TRANSMISSION

5 Spd. Manual Transmission 012/01W Front Wheel Drive

00 GENERAL, TECHNICAL DATA

TRANSMISSION, IDENTIFICATION

Transmission, identification

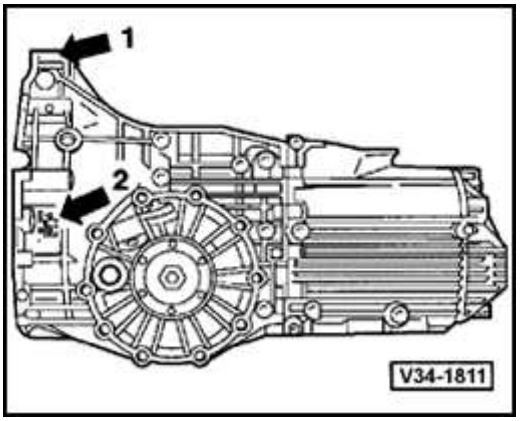


Fig. 1: Locating Transmission Identification And Date Of Construction
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Location on transmission

Code letters and date of manufacture (arrow 1)

Manual transmission 012 / 01W (arrow 2)

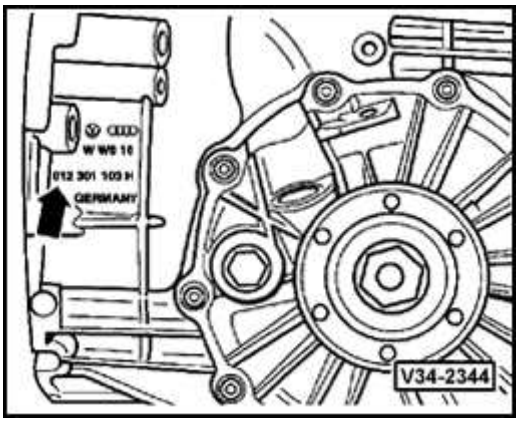


Fig. 2: Manual Transmission 012/01W/0A9
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Manual transmission 012 / 01W (arrow 2)

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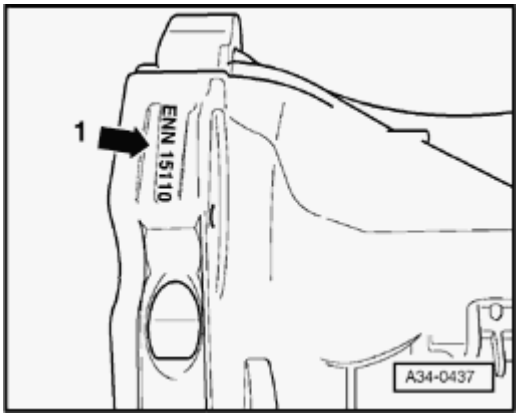


Fig. 3: Code Letters And Date Of Manufacture
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Code letters and date of manufacture (arrow 1)

Example:	**ENN**	**15**	**11**	**0**
	I	I	I	I
	I	I	I	I
	Code letters	Day	Month	Year (2000) of production

Additional data are production-related

NOTE: The code letters of the transmission are also given on the vehicle data plates.

Code letters, application, ratios, capacities

Manual transmission		**5-speed 012 / 01W**	
Code letters		**ENN**	**FPS**
Production	from to	09.00	07.01
Application	Model	**Audi A4 2002 >**	**Audi A4 2002 >**
	Engine	1.8 l - 125 kW	1.8 l - 125 kW
Ratio: Z2 : Z1	Final drive	37 : 10 = 3.700	37 : 10 = 3.700
	1st gear	34 : 9 = 3.778	34 : 9 = 3.778
	2nd gear	37 : 17 = 2.176	37 : 17 = 2.176
	3rd gear	40 : 28 = 1.429	40 : 28 = 1.429
	4th gear	36 : 33 = 1.091	36 : 33 = 1.091
	5th gear	32 : 37 = 0.865	32 : 37 = 0.865
	6th gear	-	-
	Reverse gear	31 : 9 = 3.444	31 : 9 = 3.444
	Speedometer	electronic	electronic

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Code letters	ENN	FPS
Capacity	2.25 liters	
Specification	Gear oil G 052 911 A 1 SAE 75 W 90 (synthetic oil)	
Clutch mechanism	hydraulic	hydraulic
Clutch plate diameter	228 mm	228 mm
Drive shaft flange diameter	75.5 mm	881) mm
Overall ratio in top gear	3.200	3.200

1) Drive axle with triple rotor joint.

TRANSMISSION LAYOUT

Transmission layout

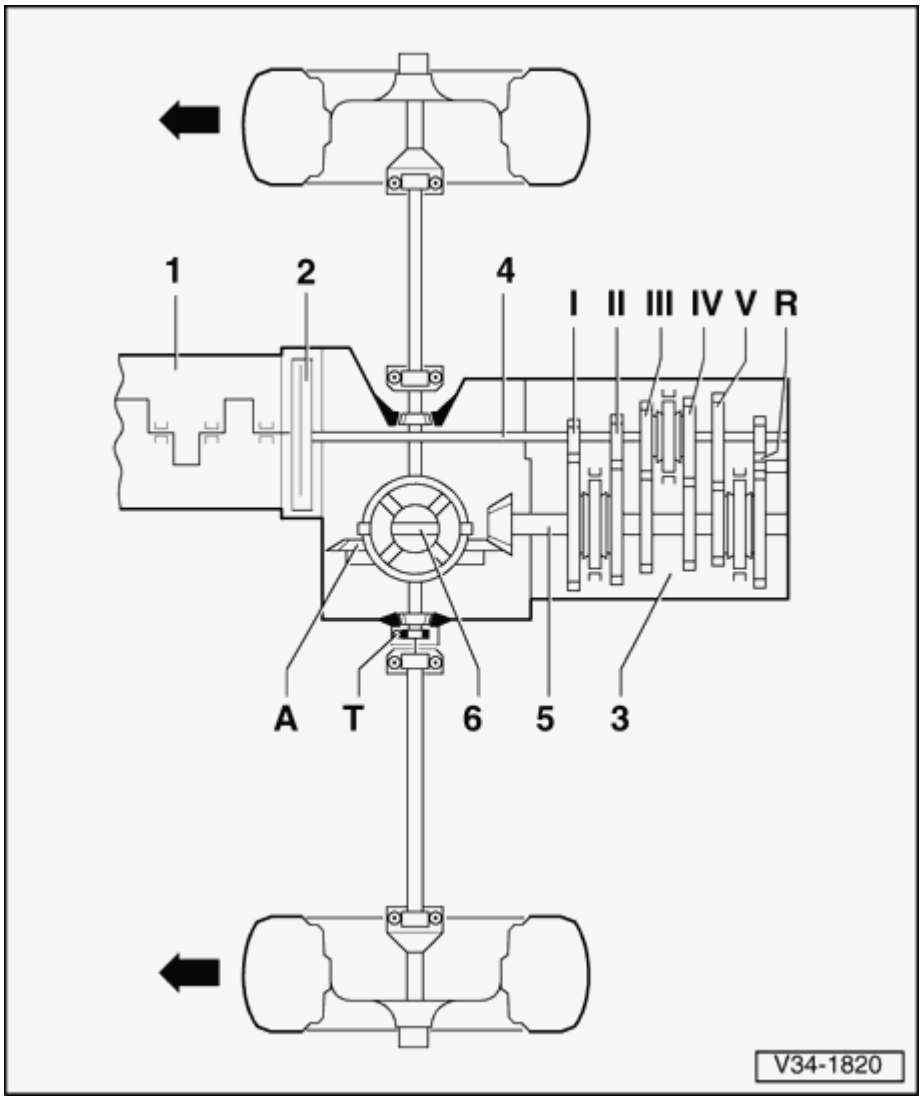


Fig. 4: Power Transfer, Overview

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Designation

1 - Engine

2 - Clutch

3 - Manual transmission

4 - Input shaft

5 - Drive pinion (output shaft)

6 - Differential

NOTE: Arrows face in direction of travel.

Ratio

I	-	1st gear
II	-	2nd gear
III	-	3rd gear
IV	-	4th gear
V	-	5th gear
R	-	Reverse gear
A	-	Final drive
T	-	Speedometer drive

NOTE: Arrows face in direction of travel.

CALCULATIONS

Calculating transmission ratios "i"

Transmission ratio

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

Ratios			**Formula**
iG	=	Gear ratio	ZG2 : ZG1
iA	=	Axle ratio	ZA2 : ZA1
itotal	=	Overall ratio	iG x iA

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Example:		
	5th gear	Final drive
Drive gear	ZG1 = 37	ZA1 = 9
Driven gear	ZG2 = 31	ZA2 = 35

Calculations:			
iG	=	31 : 37 = 0.838	
iA	=	35 : 9 = 3.889	
itotal	=	0.838 x 3.889 = 3.259	

General repair instructions

To make sure of satisfactory and successful transmission repairs the maximum care and cleanliness and proper tools are essential. When carrying out vehicle repairs basic safety precautions apply.

A number of general instructions for individual repair operations, which are otherwise mentioned at various points in the article, are summarized here. They apply to this article.

Special tools

For a complete list of special tools used in this article

Refer to Booklet; Special tools, Workshop equipment

Transmission

- Select the correct bolts and other components according to the transmission code letters. Refer to **Code letters, application, ratios, capacities**.
- When installing a new transmission, the oil level must be checked and oil added. Refer to **Oil level in manual transmission, checking**.
- Capacities and specifications. Refer to **Code letters, application, ratios, capacities**.
- Carefully clean all joints and adjacent areas before disconnecting.
- When installing transmission, make sure that the dowel sleeves are installed correctly.

Sealants

- Thoroughly clean housing joint surfaces before applying sealing paste.
- Apply sealing paste AMV 188 001 02 evenly and not too thick.
- Breather holes must remain free of sealing paste.

O-rings, seals, gaskets

- Always replace O-rings, seals and gaskets.

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- Always inspect the contact surface on the housing or shaft for burrs or other signs of damage resulting from removal of gaskets and seals.
- Thoroughly clean housing joint surfaces before assembling.

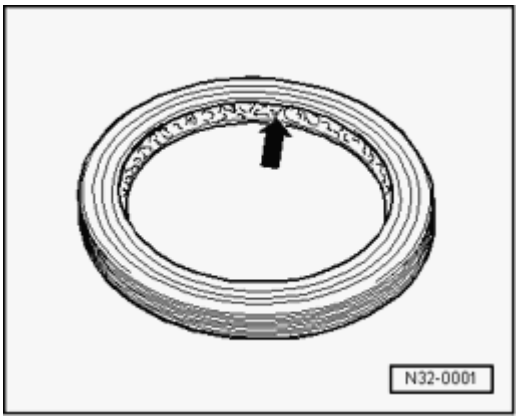


Fig. 5: Identifying Space Between Oil Seal Sealing Lips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before installing radial shaft oil seals, lubricate outer diameter slightly and half fill space between sealing lips -arrow- with sealing grease G 052 128 A1.
- Open side of the seal faces toward the side containing the oil.
- When replacing oil seals, the point at which the sealing lips make contact vary (use insertion depth tolerances).
- Lightly lubricate O-rings before installing. This prevents them from being damaged when assembling.
- Check oil level in transmission after replacing seals and gaskets. Refer to **Oil level in manual transmission, checking**.

Locking elements

- Do not over-stretch circlips.
- Always replace circlips which been damaged or over-tightened.
- Circlips must be seated in the base of the groove.

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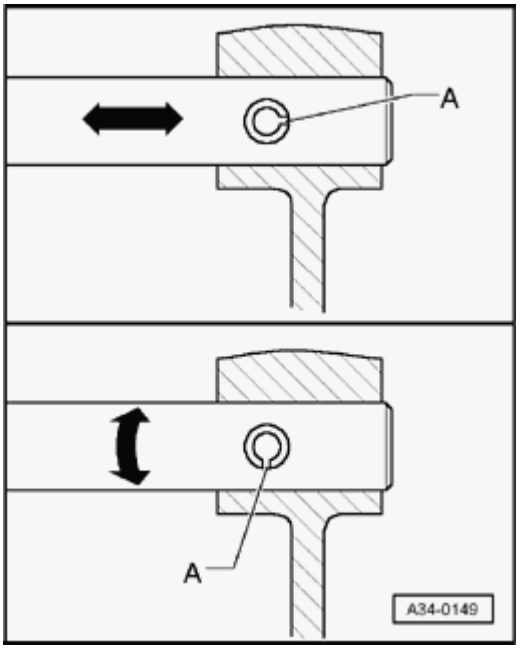


Fig. 6: Identifying Locking Elements
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Replace spring sleeves. Installation position: Slot -A- longitudinal to line of force -arrow-.

Nuts, bolts

- Loosen the nuts and bolts in reverse sequence to the specified tightening sequence.
- Tighten and loosen nuts and bolts for securing covers and housings in a diagonal sequence.
- Take care not to tilt particularly sensitive components, such as clutch pressure plates, loosen and tighten nuts and bolts gradually in a diagonal sequence.
- The tightening torques stated apply to non-oiled nuts and bolts.

- Always replace self-locking nuts and bolts.
- Clean threads of bolts using a wire brush with a locking compound screw in. Then apply AMV 185 101 A1 when inserting.
- Threaded holes into which self-locking bolts or bolts coated with locking fluid are screwed, must be cleaned (e.g. with a tap). Otherwise there is a danger of bolts shearing when subsequently being removed.

Bearings

- Install needle bearings with the lettering on the bearing (the side with thicker metal) facing toward the drift or other tool used for installing.
- Mark the needle roller bearings on 1st to 5th speed sliding gears when removing. Make sure the needle roller bearings are in the same position when re-installing.
- Grease needle roller bearing for transmission input shaft in flywheel.
- Lubricate all bearings in transmission housing with gear oil before installing.

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- Heat inner races of tapered roller bearings to approx. 100 ° C before installing. Press fully up to stop free of axial play when installing.
- Do not interchange the outer or inner races of bearings of the same size. The bearings are paired.
- Always replace the tapered roller bearings on one shaft together and use new bearings from a single manufacturer.
- The tapered roller bearings for the output shaft and the differential in the transmission are low-friction bearings. Do not add oil to new tapered roller bearings when measuring friction torque. The bearings are pre-treated at the factory with a special type of oil for this purpose.

Shims

- Use a micrometer to measure the shims at several points. Different tolerances make it possible to obtain exact shim thickness required.
- Check for burrs and damage. Install shims which are in perfect condition.

Sliding gears

- After installing, check that 1st to 5th speed sliding gears have axial play of 0.15... 0.35 mm and move freely.

Synchronizer rings

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

Gears, synchro-hubs, inner races for sliding gears

- Heat gears and synchro-hubs to approx. 100 ° C before installing. When installing press fully up to stop free of axial play.
- Heat inner races for sliding gears to approx. 100 ° C when installing.
- Temperature can be checked with temperature tester V.A.G 1558.
- Note installation position.

Clutch mechanism

- When removing transmission, remove clutch slave cylinder without disconnecting pipes.
- Do not depress the clutch pedal after removing the slave cylinder if the hydraulic line is still connected. Otherwise the piston will be pressed out of the slave cylinder.
- Make sure clutch pressure plate is kept straight; loosen and tighten bolts gradually in diagonal sequence.
- To reduce the odor of the burnt clutch, thoroughly clean the bell housing, flywheel and parts of the engine facing the transmission.

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30 CLUTCH

CLUTCH MECHANISM, SERVICING

Clutch mechanism, servicing

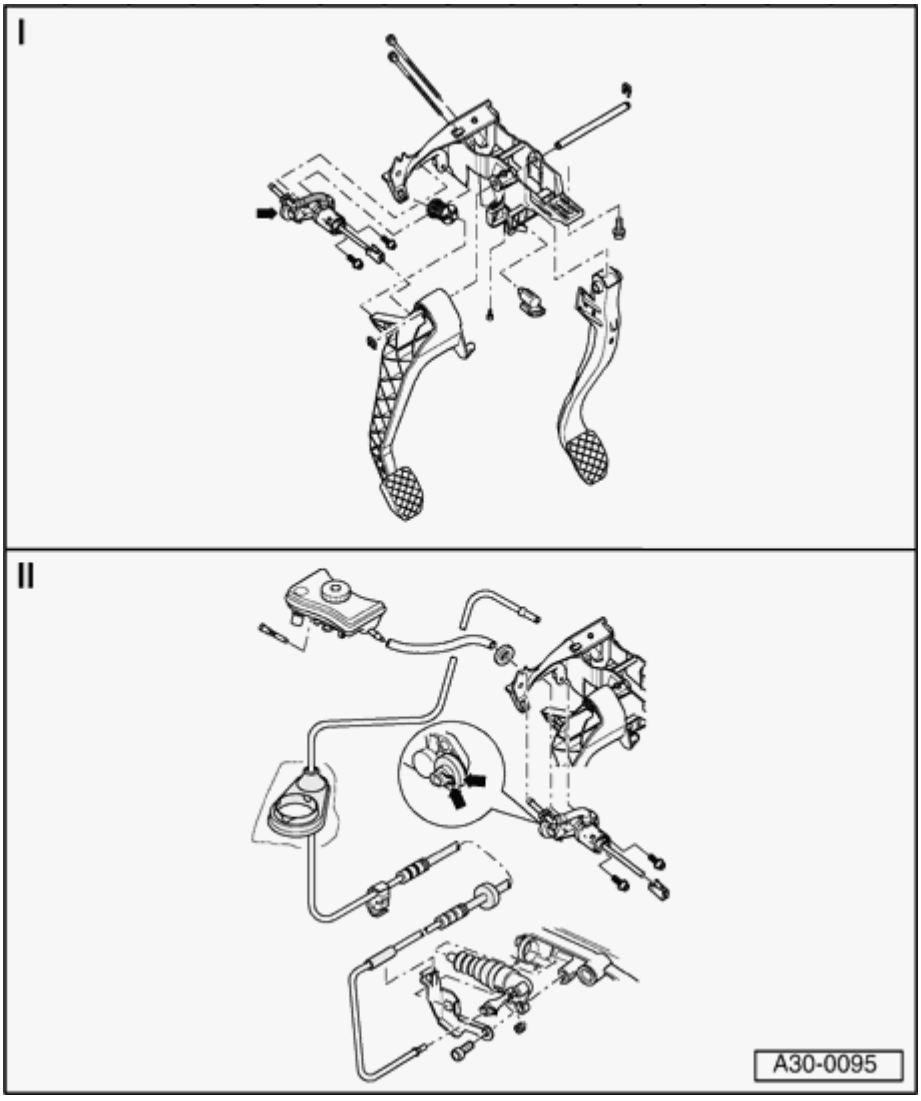


Fig. 7: Clutch Mechanism, Servicing - Pedal Cluster And Hydraulic System
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - Exploded view of pedal cluster. Refer to Pedal cluster, assembly overview

II - Exploded view of hydraulic system. Refer to Hydraulic system, assembly overview

NOTE:

- **Note or obtain radio code on vehicles with coded radio.**
- **Disconnect battery ground strap with the ignition switched off.**

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- **Lubricate all bearings and contact surfaces with polycarbamide grease G 052 142 A 2.**

CAUTION: On vehicles equipped with Audi Telematics by OnStar ® , switch-off the emergency (back-up) battery for the Telematic/Telephone Control Module prior to disconnecting the vehicle battery. Switch-on the emergency (back-up) battery after reconnecting the vehicle battery. Refer to

- **91 - COMMUNICATION**
- **91 RADIO, TELEPHONE, NAVIGATION, TRIP COMPUTER for Cabriolet**

.

- Remove cover below instrument panel, before working on foot pedal cluster

Refer to

- **68 - INTERIOR EQUIPMENT**
- **68 - INTERIOR EQUIPMENT** for Cabriolet

- Make sure brake fluid does not escape into footwell or plenum chamber or onto transmission below. If this does happen, clean the affected areas thoroughly.
- Protect the carpet from brake fluid using rags, when performing work in the footwell.

Pedal cluster, assembly overview

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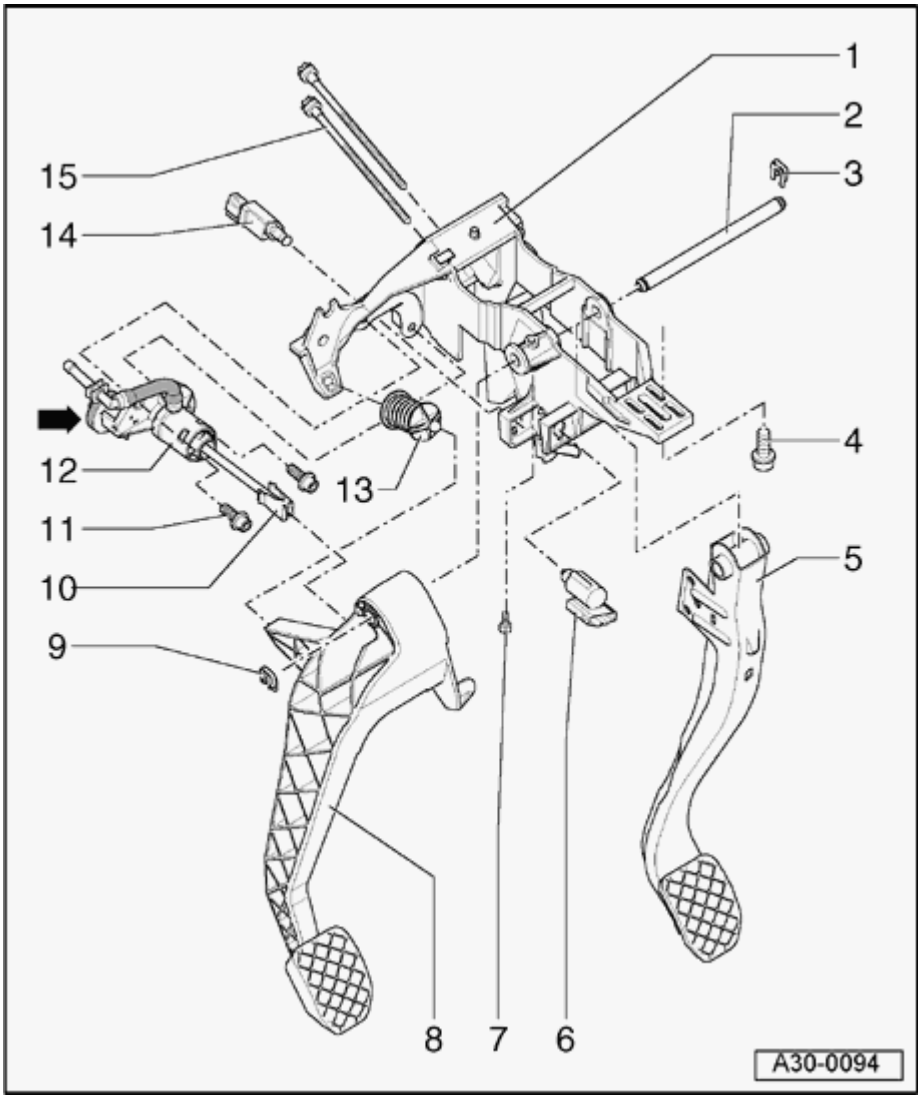


Fig. 8: Pedal Cluster, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Mounting bracket

- Removing and installing. Refer to **Slave cylinder, removing and installing**

2 - Fulcrum pin for clutch and brake pedal

3 - Fastener

4 - Hex socket-head bolt - 25 Nm

5 - Brake pedal

- Mounting is maintenance-free, do not grease

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6 - Clutch pedal switch

- Can only be installed one time

7 - Hex socket-head bolt - 5 Nm

- For securing pivot pins for clutch and brake pedal

8 - Clutch pedal

- Removing and installing. Refer to **Slave cylinder, removing and installing**

9 - Fastener

10 - Retainer

- Removing and installing. Refer to **Hydraulic system, assembly overview**

11 - Hex socket-head bolt - 20 Nm

12 - Master cylinder

- Removing and installing. Refer to **Slave cylinder, removing and installing**
- Seal -arrow- must not be removed

13 - Over-center spring

- Black end points toward clutch pedal
- Removing and installing. Refer to **Over-center spring, removing and installing**
- Allocation

Refer to Parts list

14 - Clutch Pedal Position (CPP) Switch -F194-

- Can only be installed one time

15 - Torx bolt - 25 Nm

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

Over-center spring, removing and installing

Special tools and workshop equipment required

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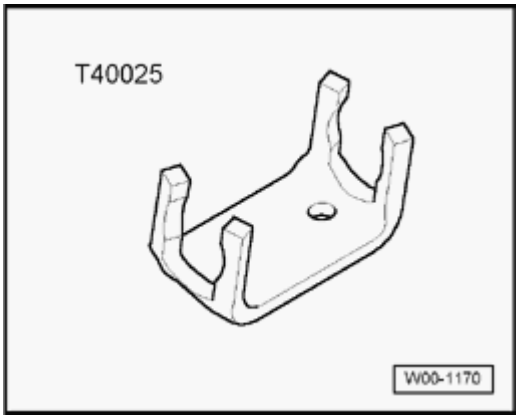


Fig. 9: T40025 Installation Clamp
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- T40025 Installation clamp

Removing

- Remove driver's storage compartment:

Refer to

- **68 - INTERIOR EQUIPMENT**
- **68 - INTERIOR EQUIPMENT** for Cabriolet

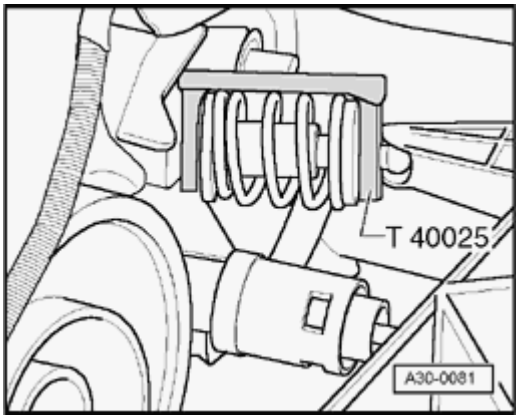


Fig. 10: Installation Clamp T40025 Installed On Over-Center Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tension over-center spring with clutch pedal and press on installation clamp T40025.
- Bring clutch pedal to rest position and take out over-center with spring and installation clamp T40025 from below.

Installing

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- Pull clutch pedal into passenger compartment.

Installation position over-center spring:

- Black end over-center spring points toward clutch pedal.

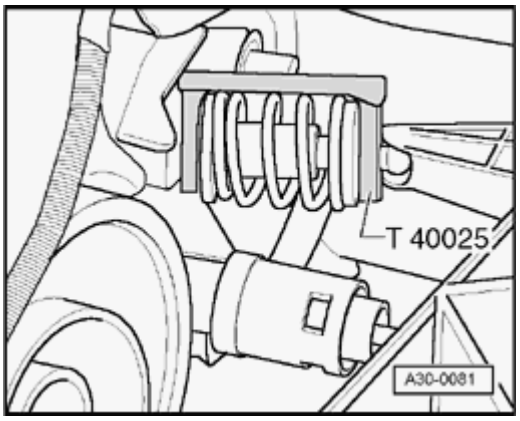


Fig. 11: Installation Clamp T40025 Installed On Over-Center Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert over-center spring with installation clamp T40025, depress clutch pedal and pull out installation clamp.

Hydraulic system, assembly overview

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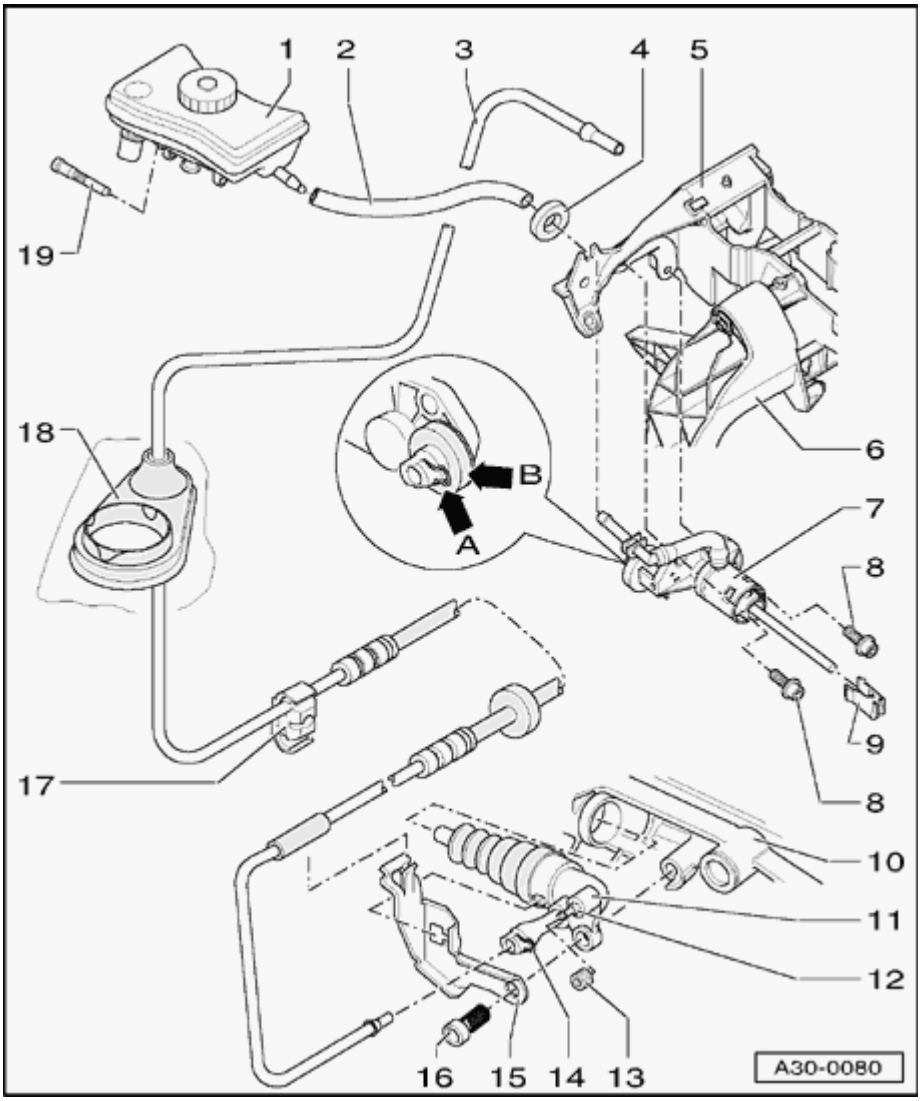


Fig. 12: Hydraulic System, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Brake fluid reservoir

2 - Supply hose

- For master cylinder

3 - Hose assembly

- For plug-in connections on master/slave cylinder
- Separating from master cylinder and installing. Refer to **Slave cylinder, removing and installing**
- Separating from slave cylinder. See **Separating slave cylinder from hose and pipe assembly**

4 - Grommet

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5 - Mounting bracket

6 - Clutch pedal

7 - Master cylinder

- Removing and installing. Refer to **Slave cylinder, removing and installing**
- Clip (arrow A) and seal (arrow B) must not be removed
- To remove hose/pipe assembly, pull clip (arrow A) out up to stop. Refer to **Fig. 27**

8 - Hex socket-head bolt - 20 Nm

9 - Retainer

- Replace only with master cylinder removed
- Removing. See **Pulling off retainer**
- Pressing on. See **Pressing master cylinder operating rod into retainer**

10 - Transmission

11 - Slave cylinder

- Do not operate clutch pedal after slave cylinder has been removed.
- Removing and installing. Refer to **Before installing, coat clutch slave cylinder with grease**
- After working on hydraulic clutch mechanism, bleed slave cylinder. Refer to **Clutch system, bleeding**
- Separating from hose/pipe assembly. See **Separating slave cylinder from hose and pipe assembly**
- Brake fluid must not come into contact with transmission

12 - Bleeder valve

- Tighten to 4.5 Nm
- Follow correct sequence when bleeding. Refer to **Clutch system, bleeding**

13 - Dust cap

14 - Clip

- To remove pipe, pull out clip up to stop. Refer to **Separating slave cylinder from hose and line assembly**

15 - Bracket

- for hose and line assembly

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- Secured to transmission with slave cylinder

16 - Hex socket-head bolt - 25 Nm

- Slave cylinder to transmission
- Self-locking
- Always replace

17 - Retaining clip

18 - Seal

19 - Securing bolt

- for brake fluid reservoir

Pulling off retainer

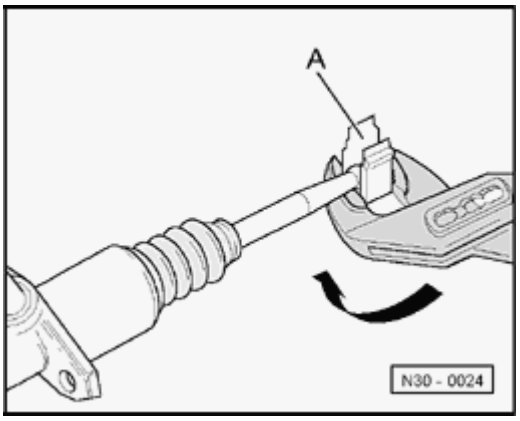
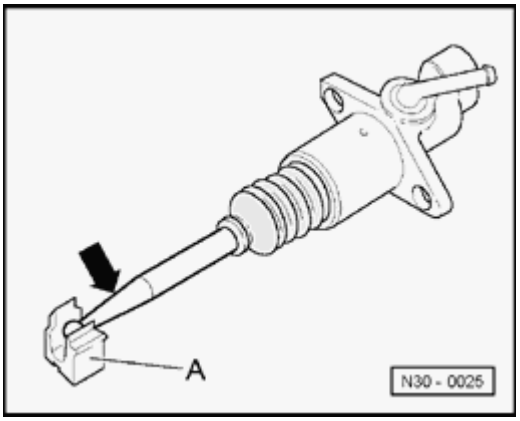


Fig. 13: Removing Retainer By Prying
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing master cylinder operating rod into retainer



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Fig. 14: Installing Clutch Master Cylinder Operating Rod In Retainer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Separating slave cylinder from hose and pipe assembly

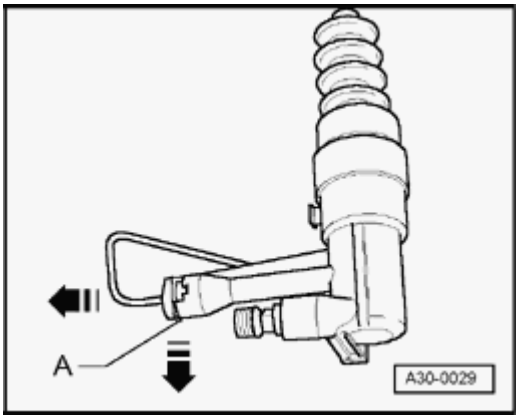


Fig. 15: Removing Hydraulic Line From Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

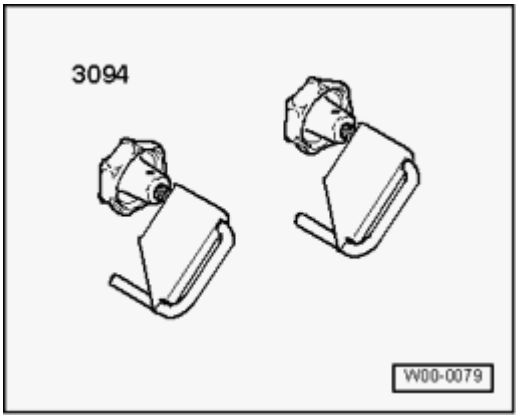
- Use a screwdriver to remove hose and line assembly, pull out clip -A- up to stop. Then the hose and pipe assembly can be pulled out.

Installing

- Press in clip -A- up to stop
- Insert hose and pipe assembly into slave cylinder until it is heard to engage.
- Test by pulling on hose and pipe assembly.

Slave cylinder, removing and installing

Special tools, testers and auxiliary items required



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Fig. 16: Identifying Hose Clamps 3094
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3094 Hose clip

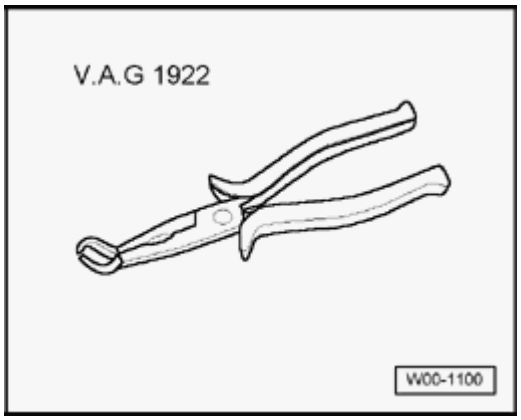


Fig. 17: Identifying Spark Plug Connector Pliers V.A.G 1922
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1922 Pliers

Removing

- Remove rubber seal from plenum chamber in direction of arrow.

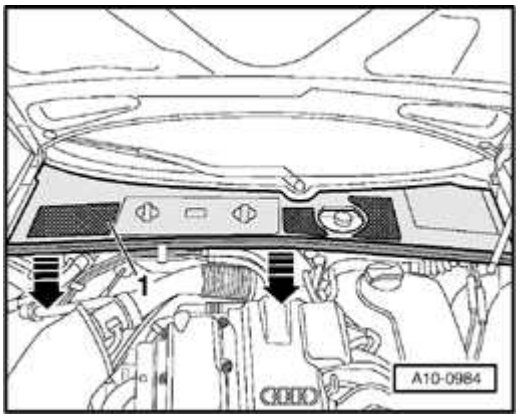


Fig. 18: Removing Cover Over Plenum Chamber
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover -1- over plenum chamber.
- Check whether an encoded radio is installed. If so, obtain anti-theft code.

CAUTION: On vehicles equipped with Audi Telematics by OnStar ® , switch-off the emergency (back-up) battery for the Telematic/Telephone Control Module prior to disconnecting the vehicle battery. Switch-on the emergency (back-

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up) battery after reconnecting the vehicle battery. Refer to

- **91 - COMMUNICATION**
- **91 RADIO, TELEPHONE, NAVIGATION, TRIP COMPUTER for Cabriolet**

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- Disconnect battery ground strap with ignition switched off.

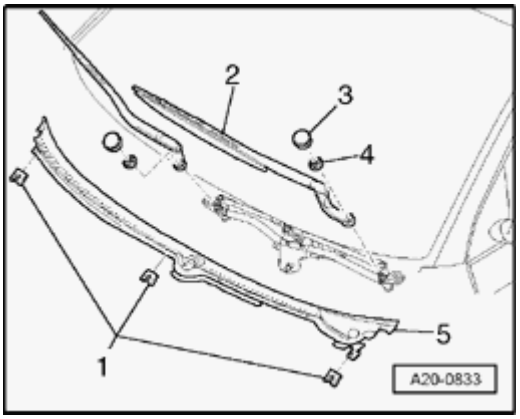


Fig. 19: Removing Securing Clips And Cowl
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Remove electronics box in plenum chamber as follows:

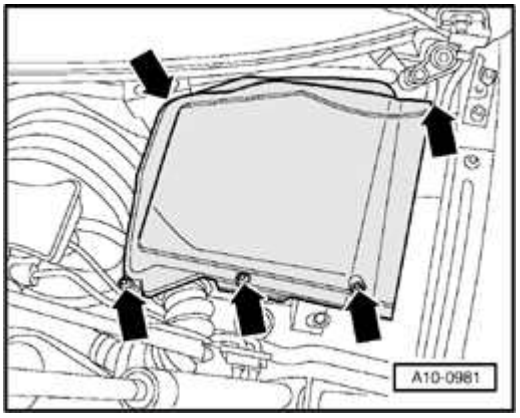


Fig. 20: Electronics Box Sealing Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Screw out bolts -arrows- and pull off sealing cover.

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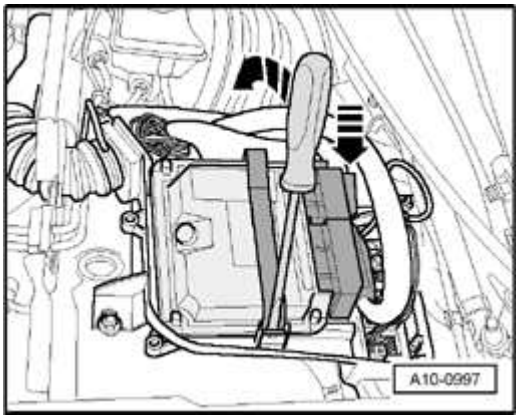


Fig. 21: Using Screwdriver To Remove Retainer Bar And Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry off retainer bar with screwdriver -arrow-.

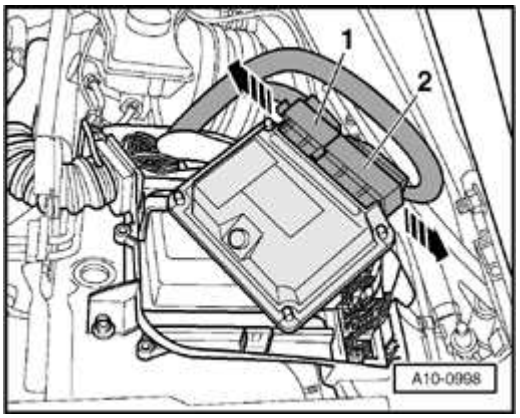


Fig. 22: Releasing Connector Latches And Pulling Off Connectors On Engine Control Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release connector latches -arrows- and pull off connectors -1- and -2- on engine control module.

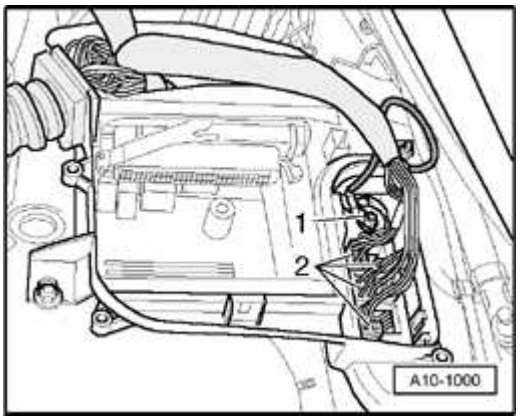


Fig. 23: Connector At Connector Rail And Wire
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Pull off connector -2- from connector rail
- Disconnect wire -1-.

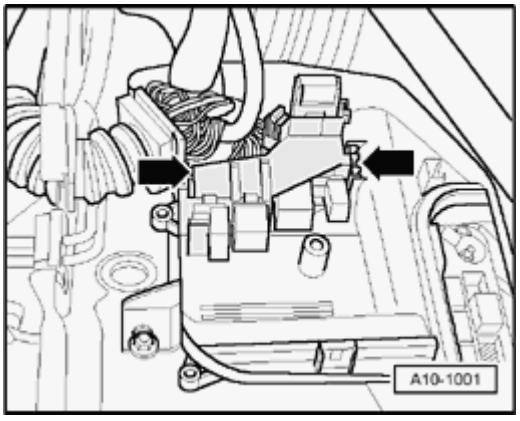


Fig. 24: Locating Auxiliary Relay Carrier Catches
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release catches -arrows- and pull auxiliary relay carrier in electronics box upward to remove.
- Pull engine wiring harness together with rubber grommet out of recess in electronics box.

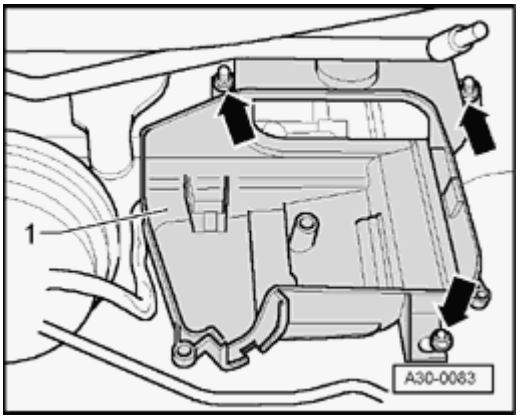


Fig. 25: Electronics Box Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

- **Make sure that brake fluid does not escape into the plenum chamber or onto the transmission below. If this does happen, clean the affected areas thoroughly.**
- **Protect the carpet from brake fluid using rags when performing work in the footwell.**

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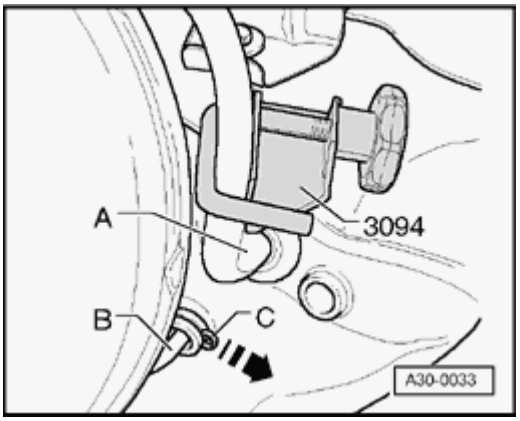


Fig. 26: Identifying Brake Fluid Reservoir Return Hose Grommet
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp supply hose -A- leading to brake fluid reservoir using special tool 3094. Pull hose off at master cylinder and plug it.
- Remove rubber grommet from bulkhead on the supply hose connecting line.
- Use a screwdriver to pry out retaining clip -C- and then pull out line -B- slightly.

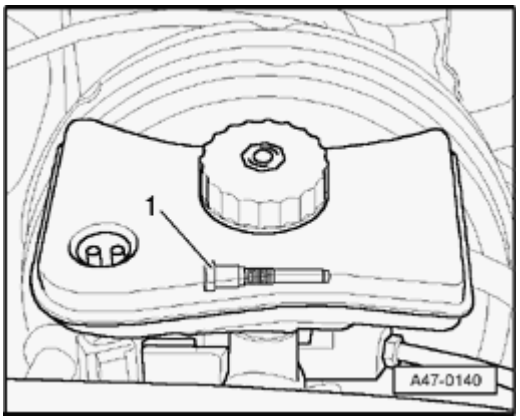


Fig. 27: Location Of Brake Fluid Reservoir Dowel Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt from brake fluid reservoir -1- and disconnect connector from fluid level below.

NOTE: Do not remove the brake fluid reservoir.

NOTE:

- **For ease of illustration, brake fluid reservoir is not shown.**
- **To remove the top Torx bolt, swivel brake fluid reservoir slightly to one side.**

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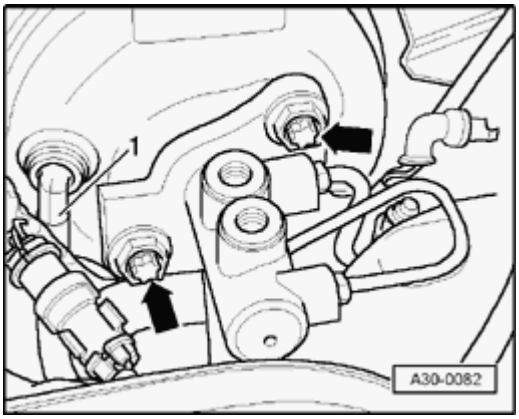


Fig. 28: Location Of Brake Servo Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the two Torx bolts -arrows-.
- Remove vacuum line from brake servo -1-.
- Remove driver's side storage compartment.

Refer to

- **68 - INTERIOR EQUIPMENT**
- **68 - INTERIOR EQUIPMENT** for Cabriolet

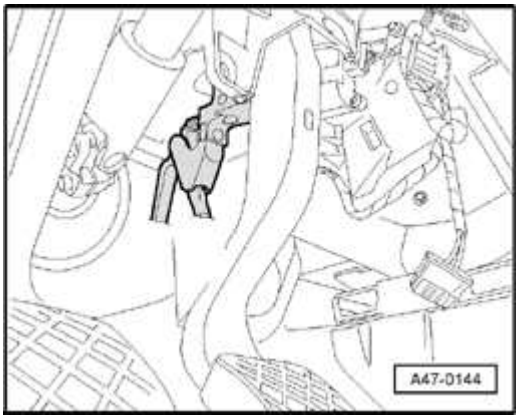


Fig. 29: Brake Pedal At Brake Servo
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach brake pedal from brake servo.

Refer to **47 - BRAKES - HYDRAULIC COMPONENTS**

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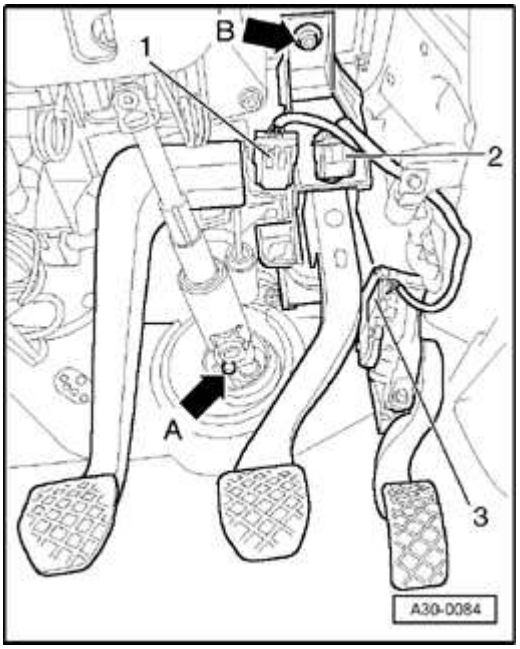


Fig. 30: Locating Steering Column At Steering Gear And Disconnecting Connector On Clutch Pedal Switch, Brake Pedal Switch And On Accelerator Pedal Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect steering column from steering gear -arrow A-.

Refer to **48 - STEERING**

- Disconnect connector on clutch pedal switch -1-, brake pedal switch -2- and on accelerator pedal module -3-.
- Remove securing bolt from mounting bracket -arrow B- and complete pedal cluster.

Release master cylinder operating rod from clutch pedal as follows:

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

NOTE:

- **Make sure a tight connection in the clutch pedal switch. Refer to Pedal cluster, assembly overview Pos. 6 as well as the Clutch Pedal Position (CPP) Switch -F194-. Refer to Pedal cluster, assembly overview Pos. 14 in the pedal cluster, these switches may only be installed once.**

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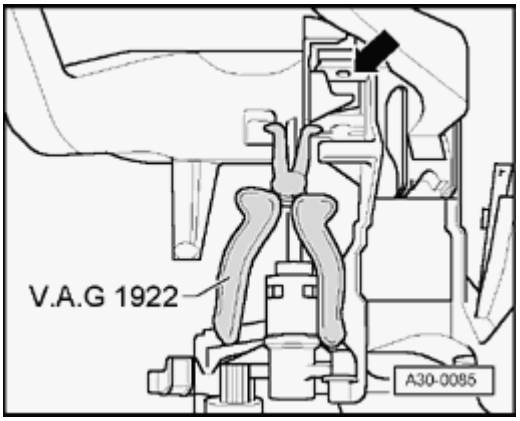


Fig. 31: pressing Retainer Together And Detaching Clutch Pedal From Master Cylinder Using VAG 1922
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When releasing clutch pedal make sure that it does not strike against retainer for clutch pedal switch -arrow-. This could break the retainer.

- Insert pliers VAG 1922 into recess of clutch pedal, press retainer together -arrows- and detach clutch pedal from master cylinder.

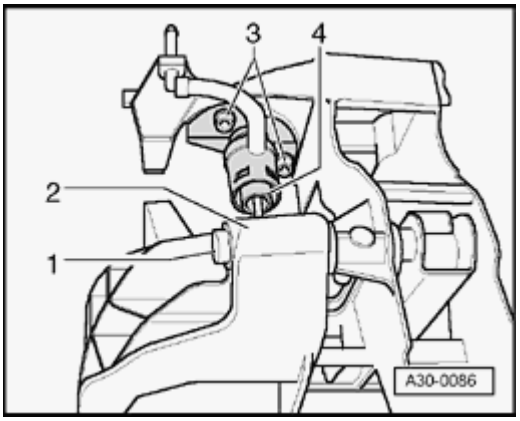


Fig. 32: Identifying Retaining Clip, Clutch Pedal, Bolts And Master Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove retaining clip -1- and pull off clutch pedal -2-.
- Remove bolts -3- and detach master cylinder -4-.

Installing

Install in reverse order, paying attention to the following:

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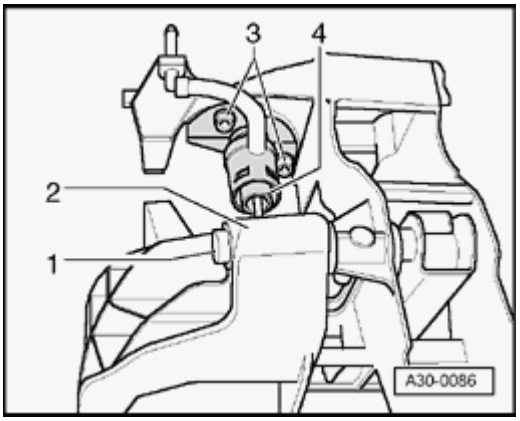


Fig. 33: Identifying Retaining Clip, Clutch Pedal, Bolts And Master Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert master cylinder and tighten screws -3- to 20 Nm.

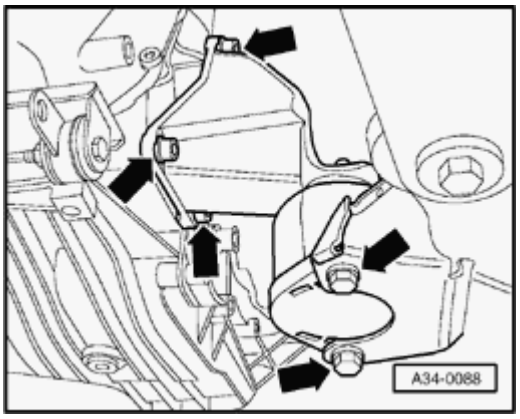


Fig. 34: Locating Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert retainer -1- into clutch pedal.
- Press clutch pedal in direction of arrow to engage, make sure that retainer -1- is correctly locked in clutch pedal.
- Install over-center spring. Refer to **Over-center spring, removing and installing**.

A second mechanic is required for the next step.

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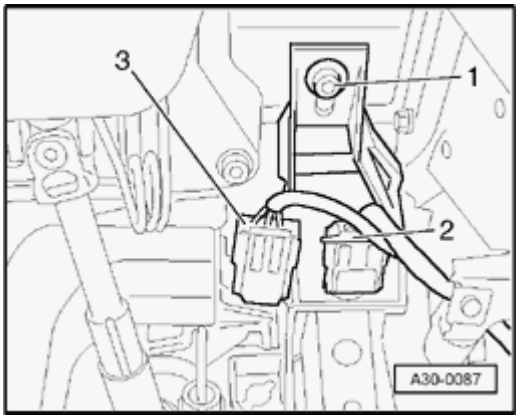


Fig. 35: Location Of Clutch Pedal Switch F36 And Pedal Assembly Securing Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert complete pedal cluster and install bolt -1- hand-tight. The second mechanic must simultaneously insert line into master cylinder from plenum chamber side.

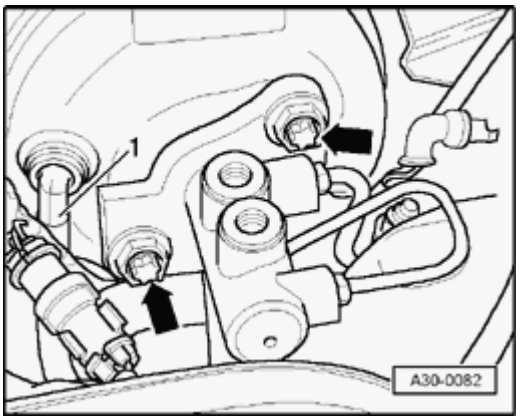


Fig. 36: Location Of Brake Servo Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

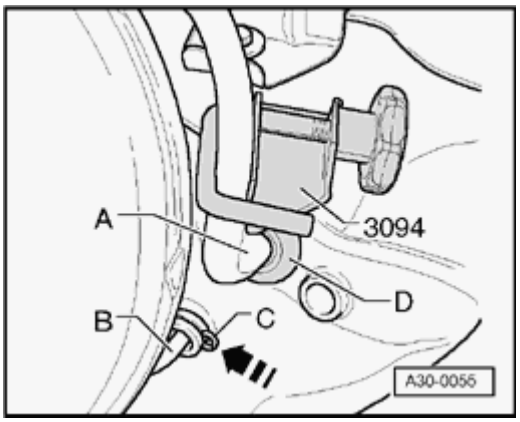


Fig. 37: Installing Rubber Grommet And After-Run Hose

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in retaining clip -C- up to stop.
- Insert line -B- into master cylinder until it is heard to engage.
- Insert rubber grommet -D- over supply hose connecting line -A- into bulkhead.
- Slide supply hose -A- for the brake fluid reservoir up to stop.

- Remove special tool 3094.
- Install bolt for brake fluid reservoir.

- Tighten hex socket-head bolt for securing pedal cluster on instrument panel support to 25 Nm.
- Plug in connectors.
- Connect brake pedal to brake servo.

Refer to **47 - BRAKES - HYDRAULIC COMPONENTS**

- Secure steering column to steering gear -arrow A-.

Refer to **48 - STEERING**

- Installing driver's storage compartment:

Refer to

- **68 - INTERIOR EQUIPMENT**
- **68 - INTERIOR EQUIPMENT** for Cabriolet

- Bleed clutch system. Refer to **Clutch system, bleeding**.

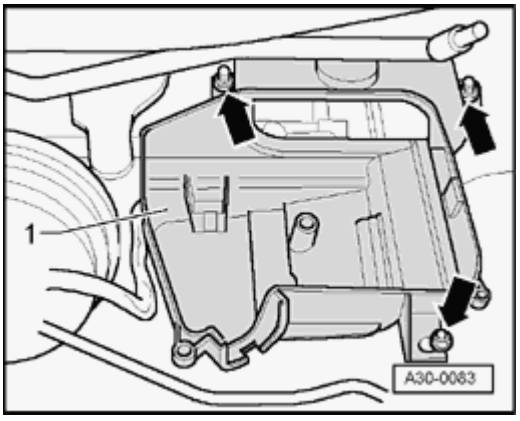


Fig. 38: Electronics Box Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert electronics box and tighten nuts -arrows- to 4 Nm.

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- Route engine wiring harness and connect connectors to connector point.
- Install engine control module and if applicable auxiliary relay carrier with auxiliary fuse carrier.

Refer to **97 WIRING**

- Press on sealing cover hand-tight and tighten screws in diagonal sequence to 4 Nm.

NOTE:

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

Refer to

- **01 - MAINTENANCE**
- **01 - MAINTENANCE** for Cabriolet

Clutch system, bleeding

Special tools, testers and auxiliary items required

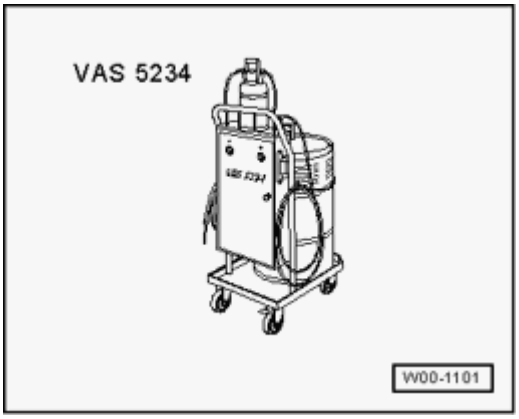


Fig. 39: Identifying Brake Filler And Bleeder Unit VAS 5234
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Brake filling and bleeding unit VAS 5234

- Brake fluid specification

Refer to **47 - BRAKES - HYDRAULIC COMPONENTS**

NOTE:

- **Open bleed valve before switching on bleeding appliance.**
- **When performing the following steps, make sure that no brake fluid escapes onto the transmission.**
- **Performing work on the hydraulic clutch mechanism the clutch system must be bled.**

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- **Pull out clutch pedal and fill brake fluid reservoir with brake fluid up to "max." mark before bleeding.**

- Connect brake filling and bleeding unit VAS 5234, but do not turn on at this time.
- If installed, remove noise insulation beneath transmission.

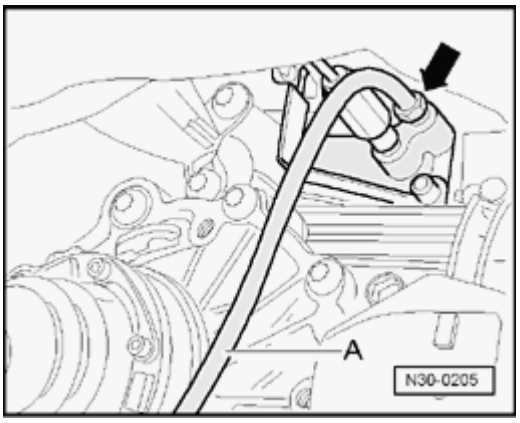


Fig. 40: Connecting Bleeder Hose To Clutch Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect bleeder hose -A- to slave cylinder (arrow) and open bleeder valve.
- Connect bleed hose to pressure hose of collector bottle.
- Switch on bleeding appliance and allow about 100 cm3 of brake fluid to flow out.

- Working pressure 2.5 bar

NOTE: Make sure bleed hose is correctly installed during bleeding operation.

- Tighten bleed valve to 4.5 Nm.
- Depress clutch pedal several times after bleeding process.
- Bleed again if necessary.

CLUTCH RELEASE MECHANISM, SERVICING

Clutch release mechanism, servicing

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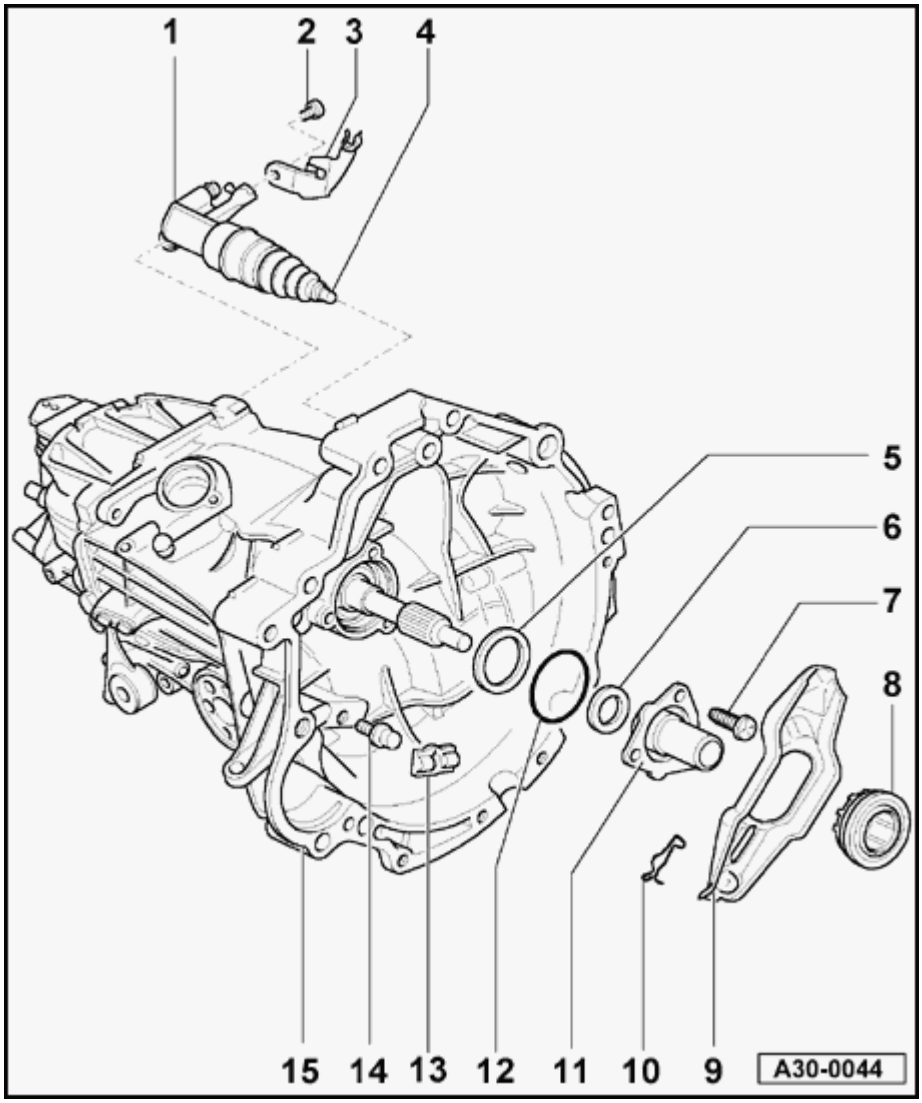


Fig. 41: Clutch Release Mechanism, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Slave cylinder

- Do not operate clutch pedal after slave cylinder has been removed.
- Separating from hose and line assembly. See **Separating slave cylinder from hose and line assembly**
- Installing. See **Before installing, coat clutch slave cylinder with grease** and . **Installing clutch slave cylinder**
- When installing, press in slave cylinder far enough so that securing bolt can be installed easily.

- Tighten bleed valve to 4.5 Nm
- Bleeding clutch system. Refer to **Clutch system, bleeding**

2 - Hex socket-head bolt, 23 Nm

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- Slave cylinder to transmission
- Self-locking
- Always replace

3 - Bracket

- For hose and line assembly
- Secured to transmission with slave cylinder
- Installing. See **Installing clutch slave cylinder**

4 - Push rod

- Lubricate end of push rod with copper grease, e.g. Z 381 351 TE

5 - Dished washer

- Smaller diameter (convex side) to guide sleeve

6 - Input shaft oil seal

- Available with guide sleeve -Item 11- **Clutch release mechanism, servicing** as replacement part

7 - Torx socket head bolt

- Self-locking
- Always replace
- Black; only for aluminum transmission
- Allocation

- On aluminum transmission tighten to 35 Nm

8 - Release bearing

- With or without plastic ring depending on design. See **Servicing release bearing with plastic ring**
- Adhering detached plastic ring. See **Servicing release bearing with plastic ring**
- Do not wash out bearing, only wipe
- Replace noisy bearings

- Allow retaining lugs on release bearing to engage in release lever

9 - Clutch release lever

- Coat contact surface of clutch slave cylinder push rod with copper grease, e.g. Z 381 351 TE before installing

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10 - Retaining spring

- Secure to clutch release lever

11 - Guide sleeve

- Available with oil seal -Item 6- **Clutch release mechanism, servicing** as replacement part
- Installation position: Oil drain hole points downward
- Cover input shaft splines with a shrink-fit hose to protect oil seal -Item 6- **Clutch release mechanism, servicing** before removing and installing

12 - O-ring

- Always replace

13 - Intermediate piece

14 - Ball stud

- Lubricate with MoS2-grease
- On aluminum transmissions tighten to 25 Nm

Separating slave cylinder from hose and line assembly

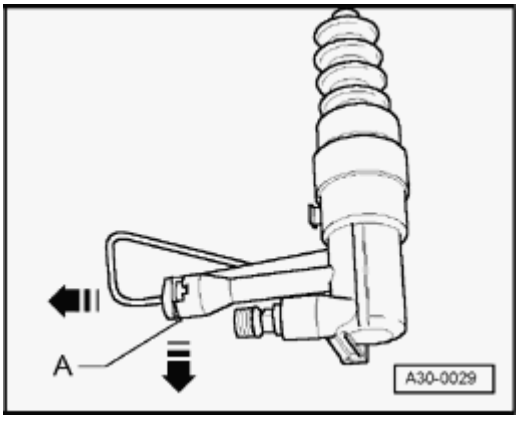


Fig. 42: Removing Hydraulic Line From Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Use a screwdriver to remove hose and line assembly, pry out clip -A- up to stop. Then pulled out the hose and line assembly.

Installing

- Press in clip -A- up to stop

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- Insert hose and line assembly into slave cylinder until it is heard to engage.
- Test by pulling on hose and line assembly.

Before installing, coat clutch slave cylinder with grease

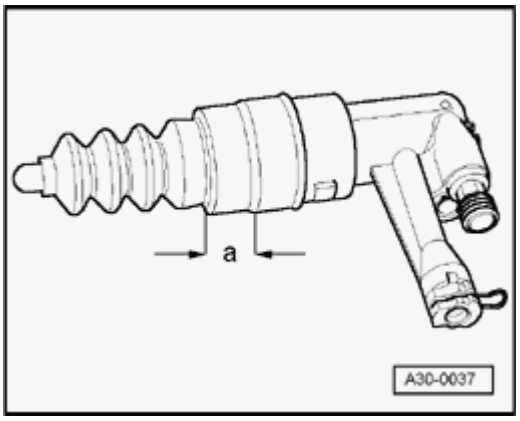


Fig. 43: Coat Boot Area Of Clutch Slave Cylinder With Lithium Grease
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly lubricate contact surface for push rod at clutch release lever with copper grease, e.g. Z 381 351 TE.
- Lubricate area -a- on boot with lithium grease G 052 150 A2 before fitting slave cylinder into transmission housing.

Installing clutch slave cylinder

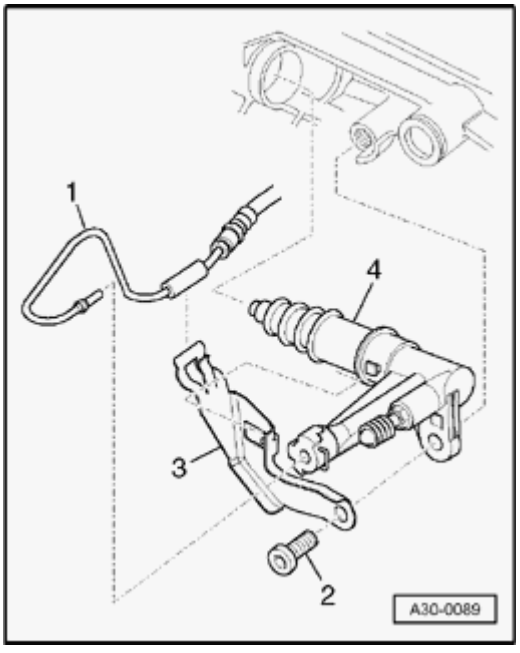


Fig. 44: Clutch Slave Cylinder, Bracket And Hose/Line Assembly
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Fasten bracket for hose line assembly -3- onto slave cylinder -4- and bolt together slave cylinder to transmission.
- Insert the clutch slave cylinder into the mounting hole of the transmission housing, keep it in line with the direction of operation of the push rod.

NOTE:

- **There is a danger that the push rod will be guided past the clutch release lever if the clutch slave cylinder -4- is inserted off-line.**
- **Press in the clutch slave cylinder far enough so that the securing bolt can be fitted easily.**
- **Replace securing bolt - 2-.**

Servicing release bearing with plastic ring

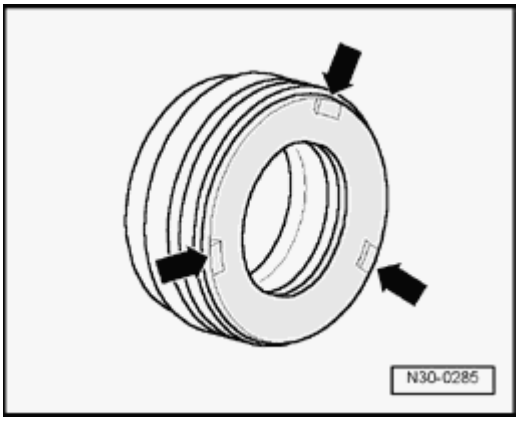


Fig. 45: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

On release bearings with plastic ring it is possible that the plastic ring detaches from the release bearing during removal of transmission or release bearing; this is not a reason for replacing release bearing.

- Adhere plastic ring back onto bearing ring with adhesive AMV 195 KD1 01 before installing transmission.

Three right-angled lugs -arrows- on plastic ring engage in the recesses of bearing ring.

NOTE: **The release bearing must be replaced if the plastic ring lies deeper than 0.5 mm on the contact surface.**

CLUTCH, SERVICING

Clutch, servicing

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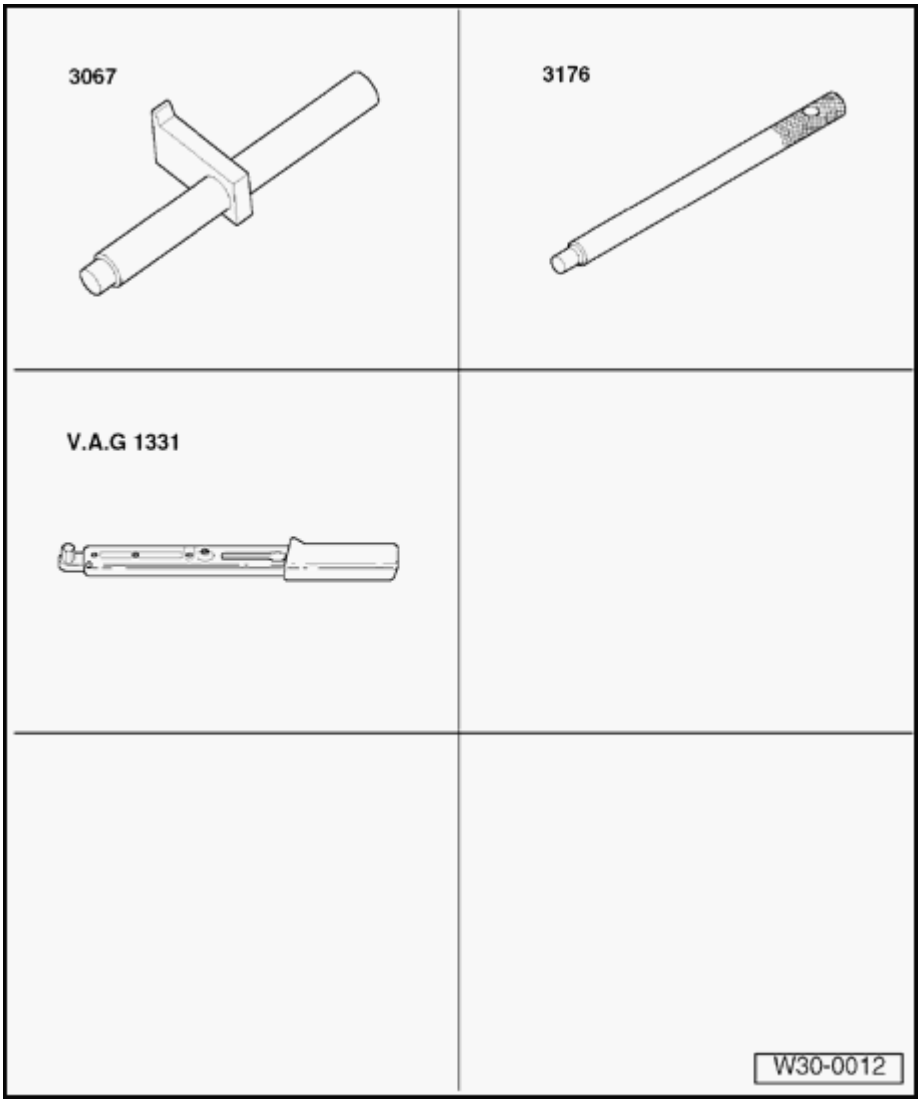


Fig. 46: Identifying Special Tools - Clutch, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- 3067 Flywheel retainer
- 3176 Centering mandrel
- VAG 1331 Torque wrench

NOTE:

- **Observe the general repair instructions. Refer to General repair instructions.**
- **Replace clutch plates and pressure plates with damaged or loose rivets.**
- **Select the correct clutch plate and pressure plate according to engine code:**

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- 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 G 000 100 to the splines. Then move clutch plate on input shaft until hub moves freely on shaft. Excess grease must be removed.
- Pressure plates are protected against corrosion and are greased. Only the contact surface may be cleaned, otherwise the service life of the clutch will be reduced.
- If the clutch has burnt out, thoroughly clean the bellhousing, flywheel and parts of the engine facing the transmission to reduce the smell of burnt linings.

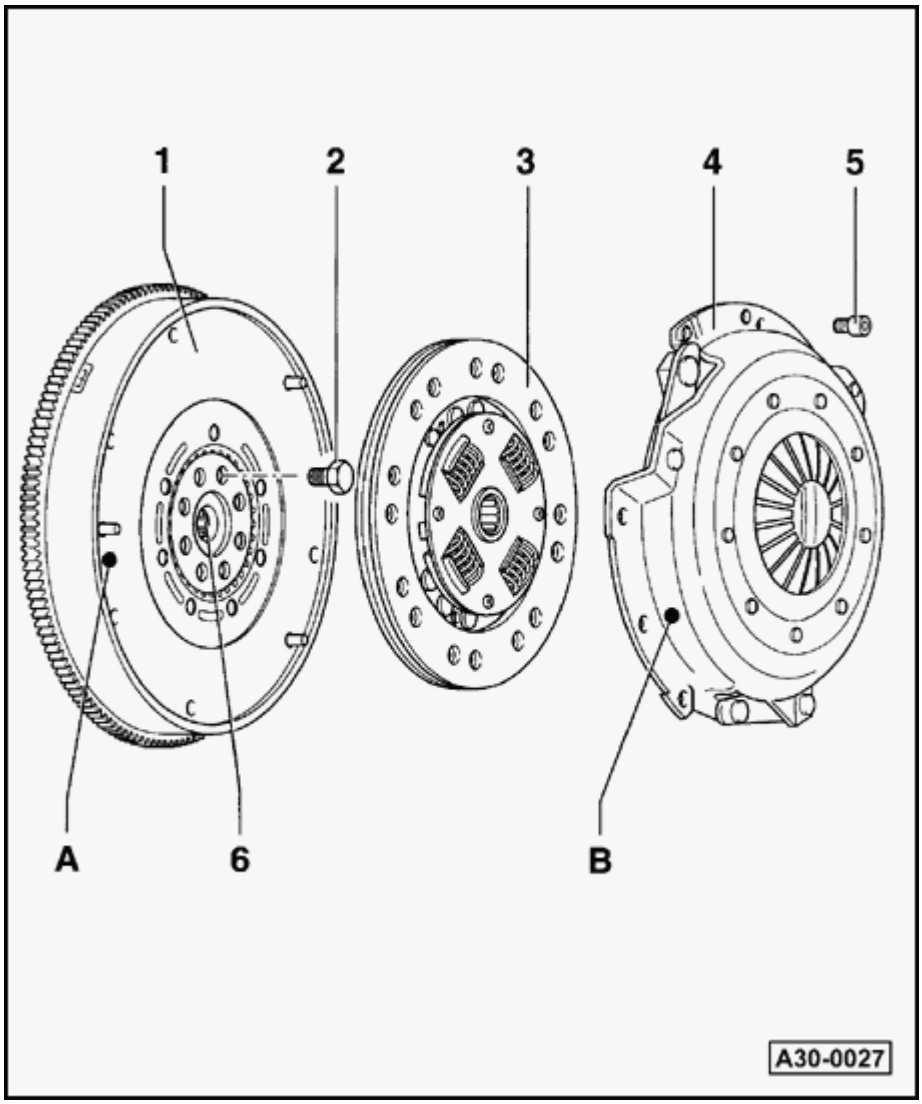


Fig. 47: Clutch Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove transmission to work on clutch. Refer to **Transmission, removing and installing**.

A - Colored marking on dual mass flywheel

- If components are marked, white marking -A- on dual mass flywheel must coincide with white marking -

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B- on pressure plate.

B - Colored marking on pressure plate

- If components are marked, white marking -A- on dual mass flywheel must coincide with white marking -B- on pressure plate.

1 - Flywheel/dual mass flywheel

- Make sure that centering pins are a tight fit
- Contact surface for clutch lining must be free of grooves, oil and grease
- Removing and installing. Refer to **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK**

2 - Bolt for flywheel

- Always replace
- Vehicles without dual mass flywheel 60 Nm + turn 90 ° further
- Vehicles with dual mass flywheel

  - Bolt length 22 mm 60 Nm + turn 90 ° further
  - Bolt length 42 mm 60 Nm + turn 180 ° further

3 - Clutch plate

- Installation position:

  - Spring pack (coil springs) toward pressure plate and transmission
  - Clutch lining must make full contact with flywheel
  - Marking "Getriebeseite" (if present) goes toward pressure plate and transmission

- Do not grease
- Clutch plate diameter. Refer to **Code letters, application, ratios, capacities**onward
- Centering. See **Centering clutch plate and removing and installing pressure plate**
- Lightly grease splines

4 - Pressure plate

- Removing and installing. See **Centering clutch plate and removing and installing pressure plate**
- Check ends of diaphragm spring. See **Checking ends of diaphragm spring**
- Checking spring connection and riveted fastenings. See **Checking spring connection and riveted fastenings**
- If components are marked, assemble with white marking on flywheel -A- aligning with white marking on pressure plate -B-.

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5 - Bolt, 25 Nm

- Loosen and tighten gradually over several stages in diagonal sequence

6 - Needle bearing

- Removing and installing:

Refer to **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK**

Centering clutch plate and removing and installing pressure plate

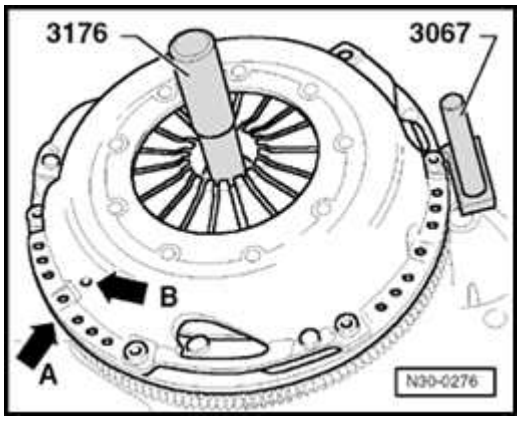


Fig. 48: Centering Clutch Plate And Removing And Installing Pressure Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen and tighten bolts gradually over several stages in diagonal sequence - 25 Nm.
- Reverse position of counterhold 3067 when removing.
- Installation position of clutch plate: Spring pack (coil springs) or marking "Getriebeseite" toward pressure plate and transmission.
- Do not insert mounting bolts until clutch lining and contact surface of pressure plate must make full contact with flywheel.

- Use mandrel 3176 to center clutch plate.
- If components are marked, assemble with white marking on dual-mass flywheel -A- aligning with white marking on pressure plate -B-.

Checking ends of diaphragm spring

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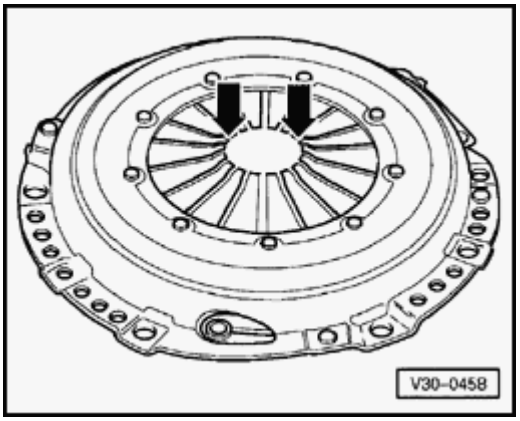


Fig. 49: Checking Ends Of Diaphragm Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE: When performing repairs always match up clutch pressure plate and clutch plate by checking engine code.

Checking spring connection and riveted fastenings

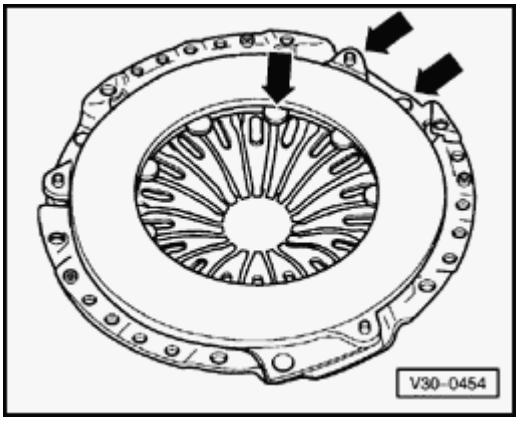


Fig. 50: Checking Spring Connections And Rivet Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check spring connection between pressure plate and cover for cracks and make sure rivet fastenings are seated tightly.
- Replace clutches with damaged springs or loose riveted fastenings -arrows-.

34 MANUAL TRANSMISSION - CONTROLS, HOUSING

SHIFT MECHANISM, SERVICING

Shift mechanism, servicing

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NOTE: **Before working on the selector mechanism, disconnect the Ground strap from the battery in the engine compartment.**

CAUTION: Before beginning repairs on the electrical system:

- **Obtain the anti-theft radio security code.**
- **Switch the ignition off.**
- **Disconnect the battery Ground (GND) strap.**
- **On vehicles equipped with Audi Telematics by OnStar ® , switch-off the emergency (back-up) battery for the Telematic/Telephone Control Module prior to disconnecting vehicle battery. Refer to**
  - **91 - COMMUNICATION**
  - **91 RADIO, TELEPHONE, NAVIGATION, TRIP COMPUTER for Cabriolet**

  .
- **After reconnecting vehicle battery, re-code and check operation of anti-theft radio. Also check operation of clock and power windows according to article and/or Owner's Manual.**
- **After reconnecting vehicle battery on vehicles equipped with Audi Telematics by OnStar ® , switch-on the emergency (back-up) battery for the Telematic/Telephone Control Module. Refer to**
  - **91 - COMMUNICATION**
  - **91 RADIO, TELEPHONE, NAVIGATION, TRIP COMPUTER for Cabriolet**

  .

Installation position of gear selector mechanism

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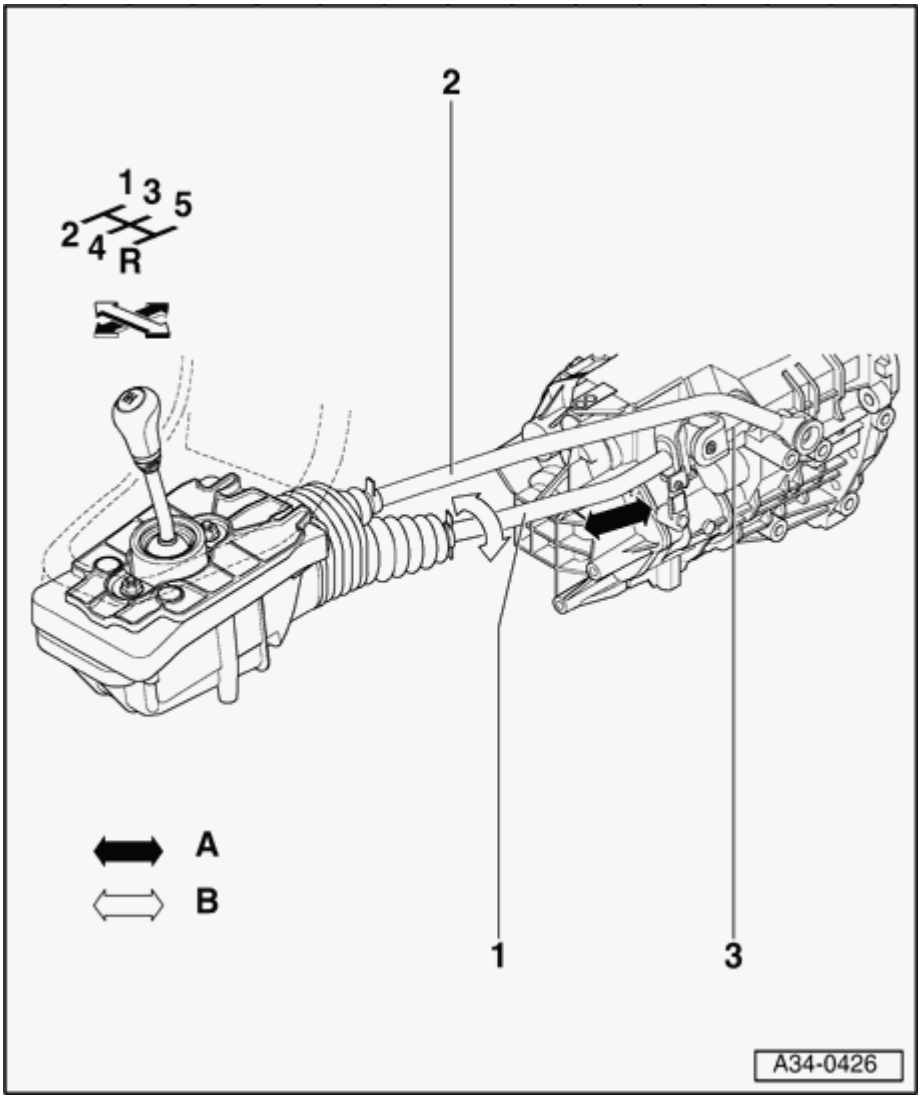


Fig. 51: Installation Position Of Gear Selector Mechanism
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector rod

2 - Front push rod

3 - Gear selector lever

Arrow -A- Gear selection movement

Arrow -B- Gate selection movement

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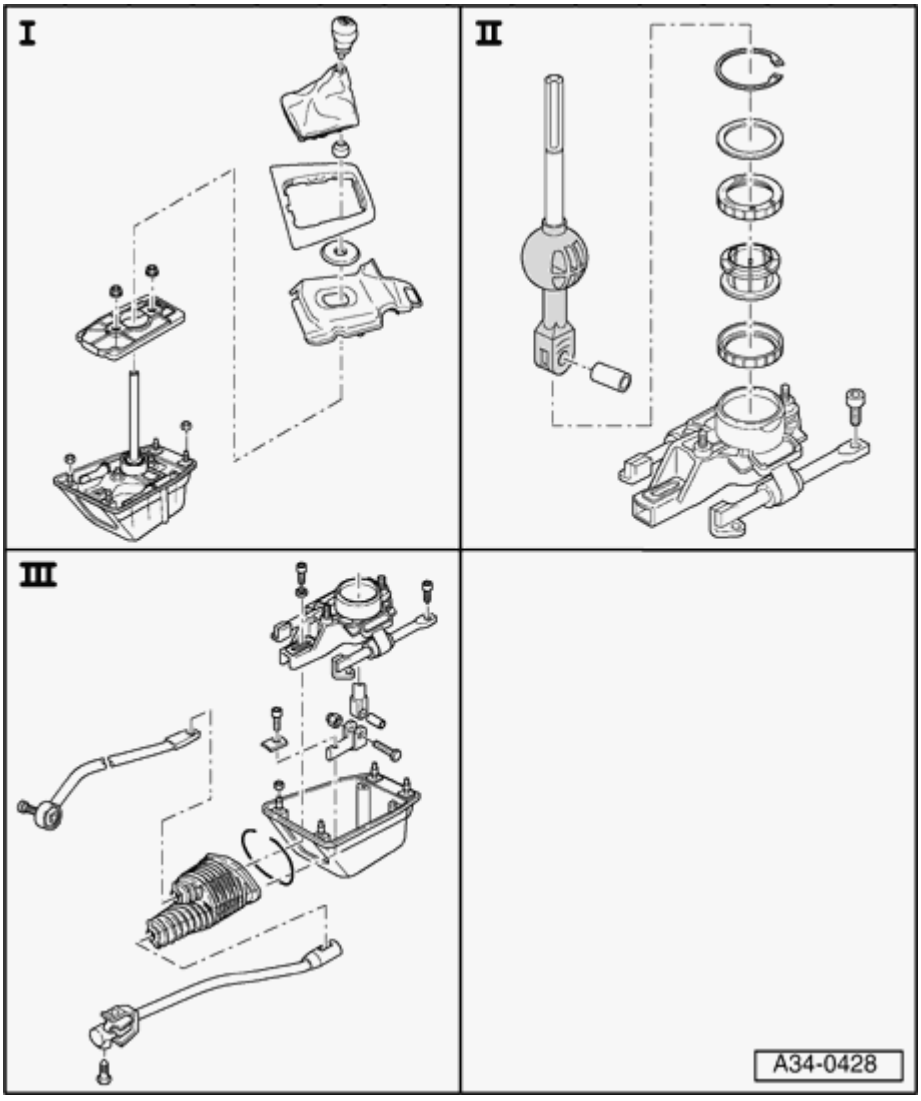


Fig. 52: Shift Lever Knob And Protective Boot Remove/Install Components, Shift Lever And - Rear Push Rod And Shift Lever And - Front Push Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - Removing and installing shift lever knob and protective boot. Refer to Shift lever knob and protective boot, removing and installing

II - Servicing shift lever and - rear push rod. Refer to Shift lever and rear push rod, servicing

III - Servicing shift lever and - front push rod. Refer to Selector rod and front push rod, servicing

Removing and installing selector mechanism. Refer to **Shift mechanism, removing and installing**

Adjusting gear selector mechanism. Refer to **Shift mechanism, adjusting**

Shift lever knob and protective boot, removing and installing

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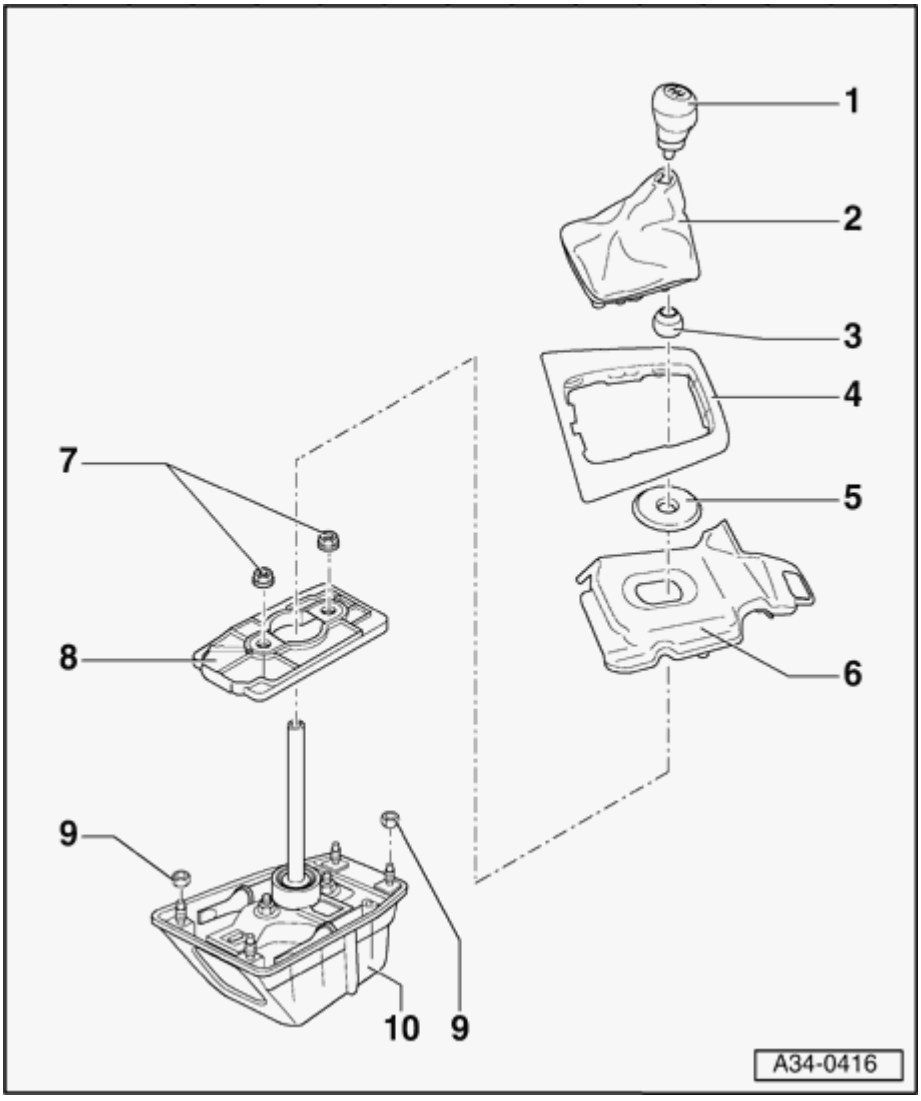


Fig. 53: Shift Lever Knob And Protective Boot Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Shift lever knob

- Remove and install together with protective boot
- Removing. Refer to **Fig. 57**

2 - Protective boot

- Remove and install together with shift lever knob
- Removing. Refer to **Fig. 57**

3 - Connector piece

- For locking shift lever knob to shift lever

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- Opening catch. Refer to **Fig. 58**
- Connects protective boot to shift lever knob

4 - Cover for center console

- Removing and installing. Refer to **Fig. 57**

5 - Damping washer

- Installation position: Convex side upward

6 - Noise insulation

- Installation position: Arrow on noise insulation points in direction of travel

7 - Hex nut, 10 Nm

8 - Noise insulation

9 - Hex nut, 10 Nm

10 - Shift lever

- Removing and installing. Refer to **Shift mechanism, removing and installing**

Shift lever and rear push rod, servicing

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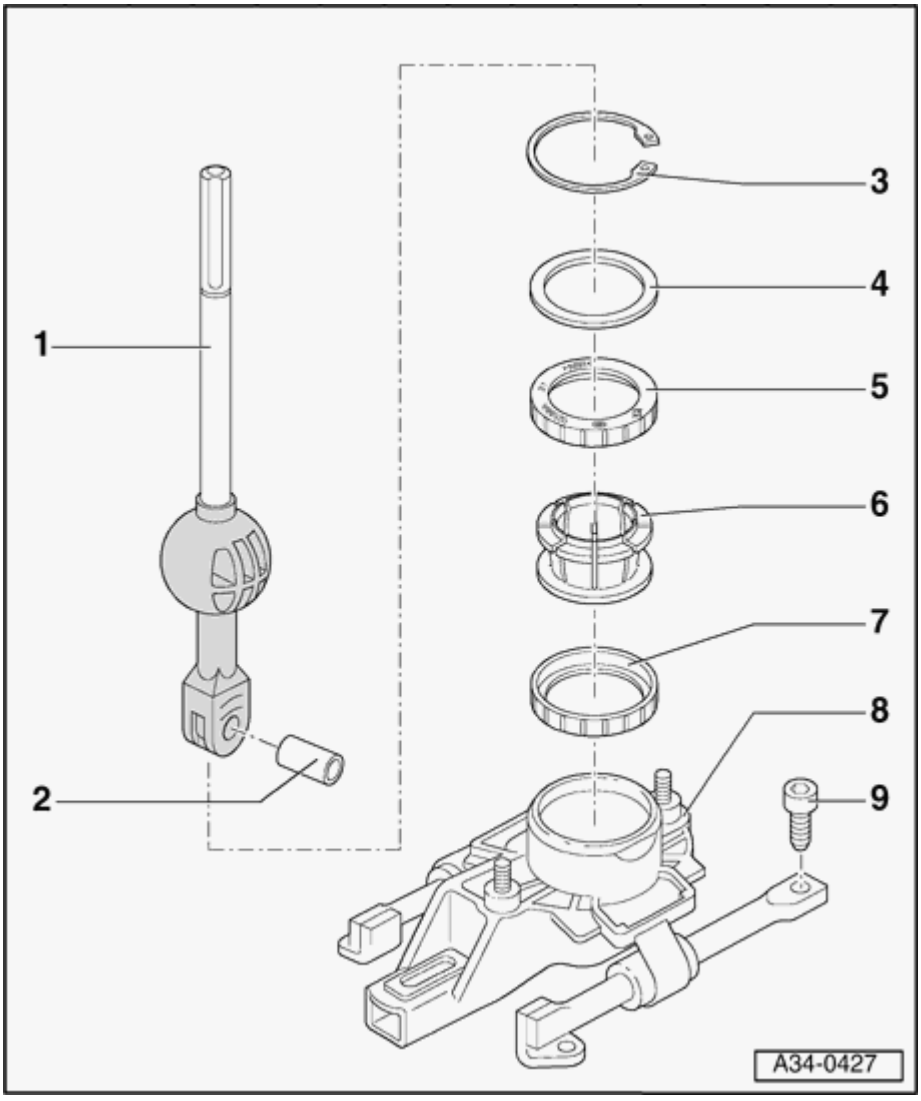


Fig. 54: Shift Lever And Rear Push Rod Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: Lubricate mountings and sliding surfaces with polycarbamide grease, part no. G 052 142 A2.

