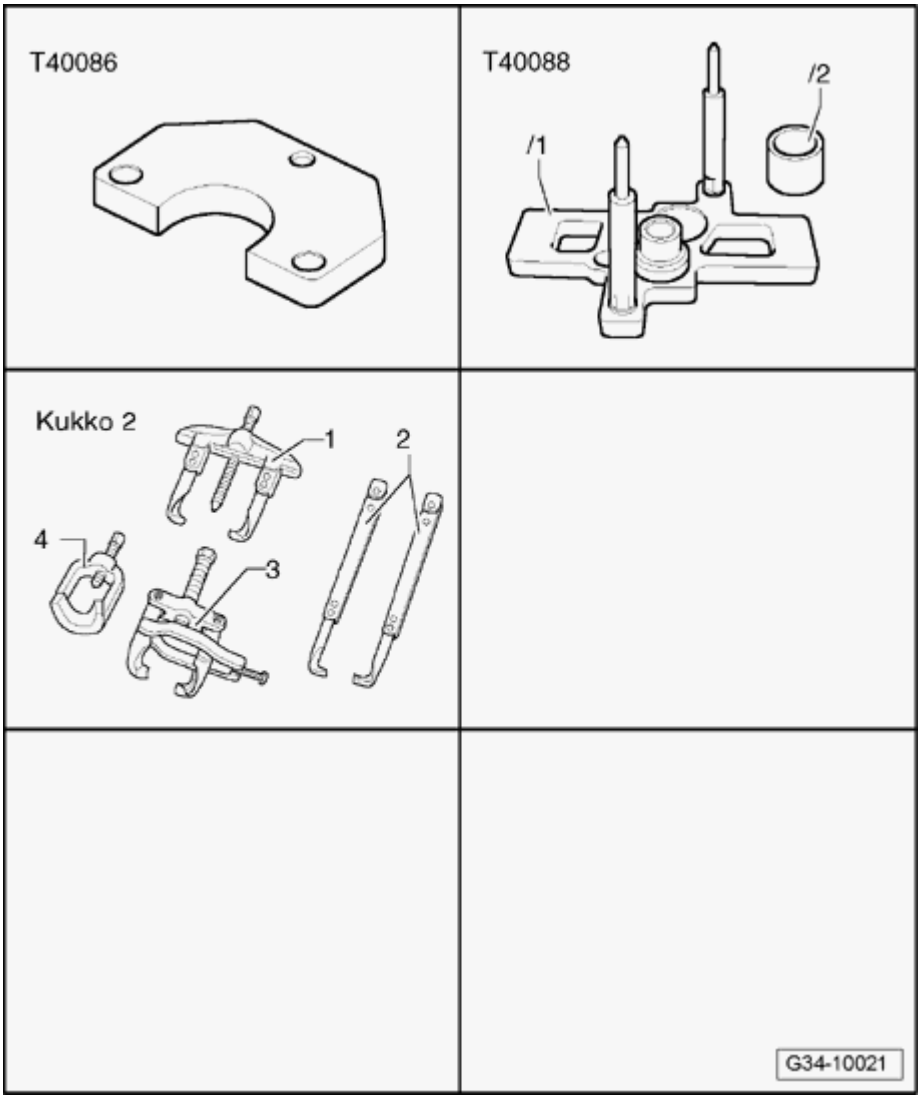


Fig. 252: Identifying Special Tools - Transmission Disassembling And Assembling Sequence (5 Of 5)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Removal plate T40086
- Holding plate T40088/1
- **- 1 -** Two-arm puller Kukko 20/10
- **- 2 -** Puller hook, length 200 mm

- **- 2 -** Puller hook, length 250 mm
- Feeler gauge
- 2 bolts M8 (length 70 mm) with washers
- **Sealing paste AMV 188 001 02**

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- **Assembly sleeve 01E311120**
- **Locking fluid AMV185101A1**

Disassembling transmission

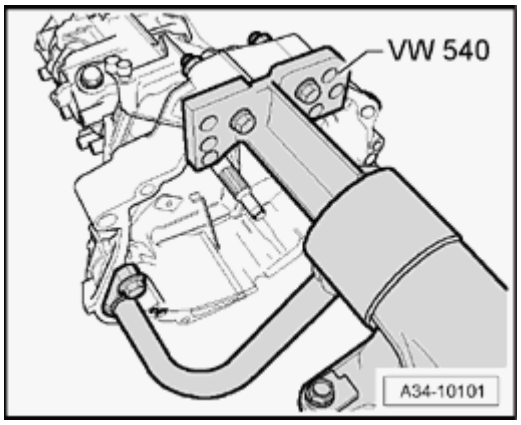


Fig. 253: Transmission Mounted On Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mount transmission on assembly stand.
- Place drip tray V.A.G 1306 under transmission.
- Drain transmission oil.

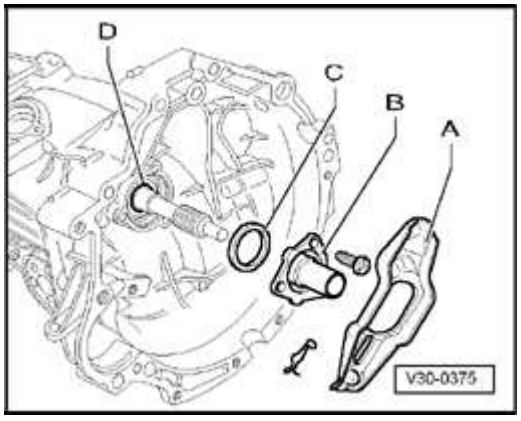


Fig. 254: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clutch release lever - **A** - together with release bearing.
- Remove guide sleeve - **B** -
- Remove dished spring - **C** -.
- Remove circlip - **D** - in front of ball bearing for input shaft.

NOTE:

- **If the input shaft or transmission housing is not to be replaced, note the**

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thickness of the circlip.

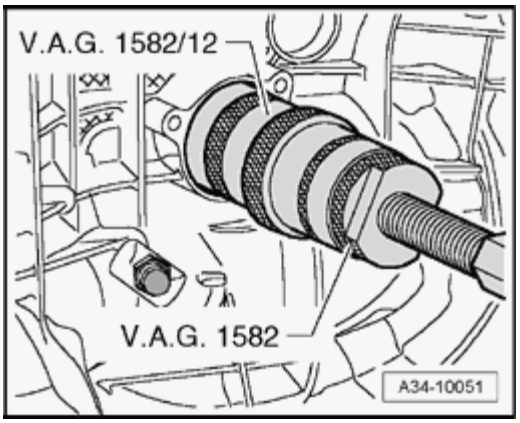


Fig. 255: Pulling Ball Bearing For Input Shaft Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull ball bearing for input shaft out of transmission housing.

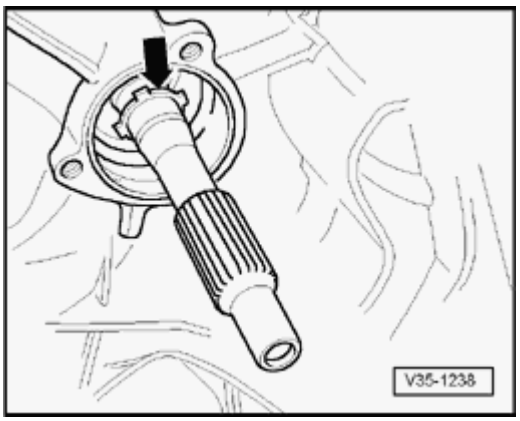


Fig. 256: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip - **arrow** - behind ball bearing for input shaft.

NOTE:

- **If the input shaft or transmission housing is not to be replaced, note the thickness of the circlip.**

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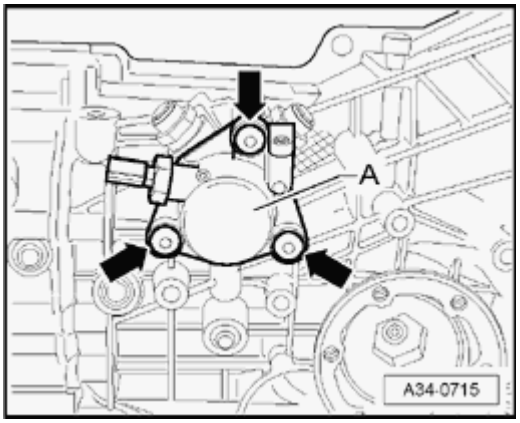


Fig. 257: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and selector shaft cover - **A** -.

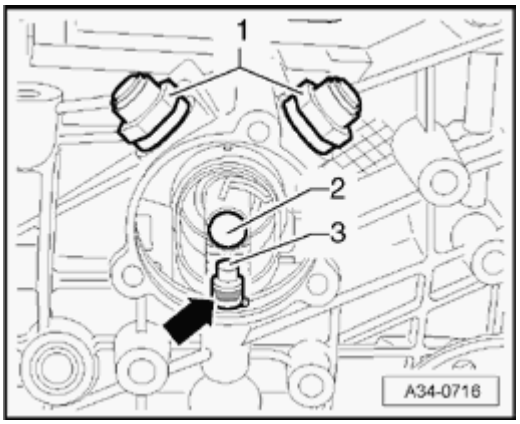


Fig. 258: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove two locking bolts - **1** - for selector shaft.
- Make sure that no gear has been engaged.
- Push selector shaft - **2** - into transmission as far as it will go, simultaneously removing pin - **3** -.
- Remove selector shaft.

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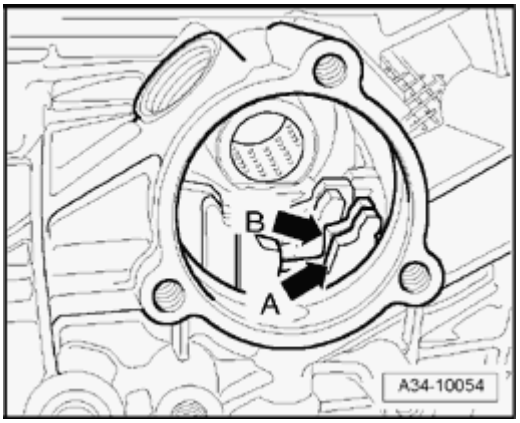


Fig. 259: Locating Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Move two selector rods - **arrow A** - and - **arrow B** - to lock input shaft by selecting two gears (e.g. reverse gear and 1st gear).

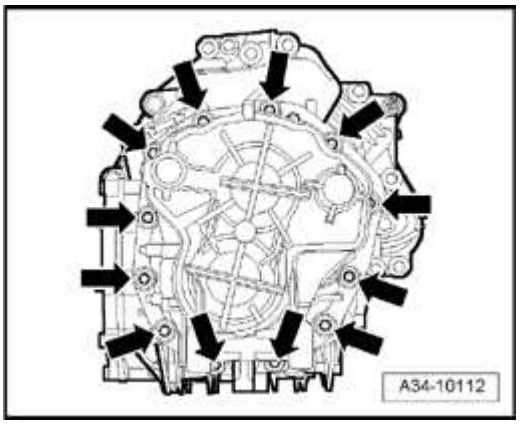


Fig. 260: Transmission Cover Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove securing bolts for transmission cover - **arrows** -.

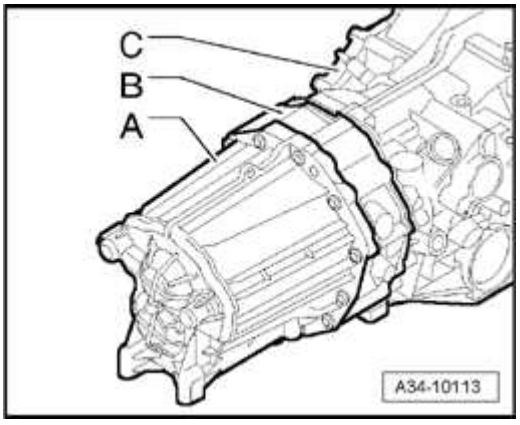


Fig. 261: Transmission Cover, Bearing Housing And Transmission Housing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully remove transmission cover - **A** - toward rear. The bearing housing - **B** - remains installed to transmission housing - **C** -.

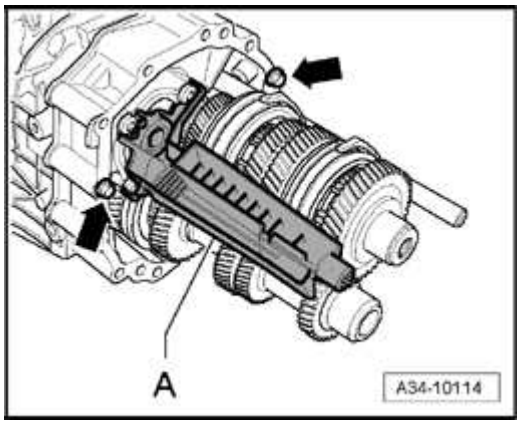


Fig. 262: Securing Bearing Housing To Transmission Housing With Two Bolts M8 And Washers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure bearing housing to transmission housing - **arrows** - with two bolts M8 (length approx. 70 mm) and washers.
- Tighten 2 bolts - **arrows** - to max. 5 Nm.
- Detach oil collector - **A** -.

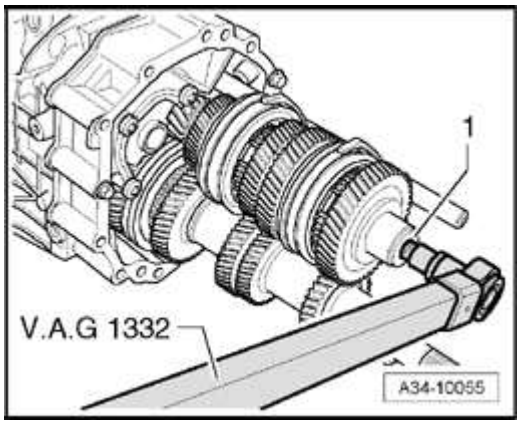


Fig. 263: Removing/Installing Multi-Point Socket Head Bolt For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check that the 2 gears are still engaged and then unscrew and remove multi-point socket head bolt - **1** - for input shaft.

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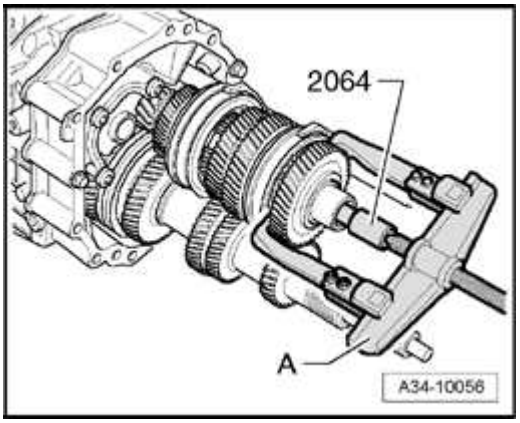


Fig. 264: Detaching 6th Speed Selector Gear With Inner Race For Roller Bearing And Thrust Washer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach 6th speed selector gear with inner race for roller bearing and thrust washer.

A - Two-arm puller, e.g. Kukko 20/10

NOTE:

- **Check the gear teeth on the selector gears and gear wheels for damage after pulling them off.**

- Remove synchro-ring and needle bearing for 6th speed selector gear.

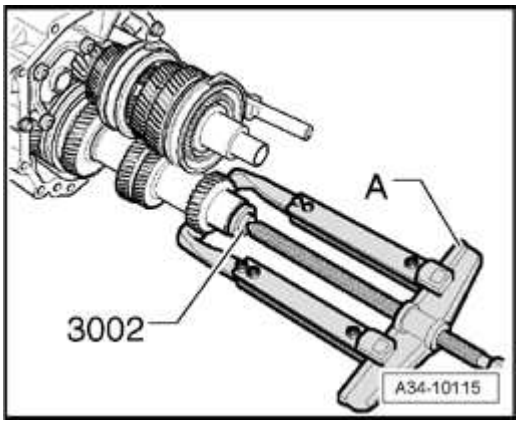


Fig. 265: Removing 6th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 6th gear wheel.

A - Two-arm puller, e.g. Kukko 20/10

- Remove spacer sleeve from output shaft.

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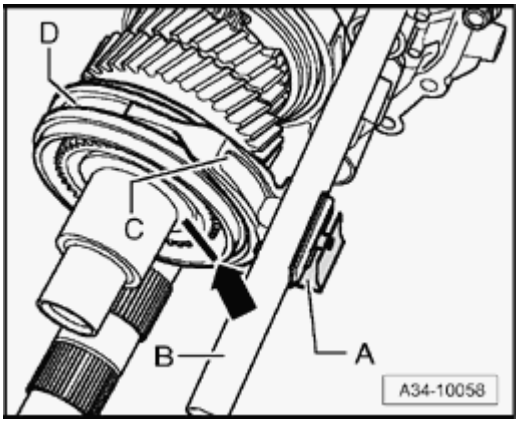


Fig. 266: Identifying Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out pin with clip - **A** - for securing selector fork for 5th and 6th gear from selector rod - **B** -.
- Mark installation position of locking collar in relation to synchronizing hub - **arrow** -.
- Move selector fork - **C** - downward and detach with locking collar - **D** -.

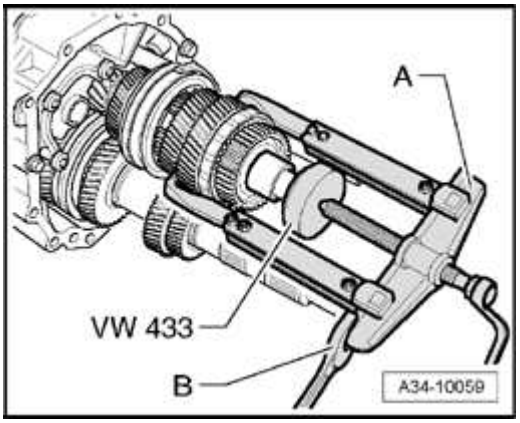


Fig. 267: Removing 5th Speed Selector Gear Together With Needle Bearing Inner Race For 6th Gear And Synchronizing Hub For 5th And 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 5th speed selector gear together with needle bearing inner race for 6th gear and synchronizing hub for 5th and 6th gear.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 200 mm

NOTE:

- **Counter-hold two-arm puller using e.g. open end wrench - B -.**
- **If the needle bearing inner race for 6th gear is in contact with press tool VW 433, insert locking pin 2064 into hole in input shaft to pull off the components all the way.**

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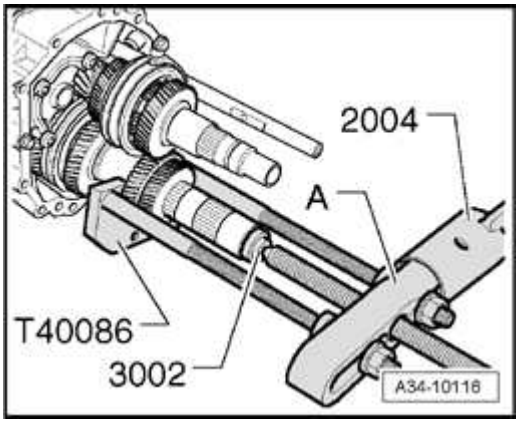


Fig. 268: Remove 4th And 5th Gear Wheels Together
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 4th and 5th gear wheels together.

A - Puller, e.g. Kukko 18/2

NOTE:

- **Counter-hold puller - A - using e.g. transmission bracket 2004.**

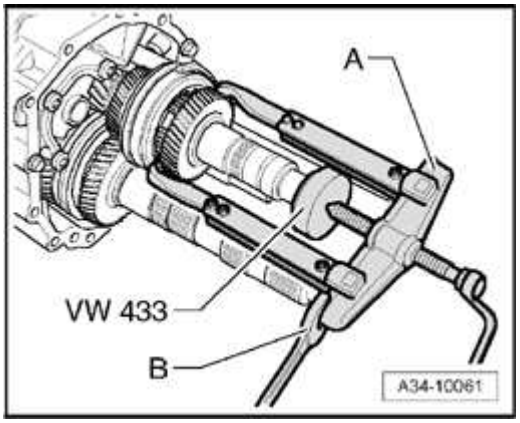


Fig. 269: Removing 4th Speed Selector Gear With Needle Bearing Inner Race For 5th Gear And Thrust Washer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 4th speed selector gear with needle bearing inner race for 5th gear and thrust washer.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 200 mm

- Counter-hold two-arm puller using e.g. open end wrench - **B** -.
- Remove synchro-ring and needle bearing for 4th speed selector gear.

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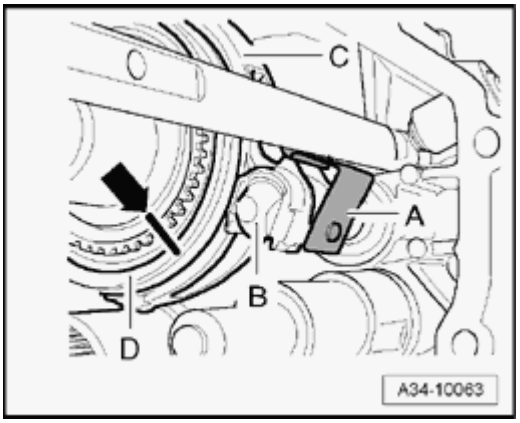


Fig. 270: Pulling Pin With Clip Securing Selector Fork For 3rd And 4th Gear Out From Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull pin with clip - **A** - securing selector fork for 3rd and 4th gear out from selector rod - **B** -.
- Mark installation position of locking collar in relation to synchronizing hub - **arrow** -.
- Detach selector fork - **C** - with locking collar - **D** -.
- Remove circlip for 3rd gear and 4th gear synchronizing hub and note thickness of circlip.

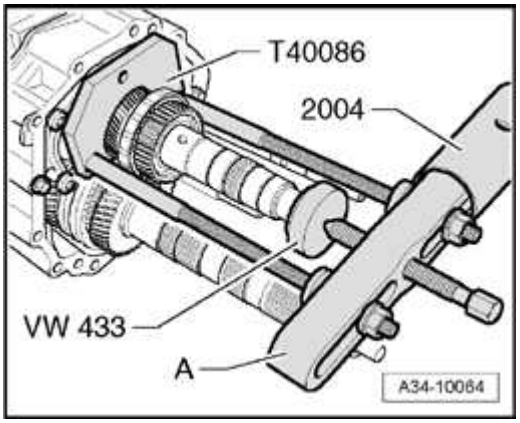


Fig. 271: Pulling Off 3rd Speed Selector Gear With Synchronizing Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 3rd speed selector gear with synchronizing hub for 3rd and 4th gear.

A - Puller, e.g. Kukko 18/2

NOTE:

- **Counter-hold puller - A - using e.g. transmission bracket 2004 to prevent plate T40086 from making contact with 3rd gear wheel or selector rod for 5th and 6th gear.**

- Remove circlip for 3rd speed selector gear needle bearing and detach 3rd gear needle bearing.

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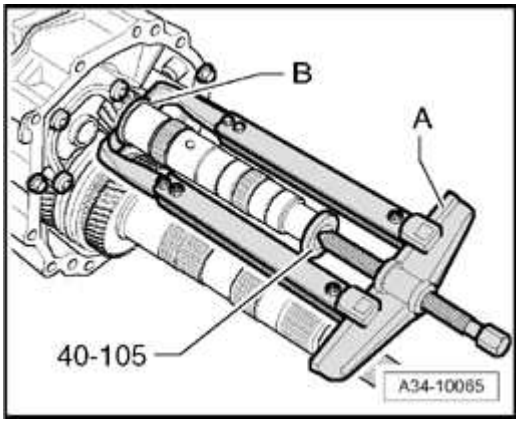


Fig. 272: Pulling Off Thrust Washer For 3rd Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off thrust washer - **B** - for 3rd speed selector gear.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 250 mm

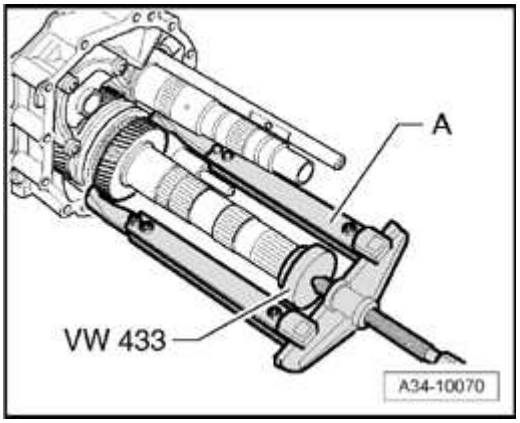


Fig. 273: Removing Circlip For 3rd Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip for 3rd gear wheel and note thickness of circlip.
- Pull off 3rd gear wheel.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 250 mm

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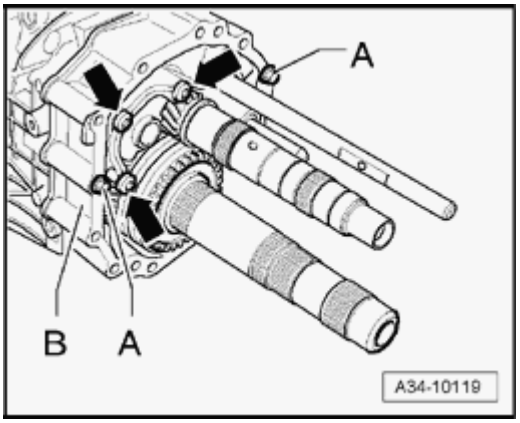


Fig. 274: Reverse Shaft Support Bolts, Bearing Housing And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for reverse shaft support.
- Remove 2 bolts - **A** - for bearing housing at transmission housing.
- Remove bearing housing - **B** - together with shafts.

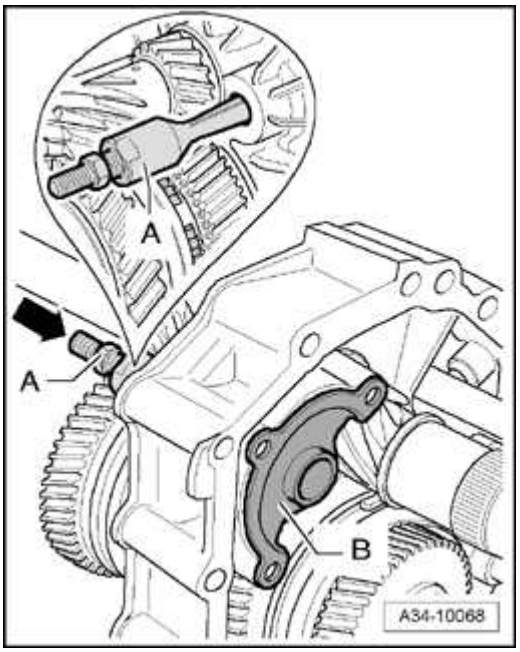


Fig. 275: Driving Reverse Shaft Support Carefully Out Of Bearing Housing And Removing With Reverse Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert an internal puller - **A** - e.g. Kukko 21/2 into bore for reverse shaft support.
- Spread open internal puller far enough for it to make contact with reverse shaft support - **B** -.
- Drive reverse shaft support carefully out of bearing housing direction of - **arrow** - and remove with reverse gear wheel.

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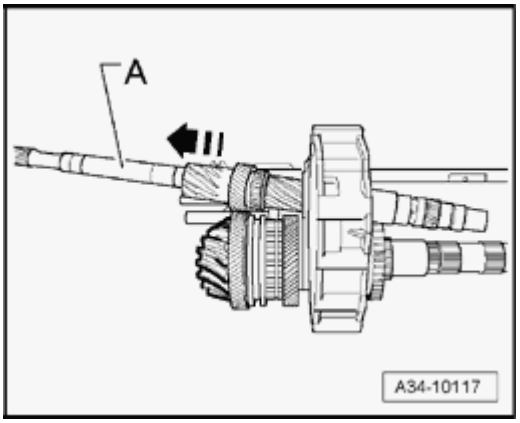


Fig. 276: Pulling Out Input Shaft From Bearing Housing At An Angle From The Front Direction Of
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out input shaft - **A** - carefully from bearing housing at an angle from the front direction of - **arrow** -.

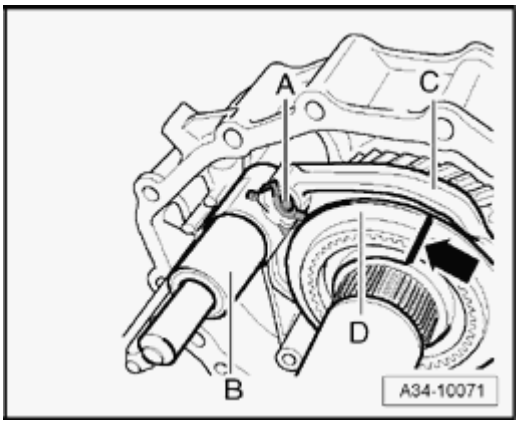


Fig. 277: Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull pin with clip - **A** - for securing selector fork for reverse gear out from selector rod - **B** -.
- Mark installation position of locking collar in relation to synchronizing hub - **arrow** -.
- Detach selector fork - **C** - with locking collar - **D** -.

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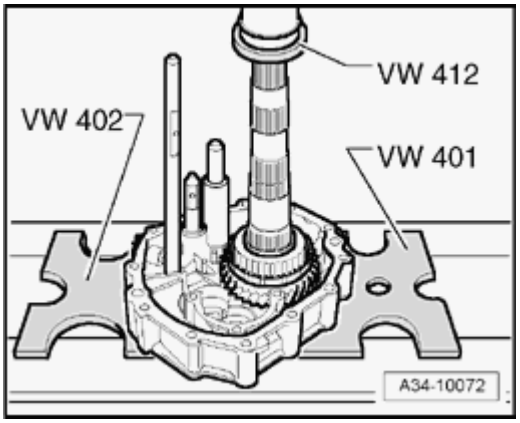


Fig. 278: Pressing Off Synchronizing Hub For Reverse Gear From Output Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press off synchronizing hub for reverse gear from output shaft.

NOTE:

- **Place the bearing housing onto thrust plates VW 401 and VW 402 so that the output shaft and selector rods are not damaged when pressing off the synchronizing hub.**

- Detach reverse selector gear, needle bearing for reverse selector gear and reverse gear synchronizing hub.
- Guide output shaft out of selector fork for 1st and 2nd gear and bearing housing.

Assembling transmission

If the input shaft or the transmission housing have been replaced, you must first re-determine the thickness of the input shaft circlips --> **Determining circlips for input shaft ball bearing**.

NOTE:

- **Lubricate all needle bearings with gear oil before installing.**
- **Check synchro-rings for wear Checking synchro-ring for wear**
- **Insert spring in selector gear Inserting spring in selector gear**
- **Heat gear wheels, needle bearing inner races and synchronizing hubs to 130° C (max.) before pressing on (wear protective gloves).**

- Insert output shaft in bearing housing and selector fork for 1st and 2nd gear.
- Place reverse gear selector gear with needle bearing, spring and synchro-ring onto output shaft.

- The lugs on synchro-ring should engage into recesses in selector gear.

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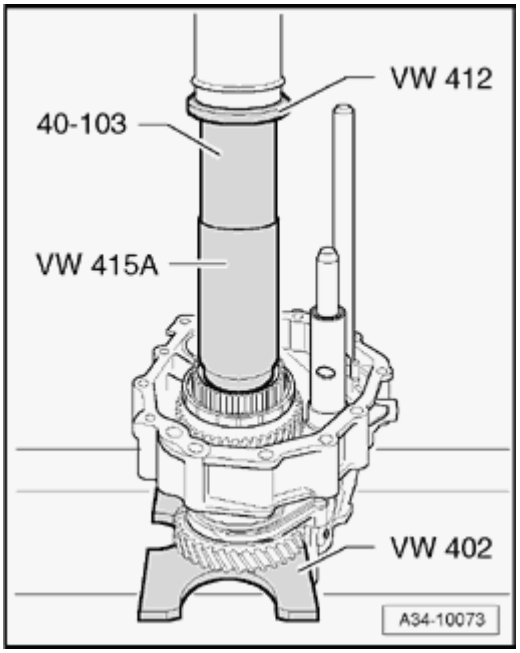


Fig. 279: Pressing On Reverse Gear Synchronizing Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on reverse gear synchronizing hub.
- Installation position: high inside collar faces 3rd gear wheel.
- Check axial clearance of reverse selector gear.

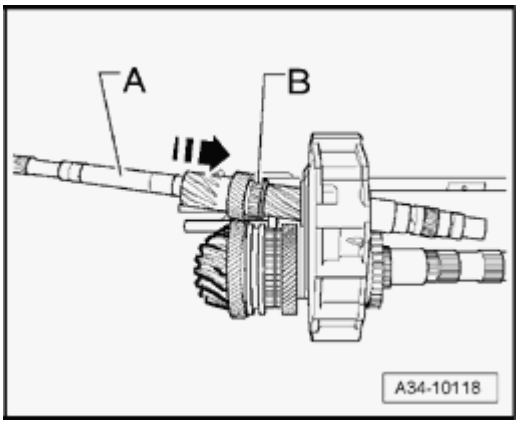


Fig. 280: Inserting Input Shaft With Needle Roller Bearing Into Bearing Housing At An Angle Toward The Rear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert input shaft - **A** - with needle roller bearing - **B** - into bearing housing in direction of - **arrow** - at an angle toward the rear.

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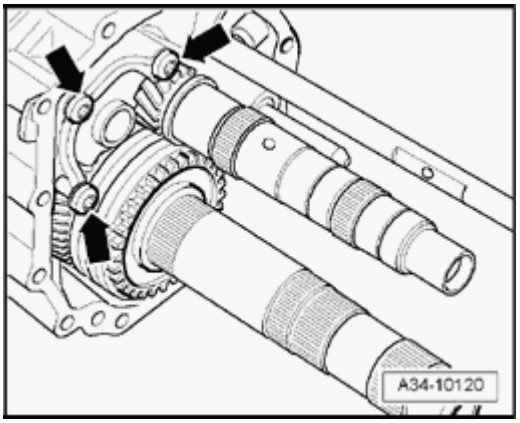


Fig. 281: Reverse Gear Wheel Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install reverse gear wheel and tighten 3 bolts - **arrows** - for reverse shaft support to 30 Nm.

Assembly overview - reverse gear wheel **Assembly overview - reverse gear wheel**

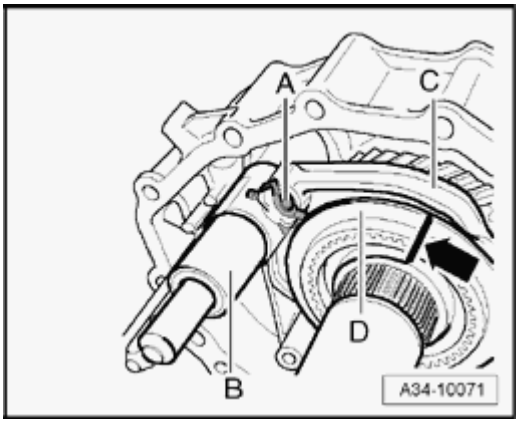


Fig. 282: Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide reverse gear selector fork - **C** - together with locking collar - **D** - onto selector rod - **B** - and reverse gear synchronizing hub.

- The markings on locking collar and synchronizing hub - **arrow** - must coincide.
- The chamfer on locking collar faces reverse selector gear.

- If the holes of selector fork and selector rod coincide, clip in pin with clip - **A** -.

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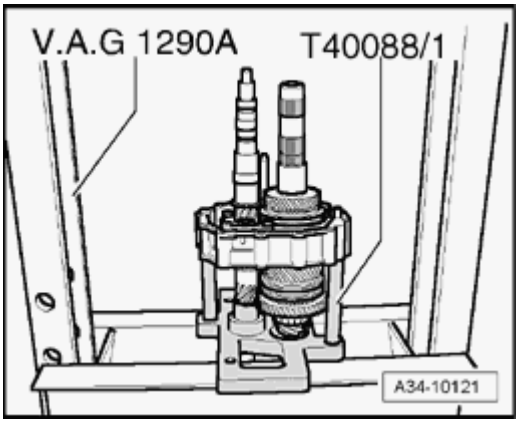


Fig. 283: Plate T40088/1 Placed On Press Table And Bearing Housing Inserted With Shafts And Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place plate T40088/1 on press table and insert bearing housing with shafts and selector rods.

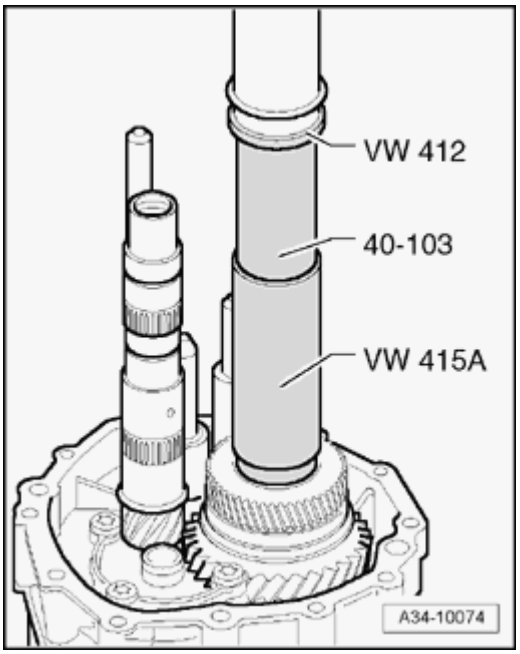


Fig. 284: Pressing On 3rd Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on 3rd gear wheel.
- Installation position: machined side faces reverse gear synchronizing hub.
- Insert circlip for 3rd gear wheel.
- When replacing gear wheel or output shaft:

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Re-determine thickness of circlip for 3rd gear wheel:

- Determine thickest circlip that will just fit and install it. For Part No.

The following circlips are available:

Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	2.10

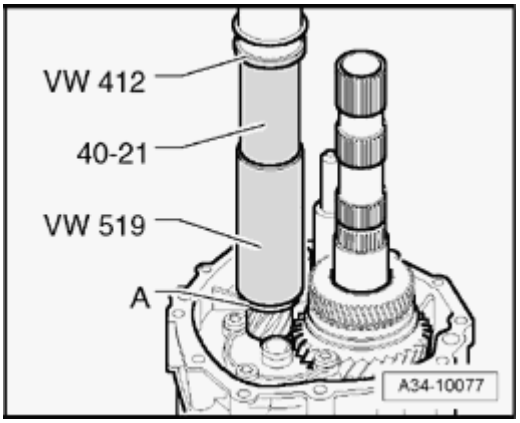


Fig. 285: Pressing On Thrust Washer For 3rd Speed Selector Gear Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on thrust washer - **A** - for 3rd speed selector gear until limit stop.

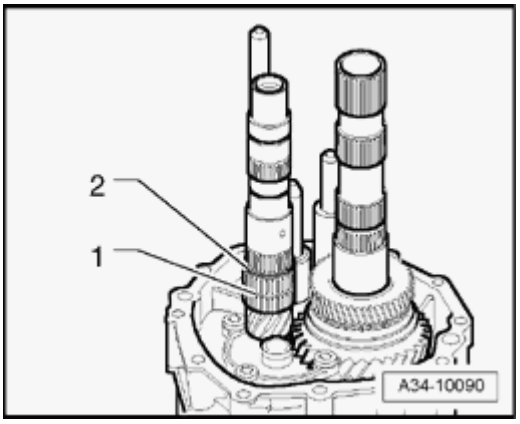


Fig. 286: Installing Needle Bearing For 3rd Speed Selector Gear And Circlip For 3rd Gear Needle Bearing Onto Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install needle bearing for 3rd speed selector gear - **1** - and circlip - **2** - for 3rd gear needle bearing onto input shaft.
- Install 3rd speed selector gear with spring and synchro-ring.

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- The lugs on synchro-ring should engage into recesses in selector gear.

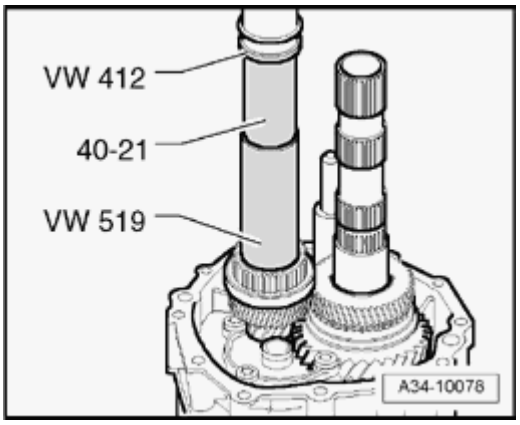


Fig. 287: Pressing On Heated Synchronizing Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on heated synchronizing hub for 3rd and 4th gear

- Installation position: high inside collar faces 3rd speed selector gear.

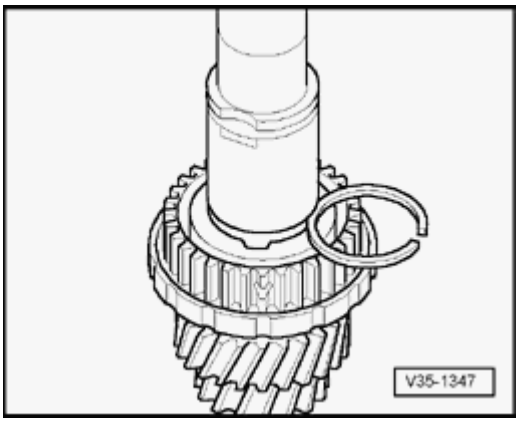


Fig. 288: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert circlip for synchronizing hub for 3rd and 4th gear.

- When replacing synchronizing hub or input shaft:

Re-determine thickness of circlip for synchronizing hub for 3rd and 4th gear:

- Determine thickest circlip that will just fit and install it. For Part No.

The following circlips are available:

Circlip thickness (mm)		

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1.90	1.96	2.02
1.93	1.99	2.05

- Check axial clearance of 3rd speed selector gear.

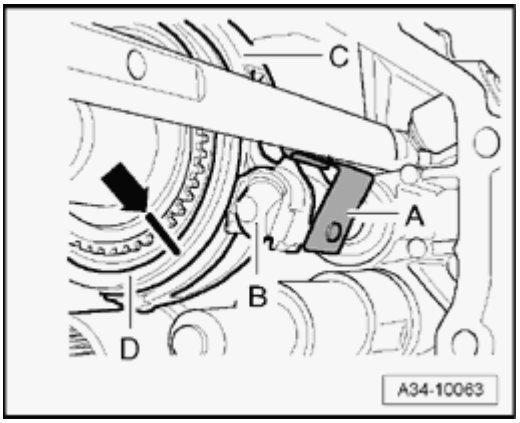


Fig. 289: Pulling Pin With Clip Securing Selector Fork For 3rd And 4th Gear Out From Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide selector fork for 3rd and 4th gear - **C** - together with locking collar - **D** - onto selector rod - **B** - and synchronizing hub for 3rd and 4th gear.

- The markings on locking collar and synchronizing hub - **arrow** - must coincide.

- If the holes of selector fork and selector rod coincide, clip in pin with clip - **A** -.

NOTE:

- **Do not insert pin with clip for 5th/6th gear selector fork (diameter 6 mm) into selector fork for 3rd and 4th gear.**

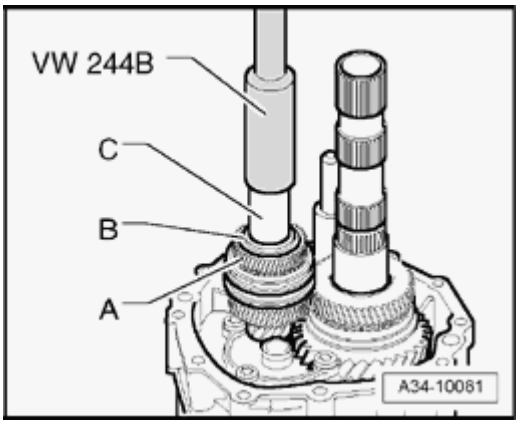


Fig. 290: Installing 4th Speed Selector Gear With Spring, Synchro-Ring, Needle Bearing And Thrust Washer For 3rd And 4th Gear And Pressing On Heated Inner Race For Needle Bearing For 5th Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Install 4th speed selector gear - **A** - with spring, synchro-ring, needle bearing and thrust washer for 3rd and 4th gear - **B** -.
- Press on heated inner race - **C** - for needle bearing for 5th speed selector gear.
- Check axial clearance of 4th speed selector gear.

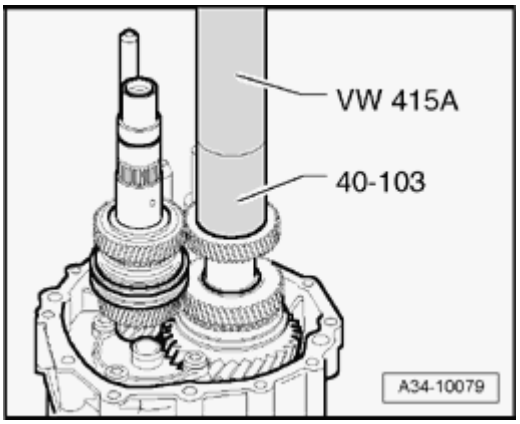


Fig. 291: Pressing On 4th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 4th gear wheel and press on.

- Installation position: high inside collar faces 5th gear wheel.

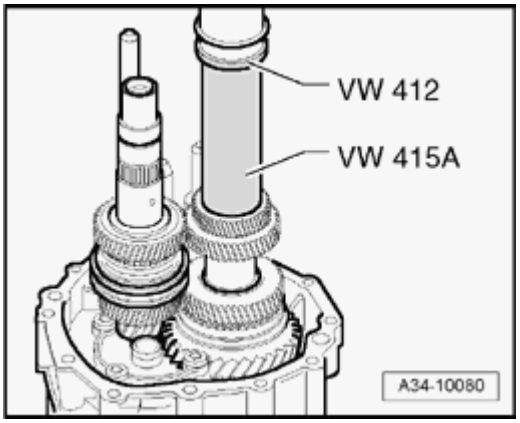


Fig. 292: Pressing On 5th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 5th gear wheel and press on.

- Installation position: high inside collar faces 4th gear wheel.

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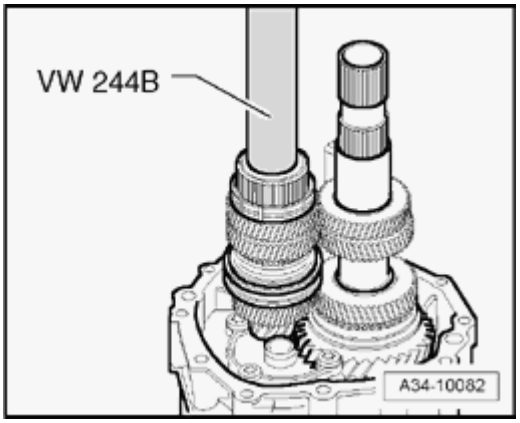


Fig. 293: Pressing On Heated Synchronizing Hub For 5th And 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place 5th speed selector gear with spring, synchro-ring and needle bearing onto input shaft.
- The lugs on synchro-ring should engage into recesses in selector gear.
- Install and press on heated synchronizing hub for 5th and 6th gear.
- Check axial clearance of 5th speed selector gear.

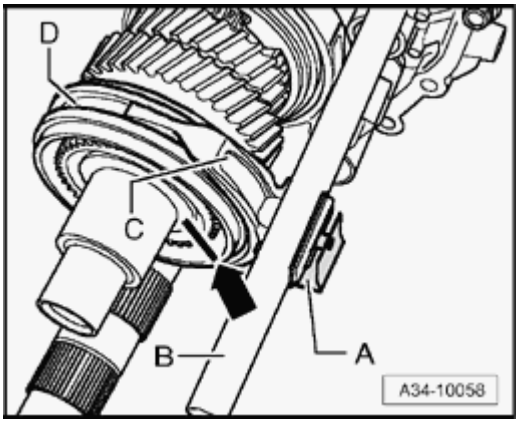


Fig. 294: Identifying Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide selector fork for 5th and 6th gear - **C** - together with locking collar - **D** - onto synchronizing hub for 5th and 6th gear.
- The markings on locking collar and synchronizing hub - **arrow** - must coincide.
- Move selector fork for 5th and 6th gear - **C** - into selector rod - **B** -.
- If holes of selector fork and selector rod coincide, clip in pin with clip - **A** -.

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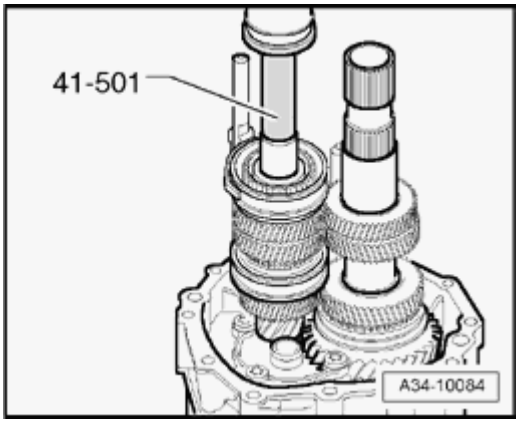


Fig. 295: Pressing On Heated Inner Race For Needle Bearing For 5th Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on heated inner race for needle bearing for 5th speed selector gear.

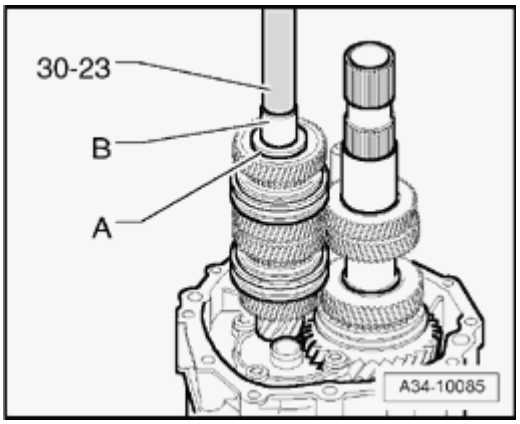


Fig. 296: Pressing On 6th Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install 6th speed selector gear with spring, synchro-ring, needle bearing and thrust washer for 6th gear - **A** -.
- Heat inner race - **B** - for needle roller bearing and press on.
- Check axial clearance of 6th speed selector gear.

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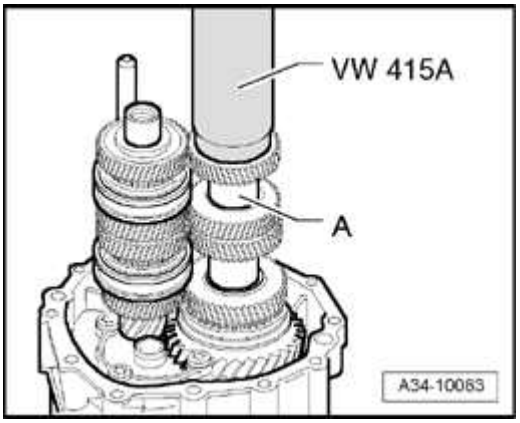


Fig. 297: Pressing On 6th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install spacer sleeve - **A** - onto output shaft.
- Heat 6th gear wheel and press on.

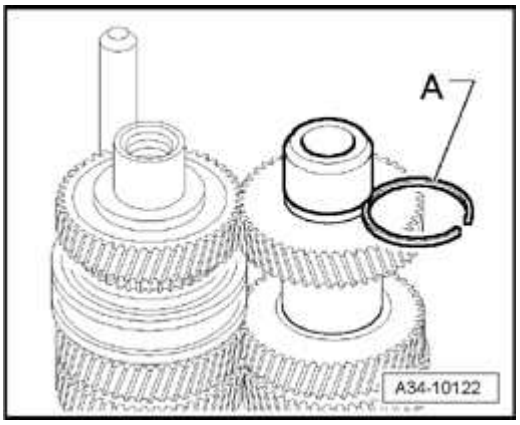


Fig. 298: Identifying 6th Gear Wheel Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Insert circlip - **A** - for 6th gear wheel.

- When replacing gear wheel or output shaft:

Re-determine circlip - **A** - for 6th gear wheel:

- Determine thickest circlip that will just fit and install it. For Part No.

The following circlips are available:

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17

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1.96	2.08	2.20
1.99	2.11	

- Remove bearing housing from holding plate T40088/1.

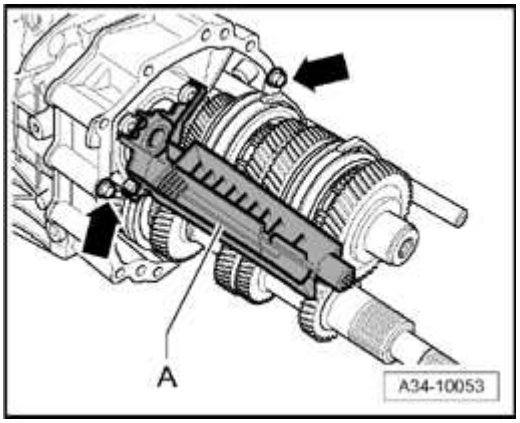


Fig. 299: Bearing Housing Secured To Transmission Housing With Two Bolts M8 And Washers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure bearing housing to transmission housing with two bolts M8 (length approx. 70 mm) - **arrows** - and washers.
- Tighten these 2 bolts - **arrows** - to max. 5 Nm.

NOTE:

- **Do not install oil collector - A - at this stage.**

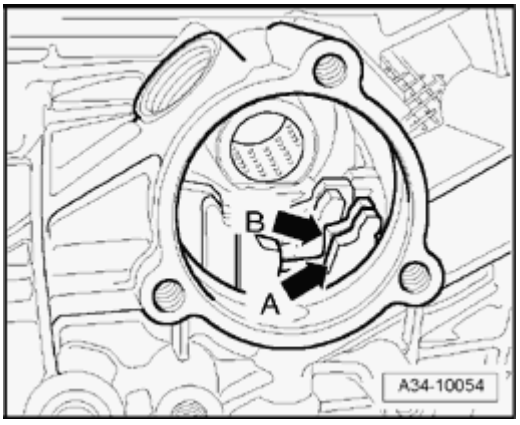


Fig. 300: Locating Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Move two selector rods - **arrow A** - and - **arrow B** - to lock input shaft by selecting two gears (e.g. reverse gear and 1st gear).

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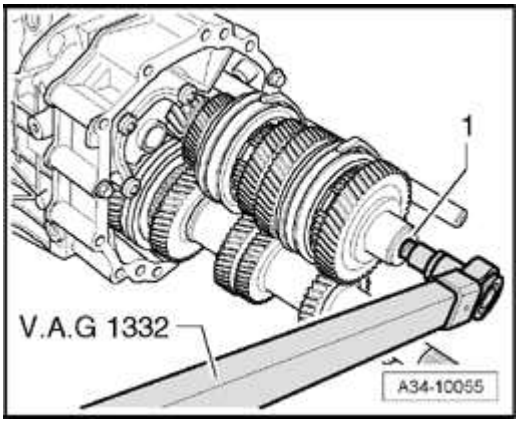


Fig. 301: Removing/Installing Multi-Point Socket Head Bolt For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten multi-point socket head bolt - **1** - for input shaft to 150 Nm.
- Remove complete bearing housing from transmission housing.
- Check if the 2 dowel sleeves are installed between transmission housing and bearing housing.
- Apply **sealing paste AMV 188 001 01** evenly and not too thickly onto contact surfaces between transmission housing and bearing housing.
- Install bearing housing onto transmission housing.

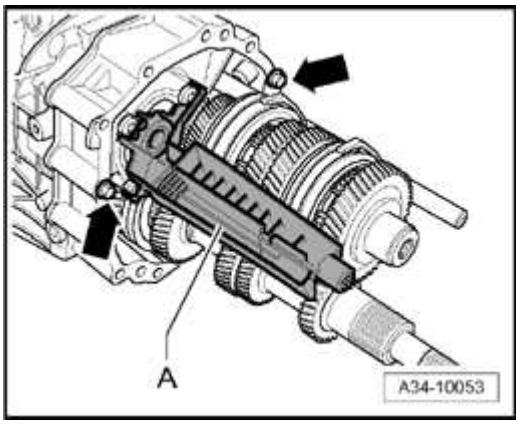


Fig. 302: Bearing Housing Secured To Transmission Housing With Two Bolts M8 And Washers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clip oil collector - **A** - into reverse shaft support.

NOTE:

- **Make sure that the bolts - arrows - are removed.**

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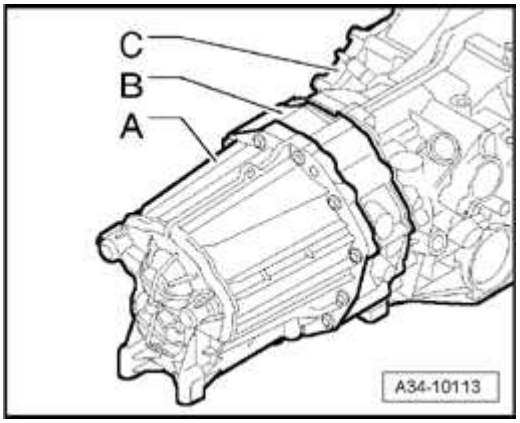


Fig. 303: Transmission Cover, Bearing Housing And Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check if the 2 dowel sleeves are installed between bearing housing - **B** - and transmission cover - **A** -.
- Apply **sealing paste AMV 188 001 02** evenly and not too thickly onto contact surfaces between bearing housing and transmission cover.
- Insert securing bolts for transmission cover - **A** - and bearing housing - **B** - to transmission housing - **C** -.

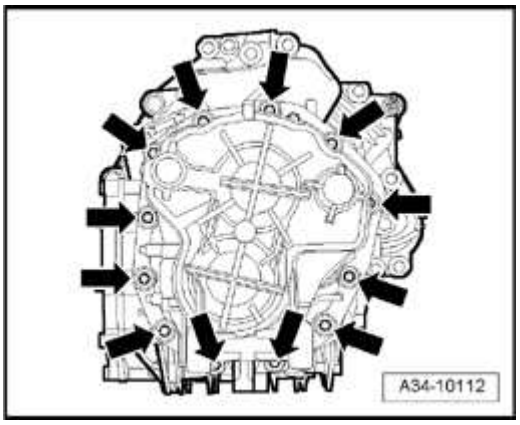


Fig. 304: Transmission Cover Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts - **arrows** - to 35Nmplus an additional 90° $^{1}/_{4}$ turn.

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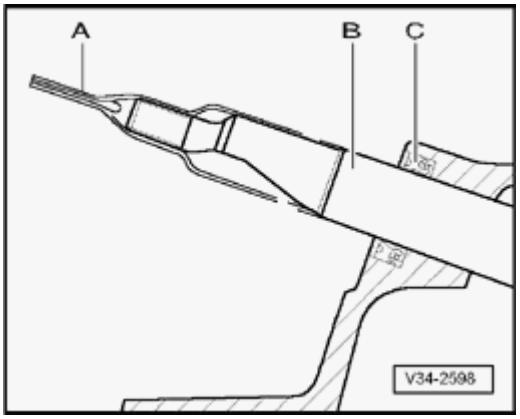


Fig. 305: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push **assembly sleeve 01E311120** - **A** - onto selector shaft - **B** -.

NOTE:

- **To avoid damaging the oil seal - C - , the oil seal and selector shaft must only be installed using assembly sleeve 01E311120 - A -.**

- Move selector rods to neutral.
- Install complete selector shaft.

- Installation position: Chamfer of selector shaft points downward.

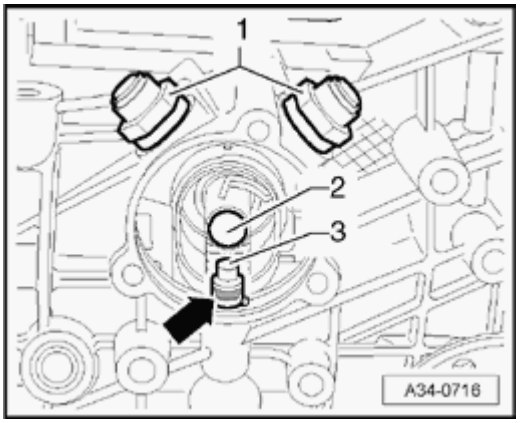


Fig. 306: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously inserting pin - **3** -.

- Installation position for pin - **3** - : The groove - **arrow** - on pin points toward selector shaft cover.

- Clean threads of locking bolts - **1** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 45 Nm.

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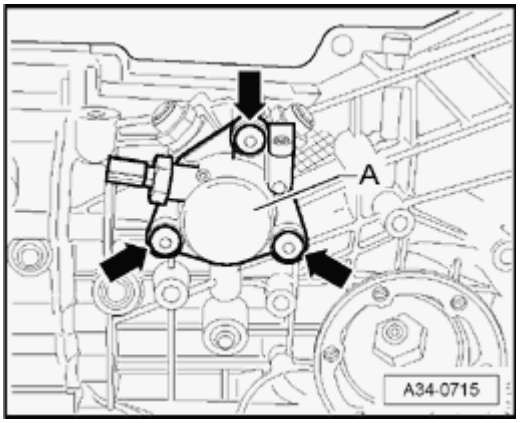


Fig. 307: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install cover - **A** - with new O-ring.
- Clean threads of bolts - **arrows** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 24 Nm.

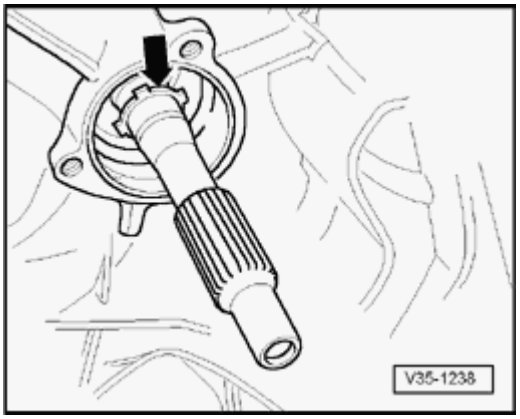


Fig. 308: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install rear circlip - **arrow** - for input shaft ball bearing.
- Then push ball bearing onto input shaft.

Installation position:

The sealed side of ball cage faces transmission housing.

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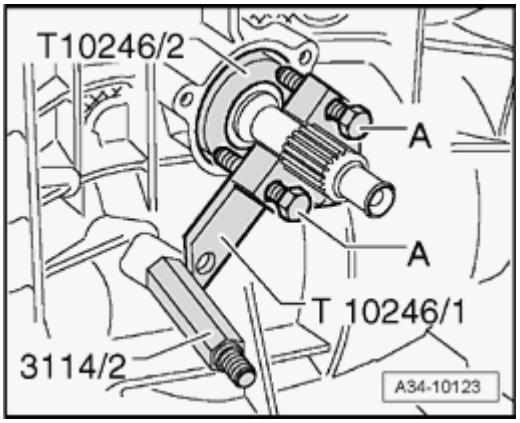


Fig. 309: Pressing In Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing in ball bearing:

First screw door hinge alignment tool (M8 and M10) 3114/2 into tapped hole for ball head stud.

Slide thrust plate T10246/2 onto input shaft.

Position fitting tool T10246/1 behind splines for clutch plate. Tighten bolts - **A** - only slightly. The bolts locate in recesses in the thrust plate T10246/2.

Press in ball bearing onto stop by tightening bolts alternately (1/2 turn at a time).

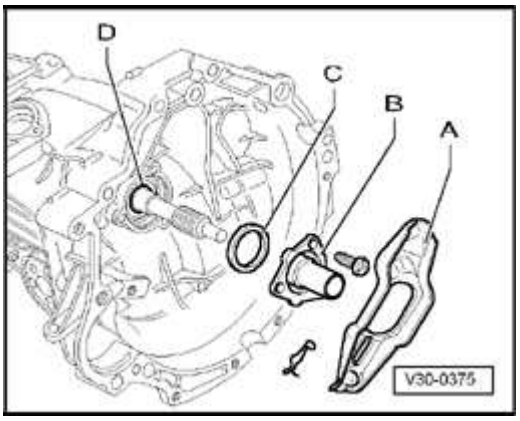


Fig. 310: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install front circlip - **D** - for input shaft ball bearing.
- Install dished spring - **C** -.

Installation position:

The curved side faces guide sleeve - **B** -.

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- Install a shrink hose onto input shaft splines.
- Install guide sleeve - **B** - for release bearing.
- Remove shrink hose.
- Install clutch release lever - **A** - with release bearing.

- Select all gears.

TRANSMISSION COVER, SERVICING

Transmission cover, servicing

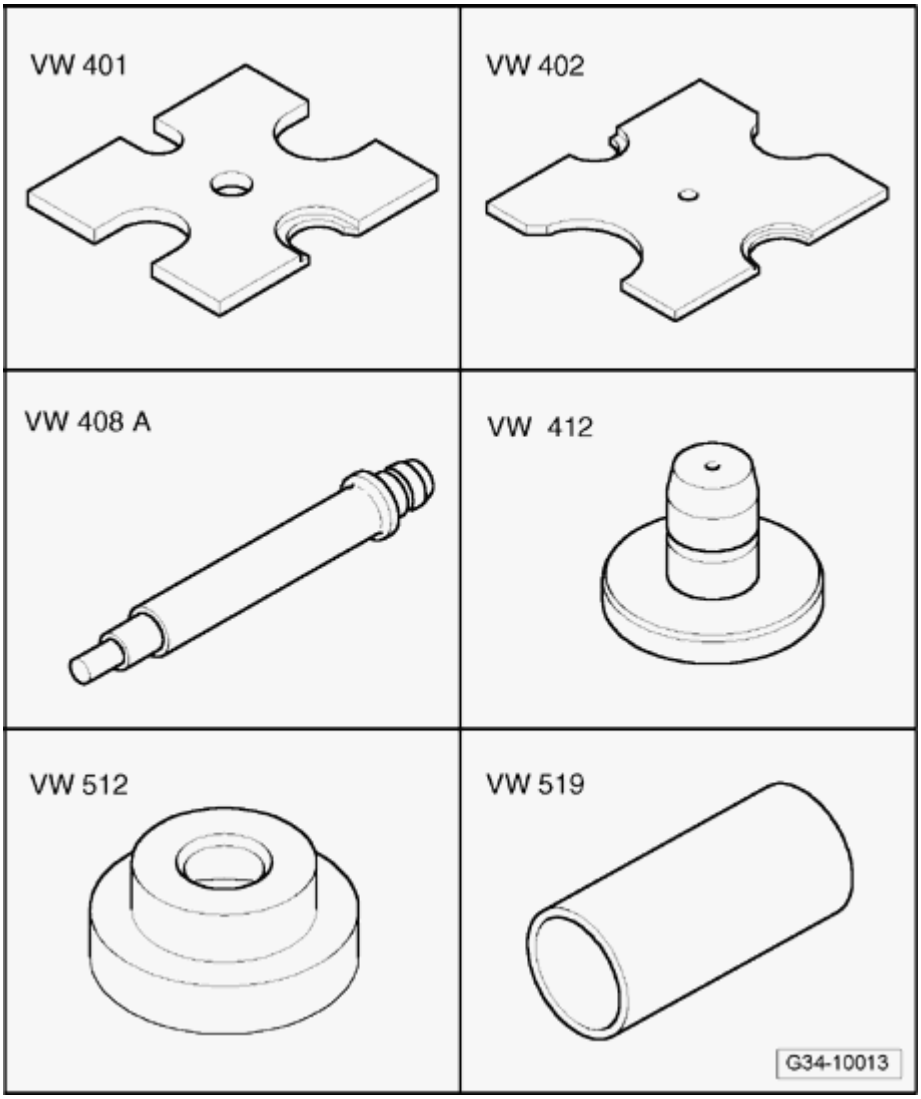


Fig. 311: Identifying Special Tools - Transmission Cover, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

- Thrust pad VW 512
- Sleeve VW 519

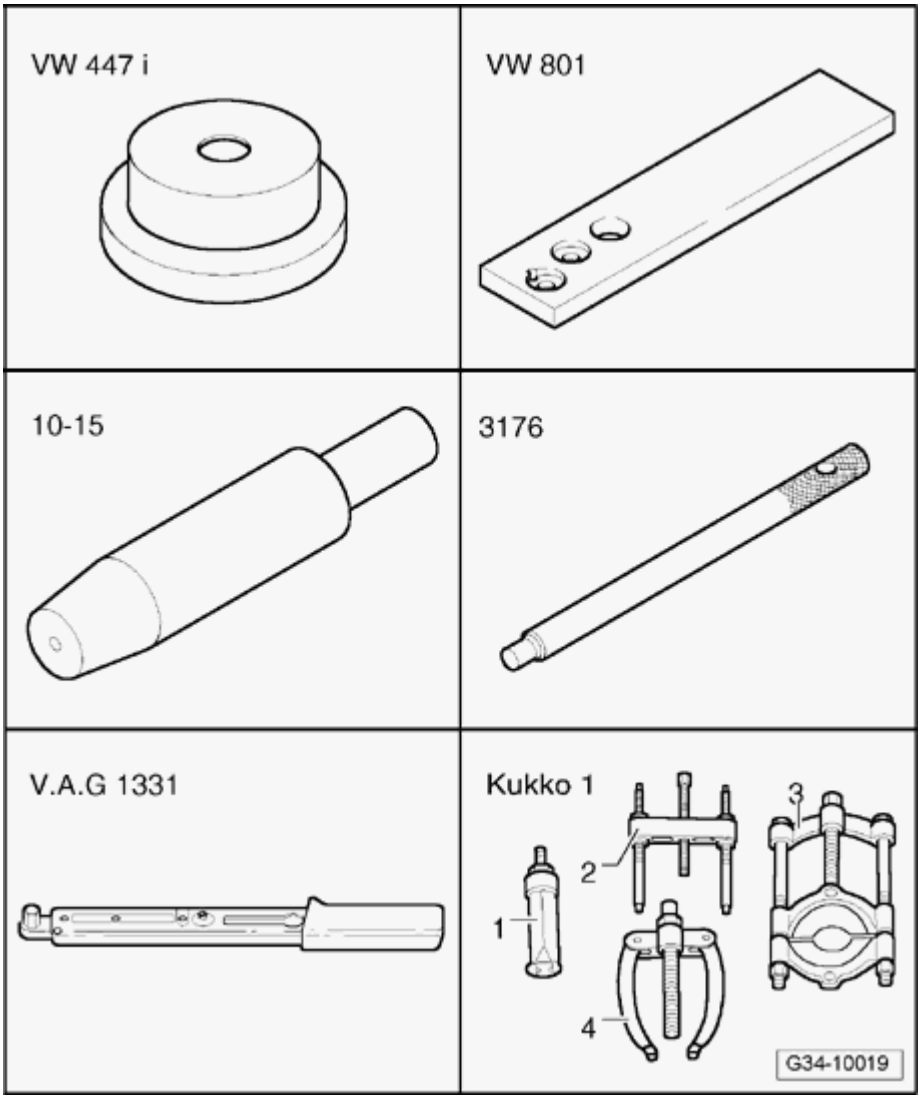


Fig. 312: Identifying Special Tools - Transmission Cover, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust pad VW 447 i
- Holding fixture VW 801

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- Guide pin 10 - 15
- Centering mandrel 3176

- Torque wrench V.A.G 1331
- - **1** - internal puller Kukko 21/2
- - **1** - Internal puller Kukko 21/5
- - **1** - Internal puller Kukko 21/6

- - **4** - Counter-support Kukko 22/2

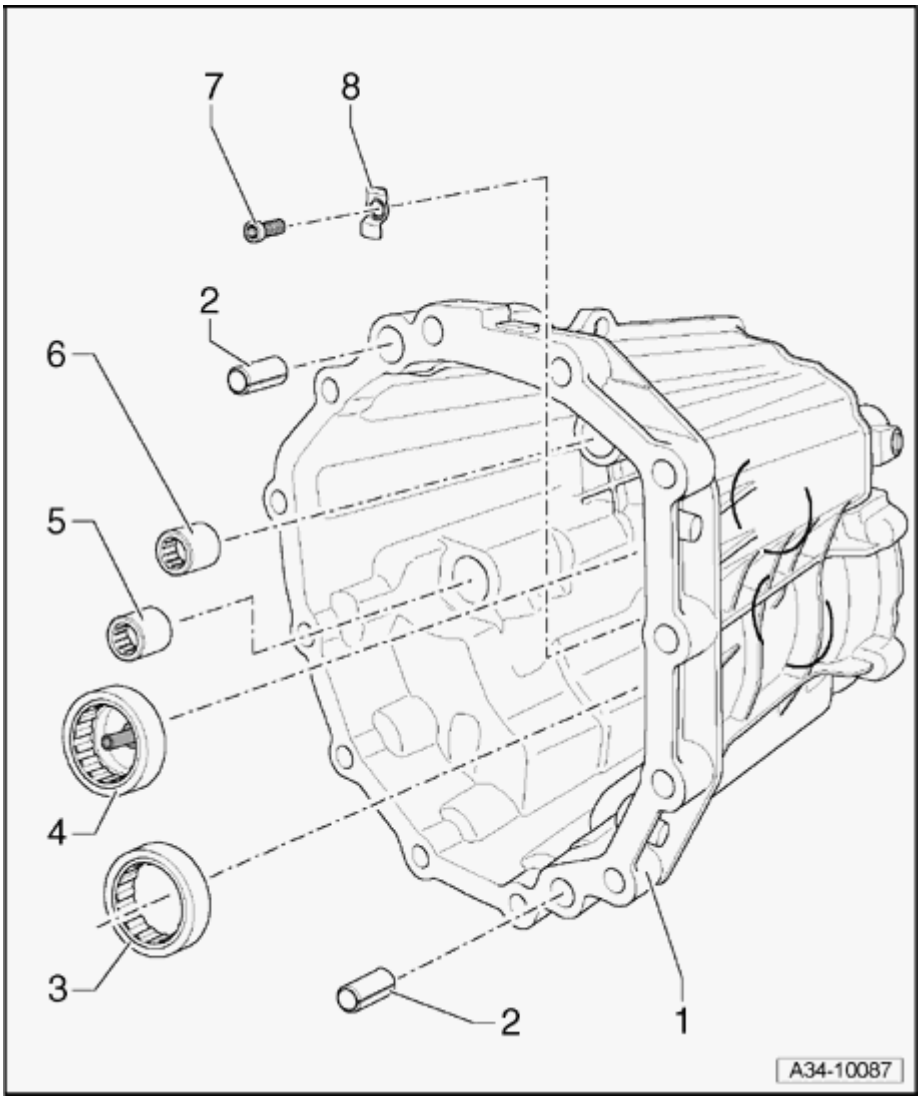


Fig. 313: Transmission Cover Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission cover

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2 - Dowel sleeve

- 2 x
- For centralizing transmission cover on bearing housing
- Drive out and in with drift 3121

3 - Roller bearing

- Bearing for output shaft in transmission cover
- Always replace
- Pulling out **Pulling roller bearing for output shaft out of transmission cover**
- Pressing in **Pressing new roller bearing for output shaft into transmission cover as far as the stop (press in carefully)**

4 - Roller bearing

- Bearing for input shaft in transmission cover
- With lubricating unit
- Always replace
- Pulling out **Pulling roller bearing for input shaft out of transmission cover**
- Pressing in **Pressing new roller bearing for input shaft into transmission cover as far as stop (press in carefully)**

5 - Ball sleeve

- For selector rod for 1st and 2nd gear
- Pulling out **Pulling out ball sleeve - C - from transmission cover**
- Driving in **Driving ball sleeve into transmission cover until flush**

6 - Ball sleeve

- For selector rod for 5th and 6th gear
- Pulling out **Pulling out ball sleeve - C - from transmission cover**
- Driving in **Driving ball sleeve into transmission cover until flush**

7 - Multi-point socket head bolt, 24Nm

8 - Retaining plate

- Installation position **Securing needle roller bearing and needle bearing in transmission cover.**

Pulling roller bearing for output shaft out of transmission cover

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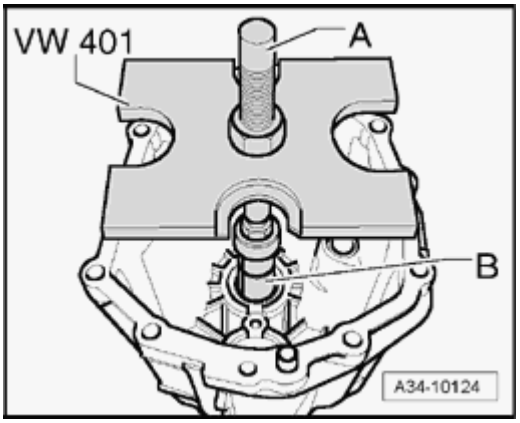


Fig. 314: Pulling Roller Bearing For Output Shaft Out Of Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Internal puller 37... 46 mm, e.g. Kukko 21/6

NOTE:

- **Always replace needle roller bearing after pulling out.**

Pressing new roller bearing for output shaft into transmission cover as far as the stop (press in carefully)

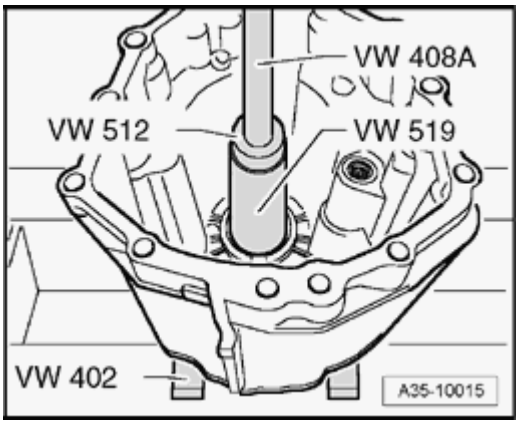


Fig. 315: Pressing New Roller Bearing For Output Shaft Into Transmission Cover As Far As The Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Support transmission cover with thrust plate VW 447 i directly below bearing mounting.

Pulling out ball sleeve - C - from transmission cover

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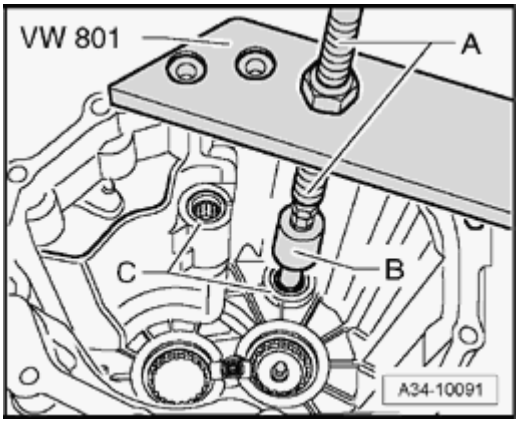


Fig. 316: Pulling Out Ball Sleeve From Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving ball sleeve into transmission cover until flush

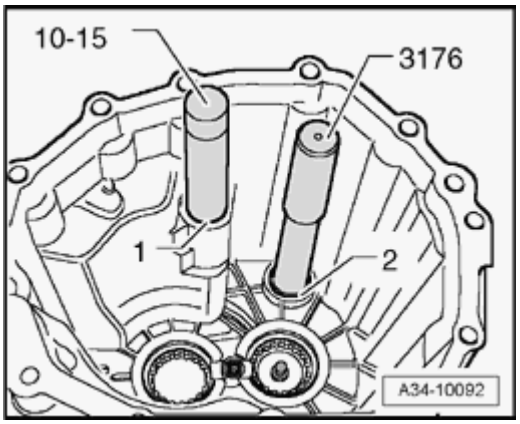


Fig. 317: Driving Ball Sleeve Into Transmission Cover Until Flush
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve - **1** - and - **2** - so that side with lettering (thicker metal) faces guide pin 10 - 15 or centering mandrel 3176.

NOTE:

- **Due to the housing depth use centering mandrel 3176 for driving in ball sleeve - 2 -.**

Pulling roller bearing for input shaft out of transmission cover

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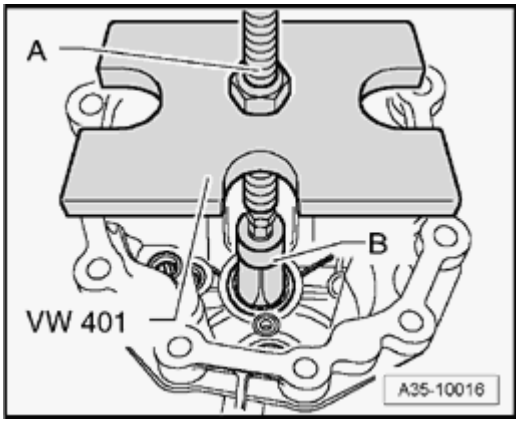


Fig. 318: Pulling Roller Bearing For Input Shaft Out Of Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Shorten (cut off) lubricating unit in needle roller bearing in order to insert internal puller - **B** -.

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

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

NOTE:

- **Always replace needle roller bearing after pulling out.**

Pressing new roller bearing for input shaft into transmission cover as far as stop (press in carefully)

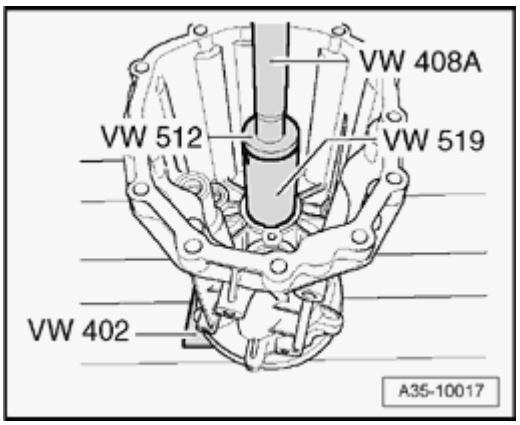


Fig. 319: Pressing New Roller Bearing For Input Shaft Into Transmission Cover As Far As Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Support transmission cover with thrust plate VW 447 i directly below bearing mounting.

Securing needle roller bearing and needle bearing in transmission cover.

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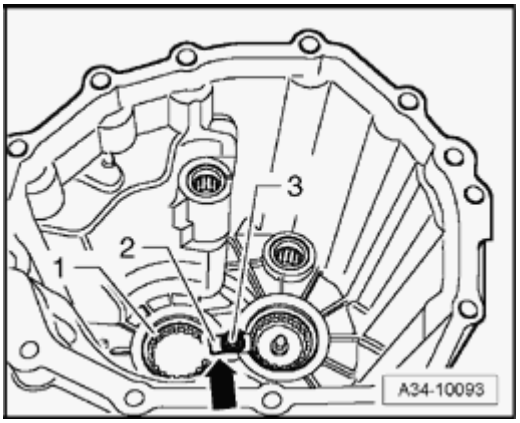


Fig. 320: Securing Needle Roller Bearing And Needle Bearing In Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert retaining plate - **2** - with high shoulder - **arrow** - facing needle bearing - **1** - into transmission cover.
- Tighten hex socket head bolt - **3** - to 24 Nm.

BEARING HOUSING, SERVICING

Bearing housing, servicing

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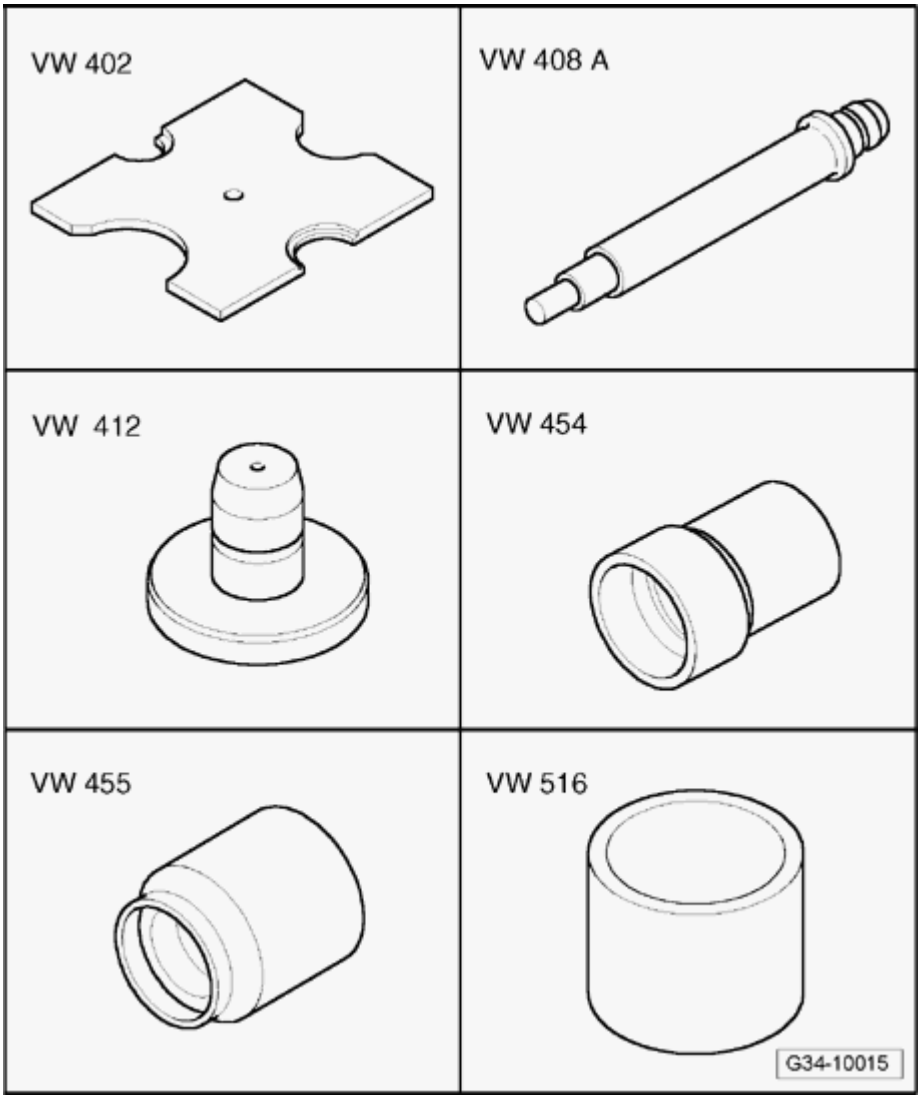


Fig. 321: Identifying Special Tools - Bearing Housing, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 402
- Press tool VW 408 A
- Thrust disc VW 412
- Thrust tube VW 454

- Installing sleeve VW 455
- Tube 42 mm dia. VW 516

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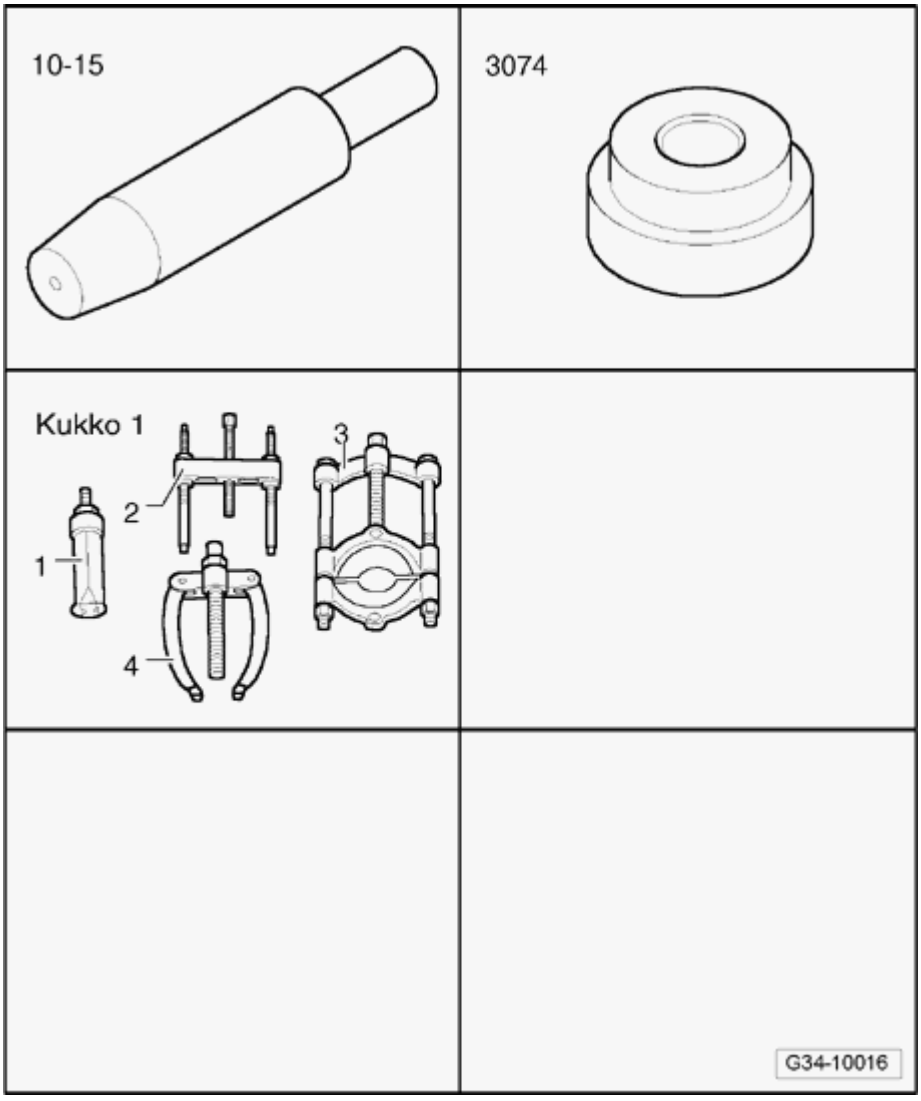


Fig. 322: Identifying Special Tools - Bearing Housing, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Guide pin 10 - 15
- Thrust pad 3074
- **- 1 -** Internal puller Kukko 21/2
- **- 4 -** Counter-support Kukko 22/1
- Drift T40085

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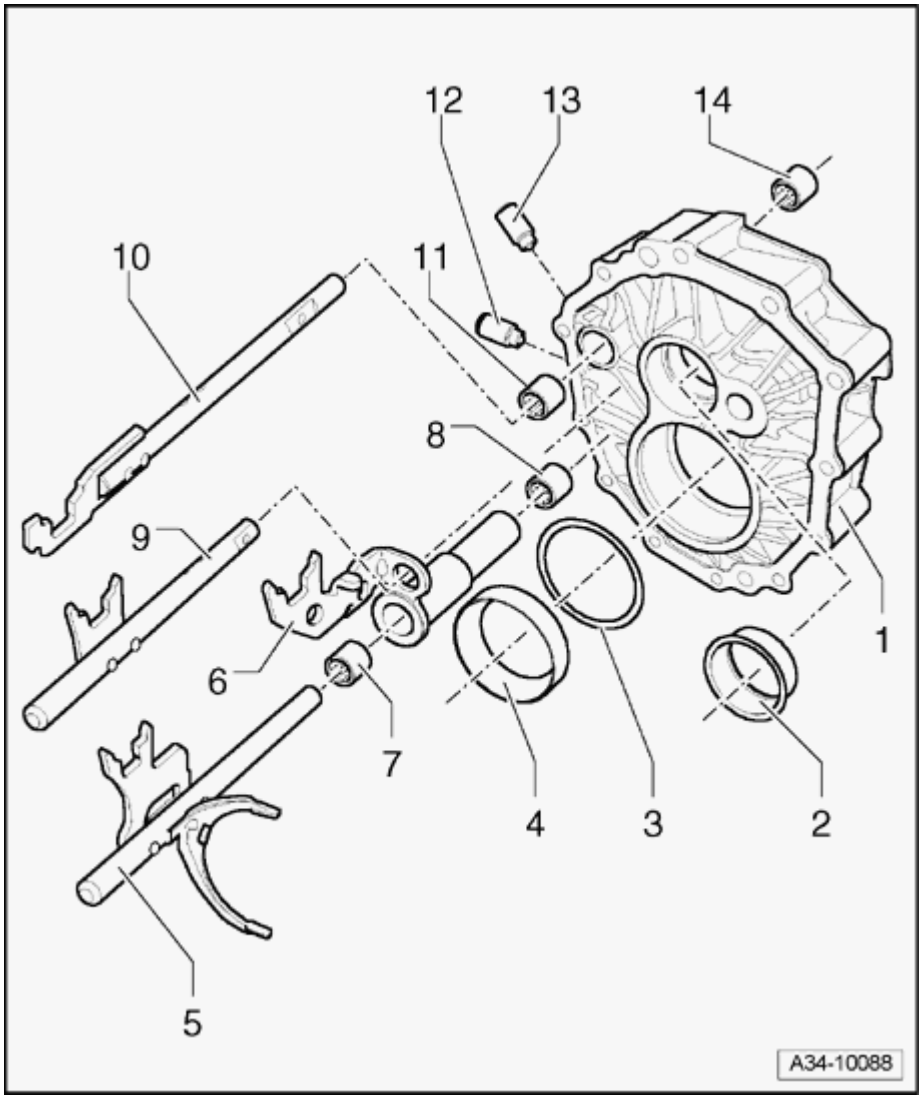


Fig. 323: Bearing Housing Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

- Re-determine shim "S_4 " when replacing --> **Re-determining shim "S4" when replacing bearing housing**

2 - Outer race

- For needle roller bearing on input shaft
- Driving out **Driving outer race for needle roller bearing out of bearing housing**
- Pressing in **Pressing outer race for needle roller bearing into bearing housing until limit stop**

3 - Shim "S_4 "

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- Table of adjustments --> **Table of adjustments**
- Re-determine when replacing bearing housing --> **Re-determining shim "S4" when replacing bearing housing**

4 - Tapered roller bearing outer race

- For output shaft

5 - Selector rod for 1st and 2nd gear

- Only replace together with selector fork for 1st and 2nd gear (secured together by means of a pin)

6 - Reverse gear selector rod

7 - Ball sleeve

- (Front) for reverse gear selector rod
- Pulling out **Pulling front ball sleeve out of reverse gear selector rod**
- Pressing in **Pressing front ball sleeve into reverse gear selector rod until limit stop.**

8 - Ball sleeve

- (Rear) for reverse gear selector rod
- Pulling out **Pulling out rear ball sleeve for reverse gear selector rod**
- Pressing in **Pressing in rear ball sleeve - A - for reverse gear selector rod**

9 - Selector rod for 3rd and 4th gear

10 - Selector rod for 5th and 6th gear

- Remove burrs and scoring after removing from bearing housing

11 - Ball sleeve

- For selector rod for 5th and 6th gear
- Pull out with internal puller Kukko 21/2
- Drive in until flush using guide pin 10 - 15

12 - Locking bushing

- For selector rod for 3rd and 4th gear
- Removing and installing **Removing and installing locking bushing for selector rod**

13 - Locking bushing

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- For selector rod for 5th and 6th gear
- Removing and installing **Removing and installing locking bushing for selector rod**

14 - Ball sleeve

- For selector rod for 3rd and 4th gear
- Pull out with internal puller Kukko 21/2
- Driving in **Driving in ball sleeve for selector rod for 3rd and 4th gear**

Driving outer race for needle roller bearing out of bearing housing

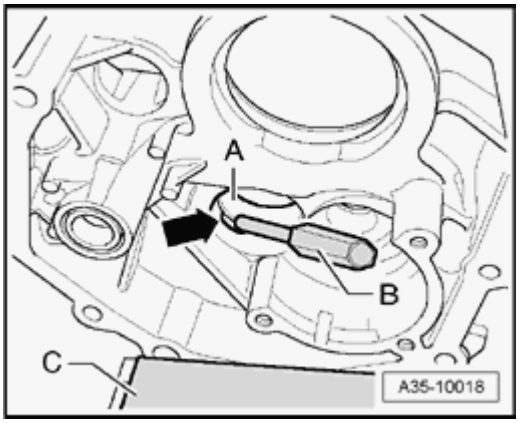


Fig. 324: Driving Outer Race For Needle Roller Bearing Out Of Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp bearing housing in vise, using jaw protectors - **C** -.
- Drive out outer race - **A** - using drift - **B** - by alternately applying drift to bearing housing recesses located opposite to each other - **arrow** -.

Pressing outer race for needle roller bearing into bearing housing until limit stop

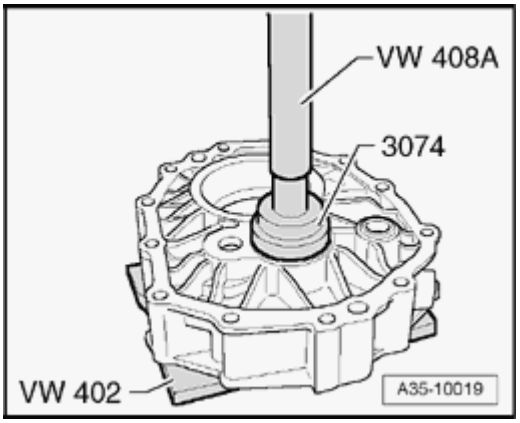


Fig. 325: Pressing Outer Race For Needle Roller Bearing Into Bearing Housing Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Pulling front ball sleeve out of reverse gear selector rod

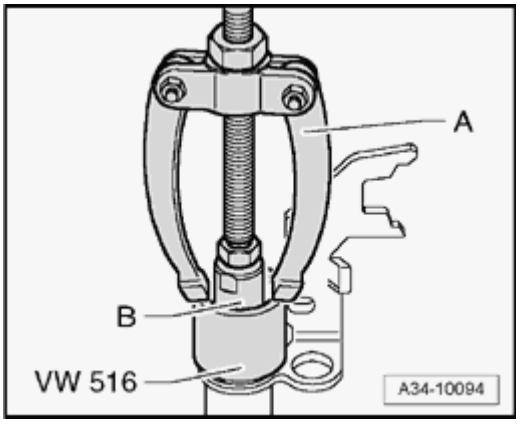


Fig. 326: Pulling Front Ball Sleeve Out Of Reverse Gear Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Pressing front ball sleeve into reverse gear selector rod until limit stop

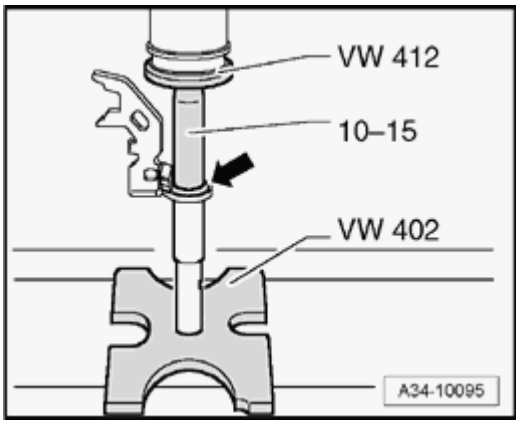


Fig. 327: Pressing Front Ball Sleeve Into Reverse Gear Selector Rod Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve - **arrow** - so that side with lettering (thicker metal) faces guide pin 10 - 15.

Pulling out rear ball sleeve for reverse gear selector rod

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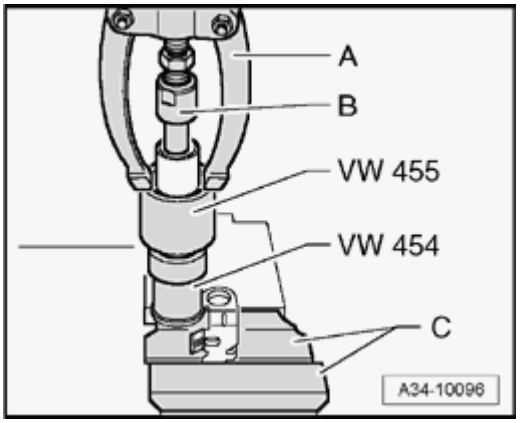


Fig. 328: Pulling Out Rear Ball Sleeve For Reverse Gear Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp actuating arm of selector rod in vise, using jaw protectors - **C** -.
- Install thrust tube VW 454 and installing sleeve VW 455 onto selector rod.

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

B - Internal puller 14.5... 18.5 mm, e.g. Kukko 21/2

Pressing in rear ball sleeve - A - for reverse gear selector rod

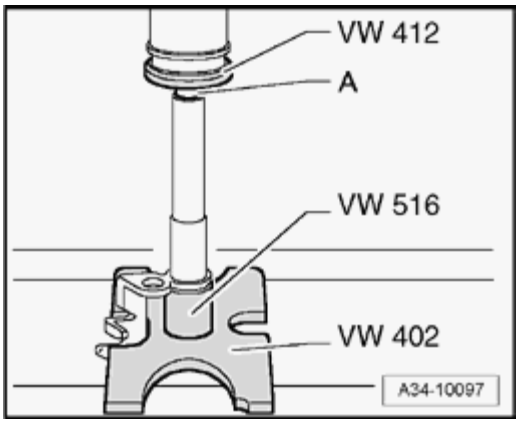


Fig. 329: Pressing In Rear Ball Sleeve For Reverse Gear Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving in ball sleeve for selector rod for 3rd and 4th gear

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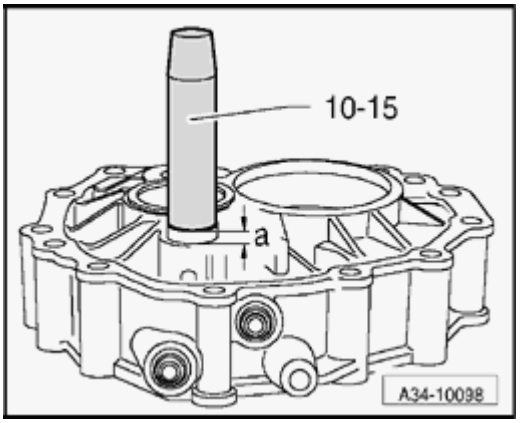


Fig. 330: Driving In Ball Sleeve For Selector Rod For 3Rd And 4Th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve so that side with lettering (thicker metal) faces guide pin 10 - 15.

- Dimension for pressing in - **a** - = 2.5 mm

Removing and installing locking bushing for selector rod

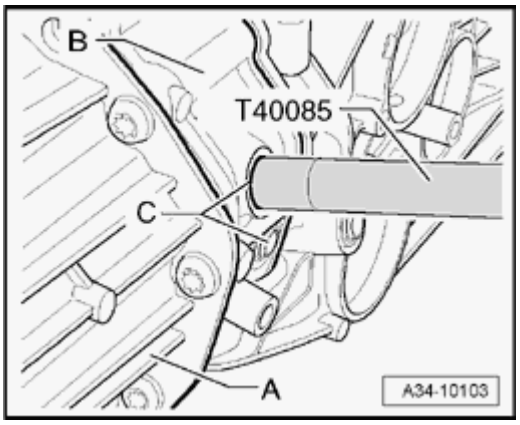


Fig. 331: Removing And Installing Locking Bushing For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove relevant selector rod (for 3rd and 4th gear or for 5th and 6th gear).
- Bolt bearing housing - **B** - with transmission cover - **A** - onto transmission housing prior to driving out and driving in the locking bushings - **C** -.

- Drive out old locking bushing inward into bearing housing.
- Drive in new locking bushing until flush.