1 - Shift lever

- Lubricate area around bottom hole with G 052 142 A2
- Lubricate ball with G 052 142 A2 polycarbamide grease

2 - Spacer tube

- Lubricate with G 052 142 A2 polycarbamide grease

3 - Circlip

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- Always replace

4 - Washer

- Collar faces ball guide (item 6 **Shift lever and rear push rod, servicing**)

5 - Rubber ring

6 - Ball guide

- Removing and installing. Refer to **Shift lever with rear push rod, removing and installing**

7 - Rubber ring

8 - Rear push rod

- With ball housing
- Removing and installing. Refer to **Shift lever with rear push rod, removing and installing**

9 - Bolt, 6 Nm

- Qty. 4
- For rear push rod - to shift lever housing

Selector rod and front push rod, servicing

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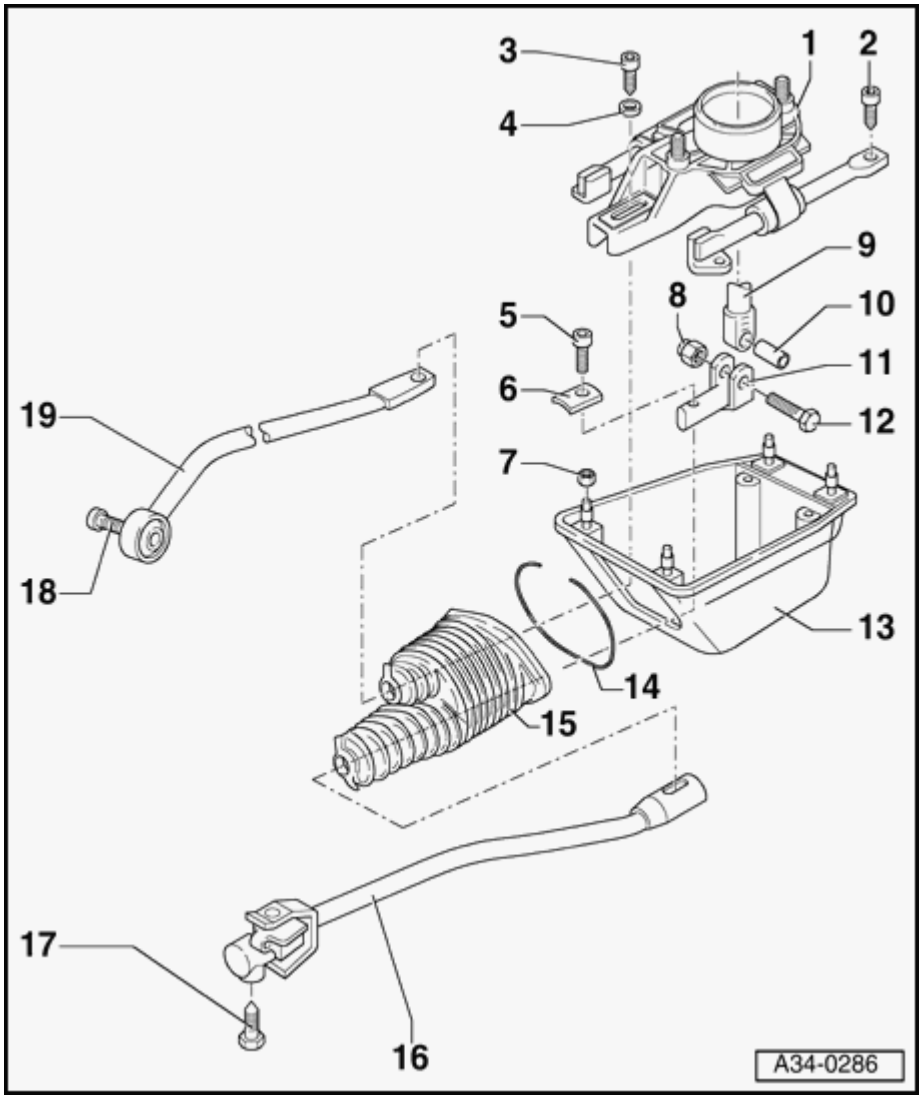


Fig. 55: Shift Rod And Pivot Rod, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Rear push rod

2 - Bolt, 6 Nm

- Qty. 4
- For rear push rod - to shift lever housing

3 - Hex socket-head bolt, 25 Nm

4 - Washer

5 - Hex socket-head bolt, 25 Nm

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6 - Clamp

7 - Hex nut, 10 Nm

- Qty. 4
- For shift lever housing to body

8 - Hex nut, 10 Nm

- Self-locking
- Always replace

9 - Shift lever

10 - Spacer tube

- Lubricate with G 052 142 A2 polycarbamide grease

11 - Selector fork

12 - Bolt

13 - Shift lever housing

14 - Tensioning ring

15 - Bellows

- Remove catalytic converter and front heat shield before removing and installing

NOTE:

- **Carefully pull boot over selector rod**
- **Place boot on markings of selector rod and push rod**

16 - Selector rod

- With selector joint

17 - Bolt, 23 Nm

- Self-locking
- Always replace

18 - Hex socket-head bolt, 40 Nm

- Cannot be removed from bearing bushing on front push rod

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19 - Front push rod

Shift lever with rear push rod, removing and installing

Removing

NOTE: The shift lever knob is removed together with shift lever cover and cover for center console.

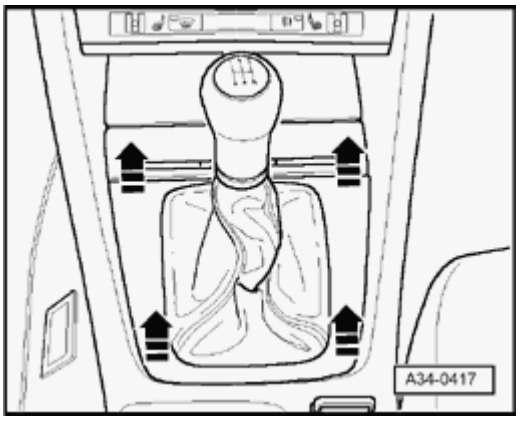


Fig. 56: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift cover for center console upward -arrows-.

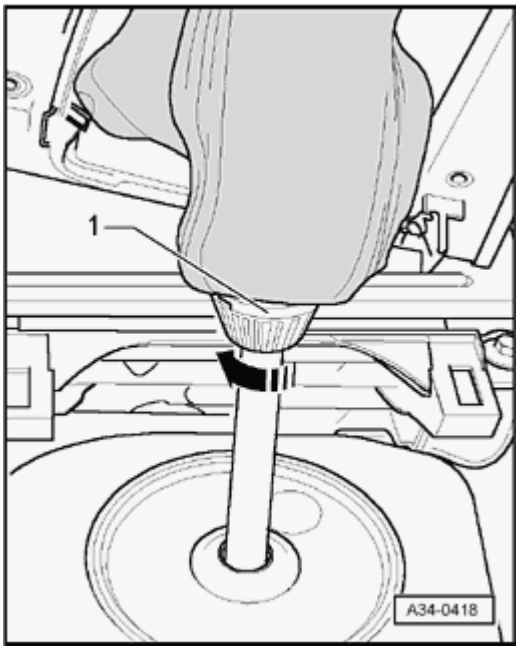


Fig. 57: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Release connector piece -1- in direction of arrow and pull off shift lever knob together with shift lever cover upward.

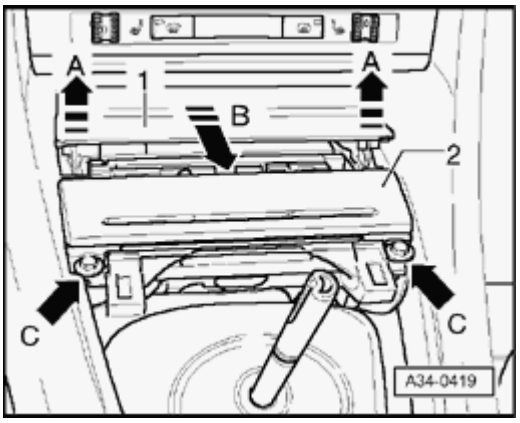


Fig. 58: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift cover off -1- first in direction of arrow -A- and then pull out in direction of arrow -B-.
- Remove bolts -arrows C- and then pull ashtray -2- from center console

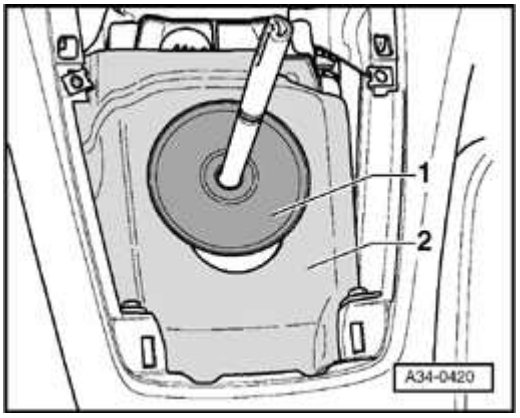


Fig. 59: Lifting Out Damping Washer And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift out damping washer -1- and noise insulation -2-.

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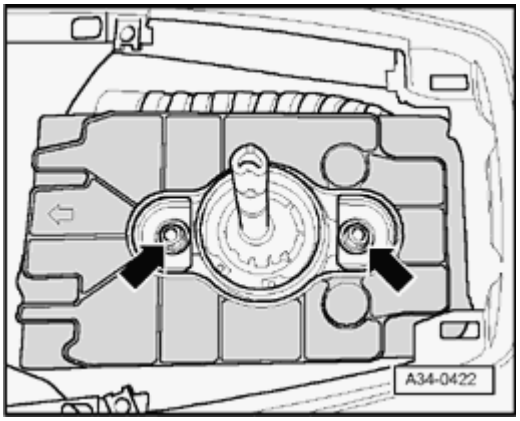


Fig. 60: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation for shift lever housing -arrows-.

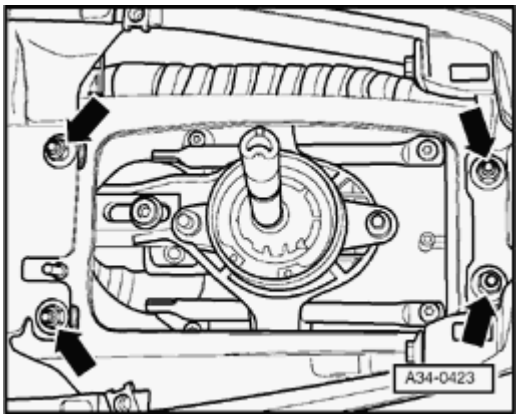
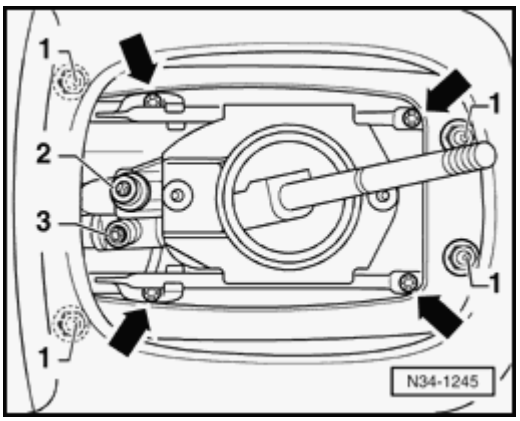


Fig. 61: Locating Securing Nuts For Shift Lever Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove securing nuts -arrows- for shift lever housing.

This lowers the shift lever housing.



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Fig. 62: Shift Mechanism Housing Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach push rod, by removing hex socket -head bolt -2-.
- Remove selector rod, by removing hex socket -head bolt -3-.
- Detach complete rear push rod - from shift lever housing -arrows-.
- Remove shift lever with rear push rod - from shift lever housing.

Installing

Installation is carried out in the reverse order of removal, note the following:

- Adjust gear selector mechanism. Refer to **Shift mechanism, adjusting**.

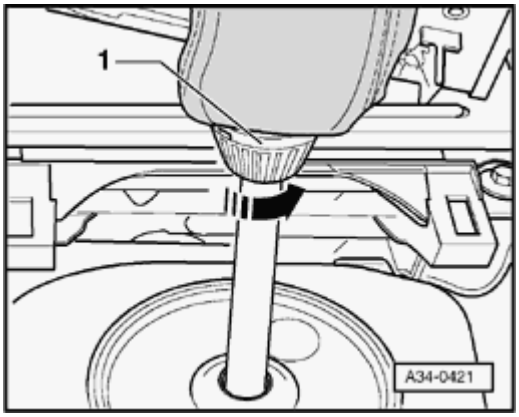


Fig. 63: Turning Connector Piece Till It Stops
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place shift lever knob together with shift lever cover onto shift lever and turn connector piece -1- in direction of arrow till it stops.

Tightening torques

Rear push rod - to shift lever housing	6 Nm
Selector rod to selector fork/shift lever	25 Nm
Front push rod to rear push rod	25 Nm
Shift lever housing to body	10 Nm
Cover to rear push rod	10 Nm

Shift mechanism, removing and installing

Removing

NOTE: The shift lever knob is removed with shift lever cover and cover for center

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console.

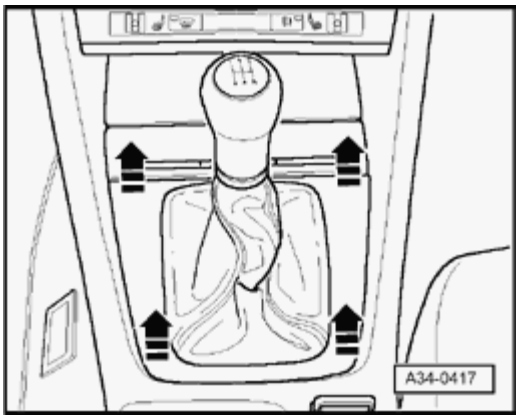


Fig. 64: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift off cover for center console upward -arrows-.

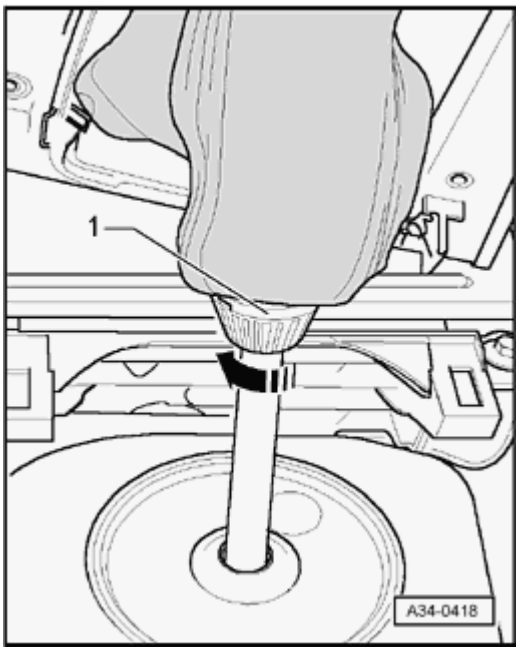


Fig. 65: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release connector piece -1- in direction of arrow and pull off shift lever knob together with shift lever cover upward.

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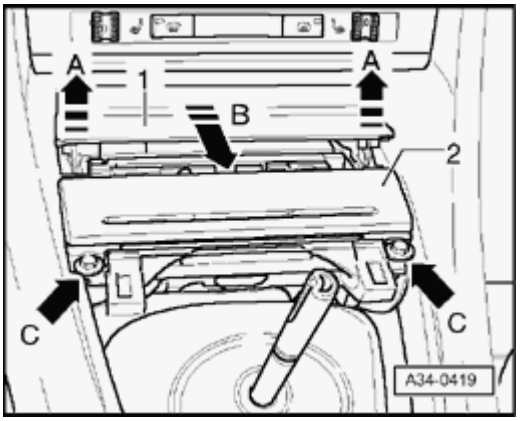


Fig. 66: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift cover off -1- first in direction of arrow -A- and then pull out in direction of arrow -B-.
- Remove bolts -arrows C- and then pull ashtray -2- from center console

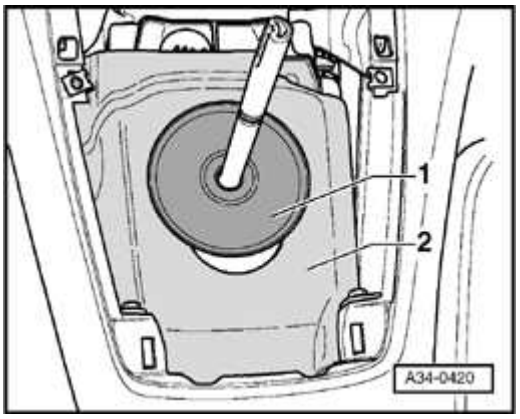


Fig. 67: Lifting Out Damping Washer And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift out damping washer -1- and noise insulation -2-.

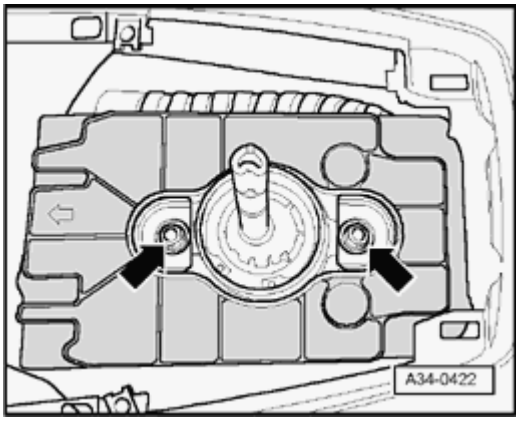


Fig. 68: Locating Noise Insulation For Shift Lever Housing Bolts

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation for shift lever housing -arrows-.

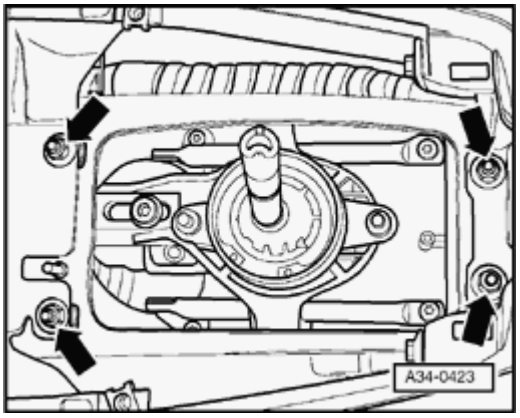


Fig. 69: Locating Securing Nuts For Shift Lever Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove securing nuts for shift lever housing -arrows-.

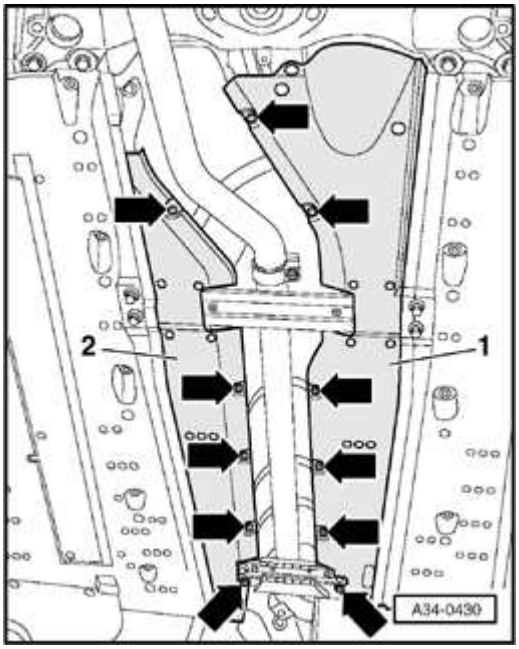


Fig. 70: Locating Covers Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts -arrows- and detach covers -1- and -2-.

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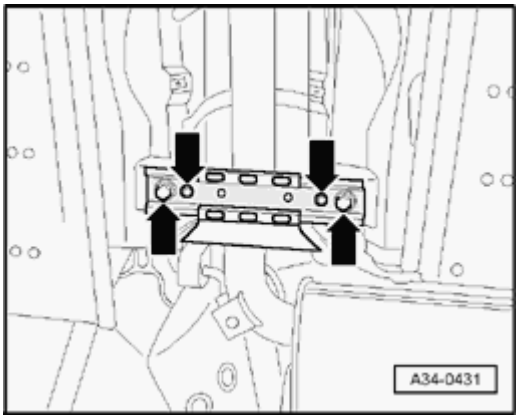


Fig. 71: Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear cross member -arrows-.

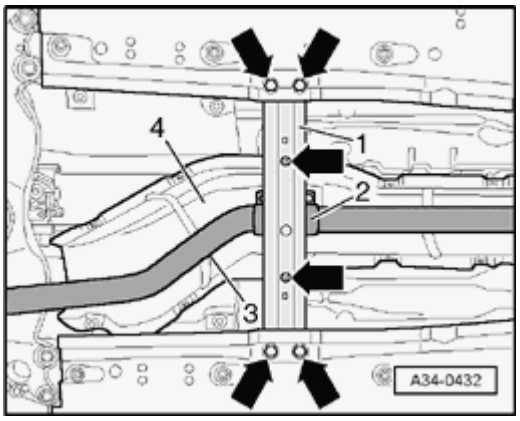


Fig. 72: Rear Section Of Exhaust System And Front Cross Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front cross member -1- -arrows-.
- Remove rear section of exhaust system (rearward of exhaust pipe clamp(s) -2-:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

- Remove heat shield -4- above exhaust system.

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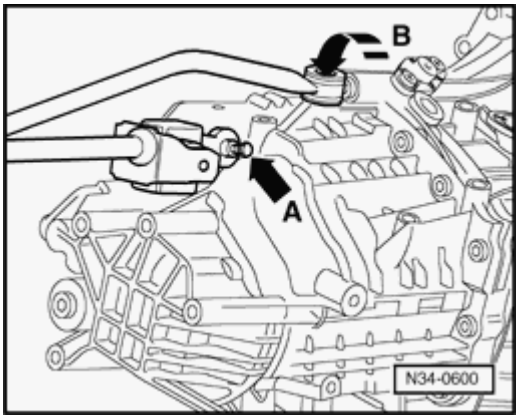


Fig. 73: Identifying Transmission Shift And Pivot Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove selector rod -arrow A-.
- Remove hex socket-head bolt of push rod -arrow B-.
- Swivel shift lever housing with selector rod and push rod downward and remove.

Installing

Installation is carried out in the reverse order.

- Push selector rod on so the securing bolt fits in the recess of the selector shaft.

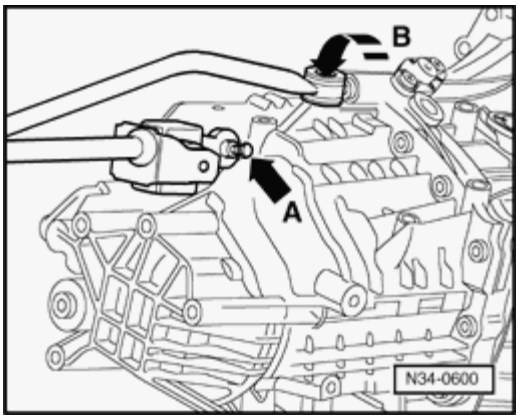


Fig. 74: Identifying Transmission Shift And Pivot Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten screw selector rod (arrow -A-).
- Push rod must be screwed to transmission (arrow -B-).
- Align exhaust system stress-free:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

- Adjust gear selector mechanism. Refer to **Shift mechanism, adjusting**.

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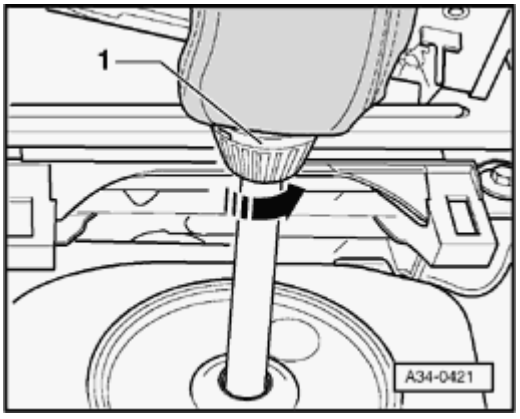


Fig. 75: Turning Connector Piece Till It Stops
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place shift lever knob together with shift lever cover onto shift lever and turn connector piece -1- in direction of arrow as far as stop.

Tightening torques

Component		Nm
Shift lever housing to body		10
Selector rod to transmission		23
Push rod to transmission		40
Clamp for exhaust pipe		40
Front cross member		55
Rear cross member		55
Noise insulation for shift lever housing to rear push rod		10 Nm

Shift mechanism, adjusting

NOTE: The following are prerequisites for correct shift linkage adjustment:

- Perfect shift linkage operating and transfer elements.
- Shift selector mechanism moves smoothly.
- Transmission, clutch and clutch mechanism must be in good condition.
- Transmission in neutral.

Removing

NOTE: Remove the shift lever knob with shift lever cover and cover for center console.

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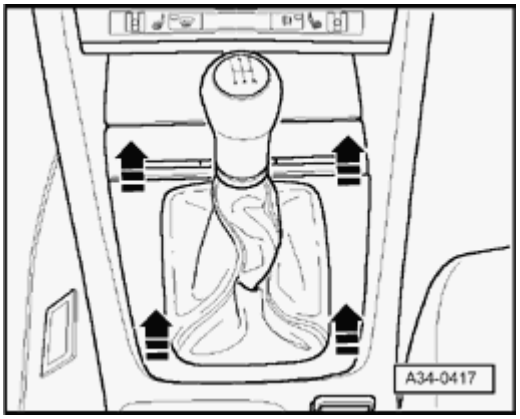


Fig. 76: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift off cover for center console upward -arrows-.

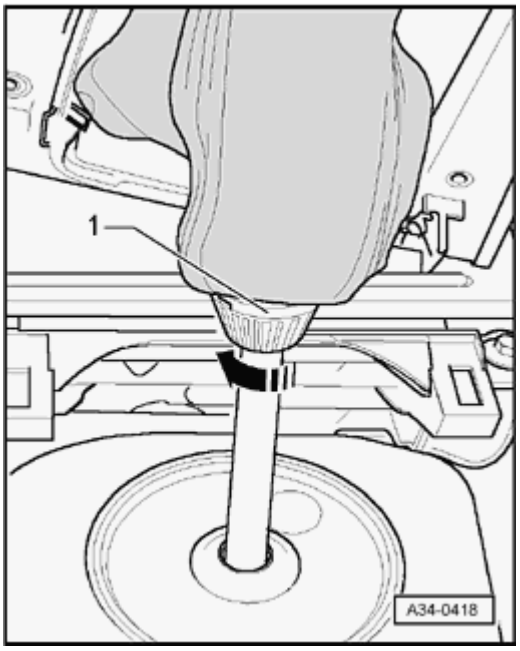


Fig. 77: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release connector piece -1- in direction of arrow and pull off shift lever knob together with shift lever cover upward.

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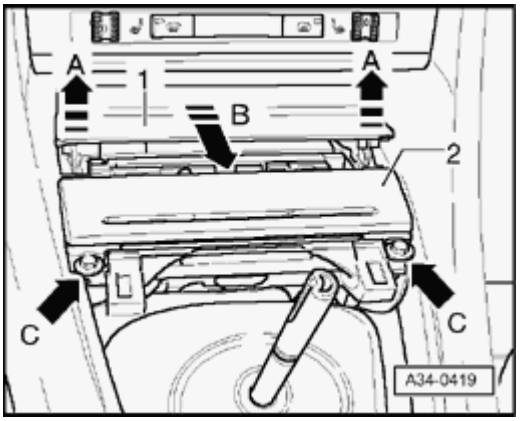


Fig. 78: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift off trim -1- first in direction of arrow -A- and then pull out in direction of arrow -B-.
- Remove bolts -arrows C- and then pull ashtray -2- from center console

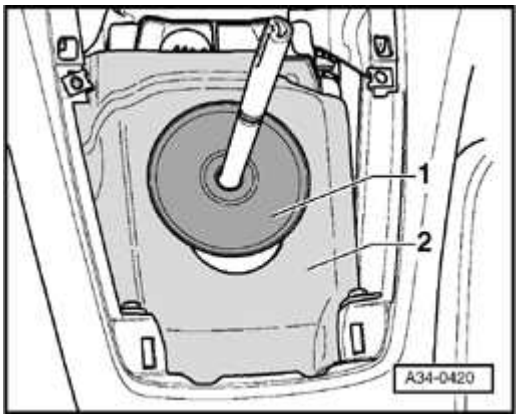


Fig. 79: Lifting Out Damping Washer And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift up damping washer -1- and noise insulation -2- upward.

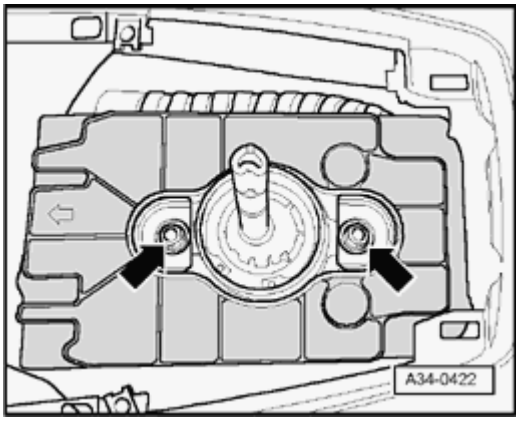


Fig. 80: Locating Noise Insulation For Shift Lever Housing Bolts

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation from shift lever housing -arrows-.
- Measure distance -a- between the two studs in shift mechanism

NOTE: Measurement is from center of stud to center of stud.

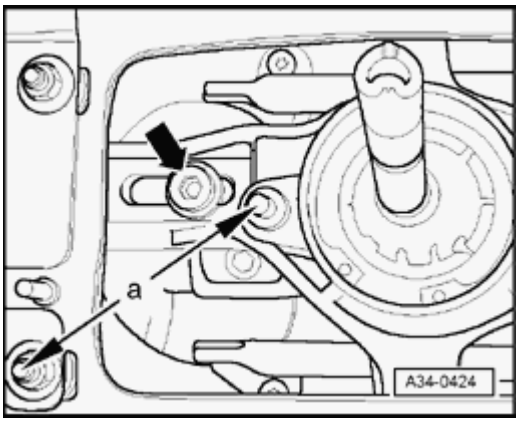


Fig. 81: Shift Mechanism Measurement And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Specification: Dimension a = 85 mm

- In case of deviation, adjust distance -a- as follows:
- Loosen bolt (arrow) for push rod.

- The rear push rod (in shift mechanism) must move back and forth easily on slide.

- Adjust measurement -a- by moving rear push rod (in shift mechanism).
- Tighten bolts for push rod -arrow- to 25 Nm.

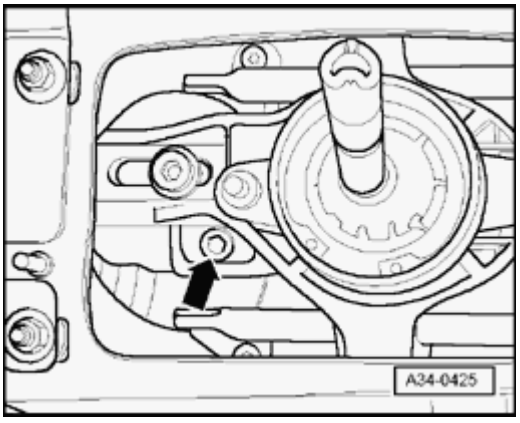


Fig. 82: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove bolts for selector rod -arrow-.

- The selector rod and shift mechanism connection must move freely

Align shift lever as follows:

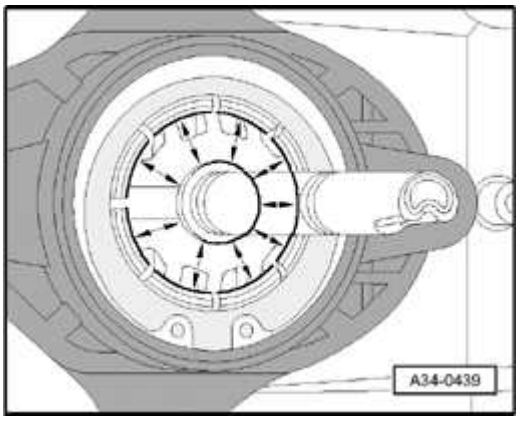


Fig. 83: Centering Bottom Of Shift Lever Centered In Ball Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Center bottom of shift lever centered in ball housing.

- The distance from ball housing to bottom of shift lever -arrows- must be same at all points.
- Shift lever stands vertical in direction of travel.

- Hold shift lever in this position.

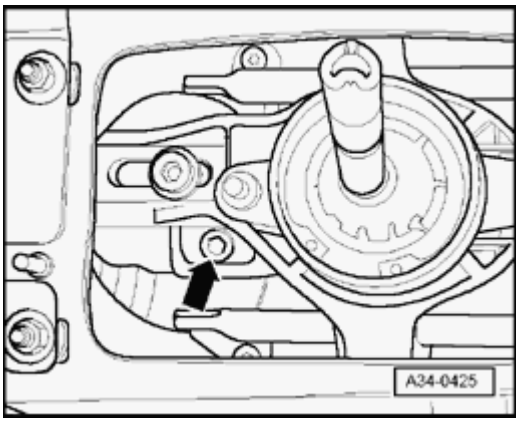


Fig. 84: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolt for selector rod -arrow- to 25 Nm.

NOTE: The shift lever must remain in the same position while the bolt is being tightened.

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- Install covers and shift lever knob.

Shift lever alignment, checking

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

- Depress clutch.
- Check that all gears can be engaged.

- The shift lever must not make contact with cover for center console when selecting gears.
- The shift lever should return by itself from the 5th/reverse gear gate into the 3rd/4th gear gate.
- It should only be possible to engage reverse gear from neutral when shift lever is in 3rd/4th gear gate.
- It must be impossible to change from 5th gear directly into reverse gear.

NOTE: If only 5th and reverse gear cannot be engaged, the 5th and reverse gear locking module must be checked and replaced. Refer to Removing and installing locking module for 5th gear and reverse gear.

TRANSMISSION, REMOVING AND INSTALLING

Transmission, removing and installing

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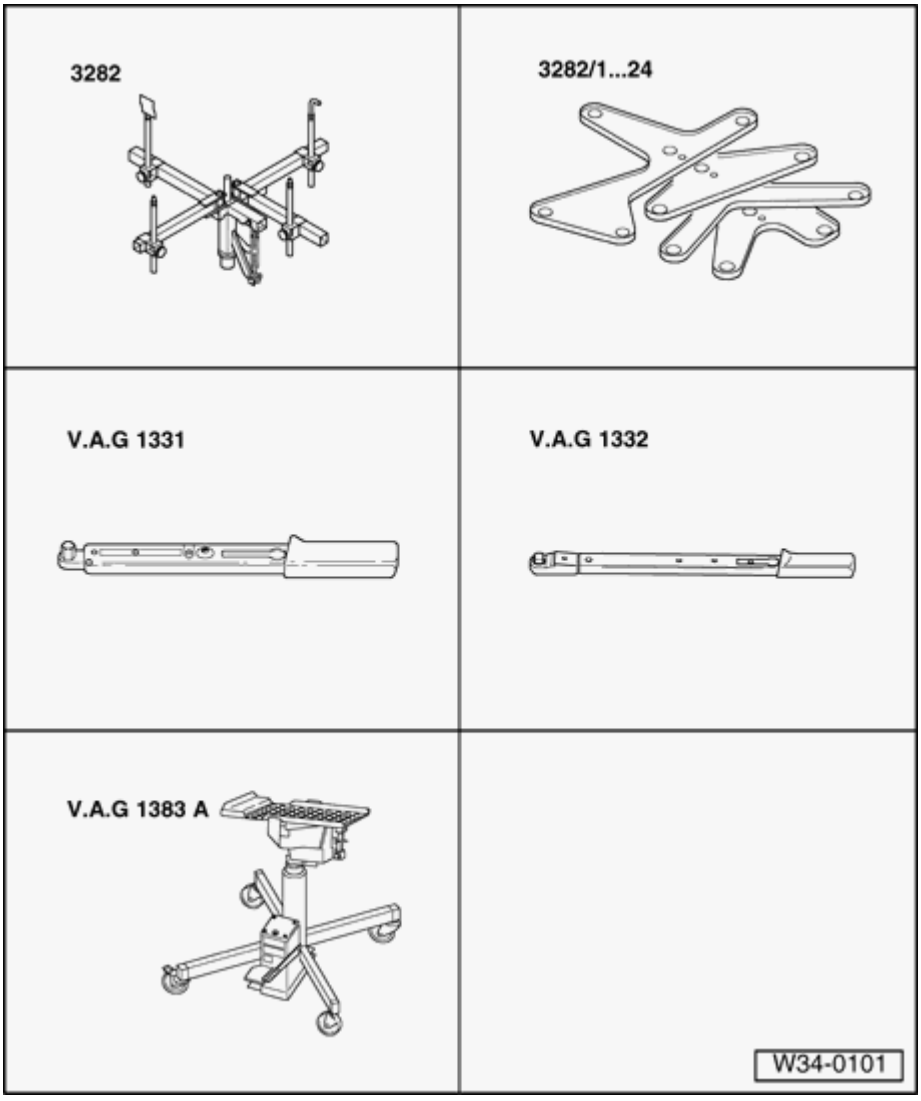


Fig. 85: Identifying Special Tools - Transmission, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- 3282 Transmission support
- 3282/10 Adjustment plate
- VAG 1331 Torque wrench
- VAG 1332 Torque wrench
- VAG 1383 A Engine/transmission lifter

Special tools and workshop equipment required

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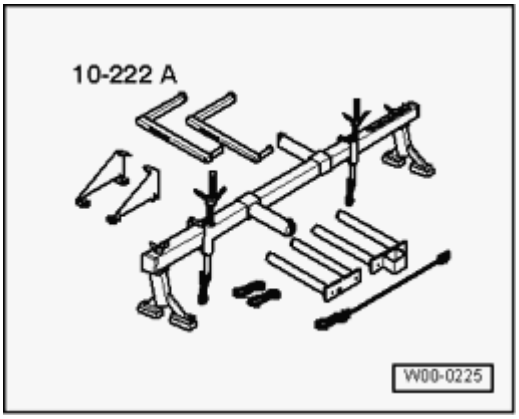


Fig. 86: Identifying 10-222A Engine Support Bridge With 10-222A/8 Bracket For Engine
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 10-222A Engine support bridge

Removing

- Read battery CAUTION! note. Refer to **Shift mechanism, servicing**.
- Note or obtain radio code on vehicles with coded radio.
- Disconnect battery ground strap with the ignition switched off.

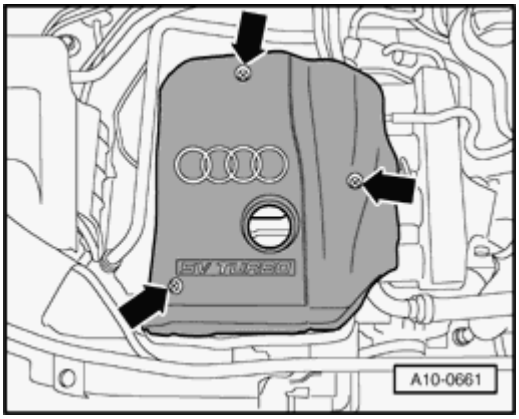


Fig. 87: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover (arrows).

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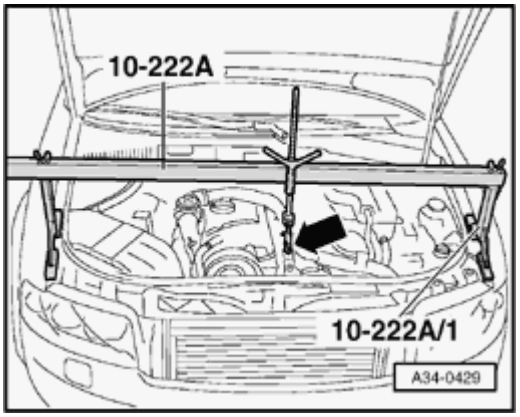


Fig. 88: Support Bar 10-222 A With Supports 10-222 A/1 Installed On Engine
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fit support bar 10-222 A with supports 10-222 A/1.
- Tighten engine slightly using the spindles.

All models:

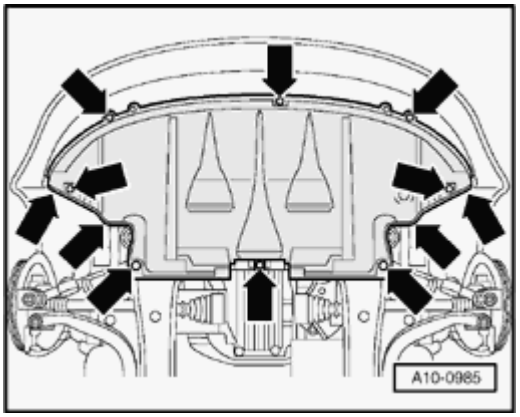


Fig. 89: Removing Sound Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach noise insulation -arrows-.

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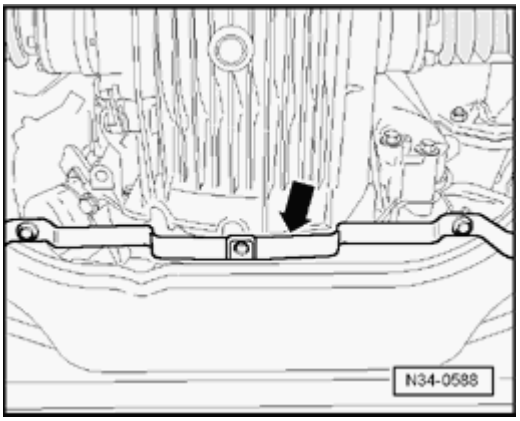


Fig. 90: Removing Noise Insulation Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for noise insulation -arrow-.

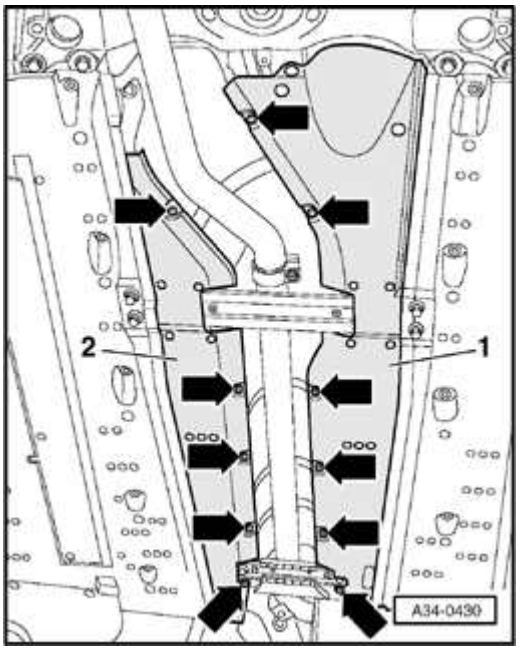


Fig. 91: Locating Covers Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts -arrows- and detach covers -1- and -2-.

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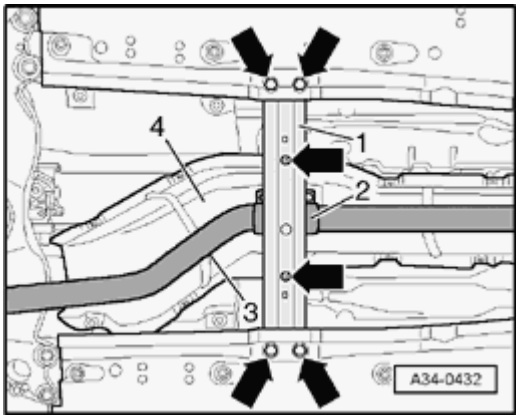


Fig. 92: Rear Section Of Exhaust System And Front Cross Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove tunnel cross member -1- -arrows-.

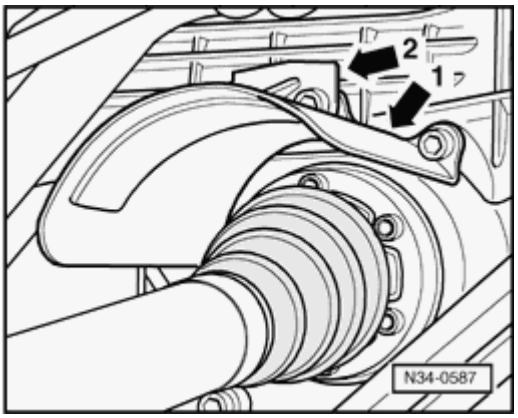


Fig. 93: Detaching Heat Shields And Right-Hand Axle Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts -arrow 1- and -arrow 2- above the right drive shaft and remove heat shield.
- If installed, remove heat shield above the left drive shaft.

Vehicles with 4-cylinder engine:

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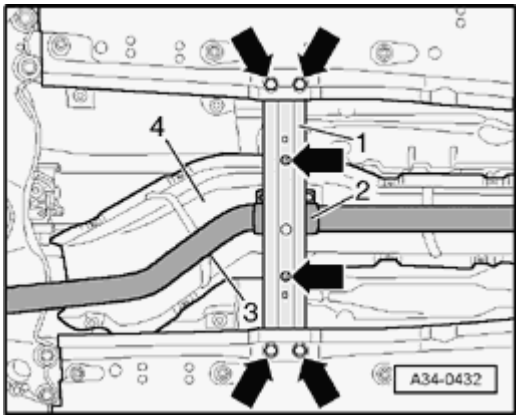


Fig. 94: Rear Section Of Exhaust System And Front Cross Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front exhaust pipe -3- from clamp -2- on:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

Vehicles with 6-cylinder engine:

- Remove front exhaust system with catalytic converter:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

Continued for all models:

- Remove heat shield -4- above exhaust system.

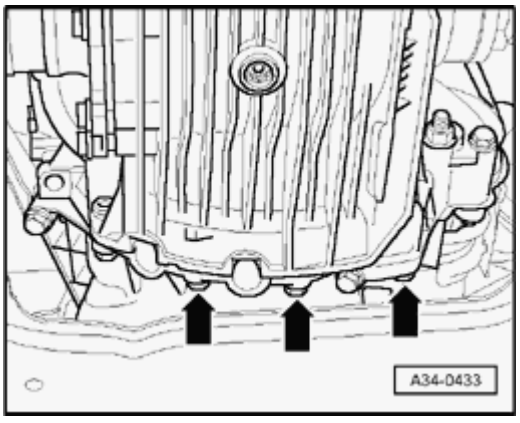


Fig. 95: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the three lower engine and transmission connecting bolts -arrow-.

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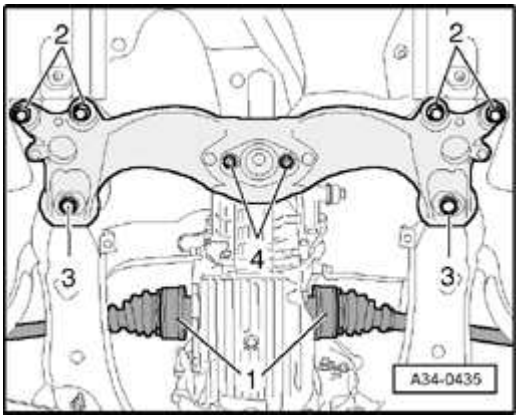


Fig. 96: Drive Shafts And Flange Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the drive shafts -1- from the flange shafts and tie these up.

NOTE: Do not damage protective coating on drive shafts.

- Support transmission with engine and transmission lifter VAG 1383 A.

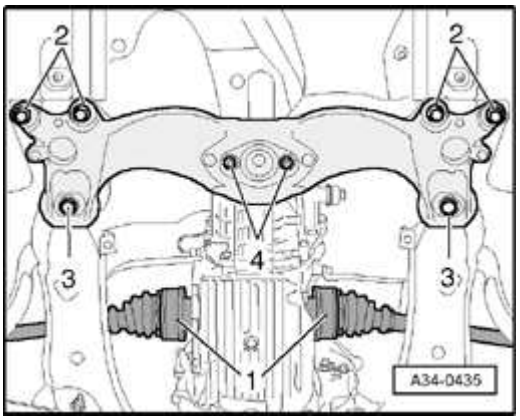


Fig. 97: Drive Shafts And Flange Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts -2- and then bolts -3- on tunnel cross member.
- Remove the two nuts -4- and detach tunnel cross member -2-.
- Lower engine and transmission lifter VAG 1383 A and place to one side.

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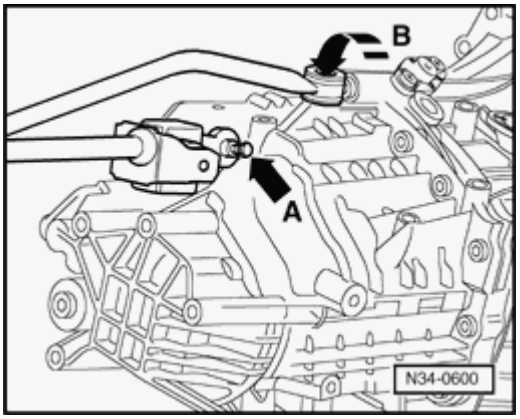


Fig. 98: Identifying Transmission Shift And Pivot Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove selector rod -arrow A-.
- Remove hex socket-head bolt on push rod -arrow B-.

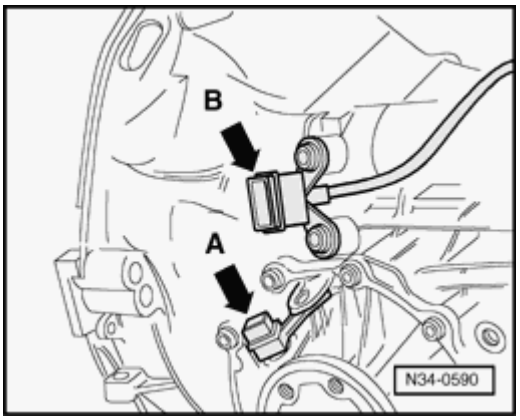


Fig. 99: Identifying Connectors For Vehicle Speed Sensor (VSS) And Back-Up Lights
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector off speedometer sensor -arrow A-.
- Disconnect connector on reversing light switch (multi-function sensor) -arrow B-.
- Disconnect all other electrical connections and ground wires from transmission and from the engine and transmission securing bolts.

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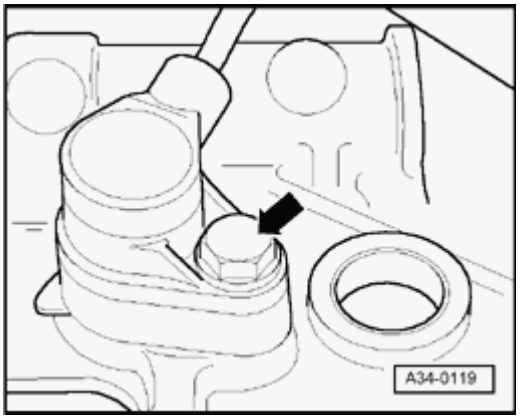


Fig. 100: Location Of Engine Speed (RPM) Sensor G28 On Coupling Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove engine speed (RPM) sensor -G28- on left of transmission -arrow- and lay to one side.

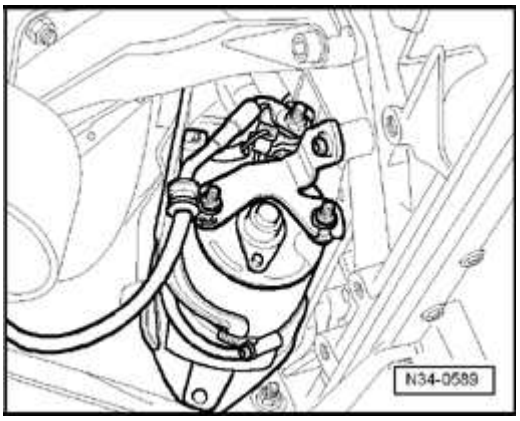


Fig. 101: Removing Starter Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove starter from engine and transmission and secure.

Refer to **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**

NOTE: Do not disconnect starter cables.

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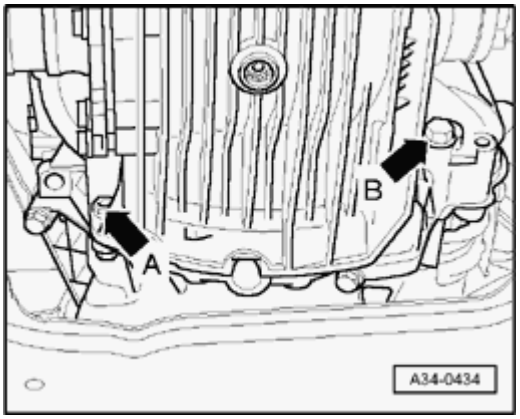


Fig. 102: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove lower engine and transmission connecting bolts, except for bolts -arrow A- and -arrow B-.

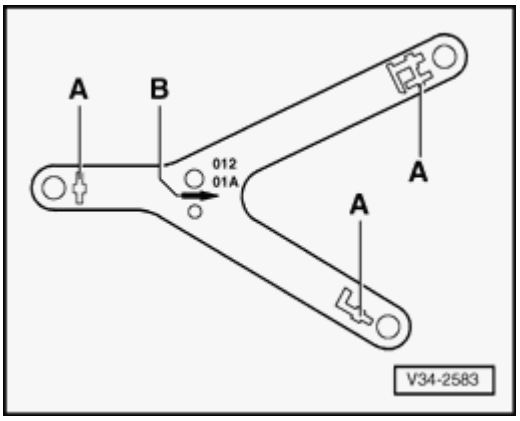


Fig. 103: Transmission Support 3282 Attachment Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set the transmission support 3282 for removing the manual 012 with adjustment plate 3282/10 and attach to transmission lifter VAG 1383 A.

A - Support elements

NOTE:

- **Support elements -A- are shown in schematic form, arrow -B- points in direction of travel.**
- **Adjustment plate 3282/10 only fits in one position.**

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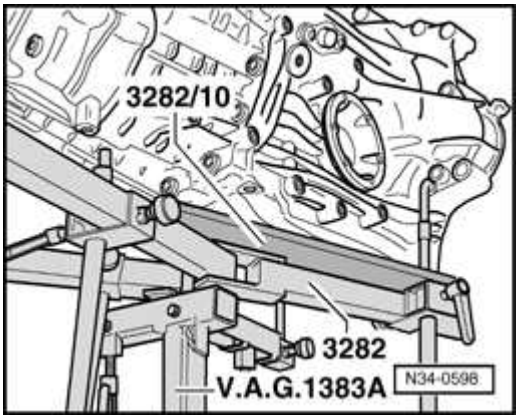


Fig. 104: Setting Transmission Jack Under Vehicle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place transmission lifter under vehicle. Arrow -B- (See **Fig. 103**) on adjustment plate points in direction of travel.

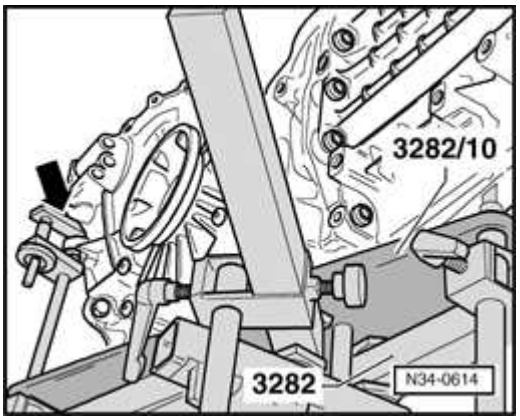
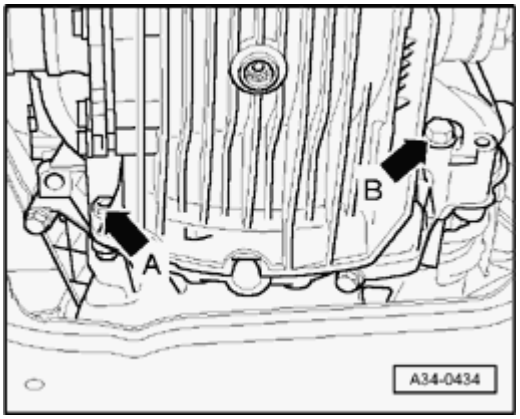


Fig. 105: Aligning Adjustment Plate Parallel To Transmission And Lock Safety Support On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align adjustment plate parallel to transmission and lock safety support -arrow- on transmission.



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Fig. 106: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine and transmission connecting bolts (arrows -A- and -B-).
- Push transmission off dowel sleeves and lower carefully with transmission lifter VAG 1383 A just far enough to access the slave cylinder.

NOTE: When lowering transmission make sure hydraulic line and hose to slave cylinder is not damaged.

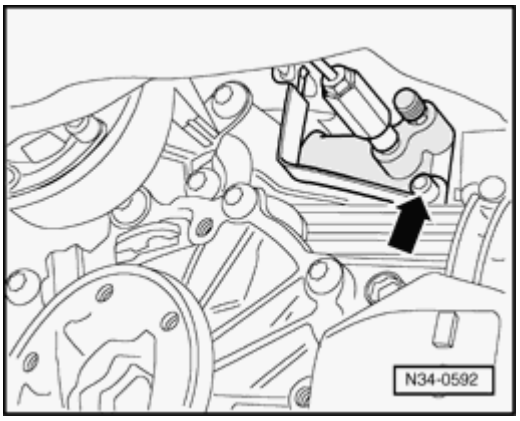


Fig. 107: Identifying Clutch Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clutch slave cylinder (arrow) and secure with wire, do not disconnect lines.

NOTE: Do not depress clutch pedal after removing slave cylinder.

- Lower transmission.

NOTE: When lowering transmission make sure there is sufficient clearance for drive shafts.

Secure transmission to repair stand with transmission support VW 353 and retaining plate VW 309 to carry out repairs.

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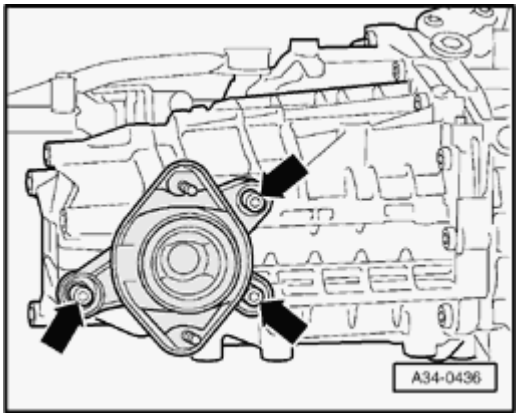


Fig. 108: Transmission Mount
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If the transmission is exchanged, the transmission mount must be transferred to the exchange transmission.

Transmission, transporting

Special tools, testers and auxiliary items required

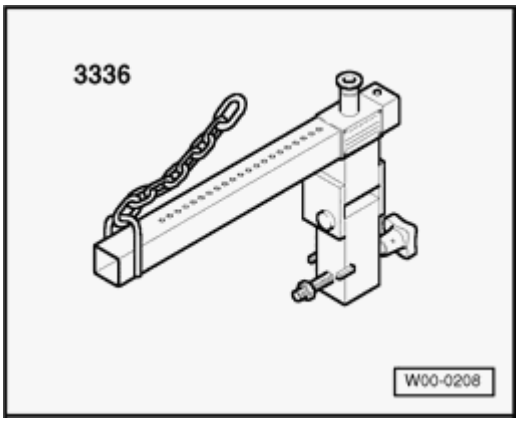


Fig. 109: Transmission Support Jig. 3336
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3336 transmission lifting beam

Transmission lifting beam can be used to transport transmission and when setting up transmission support 3282.

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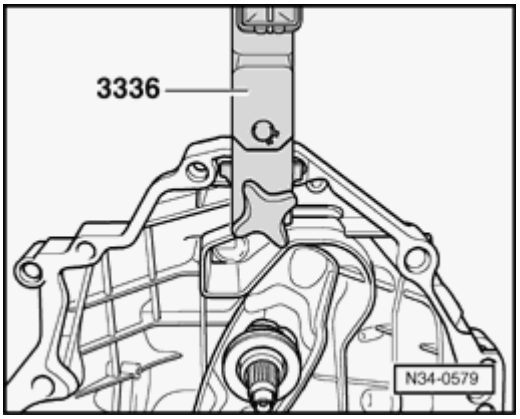


Fig. 110: Bolting Transmission Support Jig. 3336 To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt transmission lifting beam 3336 to clutch housing.

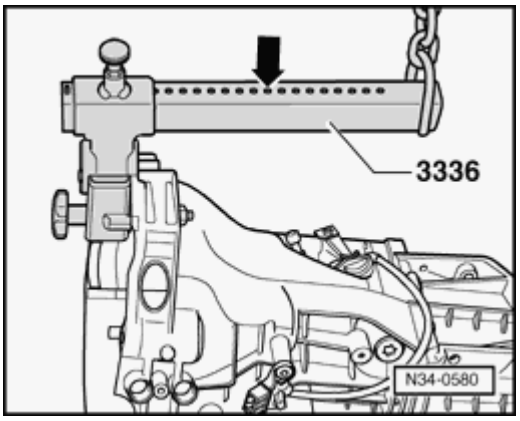


Fig. 111: Adjust Support Jig On Sliding Piece Using Locking Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set support arm in slide with locking pin (arrow).
- No. of holes visible = 17
- Lift transmission with workshop crane and transmission lifting beam 3336.

Installing

Install in reverse order, paying attention to the following:

- Clean input shaft splines and lightly grease with G000 100 grease.

The clutch plate must slide easily back and forth on input shaft.

- Lightly coat contact surface on push rod at clutch release lever with copper grease, e.g. Z 381 351 TE.

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- Check whether dowel sleeves for centering engine and transmission in cylinder block have been installed.
- If installed, make sure that intermediate plate is correctly positioned on engine.
- Check clutch release bearing for wear and replace.

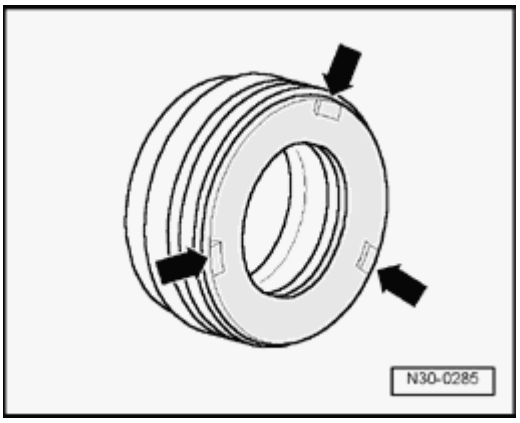


Fig. 112: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If plastic ring on release bearing is detached, adhere this back onto bearing ring with adhesive AMV 195 KD1 01.

Three right-angled lugs -arrows- on plastic ring engage in the recesses on bearing ring.

If ridges are deeper than 0.5 mm, replaced release bearing.

- All threaded holes into which self-locking bolts are installed, must be cleaned of locking fluid residue with a thread tap.
- Replace all self locking nuts.

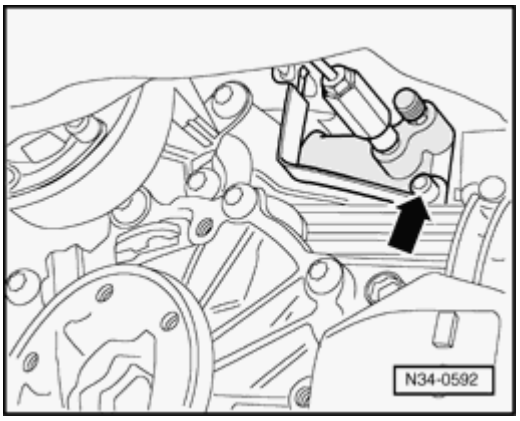


Fig. 113: Identifying Clutch Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift transmission until clutch slave cylinder with bracket for hose and line can be installed (arrow).

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- Install lower engine, transmission and starter mounting bolts and install starter.

Refer to **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**

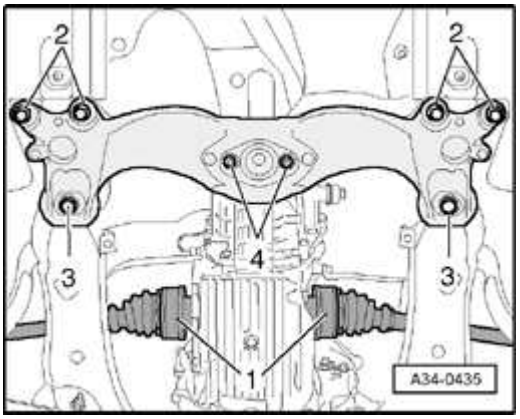


Fig. 114: Drive Shafts And Flange Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install tunnel cross member onto transmission mount -4-.
- Install tunnel cross member onto body. First install bolts -3- and then bolts -2-.
- Check shift mechanism adjustment, adjust. Refer to **Shift mechanism, adjusting**.
- Align exhaust system stress-free:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

- Checking oil level in manual transmission. Refer to **Oil level in manual transmission, checking**.
- Read battery CAUTION! note. Refer to **Shift mechanism, servicing**.
- Connect battery.
- After connecting battery, enter anti theft code for radio.

Refer to Operating instructions for radio

NOTE: On re-connecting battery, remember to check and re-activate vehicle equipment (radio, clock, convenience electronics, etc.).

Refer to

- **01 - MAINTENANCE**
- **01 - MAINTENANCE** for Cabriolet

Tightening torques

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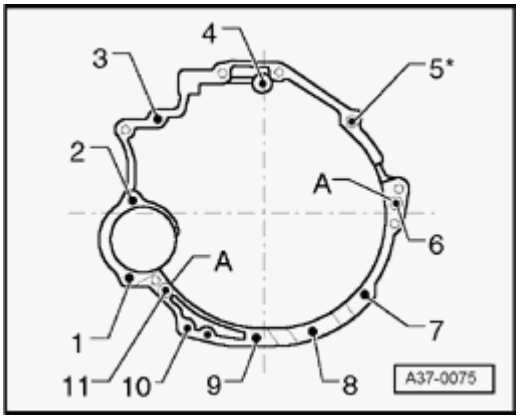


Fig. 115: Identifying Engine/Transmission Mountings (Automatic/Manual Transmission)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Attachment of 4-cylinder engine to transmission

Item	Bolt	Nm
1, 3, 4	M12 x 75	65
2	M12 x 90	65
5, 11	M12 x 110	65
7... 10	M10 x 45	45
11	M12 x 130	65

A: Dowel sleeves for centering

Transmission mount with mount to transmission -arrows-	23 Nm

1 - Drive shaft to flange shaft	M8	40 Nm
	M10	70 Nm
2 - Tunnel cross member to body 1)	M10	55 Nm
3 - Tunnel cross member to body 1)		110 Nm + 90 °
4 - Tunnel cross member to transmission mounting		23 Nm

1) Always replace bolt with washer

Component		Nm
Engine speed (RPM) sensor -G28-		10
Clutch slave cylinder to transmission1)		23
Heat shields over drive shafts to transmission		23
Selector joint to transmission 1)		23
Push rod to transmission		40

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Tunnel cross member to body	55
Clamp for exhaust pipe	40
Bracket for noise insulation to subframe	10

1) Replace bolt.

OIL LEVEL IN MANUAL TRANSMISSION, CHECKING

Oil level in manual transmission, checking

Special tools, testers and auxiliary items required

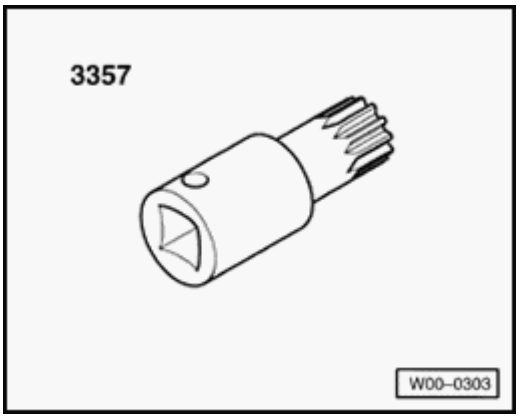


Fig. 116: Identifying Triple Square Socket Driver 3357
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3357 socket attachment

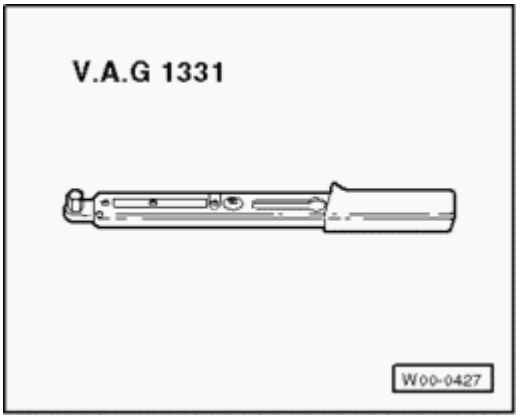


Fig. 117: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1331 Torque wrench

NOTE:

- **The vehicle must be level when checking transmission oil level. This work**

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is best performed over an inspection pit or using a 4 -column lifting platform.

- **The oil filler plug is on the left of the transmission below the speedometer sensor; it may be concealed by the heat shield for the drive shaft.**
- **Remove oil drain plug using special tool 3357.**

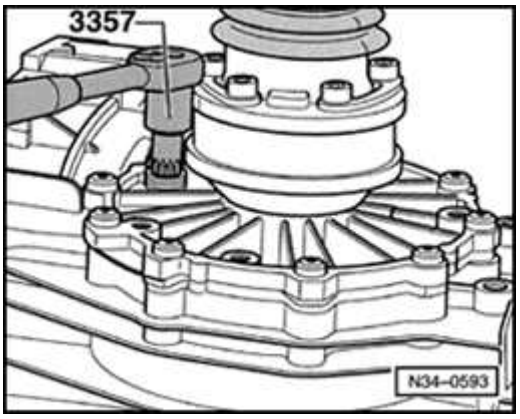


Fig. 118: Checking Oil Level At Oil Filler Hole
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To check oil level, remove oil filler plug (arrow).
- Check oil level using a shop-built tool, e.g. a piece of angled wire.

- Specification: Oil level 7 mm below bottom edge of oil filler hole

NOTE: In service centers filling to lower edge of filler hole is also permissible.

- Fill with gear oil if necessary: Specification. Refer to **Code letters, application, ratios, capacities**.

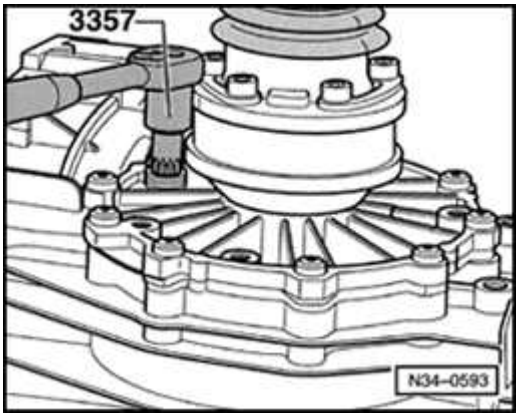


Fig. 119: Checking Oil Level At Oil Filler Hole
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install oil filler plug.

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Tightening torque

Component	Nm
Oil filler plug	25

TRANSMISSION, DISASSEMBLING AND ASSEMBLING

Transmission, disassembling and assembling

Assembly sequence. Refer to **Ball bearing for input shaft, multi-function sensor, input shaft, drive pinion, selector rods and transmission cover, removing and installing**

Transmission overview

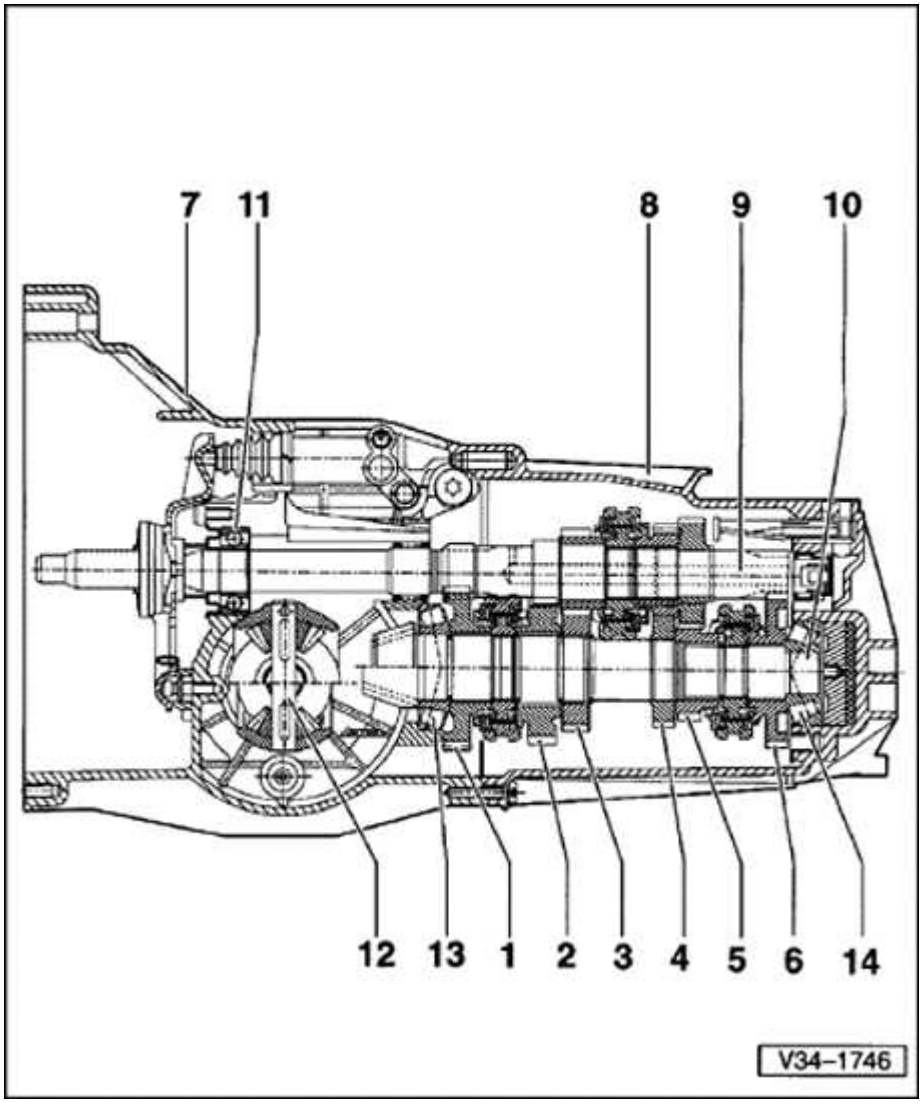


Fig. 120: Transmission, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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1 - 1st gear

2 - 2nd gear

3 - 3rd gear

4 - 4th gear

5 - 5th gear

6 - Reverse gear

- Removing and installing reverse idler. Refer to **Reverse idler gear, removing and installing**

7 - Transmission housing

8 - Transmission cover

9 - Input shaft

- Disassembling and assembling. Refer to **Input shaft, disassembling and assembling**

10 - Drive pinion

- Disassembling and assembling. Refer to **Drive pinion, disassembling and assembling**

11 - Ball bearing

- Adjusting. Refer to **Input shaft, adjusting** adjusting input shaft

12 - Differential

- Removing and installing. Refer to **Differential, removing and installing**
- Disassembling and assembling. Refer to **Differential, disassembling and assembling**

13 - Tapered roller bearings

- Adjusting. Refer to **Drive pinion, adjusting**

14 - Tapered roller bearings

- Adjusting. Refer to **Drive pinion, adjusting**

Assembly overview

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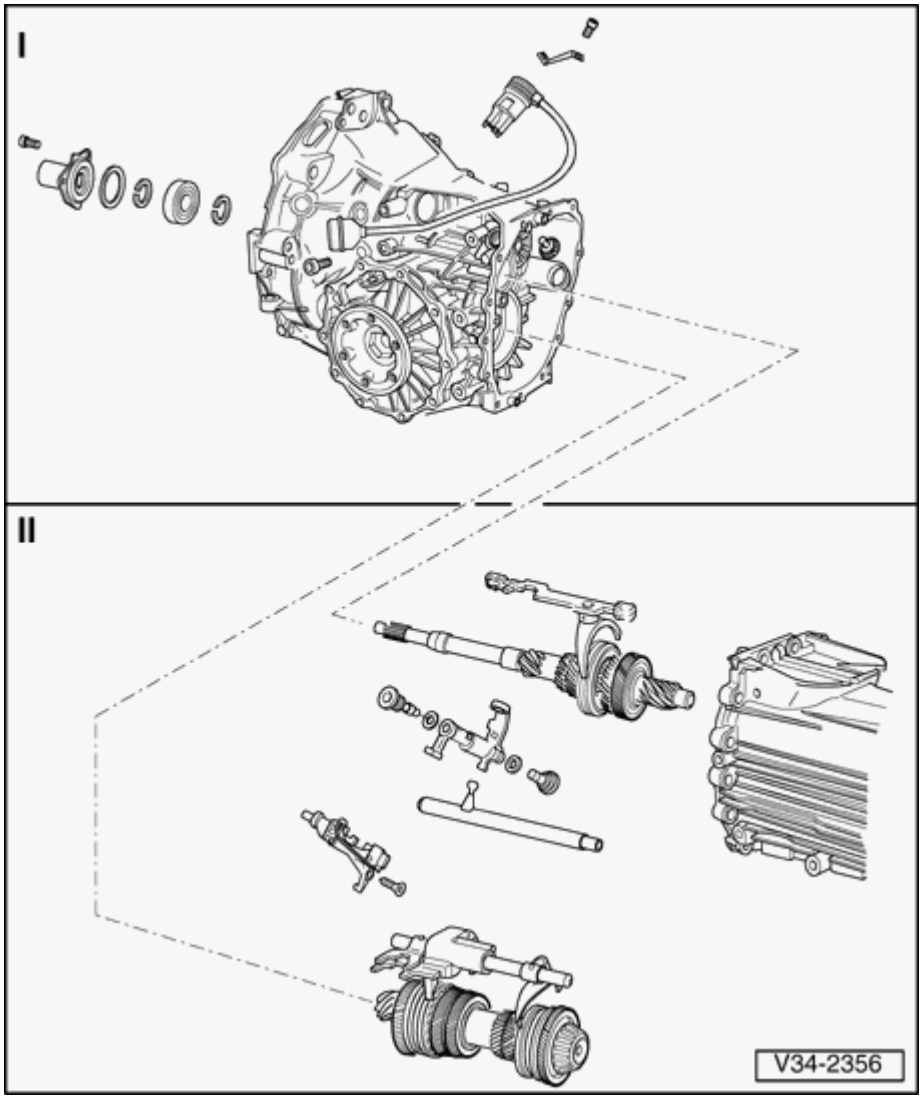


Fig. 121: Transmission, Assembly Overview, I and II
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - Removing and installing input shaft ball bearing and multi-function sensor. Refer to Input shaft ball bearing and multi-function sensor, removing and installing

II - Removing and installing input shaft, drive pinion, selector rods, transmission cover. Refer to Input shaft, drive pinion, selector rods and transmission cover, removing and installing

Input shaft ball bearing and multi-function sensor, removing and installing

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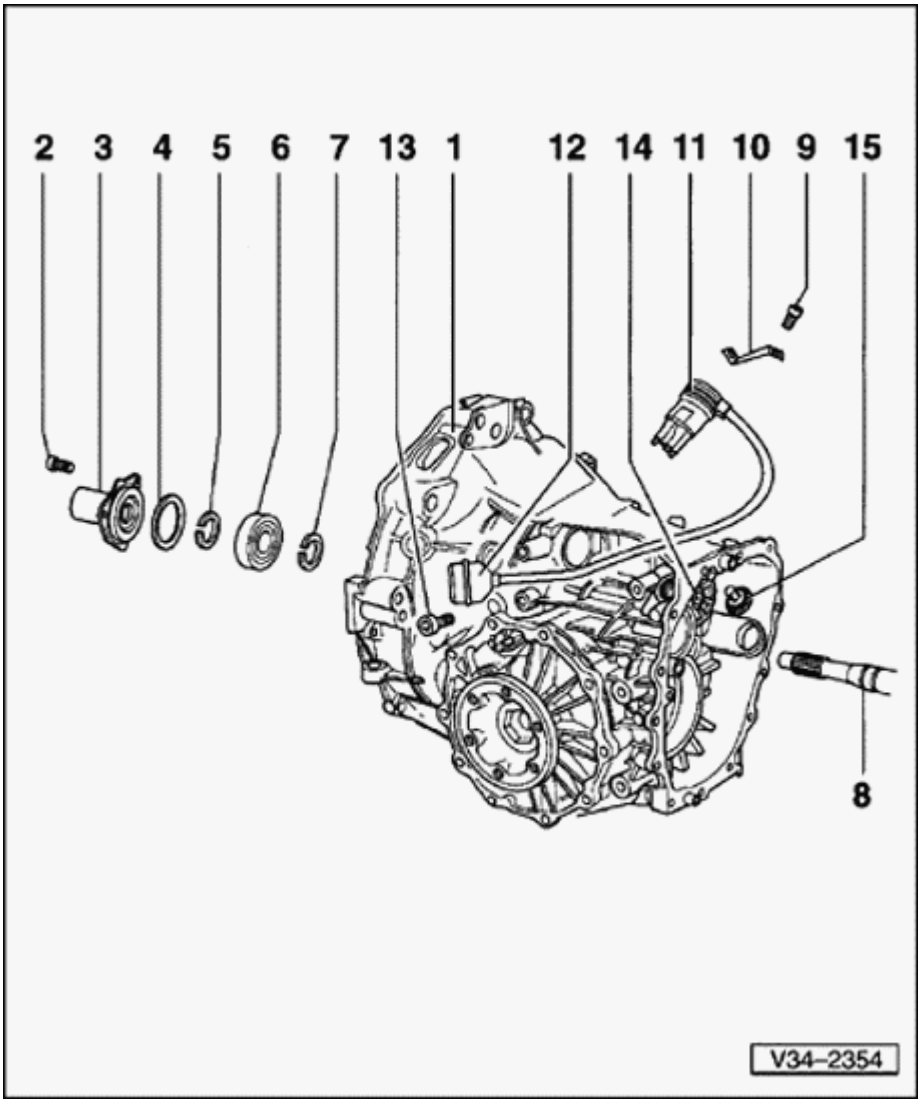


Fig. 122: Transmission Housing, Input Shaft Ball Bearing And Multi-Function Sensor, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing

- With differential and flange shafts
- Removing and installing flange shafts. Refer to **Flange shaft oil seal, replacing**
- Removing and installing differential. Refer to **Differential, removing and installing**
- Removing and installing speedometer sensor and drive wheel. Refer to **Speedometer sensor and drive wheel, removing and installing**
- Breather installation position. See **Installation position of breather**

2 - Torx socket head bolt

- Self-locking

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- Always replace

3 - Guide sleeve

- With O-ring and seal for input shaft. Refer to **Clutch release mechanism, servicing**
- Installation position: Oil drain hole points downward

4 - Dished washer

- Smaller diameter (convex side) to guide sleeve

5 - Circlip

- Determining thickness adjusting. Refer to **Input shaft, adjusting**

6 - Ball bearing

- Removing and installing. Refer to **Ball bearing for input shaft, multi-function sensor, input shaft, drive pinion, selector rods and transmission cover, removing and installing**

7 - Circlip

- Determining thickness adjusting. Refer to **Input shaft, adjusting**

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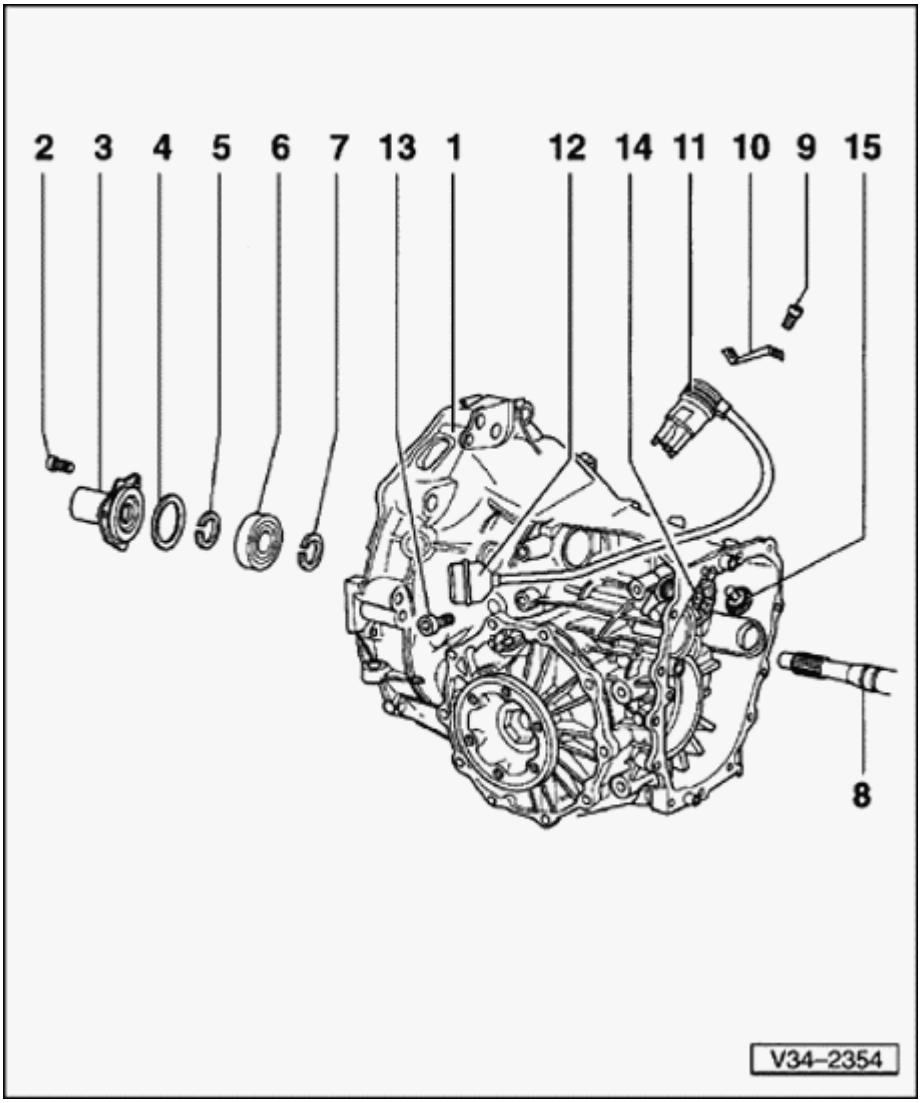


Fig. 123: Transmission Housing, Input Shaft Ball Bearing And Multi-Function Sensor, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

8 - Input shaft

- Removing and installing. Refer to **Fig. 125**
- Disassembling and assembling. Refer to **Input shaft, disassembling and assembling**
- Adjusting. Refer to **Input shaft, adjusting**
- Servicing input shaft bearings. Refer to **Input shaft, disassembling and assembling**

9 - Bolt

10 - Tab washer

- For multi-function sensor

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11 - Multi-function sensor

12 - Connector for multi-function sensor

13 - Bolt - 10 Nm

14 - Cover for selector shaft

- Removing and installing. Refer to **Shift mechanism in transmission, disassembling and assembling**

15 - Locking module for 5th gear and reverse gear

- Removing and installing. Refer to **Removing and installing locking module for 5th gear and reverse gear**

Installation position of breather

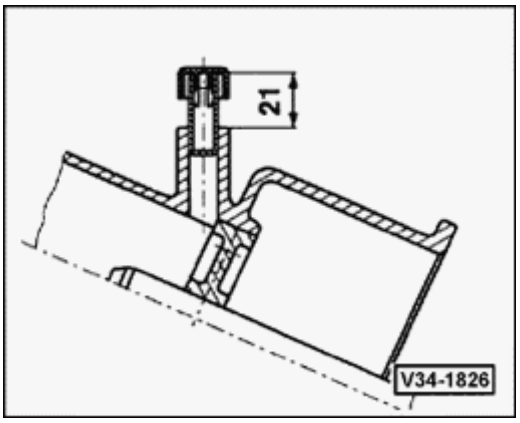


Fig. 124: Identifying Installed Position Of Breather
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The breather must project 21 mm out of housing, after being pressed in.

Input shaft, drive pinion, selector rods and transmission cover, removing and installing

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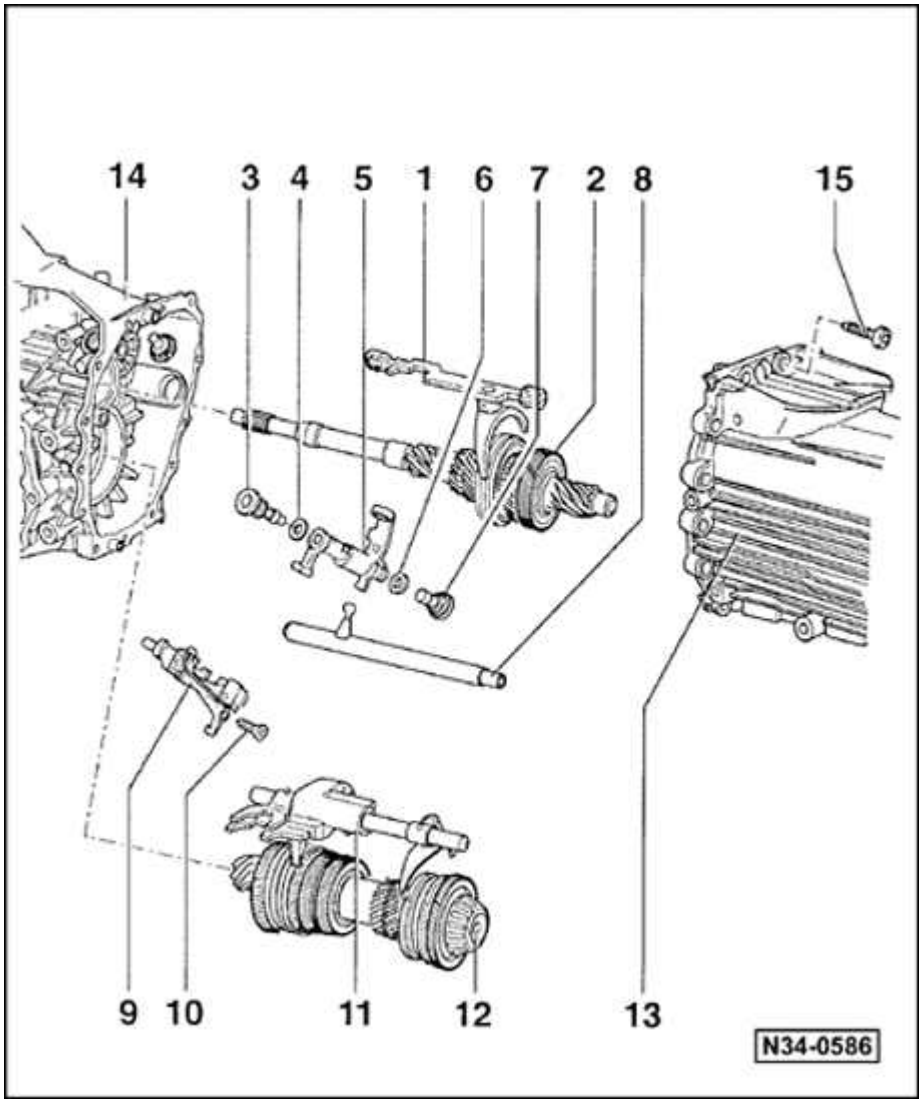


Fig. 125: Input Shaft, Drive Pinion, Shift Rods And Transmission Cover, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector rod with selector fork for 3rd and 4th gear

- Disassembling and assembling. Refer to **Shift mechanism in transmission, disassembling and assembling**
- Replacing mounting bushings. Refer to **Shift mechanism in transmission, disassembling and assembling**

2 - Input shaft

- Disassembling and assembling. Refer to **Input shaft, disassembling and assembling**
- Adjusting. Refer to **Input shaft, adjusting**
- Servicing input shaft bearings. Refer to **Input shaft, adjusting**

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3 - Left stop bolt - 40 Nm

4 - Washer

5 - Relay shaft

- Installation position. Refer to **Shift mechanism in transmission, disassembling and assembling**

6 - Washer

7 - Right stop bolt - 40 Nm

8 - Selector shaft

- Installation position. Refer to **Shift mechanism in transmission, disassembling and assembling**
- Replace selector shaft sealing ring. Refer to **Shift mechanism in transmission, disassembling and assembling**

9 - Detent segment

- Installation position. Refer to **Shift mechanism in transmission, disassembling and assembling**

10 - Torx bolt - 25 Nm

- With collar to secure the detent segment spring

11 - Selector rod with selector fork for 1st/2nd/5th and reverse gear

- Disassembling and assembling. Refer to **Shift mechanism in transmission, disassembling and assembling**
- Removing and installing ball sleeves. Refer to **Removing and installing ball sleeve**

12 - Drive pinion

- Disassembling and assembling. Refer to **Drive pinion, disassembling and assembling**
- Adjusting. Refer to **Drive pinion, adjusting**
- Servicing drive pinion bearings. Refer to **Drive pinion, disassembling and assembling**

13 - Transmission cover

- Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces
- Removing and installing oil collector. Refer to **Removing and installing oil collector**

14 - Transmission housing

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- Match components according to transmission code letters

15 - Torx bolt - 22 Nm

Removing and installing oil collector

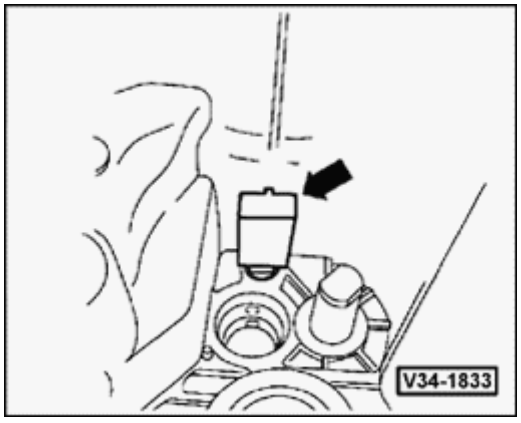


Fig. 126: Identifying Oil Collector Tray
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Turn the oil collector arrow- and then pull out.

Installing

- Push oil collector into transmission cover until it snaps in place.
- Installation position: Oil collector faces upward in transmission cover

Ball bearing for input shaft, multi-function sensor, input shaft, drive pinion, selector rods and transmission cover, removing and installing

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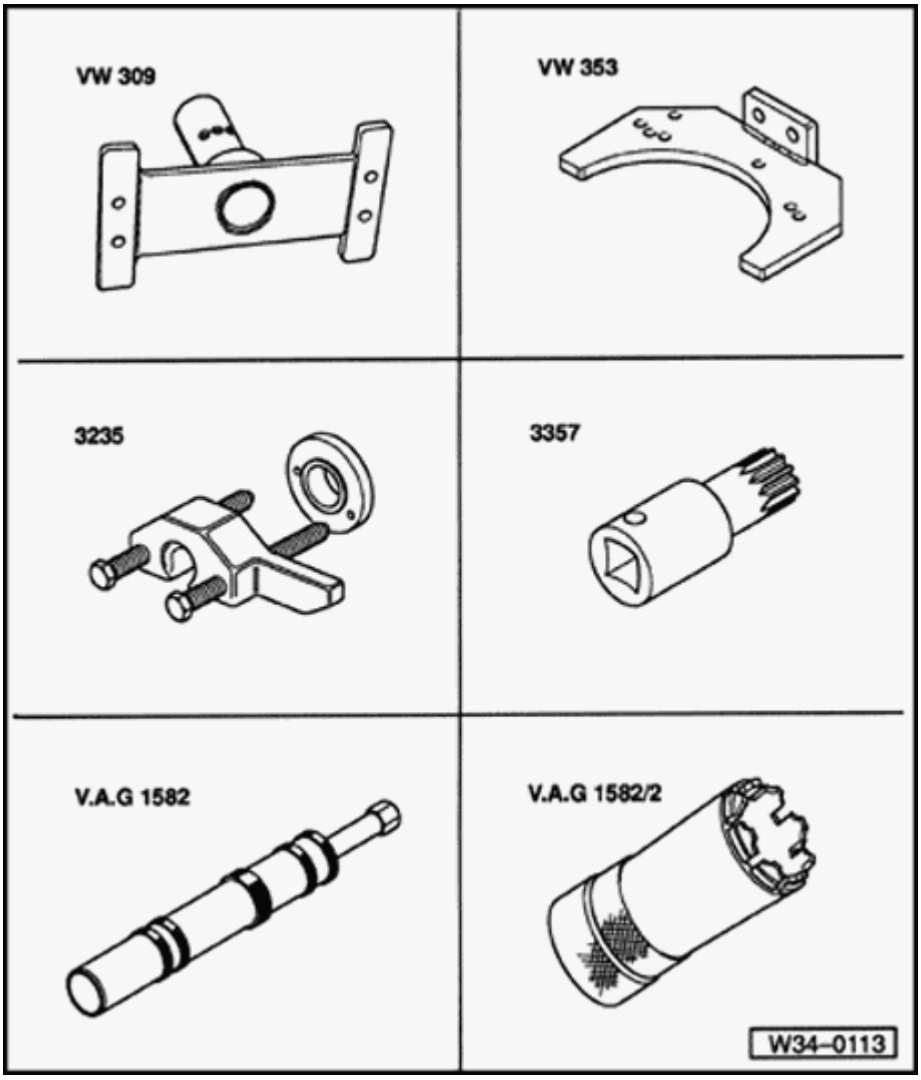


Fig. 127: Identifying Special Tools - Disassembly And Assembly
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 309 Holding plate
- VW 353 Transmission support
- 3235 Press Device
- 3357 Triple square socket driver
- VAG 1582 Tapered roller bearing puller
- VAG 1582/2 Gripping piece

Special tools and workshop equipment required

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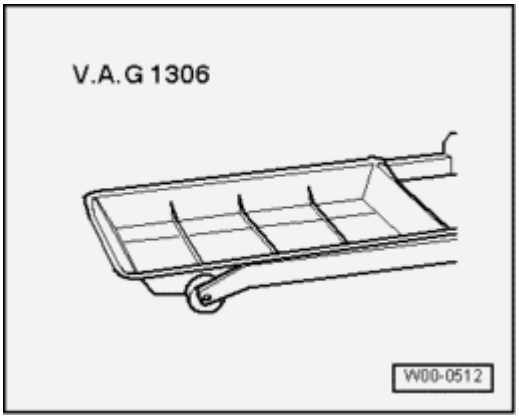


Fig. 128: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1306 Drip tray

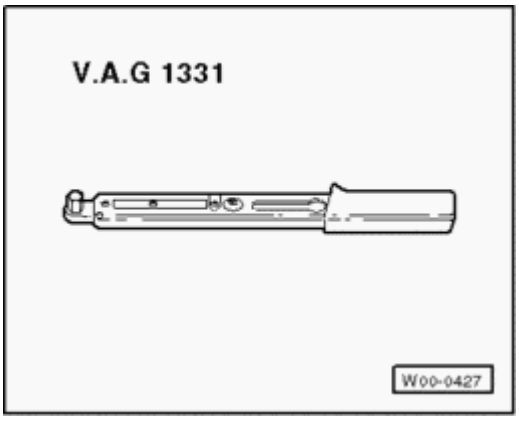


Fig. 129: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1331 Torque wrench
- Sealant AMV 188 001 02

NOTE:

- **It is not necessary to remove the differential to remove the above-mentioned components.**
- **Removal is only necessary when adjustments have to be carried out adjustment overview:**

Removing

- Place drip tray VAG 1306 underneath the transmission.
- Drain gear oil, using socket attachment 3357.

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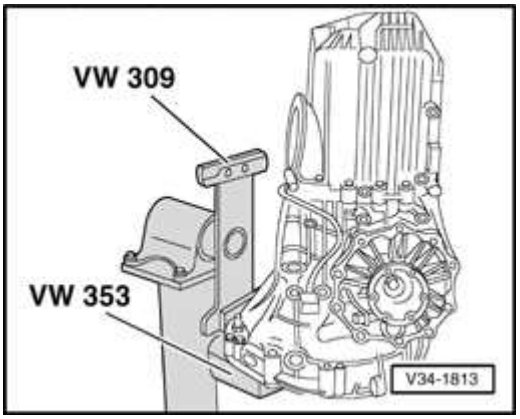


Fig. 130: Securing Transmission To Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure transmission to repair stand.

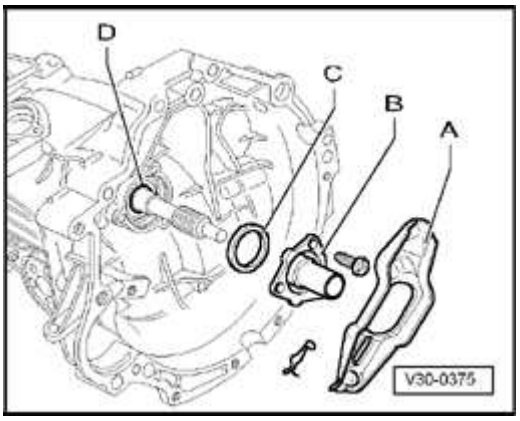


Fig. 131: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach clutch release lever -A- with release bearing.

NOTE: Cover input shaft splines with a shrink-fit hose to protect oil seal, before pulling off guide sleeve.

- Remove guide sleeve -B-.
- Remove dished washer -C-.
- In front of input shaft ball bearing remove circlip -D-.
- Note the thickness of the circlip, if the ball bearing, input shaft or transmission housing is not being replaced.

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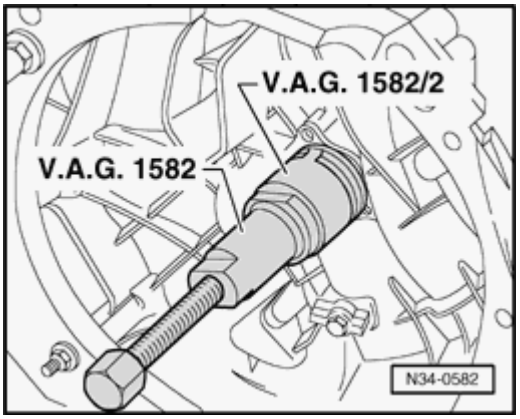


Fig. 132: Pulling Input Shaft Ball Bearing Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

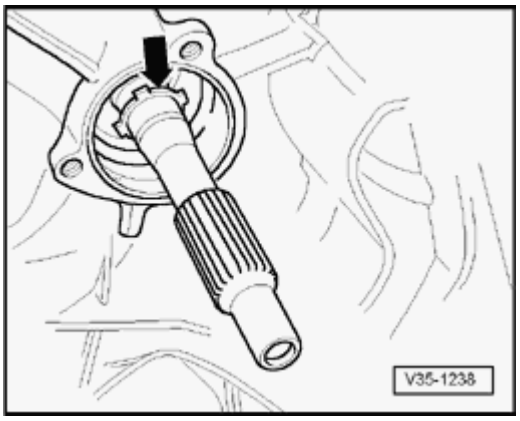
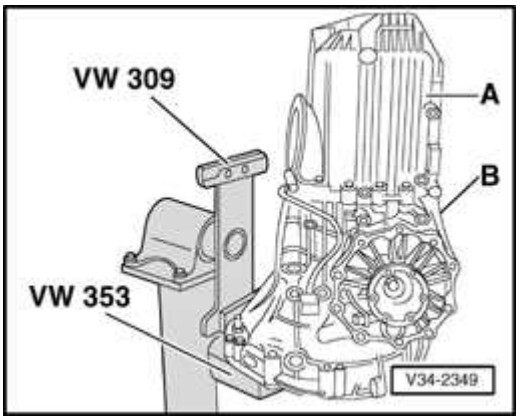


Fig. 133: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the circlip (arrow) behind the input shaft ball bearing.
- Note the thickness of the circlip, if the ball bearing, input shaft or transmission housing is not being replaced.



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Fig. 134: Transmission Cover Installed On Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove transmission cover -A- from transmission housing -B-.

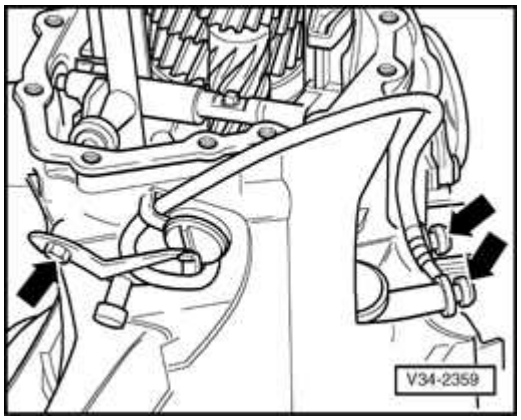


Fig. 135: Location Of Multi-Function Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts (arrows) and pull out the multi-function sensor.

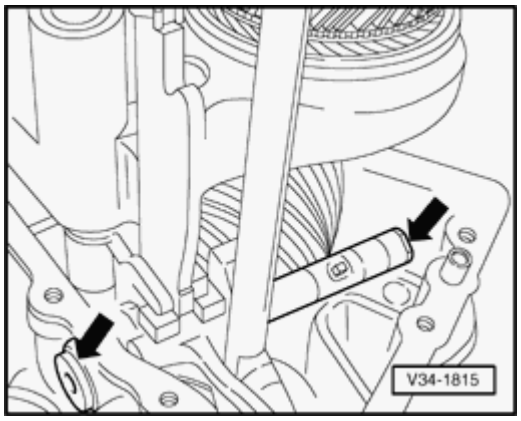


Fig. 136: Identifying Threaded Bolts At Both Ends Of Relay Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove relay shaft bolts (arrows).

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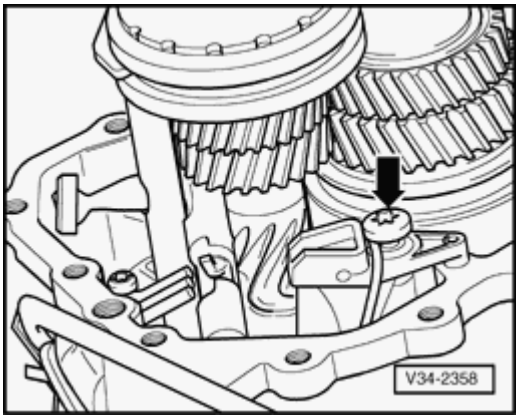


Fig. 137: Identifying Shift Detent Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove detent segment (arrow) and swivel it out.

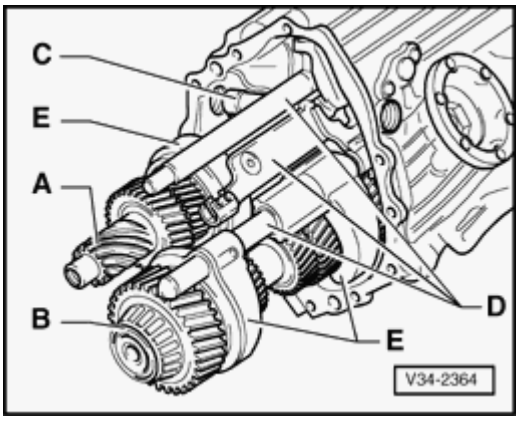


Fig. 138: Identifying Input Shaft, Drive Pinion, Relay Shaft, Shift Rods With Selector Shaft And Selector Forks
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The input shaft -A-, drive pinion -B-, relay shaft -C-, selector rods -D- with selector shaft and selector forks -E- must be carefully pulled out together.

Installing

NOTE: If input shaft ball bearing, input shaft or the transmission housing are replaced, it is necessary to re-determine the thickness of circlips for input shaft. Refer to Input shaft, adjusting, adjusting input shaft.

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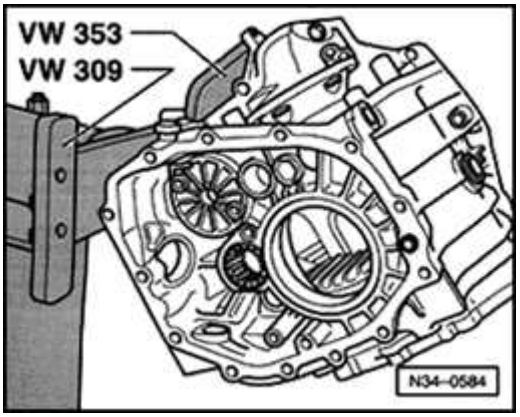


Fig. 139: Swing Transmission Housing Into Position Shown
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For easier installation of following components, swing transmission housing into the position shown.

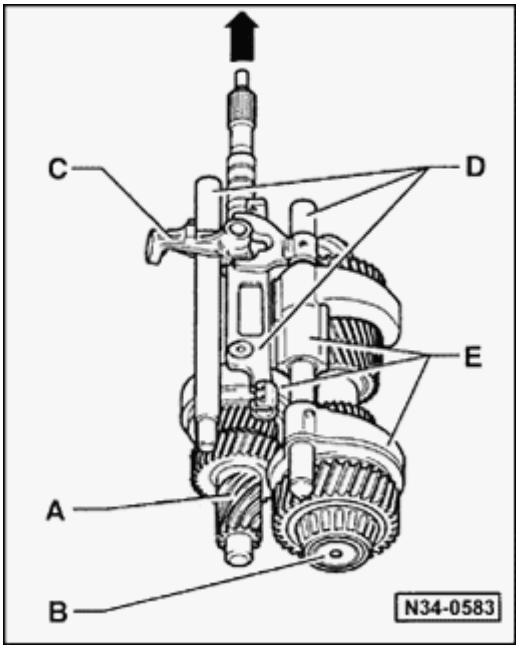


Fig. 140: Assemble Input Shaft, Drive Pinion, Relay Shaft, Selector Rods With Shift Rod And Selector Forks
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble input shaft -A-, drive pinion -B-, relay shaft -C-, selector rods -D- with selector shaft and selector forks -E-.
- Install these components together into transmission housing.

NOTE: Relay shaft -C- and selector shaft can also be installed later. Refer to Fig. 143.

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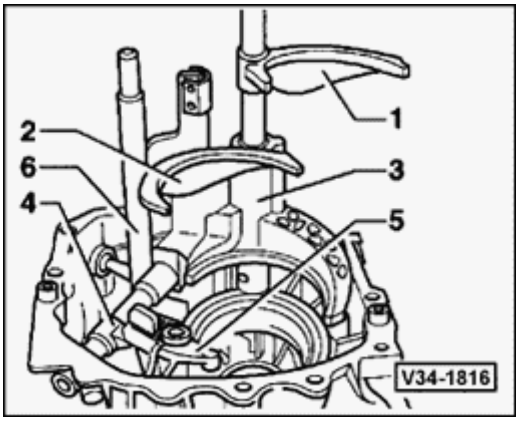


Fig. 141: Identifying Installed Position Of Complete Selector Mechanism In Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Location of shift mechanism in transmission

1 - Selector fork for 5th gear and reverse gear

2 - Selector fork for 3rd gear and 4th gear

3 - Selector fork for 1st gear and 2nd gear

4 - Relay shaft

5 - Detent mechanism

6 - Selector shaft

NOTE: Shown in illustration with input shaft and drive pinion removed.

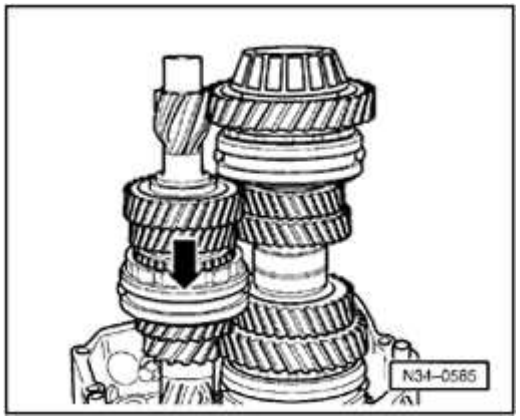


Fig. 142: Move Transmission To Engage 3rd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn transmission housing and engage 3rd gear (direction of arrow).

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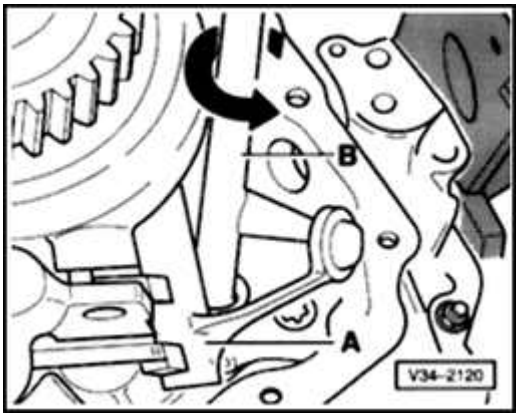


Fig. 143: Installing Relay Shaft And Shift Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install relay shaft -A-.
- Insert selector shaft -B- sideways into hole in transmission housing and assemble into mounting eye.
- Turn the selector shaft in direction of arrow.

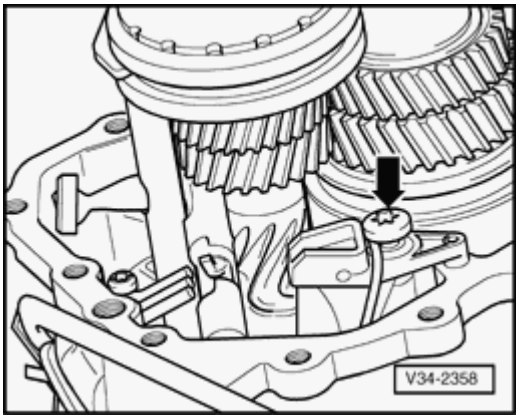


Fig. 144: Identifying Shift Detent Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert the detent segment and tighten bolt (arrow).

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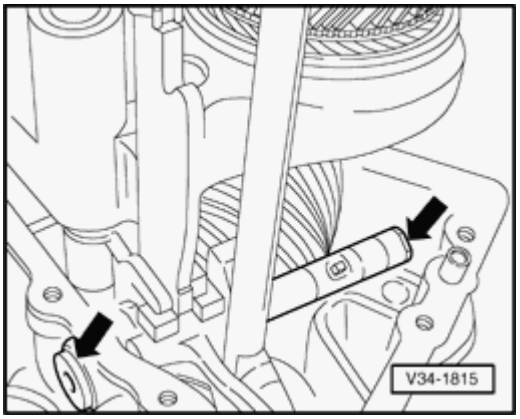


Fig. 145: Identifying Threaded Bolts At Both Ends Of Relay Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install relay shaft bolts (arrow).
- Replace O-ring for multi-function sensor.

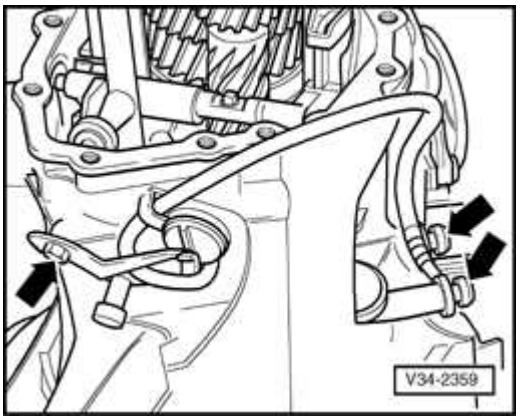


Fig. 146: Location Of Multi-Function Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully insert multi-function sensor and tighten (arrow).

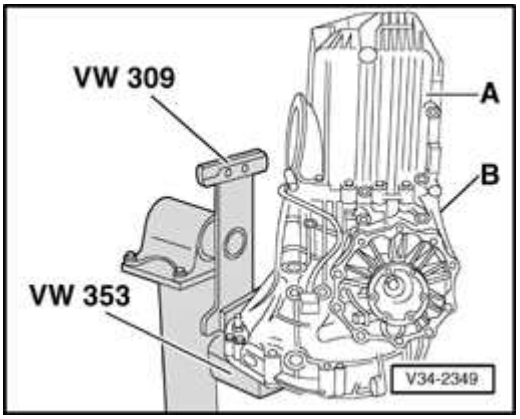


Fig. 147: Transmission Cover Installed On Transmission Housing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Check that dowel sleeves for transmission cover -A- are installed in transmission housing -B-.

- Apply thin coat of sealant AMV 188 001 02 to sealing surfaces.
- Install transmission cover onto transmission housing.

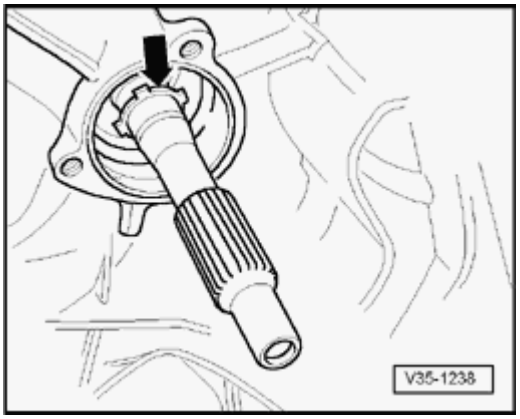


Fig. 148: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install rear input shaft ball bearing circlip (arrow).
- Slide the ball bearing onto input shaft.

- Installation position: Closed side of ball cage faces toward transmission housing

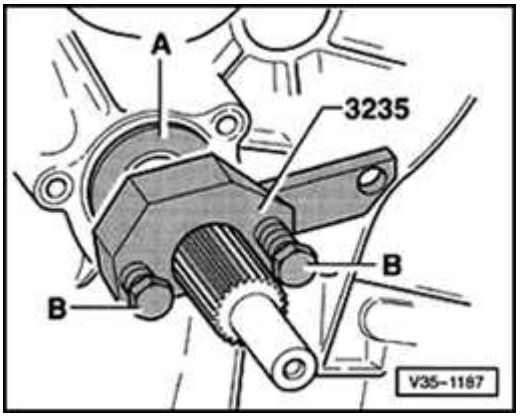


Fig. 149: Pressing In Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in ball bearing:

- Slide thrust pad -A- on press-in tool onto input shaft.
- Position press-in tool behind splines for clutch plate.
- Install bolts -B- until they make contact.

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- The bolts bear against the indentations in thrust pad -A-.

- Press in ball bearing onto its seat by alternately tightening the bolts (1/2 turn at a time).

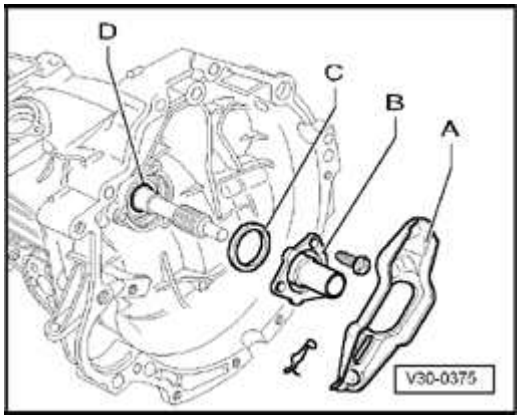


Fig. 150: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install front circlip -D- for the input shaft ball bearing.
- Install dished washer -C-.

- Installation position: Convex side toward guide sleeve -B-

NOTE: Before installing guide sleeve, cover input shaft splines with a shrink-fit hose to protect oil seal.

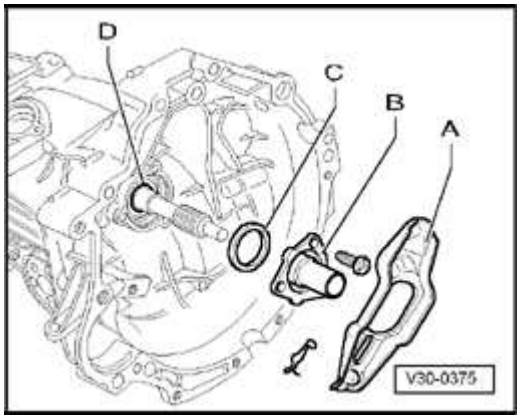


Fig. 151: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install guide sleeve -B- for release bearing.
- Install clutch release lever -A- and release bearing.

SHIFT MECHANISM IN TRANSMISSION, DISASSEMBLING AND ASSEMBLING

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Shift mechanism in transmission, disassembling and assembling

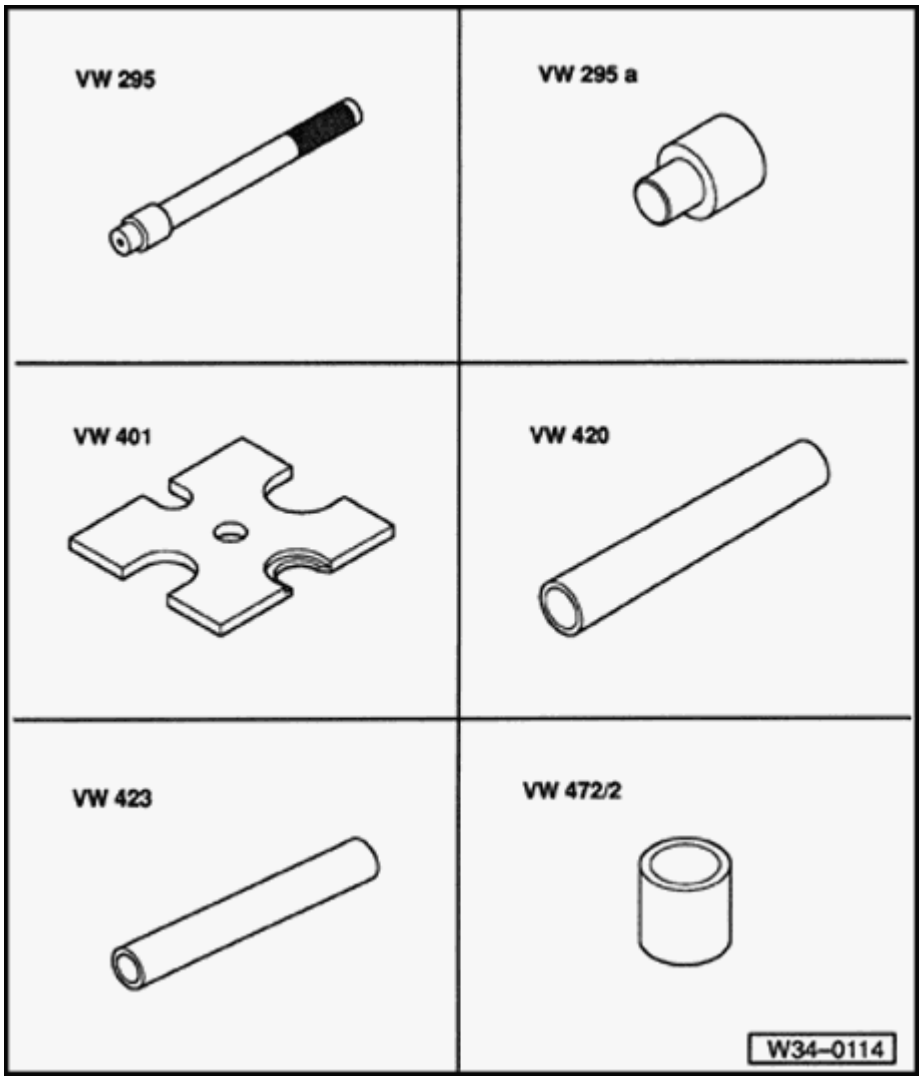


Fig. 152: Identifying Special Tools - Shift Mechanism On Transmission Side, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 295 Drift
- VW 295 A adapter
- VW 401 Thrust plate
- VW 420 Tube
- VW 423 Tube
- VW 472/2 Spacer sleeve

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Special tools and workshop equipment required

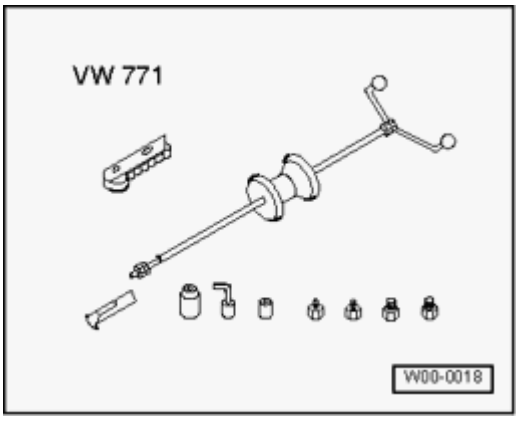


Fig. 153: Slide Hammer-Multi-Purpose Tool Set VW 771
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 771 Multi-purpose tool

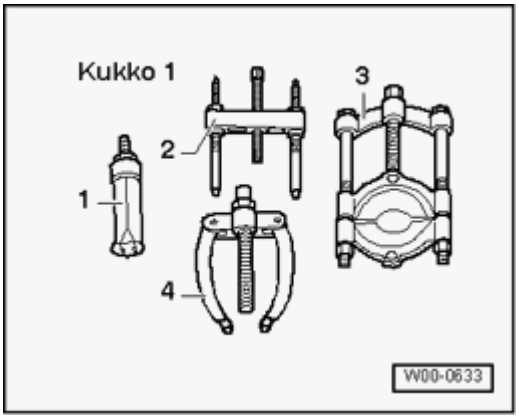


Fig. 154: Kukko 21/2 Internal puller, Kukko 21/4 Internal puller, Kukko 22/2 Counter support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Kukko 21/4 Internal puller

NOTE: **Installation position of complete shift mechanism in transmission. See Installation position of complete shift mechanism in transmission**

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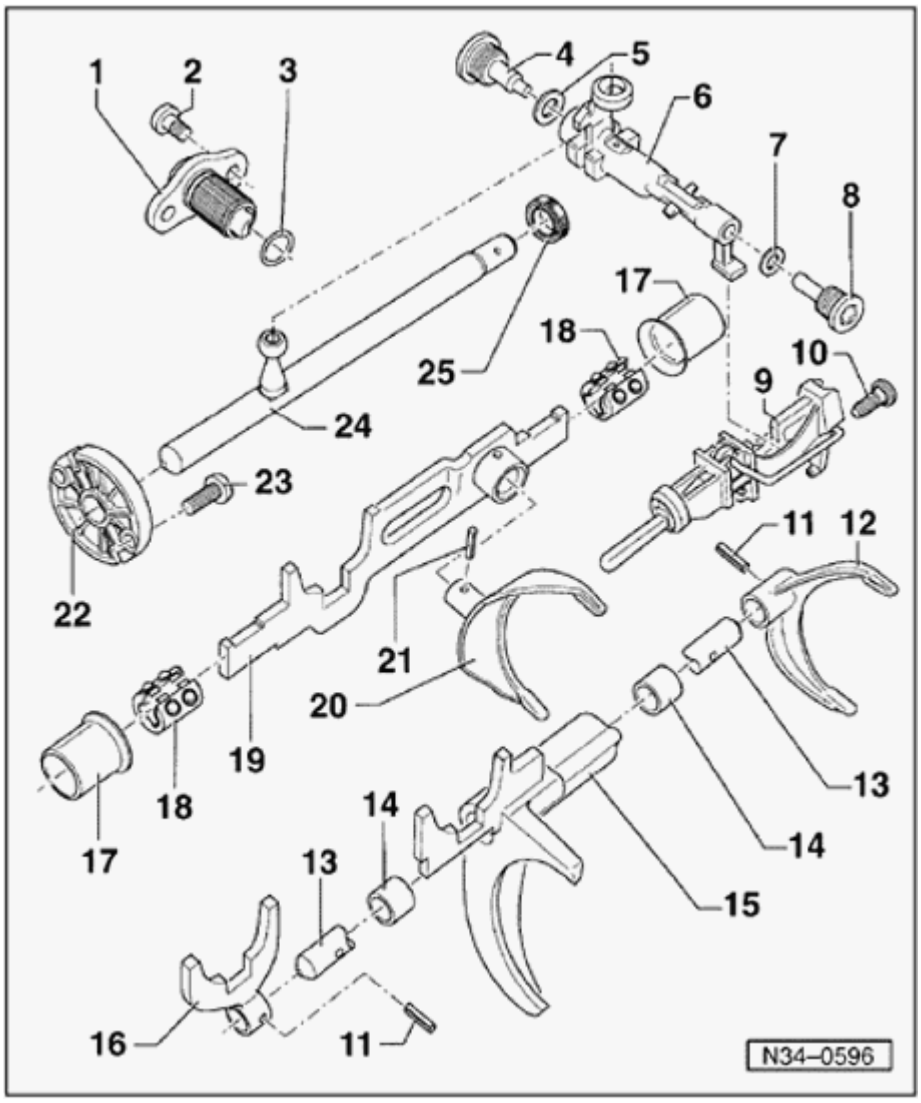


Fig. 155: Shift Mechanism In Transmission, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Locking module for 5th gear and reverse gear

- Removing and installing. Refer to **Removing and installing locking module for 5th gear and reverse gear**

2 - Torx bolt - 10 Nm

3 - O-ring

- Always replace

4 - Right stop bolt - 40 Nm

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5 - Washer

6 - Relay shaft

7 - Washer

8 - Left stop bolt - 40 Nm

9 - Detent segment

10 - Torx bolt - 25 Nm

11 - Spring pin

12 - 5th and reverse gear selector fork

- Installation position. Refer to **Installation position of 5th and reverse gear selector fork and follower for selector rod**

13 - Selector rods for 1st/2nd and 5th/reverse gear

14 - Ball sleeve

- Removing and installing. Refer to **Removing and installing ball sleeve**

15 - Selector fork, 1st and 2nd gear

16 - Relay lever

- Installation position. Refer to **Installation position of 5th and reverse gear selector fork and follower for selector rod**

17 - Mounting bushing for 3rd and 4th gear

- Pulling out. Refer to **Pulling out mounting bushing for 3rd and 4th gear selector rod**
- Driving in. Refer to **Driving mounting bushing for 3rd and 4th gear selector rod home**

18 - Ball sleeve

- Pry off the selector rod with a screwdriver
- Press on the selector rod

19 - Selector rod for 3rd and 4th gear

20 - Selector fork, 3rd and 4th gear

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21 - Spring pin

22 - Cover plate

- For selector shaft

23 - Torx bolt - 20 Nm

24 - Selector shaft

25 - Sealing ring

- Pry out with screwdriver
- Insert using tube VW 420
- Installation position. See **Installation position of oil seal**.

Installation position of 5th and reverse gear selector fork and follower for selector rod

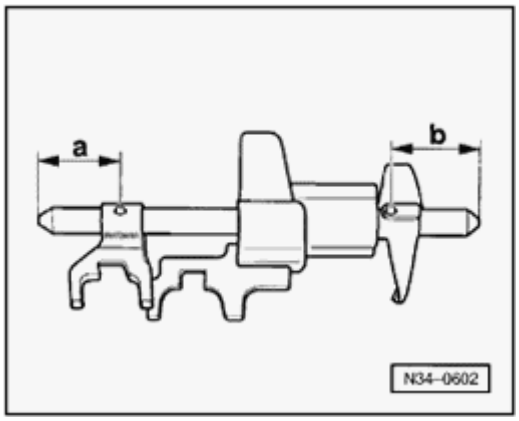


Fig. 156: Identifying Installed Position For 5th/Reverse Gear Shift Fork And Coupling Plate For Shift Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dimension a = 55 mm
- Dimension a = 60 mm

Removing and installing ball sleeve

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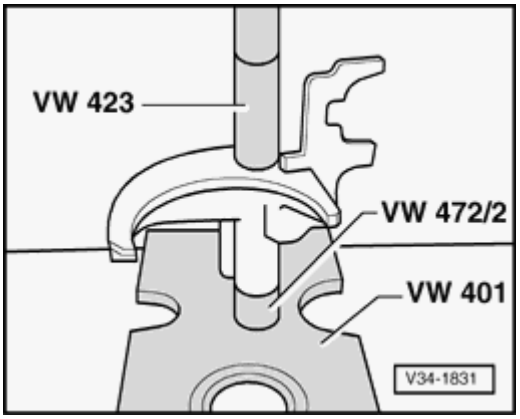


Fig. 157: Removing/Installing Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pulling out mounting bushing for 3rd and 4th gear selector rod

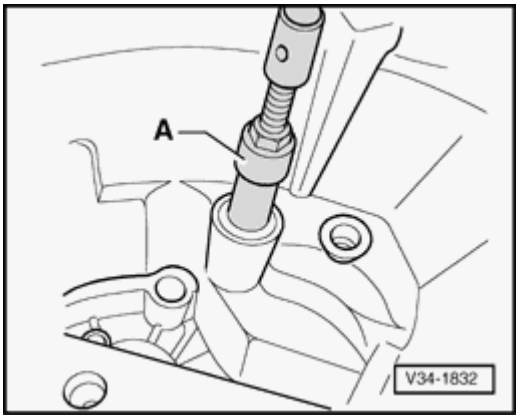
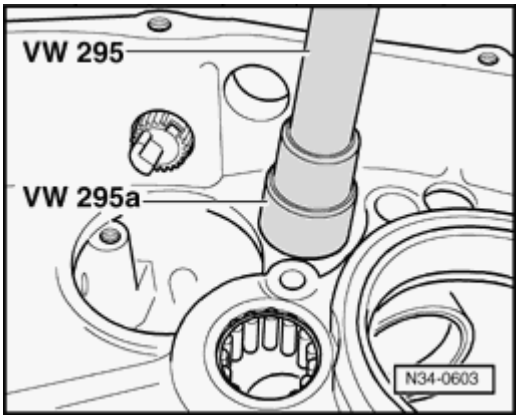


Fig. 158: Removing Bushing For 3rd And 4th Gear Shift Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal puller 22... 28 mm, e.g. Kukko 21/4, in conjunction with multi-purpose tool VW 771

Driving mounting bushing for 3rd and 4th gear selector rod home



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Fig. 159: Driving In Bushing For 3rd And 4th Gear Shift Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of oil seal

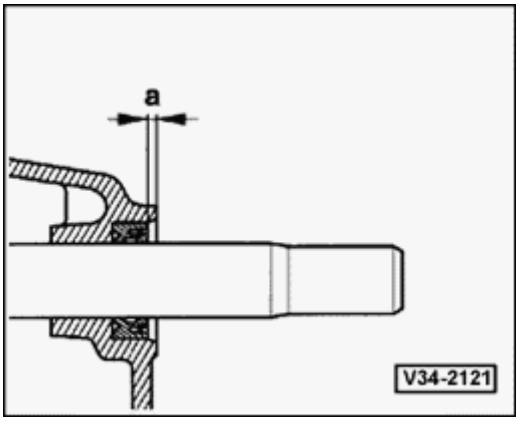


Fig. 160: Identifying Installed Position Of Sealing Washer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fill space between sealing and dust lips with multi-purpose grease.
- Lightly oil outer circumference of seal.
- Insert oil seal using tube VW 420

- Dimension a = 1 mm

Installation position of complete shift mechanism in transmission

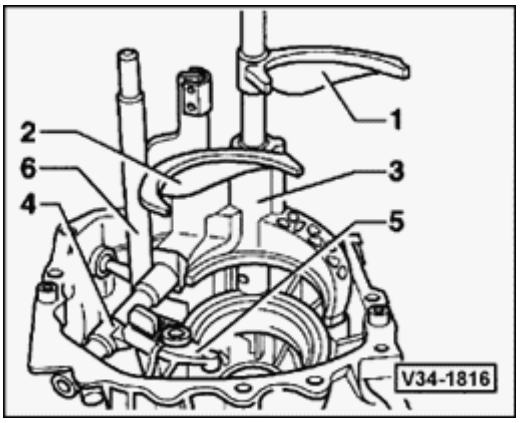


Fig. 161: Identifying Installed Position Of Complete Selector Mechanism In Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector fork for 5th gear and reverse gear

2 - Selector fork for 3rd gear and 4th gear

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3 - Selector fork for 1st gear and 2nd gear

4 - Relay shaft

5 - Detent mechanism

6 - Selector shaft

Removing and installing locking module for 5th gear and reverse gear

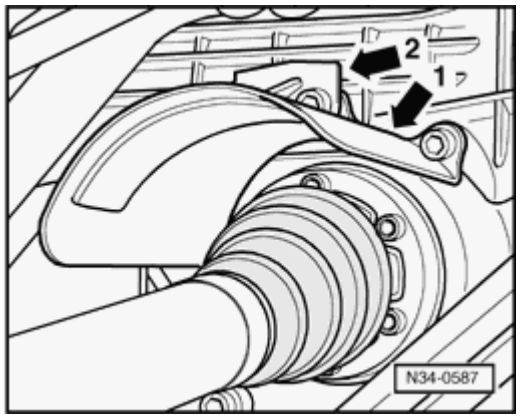


Fig. 162: Detaching Heat Shields And Right-Hand Axle Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - arrow 2- above right-hand drive shaft.
- Detach heat shield -arrow 1- above right-hand drive shaft and pivot downward.

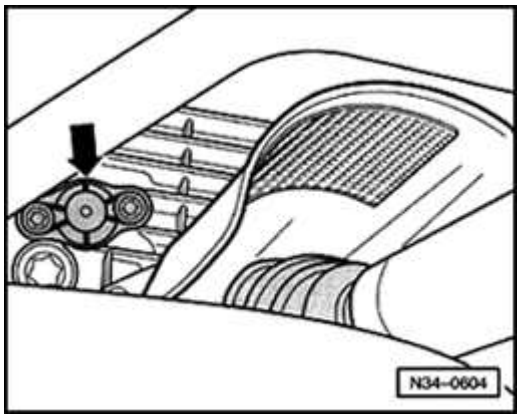


Fig. 163: Identifying Gear Lock
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking module -arrow-.

Assembling locking module:

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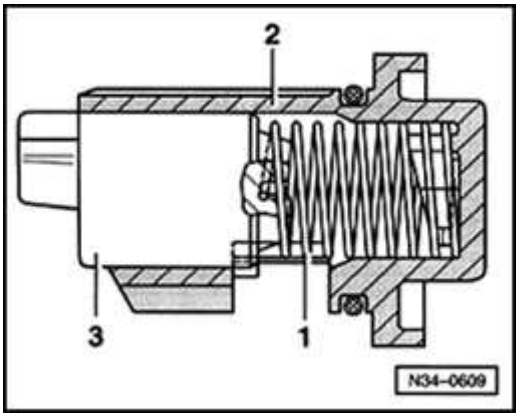


Fig. 164: Assembling Gear Lock
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert spring -1- into housing -2-, while exerting light pressure, turn spring to the left until it locates in the base of the housing.
- Insert bushing -3- into the spring so that the bent end of the spring locates in the designated groove.
- Push bushing -3- against spring and turn approx. one turn to left, until the lug on the bushing aligns with the groove in the housing -2-.
- Press lug on bushing -3- onto stop in the groove in the housing -2-.
- Turn bushing -3- clockwise and release; bushing -3- springs to installation position.

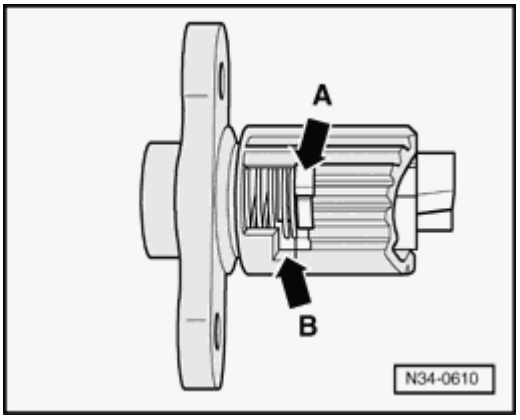


Fig. 165: Assembling Gear Lock
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of bushing:

The lug (arrow -A-) on the bushing must always be opposite the groove in the housing (arrow -B-).

Check installation position:

- Turn bushing counterclockwise and release.

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- The bushing must spring back; the lug must lie against the stop -direction of arrow A-

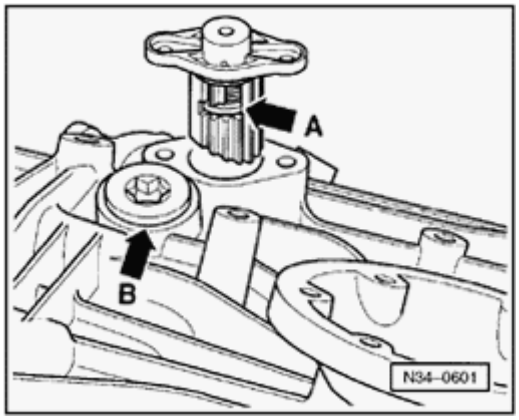


Fig. 166: Installed Position Of Complete Gear Lock In Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of complete locking module in transmission:

The recess (arrow -A-) faces bolt (arrow-B-)

35 MANUAL TRANSMISSION - GEARS, SHAFTS

INPUT SHAFT, DISASSEMBLING AND ASSEMBLING

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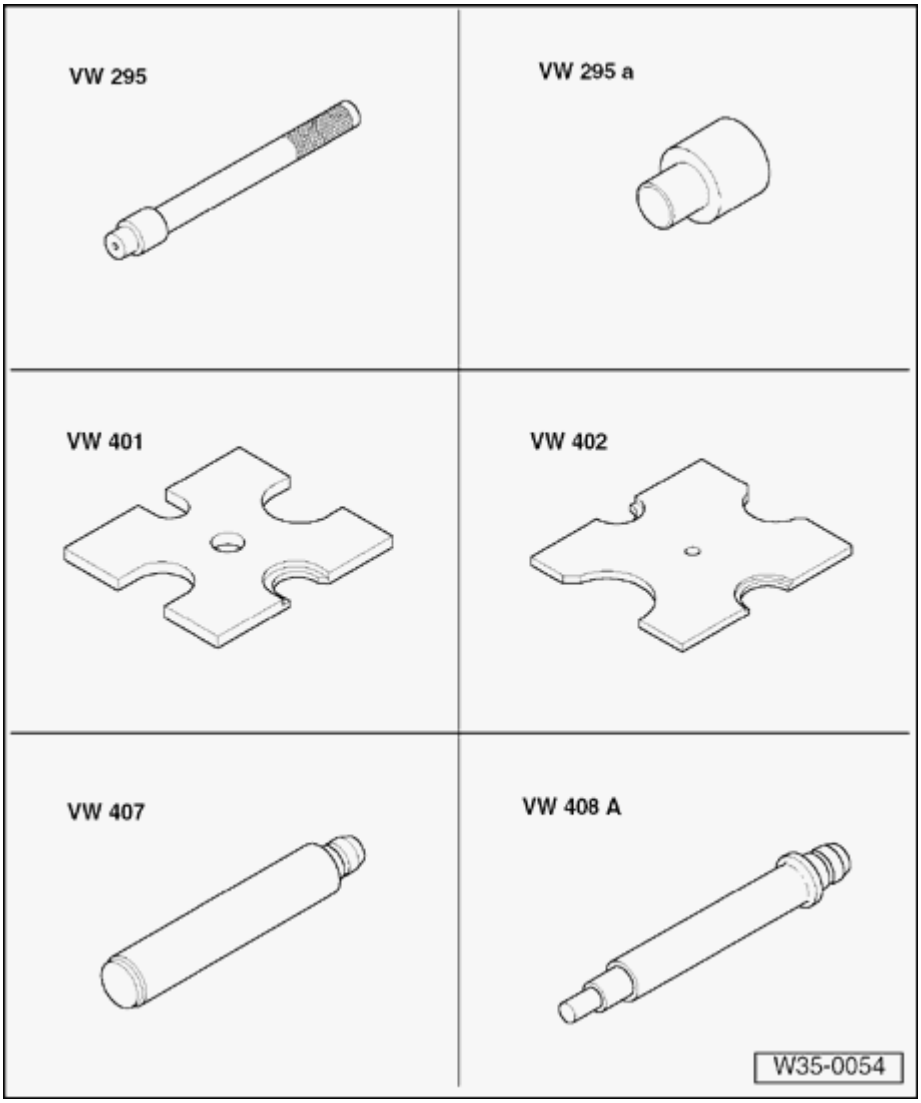


Fig. 167: Identifying Special Tools - Input Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 295 Needle bearing drift
- VW 295 A Needle bearing drift
- VW 401 Thrust plate
- VW 402 Thrust plate

- VW 407 Punch
- VW 408 A Punch

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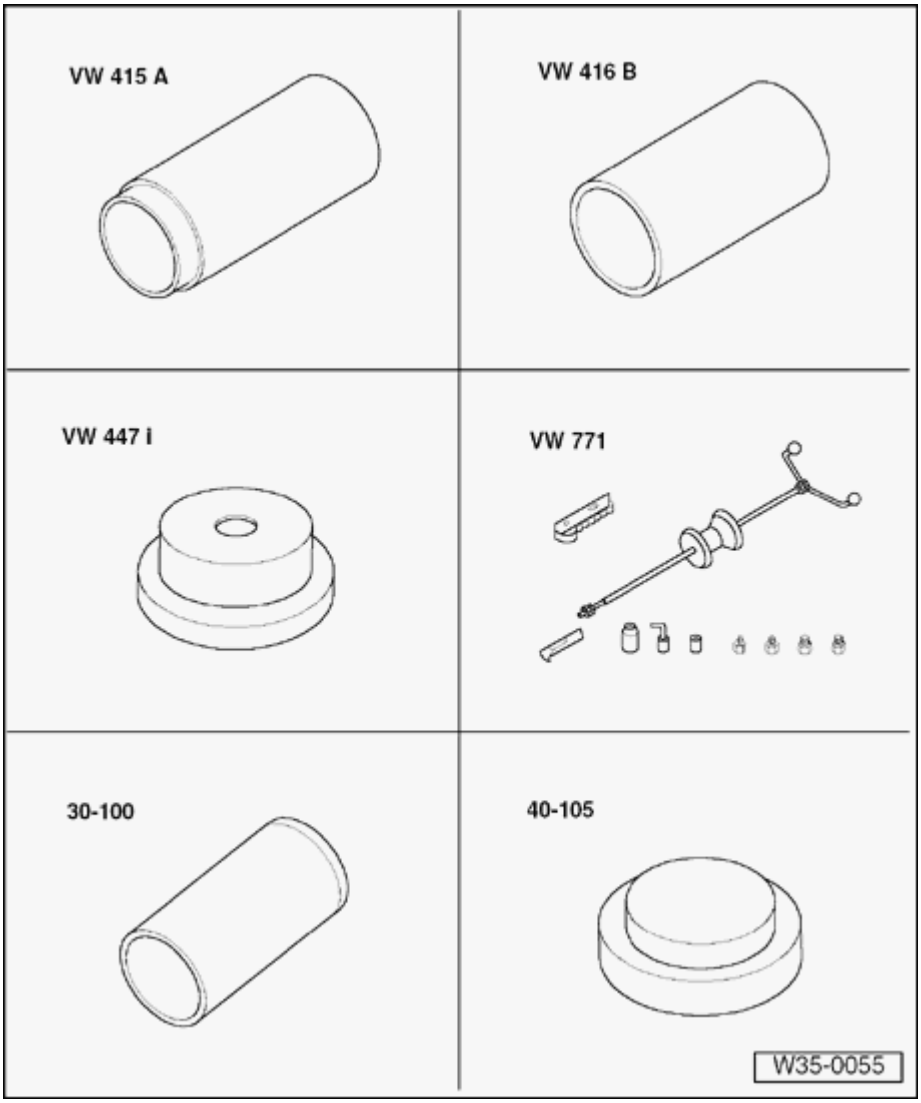


Fig. 168: Identifying Special Tools - Input Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 415 A Tube
- VW 416 B Tube
- VW 447 i Thrust pad
- VW 771 Slide hammer - complete set

- 30-100 Press tube
- 40-105 Thrust piece

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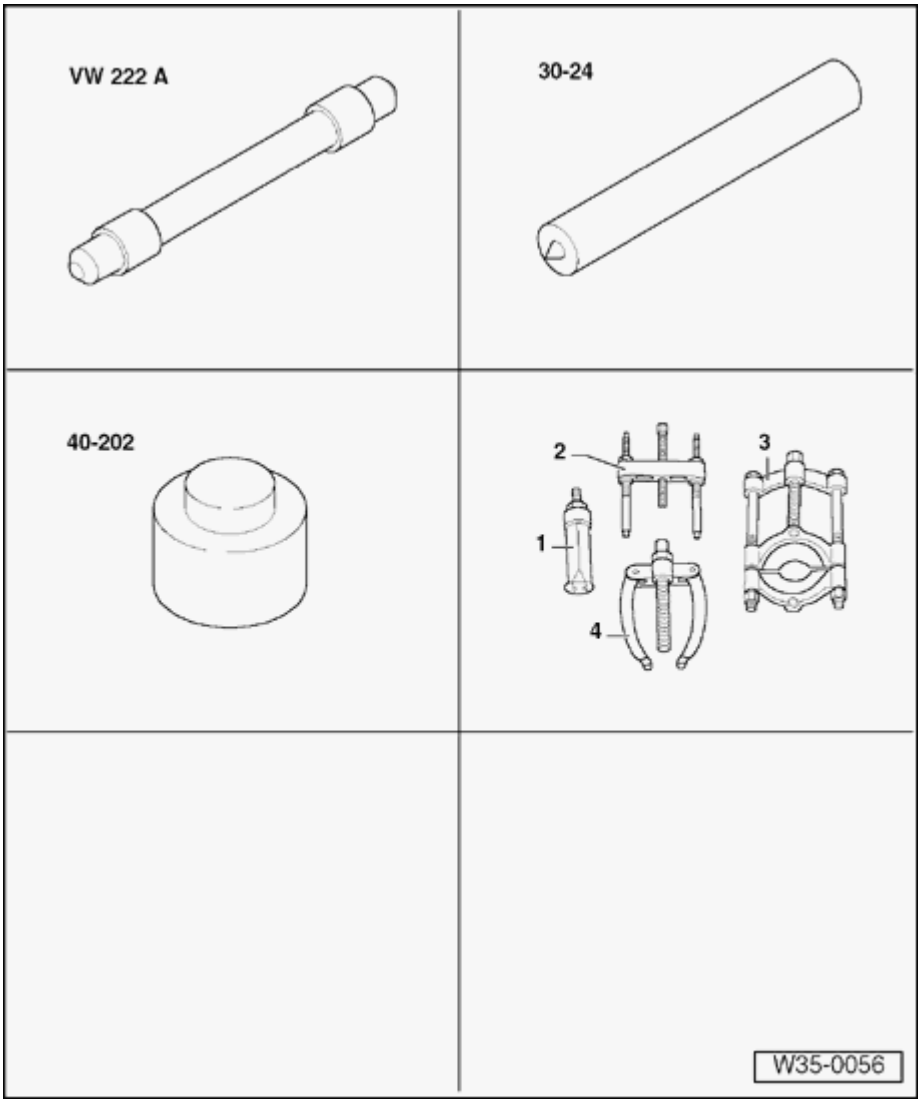


Fig. 169: Identifying Special Tools - Input Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 222 A Mandrel
- 30-24 Mandrel
- 40-202 Press tool
- 1 - Kukko 21//4 Internal puller
- 3 - Kukko 17/2 Separating tool

NOTE:

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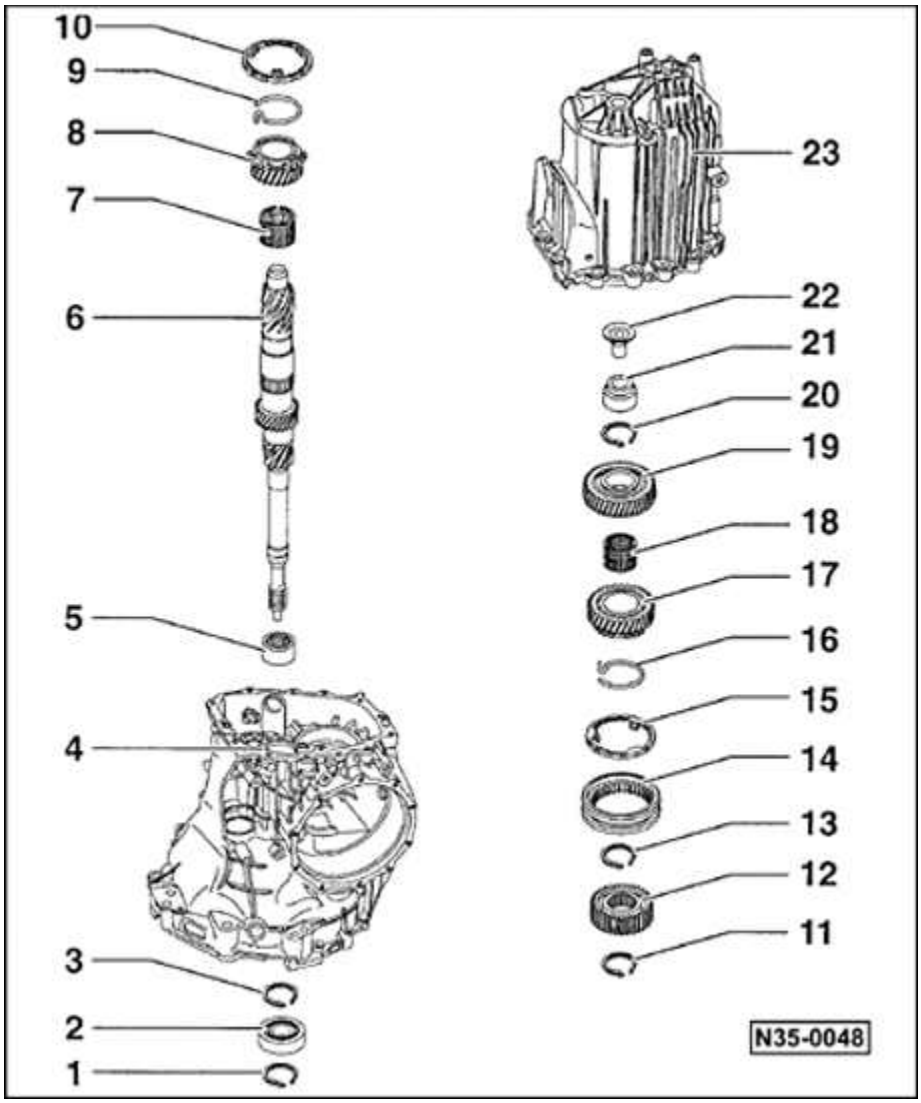


Fig. 170: Input Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing new gears or the input shaft consult technical data. Refer to **Code letters, application, ratios, capacities**.
- If -items 2, 4 or 6 under **Input shaft, disassembling and assembling** are replaced the position of the ball bearing will be affected. The input shaft should be re-adjusted. Refer to **Input shaft, adjusting**.

1 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 1
- Determining thickness. Refer to **Input shaft, adjusting** adjusting input shaft

2 - Ball bearing

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- Removing and installing. Refer to **Ball bearing for input shaft, multi-function sensor, input shaft, drive pinion, selector rods and transmission cover, removing and installing**

3 - Circlip

- Mark
- Installation position **Installation position of circlips** item 2
- Determining thickness. Refer to **Input shaft, adjusting**

4 - Transmission housing

5 - Needle bearing

- Secured with bolt. See **Remove securing bolt -arrow- for needle bearing**
- Driving out. See **Driving out needle bearing**
- Installation position. See **Installation position of needle bearing**
- Pressing in. See **Pressing in needle bearing**
- Locking. See **Screwing in securing bolt -arrow-**

6 - Input shaft

- With oil feed sleeve
- Knocking in oil feed sleeve. See **Driving oil feed sleeve into input shaft**
- Adjusting. Refer to **Input shaft, adjusting**

7 - Needle bearing for 3rd gear

- Mark

8 - 3rd speed sliding gear

9 - Spring

- Insert in 3rd speed sliding gear. See **Inserting spring in sliding gear**
- Allocation of spring to sliding gear

10 - Synchro-ring for 3rd gear

- Check for wear. See **Checking synchro-ring for wear**

11 - Circlip

- Mark

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- Installation position **Installation position of circlips** - item 3

12 - Synchro-hub for 3rd and 4th gear

- High collar faces 3rd gear
- Pressing off. See **Pressing off synchro-hub for 3rd and 4th gear**
- Pressing on. See **Pressing on synchro-hub for 3rd and 4th gear**

13 - Circlip

- Mark
- Installation position. See **Installation position of circlips** item 4
- If synchro-hub is replaced re-determine thickness. See **Determining thickness of circlip**

14 - Locking collar for 3rd and 4th gear

- Installation position. See **Installation position of locking collar**

15 - Synchro-ring for 4th gear

- Check for wear. See **Checking synchro-ring for wear**

16 - Spring

- Insert in 4th speed sliding gear. See **Inserting spring in sliding gear**
- Allocation of spring to sliding gear

17 - 4th gear sliding gear

18 - Needle bearing for 4th gear

- Mark

19 - 5th gear wheel

- Pressing off. See **Pressing off 5th gear wheel**
- Pressing on. See **Pressing on 5th gear wheel**

20 - Circlip

- Mark
- Installation position. See **Installation position of circlips** item 5
- If the 5th gear wheel is replaced re-determine thickness. See **Determining thickness of circlip**

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21 - Roller sleeve

- Replace
- Will be damaged during removal
- Pulling out. See **Pulling out roller sleeve**
- Installation position. See **Installation position of roller sleeve**
- Tapping in. See **Driving in roller sleeve**

22 - Sleeve

- Made of plastic

23 - Transmission cover

- Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

Remove securing bolt -arrow- for needle bearing

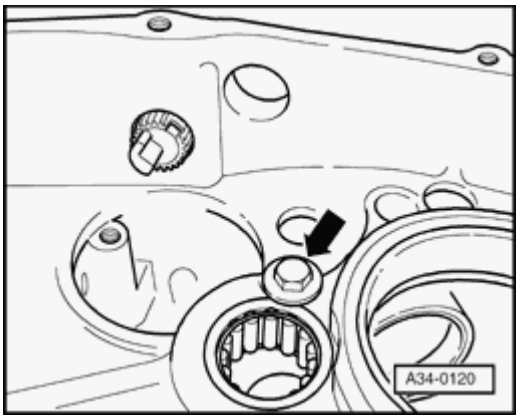


Fig. 171: Location Of Securing Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove securing bolt -arrow-.

NOTE: Bolt is not installed on all versions.

Driving out needle bearing

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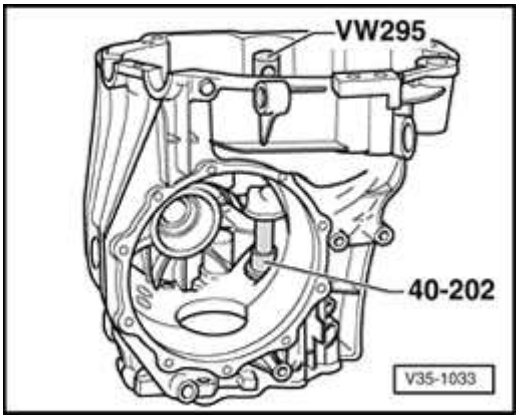


Fig. 172: Driving Out Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of needle bearing

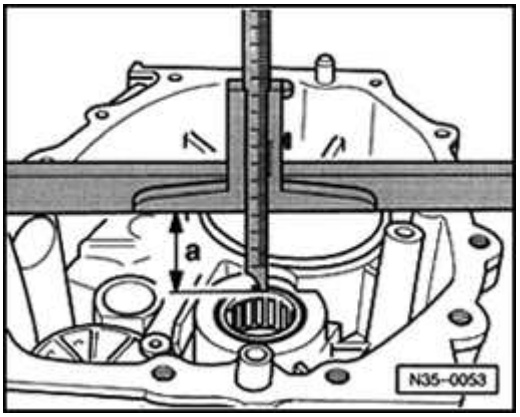


Fig. 173: Installation Position Of Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Distance -a- from lower edge of straight-edge to upper edge of needle bearing = 39.5 mm

NOTE: Measure distance from top edge of straight-edge and subtract the width of the straight-edge from the measured distance.

Pressing in needle bearing

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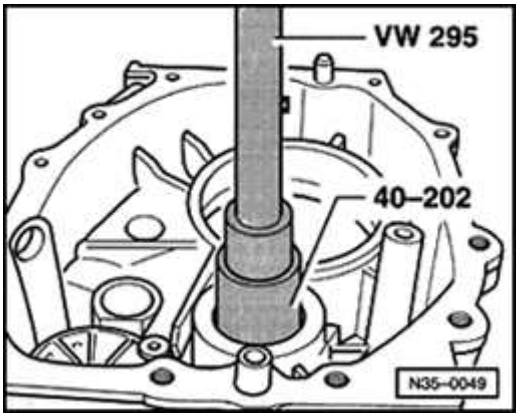


Fig. 174: Pressing In Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Screwing in securing bolt -arrow-

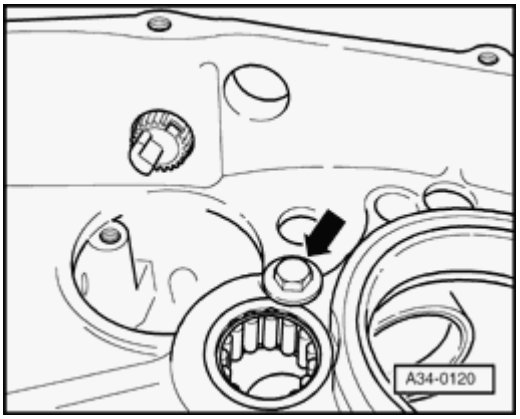


Fig. 175: Location Of Securing Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten to 25 Nm

NOTE: Bolt is not installed on all versions.

Driving oil feed sleeve into input shaft

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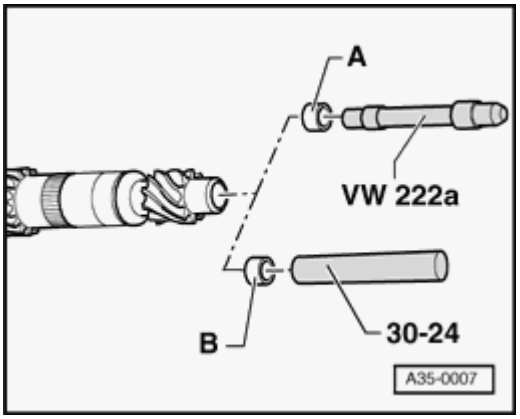


Fig. 176: Driving In Oiling Sleeve Into Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Item	Oil feed sleeve dia.	Fitting tool
A	14 mm	VW 222 A
B	16 mm	30-24

- Installation position:

Flanged edge on oil feed sleeve faces toward fitting tool

- Insertion depth:

3.5 mm below top edge

Pulling out roller sleeve

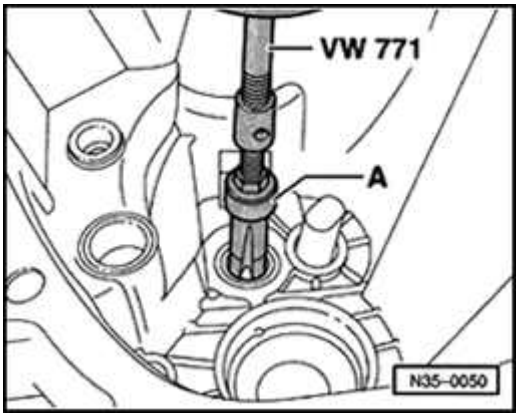


Fig. 177: Removing Roller Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal extractor, e. g. Kukko 21/4, 22... 28 mm

Before installing internal extractor, the plastic sleeve inside the roller sleeve must be destroyed.

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Installation position of roller sleeve

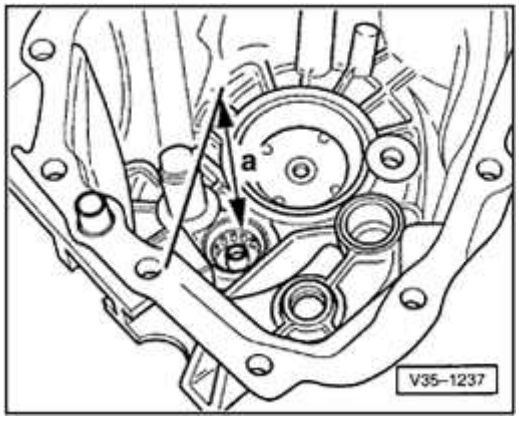


Fig. 178: Installed Position Of Roller Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dimension a = 216 mm

Driving in roller sleeve

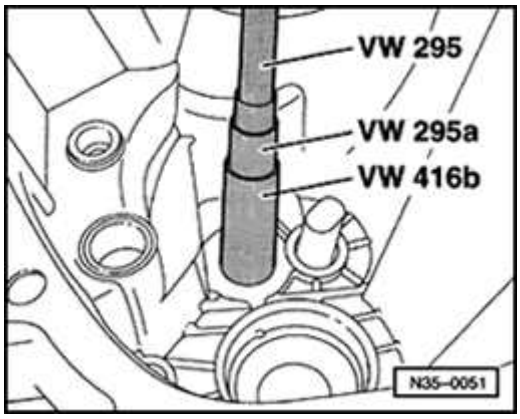


Fig. 179: Driving In Roller Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing off 5th gear wheel

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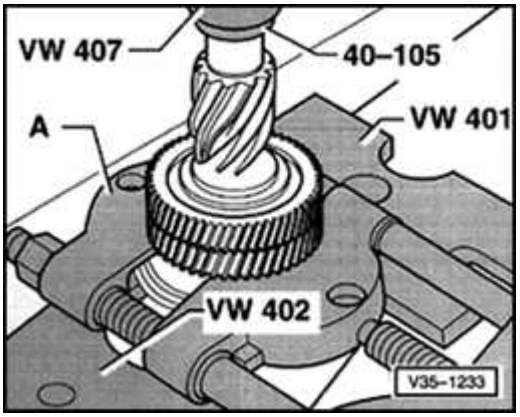


Fig. 180: Pressing Off 5th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.

A - Separating device 22... 115 mm, e.g. Kukko 17/2

Pressing off synchro-hub for 3rd and 4th gear

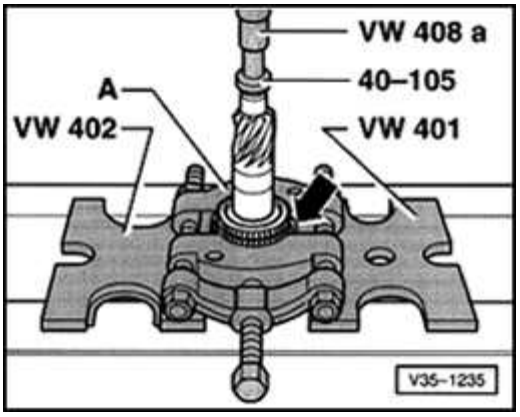


Fig. 181: Pressing Off Synchro-Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- Press 3rd gear synchro ring (arrow) toward 3rd gear wheel, then install separating device -A-.

A - Separating device 22... 115 mm, e.g. Kukko 17/2

Inserting spring in sliding gear

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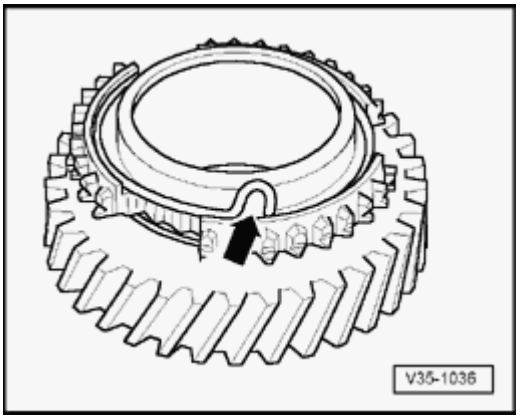


Fig. 182: Inserting Spring Into Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The bent end of the spring (arrow) must be hooked in the hole in the sliding gear.

Checking synchro-ring for wear

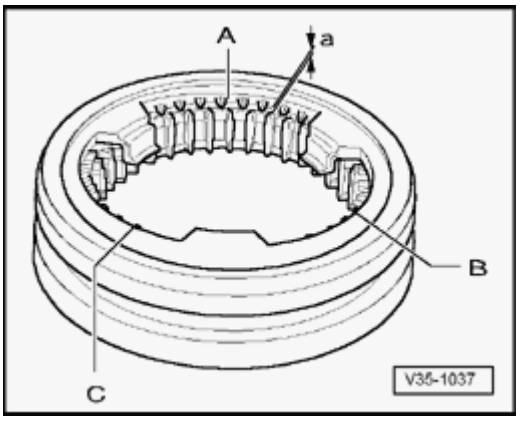


Fig. 183: Checking Synchronizer For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchro-ring into locking collar and measure gap -a- with a feeler gauge at positions -A-, -B- and -C-.
- Add the measured values and divide by 3.

The average value must not be less than 0.5 mm.

Installation position of circlips

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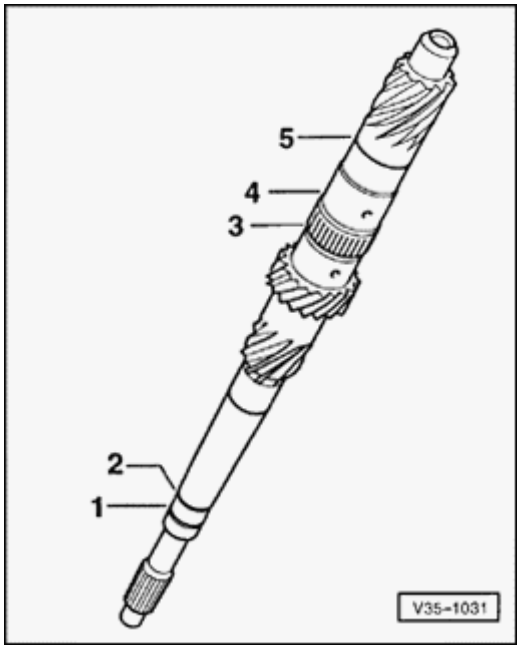


Fig. 184: Identifying Installed Positions Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlips -1- and -2- secure the input shaft ball bearing Adjusting input shaft: Refer to **Input shaft, adjusting**.
- Circlip -3- secures the 3rd and 4th gear synchro-hub.

Thickness 2.00 mm. Identification: Brown color.

- Circlip -4- secures the 3rd and 4th gear synchro-hub.

Determining thickness table on. Refer to **Available circlips for 3rd and 4th gear synchro-hubs**

- Circlip -5- secures the 5th gear wheel.

Determining thickness table on. Refer to **Available circlips for 5th gear wheel**.

Determining thickness of circlip

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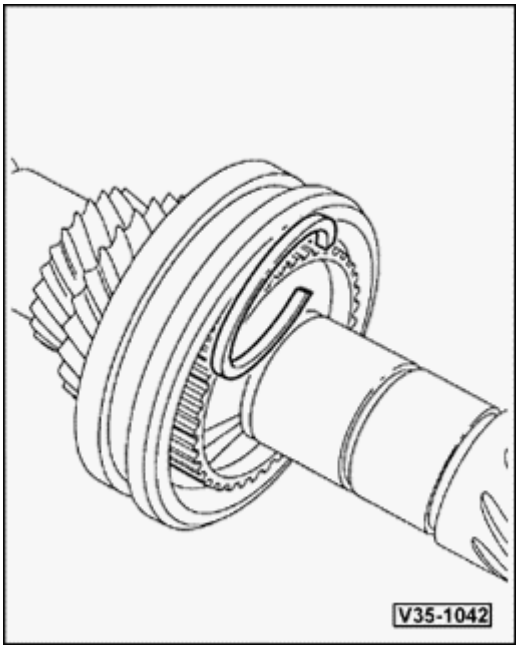


Fig. 185: Determining Circlip Fit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine thickest circlip that will just fit and install it.
- Determine circlip as accurately as possible from table. Part numbers

Available circlips for 3rd and 4th gear synchro-hubs

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

Available circlips for 5th gear wheel

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	

Pressing on synchro-hub for 3rd and 4th gear

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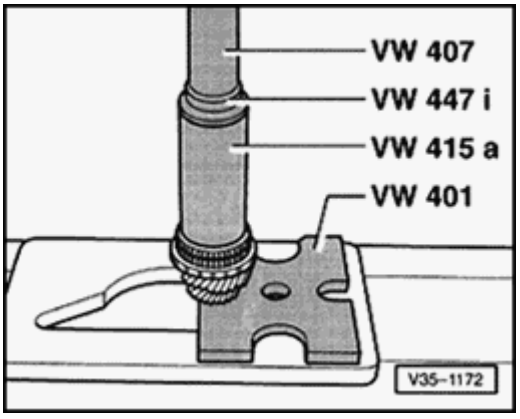


Fig. 186: Pressing On Synchronizer Hub For 3rd And 4th Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inside collar faces 3rd gear

Installation position of locking collar

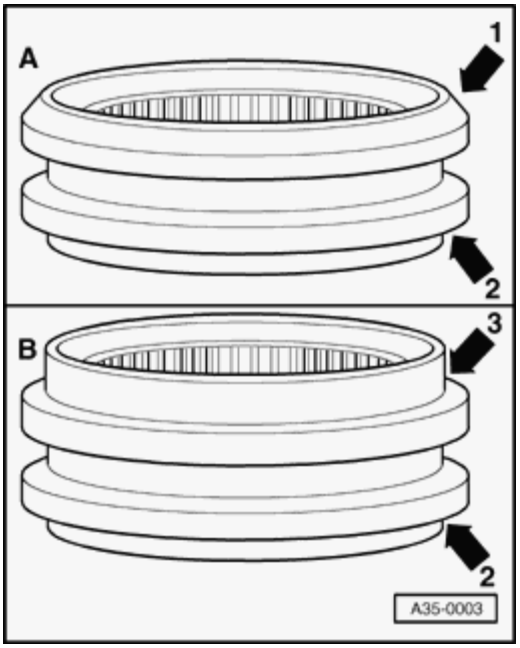


Fig. 187: Identifying Installed Position Of Operating Sleeve Up To Transmission Manufacture Date 22 06 3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Different types of locking collar are installed: illustration -A-, arrow 1- with chamfered edge, or illustration -B-, arrow 3- with large shoulder.

- Installation position:

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Chamfered edge -arrow 1- faces 4th gear

Small shoulder -arrow 2- faces 3rd gear

Large shoulder -arrow 3- faces 4th gear

Pressing on 5th gear wheel

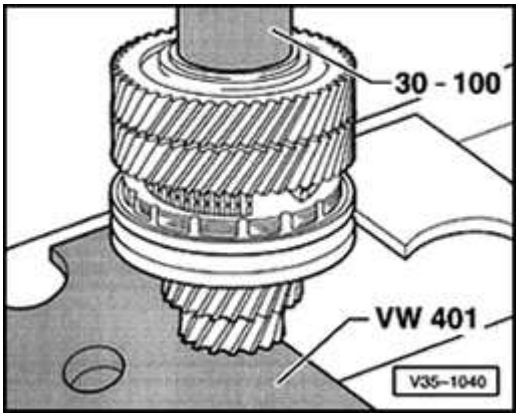


Fig. 188: Pressing On 5th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

WARNING: Wear protective gloves.

- Heat 5th gear wheel to approx. 100 ° C before pressing on.
- Installation position:

High collar faces reverse gear

INPUT SHAFT, ADJUSTING

Input shaft, adjusting

(determining circlips for input shaft)

Special tools and workshop equipment required

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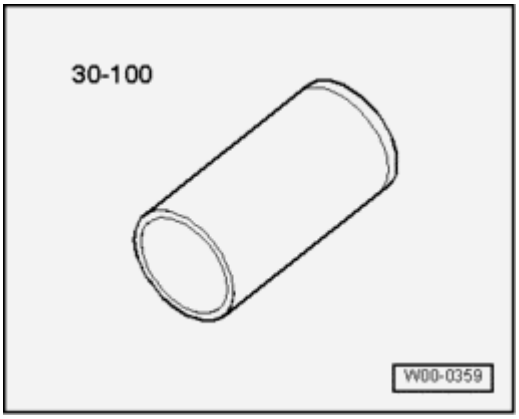


Fig. 189: Press Tube 30-100Identifying Special Tools - Oil Pump/Front Sealing Flange, Drive Chain And Chain Sprocket For Oil Pump, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 30-100 Press tube

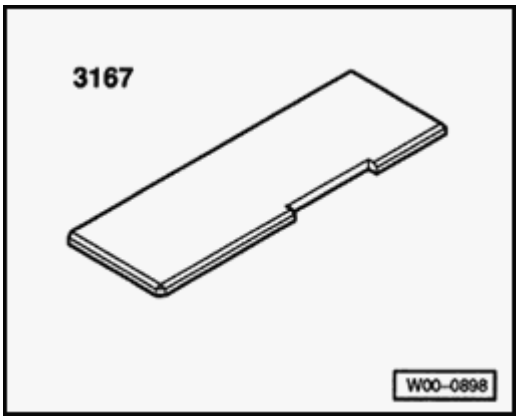


Fig. 190: Spacer Gauge 3167
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3167 Spacer gauge
- Depth gauge

It is necessary to readjust input shaft when the:

- Transmission housing
- Input shaft

or

- Ball bearing

are replaced.

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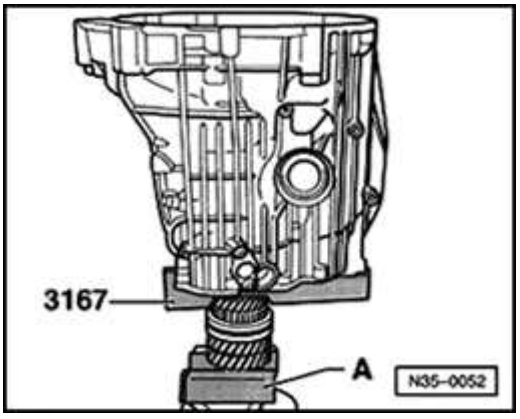


Fig. 191: Placing Transmission Housing Over Input Shaft Onto Spacer Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp input shaft in vice using soft jaws -A-.
- Place distance gauge 3167 onto 3rd gear sliding gear.
- Place transmission housing over input shaft onto the distance gauge.

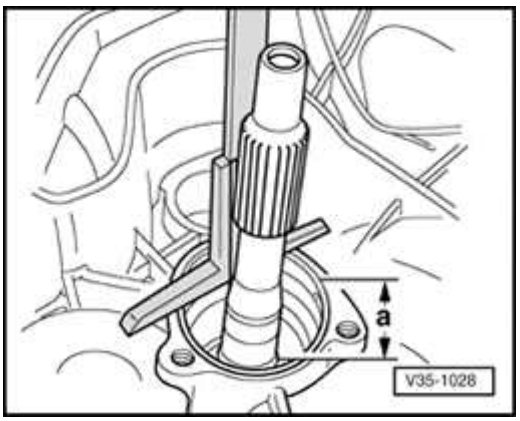


Fig. 192: Determining Circlip Thickness, Measuring Value "a"
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place depth gauge onto transmission housing and measure to the lower circlip groove in the input shaft.

- Measurement in following example: -a- = 28.50 mm

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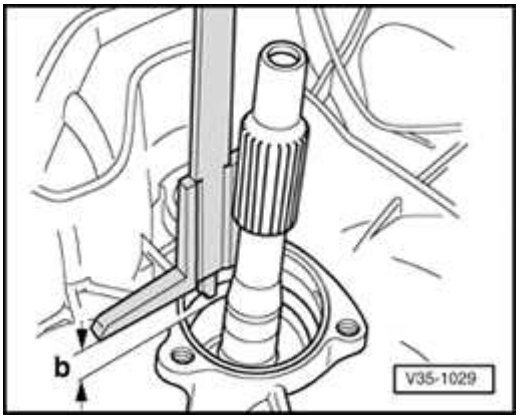


Fig. 193: Determining Circlip Thickness, Measuring Value "b"
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place depth gauge onto transmission housing and measure to seat surface for ball bearing.
- Measurement in following example: -b- = 26.80 mm

Determining circlip x behind the input shaft ball bearing.