TRANSMISSION HOUSING, SERVICING

Transmission housing, servicing

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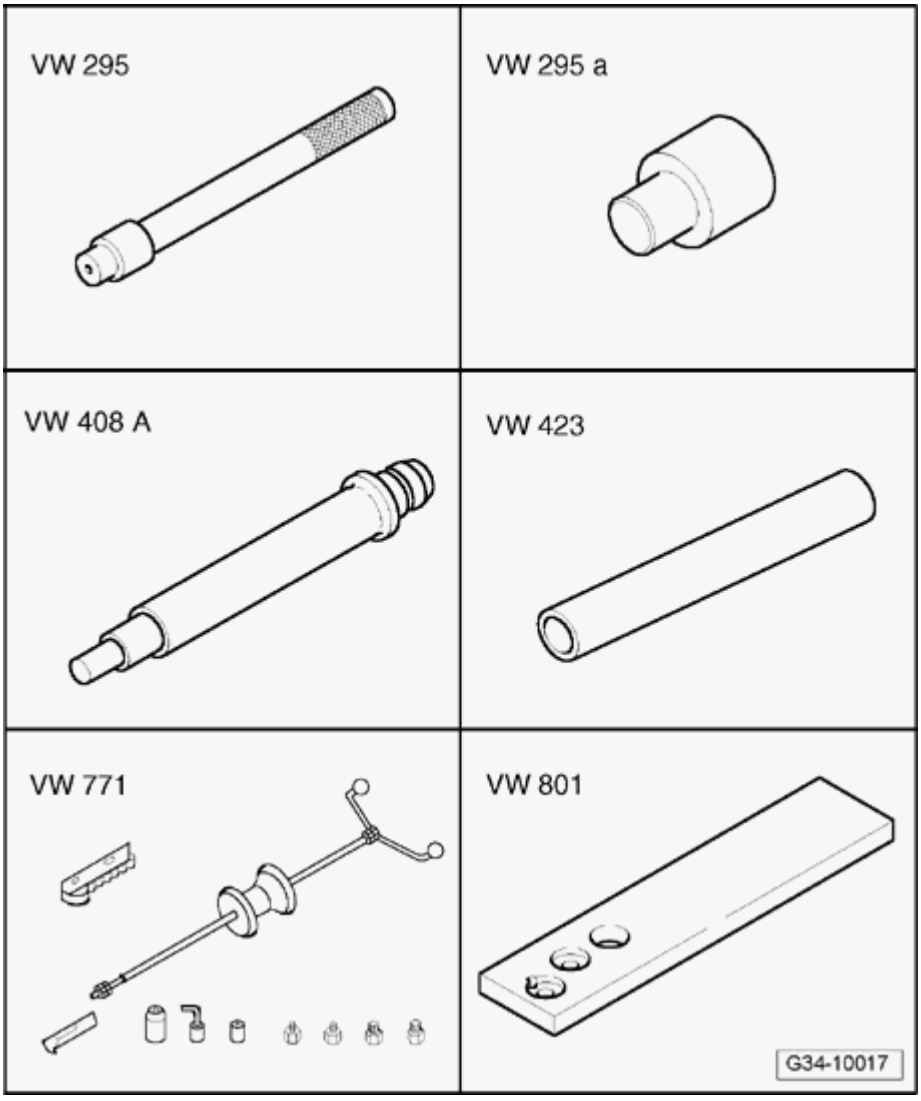


Fig. 332: Identifying Special Tools - Transmission Housing, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Needle bearing drift VW 295
- Needle bearing drift VW 295 A
- Press tool VW 408 A
- Tube VW 423

- Multi-purpose tool VW 771
- Support plate VW 801

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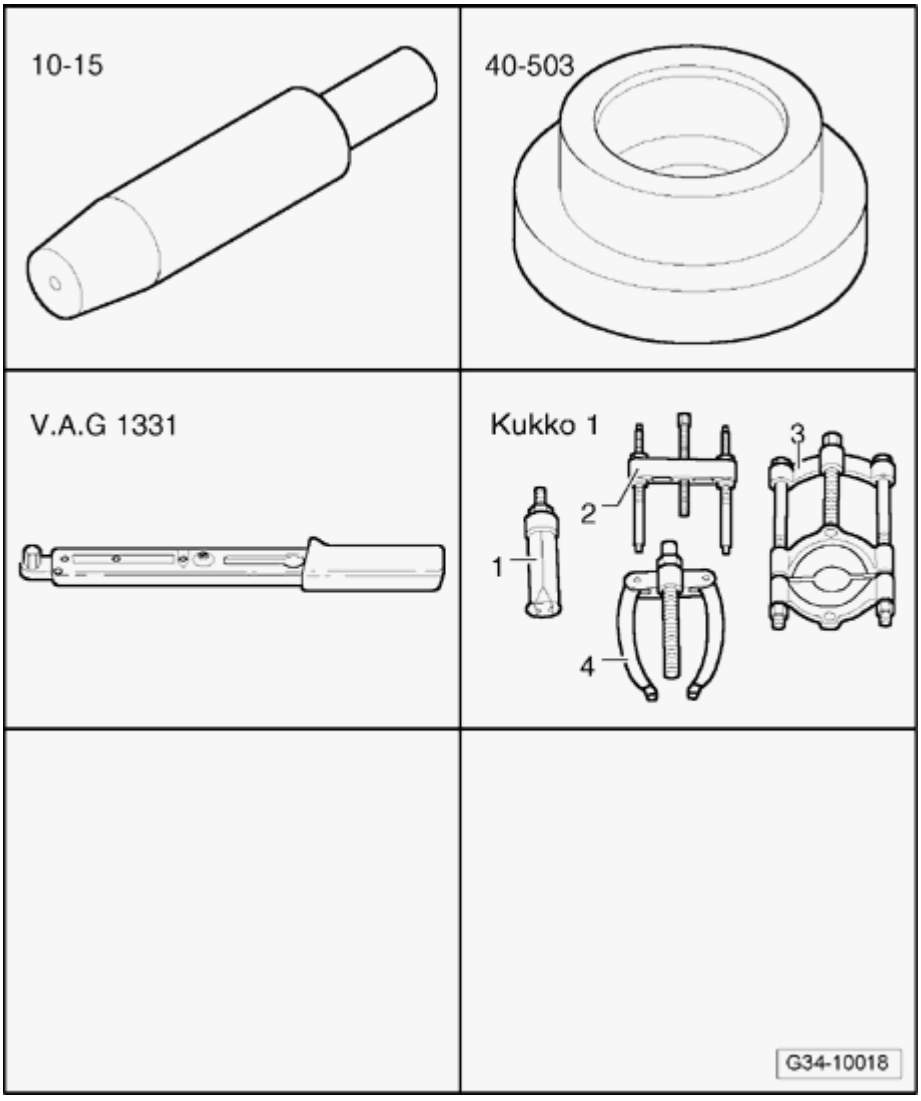


Fig. 333: Identifying Special Tools - Transmission Housing, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Guide pin 10 - 15
- Installing tool 40 - 503
- Torque wrench V.A.G 1331
- **- 1 -** Internal puller Kukko 21/2
- **- 4 -** Counter-support Kukko 22/2
- Drift T40085

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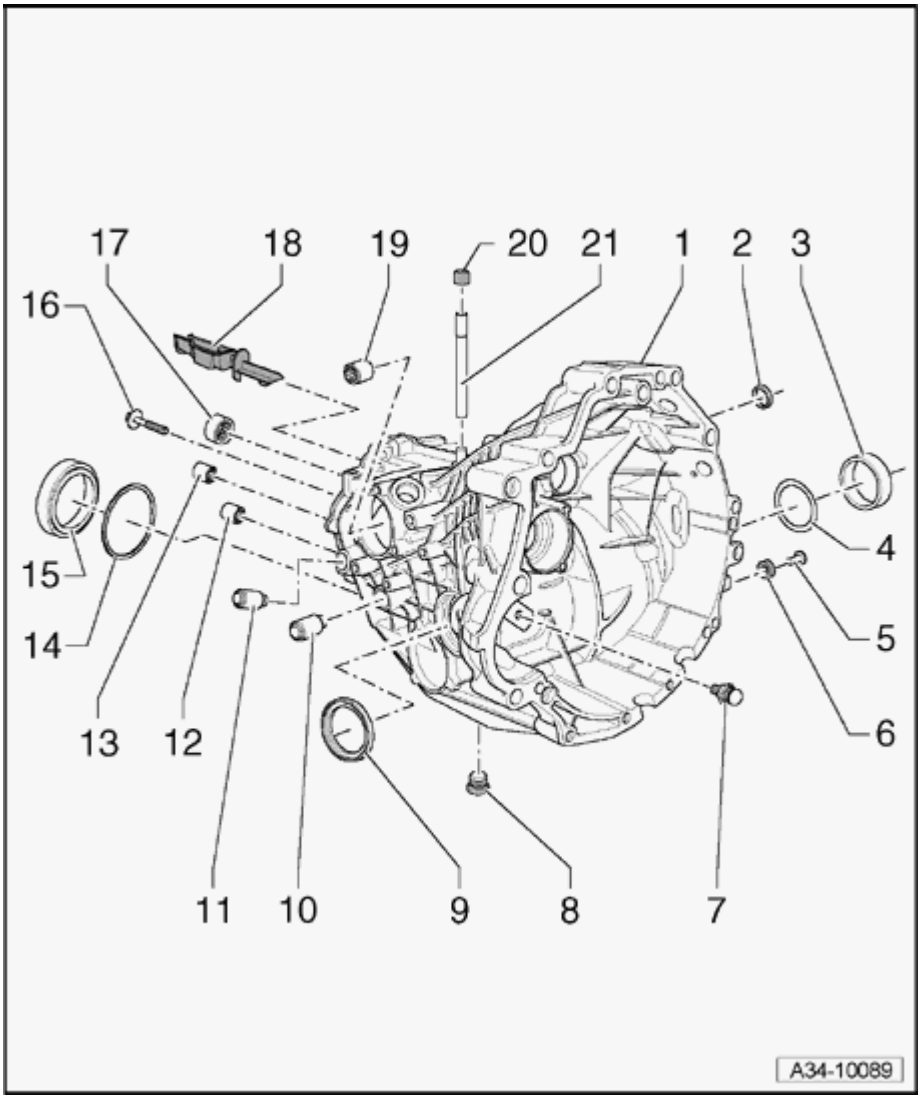


Fig. 334: Transmission Housing Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing

- When replacing: adjust input shaft --> **Input shaft, adjusting**, adjust output shaft and differential (final drive gear set) --> **Table of adjustments**

2 - Oil seal for selector shaft

- Replacing (with transmission removed) --> **Selector shaft oil seal, replacing with transmission removed (transmission remains assembled)**
- Replacing (with transmission installed) --> **Selector shaft oil seal, replacing with transmission installed**
- Always replace
- Pulling out **Pulling out oil seal for selector shaft with transmission disassembled**

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- Driving in **Driving in seal for selector shaft**
- Use assembly sleeve to install (selector shaft remains installed) --> **Selector shaft oil seal, replacing with transmission removed (transmission remains assembled)**

3 - Tapered roller bearing outer race (right-side)

- For differential
- If replaced: adjust differential (crown wheel) --> **Crown wheel, adjusting**

4 - Shim "S_2 "

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

5 - Bushing

- Drive in (for example, with press tool VW 408 A when replacing transmission

6 - Magnet

- Clean

7 - Ball head stud, 25 Nm

- Grease with **MoS2** grease

8 - Oil drain plug, 45 Nm

9 - Oil seal

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

10 - Locking bushing

- For selector rod for 1st and 2nd gear
- Removing and installing **Removing and installing locking bushing for selector rod**

11 - Locking bushing

- For reverse gear selector rod
- Removing and installing **Removing and installing locking bushing for selector rod**

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12 - Ball sleeve

- For selector rod for 1st and 2nd gear
- Pulling out **Pulling front ball sleeve out of reverse gear selector rod**
- Drive in until flush using guide pin 10 - 15

13 - Ball sleeve

- For selector rod for 3rd and 4th gear
- Pulling out **Pulling front ball sleeve out of reverse gear selector rod**
- Drive in until flush using guide pin 10 - 15

14 - Shim "S_3 "

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

15 - Tapered roller bearing outer race

- For output shaft

16 - Bolt, 24 Nm

17 - Needle bearing

- For input shaft
- Driving out **Driving out input shaft needle bearing from transmission housing**
- Driving in **Pressing in input shaft needle bearing until limit stop**

18 - Oil collector

- With magnet
- Installation position in transmission housing **Securing input shaft needle bearing**

19 - Ball sleeve

- For selector shaft
- Pulling out **Removing selector shaft ball sleeve**
- Driving in **Driving in ball sleeve for selector shaft**

20 - Cap

- For transmission breather

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21 - Breather pipe

- Drive in onto stop
- Clip in cap for transmission breather

Pulling out oil seal for selector shaft with transmission disassembled

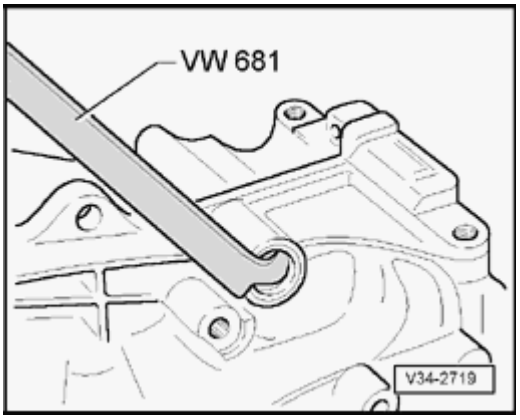


Fig. 335: Removing Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving in seal for selector shaft

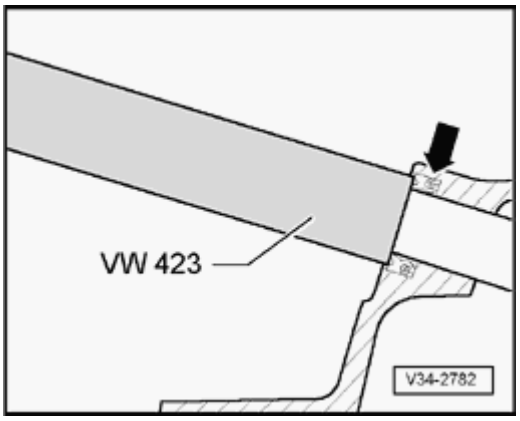


Fig. 336: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .
- Lightly oil outer circumference of seal.
- Drive oil seal - **arrow** - into housing as far as it will go.

Removing and installing locking bushing for selector rod

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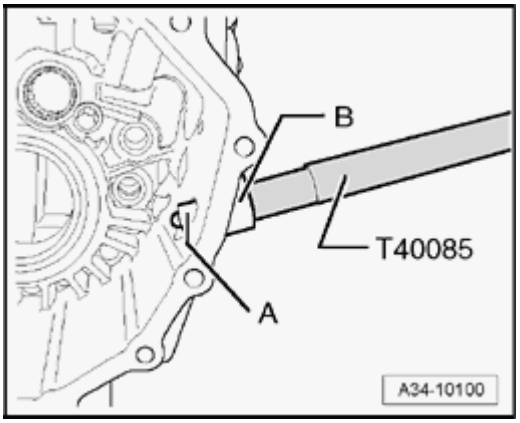


Fig. 337: Removing And Installing Locking Bushing For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive out used locking bushing - **A** - inward into transmission housing.
- Drive in new locking bushing into transmission housing - **B** - until flush.

Pulling out ball sleeve - C - from transmission housing.

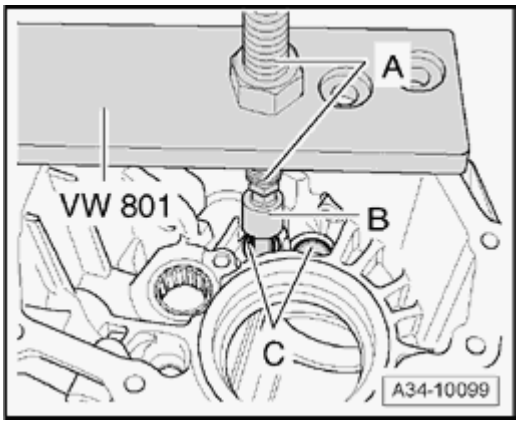


Fig. 338: Pulling Out Ball Sleeve From Transmission Housing.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Internal puller 14.5... 18.5 mm, e.g. Kukko 21/2

Driving out input shaft needle bearing from transmission housing

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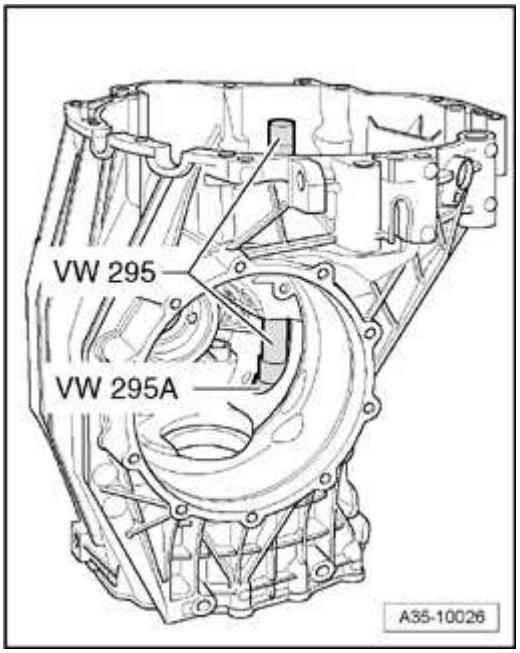


Fig. 339: Driving Out Input Shaft Needle Bearing From Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt for securing needle bearing **Securing input shaft needle bearing**.
- Install adapter VW 295 A with smaller outside diameter into needle bearing.
- Drive out needle bearing with drift VW 295.

Pressing in input shaft needle bearing until limit stop

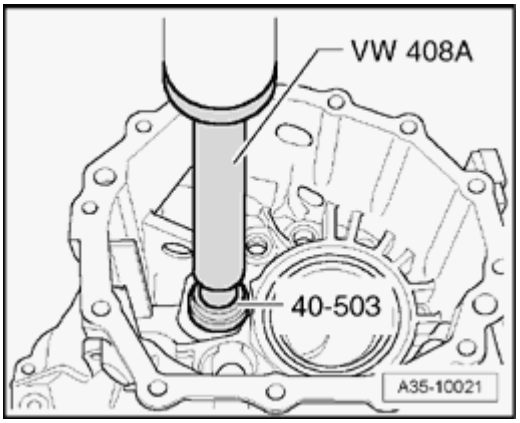


Fig. 340: Pressing In Input Shaft Needle Bearing Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure needle bearing after pressing in **Securing input shaft needle bearing**

Securing input shaft needle bearing

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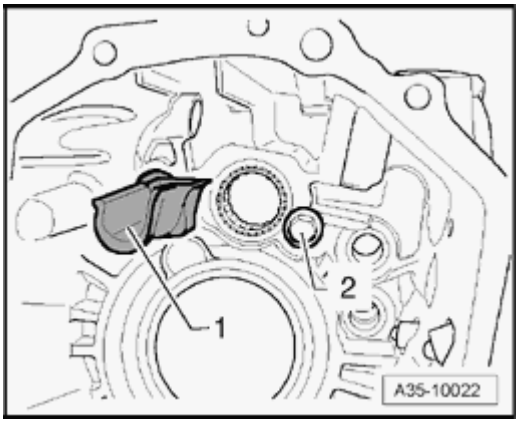


Fig. 341: Securing Input Shaft Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure input shaft needle bearing with bolt - **2** -.
- Insert oil collector - **1** - into transmission housing.

Removing selector shaft ball sleeve

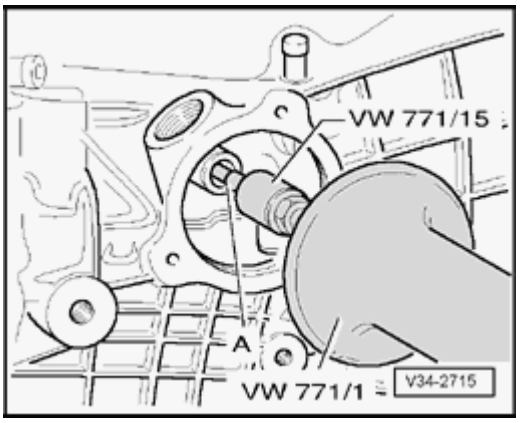


Fig. 342: Pulling Out Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving in ball sleeve for selector shaft

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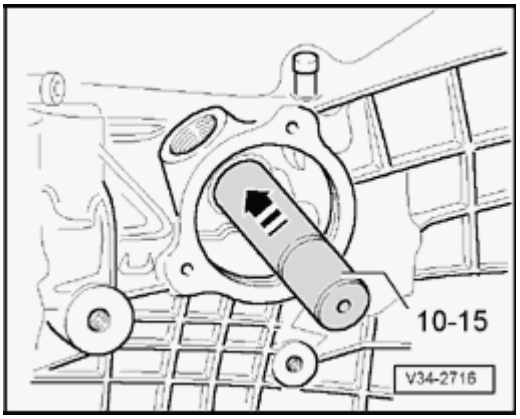


Fig. 343: Driving In Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve so that side with lettering (thicker metal) faces guide pin 10 - 15.

- Drive in ball sleeve until flush.

SELECTOR SHAFT, SERVICING

Selector shaft with transmission installed, removing and installing

Special tools, testers and auxiliary items required

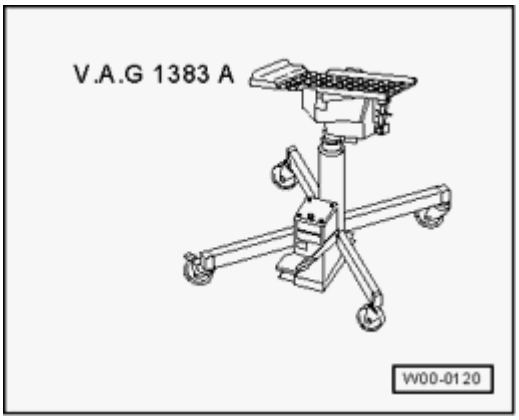


Fig. 344: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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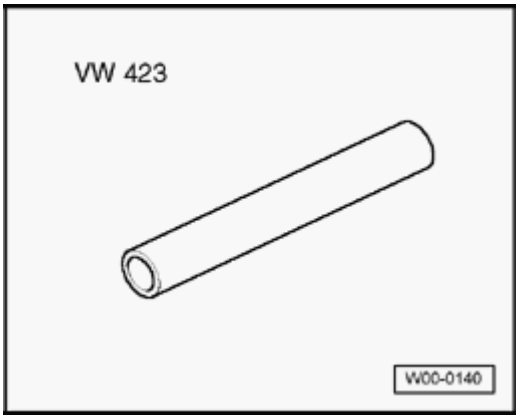


Fig. 345: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW423

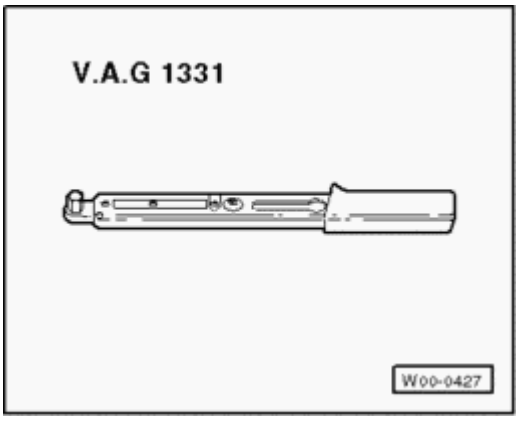
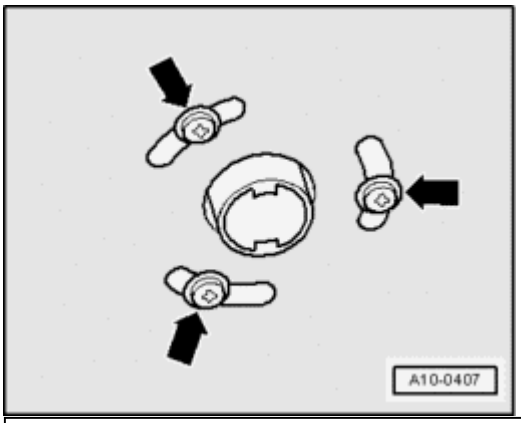


Fig. 346: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331
- **Assembly sleeve 01E 311 120**
- **Locking fluid AMV 185 101 A1**



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Fig. 347: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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

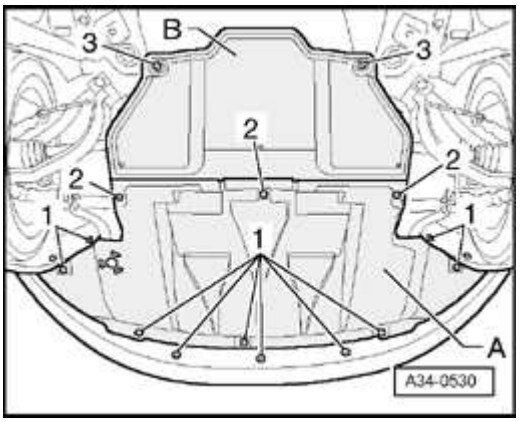


Fig. 348: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

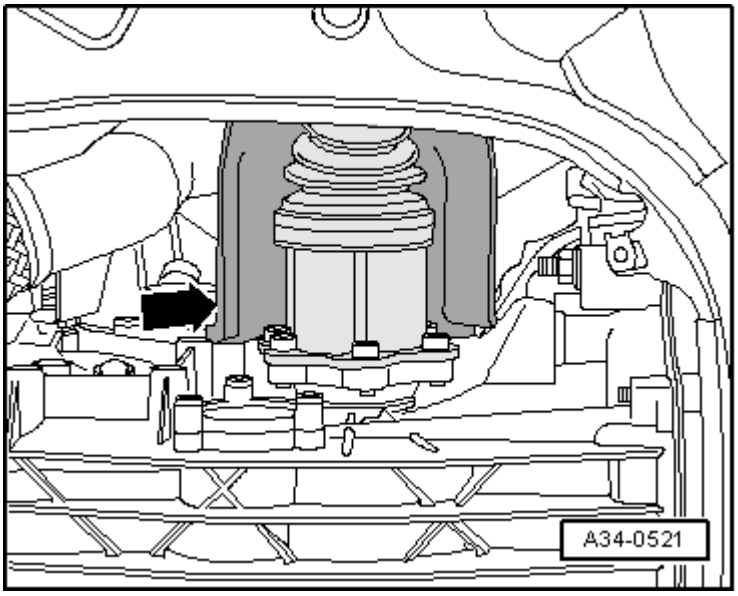


Fig. 349: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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- Remove front exhaust pipe (right side) -->
  - **26 EXHAUST SYSTEM, EMISSION CONTROLS** for AVK
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

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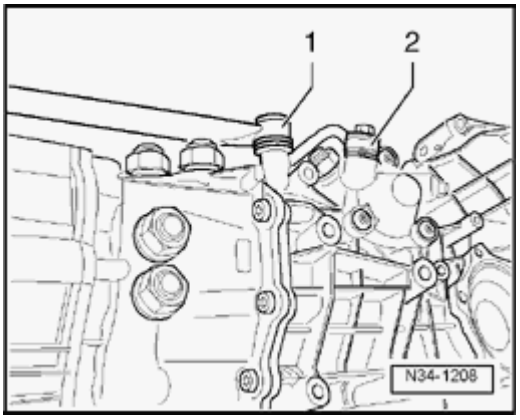


Fig. 350: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove connecting rod - **2** - for selector rod.

NOTE:

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

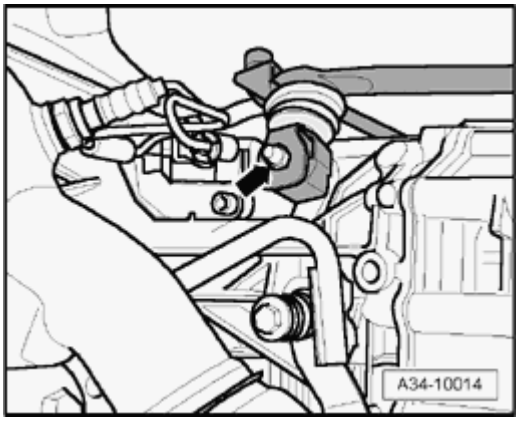


Fig. 351: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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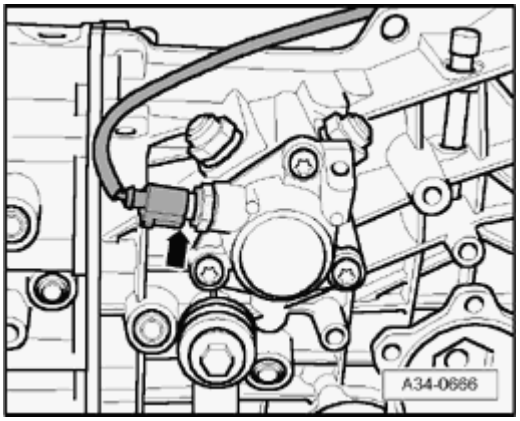


Fig. 352: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - for back-up light switch F4.

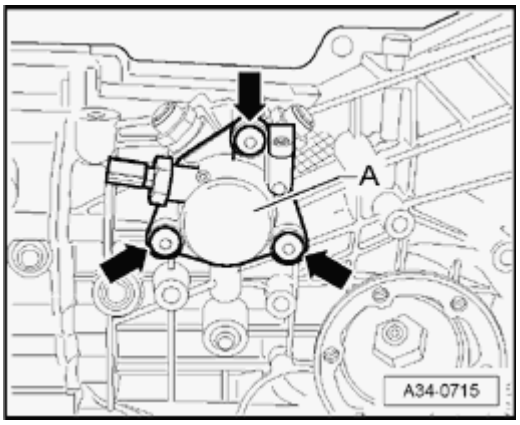


Fig. 353: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and selector shaft cover - **A** -.

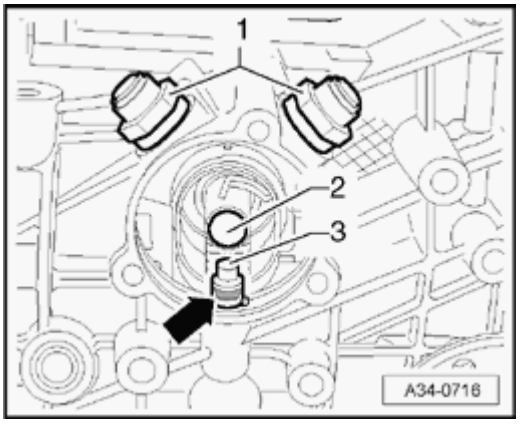


Fig. 354: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove two locking bolts - **1** - for selector shaft.

- Make sure that no gear has been engaged.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously removing pin - **3** -.
- Pull out selector shaft.

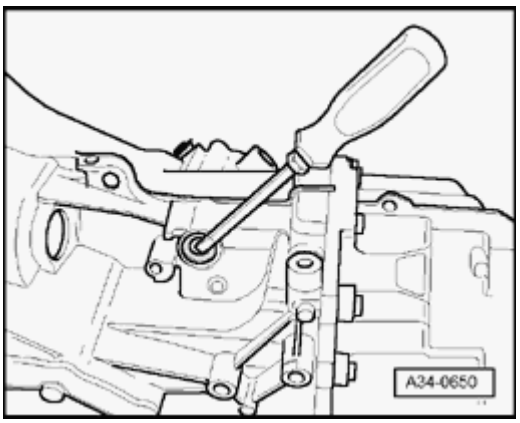


Fig. 355: Prying Out Seal With A Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry out seal with a screwdriver.

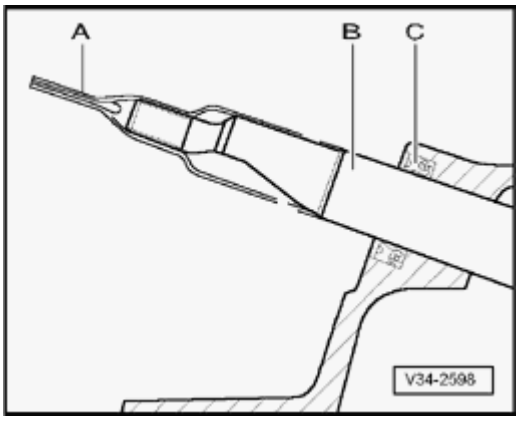


Fig. 356: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

NOTE:

- **replace seals and O-rings.**

- Install selector shaft.

- Installation position: Chamfer of selector shaft - **B** - points downwards.

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NOTE:

- **Ignore - item A - and - item C -.**

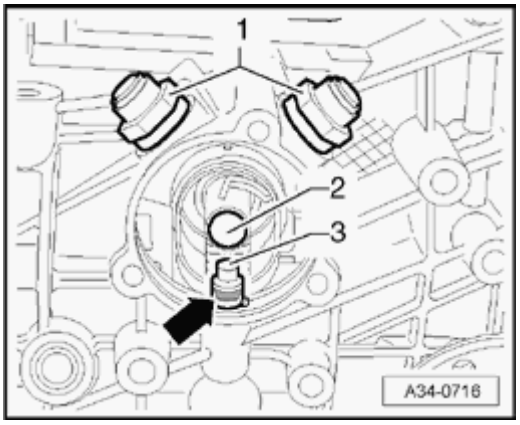


Fig. 357: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously inserting pin - **3** -.
- Installation position: groove - **arrow** - on pin - **3** - faces toward selector shaft cover.
- Clean threads of locking bolts - **1** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 45 Nm.

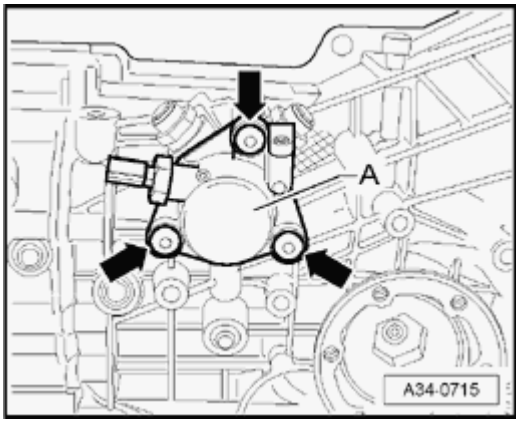


Fig. 358: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install cover - **A** - with new O-ring.
- Clean threads of bolts - **arrows** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 24 Nm.

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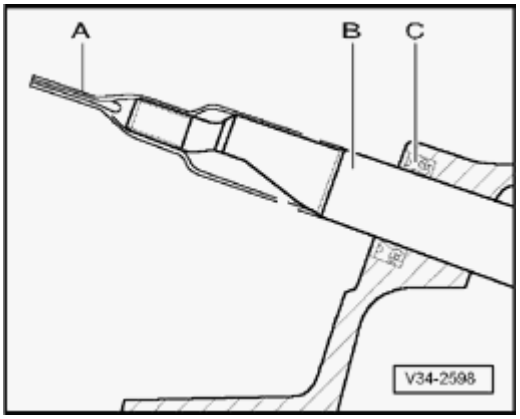


Fig. 359: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Use mounting sleeve 01E311120 - item A - to prevent damaging the seal - C - when installing.**

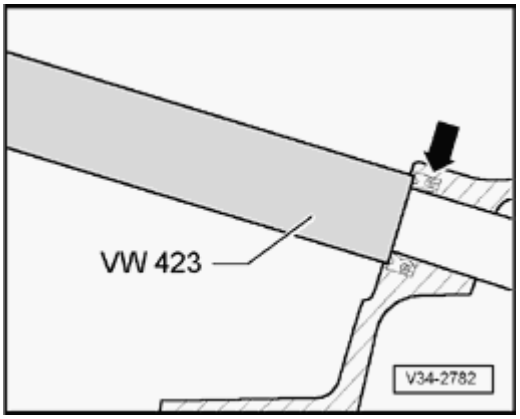


Fig. 360: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil outer circumference of seal - **arrow** -.
- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .
- Drive oil seal - **arrow** - into housing as far as it will go.

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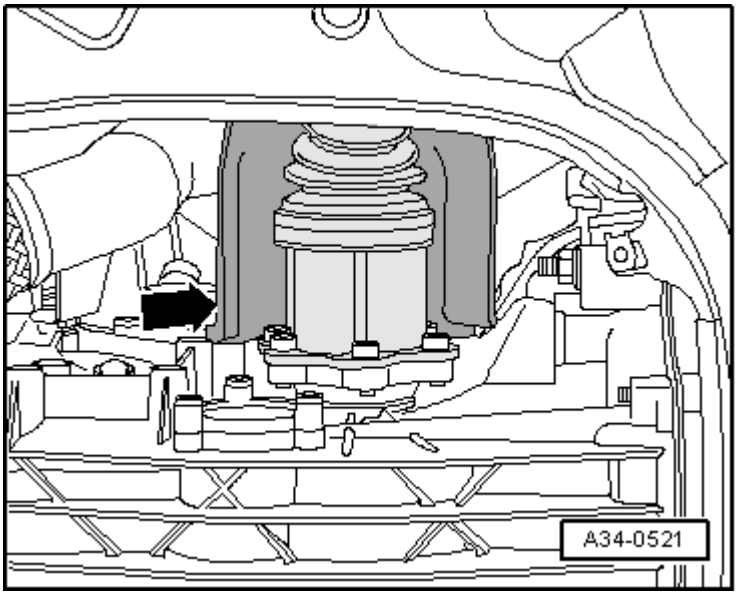


Fig. 361: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install front exhaust pipe align exhaust system so it is free of stress -->
  - **26 EXHAUST SYSTEM, EMISSION CONTROLS** for AVK
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

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

Tightening torques

Component	Nm
Locking bolts for selector shaft	45
Cover for selector shaft	24
Connecting rod to transmission	23
Selector shaft lever to selector shaft	23
Heat shield for drive axle to transmission	23

Selector shaft oil seal, replacing with transmission removed (transmission remains assembled)

NOTE:

- **Removal is also possible with transmission installed in vehicle --> Selector shaft oil seal, replacing with transmission installed.**

Special tools, testers and auxiliary items required

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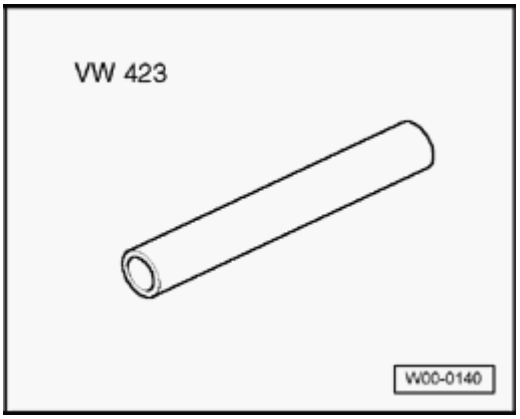


Fig. 362: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW423

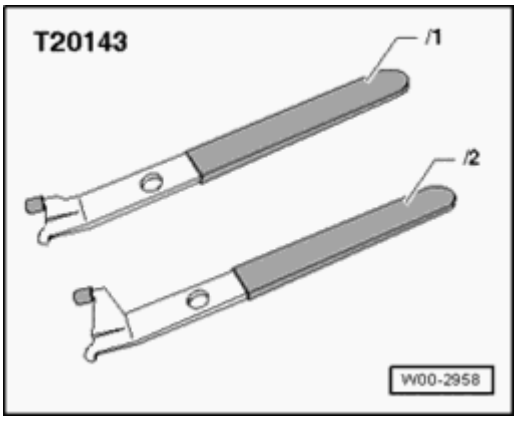
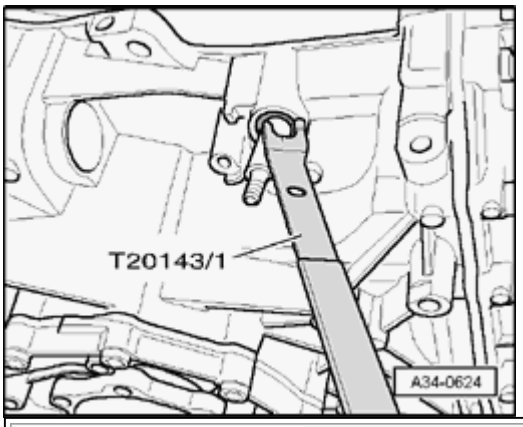


Fig. 363: Identifying Extractor Hook T20143
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor lever T20143/1
- **Assembly sleeve 01E 311 120**
- **Sealing grease G 052 128 A1**



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Fig. 364: Prying Out Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- With selector shaft installed
  - Carefully pry out oil seal, making sure shaft is not damaged.

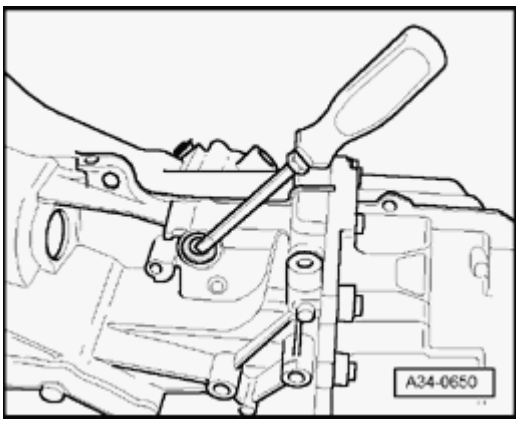


Fig. 365: Prying Out Seal With A Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With selector shaft removed
  - Carefully pry out oil seal using a screwdriver or oil seal extractor lever VW 681.

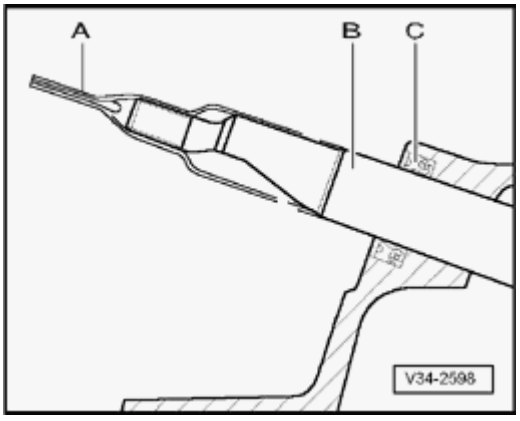


Fig. 366: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

- To avoid damaging oil seal - **C** - , oil seal and selector shaft must only be installed using **assembly sleeve 01E311120** - **A** -.

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- Pack space between sealing lip and dust lip half full with **sealing grease G052128A1** .
- Lightly oil outer circumference of seal.

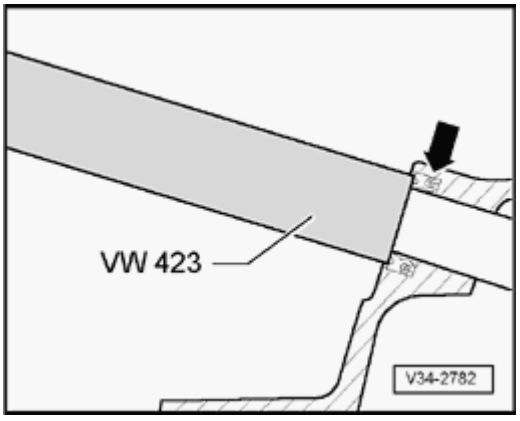


Fig. 367: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive oil seal - **arrow** - into housing as far as it will go.

Selector shaft oil seal, replacing with transmission installed

Special tools, testers and auxiliary items required

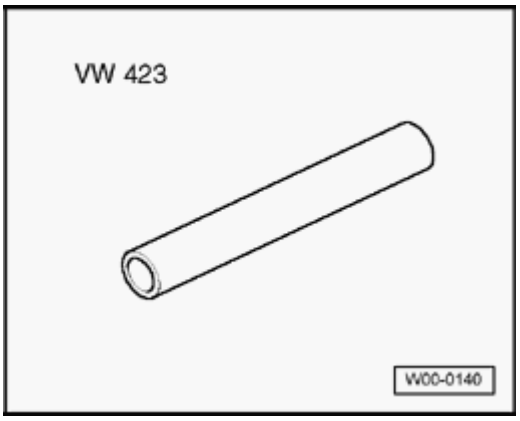


Fig. 368: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW423

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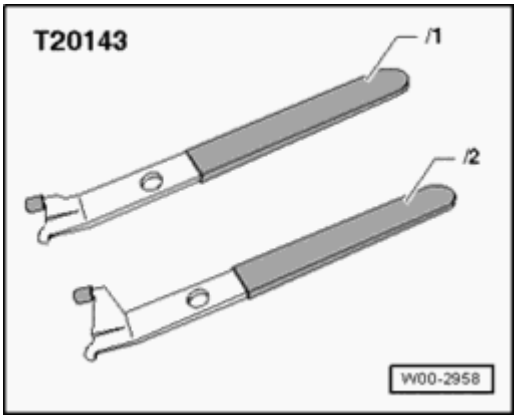


Fig. 369: Identifying Extractor Hook T20143
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor lever T20143/1

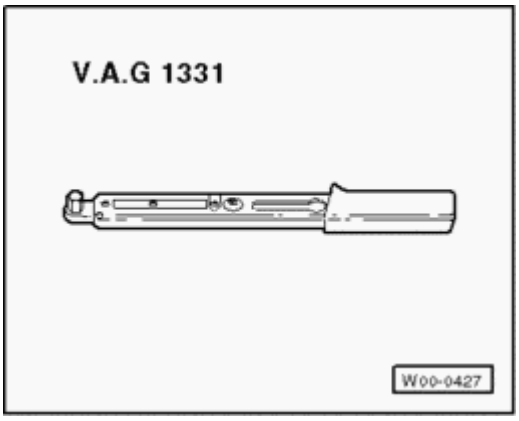
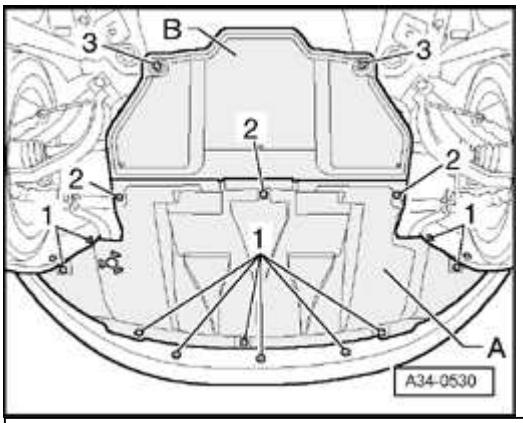


Fig. 370: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331
- **Assembly sleeve 01E 311 120**
- **Sealing grease G 052 128 A1**



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Fig. 371: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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

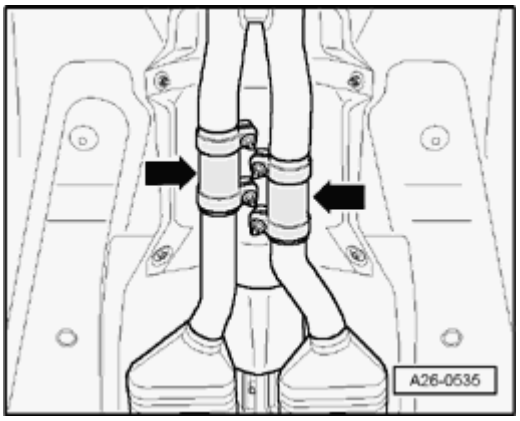


Fig. 372: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 6-cylinder engine:

- Remove heat shield for drive shaft (left-side).
- Disconnect exhaust system at clamp (left-side) - **left arrow** -.
- Remove front exhaust pipe (left-side) with catalytic converter --> 3.0 Liter 6-Cyl. 5V Engine Mechanical, Engine Code(s): AVK - **26 EXHAUST SYSTEM, EMISSION CONTROLS** .

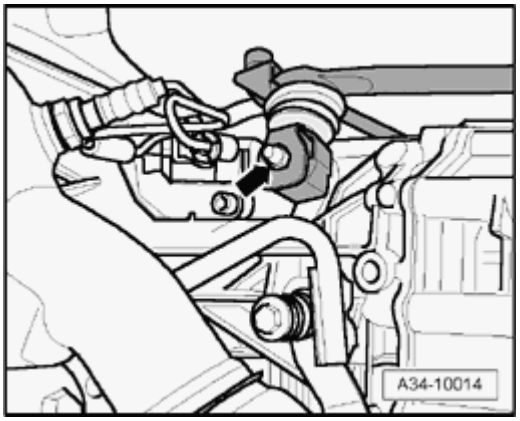


Fig. 373: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Continued for all vehicles:

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

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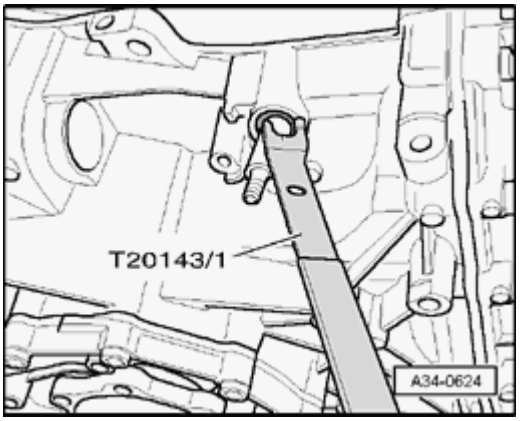


Fig. 374: Prying Out Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry out oil seal, making sure shaft is not damaged.

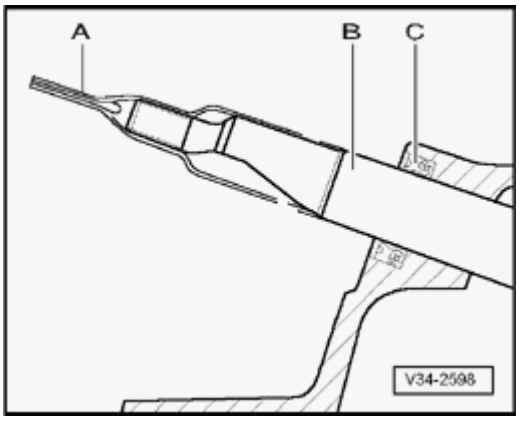


Fig. 375: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

- To avoid damaging oil seal - **C** - , oil seal and selector shaft must only be installed using **assembly sleeve 01E311120** - **A** -.
- Pack space between sealing lip and dust lip half full with **sealing grease G052128A1** .
- Lightly oil outer circumference of seal.

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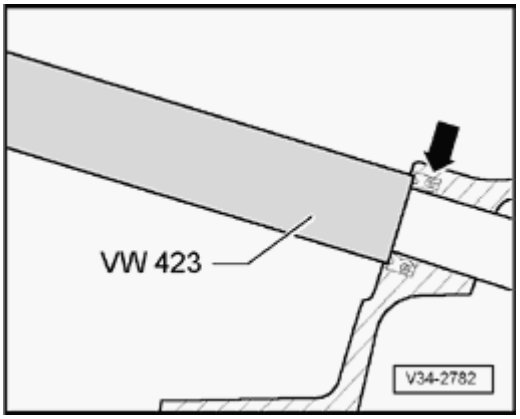


Fig. 376: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive oil seal - **arrow** - into housing as far as it will go.

The remaining installation steps are perform in the reverse sequence. Note the following:

Vehicles with 6-cylinder engine:

- Install front exhaust pipe with catalytic converter and align exhaust system so it is free of stress --> 3.0 Liter 6-Cyl. 5V Engine Mechanical, Engine Code(s): AVK - **26 EXHAUST SYSTEM, EMISSION CONTROLS** .
- Install heat shield for drive axle (left-side).

Continued for all vehicles:

- Check gear oil level in transmission --> **Transmission oil level, checking**.

Tightening torques

Component		Nm
Selector shaft lever to selector shaft		23
Heat shields above drive axles to transmission		23

Back-up light switch F4, removing and installing

Special tools, testers and auxiliary items required

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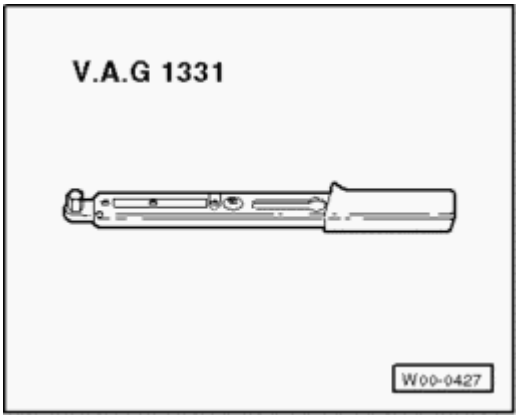


Fig. 377: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

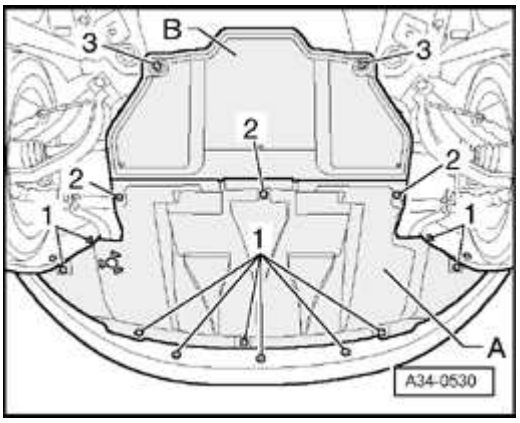
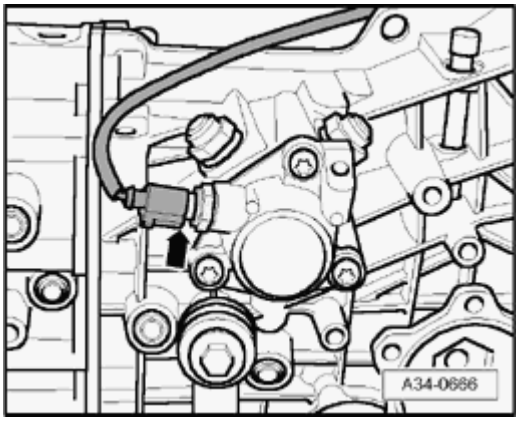


Fig. 378: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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



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Fig. 379: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - for back-up light switch F4 on transmission (right side).

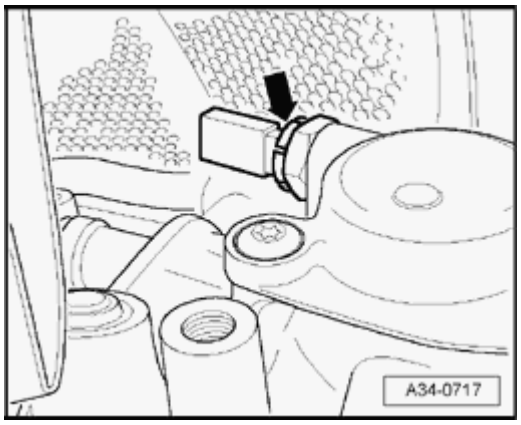


Fig. 380: Removing Back-Up Light Switch F4 From Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove back-up light switch F4 from selector shaft cover - **arrow** -.

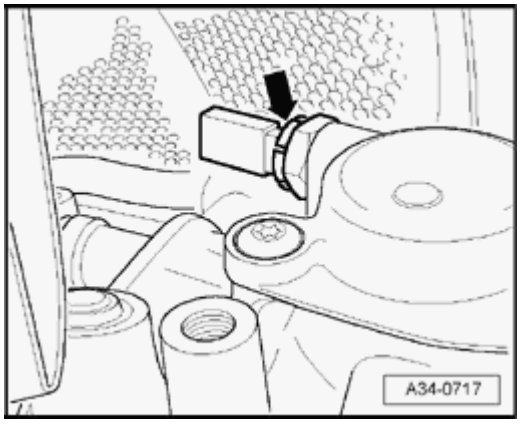


Fig. 381: Removing Back-Up Light Switch F4 From Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

- Screw back-up light switch F4 into selector shaft cover - **arrow** -.

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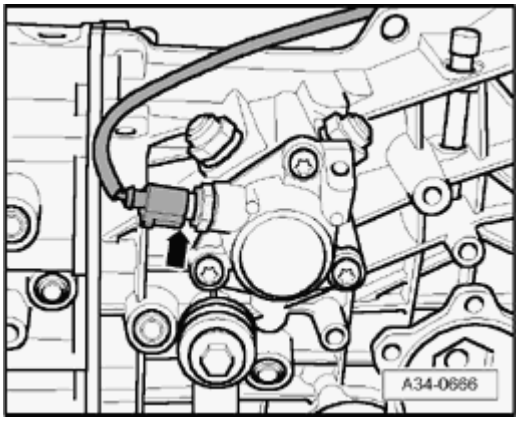


Fig. 382: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach electrical connector - **arrow** - for back-up light switch F4 on transmission (right side).

Component	Nm
Back-up light switch F4	20

35 GEARS, SHAFTS

INPUT SHAFT, DISASSEMBLING AND ASSEMBLING

Input shaft, assembly overview

NOTE:

- **Refer to technical data when installing new gears --> Code letters, allocation, transmission ratios, capacities.**
- **Lubricate all bearings on input shaft with gear oil before installing.**

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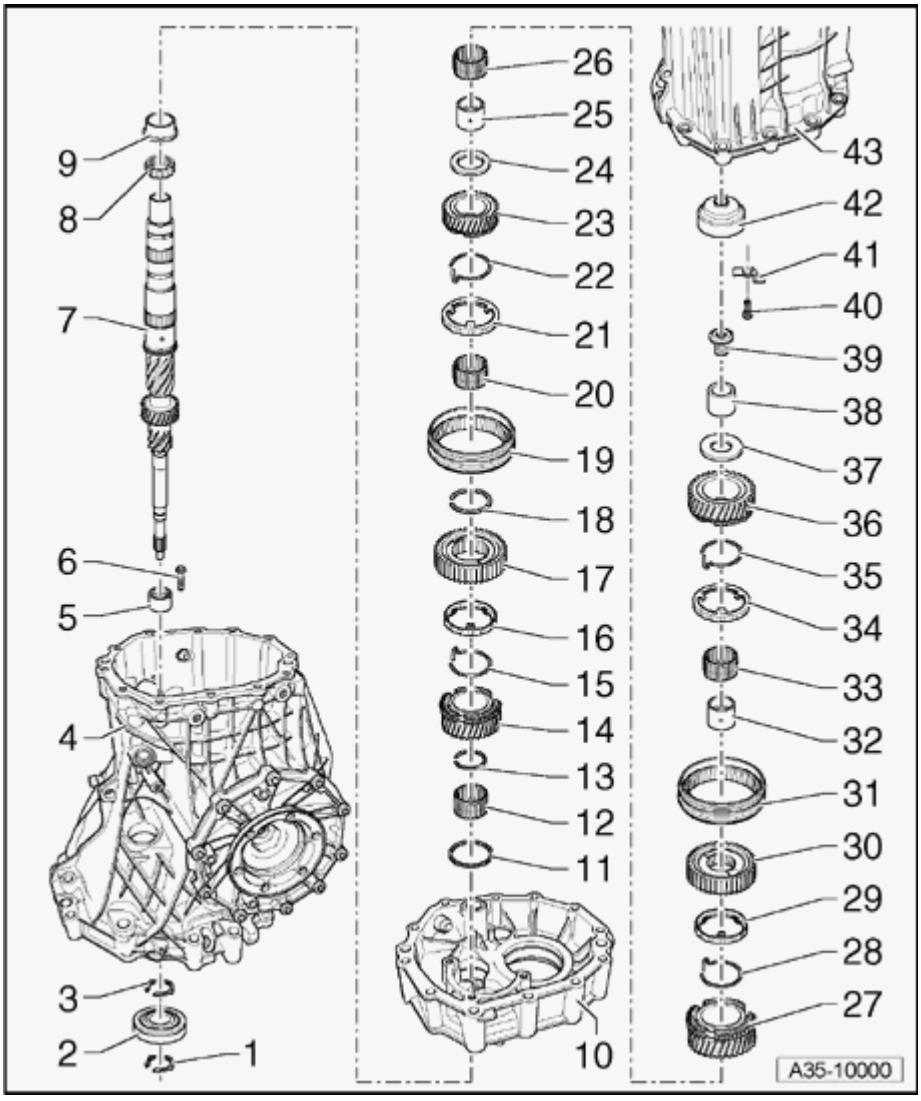


Fig. 383: Input Shaft, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 1** -
- Determining thickness

2 - Ball bearing

- Removing and installing --> **Disassembling and assembling sequence**

3 - Circlip

- Mark

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- Installation position **Installation position of circlips**, - **item 2** -
- Determining thickness

4 - Transmission housing

5 - Needle bearing

- For input shaft

6 - Bolt, 24 Nm

7 - Input shaft

- Adjusting --> **Input shaft, adjusting**

8 - Roller bearing

- Disassembling and assembling **Detaching needle roller bearing from input shaft and installing needle roller bearing onto input shaft**
- Installation position: collar faces splines for 2nd gear

9 - Outer race

- For needle roller bearing

10 - Bearing housing

11 - Thrust washer

- For 3rd speed selector gear

12 - Needle bearing

- For 3rd gear

13 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 3** -

14 - 3rd speed selector gear

15 - Spring

- Insert in 3rd speed selector gear --> **Inserting spring in selector gear**

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- Allocation of spring to selector gear

16 - 3rd gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

17 - Synchronizing hub for 3rd and 4th gear

- Installation position: high inside collar faces 3rd speed selector gear

18 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 4** -
- Re-determining thickness **Determining thickness of circlip for synchronizing hub for 3rd and 4th gear**

19 - Locking collar for 3rd and 4th gear

- Mark position in relation to synchronizing hub prior to removing

20 - Needle bearing

- For 4th gear

21 - 4th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

22 - Spring

- Insert in 4th speed selector gear --> **Inserting spring in selector gear**
- Allocation of spring to selector gear

23 - 4th speed selector gear

24 - Thrust washer

- For 4th speed and 5th speed selector gears

25 - Needle bearing inner race

- For 5th gear

26 - Needle bearing

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- For 5th gear

27 - 5th speed selector gear

28 - Spring

- Insert in 5th speed selector gear --> **Inserting spring in selector gear**
- Allocation of spring to selector gear

29 - 5th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

30 - Synchronizing hub for 5th and 6th gear

31 - Locking collar for 5th and 6th gear

- Mark position in relation to synchronizing hub prior to removing

32 - Needle bearing inner race

- For 6th gear

33 - Needle bearing

- For 6th gear

34 - 6th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

35 - Spring

- Insert in 6th speed selector gear **Inserting spring in selector gear**
- Allocation of spring to selector gear

36 - 6th speed selector gear

37 - Thrust washer

- For 6th speed selector gear

38 - Inner race

39 - Multi-point socket head bolt, 150Nm

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40 - Multi-point socket head bolt, 24Nm

41 - Retaining plate

42 - Roller bearing

- Bearing for input shaft in transmission cover
- With lubricating unit
- Always replace

43 - Transmission cover

Input shaft, Disassembling and assembling

NOTE:

- **Removing and installing 3rd to 6th speed selector gears is described in chapter on disassembling and assembling transmission --> Disassembling and assembling sequence.**

Special tools, testers and auxiliary items required

- Feeler gauge

Detaching needle roller bearing from input shaft and installing needle roller bearing onto input shaft

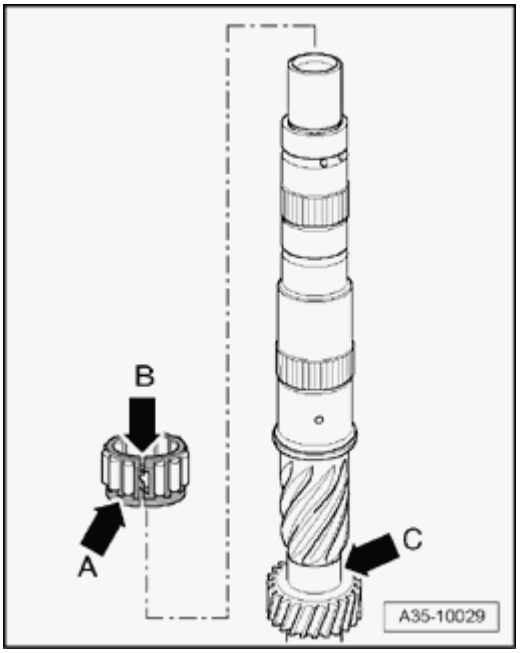


Fig. 384: Detaching Needle Roller Bearing From Input Shaft And Installing Needle Roller Bearing Onto Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Removing needle roller bearing:

- Bend open needle roller bearing at separating point - **arrow B** - far enough for it to be detached from input shaft (do not bend open more than necessary).

Installing needle roller bearing:

- The shoulder - **arrow A** - faces toward splines for 2nd gear.
- Only bend open needle roller bearing at separating point - **arrow B** - far enough for it to be guided over input shaft and onto its seat - **arrow C** -.

Inserting spring in selector gear

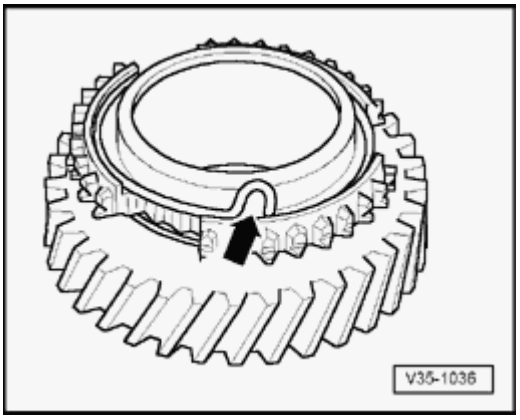


Fig. 385: Inserting Spring Into Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The bent end of spring - **arrow** - must be hooked into hole in selector gear.

Checking synchro-ring for wear

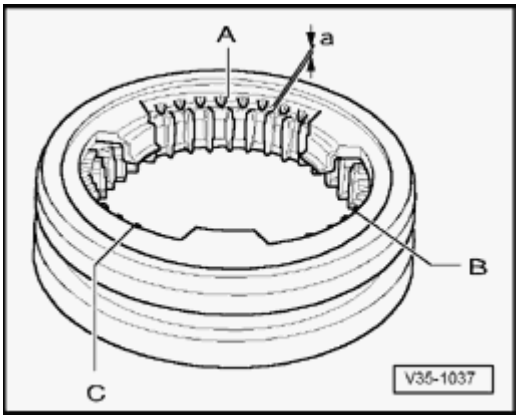


Fig. 386: Checking Synchronizer For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Press synchro-ring into locking collar and measure gap - **a** - at positions - **A** - , - **B** - and - **C** - using feeler gauge.
- Add measured values and divide by 3.

- The determined value should not exceed 0.45 mm.

Installation position of circlips

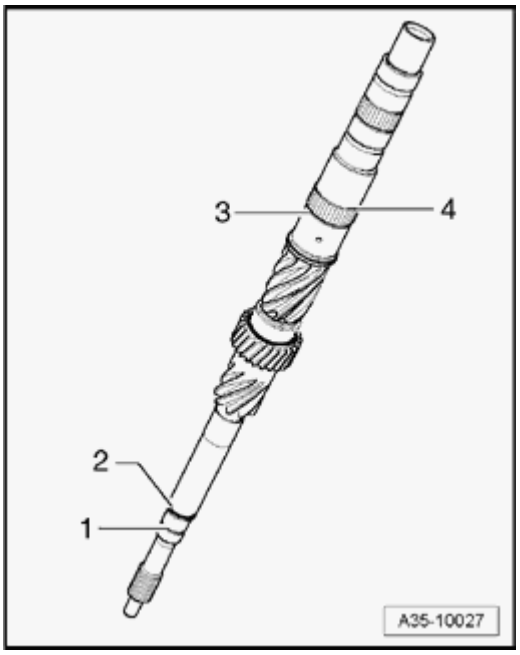


Fig. 387: Installation Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The circlips - **1** - and - **2** - secure input shaft ball bearing.

Determining thickness --> **Determining circlips for input shaft ball bearing**.

- The circlip - **3** - secures needle bearing for 3rd speed selector gear and 3rd and 4th gear synchronizing hub.

Thickness: 2.00 mm.

- The circlip - **4** - secures 3rd and 4th gear synchronizing hub.

Determining thickness **Determining thickness of circlip for synchronizing hub for 3rd and 4th gear**.

Determining thickness of circlip for synchronizing hub for 3rd and 4th gear

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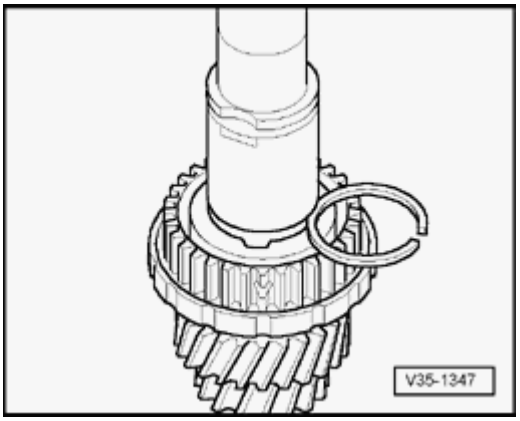


Fig. 388: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchronizing hub onto stop.
  - Determine thickest circlip that will just fit and install it. For Part No.

The following circlips are available:

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

INPUT SHAFT, ADJUSTING

Determining circlips for input shaft ball bearing

It is necessary to readjust input shaft when:

- Transmission housing

or the

- Input shaft

are replaced.

Special tools, testers and auxiliary items required

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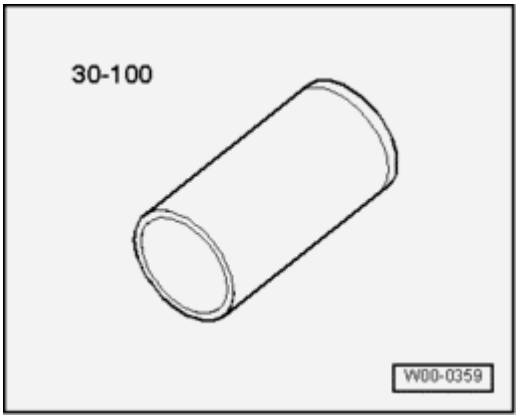


Fig. 389: Press Tube 30-100Identifying Special Tools - Oil Pump/Front Sealing Flange, Drive Chain And Chain Sprocket For Oil Pump, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drift sleeve 30 - 100

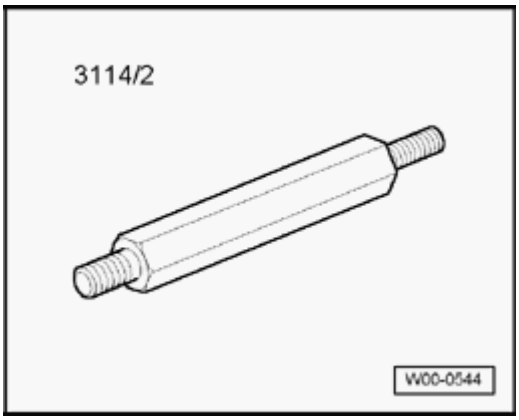


Fig. 390: 3114/2 Straightening Tool
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Door hinge alignment tool (M8 and M10) 3114/2

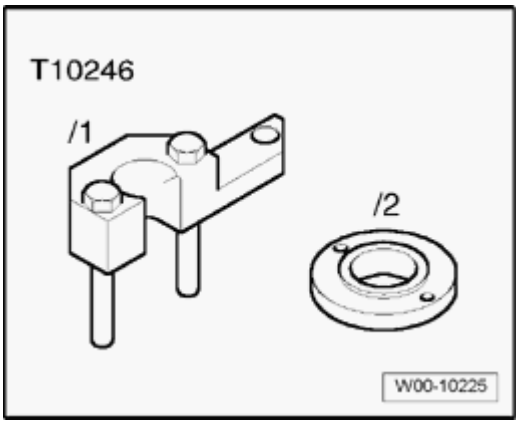


Fig. 391: Fitting Tool T10246

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fitting tool T10246
- Digital depth gauge e.g. VAS 6087

Determining thickness for circlip behind input shaft ball bearing

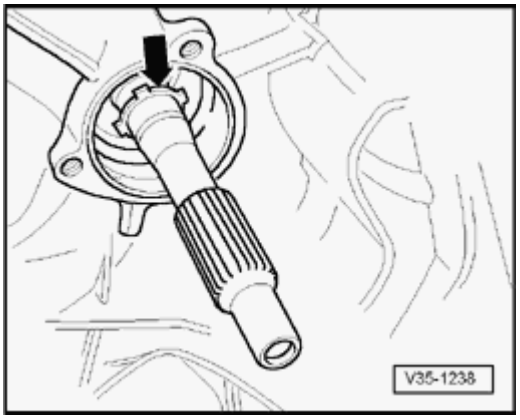


Fig. 392: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install provisional circlip - **arrow** - in rear groove on input shaft.
- Push ball bearing onto input shaft.

Installation position:

The sealed side of ball cage faces transmission housing.

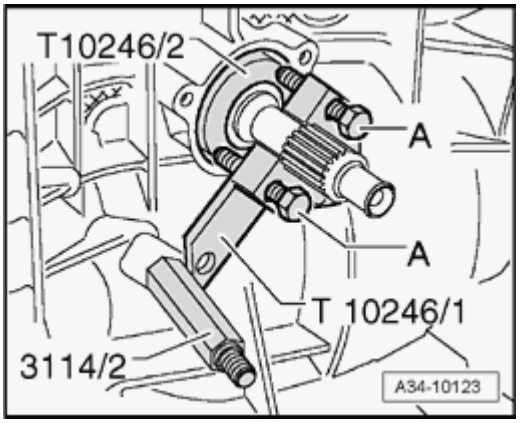


Fig. 393: Pressing In Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing in ball bearing:

Screw pin (M8 and M10) 3114/2 into tapped hole for ball head stud.

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Slide thrust plate T10246/2 onto input shaft.

Position fitting tool T10246/1 behind splines for clutch plate. Tighten bolts - **a** - only slightly. The bolts locate in recesses in thrust plate T10246/2.

Press in ball bearing onto stop by tightening bolts alternately (1/2 turn at a time).

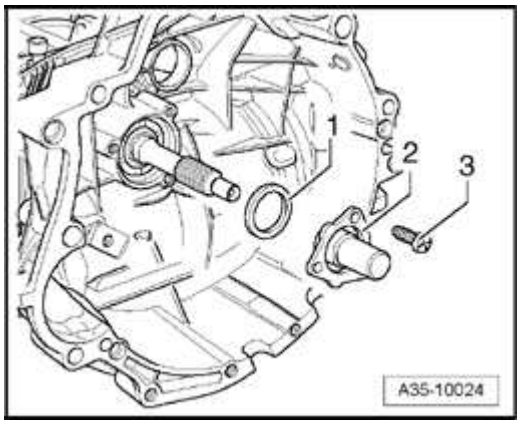


Fig. 394: Dished Spring, Guide Sleeve And Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install dished spring - **1** -.

Installation position:

The convex side faces guide sleeve - **2** -.

- Install a shrink hose onto input shaft splines.
- Bolt guide sleeve to transmission housing - **2** - with bolts - **3** -.
- Turn transmission housing so joint flange for bearing housing points upward.

- The contact surface must be cleaned to remove **sealing paste** .

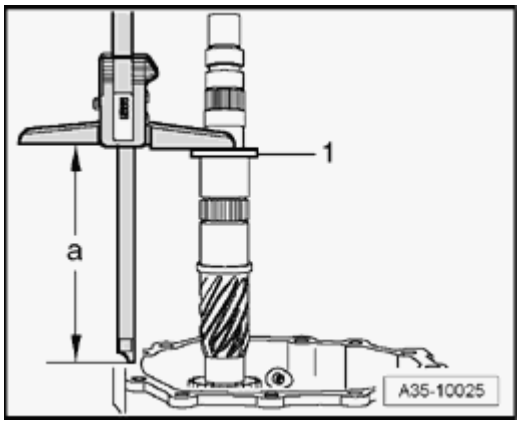


Fig. 395: Measuring From Thrust Washer To Contact Surface Of Housing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place thrust washer - **1** - for 4th and 5th speed selector gears onto input shaft.
- Place a digital depth gauge (e. g. VAS 6087) onto thrust washer and measure distance to contact surface of housing. The measuring point on housing contact surface must be as close to input shaft as possible.

NOTE:

- **When measuring, lift the input shaft with e.g. support bridge 30-211A or the help of a second mechanic until the play in the ball bearing is taken up.**

Specification: distance "a" = 164.14 mm

NOTE:

- **If the measured value exceeds the specification, use a thinner circlip than the circlip installed so that the specification is attained.**
- **If the measured value is below the specification, use a thicker circlip than the circlip installed so that the specification is attained.**
- **Determine the circlip thickness to meet the specification as exactly as possible (164.14 mm).**

The following circlips are available:

Circlip thickness (mm)		
1.54	2.08	2.62
1.63	2.17	2.71
1.72	2.26	2.80
1.81	2.35	2.89
1.90	2.44	
1.99	2.53	

- Select circlip from table.

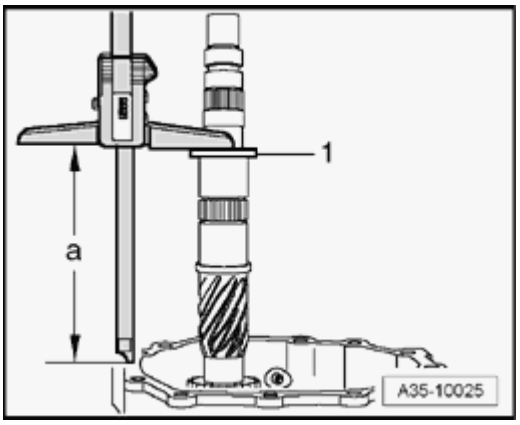


Fig. 396: Measuring From Thrust Washer To Contact Surface Of Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Checking adjustment and checking distance "a"

- Determined circlip is installed.

The distance "a" should be 164.14mm +- 0.04 mm if the correct circlip has been selected.

Determining thickness for circlip in front of the input shaft ball bearing

- Drive rear circlip (as determined) and ball bearing onto input shaft using drift sleeve 30 - 100.

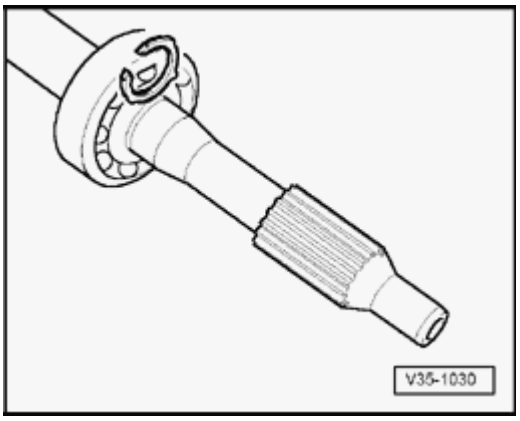


Fig. 397: Input Shaft And Thickest Circlip Which Can Still Just Be Installed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine thickest circlip which will still fit.
- Refer to table **The following circlips are available:** to determine correct circlip.

PINION SHAFT (OUTPUT SHAFT)

Pinion shaft, assembly overview

NOTE:

- **Refer to technical data --> Code letters, allocation, transmission ratios, capacities when installing new gear wheels or the final drive gear set.**
- **Refer to technical data when installing new gear wheels**
- **Lubricate all needle bearings on output shaft with gear oil before installing.**
- **Adjustment work is required when replacing the parts marked with 1) . Table of adjustments --> Table of adjustments**

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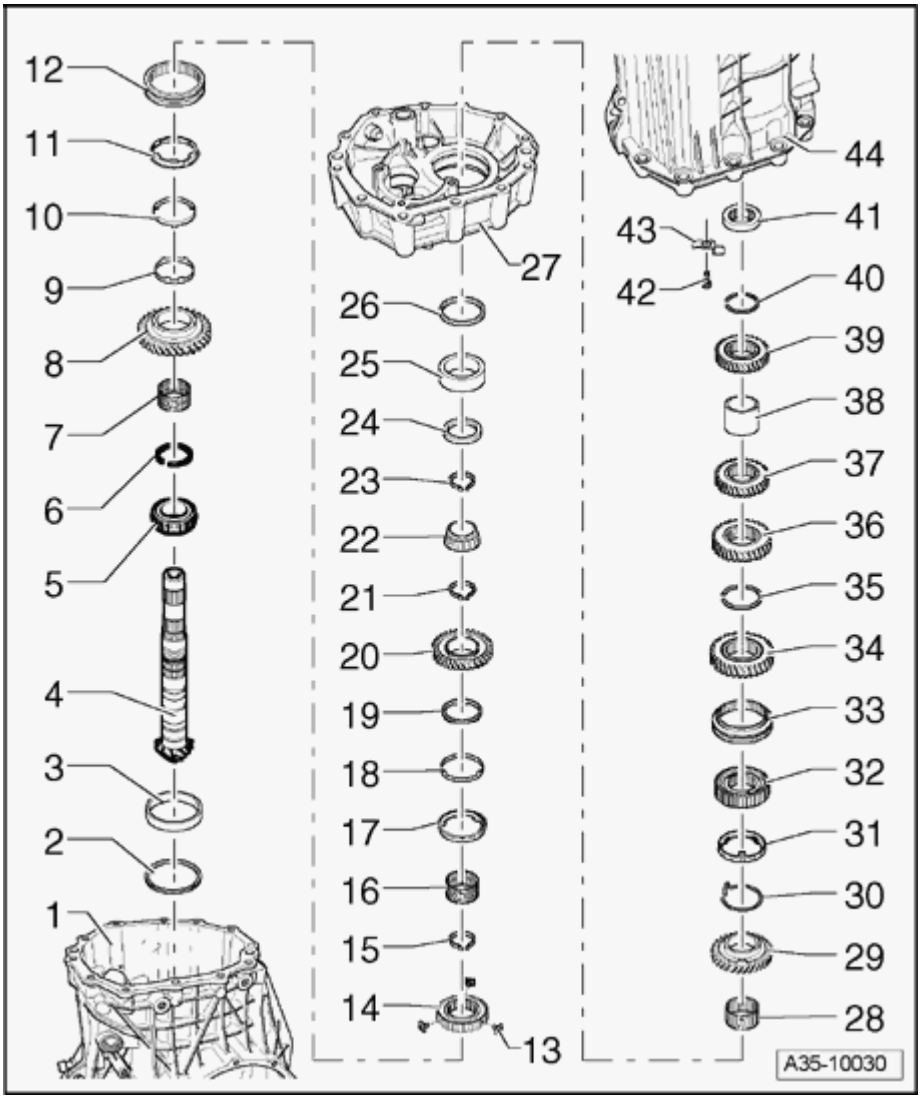


Fig. 398: Pinion Shaft, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing [1)]

- Servicing --> **Transmission housing, servicing**

2 - Shim "S3"

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

3 - Tapered roller bearing outer race [1)]

- Pulling out **Pulling tapered roller bearing outer race out of transmission housing**
- Pressing in **Heating transmission housing in order to install tapered roller bearing outer race** and **Pressing tapered roller bearing outer race into transmission housing**

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4 - Pinion shaft (output shaft) [1)]

- Is mated with crown wheel, always replace together as a set
- Adjusting crown wheel and pinion shaft --> --> **Pinion shaft and crown wheel, adjusting**

5 - Tapered roller bearing inner race[1)]

- Will be damaged during removal
- Replace
- Pressing off **Pressing off tapered roller bearing inner race**
- Pressing on **Pressing on tapered roller bearing inner race**

6 - Circlip

- Re-determine thickness if taper roller bearing is replaced **Determining thickness of circlip**

7 - Needle bearing

- For 1st gear

8 - 1st speed selector gear

- Check axial clearance after installing using feeler gauge **Checking axial play of 1st speed selector gear** (0.20 to 0.50 mm)

9 - Inner ring for 1st gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st gear inner ring for wear**
- Replace if scored or if there are visible traces of wear

10 - Intermediate ring for 1st gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**

11 - Synchro-ring for 1st gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**
- Replace if scored or if there are visible traces of wear

12 - Locking collar for 1st and 2nd gear

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- Mark position in relation to synchronizing hub prior to removing
- Assembling locking collar/synchronizing hub **Assembling 1st and 2nd gear locking collar/synchronizing hub**

13 - Locking piece

- Install locking pieces (3 Qty.) **Assembling 1st and 2nd gear locking collar/synchronizing hub**

14 - Synchronizing hub for 1st and 2nd gear

- Installation position: high inside collar faces 2nd speed selector gear
- Pressing off **Pressing off 1st and 2nd gear synchronizing hub**
- Pressing on **Pressing on 1st and 2nd gear synchronizing hub**
- Assembling locking collar/synchronizing hub **Assembling 1st and 2nd gear locking collar/synchronizing hub**

15 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 1** -
- Re-determine thickness when replacing 1st and 2nd gear synchronizing hub or pinion shaft **Determining thickness of circlip**

16 - Needle bearing

- For 2nd gear

17 - Synchro-ring for 2nd gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**
- Replace if scored or if there are visible traces of wear

18 - Intermediate ring for 2nd gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**

19 - Inner ring for 2nd gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**
- Replace if scored or if there are visible traces of wear

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20 - 2nd speed selector gear

- Check axial clearance after installing using feeler gauge **Checking axial play of 2nd speed selector gear** (0.20 to 0.50 mm)

21 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 2** -

22 - Tapered roller bearing inner race[1)]

- Pressing off **Pressing off tapered roller bearing inner race with 2nd speed selector gear**
- Pressing on **Pressing on tapered roller bearing inner race**

23 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 3** -

24 - Thrust washer

- For reverse selector gear
- Pressing off **Pressing off thrust washer for reverse selector gear**
- Pressing on **Pressing on thrust washer for reverse selector gear**

25 - Tapered roller bearing outer race [1)]

- Pulling out **Pulling tapered roller bearing outer race out of bearing housing**
- Pressing in **Pressing tapered roller bearing outer race into bearing housing**

26 - Shim "S_4 "

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

27 - Bearing housing [1)]

28 - Needle bearing

- For reverse selector gear

29 - Reverse selector gear

- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

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30 - Spring

- Insert into reverse selector gear **Inserting spring in selector gear**
- Allocation of spring to selector gear

31 - Synchronizing ring for reverse gear

- Checking for wear **Checking synchro-ring for wear**

32 - Reverse gear synchronizing hub

- Installation position: high inside collar faces 3rd gear wheel

33 - Reverse gear locking collar

- Mark position in relation to synchronizing hub prior to removing
- Installation position: taper faces reverse gear synchro-ring

34 - 3rd gear wheel

- Installation position: machined side faces reverse gear synchronizing hub

35 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 4** -
- Re-determine thickness when replacing 3rd gear wheel, reverse gear synchronizing hub or pinion shaft **Determining thickness of circlip**

36 - 4th gear wheel

- Installation position: high inside collar faces 5th gear wheel

37 - 5th gear wheel

- Installation position: high inside collar faces 4th gear wheel

38 - Spacer sleeve

39 - 6th gear wheel

40 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 5** -

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- Re-determine thickness when replacing gear wheels for 4th to 6th gear, the spacer sleeve or pinion shaft **Determining thickness of circlip**

41 - Needle bearing

- Bearing for pinion shaft in transmission cover

42 - Multi-point socket head bolt, 24Nm

43 - Retaining plate

44 - Transmission cover

Inserting spring in selector gear

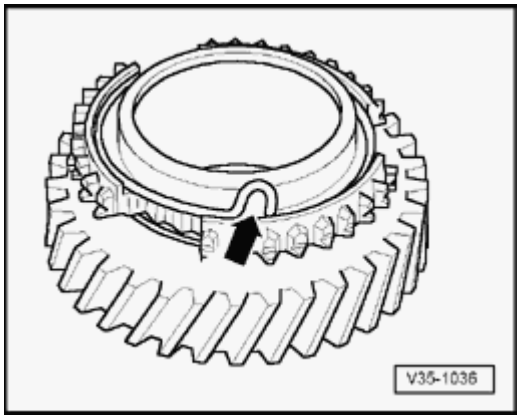


Fig. 399: Inserting Spring Into Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The bent end of spring - **arrow** - must be hooked into hole in selector gear.

Checking synchro-ring for wear

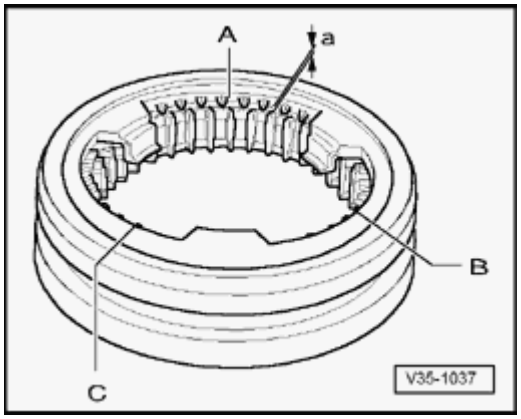


Fig. 400: Checking Synchronizer For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Press synchro-ring into locking collar and measure gap - **a** - at positions - **A** - , - **B** - and - **C** - using feeler gauge.
- Add measured values and divide by 3.

The determined value should not exceed 0.45 mm.

Pinion shaft, disassembling and assembling

NOTE:

- **Removing and installing gear wheels for 3rd to 6th gear and reverse selector gear is described in chapter on disassembling and assembling transmission --> Disassembling and assembling sequence.**

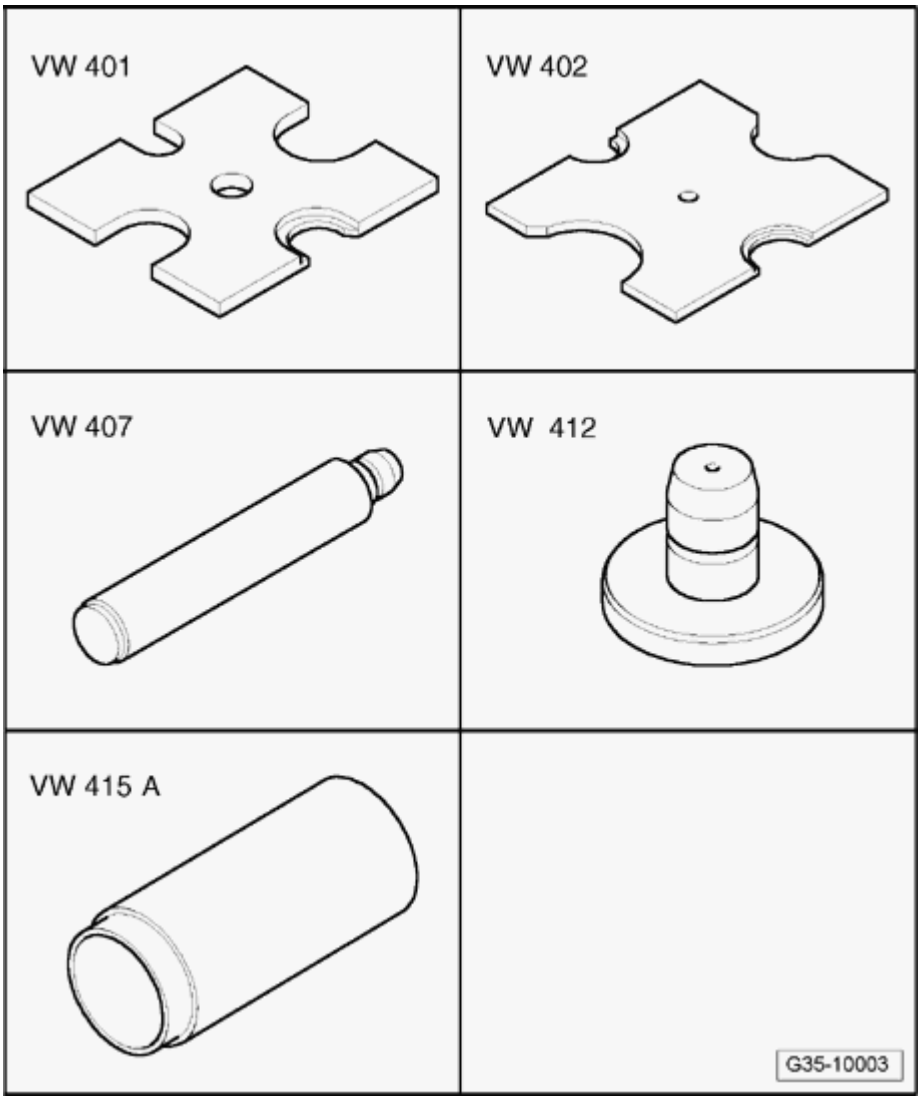


Fig. 401: Identifying Special Tools - Pinion Shaft, Disassembling And Assembling (1 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust plate VW 402
- Press tool VW 407
- Thrust disc VW 412
- Tube VW 415 A

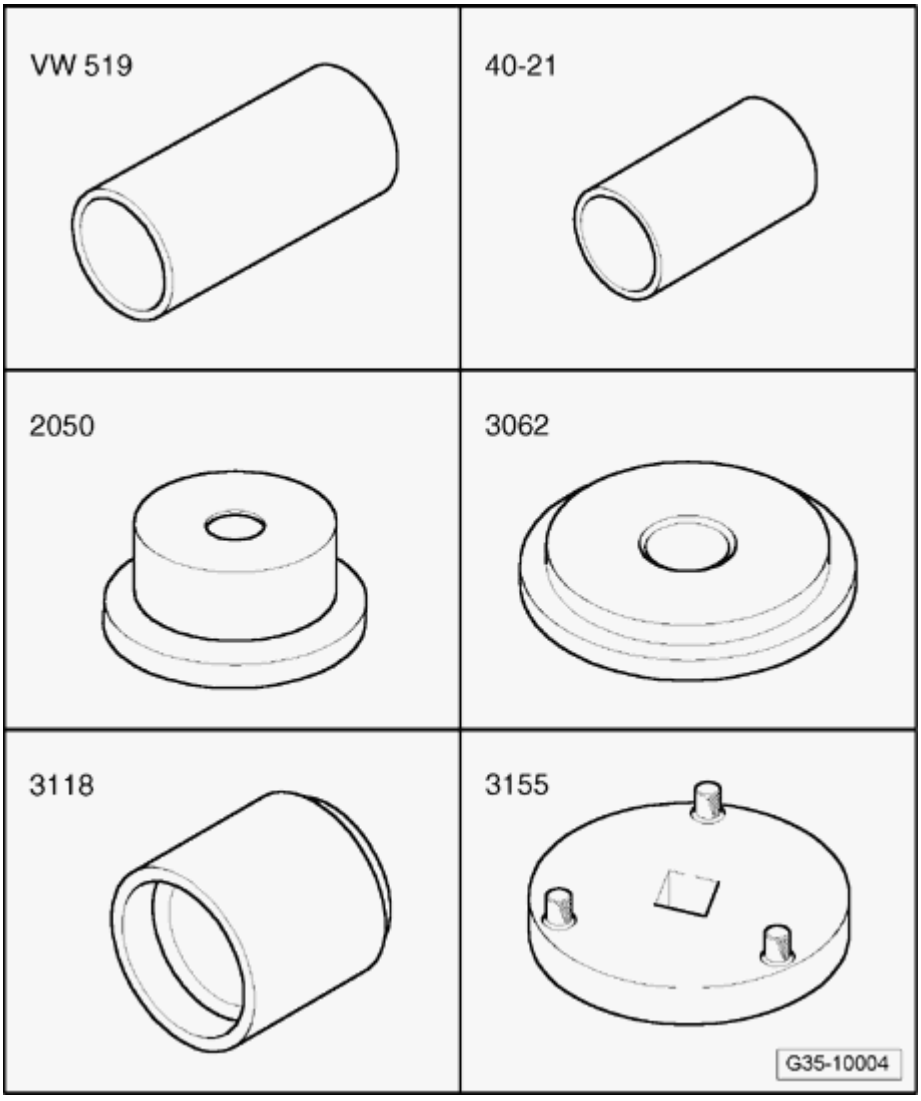


Fig. 402: Identifying Special Tools - Pinion Shaft, Disassembling And Assembling (2 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Tube VW 519

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- Press tool 40 - 21
- Thrust piece 2050
- Thrust pad 3062

- Press tool 3118
- Slotted nut wrench 3155

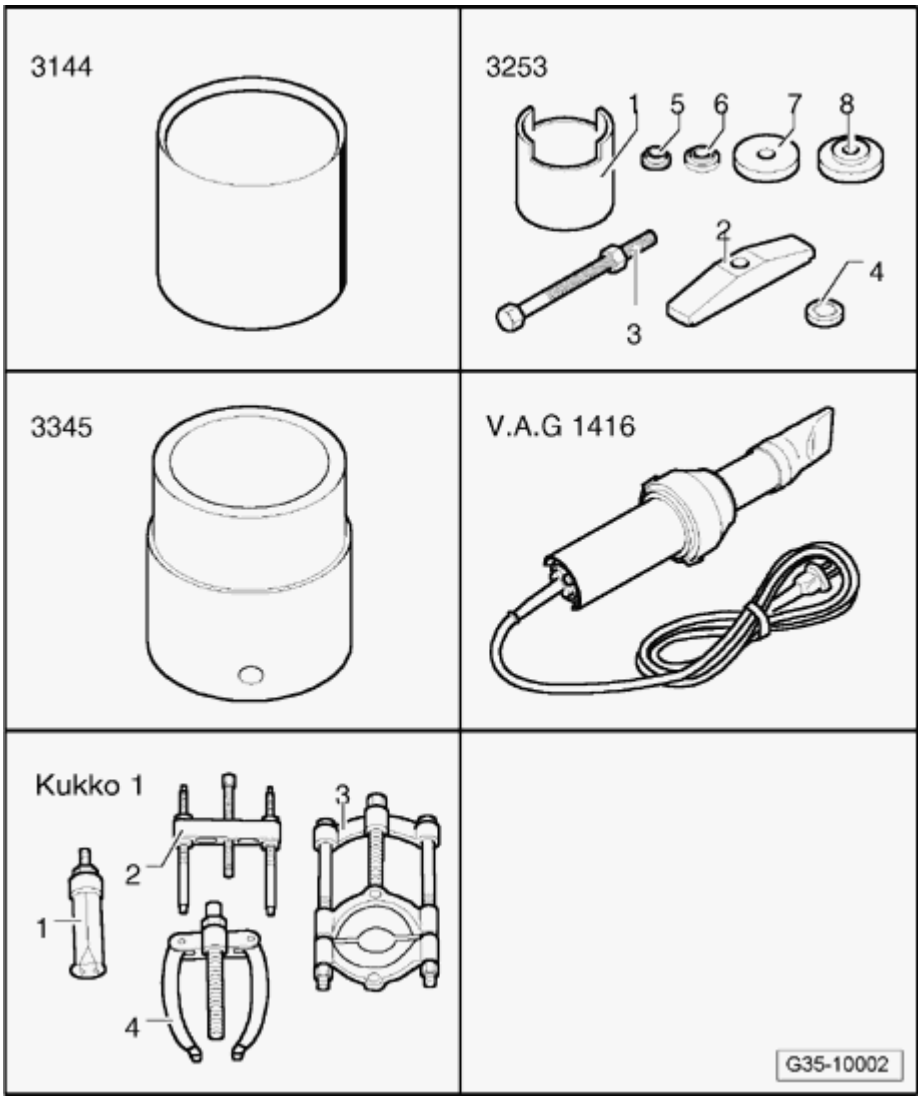


Fig. 403: Identifying Special Tools - Pinion Shaft, Disassembling And Assembling (3 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Press support-RI wheel brgs. 3144
- Assembly tool 3253
- Tube for wheel bearing 3345

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- Hot air blower V.A.G 1416

- **- 1 -** Internal puller Kukko 21/8
- **- 3 -** Splitter Kukko 17/2
- **- 4 -** Counter-support Kukko 22/2
- Feeler gauge

Pulling tapered roller bearing outer race out of transmission housing

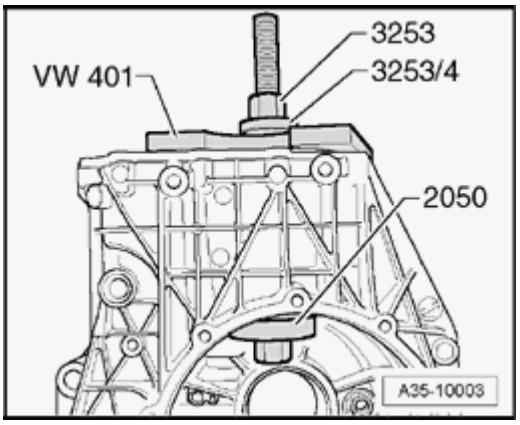


Fig. 404: Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Removing differential --> **Differential, removing and installing**.
- Install thrust piece 2050 with large diameter pointing toward outer race.
- Install threaded spindle and thrust pad of assembly tool 3253 with thrust plate VW 401 onto transmission housing.

The outer race will be pulled out of transmission housing when nut is tightened.

Heating transmission housing in order to install tapered roller bearing outer race

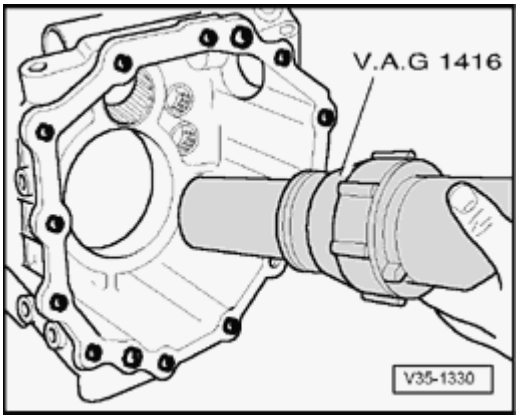


Fig. 405: Heating Transmission Housing To Insert Outer Race Of Large Taper Roller Bearing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat transmission housing in area of bearing seat for approx. 15 minutes, to approx. 100° C, with hot air blower V.A.G 1416.

Pressing tapered roller bearing outer race into transmission housing

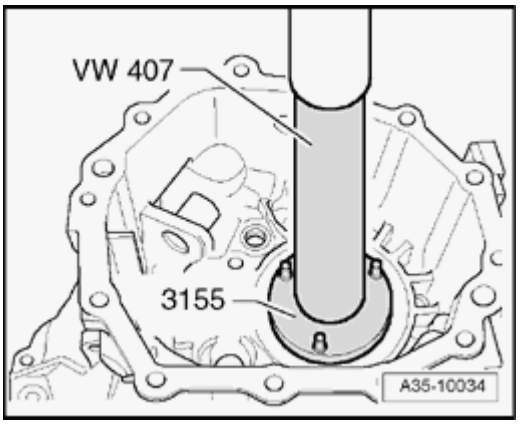


Fig. 406: Pressing Tapered Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert outer race only after heating transmission housing and push into position under Workshop press until heat exchange has taken place.

Pulling tapered roller bearing outer race out of bearing housing

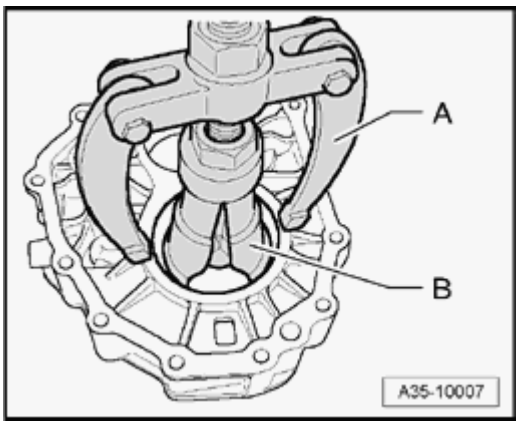


Fig. 407: Pulling Tapered Roller Bearing Outer Race Out Of Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Pressing tapered roller bearing outer race into bearing housing

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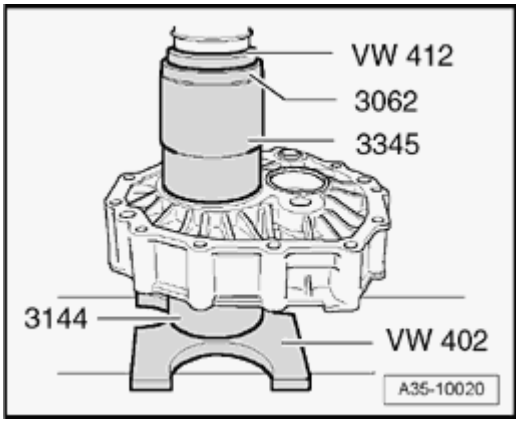


Fig. 408: Pressing In Tapered Roller Bearing Outer Race For Pinion Shaft With Shim Into Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Support bearing housing with press support-RI wheel brgs. 3144 directly below bearing mounting.

- Press in outer race until limit stop.

Pressing off thrust washer for reverse selector gear

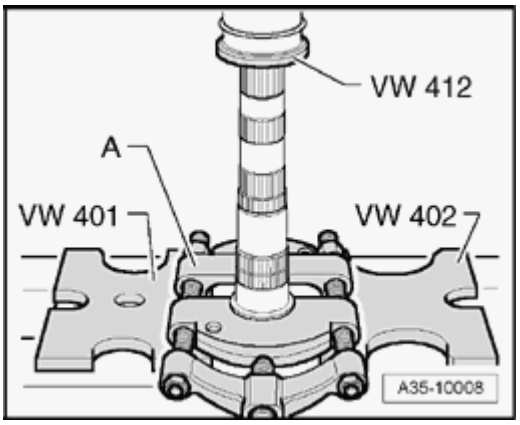


Fig. 409: Pressing Off Thrust Washer For Reverse Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Splitter 22 to 115 mm, e.g. Kukko 17/2

NOTE:

- **Install splitter - A - below thrust washer, and not below circlip.**

- Remove circlip below thrust washer.

Pressing off tapered roller bearing inner race with 2nd speed selector gear

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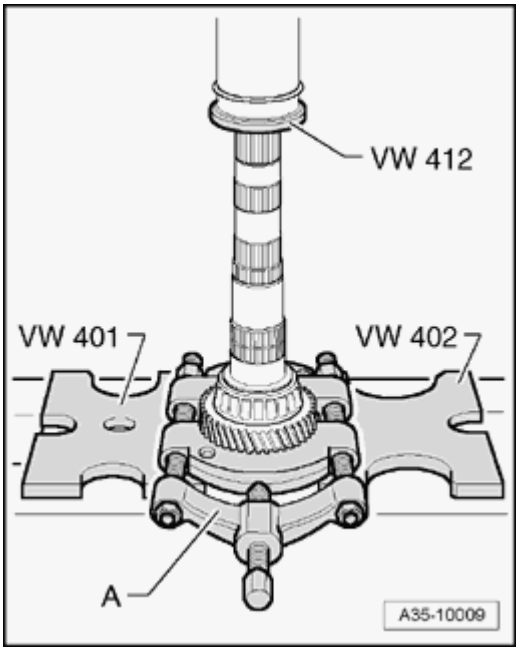


Fig. 410: Pressing Off Tapered Roller Bearing Inner Race With 2Nd Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Splitter 22 to 115 mm, e.g. Kukko 17/2

CAUTION: When pressing off, make sure that only the gear teeth of the selector gear and not the gear shift splines contact the splitter - A -. Otherwise the gear shift splines will be damaged.

- Remove circlip for tapered roller bearing inner race.

Pressing off 1st and 2nd gear synchronizing hub

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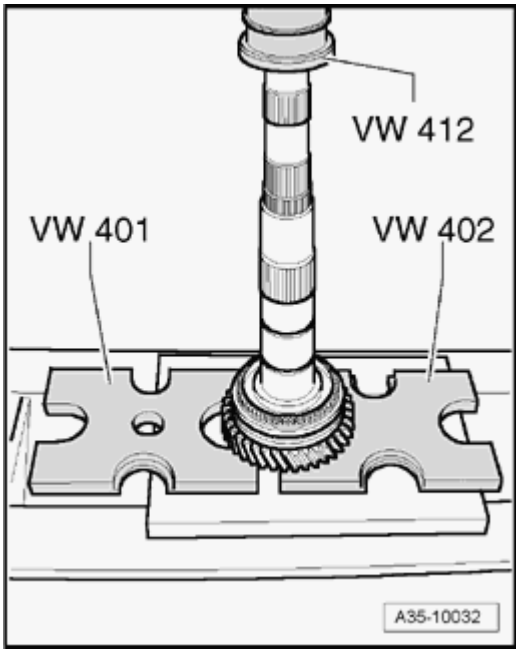


Fig. 411: Pressing Off 1st And 2nd Gear Synchronizing Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- Press synchronizing hub off with 1st speed selector gear

Pressing off tapered roller bearing inner race

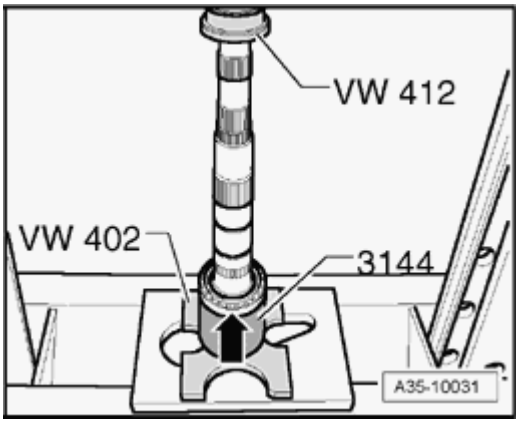


Fig. 412: Pressing Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- The outer race of tapered roller bearing - **arrow** - must be installed prior to pressing off inner race.

Pressing on tapered roller bearing inner race

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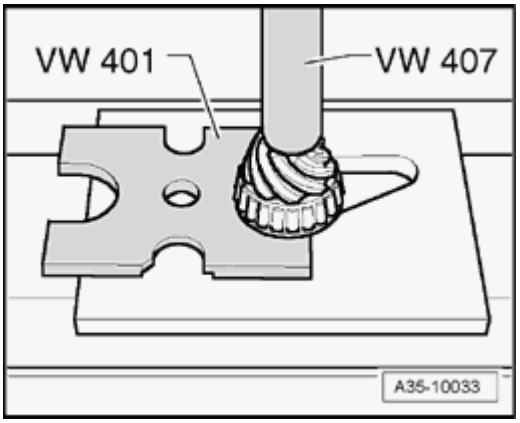


Fig. 413: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat inner race to approx. 100° C and press on.
- Determine thickness of required circlip **Determining thickness of circlip** and install circlip.

Determining thickness of circlip

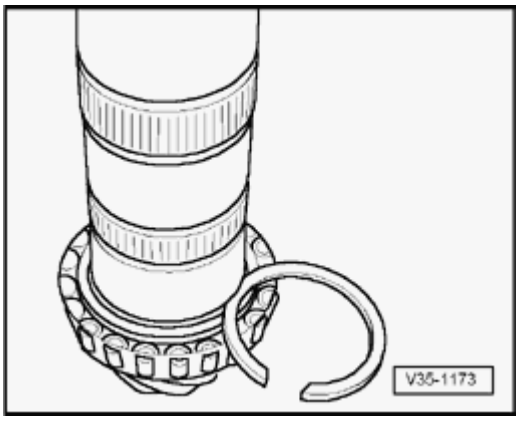


Fig. 414: Determining Circlip Fit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine thickest circlip that will just fit and install it. For Part No.

NOTE:

- **The thickness of the circlips for the synchronizing hubs and individual gear wheels must also be determined as shown for the tapered roller bearing.**

Overview for installation position of circlips **Installation position of circlips**

Installation position of circlips

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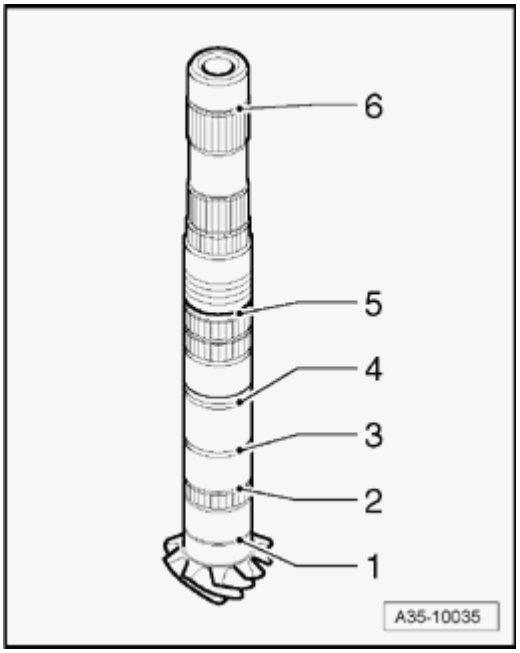


Fig. 415: Installation Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The required circlips for inner races of tapered roller bearings, the synchronizing hubs and individual gear wheels should be selected as shown in **Determining thickness of circlip**

- Circlip - **1** - secures tapered roller bearing inner race.

Circlip thickness (mm)		
2.50	2.56	2.62
2.53	2.59	2.65

- Circlip - **2** - secures 1st and 2nd gear synchronizing hub.

Identification: blue color

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17
1.96	2.08	
1.99	2.11	

- Circlip - **3** - secures tapered roller bearing inner race.

Circlip thickness (mm)
3.50

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- Circlip - **4** - secures thrust washer for reverse selector gear.

Circlip thickness (mm)
3.50

- Circlip - **5** - secures 3rd gear wheel.

Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	2.10

- Circlip - **6** - secures 6th gear wheel.

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17
1.96	2.08	2.20
1.99	2.11	

- Determine circlips according to table.

Installation position of synchronizing rings for 1st and 2nd gear:

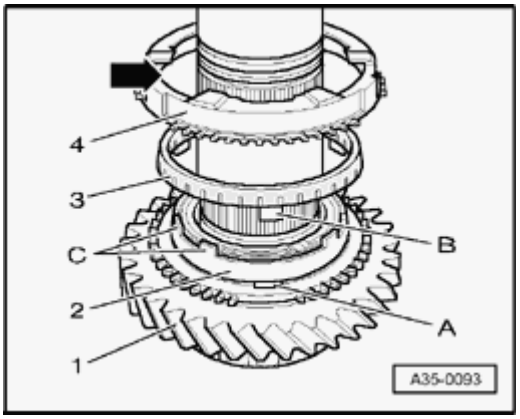


Fig. 416: Installation Position Of Synchronizer Rings For 1St And 2Nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **If components are not being replaced, make sure they are re-installed on the same gear.**

- Install inner ring - **2** - onto selector gear - **1** -.
- Install intermediate ring - **3** -. Lug - **B** - must be inserted into recess - **A** -.
- Synchro-ring - **4** - installed. Guide lugs - **C** - through recess - **arrow** -.