Formula:		
"x"	**=**	**Dimension "a" - dimension "b"**

Example:		
	Dimension "a"	28.50 mm
-	Dimension "b"	26.80 mm
=	Dimension "x" (thickness of circlip)	1.70 mm

- Determine circlip from table. Part numbers

Available circlips

Dimension "x"	Thickness (mm)
1.48... 1.56	1.54
1.57... 1.65	1.63
1.66... 1.74	1.72
1.75... 1.83	1.81
1.84... 1.92	1.90
1.93... 2.01	1.99
2.02... 2.10	2.08
2.11... 2.20	2.17
2.21... 2.27	2.25

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2.28... 2.35	2.33

Determining the circlip in front of the input shaft ball bearing

- Knock rear circlip (as calculated) and ball bearing onto input shaft with fitting sleeve 30-100.

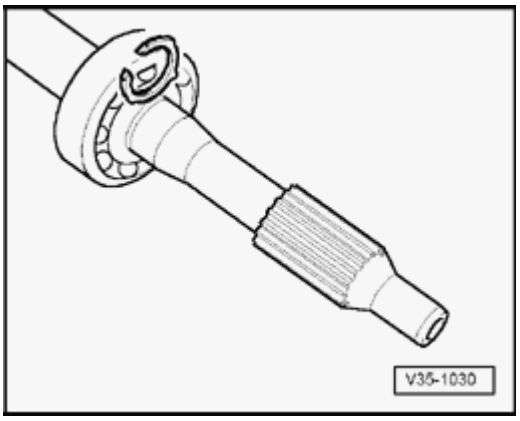


Fig. 194: Input Shaft And Thickest Circlip Which Can Still Just Be Installed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine the thickest circlip which will still fit.
- Determine circlip from table. Part numbers

Available circlips

Circlip thickness (mm)		
1.45	1.72	1.99
1.54	1.81	2.08
1.63	1.90	2.17

DRIVE PINION, DISASSEMBLING AND ASSEMBLING

Drive pinion, disassembling and assembling

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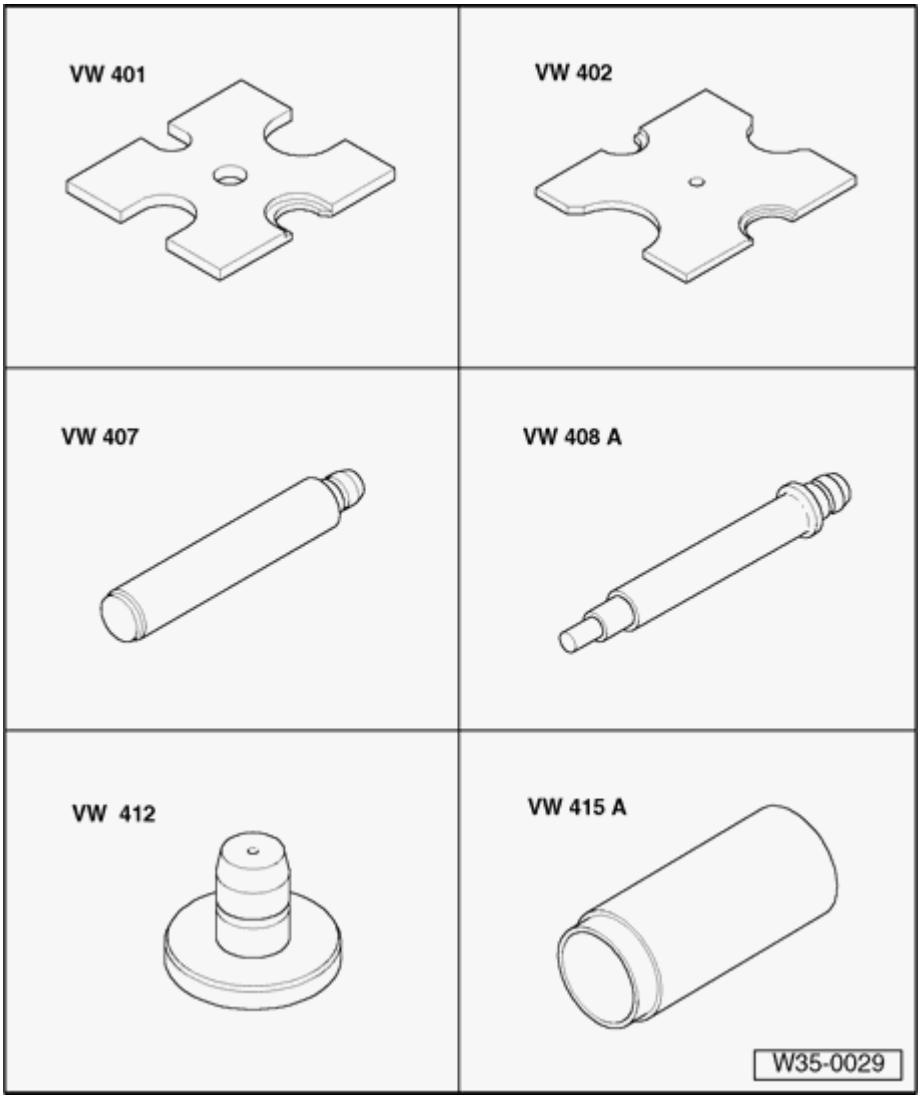


Fig. 195: Identifying Special Tools - Output Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 408 A Pressure tool
- VW 412 Thrust tool
- VW 415 A Tube

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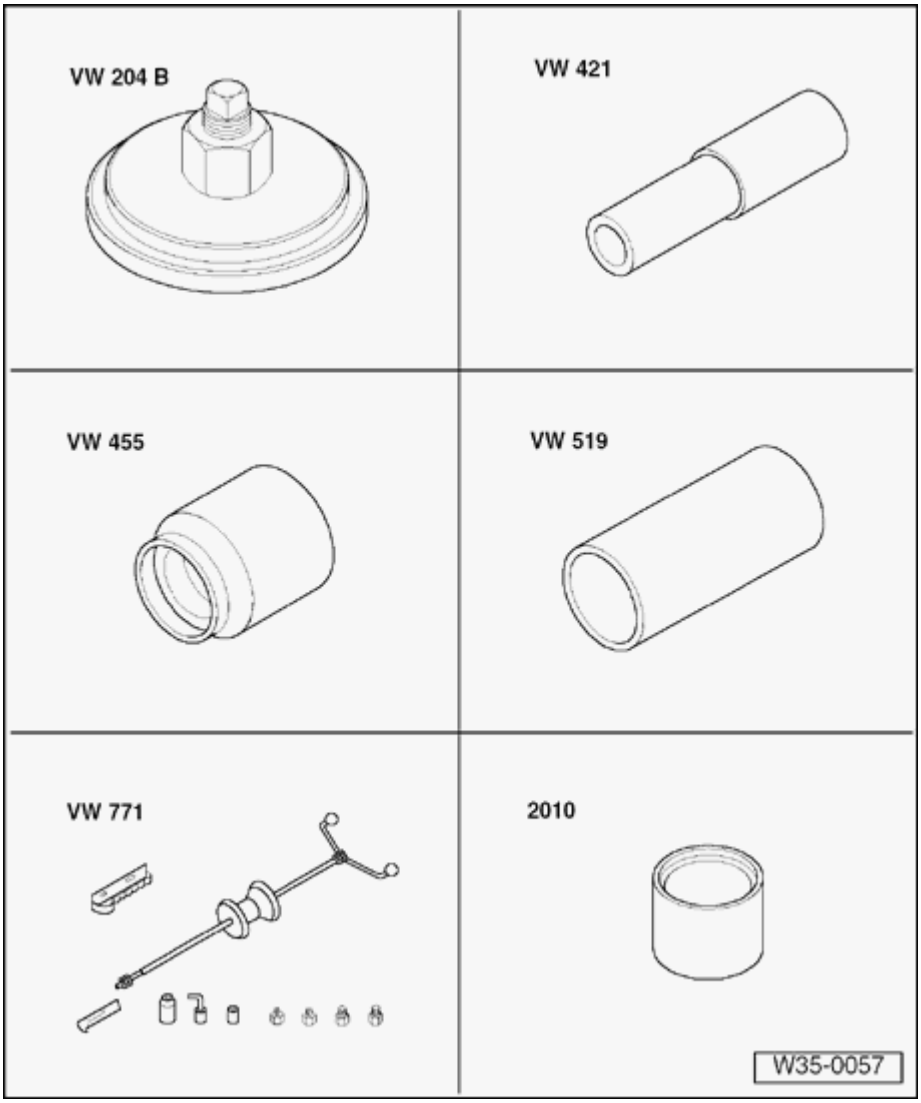


Fig. 196: Identifying Special Tools - Transmission, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- Crankshaft seal installing tool VW 204 B
- VW 421 Tube
- VW 455 Pressing-on sleeve
- VW 519 Tube
- VW 771 Multi-purpose tool
- 2010 Tube

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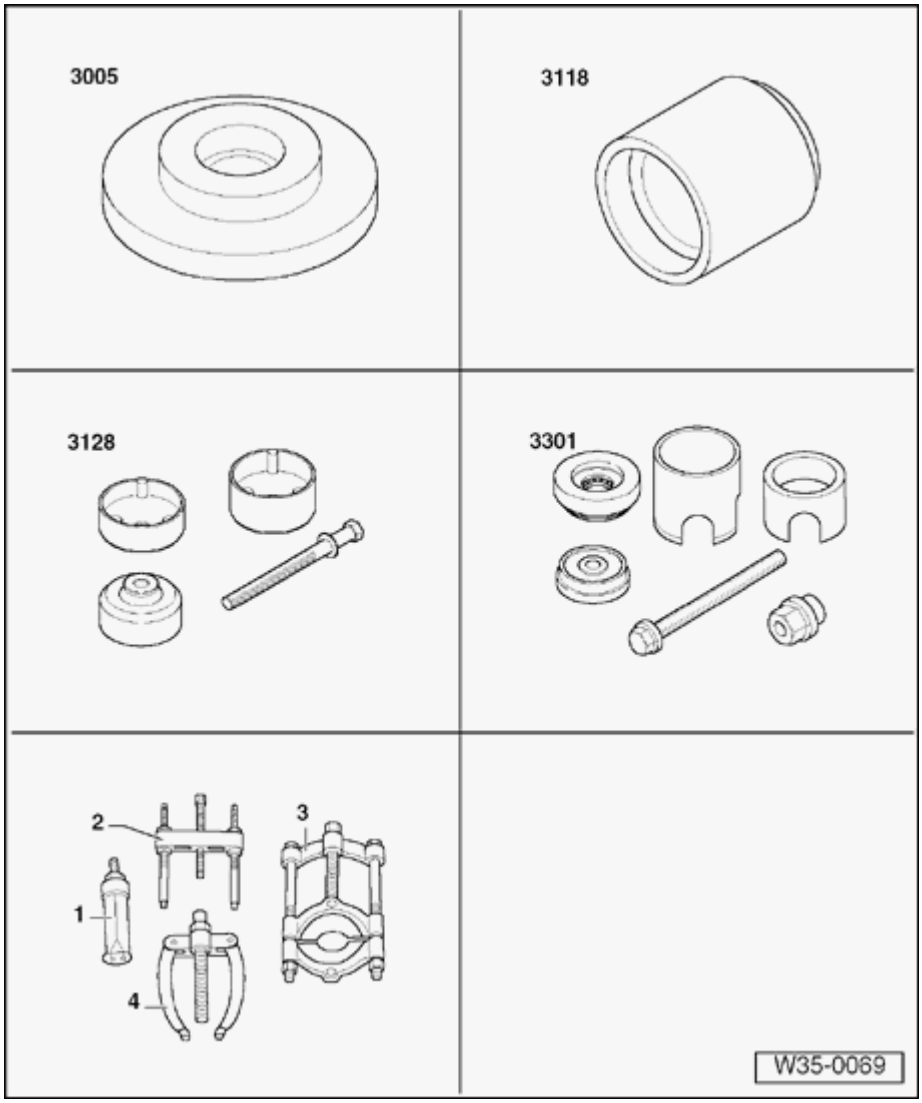


Fig. 197: Identifying Special Tools - Transmission, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- 3005 Thrust plate
- 3118 Thrust piece
- 3128 Puller
- 3301 Assembly equipment

- 1 - Kukko 21//4 Internal puller
- 3 - Kukko 17/2 Separating tool

NOTE:

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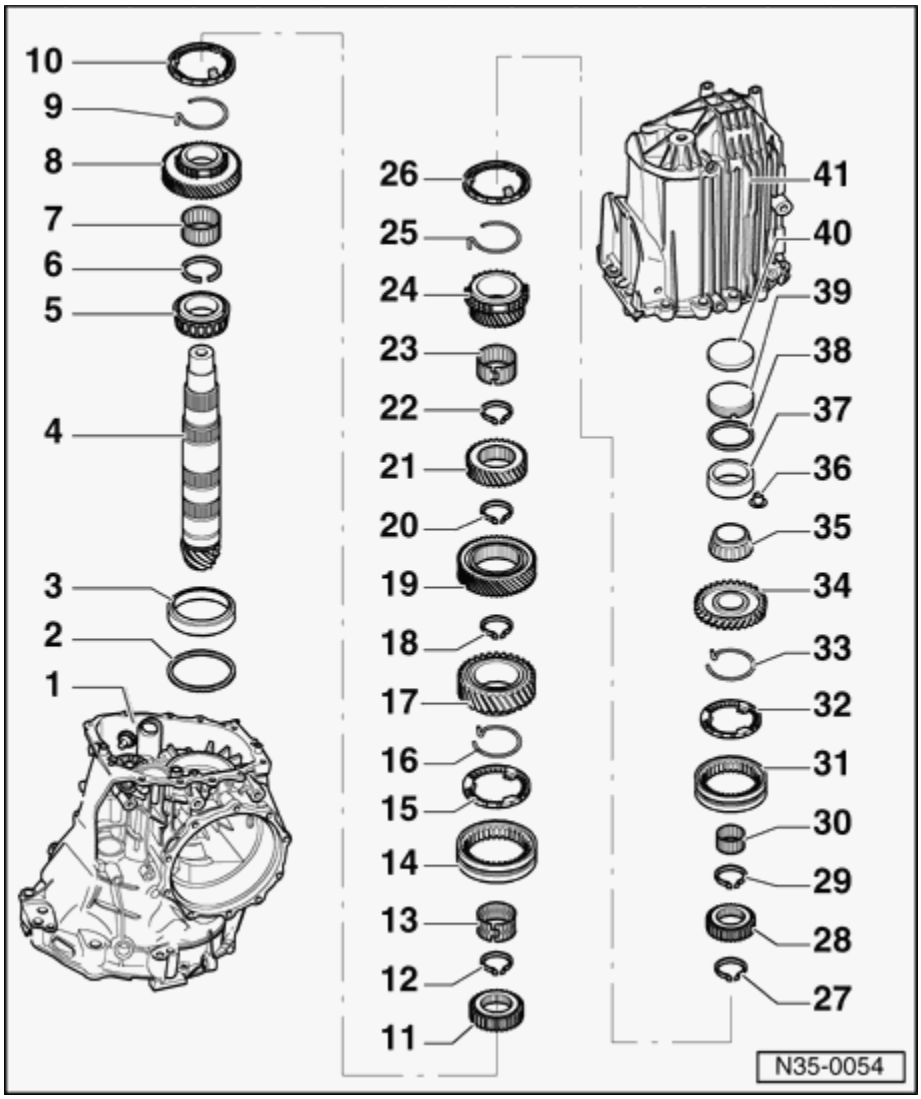


Fig. 198: Exploded View Drive Pinion Up To Transmission Manufacture Date 22 06 3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing new gears or the final drive set consult technical data. Refer to **Code letters, application, ratios, capacities**.
- Adjustments are required when replacing components marked 1).

1 - Transmission housing 1)

2 - Shim "S3"

3 - Outer race for large tapered roller bearing 1)

- Pulling out. See **Pulling out outer race for large tapered roller bearing**
- Pressing in. See **Pressing in outer race for large tapered roller bearing**

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4 - Drive pinion1)

- Is mated with ring gear, replace together as a set
- Adjusting ring gear and drive pinion. Refer to **Drive pinion and ring gear, adjusting**

5 - Inner race for large tapered roller bearing 1)

- Always replace
- Will be damaged during removal
- Pressing off. See **Pressing off inner race for large tapered roller bearing**
- Pressing on. See **Pressing on inner race for large tapered roller bearing**

6 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 1
- Re-determine thickness if tapered roller bearing is replaced. See **Determining thickness of circlip**

7 - Needle bearing for 1th gear

8 - 1st gear sliding gear

9 - Spring

- Insert in 1st gear sliding gear. See **Inserting spring in sliding gear**
- Allocation of spring to sliding gear

10 - Synchro-ring for 1st gear

- Check for wear. See **Checking synchro-ring for wear**

11 - Synchro-hub for 1st and 2nd gear

- Pressing off. See **Pressing off synchro-hub for 1st and 2nd gear**
- Pressing on. See **Pressing on synchro-hub for 1st and 2nd gear**

12 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 2
- Re-determine if the synchro-hub is replaced. See **Determining thickness of circlip**

13 - Needle bearing for 2nd gear

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14 - Locking collar, 1st and 2nd gear

- Installation position. See **Installation position of locking collar for 1st and 2nd gear**

15 - Synchro-ring for 2nd gear

- Check for wear. See **Checking synchro-ring for wear**

16 - Spring

- Insert in 2nd gear sliding gear. See **Inserting spring in sliding gear**
- Allocation of spring to sliding gear

17 - 2nd gear sliding gear

18 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 3

19 - 3rd gear wheel

- Pressing off. See **Pressing off 3rd gear wheel**
- Shoulder points to 4th gear
- Pressing on. See **Pressing on 3rd gear wheel**

20 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 4
- Re-determine thickness If the 3rd gear wheel is replaced. See **Determining thickness of circlip**

21 - 4th gear wheel

- Pressing off. See **Pressing off 4th gear wheel**
- Shoulder points to 3rd gear
- Pressing on. See **Pressing on 4th gear wheel**

22 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 5
- Re-determine thickness if the 4th gear wheel is replaced. See **Determining thickness of circlip**

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23 - Needle bearing

24 - 5th gear sliding gear

25 - Spring

- Insert in 5th gear sliding gear. See **Inserting spring in sliding gear**
- Allocation of spring to sliding gear

26 - Synchro-ring for 5th gear

- Check for wear. See **Checking synchro-ring for wear**

27 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 6

28 - 5th gear and reverse gear synchro-hub

- Pressing off. See **Pressing off 5th gear and reverse gear synchro-hub**
- Pressing on. See **Pressing on 5th gear and reverse gear synchro-hub**

29 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 5
- If the synchro-hub is replaced re-determine. See **Determining thickness of circlip**

30 - Needle bearing

- For reverse gear

31 - Locking collar for 5th and reverse gear

- Installation position. See **Installation position of locking collar for 5th and reverse gear**

32 - Reverse gear synchro-ring

- Check for wear. See **Checking synchro-ring for wear**

33 - Spring

- Insert in reverse gear sliding gear. See **Inserting spring in sliding gear**
- Allocation of spring to sliding gear

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34 - Reverse gear sliding gear

35 - Inner race for small tapered roller bearing 1)

- Pressing off. See **Pressing off inner race for small tapered roller bearing**
- Pressing on. See **Pressing on inner race for small tapered roller bearing**

36 - Socket

- To secure small tapered roller bearing outer race
- Pulling out. See **Pulling out securing bushing for small tapered roller bearing outer race**
- Need not be fitted after the small tapered roller bearing has been replaced.

37 - Outer race for small tapered roller bearing 1)

- Pulling out. See **Pulling out outer race for small tapered roller bearing**
- Pressing in. See **Pressing in outer race for small tapered roller bearing**

38 - Shim "S4"

39 - Pressure plate

40 - Rubber disc

- Compensates length variations
- To remove, insert self-tapping screw center and pull out washer on self-tapping screw.
- Use components according to the transmission code letters. Refer to **Code letters, application, ratios, capacities**.

41 - Transmission cover

- Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

Pulling out securing bushing for small tapered roller bearing outer race

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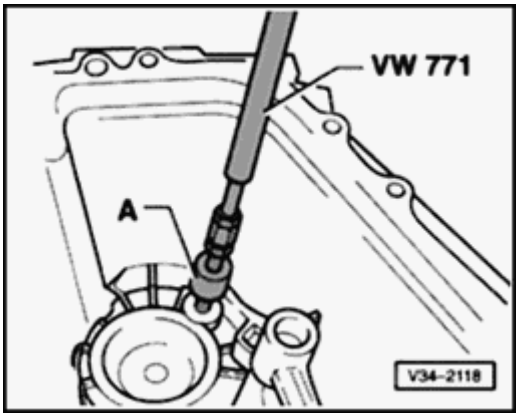


Fig. 199: Pulling Off Securing Bushing For Small Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal extractor, e. g. Kukko 21/1, 12... 16 mm

Pulling out outer race for small tapered roller bearing

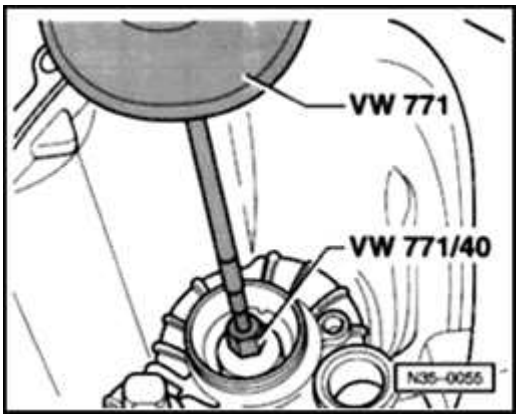


Fig. 200: Pulling Off Outer Race Of Small Tapered Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Screw special tool VW 771/40 into pressure plate
- Install multi-purpose tool VW 771 and pull outer race out via pressure plate.

Pressing in outer race for small tapered roller bearing

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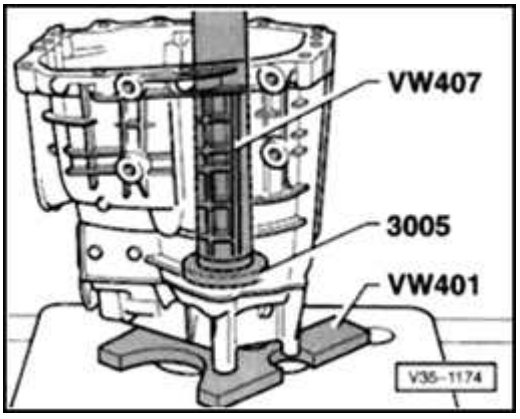


Fig. 201: Pressing In Outer Race For Small Tapered Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pulling out outer race for large tapered roller bearing

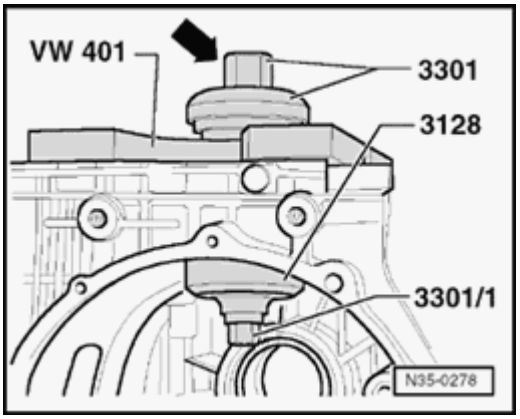


Fig. 202: Pulling Out Double Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove differential. Refer to **Differential, removing and installing**.
- Place pressure piece of puller 3128 below the outer race.
- Install threaded spindle and pressure bearing of assembly device 3301 with pressure plate VW 401 onto transmission housing.

When tightening bolt the outer race will be pulled out of housing.

Pressing in outer race for large tapered roller bearing

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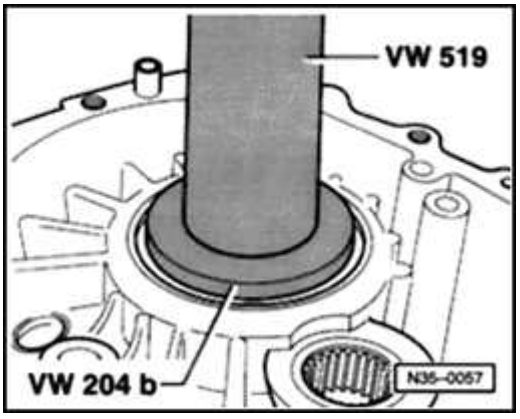


Fig. 203: Pressing In Double Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The smaller diameter of special tool VW 204 b faces outer race.

Pressing off inner race for small tapered roller bearing

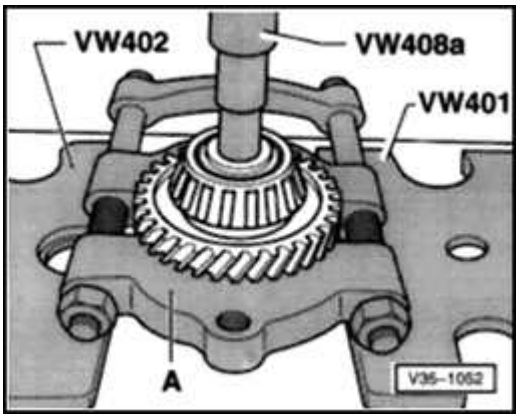


Fig. 204: Pressing Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press off inner race with reverse gear sliding gear.

A - Separating device 22... 115 mm, e.g. Kukko 17/2

Pressing off 5th gear and reverse gear synchro-hub

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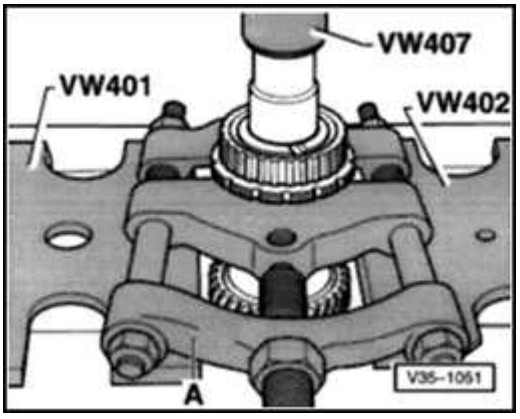


Fig. 205: Pressing Off Synchronizer Hub For 5th And Reverse Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- Press off synchro-hub with 5th gear sliding gear.

A - Separating device 22... 115 mm, e.g. Kukko 17/2

Pressing off 4th gear wheel

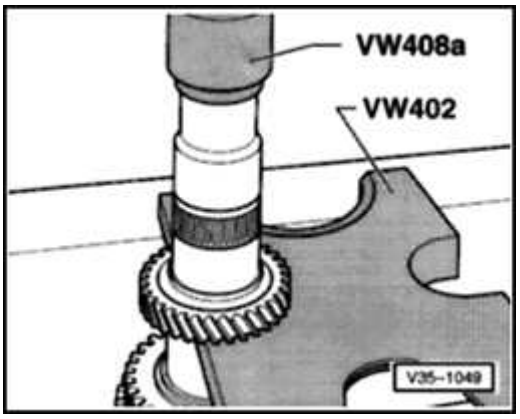


Fig. 206: Pressing Off 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.

Pressing off 3rd gear wheel

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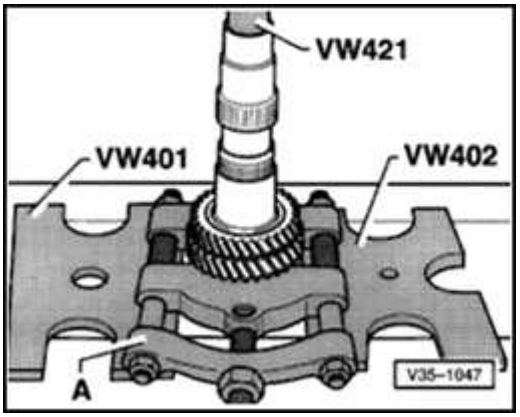


Fig. 207: Pressing Off 3rd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- Pressing off 3rd gear wheel with 2nd gear sliding gear.

A - Separating device 22... 115 mm, e.g. Kukko 17/2

Pressing off synchro-hub for 1st and 2nd gear

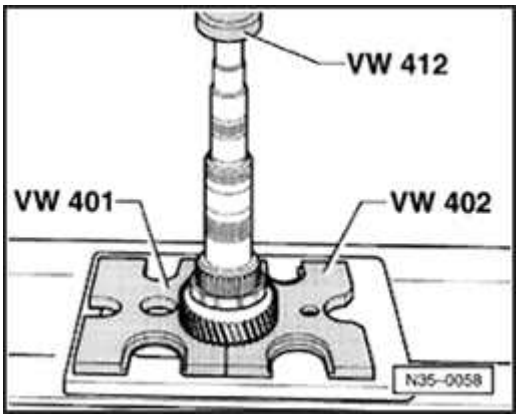


Fig. 208: Pressing Off Synchronizer Hub For 1st And 2nd Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- Press off synchro-hub with 1st gear sliding gear.

Pressing off inner race for large tapered roller bearing

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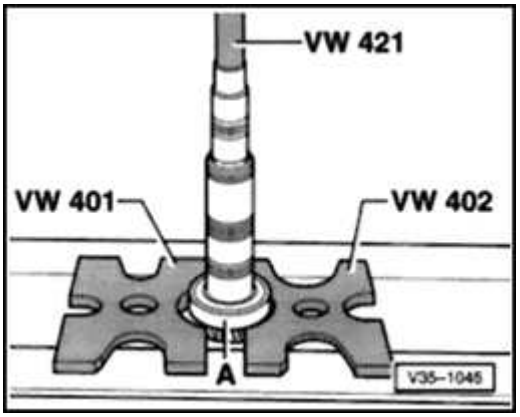


Fig. 209: Pressing Off Double Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.

The outer race -A- must be installed to press off the inner race.

Pressing on inner race for large tapered roller bearing

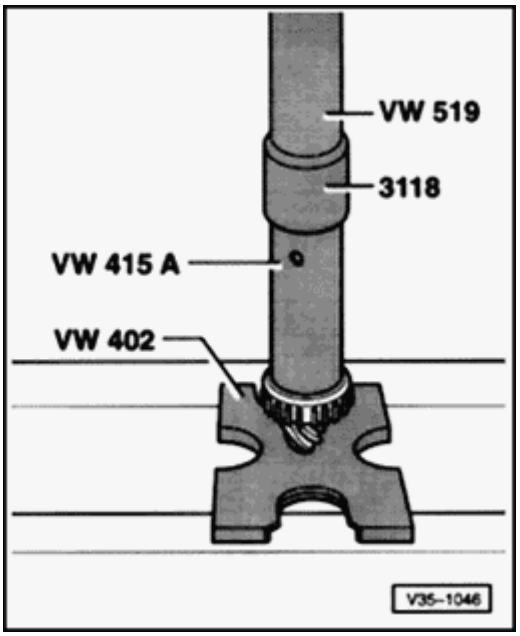


Fig. 210: Pressing On Inner Race For Large Tapered Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Determining thickness of circlip

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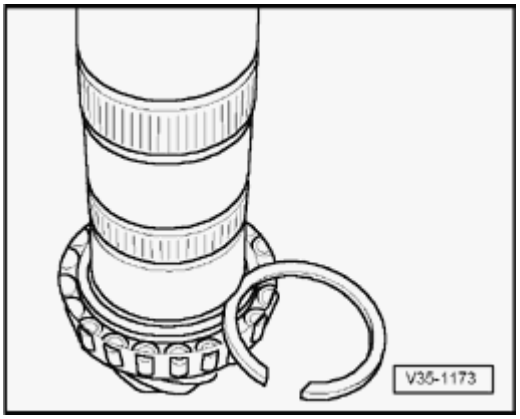


Fig. 211: Determining Circlip Fit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine thickest circlip which will still fit and install it.

The circlips for synchro-hubs and individual gear wheels should also be determined as shown for tapered roller bearing.

Available circlips and part numbers

Installation position of circlips

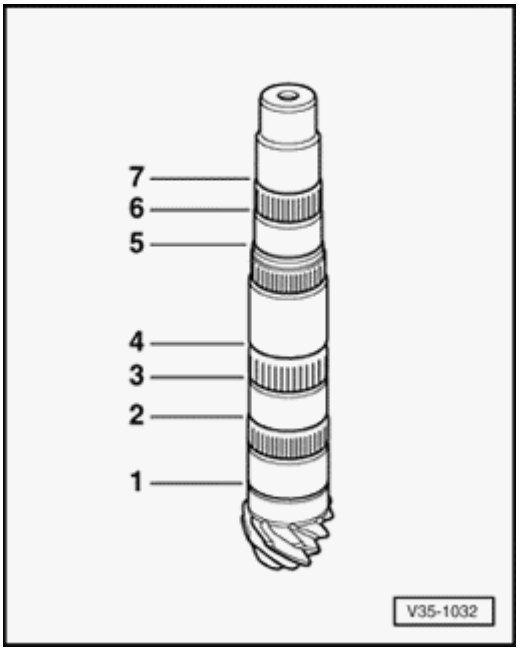


Fig. 212: Identifying Installed Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The circlips for synchro-hubs, needle roller bearings and individual gear wheels should also be determined. Refer to **Determining thickness of circlip**.

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- Circlip -1- secures the inner race for tapered roller bearing.

Circlip thickness (mm)		
2.00	2.06	2.12
2.03	2.09	2.15

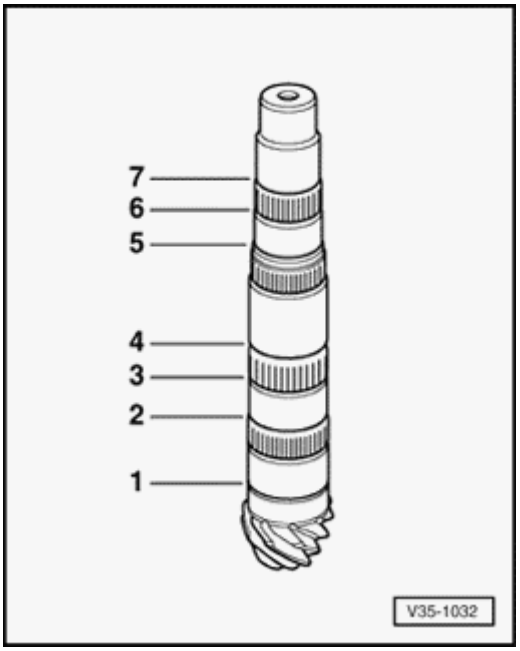


Fig. 213: Identifying Installed Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlip -2- secures the 1st and 2nd gear synchro-hub.

Distinguishing features. Color - blue

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	

- Circlip -3- secures the needle bearing for 2nd gear sliding gear.

Distinguishing features. Color - blue

Circlip thickness (mm)
2.50

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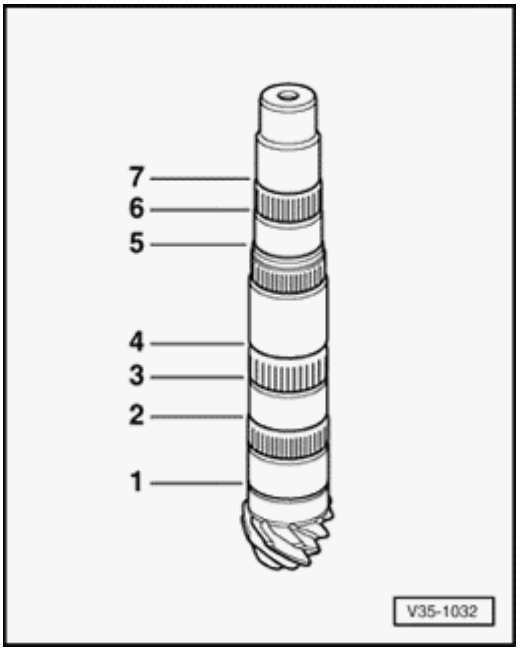


Fig. 214: Identifying Installed Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlip -4- secures the 3rd gear wheel.

Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	

- Circlip -5- secures the 4th gear wheel.

Circlip thickness (mm)		
1.86	1.94	
1.90	1.98	

- Circlip -6- secures the needle bearing for 5th gear sliding gear.

Distinguishing features. color - brown

Circlip thickness (mm)
2.00

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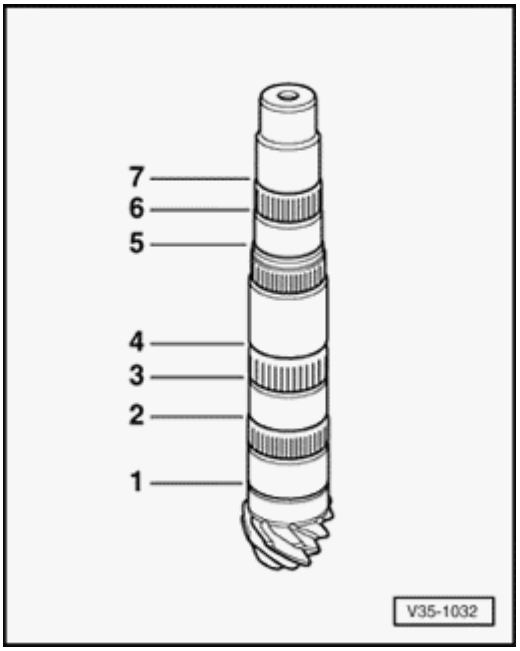


Fig. 215: Identifying Installed Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlip -7- secures the synchro-hub for 5th gear and reverse gear.

Distinguishing features. color - blue

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

- Determine circlips according to table: Part numbers

Inserting spring in sliding gear

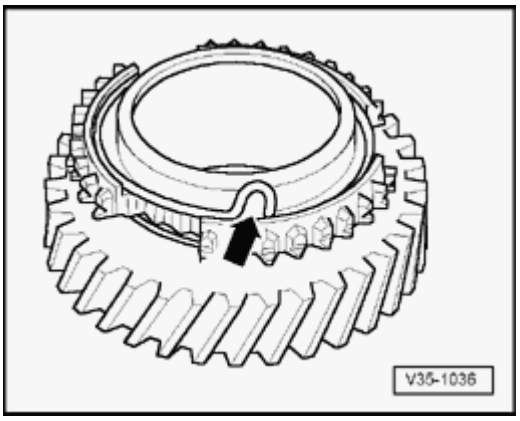


Fig. 216: Inserting Spring Into Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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The bent end of the spring (arrow) must be hooked in the hole in the sliding gear.

Checking synchro-ring for wear

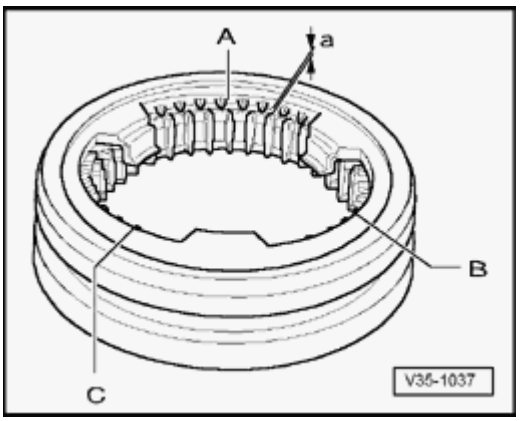


Fig. 217: Checking Synchronizer For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchro-ring into locking collar and measure gap -a- with a feeler gauge at positions -A-, -B- and -C-.
- Add measured values and divide by 3.

Calculated value must not be less than 0.5 mm.

Pressing on synchro-hub for 1st and 2nd gear

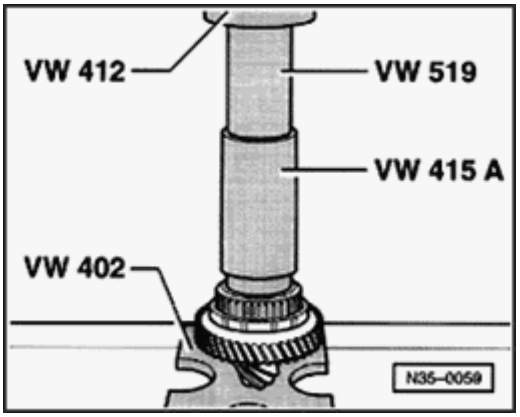


Fig. 218: Pressing On Synchronizer Hub For 1st And 2nd Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inside collar faces 2nd gear

Installation position of locking collar for 1st and 2nd gear

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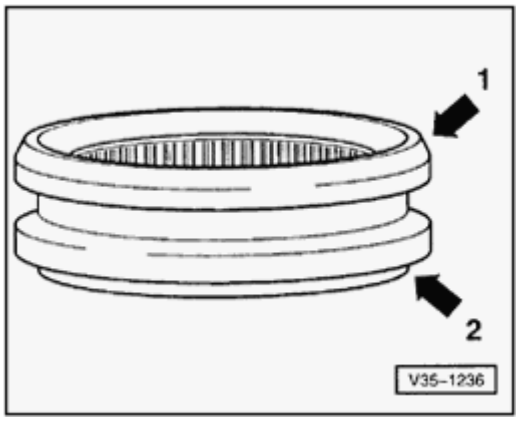


Fig. 219: Identifying Installed Position Of Operating Sleeve For 1st And 2nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

Chamfered edge -arrow 1- faces 2nd gear

Shoulder -arrow 2- faces 1st gear

Pressing on 3rd gear wheel

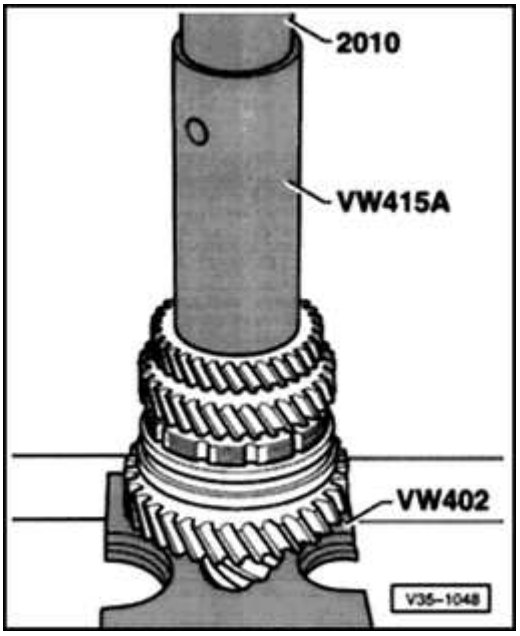


Fig. 220: Pressing On 3rd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

Groove on gear wheel faces 4th gear

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Pressing on 4th gear wheel

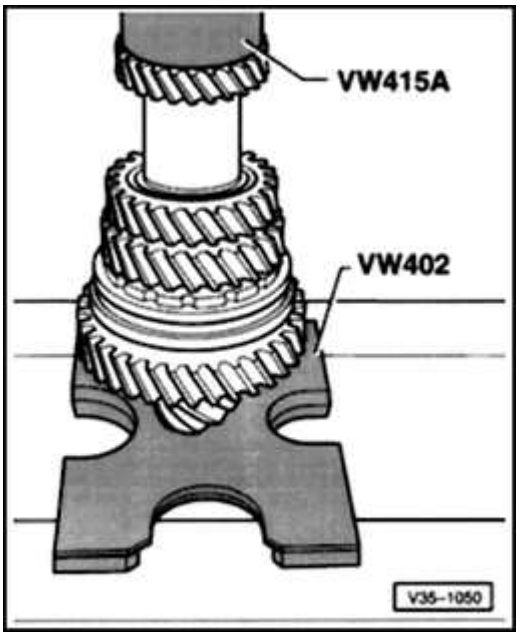


Fig. 221: Pressing On 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inside collar faces 3rd gear

Pressing on 5th gear and reverse gear synchro-hub

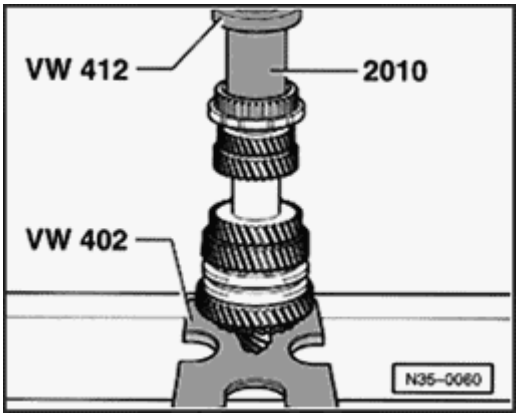


Fig. 222: Pressing On Synchronizer Hub For 5th And Reverse Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inside collar faces 5th gear

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NOTE: Large inner diameter in special tool 2010 faces synchro-hub.

Installation position of locking collar for 5th and reverse gear

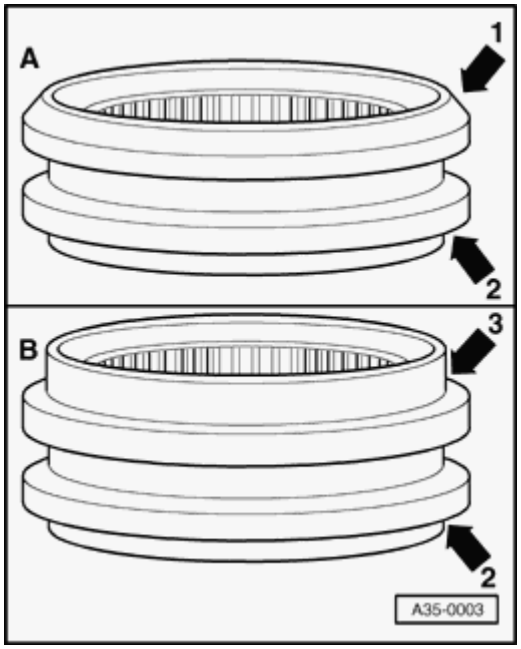


Fig. 223: Identifying Installed Position Of Operating Sleeve Up To Transmission Manufacture Date 22 06 3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Different types of locking collar are installed: illustration -A-, arrow 1- with chamfered edge, or illustration -B-, arrow 3- with large shoulder.

- Make sure locking collar is correct version for reverse gear wheel. See **Selecting correct locking collar for reverse gear wheel**
- Installation position:

Chamfered edge -arrow 1- faces reverse gear

Small shoulder -arrow 2- faces 5th gear

Large shoulder -arrow 3- faces reverse gear

Pressing on inner race for small tapered roller bearing

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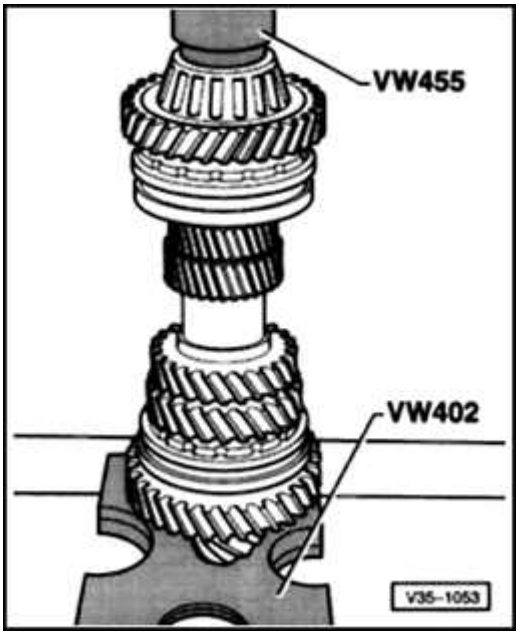


Fig. 224: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Selecting correct locking collar for reverse gear wheel

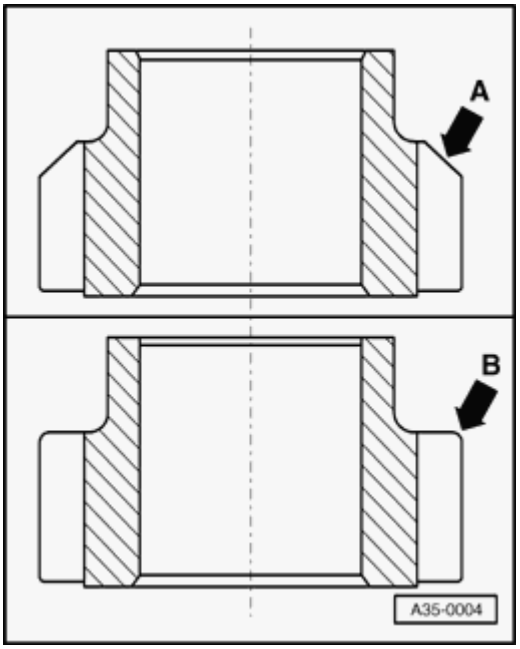


Fig. 225: Allocation Of Operating Sleeve To Reverse Idler Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A	Reverse gear wheel with chamfered edge	Both types of locking collar can be installed (with chamfered edge or large shoulder).

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B	Reverse gear wheel without chamfered edge.	Install only locking collar with large shoulder, do not use locking collar with chamfered edge.

REVERSE IDLER GEAR, REMOVING AND INSTALLING

Reverse idler gear, removing and installing

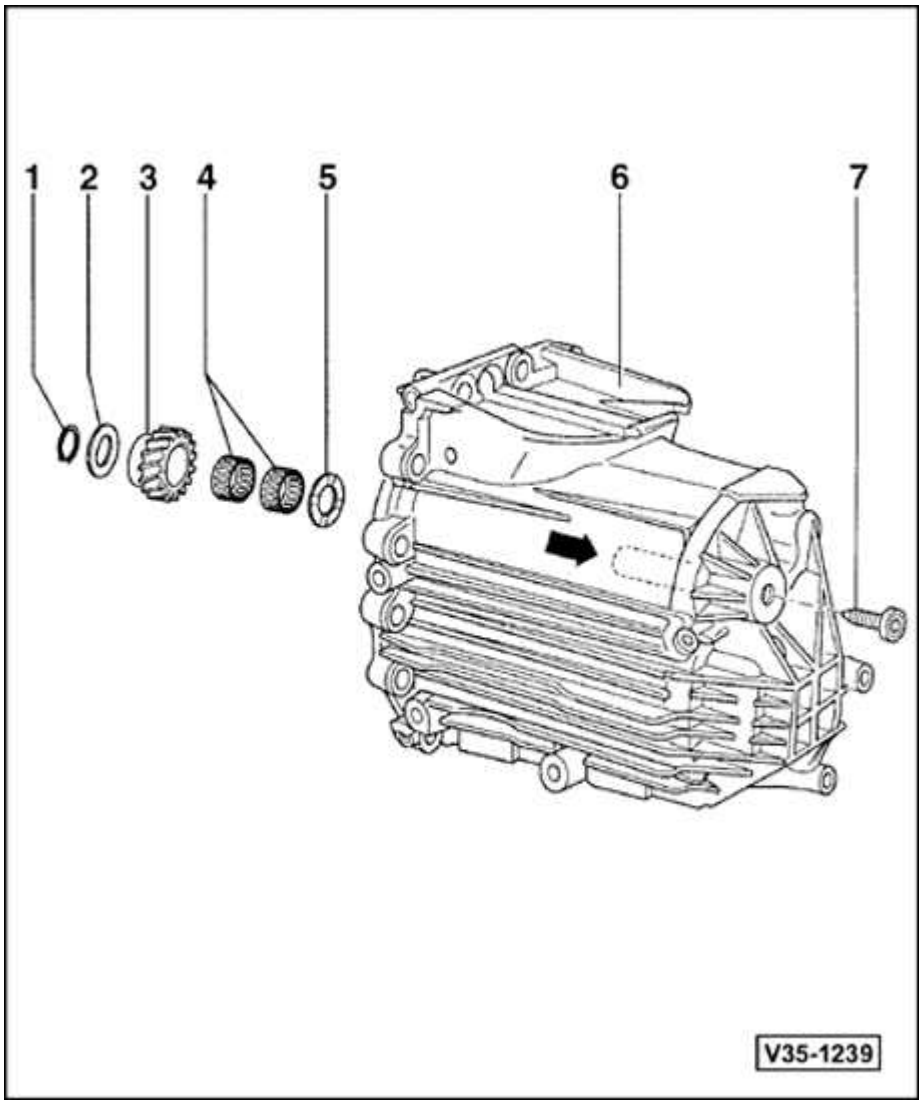


Fig. 226: Reverse Idler Gear, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Circlip

2 - Support plate

3 - Reverse idler gear

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- Different versions, assignment. See **Selecting correct locking collar for reverse gear wheel**

4 - Needle bearing

5 - Thrust washer

6 - Transmission cover

- With reverse idler gear shaft (arrow)
- It is not necessary to remove the reverse idler gear shaft to remove the reverse idler gear
- The reverse idler gear shaft is not available as a replacement part
- Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

7 - Torx bolt - 35 Nm

- To secure reverse idler gear shaft

39 FINAL DRIVE, DIFFERENTIAL

FLANGE SHAFT OIL SEAL, REPLACING

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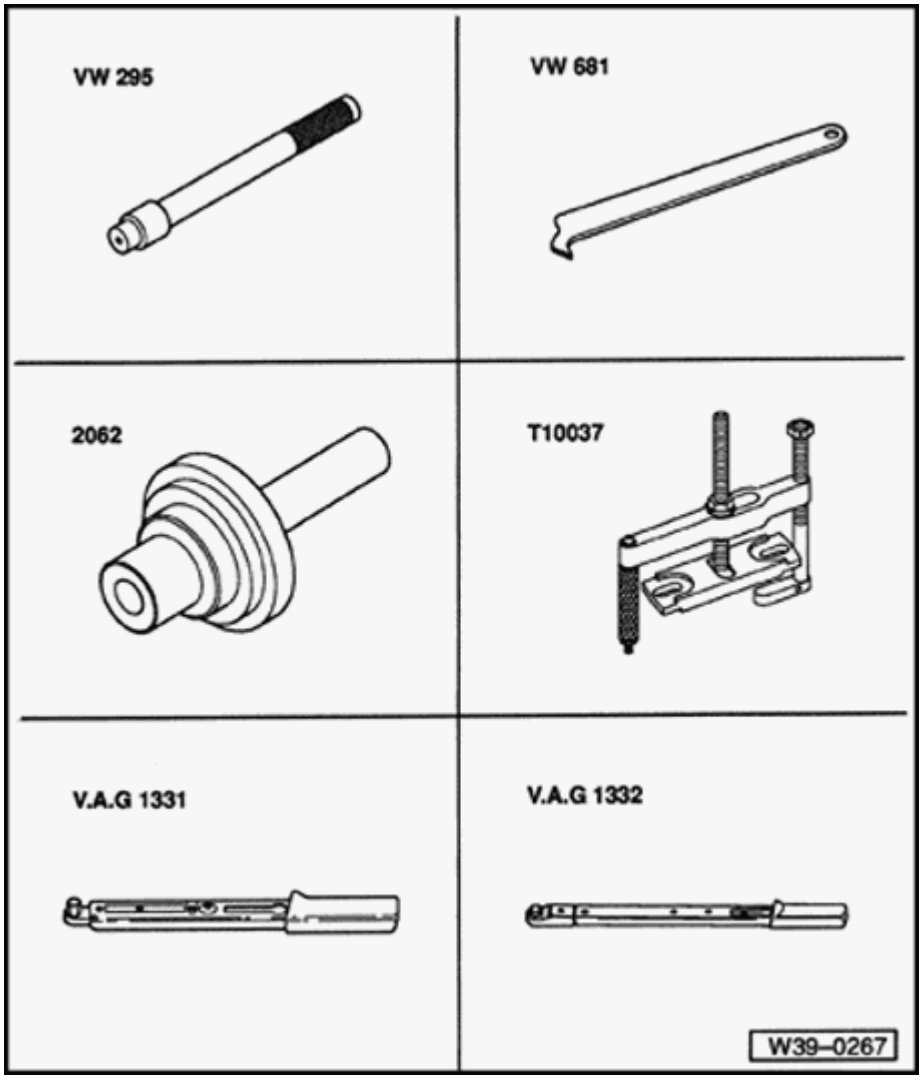


Fig. 227: Identifying Special Tools
Courtesy of VOLKSWAGEN UNITED STATES, INC.

(Transmission installed)

- Observe general repair instructions. Refer to **General repair instructions**.

Special tools and workshop equipment required

- VW 295 Needle bearing drift
- VW 681 Extractor lever
- 2062 Driver
- T10037 Puller

- VAG 1331 Torque wrench
- VAG 1332 Torque wrench

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Special tools, testers and auxiliary items required

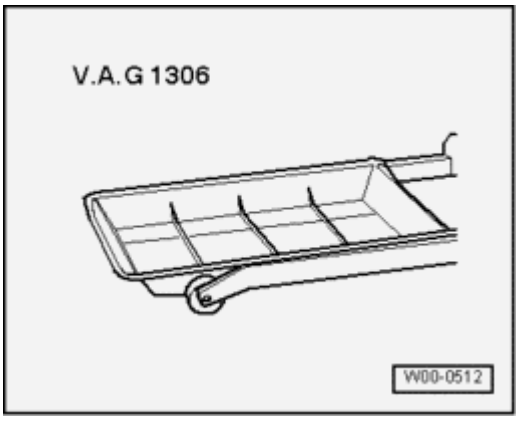


Fig. 228: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1306 Drip tray

NOTE:

- **Removal procedure is identical for left and right seals.**
- **Exhaust system does not have to be removed.**

Removing

- Turn steering to full left lock.

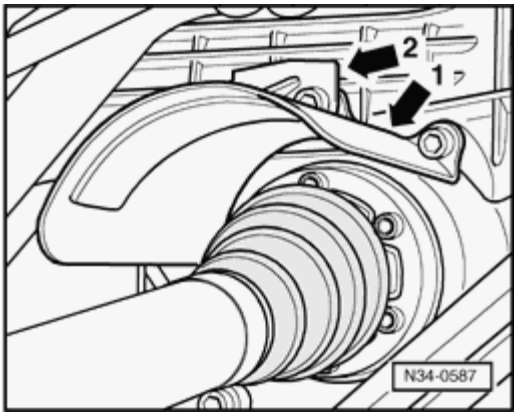


Fig. 229: Detaching Heat Shields And Right-Hand Axle Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover plates over right drive shaft (arrows 1 and 2).
- If installed, remove cover plate over left drive shaft.
- Unbolt drive shaft from flange on transmission:
- Tie up drive shaft as high as possible. Do not damage paint on drive shaft.

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- Place drip tray VAG 1306 underneath the transmission.

When replacing left oil seal:

Remove left flange shaft.

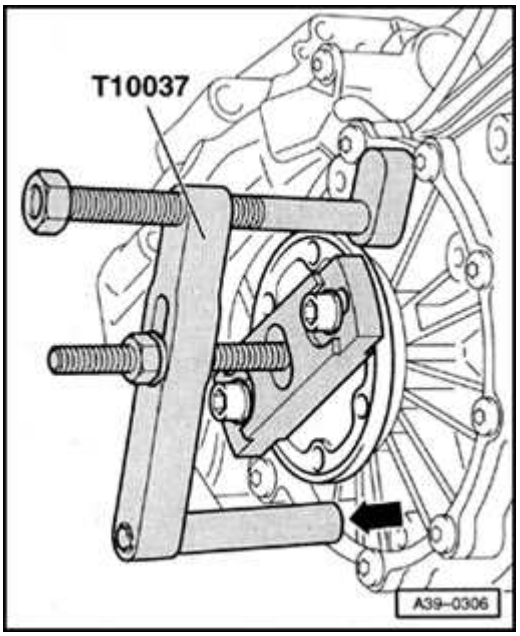


Fig. 230: Removing Drive Flange (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft; by screwing puller T10037 to differential cover (arrow).

When replacing right oil seal:

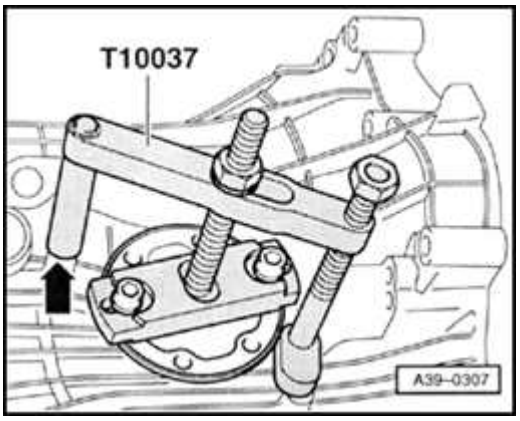


Fig. 231: Removing Drive Flange (Right Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft, by screwing puller T10037 to transmission housing (arrow).

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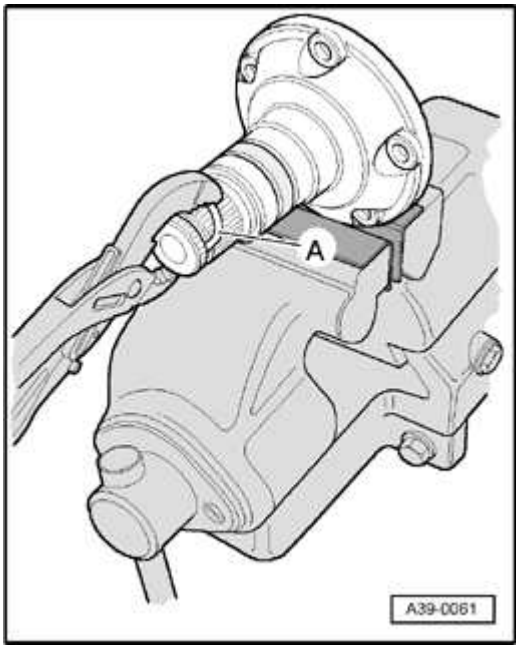


Fig. 232: Removing And Installing Securing Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Always replace flange shaft circlip.
- Clamp flange shaft in vice using soft jaws. Press out old circlip from groove in flange shaft use new circlip -A-.
- Pull out flange shaft oil seal with VW 681.

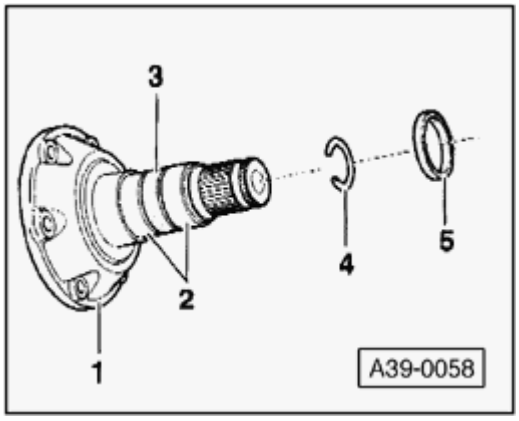


Fig. 233: Flange Shaft Design
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Assembling flange shaft with polygon bearing

1 - Flange shaft

2 - Needle bearing (polygon bearing)

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3 - Spacer ring

4 - Circlip

5 - Spacer ring - installed on shafts with 30 mm spline diameter

NOTE:

- **Rough running of the polygon bearings with flange shaft removed, does not indicate bearings are defective. An acoustic test can only be performed when installed.**
- **Inspect for signs of damage to polygon bearings (such as cracking in outer race).**
- **The polygon bearings can only be replaced together with flange shaft.**
- **A spacer ring -5- is installed between the polygon bearing and large differential bevel gear on flange shafts with 30 mm spline diameter.**

Installing

NOTE:

- **If used flange shaft is used, insert to a depth of 6.5 mm.**
- **Oil seal can also be driven in using drift 2062.**

- Lightly oil outer circumference of seal.

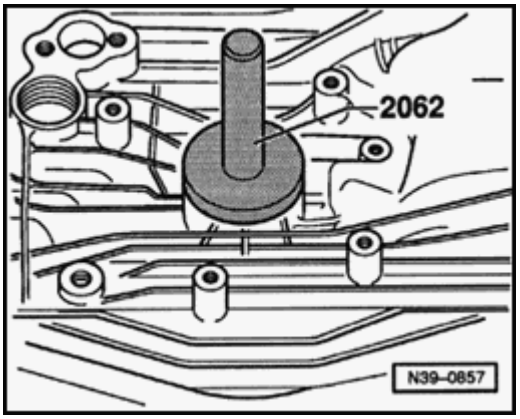


Fig. 234: Installing Right-Hand Drive Flange Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Keep seal straight when installing. Drive in new oil seal for right flange shaft to a depth of 5.5 mm below outer surface of housing.
- Fill space between sealing lip and dust lip with sealing grease G052 128 A1.

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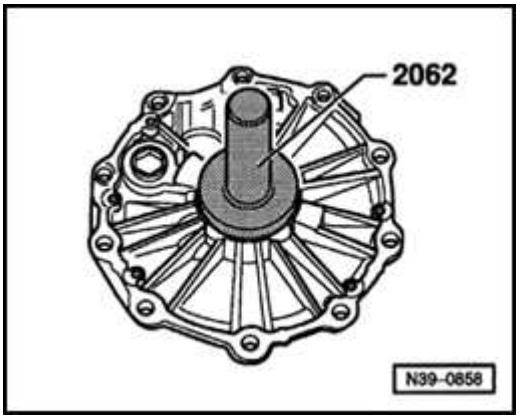


Fig. 235: Installing Left-Hand Drive Flange Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Keep seal straight when installing. Drive in new oil seal for left flange shaft to a depth of 5.5 mm below surface of cover.
- Drive in flange shaft using mandrel VW 295.
- Bolt drive shaft to flange shaft.
- Install splash plates for drive shaft.

- Check oil level in manual transmission. Refer to **Oil level in manual transmission, checking**.

Tightening torques

Component		Nm
Drive shaft to flange shaft	M8	40
	M10	70
Drive shaft heat shields		23

SPEEDOMETER SENSOR AND DRIVE WHEEL, REMOVING AND INSTALLING

Speedometer sensor and drive wheel, removing and installing

- Transmisison installed

- Observe general repair instructions. Refer to **General repair instructions**.

Speedometer Vehicle Speed Sensor (VSS) -G22-, removing and installing

Removing

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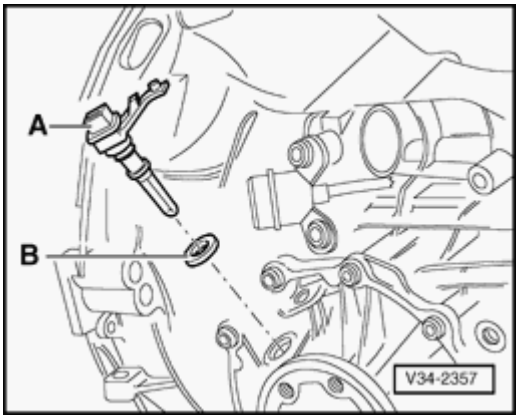


Fig. 236: Identifying Speedometer Vehicle Speed Sensor (VSS) and O-ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull connector off sensor -A-.
- Press retaining clip down, turn sensor sideways and pull out upward.

Installing

- Replace O-ring -B- during installation.
- Insert sensor and click into place.
- Handle sensor carefully. If damaged it is possible that speedometer will not be accurate.

Speedometer drive wheel, removing and installing

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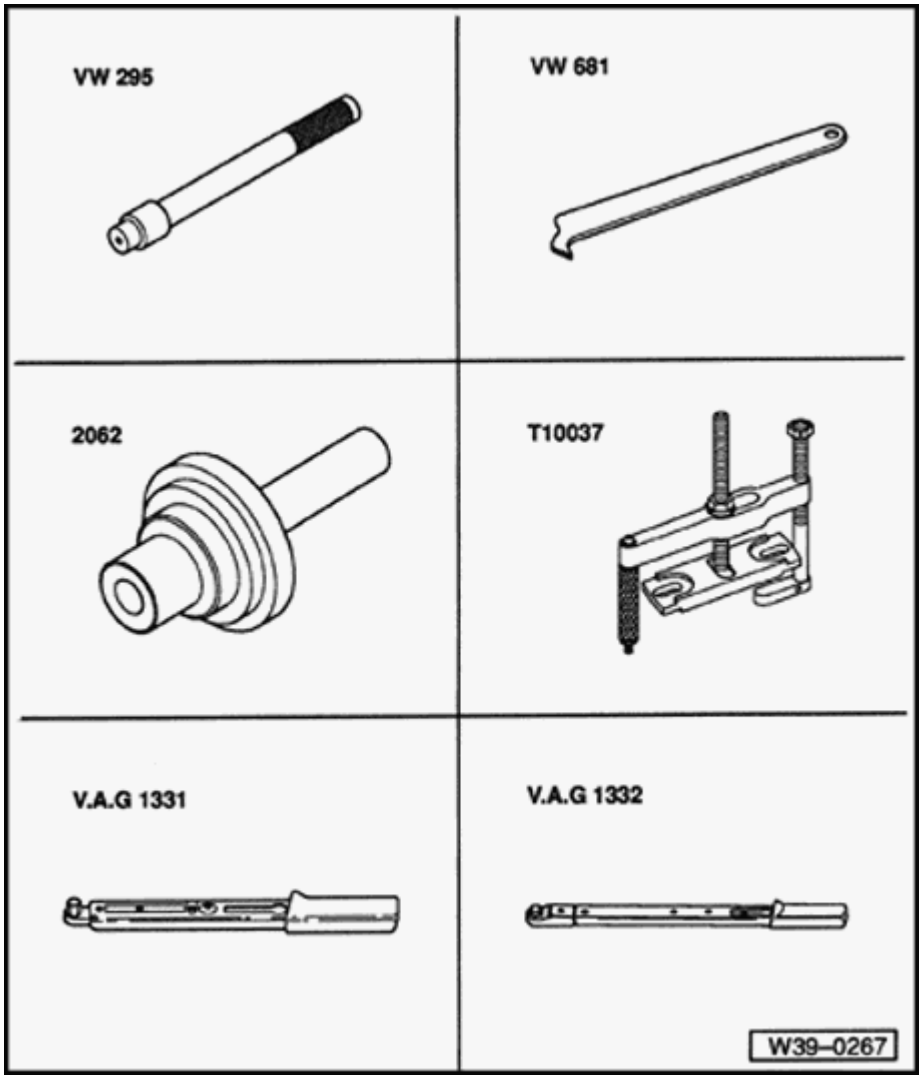


Fig. 237: Identifying Special Tools
Courtesy of VOLKSWAGEN UNITED STATES, INC.

(Transmission installed)

Special tools and workshop equipment required

- VW 295 Mandrel
- VW 681 Release lever
- 2062 Drift
- T10037 Puller
- VAG 1331 Torque wrench
- VAG 1332 Torque wrench

Special tools, testers and auxiliary items required

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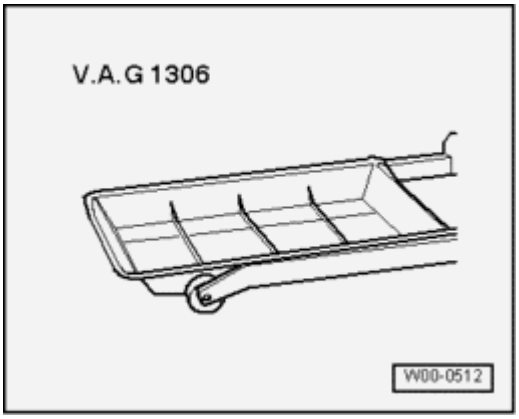


Fig. 238: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1306 Drip tray

Removing

- Turn steering to full left lock.
- If installed, remove cover plate over left drive shaft.
- Unbolt drive shaft from flange shaft.
- Place drip tray underneath.

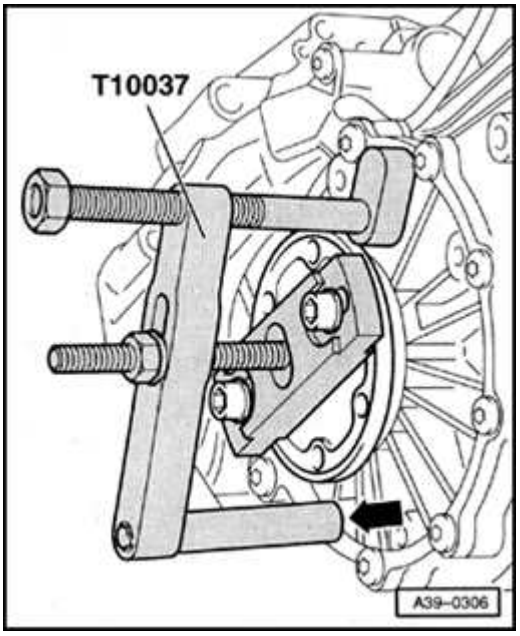


Fig. 239: Removing Drive Flange (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft; by screwing puller T10037 to differential cover (arrow).
- Pull out flange shaft oil seal with VW 681.

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- Remove speedometer sensor. Refer to **Speedometer Vehicle Speed Sensor (VSS) -G22-, removing and installing**.
- Remove speedometer drive wheel:

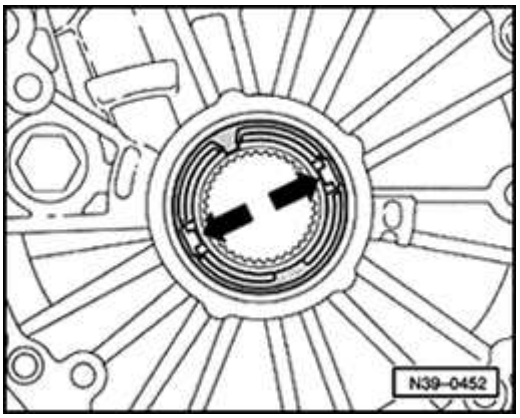


Fig. 240: Press Drive Gear Retaining Clips In Direction Of Arrows Using Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With a screwdriver press retaining clips in direction of arrows.
- Remove drive wheel by prying out, alternating between sides.

Installing

Install in reverse order, paying attention to the following:

NOTE: Install the drive wheel carefully onto the differential, make sure that it is kept straight. Do not use excessive force - the drive wheel can break.

Installation position:

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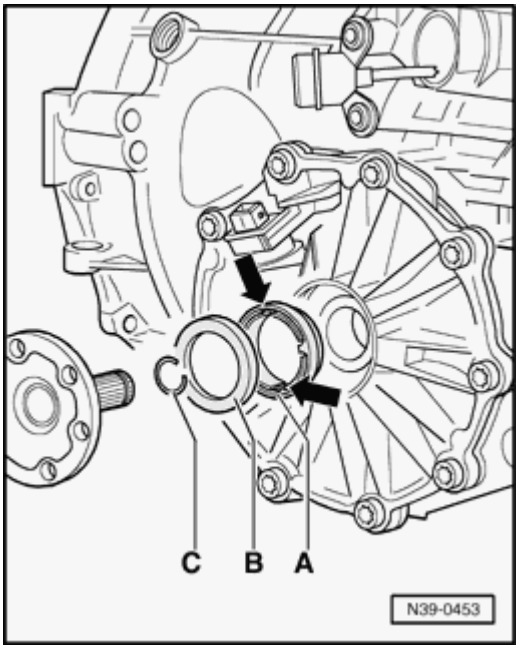


Fig. 241: Identifying Installed Position Of Drive Gear, Retaining Clip And Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The drive peg of the drive wheel -A- faces seal -B- located in the groove of the differential.

The retaining clips (arrows) located in the annular groove in the differential.

- Always replace oil seal -B- and circlip -C-. Refer to **Flange shaft oil seal, replacing**.
- Drive in flange shaft using mandrel VW 295.
- Check oil level and fill oil in transmission. Refer to **Oil level in manual transmission, checking**.

Tightening torques

Component		Nm
Drive shaft to flange shaft	M8	40
	M10	70
Heat shields over drive shafts to transmission		23

DIFFERENTIAL, REMOVING AND INSTALLING

Differential, removing and installing

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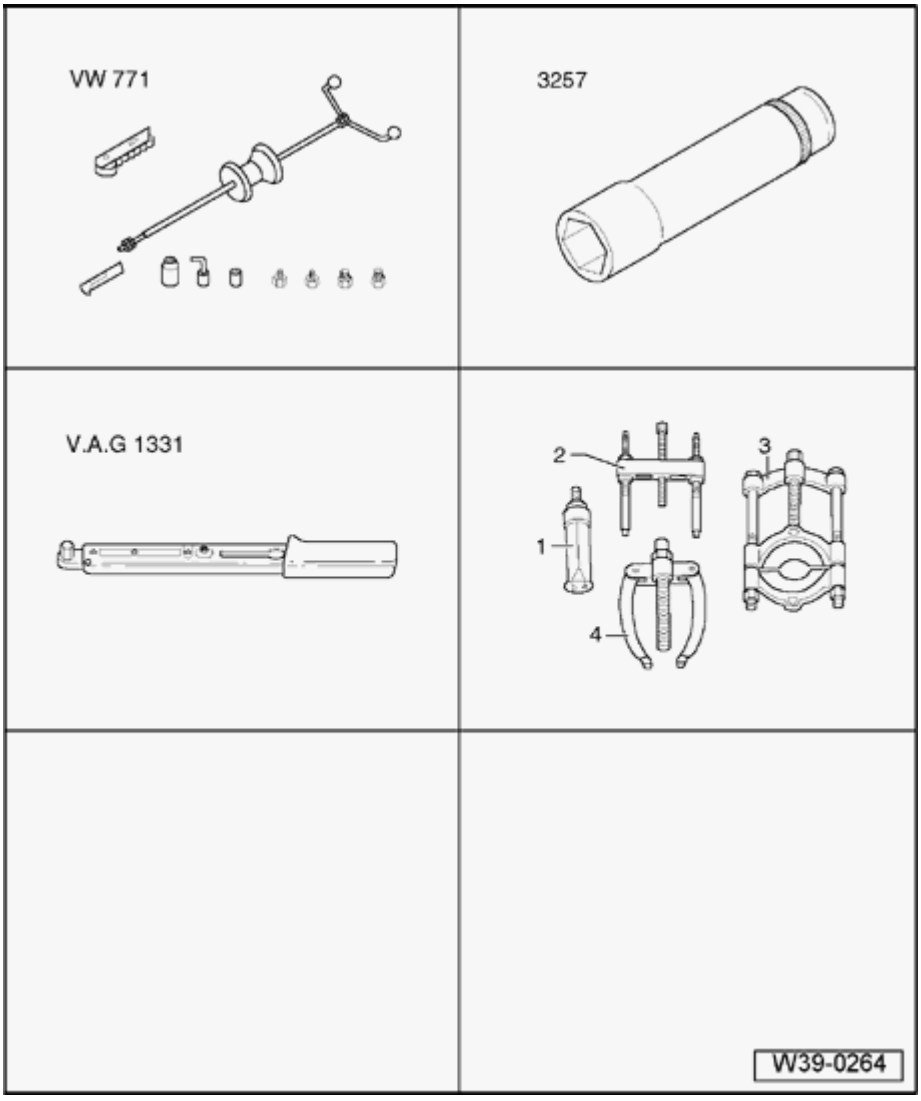


Fig. 242: Identifying Special Tools - Differential, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 771 Multi-purpose tool
- 3257 Socket attachment SW 27
- V.A.G 1331 Torque wrench
- 1 - Kukko 21/3 Internal puller

NOTE:

- **Removal and installation is possible with transmission installed.**
- **The differential can be removed and installed without removing selector mechanism, input shaft, drive pinion and transmission cover. Removal of the components above is necessary to adjust the differential.**
- **Inspect polygon bearings for visible damage.**

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- **The polygon bearings can only be replaced together with flange shaft.**

- Rough running of the polygon bearings with flange shaft removed, does not indicate that bearings are defective. An acoustic test can only be performed installed.
- A spacer ring is installed between the polygon bearing and the large differential bevel gear on flange shafts with 30 mm spline diameter. See **Assembling flange shaft**, -item 5-.
- Adjustments are required when replacing components marked 1).

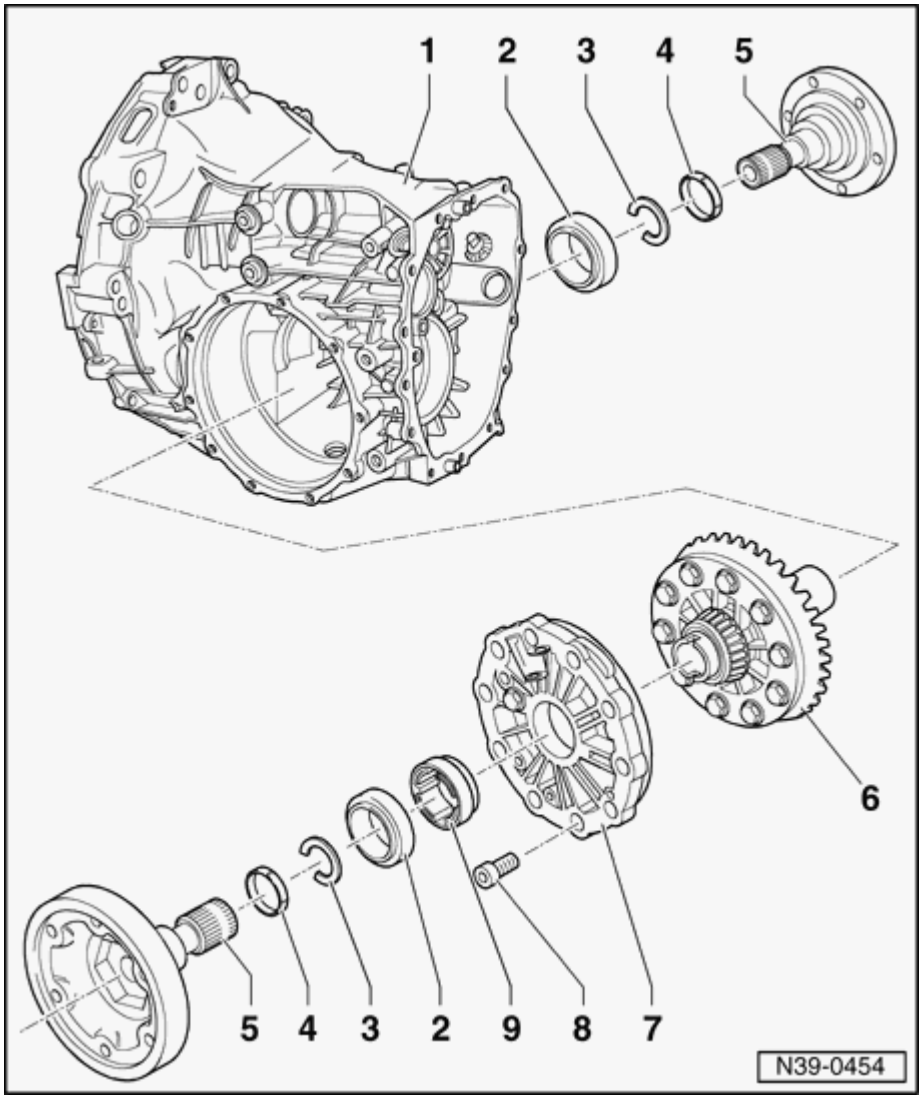


Fig. 243: Differential, Removal And Installation, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing 1)

2 - Sealing ring

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- Replacing. Refer to **Flange shaft oil seal, replacing**

3 - Circlip

- Replace
- Removing and installing. See **Removing and installing circlip**

4 - Spacer ring

- Is only inserted on flange shafts with spline diameter of 30 mm.
- Removing. See **Removing spacer ring**
- Installing. See **Installing spacer ring**

5 - Flange shaft

- Assembling flange shaft, **Assembling flange shaft**

6 - Differential with ring gear 1)

- Can be removed without removing gear cluster
- Disassembling and assembling. Refer to **Differential, disassembling and assembling**

7 - Cover for final drive 1)

- Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

8 - Torx bolt - 25 Nm

9 - Speedometer drive wheel

- Removing and installing. Refer to **Speedometer drive wheel, removing and installing**
- Carefully install the drive wheel onto the differential, make sure that it is kept straight. The drive wheel can break using excessive force.

Removing and installing circlip

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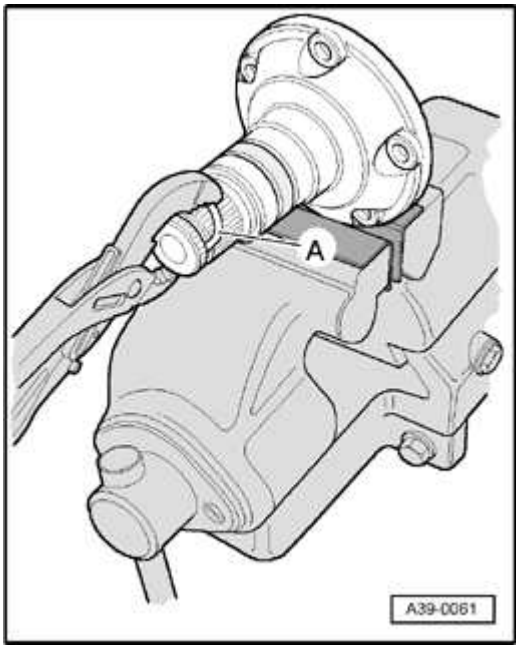


Fig. 244: Removing And Installing Securing Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp flange shaft in vice using soft jaws. Press out old circlip from groove in flange shaft use new circlip -A-.

Removing spacer ring

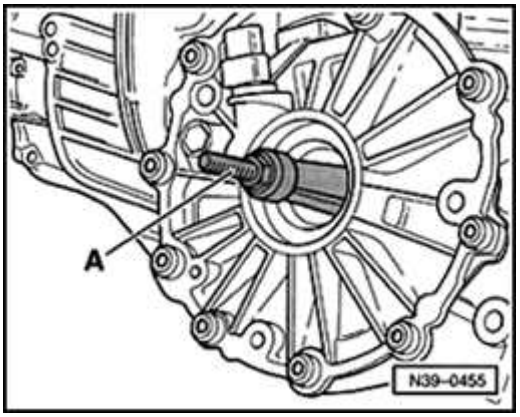


Fig. 245: Removing Spacer Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal puller 18.5... 23.5 mm, e.g. Kukko 21/3

- Pull out spacer ring using multi-purpose tool VW 771.

Installing spacer ring

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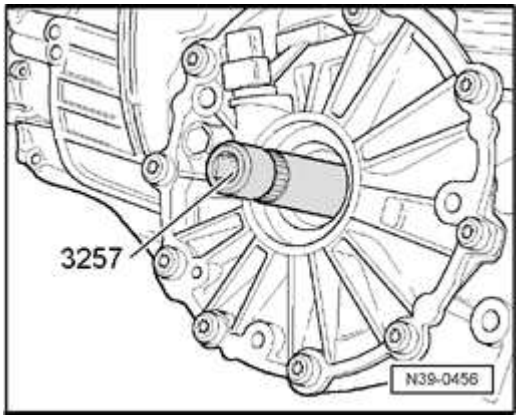


Fig. 246: Installing Spacer Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive new spacer ring home, take care not to bend ring.

Assembling flange shaft

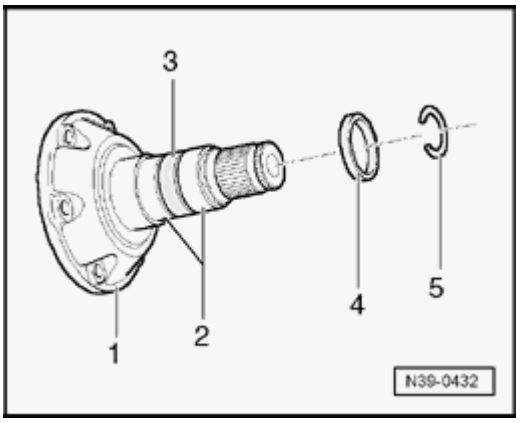


Fig. 247: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Flange shaft

2 - Needle bearing (polygon bearing)

3 - Spacer ring

4 - Spacer ring - additionally installed on shafts with 30 mm spline diameter

5 - Circlip

NOTE: The needle bearings (polygon bearings) do not turn easily when the flange shaft is removed. This does not indicate a bearing is faulty.