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Checking 1st gear inner ring for wear

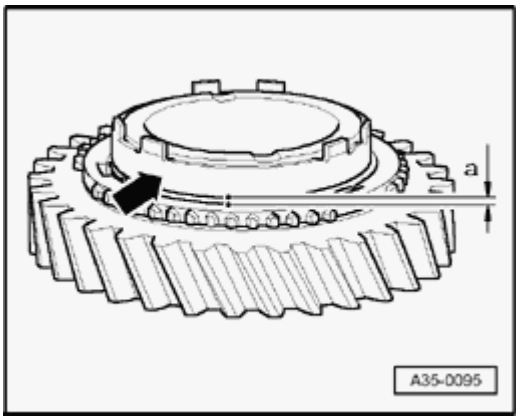


Fig. 417: Checking Inner Race Of 1st Gear For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check outer contact surface - **arrow** - for scoring or visible traces of wear and replace if necessary.
- Press inner ring onto chamfer on selector gear and measure gap - **a** - using a feeler gauge.

Gap - **a** -	As-new installation value	Wear limit
Inner ring for 1st gear	1.2 to 2.0 mm	0.6 mm

Checking 1st and 2nd gear intermediate ring for wear

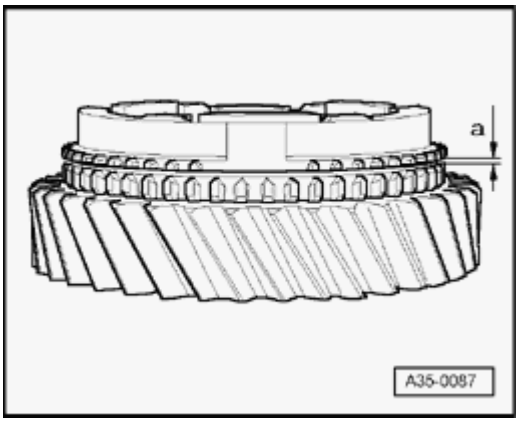


Fig. 418: Checking Synchronizer Ring For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check inner contact surface of synchro-ring for scoring or visible traces of wear and replace if necessary.
- Press inner ring, intermediate ring and synchro-ring onto chamfer on selector gear and measure gap - **a** - using a feeler gauge.

Gap - **a** -	As-new installation value	Wear limit
1st and 2nd gear	1.4 to 2.0 mm	0.8 mm

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Pressing on 1st and 2nd gear synchronizing hub

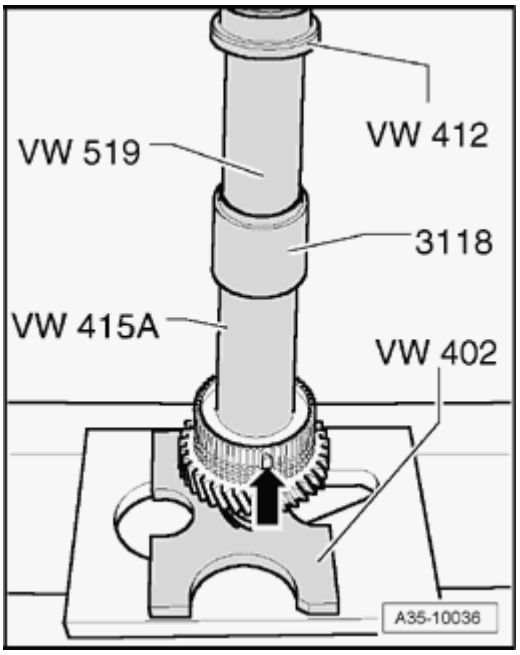


Fig. 419: Pressing On 1st And 2nd Gear Synchronizing Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inside collar faces 2nd gear.

- The lugs of 1st gear synchro-ring and recesses on synchronizing hub must align - **arrow** - when pressing on.

Assembling 1st and 2nd gear locking collar/synchronizing hub

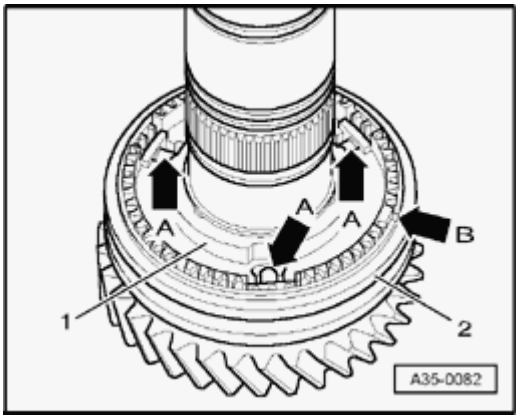


Fig. 420: Assembly Of Operating Sleeve/Synchronizers For 1st And 2nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install locking pieces - **arrows A** - into mounted synchronizing hub - **1** -.

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- Install locking collar - **2** - onto synchronizing hub so that the wide splines of locking collar and synchronizing hub - **arrow B** - coincide.
- Install circlip for 1st and 2nd gear synchronizing hub.
- Install 2nd speed selector gear with needle bearing and synchro-rings.

Pressing on tapered roller bearing inner race

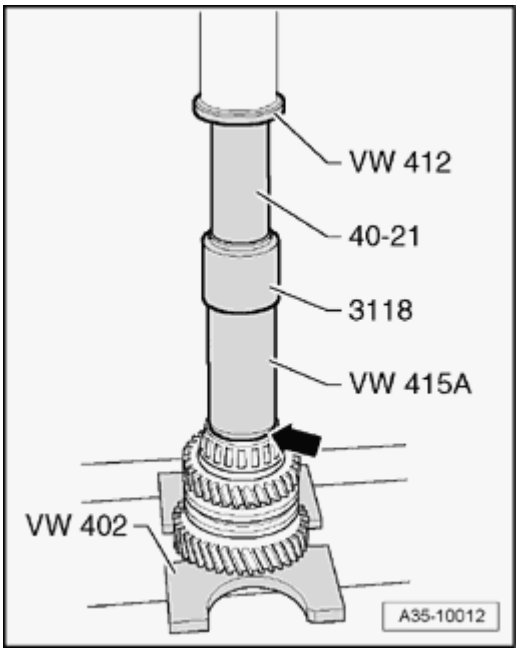


Fig. 421: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install circlip for tapered roller bearing inner race onto pinion shaft.

- Shoulder of tube VW 415 A faces inner race - **arrow** -.

Then check axial play of 1st speed and 2nd speed selector gears **Checking axial play of 1st speed selector gear** and **Checking axial play of 2nd speed selector gear**.

Checking axial play of 1st speed selector gear

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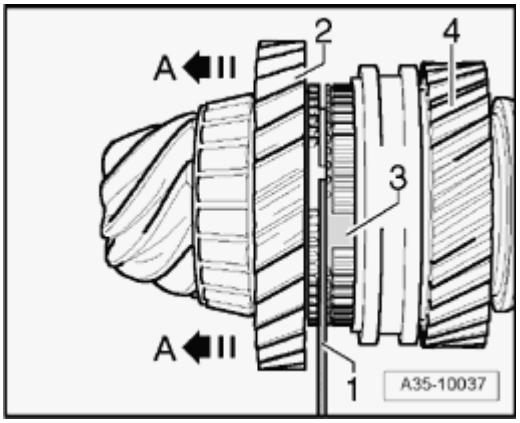


Fig. 422: Checking Axial Play Of 1st Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press 1st speed selector gear - **2** - in direction of - **arrow A** - as far as stop.
- Measure distance between 1st speed selector gear - **2** - and synchro-ring - **3** - using a feeler gauge - **1** -.

Example: 2.55 mm

- Press 1st speed selector gear - **2** - in direction of 2nd speed selector gear - **4** -.
- Measure distance again between 1st speed selector gear - **2** - and synchro-ring - **3** - using a feeler gauge - **1** -.

Example: 2.15 mm

- The difference between two measured values must be between 0.20to 0.50mm.

Checking axial play of 2nd speed selector gear

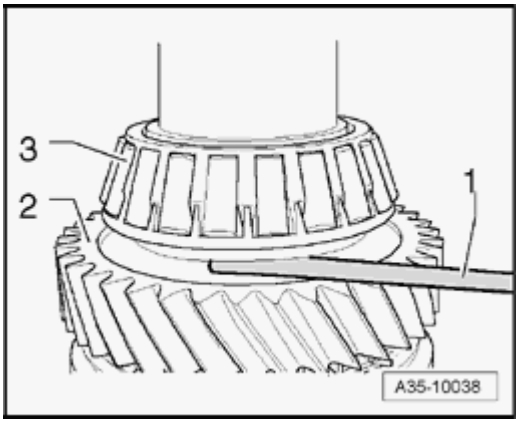


Fig. 423: Checking Axial Play Of 2nd Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check axial play between 2nd speed selector gear - **2** - and inner race of tapered roller bearing - **3** - using a feeler gauge - **1** -.

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- The play must be 0.20 to 0.50 mm.

Pressing on thrust washer for reverse selector gear

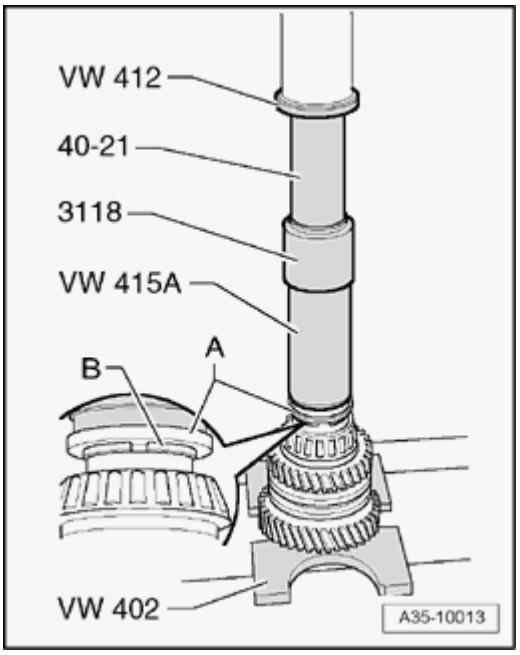


Fig. 424: Pressing On Thrust Washer For Reverse Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install circlip - **B** - onto output shaft.
- Press on thrust washer - **A** - until it makes contact with circlip.

39 FINAL DRIVE - DIFFERENTIAL

FLANGE SHAFT OIL SEAL (LEFT-SIDE), REPLACING

Flange shaft oil seal (left-side), replacing

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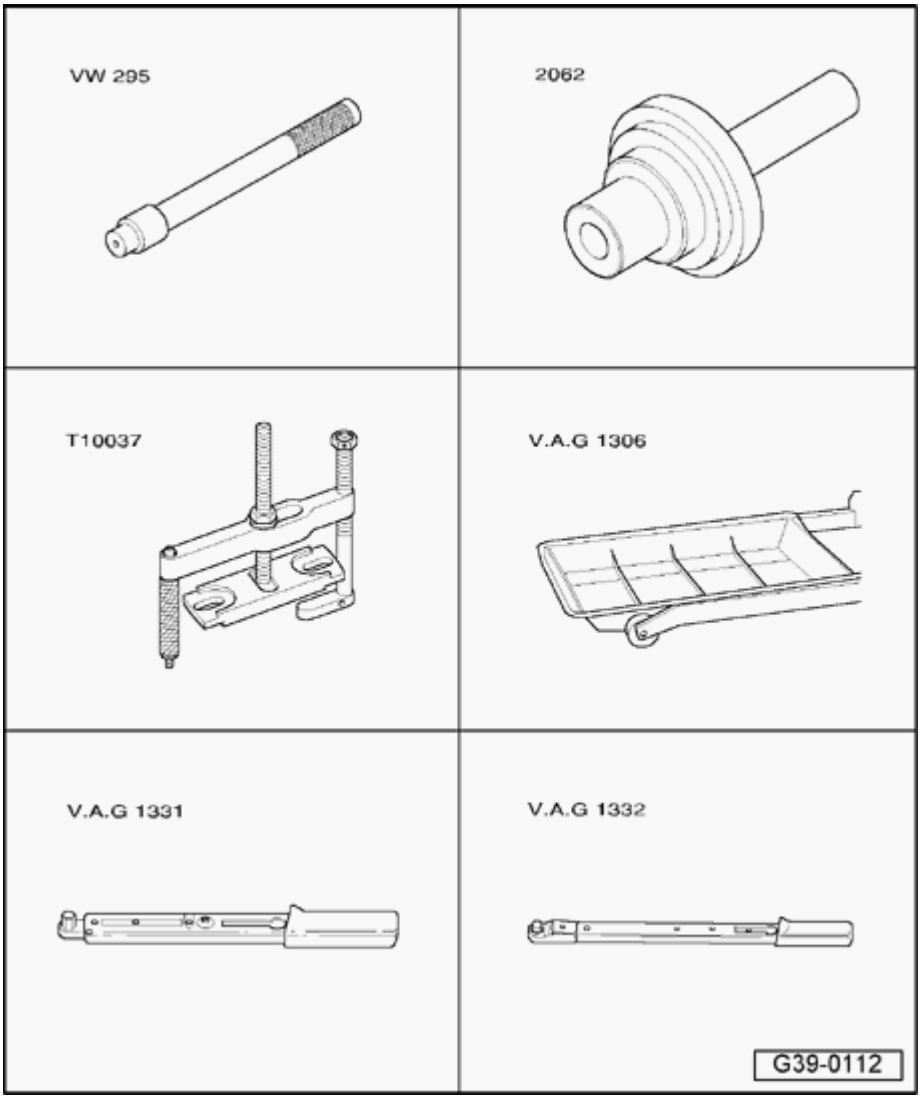


Fig. 425: Identifying Special Tools - Flange Shaft Oil Seal, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW295
- Drift 2062
- Puller T10037
- Drip tray V.A.G1306

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

Removing

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- Transmission is installed

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

- Remove left front wheel.

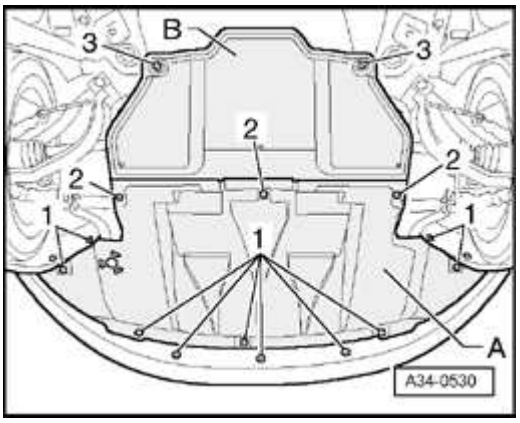


Fig. 426: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

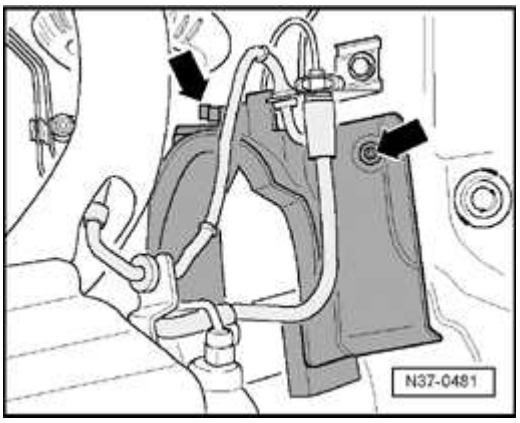


Fig. 427: Axle Shaft Noise Insulation Retainers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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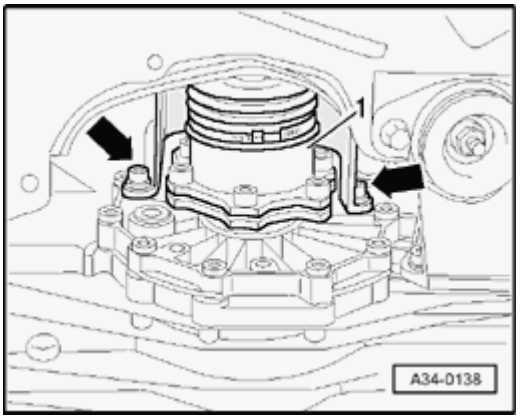


Fig. 428: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

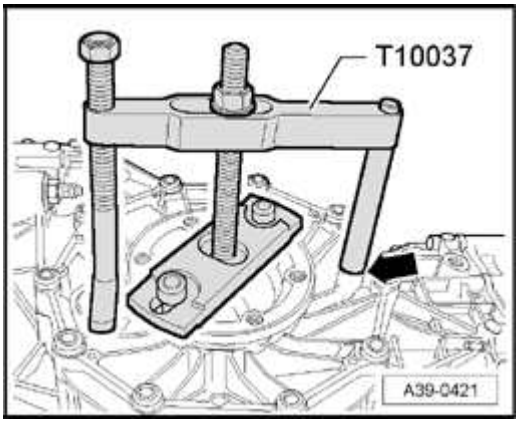


Fig. 429: Removing Flange Shaft Using Puller T10037
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray V.A.G1306 underneath.
- Remove flange shaft (left-side); to do so, secure puller T10037 to cover for final drive - **arrow** -.

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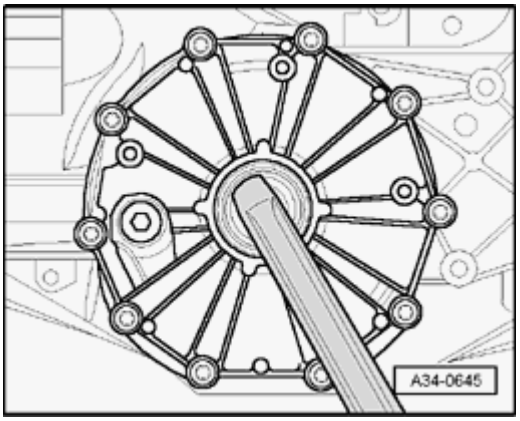


Fig. 430: Prying Out Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out flange shaft oil seal.

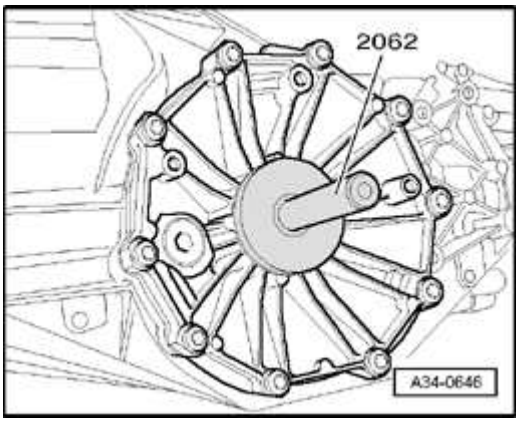


Fig. 431: Driving In New Flange Shaft Oil Seal Using Driver 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

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

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

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

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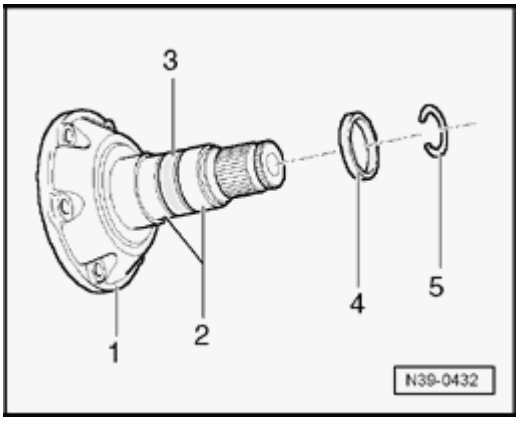


Fig. 432: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

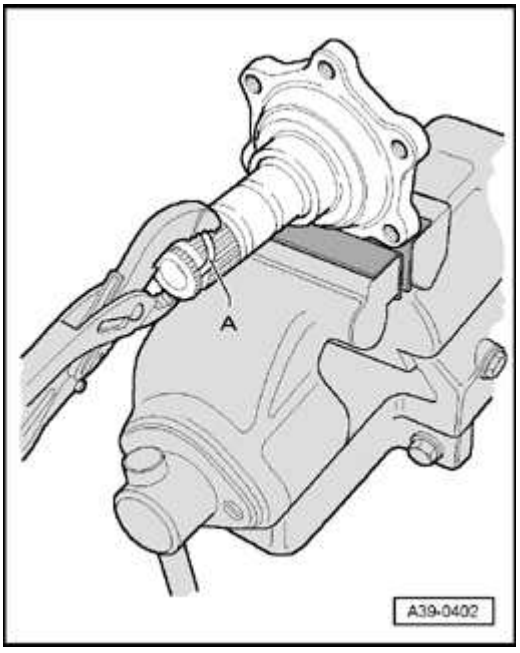


Fig. 433: Identifying Flange Shaft Clamped In Vise And Using New Circlip To Press Old Circlip Out Of Groove In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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

Tightening torque

Component		Nm
Heat shield above drive axle to transmission		23

Flange shaft oil seal (right-side), replacing

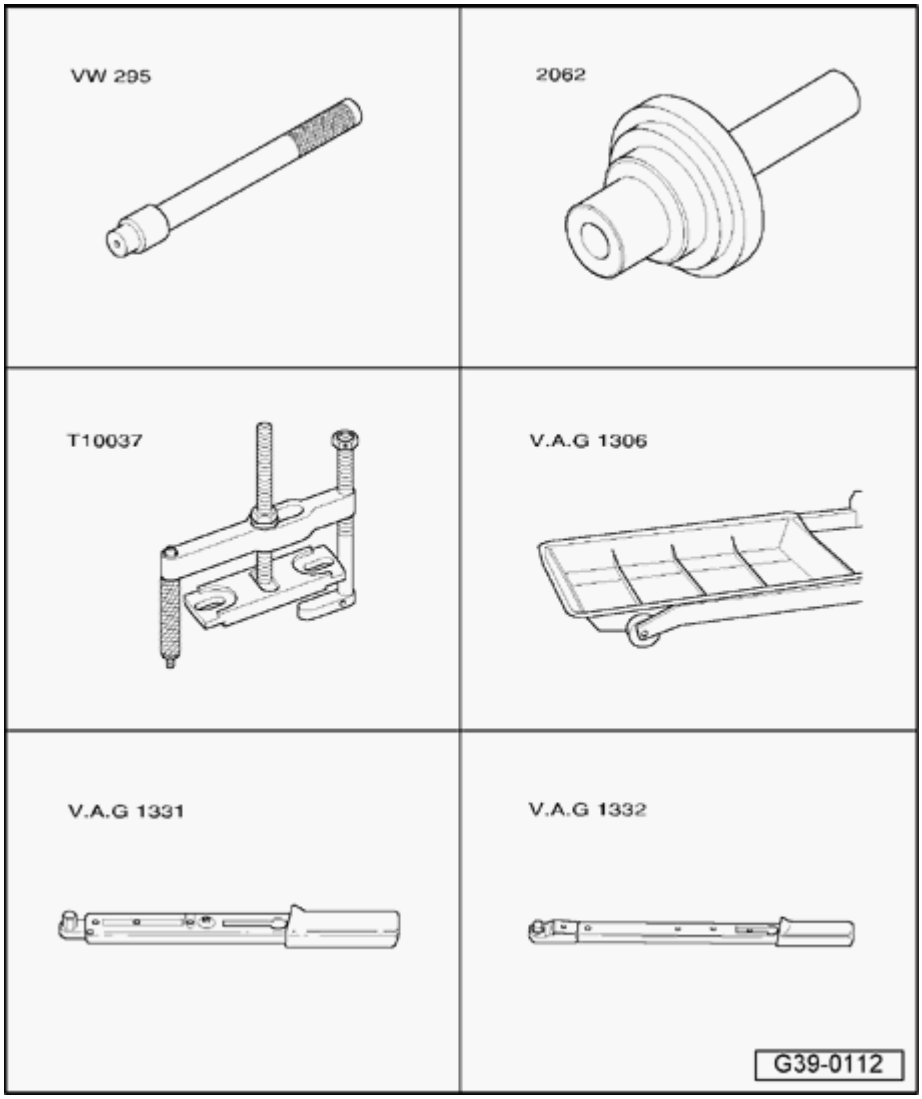


Fig. 434: Identifying Special Tools - Flange Shaft Oil Seal, Replacing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

Removing

- Transmission is installed

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

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

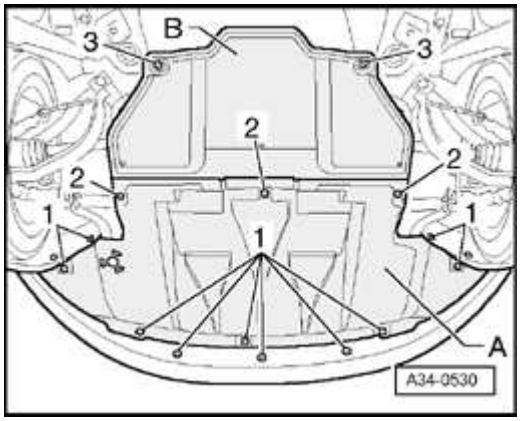


Fig. 435: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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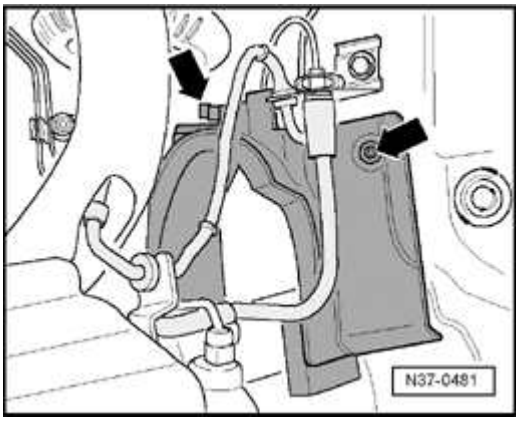


Fig. 436: Axle Shaft Noise Insulation Retainers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

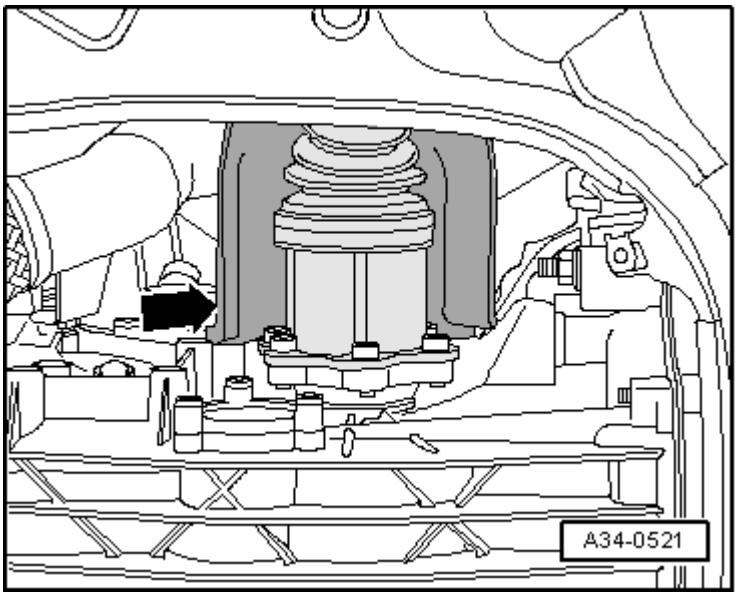


Fig. 437: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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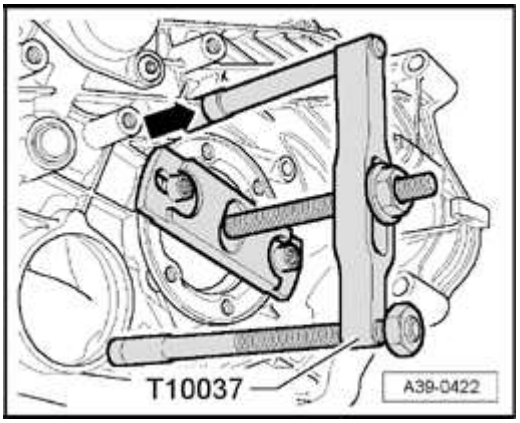


Fig. 438: Removing Flange Shaft By Securing Puller T10037 To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray V.A.G1306 underneath.
- Remove flange shaft (right-side); by securing puller T10037 to transmission housing - **arrow** -.

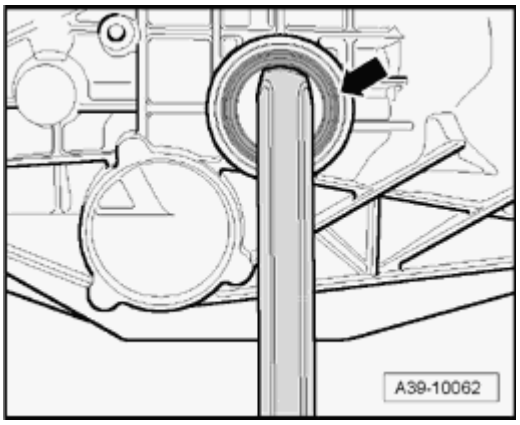


Fig. 439: Prying Out Flange Shaft Oil Seal Using An Assembly Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

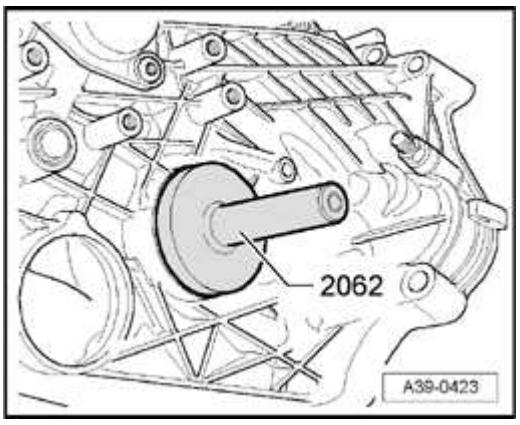


Fig. 440: Driving In New Flange Shaft Oil Seal Using Fitting Drift 2062

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

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

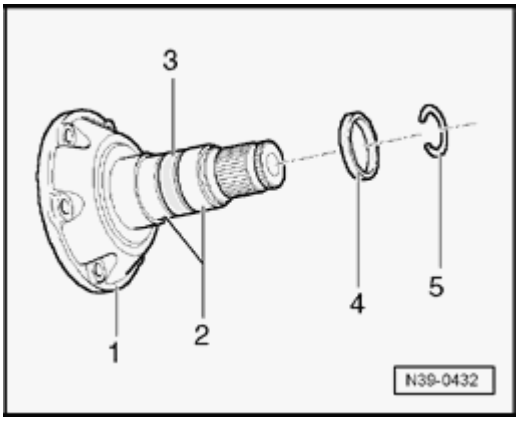


Fig. 441: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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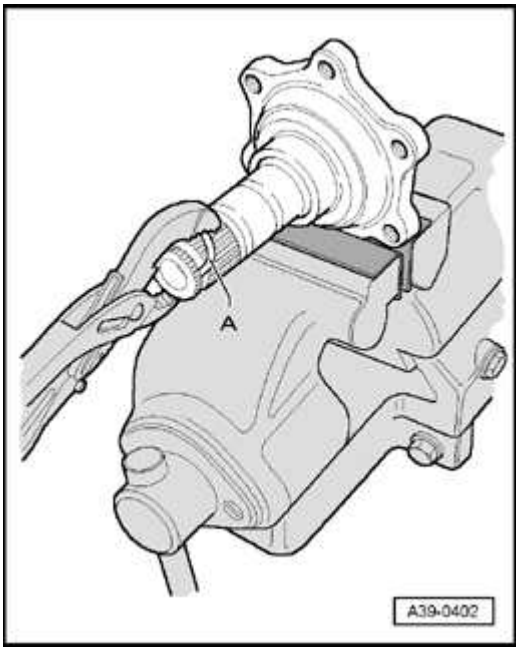


Fig. 442: Identifying Flange Shaft Clamped In Vise And Using New Circlip To Press Old Circlip Out Of Groove In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp flange shaft in vise, using jaw protectors. Use new circlip - **A** - to press old circlip out of groove in flange shaft.
- Drive flange shaft in with drift VW295.
- Install drive axle --> **40 - FRONT SUSPENSION** .
- Bolt on heat shield for drive axle (right-side).
- Fill transmission with oil and check oil level --> **Transmission oil level, checking**.
- Install sound insulation.

Tightening torque

Component		Nm
Heat shield above drive shaft to transmission		23

DIFFERENTIAL, REMOVING AND INSTALLING

Differential, removing and installing

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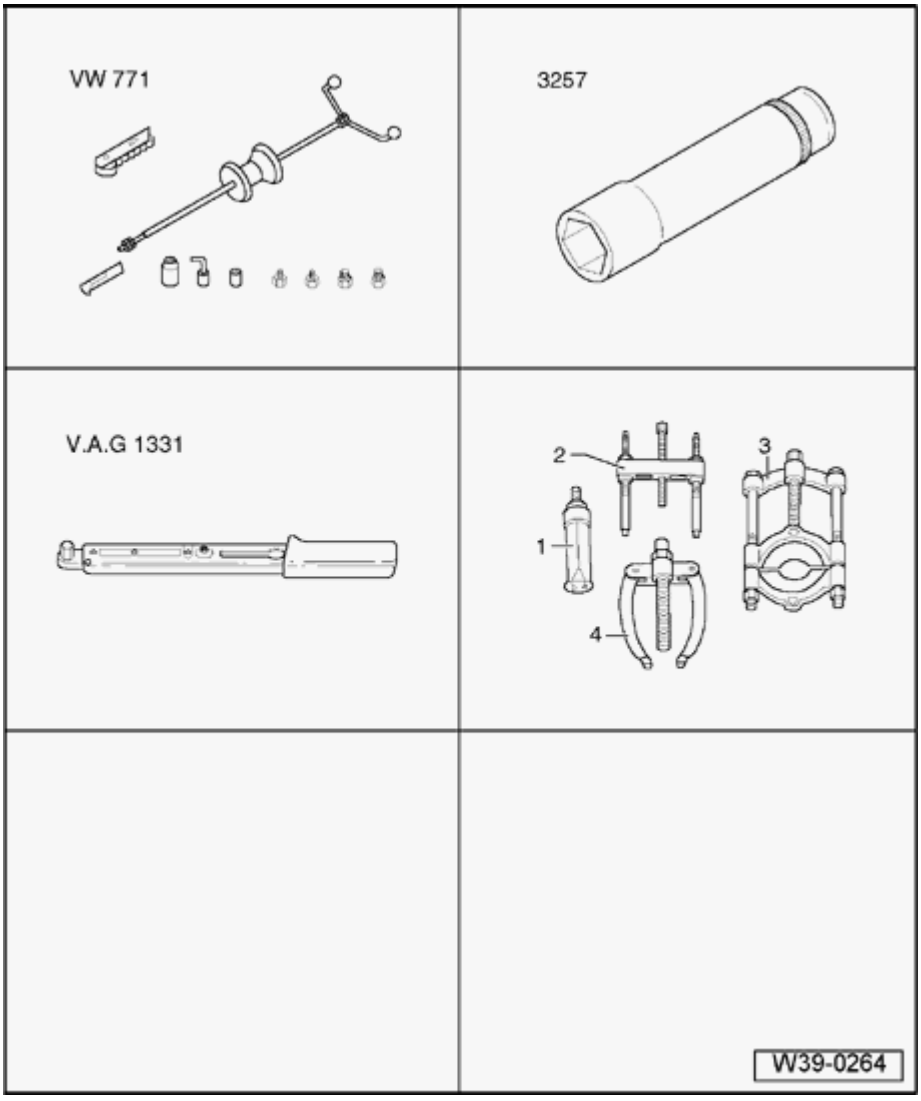


Fig. 443: Identifying Special Tools - Differential, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

NOTE:

- **Removing and installing is possible with the transmission installed.**
- **The differential can be removed and installed without removing the selector mechanism, input shaft, pinion shaft and bearing housing. These components must be removed if the differential needs to be adjusted.**
- **Inspect polygon bearings for visible damage.**

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

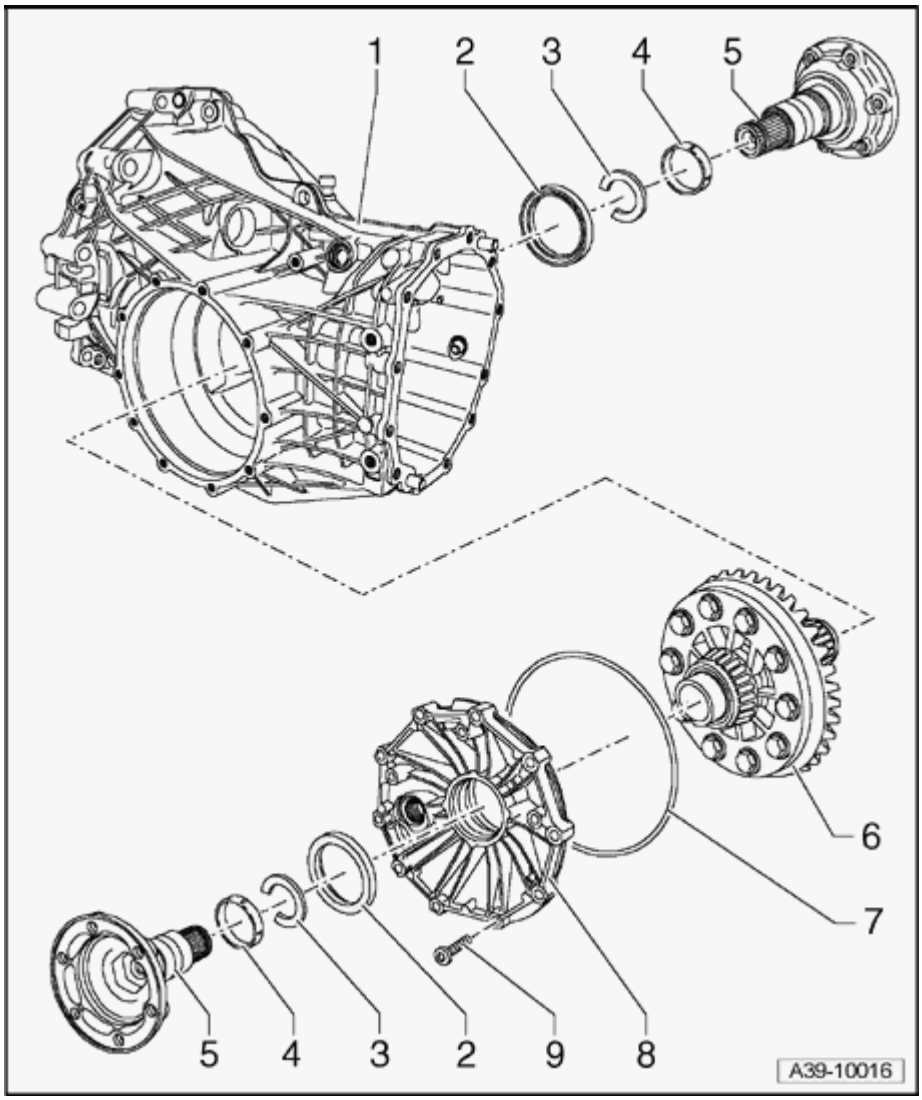


Fig. 444: Differential Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing 1)

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2 - Oil seal

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

3 - Circlip

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

4 - Spacer ring

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

5 - Flange shaft

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

6 - Differential with crown wheel 1)

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

7 - O-ring

- Always replace
- Lubricate with gear oil

8 - Cover for final drive 1)

9 - TORX bolt, 20 Nm plus an additional 90°1 / 4 turn

Removing flange shaft (left-side)

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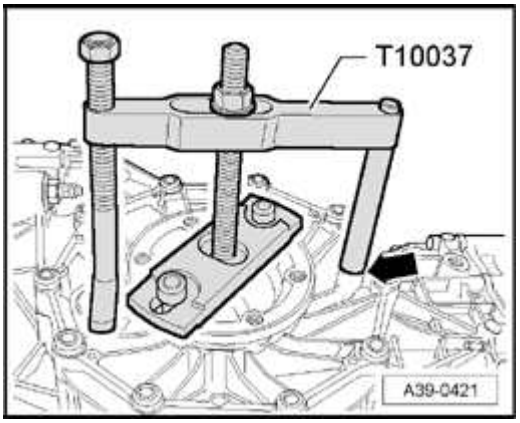


Fig. 445: Removing Flange Shaft Using Puller T10037
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Remove right flange shaft

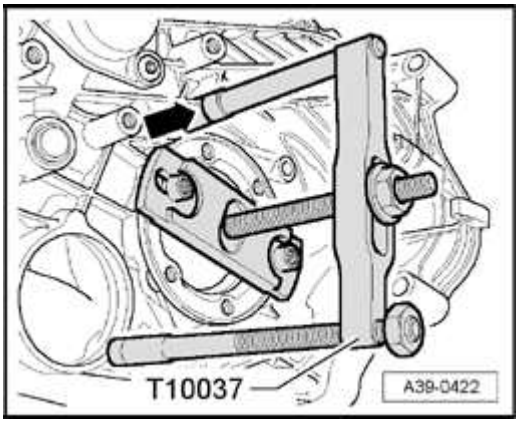


Fig. 446: Removing Flange Shaft By Securing Puller T10037 To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing and installing circlip

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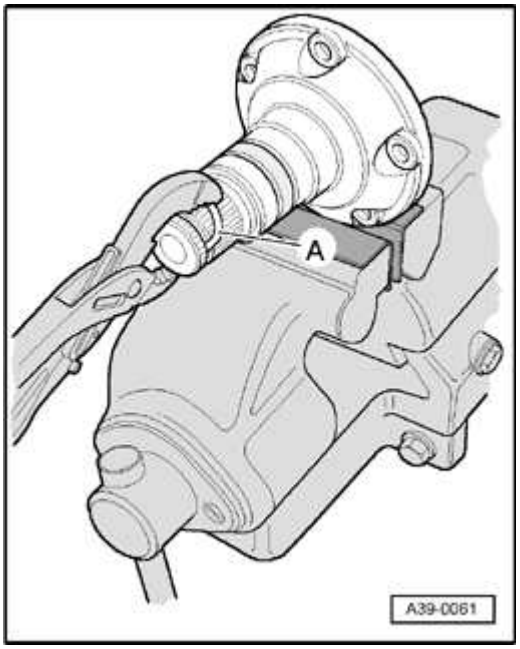


Fig. 447: Removing And Installing Securing Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing spacer ring

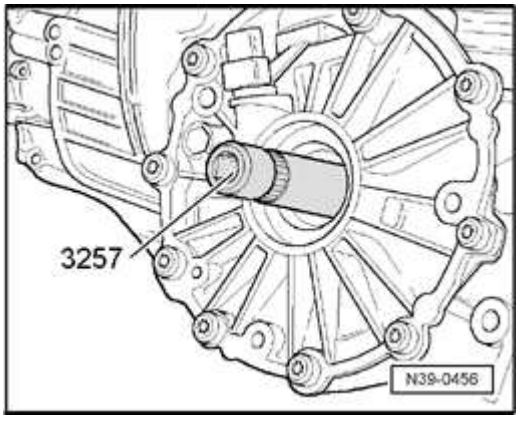


Fig. 448: Installing Spacer Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Flange shaft assembly

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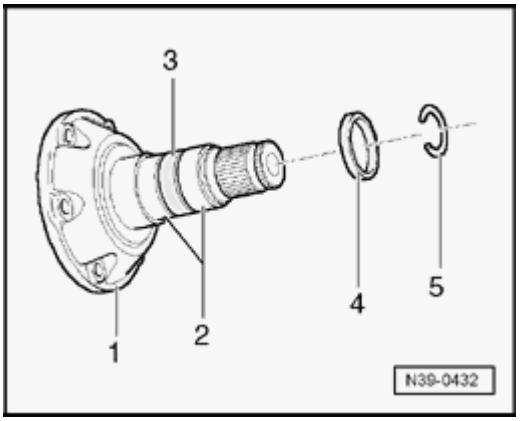


Fig. 449: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

Removing flange shaft oil seal (left-side)

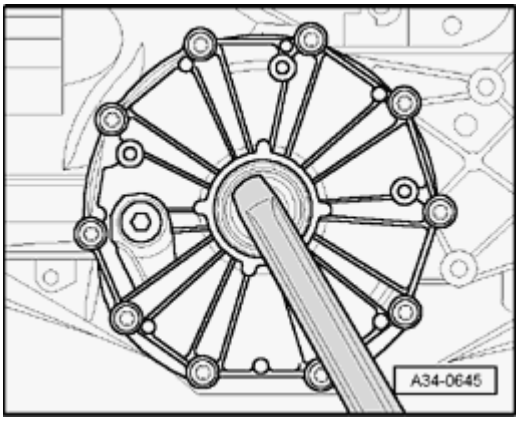


Fig. 450: Prying Out Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing flange shaft oil seal (left-side)

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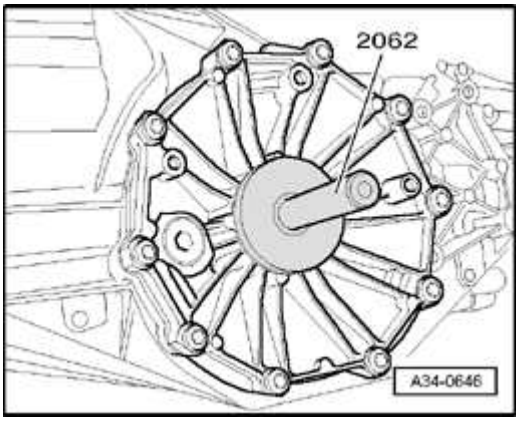


Fig. 451: Driving In New Flange Shaft Oil Seal Using Driver 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Drive flange shaft in with needle bearing drift VW295.

Removing flange shaft oil seal (right-side)

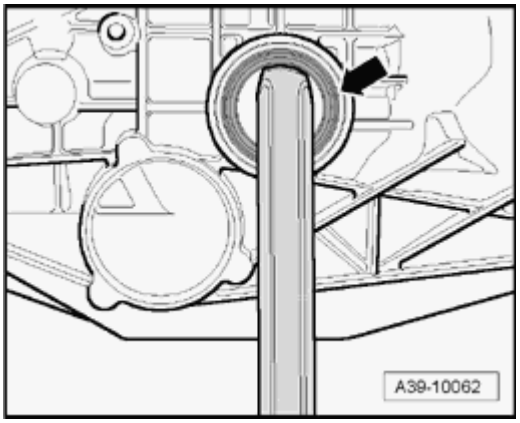


Fig. 452: Prying Out Flange Shaft Oil Seal Using An Assembly Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing flange shaft oil seal (right-side)

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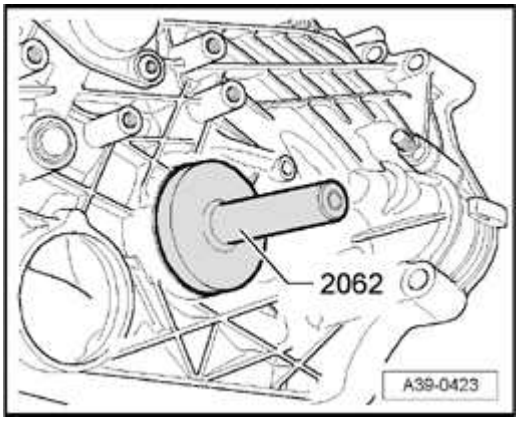


Fig. 453: Driving In New Flange Shaft Oil Seal Using Fitting Drift 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

DIFFERENTIAL, DISASSEMBLING AND ASSEMBLING

Differential, disassembling and assembling

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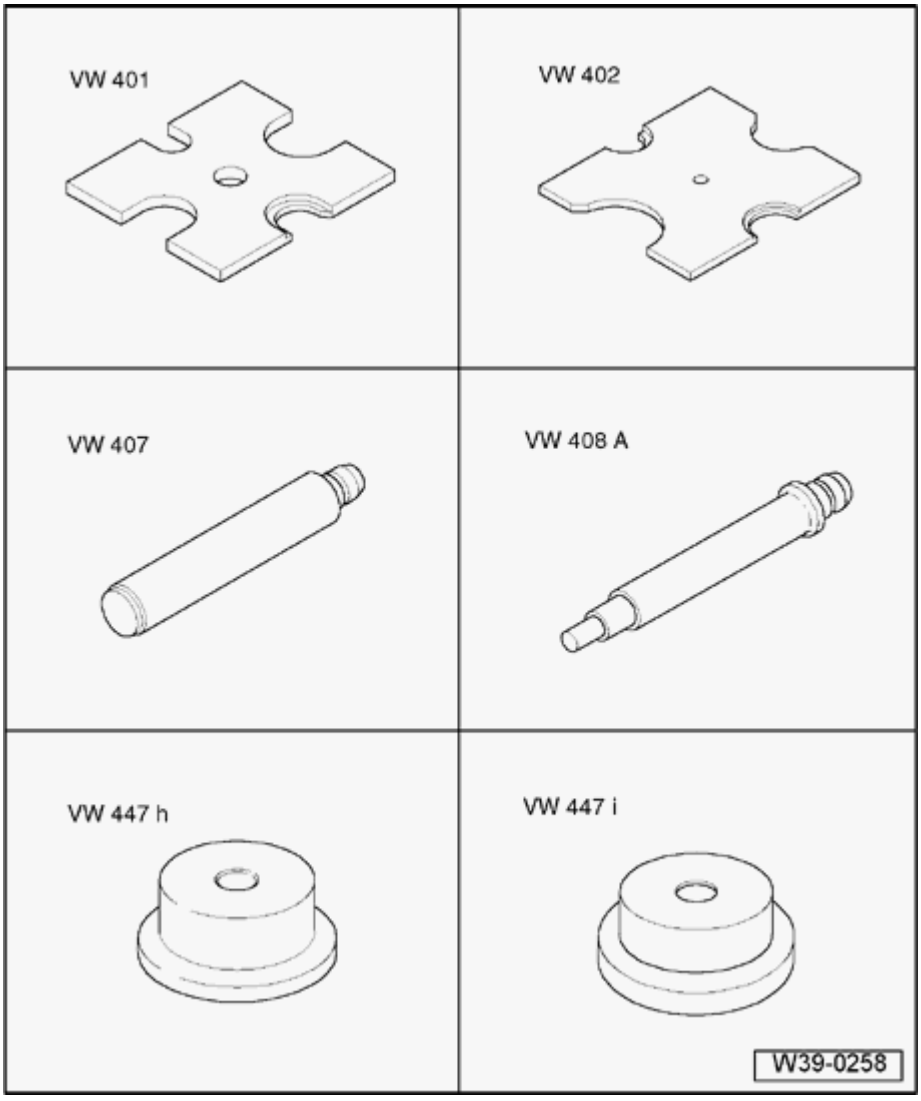


Fig. 454: Identifying Special Tools - Differential, Disassembling And Assembling (1 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW401
- Thrust plate VW402
- Press tool VW407
- Press tool VW408A

- Thrust pad VW447H
- Thrust pad VW 447 i

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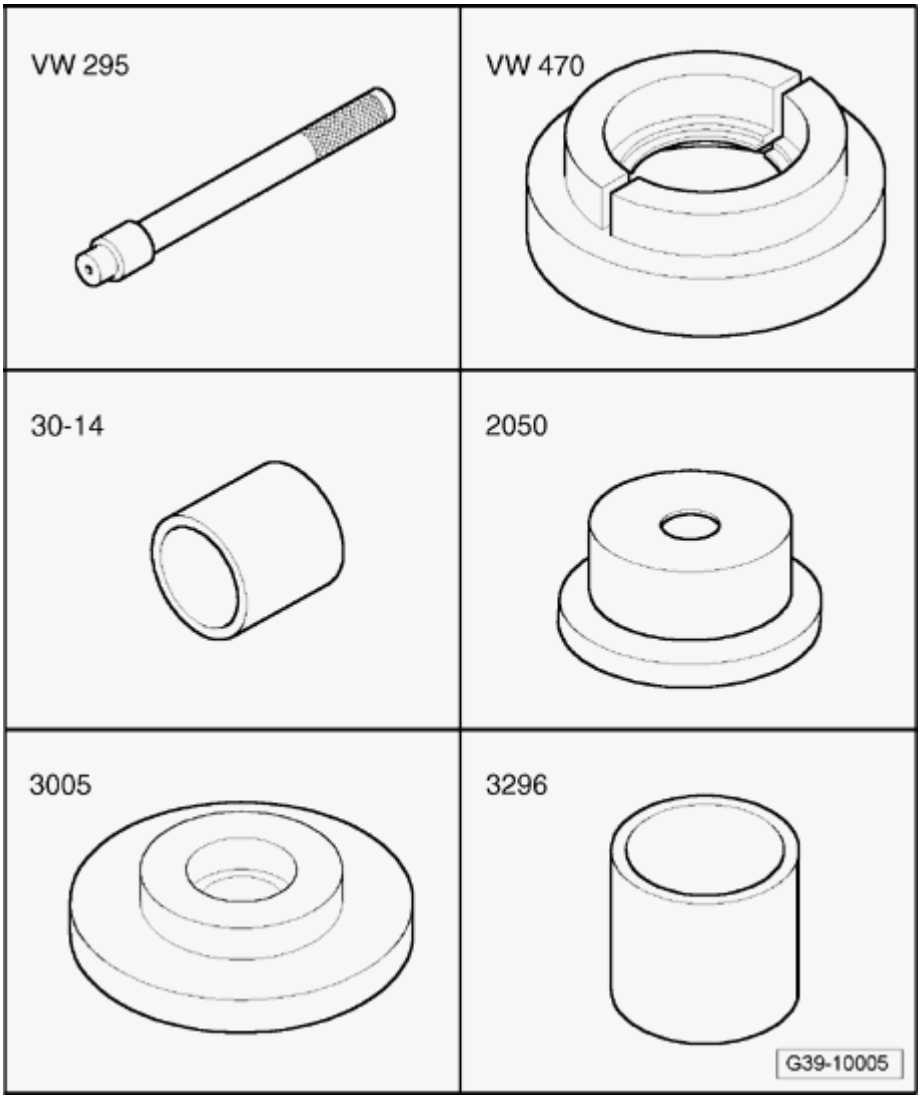


Fig. 455: Identifying Special Tools - Differential, Disassembling And Assembling (2 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW 295
- Thrust pieces for pinion shaft bearing VW 470
- Sleeve 30 - 14
- Thrust plate 2050

- Thrust pad 3005
- Tube 3296

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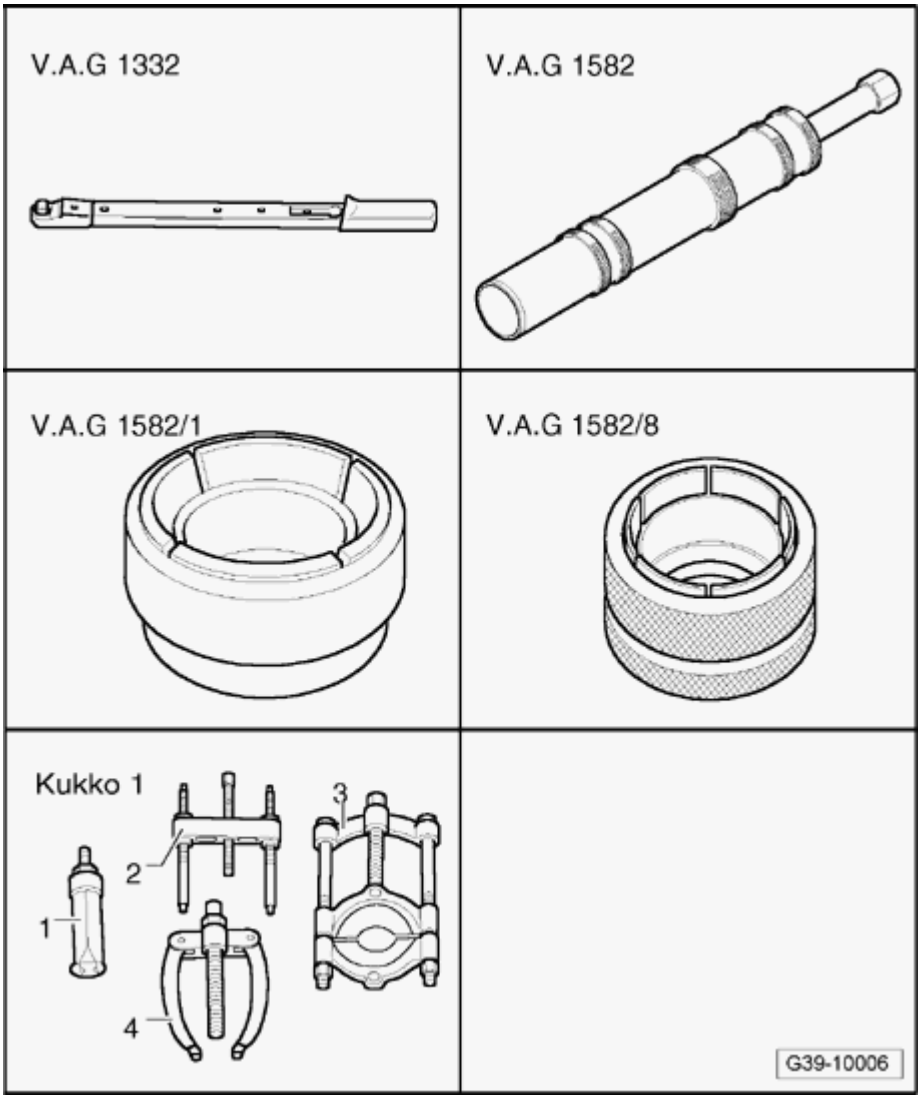


Fig. 456: Identifying Special Tools - Differential, Disassembling And Assembling (3 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

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

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

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NOTE:

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

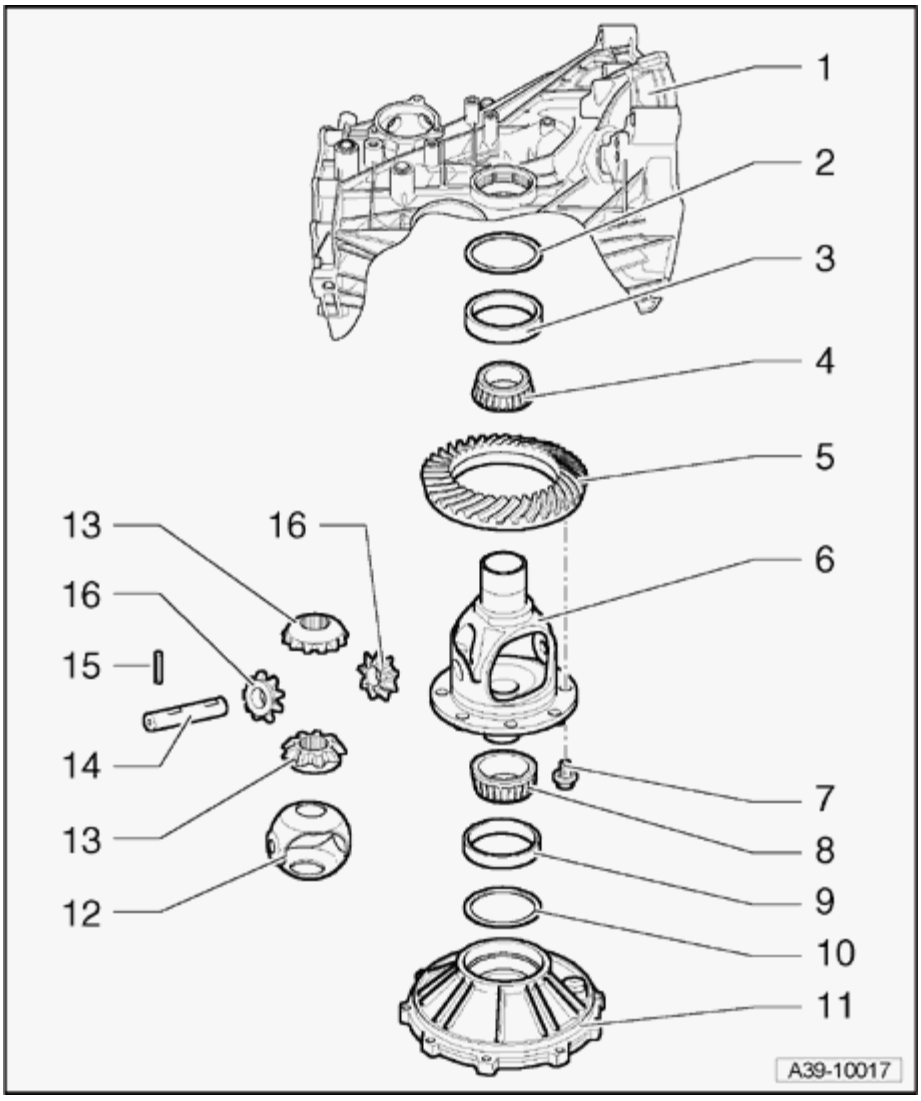


Fig. 457: Differential Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing 1)

2 - Shim "S_2 "

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

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

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

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

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

5 - Crown wheel [1)]

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

6 - Differential cage[1)]

7 - Bolt, 30 Nm plus an additional 90°[1] / $_4$ turn

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

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

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

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

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

10 - Shim "S_1 "

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

11 - Cover for final drive [1)]

- With O-ring

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12 - One-piece thrust washer

- Lubricate with gear oil before installing

13 - Sun wheel

- Installing **Installing differential bevel gears**

14 - Differential pinion pin

- Drive out with drift after removing spring pin

15 - Spring pin

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

16 - Planet pinion

- Installing **Installing differential bevel gears**

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

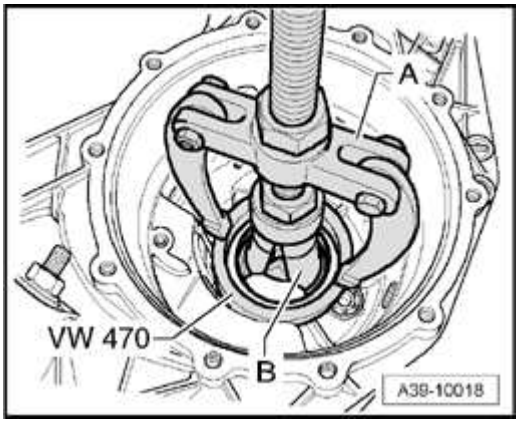


Fig. 458: Pulling Tapered Roller Bearing Outer Race (Right-Side) Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- After removing, check shims for damage.

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

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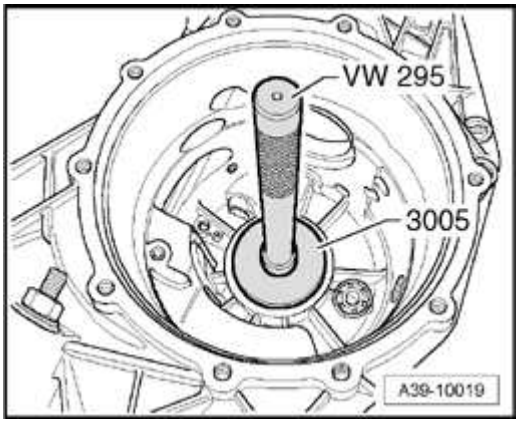


Fig. 459: Driving Outer Race For Tapered Roller Bearing With Shim Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

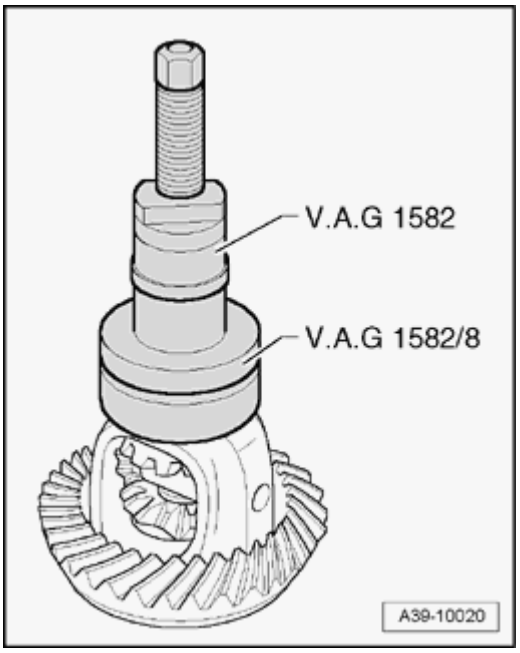


Fig. 460: Pulling Off Inner Race For Tapered Roller Bearing (Right-Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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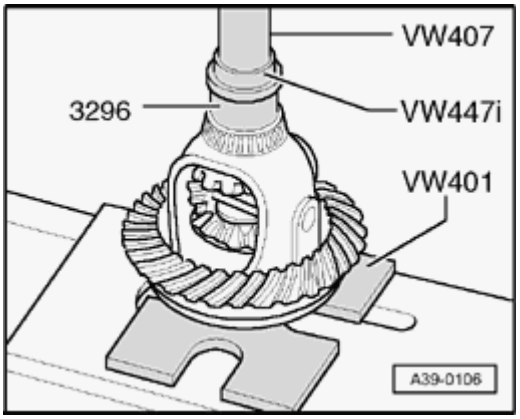


Fig. 461: Pressing On Right Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

CAUTION: Wear protective gloves.

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

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

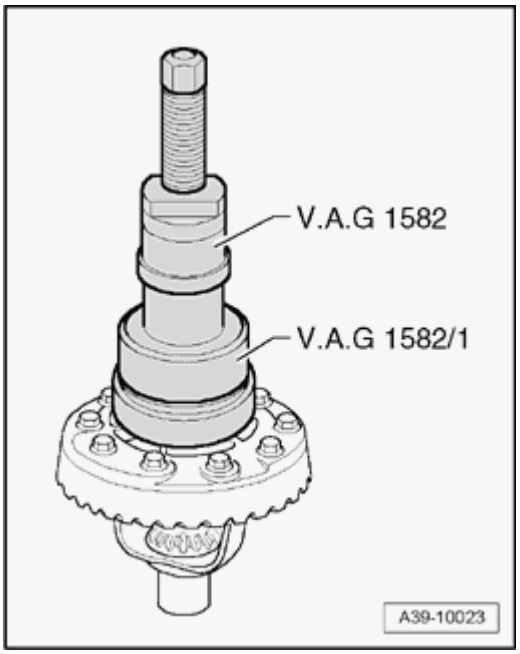


Fig. 462: Pulling Off Inner Race For Tapered Roller Bearing (Left-Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

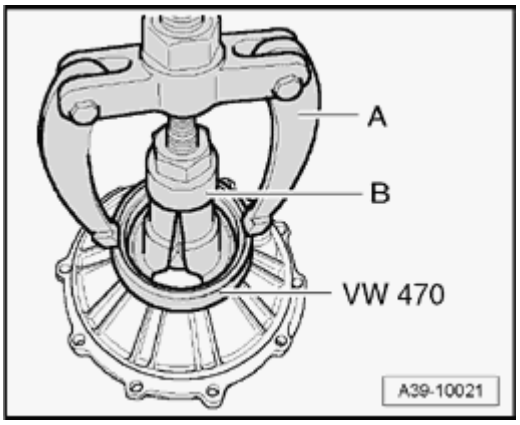


Fig. 463: Pulling Tapered Roller Bearing Outer Race (Left-Side) Out Of Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- After removing, check shims for damage.

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

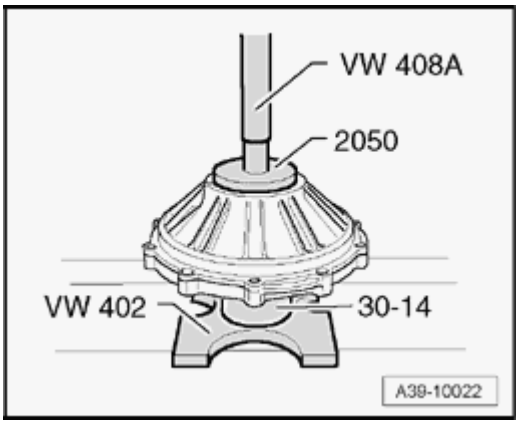


Fig. 464: Pressing Tapered Roller Bearing Outer Race (Left-Side) Into Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving crown wheel off cage

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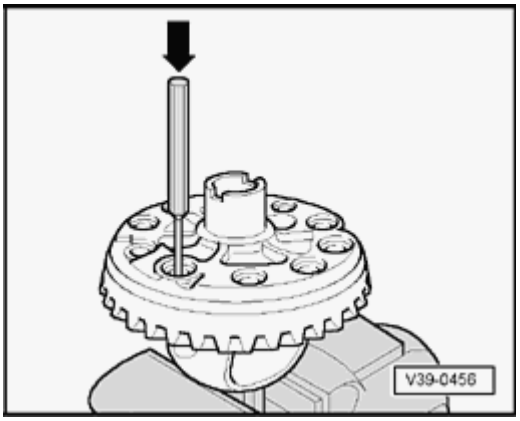


Fig. 465: Driving Out Ring Gear From Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Heating crown wheel to approx. 100° C and installing

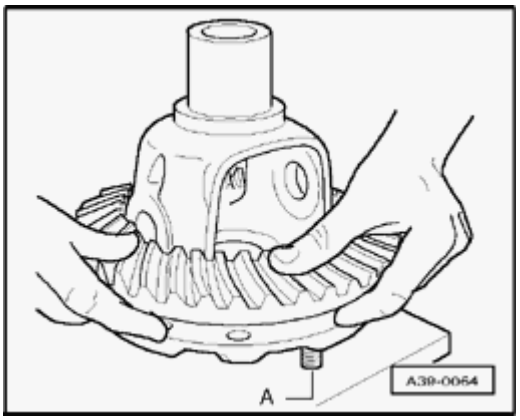


Fig. 466: Installing Ring Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

CAUTION: Wear protective gloves.

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

Installing differential bevel gears

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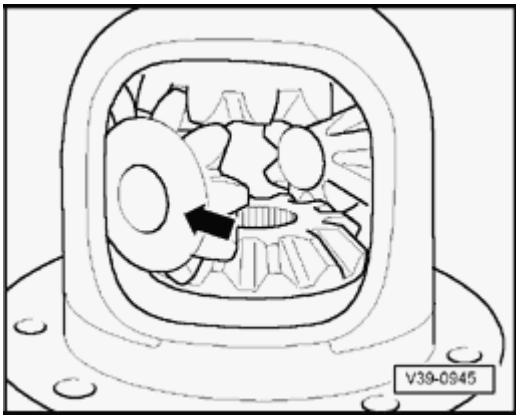


Fig. 467: Installing Small Differential Bevel Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

PINION SHAFT AND CROWN WHEEL, ADJUSTING

Pinion shaft and crown wheel, adjusting

NOTE:

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

Final drive gear set, adjustment and marking

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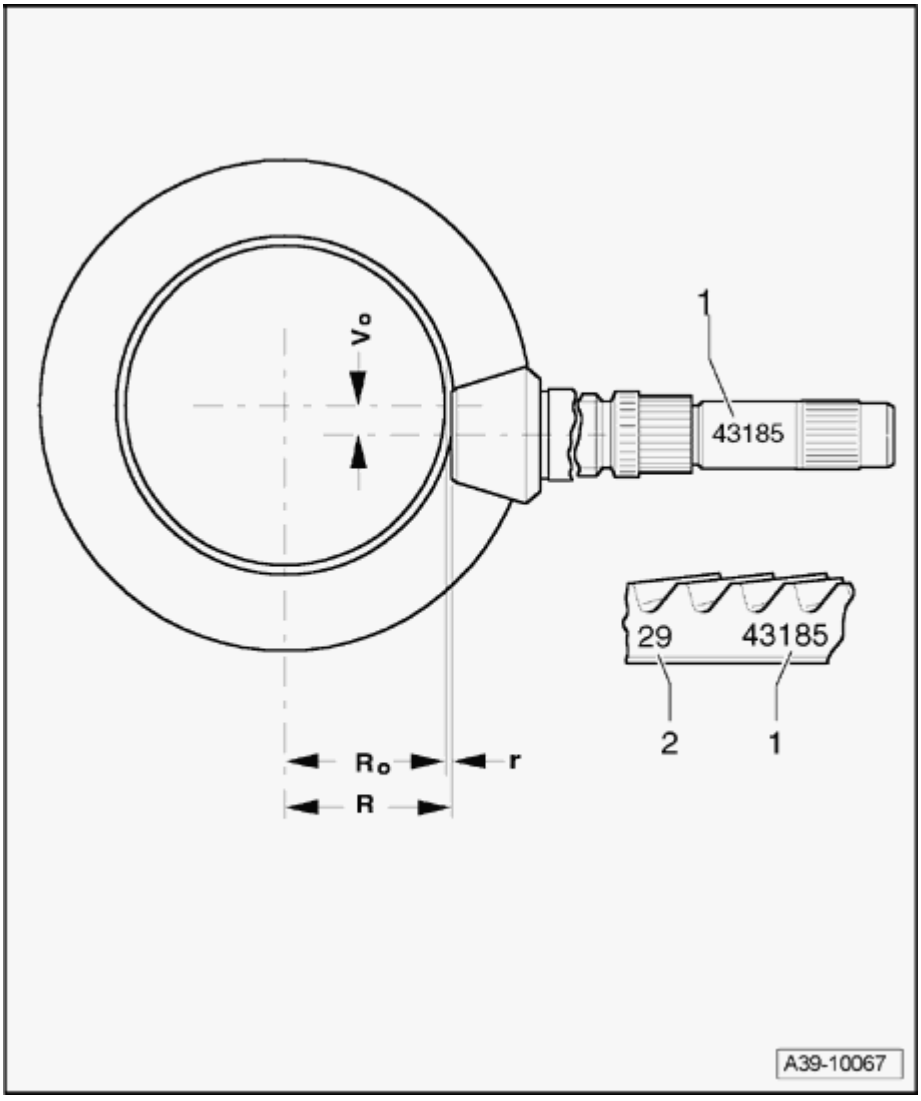


Fig. 468: Final Drive Gear Set, Adjustment And Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - "43185" number of matched pair of gears

2 - Deviation (tolerance) "r" is based on the master gauge used on the test machine in production. The dimension "r" is always given in 1/100mm. For example: "29" indicates r = 0.29 mm

Ro - Length of test machine master gauge

Ro - Crown wheel diameter 188 mm = 59.65 mm

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

Vo - Hypoid offset

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Position of shims

NOTE:

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

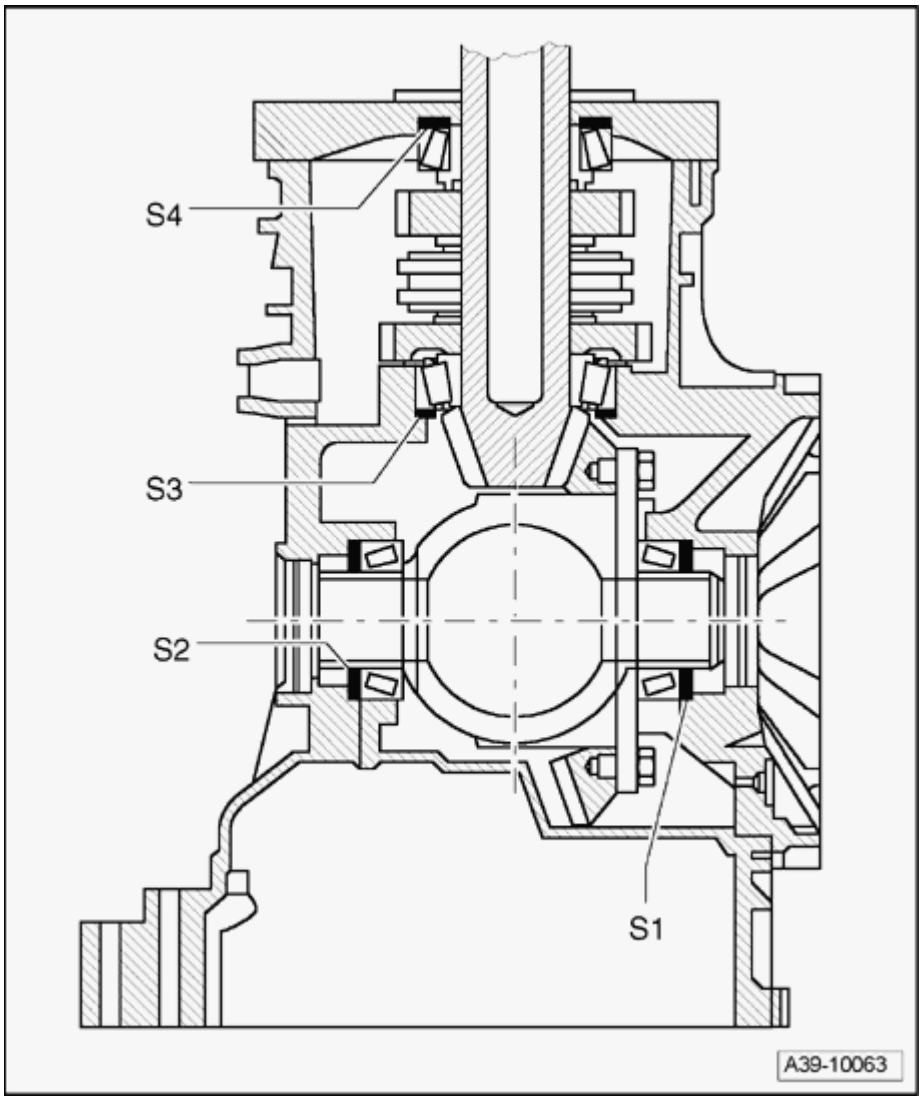


Fig. 469: Position Of Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

S1 - Shim for crown wheel in cover for final drive

S2 - Adjustment shim for crown wheel in transmission housing

S3 - Adjustment shim for pinion shaft in transmission housing

S4 - Shim for pinion shaft in bearing housing

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Table of adjustments

NOTE:

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

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

*Pinion shaft and crown wheel; only replace together.

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

Adjusting gear set, recommended sequence

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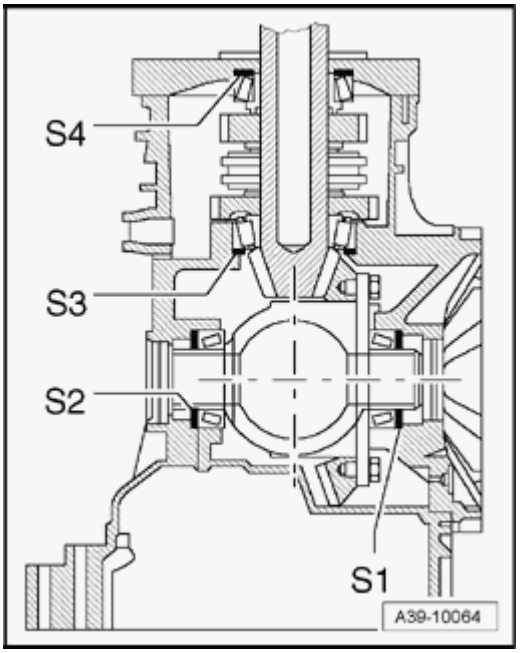


Fig. 470: Adjusting Gear Set
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The following work sequence is recommended to save time when crown wheel and pinion shaft have to be adjusted:

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

Pinion shaft, adjusting

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

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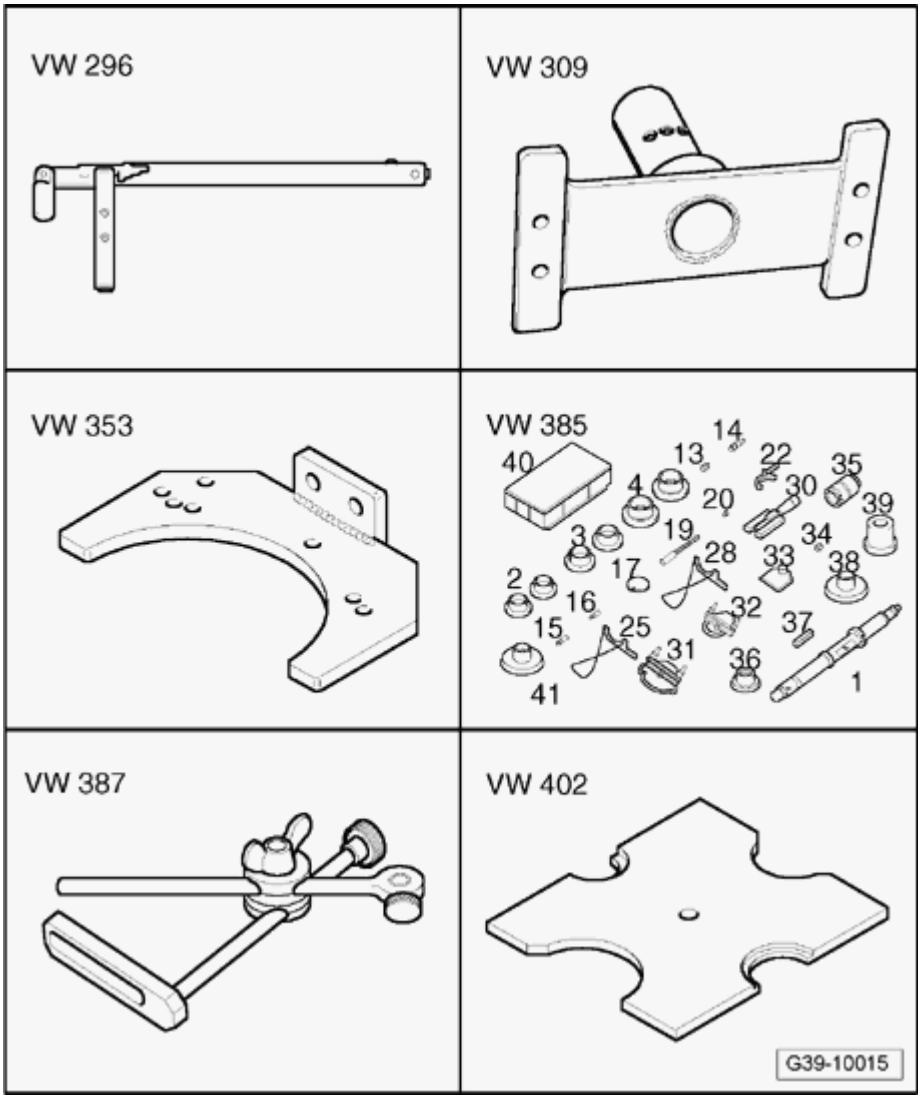


Fig. 471: Identifying Special Tools - Pinion Shaft, Adjusting (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

- Dial gauge holder VW387
- Thrust plate VW402

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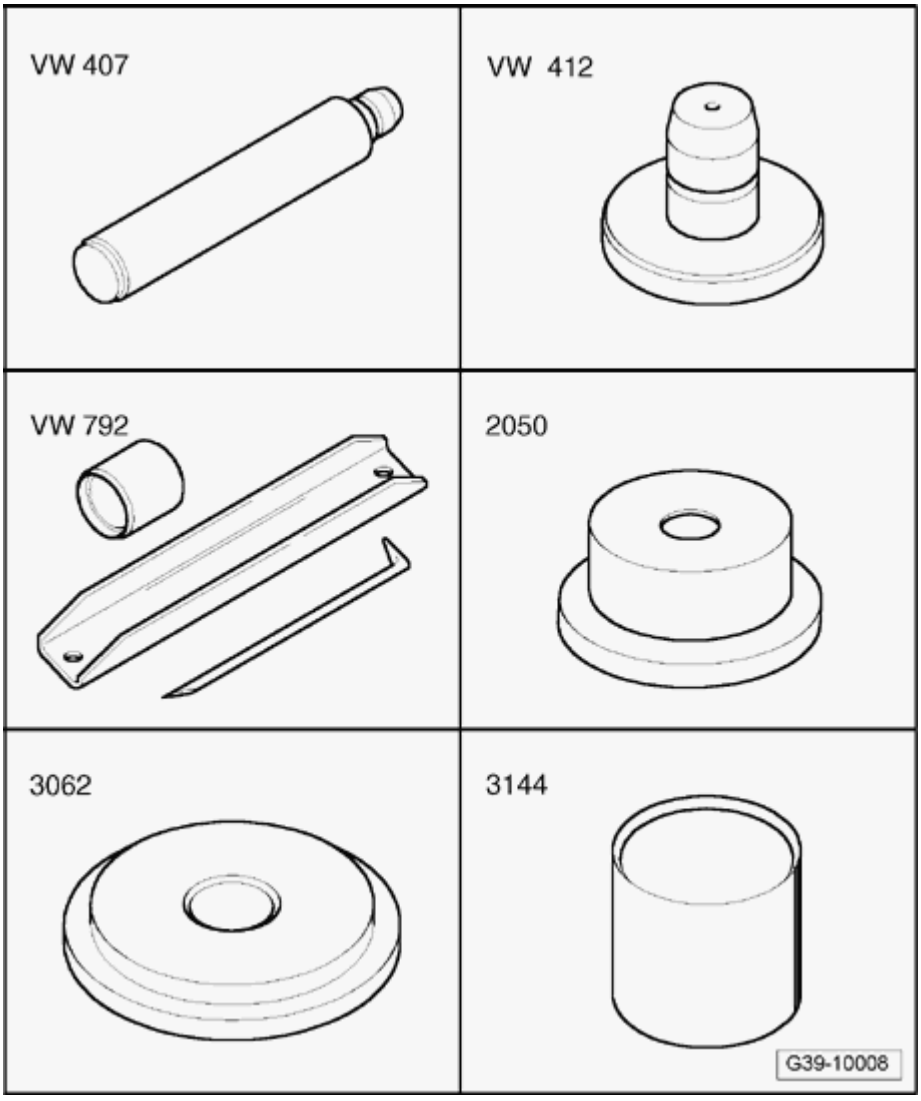


Fig. 472: Identifying Special Tools - Pinion Shaft, Adjusting (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Press tool VW407
- Thrust disc VW 412
- Assembly tool VW792
- Thrust plate 2050
- Thrust pad 3062
- Press support-RI wheel brgs. 3144

Special tools, testers and auxiliary items required

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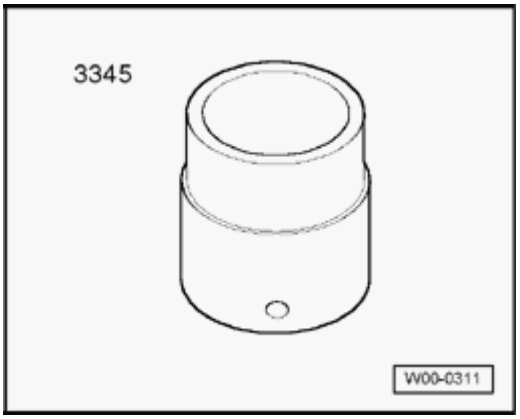


Fig. 473: Identifying Press Tool 3345
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press tool 3345

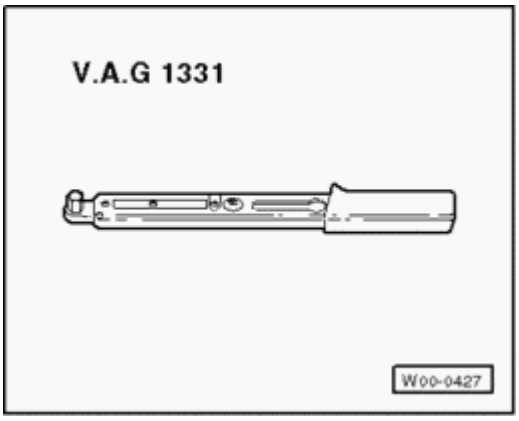


Fig. 474: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

(Setting preload of tapered roller bearings for pinion shaft)

- Differential removed.

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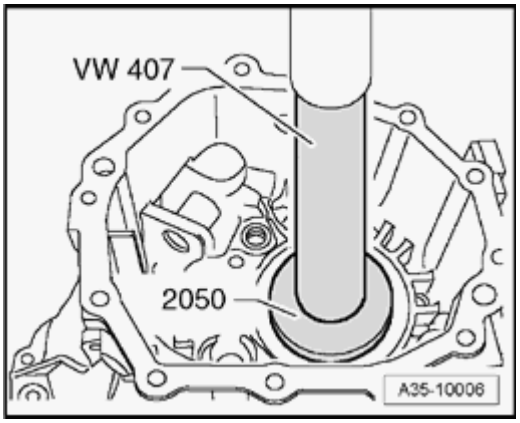


Fig. 475: Pressing Tapered Roller Bearing Outer Race For Pinion Shaft Into Transmission Housing Without Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

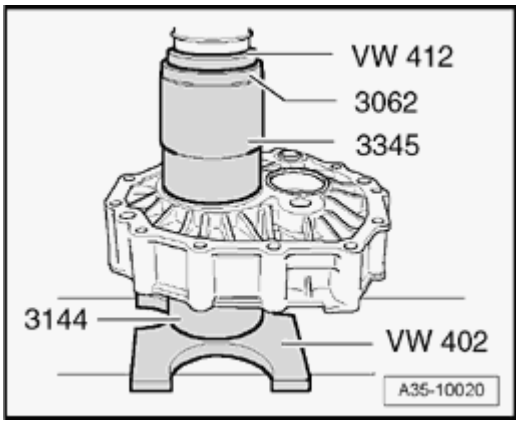


Fig. 476: Pressing In Tapered Roller Bearing Outer Race For Pinion Shaft With Shim Into Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

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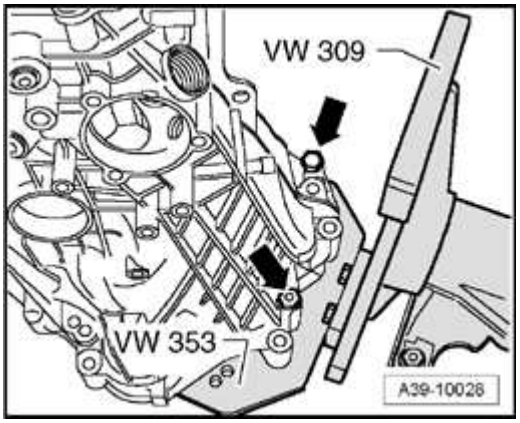


Fig. 477: Securing Transmission Housing Onto Transmission Support VW 353 With Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure transmission housing onto transmission support VW 353 with bolts - **arrows** -.

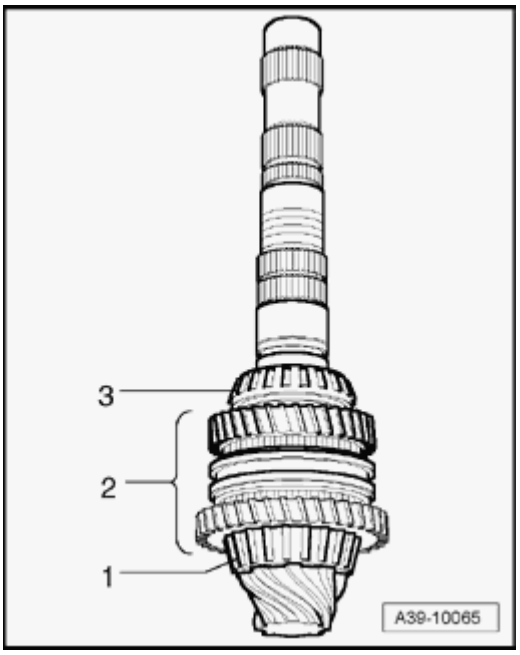


Fig. 478: Tapered Roller Bearing Inner Race, Selector Gears And Locking Collar For 1st And 2nd Gears And Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press tapered roller bearing inner race - **1** - onto pinion shaft and secure **Pressing on tapered roller bearing inner race**.
- Install selector gears and locking collar for 1st and 2nd gears - **2** - --> **Pinion shaft, disassembling and assembling**.
- Press tapered roller bearing inner race - **3** - onto pinion shaft **Pressing on tapered roller bearing inner race**.
- Insert completely assembled pinion shaft in transmission housing.

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- Install bearing housing and transmission cover with 4 dowel sleeves and tighten bolts to 35Nm.
- Turn transmission so that the transmission cover points downward.

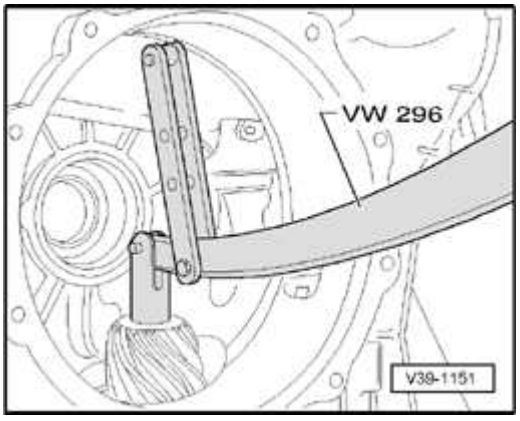


Fig. 479: Pressing Down On Drive Pinion Head Using Removal Tool VW 296
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press down on face of pinion shaft with removal tool VW 296 until tapered bearing outer race contacts bearing housing.
- Maintain pressure and rotate pinion shaft 5 turns in both directions to seat taper roller bearing.

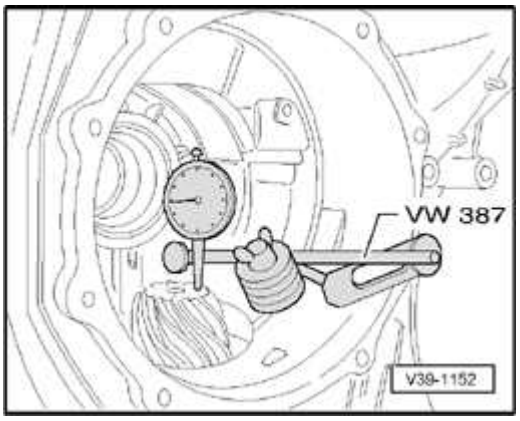


Fig. 480: Installing Dial Gauge (3 Mm Range) And Set To "0" With 2 Mm Pre-Load
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach dial gauge (3 mm measuring range) with dial gauge extension to transmission housing.
- Preload dial gauge to 1 mm and set to "0".

The dial gauge extension must contact machined surface on the face of pinion.

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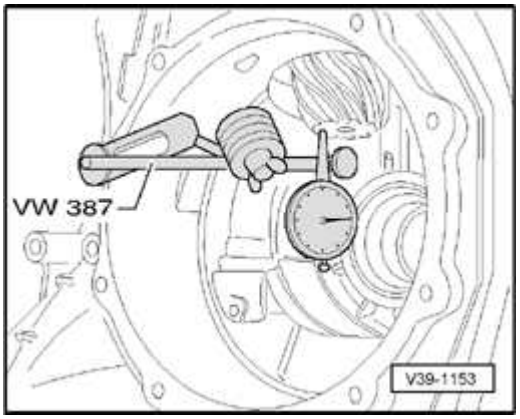


Fig. 481: Turn Transmission 180 Degrees, Settle Tapered Roller Bearing And Read Play On Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn transmission so that the transmission cover points upward.
- Rotate pinion shaft 5 turns in each direction so that the tapered roller bearing seats properly. Otherwise the result of the measurement will be incorrect.
- Read off play on dial gauge and note reading.

- Measurement in example: 0.46 mm

NOTE:

- **If the measuring procedure needs to be repeated, the pinion shaft must first be rotated 5 turns in each direction again so that the tapered roller bearing seats properly. Preload dial gauge to 1 mm and set to "0" again.**

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

Example:		
	Inserted shim "S_4 *"	1.01 mm
+	Measured value (example)	0.46 mm
+	Bearing preload (constant value)	0.12 mm
=	Total shim thickness "S_{total} " for "S_3 " plus "S_4 "	1.59 mm

Determining thickness of shim "S_3 *"

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

Example:		
	Total shim thickness "S_{total} " for "S_3 " plus "S_4 "	1.59 mm
-	Inserted shim "S_4 *"	1.01 mm
=	Thickness of shim "S_3 *"	0.58 mm

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- Pull tapered roller bearing outer race out of transmission housing **Pulling tapered roller bearing outer race out of transmission housing**
- Install shim "S_3 *" in transmission housing and install outer race again.
- Insert completely assembled pinion shaft into transmission housing again.
- Install bearing housing and transmission cover with the 4 dowel sleeves and tighten bolts to 35Nm.
- Turn pinion shaft 5 turns in each direction so that taper roller bearings seat properly.

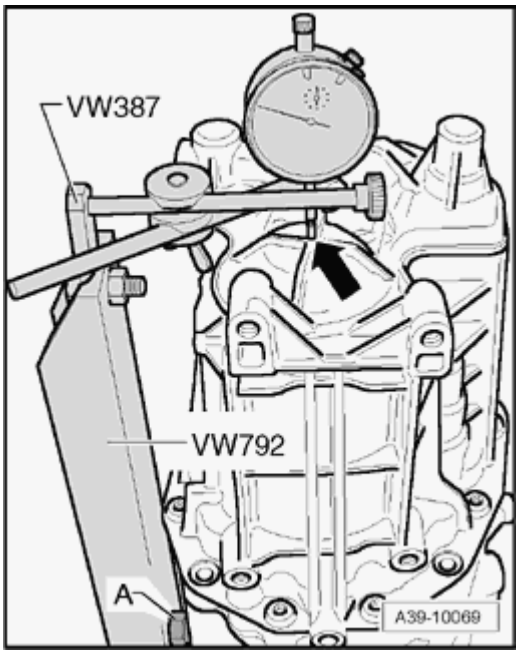


Fig. 482: Identifying Assembly Device VW 792, M12 Nut, VW 387 And Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install assembly device VW 792 on transmission housing; when doing so, insert a M12 nut - **A** - between assembly device VW 792 and transmission housing.
- Install universal dial gauge bracket VW 387 with dial gauge and 30 mm extension.
- Apply dial gauge extension exactly at center of intersection of ribs on transmission cover - **arrow** -.
- Set dial gauge (3 mm measuring range) to "0" with 1 mm preload.
- Loosen transmission cover bolts and turn pinion shaft several times.
- If correct shims have been selected the dial gauge will now indicate the following value:

- 0.06 to 0.12 mm

- Tighten transmission cover bolts again to 35 Nm.
- Take down measuring tools.
- Turn pinion shaft 5 turns in each direction so that taper roller bearings seat properly.

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Determining dimension "e"

NOTE:

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

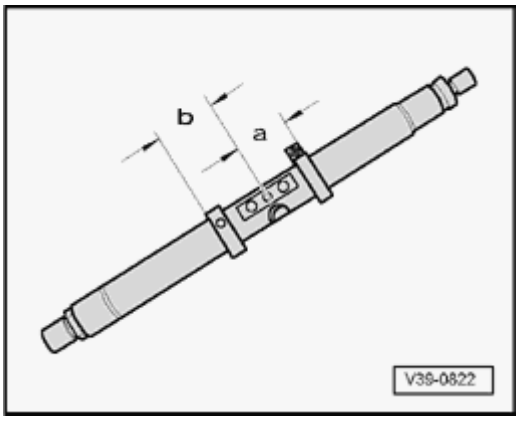


Fig. 483: Setting Adjusting Rings Of Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

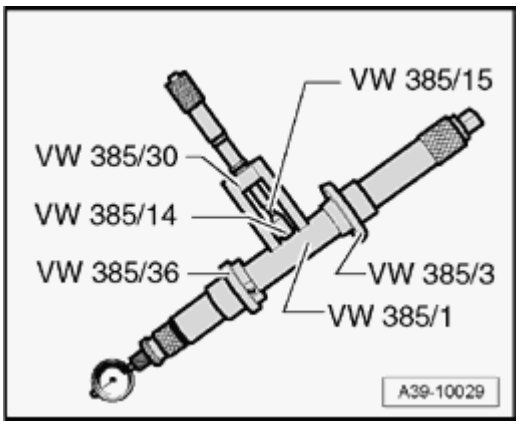


Fig. 484: Universal Measuring Tool VW385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble universal measuring tool VW385/1 as illustrated:

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

- Set master gauge VW385/30 to Ro = 59.65 mm and install onto measuring tool.

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

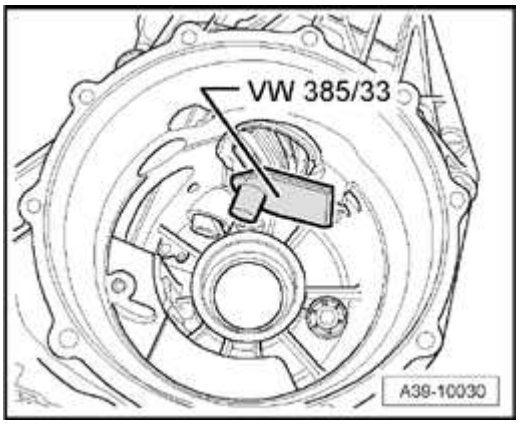


Fig. 485: Measuring Plate End Placed On Face Of Pinion Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place end measuring plate on face of pinion shaft.

NOTE:

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

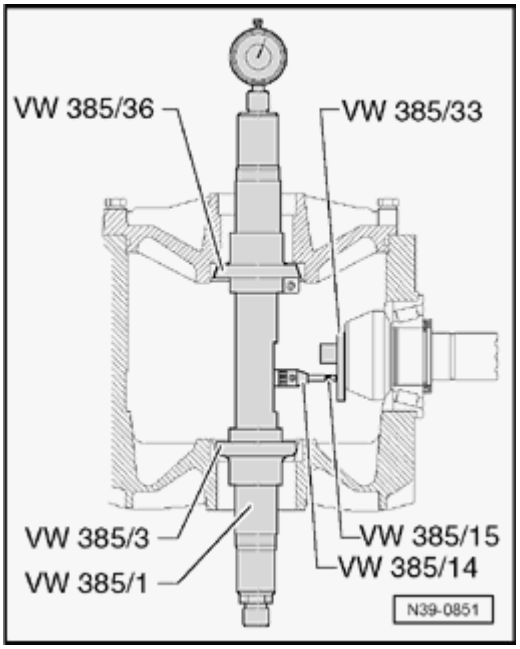


Fig. 486: Inserting Measuring Mandrel VW 385/1 Into Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove master gauge and insert measuring tool into housing.

- The dial gauge faces toward final drive cover

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- Install cover for final drive and tighten 4 bolts to 20 Nm.
- Using adjustable ring, pull 2nd centering pad VW385/36 out as far as possible so that the measuring tool can still just be turned by hand.

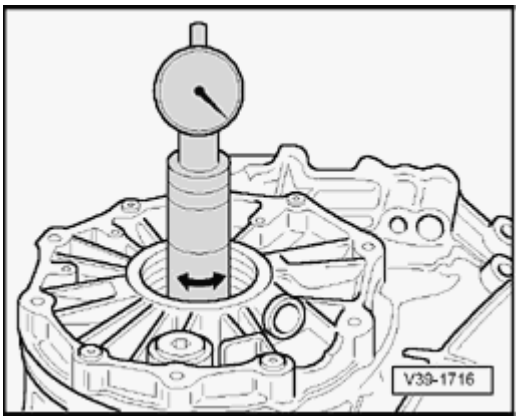


Fig. 487: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Measurement in following example: "e" = 0.17 mm (in red scale)

NOTE:

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

Determining thickness of shim "S3"

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

Formula:

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

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

Example:	
Inserted shim "S_3 *"	0.58 mm

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+	Deviation "r"	0.29 mm
-	Determined value "e" (in red scale)	0.17 mm
=	Thickness of shim "S_3 "	0.70 mm

- Determine shim(s) according to table.

Available shims for "S_3 "

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

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

Determining thickness of shim "S4"

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

Example:		
	Total shim thickness "S_{total} " for "S_3 " plus "S_4 "	1.59 mm
-	Thickness of shim "S_3 "	0.70 mm
=	Thickness of shim "S_4 "	0.89 mm

- Determine shim(s) according to table.

Shims available for "S_4 "

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

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0.57	0.91	1.37
0.61	1.01	1.41
0.65	1.05	1.45
0.69	1.09	1.49

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

Checking adjustment

Checking deviation (tolerance) "r "

- Install pinion shaft with appropriate measured shims "S_3 " and "S_4 ".
- Turn pinion shaft 5 turns in each direction so that taper roller bearings seat properly.

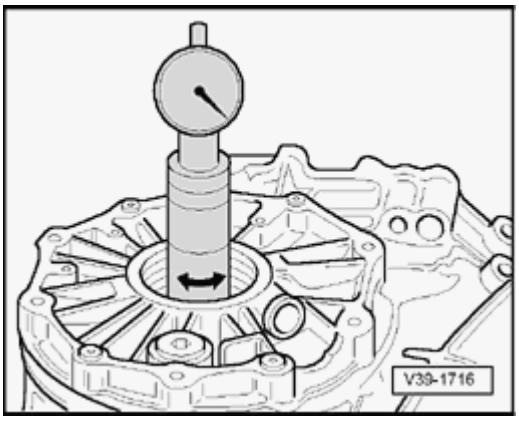


Fig. 488: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Re-determining shim "S4" when replacing bearing housing

Special tools, testers and auxiliary items required

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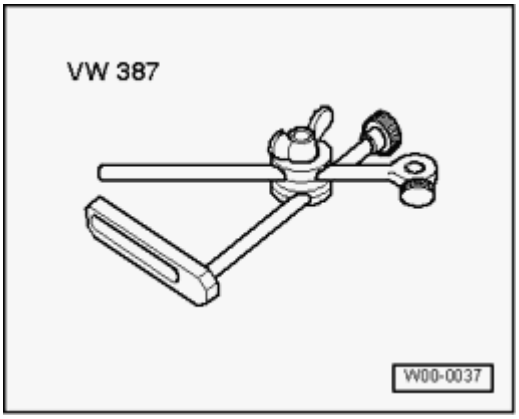


Fig. 489: Identifying Dial Gauge Holder VW 387
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Universal dial gauge bracket VW387

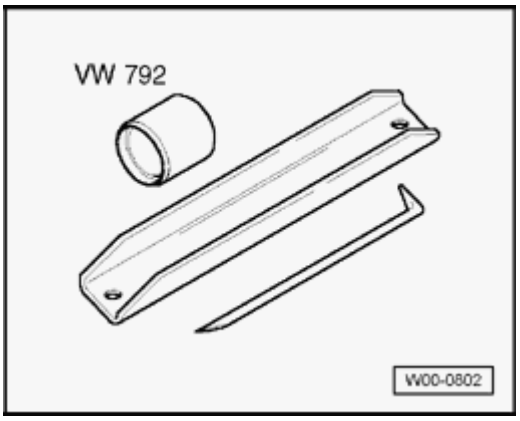


Fig. 490: Installation Arbor VW 792
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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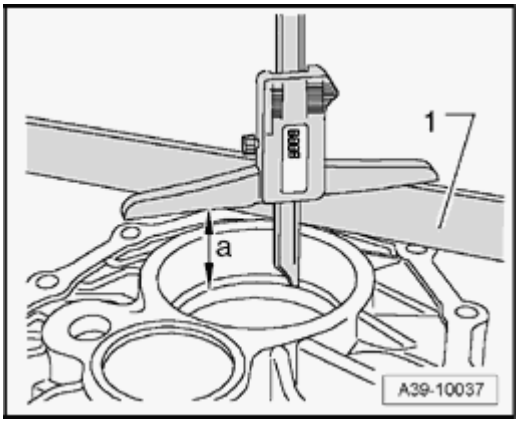


Fig. 491: Measuring Difference Between Depth On Old And New Bearing Housing With A Digital Depth Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Example:

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

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

Example:

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

Shims available.

- Press tapered roller bearing outer race with shim "S_4 " into bearing housing **Pressing tapered roller bearing outer race into bearing housing**
- Insert completely assembled pinion shaft into transmission housing again.
- Install bearing housing and transmission cover and tighten bolts to 35Nm.
- Turn pinion shaft 5 turns in each direction so that taper roller bearings seat properly.

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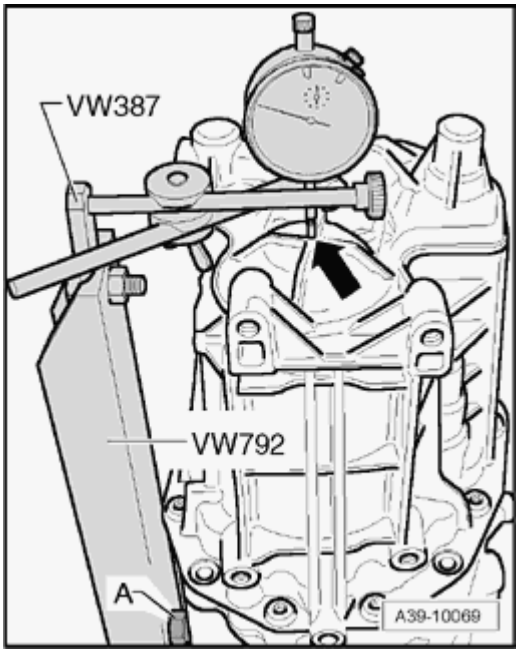


Fig. 492: Identifying Assembly Device VW 792, M12 Nut, VW 387 And Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install assembly device VW 792 on transmission housing; when doing so, insert an M12 nut - **A** - between assembly device VW 792 and transmission housing.
- Attach universal dial gauge bracket VW 387 with dial gauge and 30 mm extension.