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DIFFERENTIAL, DISASSEMBLING AND ASSEMBLING

Differential, disassembling and assembling

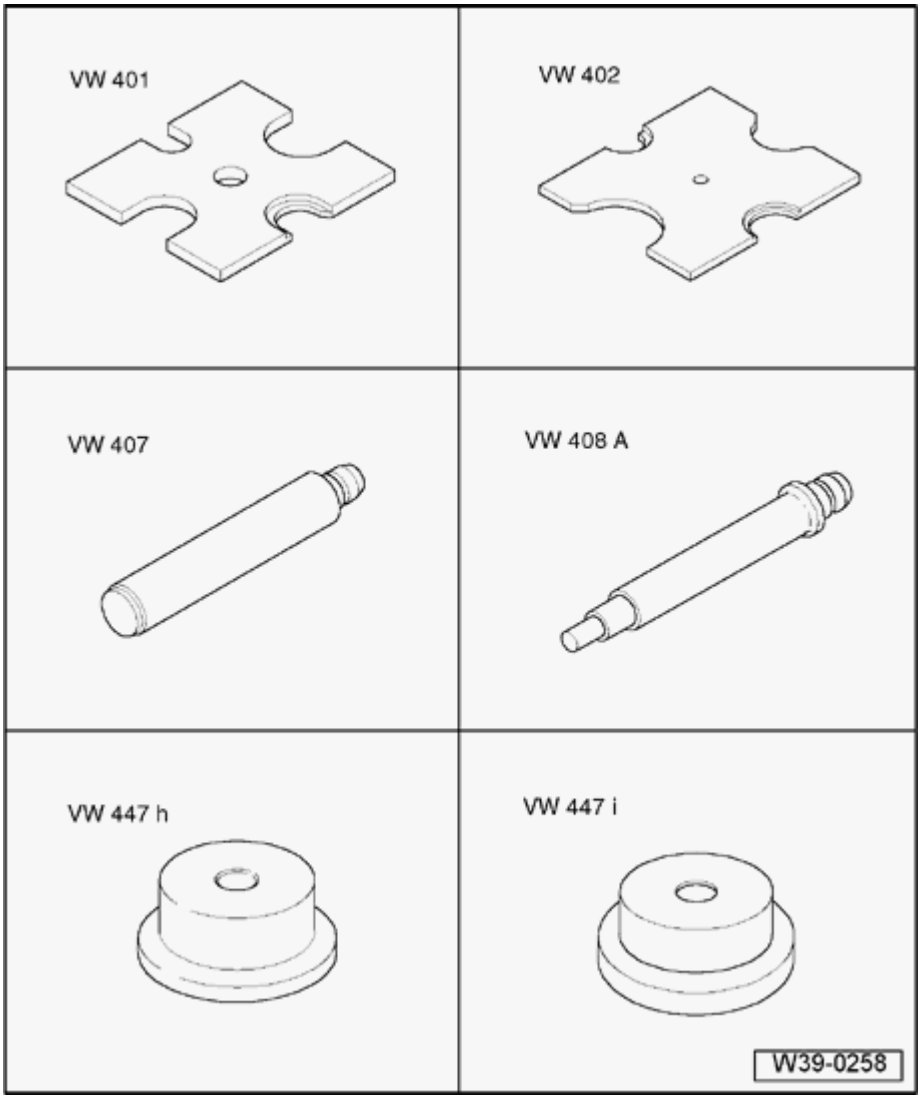


Fig. 248: Identifying Special Tools - Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Press tool
- VW 408 A Press tool
- VW 447 H Thrust disk

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- VW 447 i Thrust disk

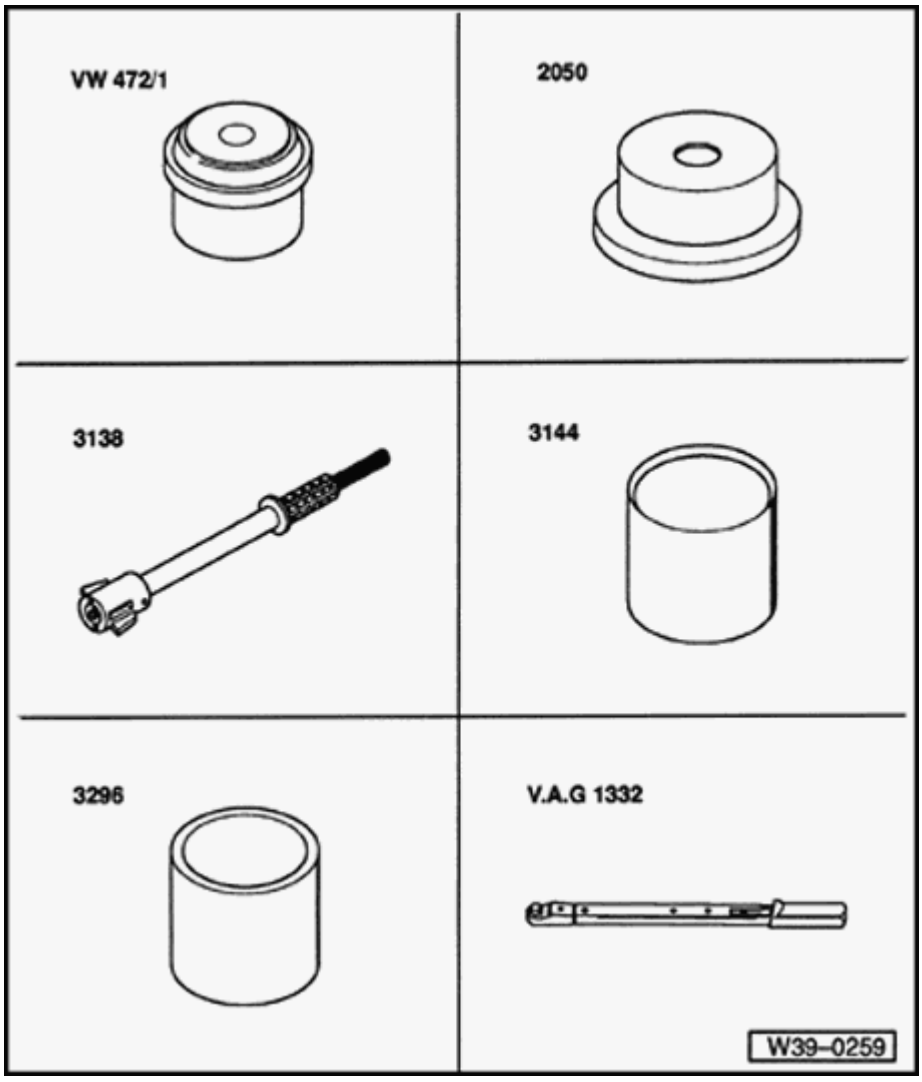


Fig. 249: Identifying Special Tools - Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 472/1 Thrust piece
- 2050 Thrust piece
- 3138 Drift
- 3144 Sleeve
- 3296 Tube
- VAG 1332 Torque wrench

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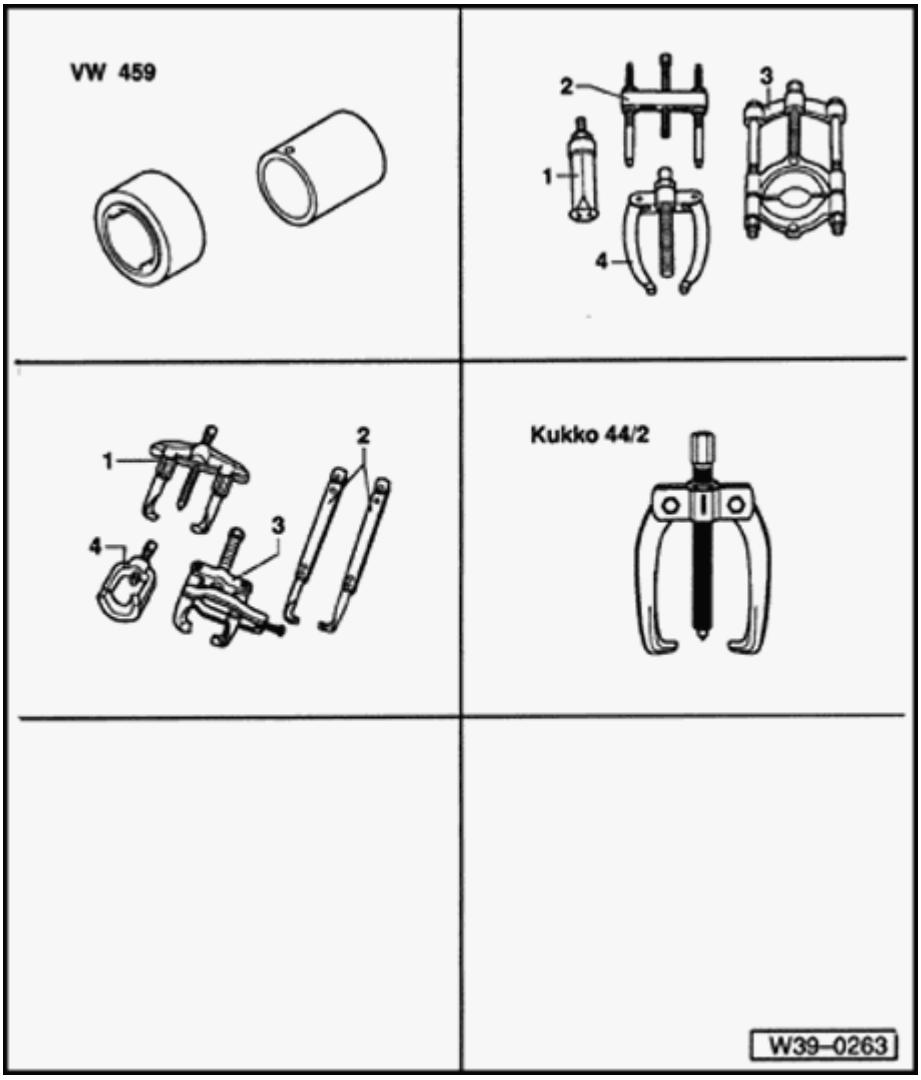


Fig. 250: Identifying Special Tools - Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 459 Installation and removal tool
- 1 - Kukko 21/7 Internal puller
- 3 - Kukko 204/2 Puller
- 4 - Kukko 22/2 Counter-support
- Kukko 44-2 Two-arm puller

NOTE:

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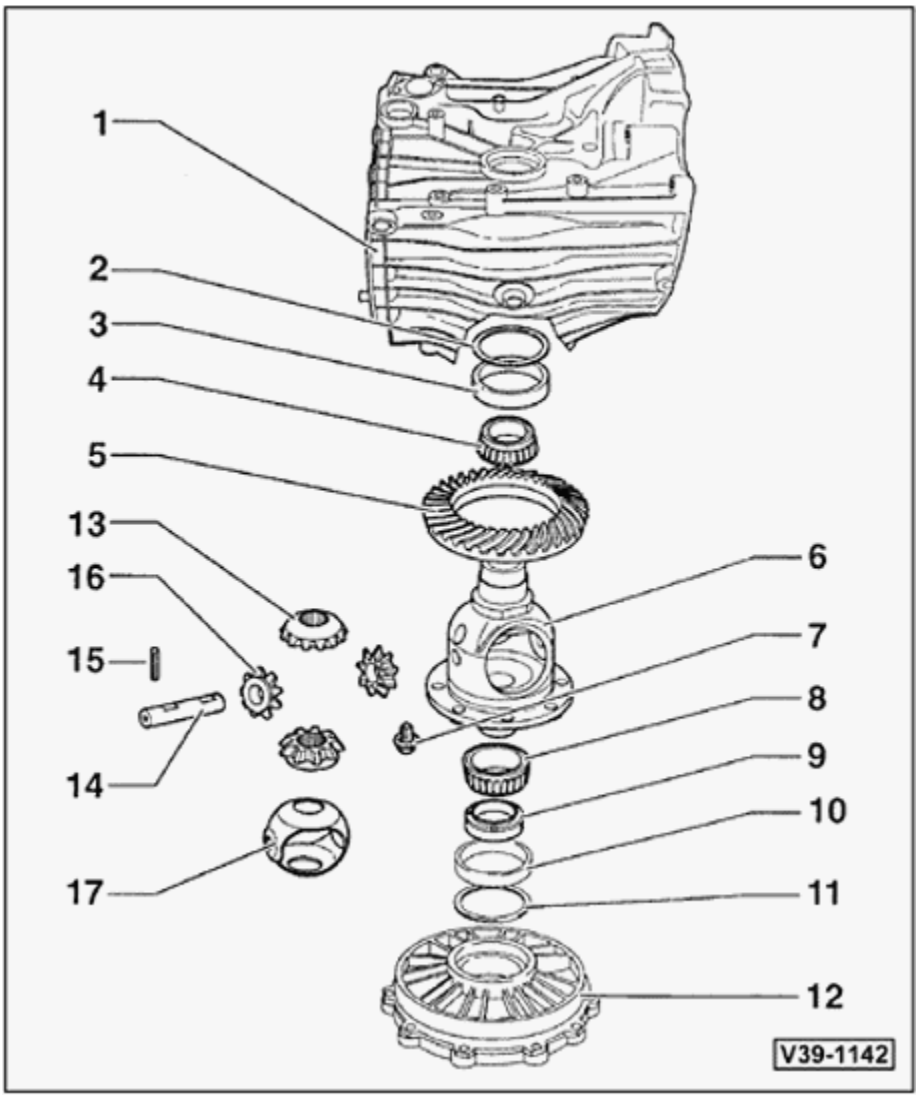


Fig. 251: Differential, Disassembling And Assembling, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Removing and installing differential. Refer to **Differential, removing and installing**.
- Replace both tapered roller bearings.
- Adjustments are required when replacing components marked 1).

1 - Transmission housing 1)

2 - Shim "S2"

- Note thickness

3 - Outer race for right tapered roller bearing 1)

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- Pulling out. See **Extracting tapered roller bearing outer race from transmission housing**
- Pressing in. See **Pressing tapered roller bearing outer race into transmission housing**

4 - Inner race for right tapered roller bearing 1)

- Pulling off. See **Pulling off inner race for right tapered roller bearing**
- Pressing on. See **Pressing on inner race for right tapered roller bearing**

5 - Ring gear 1)

- Paired with drive pinion (final drive set)
- Select according to transmission code letters. Refer to **Code letters, application, ratios, capacities**
- With a mandrel drive off housing. See **Driving ring gear off housing**
- Install to differential housing. See **HEAT THE RING GEAR TO APPROX. 100 ° C and position**

6 - Differential housing 1)

- Select according to transmission code letters. Refer to **Code letters, application, ratios, capacities**
- Allocation

7 - Bolt - 60 Nm + turn 45 ° further

- Always replace
- Lightly tighten bolts then tighten diagonally to specified torque.

8 - Inner race for left tapered roller bearing 1)

- Pulling off. See **Pulling off inner race for left tapered roller bearing**
- Allocation

9 - Speedometer drive wheel

- Removing and installing. Refer to **Speedometer drive wheel, removing and installing**
- Carefully install the drive wheel onto the differential, make sure that it is kept straight. The drive wheel can break using excessive force

10 - Outer race for left tapered roller bearing 1)

- Tapping out. See **Driving out outer race for left tapered roller bearing out of cover**
- Pressing in. See **Driving outer race for left tapered roller bearing into cover**
- Allocation

11 - Shim "S1"

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- Note thickness

12 - Cover for final drive 1)

- Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

13 - Large differential bevel gear

- Installing. See **Installing bevel gears**

14 - Shaft for bevel gears

- Remove spring sleeve knocking out with drift

15 - Spring pin

- For securing shaft for bevel gears
- With annular groove: Removing and installing. See **Removing and installing spring sleeve**
- Without annular groove: Drive out with mandrel

16 - Small differential bevel gear

- Installing. See **Installing bevel gears**

17 - One-piece thrust washer

- When installing coat with transmission oil

Extracting tapered roller bearing outer race from transmission housing

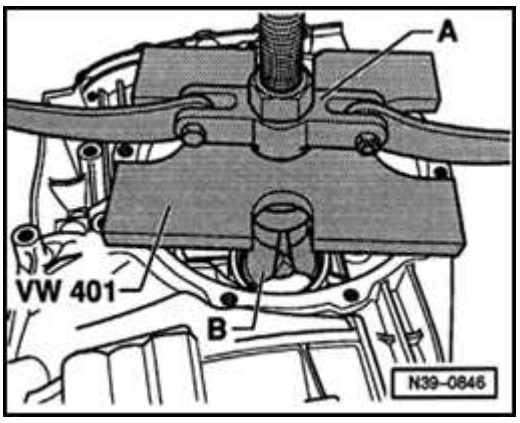


Fig. 252: Pulling Outer Race/Tapered Roller Bearing Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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B - Internal puller 46...58 mm, e.g. Kukko 21/7

- Check shims for damage after removing.

Pressing tapered roller bearing outer race into transmission housing

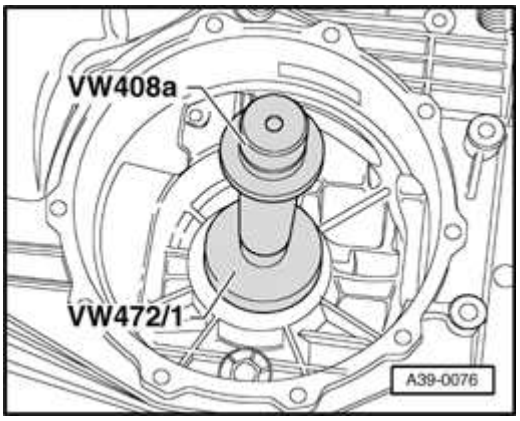


Fig. 253: Pressing Outer Race/Tapered Roller Bearing Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install thrust pad VW 472/1 with taper in outer race.
- Support transmission directly beneath bearing support with VW 459/2.

Pulling off inner race for right tapered roller bearing

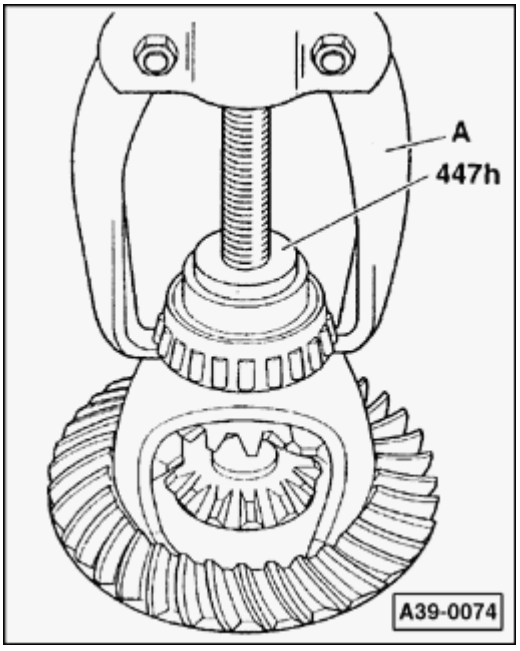


Fig. 254: Pulling Off Right Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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A - Available two-arm puller, e.g. Kukko 44/2 or Kukko 20/10

NOTE: In the differential housing there is a slot in the bearing seat for applying puller -A-.

Pressing on inner race for right tapered roller bearing

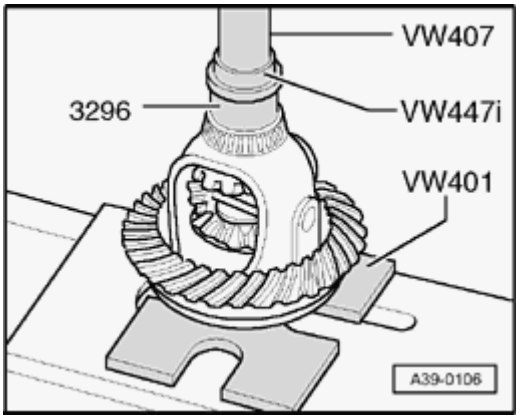


Fig. 255: Pressing On Right Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

WARNING: Wear protective gloves.

- Heat inner race to approx. 100 ° C, and push to final position.

Pulling off inner race for left tapered roller bearing

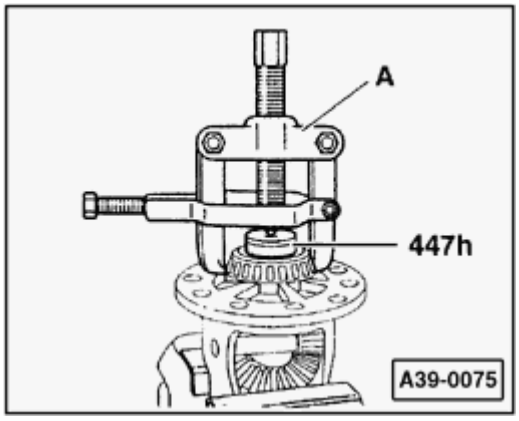


Fig. 256: Pulling Off Left Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Two arm puller, e.g. Kukko 204/2

NOTE: In the differential housing there is a slot in the bearing seat for applying puller -

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A-.

Installing inner race for left tapered roller bearing

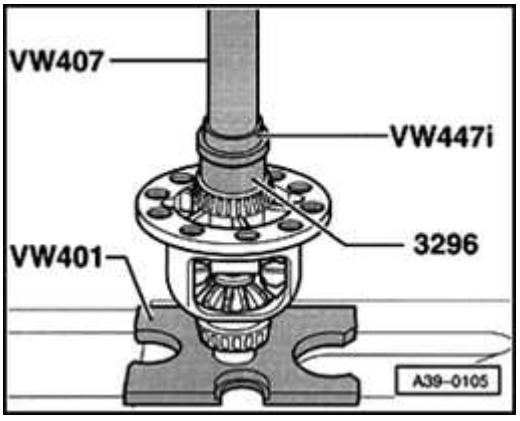


Fig. 257: Installing Left Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

WARNING: Attention:

Wear protective gloves.

- Heat inner race to approx. 100 ° C, and push to final position.

Driving out outer race for left tapered roller bearing out of cover

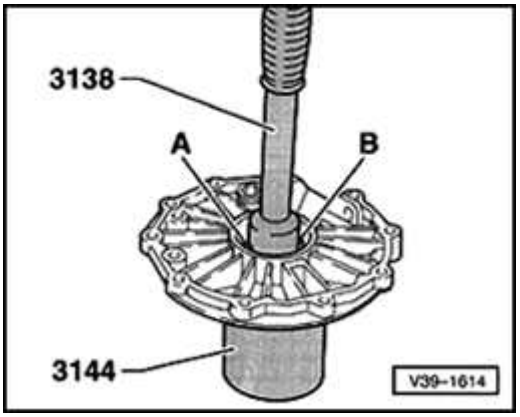


Fig. 258: Driving Out Outer Race Of Left Tapered Roller Bearing From Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn webs -A- and -B- out until they sit on outer race within recess in transmission.
- Check shims for damage after removing.

Driving outer race for left tapered roller bearing into cover

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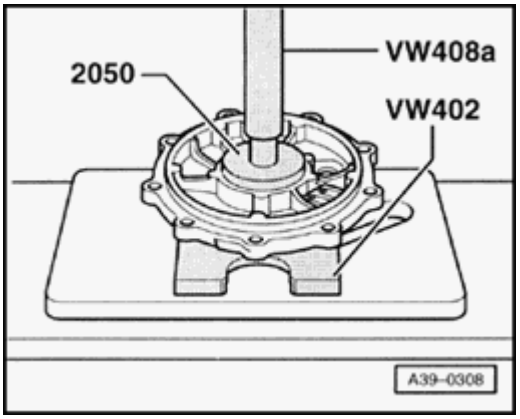


Fig. 259: Driving In Outer Race Of Tapered Roller Bearing Into Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use thrust piece 2050 to press outer race for left tapered roller bearing into cover.
- Install thrust piece 2050 with taper in outer race.

Driving ring gear off housing

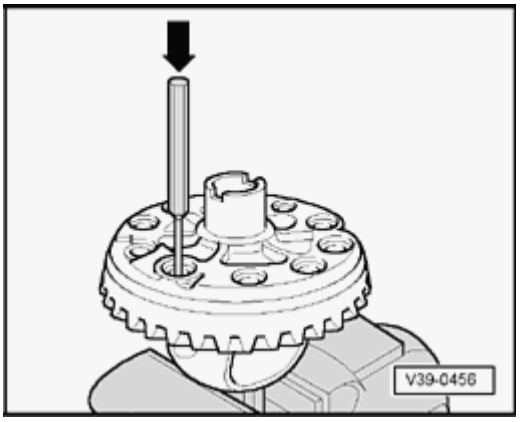


Fig. 260: Driving Out Ring Gear From Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Heat the ring gear to approx. 100 ° C and position

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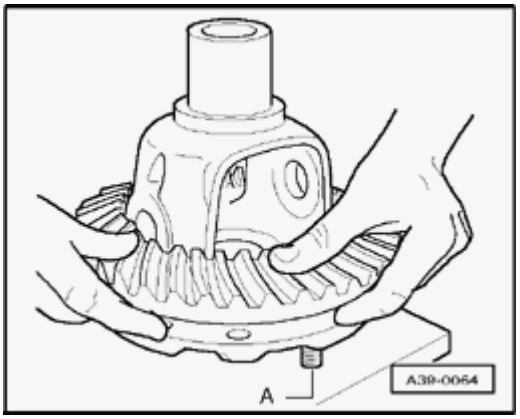


Fig. 261: Installing Ring Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

WARNING: Wear protective gloves.

- Install ring gear guide on centering pins -A- (locally made).
- Allow ring gear to cool off slightly before inserting bolts. Then tighten to specified torque.

Installing bevel gears

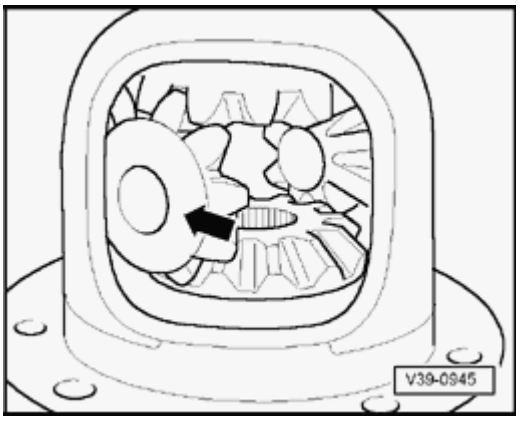


Fig. 262: Installing Small Differential Bevel Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lubricate one-piece thrust washer with transmission oil and install.
- Insert large differential bevel gears.
- Insert small differential bevel gears at 180 ° from their final position and rotate into place -arrow-.
- Drive in differential bevel gear shaft into final position and secure.

Removing and installing spring sleeve

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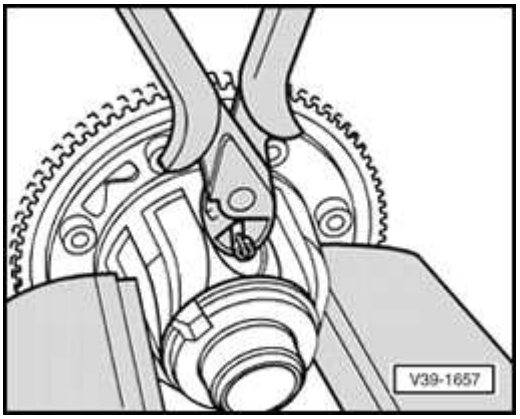


Fig. 263: Pulling Out Spring Pin With Side Cutting Pliers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Using side-cutting pliers pull out spring sleeve with annular groove.
- Using a mandrel drive out from behind the spring sleeve without annular groove.

Installing

- Drive in spring sleeve to stop.

DRIVE PINION AND RING GEAR, ADJUSTING

Drive pinion and ring gear, adjusting

NOTE:

- **Carefully adjust the drive pinion and ring gear for the service life and smooth running of the final drive. For this reason, the drive pinion and ring gear are matched together during manufacturing, and checked to make sure a good mesh pattern and quiet running. The position of quietest running is found by moving the drive pinion in an axial direction and at the same time lifting the ring gear out of the zero-play mesh position by maintaining the backlash within the specified tolerance.**
- **The deviation "r" based on master gauge "Ro" is measured and marked on the outer circumference of the ring gear. Final drive set (drive pinion and ring gear) may only be replaced together!**

Adjusting final drive sets; identification

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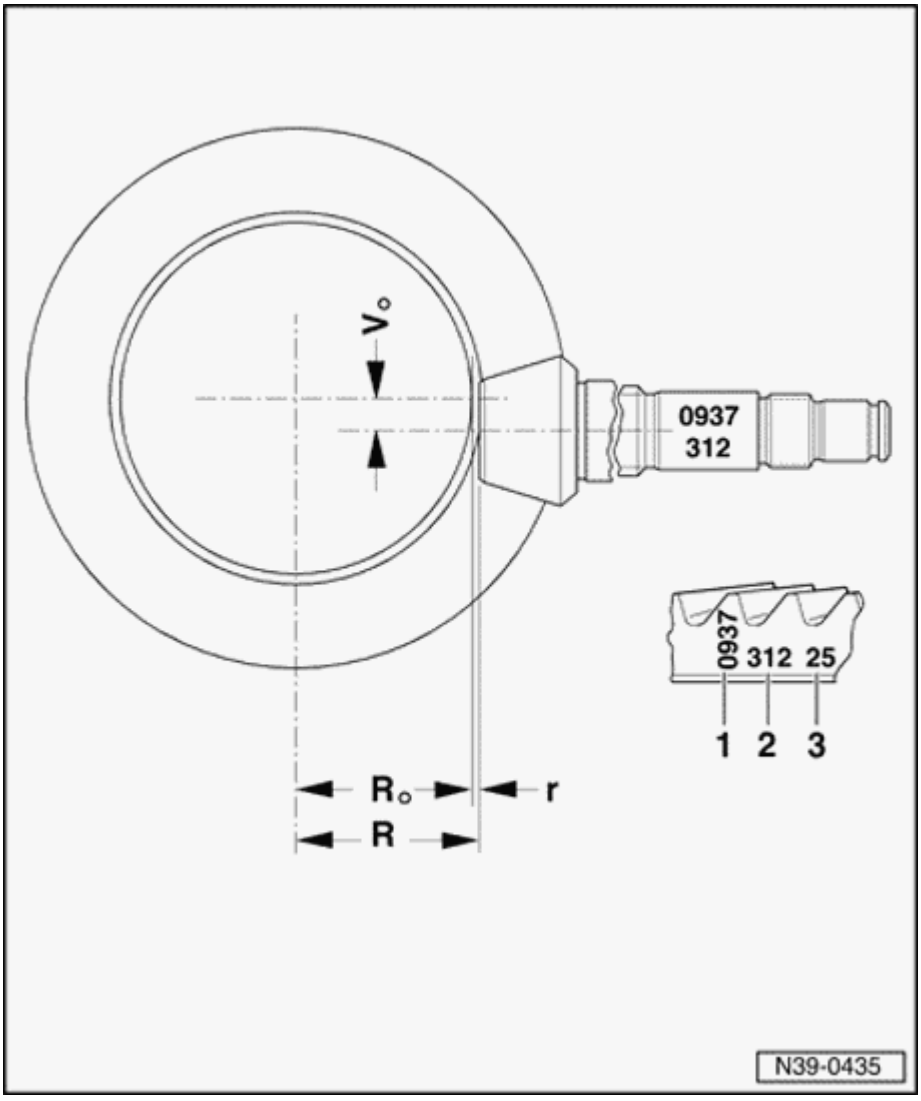


Fig. 264: Identifying Gear Set Markings And Adjustment Dimensions
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - "0937" indicates Oerlikon final drive set with a ratio of 37 : 9.

2 - Pairing number (312) of final drive set

3 - Deviation (tolerance) "r" based on the test machine master gauge used in production. The deviation "r" is always given in 1/100 mm. Example: "25" means r = 0.25 mm

Ro - Length of test machine master gauge used.

Ro - Ring gear diameter 170 mm = 54.95 mm

Ro - Ring gear diameter 180 mm = 59.65 mm

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R - Actual dimension between ring gear and face of drive pinion at point with quietest running for this gear set

Vo - Hypoid offset

Shims position

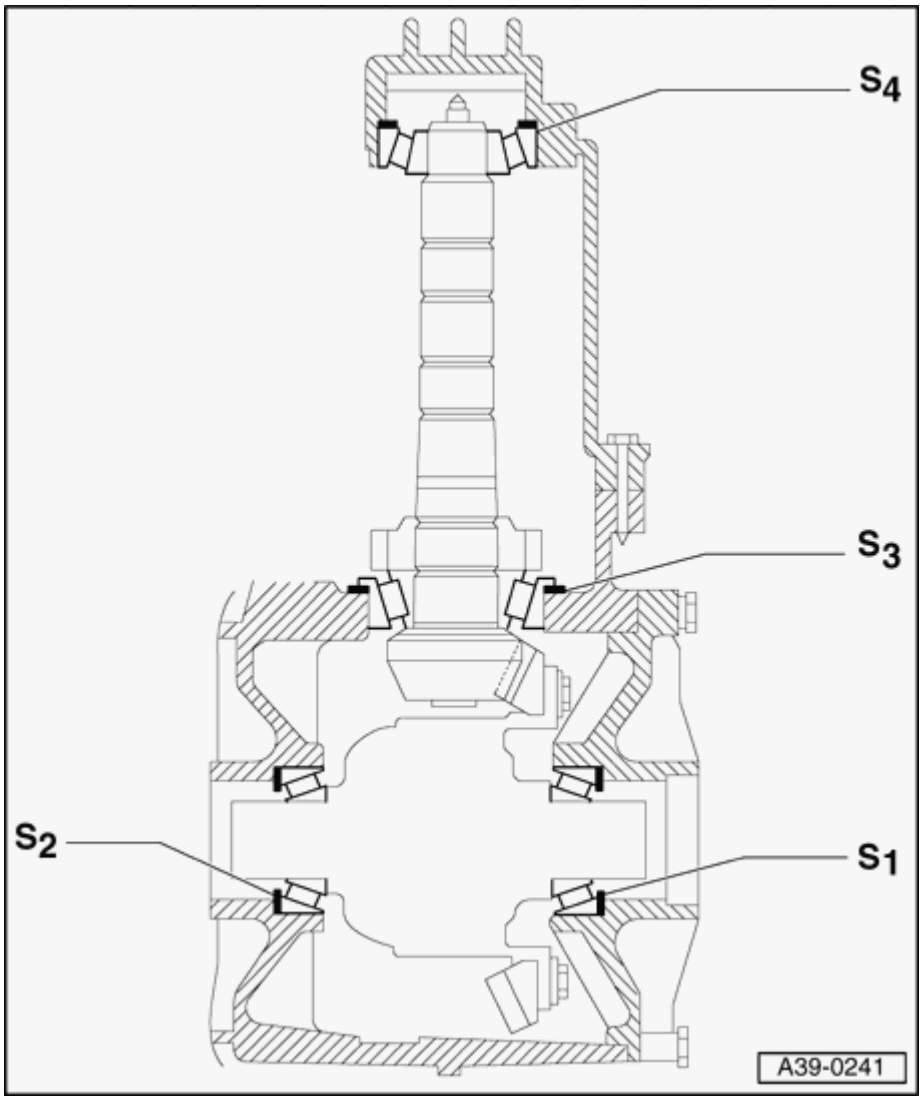


Fig. 265: Identifying Shim Locations
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: Adjustment overview when replacing individual components of transmission. .

S1 - Shim for ring gear in cover for final drive

S2 - Shim for ring gear in transmission housing

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S3 - Shim for drive pinion in transmission housing

S4 - Shim for drive pinion in transmission cover

Adjustment overview

NOTE: If repairs have been carried out on the transmission adjust drive pinion, ring gear or final drive set if components have been replaced which directly effect the adjustments of the final drive. Refer to following table to avoid unnecessary adjustments:

	To be adjusted:			
Parts replaced: ?	Ring gear "S1"+"S2" 1) Refer to **Ring gear, adjusting**	Drive pinion "S3"+"S4" 1) using deviation "r" Refer to **Drive pinion, adjusting**	Drive pinion "S4" 1) Refer to **Re-determining "S4" shim when installing new transmission cover**	Backlash Refer to **Measuring backlash**
Transmission housing 3)	X	X		X
Transmission cover			X	
Differential housing	X			X
tapered roller bearings for drive pinion		X		X
tapered roller bearing for differential	X			X
Final drive set 2)	**X**	X		X
Cover for final drive	X			X

1) Shims; installation position.

2) Drive pinion and ring gear; only replace together

3) If the transmission housing is replaced the input shaft also needs to be adjusted. Refer to **Input shaft, adjusting**, adjusting input shaft.

Final drive set sequence for re-adjusting

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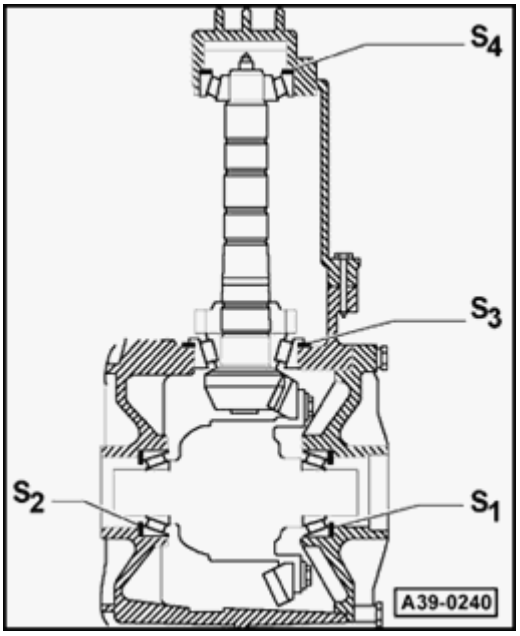


Fig. 266: Drive Pinion And Gear Ring Adjusting Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

When ring gear and drive pinion have to be adjusted, in the interests of a rational sequence, keep to the following order:

1.)	Determine total shim thickness "Stotal" for "S1" + "S2" (sets pre-load for tapered roller bearings for differential). Refer to **Determining total shim thickness "Stotal" for shims "S1" + "S2"** onward.
2.)	Determine total shim thickness "Stotal" for "S3" + "S4" (sets pre-load for tapered roller bearings for drive pinion). Refer to **Determining total shim thickness "Stotal" for shims "S3" + "S4"**
3.)	Distribute total shim thickness "Stotal" for "S3" + "S4" so that the distance from center of ring gear to face of drive pinion is the same as distance "R" which was determined during production. Refer to **Determining thickness of shim "S3"**
4.)	Distribute total shim thickness "Stotal" for "S1" + "S2" so that specified backlash exists between ring gear and drive pinion. Refer to **Determining thickness of shim "S2"**

NOTE: Overview of components and shims.

Drive pinion, adjusting

Special tools and workshop equipment required

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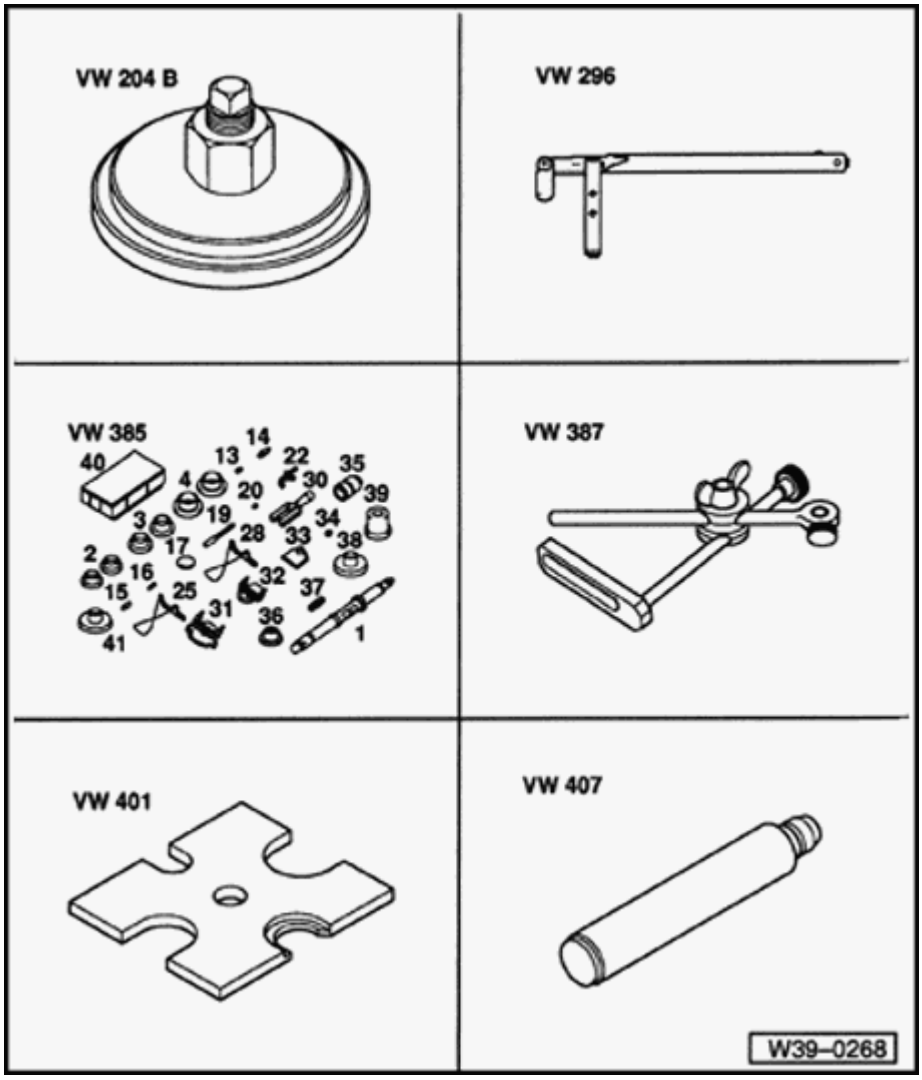


Fig. 267: Identifying Special Tools - Drive Pinion, Adjusting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft seal installing tool VW 204 B Crankshaft seal installing tool
- VW 296 Oil seal extractor
- VW 385 Universal measuring tool
- VW 387 Universal dial gauge holder
- VW 401 Thrust plate
- VW 407 Thrust tool

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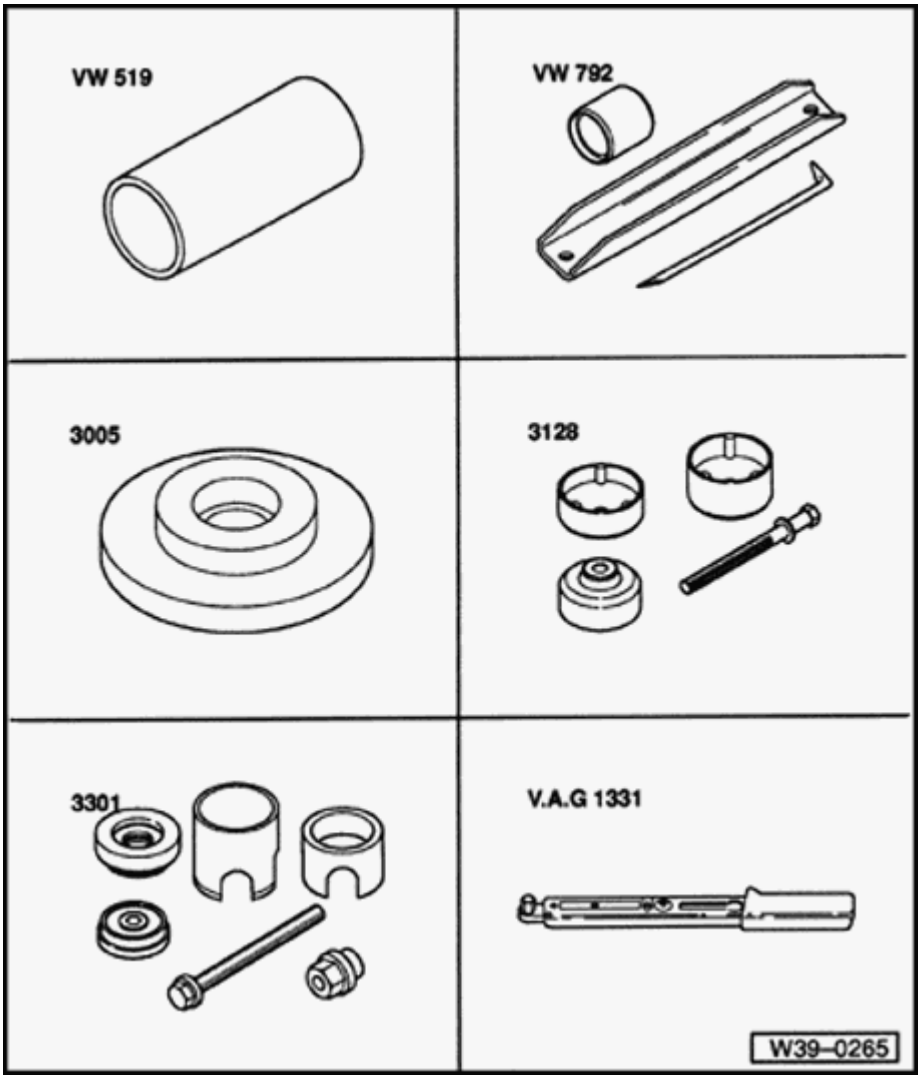


Fig. 268: Identifying Special Tools - Drive Pinion, Adjusting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 519 Tube
- VW 792 Assembly device
- 3005 Thrust plate
- 3128 Puller
- 3301 Assembly equipment
- V.A.G 1331 Torque wrench

Re-adjustment of the drive pinion is only necessary if the final drive set, tapered roller bearing for drive pinion or transmission housing is replaced. .

The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production. Maximum care and cleanliness are essential when performing repairs and taking

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measurements for achieving good results.

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

(adjusting pre-load of tapered roller bearing for drive pinion)

- Differential removed.

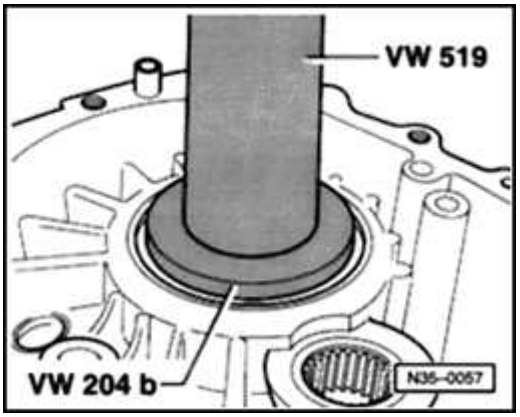


Fig. 269: Pressing In Double Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Without shims press large tapered roller bearing outer race into transmission housing.
- Insert rubber disc-item 40 and pressure plate-item 39 into transmission cover. Refer to **Drive pinion, disassembling and assembling**

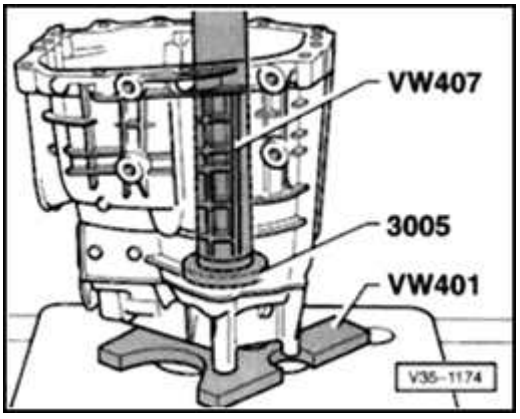


Fig. 270: Pressing In Outer Race For Small Tapered Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press small tapered roller bearing outer race together with a 1.00 mm thick preliminary shim S4* into transmission cover.

NOTE: A shim "S4" with a thickness of 1.0 mm is installed for initial measurements. It is referred to as "S4*" in the following. After determining measurement "e",

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"S4*" will be replaced by the correct shim "S4".

- Pressing on inner race for tapered roller bearing. Refer to **Drive pinion, disassembling and assembling**.

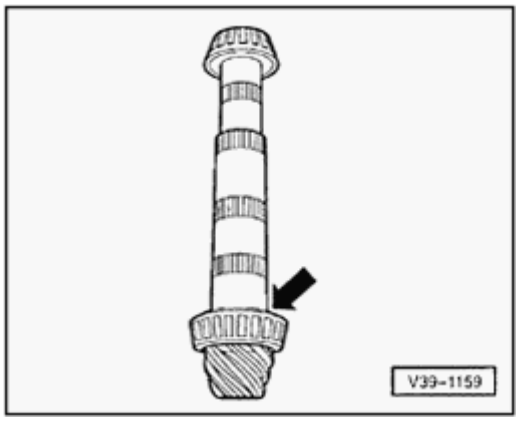


Fig. 271: Identifying Lower Tapered Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure lower tapered roller bearing (arrow). See **Determining thickness of circlip**

NOTE: Illustration shows drive pinion without gear wheels.

- Insert assembled drive pinion in transmission housing.
- Install transmission cover and tighten bolts to 22 Nm.
- Turn transmission so that transmission cover is downward.

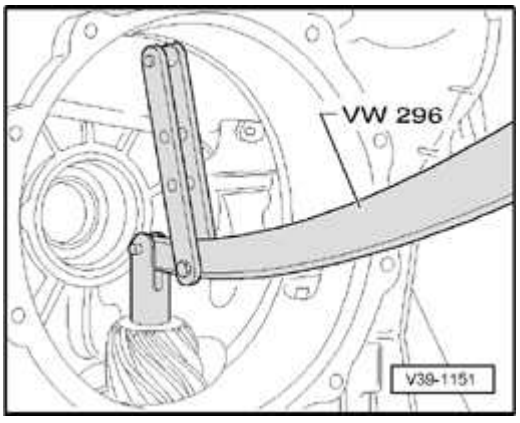


Fig. 272: Pressing Down On Drive Pinion Head Using Removal Tool VW 296
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press down on face of drive pinion head with lever VW 296 until the tapered roller bearing outer race contacts the transmission cover.
- Continue pressing on face of drive pinion head, at the same time turn drive pinion 8 turns by hand, so tapered roller bearing can settle.

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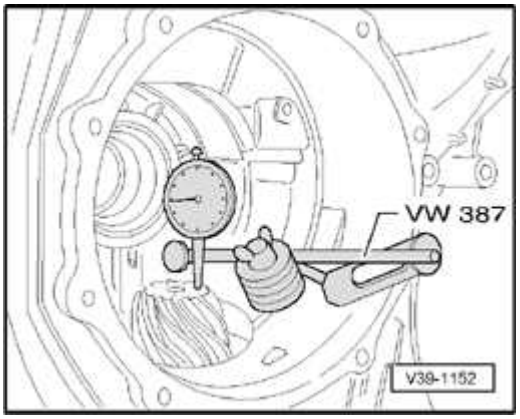


Fig. 273: Installing Dial Gauge (3 Mm Range) And Set To "0" With 2 Mm Pre-Load
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install dial gauge (3 mm measuring range) and set to "0" with 2 mm pre-load.

NOTE:

- **Use dial gauge extension 30 mm long.**
- **The dial gauge extension must contact the machined surface on the face of pinion.**

- Turn transmission 180 ° so that the transmission cover is upward.
- Rotate drive pinion 5 turns in both directions to settle the tapered roller bearing.

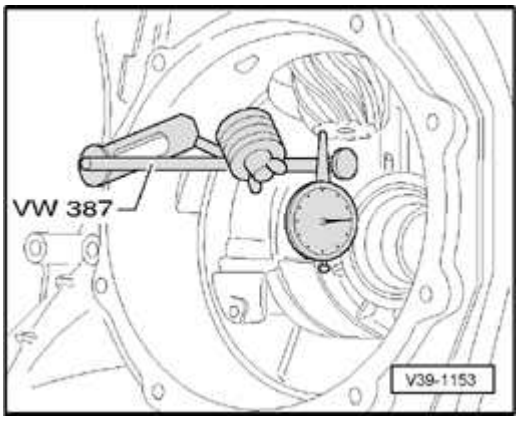


Fig. 274: Turn Transmission 180 Degrees, Settle Tapered Roller Bearing And Read Play On Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Read play on dial gauge and note reading.

- Measurement in example: 0.45 mm

NOTE:

If the measurement has to be repeated, drive pinion must first be rotated another5 turns in each direction to settle the tapered roller bearing. Reset dial gauge to "0" with 2 mm pre-load.

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Formula: **"Stotal"**	=	**"S4*" + measurement + bearing pre-load**

Example:		
	Inserted shim "S4*"	1.00 mm
+	Measurement (example)	0.45 mm
+	Bearing pre-load (constant)	0.15 mm
=	Total shim thickness "Stotal" for "S3" + "S4"	1.60 mm

Determining thickness of preliminary shim S3*

Formula: **"S3*"**	=	**"Stotal" - "S4*"**

Example:		
	Total shim thickness "Stotal" for "S3" + "S4"	1.60 mm
-	Inserted shim "S4*"	1.00 mm
=	Thickness of shim "S3*"	0.60 mm

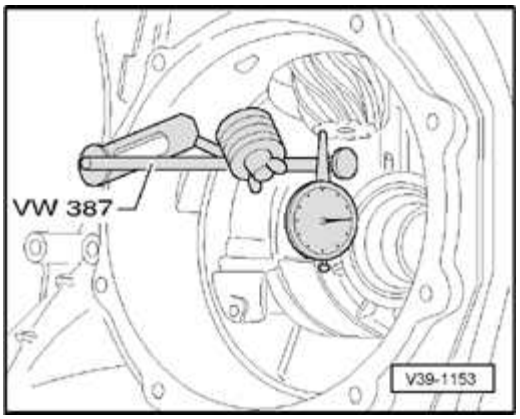


Fig. 275: Turn Transmission 180 Degrees, Settle Tapered Roller Bearing And Read Play On Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extract large tapered roller bearing outer race. See **Pulling out outer race for large tapered roller bearing**..
- Insert preliminary shim S3* into transmission housing and re-install outer race. See **Pressing in outer race for large tapered roller bearing**..
- Insert assembled drive pinion in transmission housing.
- Install transmission cover and tighten bolts to 22 Nm.

Checking pre-load of tapered roller bearing for drive pinion

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- Rotate drive pinion 5 turns in both directions to settle tapered roller bearing.

NOTE:

- **If drive pinion cannot be turned by hand, insert a bolt M10 x 20 in drive pinion head and turn pinion by using a tool on this bolt.**
- **Remove bolt again.**

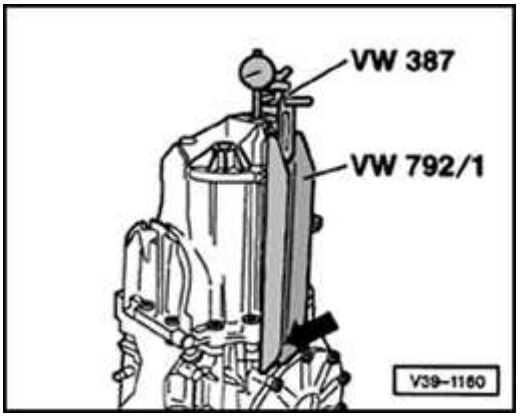


Fig. 276: Checking Preload For Tapered Roller Bearing For Drive Pinion
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install measuring tools and secure with bolt (arrow) to transmission housing.
- Position dial gauge (3 mm measuring range) center on transmission cover and set to "0" with 2 mm pre-load.
- Loosen transmission cover bolts and turn drive pinion several times.
- If correct shims have been selected dial gauge will now indicate following value:

- 0.05... 0.15 mm

- Retighten transmission cover bolts to 22 Nm.
- Remove measuring tools.
- Secure bolt M10 x 20 on drive pinion head and turn drive pinion 8 turns to allow tapered roller bearing to settle.
- Remove bolt.

Determining dimension "e"

NOTE: **Measurement "e" is required to determine the final shim thickness of "S3" and "S4".**

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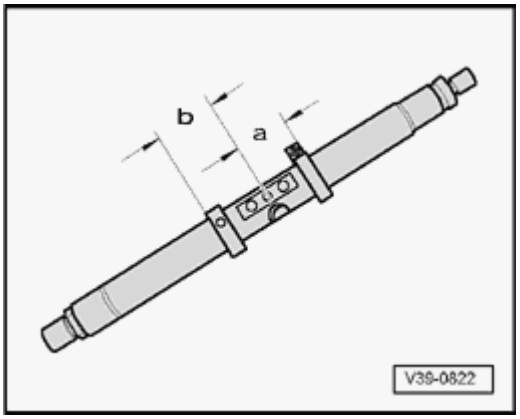


Fig. 277: Setting Adjusting Rings Of Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set adjustment rings of universal mandrel VW 385/1 to following measurements:

- Dimension a = 35 mm
- Dimension b = 75 mm

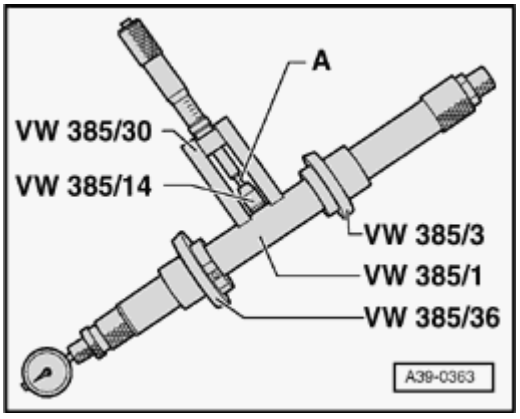


Fig. 278: Assembling Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble universal mandrel VW 385/1 according to illustration.

Dial gauge extension A	Ro	Ring gear diameter
6.5 mm	54.95	170 mm
9.3 mm	59.65	180 mm

- Set master gauge VW 385/30 to Ro according to ring gear diameter and install onto mandrel.

Ring gear diameter 180 mm Ro = 59.65 mm

Ring gear diameter 170 mm Ro = 54.95 mm

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- Set dial gauge (3 mm measuring range) to zero with 2 mm pre-load.

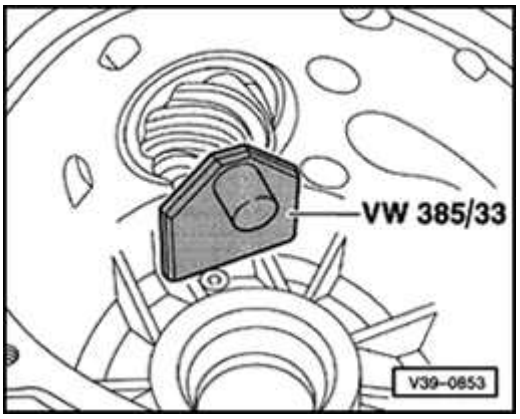


Fig. 279: Placing End Gauge On Drive Pinion Face
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place end measuring plate on face of drive pinion head.

NOTE: Make sure plate contact surface fits exactly and is free of oil.

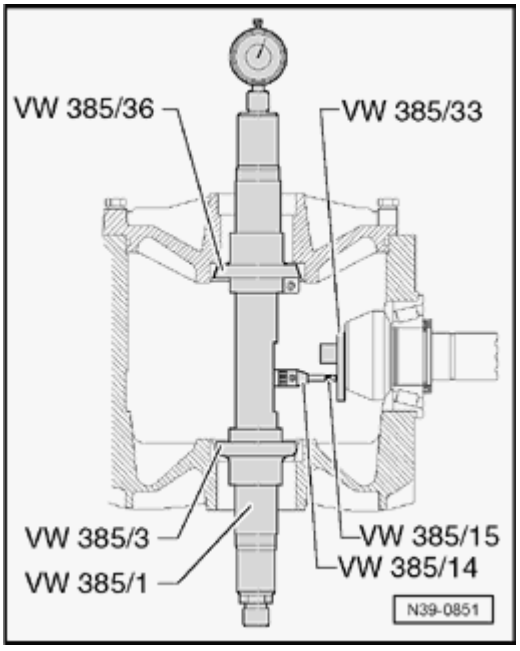


Fig. 280: Inserting Measuring Mandrel VW 385/1 Into Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove master gauge and insert measuring mandrel in housing.

- With Ro = 54.95 mm, a dial gauge extension = 6.5 mm length must be screwed in instead of dial gauge extension VW 385/15.

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- The dial gauge faces cover for final drive

- Install cover for final drive and tighten 4 bolts to 22 Nm.
- Using sliding setting ring to pull 2nd centering disc outward until mandrel can still be turned by hand.

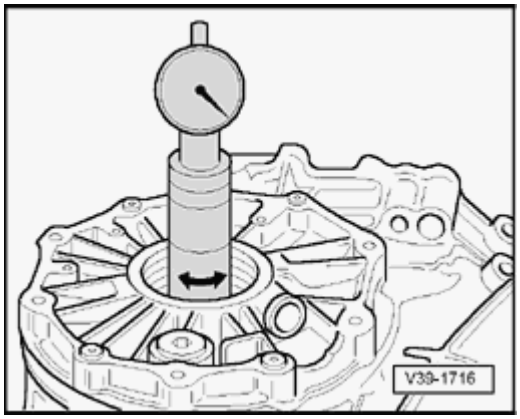


Fig. 281: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

NOTE: After removing universal mandrel check again that the dial gauge, with master gauge VW 385/30 in place, indicates "0" with 2 mm pre-load.

Determining thickness of shim "S3"

- If dial gauge reading is in red scale, subtract dimension "e".
- If dial gauge reading is in black scale, add dimension "e".
- The deviation "r", which is related to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the ring gear.

Formula:		
"S3"	**=**	**"S3*" + "r" + "e"**
("e" in black scale)		
"S3"	**=**	**"S3*" + "r" - "e"**
("e" in red scale)		

Example:		
	Inserted shim "S3*"	0.60 mm

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+	Deviation "r"	0.38 mm
-	Determined value "e" (red scale)	0.26 mm
=	Thickness of shim "S3"	0.72 mm

- Determine shim(s) as accurately as possible from table. Part numbers

The following shims are available for "S3"

Shim thickness (mm) 1)		
0.40	0.55	0.70
0.45	0.60	0.75
0.50	0.65	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

Determining thickness of shim "S4"

Formula:		
"S4"	=	**"Stotal" - "S3"**

Example:

Total shim thickness "Stotal"	1.60 mm
Shim thickness S3	- 0.72 mm
Shim thickness S4	= 0.88 mm

- Determine shim(s) as accurately as possible from table. Part numbers

The following shims are available for "S4"

Shim thickness (mm) 1)		
0.49	0.69	0.85
0.57	0.73	0.89
0.61	0.77	0.97
0.65	0.81	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

Performing check measurement

Checking dimension "r"

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- Install drive pinion with determined shims "S3" and "S4" and turn 5 turns in both directions.

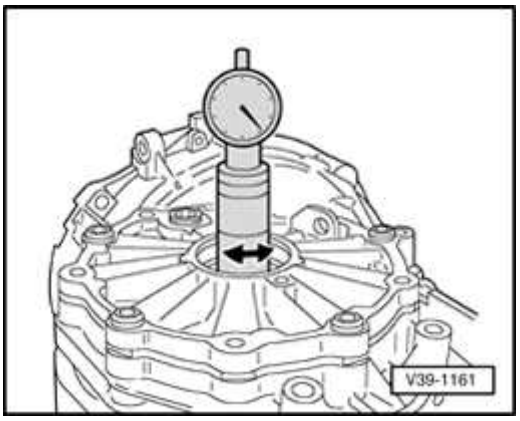


Fig. 282: Insert Universal Mandrel And Perform Check Measurement
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert universal mandrel "Determining measurement `e'". Refer to **Determining dimension "e"**, and perform check measurement.
- Read off dial gauge counterclockwise (red scale).

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

Re-determining "S4" shim when installing new transmission cover

Special tools, testers and auxiliary items required

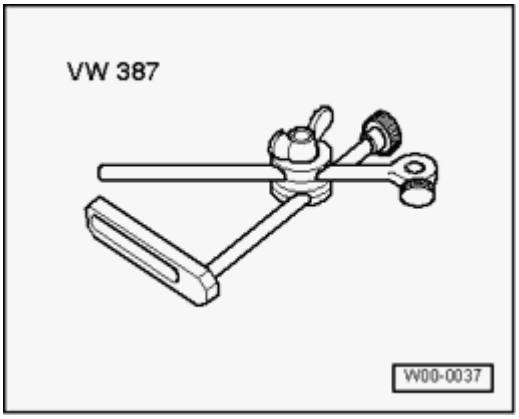


Fig. 283: Identifying Dial Gauge Holder VW 387
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 387 Universal dial gauge holder

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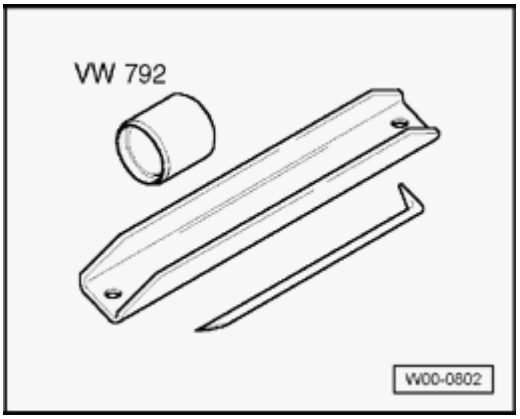


Fig. 284: Installation Arbor VW 792
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 792 Assembly device
- Dial gauge
- Dial gauge extension

- Use depth gauge to within at least 5/100 mm.
- Clean housing flange.

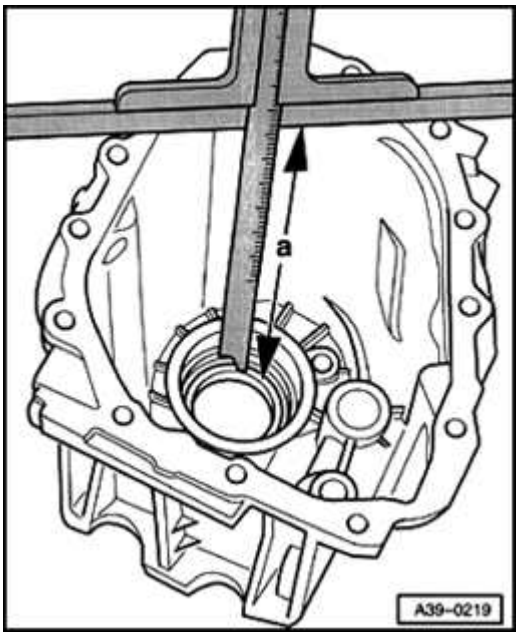


Fig. 285: Measuring Difference In Depth On Old And New Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure difference in depth "a" on old and new transmission cover.

Example:

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	Depth "a" on old transmission cover	257.40 mm
	Depth "a" on new transmission cover	257.55 mm
=	Difference	0.15 mm

- Install thicker shim "S4" if new transmission cover is deeper.
- Install thinner shim "S4" if the old transmission cover is deeper.

Example:

	Previous shim "S4"	0.95 mm
+	Difference	0.15 mm
=	New "S4" shim	1.10 mm

Available shims. Refer to table under **The following shims are available for "S4"**.

- Install outer race for tapered roller bearing with shim "S4" in transmission cover. See **Pressing in outer race for small tapered roller bearing**
- Insert completely assembled drive pinion in transmission housing again.
- Install transmission cover and tighten bolts to 22 Nm.

Checking pre-load of tapered roller bearing for drive pinion

- Rotate drive pinion 5 turns in both directions to settle the tapered roller bearing.

NOTE: Drive pinion can be rotated by simultaneously turning both flange shafts.

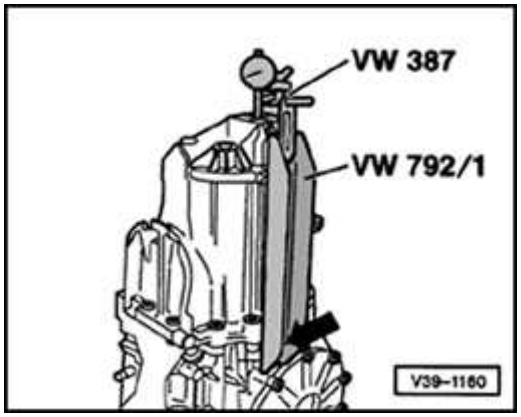


Fig. 286: Checking Preload For Tapered Roller Bearing For Drive Pinion
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install measuring tools and secure with bolt (arrow) to transmission housing.
- Position dial gauge (3 mm measuring range) center on transmission cover and set to "0" with 2 mm pre-

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load.

- Loosen transmission cover bolts and turn drive pinion several times.

If the correct shims have been selected the dial gauge will now indicate the following value:

- 0.05... 0.15 mm

- Remove measuring tools.
- Apply thin coat of sealant AMV 188 001 02 to sealing surfaces.
- Retighten transmission cover bolts to 22 Nm.

Ring gear, adjusting

Special tools and workshop equipment required

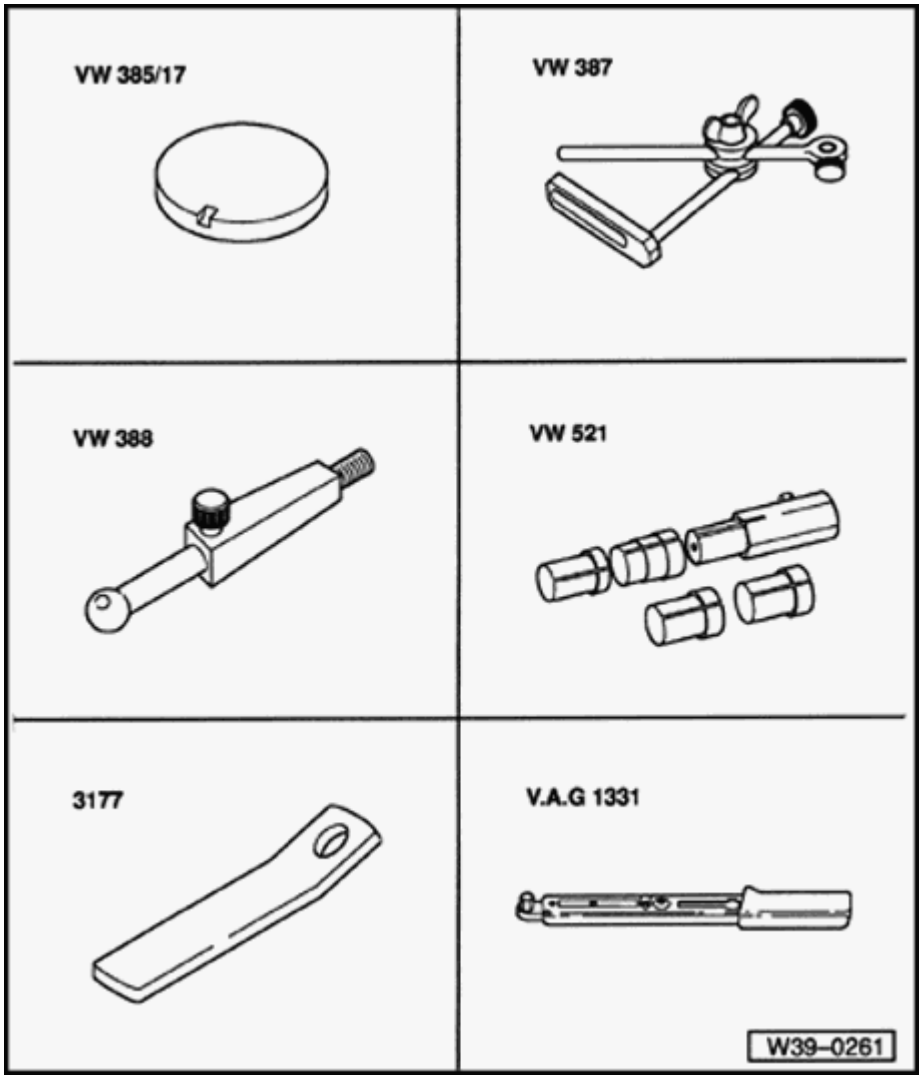


Fig. 287: Identifying Special Tools - Ring Gear, Adjusting

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

(Adjusting differential)

- VW 385/17 End measuring plate
- VW 387 Universal dial gauge holder
- VW 388 Measuring lever
- VW 521 Adjustment tool
- 3177 Clamp
- V.A.G 1331 Torque wrench

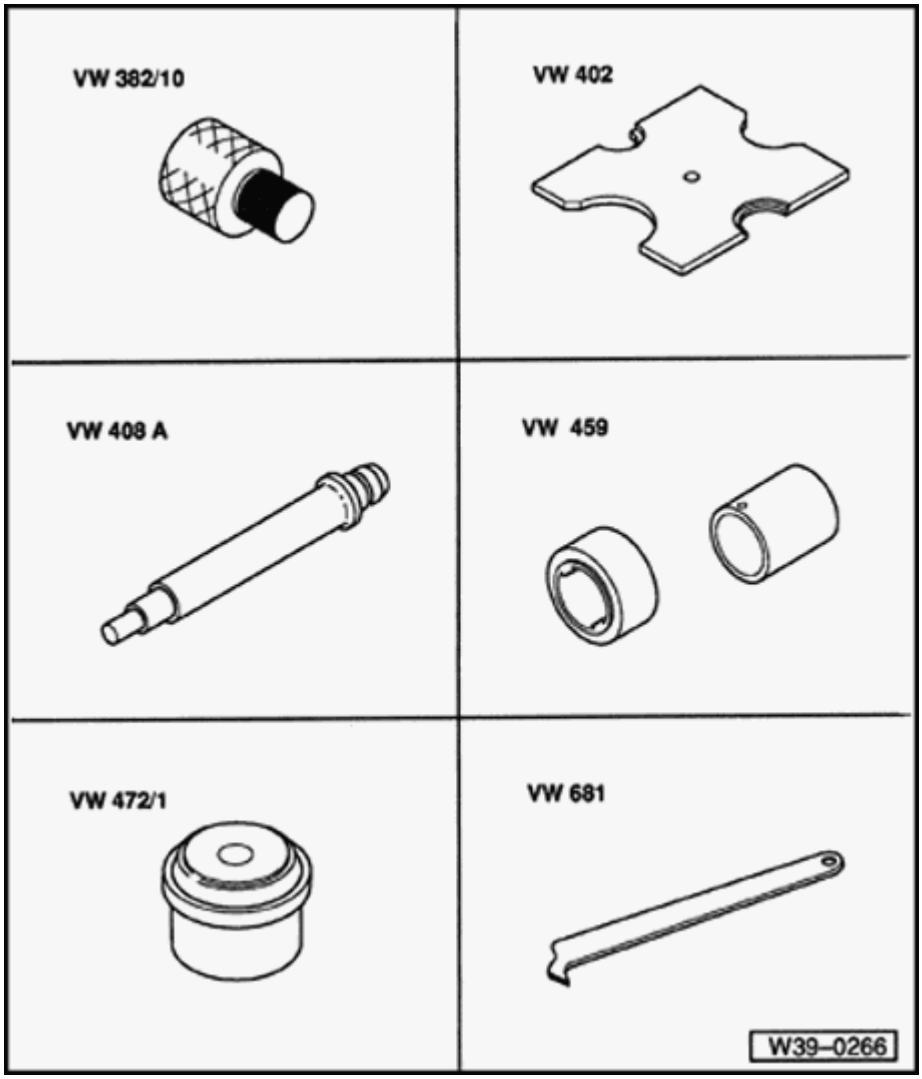


Fig. 288: Identifying Special Tools - Ring Gear, Adjusting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

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- VW 382/10 Dial gauge extension
- VW 402 Thrust plate
- VW 408 A Pressure tool
- VW 459/2 Installing and removing tool
- VW 472/1 Thrust piece
- VW 681 Extractor lever

Special tools and workshop equipment required

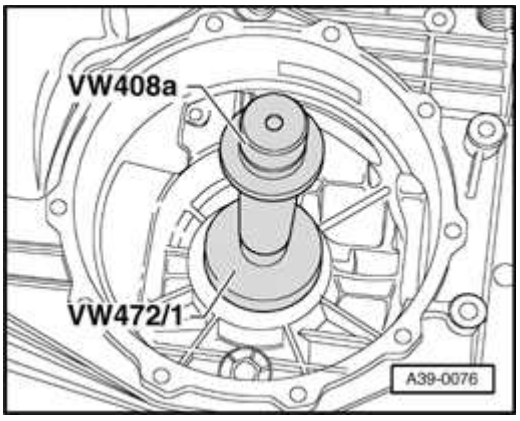


Fig. 289: Pressing Outer Race/Tapered Roller Bearing Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 2050 Thrust plate

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

(adjusting pre-load of tapered roller bearing for differential)

- Drive pinion removed

  - Pull out flange shaft oil seal with oil seal extractor VW 681.
  - Remove tapered roller bearing outer race for differential and remove shims. Refer to **Differential, disassembling and assembling**.

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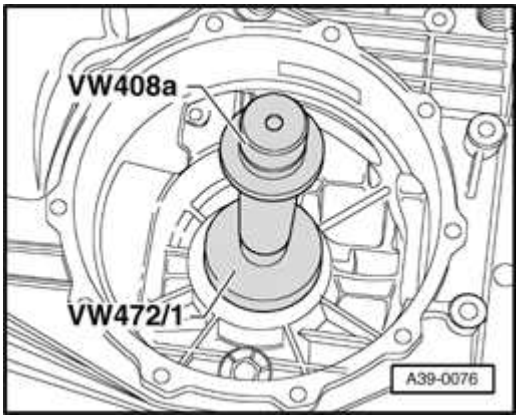


Fig. 290: Pressing Outer Race/Tapered Roller Bearing Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive outer race for small tapered roller bearing with shim "S2" into transmission housing. For measurement purposes use a 1.20 mm thick "S2*" shim (2 shims of 0.60 mm).

NOTE: For measurement purposes a shim "S2" with a thickness of 1.20 mm is initially inserted. It is referred to as "S2*" in the following. After determining the backlash "S2*" will be replaced by the correct "S2".

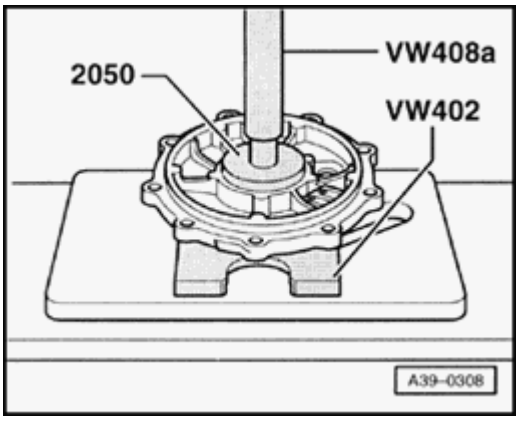


Fig. 291: Driving In Outer Race Of Tapered Roller Bearing Into Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press outer race for tapered roller bearing without shim "S1" into cover for differential.
- Insert differential without drive wheel for speedometer sensor -G22- into transmission housing.
- Install cover for differential with 4 bolts (25 Nm).
- Position transmission so that cover for differential faces up.

- Turn differential 5 turns in both directions to settle the tapered roller bearing.
- Place measuring plate VW 385/17 onto differential.

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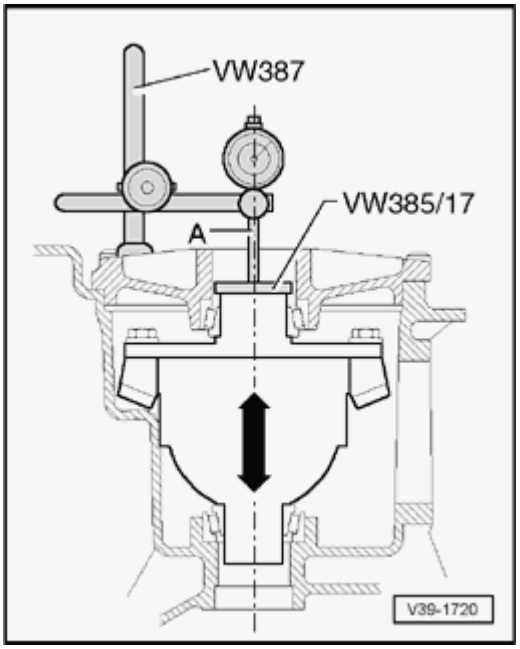


Fig. 292: Installing Magnetic Plate 50Mm Dia. VW 385/17 And Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble measuring equipment, use a 30 mm dial gauge extension.
- Set dial gauge (3 mm measuring range) to zero with 2 mm pre-load.

NOTE: The tip of the dial gauge must be positioned on center of differential.

- Lift differential without turning; read play on dial gauge and note.

- Measurement in following example: 0.62 mm

NOTE:

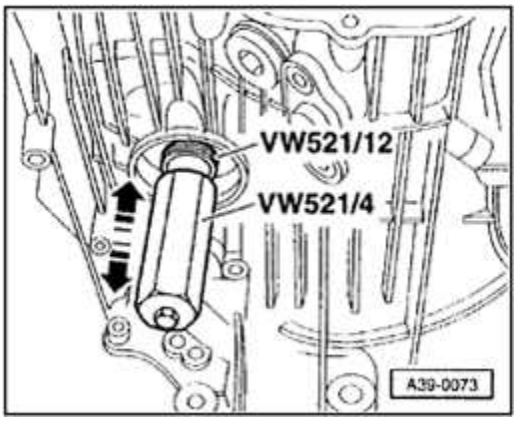


Fig. 293: Securing Special Tools VW 521/4 And VW 521/12 At Right On Differential (Housing Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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If measurement has to be repeated, differential must again be turned 5 turns in each direction to settle the tapered roller bearing.

Formula: **"Stotal"**	=	**"S2*" + measurement + bearing pre-load**

Example:		
	Inserted shim(s) "S2*"	1.20 mm
+	Measurement	0.62 mm
+	Bearing pre-load (constant)	0.30 mm
=	Total shim thickness "Stotal" for "S1" + "S2"	2.12 mm

Determining thickness of shim "S1*"

NOTE:

- **The preliminary adjustment shim "S1*" will be replaced with the final shim "S1" after determining the backlash.**
- **The total shim thickness "Stotal" remains the same.**

Formula:		
"S1*"	=	**"Stotal" - "S2*"**

Example:		
	Total shim thickness "Stotal" for "S1" + "S2"	2.12 mm
-	Inserted shim(s) "S2*"	1.20 mm
=	Thickness of shim "S1*"	0.92 mm

Measuring backlash

- Drive pinion and shims "S3*" and "S4*" installed

  - Installing differential with ring gear: S1* is installed on cover side, S2* in transmission housing.
  - Install final drive cover and tighten bolts to 25 Nm.
  - Turn differential 5 turns in both directions so that the tapered roller bearings settle.

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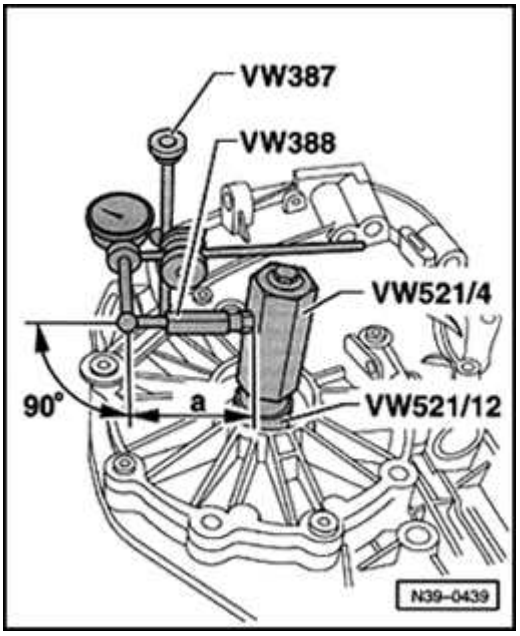


Fig. 294: Measuring Backlash
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure dial gauge holder VW 387 on housing.
- Install dial gauge with dial gauge extension VW 382/10 (6 mm flat).
- Set measuring lever VW 388 to dimension "a":

Dimension "a"	Ring gear diameter
67 mm	170 mm
72 mm	180 mm

- Measure play between teeth flanks (backlash) as follows:
- Turn ring gear until it makes contact with a tooth flank (end of backlash travel).
- Set dial gauge to "0" with 2 mm pre-load.
- Turn ring gear back until lying against an opposite tooth flank (backlash).

- Read backlash and note value.
- Turn ring gear 90 ° and repeat measurements another 3 times.

NOTE:

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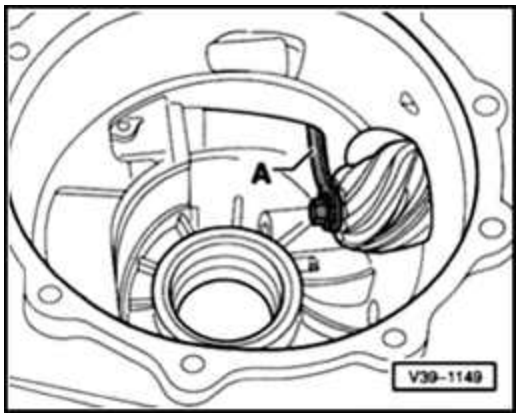


Fig. 295: Installing Clamp 3177 "A"
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If drive pinion rotates when the differential is turned, install bracket VW 3177 -A- so that backlash can be measured exactly.
- Loosen the clamp in order to turn the ring gear.
- Cut-out for large differential bevel gears must point toward drive pinion when differential is inserted.

- With holder 3177 inserted, install differential offset by 180 ° and repeat measurement.

Determining average backlash

- Add 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 divided by 4 = 0.29 mm

NOTE: If the individual measurements differ by more than 0.06 mm this means that the installation of the ring gear is not correct or that the final drive set itself is defective. Check installation, replace final drive set if necessary.

Determining thickness of shim "S2"

Formula: **"S2"**	**=**	**"S2*" - backlash + lift**

Example:	

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	Inserted shim "S2*"	1.20 mm
-	Average backlash	0.29 mm
+	Lift (constant)	0.15 mm
=	Thickness of shim "S2"	1.06 mm

- Determine shim(s) as accurately as possible from table. Part numbers

The following shims are available for "S2"

Shim thickness (mm) 1)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

Determining thickness of shim "S1"

Formula: **"S1"**	=	**"Stotal" - "S2"**

Example:		
	Total shim thickness "Stotal" for "S1" + "S2"	2.12 mm
-	Thickness of shim "S2"	1.06 mm
=	Thickness of shim "S1"	1.06 mm

- Determine shim(s) as accurately as possible from table. Part numbers

The following shims are available for "S1"

Shim thickness (mm) 1)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

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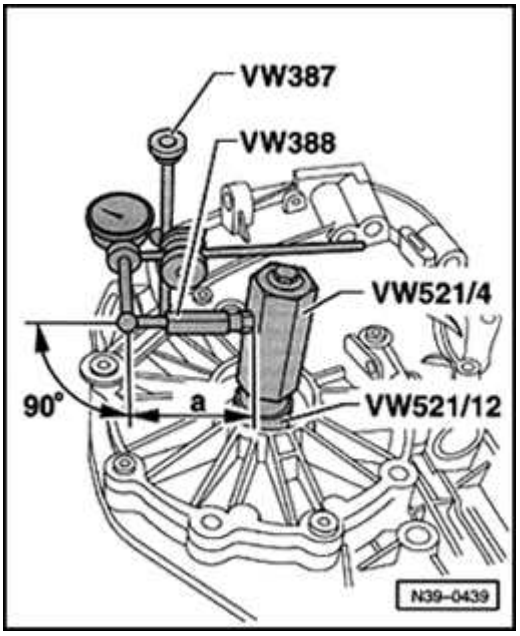


Fig. 296: Measuring Backlash
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Performing check measurement

- After installing shims "S1" and "S2", turn differential 5 turns in both directions so that tapered roller bearings settle.
- Measure backlash four times on circumference.

- Specification: 0.12... 0.22 mm

NOTE:

- **If the backlash is beyond the tolerance, the adjustments must be repeated. The total shim thickness "Stotal" must not be changed when the adjustment is repeated.**
- **The individual measurements must not differ by more than 0.06 mm from each other.**

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34 MANUAL TRANSMISSION - CONTROLS, HOUSING

SHIFT MECHANISM, SERVICING

Shift mechanism, servicing

NOTE: Before working on the selector mechanism, disconnect the Ground strap from the battery in the engine compartment.

CAUTION: Before beginning repairs on the electrical system:

- **Obtain the anti-theft radio security code.**
- **Switch the ignition off.**
- **Disconnect the battery Ground (GND) strap.**
- **On vehicles equipped with Audi Telematics by OnStar ® , switch-off the emergency (back-up) battery for the Telematic/Telephone Control Module prior to disconnecting vehicle battery. Refer to**
  - **91 - COMMUNICATION**
  - **91 RADIO, TELEPHONE, NAVIGATION, TRIP COMPUTER for Cabriolet**

  .
- **After reconnecting vehicle battery, re-code and check operation of anti-theft radio. Also check operation of clock and power windows according to article and/or Owner's Manual.**
- **After reconnecting vehicle battery on vehicles equipped with Audi Telematics by OnStar ® , switch-on the emergency (back-up) battery for the Telematic/Telephone Control Module. Refer to**
  - **91 - COMMUNICATION**
  - **91 RADIO, TELEPHONE, NAVIGATION, TRIP COMPUTER for Cabriolet**

  .

Installation position of gear selector mechanism

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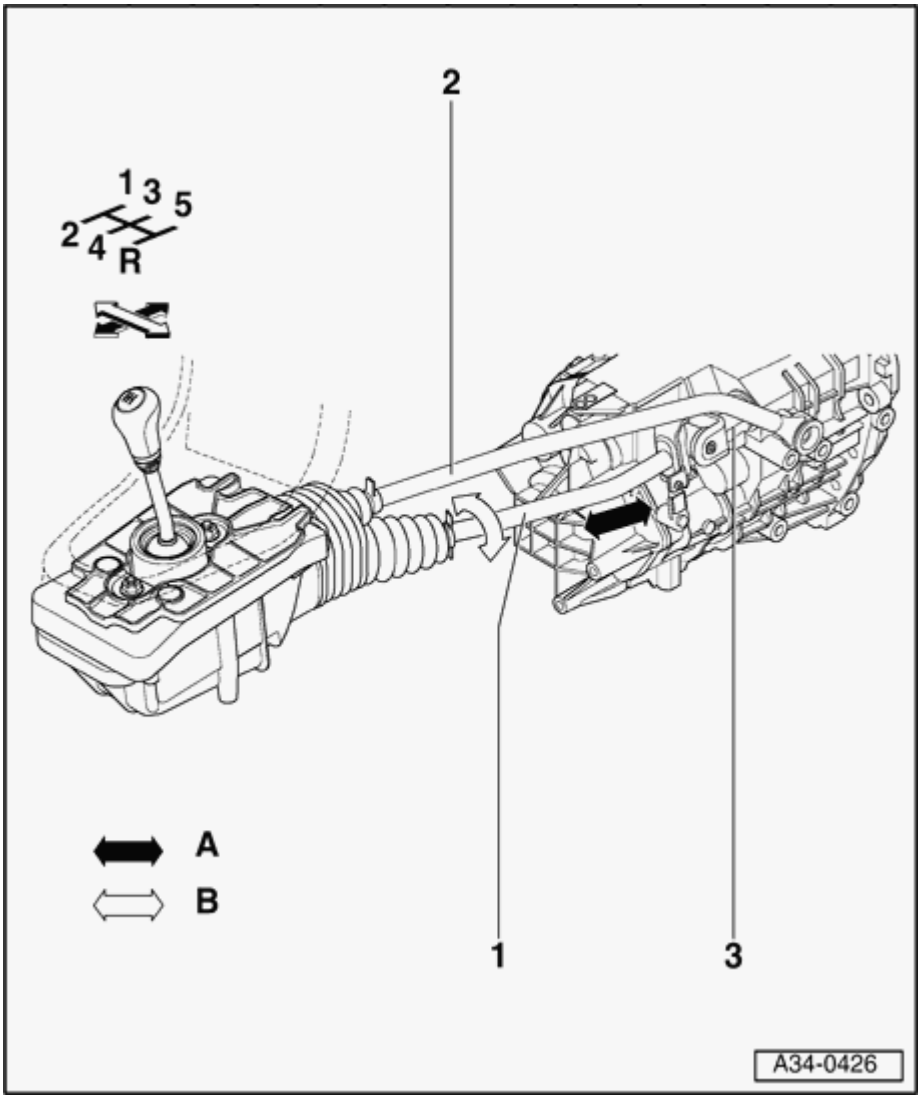


Fig. 51: Installation Position Of Gear Selector Mechanism
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector rod

2 - Front push rod

3 - Gear selector lever

Arrow -A- Gear selection movement

Arrow -B- Gate selection movement

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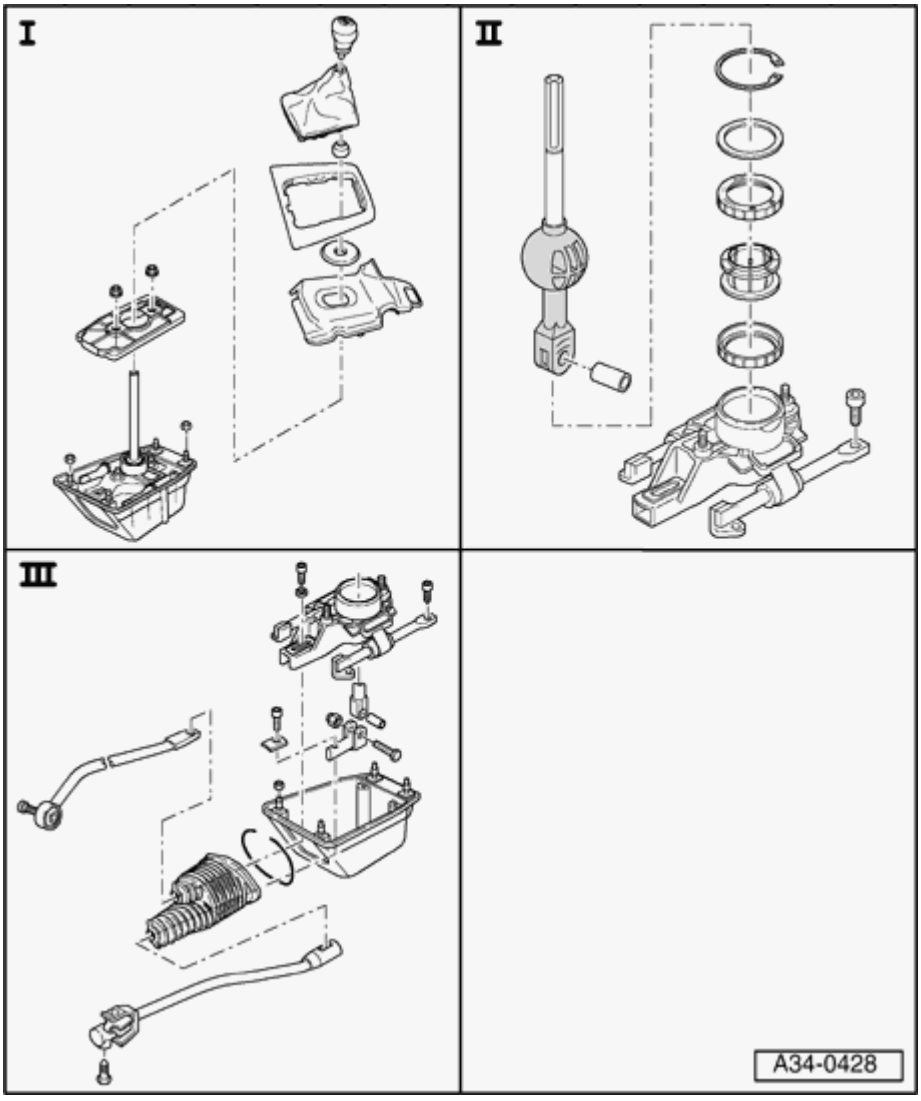


Fig. 52: Shift Lever Knob And Protective Boot Remove/Install Components, Shift Lever And - Rear Push Rod And Shift Lever And - Front Push Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - Removing and installing shift lever knob and protective boot. Refer to Shift lever knob and protective boot, removing and installing

II - Servicing shift lever and - rear push rod. Refer to Shift lever and rear push rod, servicing

III - Servicing shift lever and - front push rod. Refer to Selector rod and front push rod, servicing

Removing and installing selector mechanism. Refer to **Shift mechanism, removing and installing**

Adjusting gear selector mechanism. Refer to **Shift mechanism, adjusting**

Shift lever knob and protective boot, removing and installing

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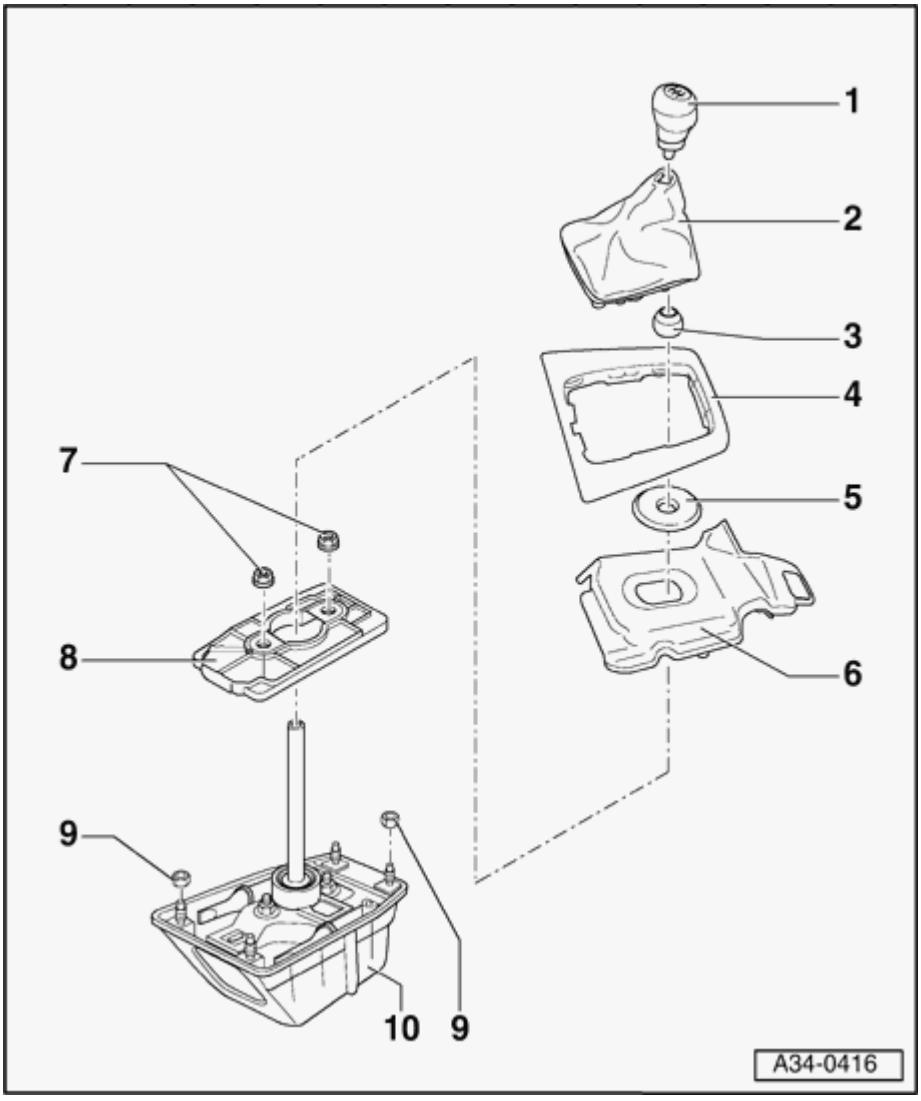


Fig. 53: Shift Lever Knob And Protective Boot Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Shift lever knob

- Remove and install together with protective boot
- Removing. Refer to **Fig. 57**

2 - Protective boot

- Remove and install together with shift lever knob
- Removing. Refer to **Fig. 57**

3 - Connector piece

- For locking shift lever knob to shift lever

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- Opening catch. Refer to **Fig. 58**
- Connects protective boot to shift lever knob

4 - Cover for center console

- Removing and installing. Refer to **Fig. 57**

5 - Damping washer

- Installation position: Convex side upward

6 - Noise insulation

- Installation position: Arrow on noise insulation points in direction of travel

7 - Hex nut, 10 Nm

8 - Noise insulation

9 - Hex nut, 10 Nm

10 - Shift lever

- Removing and installing. Refer to **Shift mechanism, removing and installing**

Shift lever and rear push rod, servicing

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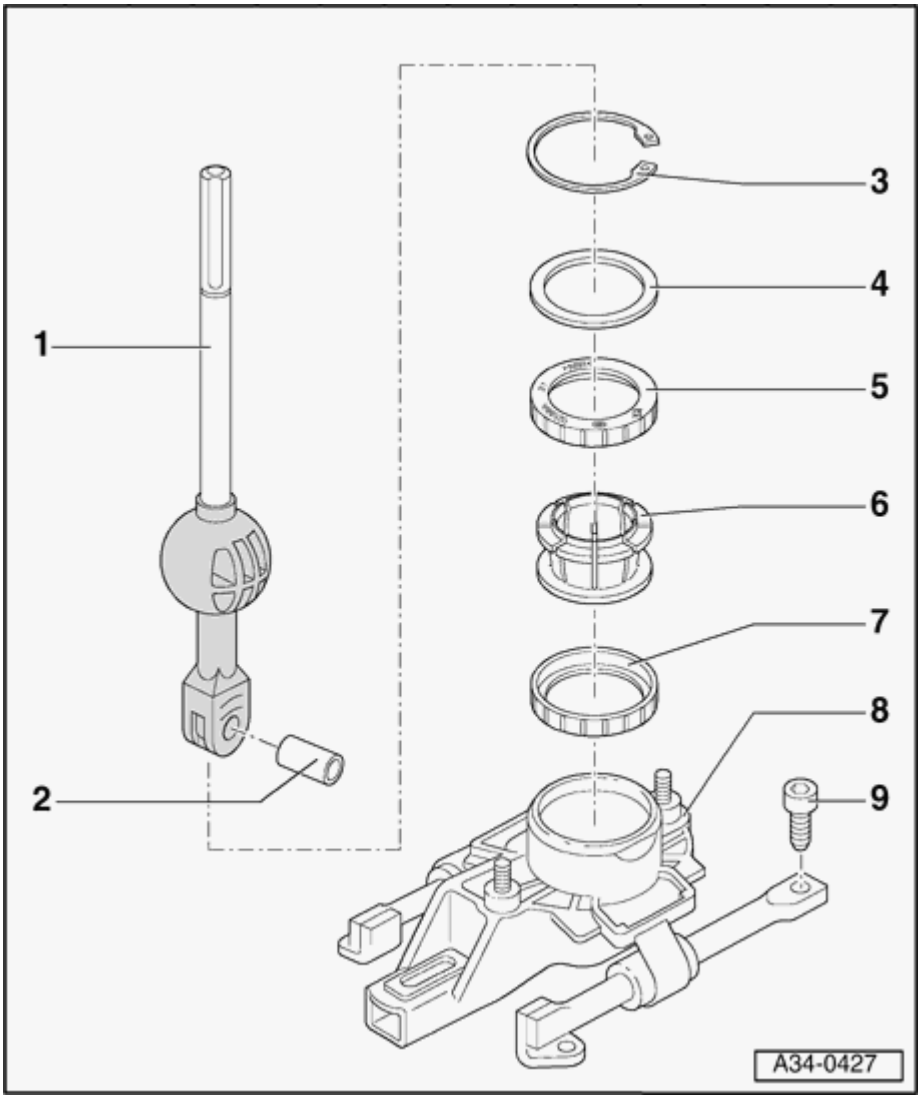


Fig. 54: Shift Lever And Rear Push Rod Remove/Install Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: Lubricate mountings and sliding surfaces with polycarbamide grease, part no. G 052 142 A2.

1 - Shift lever

- Lubricate area around bottom hole with G 052 142 A2
- Lubricate ball with G 052 142 A2 polycarbamide grease

2 - Spacer tube

- Lubricate with G 052 142 A2 polycarbamide grease

3 - Circlip

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- Always replace

4 - Washer

- Collar faces ball guide (item 6 **Shift lever and rear push rod, servicing**)

5 - Rubber ring

6 - Ball guide

- Removing and installing. Refer to **Shift lever with rear push rod, removing and installing**

7 - Rubber ring

8 - Rear push rod

- With ball housing
- Removing and installing. Refer to **Shift lever with rear push rod, removing and installing**

9 - Bolt, 6 Nm

- Qty. 4
- For rear push rod - to shift lever housing

Selector rod and front push rod, servicing

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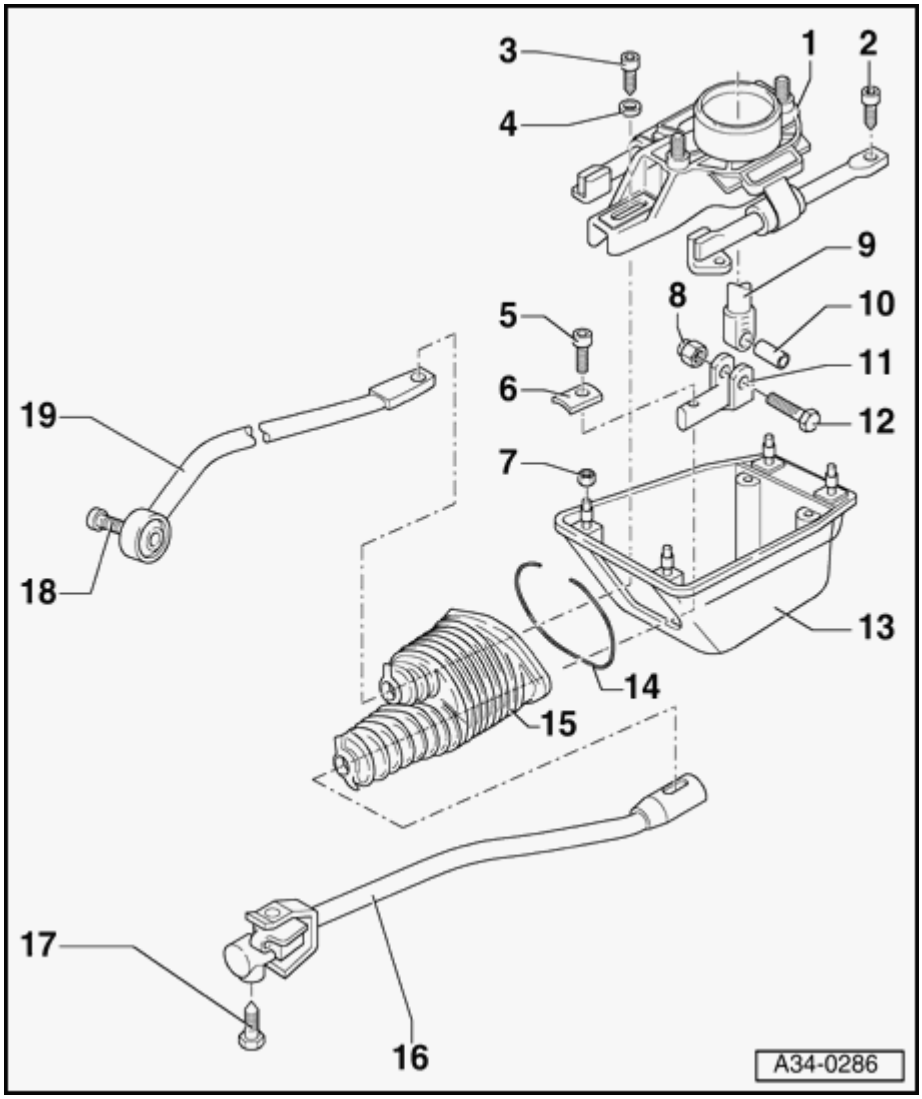


Fig. 55: Shift Rod And Pivot Rod, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Rear push rod

2 - Bolt, 6 Nm

- Qty. 4
- For rear push rod - to shift lever housing

3 - Hex socket-head bolt, 25 Nm

4 - Washer

5 - Hex socket-head bolt, 25 Nm

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6 - Clamp

7 - Hex nut, 10 Nm

- Qty. 4
- For shift lever housing to body

8 - Hex nut, 10 Nm

- Self-locking
- Always replace

9 - Shift lever

10 - Spacer tube

- Lubricate with G 052 142 A2 polycarbamide grease

11 - Selector fork

12 - Bolt

13 - Shift lever housing

14 - Tensioning ring

15 - Bellows

- Remove catalytic converter and front heat shield before removing and installing

NOTE:

- **Carefully pull boot over selector rod**
- **Place boot on markings of selector rod and push rod**

16 - Selector rod

- With selector joint

17 - Bolt, 23 Nm

- Self-locking
- Always replace

18 - Hex socket-head bolt, 40 Nm

- Cannot be removed from bearing bushing on front push rod

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19 - Front push rod

Shift lever with rear push rod, removing and installing

Removing

NOTE: The shift lever knob is removed together with shift lever cover and cover for center console.

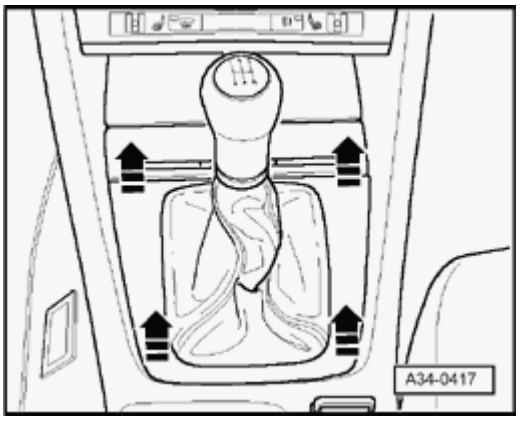


Fig. 56: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift cover for center console upward -arrows-.

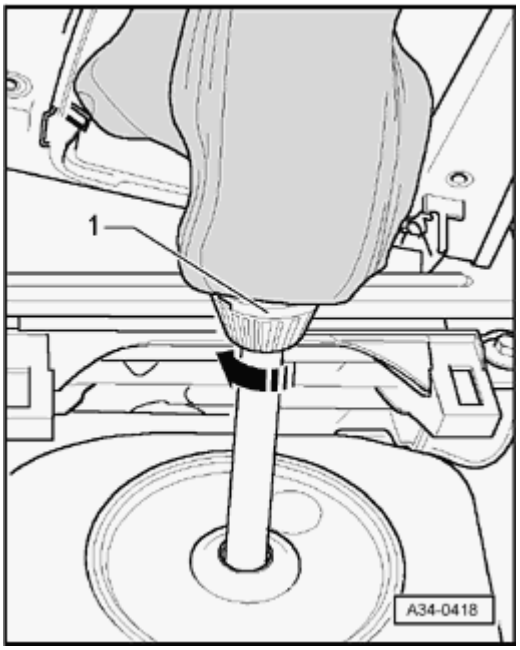


Fig. 57: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Release connector piece -1- in direction of arrow and pull off shift lever knob together with shift lever cover upward.

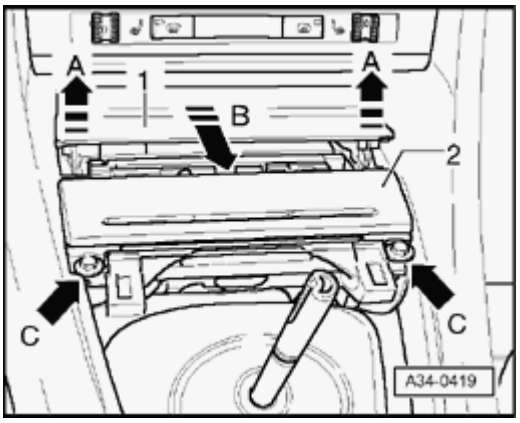


Fig. 58: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift cover off -1- first in direction of arrow -A- and then pull out in direction of arrow -B-.
- Remove bolts -arrows C- and then pull ashtray -2- from center console

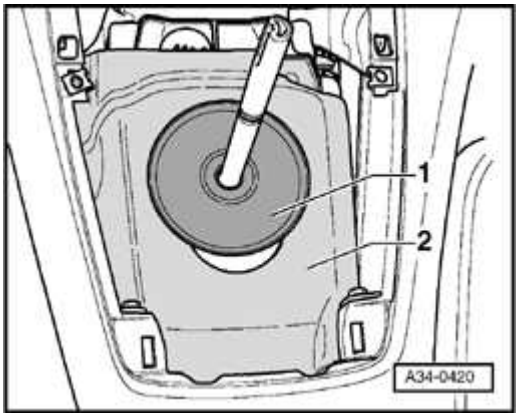


Fig. 59: Lifting Out Damping Washer And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift out damping washer -1- and noise insulation -2-.

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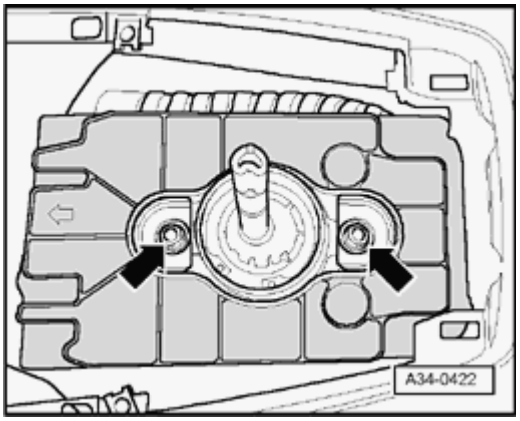


Fig. 60: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation for shift lever housing -arrows-.

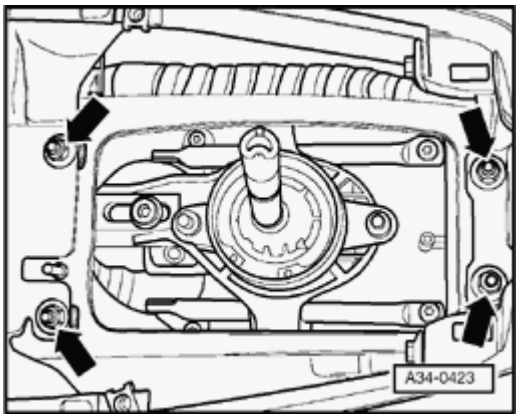
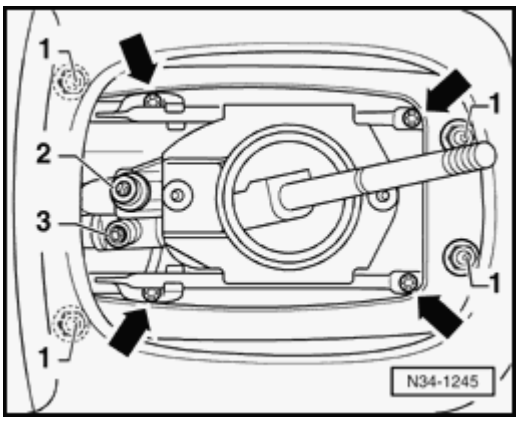


Fig. 61: Locating Securing Nuts For Shift Lever Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove securing nuts -arrows- for shift lever housing.

This lowers the shift lever housing.



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Fig. 62: Shift Mechanism Housing Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach push rod, by removing hex socket -head bolt -2-.
- Remove selector rod, by removing hex socket -head bolt -3-.
- Detach complete rear push rod - from shift lever housing -arrows-.
- Remove shift lever with rear push rod - from shift lever housing.

Installing

Installation is carried out in the reverse order of removal, note the following:

- Adjust gear selector mechanism. Refer to **Shift mechanism, adjusting**.

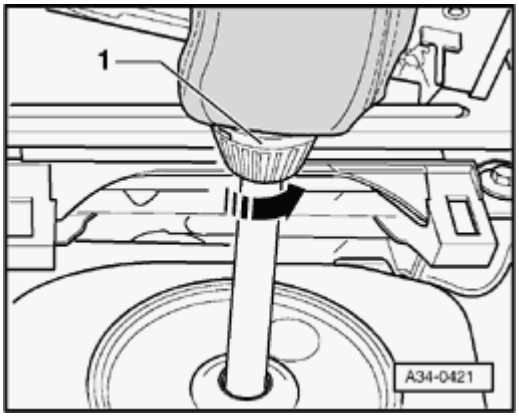


Fig. 63: Turning Connector Piece Till It Stops
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place shift lever knob together with shift lever cover onto shift lever and turn connector piece -1- in direction of arrow till it stops.

Tightening torques

Rear push rod - to shift lever housing	6 Nm
Selector rod to selector fork/shift lever	25 Nm
Front push rod to rear push rod	25 Nm
Shift lever housing to body	10 Nm
Cover to rear push rod	10 Nm

Shift mechanism, removing and installing

Removing

NOTE: The shift lever knob is removed with shift lever cover and cover for center

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console.

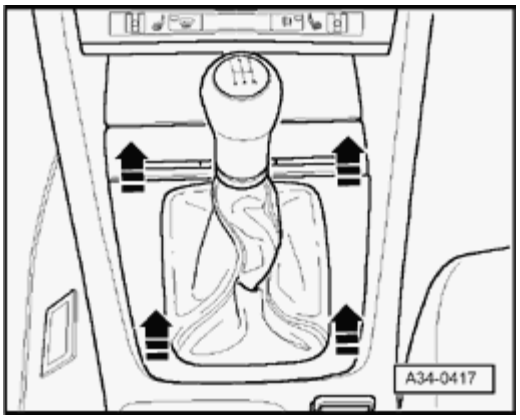


Fig. 64: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift off cover for center console upward -arrows-.

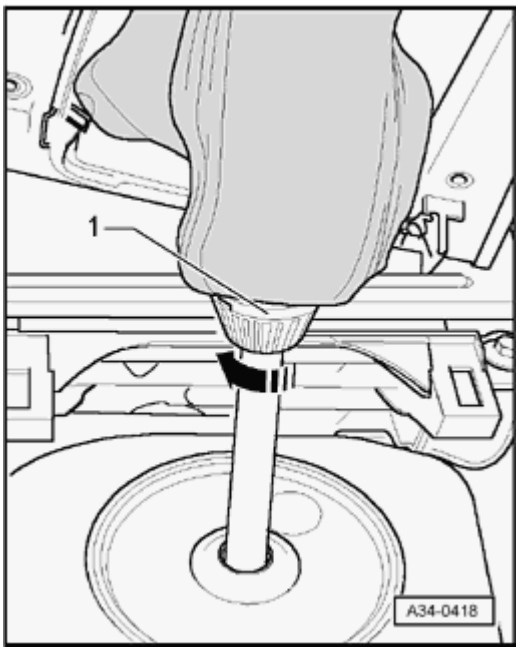


Fig. 65: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release connector piece -1- in direction of arrow and pull off shift lever knob together with shift lever cover upward.

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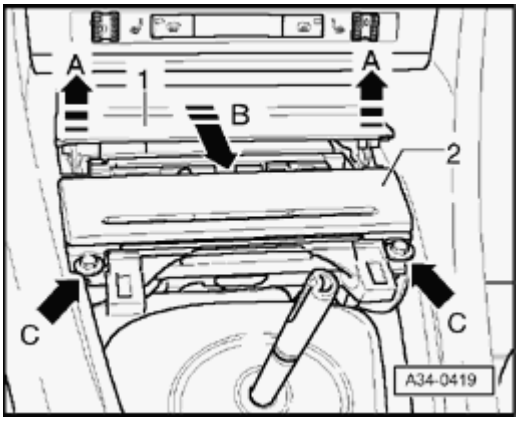


Fig. 66: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift cover off -1- first in direction of arrow -A- and then pull out in direction of arrow -B-.
- Remove bolts -arrows C- and then pull ashtray -2- from center console

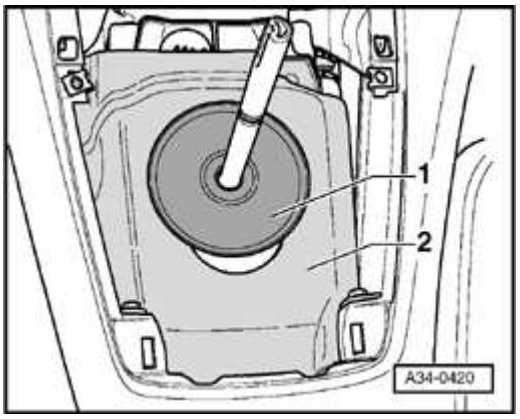


Fig. 67: Lifting Out Damping Washer And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift out damping washer -1- and noise insulation -2-.

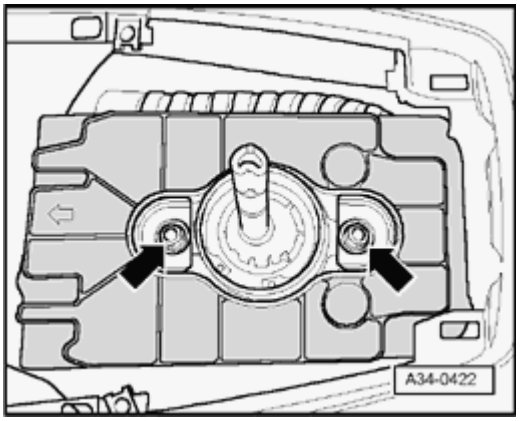


Fig. 68: Locating Noise Insulation For Shift Lever Housing Bolts

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation for shift lever housing -arrows-.

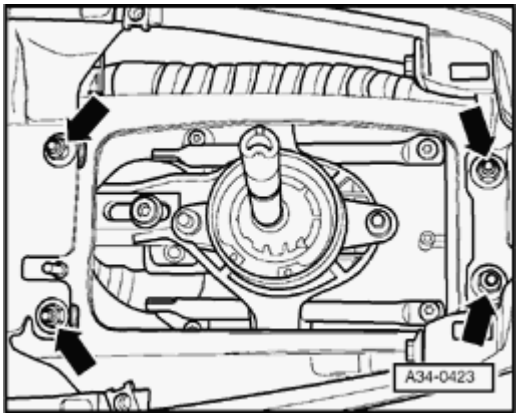


Fig. 69: Locating Securing Nuts For Shift Lever Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove securing nuts for shift lever housing -arrows-.

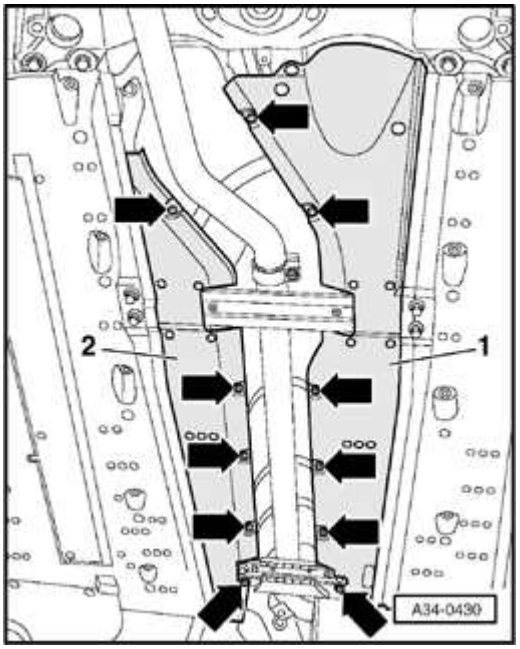


Fig. 70: Locating Covers Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts -arrows- and detach covers -1- and -2-.

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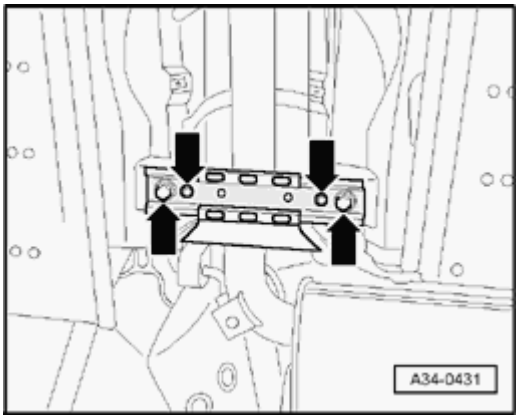


Fig. 71: Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear cross member -arrows-.

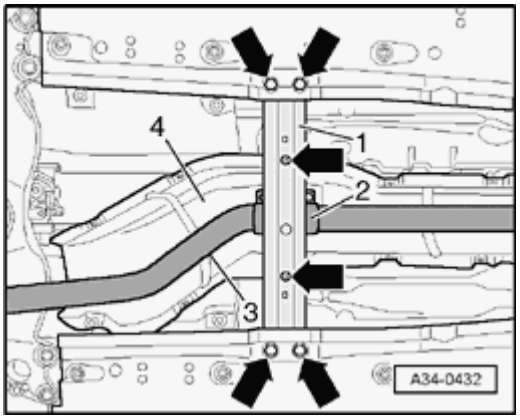


Fig. 72: Rear Section Of Exhaust System And Front Cross Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front cross member -1- -arrows-.
- Remove rear section of exhaust system (rearward of exhaust pipe clamp(s) -2-:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

- Remove heat shield -4- above exhaust system.

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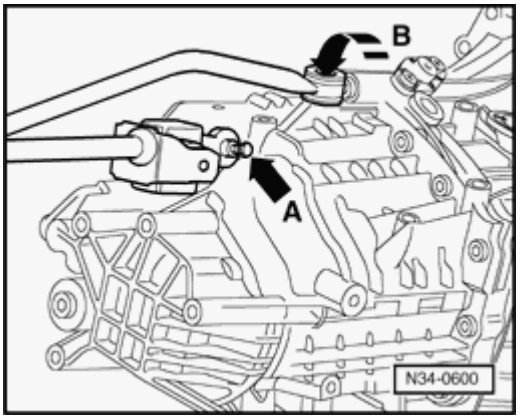


Fig. 73: Identifying Transmission Shift And Pivot Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove selector rod -arrow A-.
- Remove hex socket-head bolt of push rod -arrow B-.
- Swivel shift lever housing with selector rod and push rod downward and remove.

Installing

Installation is carried out in the reverse order.

- Push selector rod on so the securing bolt fits in the recess of the selector shaft.

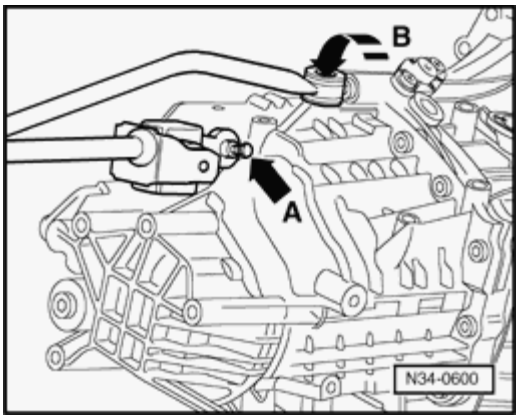


Fig. 74: Identifying Transmission Shift And Pivot Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten screw selector rod (arrow -A-).
- Push rod must be screwed to transmission (arrow -B-).
- Align exhaust system stress-free:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

- Adjust gear selector mechanism. Refer to **Shift mechanism, adjusting**.

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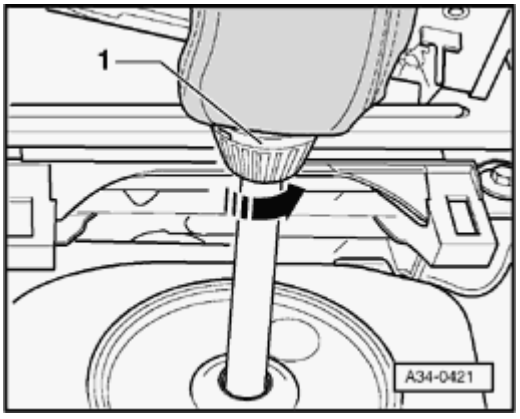


Fig. 75: Turning Connector Piece Till It Stops
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place shift lever knob together with shift lever cover onto shift lever and turn connector piece -1- in direction of arrow as far as stop.

Tightening torques

Component		Nm
Shift lever housing to body		10
Selector rod to transmission		23
Push rod to transmission		40
Clamp for exhaust pipe		40
Front cross member		55
Rear cross member		55
Noise insulation for shift lever housing to rear push rod		10 Nm

Shift mechanism, adjusting

NOTE: The following are prerequisites for correct shift linkage adjustment:

- Perfect shift linkage operating and transfer elements.
- Shift selector mechanism moves smoothly.
- Transmission, clutch and clutch mechanism must be in good condition.
- Transmission in neutral.

Removing

NOTE: Remove the shift lever knob with shift lever cover and cover for center console.

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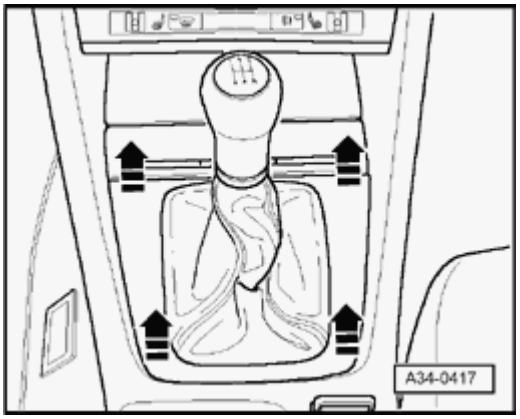


Fig. 76: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift off cover for center console upward -arrows-.

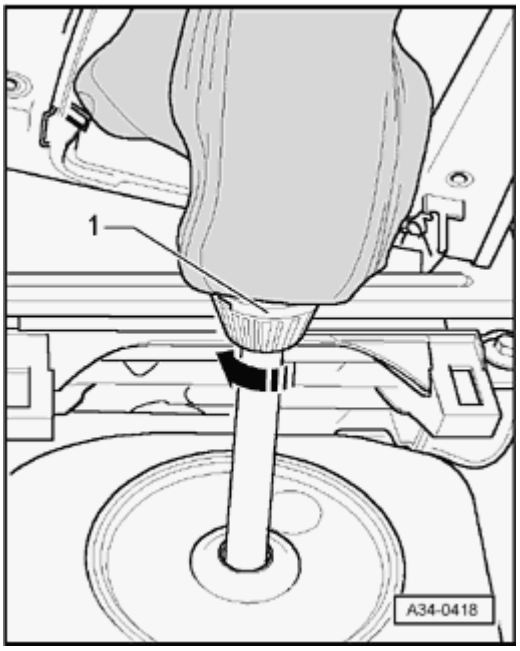


Fig. 77: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release connector piece -1- in direction of arrow and pull off shift lever knob together with shift lever cover upward.

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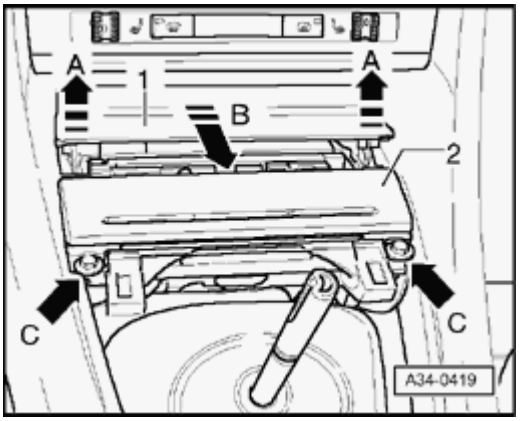


Fig. 78: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift off trim -1- first in direction of arrow -A- and then pull out in direction of arrow -B-.
- Remove bolts -arrows C- and then pull ashtray -2- from center console

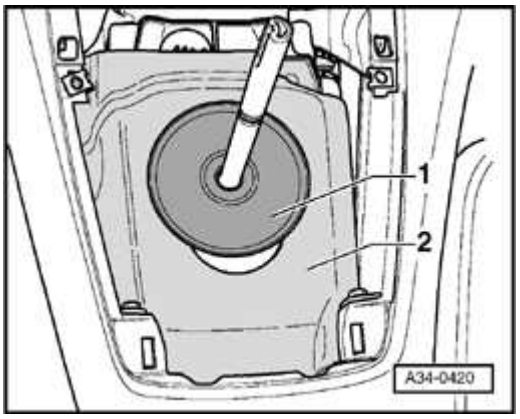


Fig. 79: Lifting Out Damping Washer And Noise Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift up damping washer -1- and noise insulation -2- upward.

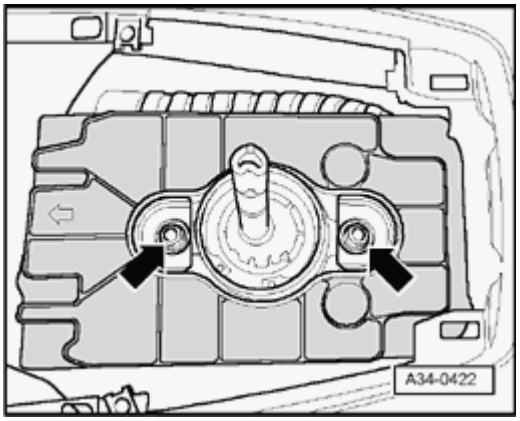


Fig. 80: Locating Noise Insulation For Shift Lever Housing Bolts

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation from shift lever housing -arrows-.
- Measure distance -a- between the two studs in shift mechanism

NOTE: Measurement is from center of stud to center of stud.

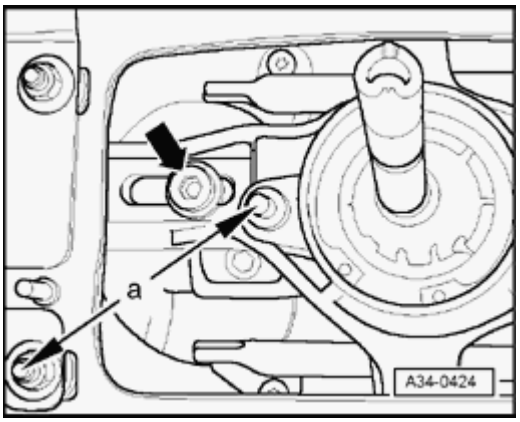


Fig. 81: Shift Mechanism Measurement And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Specification: Dimension a = 85 mm

- In case of deviation, adjust distance -a- as follows:
- Loosen bolt (arrow) for push rod.

- The rear push rod (in shift mechanism) must move back and forth easily on slide.

- Adjust measurement -a- by moving rear push rod (in shift mechanism).
- Tighten bolts for push rod -arrow- to 25 Nm.

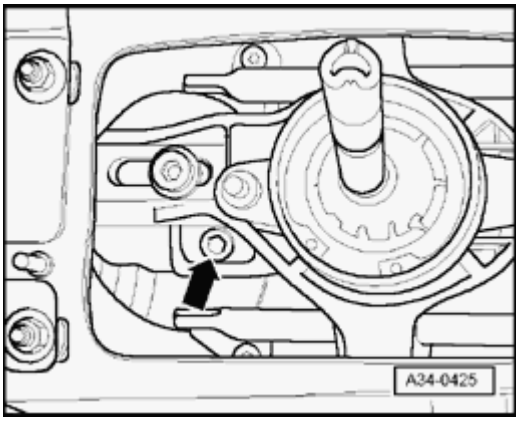


Fig. 82: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove bolts for selector rod -arrow-.

- The selector rod and shift mechanism connection must move freely

Align shift lever as follows:

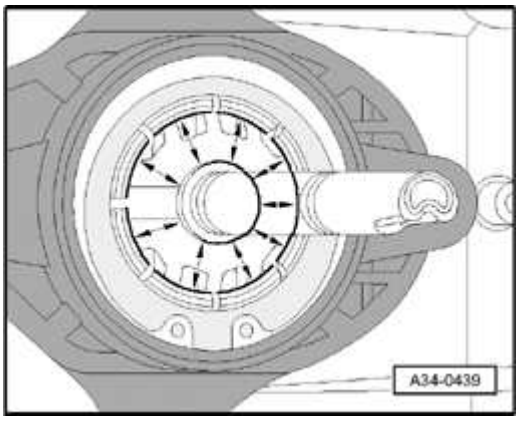


Fig. 83: Centering Bottom Of Shift Lever Centered In Ball Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Center bottom of shift lever centered in ball housing.

- The distance from ball housing to bottom of shift lever -arrows- must be same at all points.
- Shift lever stands vertical in direction of travel.

- Hold shift lever in this position.

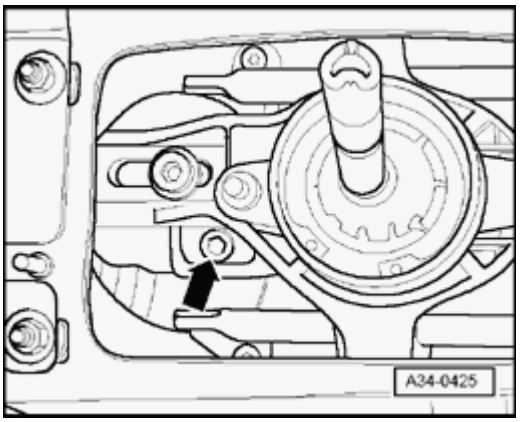


Fig. 84: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten bolt for selector rod -arrow- to 25 Nm.

NOTE: The shift lever must remain in the same position while the bolt is being tightened.

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- Install covers and shift lever knob.

Shift lever alignment, checking

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

- Depress clutch.
- Check that all gears can be engaged.

- The shift lever must not make contact with cover for center console when selecting gears.
- The shift lever should return by itself from the 5th/reverse gear gate into the 3rd/4th gear gate.
- It should only be possible to engage reverse gear from neutral when shift lever is in 3rd/4th gear gate.
- It must be impossible to change from 5th gear directly into reverse gear.

NOTE: If only 5th and reverse gear cannot be engaged, the 5th and reverse gear locking module must be checked and replaced. Refer to Removing and installing locking module for 5th gear and reverse gear.

TRANSMISSION, REMOVING AND INSTALLING

Transmission, removing and installing

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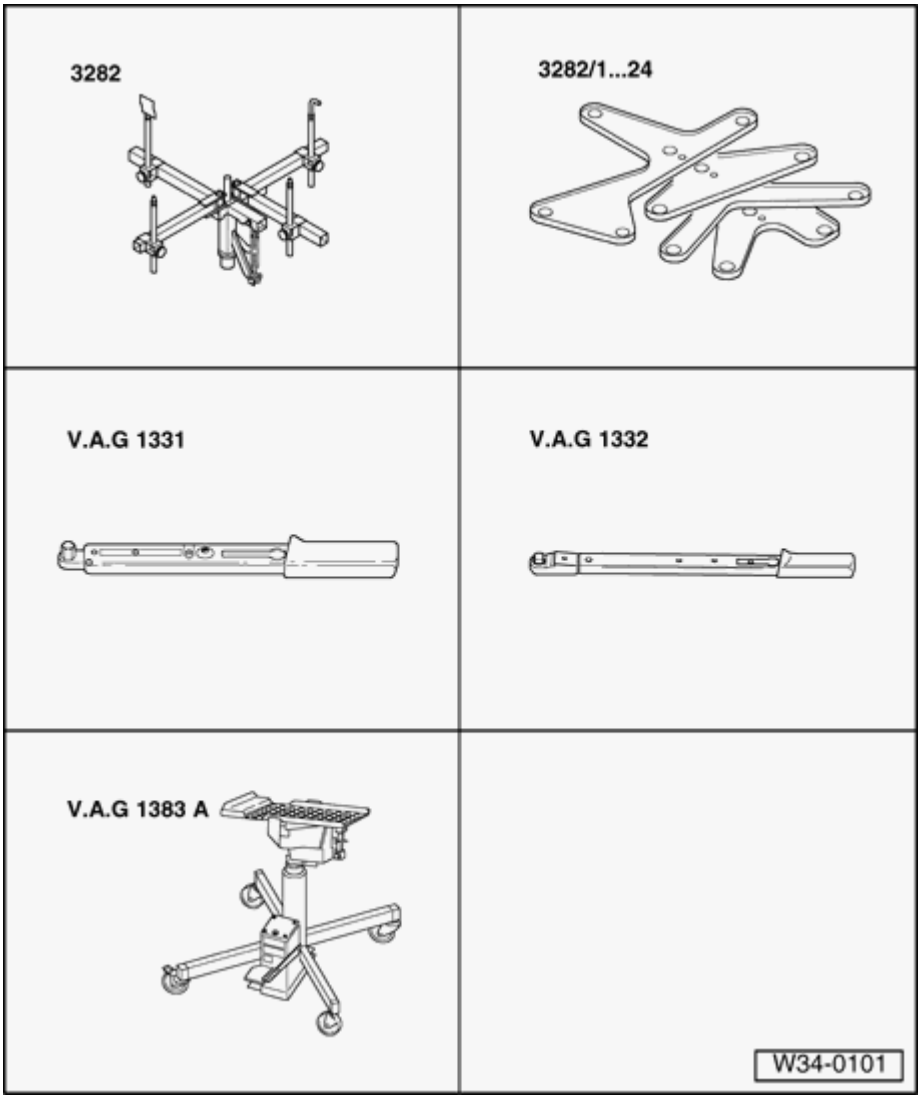


Fig. 85: Identifying Special Tools - Transmission, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- 3282 Transmission support
- 3282/10 Adjustment plate
- VAG 1331 Torque wrench
- VAG 1332 Torque wrench
- VAG 1383 A Engine/transmission lifter

Special tools and workshop equipment required

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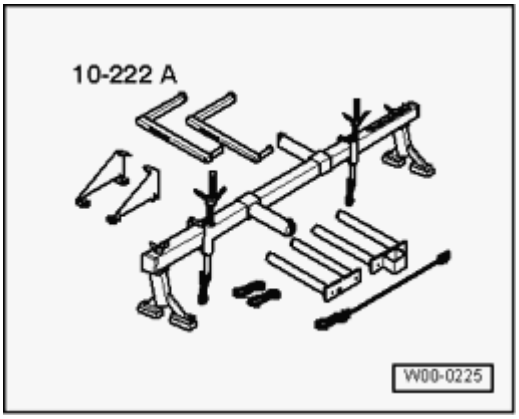


Fig. 86: Identifying 10-222A Engine Support Bridge With 10-222A/8 Bracket For Engine
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 10-222A Engine support bridge

Removing

- Read battery CAUTION! note. Refer to **Shift mechanism, servicing**.
- Note or obtain radio code on vehicles with coded radio.
- Disconnect battery ground strap with the ignition switched off.

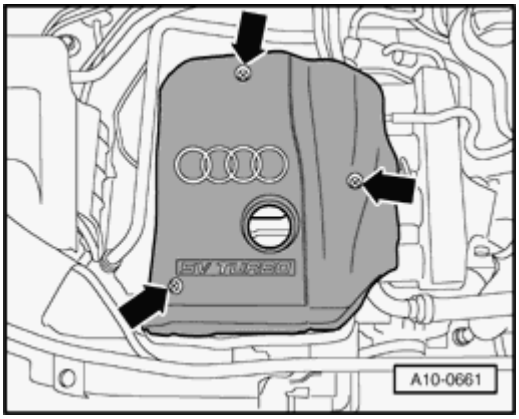


Fig. 87: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover (arrows).

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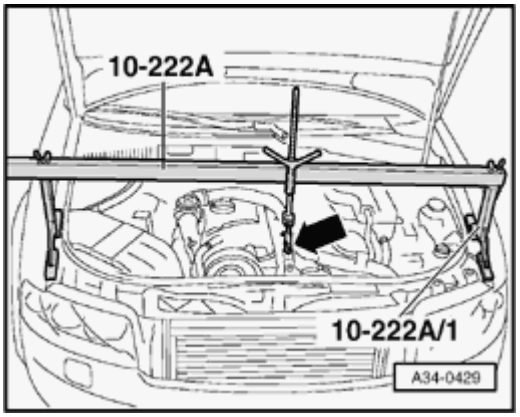


Fig. 88: Support Bar 10-222 A With Supports 10-222 A/1 Installed On Engine
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fit support bar 10-222 A with supports 10-222 A/1.
- Tighten engine slightly using the spindles.

All models:

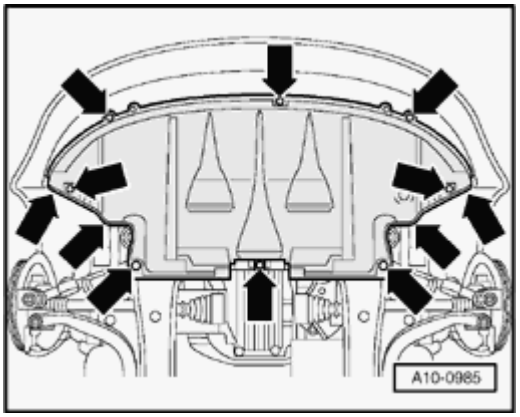


Fig. 89: Removing Sound Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach noise insulation -arrows-.

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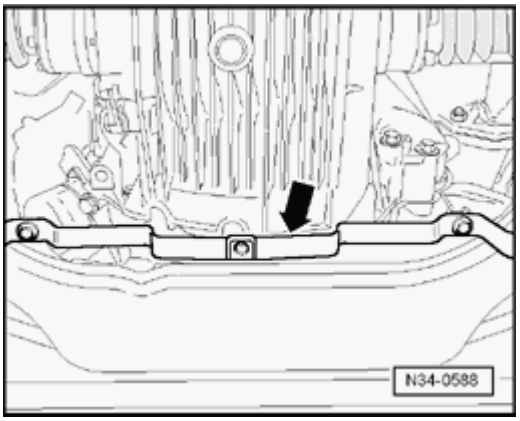


Fig. 90: Removing Noise Insulation Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bracket for noise insulation -arrow-.

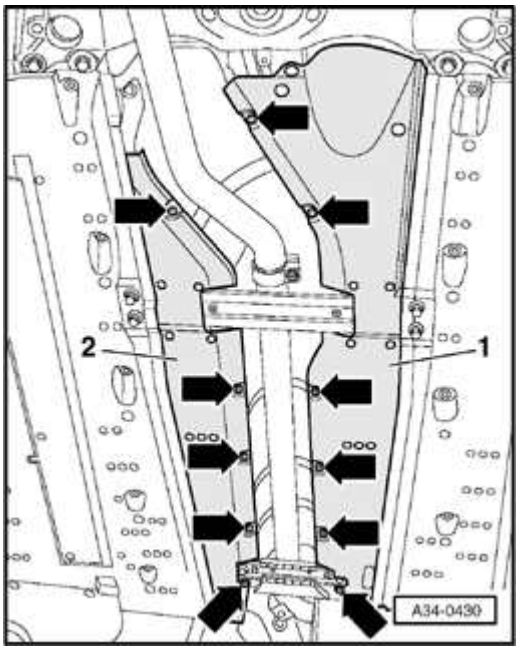


Fig. 91: Locating Covers Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts -arrows- and detach covers -1- and -2-.

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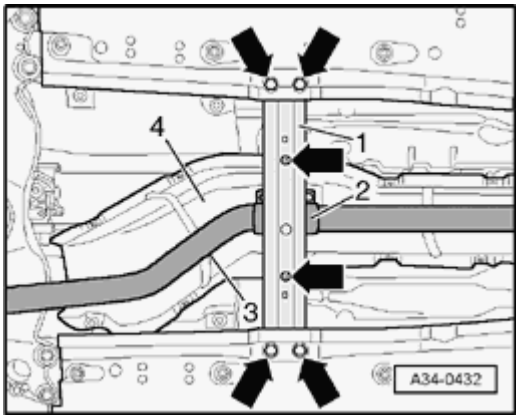


Fig. 92: Rear Section Of Exhaust System And Front Cross Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove tunnel cross member -1- -arrows-.

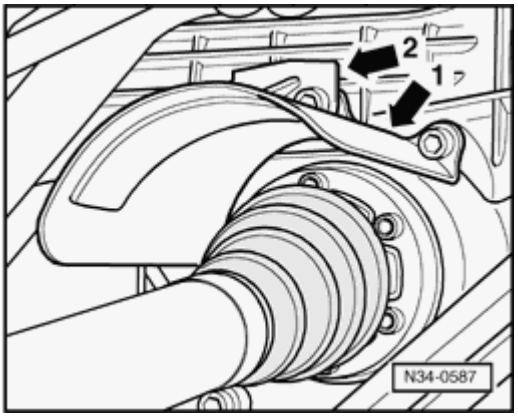


Fig. 93: Detaching Heat Shields And Right-Hand Axle Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts -arrow 1- and -arrow 2- above the right drive shaft and remove heat shield.
- If installed, remove heat shield above the left drive shaft.

Vehicles with 4-cylinder engine:

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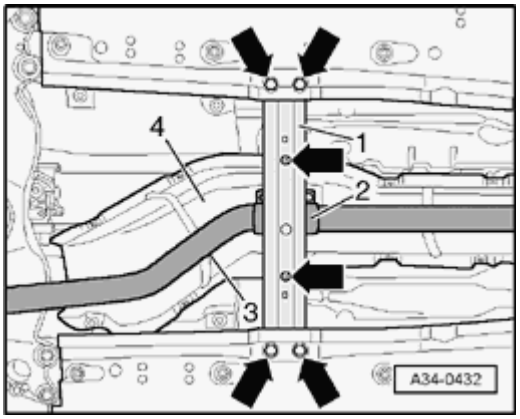


Fig. 94: Rear Section Of Exhaust System And Front Cross Member
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front exhaust pipe -3- from clamp -2- on:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

Vehicles with 6-cylinder engine:

- Remove front exhaust system with catalytic converter:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

Continued for all models:

- Remove heat shield -4- above exhaust system.

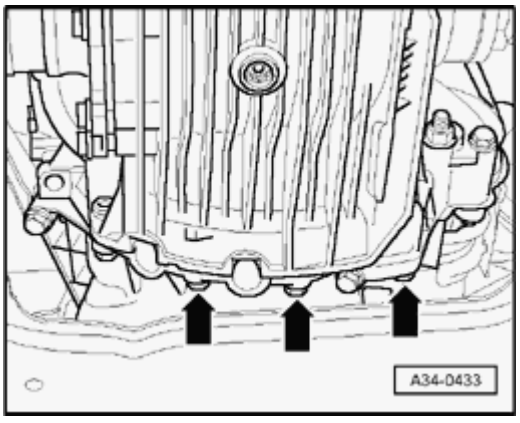


Fig. 95: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the three lower engine and transmission connecting bolts -arrow-.

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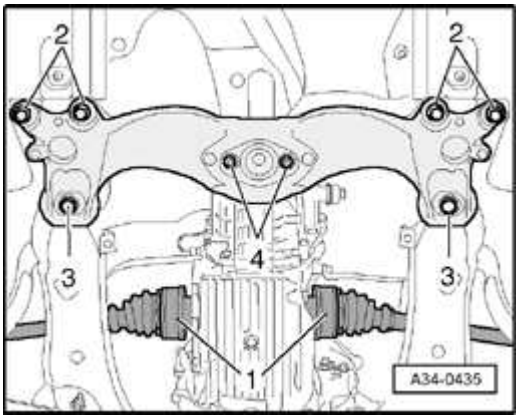


Fig. 96: Drive Shafts And Flange Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the drive shafts -1- from the flange shafts and tie these up.

NOTE: Do not damage protective coating on drive shafts.

- Support transmission with engine and transmission lifter VAG 1383 A.

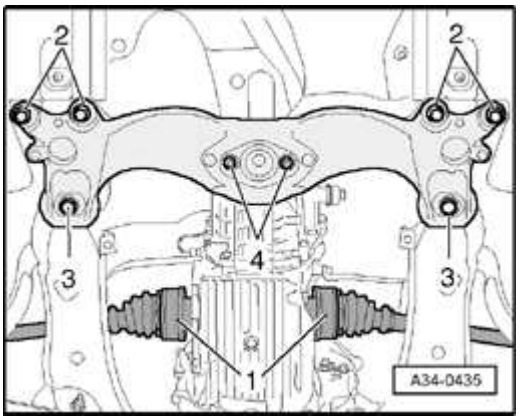


Fig. 97: Drive Shafts And Flange Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts -2- and then bolts -3- on tunnel cross member.
- Remove the two nuts -4- and detach tunnel cross member -2-.
- Lower engine and transmission lifter VAG 1383 A and place to one side.

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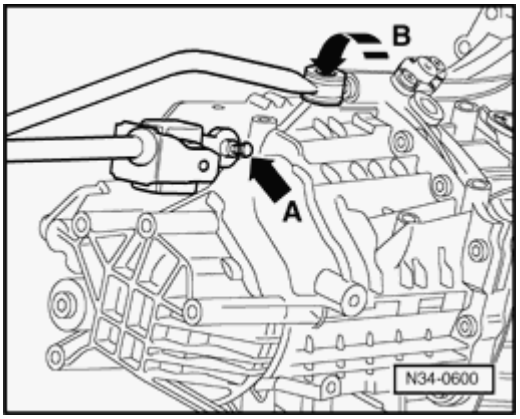


Fig. 98: Identifying Transmission Shift And Pivot Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove selector rod -arrow A-.
- Remove hex socket-head bolt on push rod -arrow B-.

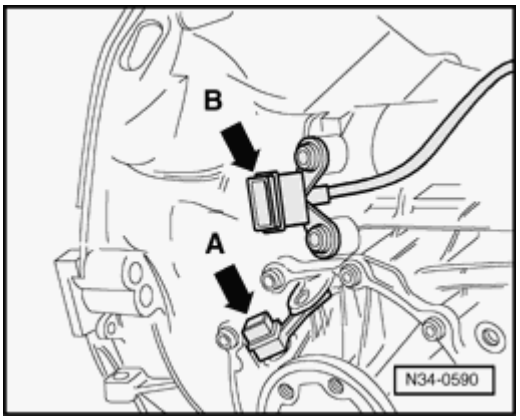


Fig. 99: Identifying Connectors For Vehicle Speed Sensor (VSS) And Back-Up Lights
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector off speedometer sensor -arrow A-.
- Disconnect connector on reversing light switch (multi-function sensor) -arrow B-.
- Disconnect all other electrical connections and ground wires from transmission and from the engine and transmission securing bolts.

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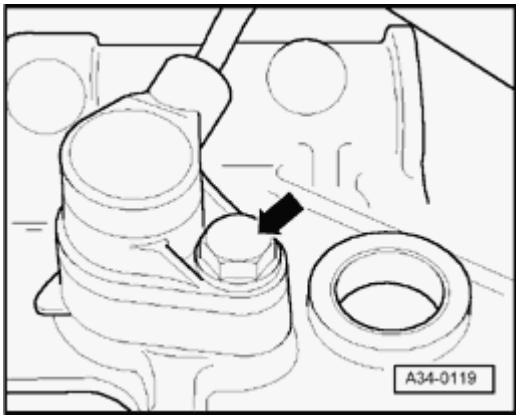


Fig. 100: Location Of Engine Speed (RPM) Sensor G28 On Coupling Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove engine speed (RPM) sensor -G28- on left of transmission -arrow- and lay to one side.

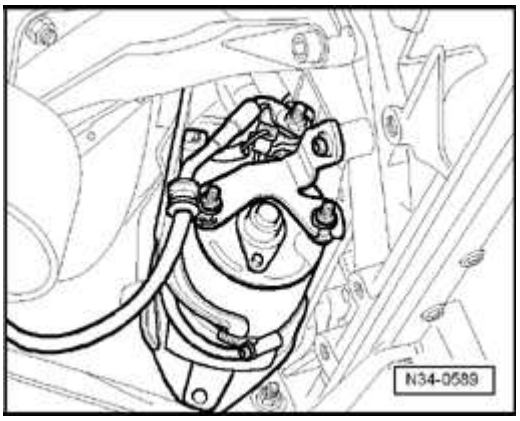


Fig. 101: Removing Starter Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove starter from engine and transmission and secure.

Refer to **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**

NOTE: Do not disconnect starter cables.

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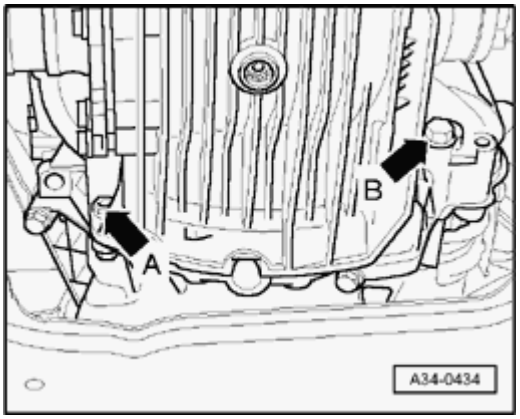


Fig. 102: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove lower engine and transmission connecting bolts, except for bolts -arrow A- and -arrow B-.

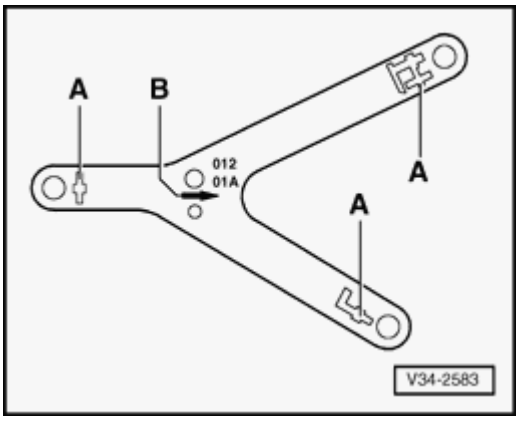


Fig. 103: Transmission Support 3282 Attachment Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set the transmission support 3282 for removing the manual 012 with adjustment plate 3282/10 and attach to transmission lifter VAG 1383 A.

A - Support elements

NOTE:

- **Support elements -A- are shown in schematic form, arrow -B- points in direction of travel.**
- **Adjustment plate 3282/10 only fits in one position.**

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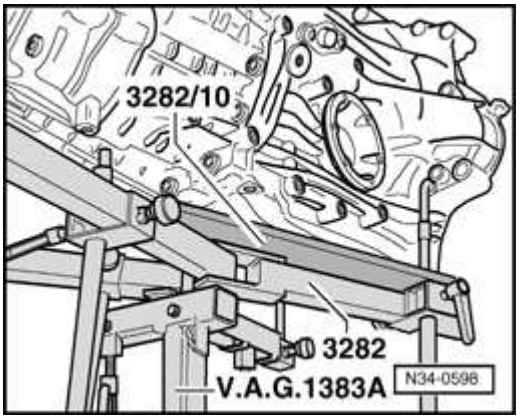


Fig. 104: Setting Transmission Jack Under Vehicle
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place transmission lifter under vehicle. Arrow -B- (See **Fig. 103**) on adjustment plate points in direction of travel.

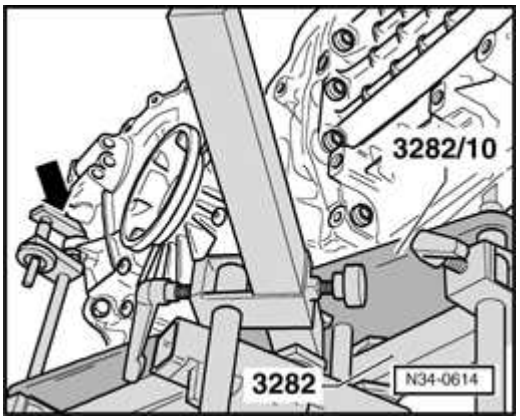
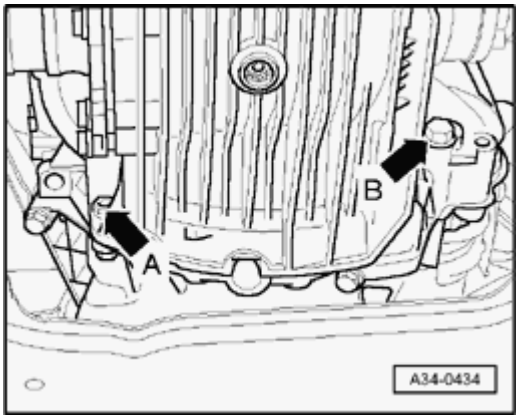


Fig. 105: Aligning Adjustment Plate Parallel To Transmission And Lock Safety Support On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align adjustment plate parallel to transmission and lock safety support -arrow- on transmission.



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Fig. 106: Lower Engine And Transmission Connecting Bolts Which Should Not Be Removed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine and transmission connecting bolts (arrows -A- and -B-).
- Push transmission off dowel sleeves and lower carefully with transmission lifter VAG 1383 A just far enough to access the slave cylinder.

NOTE: When lowering transmission make sure hydraulic line and hose to slave cylinder is not damaged.

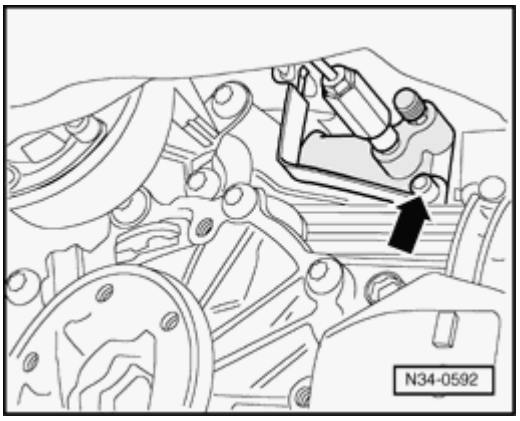


Fig. 107: Identifying Clutch Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clutch slave cylinder (arrow) and secure with wire, do not disconnect lines.

NOTE: Do not depress clutch pedal after removing slave cylinder.

- Lower transmission.

NOTE: When lowering transmission make sure there is sufficient clearance for drive shafts.

Secure transmission to repair stand with transmission support VW 353 and retaining plate VW 309 to carry out repairs.

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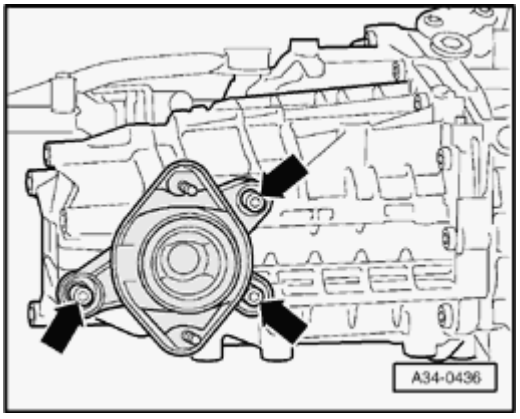


Fig. 108: Transmission Mount
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If the transmission is exchanged, the transmission mount must be transferred to the exchange transmission.

Transmission, transporting

Special tools, testers and auxiliary items required

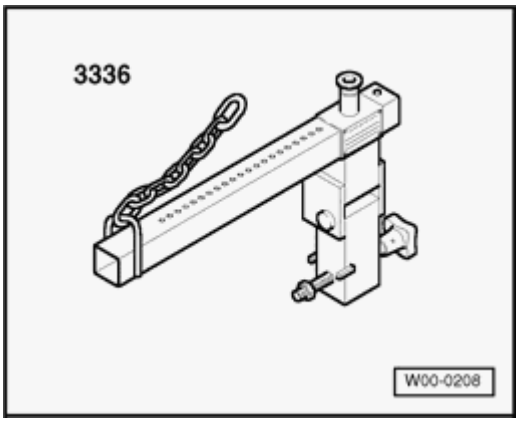


Fig. 109: Transmission Support Jig. 3336
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3336 transmission lifting beam

Transmission lifting beam can be used to transport transmission and when setting up transmission support 3282.

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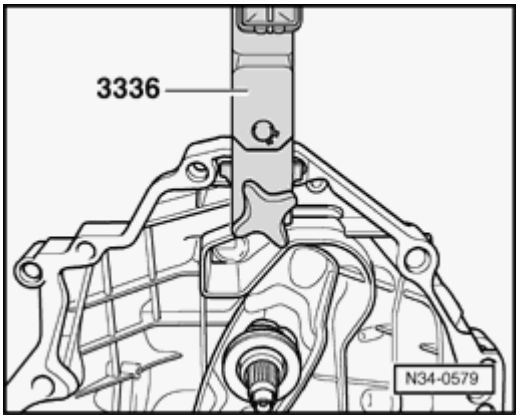


Fig. 110: Bolting Transmission Support Jig. 3336 To Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bolt transmission lifting beam 3336 to clutch housing.

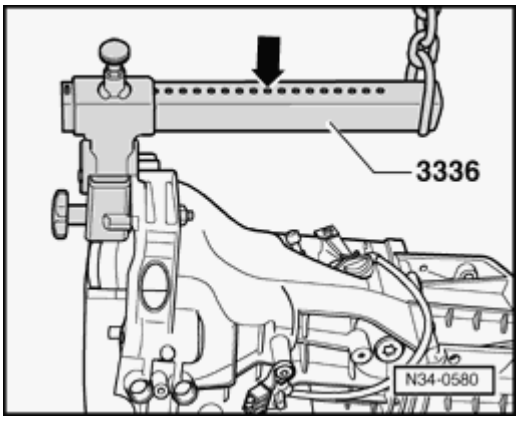


Fig. 111: Adjust Support Jig On Sliding Piece Using Locking Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set support arm in slide with locking pin (arrow).
- No. of holes visible = 17
- Lift transmission with workshop crane and transmission lifting beam 3336.

Installing

Install in reverse order, paying attention to the following:

- Clean input shaft splines and lightly grease with G000 100 grease.

The clutch plate must slide easily back and forth on input shaft.

- Lightly coat contact surface on push rod at clutch release lever with copper grease, e.g. Z 381 351 TE.

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- Check whether dowel sleeves for centering engine and transmission in cylinder block have been installed.
- If installed, make sure that intermediate plate is correctly positioned on engine.
- Check clutch release bearing for wear and replace.

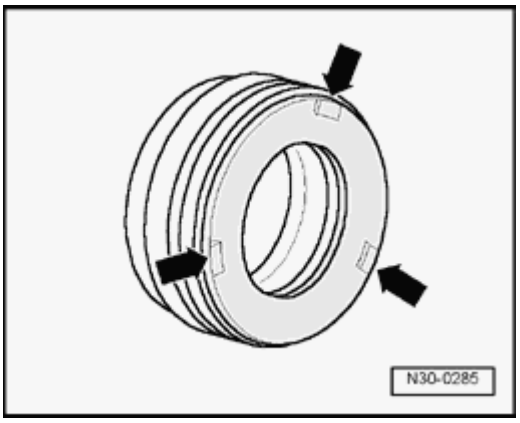


Fig. 112: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If plastic ring on release bearing is detached, adhere this back onto bearing ring with adhesive AMV 195 KD1 01.

Three right-angled lugs -arrows- on plastic ring engage in the recesses on bearing ring.

If ridges are deeper than 0.5 mm, replaced release bearing.

- All threaded holes into which self-locking bolts are installed, must be cleaned of locking fluid residue with a thread tap.
- Replace all self locking nuts.

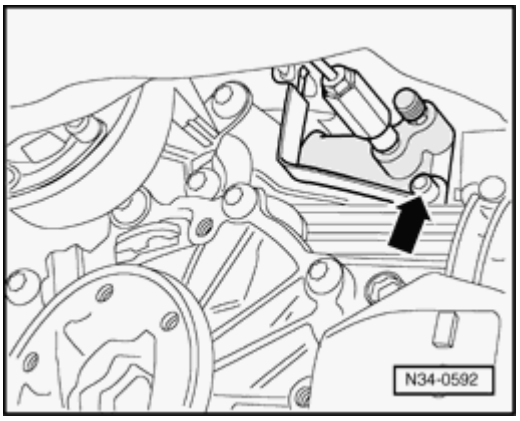


Fig. 113: Identifying Clutch Slave Cylinder Bracket And Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift transmission until clutch slave cylinder with bracket for hose and line can be installed (arrow).

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- Install lower engine, transmission and starter mounting bolts and install starter.

Refer to **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**

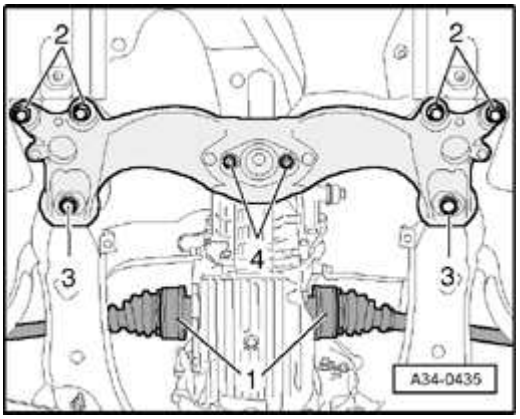


Fig. 114: Drive Shafts And Flange Shafts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install tunnel cross member onto transmission mount -4-.
- Install tunnel cross member onto body. First install bolts -3- and then bolts -2-.
- Check shift mechanism adjustment, adjust. Refer to **Shift mechanism, adjusting**.
- Align exhaust system stress-free:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

- Checking oil level in manual transmission. Refer to **Oil level in manual transmission, checking**.
- Read battery CAUTION! note. Refer to **Shift mechanism, servicing**.
- Connect battery.
- After connecting battery, enter anti theft code for radio.

Refer to Operating instructions for radio

NOTE: On re-connecting battery, remember to check and re-activate vehicle equipment (radio, clock, convenience electronics, etc.).

Refer to

- **01 - MAINTENANCE**
- **01 - MAINTENANCE** for Cabriolet

Tightening torques

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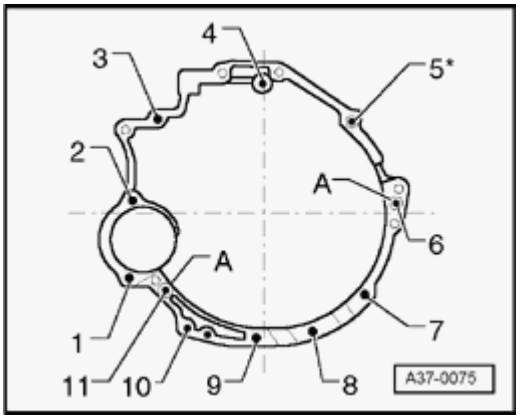


Fig. 115: Identifying Engine/Transmission Mountings (Automatic/Manual Transmission)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Attachment of 4-cylinder engine to transmission

Item	Bolt	Nm
1, 3, 4	M12 x 75	65
2	M12 x 90	65
5, 11	M12 x 110	65
7... 10	M10 x 45	45
11	M12 x 130	65

A: Dowel sleeves for centering

Transmission mount with mount to transmission -arrows-	23 Nm

1 - Drive shaft to flange shaft	M8	40 Nm
	M10	70 Nm
2 - Tunnel cross member to body 1)	M10	55 Nm
3 - Tunnel cross member to body 1)		110 Nm + 90 °
4 - Tunnel cross member to transmission mounting		23 Nm

1) Always replace bolt with washer

Component		Nm
Engine speed (RPM) sensor -G28-		10
Clutch slave cylinder to transmission1)		23
Heat shields over drive shafts to transmission		23
Selector joint to transmission 1)		23
Push rod to transmission		40

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Tunnel cross member to body	55
Clamp for exhaust pipe	40
Bracket for noise insulation to subframe	10

1) Replace bolt.

OIL LEVEL IN MANUAL TRANSMISSION, CHECKING

Oil level in manual transmission, checking

Special tools, testers and auxiliary items required

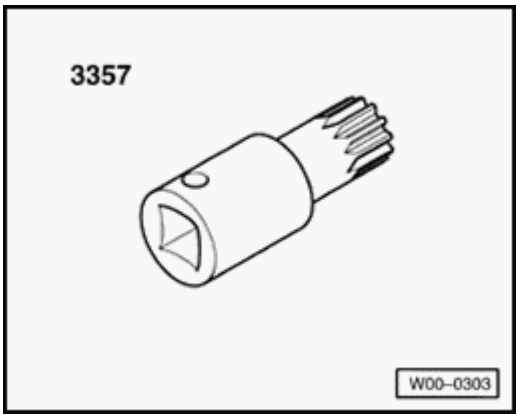


Fig. 116: Identifying Triple Square Socket Driver 3357
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3357 socket attachment

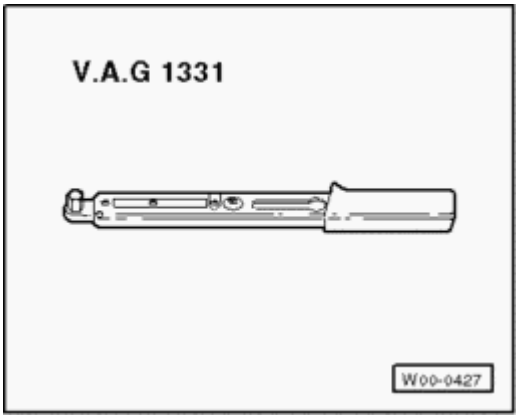


Fig. 117: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1331 Torque wrench

NOTE:

- **The vehicle must be level when checking transmission oil level. This work**

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is best performed over an inspection pit or using a 4 -column lifting platform.

- **The oil filler plug is on the left of the transmission below the speedometer sensor; it may be concealed by the heat shield for the drive shaft.**
- **Remove oil drain plug using special tool 3357.**

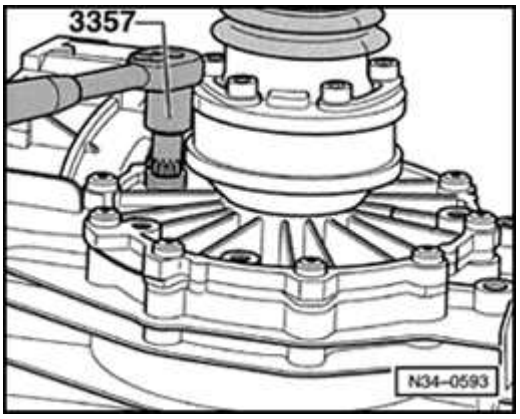


Fig. 118: Checking Oil Level At Oil Filler Hole
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To check oil level, remove oil filler plug (arrow).
- Check oil level using a shop-built tool, e.g. a piece of angled wire.

- Specification: Oil level 7 mm below bottom edge of oil filler hole

NOTE: In service centers filling to lower edge of filler hole is also permissible.

- Fill with gear oil if necessary: Specification. Refer to **Code letters, application, ratios, capacities**.

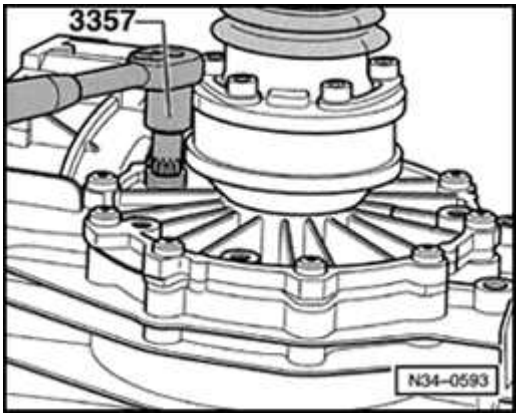


Fig. 119: Checking Oil Level At Oil Filler Hole
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install oil filler plug.

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Tightening torque

Component	Nm
Oil filler plug	25

TRANSMISSION, DISASSEMBLING AND ASSEMBLING

Transmission, disassembling and assembling

Assembly sequence. Refer to **Ball bearing for input shaft, multi-function sensor, input shaft, drive pinion, selector rods and transmission cover, removing and installing**

Transmission overview

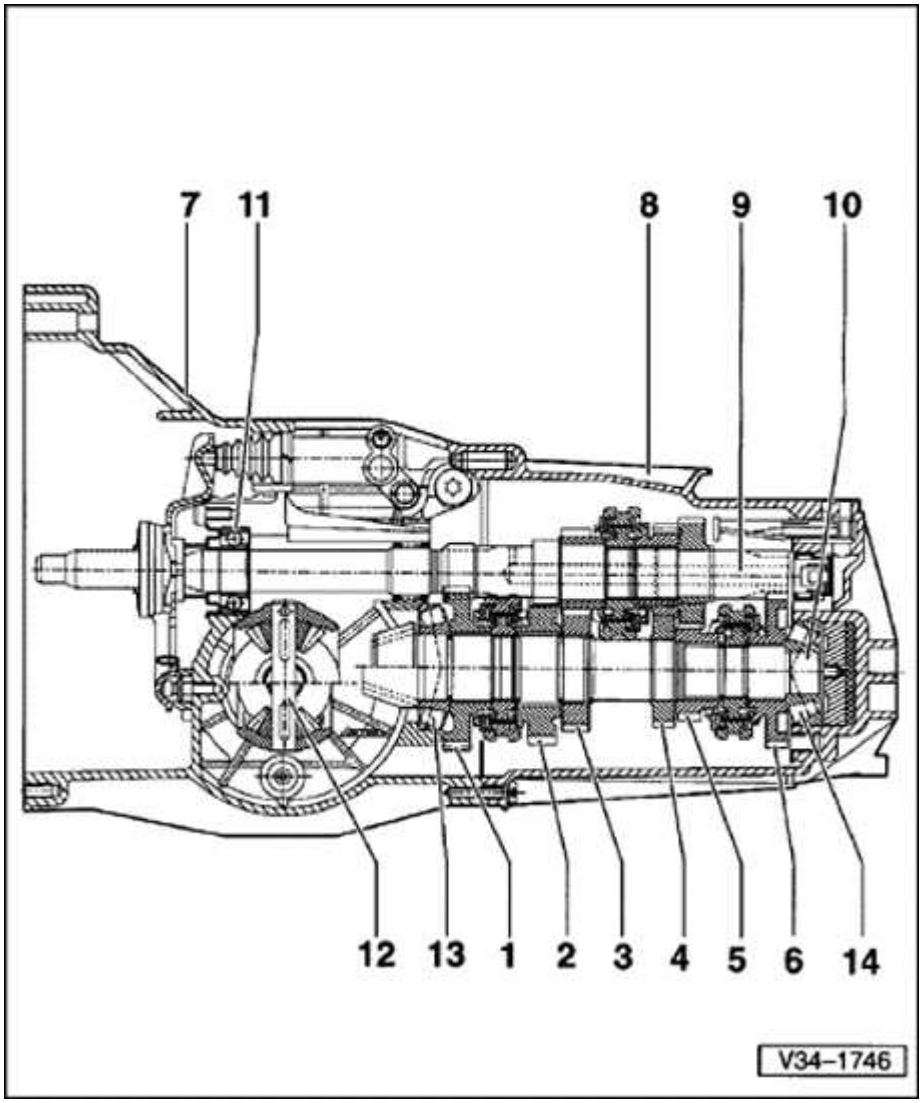


Fig. 120: Transmission, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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1 - 1st gear

2 - 2nd gear

3 - 3rd gear

4 - 4th gear

5 - 5th gear

6 - Reverse gear

- Removing and installing reverse idler. Refer to **Reverse idler gear, removing and installing**

7 - Transmission housing

8 - Transmission cover

9 - Input shaft

- Disassembling and assembling. Refer to **Input shaft, disassembling and assembling**

10 - Drive pinion

- Disassembling and assembling. Refer to **Drive pinion, disassembling and assembling**

11 - Ball bearing

- Adjusting. Refer to **Input shaft, adjusting** adjusting input shaft

12 - Differential

- Removing and installing. Refer to **Differential, removing and installing**
- Disassembling and assembling. Refer to **Differential, disassembling and assembling**

13 - Tapered roller bearings

- Adjusting. Refer to **Drive pinion, adjusting**

14 - Tapered roller bearings

- Adjusting. Refer to **Drive pinion, adjusting**

Assembly overview

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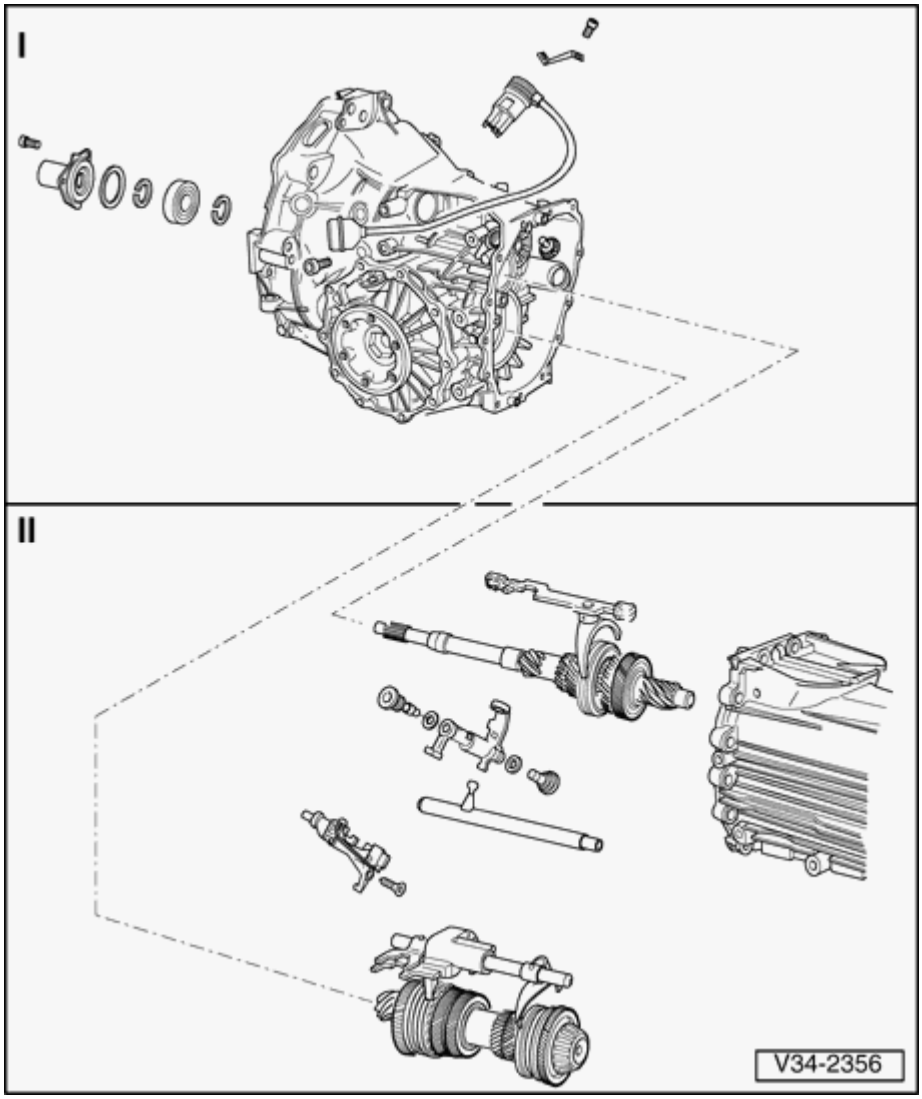


Fig. 121: Transmission, Assembly Overview, I and II
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - Removing and installing input shaft ball bearing and multi-function sensor. Refer to Input shaft ball bearing and multi-function sensor, removing and installing

II - Removing and installing input shaft, drive pinion, selector rods, transmission cover. Refer to Input shaft, drive pinion, selector rods and transmission cover, removing and installing

Input shaft ball bearing and multi-function sensor, removing and installing

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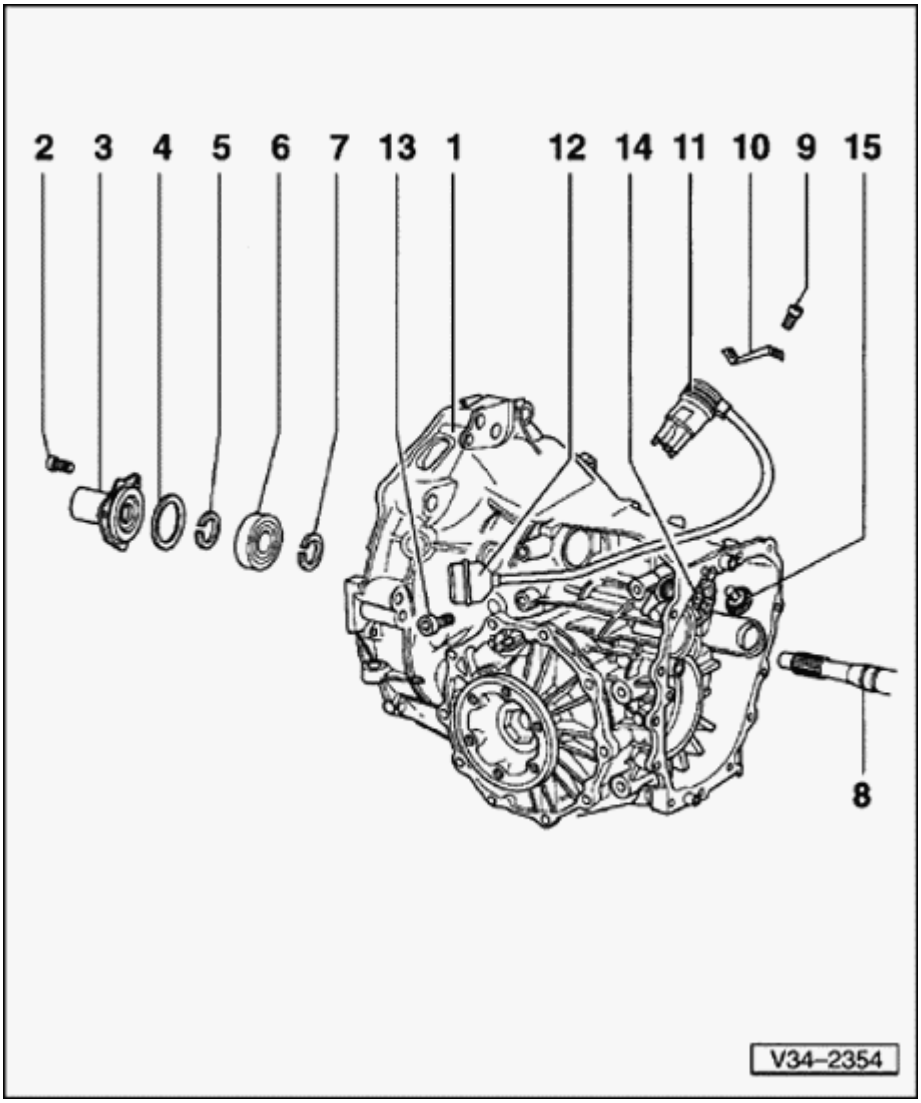


Fig. 122: Transmission Housing, Input Shaft Ball Bearing And Multi-Function Sensor, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing

- With differential and flange shafts
- Removing and installing flange shafts. Refer to **Flange shaft oil seal, replacing**
- Removing and installing differential. Refer to **Differential, removing and installing**
- Removing and installing speedometer sensor and drive wheel. Refer to **Speedometer sensor and drive wheel, removing and installing**
- Breather installation position. See **Installation position of breather**

2 - Torx socket head bolt

- Self-locking

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- Always replace

3 - Guide sleeve

- With O-ring and seal for input shaft. Refer to **Clutch release mechanism, servicing**
- Installation position: Oil drain hole points downward

4 - Dished washer

- Smaller diameter (convex side) to guide sleeve

5 - Circlip

- Determining thickness adjusting. Refer to **Input shaft, adjusting**

6 - Ball bearing

- Removing and installing. Refer to **Ball bearing for input shaft, multi-function sensor, input shaft, drive pinion, selector rods and transmission cover, removing and installing**

7 - Circlip

- Determining thickness adjusting. Refer to **Input shaft, adjusting**

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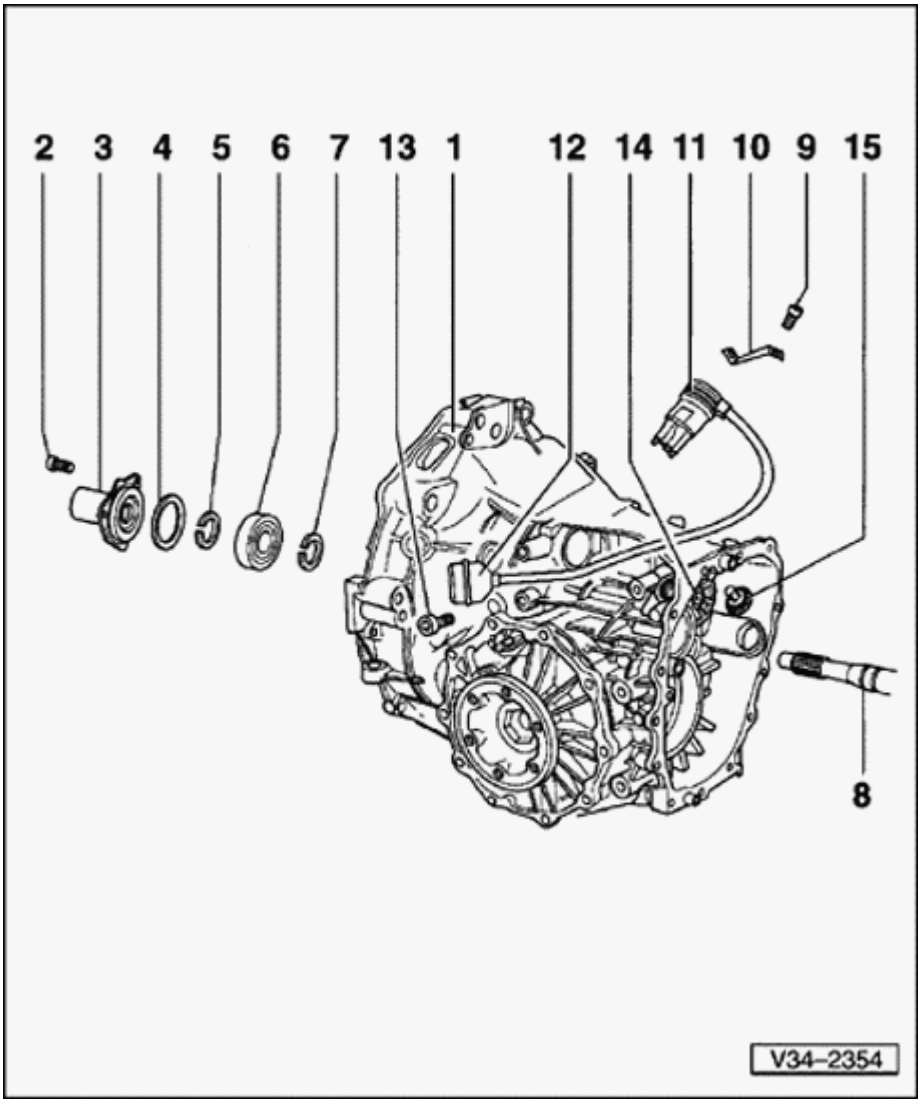


Fig. 123: Transmission Housing, Input Shaft Ball Bearing And Multi-Function Sensor, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

8 - Input shaft

- Removing and installing. Refer to **Fig. 125**
- Disassembling and assembling. Refer to **Input shaft, disassembling and assembling**
- Adjusting. Refer to **Input shaft, adjusting**
- Servicing input shaft bearings. Refer to **Input shaft, disassembling and assembling**

9 - Bolt

10 - Tab washer

- For multi-function sensor

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11 - Multi-function sensor

12 - Connector for multi-function sensor

13 - Bolt - 10 Nm

14 - Cover for selector shaft

- Removing and installing. Refer to **Shift mechanism in transmission, disassembling and assembling**

15 - Locking module for 5th gear and reverse gear

- Removing and installing. Refer to **Removing and installing locking module for 5th gear and reverse gear**

Installation position of breather

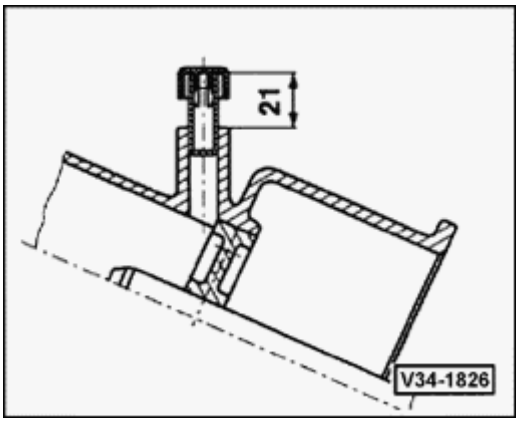


Fig. 124: Identifying Installed Position Of Breather
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The breather must project 21 mm out of housing, after being pressed in.