NOTE:

- **Attach dial gauge extension exactly at the center of the webbing intersection on the transmission cover - arrow -.**

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

- 0.06 to 0.12 mm

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

Crown wheel, adjusting

(Adjusting differential)

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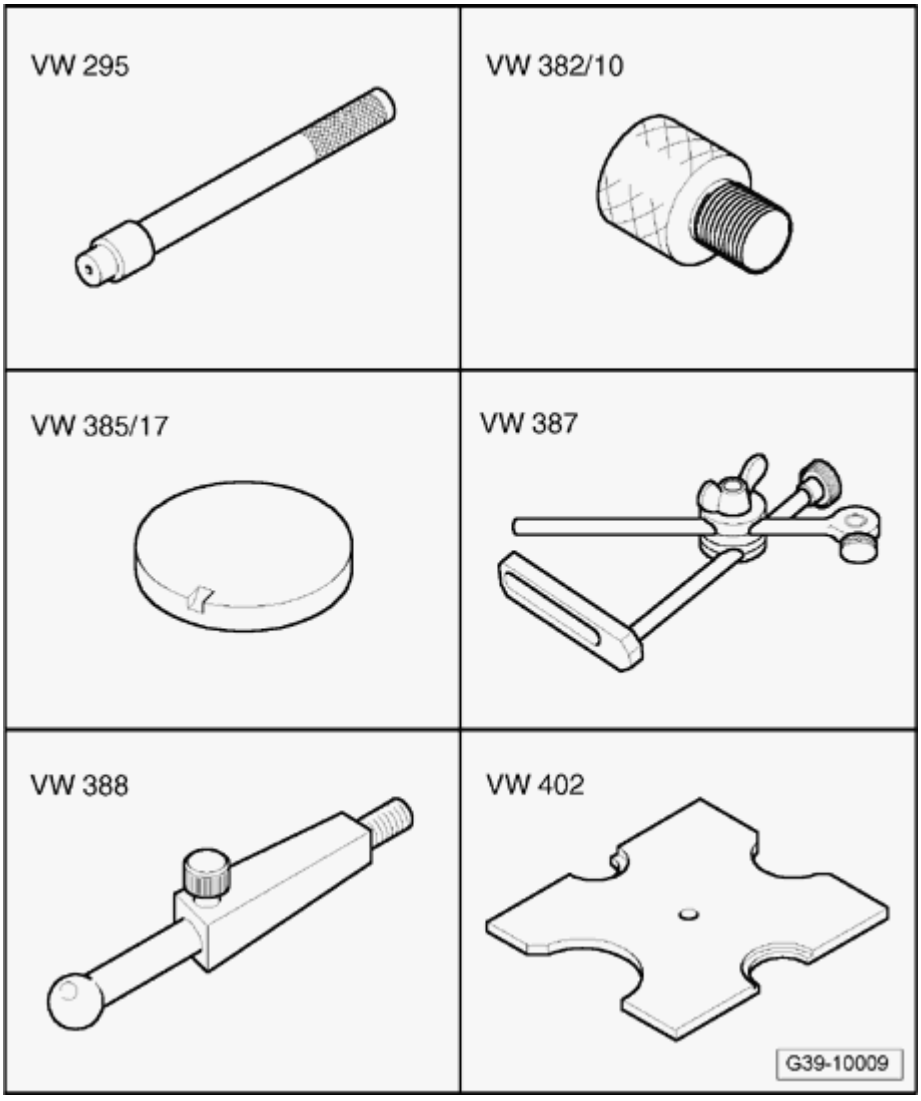


Fig. 493: Identifying Special Tools - Crown Wheel, Adjusting (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW 295
- Dial gauge extension VW382/10
- End measuring plate VW385/17
- Universal dial gauge bracket VW387
- Adjustable measuring lever VW 388
- Thrust plate VW402

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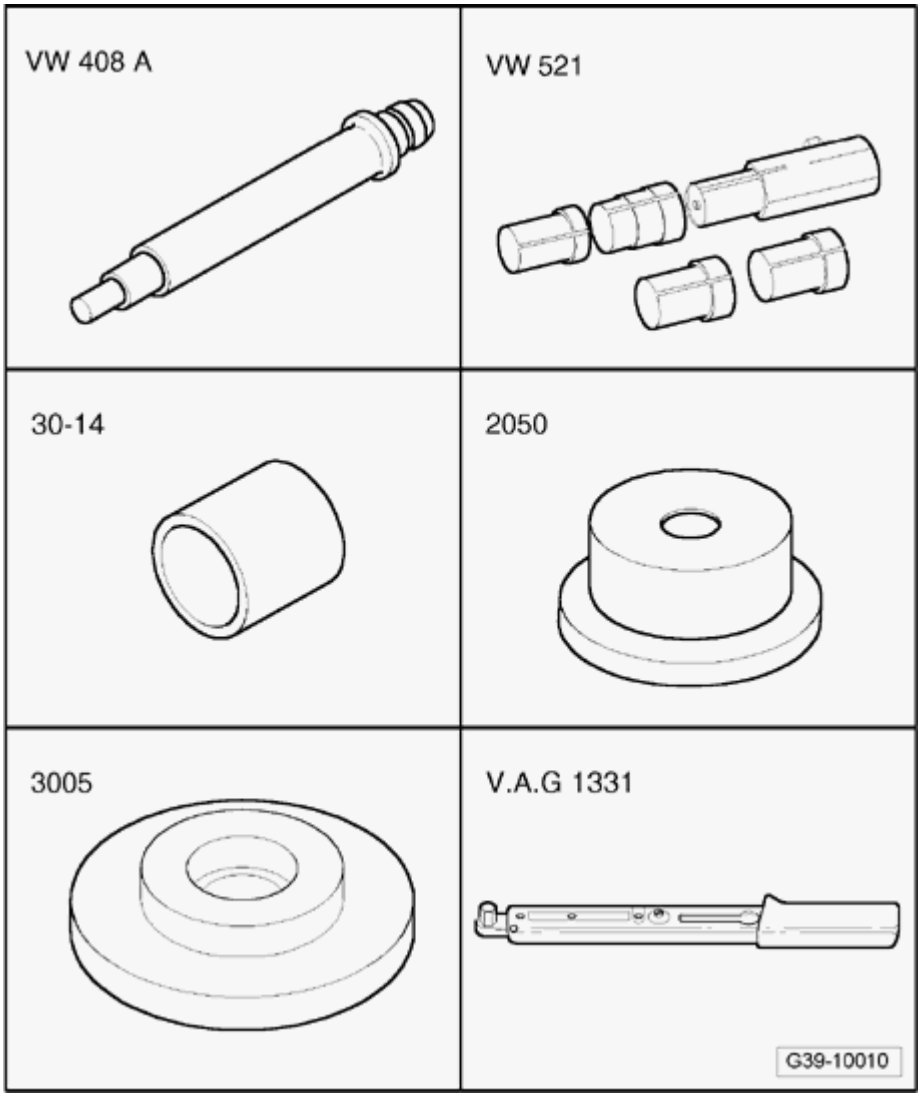


Fig. 494: Identifying Special Tools - Crown Wheel, Adjusting (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Press tool VW408A
- Crown wheel adjusting tool VW 521
- Tube 30 - 14
- Thrust piece 2050
- Thrust plate 3005
- Torque wrench V.A.G1331
- Dial gauge
- Dial gauge extension, 30 mm

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It is necessary to readjust crown wheel when the following components have been replaced:

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

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

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

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

- Pinion shaft removed

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

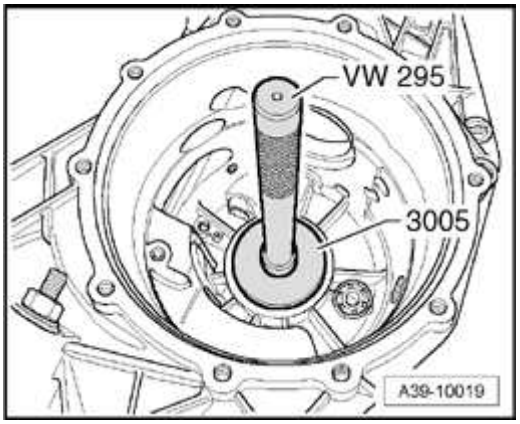


Fig. 495: Driving Outer Race For Tapered Roller Bearing With Shim Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

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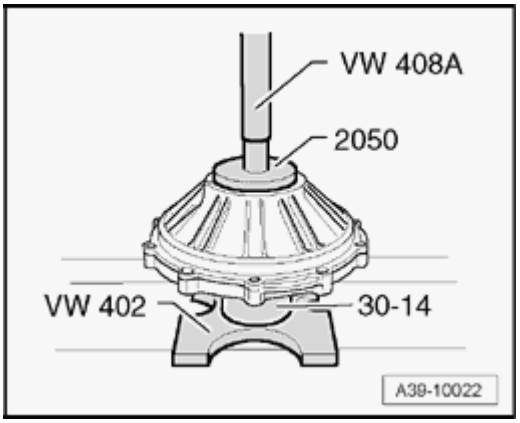


Fig. 496: Pressing Tapered Roller Bearing Outer Race (Left-Side) Into Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

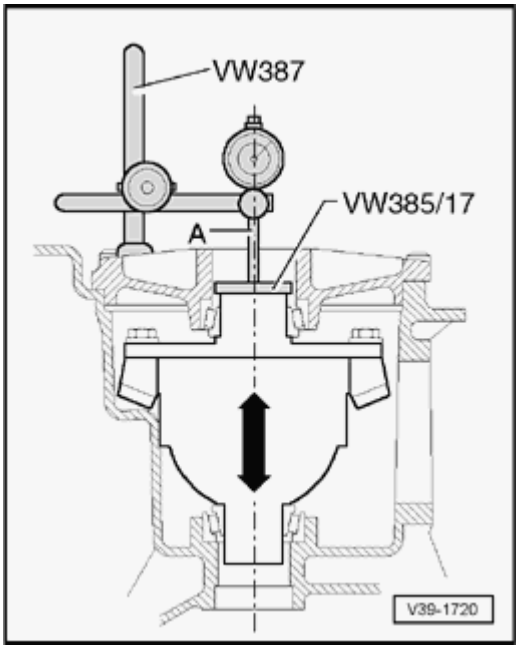


Fig. 497: Installing Magnetic Plate 50Mm Dia. VW 385/17 And Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up measuring tool using 30 mm extension.

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

NOTE:

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

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

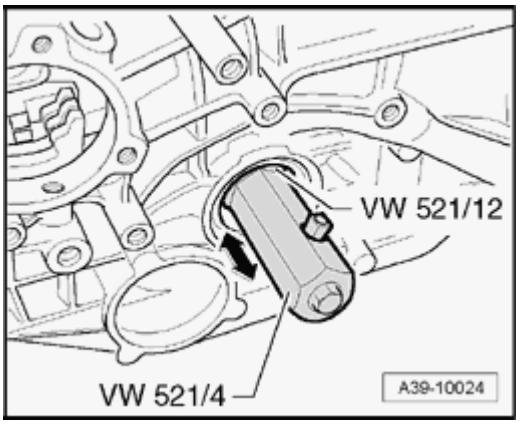


Fig. 498: Special Tools VW521/4 And VW521/12 Secured On Right Of Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

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

Determining thickness of shim "S_1 *"

NOTE:

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

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

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

Measuring backlash

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

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

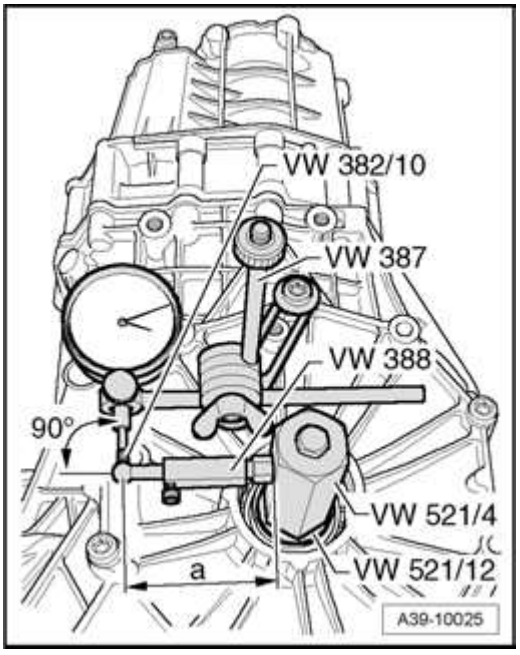


Fig. 499: Measuring Backlash
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure universal dial gauge bracket VW 387 to housing.
- Install dial gauge with dial gauge extension VW382/10 (6mm flat).
- Adjust measuring lever VW388 to distance "a" = 79 mm (for diameter 188 mm crown wheel).
- Measure play between teeth faces (backlash) as follows:

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

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

- Turn crown wheel through 90° and repeat measurements a further 3 times.

Determining average backlash

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

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

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

NOTE:

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

Determining thickness of shim "S2"

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

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

- Determine shim(s) according to table.

Available shims for "S_2 "

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

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0.57	0.73	

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

Determining thickness of shim "S1"

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

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

- Determine shim(s) according to table.

Available shims for "S_1 "

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

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

Adjustment, checking

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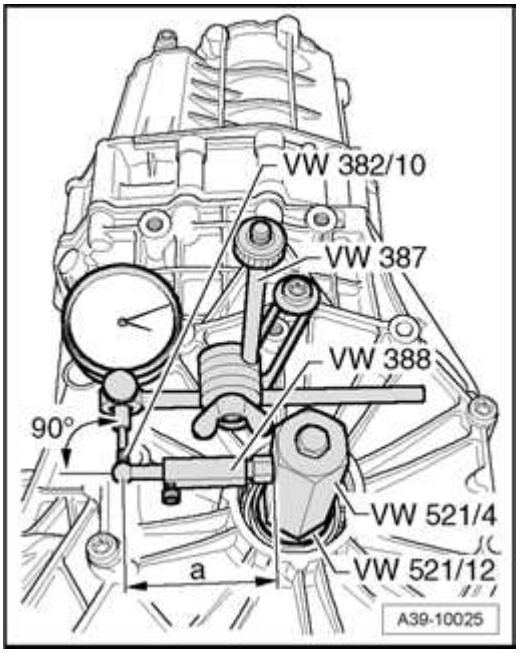


Fig. 500: Measuring Backlash
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Specification: 0.12 to0.28 mm

NOTE:

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

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34 CONTROLS, HOUSING

SELECTOR MECHANISM, SERVICING

Installation position of selector mechanism

- **Arrow A** - gear selection movement

- **Arrow B** - gate selection movement

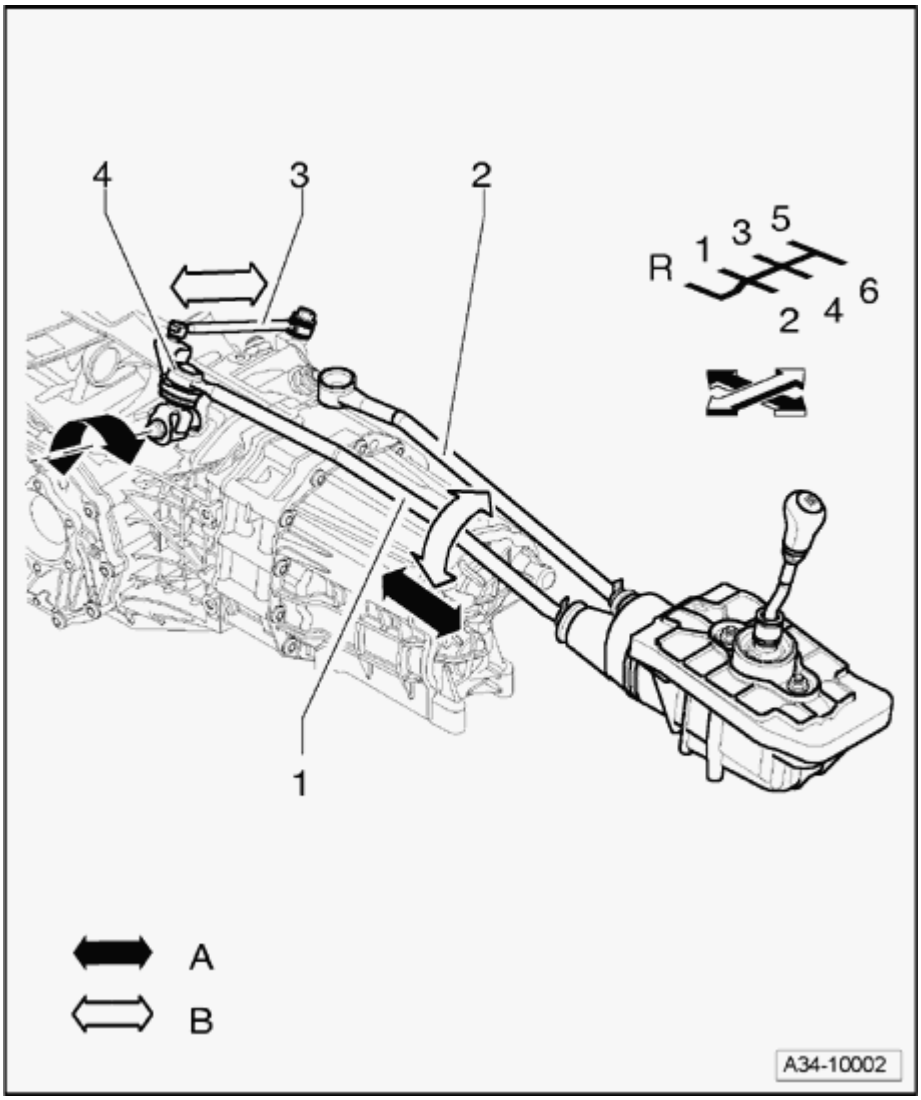


Fig. 102: Installation Position Of Selector Mechanism, Gear Selection Movement And Gate Selection Movement
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector rod

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2 - Push rod

3 - Connecting rod

4 - Selector shaft lever

Selector mechanism components, assembly overview

Part I

NOTE:

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

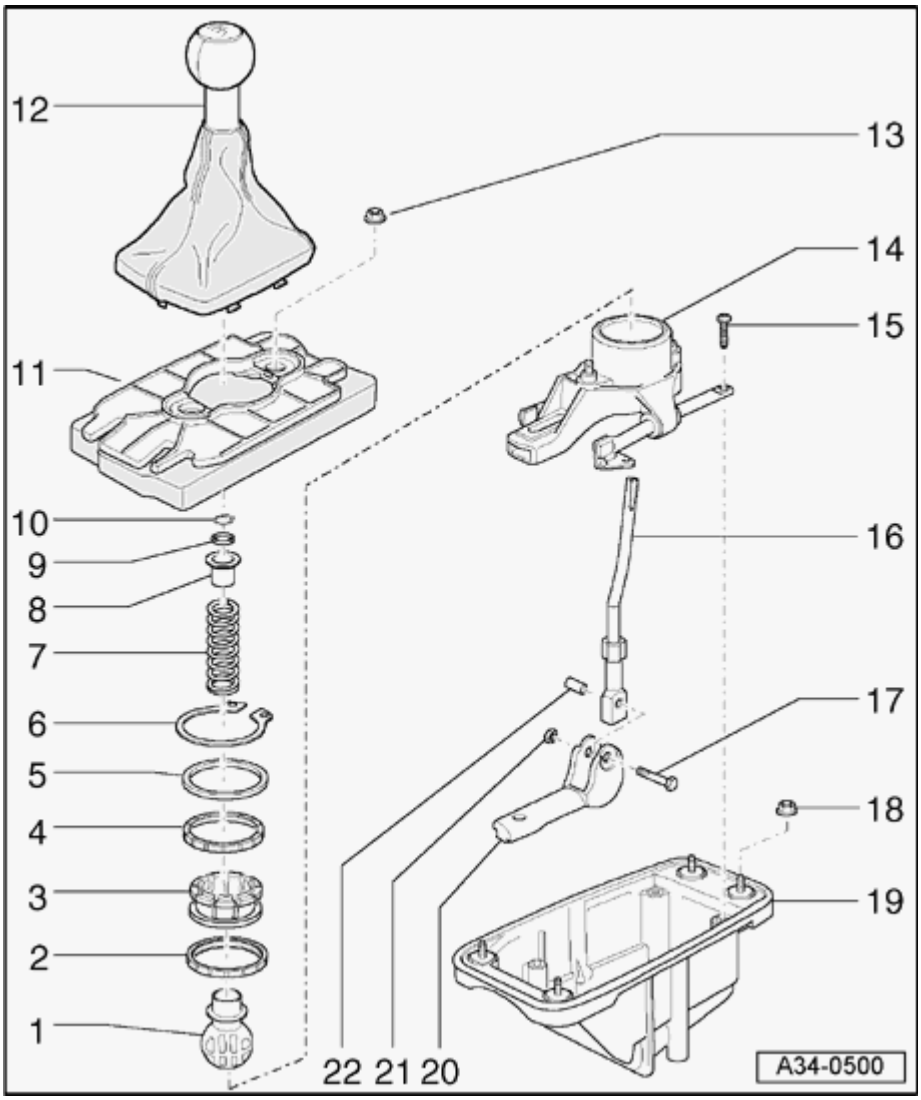


Fig. 103: Shift Mechanism Remove/Install Components -- Part I
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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1 - Ball

2 - Rubber ring

3 - Ball guide

4 - Rubber ring

5 - Washer

6 - Circlip

- Take out before removing ball

7 - Spring

8 - Spacer sleeve

9 - Washer

10 - Circlip

11 - Sound insulation

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

12 - Gear lever knob

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

13 - Nut -10 Nm-

14 - Ball housing

15 - Torx socket head bolt

16 - Gear lever

- Bend points towards rear

17 - Bolt

18 - Nut, 10 Nm

19 - Selector housing

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20 - Joint for gear lever/selector rod

21 - Nut, 10 Nm

- Self-locking
- Replace

22 - Bushing

Part II

NOTE:

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

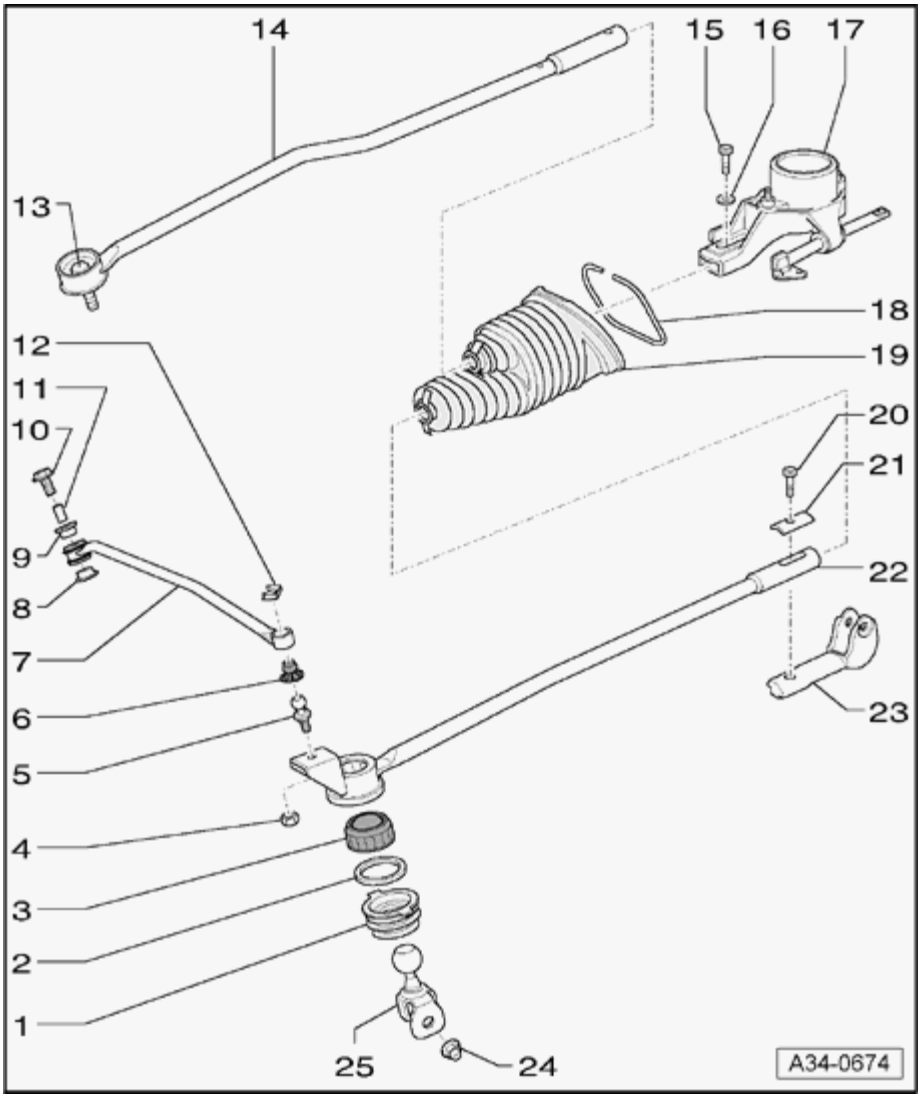


Fig. 104: Shift Mechanism Remove/Install Components -- Part II

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Boot

- Secure to selector rod with commercially available instant adhesive

2 - Washer

3 - Ball socket

4 - Cap nut, 23 Nm

5 - Ball stud

6 - Ball socket

7 - Connecting rod

8 - Bushing

9 - Bushing

10 - Bolt, 23 Nm

11 - Sleeve

12 - Retaining clip

13 - Bolt, 40 Nm

14 - Push rod

- With bushing, bolt and washers

15 - Hex socket head bolt, 23 Nm

16 - Washer

17 - Gear lever bearing

18 - Clamping ring for boot

19 - Boot

20 - Hex socket head bolt, 23 Nm

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21 - Clamp

22 - Selector rod

23 - Joint for gear lever/selector rod

24 - Cap nut, 10 Nm

- Self-locking
- Replace

25 - Selector shaft lever

Gear lever knob with boot, removing and installing

Special tools, testers and auxiliary items required

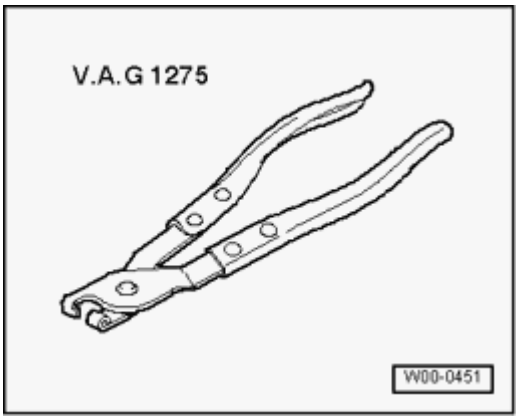


Fig. 105: Identifying Hose Clamp Pliers V.A.G 1275
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hose clip pliers V.A.G 1275

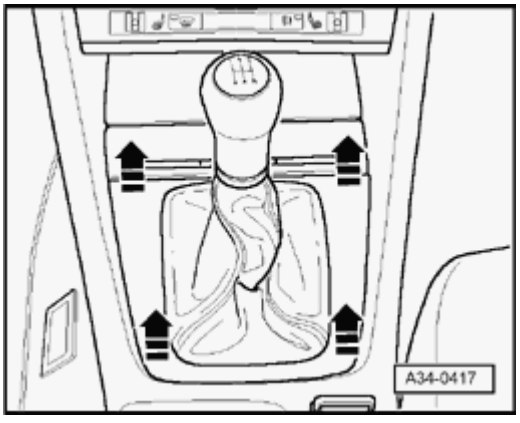


Fig. 106: Lifting Cover For Center Console Upward

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

NOTE:

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

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

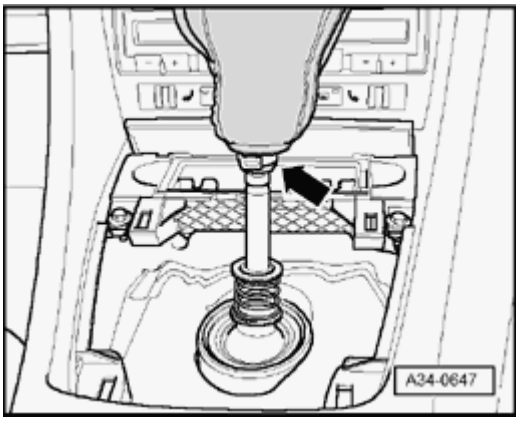


Fig. 107: Locating Clip And Pulling Off Gear Lever Knob Together With Boot
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Gear lever knob with clip:

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

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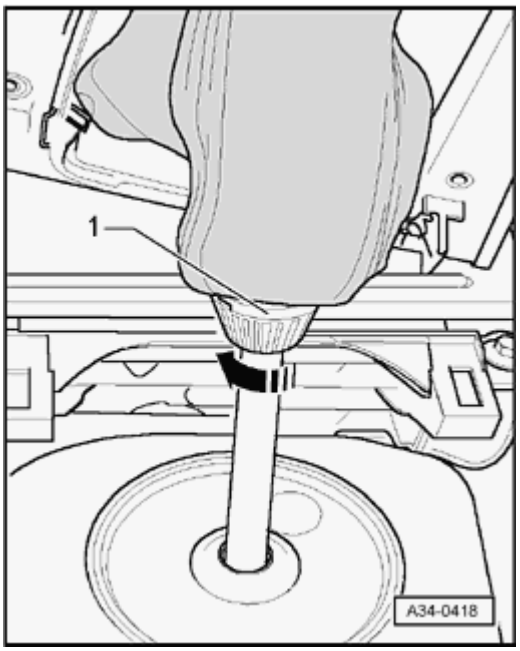


Fig. 108: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Gear lever knob with locking mechanism:

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

Installing

Perform installation in reverse sequence of removal.

Selector mechanism, removing and installing

Special tools, testers and auxiliary items required

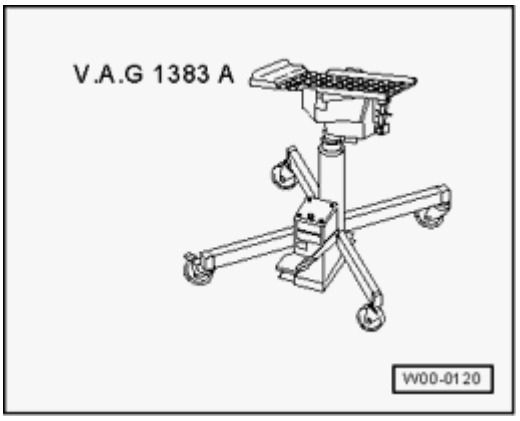


Fig. 109: Identifying Engine/Transmission Jack V.A.G. 1383 A

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing

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

Vehicles with large radio slot:

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

Vehicles with small radio slot:

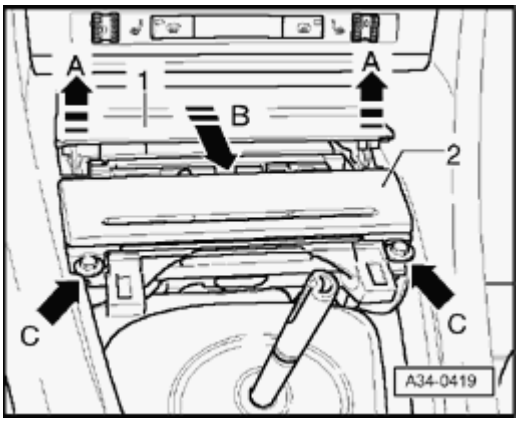


Fig. 110: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Continued for all vehicles:

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

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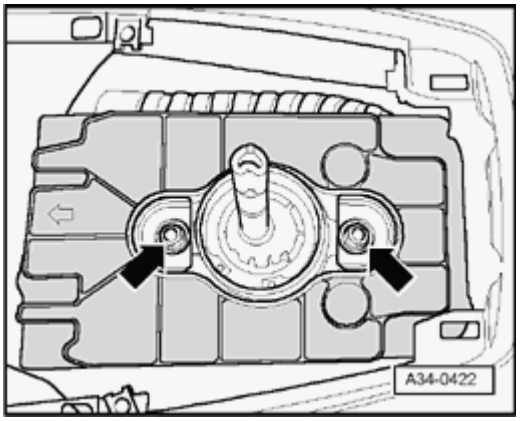


Fig. 111: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

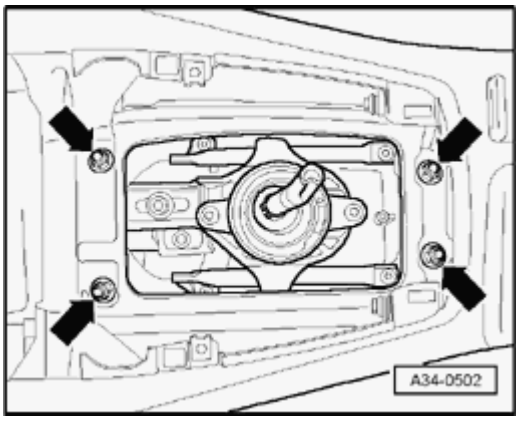


Fig. 112: Shift Lever Housing Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **arrows** -.

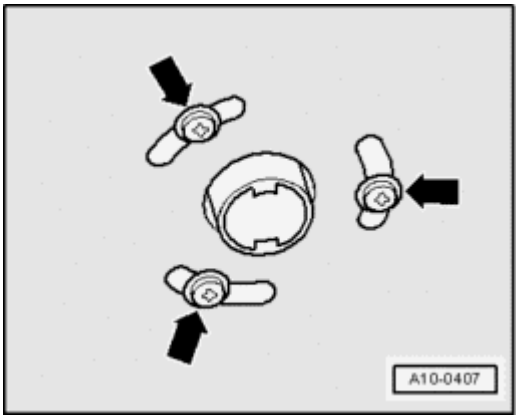


Fig. 113: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

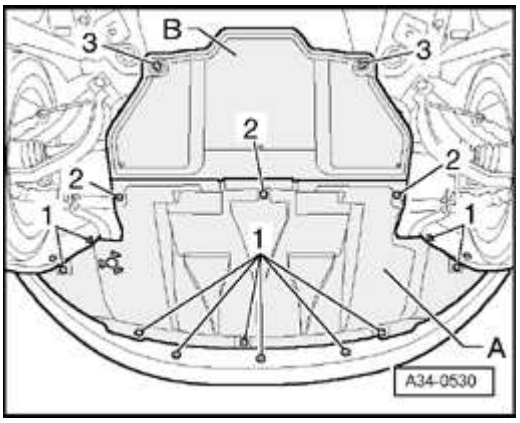


Fig. 114: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

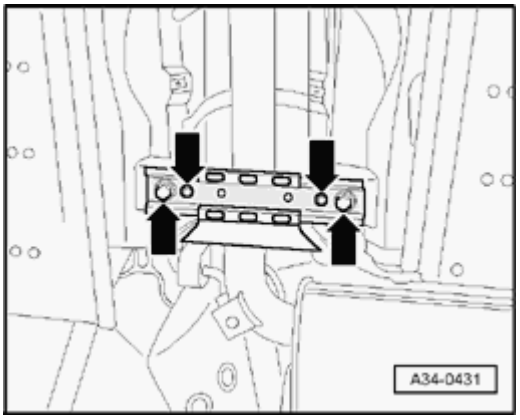


Fig. 115: Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 6-cylinder engine:

Remove tunnel cross piece (rear) - **arrows** -.

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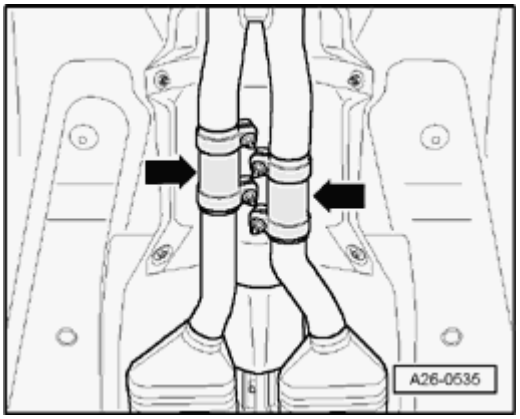


Fig. 116: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamps - **arrows** -.
- Remove rear section of exhaust system -->
  - **26 EXHAUST SYSTEM, EMISSION CONTROLS** for AVK
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

.

NOTE:

- **The flexible pipe connection (de-coupling element) on the front exhaust pipe must not be bent more than 10° - otherwise it can be damaged.**
- **A second technician is required for removing the rear section of the exhaust system.**

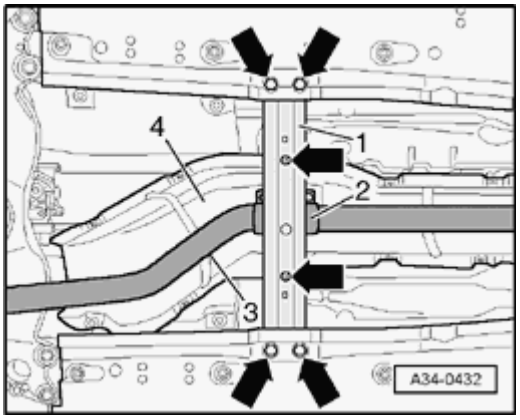


Fig. 117: Rear Section Of Exhaust System And Front Cross Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 4-cylinder engine:

- Disconnect exhaust system at clamp - **2** -.

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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.**

Continued for all vehicles:

- Remove tunnel cross piece (front) - **1** - - **arrows** -.
- Remove heat shield for exhaust system - **4** - from below selector mechanism.

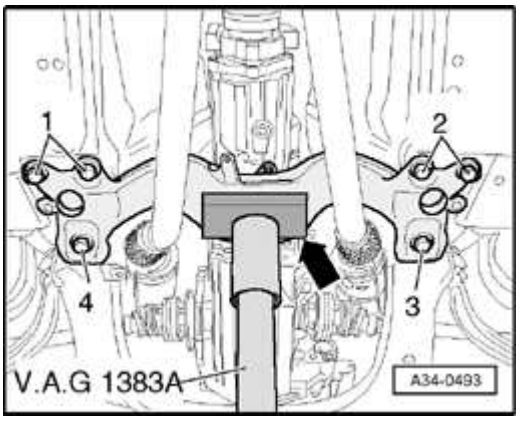


Fig. 118: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

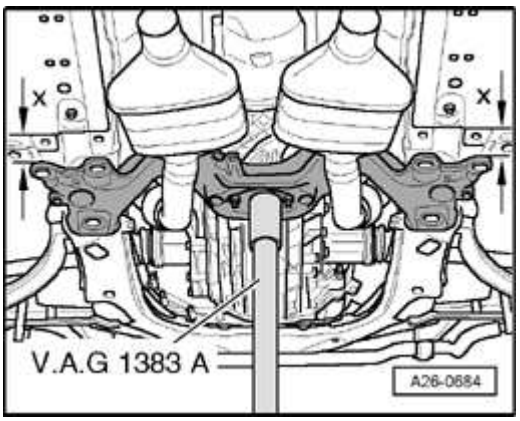


Fig. 119: Identifying Distance Between Cross Member And Body Reaches Dimension
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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- Dimension x = 60 mm

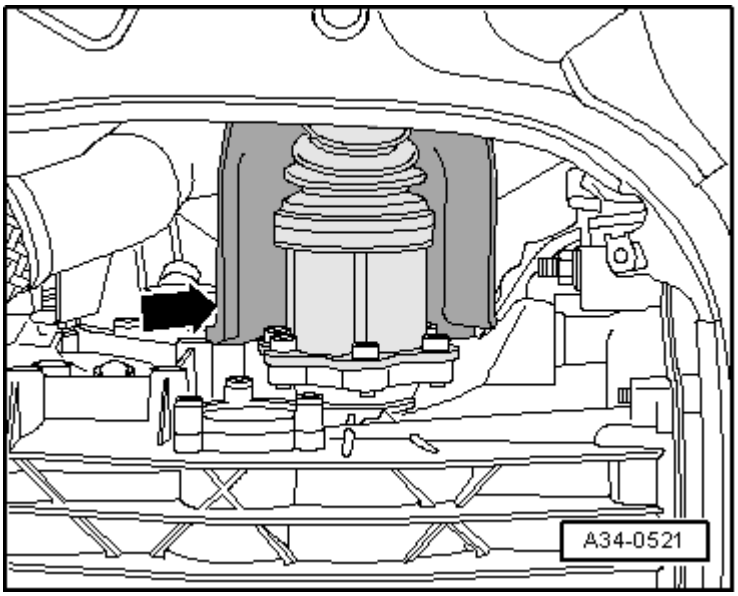


Fig. 120: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

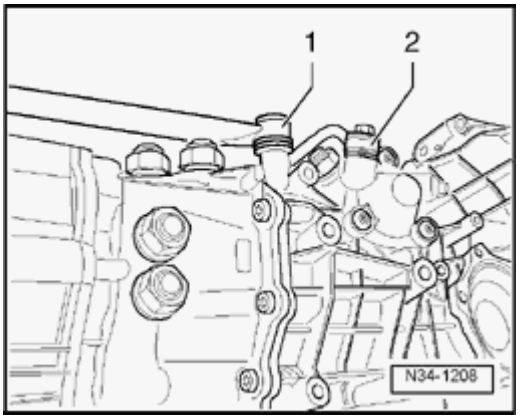


Fig. 121: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove connecting rod - **2** - for selector rod.
- Detach push rod - **1** - ; to do so, unscrew hex socket head bolt.

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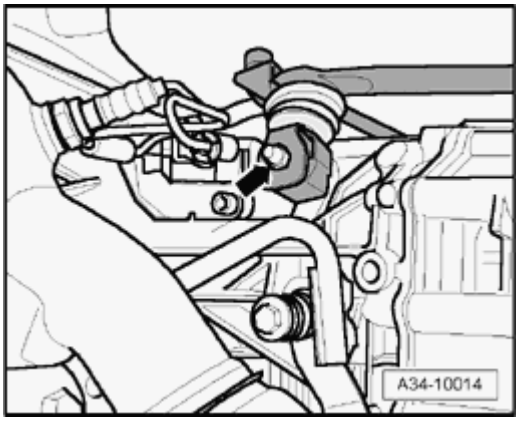


Fig. 122: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing

Installation is perform in reverse sequence. Note the following:

NOTE:

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

- Install tunnel cross member --> **40 - FRONT SUSPENSION** .
- Install exhaust system and perform stress-free alignment -->
  - **26 EXHAUST SYSTEM, EMISSION CONTROLS** for AVK
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

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

Tightening torques

Component	Nm
Connecting rod to transmission	23
Selector shaft lever to selector shaft	23
Push rod to transmission	40
Heat shield for drive shaft to transmission	23
Tunnel cross member (front) to body	55
Tunnel cross member (rear) to body	60
Selector mechanism to body	10
sound insulation to selector mechanism	10

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Selector mechanism, adjusting

The following are requirements for correct gear lever alignment:

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

Procedure

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

Vehicles with large radio slot:

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

Vehicles with small radio slot:

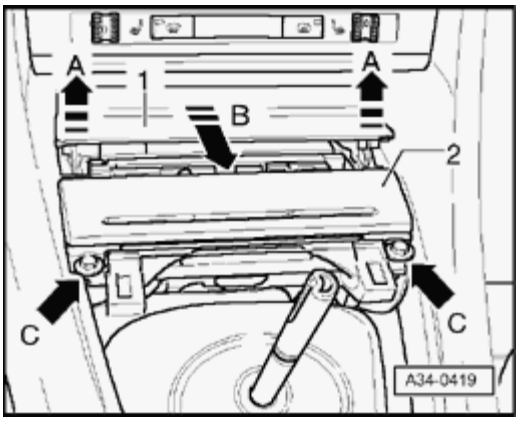


Fig. 123: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Continued for all vehicles:

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

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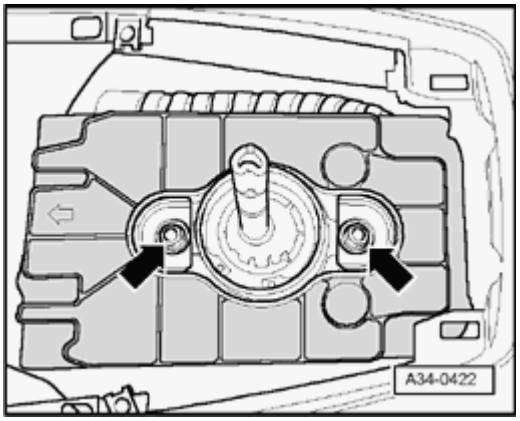


Fig. 124: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

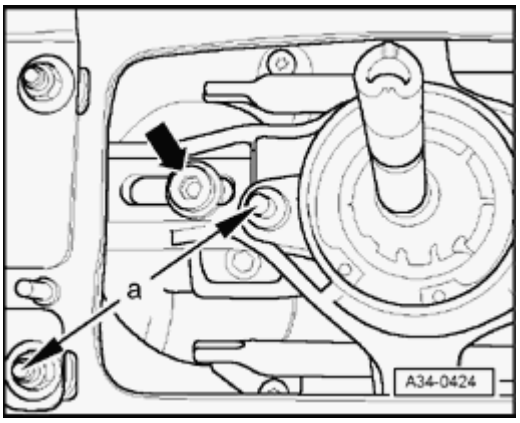


Fig. 125: Shift Mechanism Measurement And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure distance - **a** - between two studs in selector mechanism.

- Specification: distance a = 85 mm

NOTE:

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

- If distance measured is not correct, adjust dimension - **a** - as follows:
- Loosen bolt - **arrow** - for push rod.

- Rear push rod (in selector mechanism) 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.

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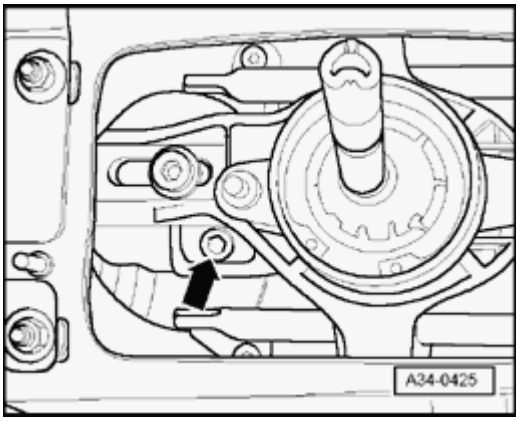


Fig. 126: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt for selector rod - **arrow** -.
- Connection between selector rod and selector mechanism should move freely.

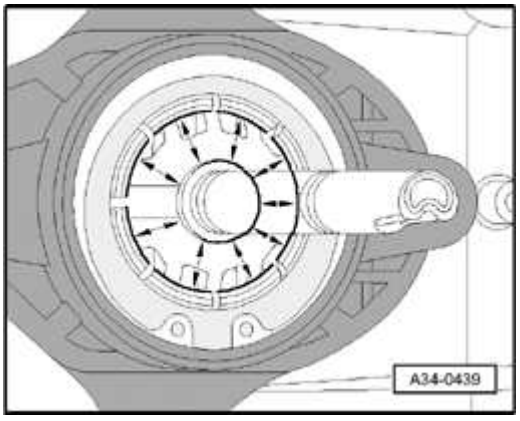


Fig. 127: Centering Bottom Of Shift Lever Centered In Ball Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Align gear lever

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

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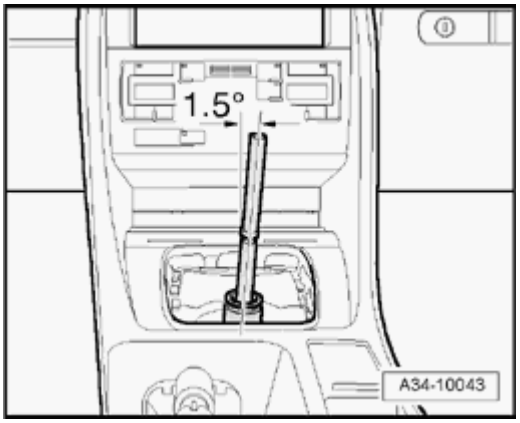


Fig. 128: Gear Lever Alignment Pointing Slightly To Right
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

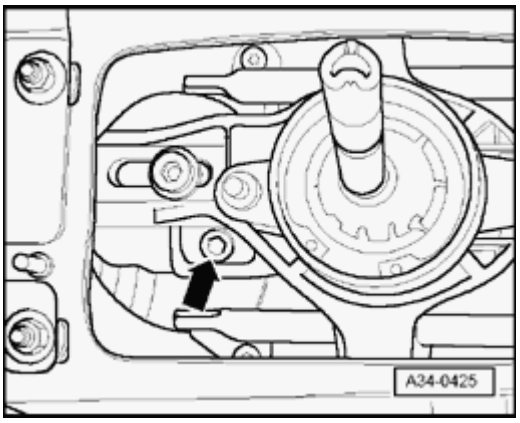


Fig. 129: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

Checking gear lever setting

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

- Press clutch pedal.
- Select all gears several times.
- Check operation of reverse gear lock.

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- The gear lever should return by itself from reverse gear gate to 3rd / 4th gear gate.

If gear lever sticks or bauks repeatedly when engaging a gear, perform adjustment procedure again.

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

TRANSMISSION, REMOVING AND INSTALLING

Transmission, removing and installing

- Transmission, removing from vehicles with 4-cylinder engine --> **Transmission, removing from vehicles with 4-cylinder engine**.
- Transmission, removing from vehicles with 6-cylinder engine --> **Transmission, removing from vehicles with 6-cylinder engine**.
- Transmission, installing in vehicles with 4-cylinder or 6-cylinder engine --> **Transmission, installing in vehicles with 4-cylinder or 6-cylinder engine**.

Transmission, removing from vehicles with 4-cylinder engine

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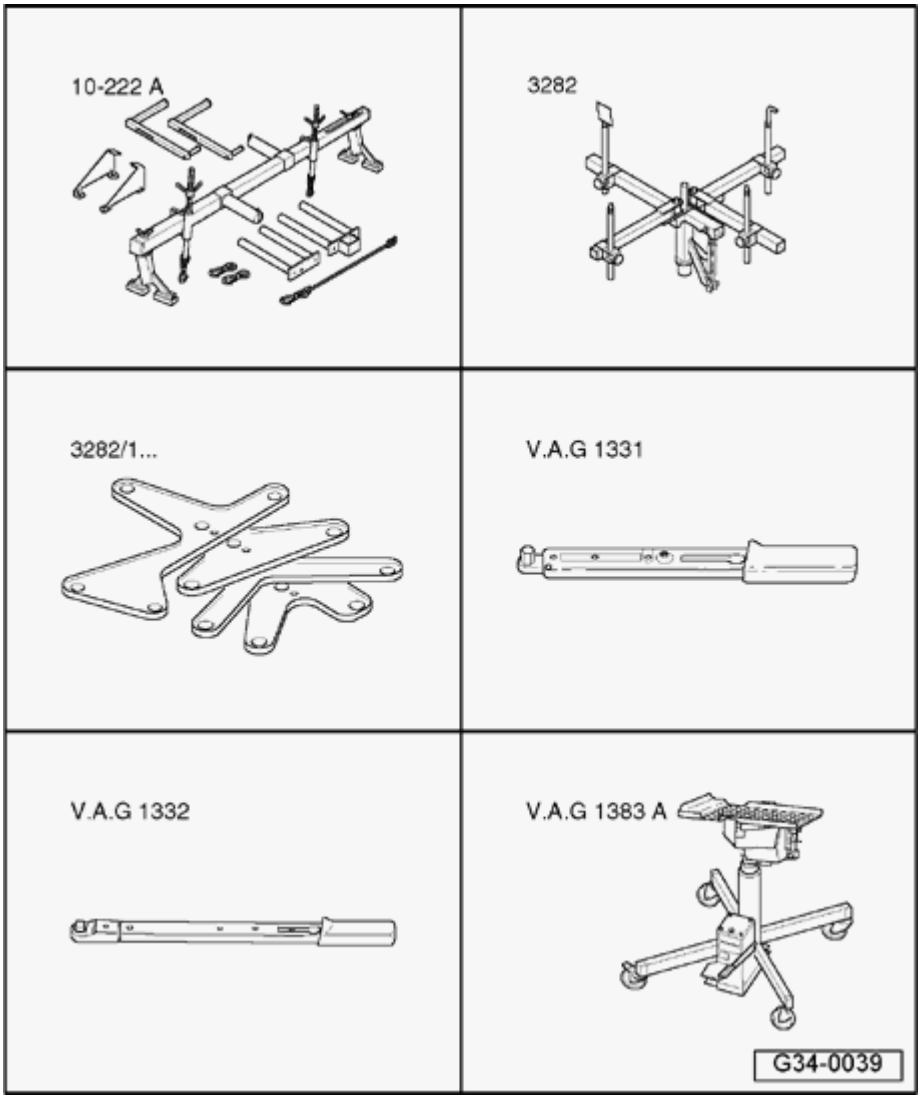


Fig. 130: Identifying Special Tools - Transmission, Removing From Vehicles
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Engine support bridge 10-222 A
- Transmission support 3282
- Adjustment plate 3282/43
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332
- Engine/transmission jack V.A.G 1383 A

Special tools, testers and auxiliary items required

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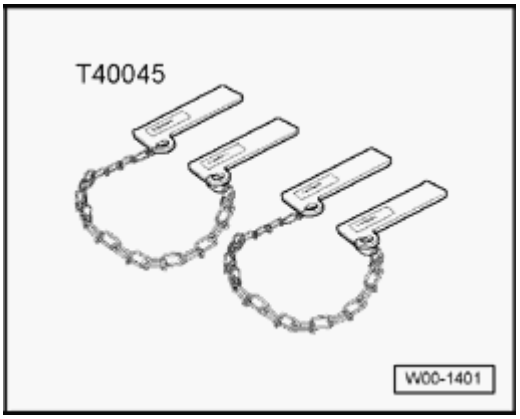


Fig. 131: Insert Pad For Front Fender T40045
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Procedure

NOTE:

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

CAUTION:

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

.

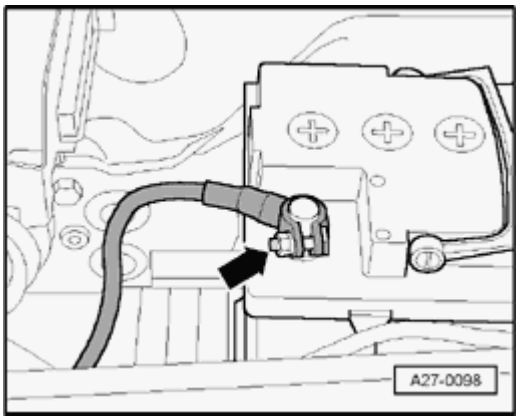


Fig. 132: Disconnecting Battery Ground (GND) Strap

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

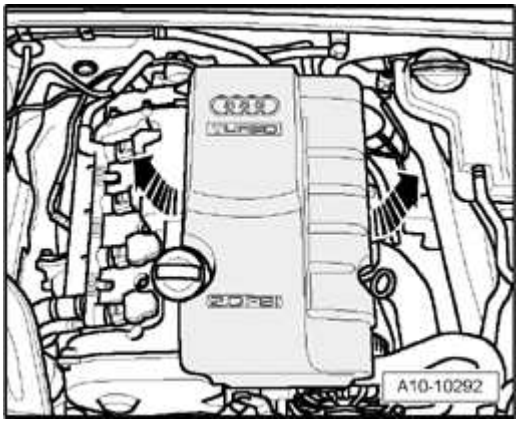


Fig. 133: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

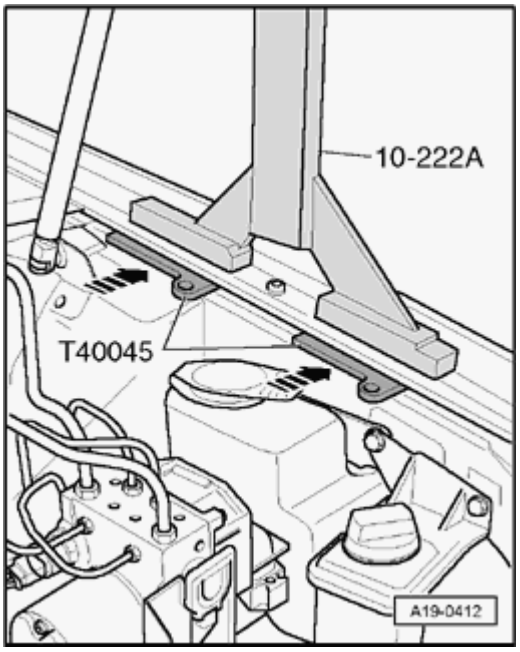


Fig. 134: Placing Insert Pad For Front Fender T40045 On Both Sides Between Fender Attachment Edge And Web Plate Lying Beneath
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach rubber seal from edges of wing mounting flanges.
- To avoid damaging edges of fenders with engine support bridge 10-222 A, insert wing compensation plates T40045 on both sides between fender mounting flange and body panel underneath.

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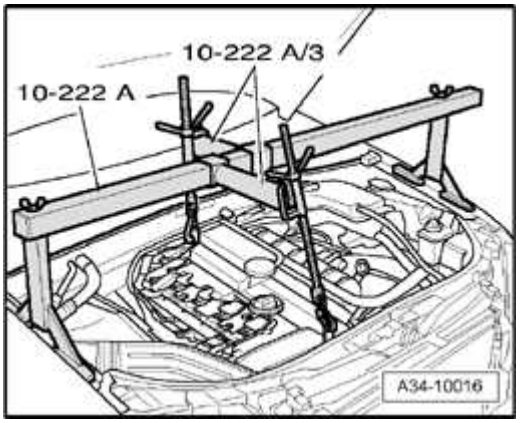


Fig. 135: Engine Support Bridge 10-222 A Set Up With Adapters 10-222/3 On Fender Mounting Flanges
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

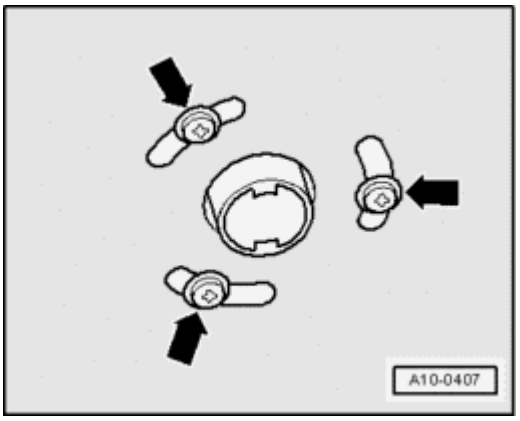


Fig. 136: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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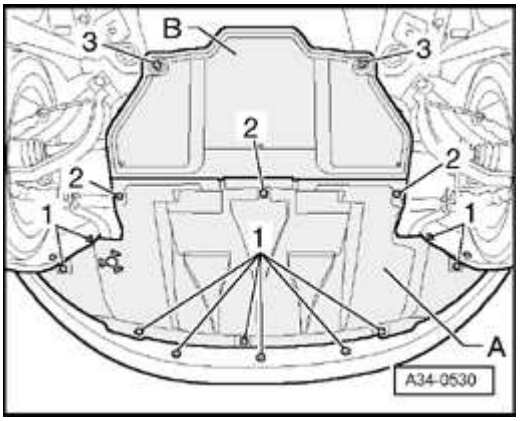


Fig. 137: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolts/quick release fasteners - **1** - and - **2** - and remove front sound insulation - **A** -.

NOTE:

- **- Item 3 - and - item B - can be disregarded.**

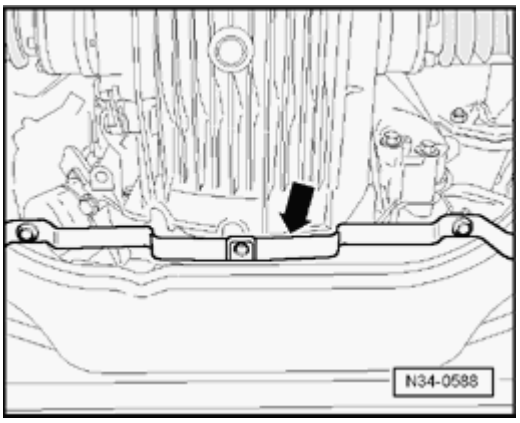


Fig. 138: Removing Noise Insulation Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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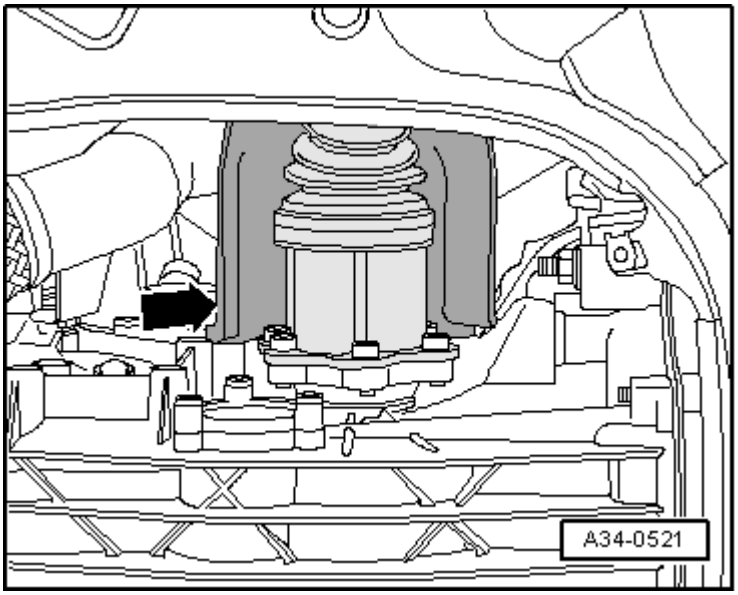


Fig. 139: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

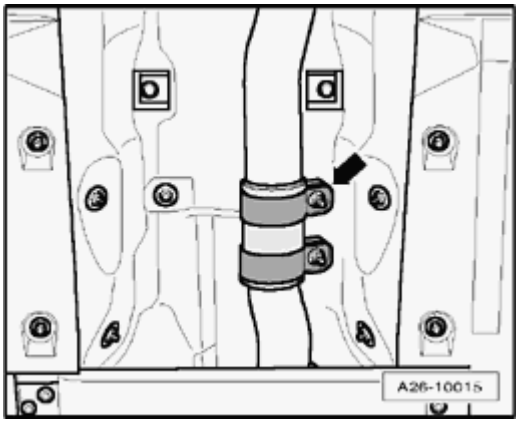


Fig. 140: Loosening Clamping Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

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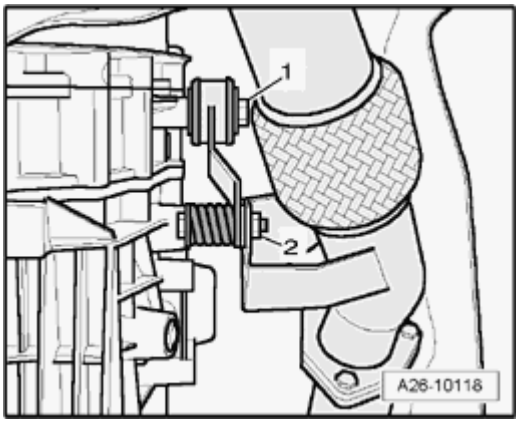


Fig. 141: Retaining Bracket For Front Exhaust Pipe, Bolt And Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

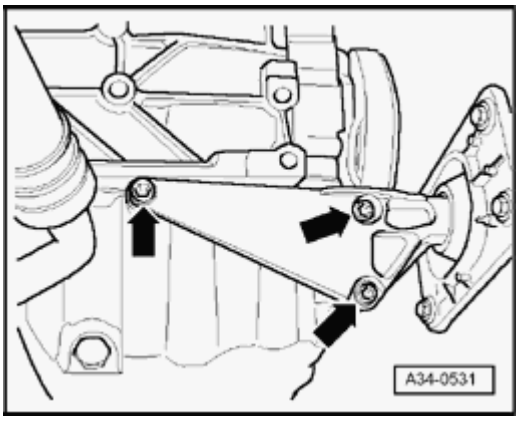


Fig. 142: Torque Reaction Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Cabriolet:

NOTE:

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

- Unbolt torque reaction support - **arrows** -.

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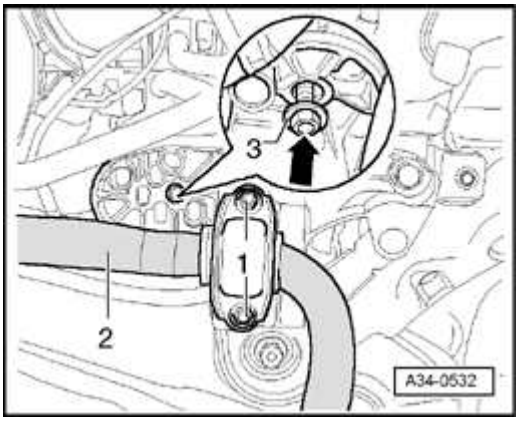


Fig. 143: Swivel Stabilizer Bar Nuts, Engine Mountings Nut And End Of Stud
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts - **1** - on left and right sides, and swivel stabilizer bar - **2** - downward.
- Remove nut - **3** - on left and right engine mountings until bottom of nut is flush with end of stud - **arrow** -.
- Use engine support bridge 10-222 A to lift engine just enough for nuts - **3** - to make contact with bottom surface of left and right consoles.

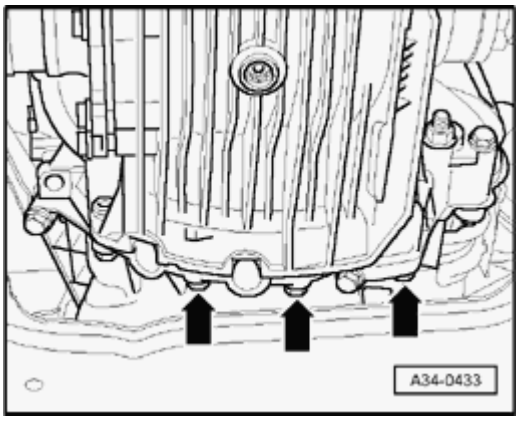


Fig. 144: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Continued for all vehicles:

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

Cabriolet:

- Lower engine back down.

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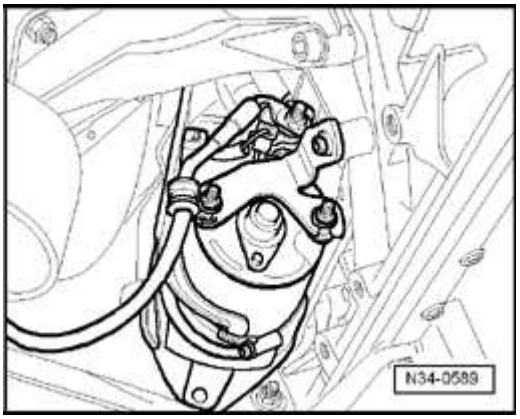


Fig. 145: Locating Starter Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Continued for all vehicles:

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

.

NOTE:

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

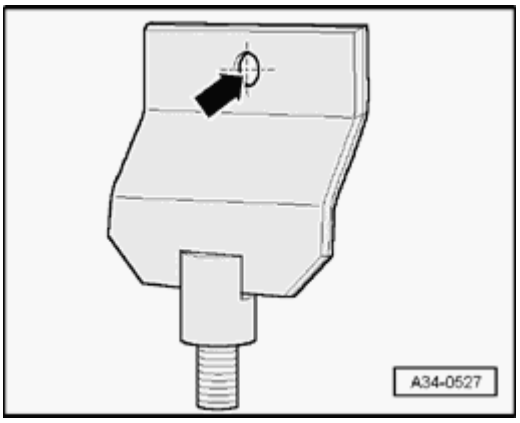


Fig. 146: Hole In Supporting Elements Of Transmission Support 3282
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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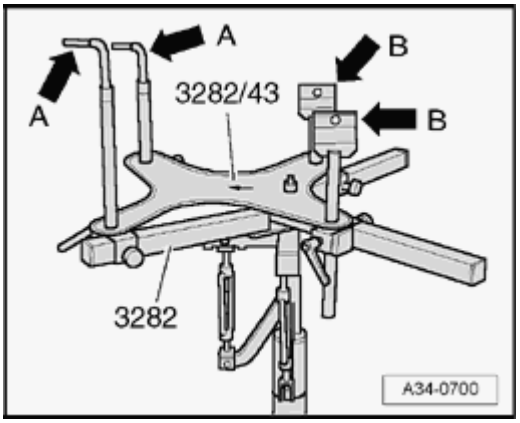


Fig. 147: Support Elements 3282/49 And 3282/52 And Arrow On The Adjustment Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove manual transmission 01X, set up transmission support 3282 with adjustment plate 3282/43 and place on engine/transmission jack V.A.G 1383 A.

NOTE:

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

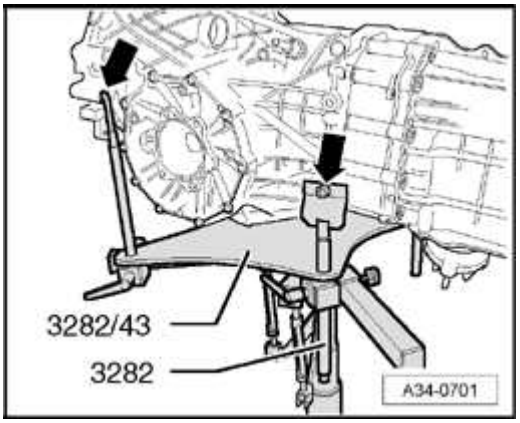


Fig. 148: Supporting Elements Secured To Left Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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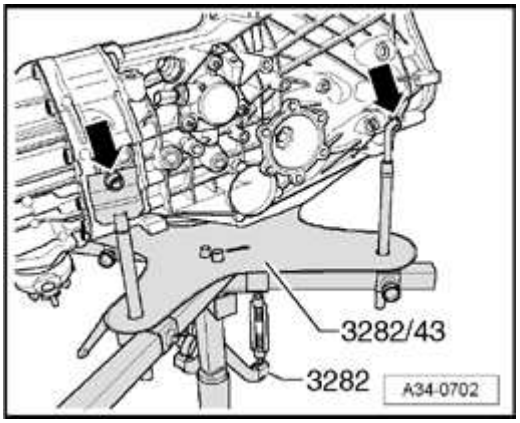


Fig. 149: Supporting Elements Secured To Right Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

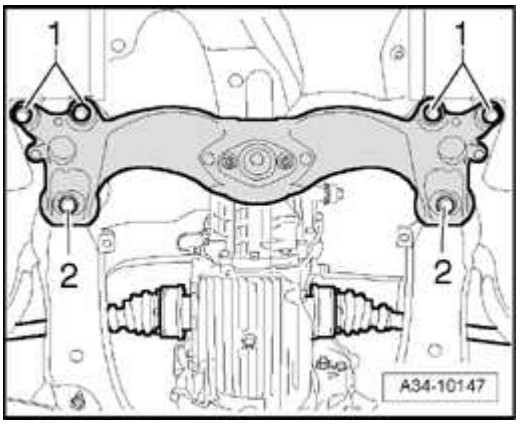


Fig. 150: Tunnel Cross Member Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **1** - and bolts - **2** -.

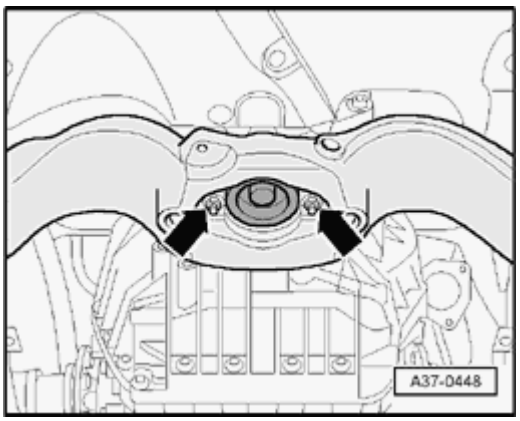


Fig. 151: Tunnel Cross Member Nuts

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

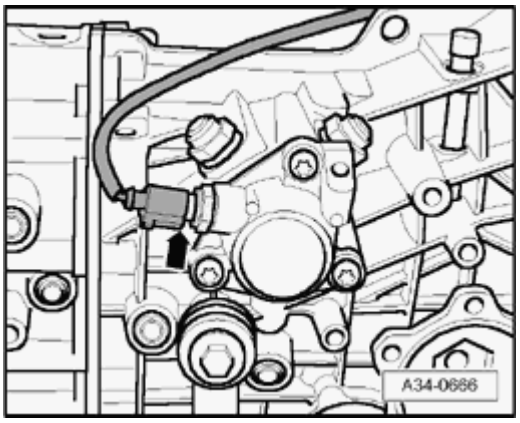


Fig. 152: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

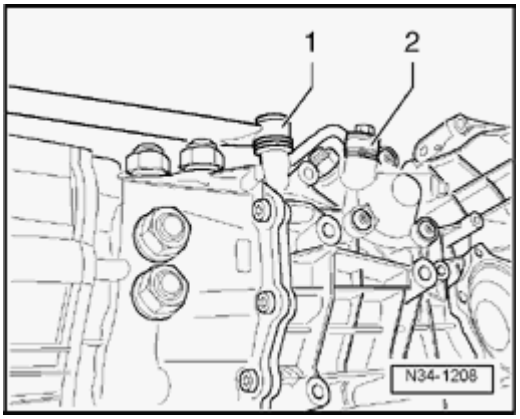


Fig. 153: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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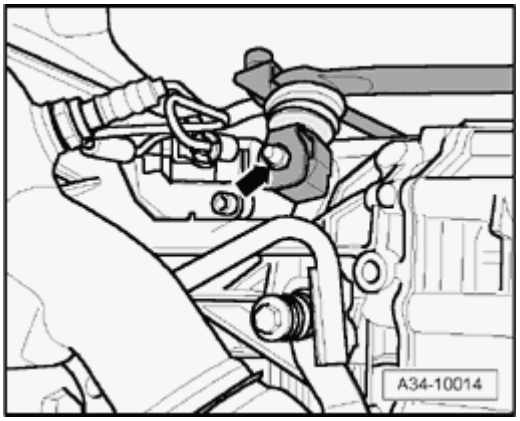


Fig. 154: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

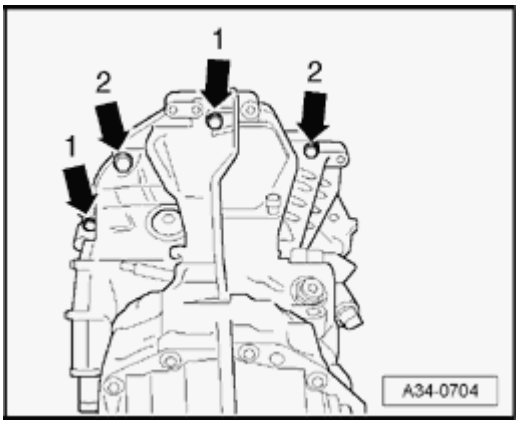


Fig. 155: Upper Engine/Transmission Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove upper engine/transmission securing bolts - **arrows 1** - and - **arrows 2** -. Please note that retaining brackets for wires/lines and coolant pipe may be secured on bolts - **arrows2** - (important for installation).
- If installed, remove retaining clips/cable ties together with Lambda probe wiring from transmission.

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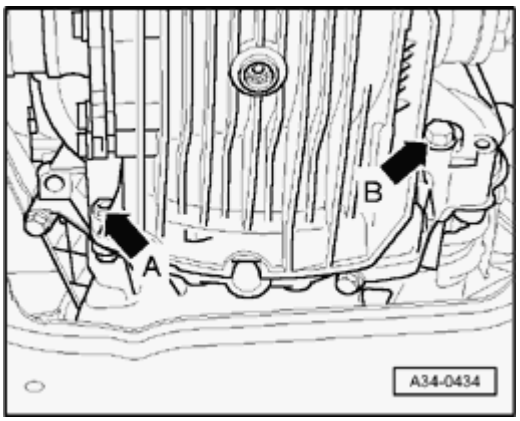


Fig. 156: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

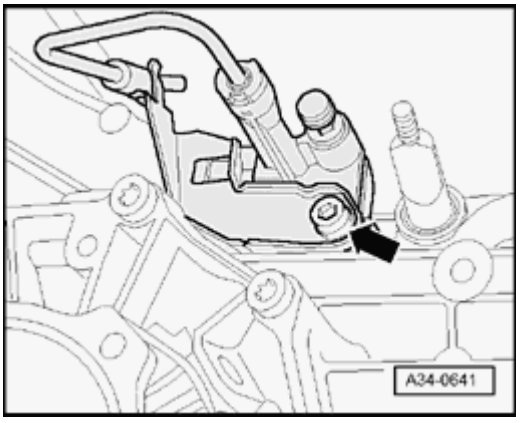


Fig. 157: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove slave cylinder from transmission - **arrow** - and secure with wire; do not open line/hose system.

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

- Lower transmission completely with engine/transmission jack V.A.G 1383 A.

NOTE:

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

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drive axles.

- Before carrying out assembly work, secure transmission to assembly stand, using holding fixture VW 540 --> **Transmission, mounting on assembly stand**.

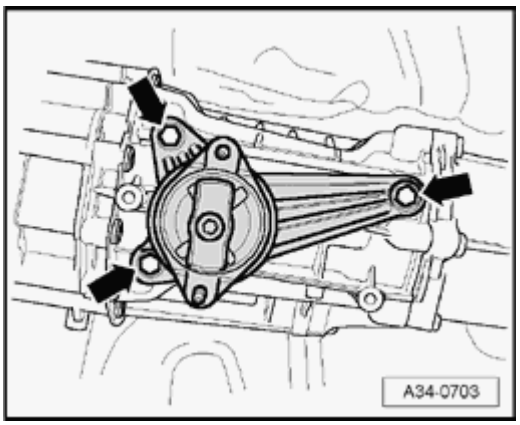


Fig. 158: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 --> **Transmission, installing in vehicles with 4-cylinder or 6-cylinder engine**.

Transmission, removing from vehicles with 6-cylinder engine

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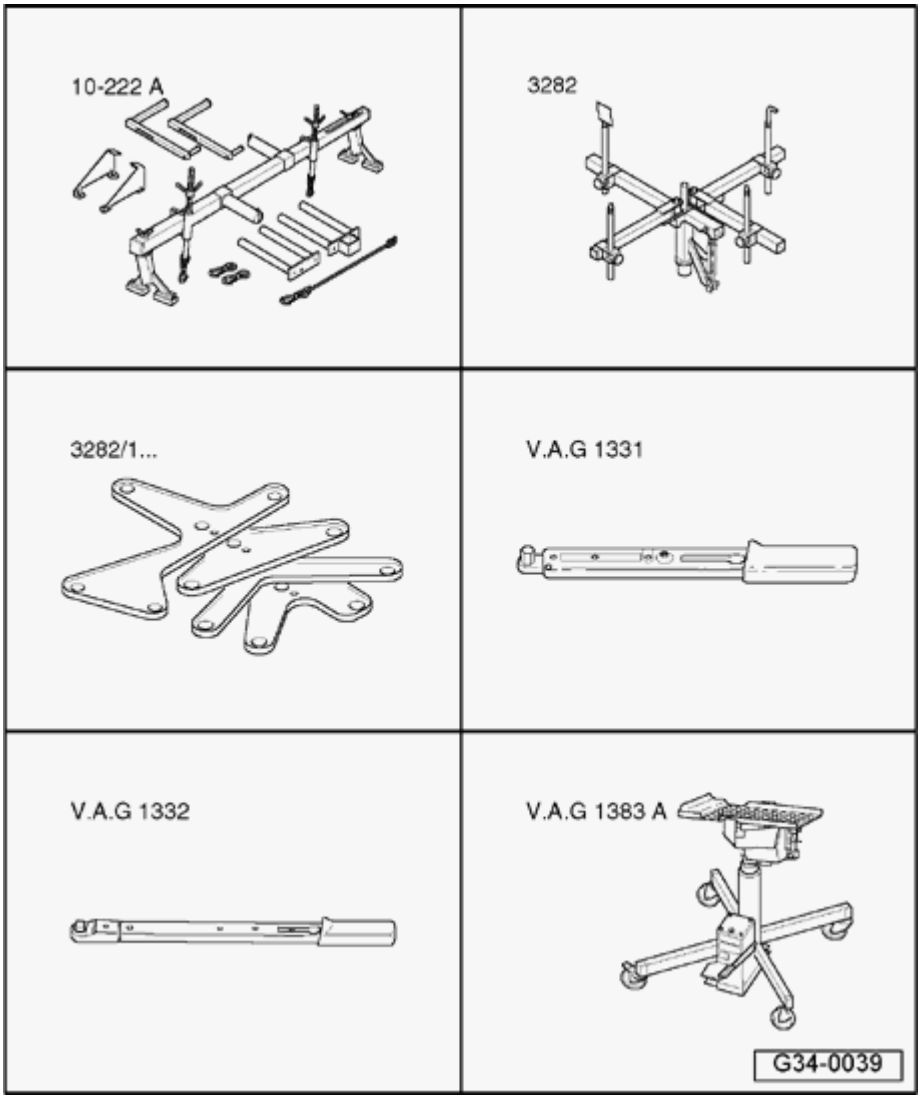


Fig. 159: Identifying Special Tools - Transmission, Removing From Vehicles
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Engine support bridge 10-222 A
- Transmission support 3282
- Adjustment plate 3282/43
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332
- Engine/transmission jack V.A.G 1383 A

Special tools, testers and auxiliary items required

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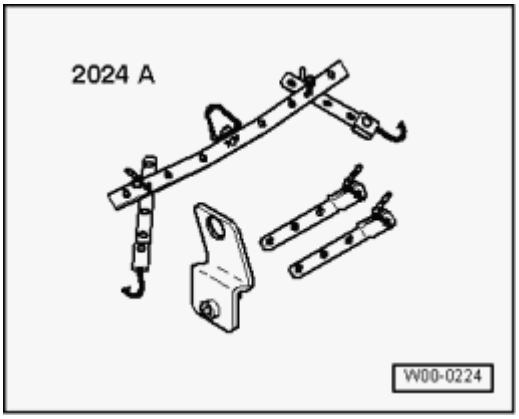


Fig. 160: Engine Sling 2024 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engine sling 2024 A
- **Grease for clutch plate splines G000100**
- **Copper grease Z381351TE**

Procedure

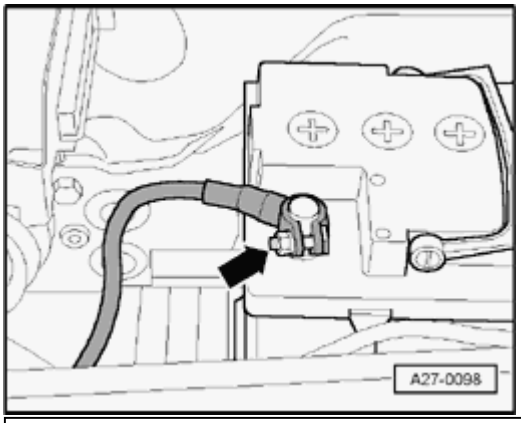
NOTE:

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

CAUTION: Follow steps required when disconnecting battery -->

- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL for Cabriolet**

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Fig. 161: Disconnecting Battery Ground (GND) Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

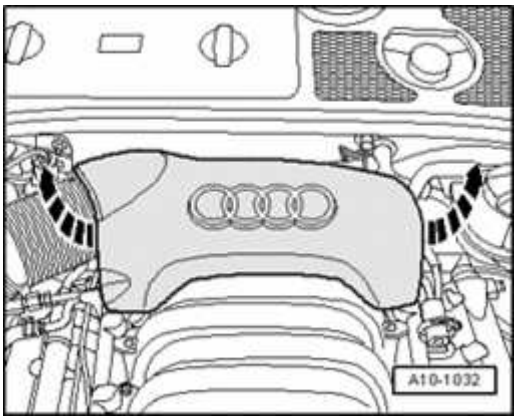


Fig. 162: Removing Rear Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

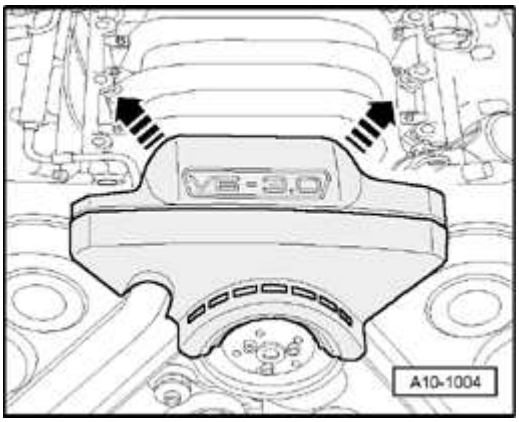


Fig. 163: Removing Front Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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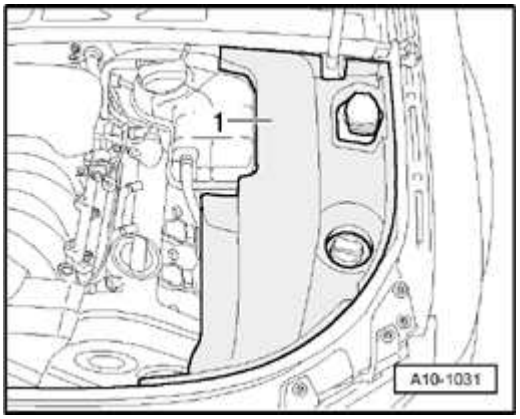


Fig. 164: Removing Cover In Engine Compartment (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

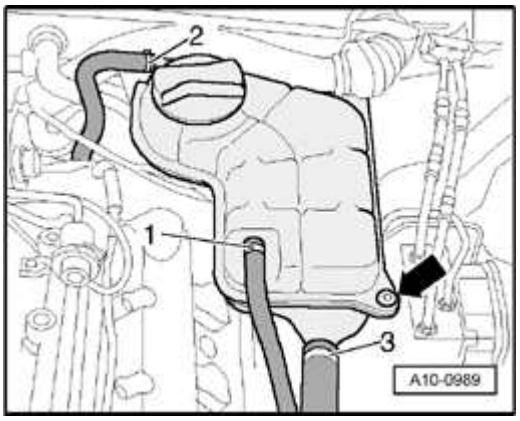


Fig. 165: Removing Coolant Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unfasten coolant expansion tank - **arrow** -.
- Disconnect electrical connector for Engine Coolant Level (ECL) Warning Switch F66 at bottom of coolant expansion tank. Move coolant expansion tank (with coolant hoses - **1to 3** - attached) clear to one side.

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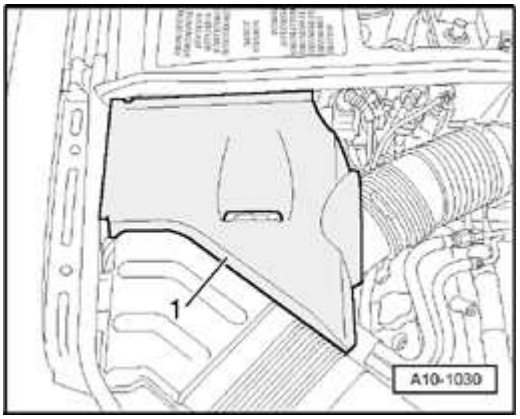


Fig. 166: Removing Cover In Engine Compartment (Right Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

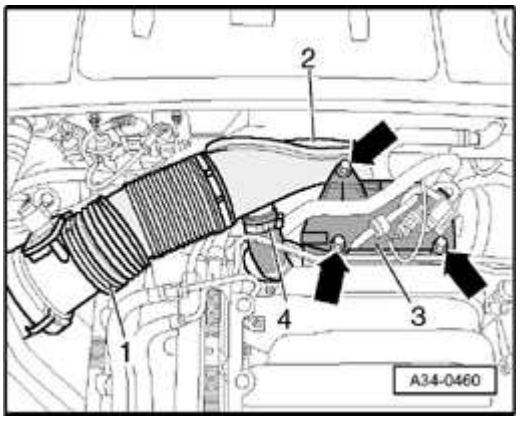
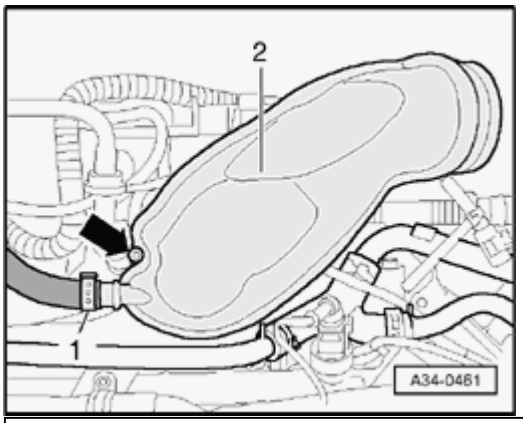


Fig. 167: Identifying Holding Plate, Intake Air Hose, Hose & Air Duct
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - from solenoid valve mounting plate - **3** -.
- Disconnect air intake hose - **1** - from mass air flow sensor.
- Pull hose - **4** - for crankcase breather system off air duct - **2** -.



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Fig. 168: Removing Bolt And Disconnect Air Duct At Throttle Valve Control Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt - **arrow** - and disconnect air duct - **2** - from throttle valve module.
- If installed, disconnect hose - **1** - from air duct.

NOTE:

- **In the illustration, the air duct is shown from the rear and with the engine removed.**

- Remove engine/transmission securing bolts which are accessible from above.

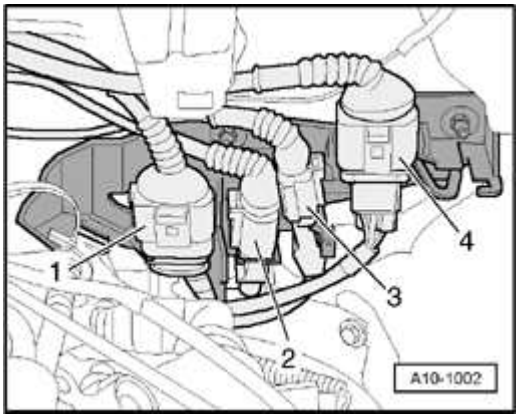


Fig. 169: Removing Harness Connectors From Bracket At Left Of Bulkhead
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connectors - **1 to 4** - from retainer at left of bulkhead.
- Disconnect electrical connectors - **1** - and - **4** -.
- Move oxygen sensor wires clear.
- Remove retainer for connectors.

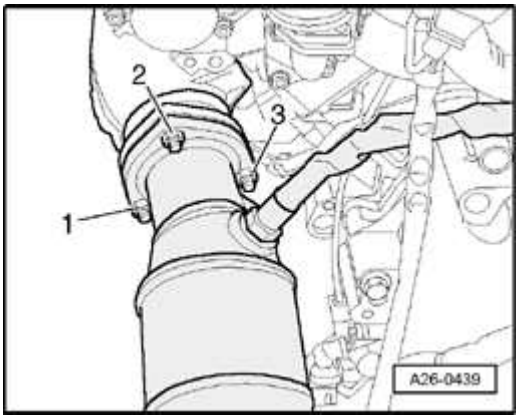


Fig. 170: Left Front Exhaust Pipe To Exhaust Manifold Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove nut - **1** - (access from above), connecting left front exhaust pipe with exhaust manifold.

NOTE:

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

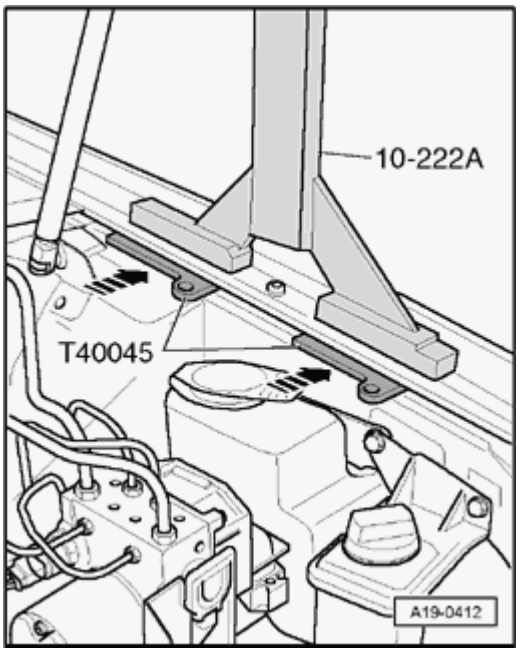


Fig. 171: Placing Insert Pad For Front Fender T40045 On Both Sides Between Fender Attachment Edge And Web Plate Lying Beneath
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

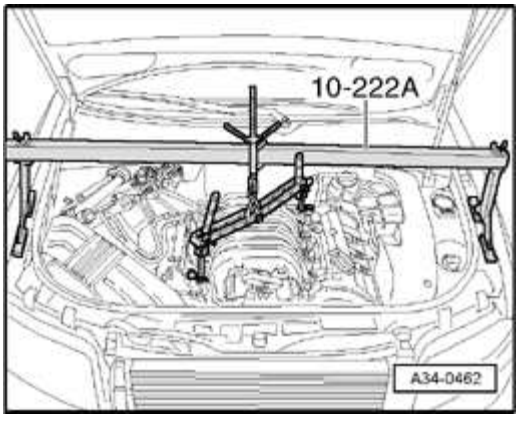


Fig. 172: Positioning 10-222A Engine Support Bridge On Bolted Flanges Of Fenders
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up Engine support bridge 10-222 A on fender mounting flanges.

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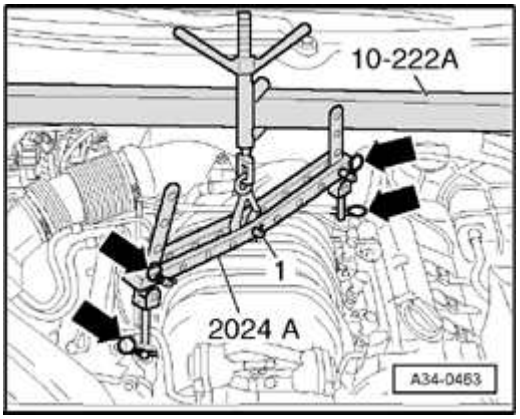


Fig. 173: Removing Eyelet For 2024A Engine Sling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove eye of lifting tackle 2024A.
- Re-insert pin - **1** - in middle hole on lifting tackle and secure it with split pin.
- Hook pin on lifting tackle 2024A onto spindle on Engine support bridge 10-222 A.
- Hook lifting tackle 2024A into lifting eyes at front and rear of engine.

CAUTION: Support hooks and locking pins on lifting tackle must be secured with retainers - arrows - in illustration.

- Slightly pretension engine with spindle of Engine support bridge.

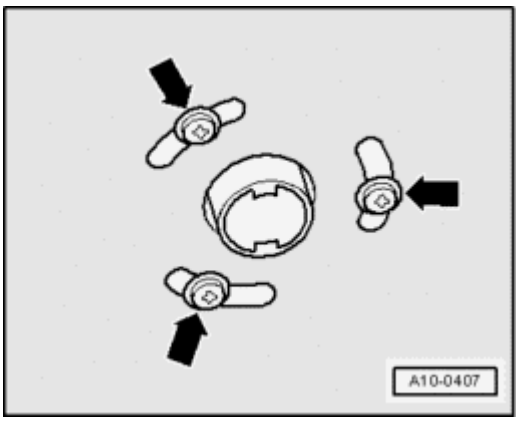


Fig. 174: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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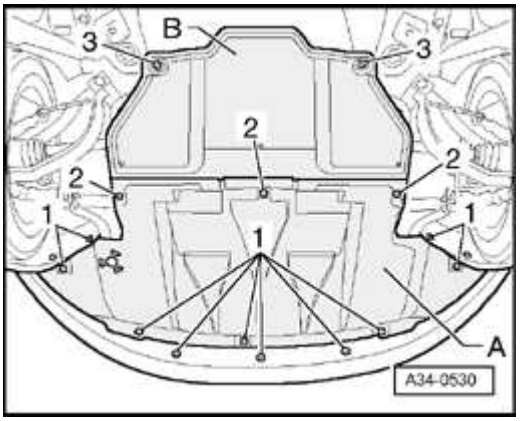


Fig. 175: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

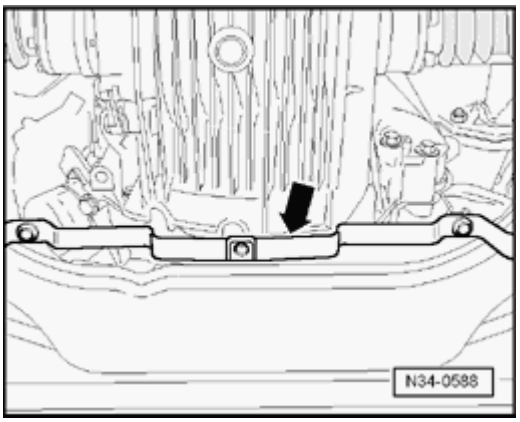


Fig. 176: Removing Noise Insulation Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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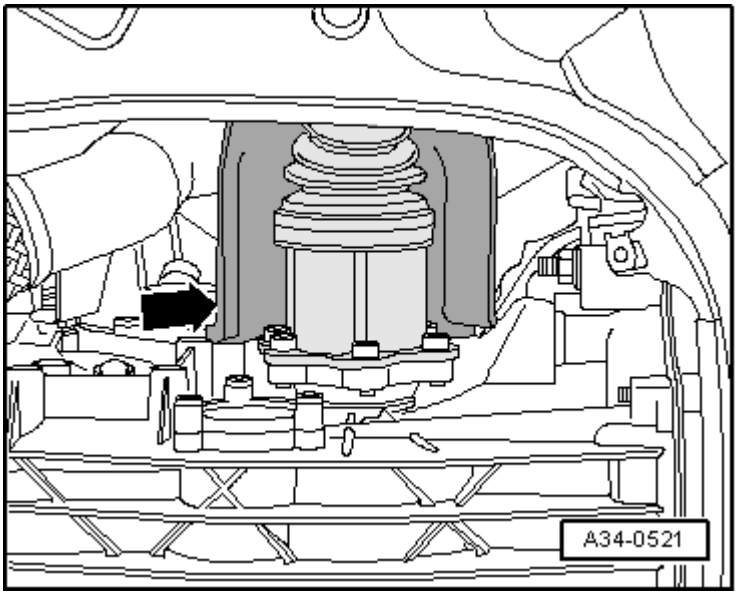


Fig. 177: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - **arrow** - for drive axles (left and right).

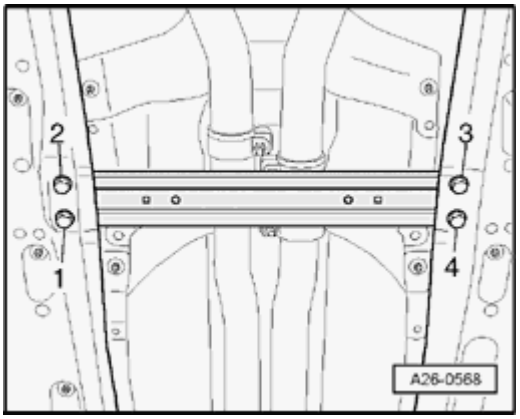


Fig. 178: Removing Bolts For Front Vehicle Floor Crossmember
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove tunnel cross member (front) - **1 to 4** -.

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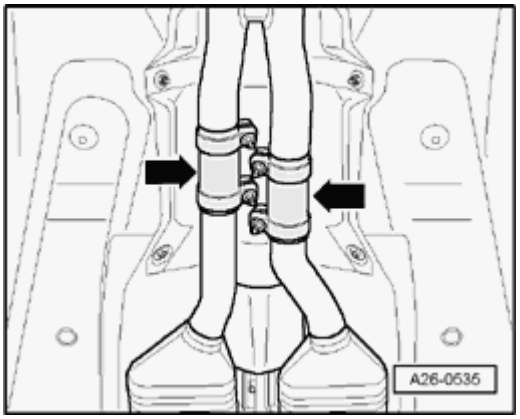


Fig. 179: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at clamps - **arrows** -.
- Remove front exhaust pipe (left-side) with catalytic converter --> 3.0 Liter 6-Cyl. 5V Engine Mechanical, Engine Code(s): AVK - **26 EXHAUST SYSTEM, EMISSION CONTROLS** .
- Remove bracket for exhaust pipe (front right) from transmission.

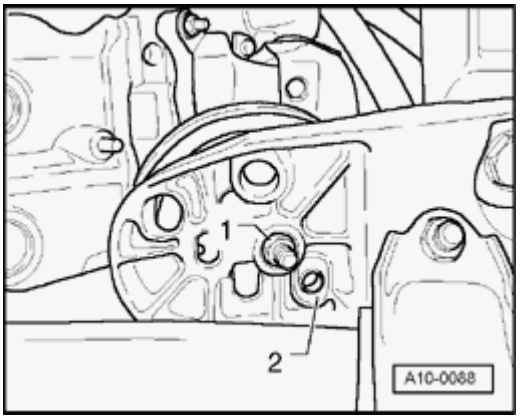


Fig. 180: Threaded Connections And Positioning Sleeves On Lower Engine Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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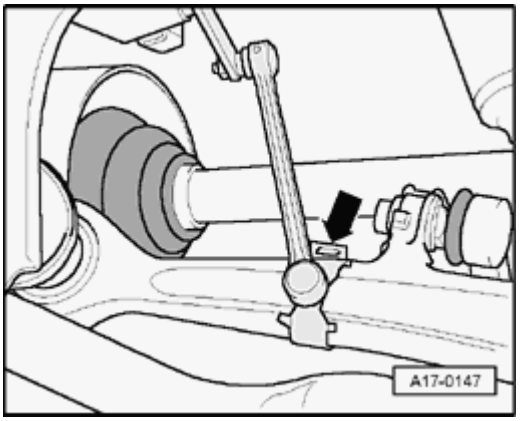


Fig. 181: Unclipping Operating Rod For Vehicle Levelling Sensor At Lower Transverse Link
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, unclip operating rod for Left Front Level Control System Sensor G78 from lower transverse link - **arrow** -.

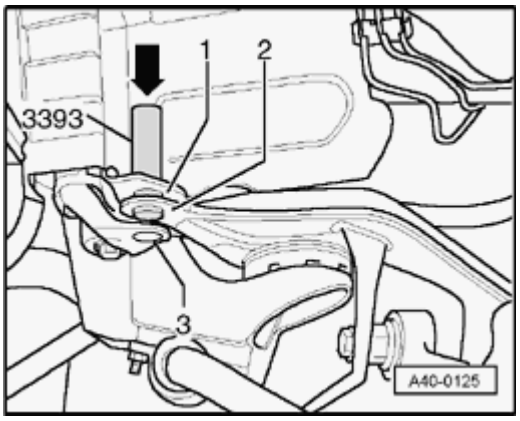


Fig. 182: Checking Holes Align Using Testing Mandrel 3393
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before loosening subframe, use testing mandrel 3393 to check whether holes - **1** - and - **2** - are aligned.

If holes are not aligned, a wheel alignment has to be performed after installing the subframe.

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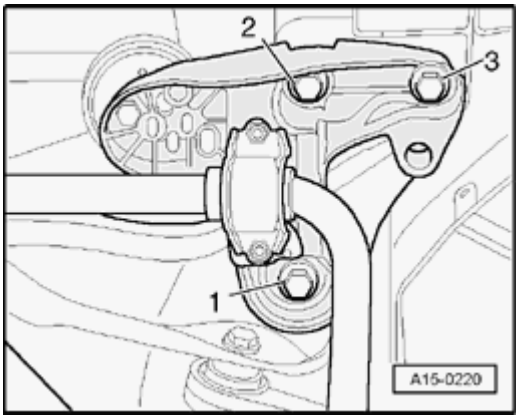


Fig. 183: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

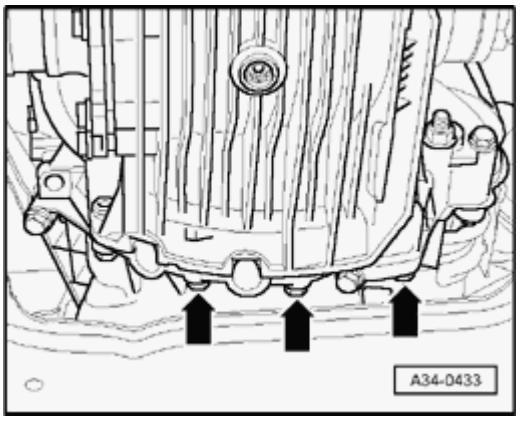


Fig. 184: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

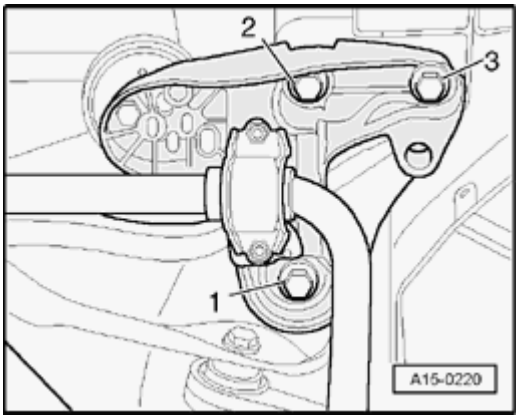


Fig. 185: Removing Front Bolts From Left And Right Subframe

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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.

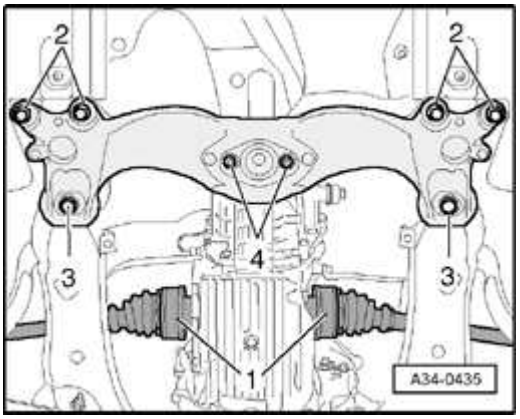


Fig. 186: Drive Shafts And Flange Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove drive axles - **1** - from flange shafts and tie up to side.

NOTE:

- **Do not damage surface coating on drive axles.**

- Support transmission with engine/transmission jack V.A.G 1383 A.
- Remove bolts - **2** - and then bolts - **3** - at tunnel cross member.
- Remove two nuts - **4** - and detach tunnel cross member.
- Carefully lower engine/transmission jack V.A.G 1383 A and move it aside.

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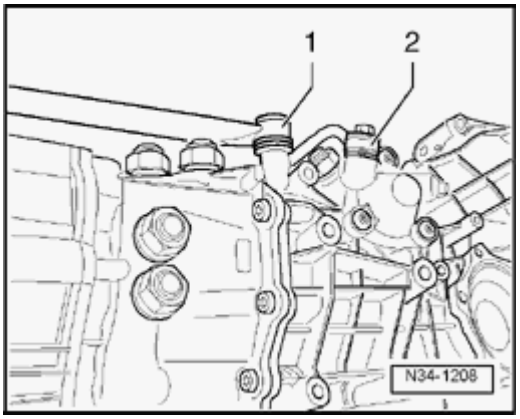


Fig. 187: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

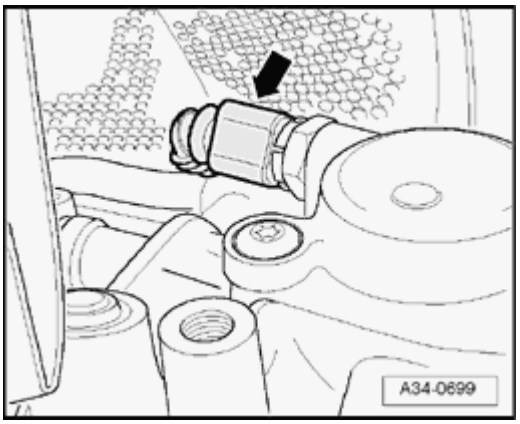


Fig. 188: Back-Up Light Switch Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector - **arrow** - for back-up light switch on right side of transmission.