Input shaft, drive pinion, selector rods and transmission cover, removing and installing

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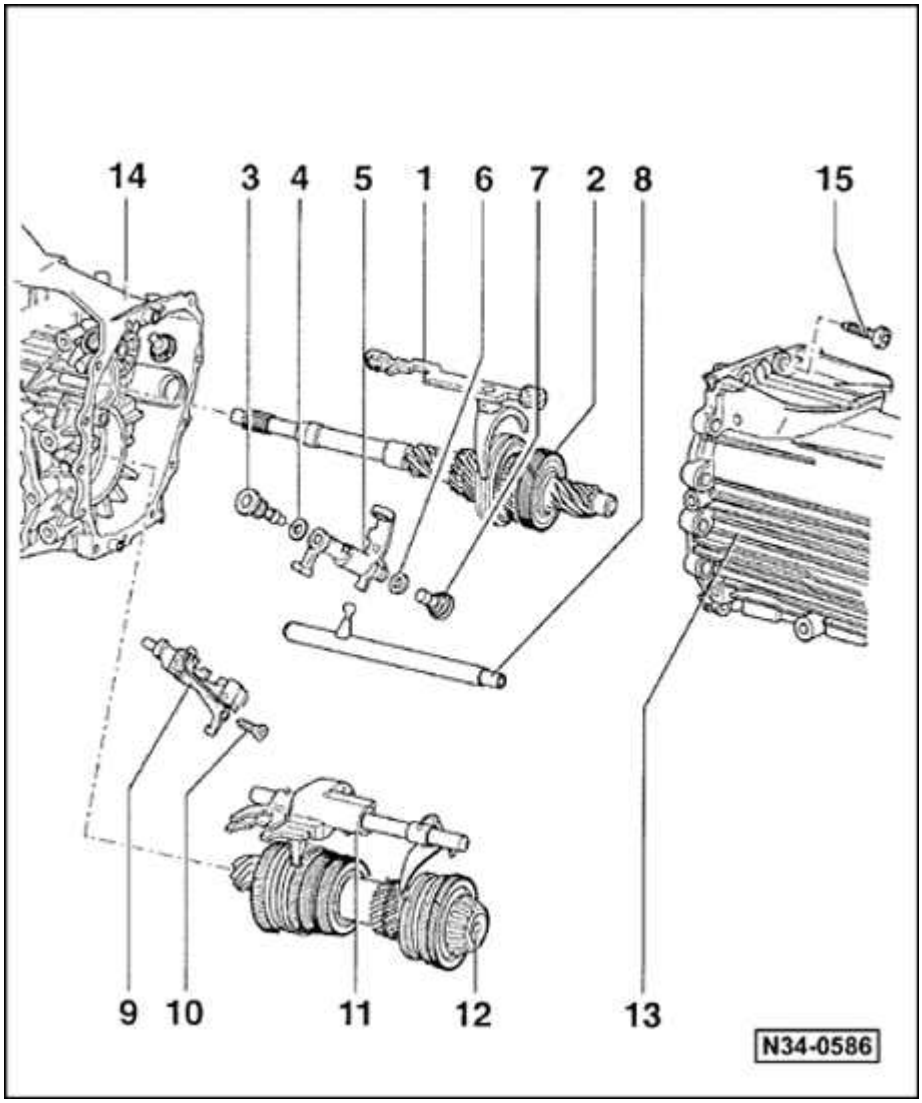


Fig. 125: Input Shaft, Drive Pinion, Shift Rods And Transmission Cover, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector rod with selector fork for 3rd and 4th gear

- Disassembling and assembling. Refer to **Shift mechanism in transmission, disassembling and assembling**
- Replacing mounting bushings. Refer to **Shift mechanism in transmission, disassembling and assembling**

2 - Input shaft

- Disassembling and assembling. Refer to **Input shaft, disassembling and assembling**
- Adjusting. Refer to **Input shaft, adjusting**
- Servicing input shaft bearings. Refer to **Input shaft, adjusting**

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3 - Left stop bolt - 40 Nm

4 - Washer

5 - Relay shaft

- Installation position. Refer to **Shift mechanism in transmission, disassembling and assembling**

6 - Washer

7 - Right stop bolt - 40 Nm

8 - Selector shaft

- Installation position. Refer to **Shift mechanism in transmission, disassembling and assembling**
- Replace selector shaft sealing ring. Refer to **Shift mechanism in transmission, disassembling and assembling**

9 - Detent segment

- Installation position. Refer to **Shift mechanism in transmission, disassembling and assembling**

10 - Torx bolt - 25 Nm

- With collar to secure the detent segment spring

11 - Selector rod with selector fork for 1st/2nd/5th and reverse gear

- Disassembling and assembling. Refer to **Shift mechanism in transmission, disassembling and assembling**
- Removing and installing ball sleeves. Refer to **Removing and installing ball sleeve**

12 - Drive pinion

- Disassembling and assembling. Refer to **Drive pinion, disassembling and assembling**
- Adjusting. Refer to **Drive pinion, adjusting**
- Servicing drive pinion bearings. Refer to **Drive pinion, disassembling and assembling**

13 - Transmission cover

- Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces
- Removing and installing oil collector. Refer to **Removing and installing oil collector**

14 - Transmission housing

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- Match components according to transmission code letters

15 - Torx bolt - 22 Nm

Removing and installing oil collector

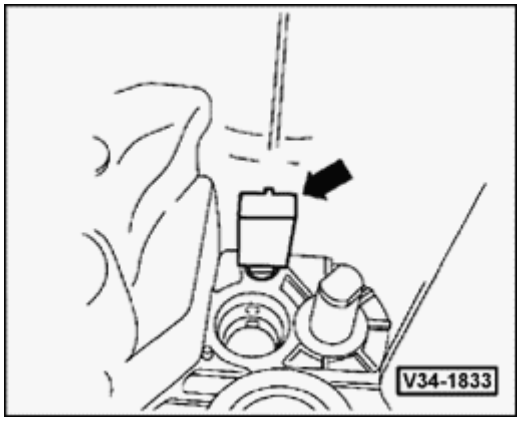


Fig. 126: Identifying Oil Collector Tray
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Turn the oil collector arrow- and then pull out.

Installing

- Push oil collector into transmission cover until it snaps in place.
- Installation position: Oil collector faces upward in transmission cover

Ball bearing for input shaft, multi-function sensor, input shaft, drive pinion, selector rods and transmission cover, removing and installing

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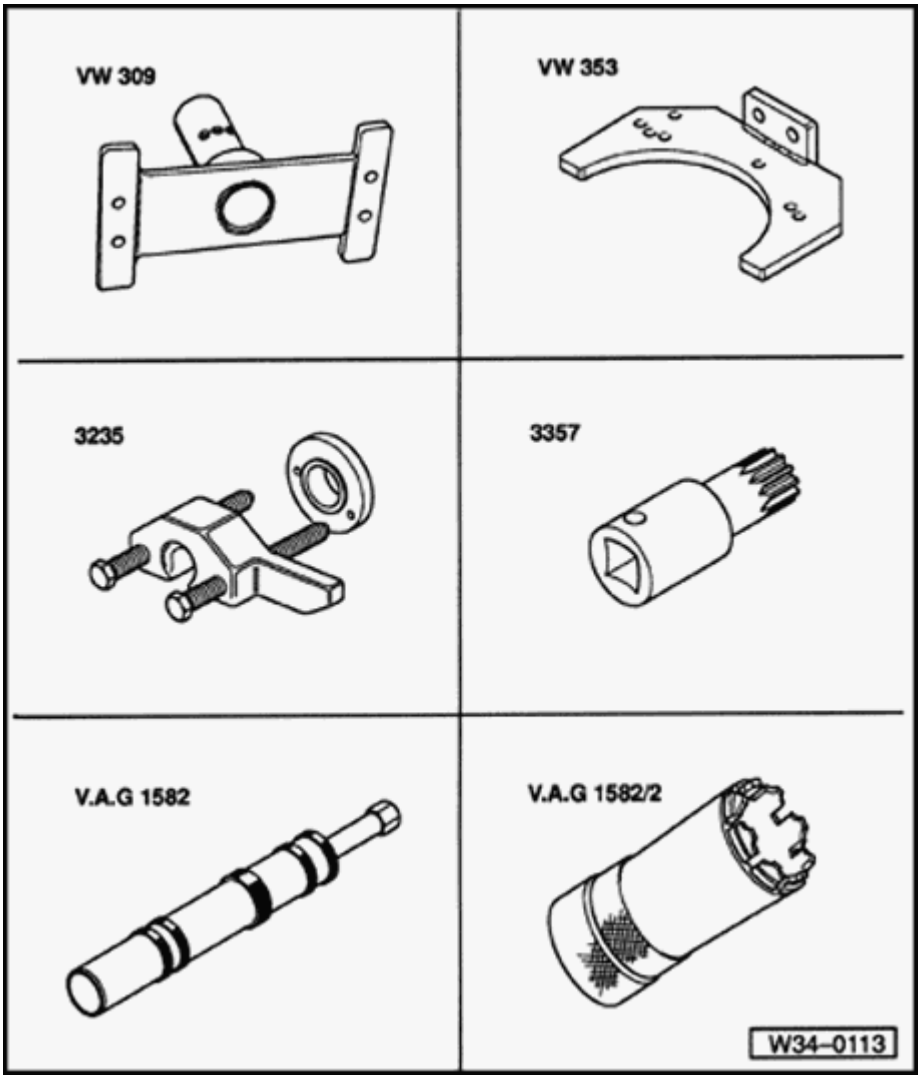


Fig. 127: Identifying Special Tools - Disassembly And Assembly
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 309 Holding plate
- VW 353 Transmission support
- 3235 Press Device
- 3357 Triple square socket driver
- VAG 1582 Tapered roller bearing puller
- VAG 1582/2 Gripping piece

Special tools and workshop equipment required

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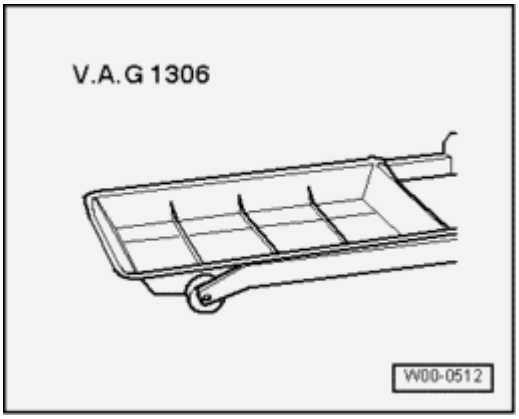


Fig. 128: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1306 Drip tray

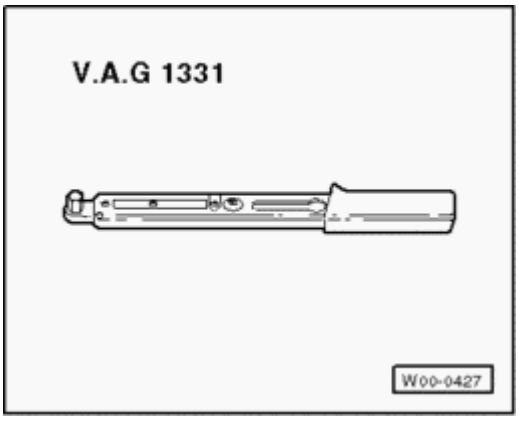


Fig. 129: Identifying Torque Wrench V.A.G. 1331
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1331 Torque wrench
- Sealant AMV 188 001 02

NOTE:

- **It is not necessary to remove the differential to remove the above-mentioned components.**
- **Removal is only necessary when adjustments have to be carried out adjustment overview:**

Removing

- Place drip tray VAG 1306 underneath the transmission.
- Drain gear oil, using socket attachment 3357.

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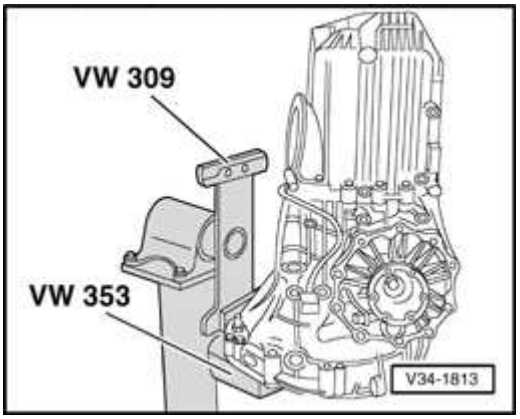


Fig. 130: Securing Transmission To Assembly Stand
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure transmission to repair stand.

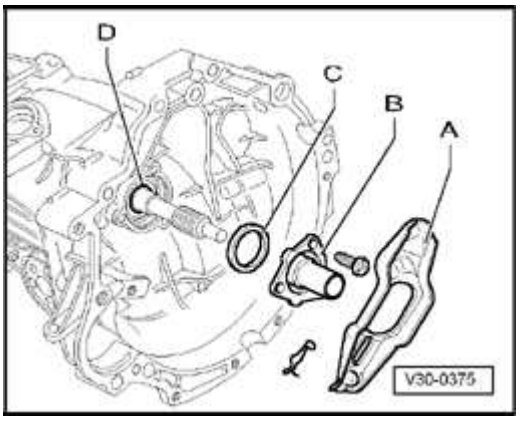


Fig. 131: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach clutch release lever -A- with release bearing.

NOTE: Cover input shaft splines with a shrink-fit hose to protect oil seal, before pulling off guide sleeve.

- Remove guide sleeve -B-.
- Remove dished washer -C-.
- In front of input shaft ball bearing remove circlip -D-.
- Note the thickness of the circlip, if the ball bearing, input shaft or transmission housing is not being replaced.

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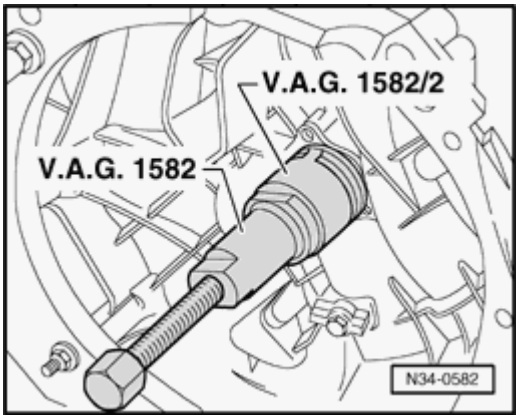


Fig. 132: Pulling Input Shaft Ball Bearing Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

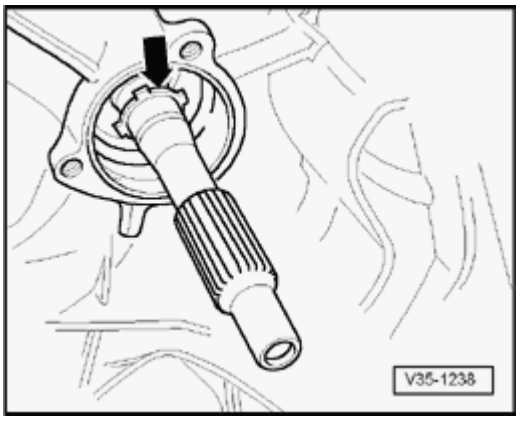
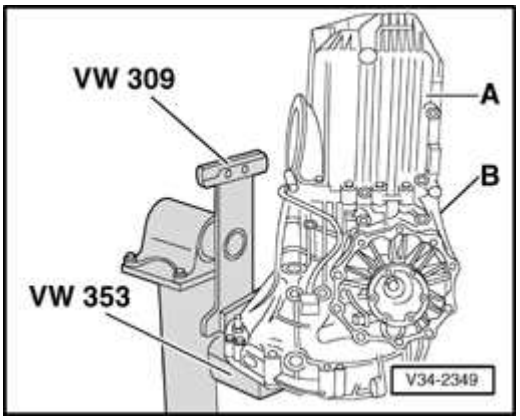


Fig. 133: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the circlip (arrow) behind the input shaft ball bearing.
- Note the thickness of the circlip, if the ball bearing, input shaft or transmission housing is not being replaced.



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Fig. 134: Transmission Cover Installed On Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove transmission cover -A- from transmission housing -B-.

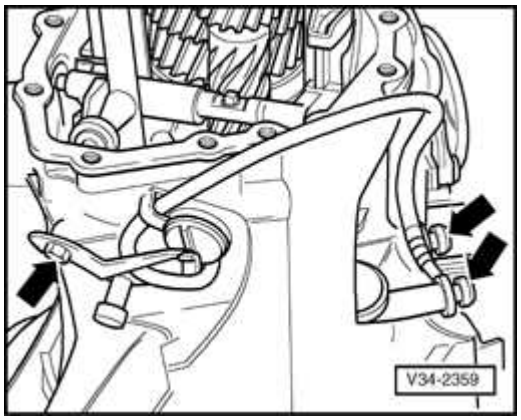


Fig. 135: Location Of Multi-Function Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts (arrows) and pull out the multi-function sensor.

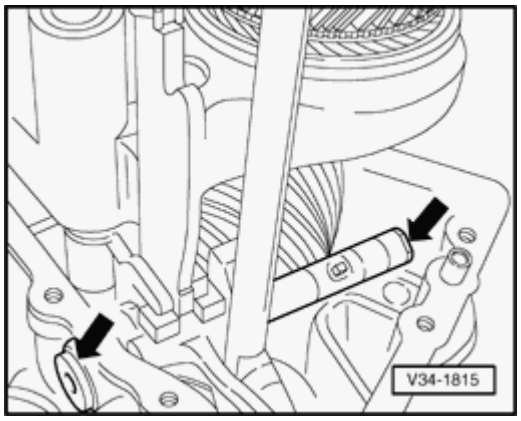


Fig. 136: Identifying Threaded Bolts At Both Ends Of Relay Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove relay shaft bolts (arrows).

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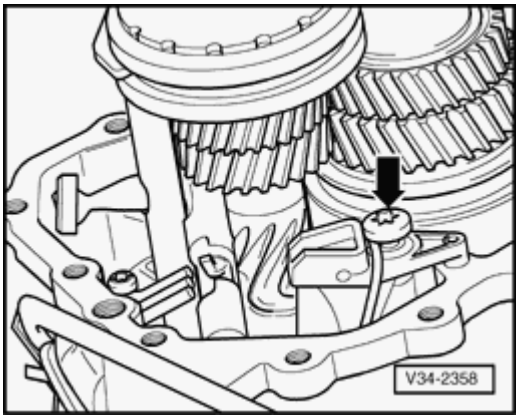


Fig. 137: Identifying Shift Detent Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove detent segment (arrow) and swivel it out.

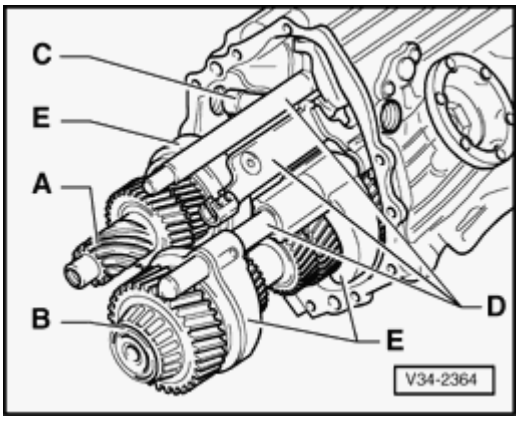


Fig. 138: Identifying Input Shaft, Drive Pinion, Relay Shaft, Shift Rods With Selector Shaft And Selector Forks
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The input shaft -A-, drive pinion -B-, relay shaft -C-, selector rods -D- with selector shaft and selector forks -E- must be carefully pulled out together.

Installing

NOTE: If input shaft ball bearing, input shaft or the transmission housing are replaced, it is necessary to re-determine the thickness of circlips for input shaft. Refer to Input shaft, adjusting, adjusting input shaft.

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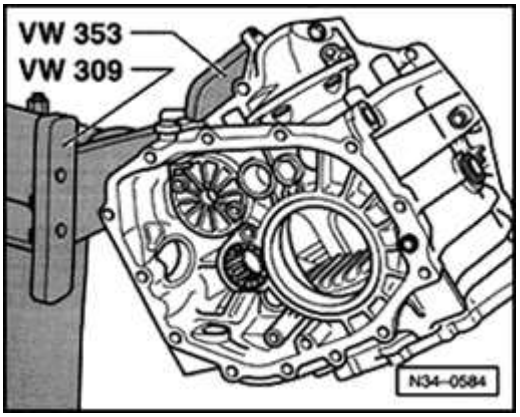


Fig. 139: Swing Transmission Housing Into Position Shown
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For easier installation of following components, swing transmission housing into the position shown.

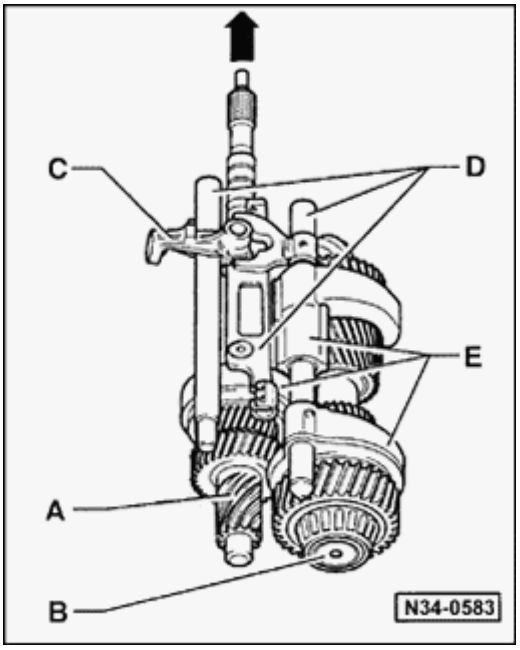


Fig. 140: Assemble Input Shaft, Drive Pinion, Relay Shaft, Selector Rods With Shift Rod And Selector Forks
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble input shaft -A-, drive pinion -B-, relay shaft -C-, selector rods -D- with selector shaft and selector forks -E-.
- Install these components together into transmission housing.

NOTE: Relay shaft -C- and selector shaft can also be installed later. Refer to Fig. 143.

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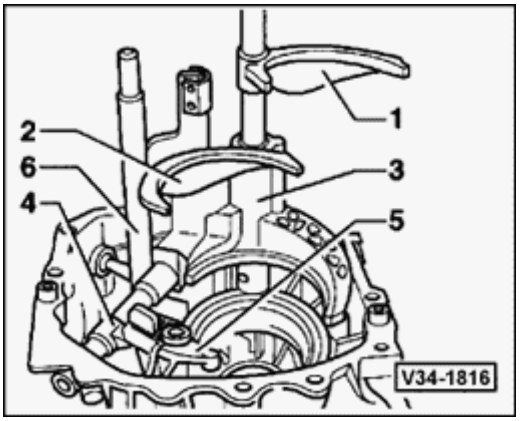


Fig. 141: Identifying Installed Position Of Complete Selector Mechanism In Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Location of shift mechanism in transmission

1 - Selector fork for 5th gear and reverse gear

2 - Selector fork for 3rd gear and 4th gear

3 - Selector fork for 1st gear and 2nd gear

4 - Relay shaft

5 - Detent mechanism

6 - Selector shaft

NOTE: Shown in illustration with input shaft and drive pinion removed.

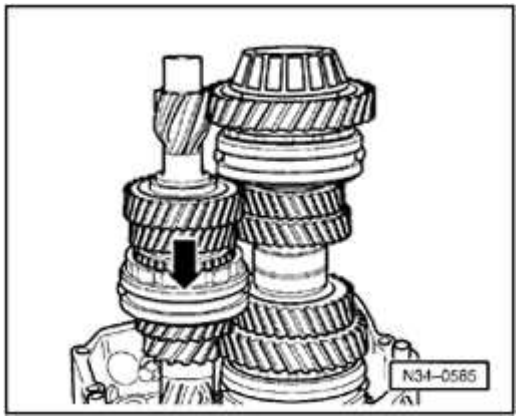


Fig. 142: Move Transmission To Engage 3rd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn transmission housing and engage 3rd gear (direction of arrow).

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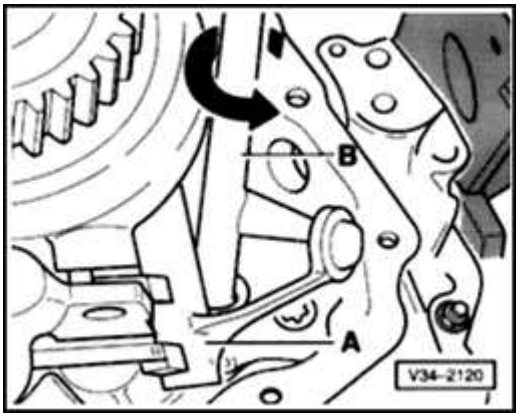


Fig. 143: Installing Relay Shaft And Shift Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install relay shaft -A-.

- Insert selector shaft -B- sideways into hole in transmission housing and assemble into mounting eye.
- Turn the selector shaft in direction of arrow.

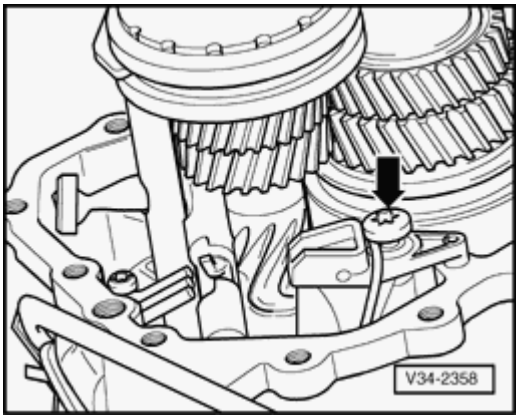


Fig. 144: Identifying Shift Detent Fastener
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert the detent segment and tighten bolt (arrow).

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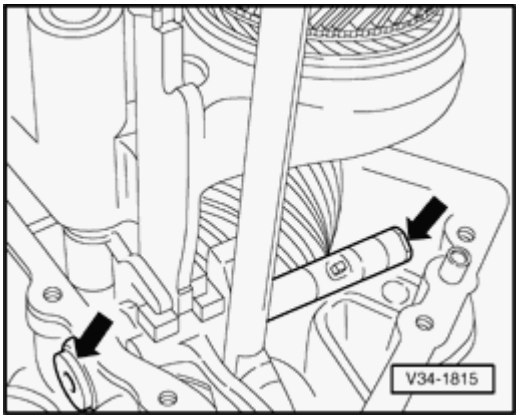


Fig. 145: Identifying Threaded Bolts At Both Ends Of Relay Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install relay shaft bolts (arrow).
- Replace O-ring for multi-function sensor.

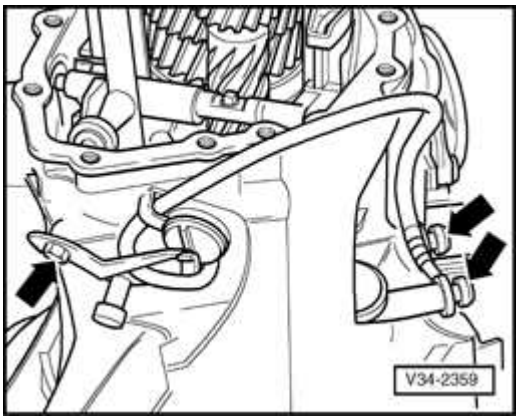


Fig. 146: Location Of Multi-Function Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully insert multi-function sensor and tighten (arrow).

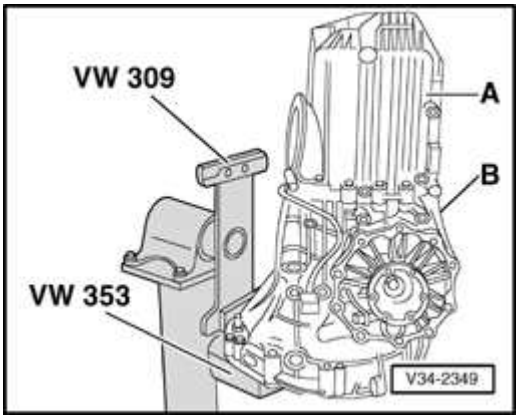


Fig. 147: Transmission Cover Installed On Transmission Housing

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

Check that dowel sleeves for transmission cover -A- are installed in transmission housing -B-.

- Apply thin coat of sealant AMV 188 001 02 to sealing surfaces.
- Install transmission cover onto transmission housing.

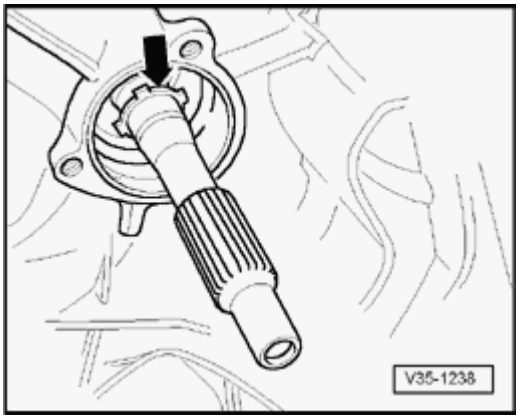


Fig. 148: Location Of Rear Circlip For Input Shaft Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install rear input shaft ball bearing circlip (arrow).
- Slide the ball bearing onto input shaft.

- Installation position: Closed side of ball cage faces toward transmission housing

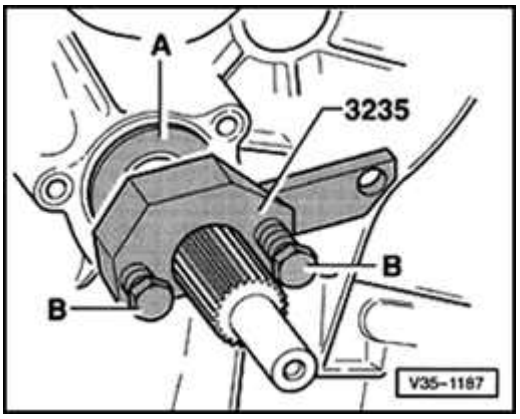


Fig. 149: Pressing In Ball Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in ball bearing:

- Slide thrust pad -A- on press-in tool onto input shaft.
- Position press-in tool behind splines for clutch plate.
- Install bolts -B- until they make contact.

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- The bolts bear against the indentations in thrust pad -A-.

- Press in ball bearing onto its seat by alternately tightening the bolts (1/2 turn at a time).

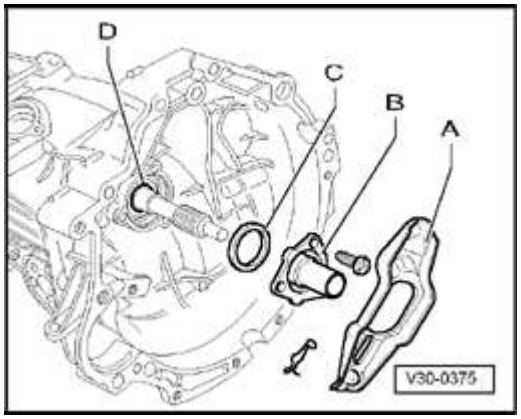


Fig. 150: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install front circlip -D- for the input shaft ball bearing.
- Install dished washer -C-.

- Installation position: Convex side toward guide sleeve -B-

NOTE: Before installing guide sleeve, cover input shaft splines with a shrink-fit hose to protect oil seal.

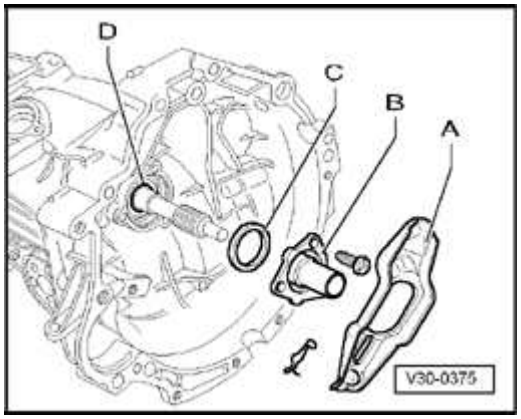


Fig. 151: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install guide sleeve -B- for release bearing.
- Install clutch release lever -A- and release bearing.

SHIFT MECHANISM IN TRANSMISSION, DISASSEMBLING AND ASSEMBLING

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Shift mechanism in transmission, disassembling and assembling

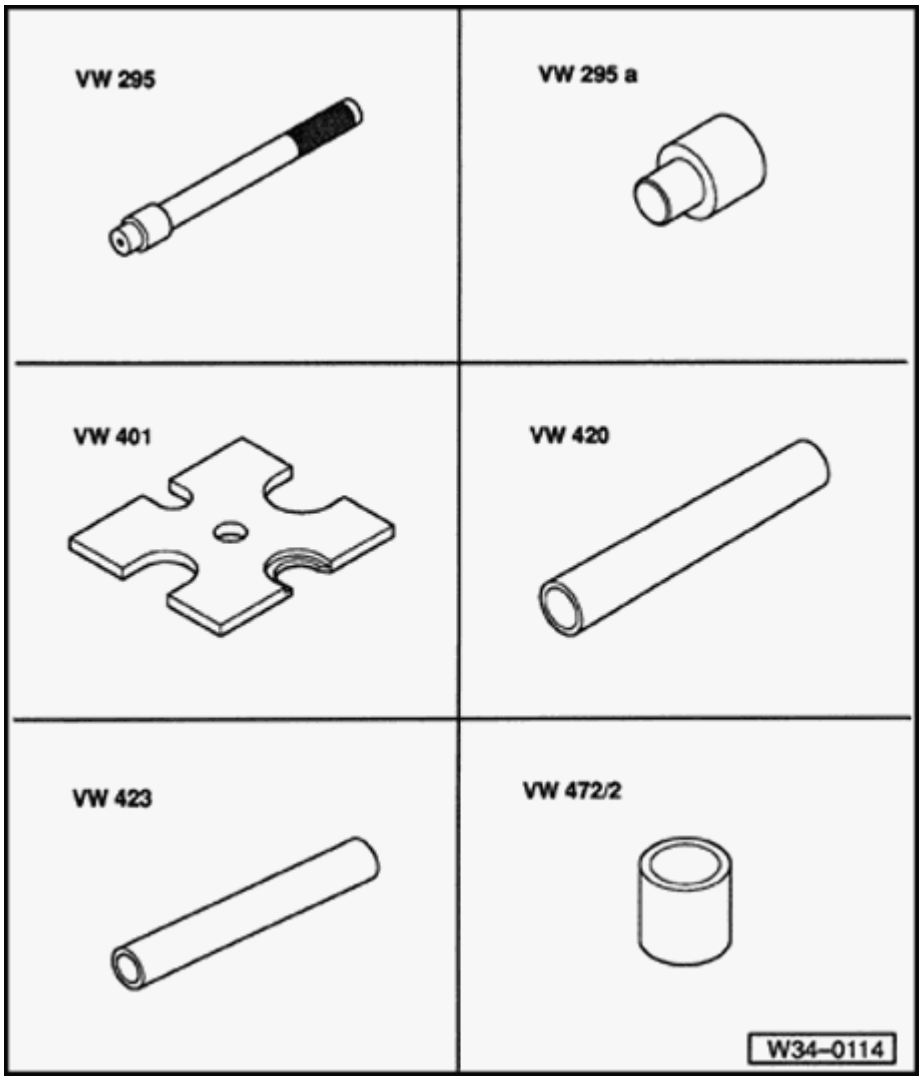


Fig. 152: Identifying Special Tools - Shift Mechanism On Transmission Side, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 295 Drift
- VW 295 A adapter
- VW 401 Thrust plate
- VW 420 Tube
- VW 423 Tube
- VW 472/2 Spacer sleeve

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Special tools and workshop equipment required

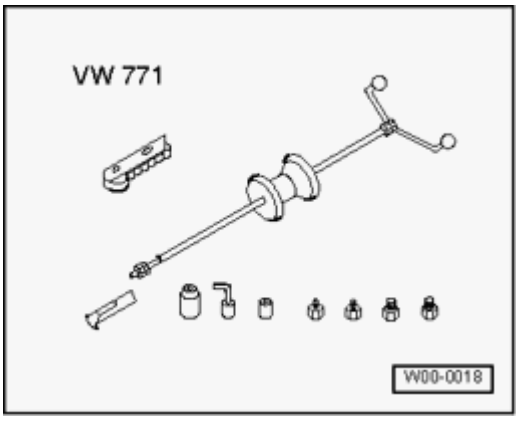


Fig. 153: Slide Hammer-Multi-Purpose Tool Set VW 771
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 771 Multi-purpose tool

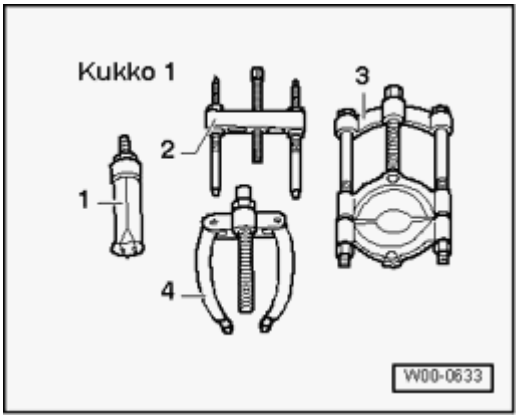


Fig. 154: Kukko 21/2 Internal puller, Kukko 21/4 Internal puller, Kukko 22/2 Counter support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Kukko 21/4 Internal puller

NOTE: **Installation position of complete shift mechanism in transmission. See Installation position of complete shift mechanism in transmission**

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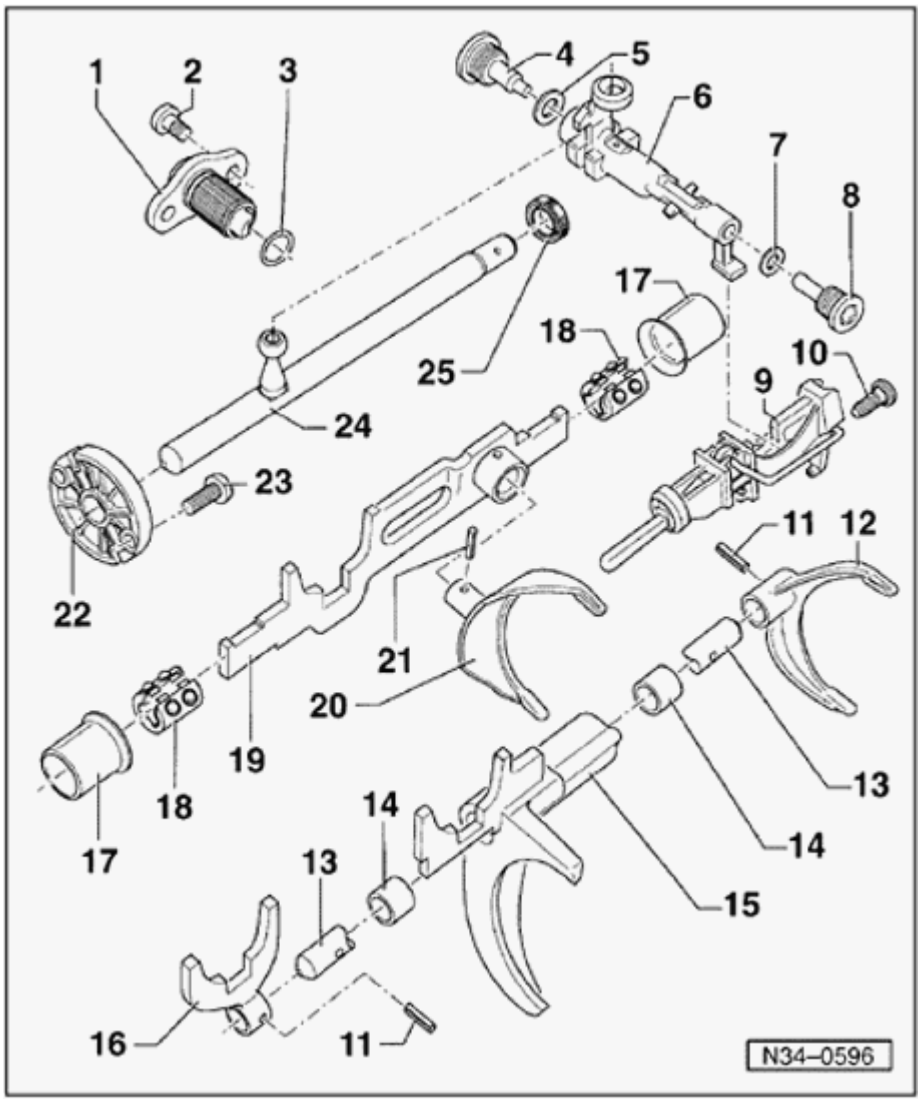


Fig. 155: Shift Mechanism In Transmission, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Locking module for 5th gear and reverse gear

- Removing and installing. Refer to **Removing and installing locking module for 5th gear and reverse gear**

2 - Torx bolt - 10 Nm

3 - O-ring

- Always replace

4 - Right stop bolt - 40 Nm

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5 - Washer

6 - Relay shaft

7 - Washer

8 - Left stop bolt - 40 Nm

9 - Detent segment

10 - Torx bolt - 25 Nm

11 - Spring pin

12 - 5th and reverse gear selector fork

- Installation position. Refer to **Installation position of 5th and reverse gear selector fork and follower for selector rod**

13 - Selector rods for 1st/2nd and 5th/reverse gear

14 - Ball sleeve

- Removing and installing. Refer to **Removing and installing ball sleeve**

15 - Selector fork, 1st and 2nd gear

16 - Relay lever

- Installation position. Refer to **Installation position of 5th and reverse gear selector fork and follower for selector rod**

17 - Mounting bushing for 3rd and 4th gear

- Pulling out. Refer to **Pulling out mounting bushing for 3rd and 4th gear selector rod**
- Driving in. Refer to **Driving mounting bushing for 3rd and 4th gear selector rod home**

18 - Ball sleeve

- Pry off the selector rod with a screwdriver
- Press on the selector rod

19 - Selector rod for 3rd and 4th gear

20 - Selector fork, 3rd and 4th gear

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21 - Spring pin

22 - Cover plate

- For selector shaft

23 - Torx bolt - 20 Nm

24 - Selector shaft

25 - Sealing ring

- Pry out with screwdriver
- Insert using tube VW 420
- Installation position. See **Installation position of oil seal**.

Installation position of 5th and reverse gear selector fork and follower for selector rod

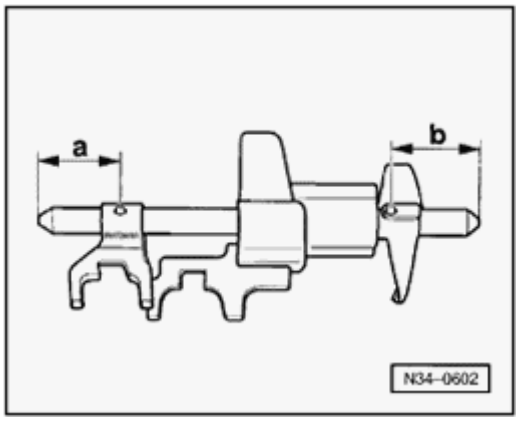


Fig. 156: Identifying Installed Position For 5th/Reverse Gear Shift Fork And Coupling Plate For Shift Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dimension a = 55 mm
- Dimension a = 60 mm

Removing and installing ball sleeve

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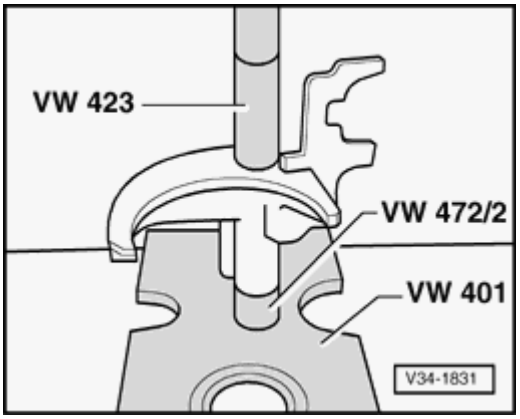


Fig. 157: Removing/Installing Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pulling out mounting bushing for 3rd and 4th gear selector rod

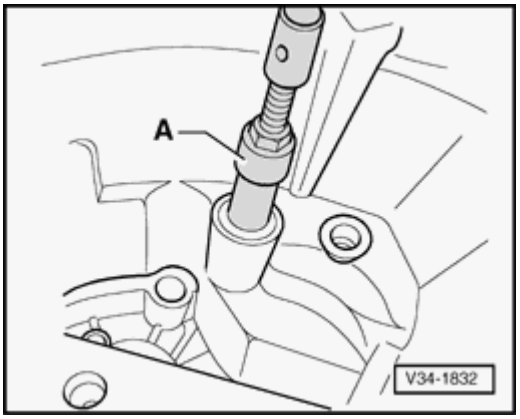
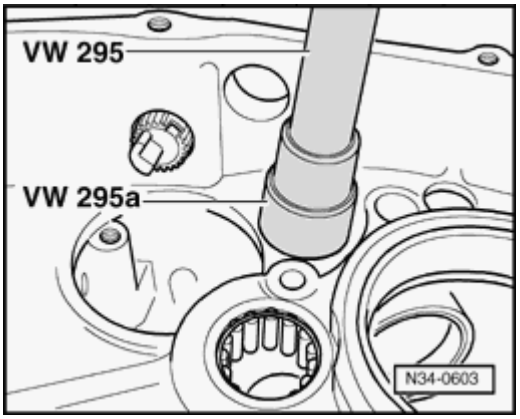


Fig. 158: Removing Bushing For 3rd And 4th Gear Shift Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal puller 22... 28 mm, e.g. Kukko 21/4, in conjunction with multi-purpose tool VW 771

Driving mounting bushing for 3rd and 4th gear selector rod home



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Fig. 159: Driving In Bushing For 3rd And 4th Gear Shift Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of oil seal

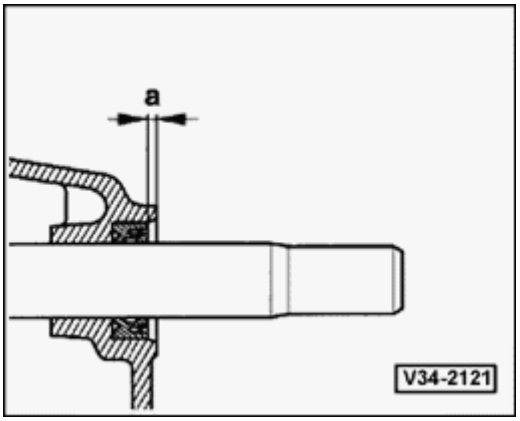


Fig. 160: Identifying Installed Position Of Sealing Washer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fill space between sealing and dust lips with multi-purpose grease.
- Lightly oil outer circumference of seal.
- Insert oil seal using tube VW 420

- Dimension a = 1 mm

Installation position of complete shift mechanism in transmission

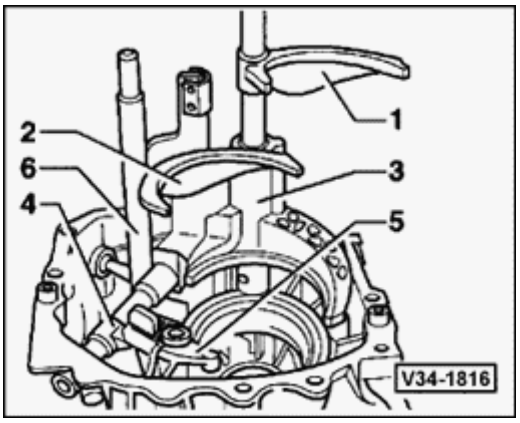


Fig. 161: Identifying Installed Position Of Complete Selector Mechanism In Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector fork for 5th gear and reverse gear

2 - Selector fork for 3rd gear and 4th gear

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3 - Selector fork for 1st gear and 2nd gear

4 - Relay shaft

5 - Detent mechanism

6 - Selector shaft

Removing and installing locking module for 5th gear and reverse gear

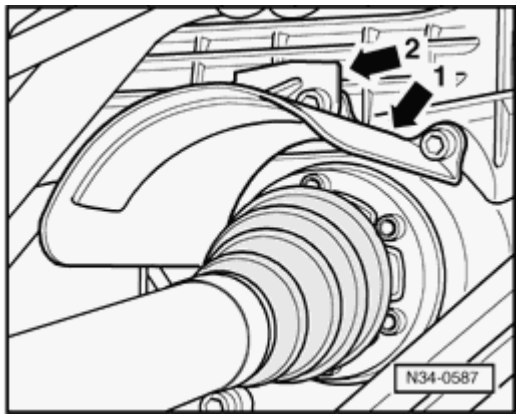


Fig. 162: Detaching Heat Shields And Right-Hand Axle Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield - arrow 2- above right-hand drive shaft.
- Detach heat shield -arrow 1- above right-hand drive shaft and pivot downward.

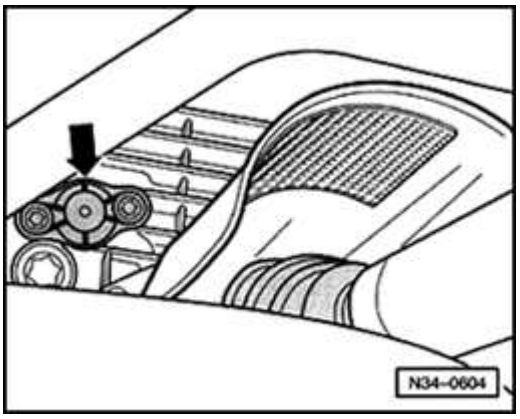


Fig. 163: Identifying Gear Lock
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking module -arrow-.

Assembling locking module:

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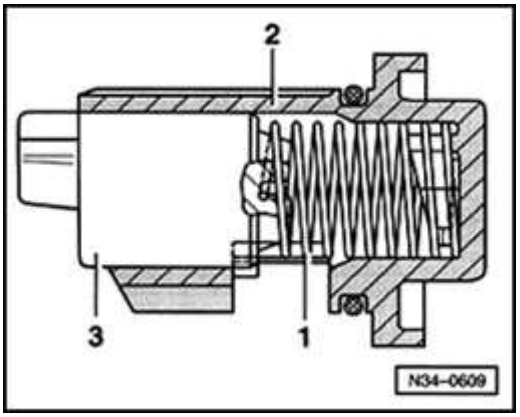


Fig. 164: Assembling Gear Lock
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert spring -1- into housing -2-, while exerting light pressure, turn spring to the left until it locates in the base of the housing.
- Insert bushing -3- into the spring so that the bent end of the spring locates in the designated groove.
- Push bushing -3- against spring and turn approx. one turn to left, until the lug on the bushing aligns with the groove in the housing -2-.
- Press lug on bushing -3- onto stop in the groove in the housing -2-.
- Turn bushing -3- clockwise and release; bushing -3- springs to installation position.

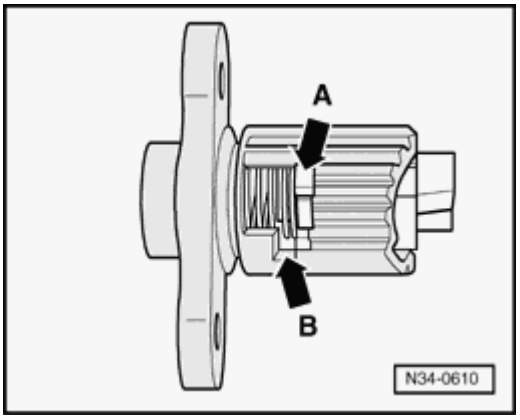


Fig. 165: Assembling Gear Lock
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of bushing:

The lug (arrow -A-) on the bushing must always be opposite the groove in the housing (arrow -B-).

Check installation position:

- Turn bushing counterclockwise and release.

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- The bushing must spring back; the lug must lie against the stop -direction of arrow A-

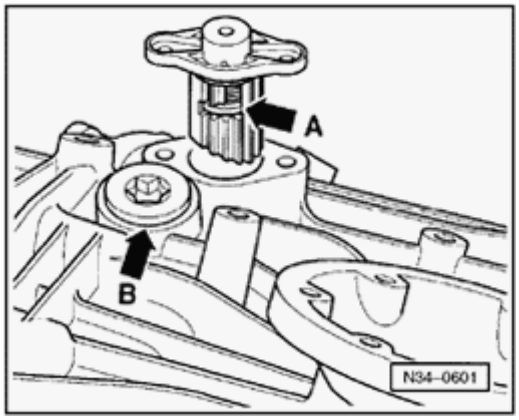


Fig. 166: Installed Position Of Complete Gear Lock In Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of complete locking module in transmission:

The recess (arrow -A-) faces bolt (arrow-B-)

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35 MANUAL TRANSMISSION - GEARS, SHAFTS

INPUT SHAFT, DISASSEMBLING AND ASSEMBLING

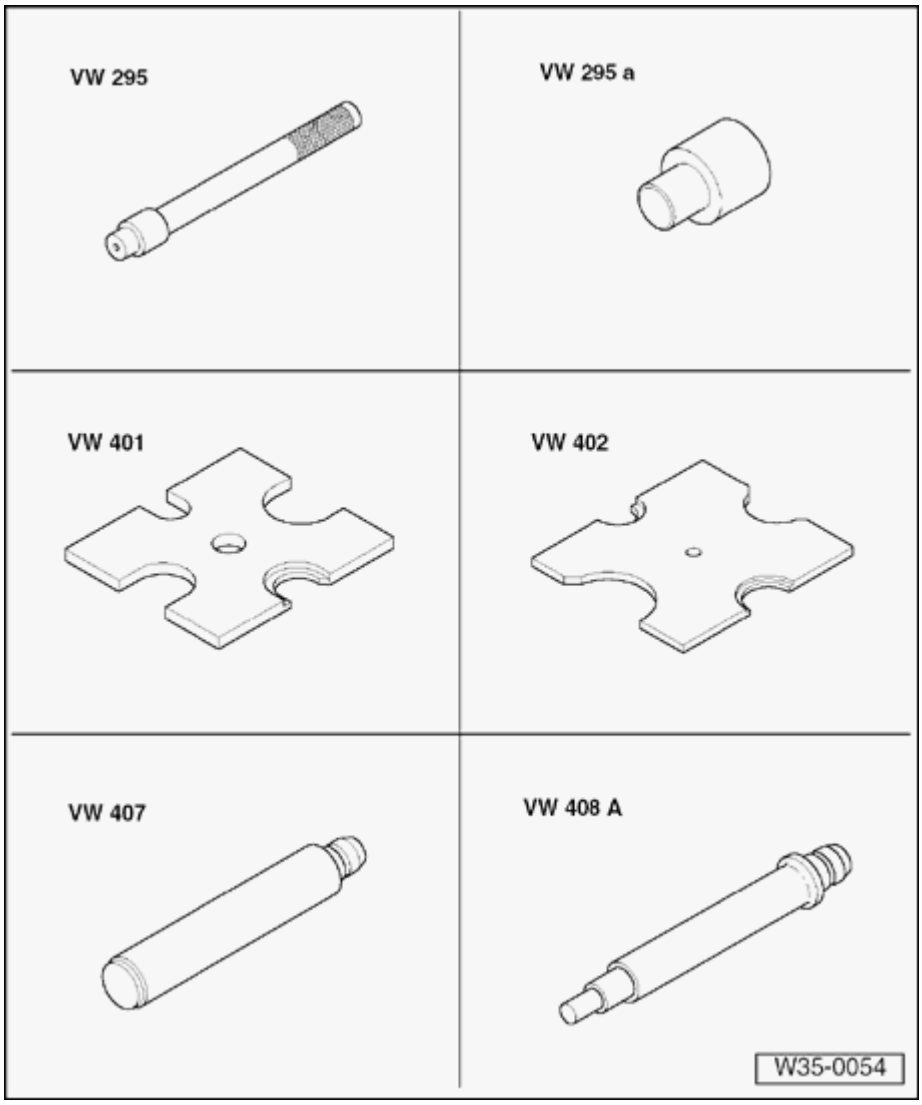


Fig. 167: Identifying Special Tools - Input Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 295 Needle bearing drift
- VW 295 A Needle bearing drift
- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Punch

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- VW 408 A Punch

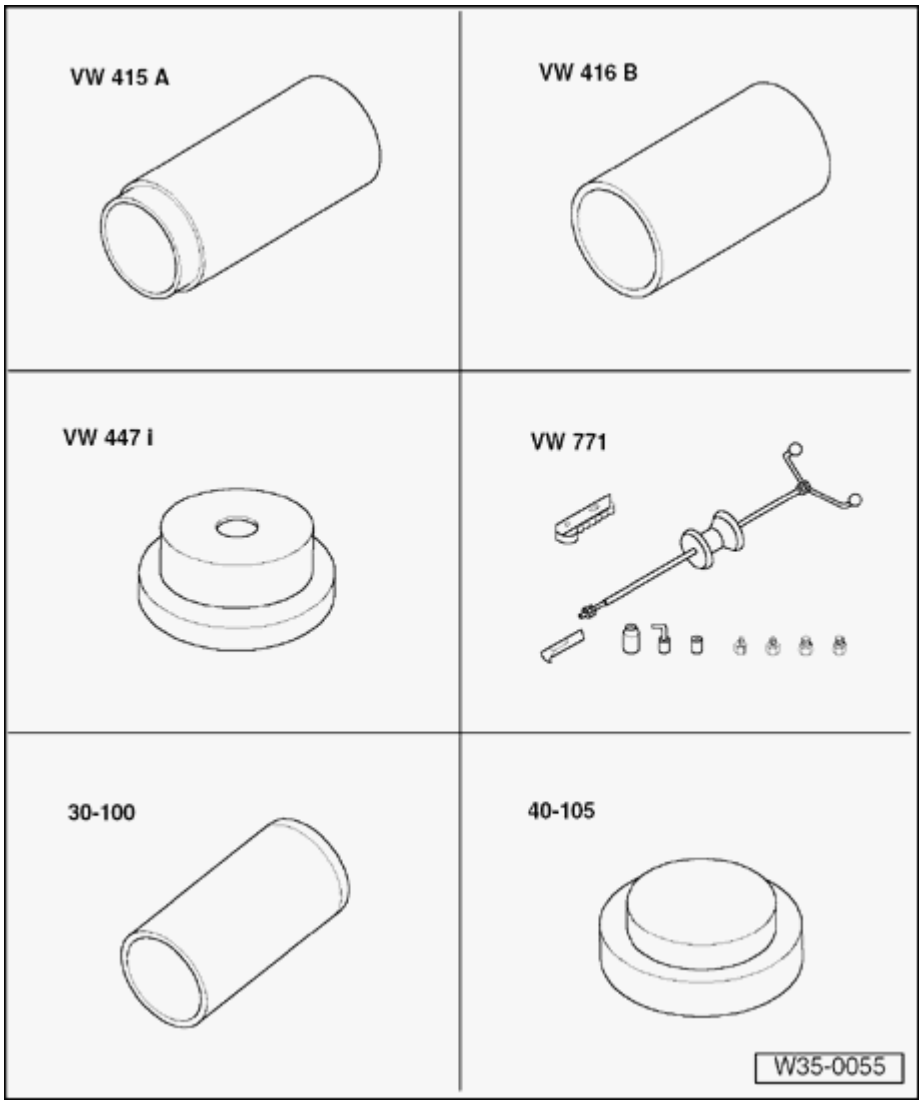


Fig. 168: Identifying Special Tools - Input Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 415 A Tube
- VW 416 B Tube
- VW 447 i Thrust pad
- VW 771 Slide hammer - complete set

- 30-100 Press tube
- 40-105 Thrust piece

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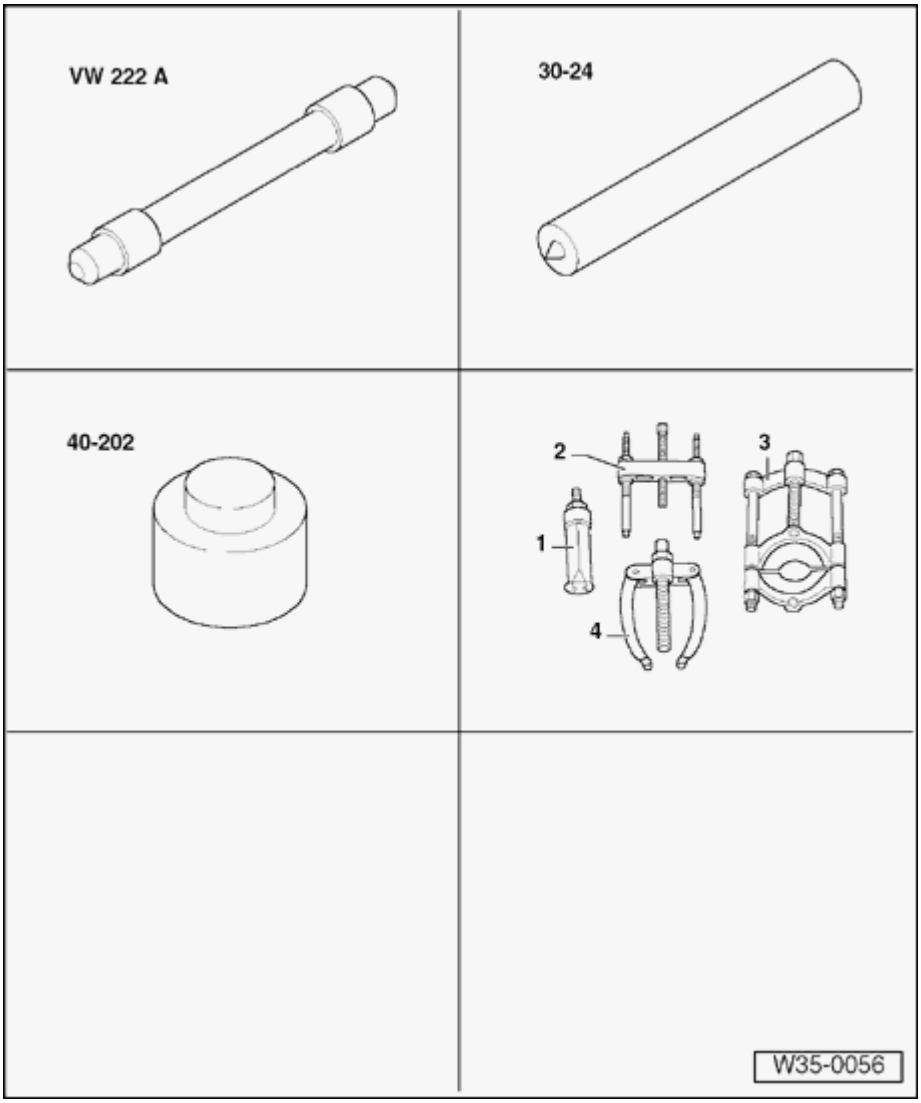


Fig. 169: Identifying Special Tools - Input Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 222 A Mandrel
- 30-24 Mandrel
- 40-202 Press tool
- 1 - Kukko 21//4 Internal puller
- 3 - Kukko 17/2 Separating tool

NOTE:

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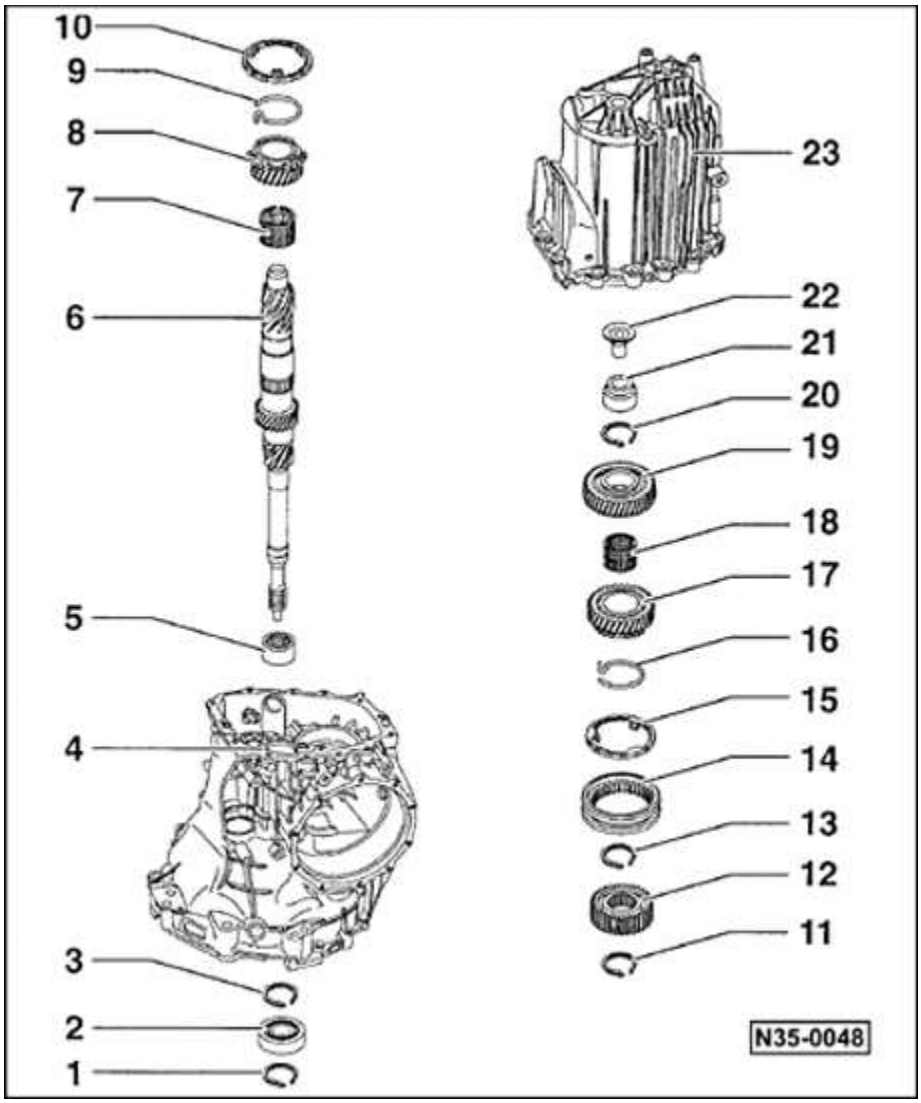


Fig. 170: Input Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing new gears or the input shaft consult technical data. Refer to **Code letters, application, ratios, capacities**.
- If -items 2, 4 or 6 under **Input shaft, disassembling and assembling** are replaced the position of the ball bearing will be affected. The input shaft should be re-adjusted. Refer to **Input shaft, adjusting**.

1 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 1
- Determining thickness. Refer to **Input shaft, adjusting** adjusting input shaft

2 - Ball bearing

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- Removing and installing. Refer to **Ball bearing for input shaft, multi-function sensor, input shaft, drive pinion, selector rods and transmission cover, removing and installing**

3 - Circlip

- Mark
- Installation position **Installation position of circlips** item 2
- Determining thickness. Refer to **Input shaft, adjusting**

4 - Transmission housing

5 - Needle bearing

- Secured with bolt. See **Remove securing bolt -arrow- for needle bearing**
- Driving out. See **Driving out needle bearing**
- Installation position. See **Installation position of needle bearing**
- Pressing in. See **Pressing in needle bearing**
- Locking. See **Screwing in securing bolt -arrow-**

6 - Input shaft

- With oil feed sleeve
- Knocking in oil feed sleeve. See **Driving oil feed sleeve into input shaft**
- Adjusting. Refer to **Input shaft, adjusting**

7 - Needle bearing for 3rd gear

- Mark

8 - 3rd speed sliding gear

9 - Spring

- Insert in 3rd speed sliding gear. See **Inserting spring in sliding gear**
- Allocation of spring to sliding gear

10 - Synchro-ring for 3rd gear

- Check for wear. See **Checking synchro-ring for wear**

11 - Circlip

- Mark

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- Installation position **Installation position of circlips** - item 3

12 - Synchro-hub for 3rd and 4th gear

- High collar faces 3rd gear
- Pressing off. See **Pressing off synchro-hub for 3rd and 4th gear**
- Pressing on. See **Pressing on synchro-hub for 3rd and 4th gear**

13 - Circlip

- Mark
- Installation position. See **Installation position of circlips** item 4
- If synchro-hub is replaced re-determine thickness. See **Determining thickness of circlip**

14 - Locking collar for 3rd and 4th gear

- Installation position. See **Installation position of locking collar**

15 - Synchro-ring for 4th gear

- Check for wear. See **Checking synchro-ring for wear**

16 - Spring

- Insert in 4th speed sliding gear. See **Inserting spring in sliding gear**
- Allocation of spring to sliding gear

17 - 4th gear sliding gear

18 - Needle bearing for 4th gear

- Mark

19 - 5th gear wheel

- Pressing off. See **Pressing off 5th gear wheel**
- Pressing on. See **Pressing on 5th gear wheel**

20 - Circlip

- Mark
- Installation position. See **Installation position of circlips** item 5
- If the 5th gear wheel is replaced re-determine thickness. See **Determining thickness of circlip**

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21 - Roller sleeve

- Replace
- Will be damaged during removal
- Pulling out. See **Pulling out roller sleeve**
- Installation position. See **Installation position of roller sleeve**
- Tapping in. See **Driving in roller sleeve**

22 - Sleeve

- Made of plastic

23 - Transmission cover

- Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

Remove securing bolt -arrow- for needle bearing

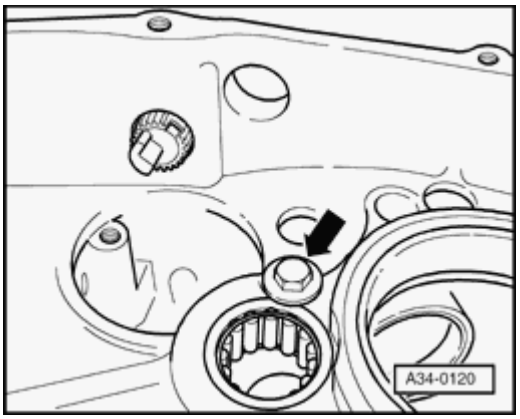


Fig. 171: Location Of Securing Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove securing bolt -arrow-.

NOTE: Bolt is not installed on all versions.

Driving out needle bearing

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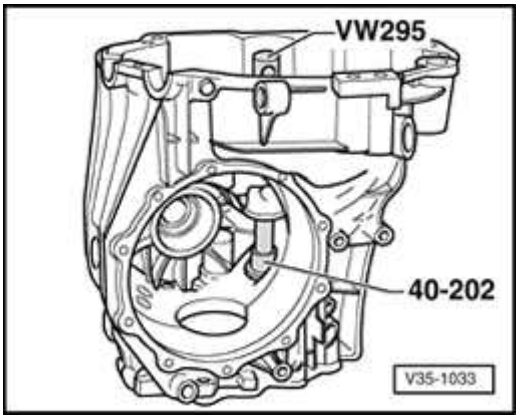


Fig. 172: Driving Out Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of needle bearing

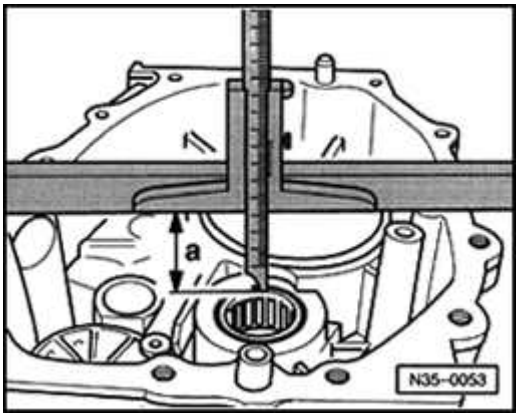


Fig. 173: Installation Position Of Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Distance -a- from lower edge of straight-edge to upper edge of needle bearing = 39.5 mm

NOTE: Measure distance from top edge of straight-edge and subtract the width of the straight-edge from the measured distance.

Pressing in needle bearing

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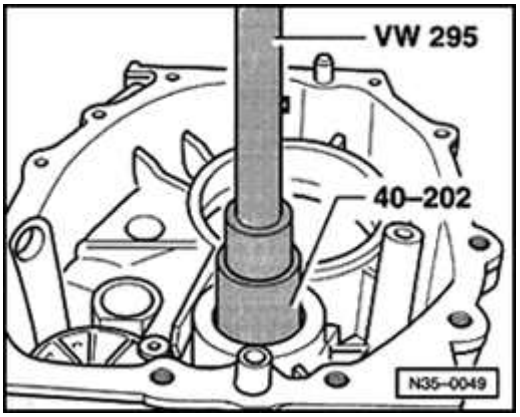


Fig. 174: Pressing In Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Screwing in securing bolt -arrow-

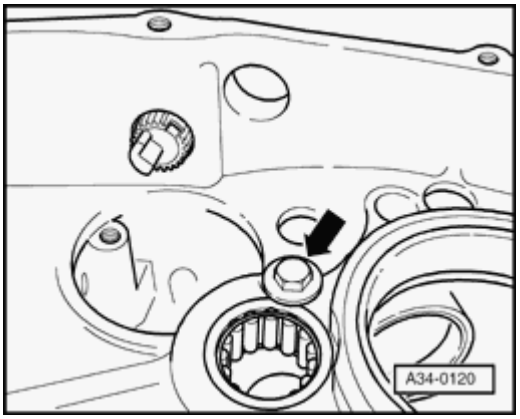


Fig. 175: Location Of Securing Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten to 25 Nm

NOTE: Bolt is not installed on all versions.

Driving oil feed sleeve into input shaft

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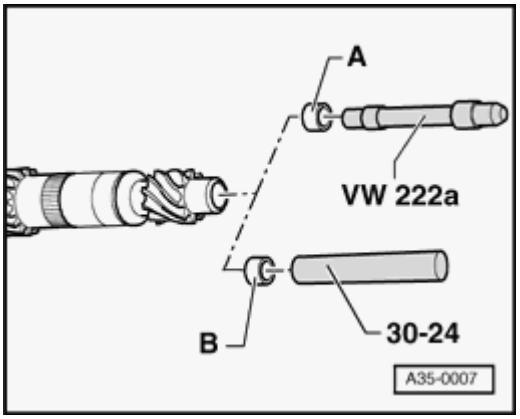


Fig. 176: Driving In Oiling Sleeve Into Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Item	Oil feed sleeve dia.	Fitting tool
A	14 mm	VW 222 A
B	16 mm	30-24

- Installation position:

Flanged edge on oil feed sleeve faces toward fitting tool

- Insertion depth:

3.5 mm below top edge

Pulling out roller sleeve

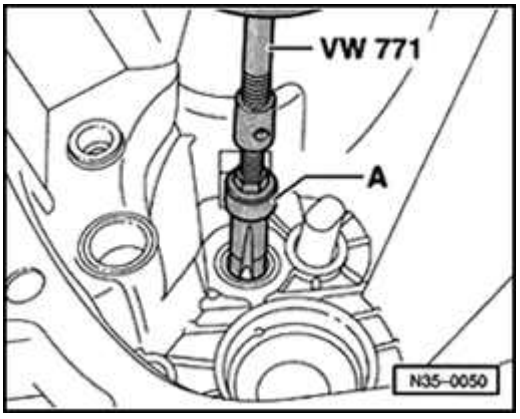


Fig. 177: Removing Roller Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal extractor, e. g. Kukko 21/4, 22... 28 mm

Before installing internal extractor, the plastic sleeve inside the roller sleeve must be destroyed.

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Installation position of roller sleeve

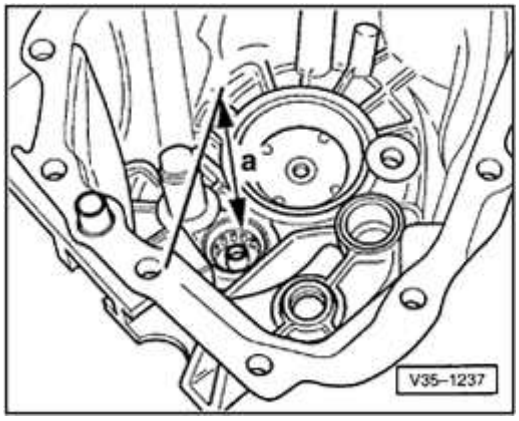


Fig. 178: Installed Position Of Roller Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Dimension a = 216 mm

Driving in roller sleeve

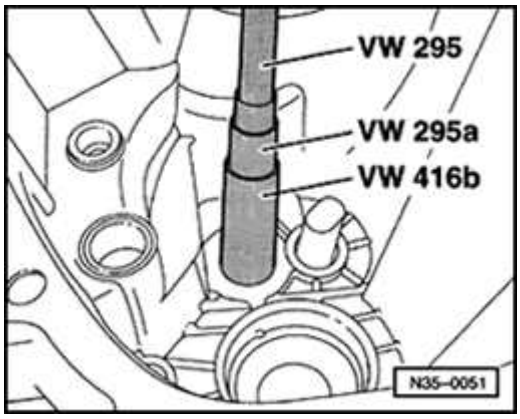


Fig. 179: Driving In Roller Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing off 5th gear wheel

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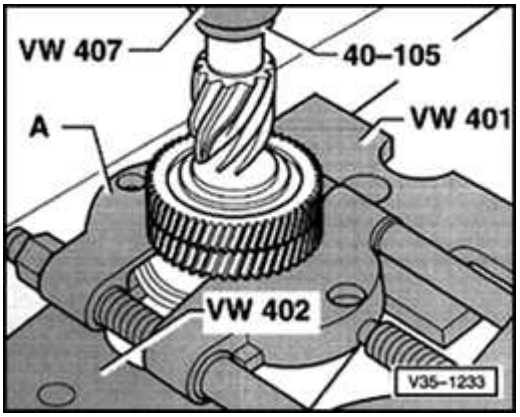


Fig. 180: Pressing Off 5th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.

A - Separating device 22... 115 mm, e.g. Kukko 17/2

Pressing off synchro-hub for 3rd and 4th gear

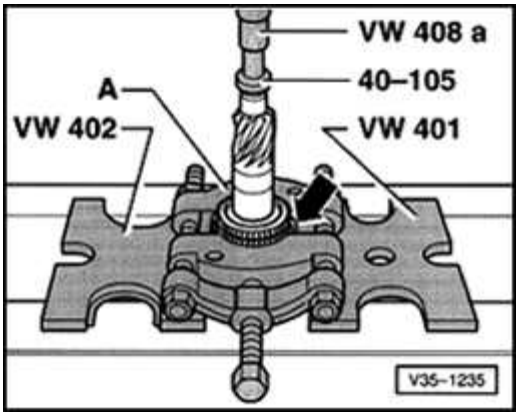


Fig. 181: Pressing Off Synchro-Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- Press 3rd gear synchro ring (arrow) toward 3rd gear wheel, then install separating device -A-.

A - Separating device 22... 115 mm, e.g. Kukko 17/2

Inserting spring in sliding gear

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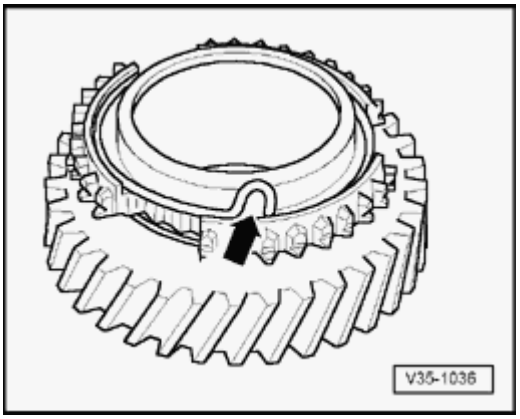


Fig. 182: Inserting Spring Into Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The bent end of the spring (arrow) must be hooked in the hole in the sliding gear.

Checking synchro-ring for wear

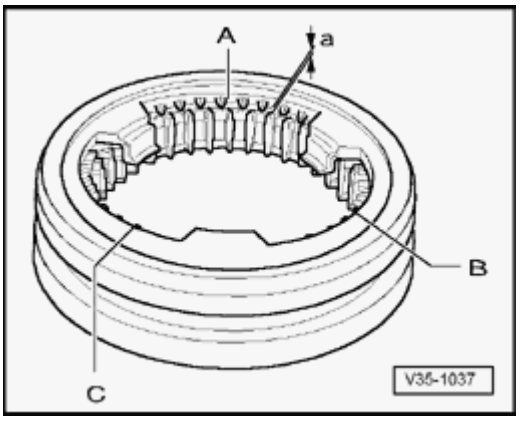


Fig. 183: Checking Synchronizer For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchro-ring into locking collar and measure gap -a- with a feeler gauge at positions -A-, -B- and -C-.
- Add the measured values and divide by 3.

The average value must not be less than 0.5 mm.

Installation position of circlips

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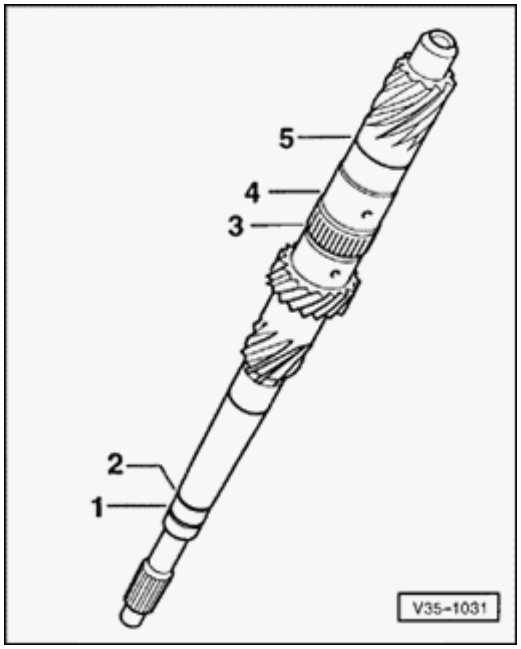


Fig. 184: Identifying Installed Positions Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlips -1- and -2- secure the input shaft ball bearing Adjusting input shaft: Refer to **Input shaft, adjusting**.
- Circlip -3- secures the 3rd and 4th gear synchro-hub.

Thickness 2.00 mm. Identification: Brown color.

- Circlip -4- secures the 3rd and 4th gear synchro-hub.

Determining thickness table on. Refer to **Available circlips for 3rd and 4th gear synchro-hubs**

- Circlip -5- secures the 5th gear wheel.

Determining thickness table on. Refer to **Available circlips for 5th gear wheel**.

Determining thickness of circlip

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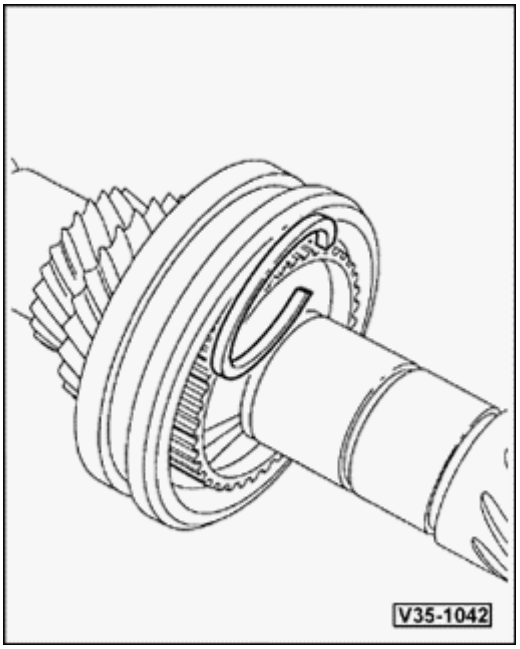


Fig. 185: Determining Circlip Fit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine thickest circlip that will just fit and install it.
- Determine circlip as accurately as possible from table. Part numbers

Available circlips for 3rd and 4th gear synchro-hubs

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

Available circlips for 5th gear wheel

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	

Pressing on synchro-hub for 3rd and 4th gear

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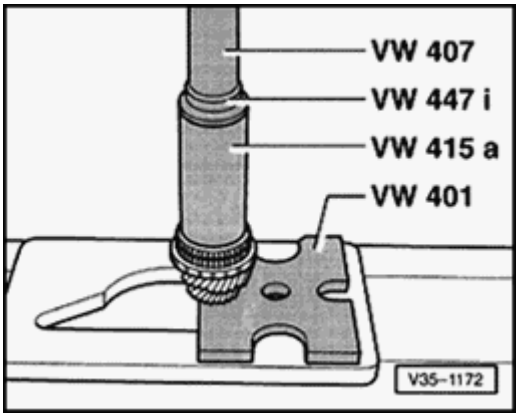


Fig. 186: Pressing On Synchronizer Hub For 3rd And 4th Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inside collar faces 3rd gear

Installation position of locking collar

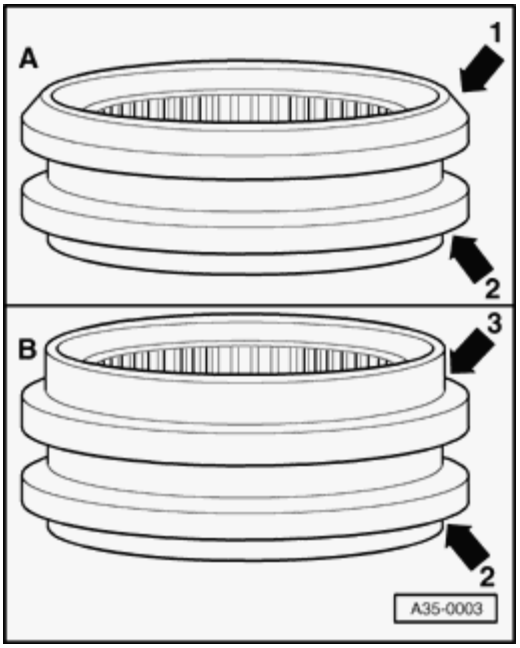


Fig. 187: Identifying Installed Position Of Operating Sleeve Up To Transmission Manufacture Date 22 06 3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Different types of locking collar are installed: illustration -A-, arrow 1- with chamfered edge, or illustration -B-, arrow 3- with large shoulder.

- Installation position:

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Chamfered edge -arrow 1- faces 4th gear

Small shoulder -arrow 2- faces 3rd gear

Large shoulder -arrow 3- faces 4th gear

Pressing on 5th gear wheel

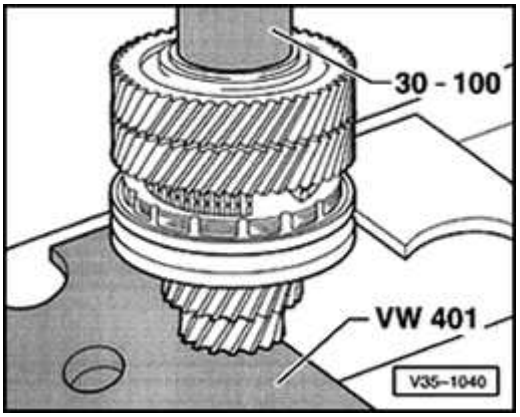


Fig. 188: Pressing On 5th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

WARNING: Wear protective gloves.

- Heat 5th gear wheel to approx. 100 ° C before pressing on.
- Installation position:

High collar faces reverse gear

INPUT SHAFT, ADJUSTING

Input shaft, adjusting

(determining circlips for input shaft)

Special tools and workshop equipment required

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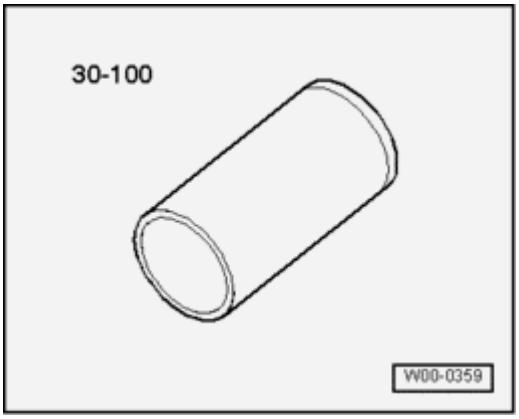


Fig. 189: Press Tube 30-100Identifying Special Tools - Oil Pump/Front Sealing Flange, Drive Chain And Chain Sprocket For Oil Pump, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 30-100 Press tube

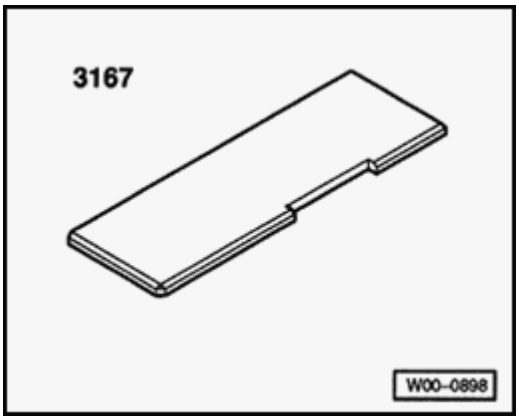


Fig. 190: Spacer Gauge 3167
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3167 Spacer gauge
- Depth gauge

It is necessary to readjust input shaft when the:

- Transmission housing
- Input shaft

or

- Ball bearing

are replaced.

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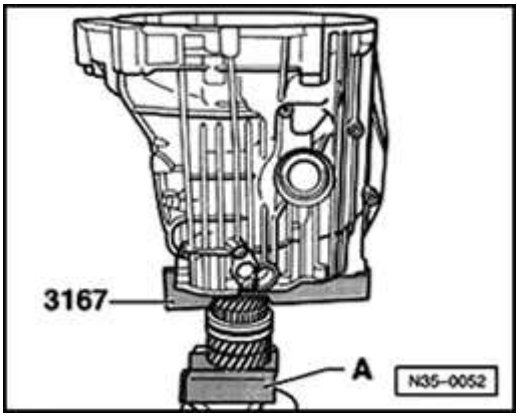


Fig. 191: Placing Transmission Housing Over Input Shaft Onto Spacer Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp input shaft in vice using soft jaws -A-.
- Place distance gauge 3167 onto 3rd gear sliding gear.
- Place transmission housing over input shaft onto the distance gauge.

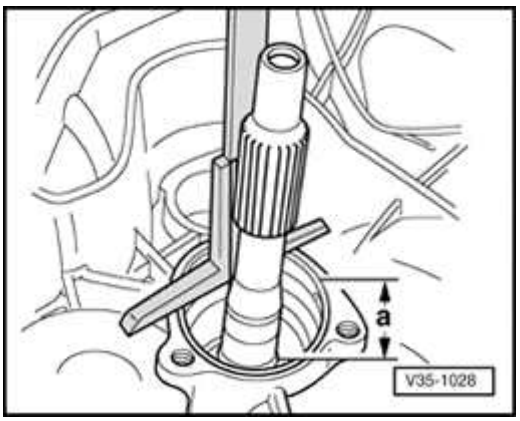


Fig. 192: Determining Circlip Thickness, Measuring Value "a"
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place depth gauge onto transmission housing and measure to the lower circlip groove in the input shaft.

- Measurement in following example: -a- = 28.50 mm

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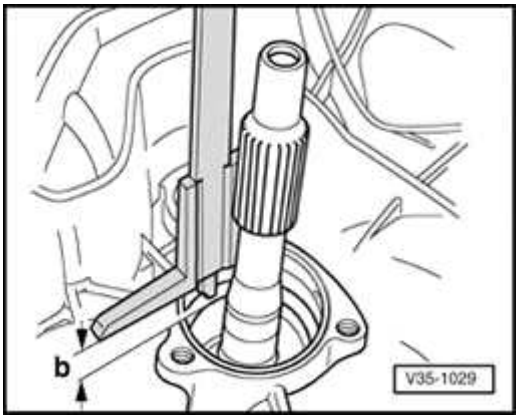


Fig. 193: Determining Circlip Thickness, Measuring Value "b"
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place depth gauge onto transmission housing and measure to seat surface for ball bearing.
- Measurement in following example: -b- = 26.80 mm

Determining circlip x behind the input shaft ball bearing.

Formula:		
"x"	**=**	**Dimension "a" - dimension "b"**

Example:		
	Dimension "a"	28.50 mm
-	Dimension "b"	26.80 mm
=	Dimension "x" (thickness of circlip)	1.70 mm

- Determine circlip from table. Part numbers

Available circlips

Dimension "x"	Thickness (mm)
1.48... 1.56	1.54
1.57... 1.65	1.63
1.66... 1.74	1.72
1.75... 1.83	1.81
1.84... 1.92	1.90
1.93... 2.01	1.99
2.02... 2.10	2.08
2.11... 2.20	2.17
2.21... 2.27	2.25

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2.28... 2.35	2.33

Determining the circlip in front of the input shaft ball bearing

- Knock rear circlip (as calculated) and ball bearing onto input shaft with fitting sleeve 30-100.