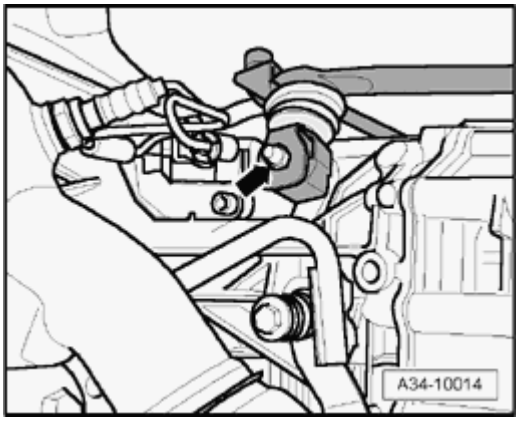


Fig. 189: Selector Shaft Lever Nut

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

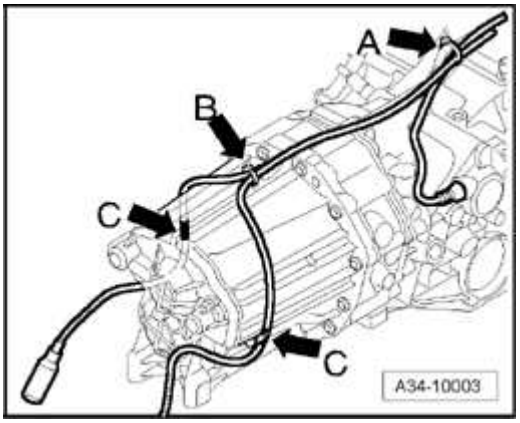


Fig. 190: Locating Cable Ties And Oxygen Sensor Wiring At Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open cable ties - **arrows A and B** - , unclip oxygen sensor wiring at side - **arrows C** - and move wiring clear.

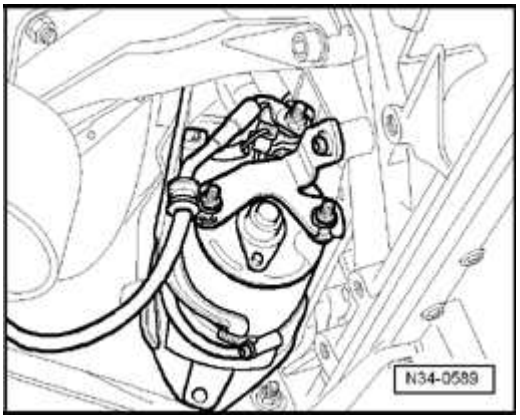


Fig. 191: Locating Starter Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

.

NOTE:

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

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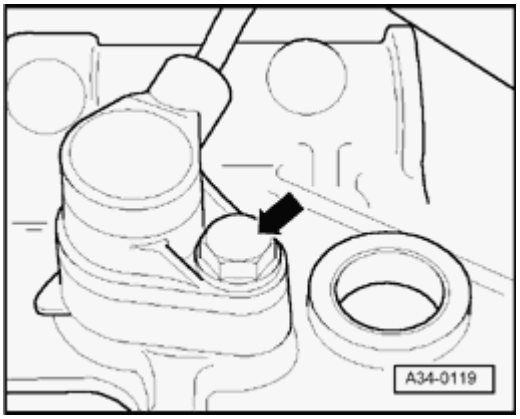


Fig. 192: Location Of Engine Speed (RPM) Sensor G28 On Coupling Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove engine speed (RPM) sensor G28 from left side of transmission - **arrow** - and lay aside.

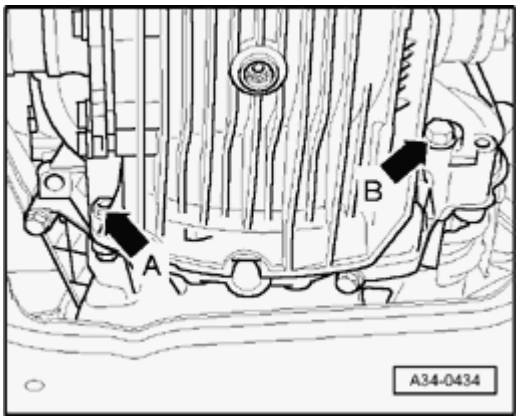
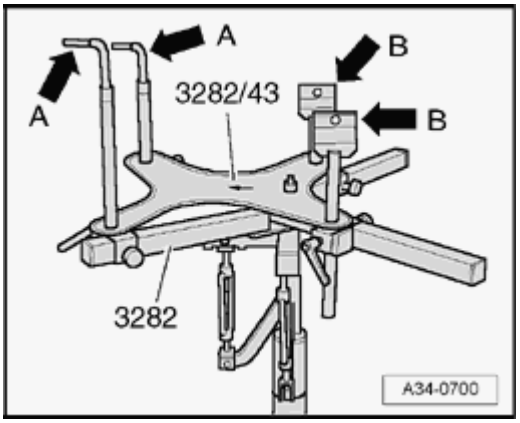


Fig. 193: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove upper engine/transmission securing bolts as well as those on the side, except for bolts marked with - **arrow A** - and - **arrow B** -.



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Fig. 194: Support Elements 3282/49 And 3282/52 And Arrow On The Adjustment Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove manual transmission 01X set up transmission support 3282 with adjustment plate 3282 /43 and place on engine/transmission jack V.A.G 1383 A.

NOTE:

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

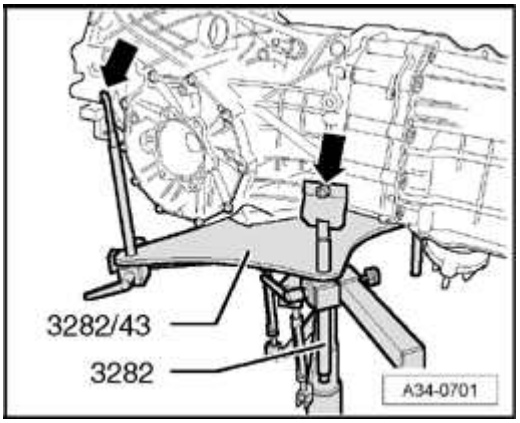


Fig. 195: Supporting Elements Secured To Left Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

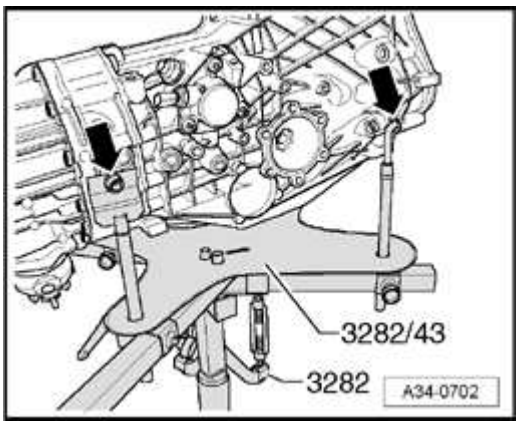


Fig. 196: Supporting Elements Secured To Right Side Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure supporting elements to right side of transmission, as shown in illustration. Tighten bolt - **arrow** -

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on left side to 20 Nm.

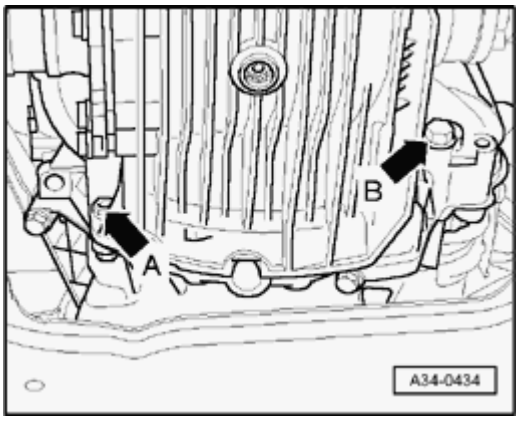


Fig. 197: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

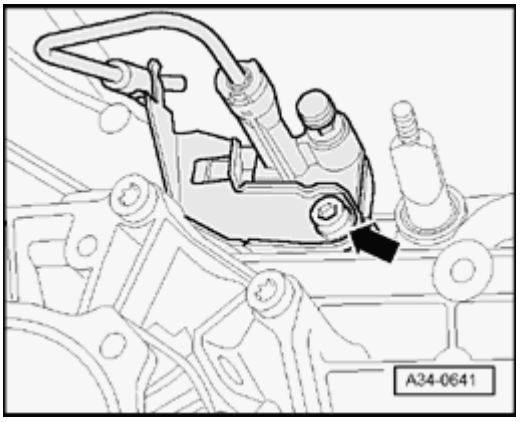


Fig. 198: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove slave cylinder from transmission - **arrow** - and secure with wire; do not open line/hose system.

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

- Lower transmission.

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NOTE:

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

- Before carrying out assembly work, secure transmission to assembly stand, using holding fixture VW 540 --> **Transmission, mounting on assembly stand**.

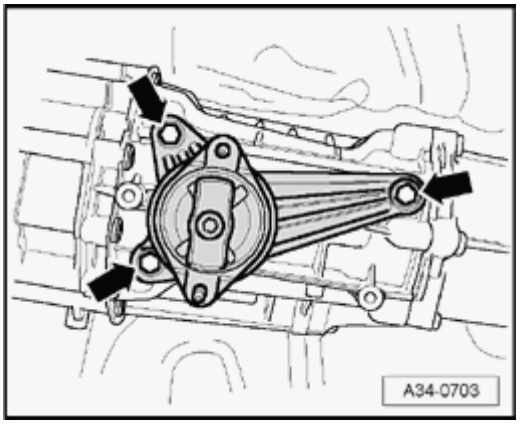


Fig. 199: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Transmission, installing in vehicles with 4-cylinder or 6-cylinder engine

Installation is perform in reverse sequence; note the following:

- Use a thread tap to remove any remaining locking fluid from all threaded holes which will accommodate self-locking bolts.
- Always replace self-locking bolts and nuts.
- Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of **grease for clutch plate splines G000100** to splines. Do not grease guide sleeve.

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

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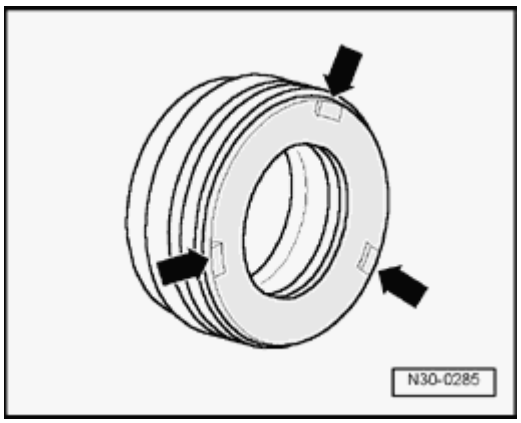


Fig. 200: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check clutch release bearing for wear and replace if necessary.
- If plastic ring - **arrows** - has come loose, service release bearing as required **Checking and servicing release bearing with glued plastic ring**.

NOTE:

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

- Check that dowel sleeves for centralizing engine/transmission are in cylinder block, install if necessary.
- Place intermediate plate on dowel sleeves at engine flange.
- Before installing transmission, tie electrical wires and brackets off to one side so that they are not trapped between engine and the transmission.

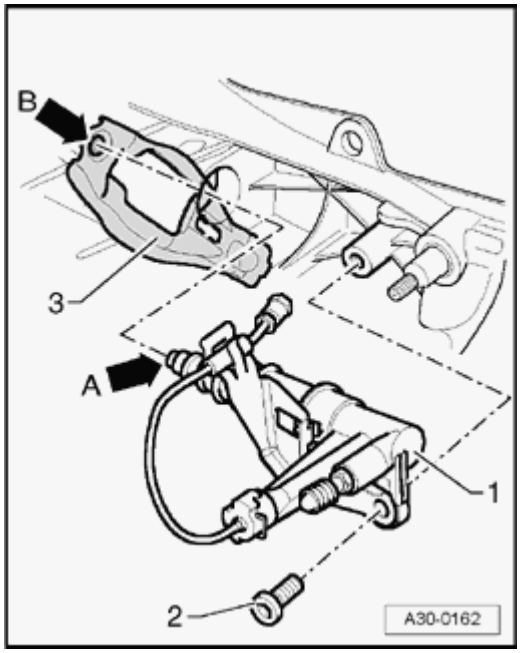


Fig. 201: Guiding Slave Cylinder Into Bore Of Transmission Housing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly lubricate surface where operating rod and clutch release lever make contact - **arrow B** - using copper grease Z381351TE.
- Raise transmission far enough to be able to install slave cylinder with bracket for hose/line assembly.
- 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 resistance when depressing the clutch pedal, you must not press it down further. The push rod of the slave cylinder is likely to have been guided past the clutch release lever. The slave cylinder would then be destroyed once pedal force exceeds approx. 300 N.

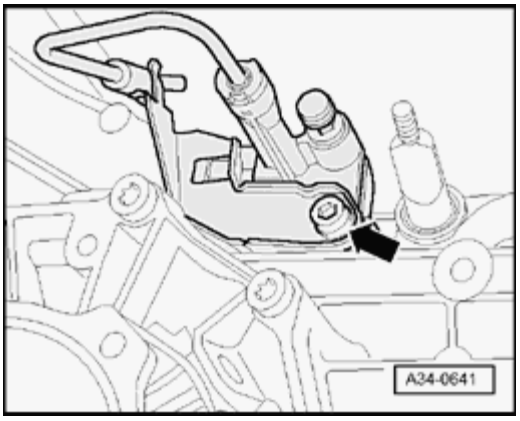


Fig. 202: Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure slave cylinder with new bolt - **arrow** -.
- Insert transmission, making sure there is sufficient clearance to drive axles.

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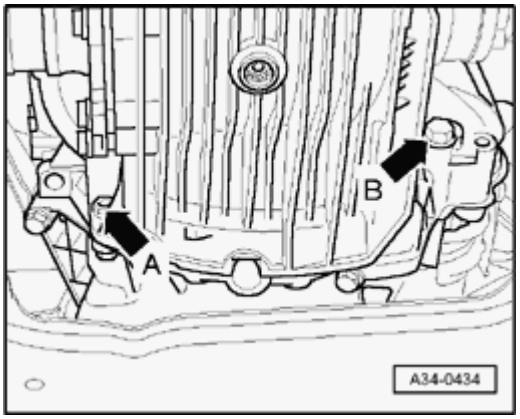


Fig. 203: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install engine/transmission securing bolts - **arrow A** - and - **arrow B** -.

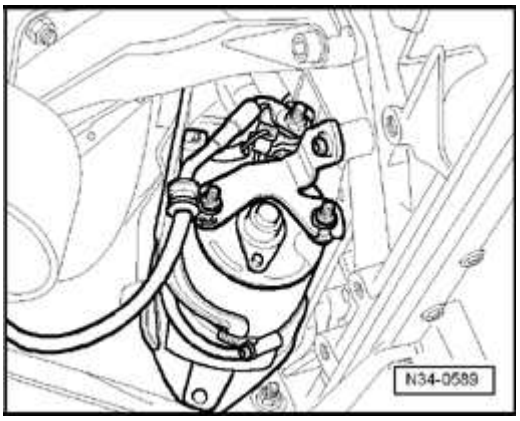


Fig. 204: Locating Starter Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install starter -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

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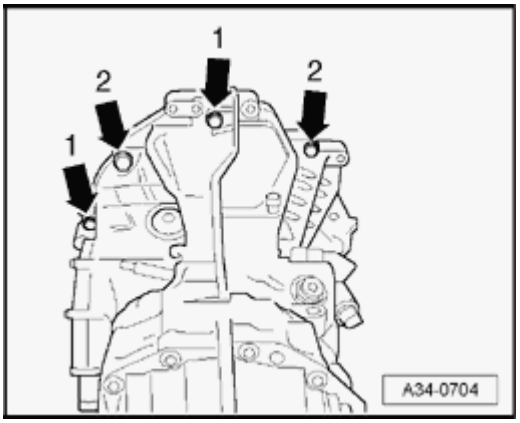


Fig. 205: Upper Engine/Transmission Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully lower transmission a short distance using engine/transmission jack V.A.G 1383 A.
- If possible, tighten upper engine/transmission securing bolts - **arrows1** - and - **arrows2** -.

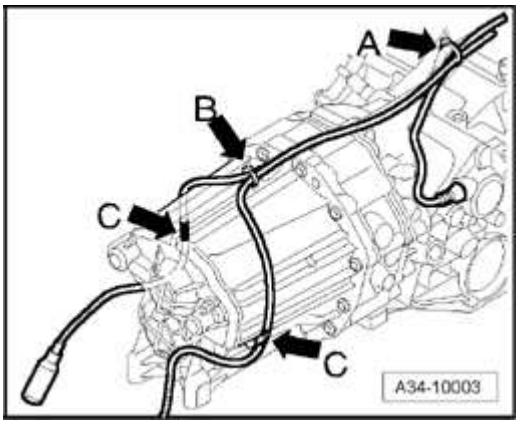


Fig. 206: Locating Cable Ties And Oxygen Sensor Wiring At Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, secure all electrical wiring to transmission again - **arrows A to C** -.

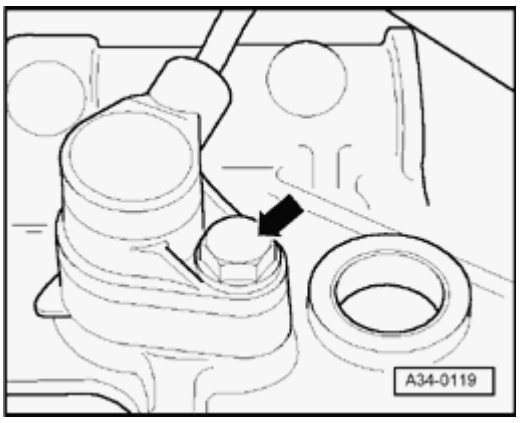


Fig. 207: Location Of Engine Speed (RPM) Sensor G28 On Coupling Housing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, install engine speed (RPM) sensor G28 on left side of transmission.

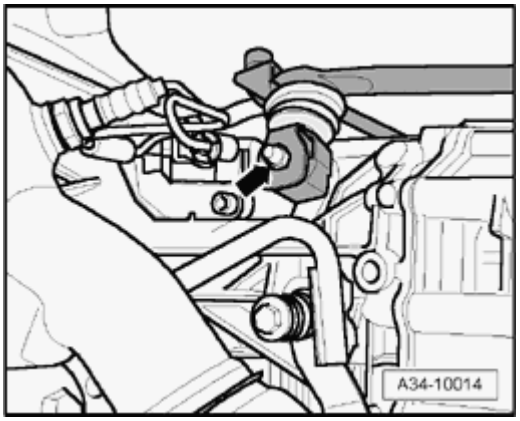


Fig. 208: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install selector shaft lever and tighten nut - **arrow** -.

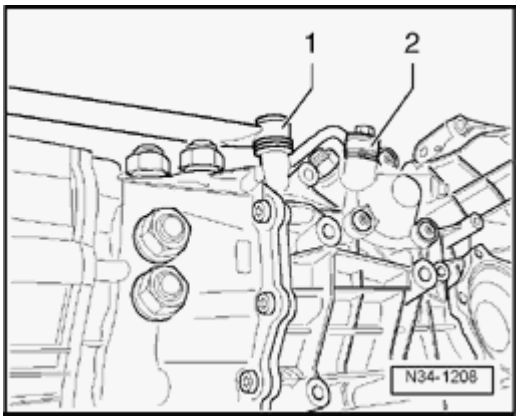


Fig. 209: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install push rod - **1** - ; by tightening hex socket-head bolt.
- Secure connecting rod - **2** - for selector rod.

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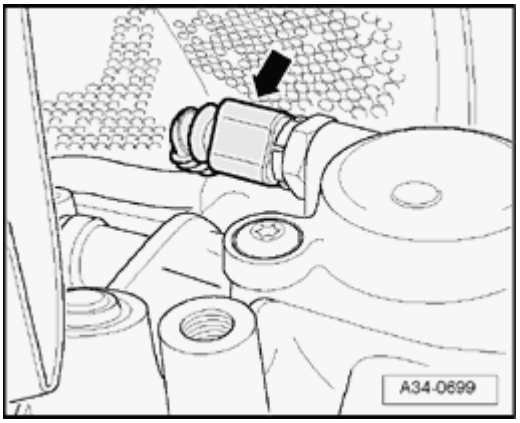


Fig. 210: Back-Up Light Switch Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect electrical connector - **arrow** - for reversing light switch on transmission (right side).

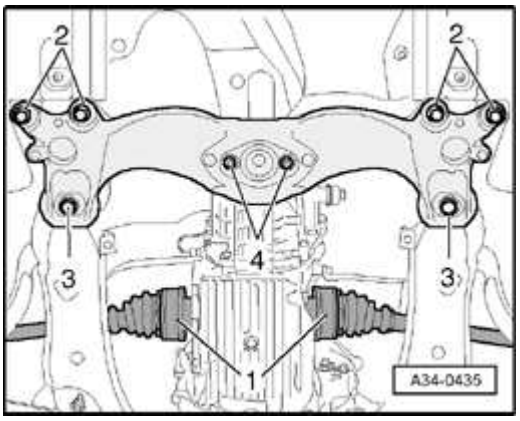


Fig. 211: Drive Shafts And Flange Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift transmission again using engine/transmission jack V.A.G 1383 A.
- Attach tunnel cross member to body with new bolts - **2** - and - **3** - (tighten hand-tight only).
- Secure tunnel cross member to transmission mounting - **4** - --> **40 - FRONT SUSPENSION** .
- Carefully lower engine/transmission jack V.A.G 1383 A and move it aside.

- Bolt drive axles - **1** - to flange shafts --> **40 - FRONT SUSPENSION** .

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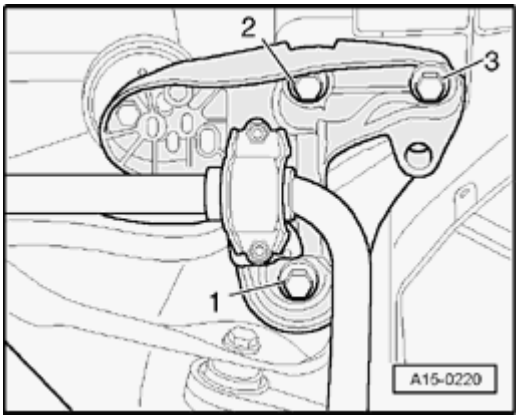


Fig. 212: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 6-cylinder engine:

- Weight of engine is supported with engine support bridge **Fig. 172**.

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

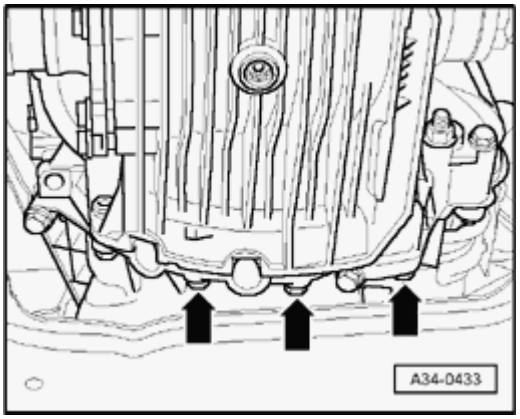


Fig. 213: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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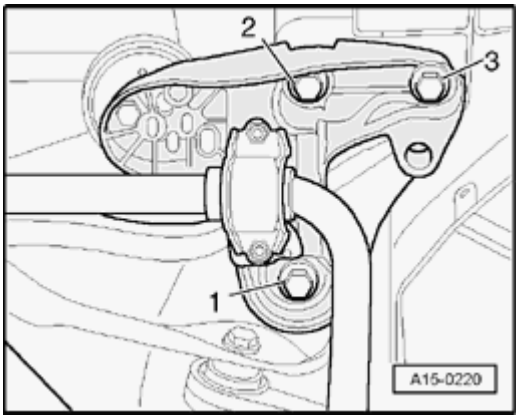


Fig. 214: Removing Front Bolts From Left And Right Subframe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace front subframe bolts - **1** - , - **2** - and - **3** - on both sides of vehicle.

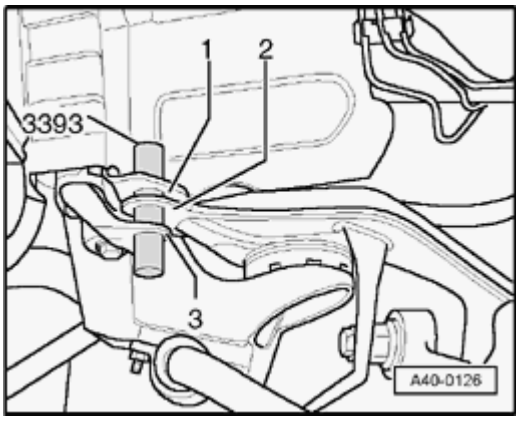


Fig. 215: Identifying Hole, Sub-Frame Hole And Aluminum Console Hole Align On Both Sides
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Before tightening subframe, it must be aligned with body using testing mandrel 3393.

- Hole - **1** - and hole - **2** - of subframe and hole - **3** - of aluminum bracket must be flush on both sides.

NOTE:

- **This alignment can only replace a subsequent wheel alignment if holes - 1 - and - 2 - coincided before the repair work was perform.**

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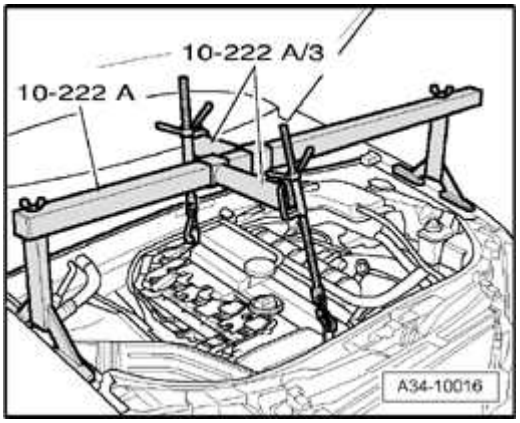


Fig. 216: Engine Support Bridge 10-222 A Set Up With Adapters 10-222/3 On Fender Mounting Flanges
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Cabriolet vehicles with 4-cylinder engine:

- Lift engine slightly using spindles.

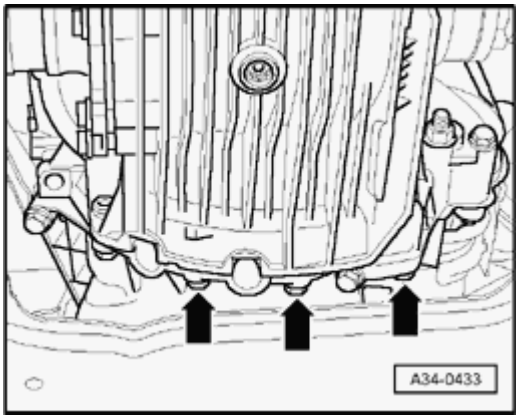


Fig. 217: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bottom engine/transmission securing bolts - **arrows** -.
- Lower engine back down.

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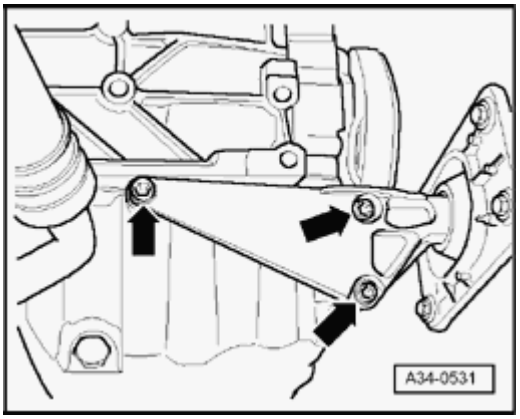


Fig. 218: Torque Reaction Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure torque reaction support - **arrows** -.

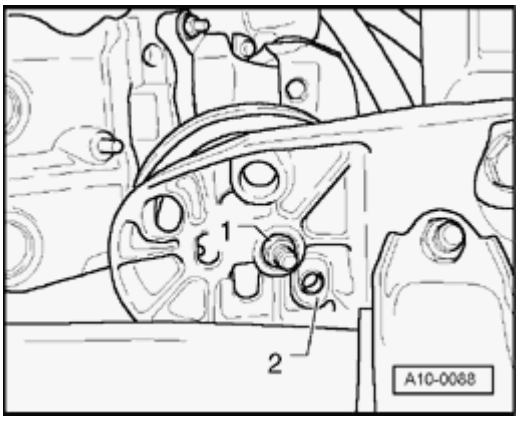


Fig. 219: Threaded Connections And Positioning Sleeves On Lower Engine Mounts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten nuts - **1** - for engine mountings -->
  - **10 ENGINE - ASSEMBLY** for AVK
  - **10 - ENGINE - ASSEMBLY** for BPG

  .

Continued for all vehicles:

- Secure subframe and tunnel cross member --> **40 - FRONT SUSPENSION** .
- Install exhaust system and align stress free -->
  - **26 EXHAUST SYSTEM, EMISSION CONTROLS** for AVK
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

  .
- Check selector mechanism setting and adjust if necessary --> **Selector mechanism, adjusting**.

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- Check fluid level in transmission --> **Transmission oil level, checking**.
- Follow steps required after connecting battery -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for Cabriolet

  .
- If necessary, carry out wheel alignment --> **44 - WHEELS, TIRES, VEHICLE ALIGNMENT** .

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

Tightening torques

NOTE:

- **Tightening torques only apply to lightly greased, oiled, phosphated or blackened nuts and bolts.**
- **Additional lubricant such as engine or transmission oil may be used, but do not use graphite lubricant.**
- **Do not use parts which have been degreased.**
- **Tolerance for tightening torques ±15%.**

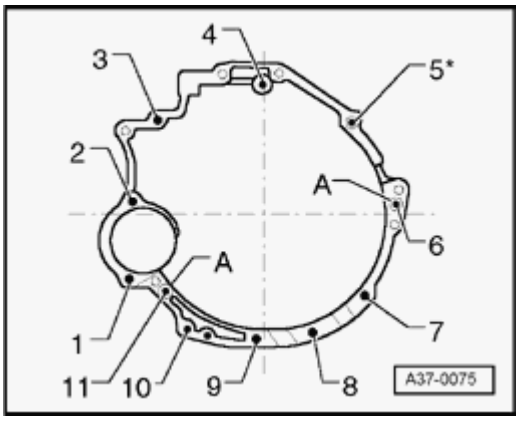


Fig. 220: Identifying Engine/Transmission Mountings (Automatic/Manual Transmission)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission attachment (2.0 ltr. engine)

Item	Bolt	Nm
1 * See note	M12x75	65
2 * See note	M12x90	65
3 * See note	M12x75	65

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4, 6	M12x90	65
5 * See note	M12x110	65
7 * See note	M10x50	45
8, 9, 10	M10x45	45
11 * See note	M12x110	65
A	Dowel sleeves for centralizing	

*For securing starter to transmission

*With bracket for wiring harness

*Hammer head bolt with nut

*With nut

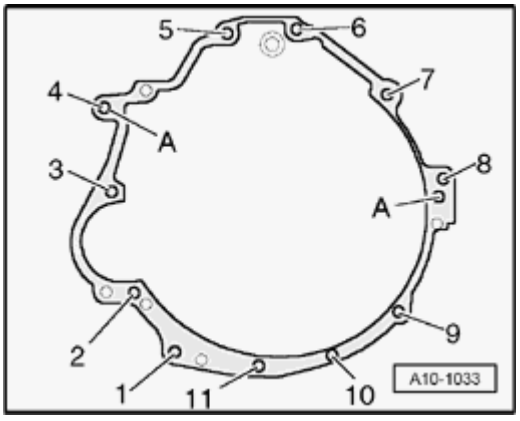


Fig. 221: Identifying Engine/Transmission Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine/transmission attachment (6-cylinder 3.0 ltr. engine)

Item	Bolt	Nm
1, 10, 11	M10x60	45
2 * See note	M10x150	65
3 * See note	M12x130	65
4	M12x85	65
5, 6	M12x90	65
7	M12x100	65
8	M12x95	65
9 * See note	M10x60	45
A	Dowel sleeves for centralizing	

*For securing starter to transmission

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*Hammer head bolt with nut

Component	Nm
Slave cylinder to transmission	23 * See note
Transmission selector lever to transmission	23
Push rod to transmission	40
Connecting rod for selector rod to transmission	23
Transmission mounting to transmission	23
Tunnel cross member to transmission mounting	23
Heat shields above drive axles to transmission	23
Engine mounting to engine support	23
Tunnel cross member (front) to body	55
Bracket for sound insulation to subframe	10

*replace bolt

Transporting the transmission

Special tools, testers and auxiliary items required

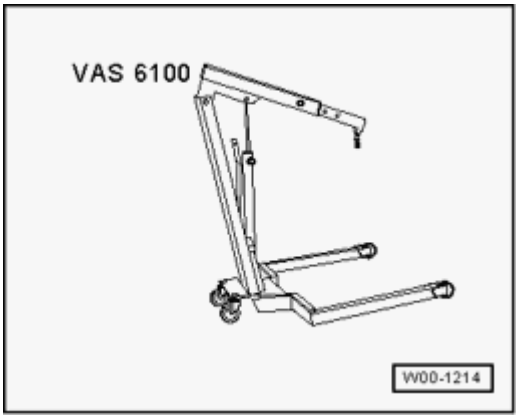


Fig. 222: Identifying Shop Crane VAS 6100
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Workshop crane VAS 6100

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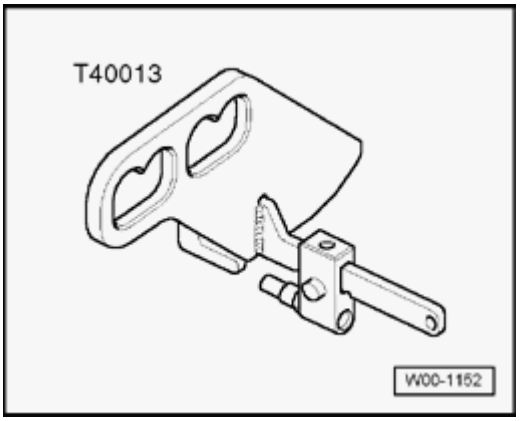


Fig. 223: Transmission Lift Hook T40013
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Transmission lift hook T40013

Procedure

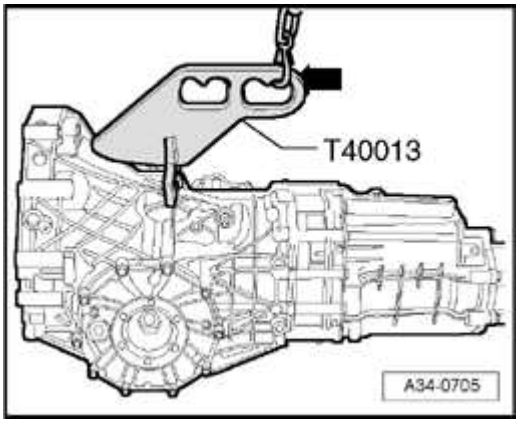


Fig. 224: Hook Of Workshop Crane Fastened In 4th Notch On Lifting Tackle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert transmission lift hook T40013 in lifting eye on transmission and secure.
- Fasten hook of workshop crane in 4th notch - **arrow** - on lifting tackle.
- Lift transmission with workshop crane and transmission lift hook T40013.

TRANSMISSION MOUNTING, REMOVING AND INSTALLING

Transmission mounting, removing and installing

Special tools, testers and auxiliary items required

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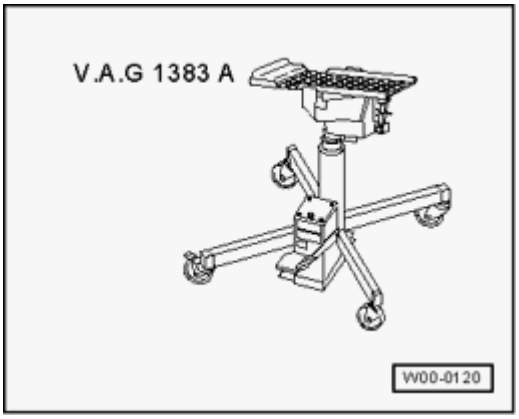


Fig. 225: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

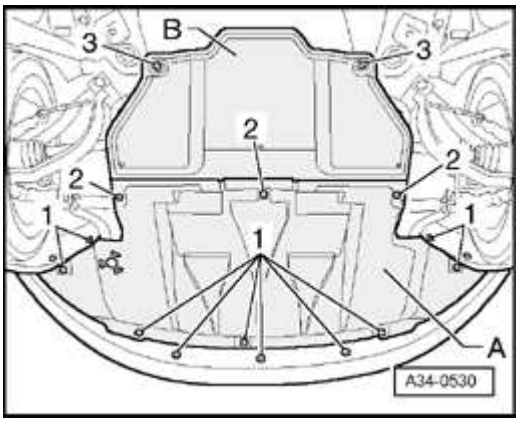
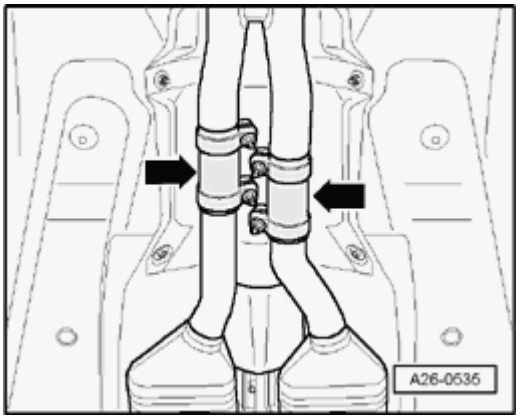


Fig. 226: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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



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Fig. 227: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

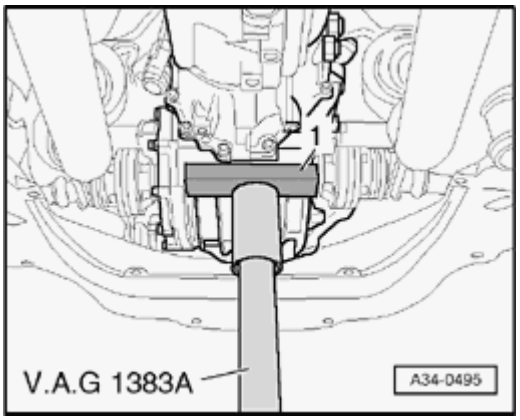


Fig. 228: Transmission Raised Using Punch Of VAG 1383 A So That A Piece Of Wood Can Be Placed In Between
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

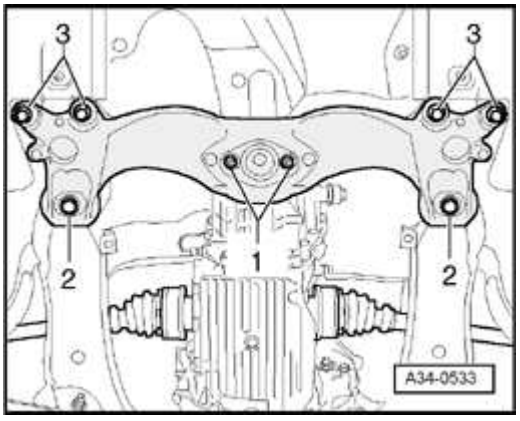


Fig. 229: Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **3** - and then bolts - **2** - at tunnel cross member.
- Lower transmission slightly.
- Remove two nuts - **1** - and push tunnel cross member backward slightly.

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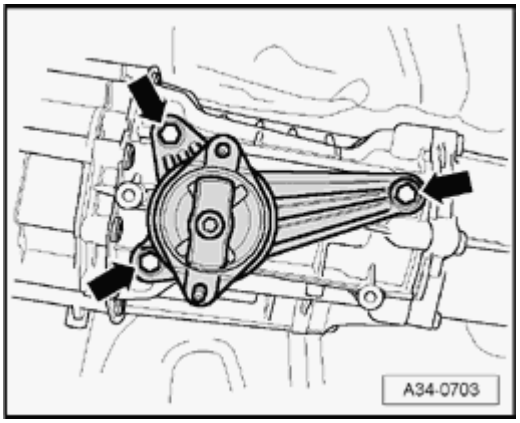


Fig. 230: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove transmission mounting - **arrows** -.

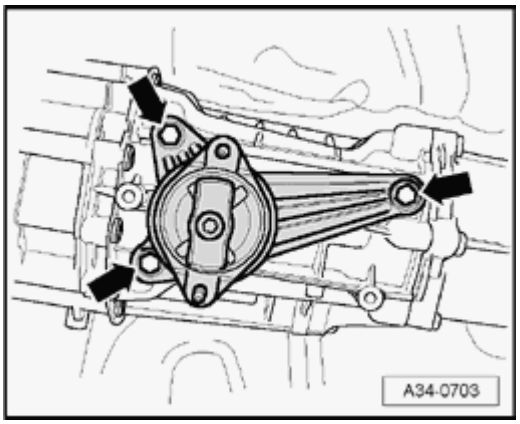


Fig. 231: Transmission Mounting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

Installation is in reverse sequence. Note the following:

- Secure transmission mounting to transmission - **arrows** - (tightening torque: 23 Nm).

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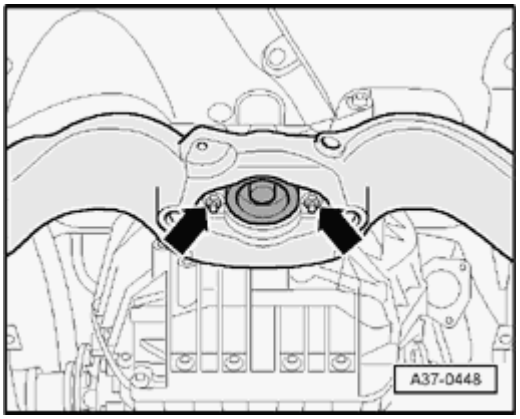


Fig. 232: Tunnel Cross Member Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt tunnel cross member onto transmission mounting - **arrows** -.

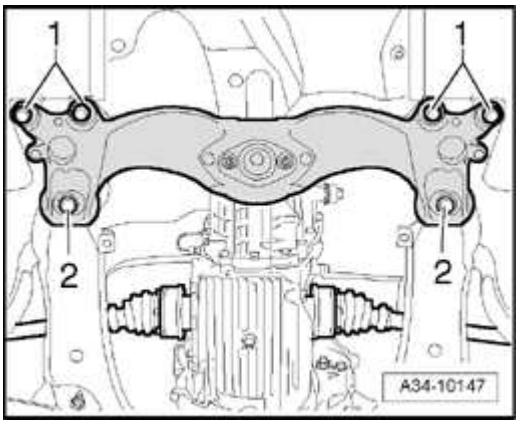


Fig. 233: Tunnel Cross Member Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift transmission far enough to be able to screw in bolts - **2** -.
- Tighten bolts - **2** - and then bolts - **1** - --> **40 - FRONT SUSPENSION** .

NOTE:

- **Replace bolts - 1 - and - 2 -.**

- Install exhaust system so it is free of stress -->
  - **26 EXHAUST SYSTEM, EMISSION CONTROLS** for AVK
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

.

Tightening torques

Component	Nm

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

TRANSMISSION OIL LEVEL, CHECKING

Transmission oil level, checking

Special tools, testers and auxiliary items required

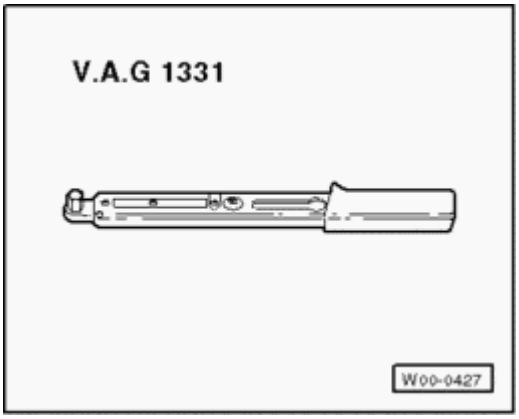


Fig. 234: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

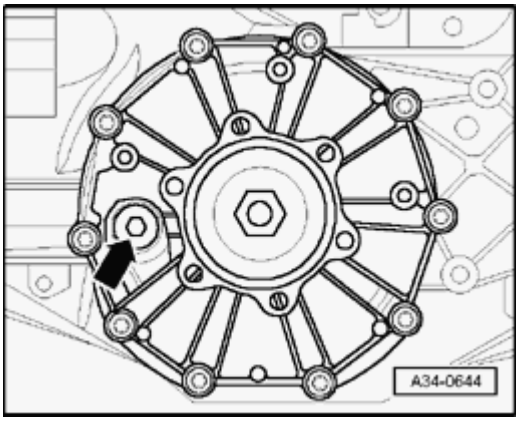


Fig. 235: Locating Oil Filler Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Procedure

NOTE:

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

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

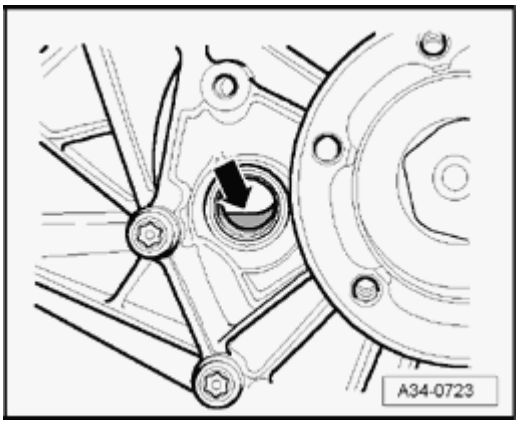


Fig. 236: Identifying Correct Oil Level
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Oil level is correct when transmission is filled up to edge of housing - **arrow** -.

- Top off with gear oil if necessary. Specification --> **Code letters, allocation, transmission ratios, capacities**.
- Install oil filler plug and tighten.

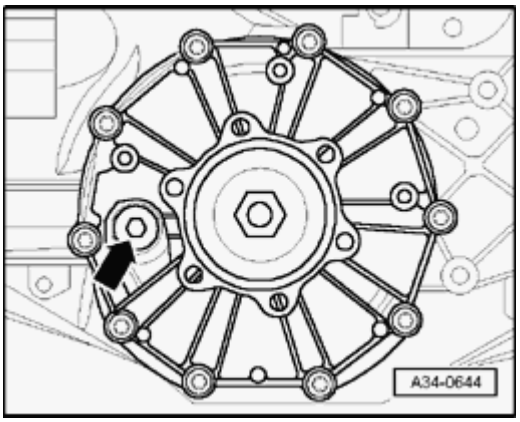


Fig. 237: Locating Oil Filler Plug
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Note the following when filling with new oil:

- Remove oil filler plug - **arrow** -.

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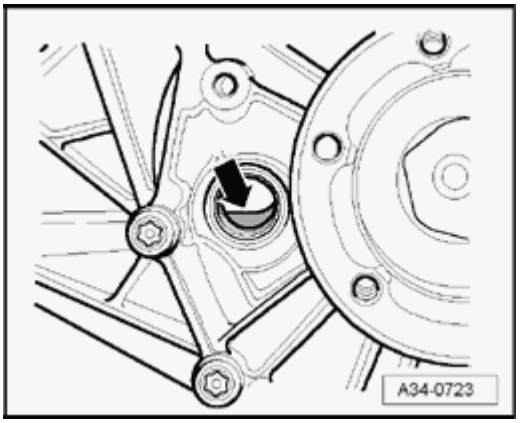


Fig. 238: Identifying Correct Oil Level
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fill with gear oil up to edge of housing - **arrow** -.
- Install oil filler plug.
- Start engine, engage a gear and allow transmission to turn for approx. 2 minutes.
- Switch off engine and remove oil filler plug.

Once more, fill with gear oil up to edge of housing - **arrow** -.

- Screw in oil filler plug and tighten.

Tightening torque

Component	Nm
Oil filler plug	45

TRANSMISSION, MOUNTING ON ASSEMBLY STAND

Transmission, mounting on assembly stand

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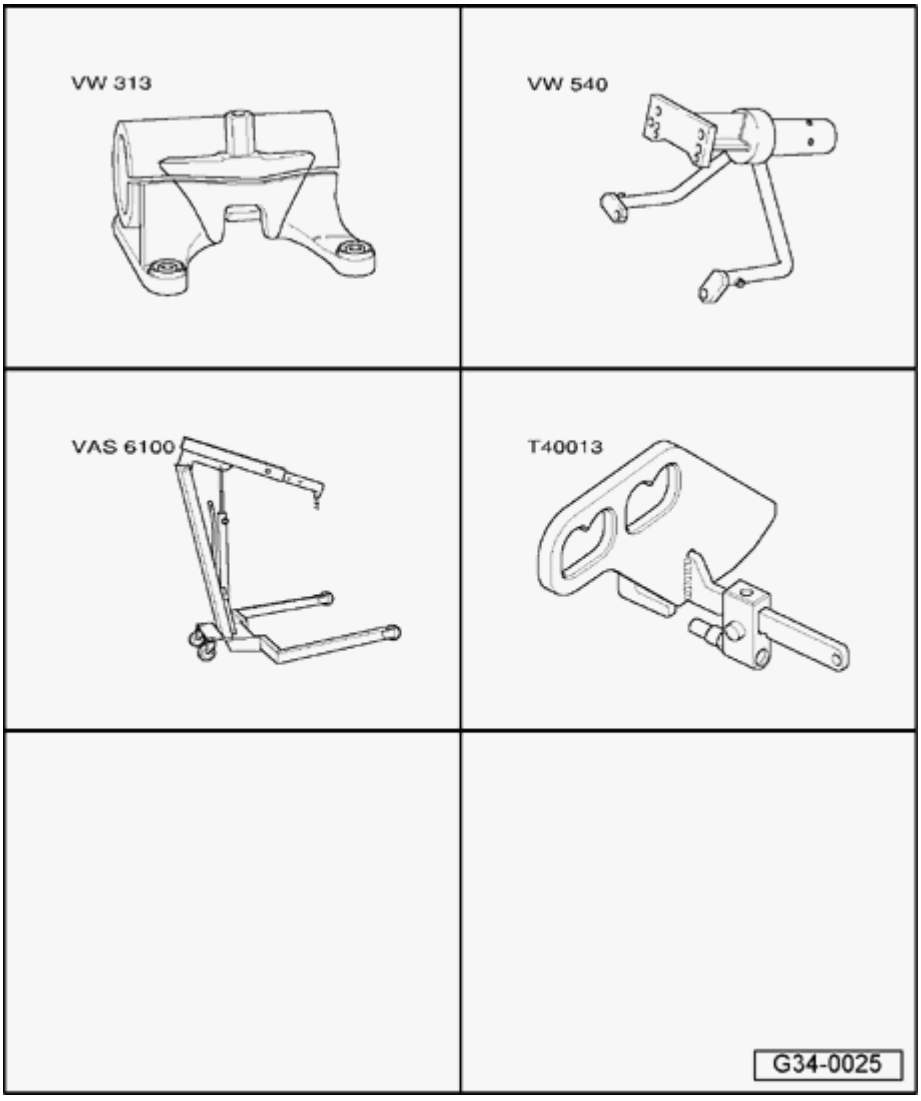


Fig. 239: Identifying Special Tools - Transmission, Mounting On Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Support clamp VW313
- Engine/transmission support VW540
- Workshop crane VAS6100
- Transmission lift hook T40013

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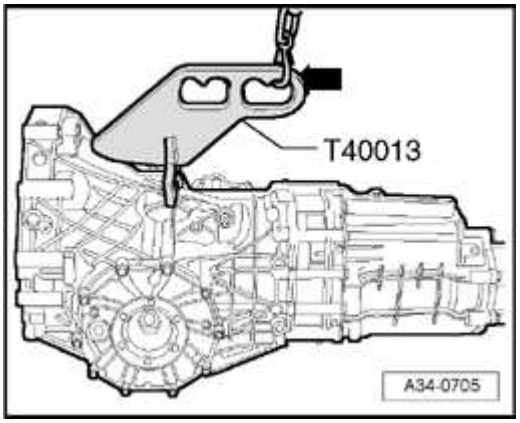


Fig. 240: Hook Of Workshop Crane Fastened In 4th Notch On Lifting Tackle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Procedure

- Insert transmission lift hook T40013 in lifting eye on transmission and secure.
- Fasten hook of workshop crane VAS6100 in 4th notch - **arrow** - on transmission lift hook T40013.
- Lift transmission with workshop crane VAS6100 and transmission lift hook T40013.

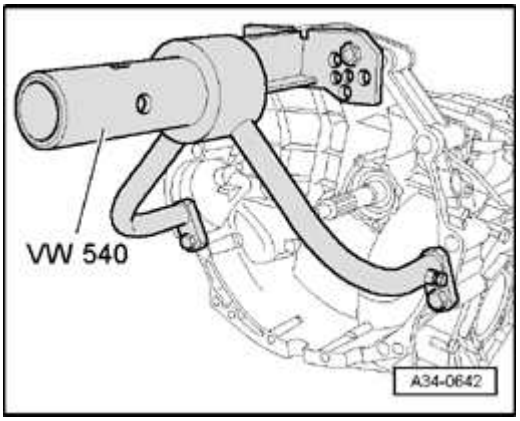


Fig. 241: Holding Fixture VW 540 Secured To Transmission And Installed Into Support Clamp VW313
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure holding fixture VW 540 to transmission and install into support clamp VW313.

TRANSMISSION, DISASSEMBLING AND ASSEMBLING

Transmission, overview

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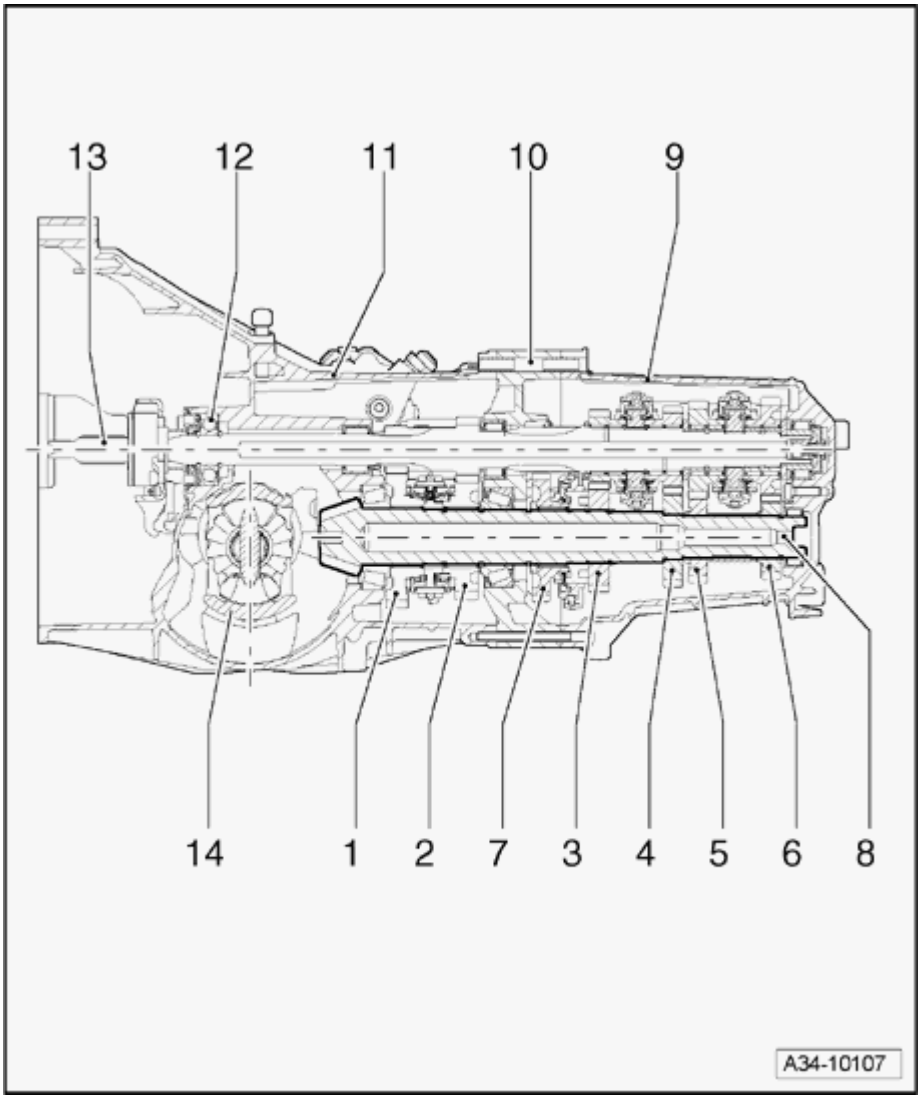


Fig. 242: Transmission, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 - Pinion shaft (output shaft)

9 - Transmission cover

10 - Bearing housing

11 - Transmission housing

12 - Ball bearing

- For input shaft

13 - Input shaft (main shaft)

14 - Differential

Assembly overview

Sequence for disassembling and assembling --> **Disassembling and assembling sequence**

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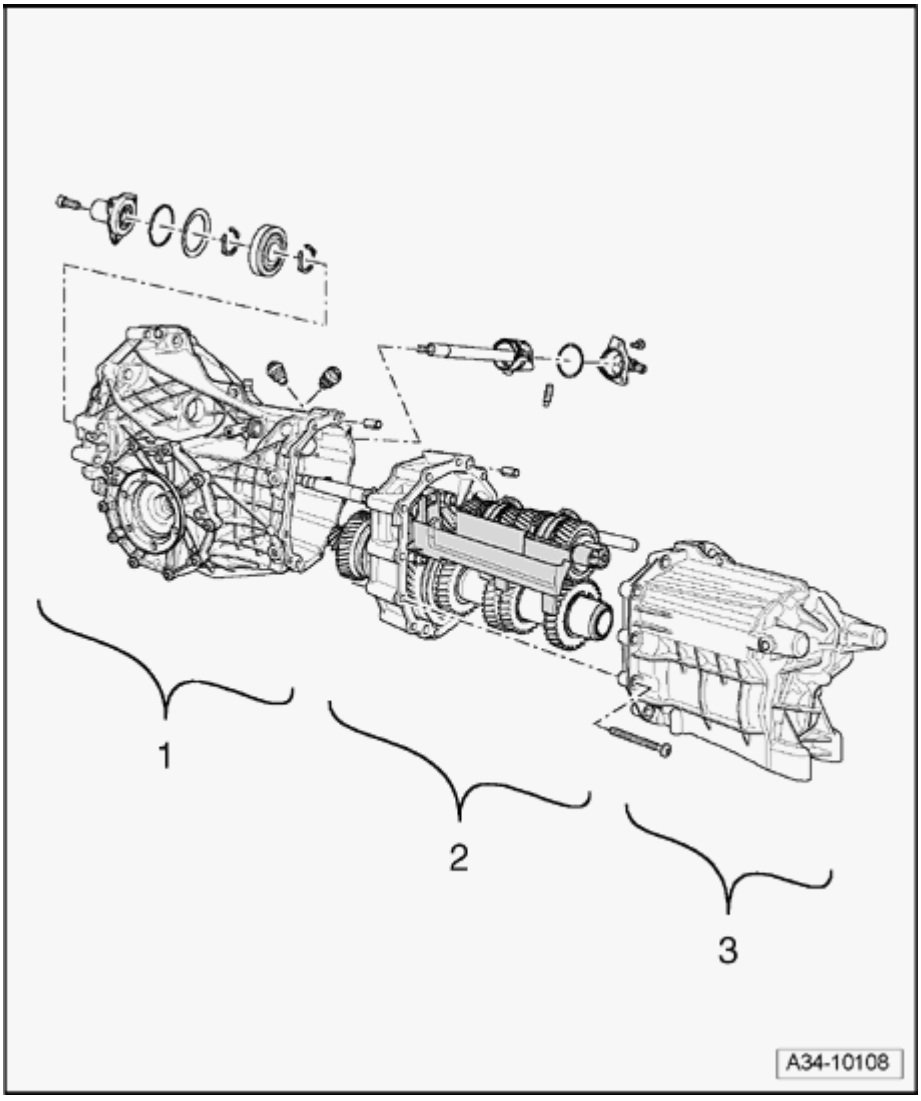


Fig. 243: Transmission Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing with differential, ball bearing for input shaft and selector shaft

- Removing and installing ball bearing for input shaft, transmission cover, bearing housing and selector shaft --> **Ball bearing for input shaft, transmission cover, bearing housing and selector shaft, removing and installing, assembly overview**
- Removing and installing differential --> **Differential, removing and installing**
- Servicing transmission housing --> **Transmission housing, servicing**

2 - Bearing housing with gear assembly

- Removing and installing 3rd to 6th gear --> **3rd to 6th gear assembly overview, removing and installing**
- Removing and installing input shaft, output shaft with selector gear for 1st and 2nd gear, reverse gear

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wheel and reverse selector gear --> **Input shaft, output shaft, reverse gear wheel and reverse selector gear, assembly overview, removing and installing**

3 - Transmission cover

- Servicing --> **Transmission cover, servicing**

Ball bearing for input shaft, transmission cover, bearing housing and selector shaft, removing and installing, assembly overview

Sequence for disassembling and assembling --> **Disassembling and assembling sequence**

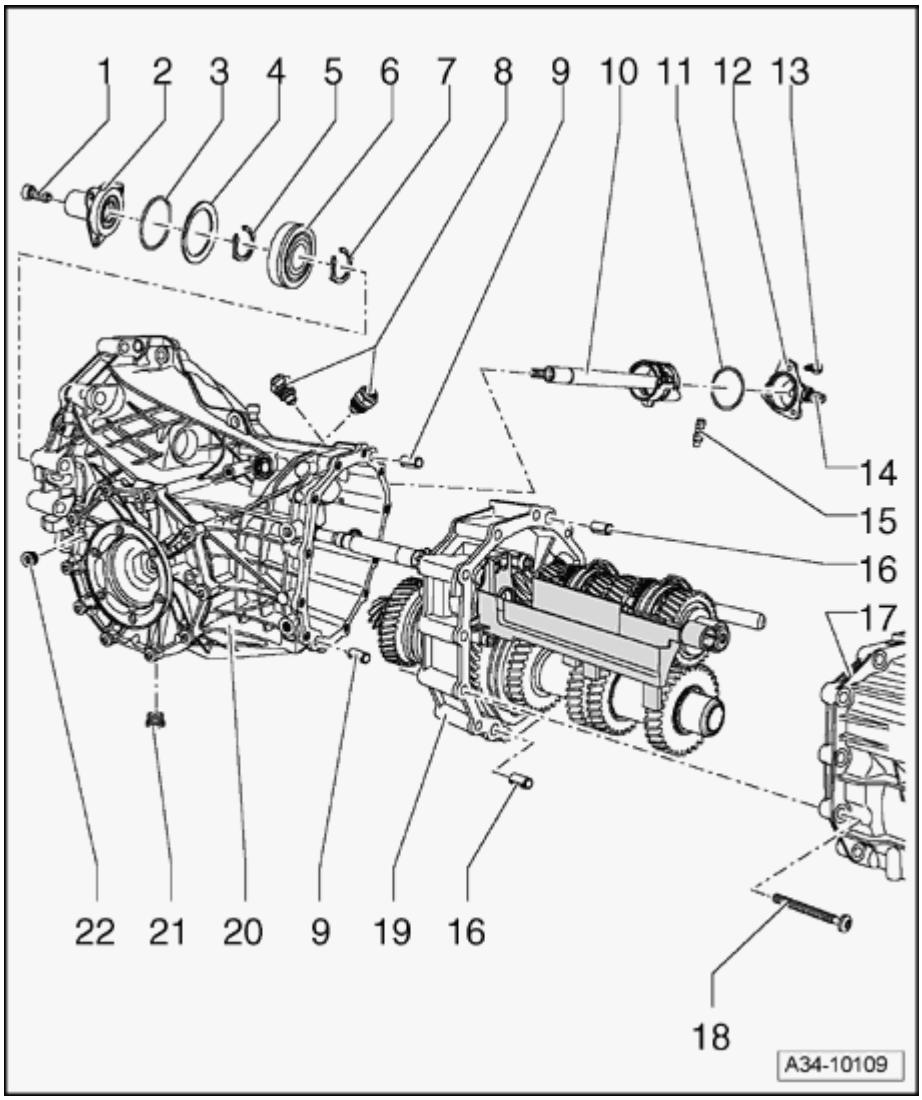


Fig. 244: Ball Bearing For Input Shaft, Transmission Cover, Bearing Housing And Selector Shaft, Removing And Installing, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Torx bolt, 35Nm

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- 3 (Qty.)
- Apply **locking fluid AMV 185 101 A1** when installing

2 - Guide sleeve

- With seal
- Removing and installing --> **Disassembling and assembling sequence**

3 - O-ring

- Always replace

4 - Dished spring

5 - Circlip

- Note thickness
- Re-determining thickness

6 - Ball bearing

- Removing and installing --> **Disassembling and assembling sequence**

7 - Circlip

- Note thickness
- Re-determining thickness

8 - Locking bolt, 45 Nm

- 2 (Qty.)
- Apply **locking fluid AMV185101A1** when installing

9 - Dowel sleeve

- 2 (Qty.)
- Insert in transmission housing
- Remove and install with drift 3121

10 - Selector shaft with selector cylinder

- Removing and installing --> **Disassembling and assembling sequence**

11 - O-ring

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- For selector shaft cover
- Always replace
- Lubricate with gear oil

12 - Cover for selector shaft

- With Back-up light switch F4
- Removing and installing --> **Disassembling and assembling sequence**

13 - Bolt, 24 Nm

- 3 (Qty.)
- Apply **locking fluid AMV185101A1** when installing

14 - Back-up light switch F4 -20 Nm-

15 - Pin

- For selector shaft stop
- Insert in transmission housing
- Installation position: groove on threaded pin points toward selector shaft cover

16 - Dowel sleeve

- 2 (Qty.)
- Insert in bearing housing
- Remove and install with drift 3121

17 - Transmission cover

- Servicing --> **Transmission cover, servicing**

18 - Bolt, 35 Nm plus an additional 90° $^{1}/_{4}$ turn

- 12 (Qty.)

19 - Bearing housing

- Removing and installing 3rd to 6th gear --> **3rd to 6th gear assembly overview, removing and installing**
- Removing and installing input shaft, output shaft with selector gear for 1st and 2nd gear, reverse gear wheel and reverse selector gear --> **Input shaft, output shaft, reverse gear wheel and reverse selector gear, assembly overview, removing and installing**

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- Servicing --> **Bearing housing, servicing**

20 - Transmission housing

- With differential and flange shafts
- Removing and installing differential --> **Differential, removing and installing**
- Servicing transmission housing --> **Transmission housing, servicing**

21 - Oil drain plug, 45 Nm

22 - Oil filler plug, 45 Nm

3rd to 6th gear assembly overview, removing and installing

Sequence for disassembling and assembling --> **Disassembling and assembling sequence**

NOTE:

- **3rd to 6th speed selector gears should have an axial play of 0.20to 0.50mm after installing.**

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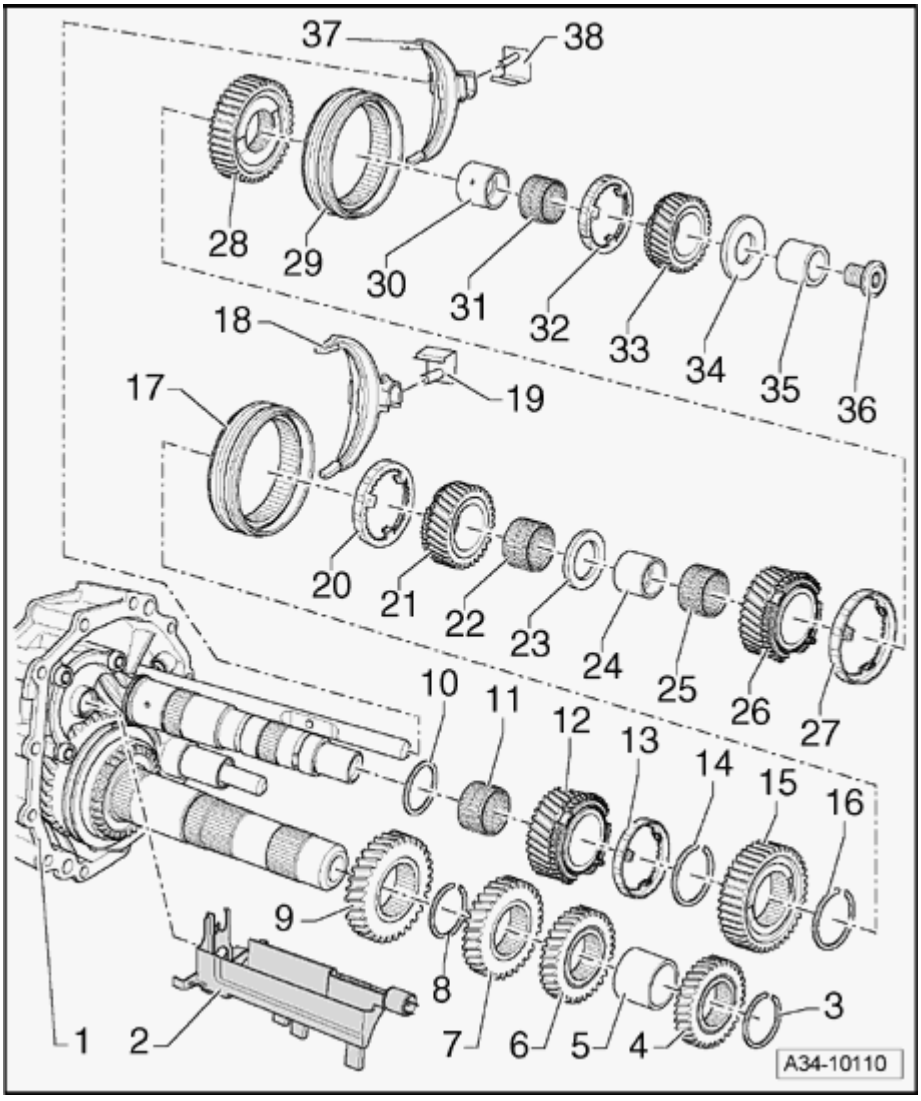


Fig. 245: 3rd To 6th Gear Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

- With input shaft and output shaft

2 - Oil collector

- With magnet
- Clipped into reverse shaft support.

3 - Circlip

- Install thickest circlip that will still just fit.
- Re-determining thickness --> **Disassembling and assembling sequence**

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4 - 6th gear wheel

5 - Spacer sleeve

6 - 5th gear wheel

- Installation position: high inside collar faces 4th gear wheel

7 - 4th gear wheel

- Installation position: high inside collar faces 5th gear wheel

8 - Circlip

- Install thickest circlip that will still just fit.
- Re-determining thickness --> **Disassembling and assembling sequence**

9 - 3rd gear wheel

- Installation position: machined side faces reverse gear synchronizing hub

10 - Thrust washer

- For 3rd speed selector gear

11 - Needle bearing

- For 3rd gear

12 - 3rd speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

13 - 3rd gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

14 - Circlip

- Mark

15 - Synchronizing hub for 3rd and 4th gear

- Installation position: high inside collar faces 3rd speed selector gear

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16 - Circlip

- Re-determining thickness --> **Disassembling and assembling sequence**

17 - Locking collar for 3rd and 4th gear

- Mark position in relation to synchronizing hub prior to removing

18 - Selector fork for 3rd and 4th gear

19 - Pin with clip

- For securing selector fork for 3rd and 4th gear to selector rod

20 - 4th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

21 - 4th speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

22 - Needle bearing

- For 4th gear

23 - Thrust washer

- For 4th speed and 5th speed selector gears

24 - Needle bearing inner race

- For 5th gear

25 - Needle bearing

- For 5th gear

26 - 5th speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

27 - 5th gear synchro-ring

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- Checking for wear **Checking synchro-ring for wear**

28 - Synchronizing hub for 5th and 6th gear

29 - Locking collar for 5th and 6th gear

- Mark position in relation to synchronizing hub prior to removing

30 - Needle bearing inner race

- For 6th gear

31 - Needle bearing

- For 6th gear

32 - 6th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

33 - 6th speed selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

34 - Thrust washer

- For 6th speed selector gear

35 - Inner race

- For needle roller bearing

36 - Multi-point socket head bolt, 150Nm

37 - Selector fork for 5th and 6th gear

38 - Pin with clip

- For securing selector fork for 5th and 6th gear to selector rod

Input shaft, output shaft, reverse gear wheel and reverse selector gear, assembly overview, removing and installing

Sequence for dismantling and assembling --> **Disassembling and assembling sequence**

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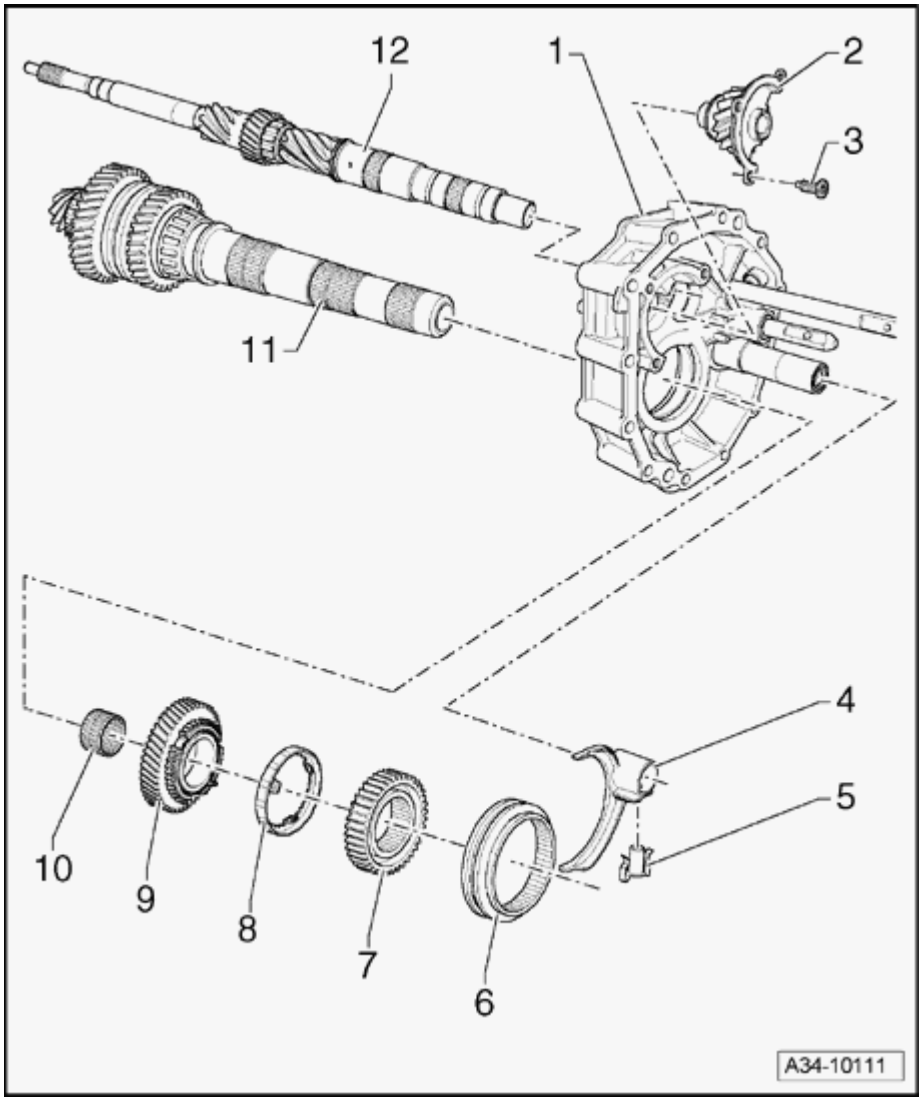


Fig. 246: Input Shaft, Output Shaft, Reverse Gear Wheel And Reverse Selector Gear, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

2 - Reverse gear wheel

- With support for reverse shaft
- Assembly overview - reverse gear wheel **Assembly overview - reverse gear wheel**

3 - Bolt, 30 Nm

- 3 (Qty.)

4 - Reverse gear selector fork

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5 - Pin with clip

- For securing reverse gear selector fork to selector rod

6 - Reverse gear locking collar

- Mark position in relation to synchronizing hub prior to removing
- Installation position: taper faces reverse gear synchro-ring

7 - Reverse gear synchronizing hub

- Installation position: high inside collar faces 3rd gear wheel

8 - Synchronizing ring for reverse gear

- Checking for wear **Checking synchro-ring for wear**

9 - Reverse selector gear

- Insert spring before installing **Inserting spring in selector gear**
- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

10 - Needle bearing

- For reverse gear

11 - Pinion shaft (output shaft)

- With tapered roller bearing and selector gears for 1st and 2nd speed
- Disassembling and assembling --> **Pinion shaft, disassembling and assembling**

12 - Input shaft

- Disassembling and assembling --> **Input shaft, disassembling and assembling**

Assembly overview - reverse gear wheel

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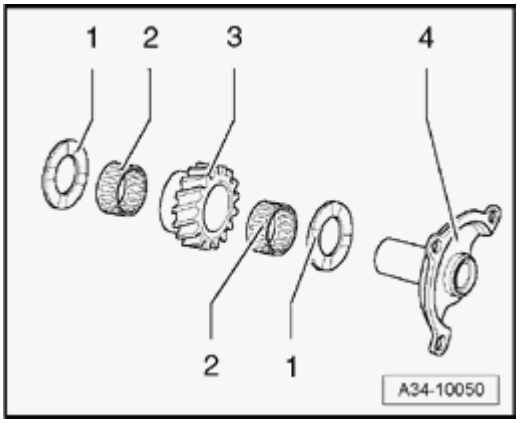


Fig. 247: Assembly Overview - Reverse Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Thrust washer
2. Needle bearing
3. Reverse gear wheel

Installation position: collar points toward bearing housing

4 - Reverse shaft support

Disassembling and assembling sequence

Removing and installing ball bearing for input shaft, selector shaft, transmission cover and bearing housing with input shaft and pinion shaft.

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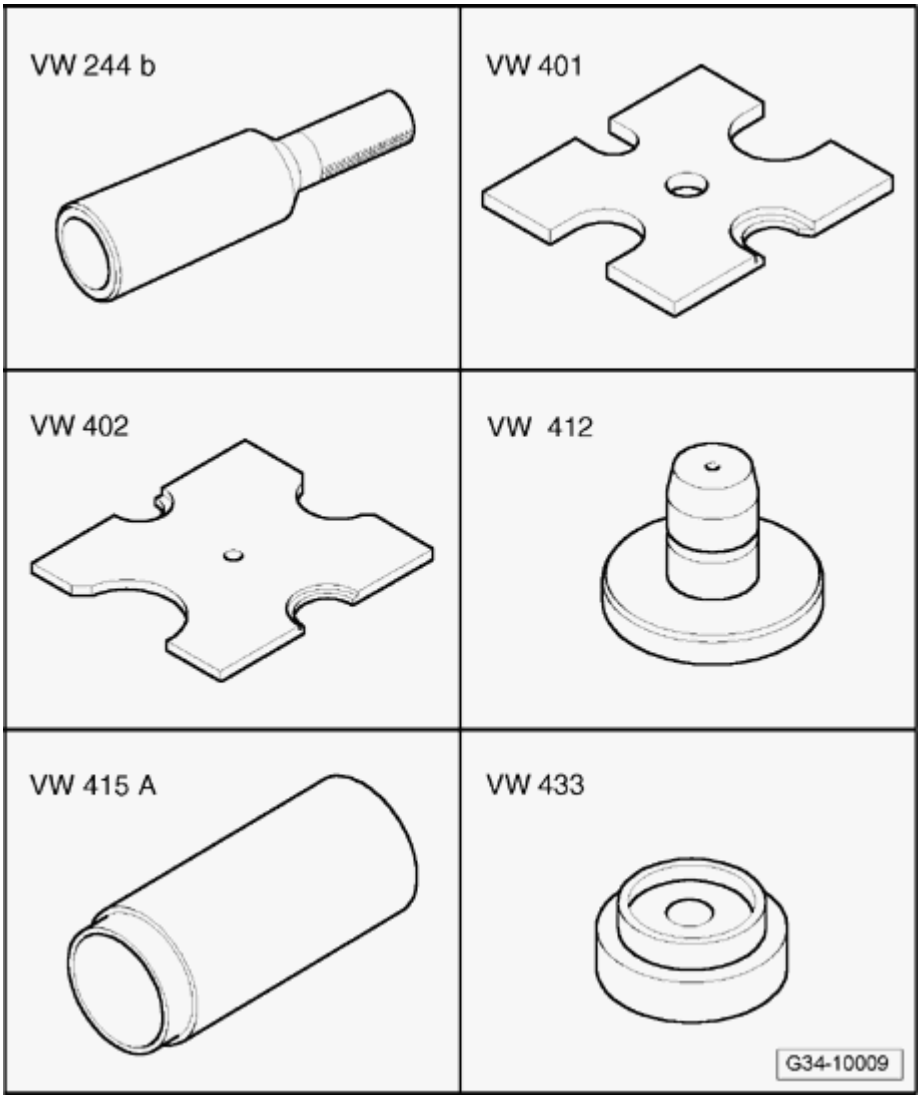


Fig. 248: Identifying Special Tools - Transmission Disassembling And Assembling Sequence (1 Of 5)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift sleeve VW 244 B
- Thrust plate VW 401
- Thrust plate VW 402
- Thrust disc VW 412

- Tube 60 mm dia. VW 415 A
- Thrust pad con. VW 433

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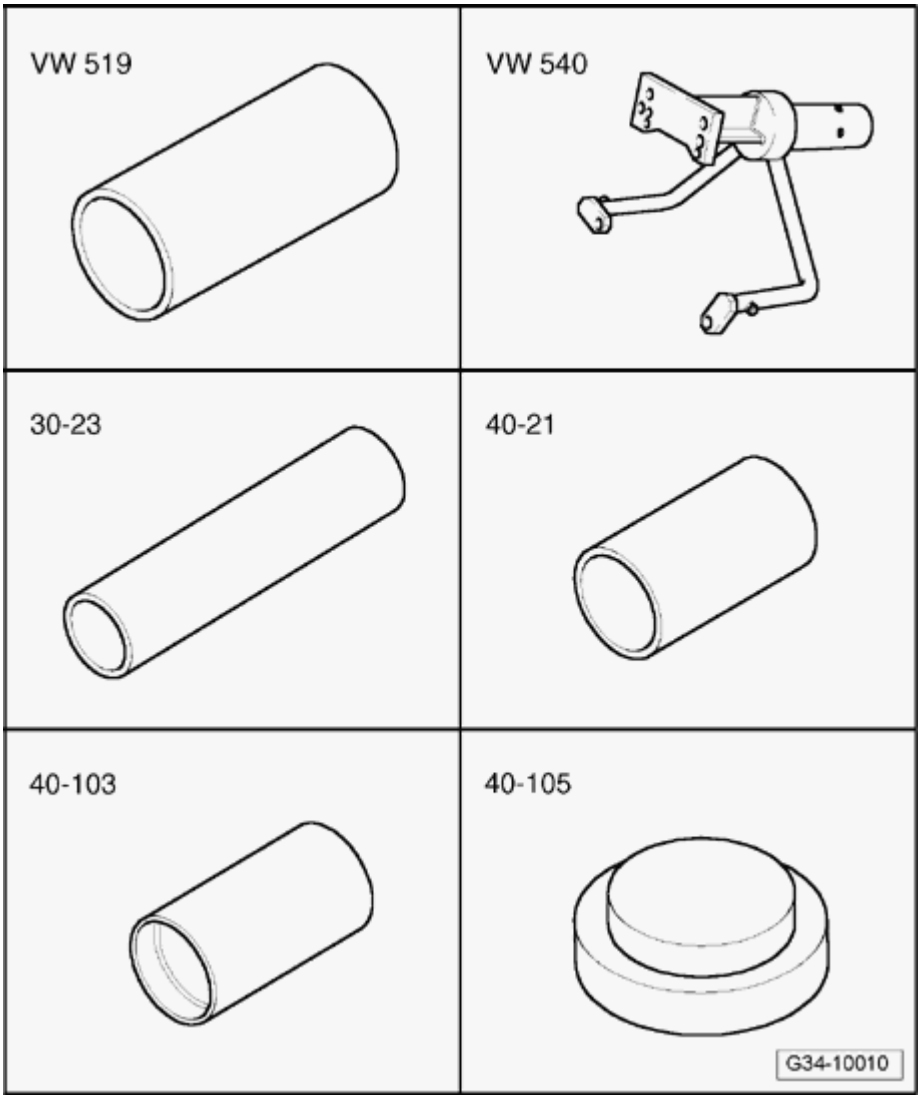


Fig. 249: Identifying Special Tools - Transmission Disassembling And Assembling Sequence (2 Of 5)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Sleeve VW 519
- Holding fixture VW 540
- Press tube 30 - 23
- Press tool 40 - 21

- Sleeve 40 - 103
- Thrust piece 40 - 105

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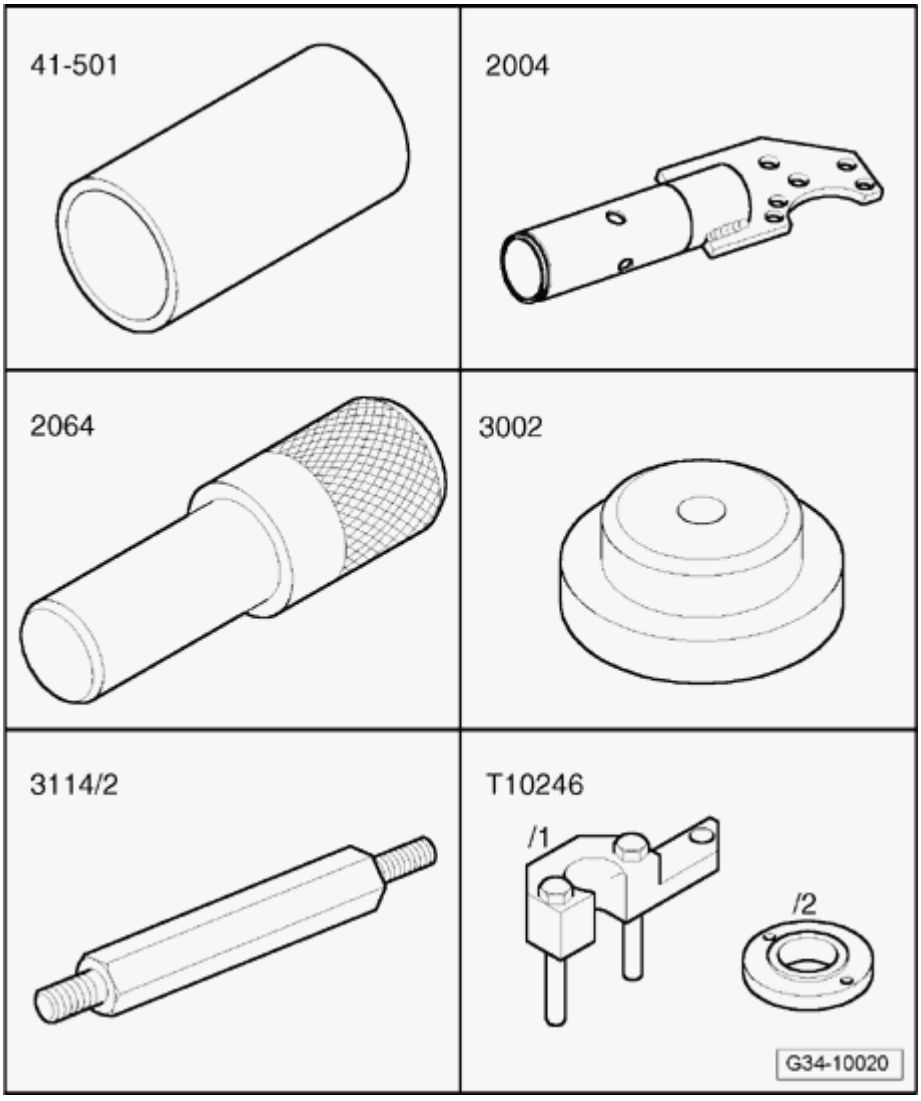


Fig. 250: Identifying Special Tools - Transmission Disassembling And Assembling Sequence (3 Of 5)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift sleeve 41 - 501
- Transmission support 2004
- Mandrel 2064
- Thrust piece 3002

- Door hinge alignment tool (M8 and M10) 3114/2
- Fitting tool T10246

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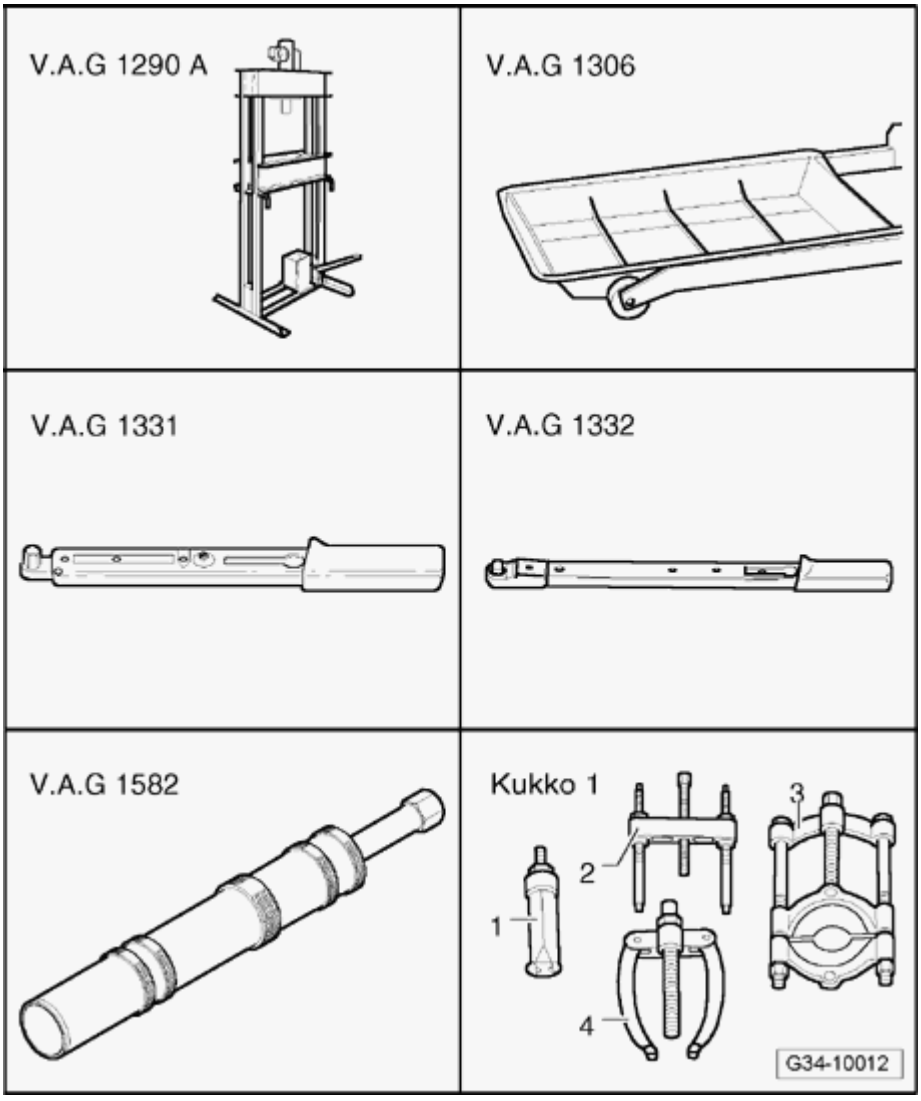


Fig. 251: Identifying Special Tools - Transmission Disassembling And Assembling Sequence (4 Of 5)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Repair press V.A.G 1290 A
- Drip tray V.A.G 1306
- Torque wrench V.A.G 1331
- Torque wrench V.A.G 1332

- Taper roller bearing puller V.A.G 1582
- Adapter V.A.G 1582/12
- **- 1 -** Internal puller Kukko 21/2
- **- 2 -** Puller Kukko 18/2

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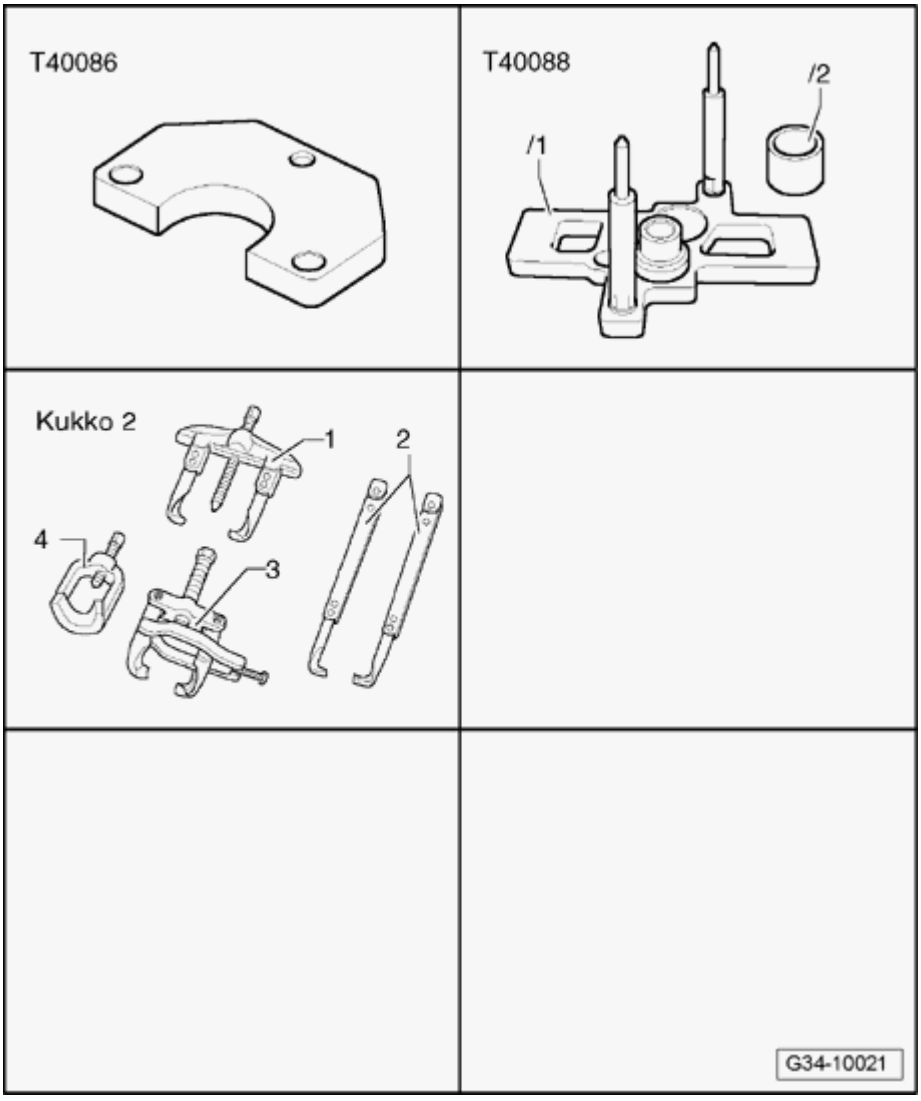


Fig. 252: Identifying Special Tools - Transmission Disassembling And Assembling Sequence (5 Of 5)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Removal plate T40086
- Holding plate T40088/1
- **- 1 -** Two-arm puller Kukko 20/10
- **- 2 -** Puller hook, length 200 mm

- **- 2 -** Puller hook, length 250 mm
- Feeler gauge
- 2 bolts M8 (length 70 mm) with washers
- **Sealing paste AMV 188 001 02**

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- **Assembly sleeve 01E311120**
- **Locking fluid AMV185101A1**

Disassembling transmission

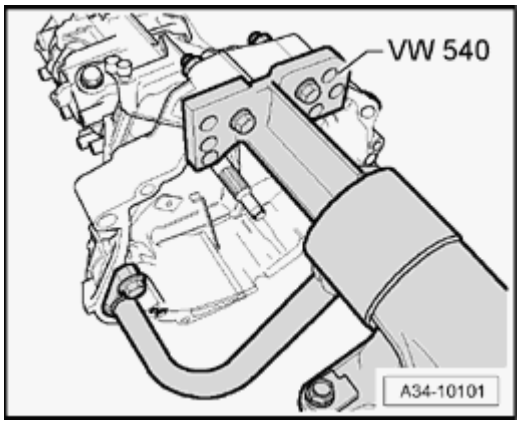


Fig. 253: Transmission Mounted On Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mount transmission on assembly stand.
- Place drip tray V.A.G 1306 under transmission.
- Drain transmission oil.

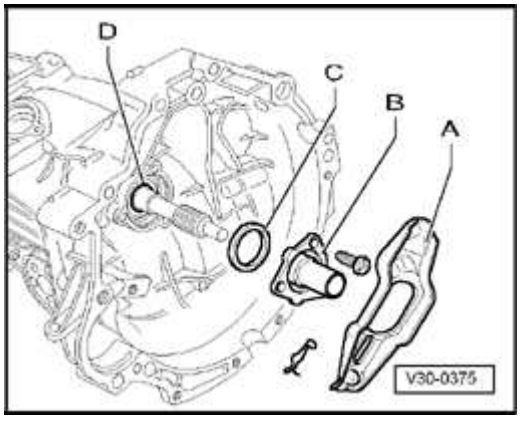


Fig. 254: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clutch release lever - **A** - together with release bearing.
- Remove guide sleeve - **B** -
- Remove dished spring - **C** -.
- Remove circlip - **D** - in front of ball bearing for input shaft.

NOTE:

- **If the input shaft or transmission housing is not to be replaced, note the**

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thickness of the circlip.

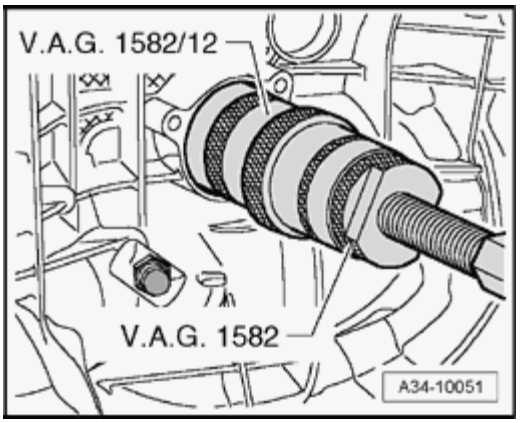


Fig. 255: Pulling Ball Bearing For Input Shaft Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull ball bearing for input shaft out of transmission housing.

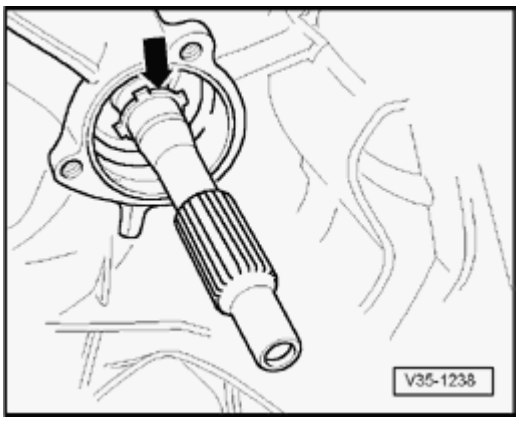


Fig. 256: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip - **arrow** - behind ball bearing for input shaft.

NOTE:

- **If the input shaft or transmission housing is not to be replaced, note the thickness of the circlip.**

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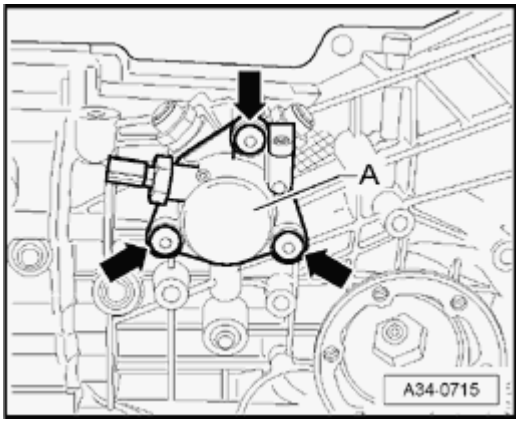


Fig. 257: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and selector shaft cover - **A** -.

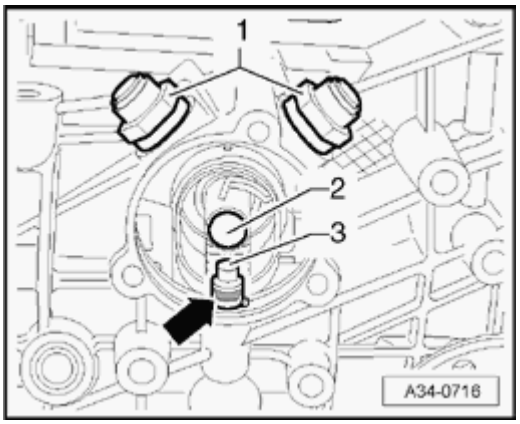


Fig. 258: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove two locking bolts - **1** - for selector shaft.

- Make sure that no gear has been engaged.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously removing pin - **3** -.
- Remove selector shaft.

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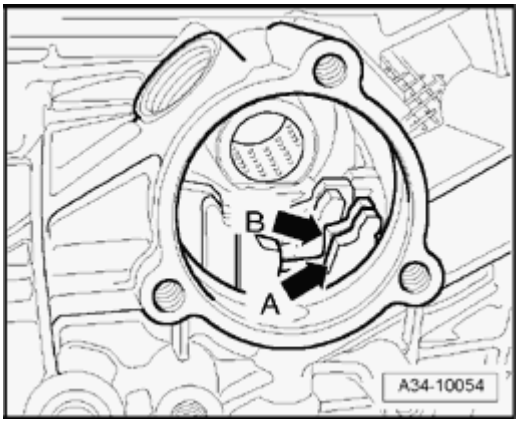


Fig. 259: Locating Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Move two selector rods - **arrow A** - and - **arrow B** - to lock input shaft by selecting two gears (e.g. reverse gear and 1st gear).

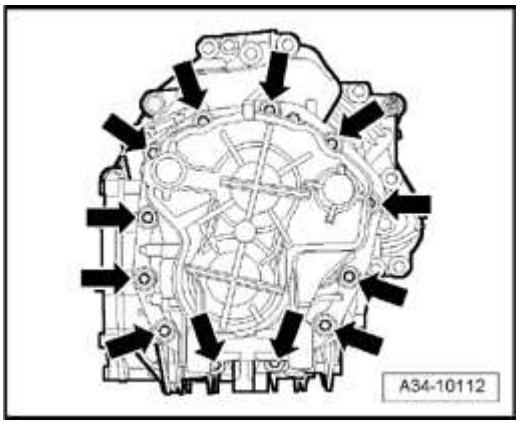


Fig. 260: Transmission Cover Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove securing bolts for transmission cover - **arrows** -.

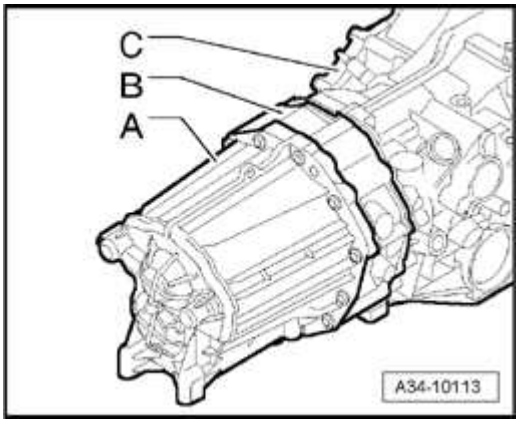


Fig. 261: Transmission Cover, Bearing Housing And Transmission Housing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully remove transmission cover - **A** - toward rear. The bearing housing - **B** - remains installed to transmission housing - **C** -.

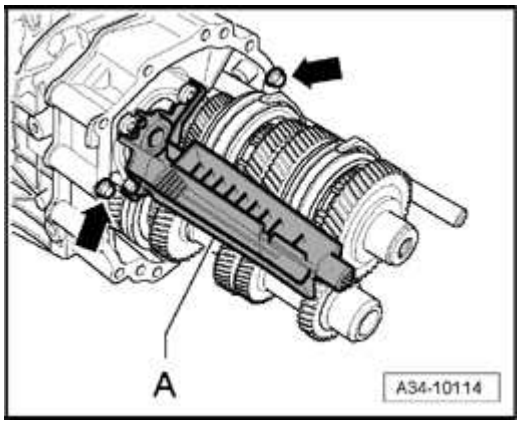


Fig. 262: Securing Bearing Housing To Transmission Housing With Two Bolts M8 And Washers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure bearing housing to transmission housing - **arrows** - with two bolts M8 (length approx. 70 mm) and washers.
- Tighten 2 bolts - **arrows** - to max. 5 Nm.
- Detach oil collector - **A** -.

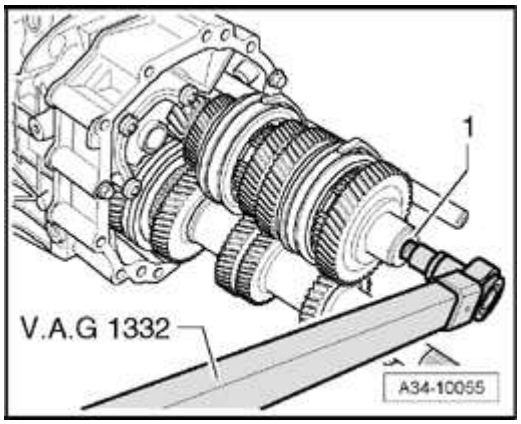


Fig. 263: Removing/Installing Multi-Point Socket Head Bolt For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check that the 2 gears are still engaged and then unscrew and remove multi-point socket head bolt - **1** - for input shaft.

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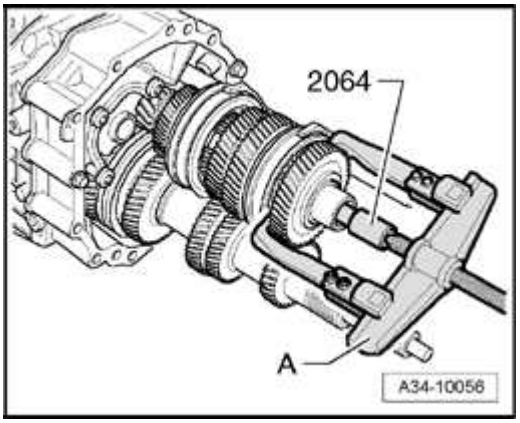


Fig. 264: Detaching 6th Speed Selector Gear With Inner Race For Roller Bearing And Thrust Washer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach 6th speed selector gear with inner race for roller bearing and thrust washer.

A - Two-arm puller, e.g. Kukko 20/10

NOTE:

- **Check the gear teeth on the selector gears and gear wheels for damage after pulling them off.**

- Remove synchro-ring and needle bearing for 6th speed selector gear.

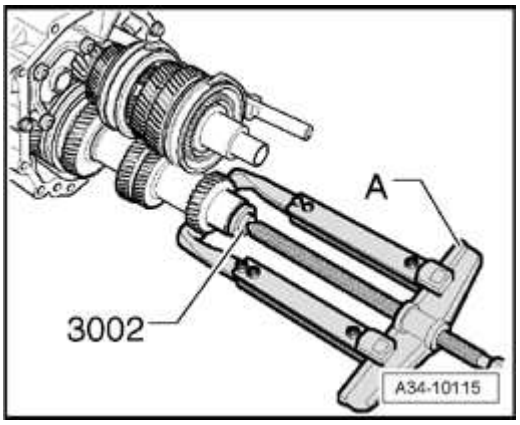


Fig. 265: Removing 6th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 6th gear wheel.

A - Two-arm puller, e.g. Kukko 20/10

- Remove spacer sleeve from output shaft.

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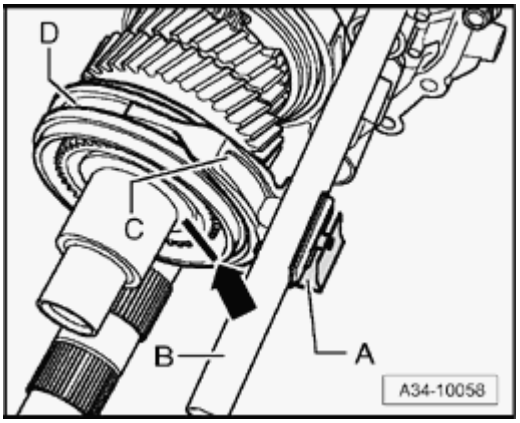


Fig. 266: Identifying Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out pin with clip - **A** - for securing selector fork for 5th and 6th gear from selector rod - **B** -.
- Mark installation position of locking collar in relation to synchronizing hub - **arrow** -.
- Move selector fork - **C** - downward and detach with locking collar - **D** -.

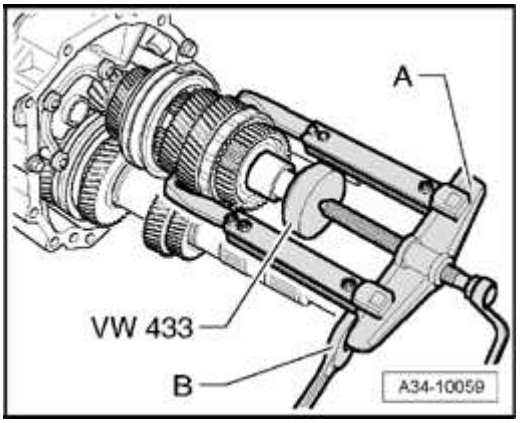


Fig. 267: Removing 5th Speed Selector Gear Together With Needle Bearing Inner Race For 6th Gear And Synchronizing Hub For 5th And 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 5th speed selector gear together with needle bearing inner race for 6th gear and synchronizing hub for 5th and 6th gear.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 200 mm

NOTE:

- **Counter-hold two-arm puller using e.g. open end wrench - B -.**
- **If the needle bearing inner race for 6th gear is in contact with press tool VW 433, insert locking pin 2064 into hole in input shaft to pull off the components all the way.**

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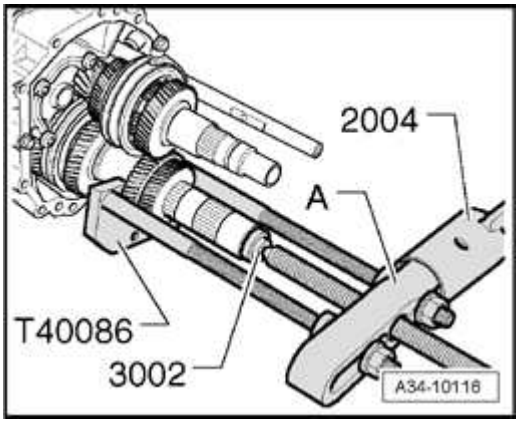


Fig. 268: Remove 4th And 5th Gear Wheels Together
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 4th and 5th gear wheels together.

A - Puller, e.g. Kukko 18/2

NOTE:

- **Counter-hold puller - A - using e.g. transmission bracket 2004.**

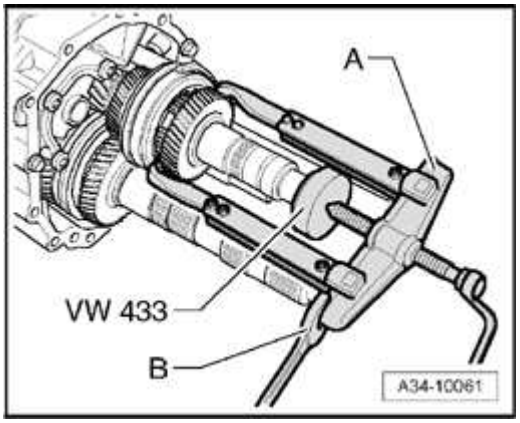


Fig. 269: Removing 4th Speed Selector Gear With Needle Bearing Inner Race For 5th Gear And Thrust Washer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 4th speed selector gear with needle bearing inner race for 5th gear and thrust washer.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 200 mm

- Counter-hold two-arm puller using e.g. open end wrench - **B** -.
- Remove synchro-ring and needle bearing for 4th speed selector gear.

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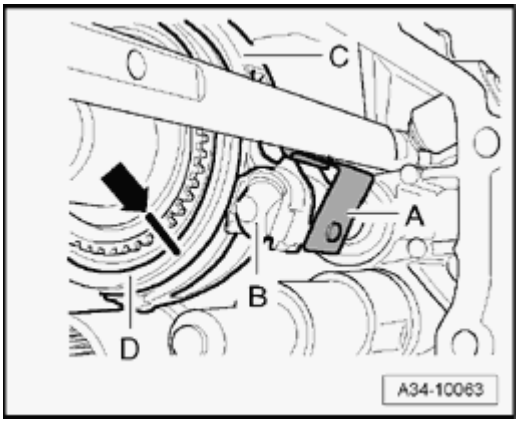


Fig. 270: Pulling Pin With Clip Securing Selector Fork For 3rd And 4th Gear Out From Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull pin with clip - **A** - securing selector fork for 3rd and 4th gear out from selector rod - **B** -.
- Mark installation position of locking collar in relation to synchronizing hub - **arrow** -.
- Detach selector fork - **C** - with locking collar - **D** -.
- Remove circlip for 3rd gear and 4th gear synchronizing hub and note thickness of circlip.

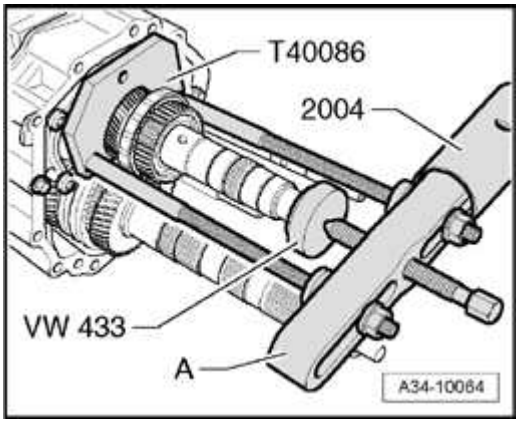


Fig. 271: Pulling Off 3rd Speed Selector Gear With Synchronizing Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 3rd speed selector gear with synchronizing hub for 3rd and 4th gear.

A - Puller, e.g. Kukko 18/2

NOTE:

- **Counter-hold puller - A - using e.g. transmission bracket 2004 to prevent plate T40086 from making contact with 3rd gear wheel or selector rod for 5th and 6th gear.**

- Remove circlip for 3rd speed selector gear needle bearing and detach 3rd gear needle bearing.

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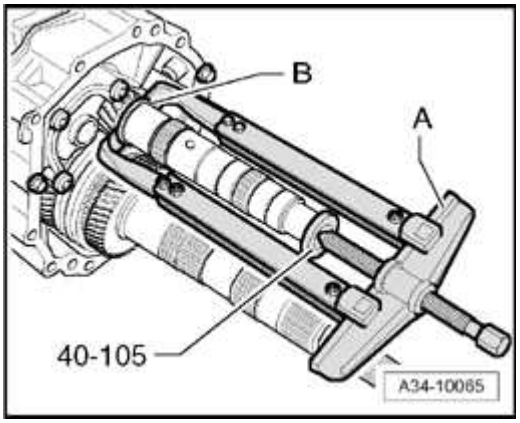


Fig. 272: Pulling Off Thrust Washer For 3rd Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off thrust washer - **B** - for 3rd speed selector gear.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 250 mm

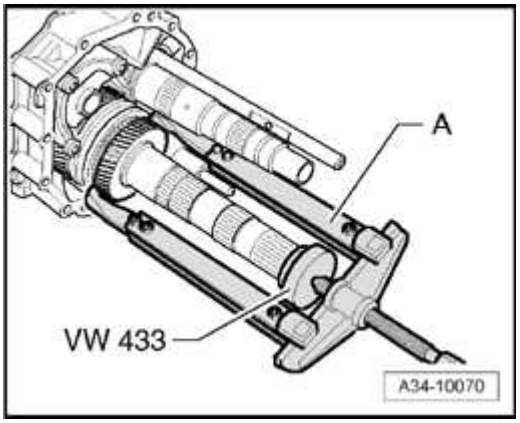


Fig. 273: Removing Circlip For 3rd Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip for 3rd gear wheel and note thickness of circlip.
- Pull off 3rd gear wheel.

A - Two-arm puller, e.g. Kukko 20/10 with puller hook, length 250 mm

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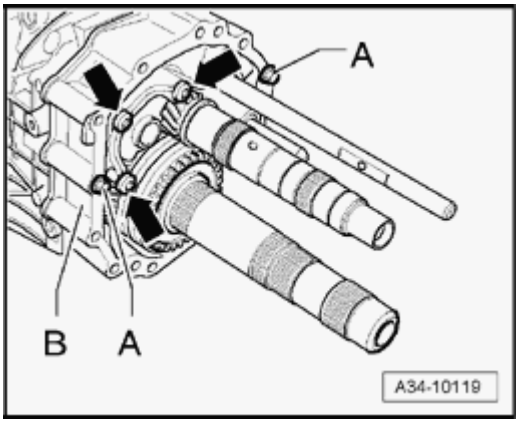


Fig. 274: Reverse Shaft Support Bolts, Bearing Housing And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - for reverse shaft support.
- Remove 2 bolts - **A** - for bearing housing at transmission housing.
- Remove bearing housing - **B** - together with shafts.

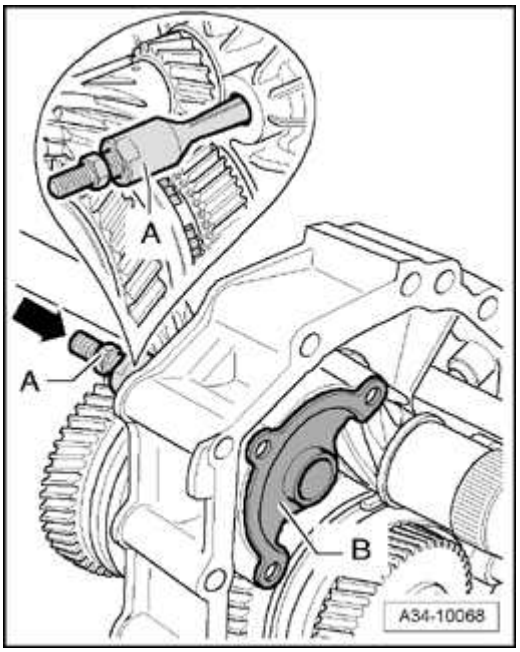


Fig. 275: Driving Reverse Shaft Support Carefully Out Of Bearing Housing And Removing With Reverse Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert an internal puller - **A** - e.g. Kukko 21/2 into bore for reverse shaft support.
- Spread open internal puller far enough for it to make contact with reverse shaft support - **B** -.
- Drive reverse shaft support carefully out of bearing housing direction of - **arrow** - and remove with reverse gear wheel.

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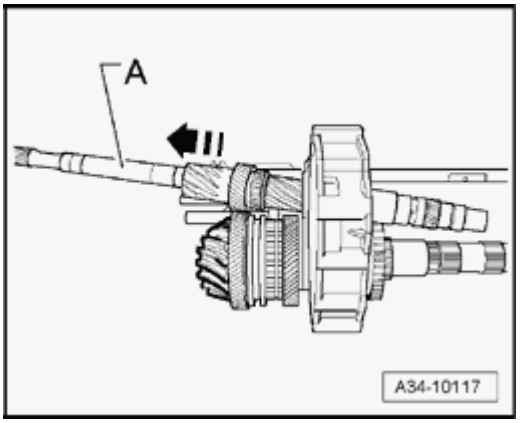


Fig. 276: Pulling Out Input Shaft From Bearing Housing At An Angle From The Front Direction Of
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out input shaft - **A** - carefully from bearing housing at an angle from the front direction of - **arrow** -.

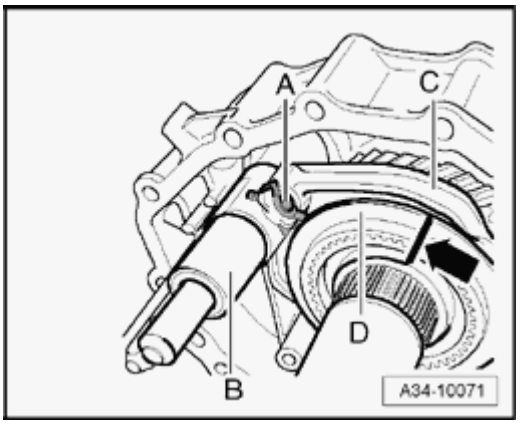


Fig. 277: Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull pin with clip - **A** - for securing selector fork for reverse gear out from selector rod - **B** -.
- Mark installation position of locking collar in relation to synchronizing hub - **arrow** -.
- Detach selector fork - **C** - with locking collar - **D** -.

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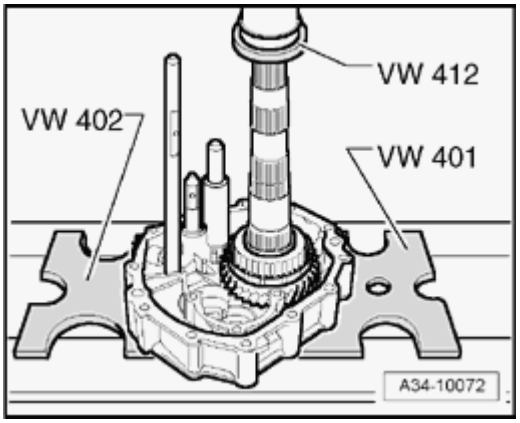


Fig. 278: Pressing Off Synchronizing Hub For Reverse Gear From Output Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press off synchronizing hub for reverse gear from output shaft.

NOTE:

- **Place the bearing housing onto thrust plates VW 401 and VW 402 so that the output shaft and selector rods are not damaged when pressing off the synchronizing hub.**

- Detach reverse selector gear, needle bearing for reverse selector gear and reverse gear synchronizing hub.
- Guide output shaft out of selector fork for 1st and 2nd gear and bearing housing.

Assembling transmission

If the input shaft or the transmission housing have been replaced, you must first re-determine the thickness of the input shaft circlips --> **Determining circlips for input shaft ball bearing**.

NOTE:

- **Lubricate all needle bearings with gear oil before installing.**
- **Check synchro-rings for wear Checking synchro-ring for wear**
- **Insert spring in selector gear Inserting spring in selector gear**
- **Heat gear wheels, needle bearing inner races and synchronizing hubs to 130° C (max.) before pressing on (wear protective gloves).**

- Insert output shaft in bearing housing and selector fork for 1st and 2nd gear.
- Place reverse gear selector gear with needle bearing, spring and synchro-ring onto output shaft.

- The lugs on synchro-ring should engage into recesses in selector gear.

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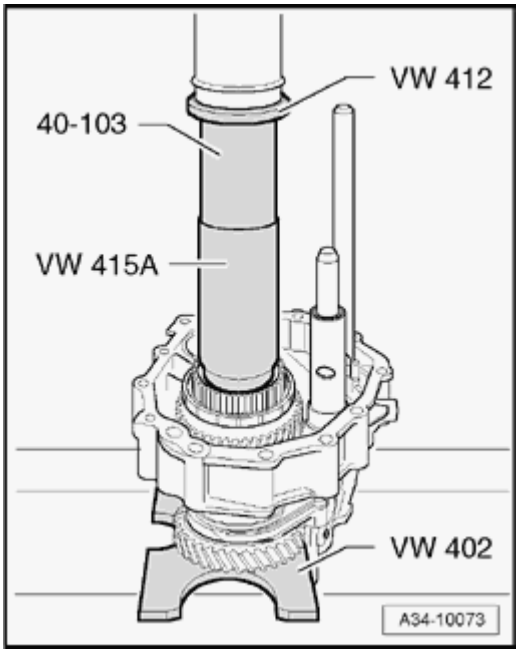


Fig. 279: Pressing On Reverse Gear Synchronizing Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on reverse gear synchronizing hub.
- Installation position: high inside collar faces 3rd gear wheel.
- Check axial clearance of reverse selector gear.

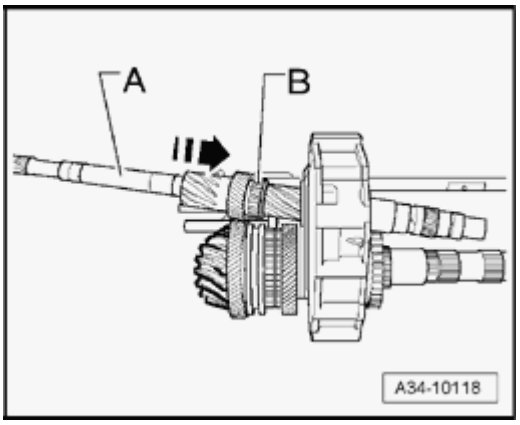


Fig. 280: Inserting Input Shaft With Needle Roller Bearing Into Bearing Housing At An Angle Toward The Rear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert input shaft - **A** - with needle roller bearing - **B** - into bearing housing in direction of - **arrow** - at an angle toward the rear.

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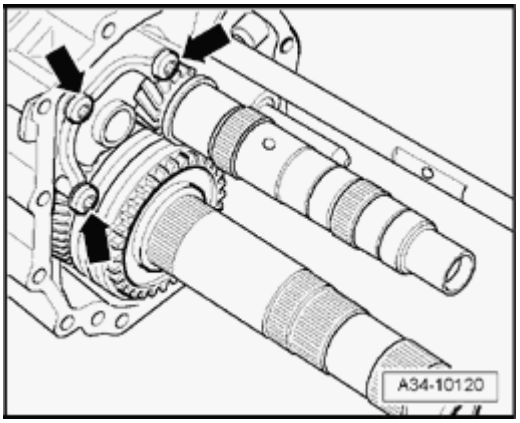


Fig. 281: Reverse Gear Wheel Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install reverse gear wheel and tighten 3 bolts - **arrows** - for reverse shaft support to 30 Nm.

Assembly overview - reverse gear wheel **Assembly overview - reverse gear wheel**

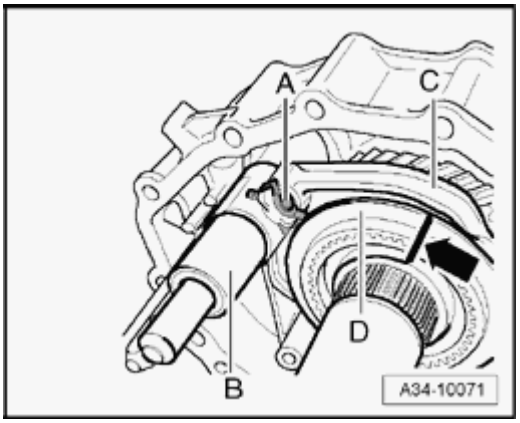


Fig. 282: Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide reverse gear selector fork - **C** - together with locking collar - **D** - onto selector rod - **B** - and reverse gear synchronizing hub.

- The markings on locking collar and synchronizing hub - **arrow** - must coincide.
- The chamfer on locking collar faces reverse selector gear.

- If the holes of selector fork and selector rod coincide, clip in pin with clip - **A** -.

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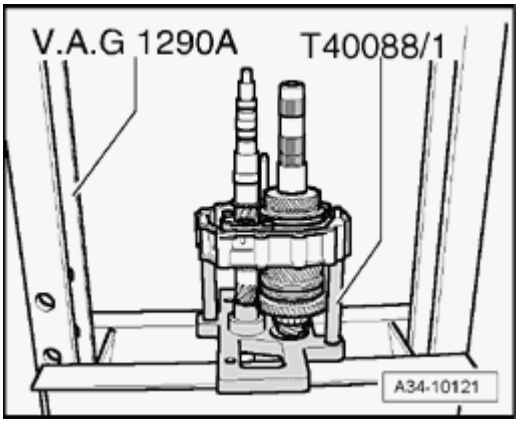


Fig. 283: Plate T40088/1 Placed On Press Table And Bearing Housing Inserted With Shafts And Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place plate T40088/1 on press table and insert bearing housing with shafts and selector rods.

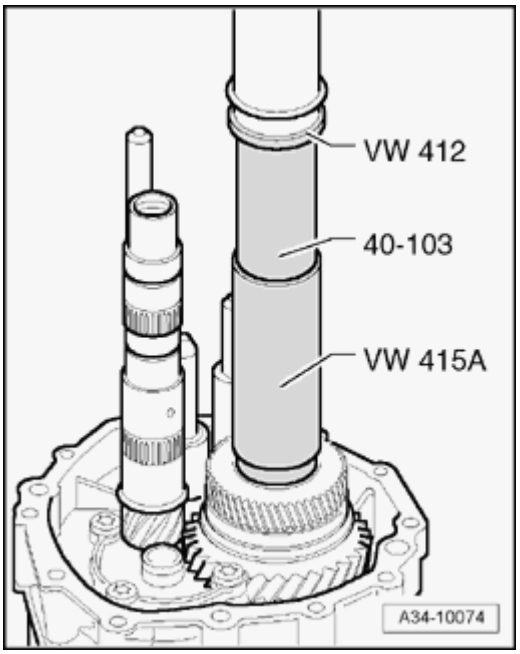


Fig. 284: Pressing On 3rd Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on 3rd gear wheel.
- Installation position: machined side faces reverse gear synchronizing hub.
- Insert circlip for 3rd gear wheel.
- When replacing gear wheel or output shaft:

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Re-determine thickness of circlip for 3rd gear wheel:

- Determine thickest circlip that will just fit and install it. For Part No.

The following circlips are available:

Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	2.10

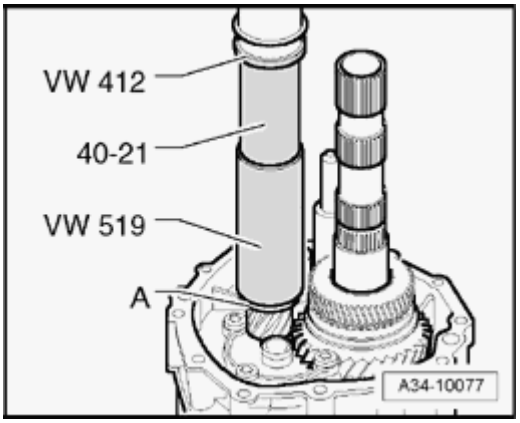


Fig. 285: Pressing On Thrust Washer For 3rd Speed Selector Gear Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on thrust washer - **A** - for 3rd speed selector gear until limit stop.

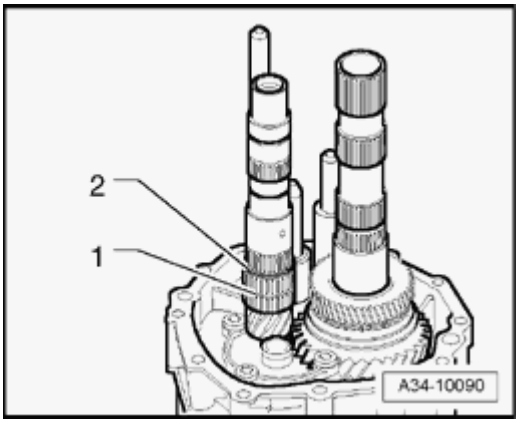


Fig. 286: Installing Needle Bearing For 3rd Speed Selector Gear And Circlip For 3rd Gear Needle Bearing Onto Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install needle bearing for 3rd speed selector gear - **1** - and circlip - **2** - for 3rd gear needle bearing onto input shaft.
- Install 3rd speed selector gear with spring and synchro-ring.

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- The lugs on synchro-ring should engage into recesses in selector gear.

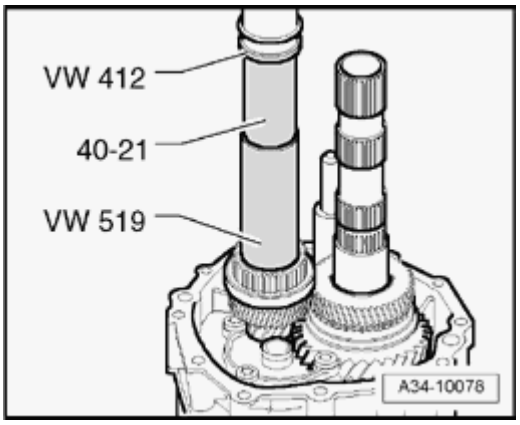


Fig. 287: Pressing On Heated Synchronizing Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on heated synchronizing hub for 3rd and 4th gear

- Installation position: high inside collar faces 3rd speed selector gear.

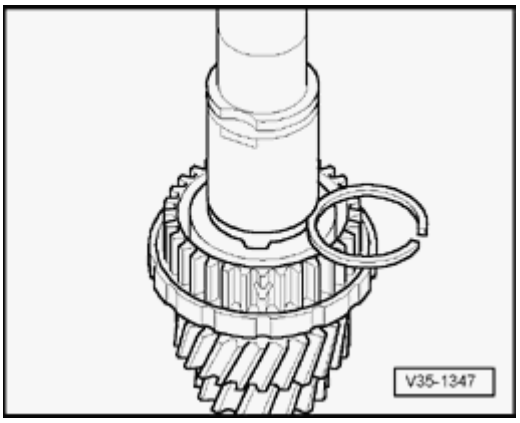


Fig. 288: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert circlip for synchronizing hub for 3rd and 4th gear.

- When replacing synchronizing hub or input shaft:

Re-determine thickness of circlip for synchronizing hub for 3rd and 4th gear:

- Determine thickest circlip that will just fit and install it. For Part No.

The following circlips are available:

Circlip thickness (mm)		

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1.90	1.96	2.02
1.93	1.99	2.05

- Check axial clearance of 3rd speed selector gear.

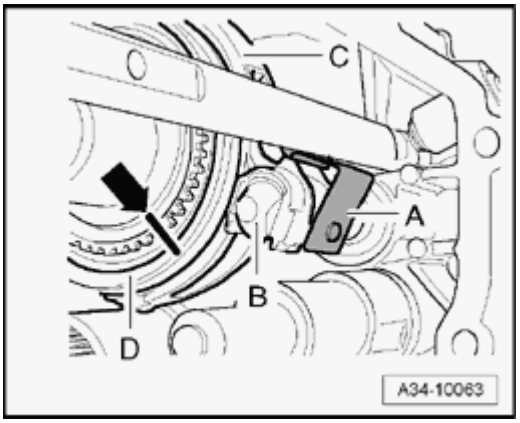


Fig. 289: Pulling Pin With Clip Securing Selector Fork For 3rd And 4th Gear Out From Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide selector fork for 3rd and 4th gear - **C** - together with locking collar - **D** - onto selector rod - **B** - and synchronizing hub for 3rd and 4th gear.

- The markings on locking collar and synchronizing hub - **arrow** - must coincide.

- If the holes of selector fork and selector rod coincide, clip in pin with clip - **A** -.

NOTE:

- **Do not insert pin with clip for 5th/6th gear selector fork (diameter 6 mm) into selector fork for 3rd and 4th gear.**

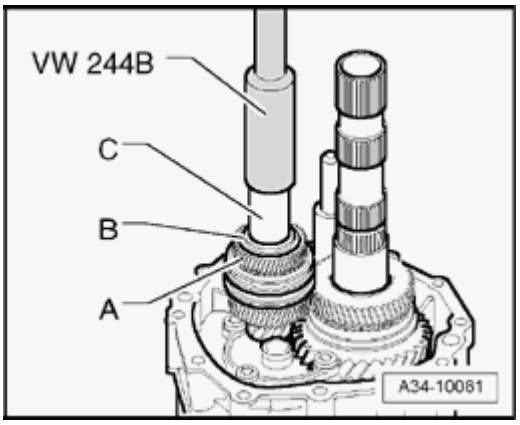


Fig. 290: Installing 4th Speed Selector Gear With Spring, Synchro-Ring, Needle Bearing And Thrust Washer For 3rd And 4th Gear And Pressing On Heated Inner Race For Needle Bearing For 5th Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Install 4th speed selector gear - **A** - with spring, synchro-ring, needle bearing and thrust washer for 3rd and 4th gear - **B** -.
- Press on heated inner race - **C** - for needle bearing for 5th speed selector gear.
- Check axial clearance of 4th speed selector gear.

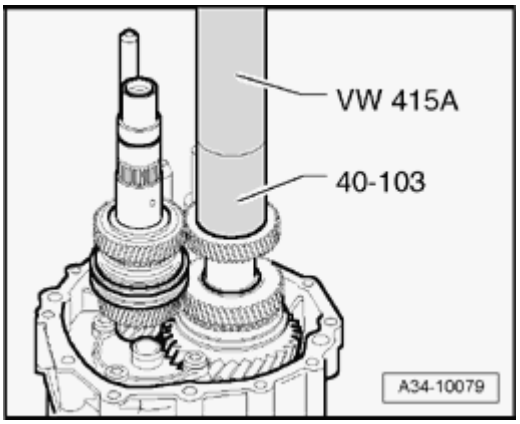


Fig. 291: Pressing On 4th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 4th gear wheel and press on.

- Installation position: high inside collar faces 5th gear wheel.

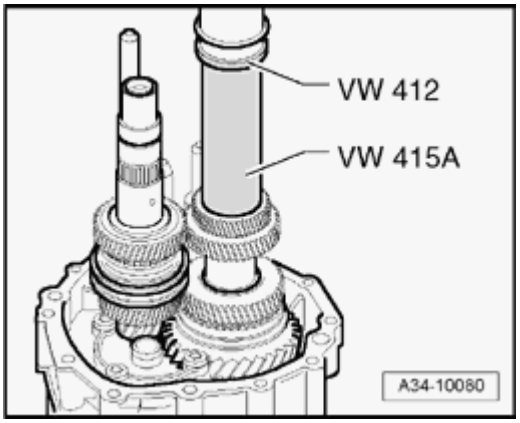


Fig. 292: Pressing On 5th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 5th gear wheel and press on.

- Installation position: high inside collar faces 4th gear wheel.

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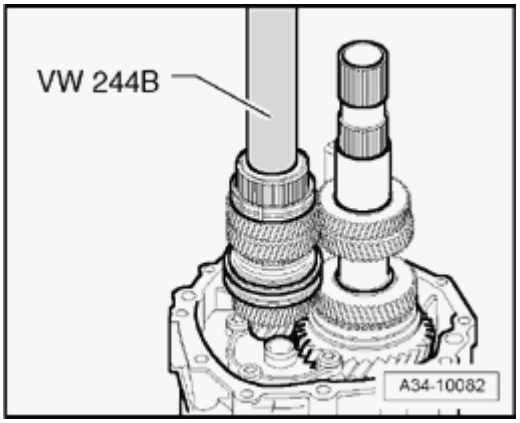


Fig. 293: Pressing On Heated Synchronizing Hub For 5th And 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place 5th speed selector gear with spring, synchro-ring and needle bearing onto input shaft.
- The lugs on synchro-ring should engage into recesses in selector gear.
- Install and press on heated synchronizing hub for 5th and 6th gear.
- Check axial clearance of 5th speed selector gear.

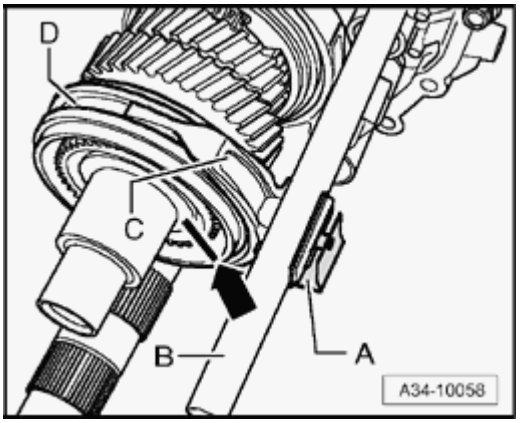


Fig. 294: Identifying Installation Position Of Locking Collar In Relation To Synchronizing Hub, Clip, Selector Rod, Selector Fork And Locking Collar
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide selector fork for 5th and 6th gear - **C** - together with locking collar - **D** - onto synchronizing hub for 5th and 6th gear.
- The markings on locking collar and synchronizing hub - **arrow** - must coincide.
- Move selector fork for 5th and 6th gear - **C** - into selector rod - **B** -.
- If holes of selector fork and selector rod coincide, clip in pin with clip - **A** -.

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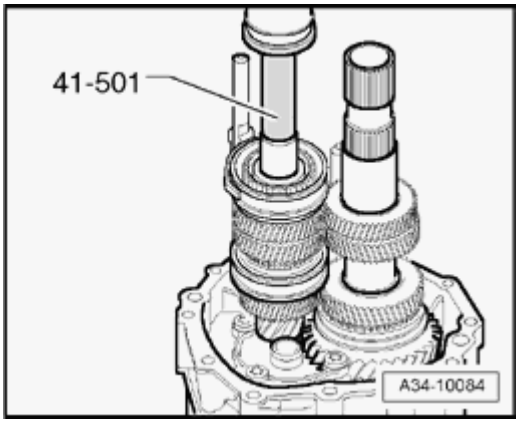


Fig. 295: Pressing On Heated Inner Race For Needle Bearing For 5th Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on heated inner race for needle bearing for 5th speed selector gear.

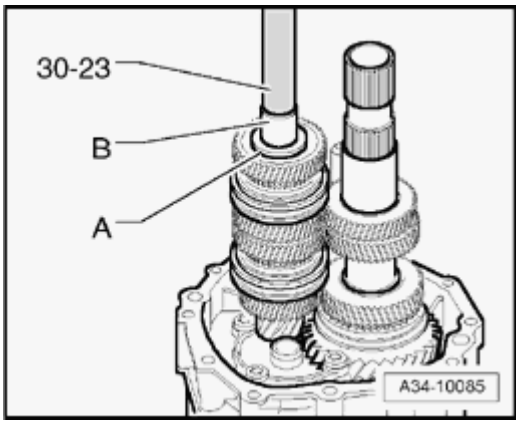


Fig. 296: Pressing On 6th Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install 6th speed selector gear with spring, synchro-ring, needle bearing and thrust washer for 6th gear - **A** -.
- Heat inner race - **B** - for needle roller bearing and press on.
- Check axial clearance of 6th speed selector gear.

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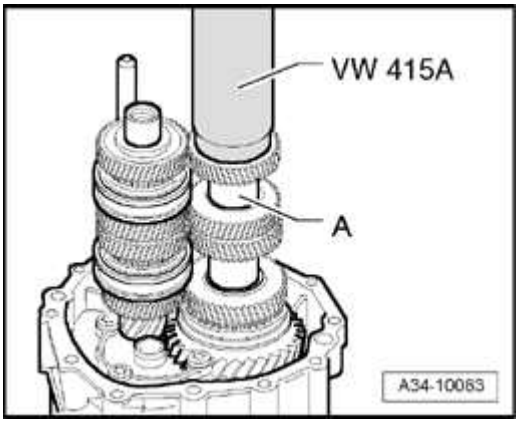


Fig. 297: Pressing On 6th Gear Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install spacer sleeve - **A** - onto output shaft.
- Heat 6th gear wheel and press on.

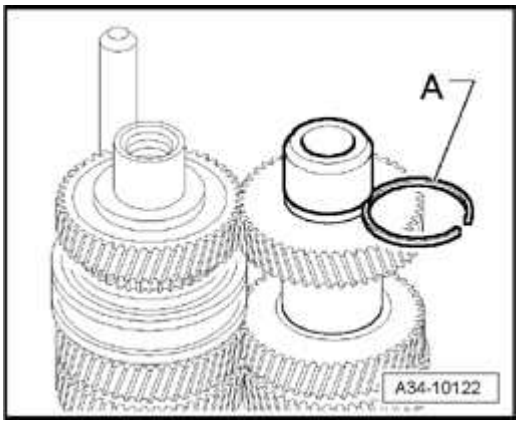


Fig. 298: Identifying 6th Gear Wheel Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Insert circlip - **A** - for 6th gear wheel.

- When replacing gear wheel or output shaft:

Re-determine circlip - **A** - for 6th gear wheel:

- Determine thickest circlip that will just fit and install it. For Part No.

The following circlips are available:

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17

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1.96	2.08	2.20
1.99	2.11	

- Remove bearing housing from holding plate T40088/1.

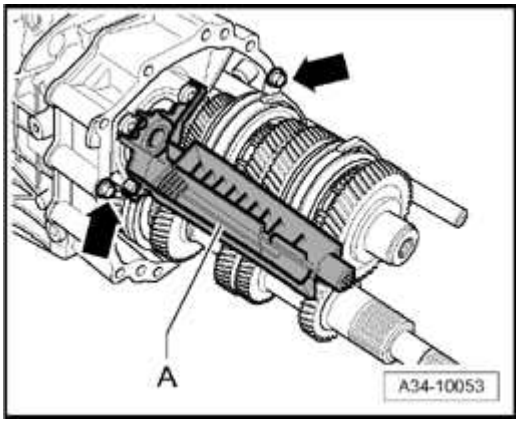


Fig. 299: Bearing Housing Secured To Transmission Housing With Two Bolts M8 And Washers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure bearing housing to transmission housing with two bolts M8 (length approx. 70 mm) - **arrows** - and washers.
- Tighten these 2 bolts - **arrows** - to max. 5 Nm.

NOTE:

- **Do not install oil collector - A - at this stage.**

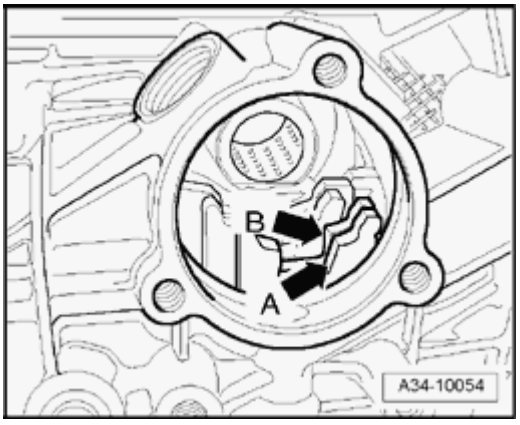


Fig. 300: Locating Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Move two selector rods - **arrow A** - and - **arrow B** - to lock input shaft by selecting two gears (e.g. reverse gear and 1st gear).

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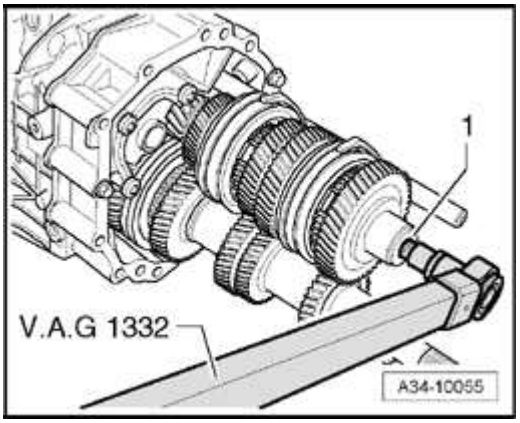


Fig. 301: Removing/Installing Multi-Point Socket Head Bolt For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten multi-point socket head bolt - **1** - for input shaft to 150 Nm.
- Remove complete bearing housing from transmission housing.
- Check if the 2 dowel sleeves are installed between transmission housing and bearing housing.
- Apply **sealing paste AMV 188 001 01** evenly and not too thickly onto contact surfaces between transmission housing and bearing housing.
- Install bearing housing onto transmission housing.

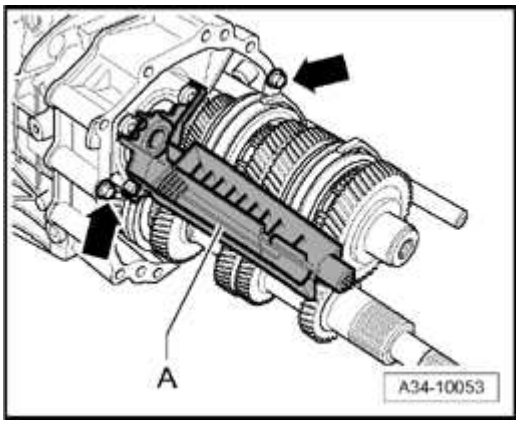


Fig. 302: Bearing Housing Secured To Transmission Housing With Two Bolts M8 And Washers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clip oil collector - **A** - into reverse shaft support.

NOTE:

- **Make sure that the bolts - arrows - are removed.**

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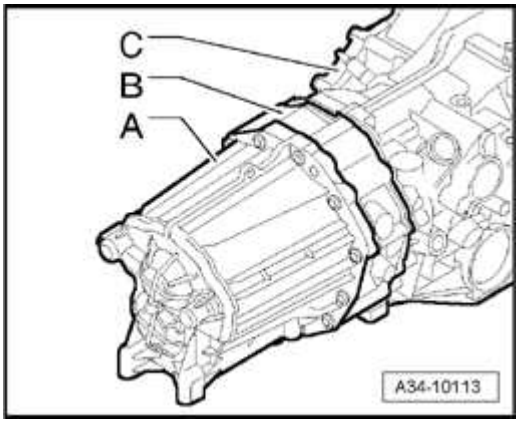


Fig. 303: Transmission Cover, Bearing Housing And Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check if the 2 dowel sleeves are installed between bearing housing - **B** - and transmission cover - **A** -.
- Apply **sealing paste AMV 188 001 02** evenly and not too thickly onto contact surfaces between bearing housing and transmission cover.
- Insert securing bolts for transmission cover - **A** - and bearing housing - **B** - to transmission housing - **C** -.

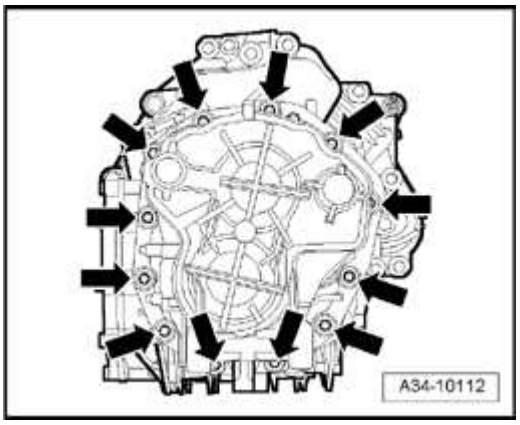


Fig. 304: Transmission Cover Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolts - **arrows** - to 35Nmplus an additional 90° $^{1}/_{4}$ turn.

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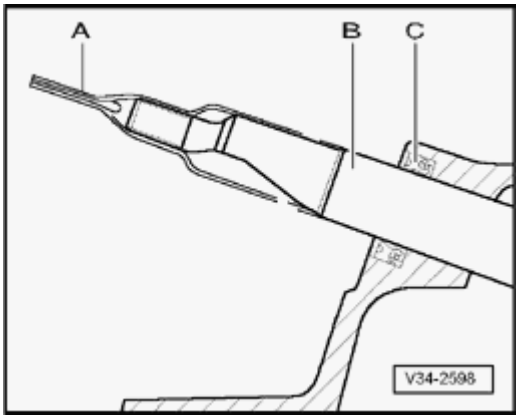


Fig. 305: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push **assembly sleeve 01E311120** - **A** - onto selector shaft - **B** -.

NOTE:

- **To avoid damaging the oil seal - C - , the oil seal and selector shaft must only be installed using assembly sleeve 01E311120 - A -.**

- Move selector rods to neutral.
- Install complete selector shaft.

- Installation position: Chamfer of selector shaft points downward.

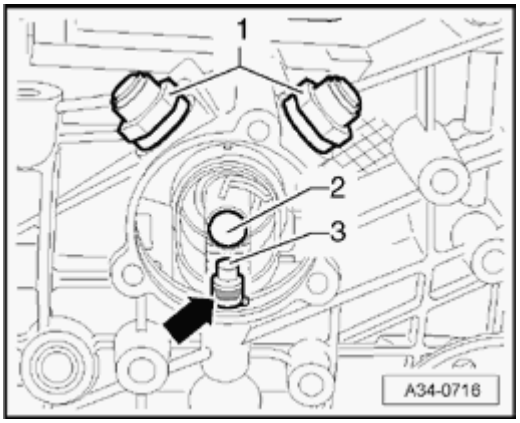


Fig. 306: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously inserting pin - **3** -.

- Installation position for pin - **3** - : The groove - **arrow** - on pin points toward selector shaft cover.

- Clean threads of locking bolts - **1** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 45 Nm.

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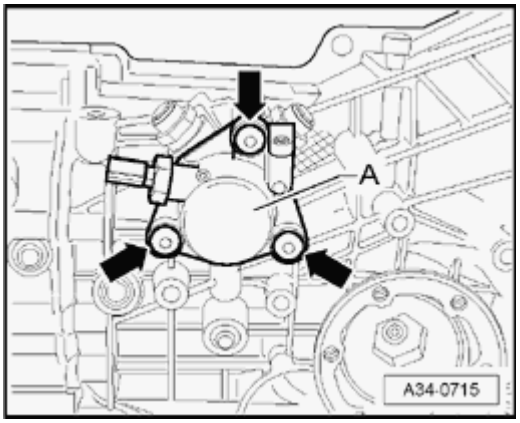


Fig. 307: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install cover - **A** - with new O-ring.
- Clean threads of bolts - **arrows** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 24 Nm.

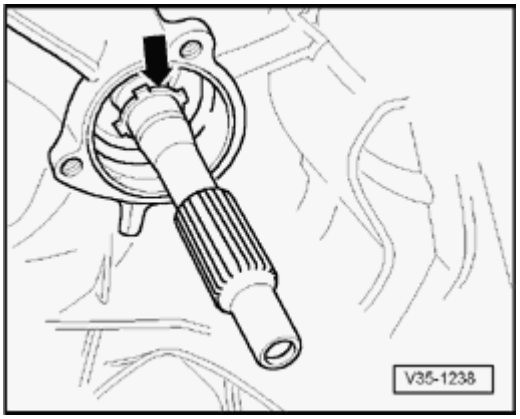


Fig. 308: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install rear circlip - **arrow** - for input shaft ball bearing.
- Then push ball bearing onto input shaft.

Installation position:

The sealed side of ball cage faces transmission housing.

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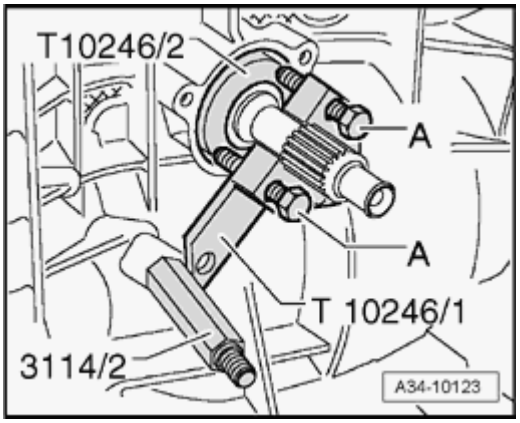


Fig. 309: Pressing In Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing in ball bearing:

First screw door hinge alignment tool (M8 and M10) 3114/2 into tapped hole for ball head stud.

Slide thrust plate T10246/2 onto input shaft.

Position fitting tool T10246/1 behind splines for clutch plate. Tighten bolts - **A** - only slightly. The bolts locate in recesses in the thrust plate T10246/2.

Press in ball bearing onto stop by tightening bolts alternately (1/2 turn at a time).

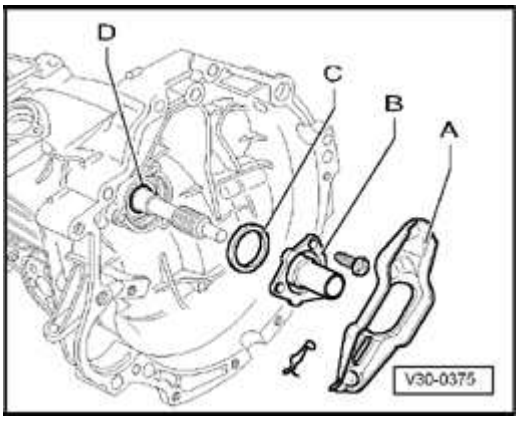


Fig. 310: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install front circlip - **D** - for input shaft ball bearing.
- Install dished spring - **C** -.

Installation position:

The curved side faces guide sleeve - **B** -.

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- Install a shrink hose onto input shaft splines.
- Install guide sleeve - **B** - for release bearing.
- Remove shrink hose.
- Install clutch release lever - **A** - with release bearing.

- Select all gears.

TRANSMISSION COVER, SERVICING

Transmission cover, servicing

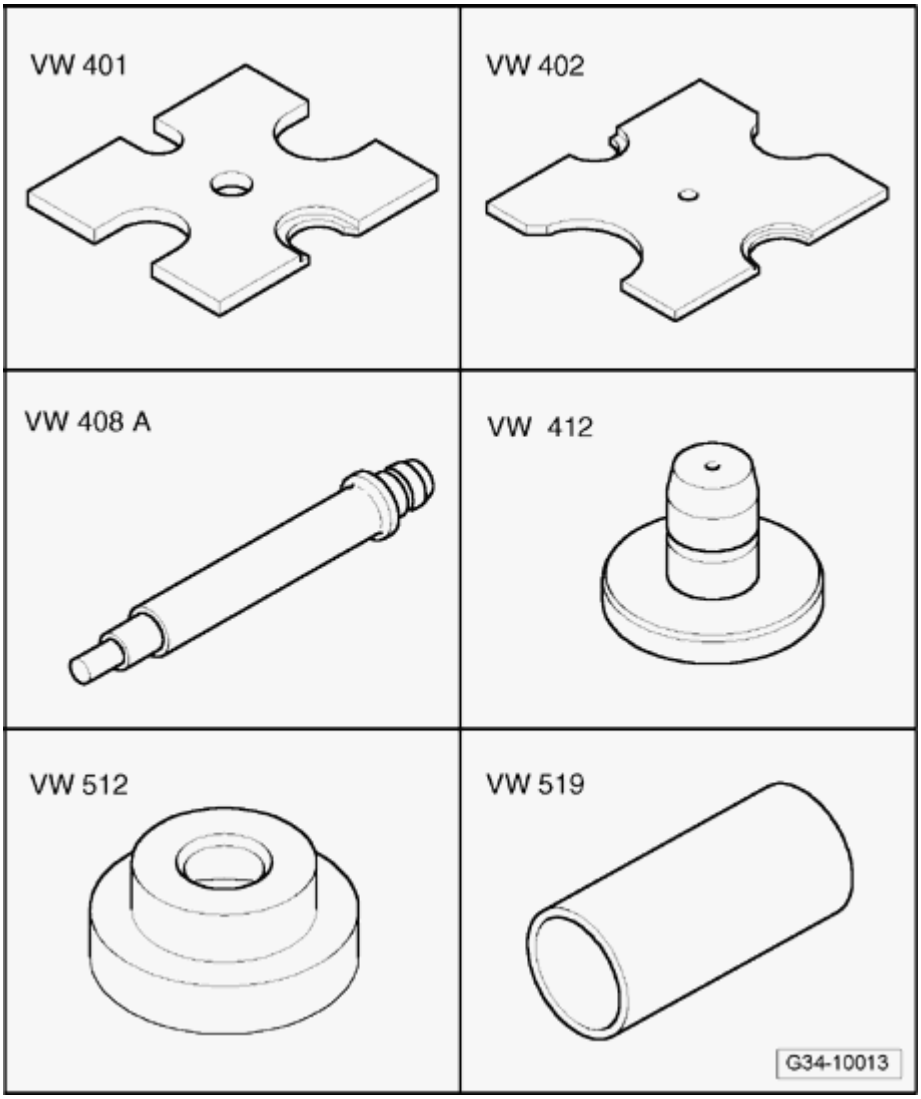


Fig. 311: Identifying Special Tools - Transmission Cover, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

- Thrust pad VW 512
- Sleeve VW 519

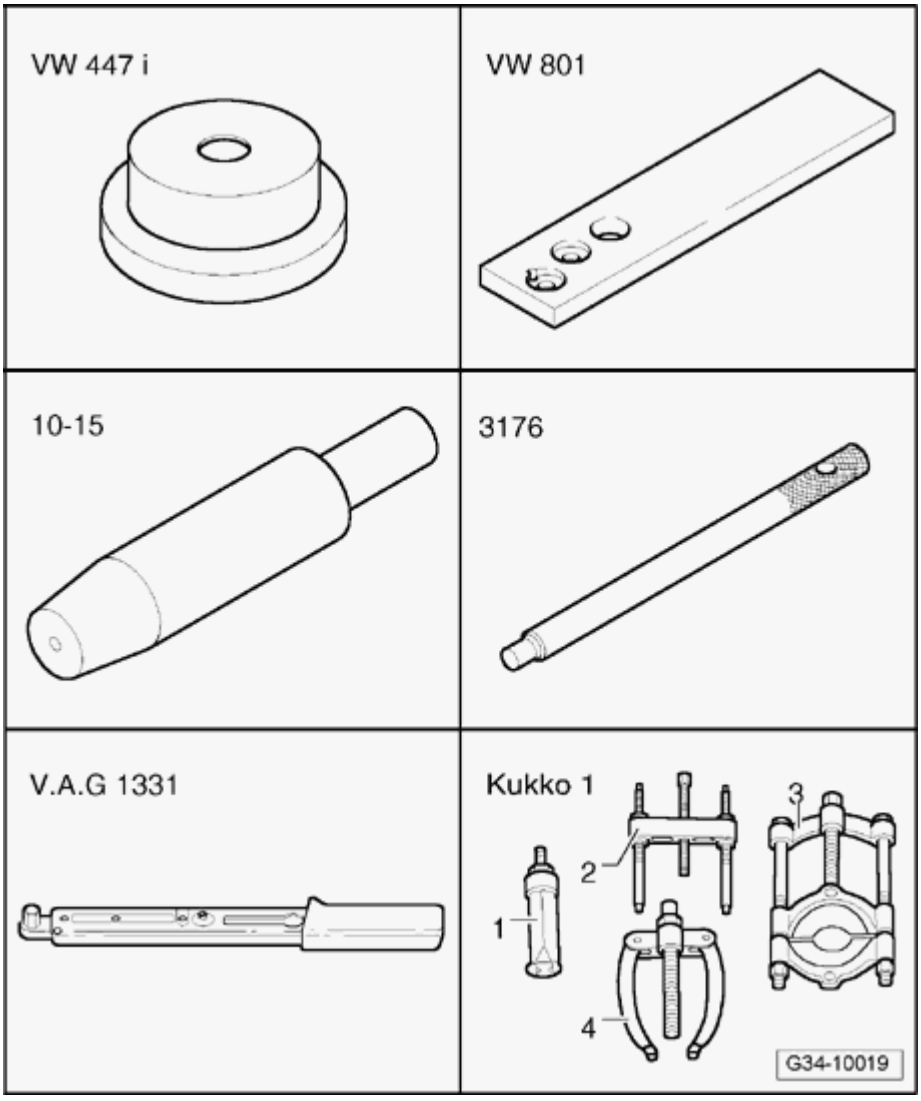


Fig. 312: Identifying Special Tools - Transmission Cover, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust pad VW 447 i
- Holding fixture VW 801

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- Guide pin 10 - 15
- Centering mandrel 3176

- Torque wrench V.A.G 1331
- - **1** - internal puller Kukko 21/2
- - **1** - Internal puller Kukko 21/5
- - **1** - Internal puller Kukko 21/6

- - **4** - Counter-support Kukko 22/2

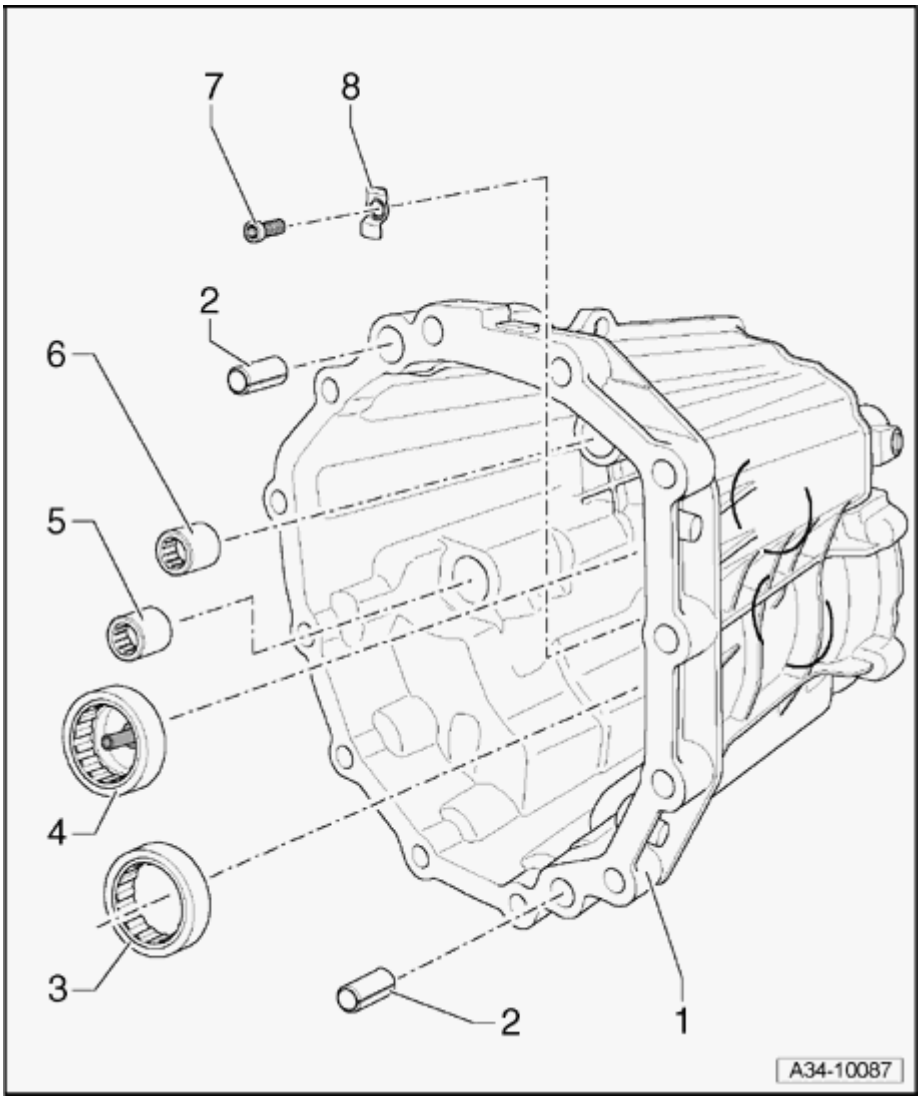


Fig. 313: Transmission Cover Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission cover

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2 - Dowel sleeve

- 2 x
- For centralizing transmission cover on bearing housing
- Drive out and in with drift 3121

3 - Roller bearing

- Bearing for output shaft in transmission cover
- Always replace
- Pulling out **Pulling roller bearing for output shaft out of transmission cover**
- Pressing in **Pressing new roller bearing for output shaft into transmission cover as far as the stop (press in carefully)**

4 - Roller bearing

- Bearing for input shaft in transmission cover
- With lubricating unit
- Always replace
- Pulling out **Pulling roller bearing for input shaft out of transmission cover**
- Pressing in **Pressing new roller bearing for input shaft into transmission cover as far as stop (press in carefully)**

5 - Ball sleeve

- For selector rod for 1st and 2nd gear
- Pulling out **Pulling out ball sleeve - C - from transmission cover**
- Driving in **Driving ball sleeve into transmission cover until flush**

6 - Ball sleeve

- For selector rod for 5th and 6th gear
- Pulling out **Pulling out ball sleeve - C - from transmission cover**
- Driving in **Driving ball sleeve into transmission cover until flush**

7 - Multi-point socket head bolt, 24Nm

8 - Retaining plate

- Installation position **Securing needle roller bearing and needle bearing in transmission cover.**

Pulling roller bearing for output shaft out of transmission cover

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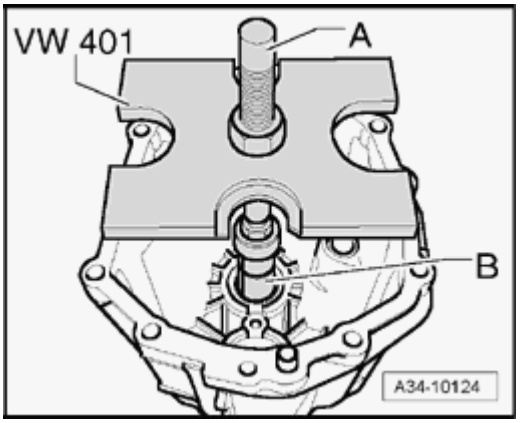


Fig. 314: Pulling Roller Bearing For Output Shaft Out Of Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Internal puller 37... 46 mm, e.g. Kukko 21/6

NOTE:

- **Always replace needle roller bearing after pulling out.**

Pressing new roller bearing for output shaft into transmission cover as far as the stop (press in carefully)

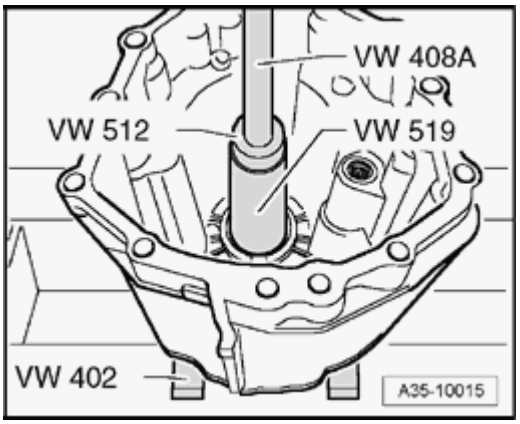


Fig. 315: Pressing New Roller Bearing For Output Shaft Into Transmission Cover As Far As The Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Support transmission cover with thrust plate VW 447 i directly below bearing mounting.

Pulling out ball sleeve - C - from transmission cover

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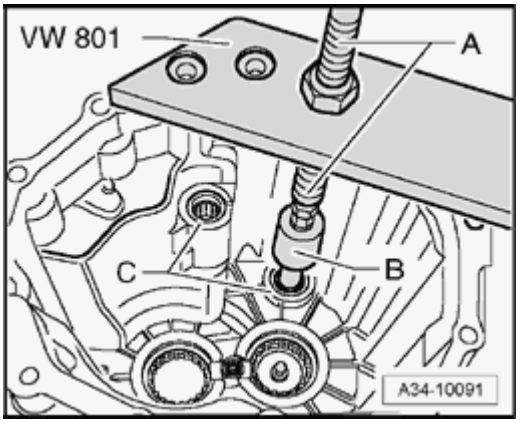


Fig. 316: Pulling Out Ball Sleeve From Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving ball sleeve into transmission cover until flush

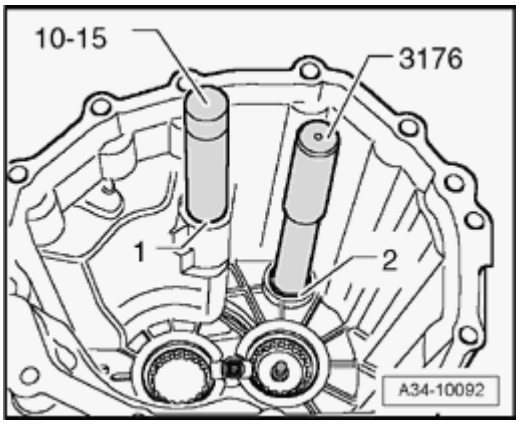


Fig. 317: Driving Ball Sleeve Into Transmission Cover Until Flush
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve - **1** - and - **2** - so that side with lettering (thicker metal) faces guide pin 10 - 15 or centering mandrel 3176.

NOTE:

- **Due to the housing depth use centering mandrel 3176 for driving in ball sleeve - 2 -.**

Pulling roller bearing for input shaft out of transmission cover

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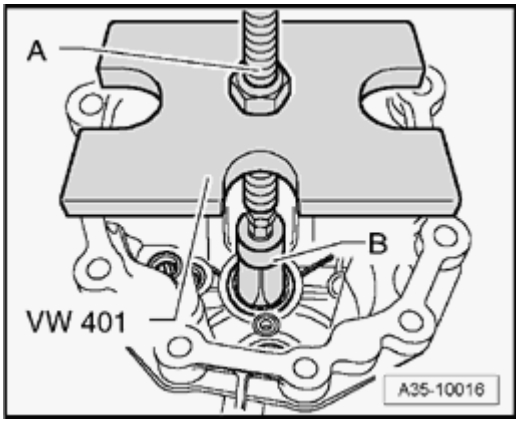


Fig. 318: Pulling Roller Bearing For Input Shaft Out Of Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Shorten (cut off) lubricating unit in needle roller bearing in order to insert internal puller - **B** -.

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

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

NOTE:

- **Always replace needle roller bearing after pulling out.**

Pressing new roller bearing for input shaft into transmission cover as far as stop (press in carefully)

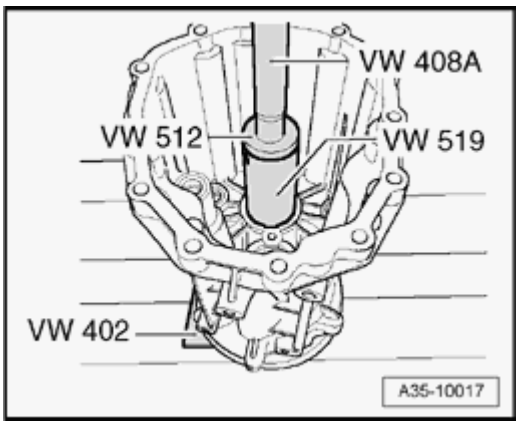


Fig. 319: Pressing New Roller Bearing For Input Shaft Into Transmission Cover As Far As Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Support transmission cover with thrust plate VW 447 i directly below bearing mounting.

Securing needle roller bearing and needle bearing in transmission cover.

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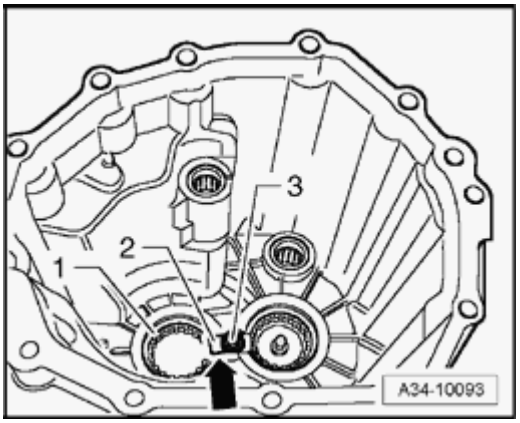


Fig. 320: Securing Needle Roller Bearing And Needle Bearing In Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert retaining plate - **2** - with high shoulder - **arrow** - facing needle bearing - **1** - into transmission cover.
- Tighten hex socket head bolt - **3** - to 24 Nm.

BEARING HOUSING, SERVICING

Bearing housing, servicing

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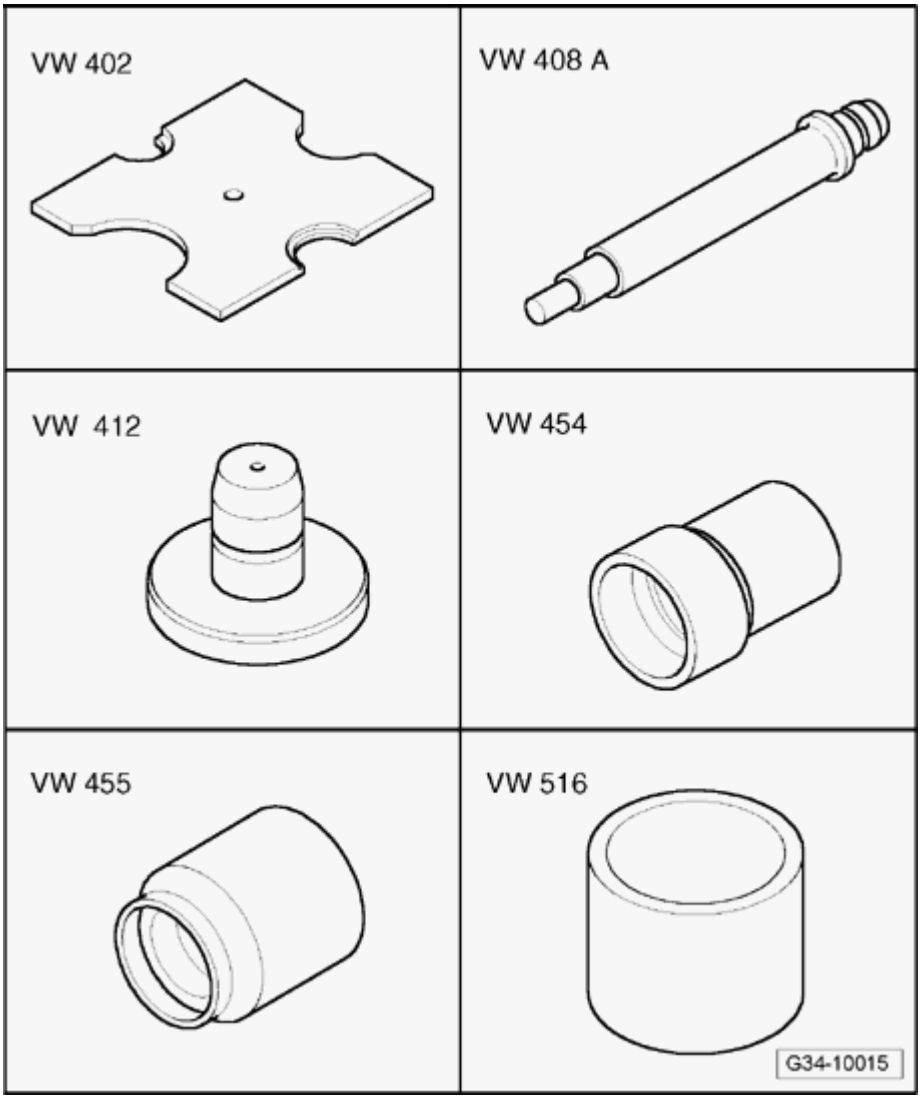


Fig. 321: Identifying Special Tools - Bearing Housing, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW 402
- Press tool VW 408 A
- Thrust disc VW 412
- Thrust tube VW 454

- Installing sleeve VW 455
- Tube 42 mm dia. VW 516

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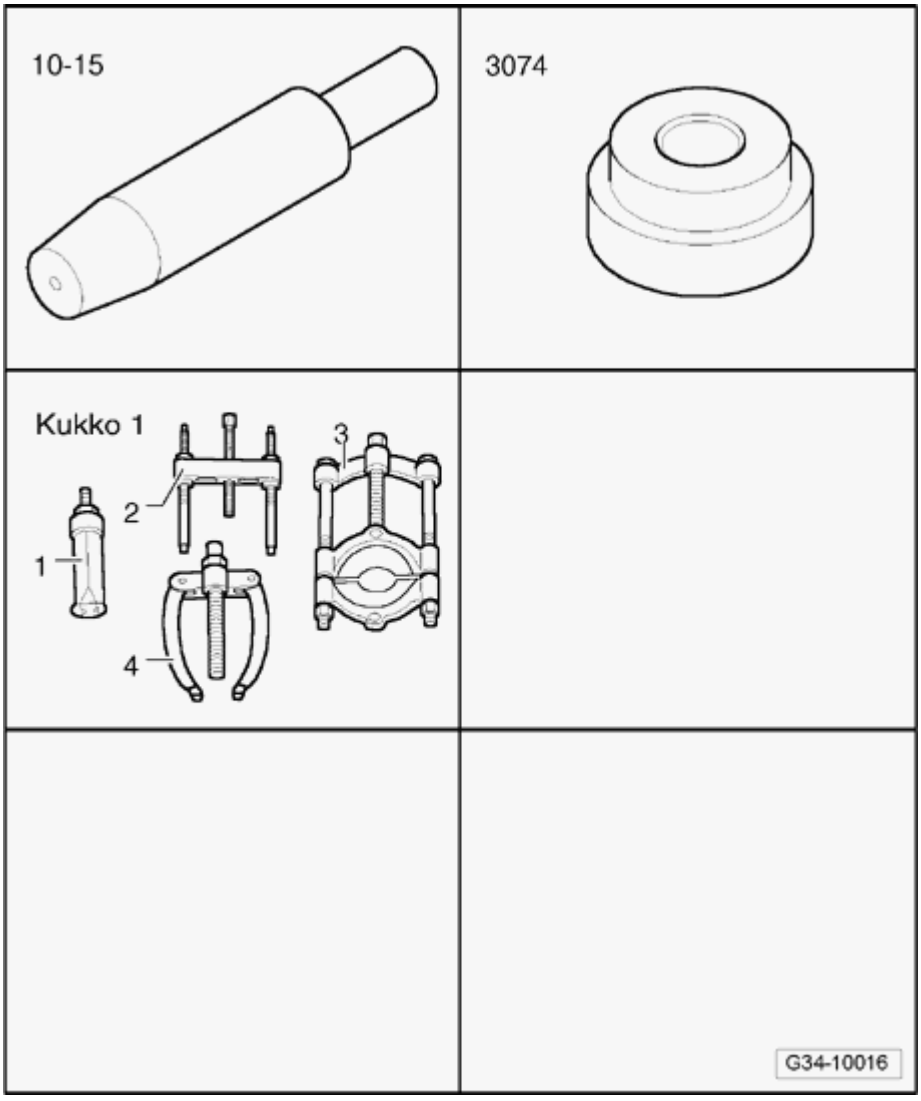


Fig. 322: Identifying Special Tools - Bearing Housing, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Guide pin 10 - 15
- Thrust pad 3074
- **- 1 -** Internal puller Kukko 21/2
- **- 4 -** Counter-support Kukko 22/1
- Drift T40085

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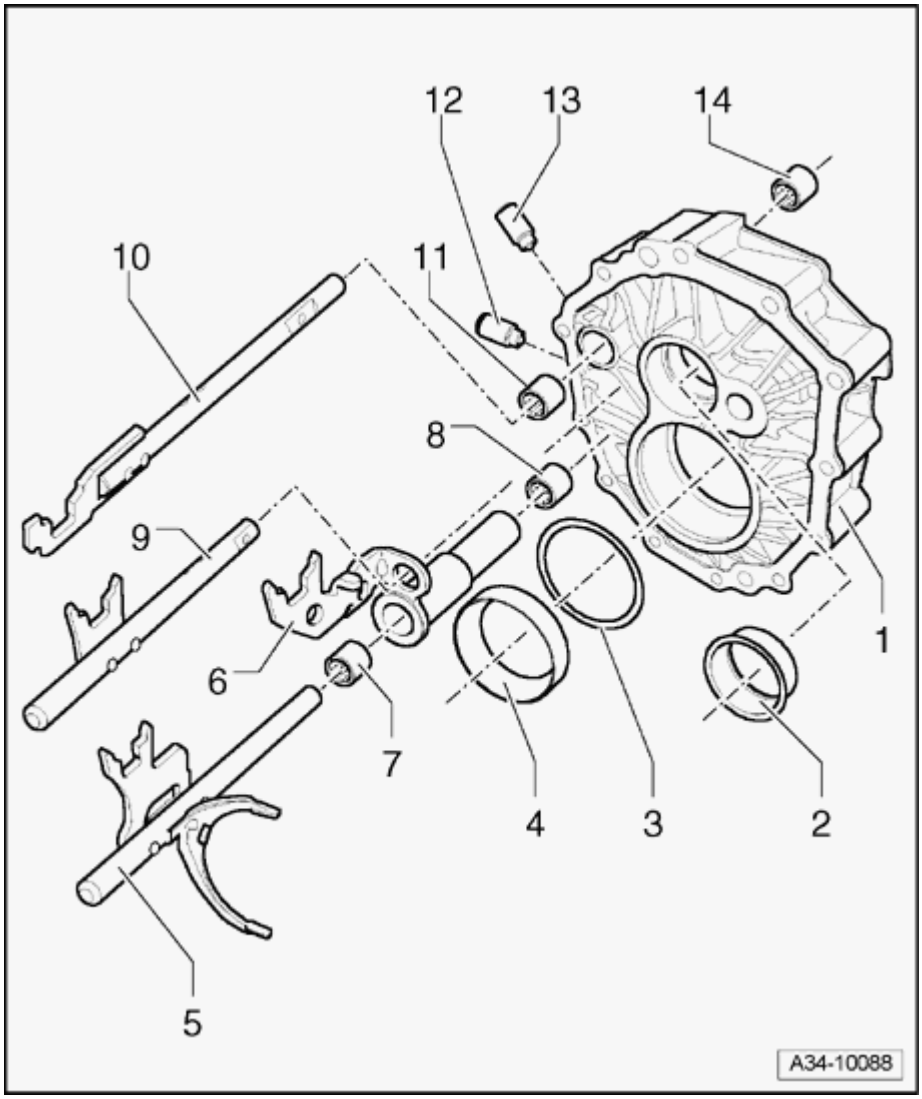


Fig. 323: Bearing Housing Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

- Re-determine shim "S_4 " when replacing --> **Re-determining shim "S4" when replacing bearing housing**

2 - Outer race

- For needle roller bearing on input shaft
- Driving out **Driving outer race for needle roller bearing out of bearing housing**
- Pressing in **Pressing outer race for needle roller bearing into bearing housing until limit stop**

3 - Shim "S_4 "

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- Table of adjustments --> **Table of adjustments**
- Re-determine when replacing bearing housing --> **Re-determining shim "S4" when replacing bearing housing**

4 - Tapered roller bearing outer race

- For output shaft

5 - Selector rod for 1st and 2nd gear

- Only replace together with selector fork for 1st and 2nd gear (secured together by means of a pin)

6 - Reverse gear selector rod

7 - Ball sleeve

- (Front) for reverse gear selector rod
- Pulling out **Pulling front ball sleeve out of reverse gear selector rod**
- Pressing in **Pressing front ball sleeve into reverse gear selector rod until limit stop.**

8 - Ball sleeve

- (Rear) for reverse gear selector rod
- Pulling out **Pulling out rear ball sleeve for reverse gear selector rod**
- Pressing in **Pressing in rear ball sleeve - A - for reverse gear selector rod**

9 - Selector rod for 3rd and 4th gear

10 - Selector rod for 5th and 6th gear

- Remove burrs and scoring after removing from bearing housing

11 - Ball sleeve

- For selector rod for 5th and 6th gear
- Pull out with internal puller Kukko 21/2
- Drive in until flush using guide pin 10 - 15

12 - Locking bushing

- For selector rod for 3rd and 4th gear
- Removing and installing **Removing and installing locking bushing for selector rod**

13 - Locking bushing

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- For selector rod for 5th and 6th gear
- Removing and installing **Removing and installing locking bushing for selector rod**

14 - Ball sleeve

- For selector rod for 3rd and 4th gear
- Pull out with internal puller Kukko 21/2
- Driving in **Driving in ball sleeve for selector rod for 3rd and 4th gear**

Driving outer race for needle roller bearing out of bearing housing

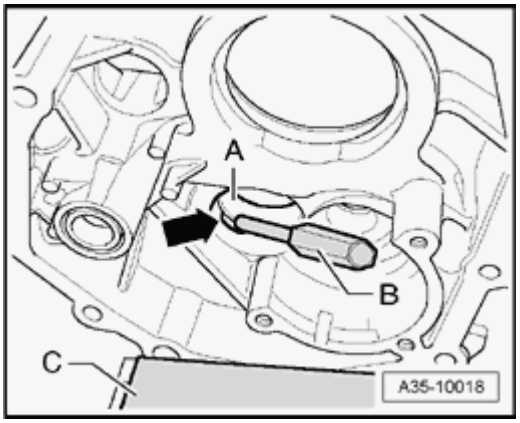


Fig. 324: Driving Outer Race For Needle Roller Bearing Out Of Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp bearing housing in vise, using jaw protectors - **C** -.
- Drive out outer race - **A** - using drift - **B** - by alternately applying drift to bearing housing recesses located opposite to each other - **arrow** -.

Pressing outer race for needle roller bearing into bearing housing until limit stop

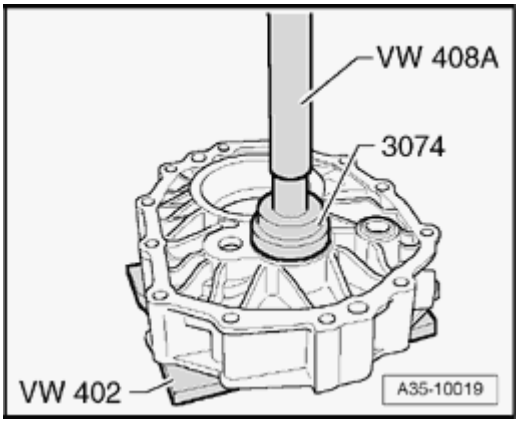


Fig. 325: Pressing Outer Race For Needle Roller Bearing Into Bearing Housing Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Pulling front ball sleeve out of reverse gear selector rod

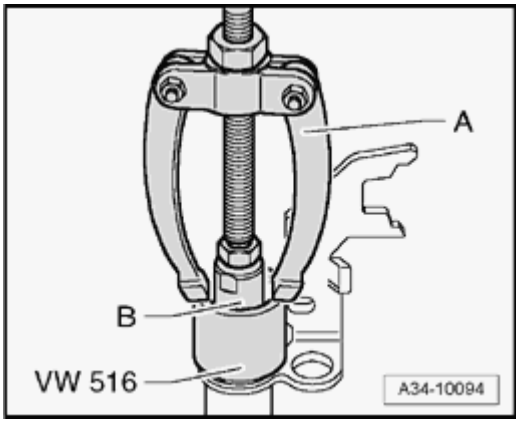


Fig. 326: Pulling Front Ball Sleeve Out Of Reverse Gear Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Pressing front ball sleeve into reverse gear selector rod until limit stop

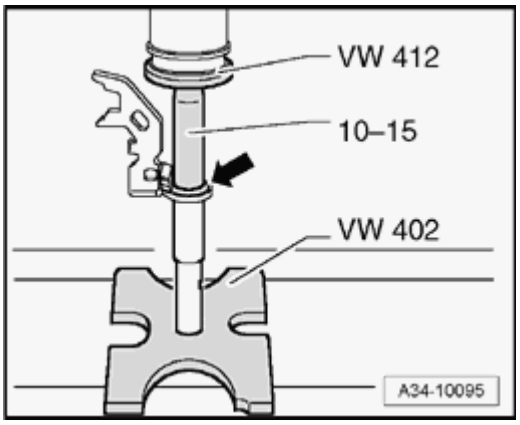


Fig. 327: Pressing Front Ball Sleeve Into Reverse Gear Selector Rod Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve - **arrow** - so that side with lettering (thicker metal) faces guide pin 10 - 15.

Pulling out rear ball sleeve for reverse gear selector rod

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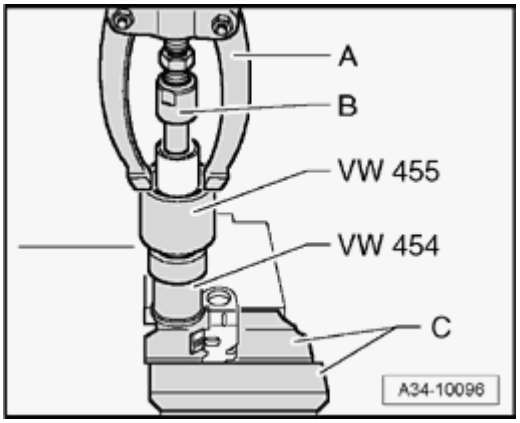


Fig. 328: Pulling Out Rear Ball Sleeve For Reverse Gear Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp actuating arm of selector rod in vise, using jaw protectors - **C** -.
- Install thrust tube VW 454 and installing sleeve VW 455 onto selector rod.

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

B - Internal puller 14.5... 18.5 mm, e.g. Kukko 21/2

Pressing in rear ball sleeve - A - for reverse gear selector rod

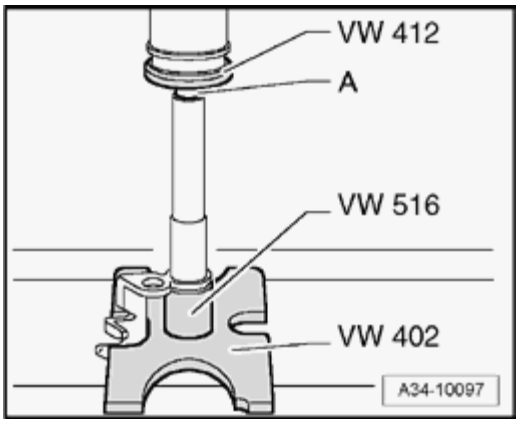


Fig. 329: Pressing In Rear Ball Sleeve For Reverse Gear Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving in ball sleeve for selector rod for 3rd and 4th gear

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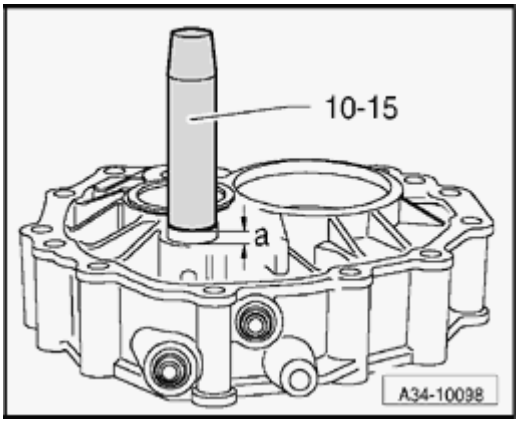


Fig. 330: Driving In Ball Sleeve For Selector Rod For 3Rd And 4Th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve so that side with lettering (thicker metal) faces guide pin 10 - 15.

- Dimension for pressing in - **a** - = 2.5 mm

Removing and installing locking bushing for selector rod

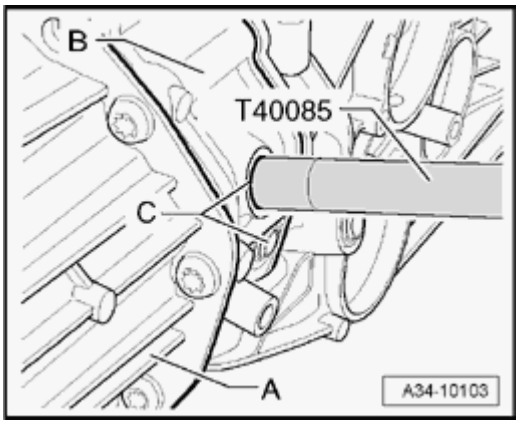


Fig. 331: Removing And Installing Locking Bushing For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove relevant selector rod (for 3rd and 4th gear or for 5th and 6th gear).
- Bolt bearing housing - **B** - with transmission cover - **A** - onto transmission housing prior to driving out and driving in the locking bushings - **C** -.

- Drive out old locking bushing inward into bearing housing.
- Drive in new locking bushing until flush.

TRANSMISSION HOUSING, SERVICING

Transmission housing, servicing

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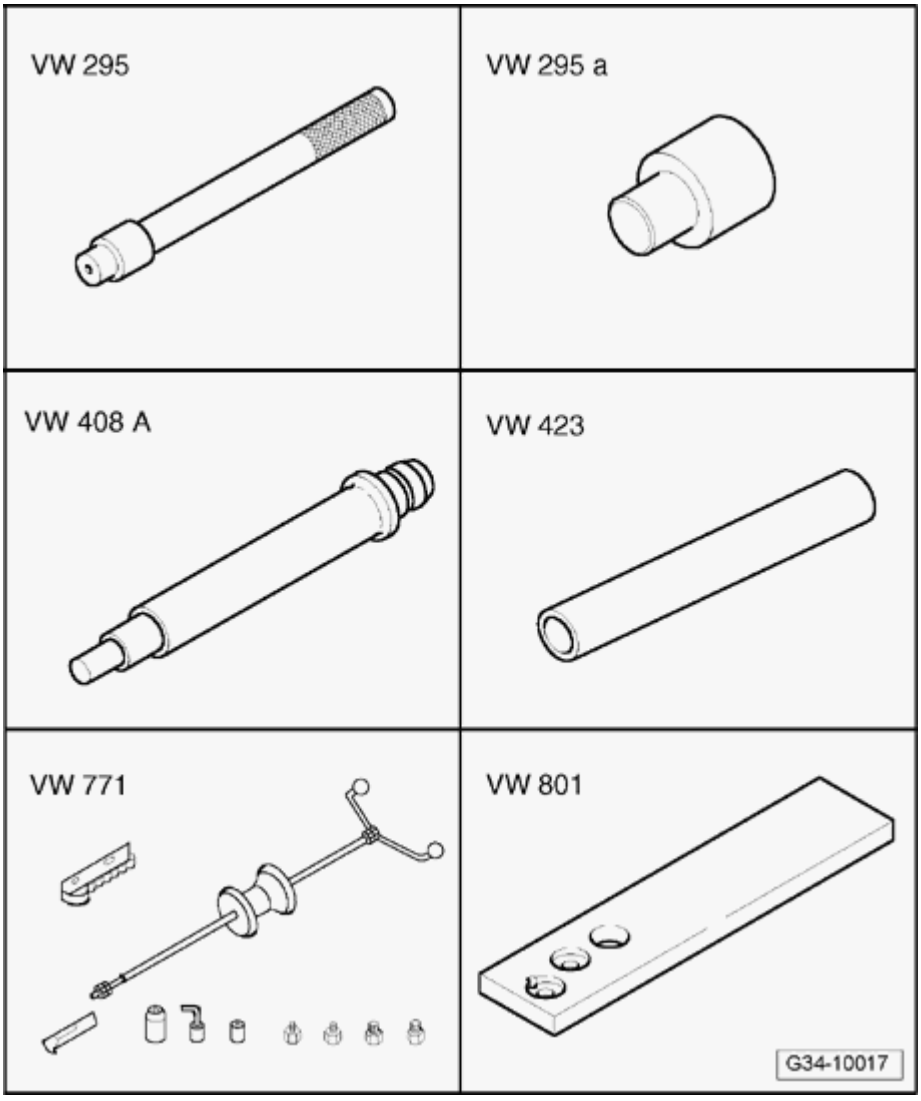


Fig. 332: Identifying Special Tools - Transmission Housing, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Needle bearing drift VW 295
- Needle bearing drift VW 295 A
- Press tool VW 408 A
- Tube VW 423

- Multi-purpose tool VW 771
- Support plate VW 801

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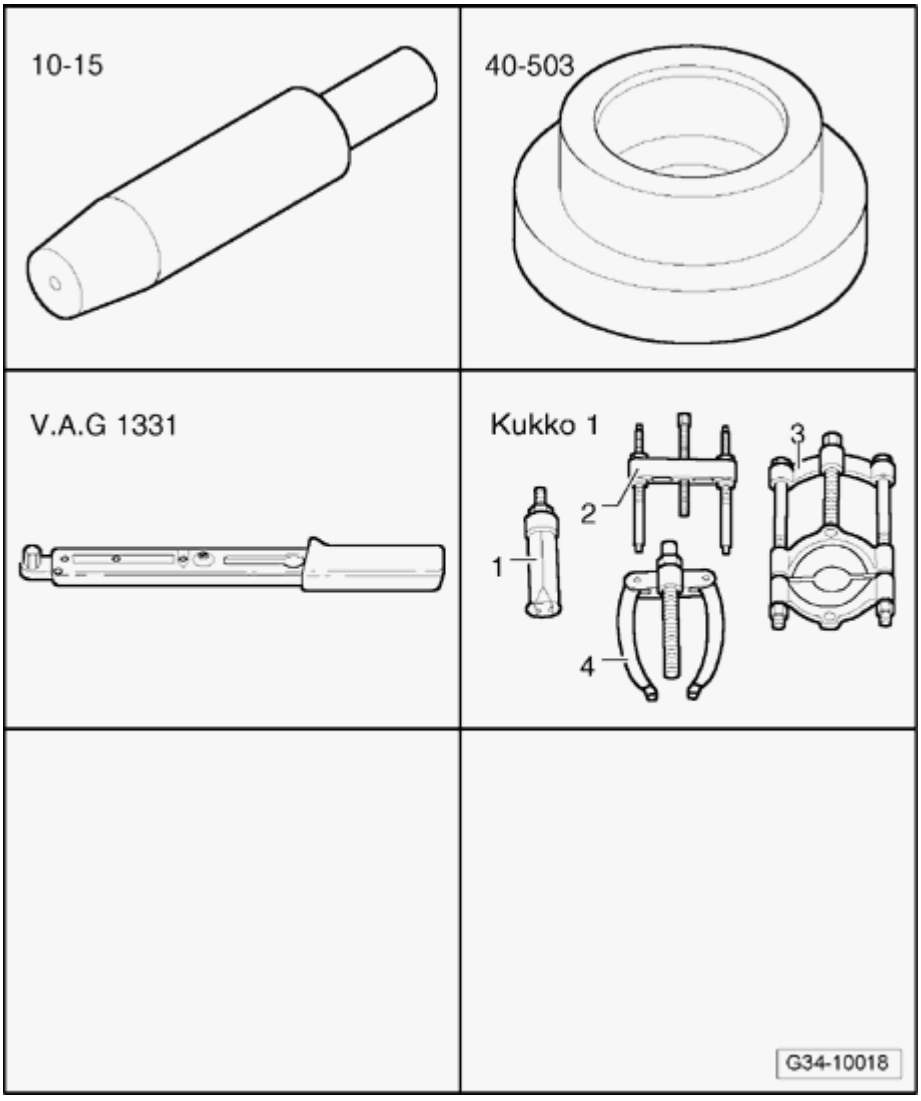


Fig. 333: Identifying Special Tools - Transmission Housing, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Guide pin 10 - 15
- Installing tool 40 - 503
- Torque wrench V.A.G 1331
- **- 1 -** Internal puller Kukko 21/2
- **- 4 -** Counter-support Kukko 22/2
- Drift T40085

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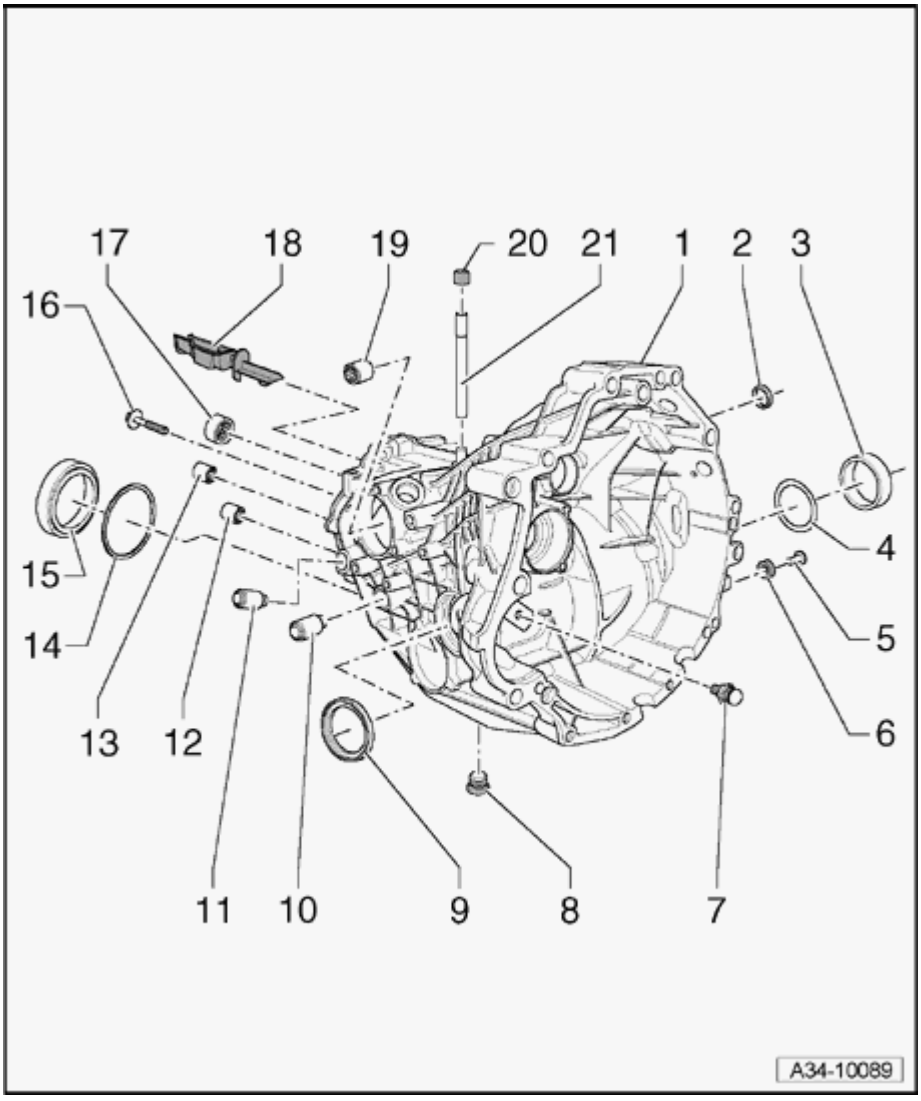


Fig. 334: Transmission Housing Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing

- When replacing: adjust input shaft --> **Input shaft, adjusting**, adjust output shaft and differential (final drive gear set) --> **Table of adjustments**

2 - Oil seal for selector shaft

- Replacing (with transmission removed) --> **Selector shaft oil seal, replacing with transmission removed (transmission remains assembled)**
- Replacing (with transmission installed) --> **Selector shaft oil seal, replacing with transmission installed**
- Always replace
- Pulling out **Pulling out oil seal for selector shaft with transmission disassembled**

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- Driving in **Driving in seal for selector shaft**
- Use assembly sleeve to install (selector shaft remains installed) --> **Selector shaft oil seal, replacing with transmission removed (transmission remains assembled)**

3 - Tapered roller bearing outer race (right-side)

- For differential
- If replaced: adjust differential (crown wheel) --> **Crown wheel, adjusting**

4 - Shim "S_2 "

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

5 - Bushing

- Drive in (for example, with press tool VW 408 A when replacing transmission

6 - Magnet

- Clean

7 - Ball head stud, 25 Nm

- Grease with **MoS2** grease

8 - Oil drain plug, 45 Nm

9 - Oil seal

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

10 - Locking bushing

- For selector rod for 1st and 2nd gear
- Removing and installing **Removing and installing locking bushing for selector rod**

11 - Locking bushing

- For reverse gear selector rod
- Removing and installing **Removing and installing locking bushing for selector rod**

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12 - Ball sleeve

- For selector rod for 1st and 2nd gear
- Pulling out **Pulling front ball sleeve out of reverse gear selector rod**
- Drive in until flush using guide pin 10 - 15

13 - Ball sleeve

- For selector rod for 3rd and 4th gear
- Pulling out **Pulling front ball sleeve out of reverse gear selector rod**
- Drive in until flush using guide pin 10 - 15

14 - Shim "S_3 "

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

15 - Tapered roller bearing outer race

- For output shaft

16 - Bolt, 24 Nm

17 - Needle bearing

- For input shaft
- Driving out **Driving out input shaft needle bearing from transmission housing**
- Driving in **Pressing in input shaft needle bearing until limit stop**

18 - Oil collector

- With magnet
- Installation position in transmission housing **Securing input shaft needle bearing**

19 - Ball sleeve

- For selector shaft
- Pulling out **Removing selector shaft ball sleeve**
- Driving in **Driving in ball sleeve for selector shaft**

20 - Cap

- For transmission breather

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21 - Breather pipe

- Drive in onto stop
- Clip in cap for transmission breather

Pulling out oil seal for selector shaft with transmission disassembled

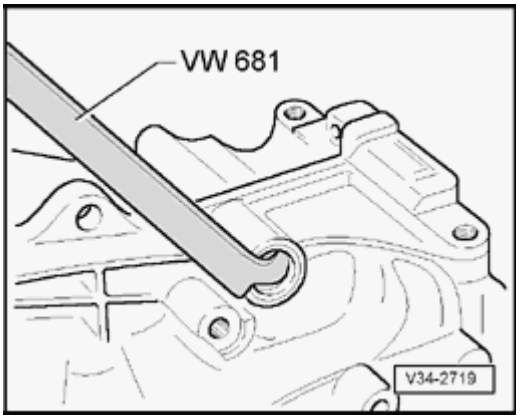


Fig. 335: Removing Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving in seal for selector shaft

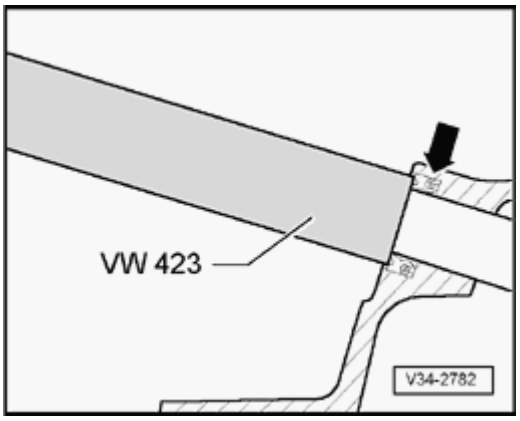


Fig. 336: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .
- Lightly oil outer circumference of seal.
- Drive oil seal - **arrow** - into housing as far as it will go.

Removing and installing locking bushing for selector rod

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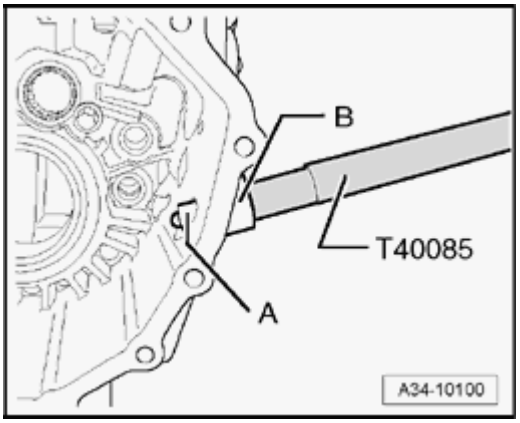


Fig. 337: Removing And Installing Locking Bushing For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive out used locking bushing - **A** - inward into transmission housing.
- Drive in new locking bushing into transmission housing - **B** - until flush.

Pulling out ball sleeve - C - from transmission housing.

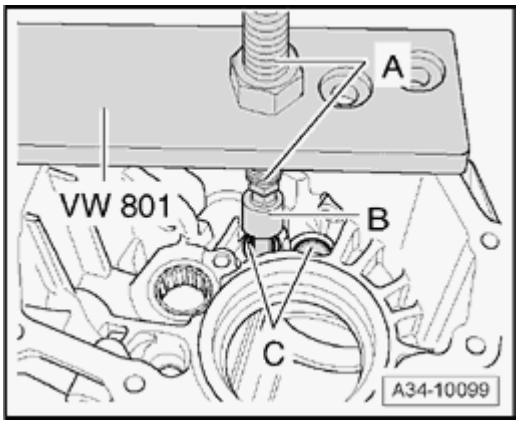


Fig. 338: Pulling Out Ball Sleeve From Transmission Housing.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Internal puller 14.5... 18.5 mm, e.g. Kukko 21/2

Driving out input shaft needle bearing from transmission housing

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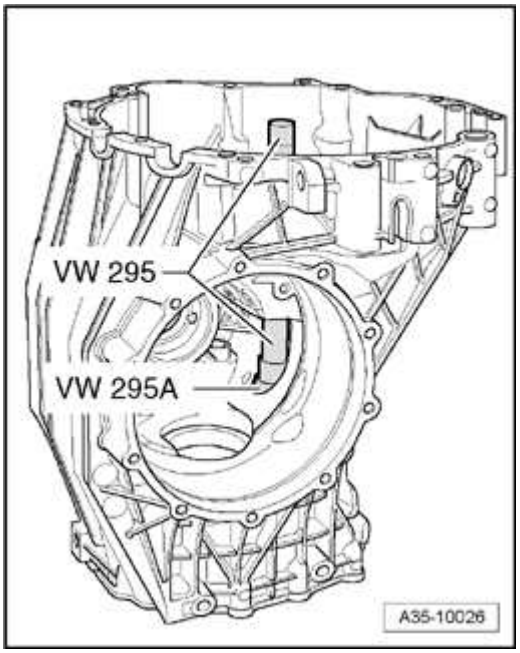


Fig. 339: Driving Out Input Shaft Needle Bearing From Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt for securing needle bearing **Securing input shaft needle bearing**.
- Install adapter VW 295 A with smaller outside diameter into needle bearing.
- Drive out needle bearing with drift VW 295.

Pressing in input shaft needle bearing until limit stop

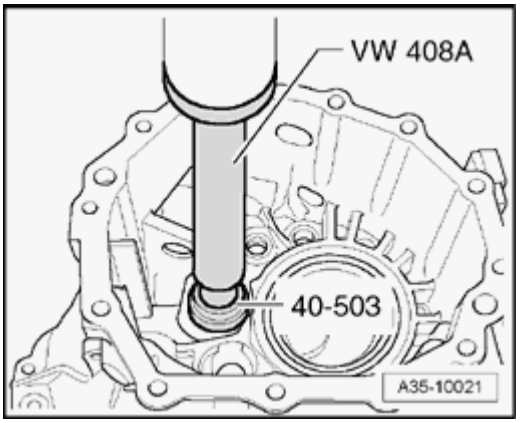


Fig. 340: Pressing In Input Shaft Needle Bearing Until Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure needle bearing after pressing in **Securing input shaft needle bearing**

Securing input shaft needle bearing

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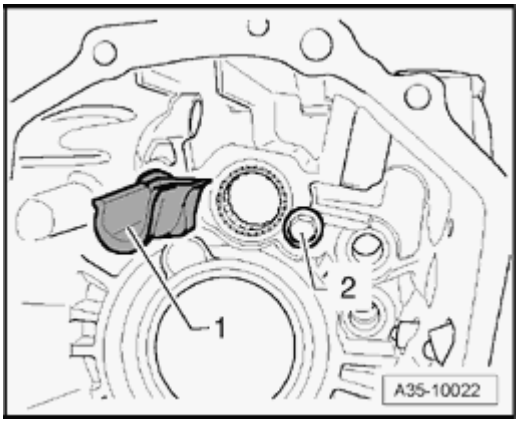


Fig. 341: Securing Input Shaft Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure input shaft needle bearing with bolt - **2** -.
- Insert oil collector - **1** - into transmission housing.

Removing selector shaft ball sleeve

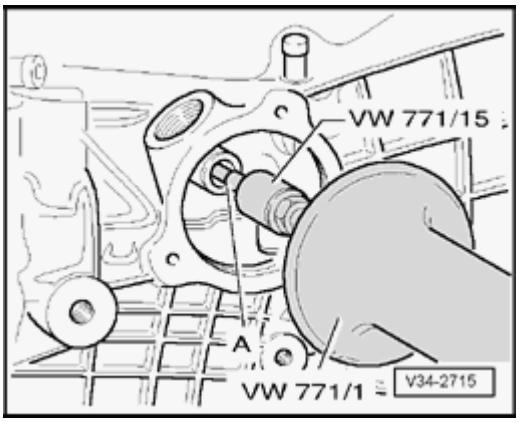


Fig. 342: Pulling Out Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal puller 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving in ball sleeve for selector shaft

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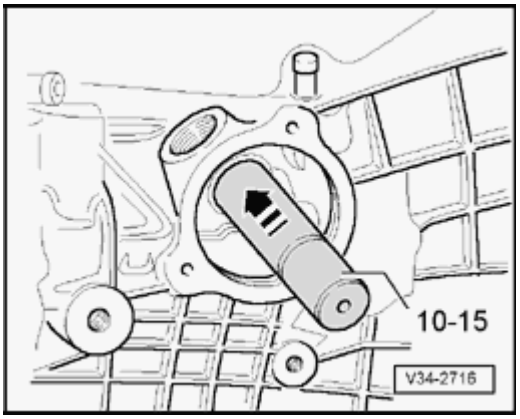


Fig. 343: Driving In Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve so that side with lettering (thicker metal) faces guide pin 10 - 15.

- Drive in ball sleeve until flush.

SELECTOR SHAFT, SERVICING

Selector shaft with transmission installed, removing and installing

Special tools, testers and auxiliary items required

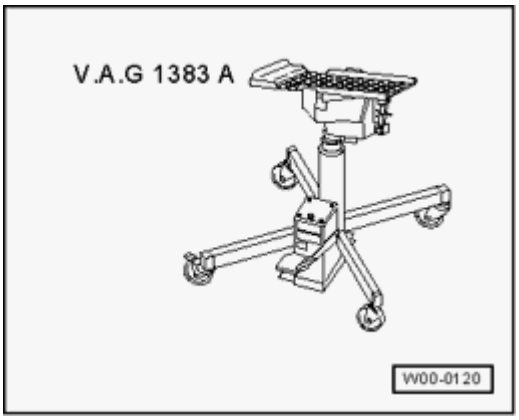


Fig. 344: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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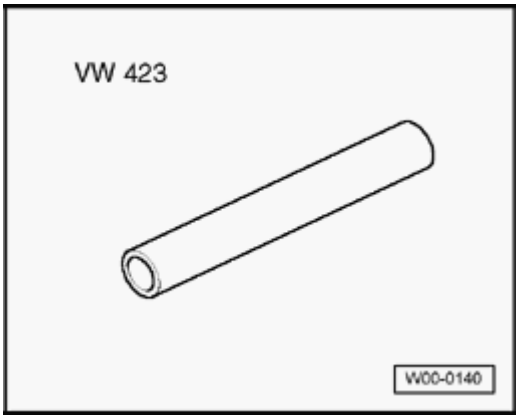


Fig. 345: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW423

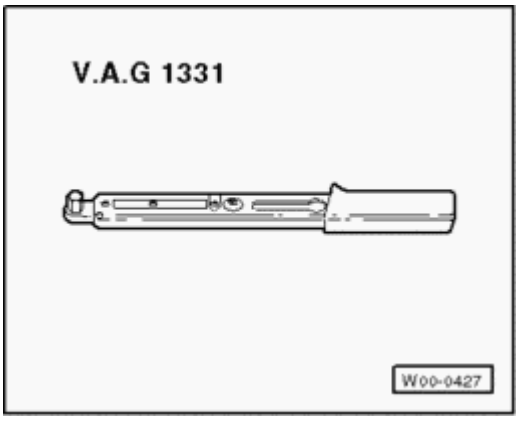
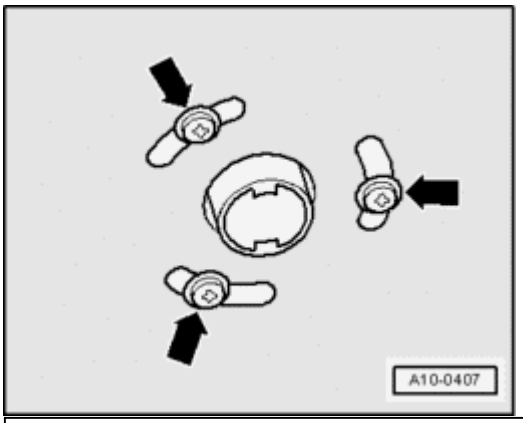


Fig. 346: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331
- **Assembly sleeve 01E 311 120**
- **Locking fluid AMV 185 101 A1**



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Fig. 347: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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

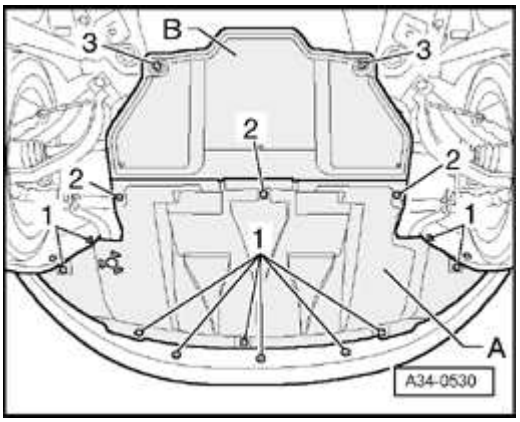


Fig. 348: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

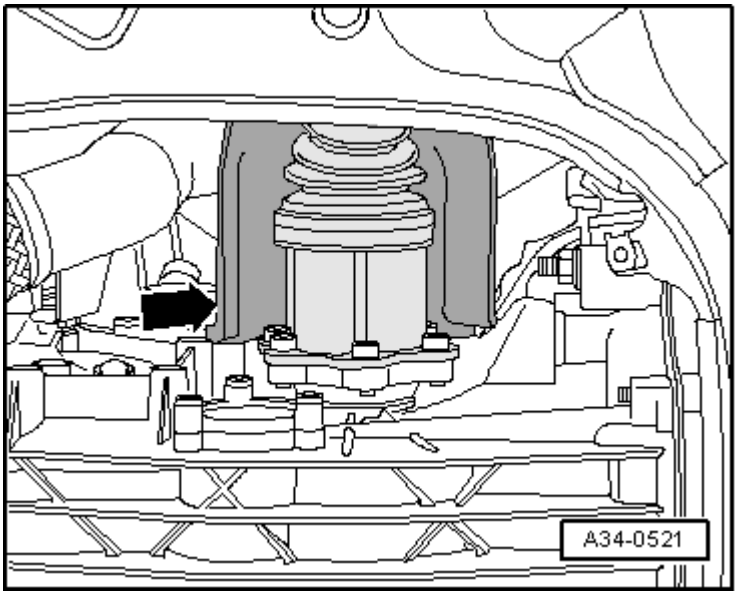


Fig. 349: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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- Remove front exhaust pipe (right side) -->
  - **26 EXHAUST SYSTEM, EMISSION CONTROLS** for AVK
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

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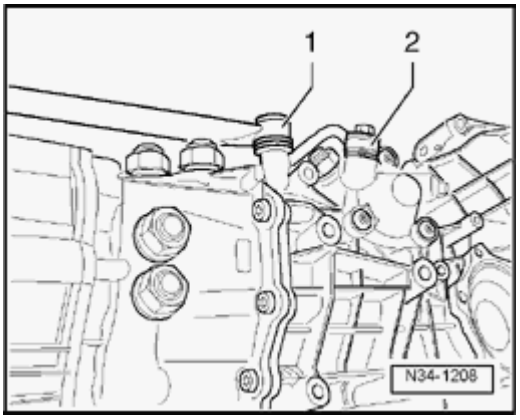


Fig. 350: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove connecting rod - **2** - for selector rod.

NOTE:

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

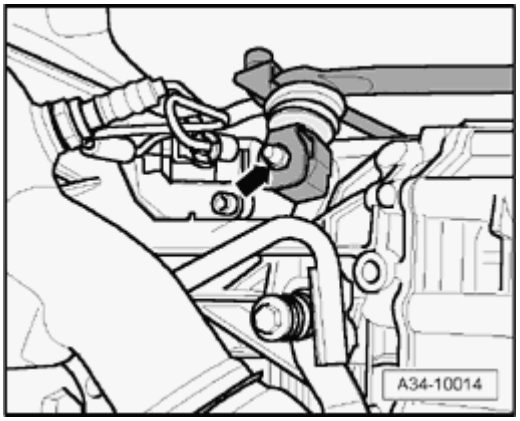


Fig. 351: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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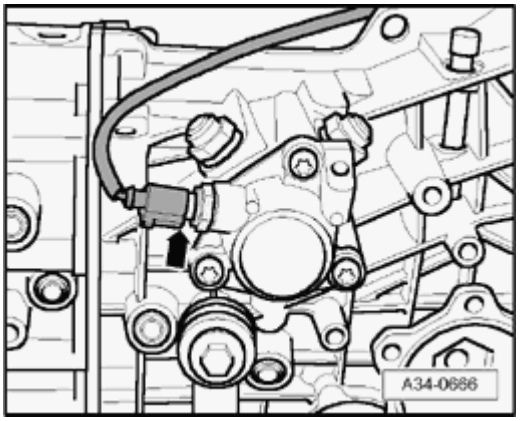


Fig. 352: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - for back-up light switch F4.

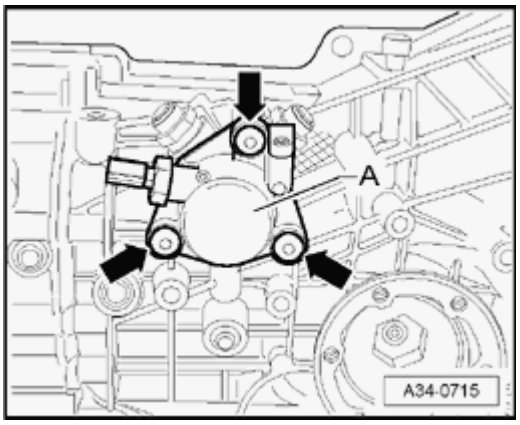


Fig. 353: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts - **arrows** - and selector shaft cover - **A** -.

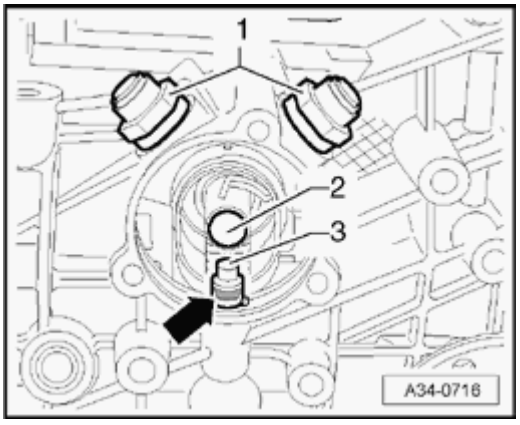


Fig. 354: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove two locking bolts - **1** - for selector shaft.

- Make sure that no gear has been engaged.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously removing pin - **3** -.
- Pull out selector shaft.

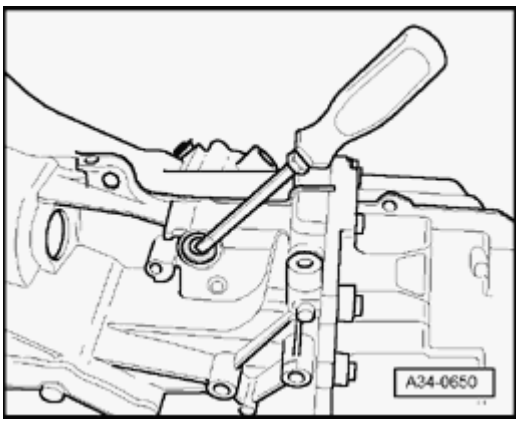


Fig. 355: Prying Out Seal With A Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry out seal with a screwdriver.

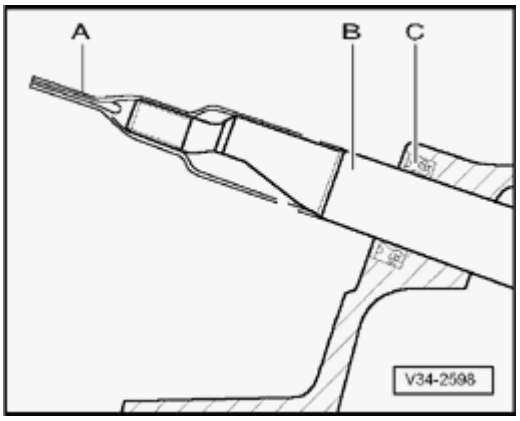


Fig. 356: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

NOTE:

- **replace seals and O-rings.**

- Install selector shaft.

- Installation position: Chamfer of selector shaft - **B** - points downwards.

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NOTE:

- **Ignore - item A - and - item C -.**

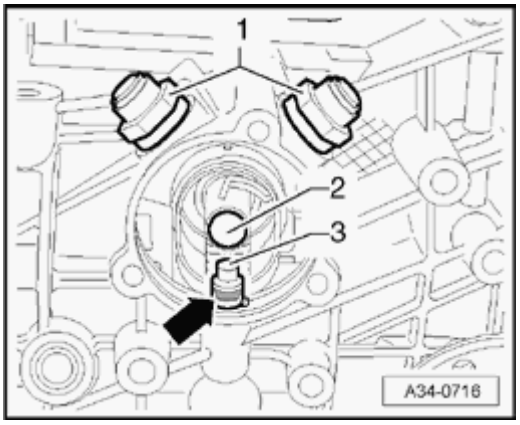


Fig. 357: Selector Shaft Locking Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Push selector shaft - **2** - into transmission as far as it will go, simultaneously inserting pin - **3** -.
- Installation position: groove - **arrow** - on pin - **3** - faces toward selector shaft cover.
- Clean threads of locking bolts - **1** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 45 Nm.

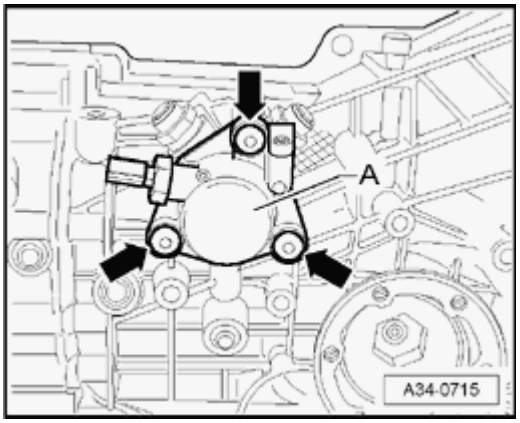


Fig. 358: Selector Shaft Cover Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install cover - **A** - with new O-ring.
- Clean threads of bolts - **arrows** - with a wire brush. Then insert bolts with **locking fluid AMV185101A1** and tighten to 24 Nm.

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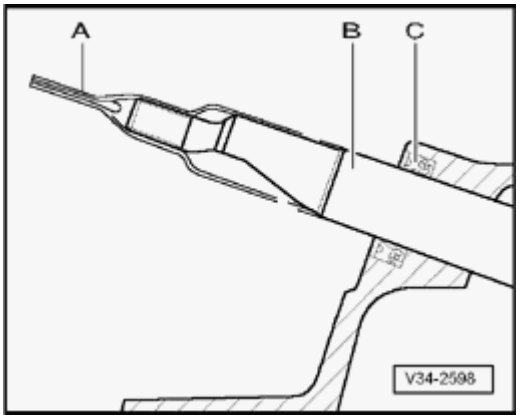


Fig. 359: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Use mounting sleeve 01E311120 - item A - to prevent damaging the seal - C - when installing.**

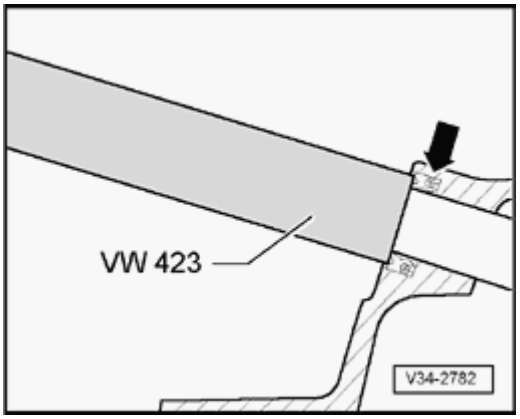


Fig. 360: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil outer circumference of seal - **arrow** -.
- Pack space between sealing lip and dust lip half-full with **sealing grease G052128A1** .
- Drive oil seal - **arrow** - into housing as far as it will go.

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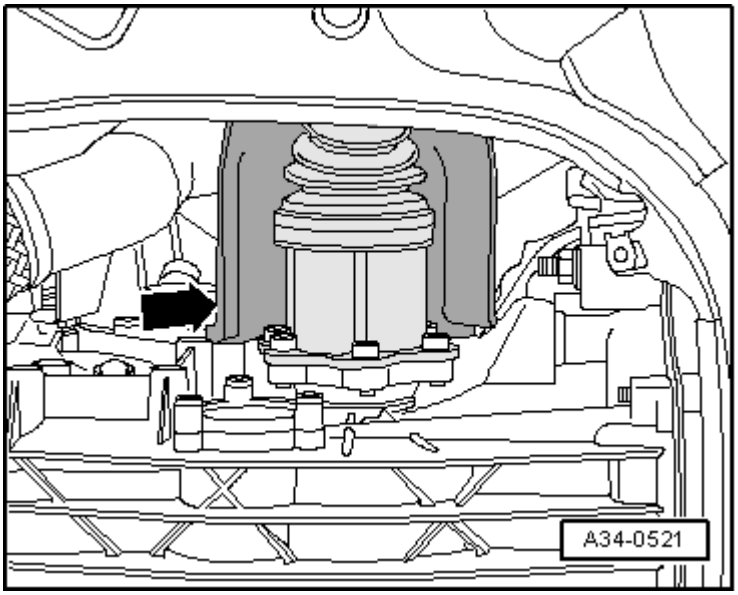


Fig. 361: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install front exhaust pipe align exhaust system so it is free of stress -->
  - **26 EXHAUST SYSTEM, EMISSION CONTROLS** for AVK
  - **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for BPG

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

Tightening torques

Component	Nm
Locking bolts for selector shaft	45
Cover for selector shaft	24
Connecting rod to transmission	23
Selector shaft lever to selector shaft	23
Heat shield for drive axle to transmission	23

Selector shaft oil seal, replacing with transmission removed (transmission remains assembled)

NOTE:

- **Removal is also possible with transmission installed in vehicle --> Selector shaft oil seal, replacing with transmission installed.**

Special tools, testers and auxiliary items required

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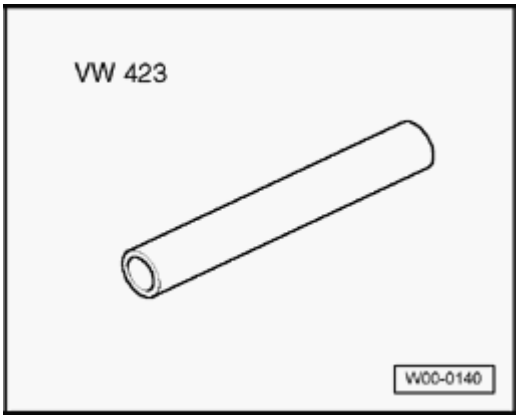


Fig. 362: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW423

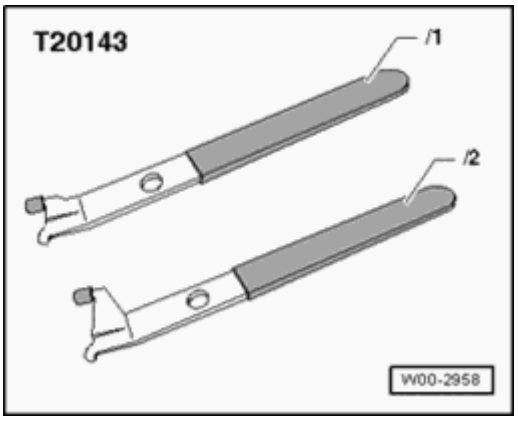
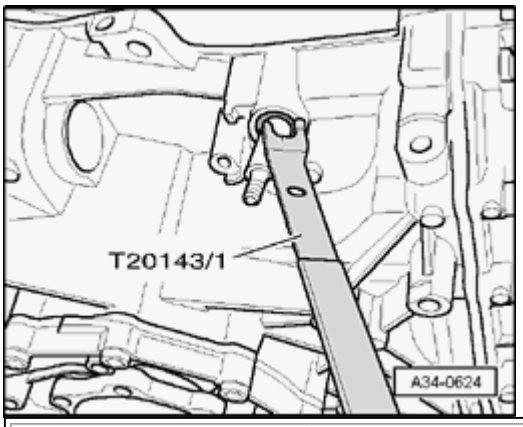


Fig. 363: Identifying Extractor Hook T20143
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor lever T20143/1
- **Assembly sleeve 01E 311 120**
- **Sealing grease G 052 128 A1**



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Fig. 364: Prying Out Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- With selector shaft installed
  - Carefully pry out oil seal, making sure shaft is not damaged.

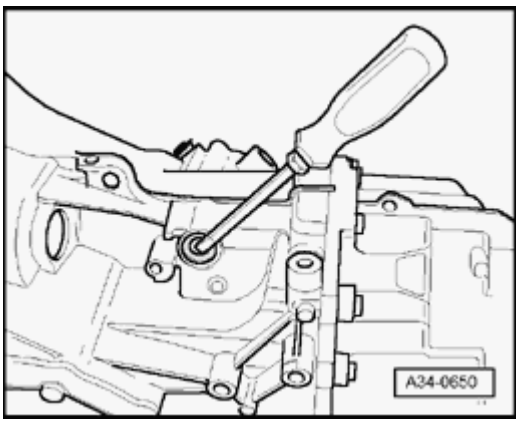


Fig. 365: Prying Out Seal With A Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With selector shaft removed
  - Carefully pry out oil seal using a screwdriver or oil seal extractor lever VW 681.

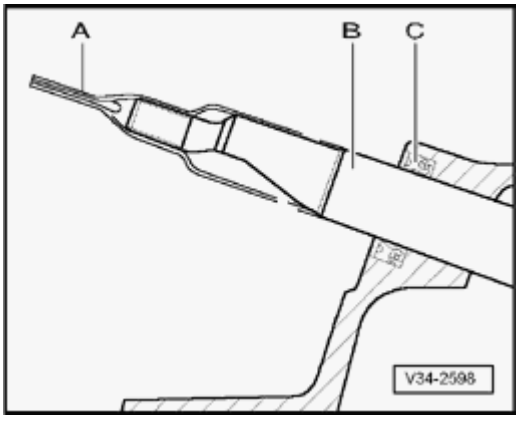


Fig. 366: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

- To avoid damaging oil seal - **C** - , oil seal and selector shaft must only be installed using **assembly sleeve 01E311120** - **A** -.

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- Pack space between sealing lip and dust lip half full with **sealing grease G052128A1** .
- Lightly oil outer circumference of seal.

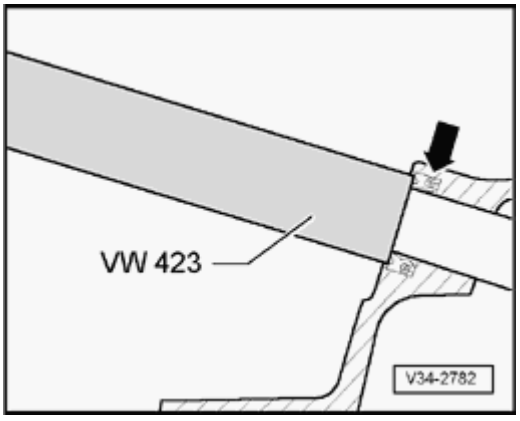


Fig. 367: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive oil seal - **arrow** - into housing as far as it will go.

Selector shaft oil seal, replacing with transmission installed

Special tools, testers and auxiliary items required

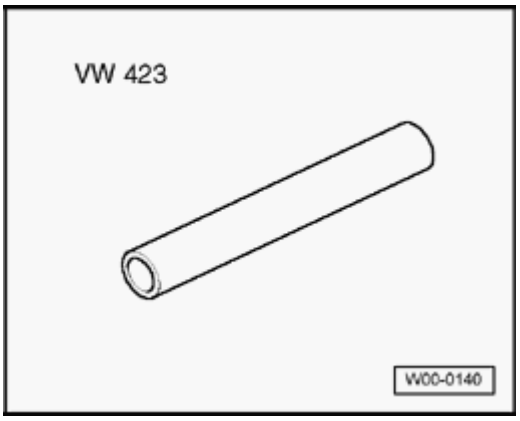


Fig. 368: Identifying Tube VW 423
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tube VW423

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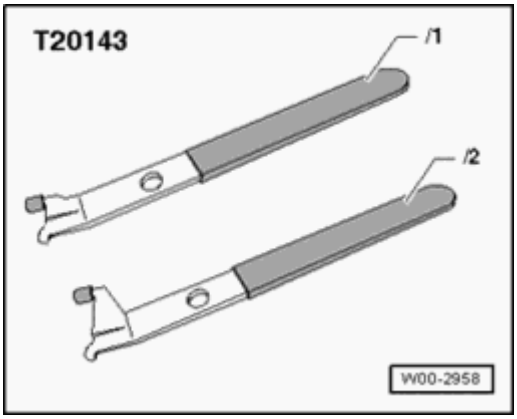


Fig. 369: Identifying Extractor Hook T20143
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extractor lever T20143/1

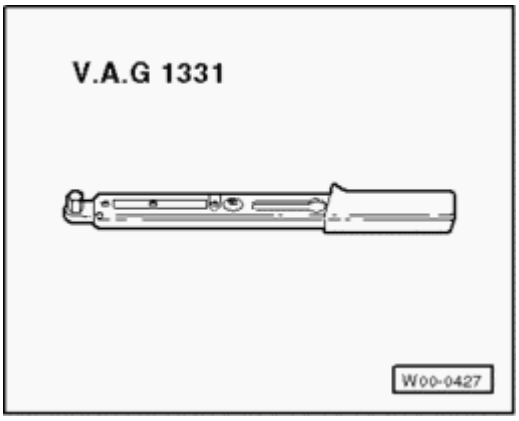
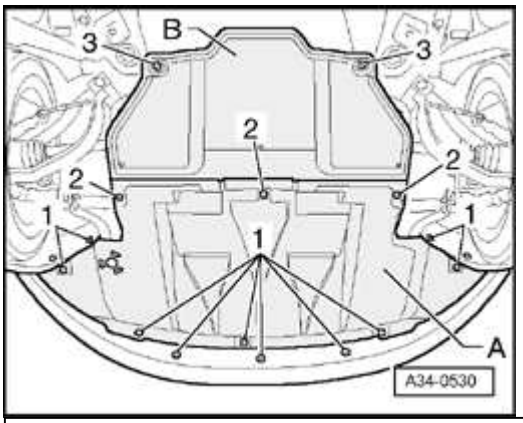


Fig. 370: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331
- **Assembly sleeve 01E 311 120**
- **Sealing grease G 052 128 A1**



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Fig. 371: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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

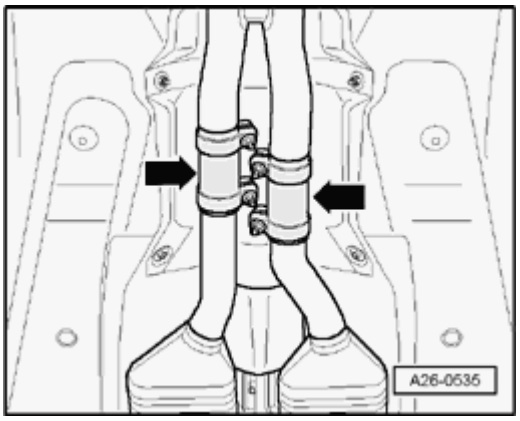


Fig. 372: Exhaust System And Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vehicles with 6-cylinder engine:

- Remove heat shield for drive shaft (left-side).
- Disconnect exhaust system at clamp (left-side) - **left arrow** -.
- Remove front exhaust pipe (left-side) with catalytic converter --> 3.0 Liter 6-Cyl. 5V Engine Mechanical, Engine Code(s): AVK - **26 EXHAUST SYSTEM, EMISSION CONTROLS** .

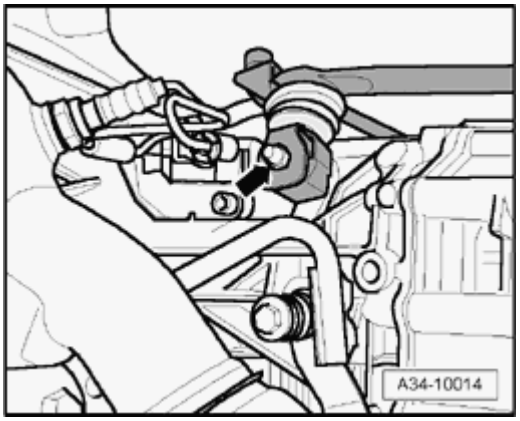


Fig. 373: Selector Shaft Lever Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Continued for all vehicles:

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

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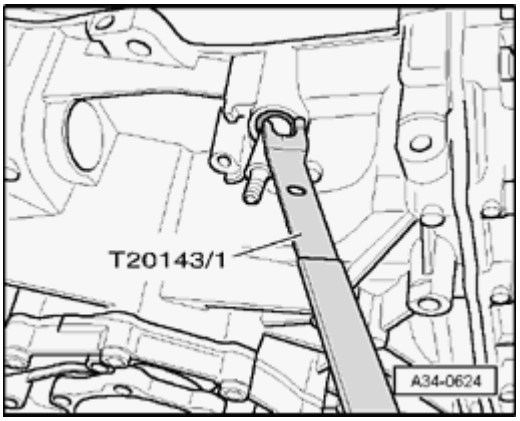


Fig. 374: Prying Out Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry out oil seal, making sure shaft is not damaged.

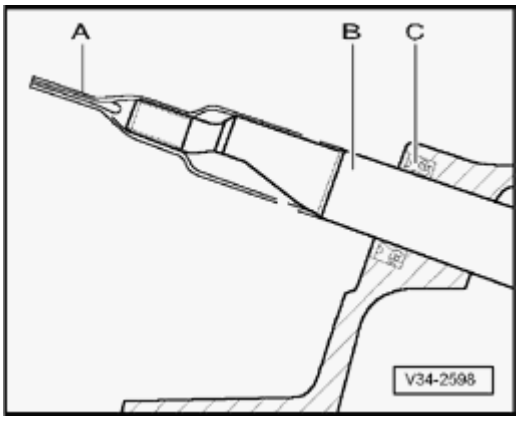


Fig. 375: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

- To avoid damaging oil seal - **C** - , oil seal and selector shaft must only be installed using **assembly sleeve 01E311120** - **A** -.
- Pack space between sealing lip and dust lip half full with **sealing grease G052128A1** .
- Lightly oil outer circumference of seal.

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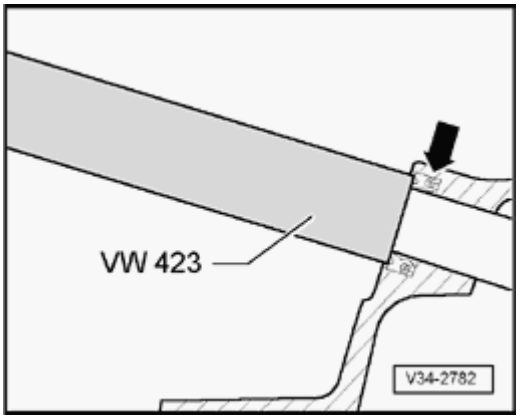


Fig. 376: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive oil seal - **arrow** - into housing as far as it will go.

The remaining installation steps are perform in the reverse sequence. Note the following:

Vehicles with 6-cylinder engine:

- Install front exhaust pipe with catalytic converter and align exhaust system so it is free of stress --> 3.0 Liter 6-Cyl. 5V Engine Mechanical, Engine Code(s): AVK - **26 EXHAUST SYSTEM, EMISSION CONTROLS** .
- Install heat shield for drive axle (left-side).

Continued for all vehicles:

- Check gear oil level in transmission --> **Transmission oil level, checking**.

Tightening torques

Component		Nm
Selector shaft lever to selector shaft		23
Heat shields above drive axles to transmission		23

Back-up light switch F4, removing and installing

Special tools, testers and auxiliary items required

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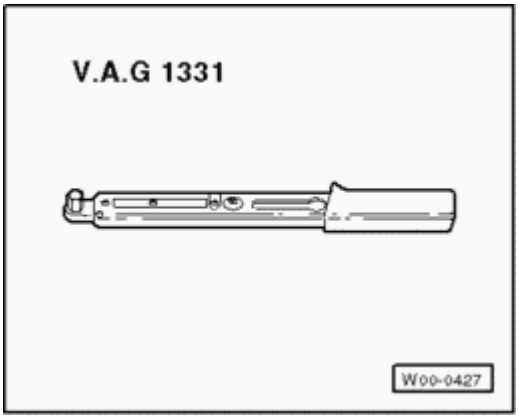


Fig. 377: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Torque wrench V.A.G 1331

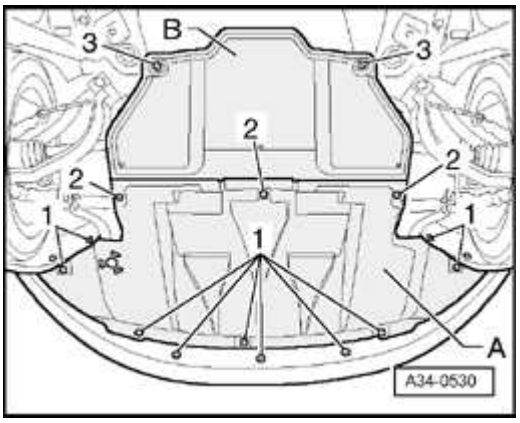
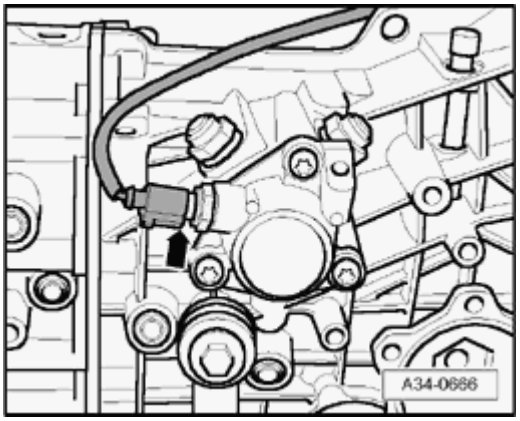


Fig. 378: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

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



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Fig. 379: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - **arrow** - for back-up light switch F4 on transmission (right side).

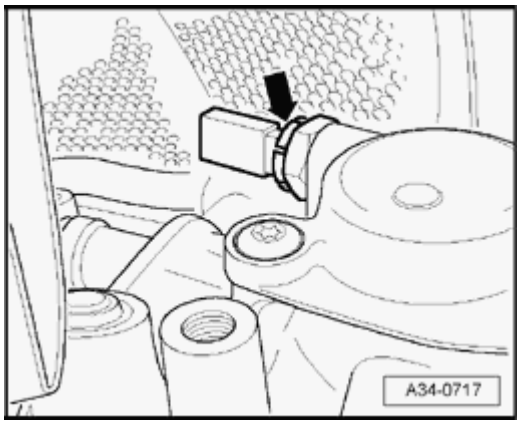


Fig. 380: Removing Back-Up Light Switch F4 From Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove back-up light switch F4 from selector shaft cover - **arrow** -.

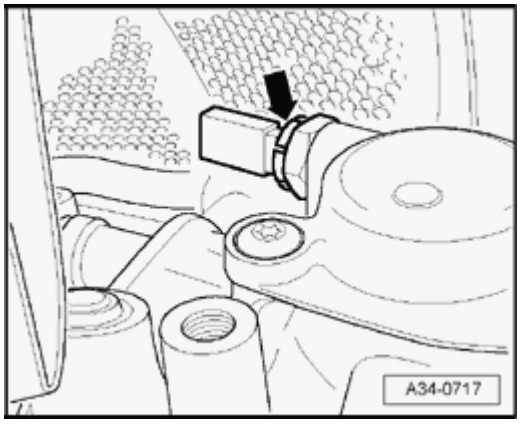


Fig. 381: Removing Back-Up Light Switch F4 From Selector Shaft Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

- Screw back-up light switch F4 into selector shaft cover - **arrow** -.

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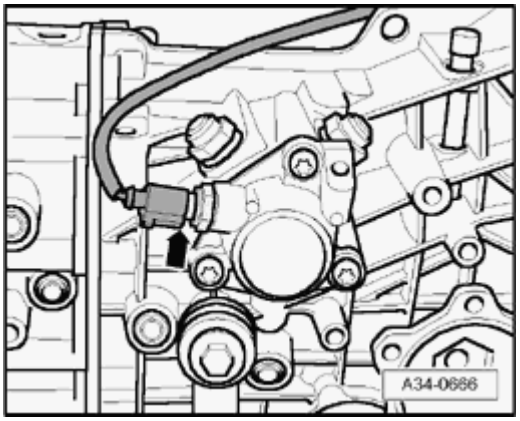


Fig. 382: Back-Up Light Switch F4 Electrical Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach electrical connector - **arrow** - for back-up light switch F4 on transmission (right side).

Component	Nm
Back-up light switch F4	20

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35 GEARS, SHAFTS

INPUT SHAFT, DISASSEMBLING AND ASSEMBLING

Input shaft, assembly overview

NOTE:

- **Refer to technical data when installing new gears --> Code letters, allocation, transmission ratios, capacities.**
- **Lubricate all bearings on input shaft with gear oil before installing.**

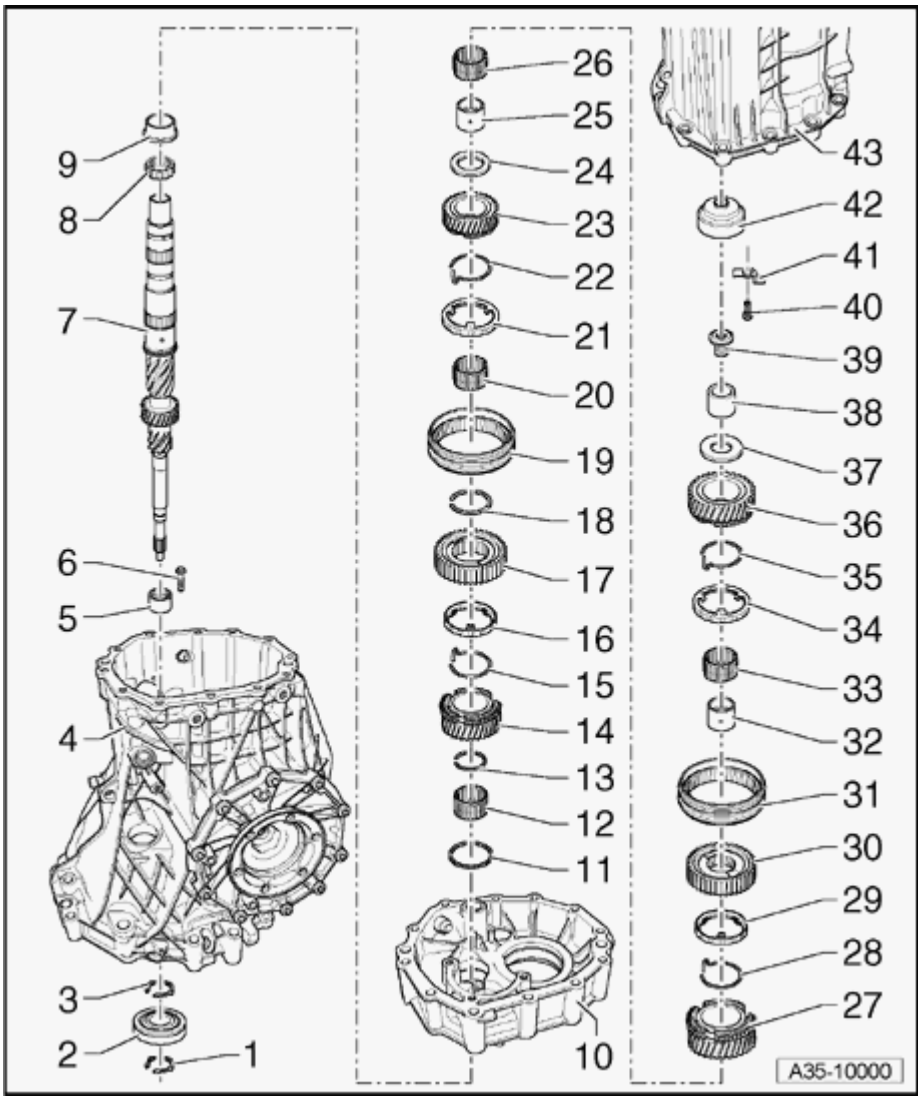


Fig. 383: Input Shaft, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Circlip

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- Mark
- Installation position **Installation position of circlips**, - **item 1** -
- Determining thickness

2 - Ball bearing

- Removing and installing --> **Disassembling and assembling sequence**

3 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 2** -
- Determining thickness

4 - Transmission housing

5 - Needle bearing

- For input shaft

6 - Bolt, 24 Nm

7 - Input shaft

- Adjusting --> **Input shaft, adjusting**

8 - Roller bearing

- Disassembling and assembling **Detaching needle roller bearing from input shaft and installing needle roller bearing onto input shaft**
- Installation position: collar faces splines for 2nd gear

9 - Outer race

- For needle roller bearing

10 - Bearing housing

11 - Thrust washer

- For 3rd speed selector gear

12 - Needle bearing

- For 3rd gear

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13 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 3** -

14 - 3rd speed selector gear

15 - Spring

- Insert in 3rd speed selector gear --> **Inserting spring in selector gear**
- Allocation of spring to selector gear

16 - 3rd gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

17 - Synchronizing hub for 3rd and 4th gear

- Installation position: high inside collar faces 3rd speed selector gear

18 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 4** -
- Re-determining thickness **Determining thickness of circlip for synchronizing hub for 3rd and 4th gear**

19 - Locking collar for 3rd and 4th gear

- Mark position in relation to synchronizing hub prior to removing

20 - Needle bearing

- For 4th gear

21 - 4th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

22 - Spring

- Insert in 4th speed selector gear --> **Inserting spring in selector gear**
- Allocation of spring to selector gear

23 - 4th speed selector gear

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24 - Thrust washer

- For 4th speed and 5th speed selector gears

25 - Needle bearing inner race

- For 5th gear

26 - Needle bearing

- For 5th gear

27 - 5th speed selector gear

28 - Spring

- Insert in 5th speed selector gear --> **Inserting spring in selector gear**
- Allocation of spring to selector gear

29 - 5th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

30 - Synchronizing hub for 5th and 6th gear

31 - Locking collar for 5th and 6th gear

- Mark position in relation to synchronizing hub prior to removing

32 - Needle bearing inner race

- For 6th gear

33 - Needle bearing

- For 6th gear

34 - 6th gear synchro-ring

- Checking for wear **Checking synchro-ring for wear**

35 - Spring

- Insert in 6th speed selector gear **Inserting spring in selector gear**
- Allocation of spring to selector gear

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36 - 6th speed selector gear

37 - Thrust washer

- For 6th speed selector gear

38 - Inner race

39 - Multi-point socket head bolt, 150Nm

40 - Multi-point socket head bolt, 24Nm

41 - Retaining plate

42 - Roller bearing

- Bearing for input shaft in transmission cover
- With lubricating unit
- Always replace

43 - Transmission cover

Input shaft, Disassembling and assembling

NOTE:

- **Removing and installing 3rd to 6th speed selector gears is described in chapter on disassembling and assembling transmission --> Disassembling and assembling sequence.**

Special tools, testers and auxiliary items required

- Feeler gauge

Detaching needle roller bearing from input shaft and installing needle roller bearing onto input shaft

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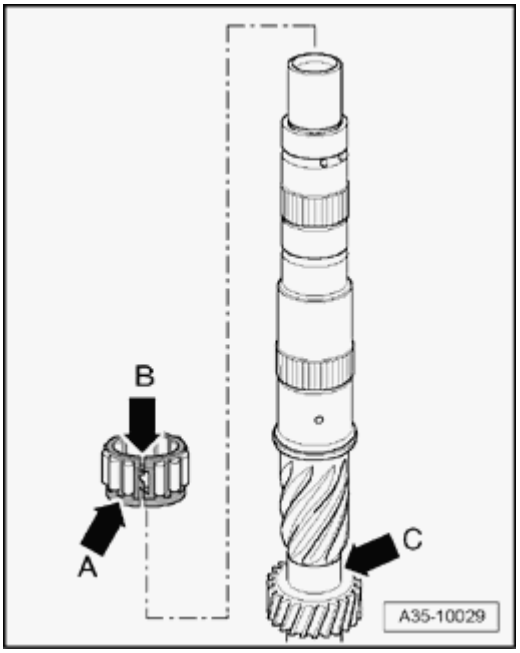


Fig. 384: Detaching Needle Roller Bearing From Input Shaft And Installing Needle Roller Bearing Onto Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

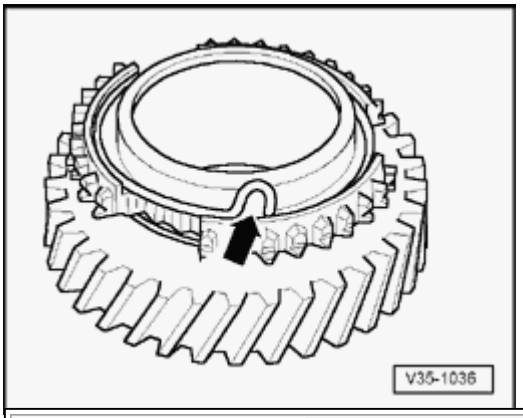
Removing needle roller bearing:

- Bend open needle roller bearing at separating point - **arrow B** - far enough for it to be detached from input shaft (do not bend open more than necessary).

Installing needle roller bearing:

- The shoulder - **arrow A** - faces toward splines for 2nd gear.
- Only bend open needle roller bearing at separating point - **arrow B** - far enough for it to be guided over input shaft and onto its seat - **arrow C** -.

Inserting spring in selector gear



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Fig. 385: Inserting Spring Into Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The bent end of spring - **arrow** - must be hooked into hole in selector gear.

Checking synchro-ring for wear

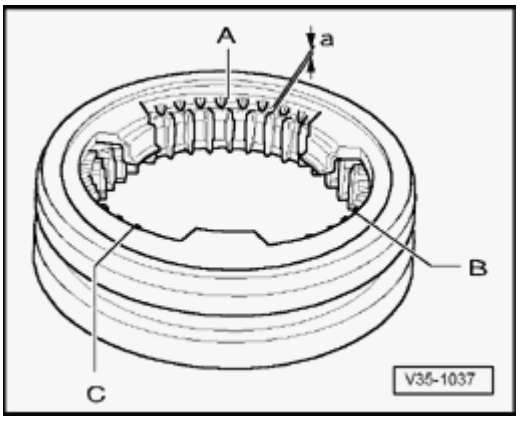


Fig. 386: Checking Synchronizer For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchro-ring into locking collar and measure gap - **a** - at positions - **A** - , - **B** - and - **C** - using feeler gauge.
- Add measured values and divide by 3.

- The determined value should not exceed 0.45 mm.

Installation position of circlips

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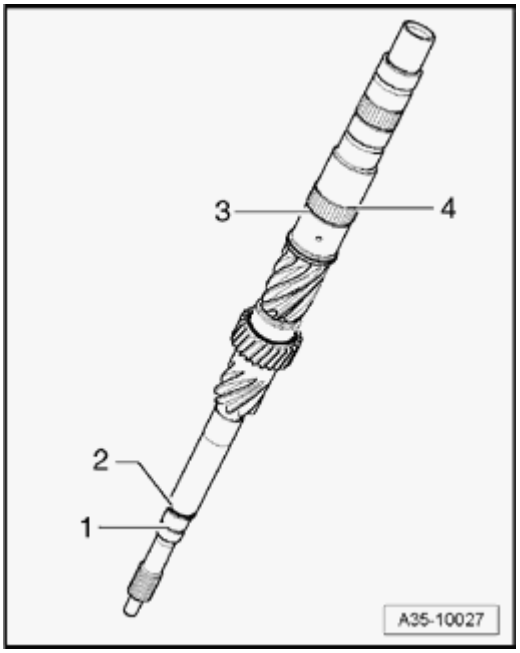


Fig. 387: Installation Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The circlips - **1** - and - **2** - secure input shaft ball bearing.

Determining thickness --> **Determining circlips for input shaft ball bearing**.

- The circlip - **3** - secures needle bearing for 3rd speed selector gear and 3rd and 4th gear synchronizing hub.

Thickness: 2.00 mm.

- The circlip - **4** - secures 3rd and 4th gear synchronizing hub.

Determining thickness **Determining thickness of circlip for synchronizing hub for 3rd and 4th gear**.

Determining thickness of circlip for synchronizing hub for 3rd and 4th gear

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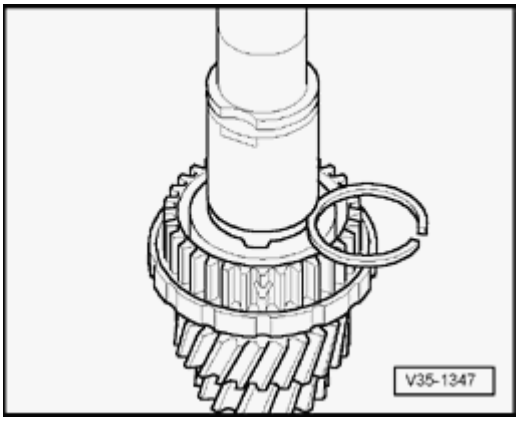


Fig. 388: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchronizing hub onto stop.
  - Determine thickest circlip that will just fit and install it. For Part No.

The following circlips are available:

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

INPUT SHAFT, ADJUSTING

Determining circlips for input shaft ball bearing

It is necessary to readjust input shaft when:

- Transmission housing

or the

- Input shaft

are replaced.

Special tools, testers and auxiliary items required

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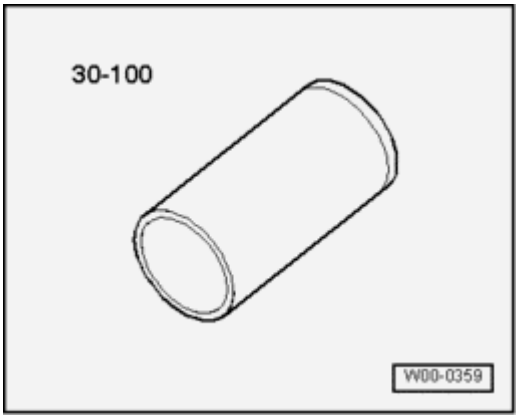


Fig. 389: Press Tube 30-100Identifying Special Tools - Oil Pump/Front Sealing Flange, Drive Chain And Chain Sprocket For Oil Pump, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drift sleeve 30 - 100

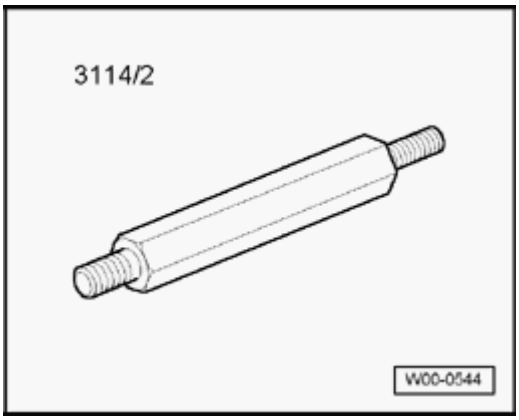


Fig. 390: 3114/2 Straightening Tool
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Door hinge alignment tool (M8 and M10) 3114/2

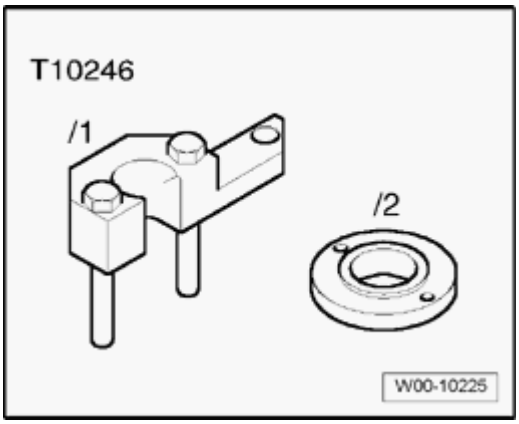


Fig. 391: Fitting Tool T10246

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fitting tool T10246
- Digital depth gauge e.g. VAS 6087

Determining thickness for circlip behind input shaft ball bearing

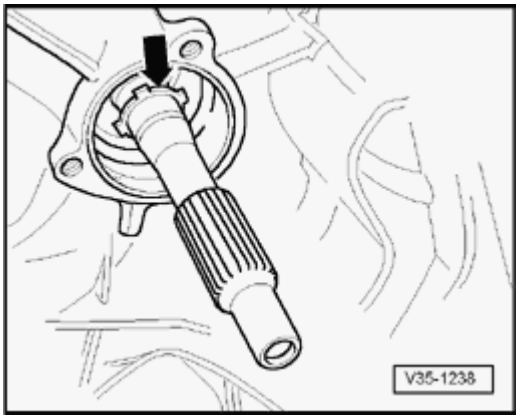


Fig. 392: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install provisional circlip - **arrow** - in rear groove on input shaft.
- Push ball bearing onto input shaft.

Installation position:

The sealed side of ball cage faces transmission housing.

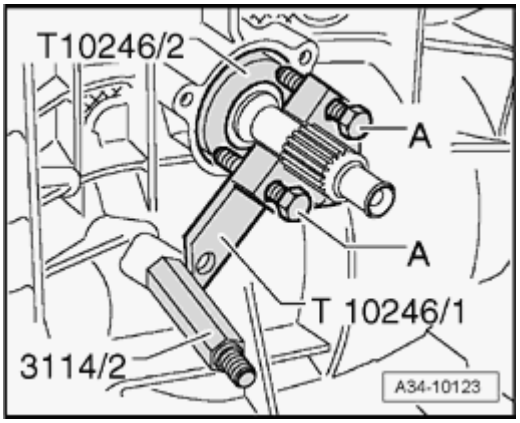


Fig. 393: Pressing In Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing in ball bearing:

Screw pin (M8 and M10) 3114/2 into tapped hole for ball head stud.

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Slide thrust plate T10246/2 onto input shaft.

Position fitting tool T10246/1 behind splines for clutch plate. Tighten bolts - **a** - only slightly. The bolts locate in recesses in thrust plate T10246/2.

Press in ball bearing onto stop by tightening bolts alternately (1/2 turn at a time).

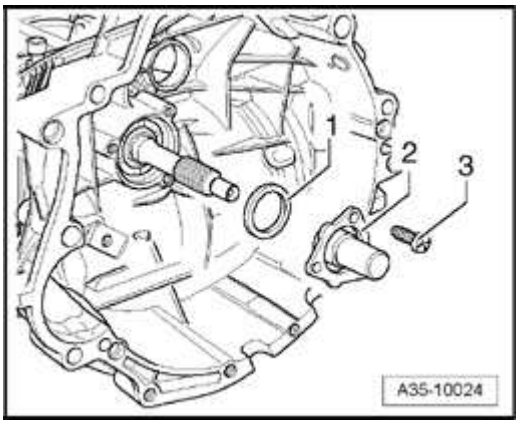


Fig. 394: Dished Spring, Guide Sleeve And Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install dished spring - **1** -.

Installation position:

The convex side faces guide sleeve - **2** -.

- Install a shrink hose onto input shaft splines.
- Bolt guide sleeve to transmission housing - **2** - with bolts - **3** -.
- Turn transmission housing so joint flange for bearing housing points upward.

- The contact surface must be cleaned to remove **sealing paste** .

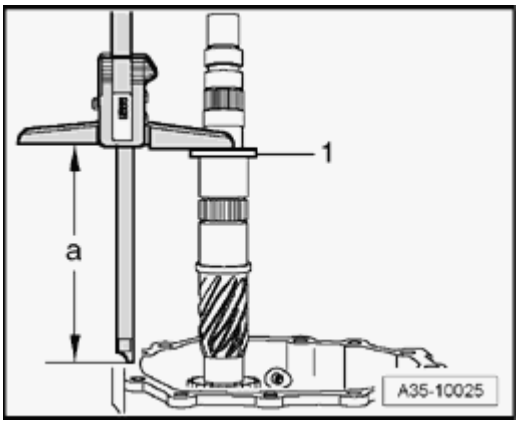


Fig. 395: Measuring From Thrust Washer To Contact Surface Of Housing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place thrust washer - **1** - for 4th and 5th speed selector gears onto input shaft.
- Place a digital depth gauge (e. g. VAS 6087) onto thrust washer and measure distance to contact surface of housing. The measuring point on housing contact surface must be as close to input shaft as possible.

NOTE:

- **When measuring, lift the input shaft with e.g. support bridge 30-211A or the help of a second mechanic until the play in the ball bearing is taken up.**

Specification: distance "a" = 164.14 mm

NOTE:

- **If the measured value exceeds the specification, use a thinner circlip than the circlip installed so that the specification is attained.**
- **If the measured value is below the specification, use a thicker circlip than the circlip installed so that the specification is attained.**
- **Determine the circlip thickness to meet the specification as exactly as possible (164.14 mm).**

The following circlips are available:

Circlip thickness (mm)		
1.54	2.08	2.62
1.63	2.17	2.71
1.72	2.26	2.80
1.81	2.35	2.89
1.90	2.44	
1.99	2.53	

- Select circlip from table.

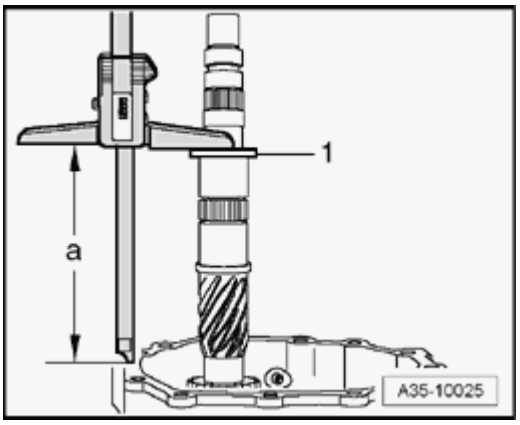


Fig. 396: Measuring From Thrust Washer To Contact Surface Of Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Checking adjustment and checking distance "a"

- Determined circlip is installed.

The distance "a" should be 164.14mm +- 0.04 mm if the correct circlip has been selected.

Determining thickness for circlip in front of the input shaft ball bearing

- Drive rear circlip (as determined) and ball bearing onto input shaft using drift sleeve 30 - 100.

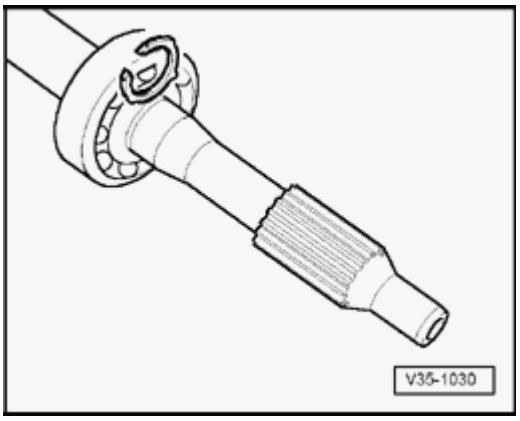


Fig. 397: Input Shaft And Thickest Circlip Which Can Still Just Be Installed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine thickest circlip which will still fit.
- Refer to table **The following circlips are available:** to determine correct circlip.

PINION SHAFT (OUTPUT SHAFT)

Pinion shaft, assembly overview

NOTE:

- **Refer to technical data --> Code letters, allocation, transmission ratios, capacities when installing new gear wheels or the final drive gear set.**
- **Refer to technical data when installing new gear wheels**
- **Lubricate all needle bearings on output shaft with gear oil before installing.**
- **Adjustment work is required when replacing the parts marked with 1) . Table of adjustments --> Table of adjustments**

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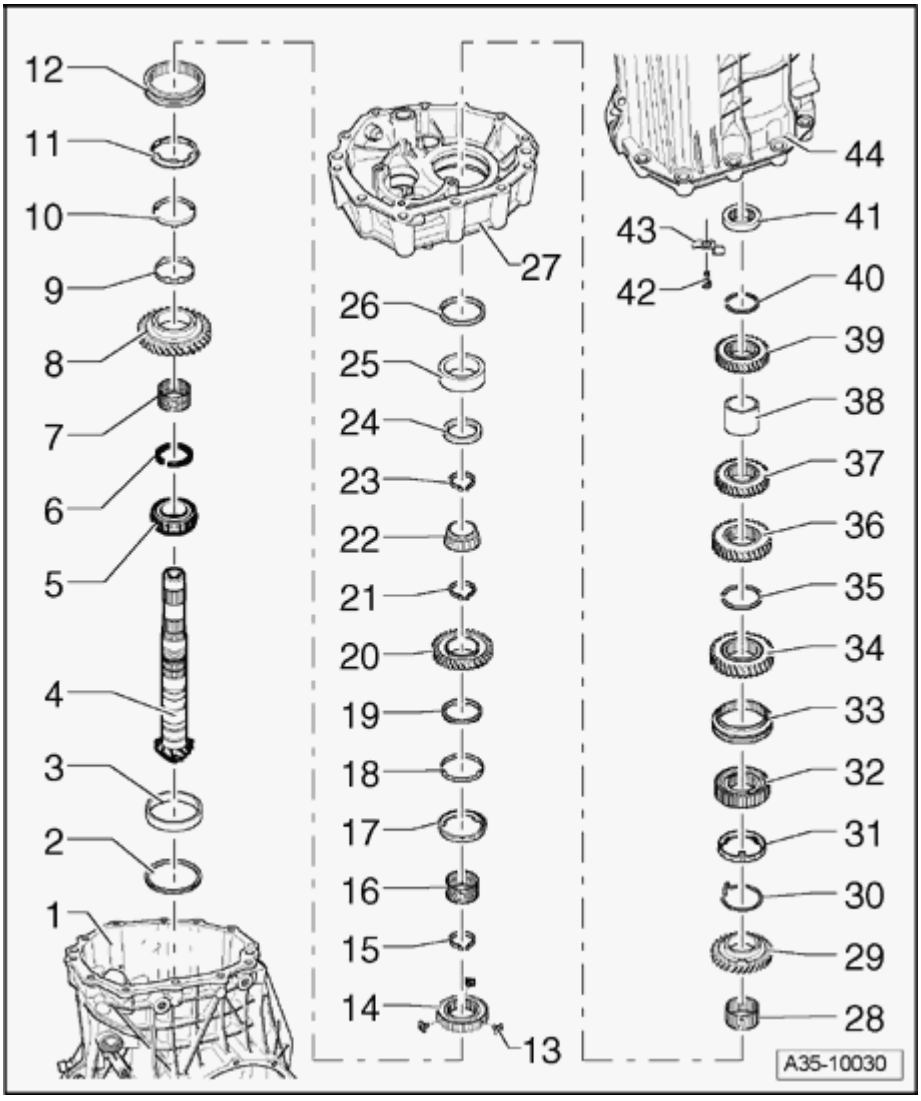


Fig. 398: Pinion Shaft, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing [1)]

- Servicing --> **Transmission housing, servicing**

2 - Shim "S3"

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

3 - Tapered roller bearing outer race [1)]

- Pulling out **Pulling tapered roller bearing outer race out of transmission housing**
- Pressing in **Heating transmission housing in order to install tapered roller bearing outer race** and **Pressing tapered roller bearing outer race into transmission housing**

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4 - Pinion shaft (output shaft) [1)]

- Is mated with crown wheel, always replace together as a set
- Adjusting crown wheel and pinion shaft --> --> **Pinion shaft and crown wheel, adjusting**

5 - Tapered roller bearing inner race[1)]

- Will be damaged during removal
- Replace
- Pressing off **Pressing off tapered roller bearing inner race**
- Pressing on **Pressing on tapered roller bearing inner race**

6 - Circlip

- Re-determine thickness if taper roller bearing is replaced **Determining thickness of circlip**

7 - Needle bearing

- For 1st gear

8 - 1st speed selector gear

- Check axial clearance after installing using feeler gauge **Checking axial play of 1st speed selector gear** (0.20 to 0.50 mm)

9 - Inner ring for 1st gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st gear inner ring for wear**
- Replace if scored or if there are visible traces of wear

10 - Intermediate ring for 1st gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**

11 - Synchro-ring for 1st gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**
- Replace if scored or if there are visible traces of wear

12 - Locking collar for 1st and 2nd gear

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- Mark position in relation to synchronizing hub prior to removing
- Assembling locking collar/synchronizing hub **Assembling 1st and 2nd gear locking collar/synchronizing hub**

13 - Locking piece

- Install locking pieces (3 Qty.) **Assembling 1st and 2nd gear locking collar/synchronizing hub**

14 - Synchronizing hub for 1st and 2nd gear

- Installation position: high inside collar faces 2nd speed selector gear
- Pressing off **Pressing off 1st and 2nd gear synchronizing hub**
- Pressing on **Pressing on 1st and 2nd gear synchronizing hub**
- Assembling locking collar/synchronizing hub **Assembling 1st and 2nd gear locking collar/synchronizing hub**

15 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 1** -
- Re-determine thickness when replacing 1st and 2nd gear synchronizing hub or pinion shaft **Determining thickness of circlip**

16 - Needle bearing

- For 2nd gear

17 - Synchro-ring for 2nd gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**
- Replace if scored or if there are visible traces of wear

18 - Intermediate ring for 2nd gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**

19 - Inner ring for 2nd gear

- Installation position **Installation position of synchronizing rings for 1st and 2nd gear:**
- Checking for wear **Checking 1st and 2nd gear intermediate ring for wear**
- Replace if scored or if there are visible traces of wear

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20 - 2nd speed selector gear

- Check axial clearance after installing using feeler gauge **Checking axial play of 2nd speed selector gear** (0.20 to 0.50 mm)

21 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 2** -

22 - Tapered roller bearing inner race[1)]

- Pressing off **Pressing off tapered roller bearing inner race with 2nd speed selector gear**
- Pressing on **Pressing on tapered roller bearing inner race**

23 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 3** -

24 - Thrust washer

- For reverse selector gear
- Pressing off **Pressing off thrust washer for reverse selector gear**
- Pressing on **Pressing on thrust washer for reverse selector gear**

25 - Tapered roller bearing outer race [1)]

- Pulling out **Pulling tapered roller bearing outer race out of bearing housing**
- Pressing in **Pressing tapered roller bearing outer race into bearing housing**

26 - Shim "S_4 "

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

27 - Bearing housing [1)]

28 - Needle bearing

- For reverse selector gear

29 - Reverse selector gear

- Check axial clearance after installing using feeler gauge (0.20 to 0.50 mm)

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30 - Spring

- Insert into reverse selector gear **Inserting spring in selector gear**
- Allocation of spring to selector gear

31 - Synchronizing ring for reverse gear

- Checking for wear **Checking synchro-ring for wear**

32 - Reverse gear synchronizing hub

- Installation position: high inside collar faces 3rd gear wheel

33 - Reverse gear locking collar

- Mark position in relation to synchronizing hub prior to removing
- Installation position: taper faces reverse gear synchro-ring

34 - 3rd gear wheel

- Installation position: machined side faces reverse gear synchronizing hub

35 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 4** -
- Re-determine thickness when replacing 3rd gear wheel, reverse gear synchronizing hub or pinion shaft **Determining thickness of circlip**

36 - 4th gear wheel

- Installation position: high inside collar faces 5th gear wheel

37 - 5th gear wheel

- Installation position: high inside collar faces 4th gear wheel

38 - Spacer sleeve

39 - 6th gear wheel

40 - Circlip

- Mark
- Installation position **Installation position of circlips**, - **item 5** -

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- Re-determine thickness when replacing gear wheels for 4th to 6th gear, the spacer sleeve or pinion shaft **Determining thickness of circlip**

41 - Needle bearing

- Bearing for pinion shaft in transmission cover

42 - Multi-point socket head bolt, 24Nm

43 - Retaining plate

44 - Transmission cover

Inserting spring in selector gear

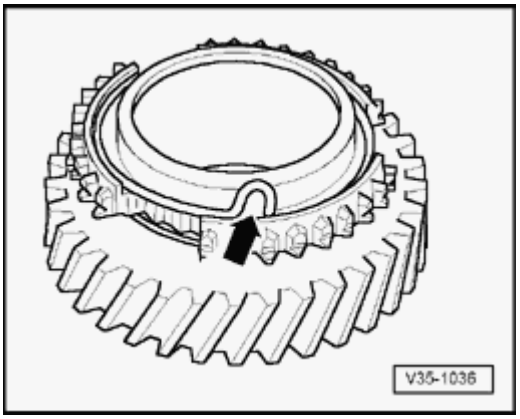


Fig. 399: Inserting Spring Into Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The bent end of spring - **arrow** - must be hooked into hole in selector gear.

Checking synchro-ring for wear

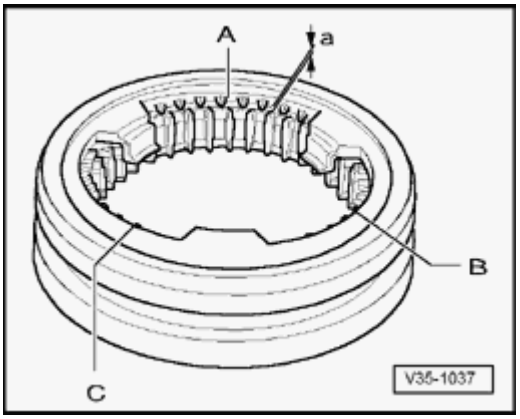


Fig. 400: Checking Synchronizer For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Press synchro-ring into locking collar and measure gap - **a** - at positions - **A** - , - **B** - and - **C** - using feeler gauge.
- Add measured values and divide by 3.

The determined value should not exceed 0.45 mm.

Pinion shaft, disassembling and assembling

NOTE:

- **Removing and installing gear wheels for 3rd to 6th gear and reverse selector gear is described in chapter on disassembling and assembling transmission --> Disassembling and assembling sequence.**

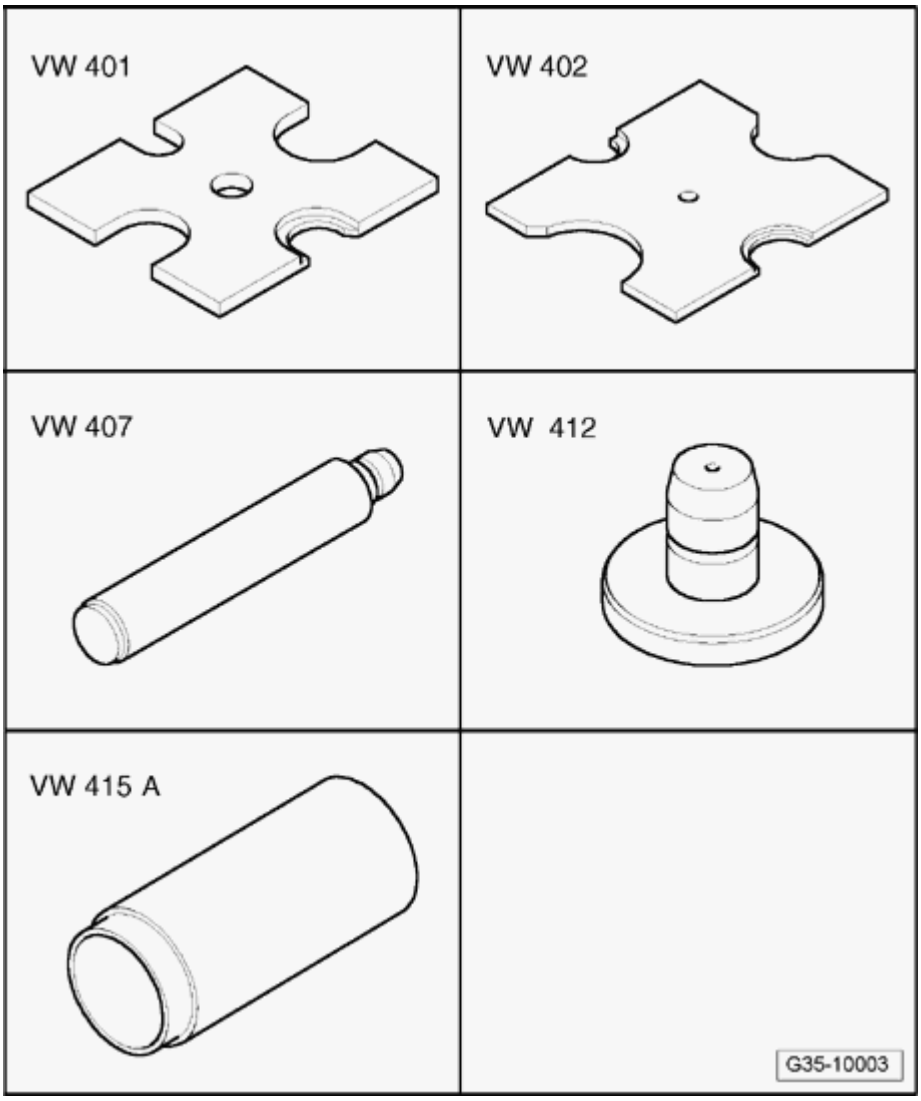


Fig. 401: Identifying Special Tools - Pinion Shaft, Disassembling And Assembling (1 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Special tools, testers and auxiliary items required

- Thrust plate VW 401
- Thrust plate VW 402
- Press tool VW 407
- Thrust disc VW 412
- Tube VW 415 A

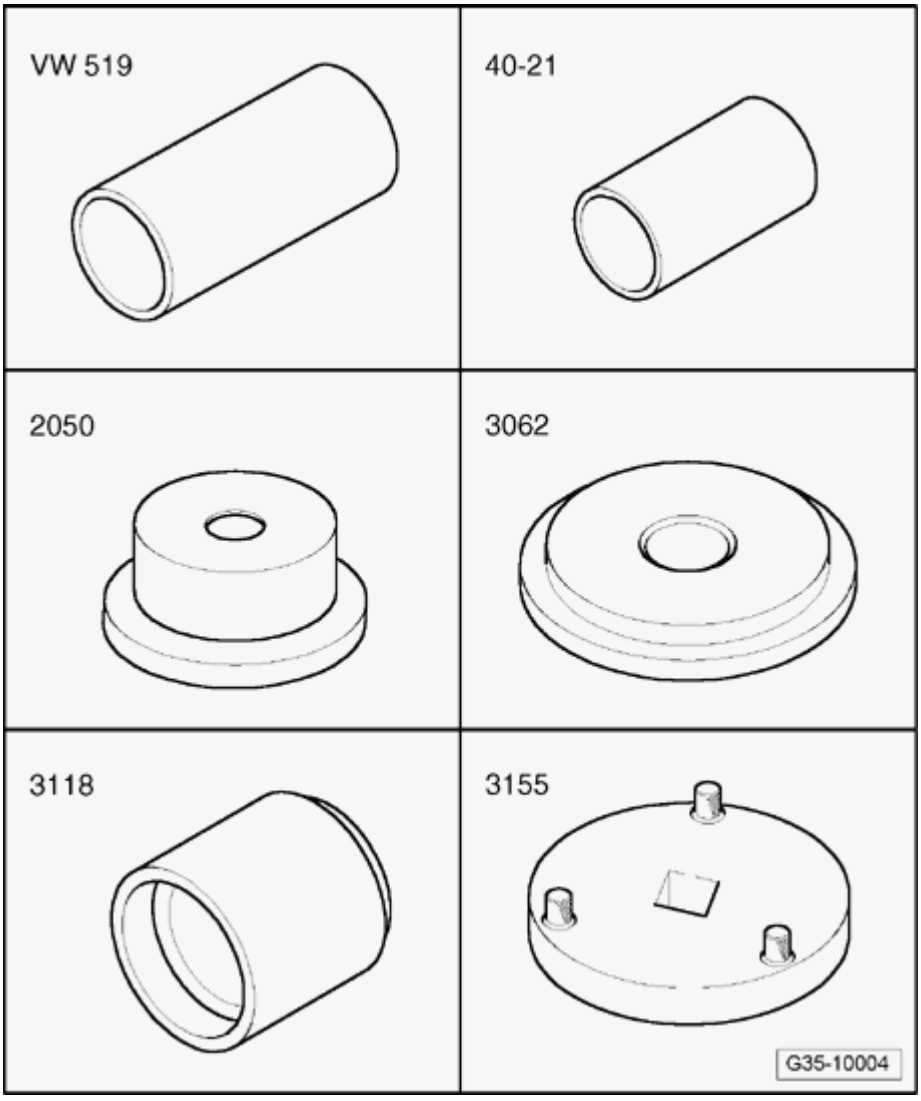


Fig. 402: Identifying Special Tools - Pinion Shaft, Disassembling And Assembling (2 Of 3)
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Special tools, testers and auxiliary items required

- Tube VW 519

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- Press tool 40 - 21
- Thrust piece 2050
- Thrust pad 3062

- Press tool 3118
- Slotted nut wrench 3155

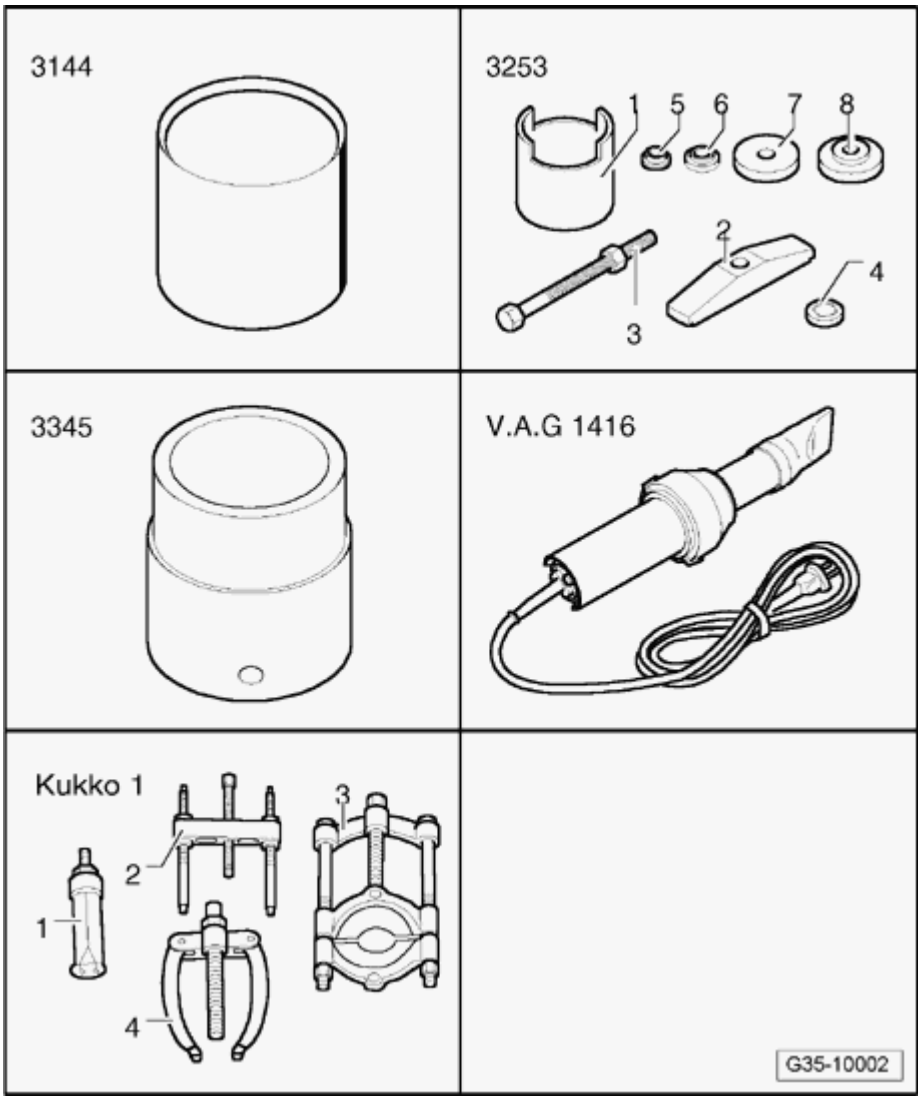


Fig. 403: Identifying Special Tools - Pinion Shaft, Disassembling And Assembling (3 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Press support-RI wheel brgs. 3144
- Assembly tool 3253
- Tube for wheel bearing 3345

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- Hot air blower V.A.G 1416

- **- 1 -** Internal puller Kukko 21/8
- **- 3 -** Splitter Kukko 17/2
- **- 4 -** Counter-support Kukko 22/2
- Feeler gauge

Pulling tapered roller bearing outer race out of transmission housing

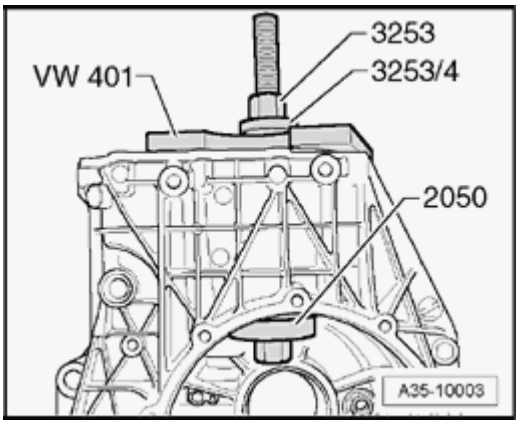


Fig. 404: Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Removing differential --> **Differential, removing and installing**.
- Install thrust piece 2050 with large diameter pointing toward outer race.
- Install threaded spindle and thrust pad of assembly tool 3253 with thrust plate VW 401 onto transmission housing.

The outer race will be pulled out of transmission housing when nut is tightened.

Heating transmission housing in order to install tapered roller bearing outer race

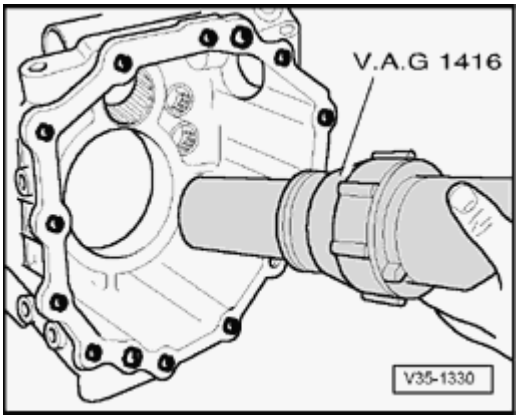


Fig. 405: Heating Transmission Housing To Insert Outer Race Of Large Taper Roller Bearing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat transmission housing in area of bearing seat for approx. 15 minutes, to approx. 100° C, with hot air blower V.A.G 1416.

Pressing tapered roller bearing outer race into transmission housing

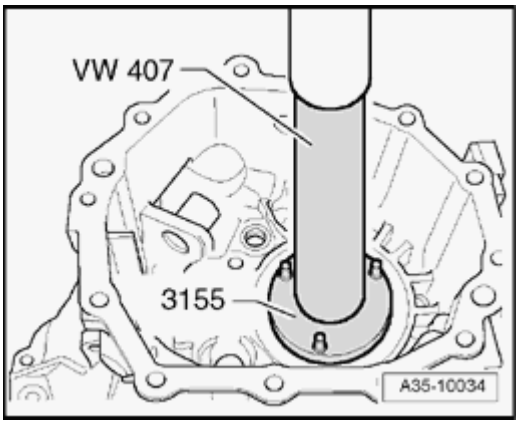


Fig. 406: Pressing Tapered Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert outer race only after heating transmission housing and push into position under Workshop press until heat exchange has taken place.

Pulling tapered roller bearing outer race out of bearing housing

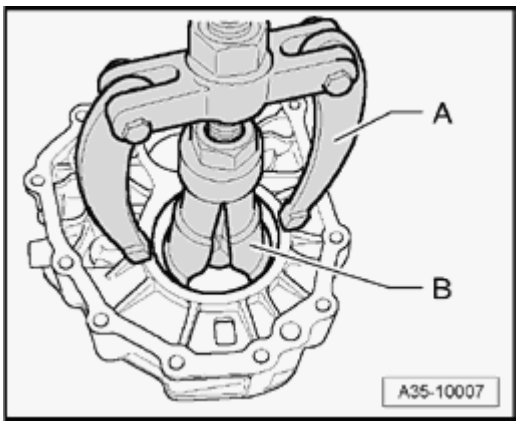


Fig. 407: Pulling Tapered Roller Bearing Outer Race Out Of Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Pressing tapered roller bearing outer race into bearing housing

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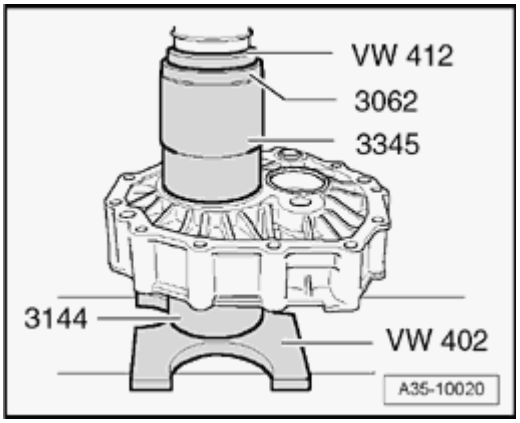


Fig. 408: Pressing In Tapered Roller Bearing Outer Race For Pinion Shaft With Shim Into Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Support bearing housing with press support-RI wheel brgs. 3144 directly below bearing mounting.

- Press in outer race until limit stop.

Pressing off thrust washer for reverse selector gear

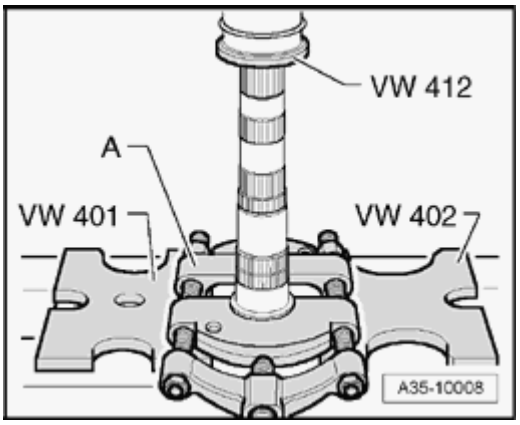


Fig. 409: Pressing Off Thrust Washer For Reverse Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Splitter 22 to 115 mm, e.g. Kukko 17/2

NOTE:

- **Install splitter - A - below thrust washer, and not below circlip.**

- Remove circlip below thrust washer.

Pressing off tapered roller bearing inner race with 2nd speed selector gear

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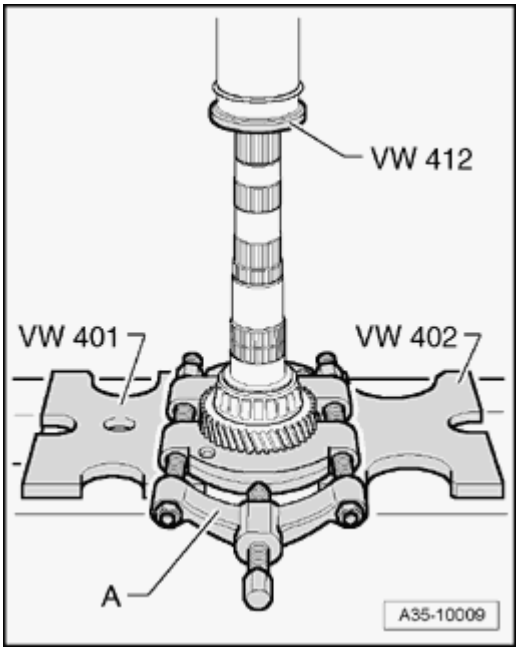


Fig. 410: Pressing Off Tapered Roller Bearing Inner Race With 2Nd Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Splitter 22 to 115 mm, e.g. Kukko 17/2

CAUTION: When pressing off, make sure that only the gear teeth of the selector gear and not the gear shift splines contact the splitter - A -. Otherwise the gear shift splines will be damaged.

- Remove circlip for tapered roller bearing inner race.

Pressing off 1st and 2nd gear synchronizing hub

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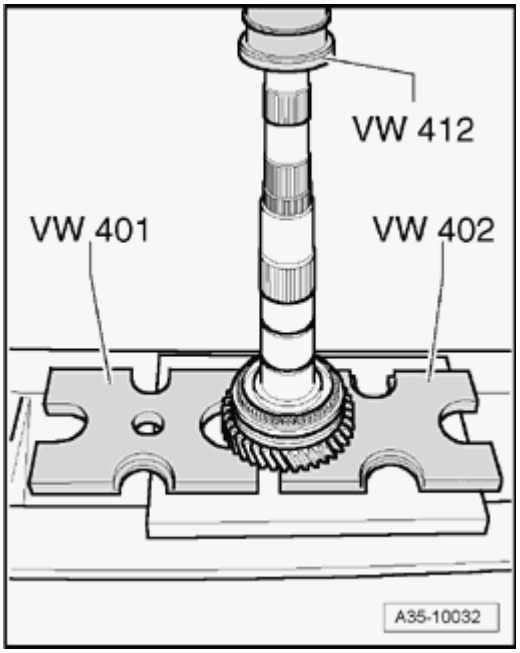


Fig. 411: Pressing Off 1st And 2nd Gear Synchronizing Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- Press synchronizing hub off with 1st speed selector gear

Pressing off tapered roller bearing inner race

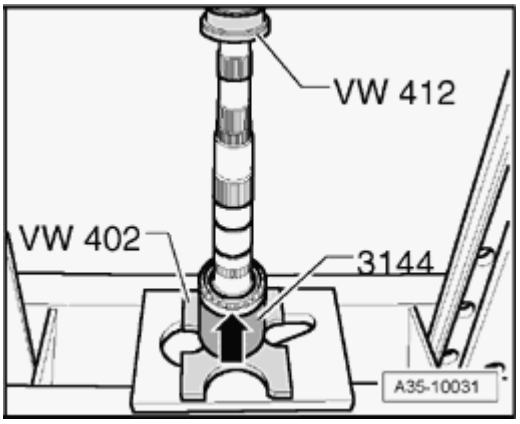


Fig. 412: Pressing Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- The outer race of tapered roller bearing - **arrow** - must be installed prior to pressing off inner race.

Pressing on tapered roller bearing inner race

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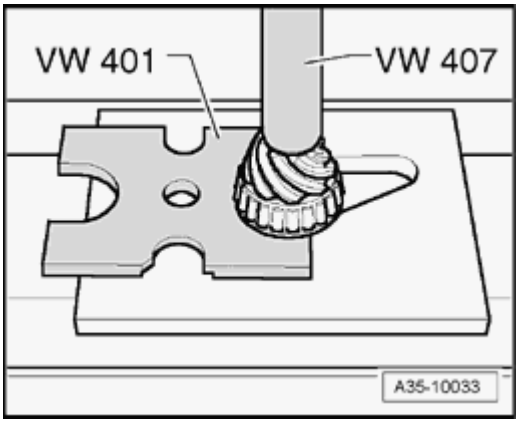


Fig. 413: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat inner race to approx. 100° C and press on.
- Determine thickness of required circlip **Determining thickness of circlip** and install circlip.

Determining thickness of circlip

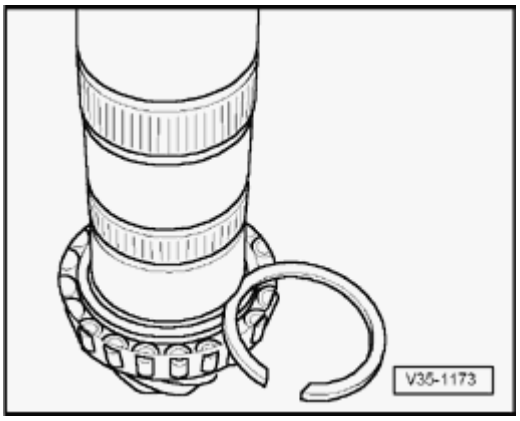


Fig. 414: Determining Circlip Fit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine thickest circlip that will just fit and install it. For Part No.

NOTE:

- **The thickness of the circlips for the synchronizing hubs and individual gear wheels must also be determined as shown for the tapered roller bearing.**

Overview for installation position of circlips **Installation position of circlips**

Installation position of circlips

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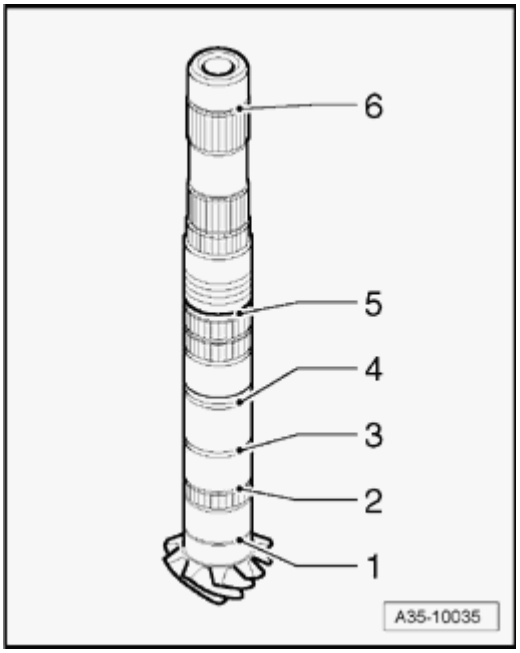


Fig. 415: Installation Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The required circlips for inner races of tapered roller bearings, the synchronizing hubs and individual gear wheels should be selected as shown in **Determining thickness of circlip**

- Circlip - **1** - secures tapered roller bearing inner race.

Circlip thickness (mm)		
2.50	2.56	2.62
2.53	2.59	2.65

- Circlip - **2** - secures 1st and 2nd gear synchronizing hub.

Identification: blue color

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17
1.96	2.08	
1.99	2.11	

- Circlip - **3** - secures tapered roller bearing inner race.

Circlip thickness (mm)
3.50

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- Circlip - **4** - secures thrust washer for reverse selector gear.

Circlip thickness (mm)
3.50

- Circlip - **5** - secures 3rd gear wheel.

Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	2.10

- Circlip - **6** - secures 6th gear wheel.

Circlip thickness (mm)		
1.90	2.02	2.14
1.93	2.05	2.17
1.96	2.08	2.20
1.99	2.11	

- Determine circlips according to table.

Installation position of synchronizing rings for 1st and 2nd gear:

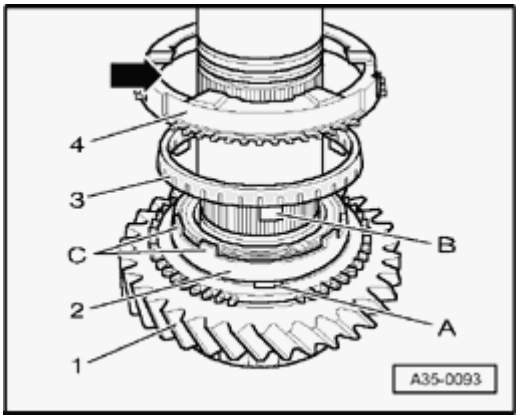


Fig. 416: Installation Position Of Synchronizer Rings For 1St And 2Nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **If components are not being replaced, make sure they are re-installed on the same gear.**

- Install inner ring - **2** - onto selector gear - **1** -.
- Install intermediate ring - **3** -. Lug - **B** - must be inserted into recess - **A** -.
- Synchro-ring - **4** - installed. Guide lugs - **C** - through recess - **arrow** -.

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Checking 1st gear inner ring for wear

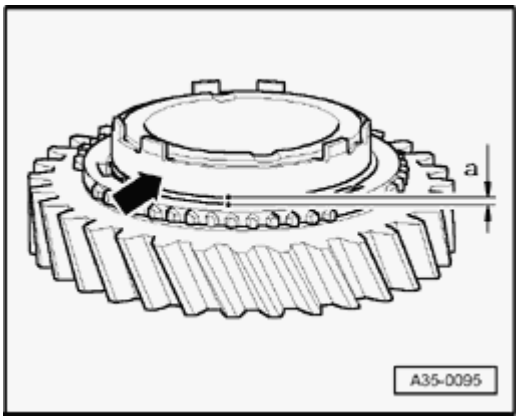


Fig. 417: Checking Inner Race Of 1st Gear For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check outer contact surface - **arrow** - for scoring or visible traces of wear and replace if necessary.
- Press inner ring onto chamfer on selector gear and measure gap - **a** - using a feeler gauge.

Gap - **a** -	As-new installation value	Wear limit
Inner ring for 1st gear	1.2 to 2.0 mm	0.6 mm

Checking 1st and 2nd gear intermediate ring for wear

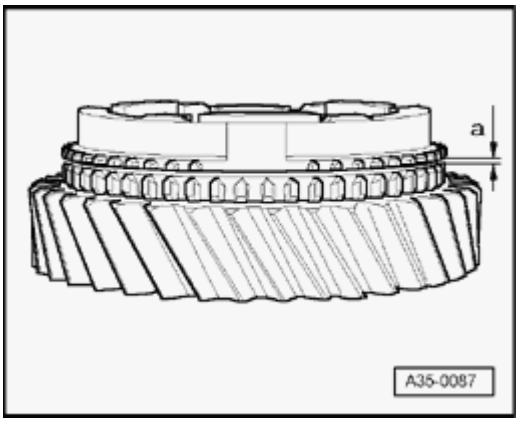


Fig. 418: Checking Synchronizer Ring For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check inner contact surface of synchro-ring for scoring or visible traces of wear and replace if necessary.
- Press inner ring, intermediate ring and synchro-ring onto chamfer on selector gear and measure gap - **a** - using a feeler gauge.

Gap - **a** -	As-new installation value	Wear limit
1st and 2nd gear	1.4 to 2.0 mm	0.8 mm

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Pressing on 1st and 2nd gear synchronizing hub

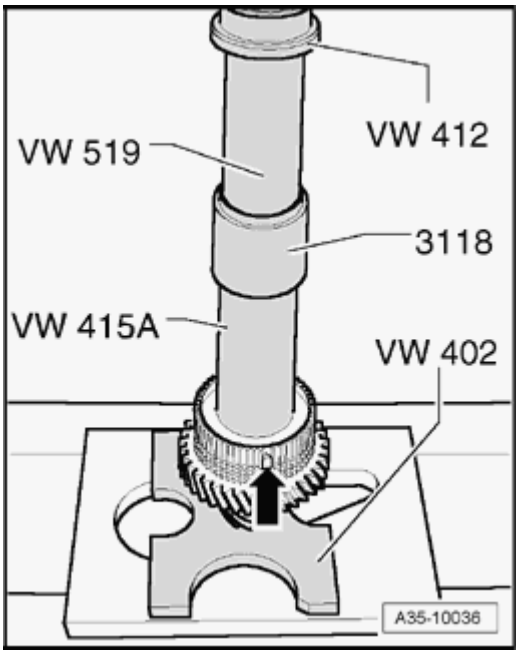


Fig. 419: Pressing On 1st And 2nd Gear Synchronizing Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inside collar faces 2nd gear.

- The lugs of 1st gear synchro-ring and recesses on synchronizing hub must align - **arrow** - when pressing on.

Assembling 1st and 2nd gear locking collar/synchronizing hub

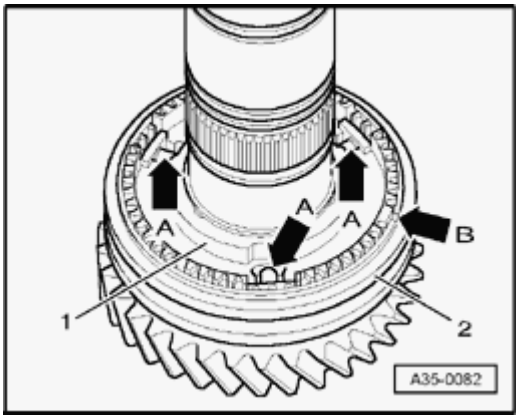


Fig. 420: Assembly Of Operating Sleeve/Synchronizers For 1st And 2nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install locking pieces - **arrows A** - into mounted synchronizing hub - **1** -.

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- Install locking collar - **2** - onto synchronizing hub so that the wide splines of locking collar and synchronizing hub - **arrow B** - coincide.
- Install circlip for 1st and 2nd gear synchronizing hub.
- Install 2nd speed selector gear with needle bearing and synchro-rings.

Pressing on tapered roller bearing inner race

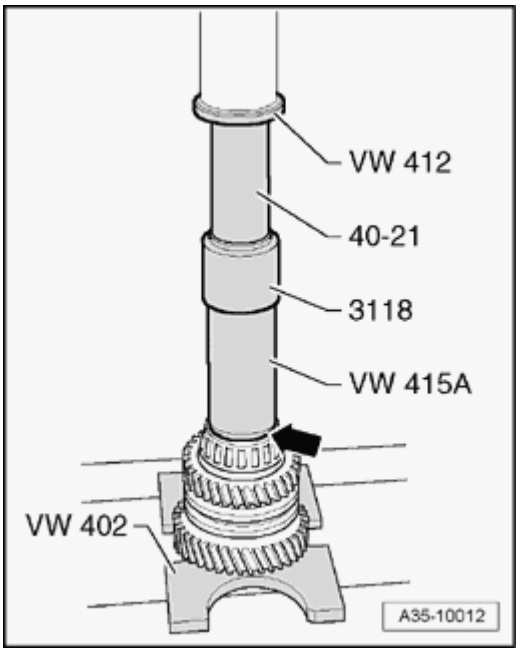


Fig. 421: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install circlip for tapered roller bearing inner race onto pinion shaft.

- Shoulder of tube VW 415 A faces inner race - **arrow** -.

Then check axial play of 1st speed and 2nd speed selector gears **Checking axial play of 1st speed selector gear** and **Checking axial play of 2nd speed selector gear**.

Checking axial play of 1st speed selector gear

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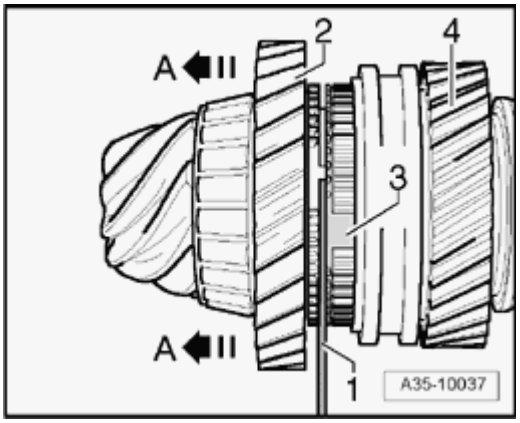


Fig. 422: Checking Axial Play Of 1st Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press 1st speed selector gear - **2** - in direction of - **arrow A** - as far as stop.
- Measure distance between 1st speed selector gear - **2** - and synchro-ring - **3** - using a feeler gauge - **1** -.

Example: 2.55 mm

- Press 1st speed selector gear - **2** - in direction of 2nd speed selector gear - **4** -.
- Measure distance again between 1st speed selector gear - **2** - and synchro-ring - **3** - using a feeler gauge - **1** -.

Example: 2.15 mm

- The difference between two measured values must be between 0.20to 0.50mm.

Checking axial play of 2nd speed selector gear

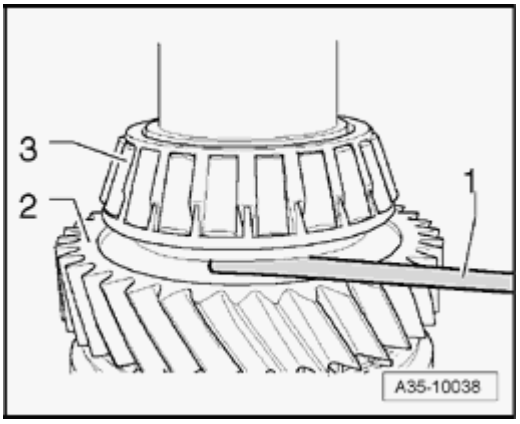


Fig. 423: Checking Axial Play Of 2nd Speed Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check axial play between 2nd speed selector gear - **2** - and inner race of tapered roller bearing - **3** - using a feeler gauge - **1** -.

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- The play must be 0.20 to 0.50 mm.

Pressing on thrust washer for reverse selector gear

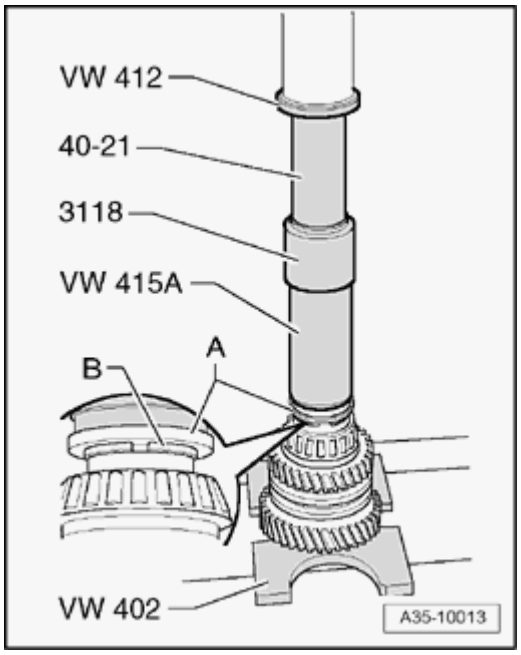


Fig. 424: Pressing On Thrust Washer For Reverse Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install circlip - **B** - onto output shaft.
- Press on thrust washer - **A** - until it makes contact with circlip.

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39 FINAL DRIVE - DIFFERENTIAL

FLANGE SHAFT OIL SEAL (LEFT-SIDE), REPLACING

Flange shaft oil seal (left-side), replacing

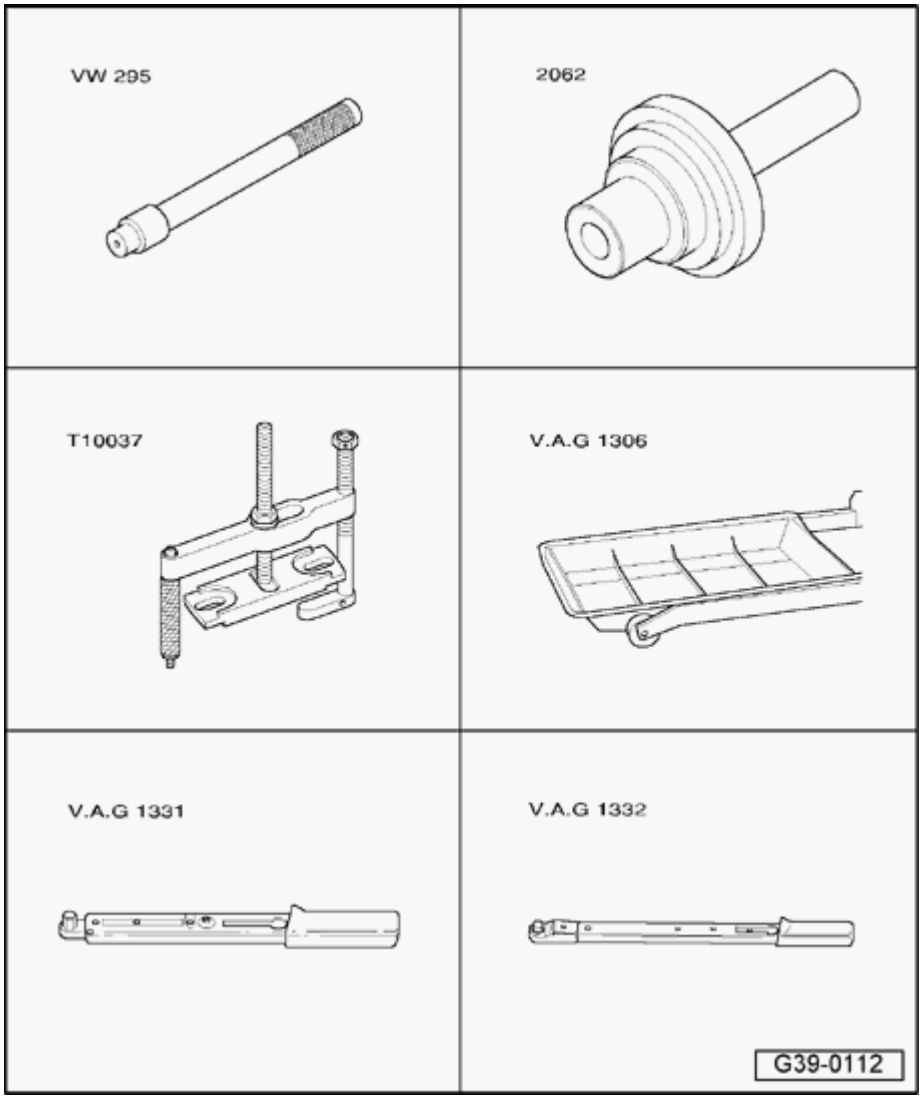


Fig. 425: Identifying Special Tools - Flange Shaft Oil Seal, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW295
- Drift 2062
- Puller T10037
- Drip tray V.A.G1306

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

Removing

- Transmission is installed

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

- Remove left front wheel.

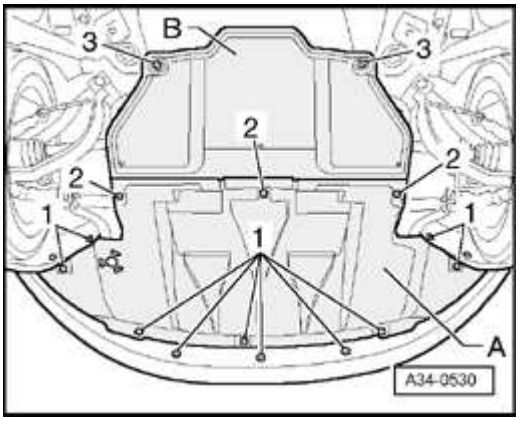


Fig. 426: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

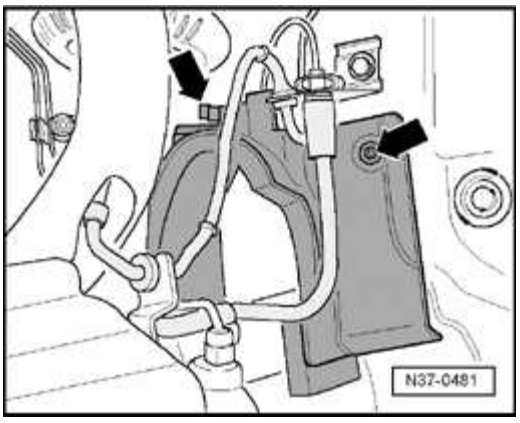


Fig. 427: Axle Shaft Noise Insulation Retainers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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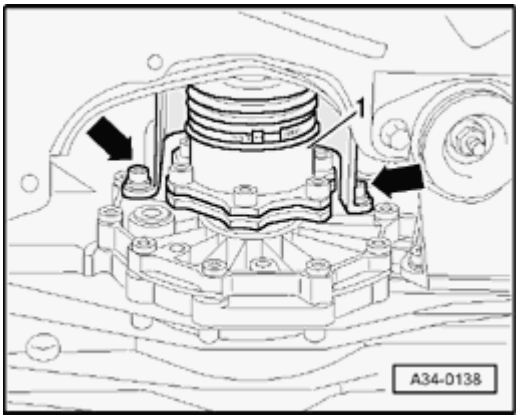


Fig. 428: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

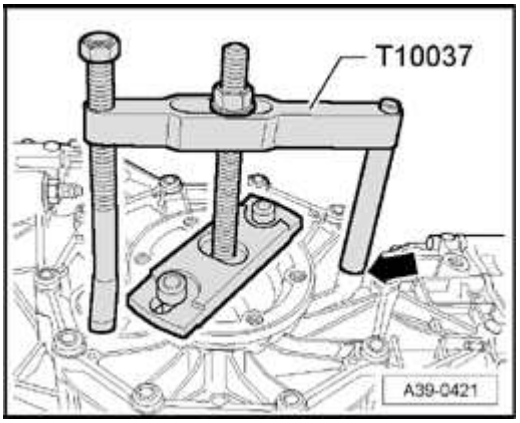


Fig. 429: Removing Flange Shaft Using Puller T10037
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray V.A.G1306 underneath.
- Remove flange shaft (left-side); to do so, secure puller T10037 to cover for final drive - **arrow** -.

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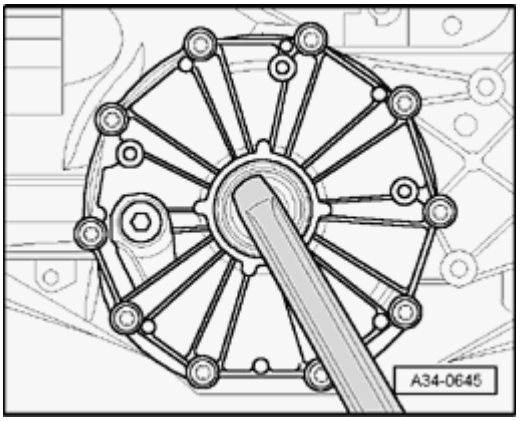


Fig. 430: Prying Out Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry out flange shaft oil seal.

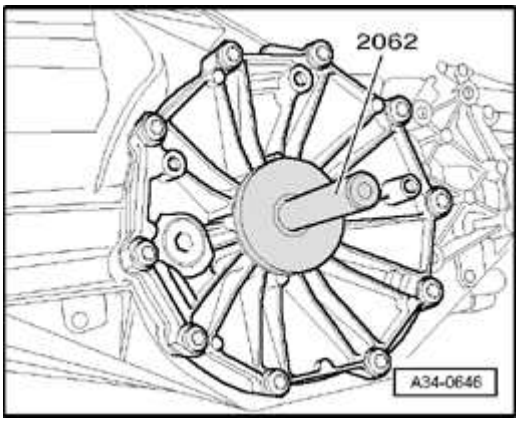


Fig. 431: Driving In New Flange Shaft Oil Seal Using Driver 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

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

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

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

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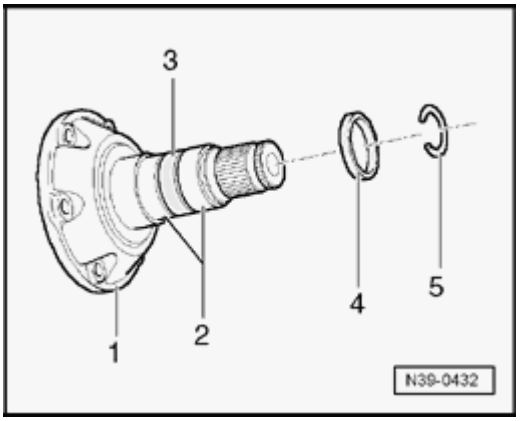


Fig. 432: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

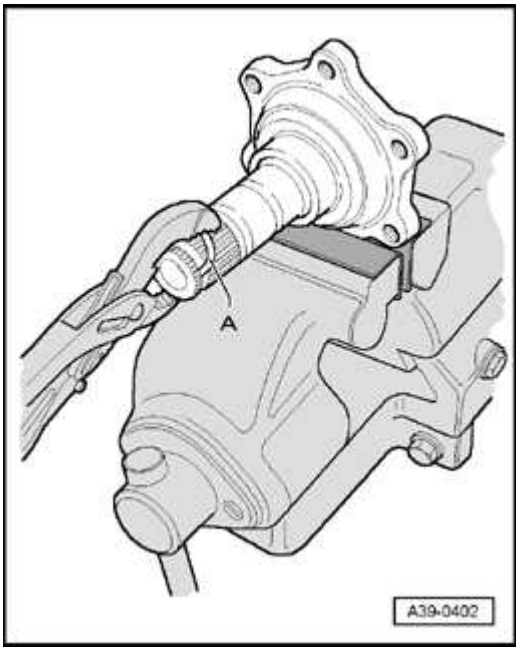


Fig. 433: Identifying Flange Shaft Clamped In Vise And Using New Circlip To Press Old Circlip Out Of Groove In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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

Tightening torque

Component		Nm
Heat shield above drive axle to transmission		23

Flange shaft oil seal (right-side), replacing

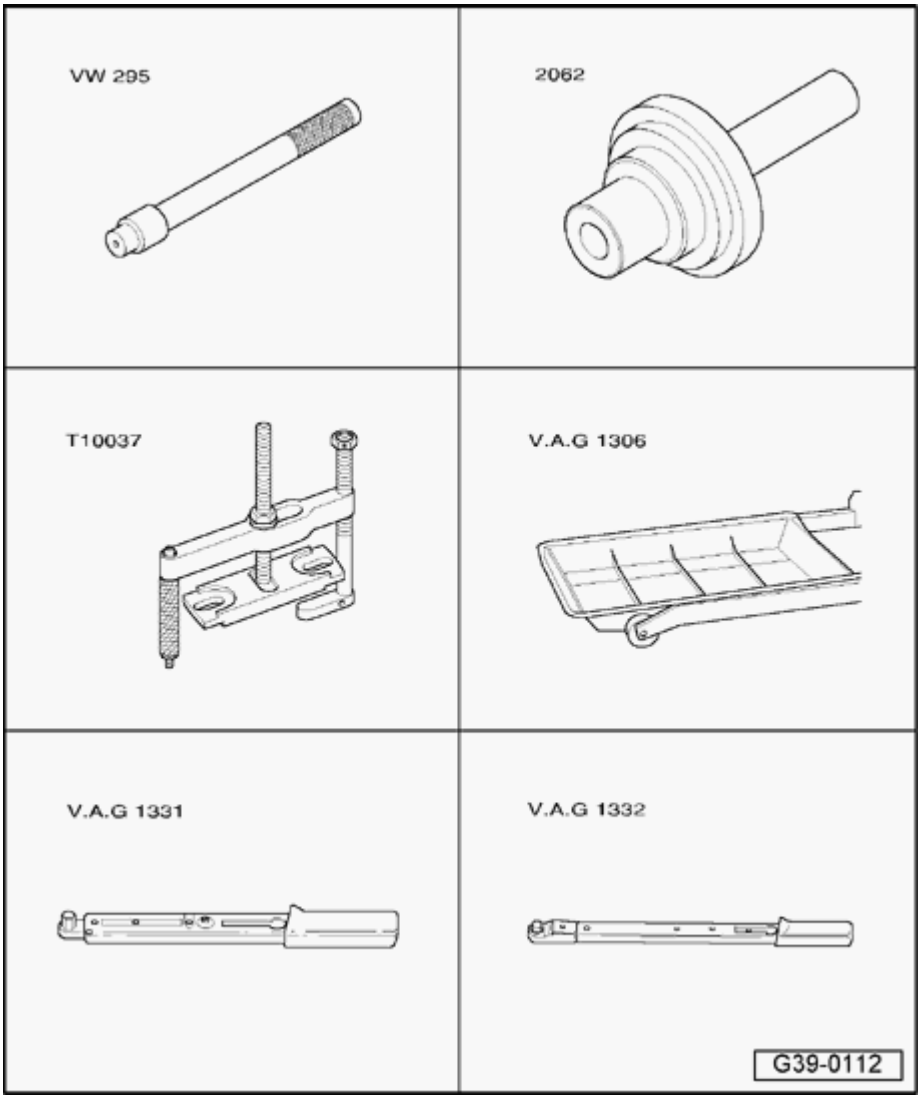


Fig. 434: Identifying Special Tools - Flange Shaft Oil Seal, Replacing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

Removing

- Transmission is installed

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

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

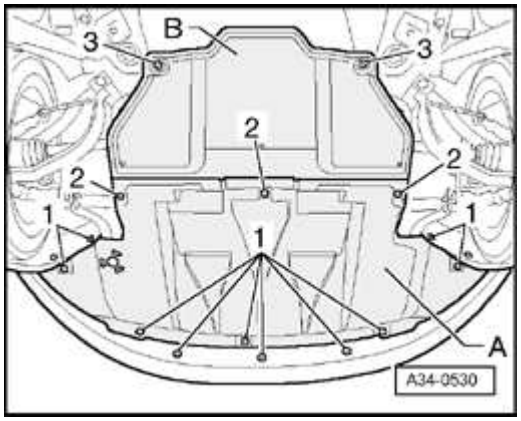


Fig. 435: Front And Rear Sound Insulation And Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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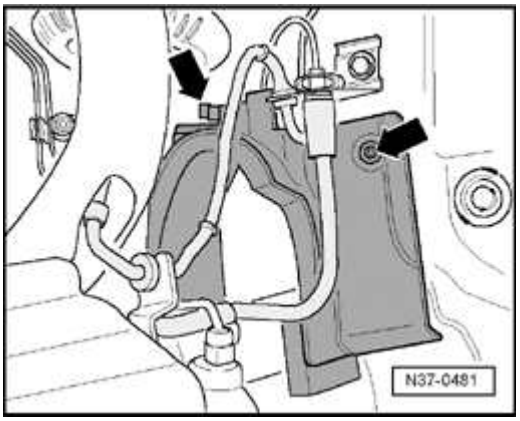


Fig. 436: Axle Shaft Noise Insulation Retainers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

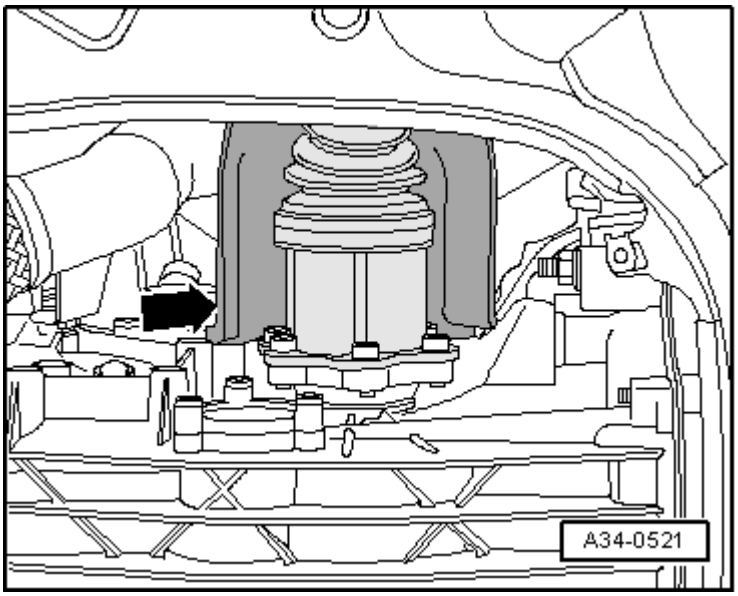


Fig. 437: Drive Axle Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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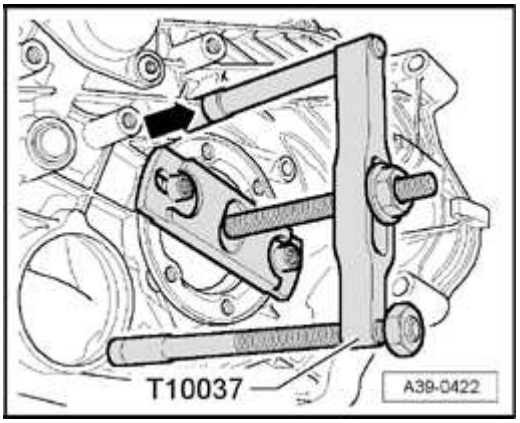


Fig. 438: Removing Flange Shaft By Securing Puller T10037 To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place drip tray V.A.G1306 underneath.
- Remove flange shaft (right-side); by securing puller T10037 to transmission housing - **arrow** -.

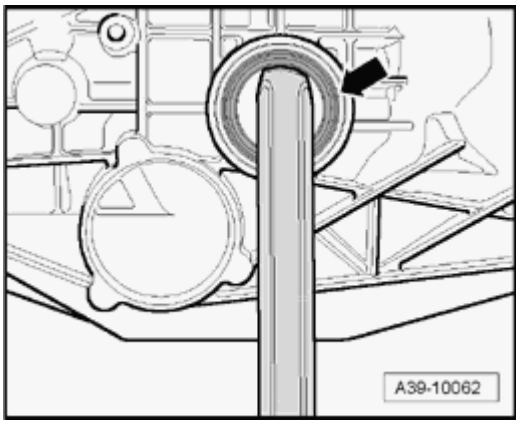


Fig. 439: Prying Out Flange Shaft Oil Seal Using An Assembly Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

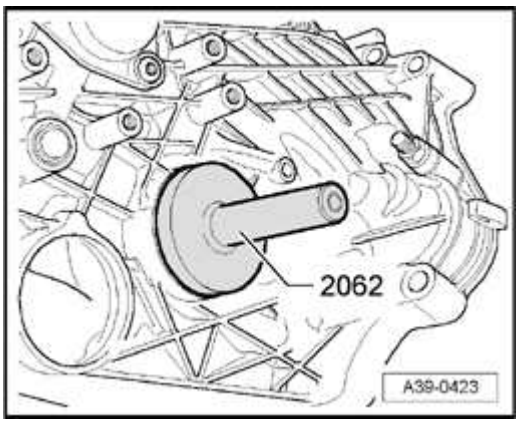


Fig. 440: Driving In New Flange Shaft Oil Seal Using Fitting Drift 2062

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installing

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

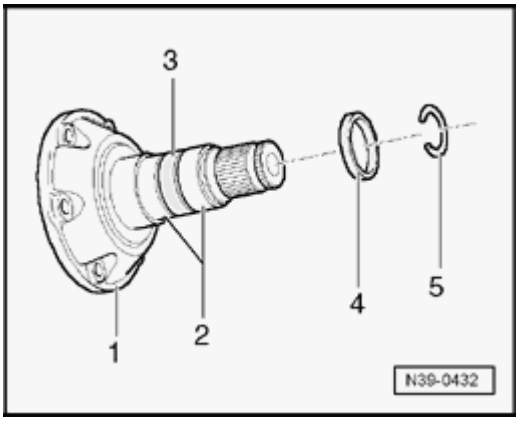


Fig. 441: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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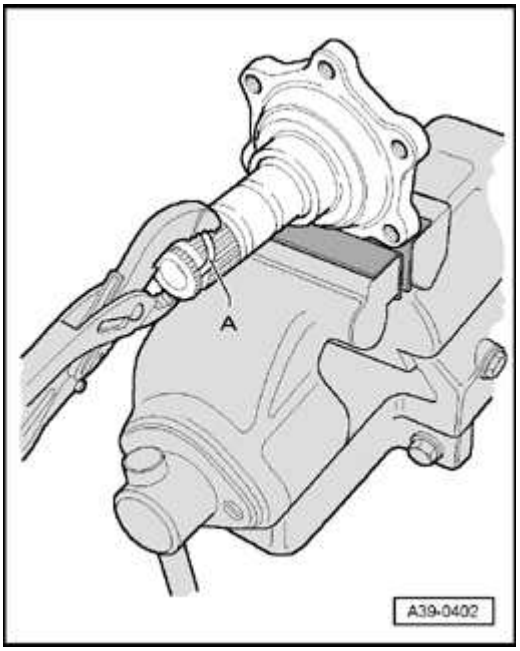


Fig. 442: Identifying Flange Shaft Clamped In Vise And Using New Circlip To Press Old Circlip Out Of Groove In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp flange shaft in vise, using jaw protectors. Use new circlip - **A** - to press old circlip out of groove in flange shaft.
- Drive flange shaft in with drift VW295.
- Install drive axle --> **40 - FRONT SUSPENSION** .
- Bolt on heat shield for drive axle (right-side).
- Fill transmission with oil and check oil level --> **Transmission oil level, checking**.
- Install sound insulation.

Tightening torque

Component		Nm
Heat shield above drive shaft to transmission		23

DIFFERENTIAL, REMOVING AND INSTALLING

Differential, removing and installing

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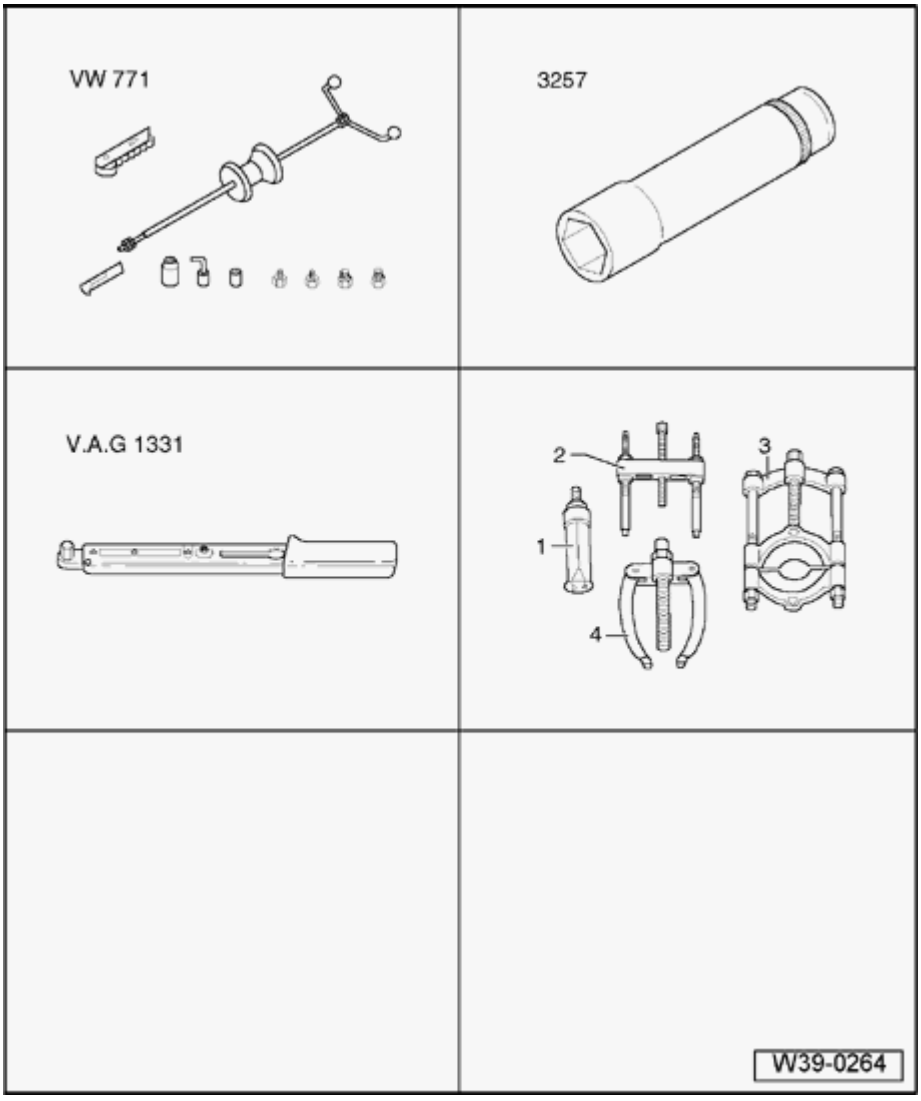


Fig. 443: Identifying Special Tools - Differential, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

NOTE:

- **Removing and installing is possible with the transmission installed.**
- **The differential can be removed and installed without removing the selector mechanism, input shaft, pinion shaft and bearing housing. These components must be removed if the differential needs to be adjusted.**
- **Inspect polygon bearings for visible damage.**

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

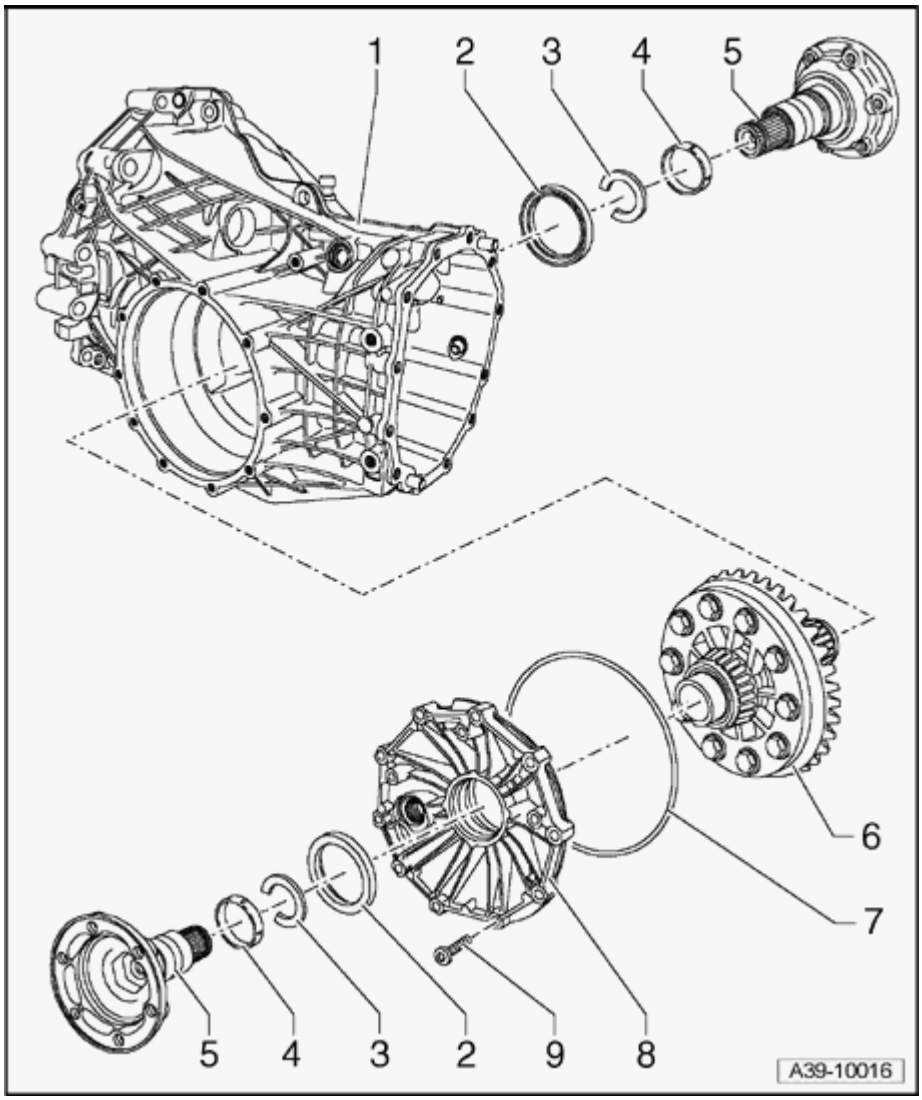


Fig. 444: Differential Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing 1)

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2 - Oil seal

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

3 - Circlip

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

4 - Spacer ring

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

5 - Flange shaft

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

6 - Differential with crown wheel 1)

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

7 - O-ring

- Always replace
- Lubricate with gear oil

8 - Cover for final drive 1)

9 - TORX bolt, 20 Nm plus an additional 90°1 / 4 turn

Removing flange shaft (left-side)

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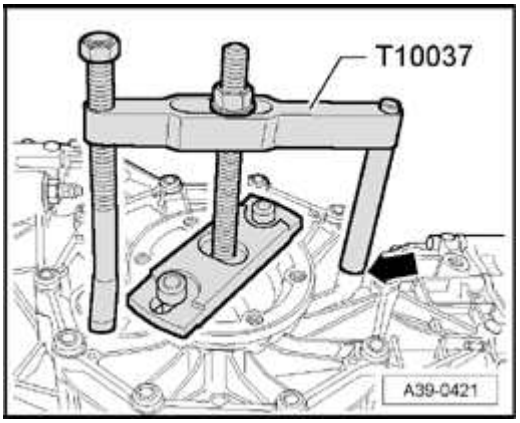


Fig. 445: Removing Flange Shaft Using Puller T10037
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Remove right flange shaft

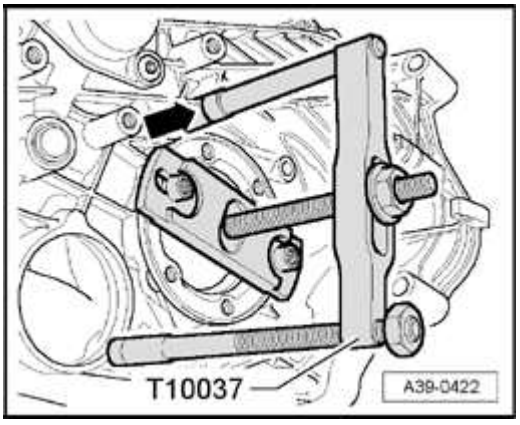


Fig. 446: Removing Flange Shaft By Securing Puller T10037 To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Removing and installing circlip

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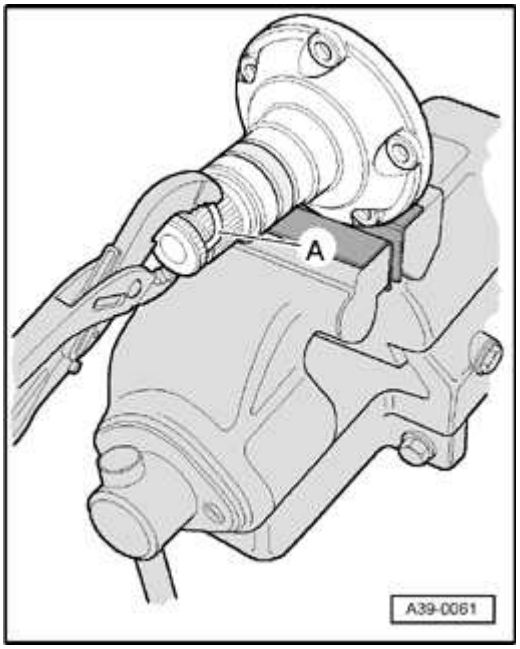


Fig. 447: Removing And Installing Securing Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing spacer ring

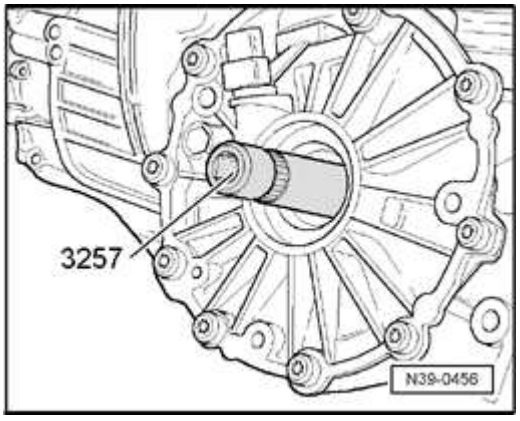


Fig. 448: Installing Spacer Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Flange shaft assembly

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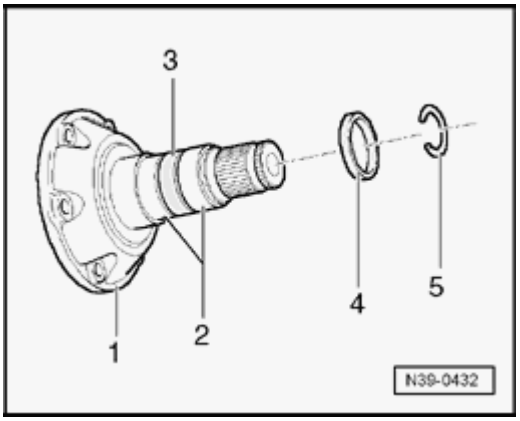


Fig. 449: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

Removing flange shaft oil seal (left-side)

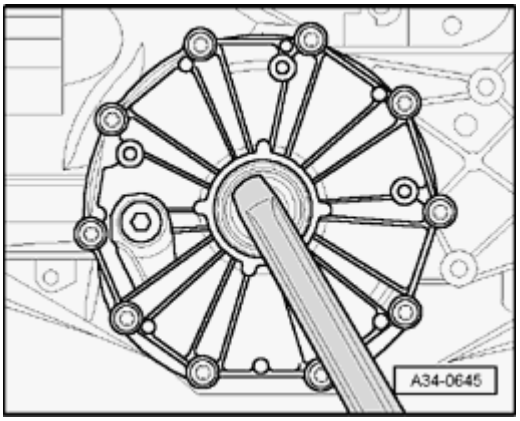


Fig. 450: Prying Out Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing flange shaft oil seal (left-side)

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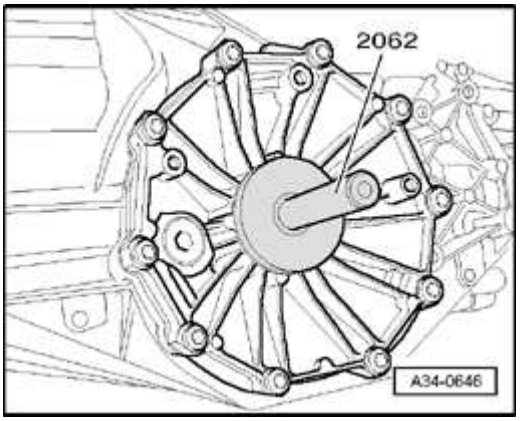


Fig. 451: Driving In New Flange Shaft Oil Seal Using Driver 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- Drive flange shaft in with needle bearing drift VW295.

Removing flange shaft oil seal (right-side)

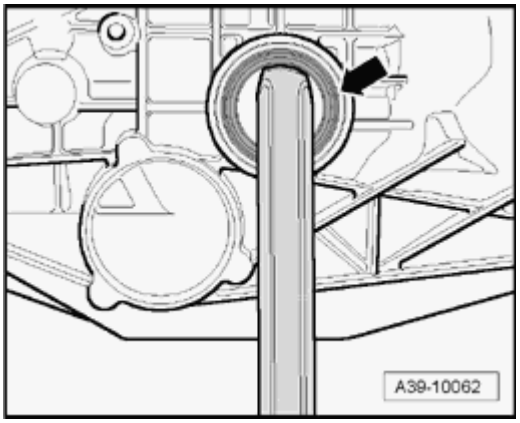


Fig. 452: Prying Out Flange Shaft Oil Seal Using An Assembly Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Installing flange shaft oil seal (right-side)

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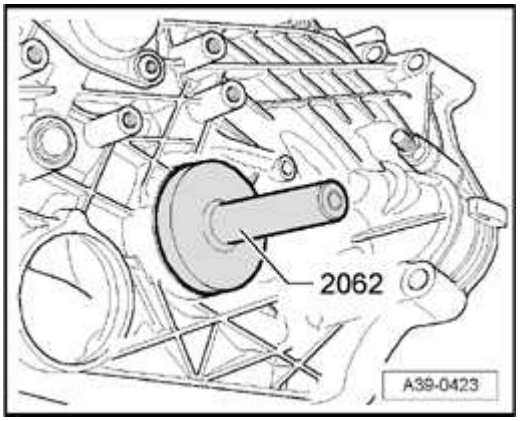


Fig. 453: Driving In New Flange Shaft Oil Seal Using Fitting Drift 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

DIFFERENTIAL, DISASSEMBLING AND ASSEMBLING

Differential, disassembling and assembling

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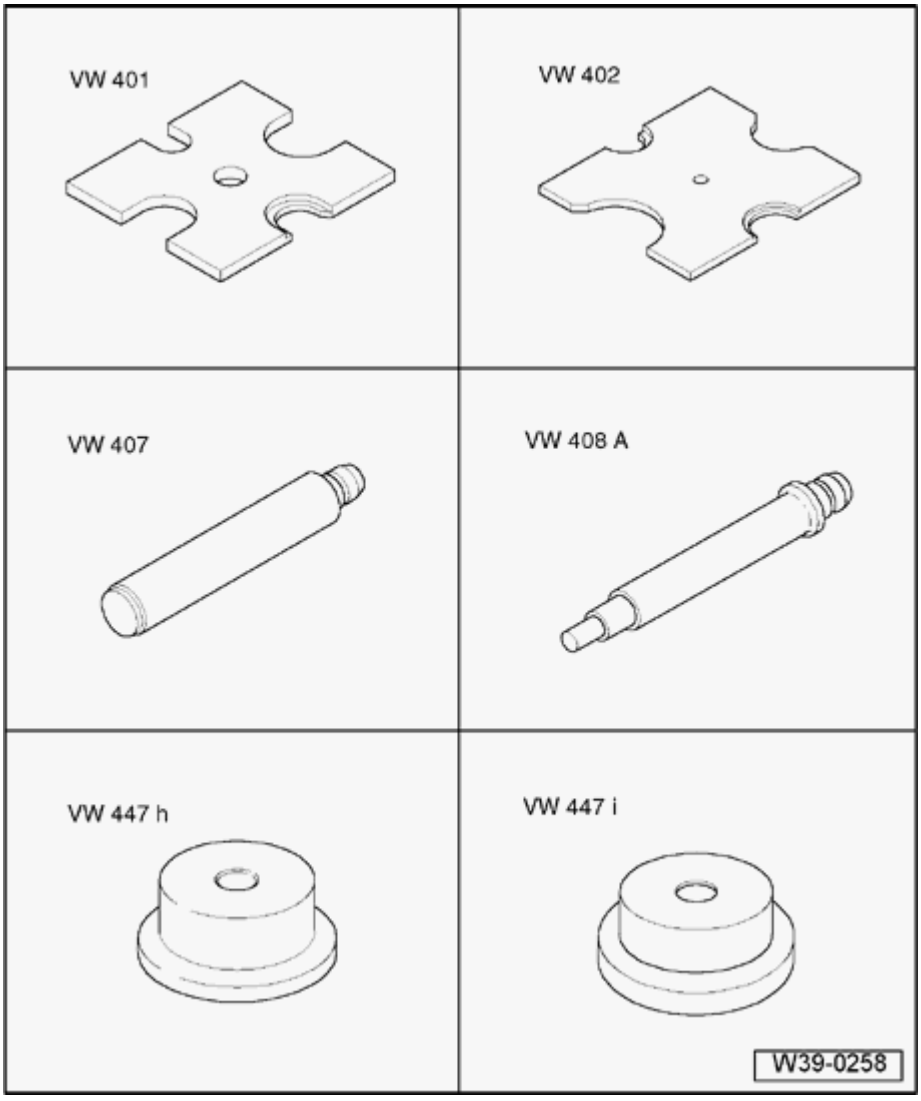


Fig. 454: Identifying Special Tools - Differential, Disassembling And Assembling (1 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Thrust plate VW401
- Thrust plate VW402
- Press tool VW407
- Press tool VW408A

- Thrust pad VW447H
- Thrust pad VW 447 i

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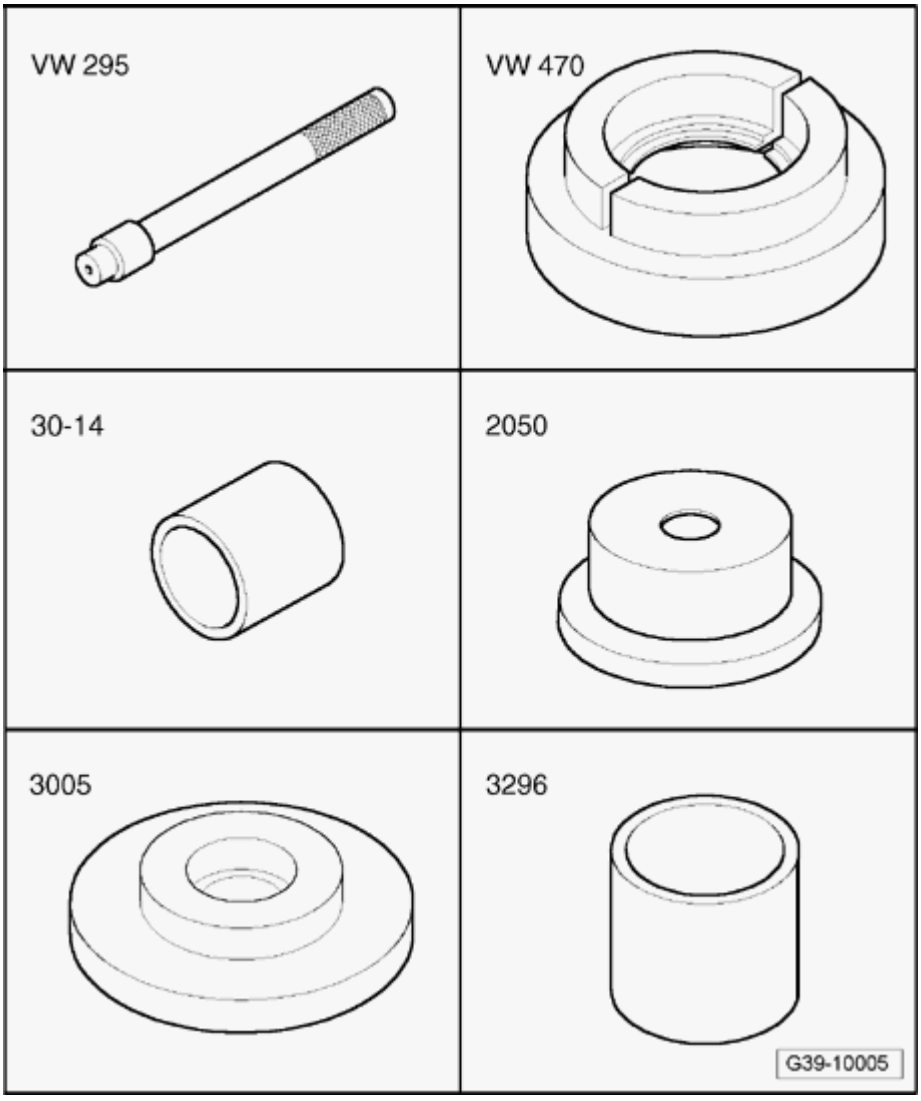


Fig. 455: Identifying Special Tools - Differential, Disassembling And Assembling (2 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW 295
- Thrust pieces for pinion shaft bearing VW 470
- Sleeve 30 - 14
- Thrust plate 2050

- Thrust pad 3005
- Tube 3296

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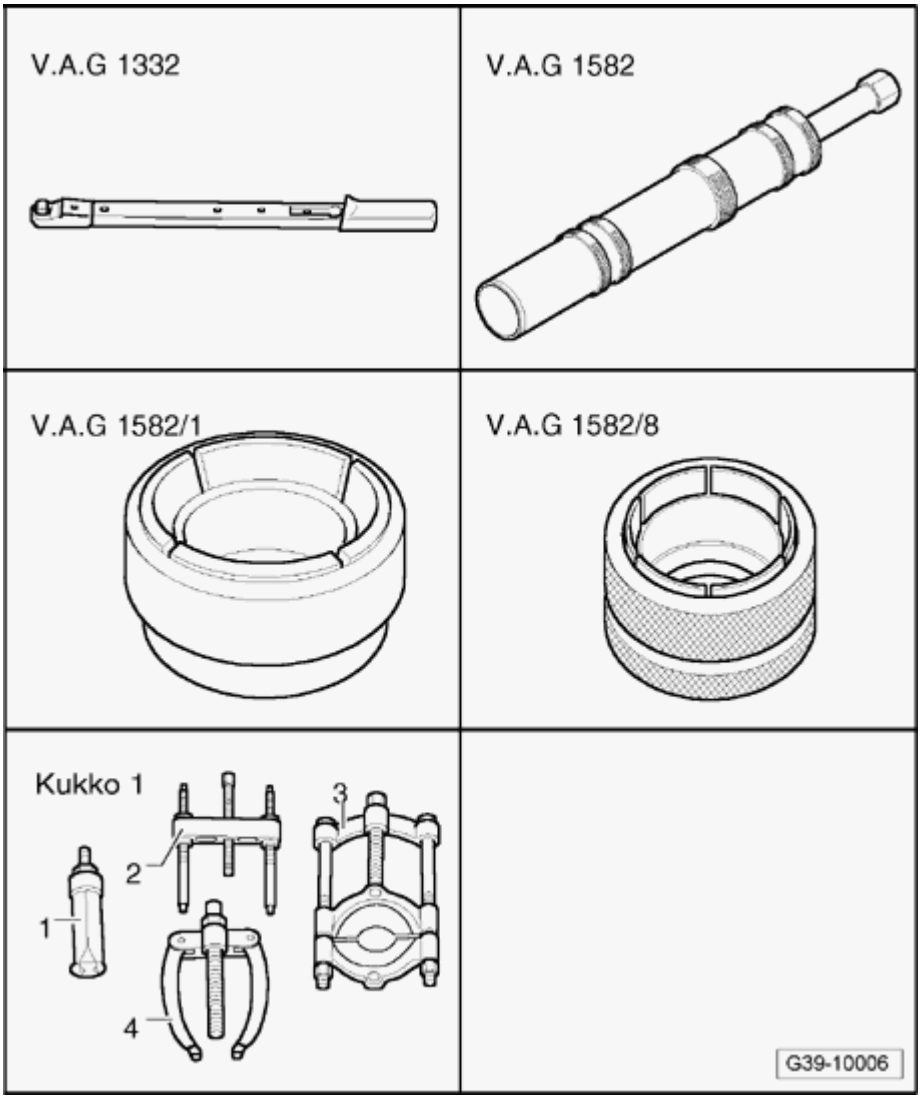


Fig. 456: Identifying Special Tools - Differential, Disassembling And Assembling (3 Of 3)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

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

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

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NOTE:

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

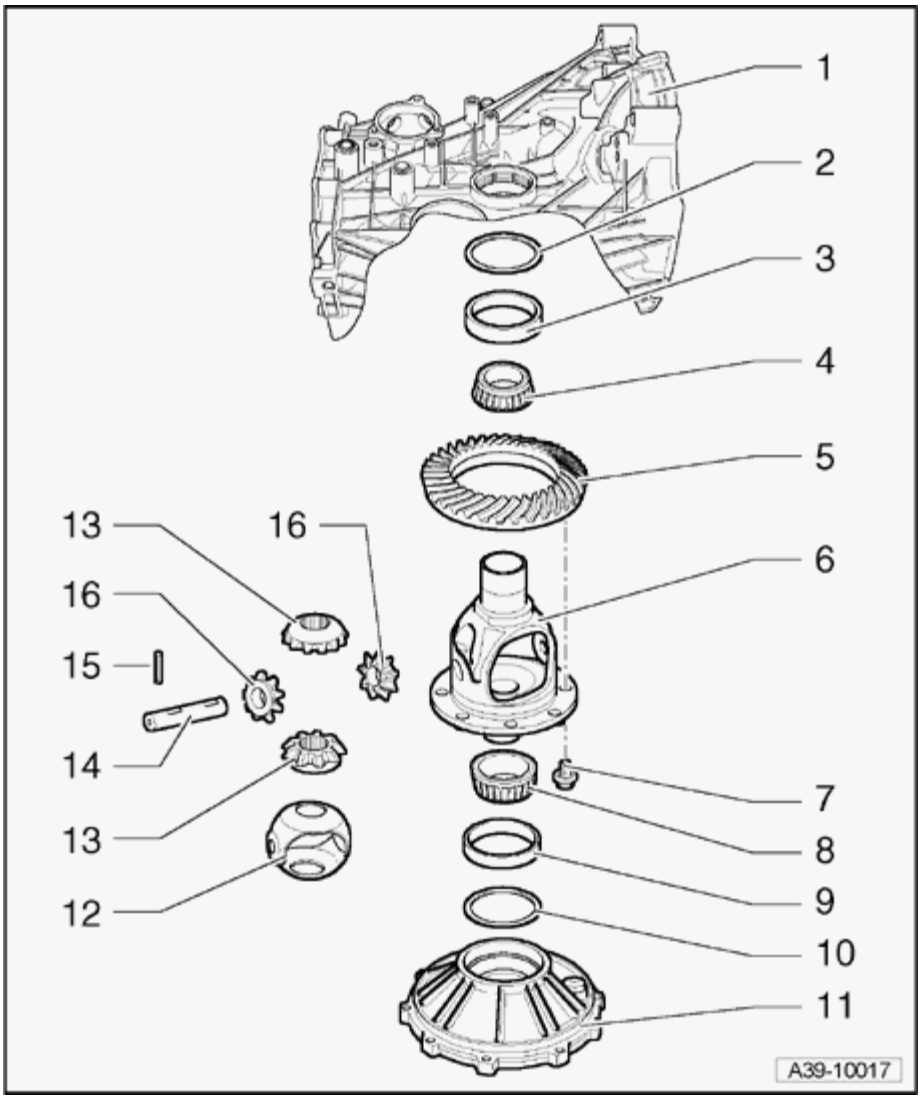


Fig. 457: Differential Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing 1)

2 - Shim "S_2 "

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

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

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

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

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

5 - Crown wheel [1)]

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

6 - Differential cage[1)]

7 - Bolt, 30 Nm plus an additional 90°[1] / $_4$ turn

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

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

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

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

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

10 - Shim "S_1 "

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

11 - Cover for final drive [1)]

- With O-ring

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12 - One-piece thrust washer

- Lubricate with gear oil before installing

13 - Sun wheel

- Installing **Installing differential bevel gears**

14 - Differential pinion pin

- Drive out with drift after removing spring pin

15 - Spring pin

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

16 - Planet pinion

- Installing **Installing differential bevel gears**

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

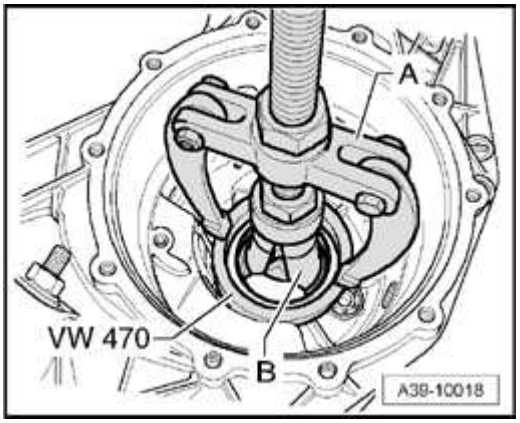


Fig. 458: Pulling Tapered Roller Bearing Outer Race (Right-Side) Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- After removing, check shims for damage.

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

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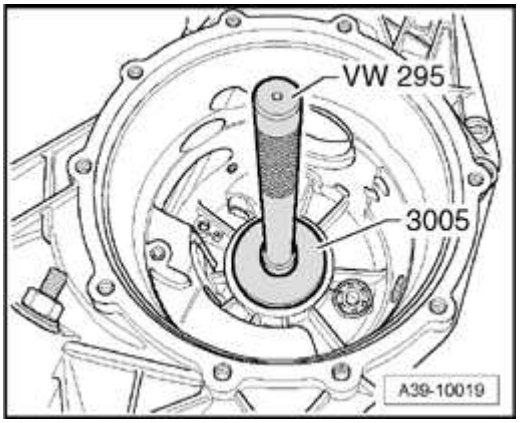


Fig. 459: Driving Outer Race For Tapered Roller Bearing With Shim Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

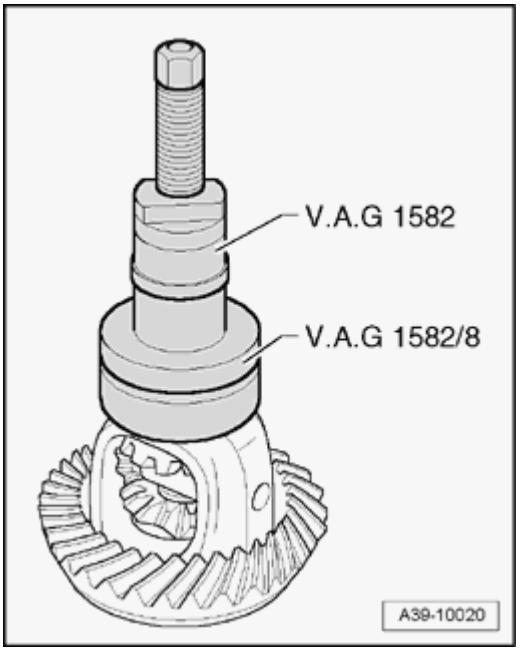


Fig. 460: Pulling Off Inner Race For Tapered Roller Bearing (Right-Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

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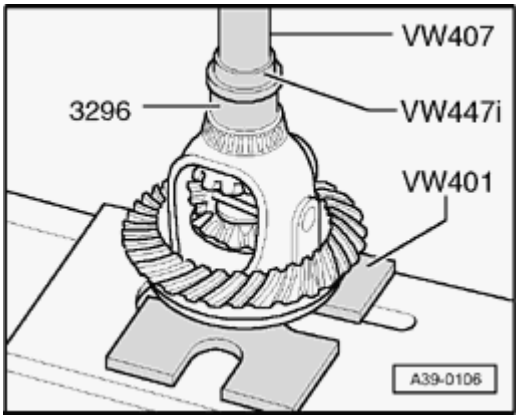


Fig. 461: Pressing On Right Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

CAUTION: Wear protective gloves.

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

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

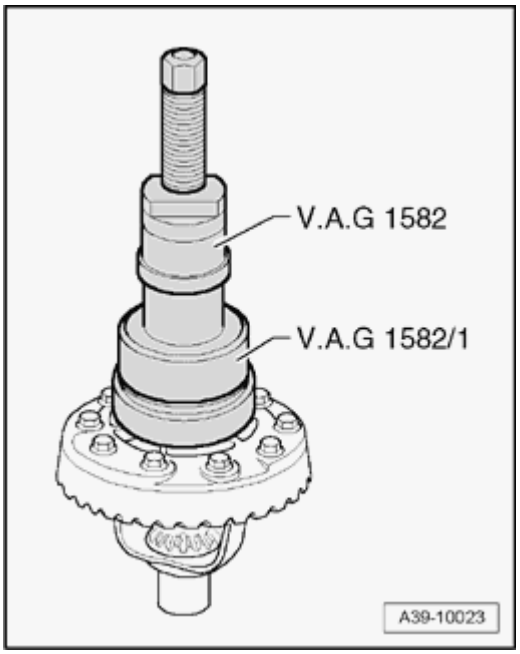


Fig. 462: Pulling Off Inner Race For Tapered Roller Bearing (Left-Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

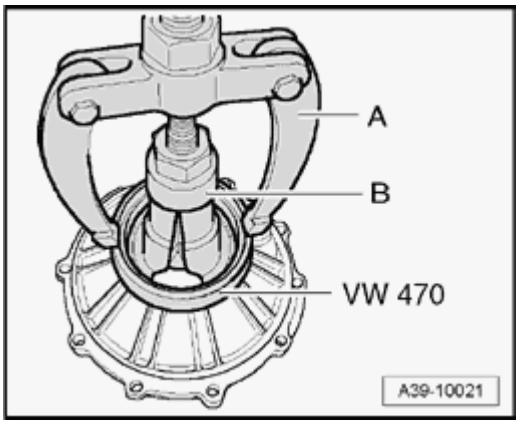


Fig. 463: Pulling Tapered Roller Bearing Outer Race (Left-Side) Out Of Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

- After removing, check shims for damage.

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

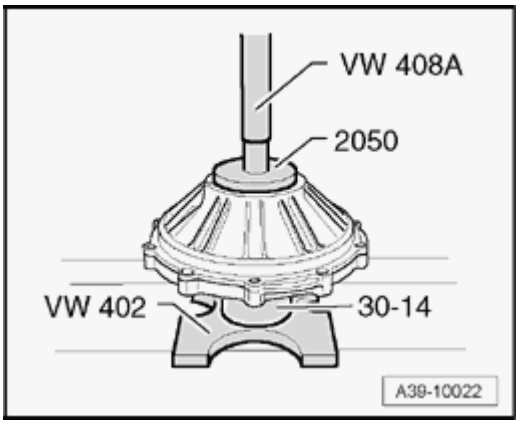


Fig. 464: Pressing Tapered Roller Bearing Outer Race (Left-Side) Into Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving crown wheel off cage

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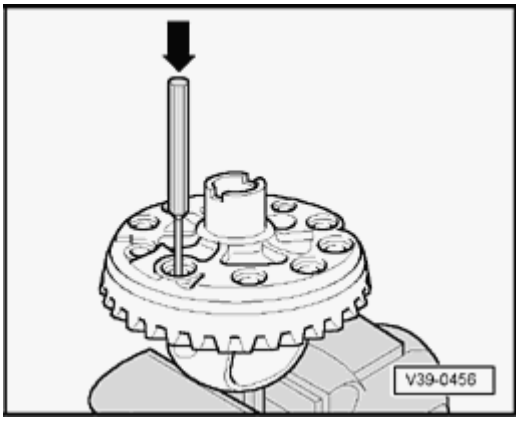


Fig. 465: Driving Out Ring Gear From Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Heating crown wheel to approx. 100° C and installing

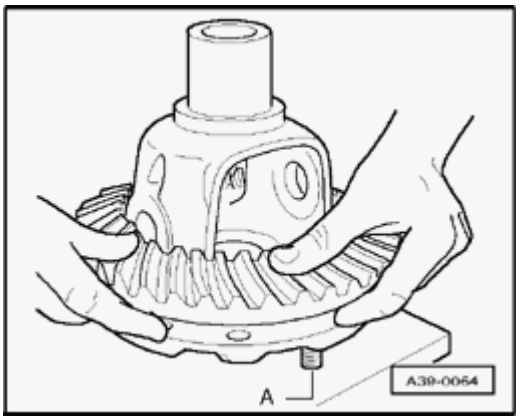


Fig. 466: Installing Ring Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

CAUTION: Wear protective gloves.

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

Installing differential bevel gears

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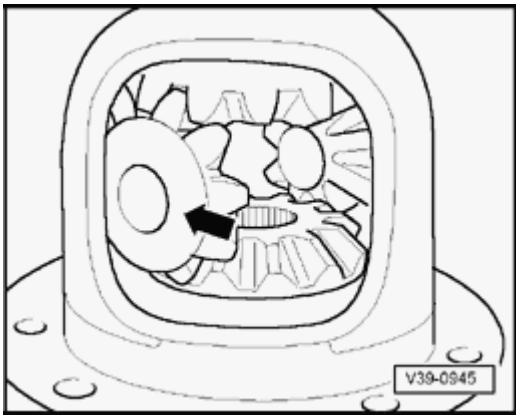


Fig. 467: Installing Small Differential Bevel Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

PINION SHAFT AND CROWN WHEEL, ADJUSTING

Pinion shaft and crown wheel, adjusting

NOTE:

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

Final drive gear set, adjustment and marking

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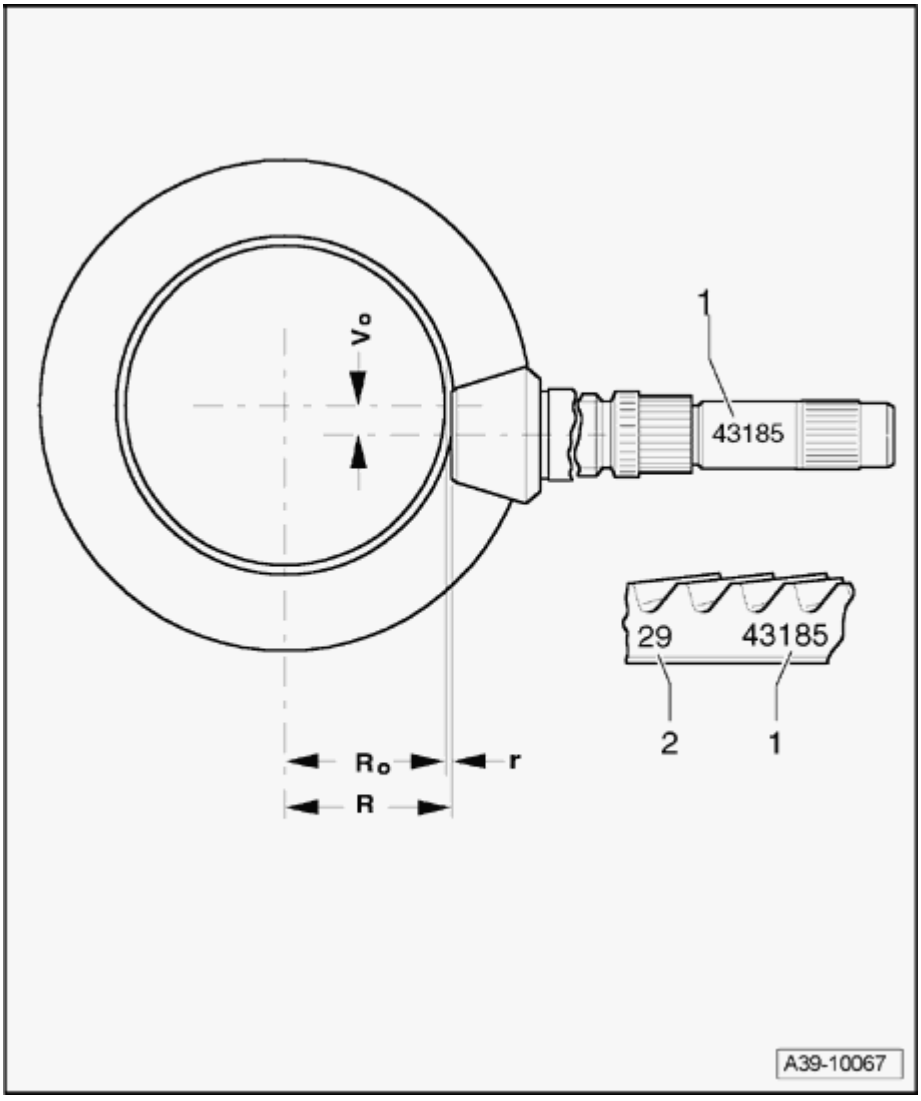


Fig. 468: Final Drive Gear Set, Adjustment And Marking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - "43185" number of matched pair of gears

2 - Deviation (tolerance) "r" is based on the master gauge used on the test machine in production. The dimension "r" is always given in 1/100mm. For example: "29" indicates r = 0.29 mm

Ro - Length of test machine master gauge

Ro - Crown wheel diameter 188 mm = 59.65 mm

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

Vo - Hypoid offset

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Position of shims

NOTE:

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

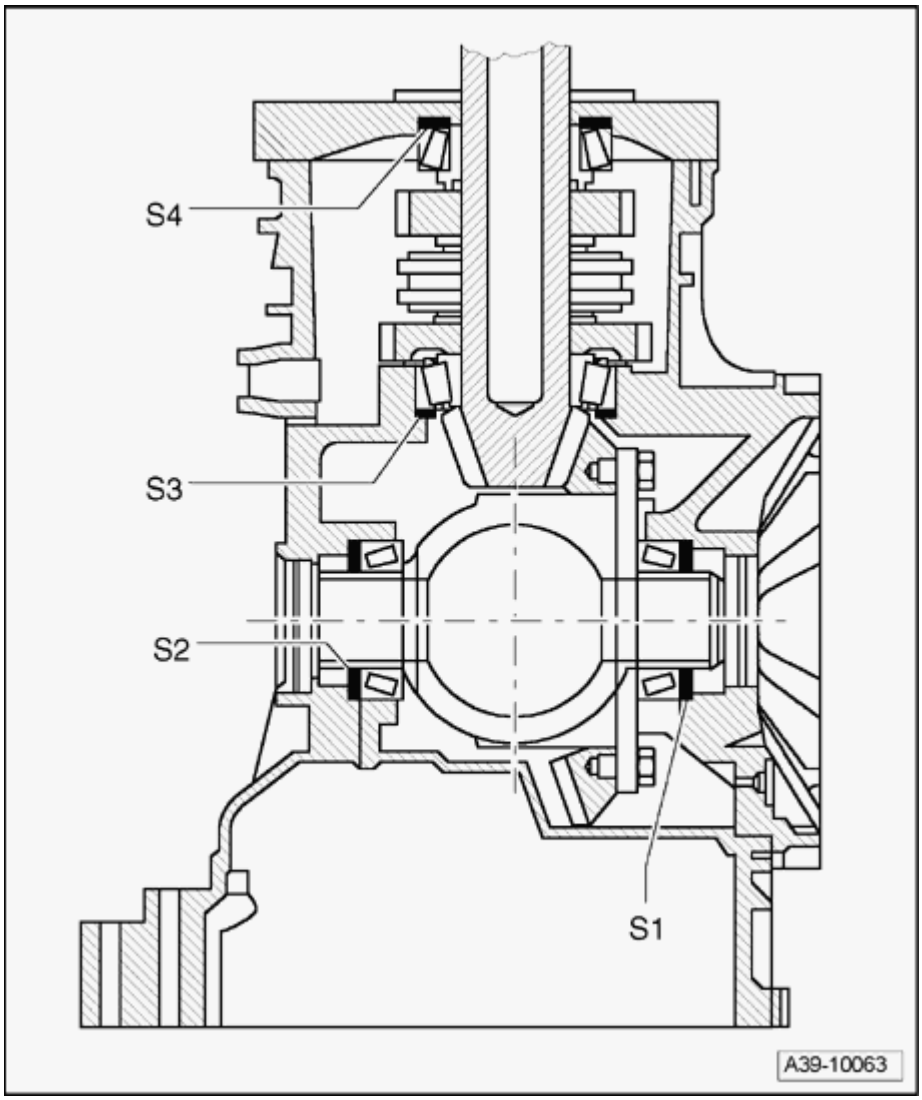


Fig. 469: Position Of Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

S1 - Shim for crown wheel in cover for final drive

S2 - Adjustment shim for crown wheel in transmission housing

S3 - Adjustment shim for pinion shaft in transmission housing

S4 - Shim for pinion shaft in bearing housing

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Table of adjustments

NOTE:

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

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

*Pinion shaft and crown wheel; only replace together.

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

Adjusting gear set, recommended sequence

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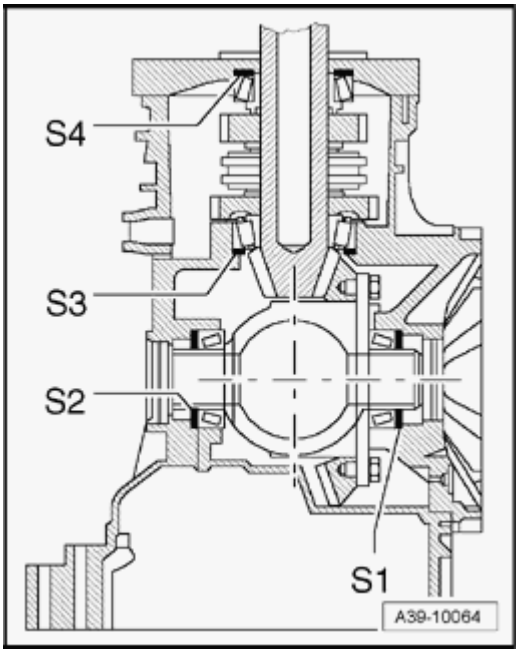


Fig. 470: Adjusting Gear Set
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The following work sequence is recommended to save time when crown wheel and pinion shaft have to be adjusted:

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

Pinion shaft, adjusting

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

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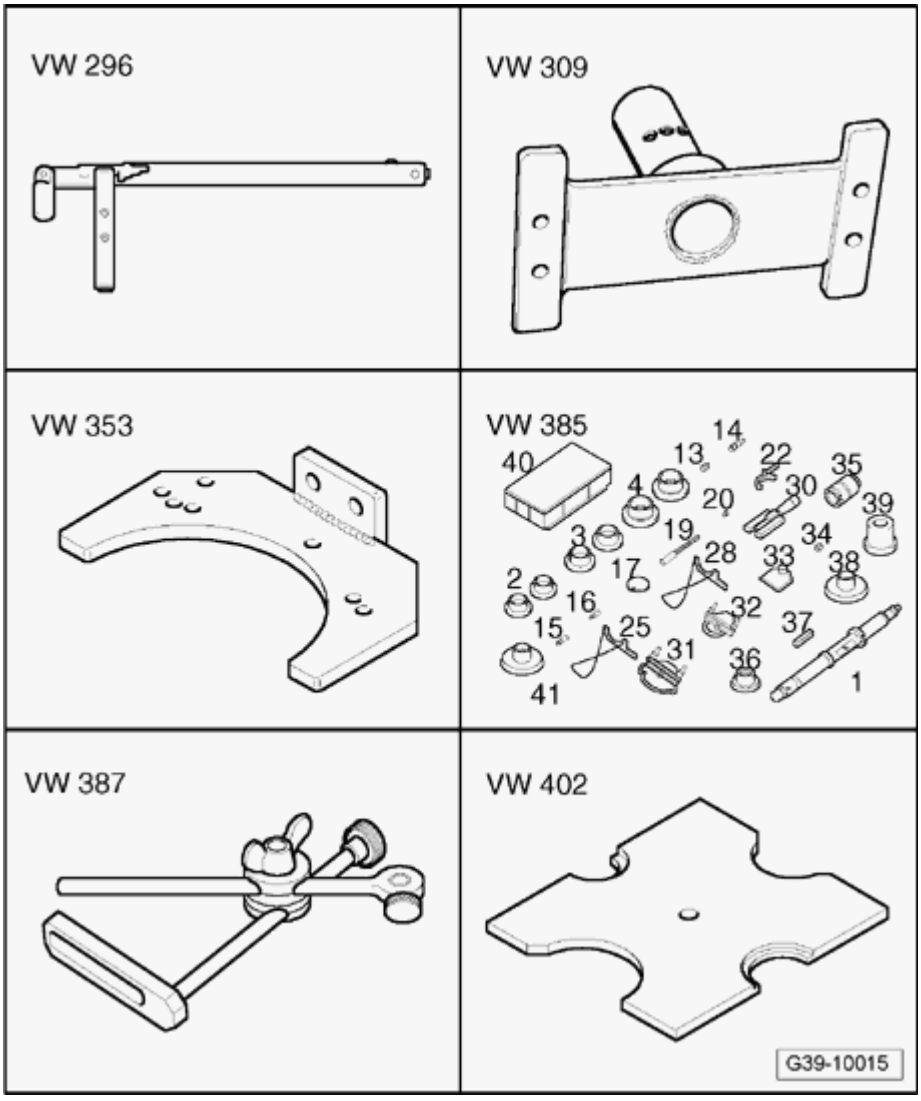


Fig. 471: Identifying Special Tools - Pinion Shaft, Adjusting (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

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

- Dial gauge holder VW387
- Thrust plate VW402

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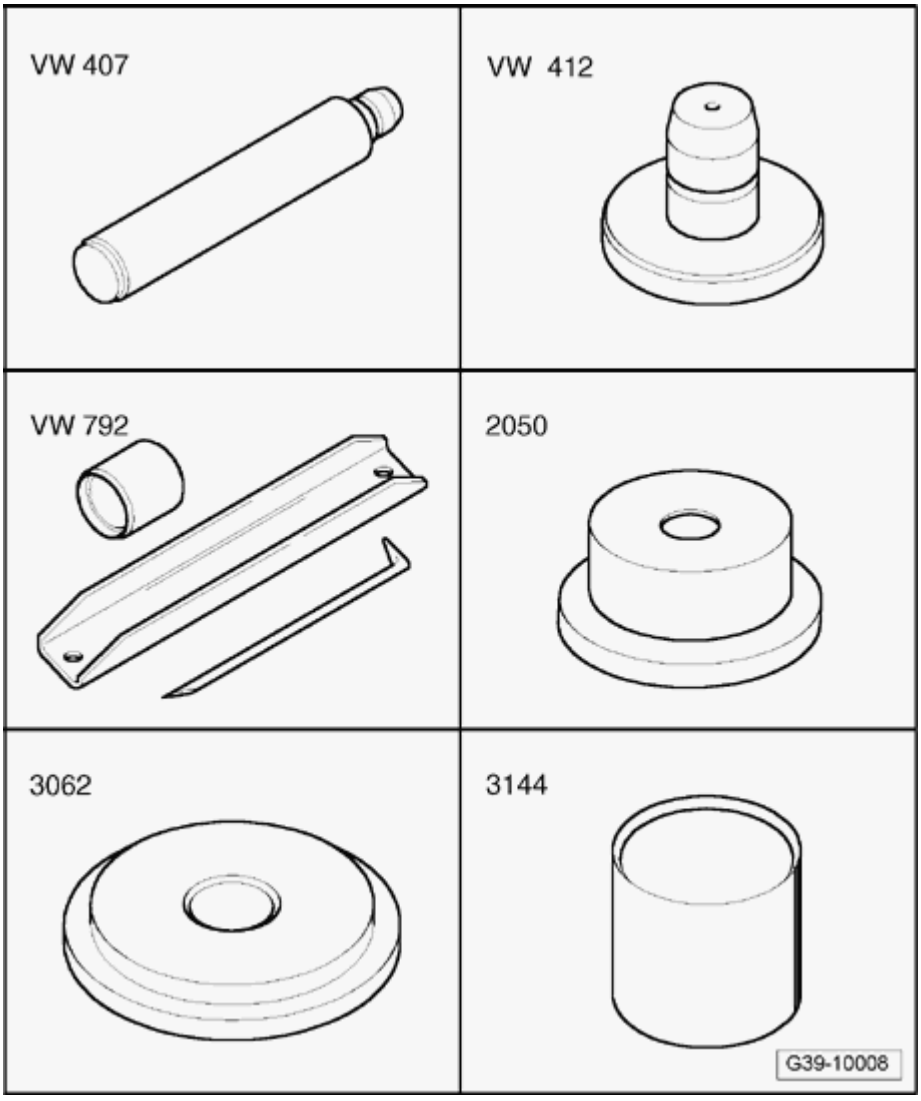


Fig. 472: Identifying Special Tools - Pinion Shaft, Adjusting (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Press tool VW407
- Thrust disc VW 412
- Assembly tool VW792
- Thrust plate 2050
- Thrust pad 3062
- Press support-RI wheel brgs. 3144

Special tools, testers and auxiliary items required

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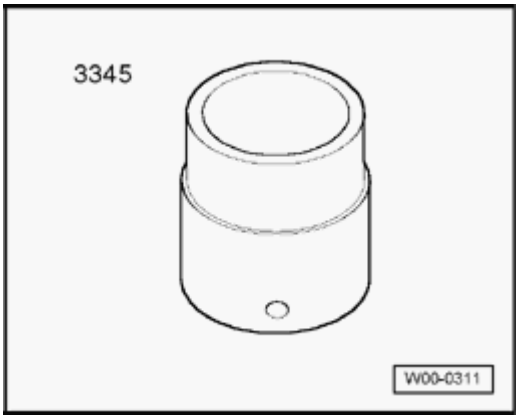


Fig. 473: Identifying Press Tool 3345
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press tool 3345

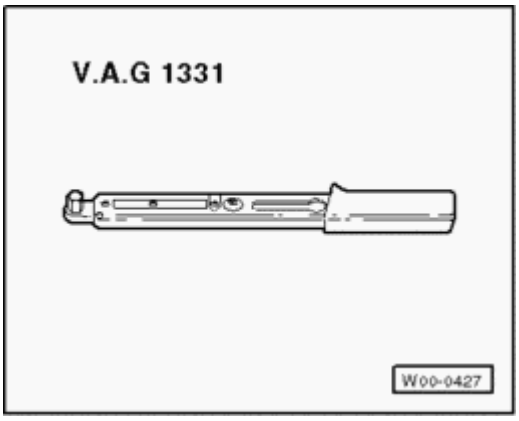


Fig. 474: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

(Setting preload of tapered roller bearings for pinion shaft)

- Differential removed.

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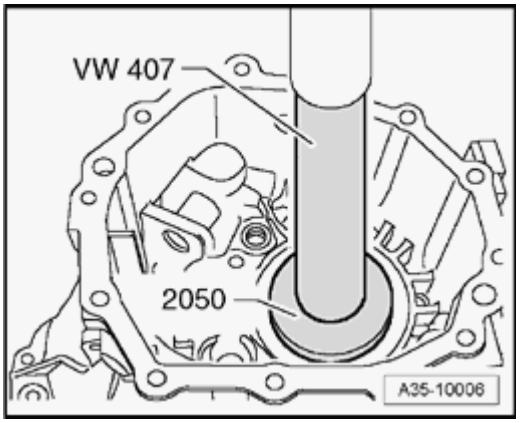


Fig. 475: Pressing Tapered Roller Bearing Outer Race For Pinion Shaft Into Transmission Housing Without Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

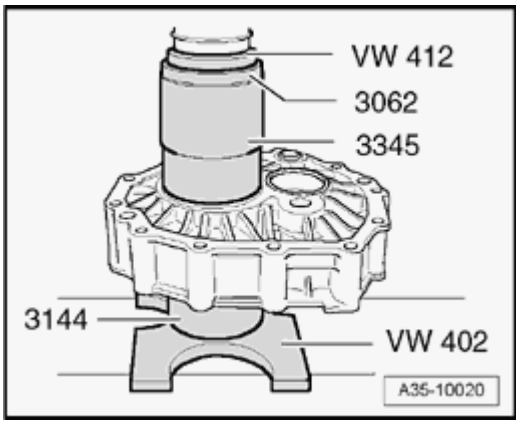


Fig. 476: Pressing In Tapered Roller Bearing Outer Race For Pinion Shaft With Shim Into Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

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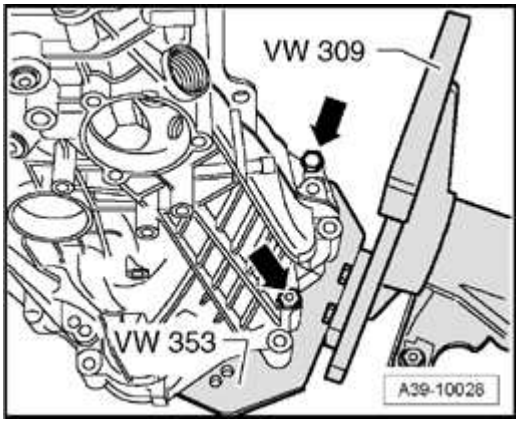


Fig. 477: Securing Transmission Housing Onto Transmission Support VW 353 With Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure transmission housing onto transmission support VW 353 with bolts - **arrows** -.

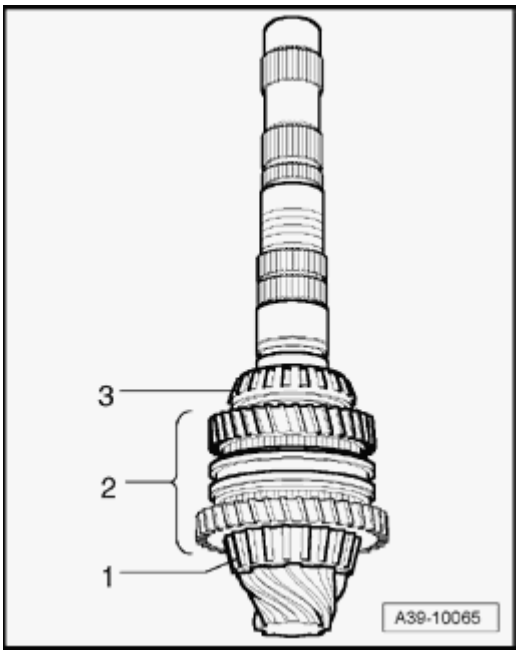


Fig. 478: Tapered Roller Bearing Inner Race, Selector Gears And Locking Collar For 1st And 2nd Gears And Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press tapered roller bearing inner race - **1** - onto pinion shaft and secure **Pressing on tapered roller bearing inner race**.
- Install selector gears and locking collar for 1st and 2nd gears - **2** - --> **Pinion shaft, disassembling and assembling**.
- Press tapered roller bearing inner race - **3** - onto pinion shaft **Pressing on tapered roller bearing inner race**.
- Insert completely assembled pinion shaft in transmission housing.

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- Install bearing housing and transmission cover with 4 dowel sleeves and tighten bolts to 35Nm.
- Turn transmission so that the transmission cover points downward.

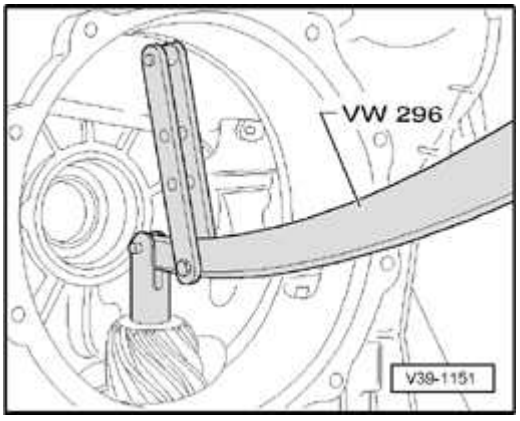


Fig. 479: Pressing Down On Drive Pinion Head Using Removal Tool VW 296
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press down on face of pinion shaft with removal tool VW 296 until tapered bearing outer race contacts bearing housing.
- Maintain pressure and rotate pinion shaft 5 turns in both directions to seat taper roller bearing.

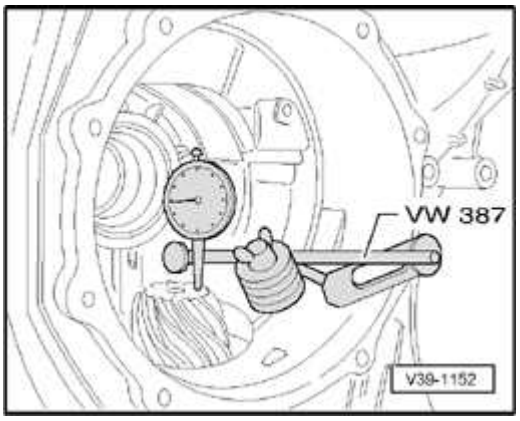


Fig. 480: Installing Dial Gauge (3 Mm Range) And Set To "0" With 2 Mm Pre-Load
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach dial gauge (3 mm measuring range) with dial gauge extension to transmission housing.
- Preload dial gauge to 1 mm and set to "0".

The dial gauge extension must contact machined surface on the face of pinion.

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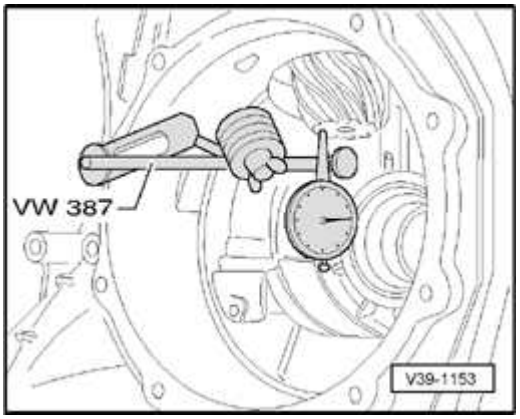


Fig. 481: Turn Transmission 180 Degrees, Settle Tapered Roller Bearing And Read Play On Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn transmission so that the transmission cover points upward.
- Rotate pinion shaft 5 turns in each direction so that the tapered roller bearing seats properly. Otherwise the result of the measurement will be incorrect.
- Read off play on dial gauge and note reading.

- Measurement in example: 0.46 mm

NOTE:

- **If the measuring procedure needs to be repeated, the pinion shaft must first be rotated 5 turns in each direction again so that the tapered roller bearing seats properly. Preload dial gauge to 1 mm and set to "0" again.**

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

Example:		
	Inserted shim "S_4 *"	1.01 mm
+	Measured value (example)	0.46 mm
+	Bearing preload (constant value)	0.12 mm
=	Total shim thickness "S_{total} " for "S_3 " plus "S_4 "	1.59 mm

Determining thickness of shim "S_3 *"

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

Example:		
	Total shim thickness "S_{total} " for "S_3 " plus "S_4 "	1.59 mm
-	Inserted shim "S_4 *"	1.01 mm
=	Thickness of shim "S_3 *"	0.58 mm

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- Pull tapered roller bearing outer race out of transmission housing **Pulling tapered roller bearing outer race out of transmission housing**
- Install shim "S_3 *" in transmission housing and install outer race again.
- Insert completely assembled pinion shaft into transmission housing again.
- Install bearing housing and transmission cover with the 4 dowel sleeves and tighten bolts to 35Nm.
- Turn pinion shaft 5 turns in each direction so that taper roller bearings seat properly.

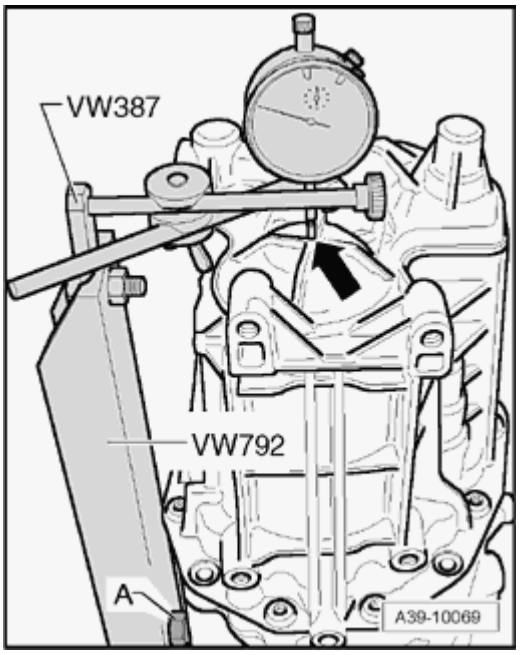


Fig. 482: Identifying Assembly Device VW 792, M12 Nut, VW 387 And Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install assembly device VW 792 on transmission housing; when doing so, insert a M12 nut - **A** - between assembly device VW 792 and transmission housing.
- Install universal dial gauge bracket VW 387 with dial gauge and 30 mm extension.
- Apply dial gauge extension exactly at center of intersection of ribs on transmission cover - **arrow** -.
- Set dial gauge (3 mm measuring range) to "0" with 1 mm preload.
- Loosen transmission cover bolts and turn pinion shaft several times.
- If correct shims have been selected the dial gauge will now indicate the following value:

- 0.06 to 0.12 mm

- Tighten transmission cover bolts again to 35 Nm.
- Take down measuring tools.
- Turn pinion shaft 5 turns in each direction so that taper roller bearings seat properly.

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Determining dimension "e"

NOTE:

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

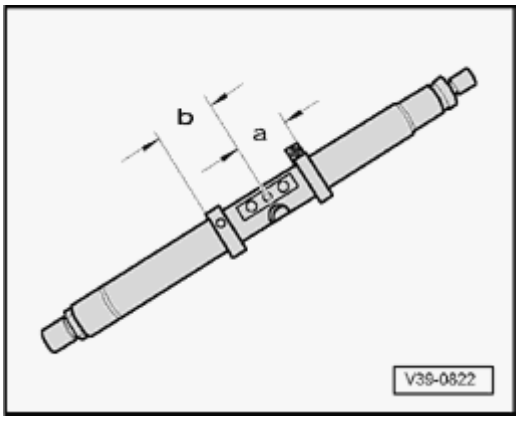


Fig. 483: Setting Adjusting Rings Of Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

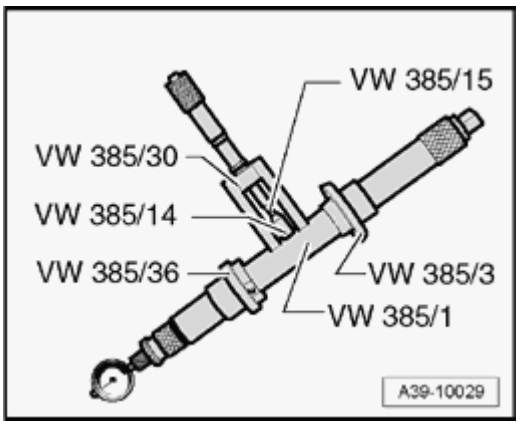


Fig. 484: Universal Measuring Tool VW385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble universal measuring tool VW385/1 as illustrated:

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

- Set master gauge VW385/30 to Ro = 59.65 mm and install onto measuring tool.

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

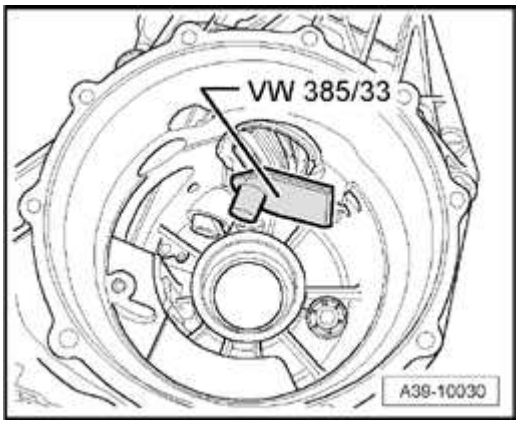


Fig. 485: Measuring Plate End Placed On Face Of Pinion Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place end measuring plate on face of pinion shaft.

NOTE:

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

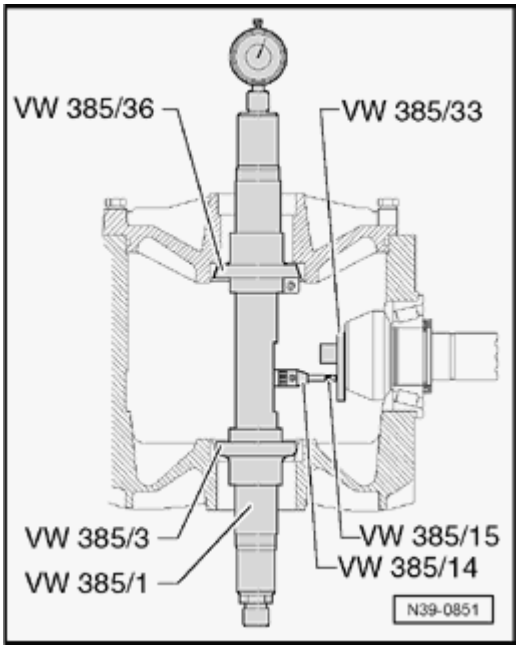


Fig. 486: Inserting Measuring Mandrel VW 385/1 Into Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove master gauge and insert measuring tool into housing.

- The dial gauge faces toward final drive cover

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- Install cover for final drive and tighten 4 bolts to 20 Nm.
- Using adjustable ring, pull 2nd centering pad VW385/36 out as far as possible so that the measuring tool can still just be turned by hand.

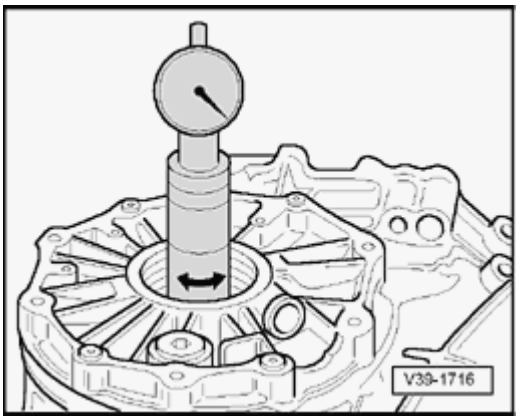


Fig. 487: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Measurement in following example: "e" = 0.17 mm (in red scale)

NOTE:

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

Determining thickness of shim "S3"

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

Formula:

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

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

Example:	
Inserted shim "S_3 *"	0.58 mm

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+	Deviation "r"	0.29 mm
-	Determined value "e" (in red scale)	0.17 mm
=	Thickness of shim "S_3 "	0.70 mm

- Determine shim(s) according to table.

Available shims for "S_3 "

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

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

Determining thickness of shim "S4"

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

Example:		
	Total shim thickness "S_{total} " for "S_3 " plus "S_4 "	1.59 mm
-	Thickness of shim "S_3 "	0.70 mm
=	Thickness of shim "S_4 "	0.89 mm

- Determine shim(s) according to table.

Shims available for "S_4 "

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

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0.57	0.91	1.37
0.61	1.01	1.41
0.65	1.05	1.45
0.69	1.09	1.49

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

Checking adjustment

Checking deviation (tolerance) "r "

- Install pinion shaft with appropriate measured shims "S_3 " and "S_4 ".
- Turn pinion shaft 5 turns in each direction so that taper roller bearings seat properly.

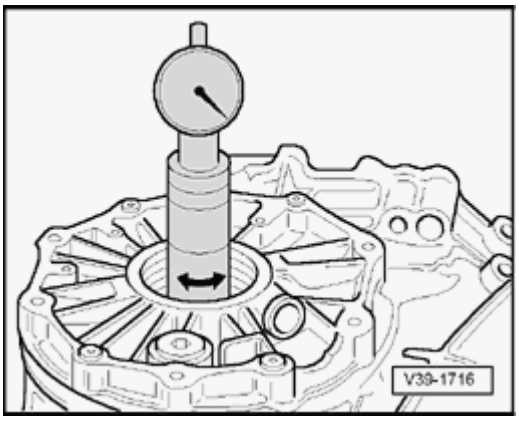


Fig. 488: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Re-determining shim "S4" when replacing bearing housing

Special tools, testers and auxiliary items required

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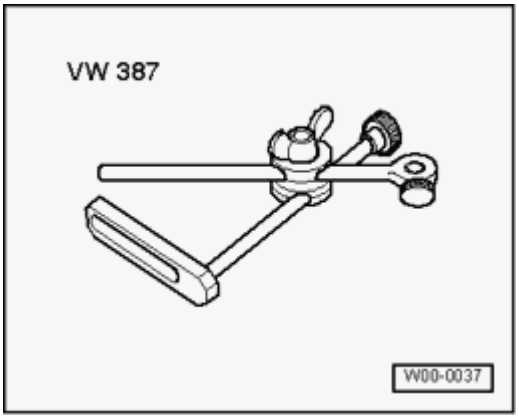


Fig. 489: Identifying Dial Gauge Holder VW 387
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Universal dial gauge bracket VW387

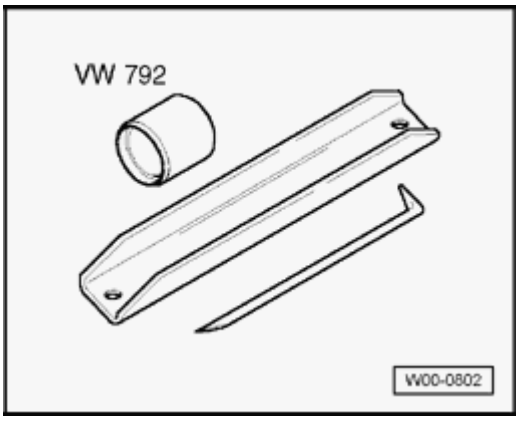


Fig. 490: Installation Arbor VW 792
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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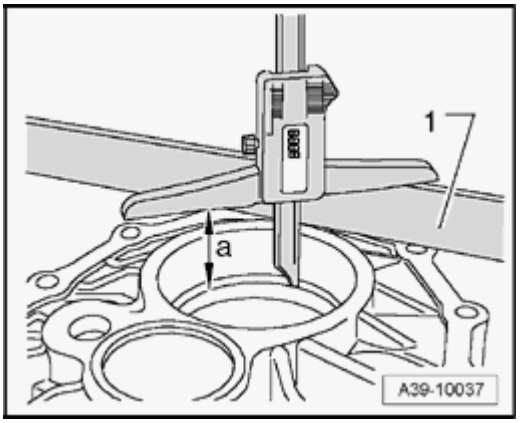


Fig. 491: Measuring Difference Between Depth On Old And New Bearing Housing With A Digital Depth Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Example:

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

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

Example:

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

Shims available.

- Press tapered roller bearing outer race with shim "S_4 " into bearing housing **Pressing tapered roller bearing outer race into bearing housing**
- Insert completely assembled pinion shaft into transmission housing again.
- Install bearing housing and transmission cover and tighten bolts to 35Nm.
- Turn pinion shaft 5 turns in each direction so that taper roller bearings seat properly.

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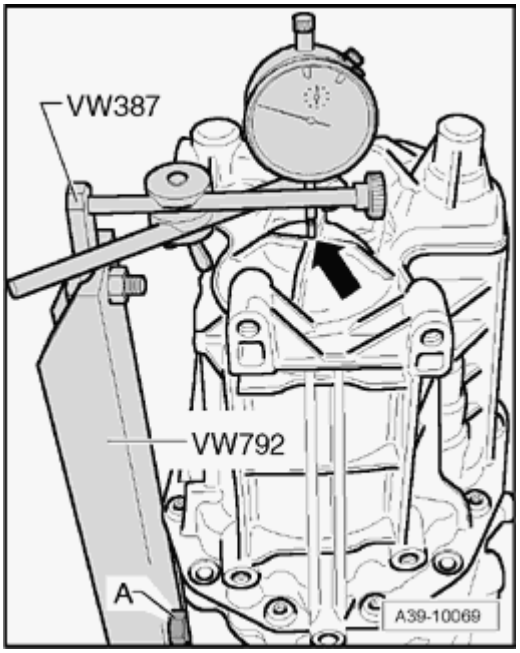


Fig. 492: Identifying Assembly Device VW 792, M12 Nut, VW 387 And Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install assembly device VW 792 on transmission housing; when doing so, insert an M12 nut - **A** - between assembly device VW 792 and transmission housing.
- Attach universal dial gauge bracket VW 387 with dial gauge and 30 mm extension.

NOTE:

- **Attach dial gauge extension exactly at the center of the webbing intersection on the transmission cover - arrow -.**

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

- 0.06 to 0.12 mm

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

Crown wheel, adjusting

(Adjusting differential)

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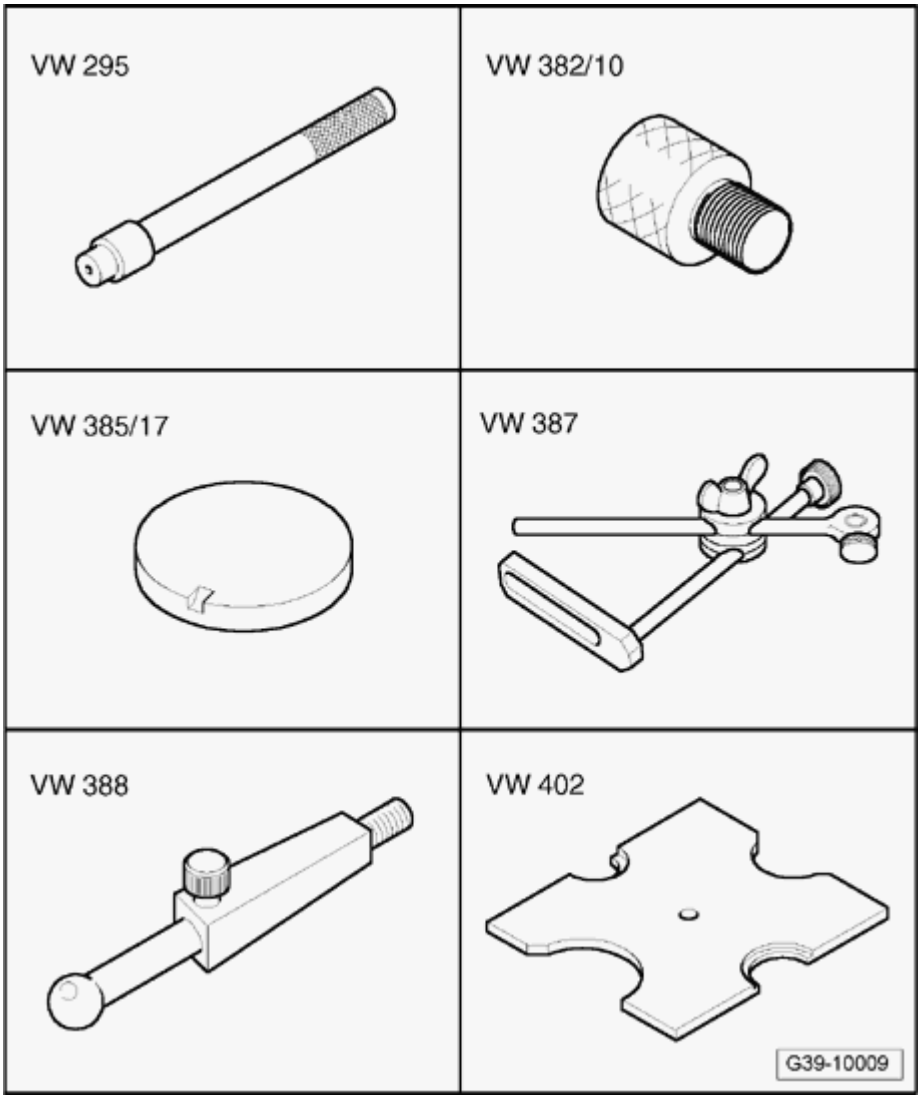


Fig. 493: Identifying Special Tools - Crown Wheel, Adjusting (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Drift VW 295
- Dial gauge extension VW382/10
- End measuring plate VW385/17
- Universal dial gauge bracket VW387
- Adjustable measuring lever VW 388
- Thrust plate VW402

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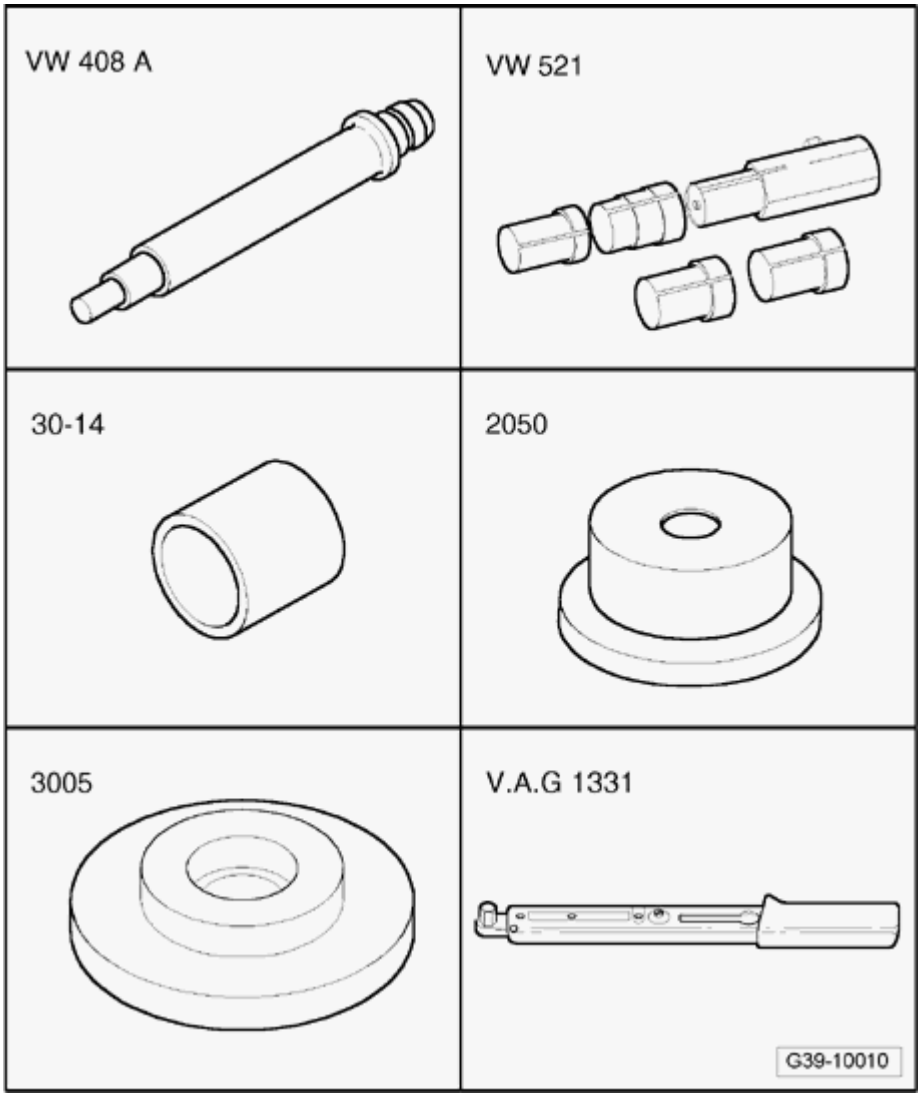


Fig. 494: Identifying Special Tools - Crown Wheel, Adjusting (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools, testers and auxiliary items required

- Press tool VW408A
- Crown wheel adjusting tool VW 521
- Tube 30 - 14
- Thrust piece 2050
- Thrust plate 3005
- Torque wrench V.A.G1331
- Dial gauge
- Dial gauge extension, 30 mm

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It is necessary to readjust crown wheel when the following components have been replaced:

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

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

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

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

- Pinion shaft removed

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

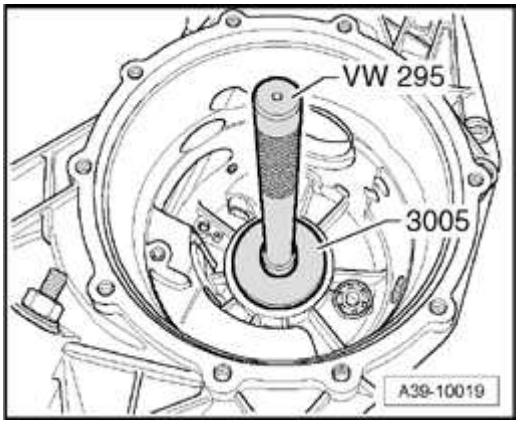


Fig. 495: Driving Outer Race For Tapered Roller Bearing With Shim Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

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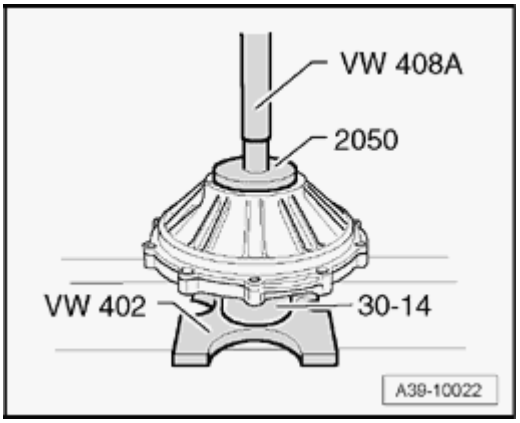


Fig. 496: Pressing Tapered Roller Bearing Outer Race (Left-Side) Into Cover For Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

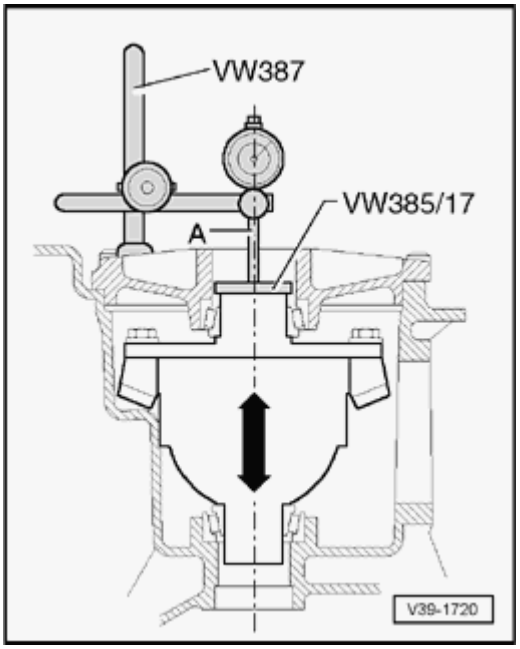


Fig. 497: Installing Magnetic Plate 50Mm Dia. VW 385/17 And Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up measuring tool using 30 mm extension.

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

NOTE:

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

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

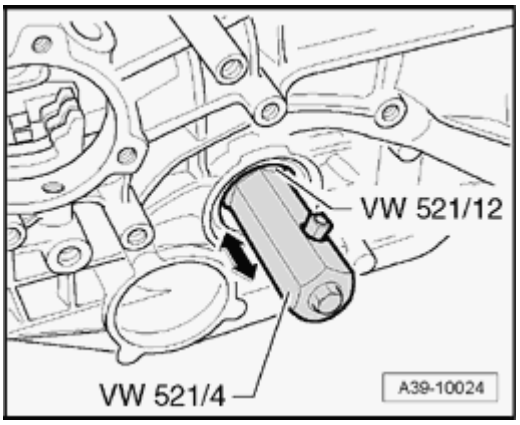


Fig. 498: Special Tools VW521/4 And VW521/12 Secured On Right Of Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

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

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

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

Determining thickness of shim "S_1 *"

NOTE:

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

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

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

Measuring backlash

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

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

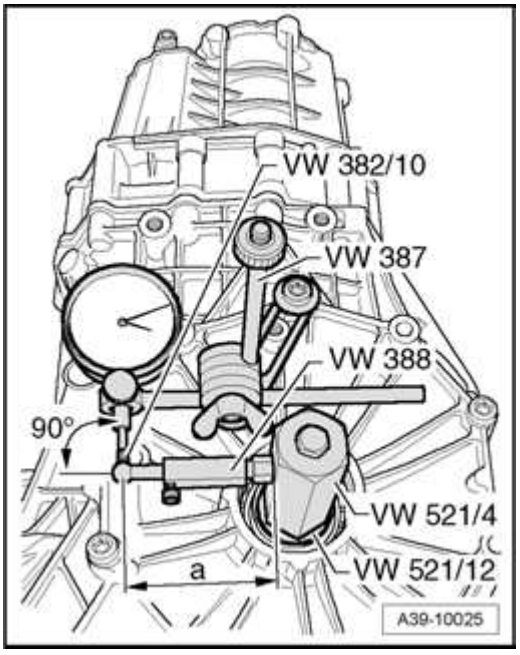


Fig. 499: Measuring Backlash
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure universal dial gauge bracket VW 387 to housing.
- Install dial gauge with dial gauge extension VW382/10 (6mm flat).
- Adjust measuring lever VW388 to distance "a" = 79 mm (for diameter 188 mm crown wheel).
- Measure play between teeth faces (backlash) as follows:

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

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

- Turn crown wheel through 90° and repeat measurements a further 3 times.

Determining average backlash

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

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

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

NOTE:

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

Determining thickness of shim "S2"

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

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

- Determine shim(s) according to table.

Available shims for "S_2 "

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

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0.57	0.73	

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

Determining thickness of shim "S1"

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

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

- Determine shim(s) according to table.

Available shims for "S_1 "

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

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

Adjustment, checking

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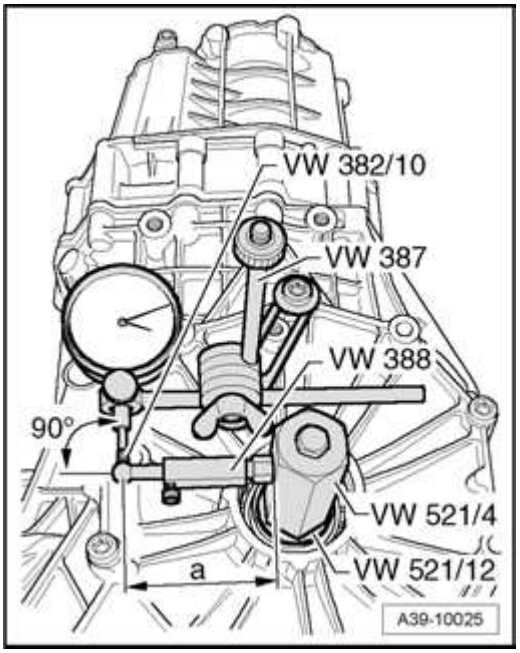


Fig. 500: Measuring Backlash
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Specification: 0.12 to0.28 mm

NOTE:

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

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