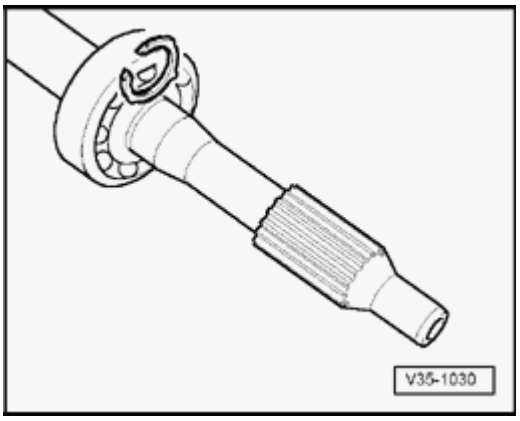


Fig. 194: Input Shaft And Thickest Circlip Which Can Still Just Be Installed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine the thickest circlip which will still fit.
- Determine circlip from table. Part numbers

Available circlips

Circlip thickness (mm)		
1.45	1.72	1.99
1.54	1.81	2.08
1.63	1.90	2.17

DRIVE PINION, DISASSEMBLING AND ASSEMBLING

Drive pinion, disassembling and assembling

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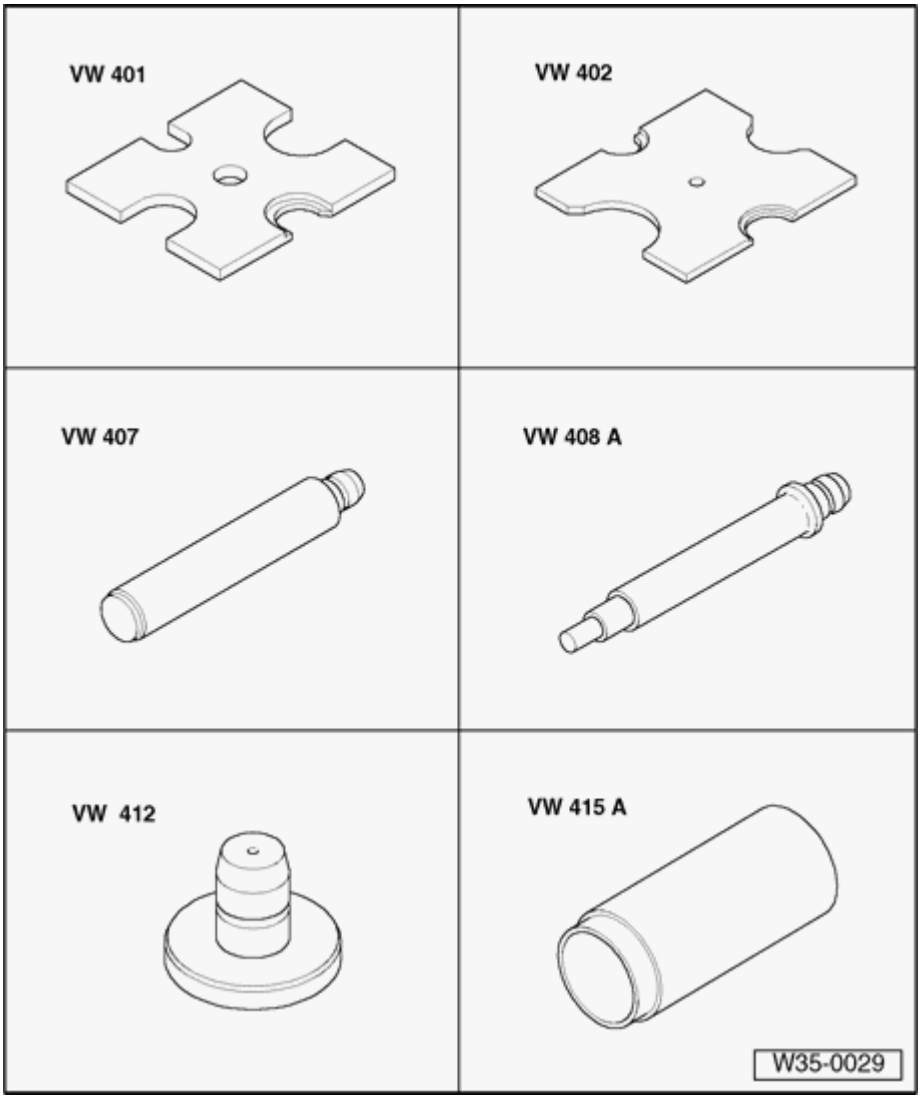


Fig. 195: Identifying Special Tools - Output Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 408 A Pressure tool

- VW 412 Thrust tool
- VW 415 A Tube

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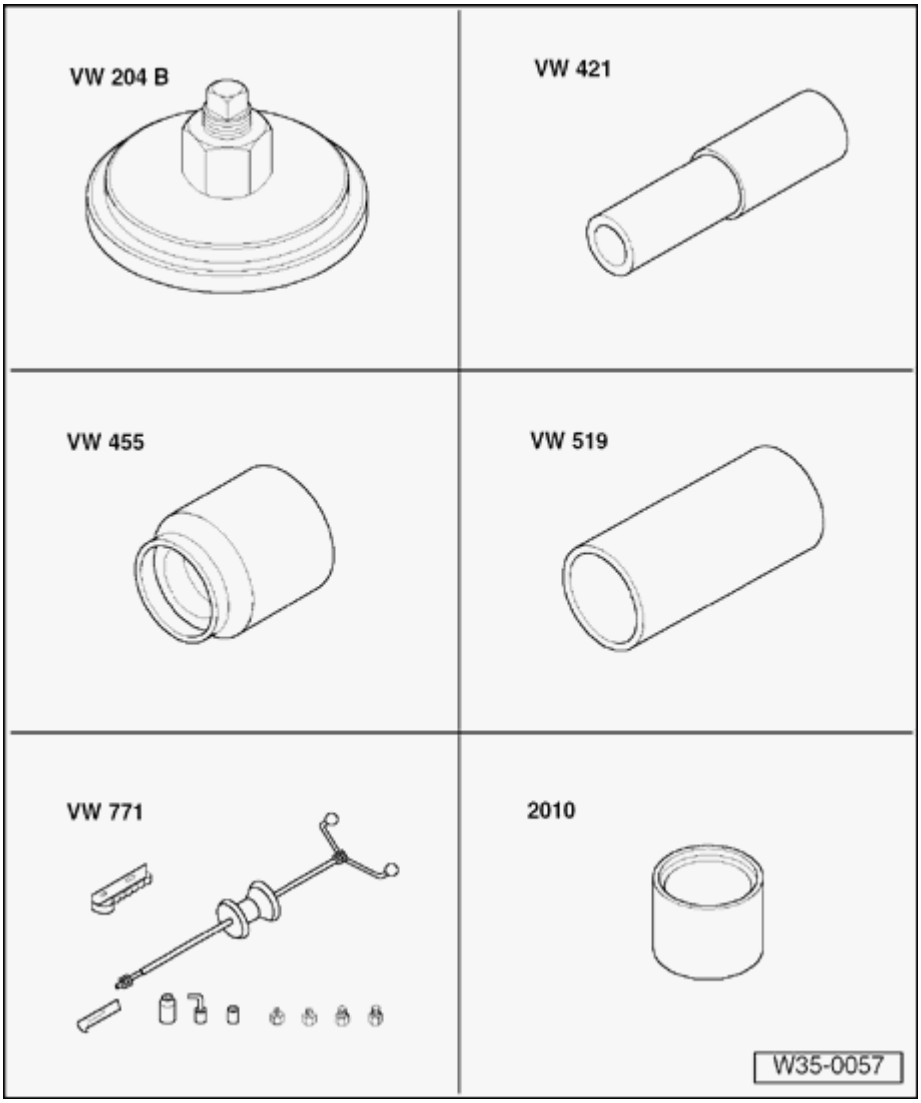


Fig. 196: Identifying Special Tools - Transmission, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- Crankshaft seal installing tool VW 204 B
- VW 421 Tube
- VW 455 Pressing-on sleeve
- VW 519 Tube
- VW 771 Multi-purpose tool
- 2010 Tube

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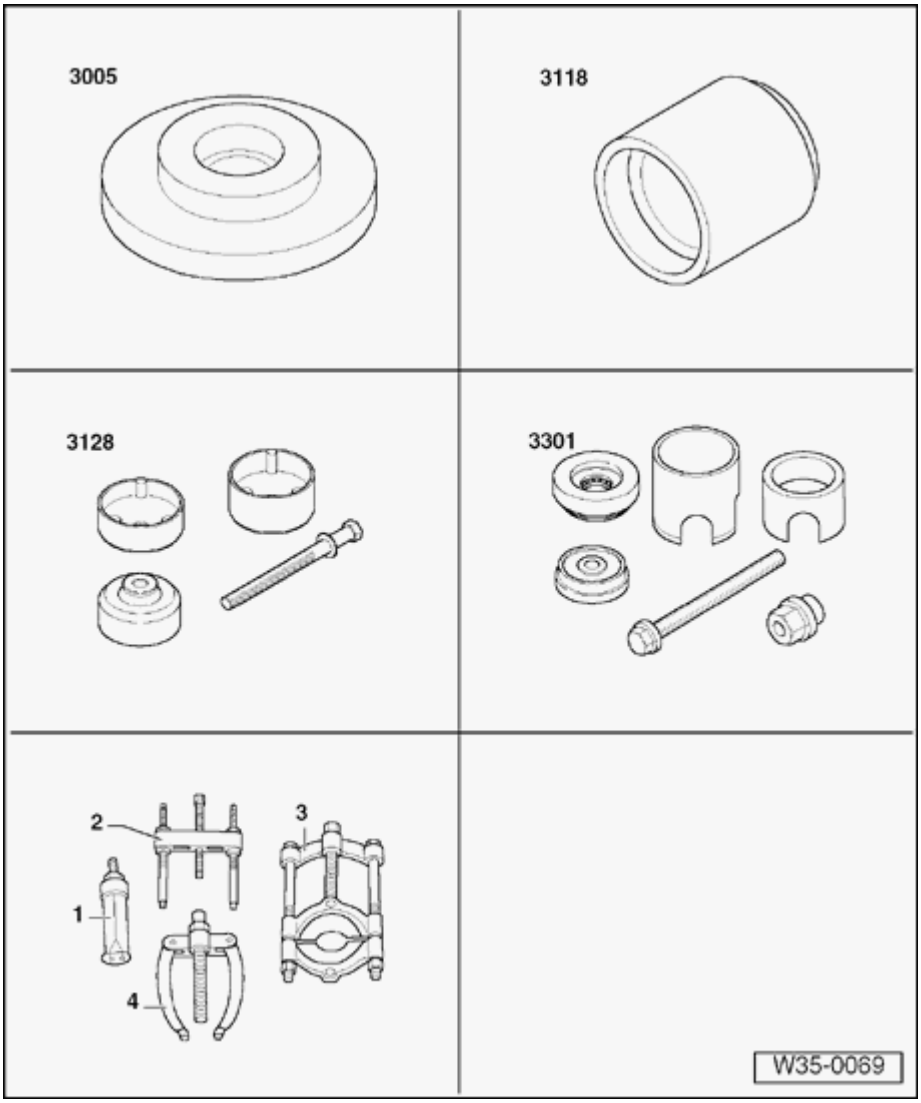


Fig. 197: Identifying Special Tools - Transmission, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- 3005 Thrust plate
- 3118 Thrust piece
- 3128 Puller
- 3301 Assembly equipment

- 1 - Kukko 21//4 Internal puller
- 3 - Kukko 17/2 Separating tool

NOTE:

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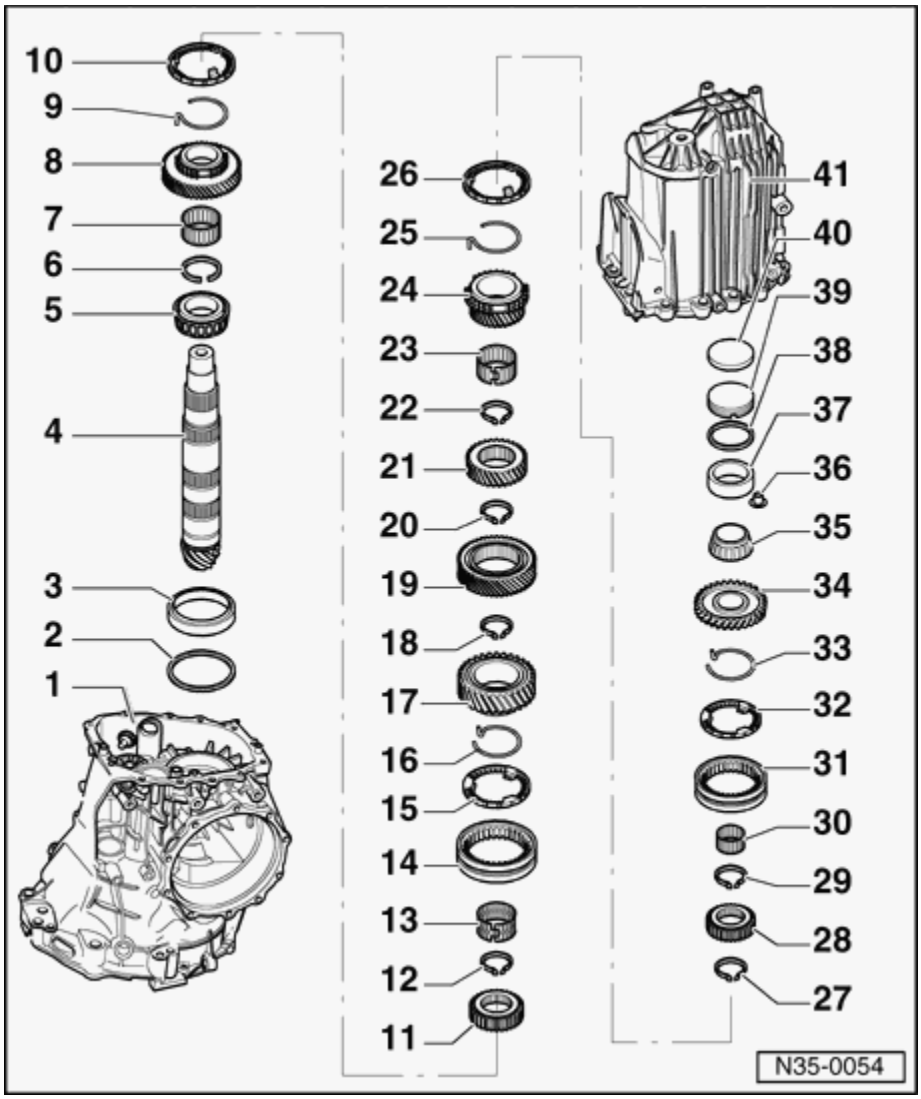


Fig. 198: Exploded View Drive Pinion Up To Transmission Manufacture Date 22 06 3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing new gears or the final drive set consult technical data. Refer to **Code letters, application, ratios, capacities**.
- Adjustments are required when replacing components marked 1).

1 - Transmission housing 1)

2 - Shim "S3"

3 - Outer race for large tapered roller bearing 1)

- Pulling out. See **Pulling out outer race for large tapered roller bearing**
- Pressing in. See **Pressing in outer race for large tapered roller bearing**

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4 - Drive pinion1)

- Is mated with ring gear, replace together as a set
- Adjusting ring gear and drive pinion. Refer to **Drive pinion and ring gear, adjusting**

5 - Inner race for large tapered roller bearing 1)

- Always replace
- Will be damaged during removal
- Pressing off. See **Pressing off inner race for large tapered roller bearing**
- Pressing on. See **Pressing on inner race for large tapered roller bearing**

6 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 1
- Re-determine thickness if tapered roller bearing is replaced. See **Determining thickness of circlip**

7 - Needle bearing for 1th gear

8 - 1st gear sliding gear

9 - Spring

- Insert in 1st gear sliding gear. See **Inserting spring in sliding gear**
- Allocation of spring to sliding gear

10 - Synchro-ring for 1st gear

- Check for wear. See **Checking synchro-ring for wear**

11 - Synchro-hub for 1st and 2nd gear

- Pressing off. See **Pressing off synchro-hub for 1st and 2nd gear**
- Pressing on. See **Pressing on synchro-hub for 1st and 2nd gear**

12 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 2
- Re-determine if the synchro-hub is replaced. See **Determining thickness of circlip**

13 - Needle bearing for 2nd gear

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14 - Locking collar, 1st and 2nd gear

- Installation position. See **Installation position of locking collar for 1st and 2nd gear**

15 - Synchro-ring for 2nd gear

- Check for wear. See **Checking synchro-ring for wear**

16 - Spring

- Insert in 2nd gear sliding gear. See **Inserting spring in sliding gear**
- Allocation of spring to sliding gear

17 - 2nd gear sliding gear

18 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 3

19 - 3rd gear wheel

- Pressing off. See **Pressing off 3rd gear wheel**
- Shoulder points to 4th gear
- Pressing on. See **Pressing on 3rd gear wheel**

20 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 4
- Re-determine thickness If the 3rd gear wheel is replaced. See **Determining thickness of circlip**

21 - 4th gear wheel

- Pressing off. See **Pressing off 4th gear wheel**
- Shoulder points to 3rd gear
- Pressing on. See **Pressing on 4th gear wheel**

22 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 5
- Re-determine thickness if the 4th gear wheel is replaced. See **Determining thickness of circlip**

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23 - Needle bearing

24 - 5th gear sliding gear

25 - Spring

- Insert in 5th gear sliding gear. See **Inserting spring in sliding gear**
- Allocation of spring to sliding gear

26 - Synchro-ring for 5th gear

- Check for wear. See **Checking synchro-ring for wear**

27 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 6

28 - 5th gear and reverse gear synchro-hub

- Pressing off. See **Pressing off 5th gear and reverse gear synchro-hub**
- Pressing on. See **Pressing on 5th gear and reverse gear synchro-hub**

29 - Circlip

- Mark
- Installation position **Installation position of circlips** - item 5
- If the synchro-hub is replaced re-determine. See **Determining thickness of circlip**

30 - Needle bearing

- For reverse gear

31 - Locking collar for 5th and reverse gear

- Installation position. See **Installation position of locking collar for 5th and reverse gear**

32 - Reverse gear synchro-ring

- Check for wear. See **Checking synchro-ring for wear**

33 - Spring

- Insert in reverse gear sliding gear. See **Inserting spring in sliding gear**
- Allocation of spring to sliding gear

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34 - Reverse gear sliding gear

35 - Inner race for small tapered roller bearing 1)

- Pressing off. See **Pressing off inner race for small tapered roller bearing**
- Pressing on. See **Pressing on inner race for small tapered roller bearing**

36 - Socket

- To secure small tapered roller bearing outer race
- Pulling out. See **Pulling out securing bushing for small tapered roller bearing outer race**
- Need not be fitted after the small tapered roller bearing has been replaced.

37 - Outer race for small tapered roller bearing 1)

- Pulling out. See **Pulling out outer race for small tapered roller bearing**
- Pressing in. See **Pressing in outer race for small tapered roller bearing**

38 - Shim "S4"

39 - Pressure plate

40 - Rubber disc

- Compensates length variations
- To remove, insert self-tapping screw center and pull out washer on self-tapping screw.
- Use components according to the transmission code letters. Refer to **Code letters, application, ratios, capacities**.

41 - Transmission cover

- Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

Pulling out securing bushing for small tapered roller bearing outer race

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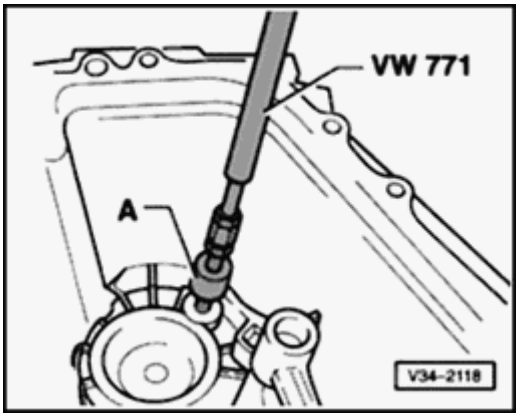


Fig. 199: Pulling Off Securing Bushing For Small Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal extractor, e. g. Kukko 21/1, 12... 16 mm

Pulling out outer race for small tapered roller bearing

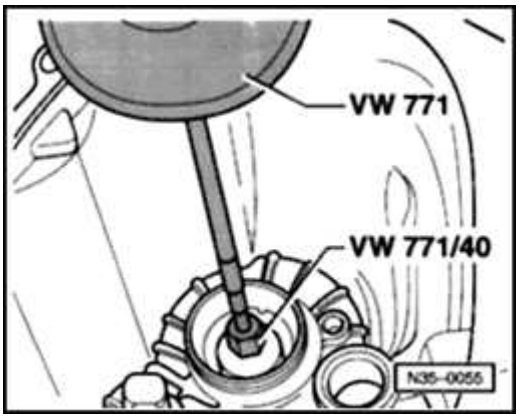


Fig. 200: Pulling Off Outer Race Of Small Tapered Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Screw special tool VW 771/40 into pressure plate
- Install multi-purpose tool VW 771 and pull outer race out via pressure plate.

Pressing in outer race for small tapered roller bearing

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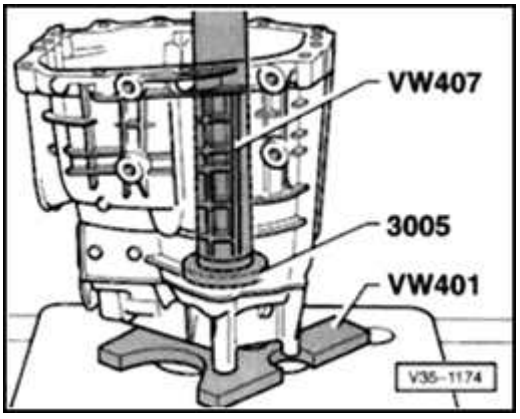


Fig. 201: Pressing In Outer Race For Small Tapered Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pulling out outer race for large tapered roller bearing

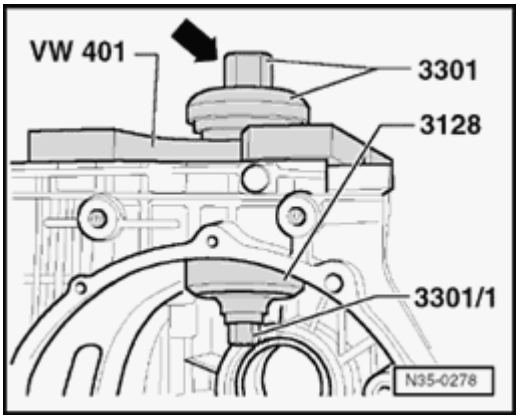


Fig. 202: Pulling Out Double Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove differential. Refer to **Differential, removing and installing**.
- Place pressure piece of puller 3128 below the outer race.
- Install threaded spindle and pressure bearing of assembly device 3301 with pressure plate VW 401 onto transmission housing.

When tightening bolt the outer race will be pulled out of housing.

Pressing in outer race for large tapered roller bearing

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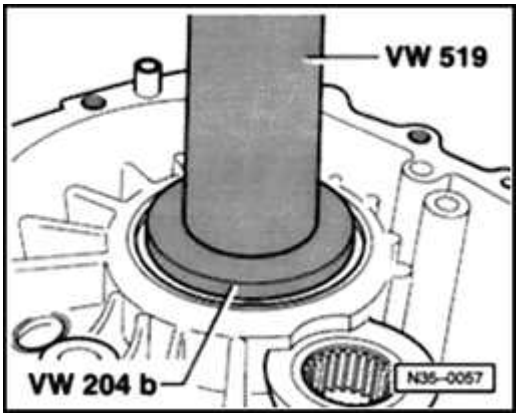


Fig. 203: Pressing In Double Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The smaller diameter of special tool VW 204 b faces outer race.

Pressing off inner race for small tapered roller bearing

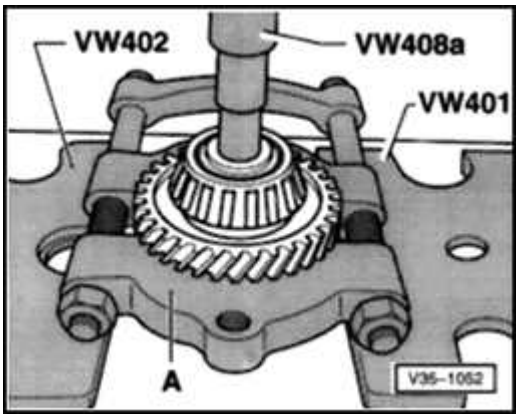


Fig. 204: Pressing Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press off inner race with reverse gear sliding gear.

A - Separating device 22... 115 mm, e.g. Kukko 17/2

Pressing off 5th gear and reverse gear synchro-hub

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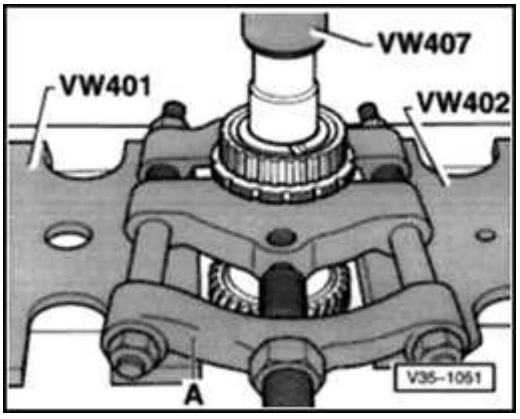


Fig. 205: Pressing Off Synchronizer Hub For 5th And Reverse Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- Press off synchro-hub with 5th gear sliding gear.

A - Separating device 22... 115 mm, e.g. Kukko 17/2

Pressing off 4th gear wheel

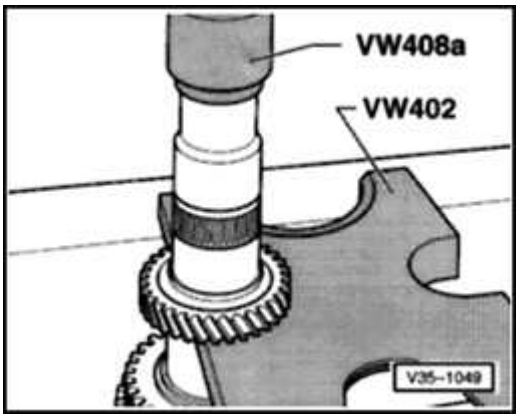


Fig. 206: Pressing Off 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.

Pressing off 3rd gear wheel

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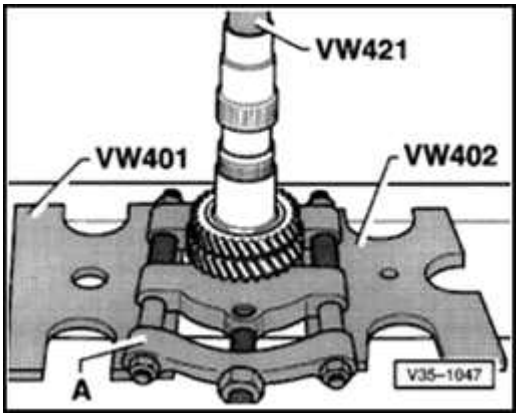


Fig. 207: Pressing Off 3rd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- Pressing off 3rd gear wheel with 2nd gear sliding gear.

A - Separating device 22... 115 mm, e.g. Kukko 17/2

Pressing off synchro-hub for 1st and 2nd gear

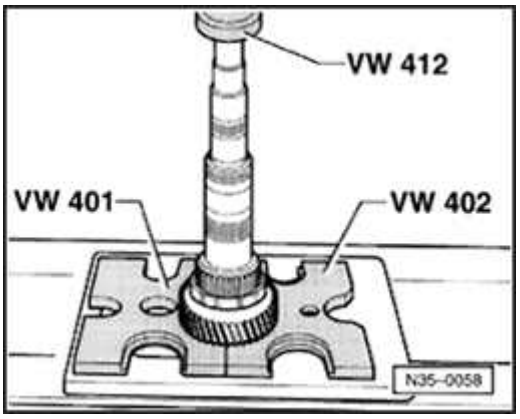


Fig. 208: Pressing Off Synchronizer Hub For 1st And 2nd Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.
- Press off synchro-hub with 1st gear sliding gear.

Pressing off inner race for large tapered roller bearing

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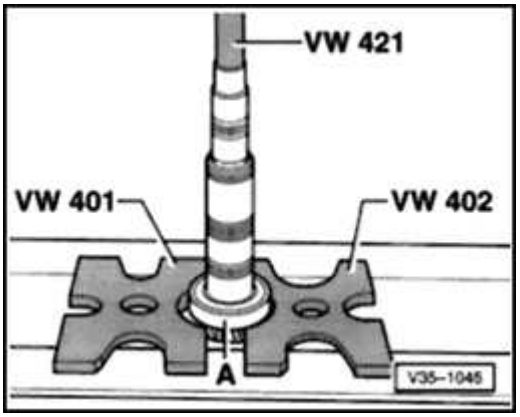


Fig. 209: Pressing Off Double Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing off.

The outer race -A- must be installed to press off the inner race.

Pressing on inner race for large tapered roller bearing

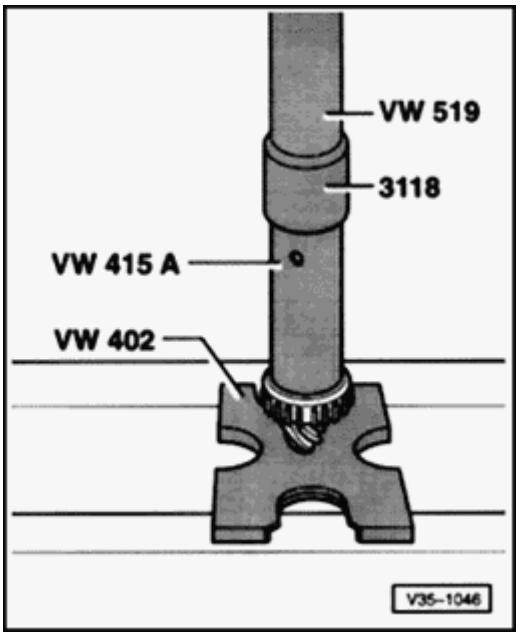


Fig. 210: Pressing On Inner Race For Large Tapered Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Determining thickness of circlip

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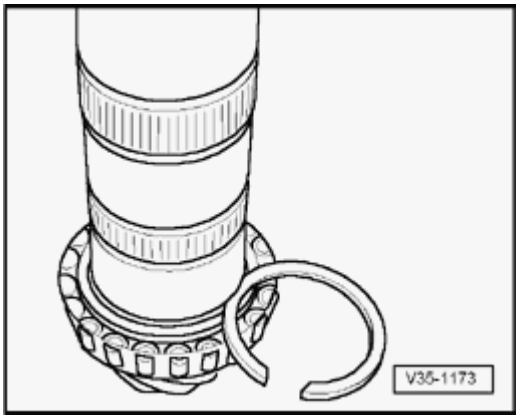


Fig. 211: Determining Circlip Fit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine thickest circlip which will still fit and install it.

The circlips for synchro-hubs and individual gear wheels should also be determined as shown for tapered roller bearing.

Available circlips and part numbers

Installation position of circlips

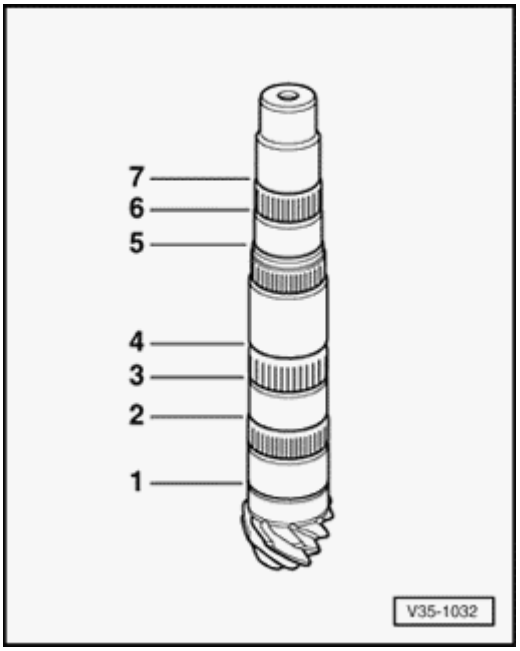


Fig. 212: Identifying Installed Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The circlips for synchro-hubs, needle roller bearings and individual gear wheels should also be determined. Refer to **Determining thickness of circlip**.

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- Circlip -1- secures the inner race for tapered roller bearing.

Circlip thickness (mm)		
2.00	2.06	2.12
2.03	2.09	2.15

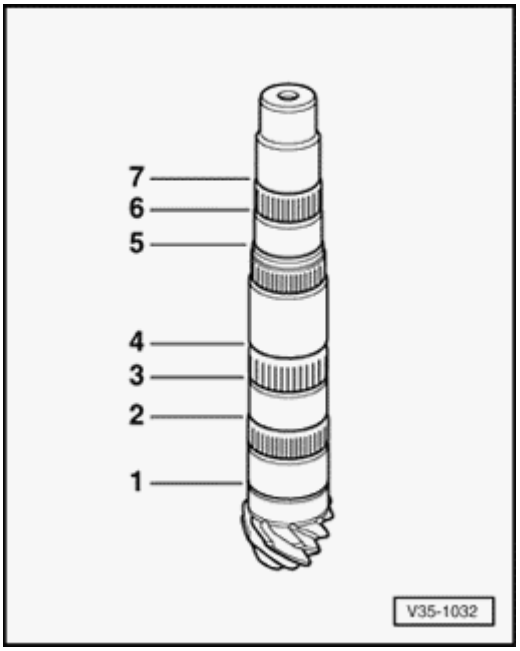


Fig. 213: Identifying Installed Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlip -2- secures the 1st and 2nd gear synchro-hub.

Distinguishing features. Color - blue

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	

- Circlip -3- secures the needle bearing for 2nd gear sliding gear.

Distinguishing features. Color - blue

Circlip thickness (mm)
2.50

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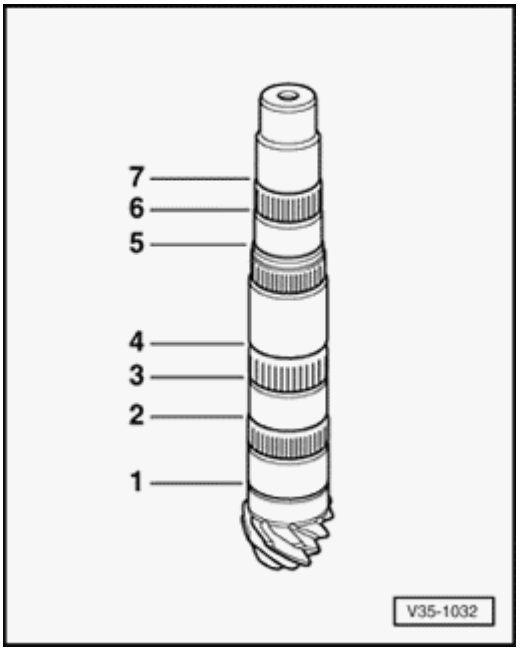


Fig. 214: Identifying Installed Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlip -4- secures the 3rd gear wheel.

Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	

- Circlip -5- secures the 4th gear wheel.

Circlip thickness (mm)		
1.86	1.94	
1.90	1.98	

- Circlip -6- secures the needle bearing for 5th gear sliding gear.

Distinguishing features. color - brown

Circlip thickness (mm)
2.00

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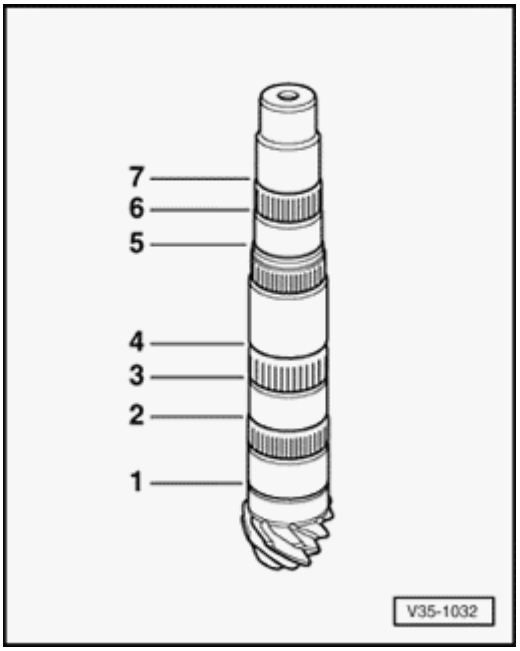


Fig. 215: Identifying Installed Position Of Circlips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Circlip -7- secures the synchro-hub for 5th gear and reverse gear.

Distinguishing features. color - blue

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

- Determine circlips according to table: Part numbers

Inserting spring in sliding gear

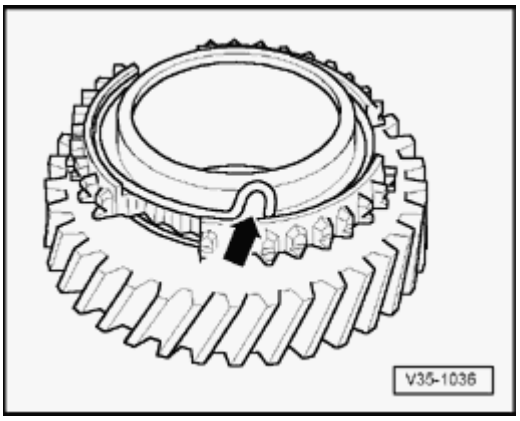


Fig. 216: Inserting Spring Into Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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The bent end of the spring (arrow) must be hooked in the hole in the sliding gear.

Checking synchro-ring for wear

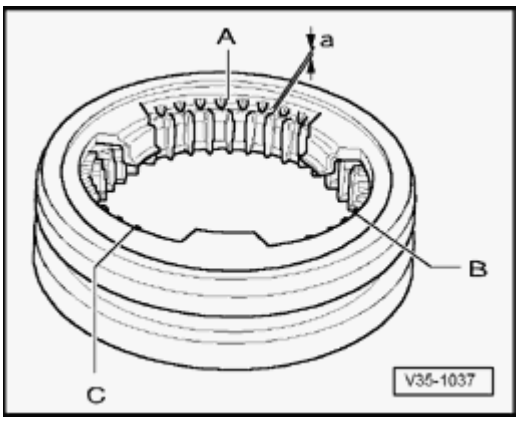


Fig. 217: Checking Synchronizer For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchro-ring into locking collar and measure gap -a- with a feeler gauge at positions -A-, -B- and -C-.
- Add measured values and divide by 3.

Calculated value must not be less than 0.5 mm.

Pressing on synchro-hub for 1st and 2nd gear

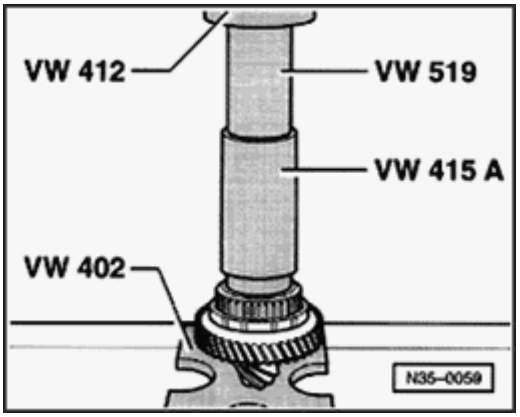


Fig. 218: Pressing On Synchronizer Hub For 1st And 2nd Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inside collar faces 2nd gear

Installation position of locking collar for 1st and 2nd gear

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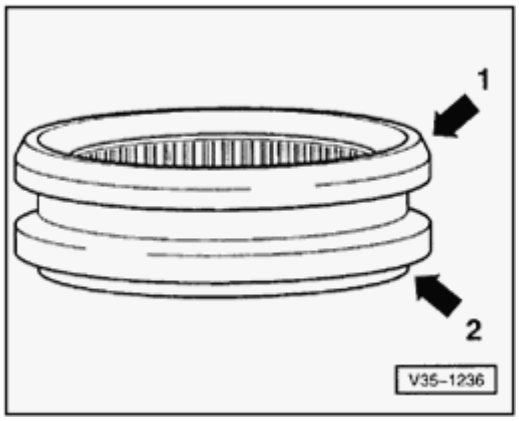


Fig. 219: Identifying Installed Position Of Operating Sleeve For 1st And 2nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

Chamfered edge -arrow 1- faces 2nd gear

Shoulder -arrow 2- faces 1st gear

Pressing on 3rd gear wheel

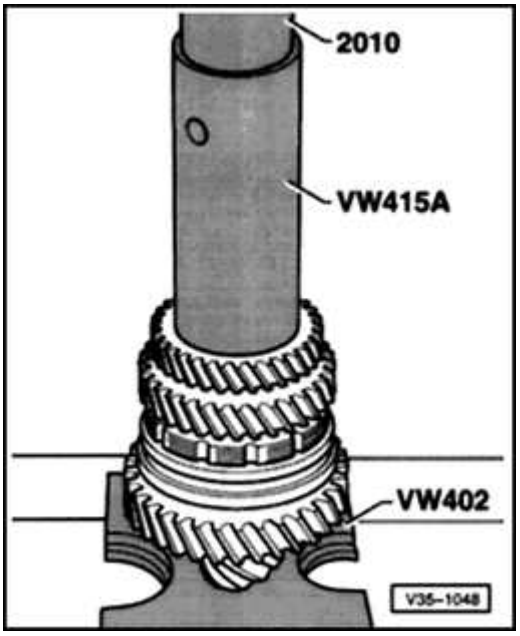


Fig. 220: Pressing On 3rd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

Groove on gear wheel faces 4th gear

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Pressing on 4th gear wheel

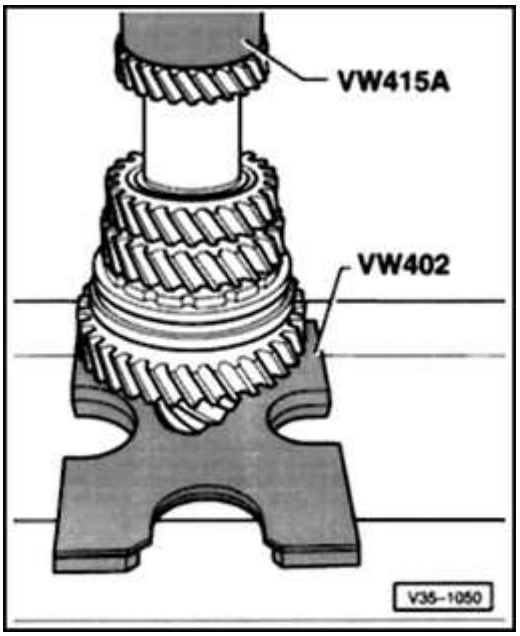


Fig. 221: Pressing On 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inside collar faces 3rd gear

Pressing on 5th gear and reverse gear synchro-hub

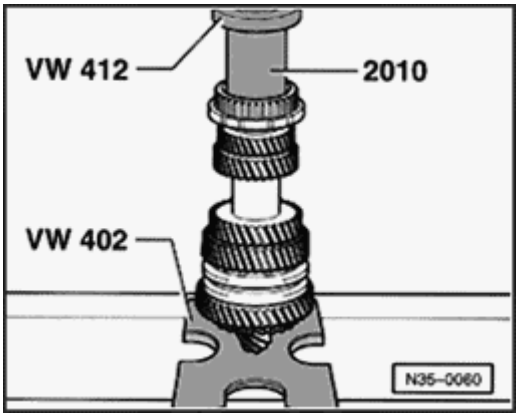


Fig. 222: Pressing On Synchronizer Hub For 5th And Reverse Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position:

High inside collar faces 5th gear

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NOTE: Large inner diameter in special tool 2010 faces synchro-hub.

Installation position of locking collar for 5th and reverse gear

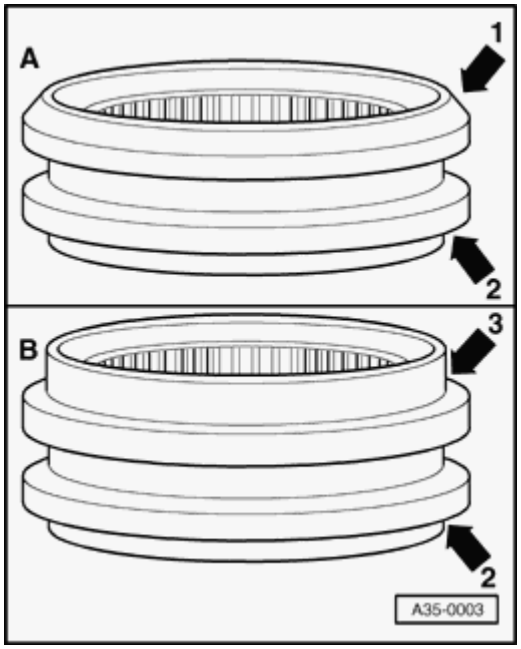


Fig. 223: Identifying Installed Position Of Operating Sleeve Up To Transmission Manufacture Date 22 06 3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Different types of locking collar are installed: illustration -A-, arrow 1- with chamfered edge, or illustration -B-, arrow 3- with large shoulder.

- Make sure locking collar is correct version for reverse gear wheel. See **Selecting correct locking collar for reverse gear wheel**
- Installation position:

Chamfered edge -arrow 1- faces reverse gear

Small shoulder -arrow 2- faces 5th gear

Large shoulder -arrow 3- faces reverse gear

Pressing on inner race for small tapered roller bearing

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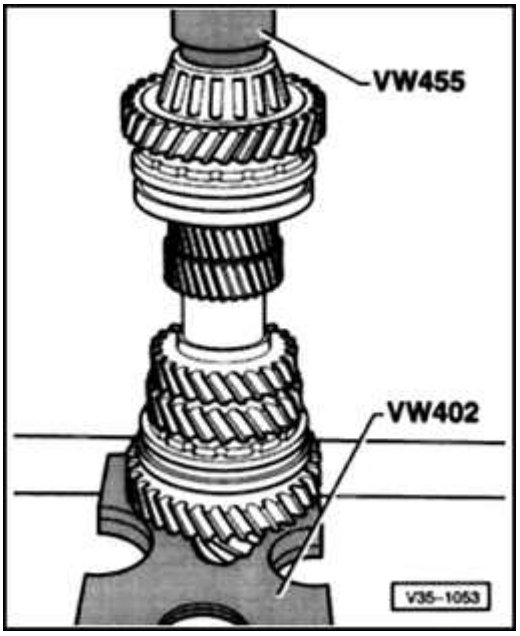


Fig. 224: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Selecting correct locking collar for reverse gear wheel

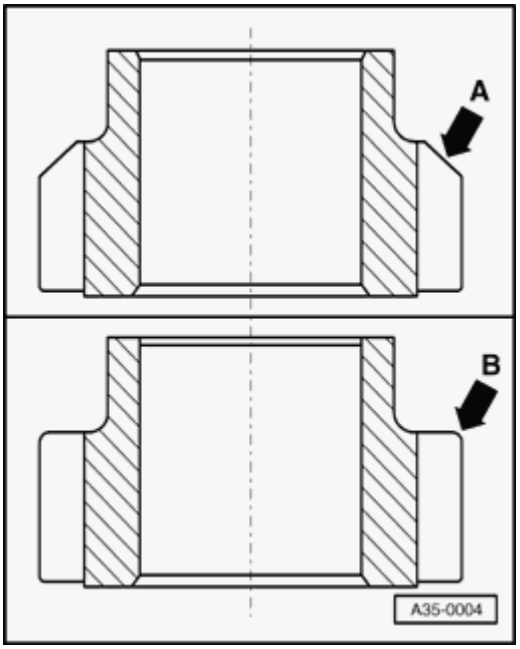


Fig. 225: Allocation Of Operating Sleeve To Reverse Idler Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A	Reverse gear wheel with chamfered edge	Both types of locking collar can be installed (with chamfered edge or large shoulder).

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B	Reverse gear wheel without chamfered edge.	Install only locking collar with large shoulder, do not use locking collar with chamfered edge.

REVERSE IDLER GEAR, REMOVING AND INSTALLING

Reverse idler gear, removing and installing

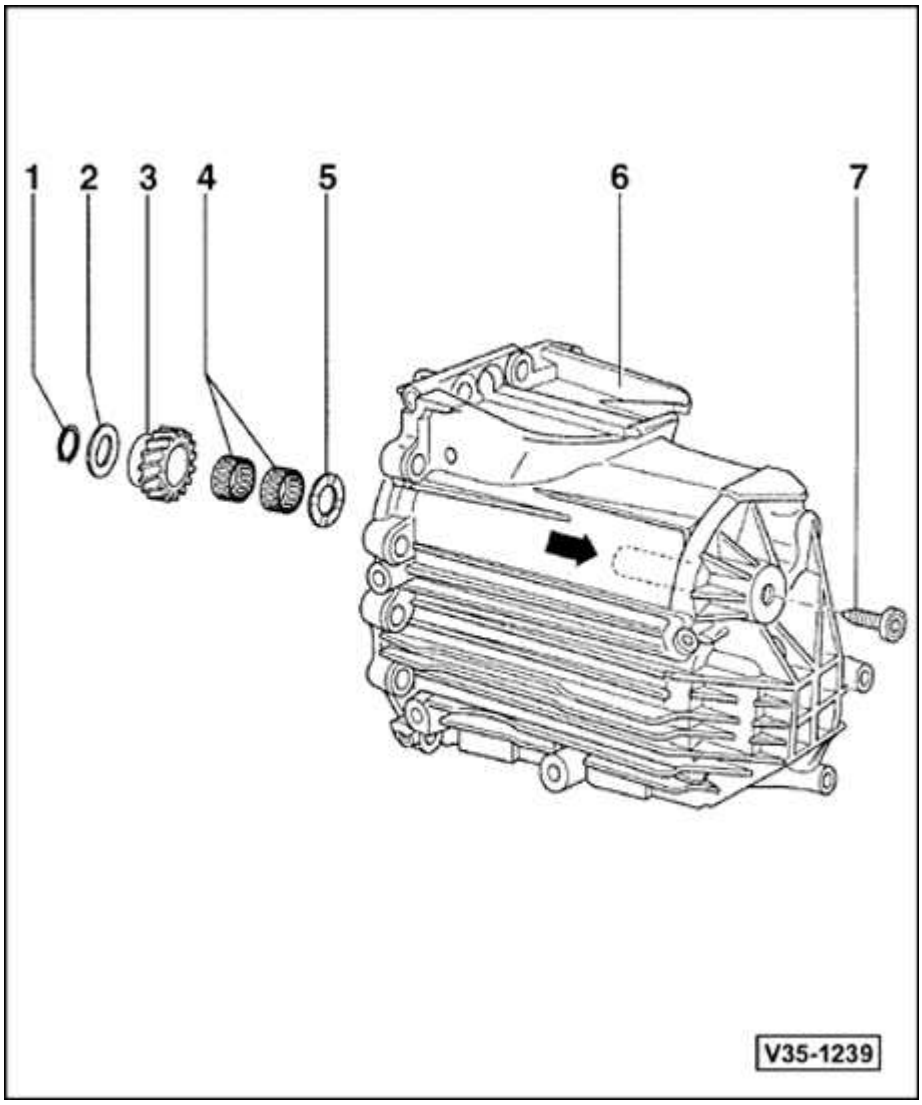


Fig. 226: Reverse Idler Gear, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Circlip

2 - Support plate

3 - Reverse idler gear

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- Different versions, assignment. See **Selecting correct locking collar for reverse gear wheel**

4 - Needle bearing

5 - Thrust washer

6 - Transmission cover

- With reverse idler gear shaft (arrow)
- It is not necessary to remove the reverse idler gear shaft to remove the reverse idler gear
- The reverse idler gear shaft is not available as a replacement part
- Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

7 - Torx bolt - 35 Nm

- To secure reverse idler gear shaft

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39 FINAL DRIVE, DIFFERENTIAL

FLANGE SHAFT OIL SEAL, REPLACING

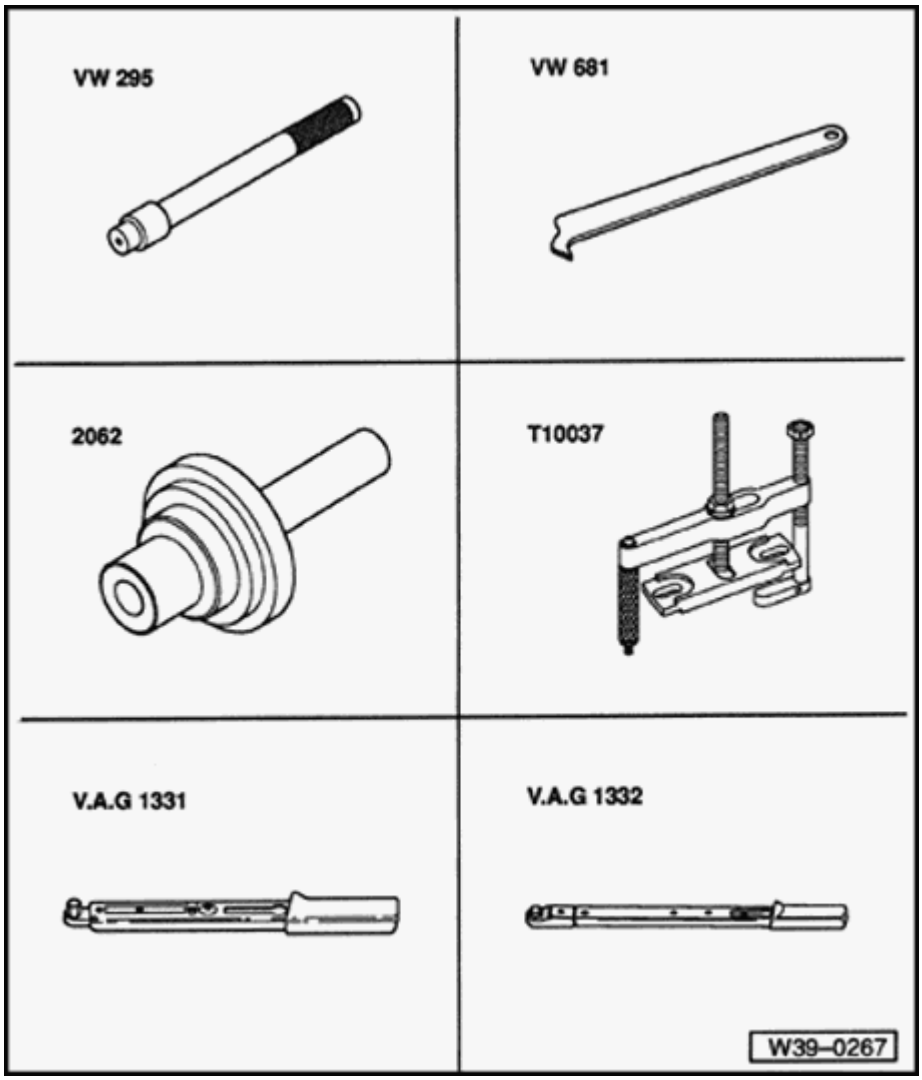


Fig. 227: Identifying Special Tools
Courtesy of VOLKSWAGEN UNITED STATES, INC.

(Transmission installed)

- Observe general repair instructions. Refer to **General repair instructions**.

Special tools and workshop equipment required

- VW 295 Needle bearing drift
- VW 681 Extractor lever
- 2062 Driver

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- T10037 Puller
- VAG 1331 Torque wrench
- VAG 1332 Torque wrench

Special tools, testers and auxiliary items required

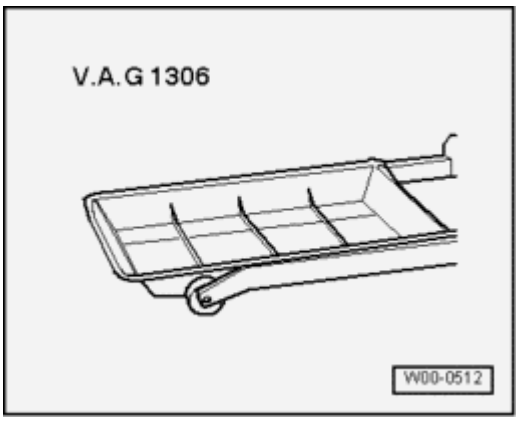


Fig. 228: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1306 Drip tray

NOTE:

- **Removal procedure is identical for left and right seals.**
- **Exhaust system does not have to be removed.**

Removing

- Turn steering to full left lock.

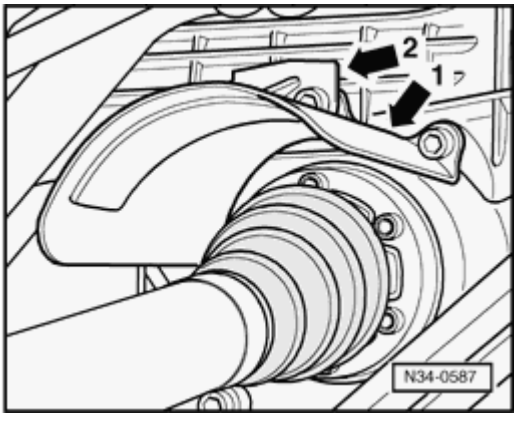


Fig. 229: Detaching Heat Shields And Right-Hand Axle Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove cover plates over right drive shaft (arrows 1 and 2).
- If installed, remove cover plate over left drive shaft.
- Unbolt drive shaft from flange on transmission:
- Tie up drive shaft as high as possible. Do not damage paint on drive shaft.

- Place drip tray VAG 1306 underneath the transmission.

When replacing left oil seal:

Remove left flange shaft.

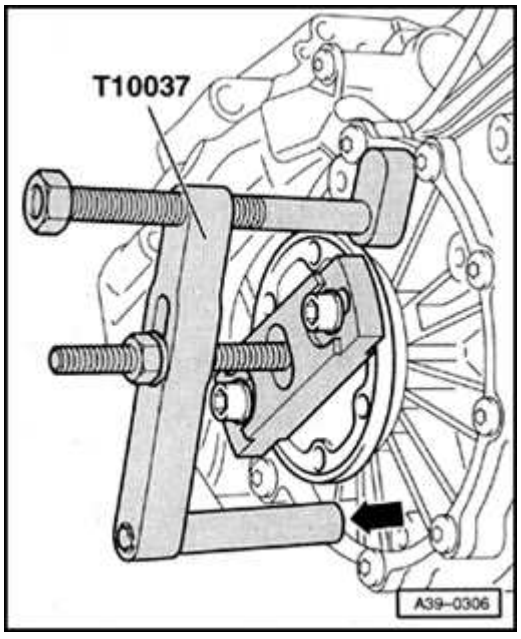


Fig. 230: Removing Drive Flange (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft; by screwing puller T10037 to differential cover (arrow).

When replacing right oil seal:

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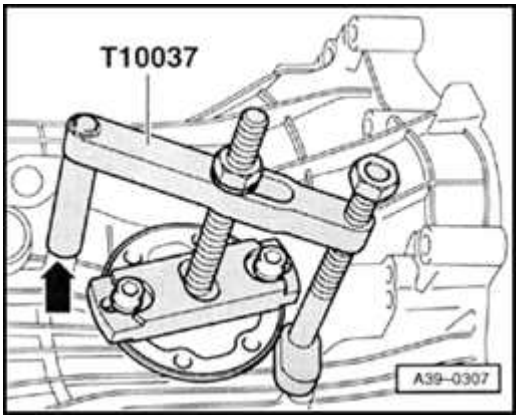


Fig. 231: Removing Drive Flange (Right Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft, by screwing puller T10037 to transmission housing (arrow).

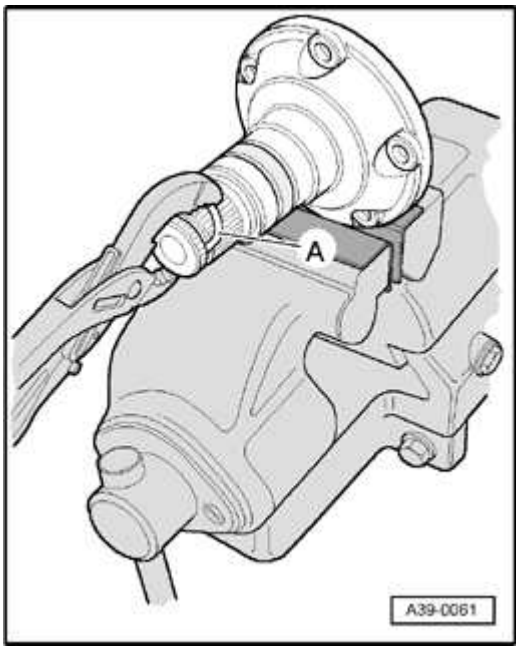


Fig. 232: Removing And Installing Securing Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Always replace flange shaft circlip.
- Clamp flange shaft in vice using soft jaws. Press out old circlip from groove in flange shaft use new circlip -A-.
- Pull out flange shaft oil seal with VW 681.

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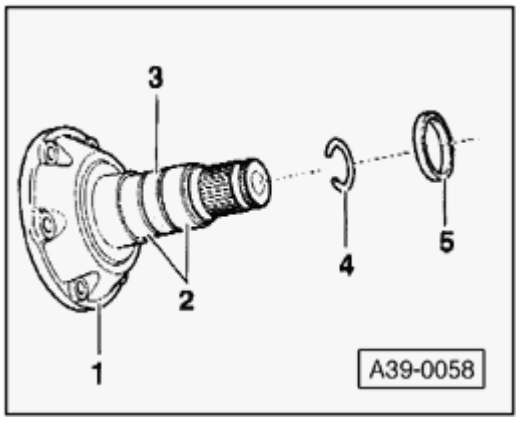


Fig. 233: Flange Shaft Design
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Assembling flange shaft with polygon bearing

1 - Flange shaft

2 - Needle bearing (polygon bearing)

3 - Spacer ring

4 - Circlip

5 - Spacer ring - installed on shafts with 30 mm spline diameter

NOTE:

- **Rough running of the polygon bearings with flange shaft removed, does not indicate bearings are defective. An acoustic test can only be performed when installed.**
- **Inspect for signs of damage to polygon bearings (such as cracking in outer race).**
- **The polygon bearings can only be replaced together with flange shaft.**
- **A spacer ring -5- is installed between the polygon bearing and large differential bevel gear on flange shafts with 30 mm spline diameter.**

Installing

NOTE:

- **If used flange shaft is used, insert to a depth of 6.5 mm.**
- **Oil seal can also be driven in using drift 2062.**

  - Lightly oil outer circumference of seal.

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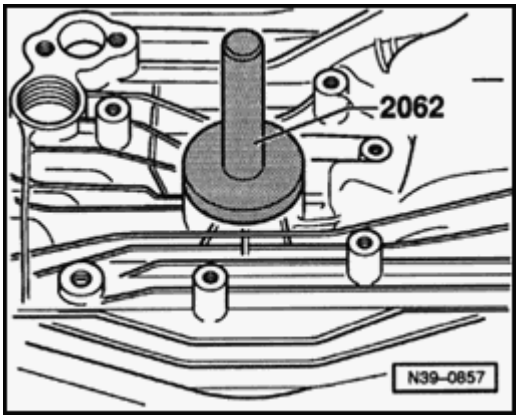


Fig. 234: Installing Right-Hand Drive Flange Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Keep seal straight when installing. Drive in new oil seal for right flange shaft to a depth of 5.5 mm below outer surface of housing.
- Fill space between sealing lip and dust lip with sealing grease G052 128 A1.

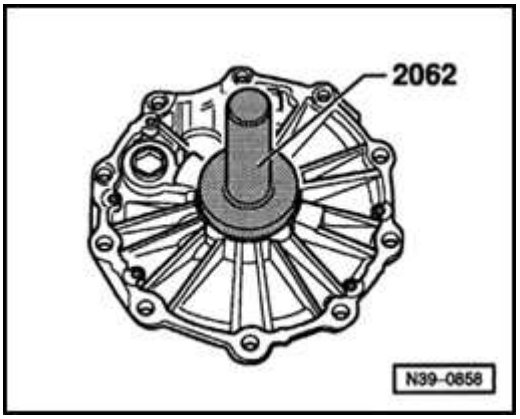


Fig. 235: Installing Left-Hand Drive Flange Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Keep seal straight when installing. Drive in new oil seal for left flange shaft to a depth of 5.5 mm below surface of cover.
- Drive in flange shaft using mandrel VW 295.
- Bolt drive shaft to flange shaft.
- Install splash plates for drive shaft.

- Check oil level in manual transmission. Refer to **Oil level in manual transmission, checking**.

Tightening torques

Component		Nm
Drive shaft to flange shaft	M8	40

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	M10	70
Drive shaft heat shields		23

SPEEDOMETER SENSOR AND DRIVE WHEEL, REMOVING AND INSTALLING

Speedometer sensor and drive wheel, removing and installing

- Transmisison installed
  - Observe general repair instructions. Refer to **General repair instructions**.

Speedometer Vehicle Speed Sensor (VSS) -G22-, removing and installing

Removing

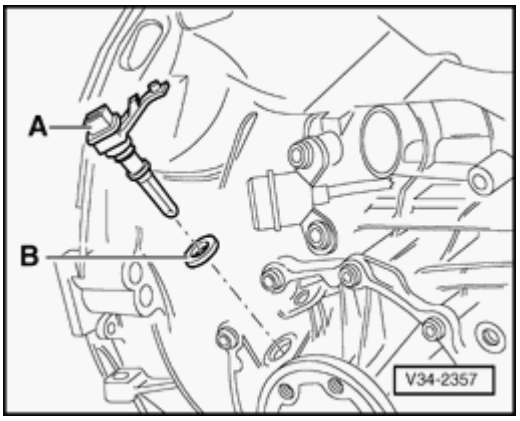


Fig. 236: Identifying Speedometer Vehicle Speed Sensor (VSS) and O-ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull connector off sensor -A-.
- Press retaining clip down, turn sensor sideways and pull out upward.

Installing

- Replace O-ring -B- during installation.
- Insert sensor and click into place.
- Handle sensor carefully. If damaged it is possible that speedometer will not be accurate.

Speedometer drive wheel, removing and installing

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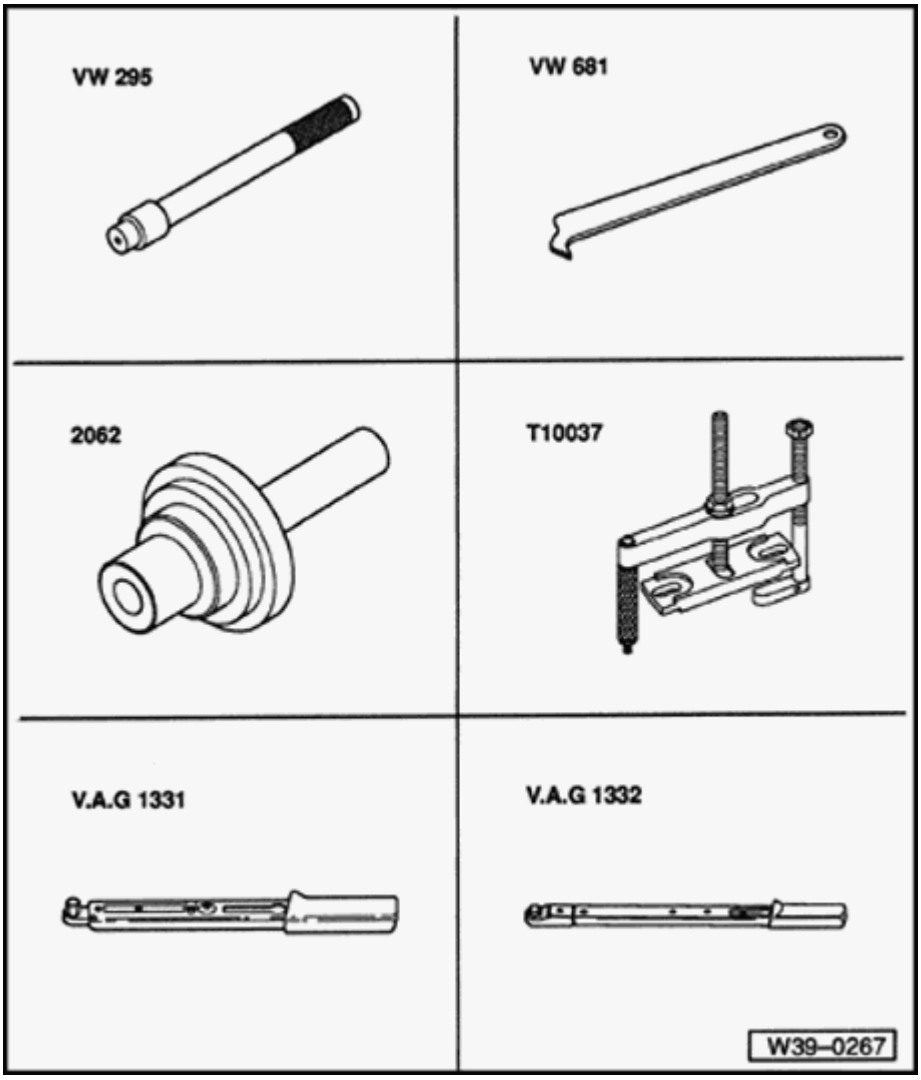


Fig. 237: Identifying Special Tools
Courtesy of VOLKSWAGEN UNITED STATES, INC.

(Transmission installed)

Special tools and workshop equipment required

- VW 295 Mandrel
- VW 681 Release lever
- 2062 Drift
- T10037 Puller
- VAG 1331 Torque wrench
- VAG 1332 Torque wrench

Special tools, testers and auxiliary items required

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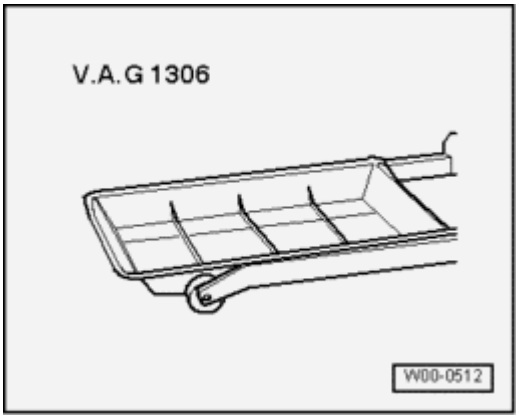


Fig. 238: Identifying Drip Tray V.A.G 1306
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1306 Drip tray

Removing

- Turn steering to full left lock.
- If installed, remove cover plate over left drive shaft.
- Unbolt drive shaft from flange shaft.
- Place drip tray underneath.

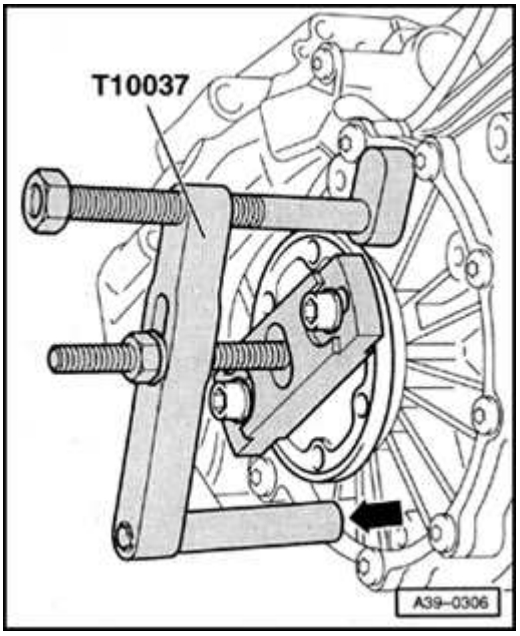


Fig. 239: Removing Drive Flange (Left Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove flange shaft; by screwing puller T10037 to differential cover (arrow).
- Pull out flange shaft oil seal with VW 681.

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- Remove speedometer sensor. Refer to **Speedometer Vehicle Speed Sensor (VSS) -G22-, removing and installing**.
- Remove speedometer drive wheel:

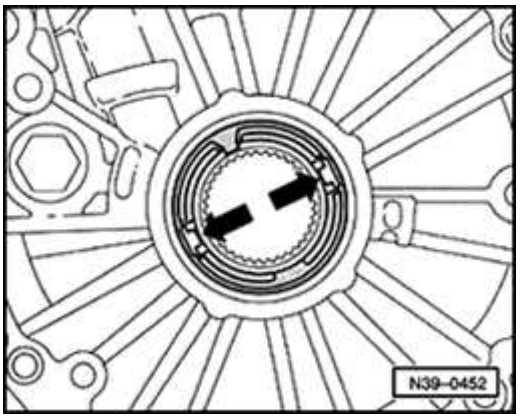


Fig. 240: Press Drive Gear Retaining Clips In Direction Of Arrows Using Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- With a screwdriver press retaining clips in direction of arrows.
- Remove drive wheel by prying out, alternating between sides.

Installing

Install in reverse order, paying attention to the following:

NOTE: Install the drive wheel carefully onto the differential, make sure that it is kept straight. Do not use excessive force - the drive wheel can break.

Installation position:

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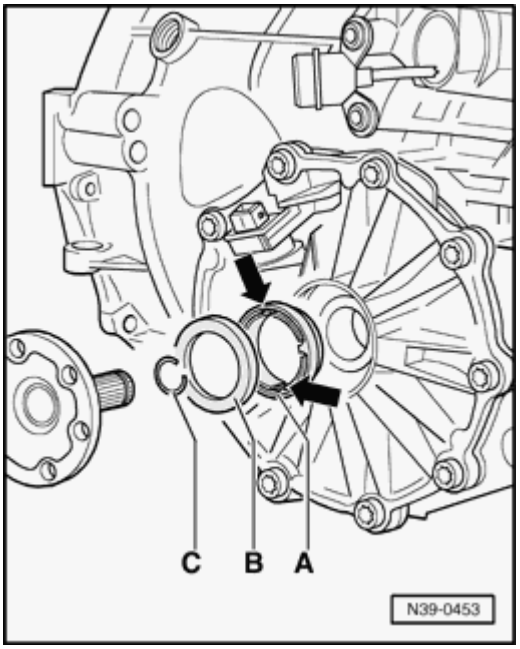


Fig. 241: Identifying Installed Position Of Drive Gear, Retaining Clip And Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The drive peg of the drive wheel -A- faces seal -B- located in the groove of the differential.

The retaining clips (arrows) located in the annular groove in the differential.

- Always replace oil seal -B- and circlip -C-. Refer to **Flange shaft oil seal, replacing**.
- Drive in flange shaft using mandrel VW 295.
- Check oil level and fill oil in transmission. Refer to **Oil level in manual transmission, checking**.

Tightening torques

Component		Nm
Drive shaft to flange shaft	M8	40
	M10	70
Heat shields over drive shafts to transmission		23

DIFFERENTIAL, REMOVING AND INSTALLING

Differential, removing and installing

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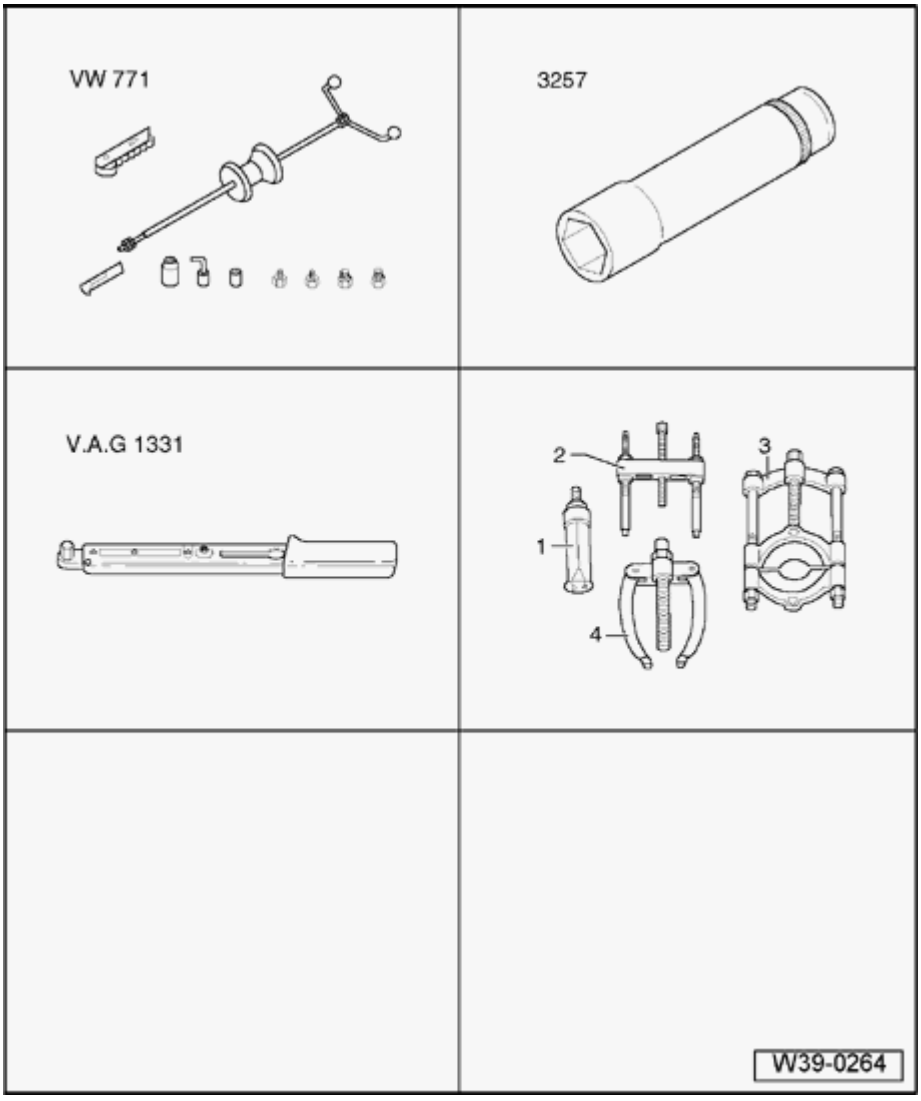


Fig. 242: Identifying Special Tools - Differential, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 771 Multi-purpose tool
- 3257 Socket attachment SW 27
- V.A.G 1331 Torque wrench
- 1 - Kukko 21/3 Internal puller

NOTE:

- **Removal and installation is possible with transmission installed.**
- **The differential can be removed and installed without removing selector mechanism, input shaft, drive pinion and transmission cover. Removal of the components above is necessary to adjust the differential.**
- **Inspect polygon bearings for visible damage.**

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- **The polygon bearings can only be replaced together with flange shaft.**

- Rough running of the polygon bearings with flange shaft removed, does not indicate that bearings are defective. An acoustic test can only be performed installed.
- A spacer ring is installed between the polygon bearing and the large differential bevel gear on flange shafts with 30 mm spline diameter. See **Assembling flange shaft**, -item 5-.
- Adjustments are required when replacing components marked 1).

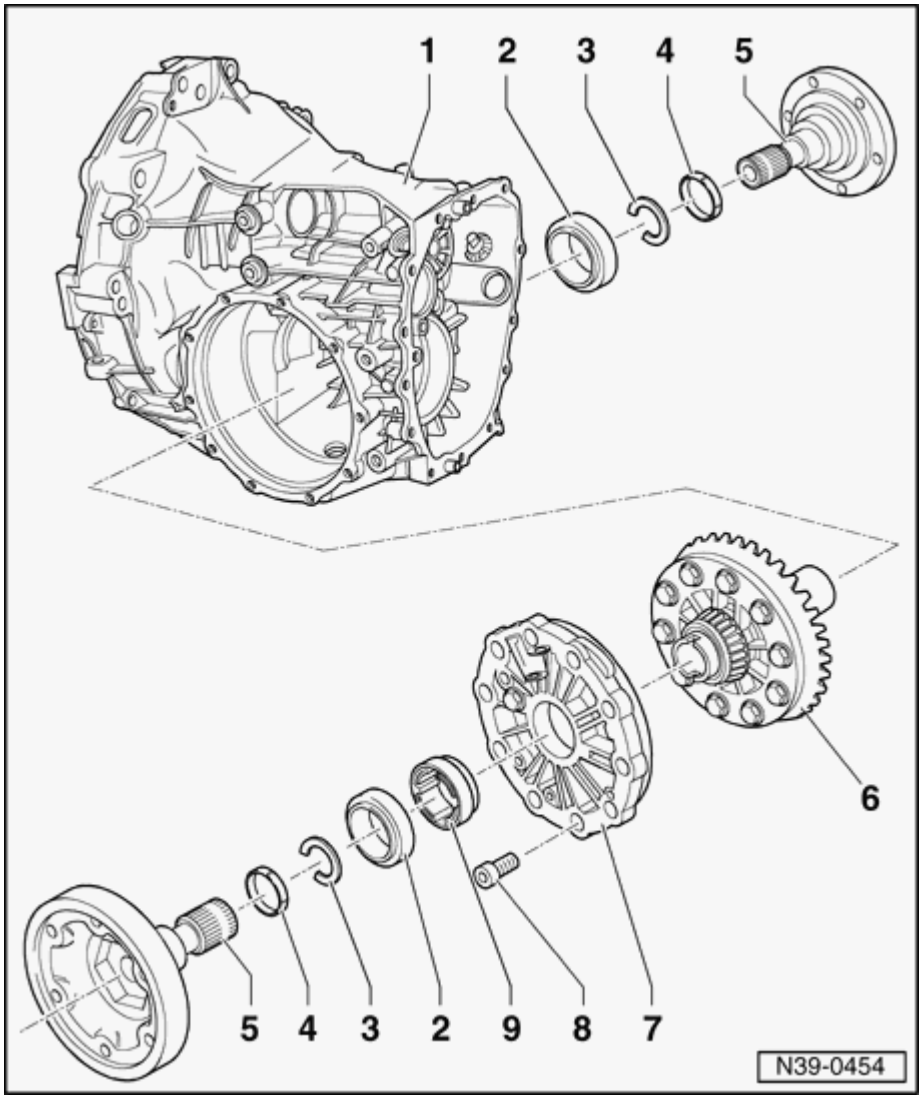


Fig. 243: Differential, Removal And Installation, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing 1)

2 - Sealing ring

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- Replacing. Refer to **Flange shaft oil seal, replacing**

3 - Circlip

- Replace
- Removing and installing. See **Removing and installing circlip**

4 - Spacer ring

- Is only inserted on flange shafts with spline diameter of 30 mm.
- Removing. See **Removing spacer ring**
- Installing. See **Installing spacer ring**

5 - Flange shaft

- Assembling flange shaft, **Assembling flange shaft**

6 - Differential with ring gear 1)

- Can be removed without removing gear cluster
- Disassembling and assembling. Refer to **Differential, disassembling and assembling**

7 - Cover for final drive 1)

- Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

8 - Torx bolt - 25 Nm

9 - Speedometer drive wheel

- Removing and installing. Refer to **Speedometer drive wheel, removing and installing**
- Carefully install the drive wheel onto the differential, make sure that it is kept straight. The drive wheel can break using excessive force.

Removing and installing circlip

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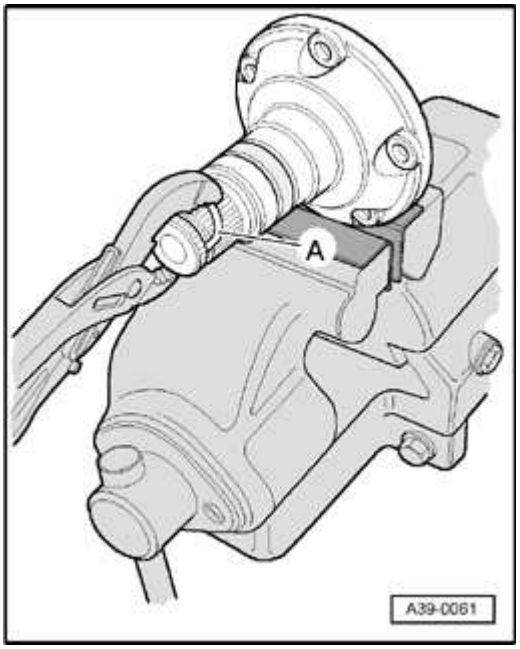


Fig. 244: Removing And Installing Securing Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp flange shaft in vice using soft jaws. Press out old circlip from groove in flange shaft use new circlip -A-.

Removing spacer ring

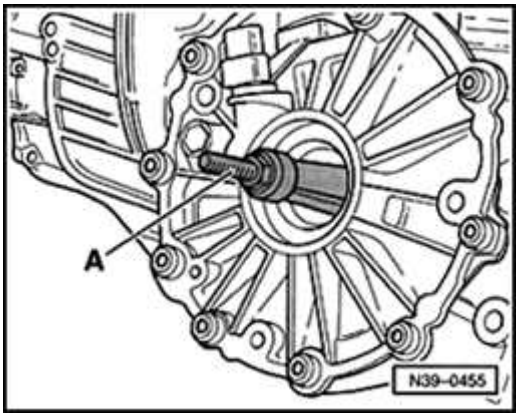


Fig. 245: Removing Spacer Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal puller 18.5... 23.5 mm, e.g. Kukko 21/3

- Pull out spacer ring using multi-purpose tool VW 771.

Installing spacer ring

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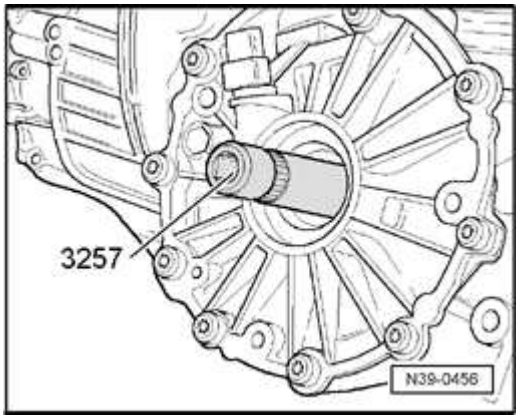


Fig. 246: Installing Spacer Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive new spacer ring home, take care not to bend ring.

Assembling flange shaft

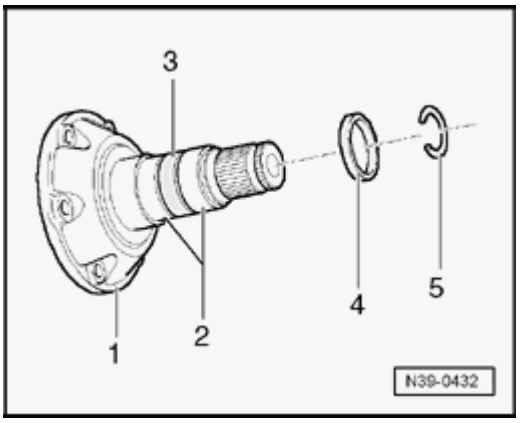


Fig. 247: Flange Shaft Assembly, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Flange shaft

2 - Needle bearing (polygon bearing)

3 - Spacer ring

4 - Spacer ring - additionally installed on shafts with 30 mm spline diameter

5 - Circlip

NOTE: The needle bearings (polygon bearings) do not turn easily when the flange shaft is removed. This does not indicate a bearing is faulty.

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DIFFERENTIAL, DISASSEMBLING AND ASSEMBLING

Differential, disassembling and assembling

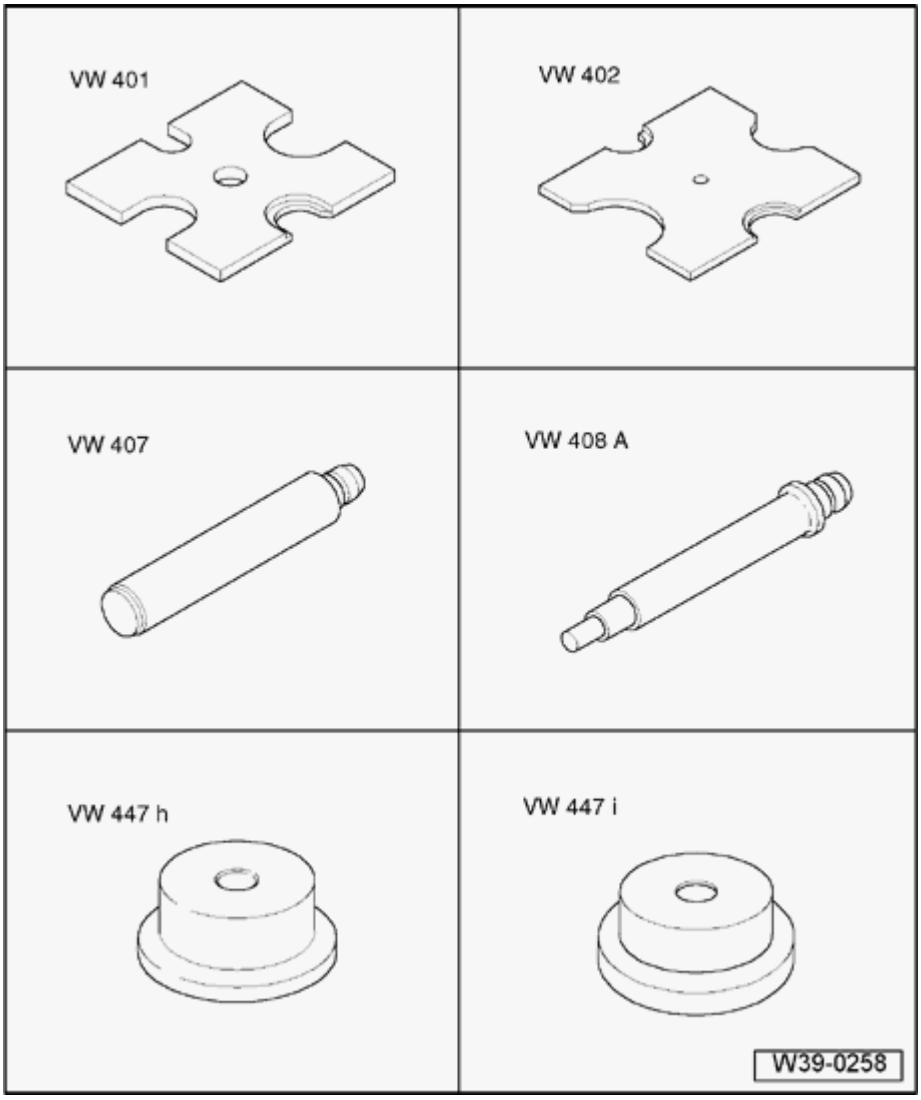


Fig. 248: Identifying Special Tools - Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Press tool
- VW 408 A Press tool
- VW 447 H Thrust disk

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- VW 447 i Thrust disk

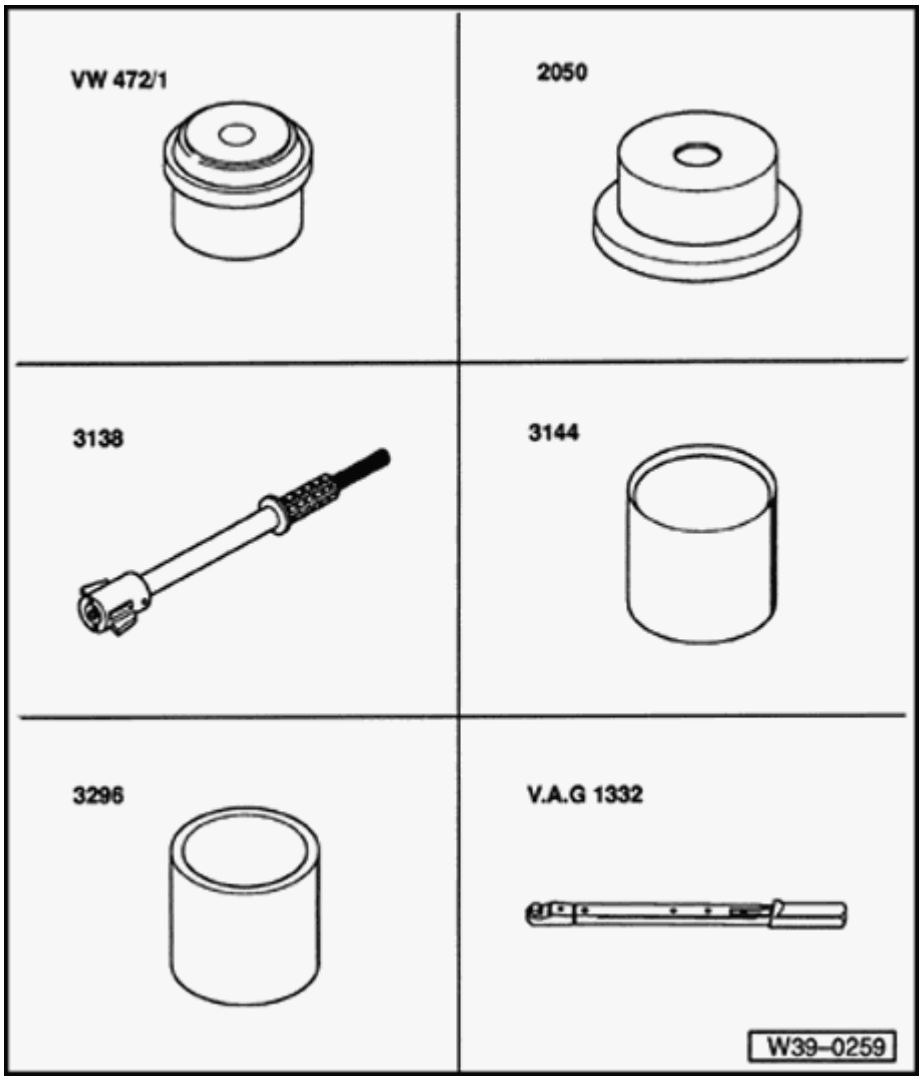


Fig. 249: Identifying Special Tools - Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 472/1 Thrust piece
- 2050 Thrust piece
- 3138 Drift
- 3144 Sleeve
- 3296 Tube
- VAG 1332 Torque wrench

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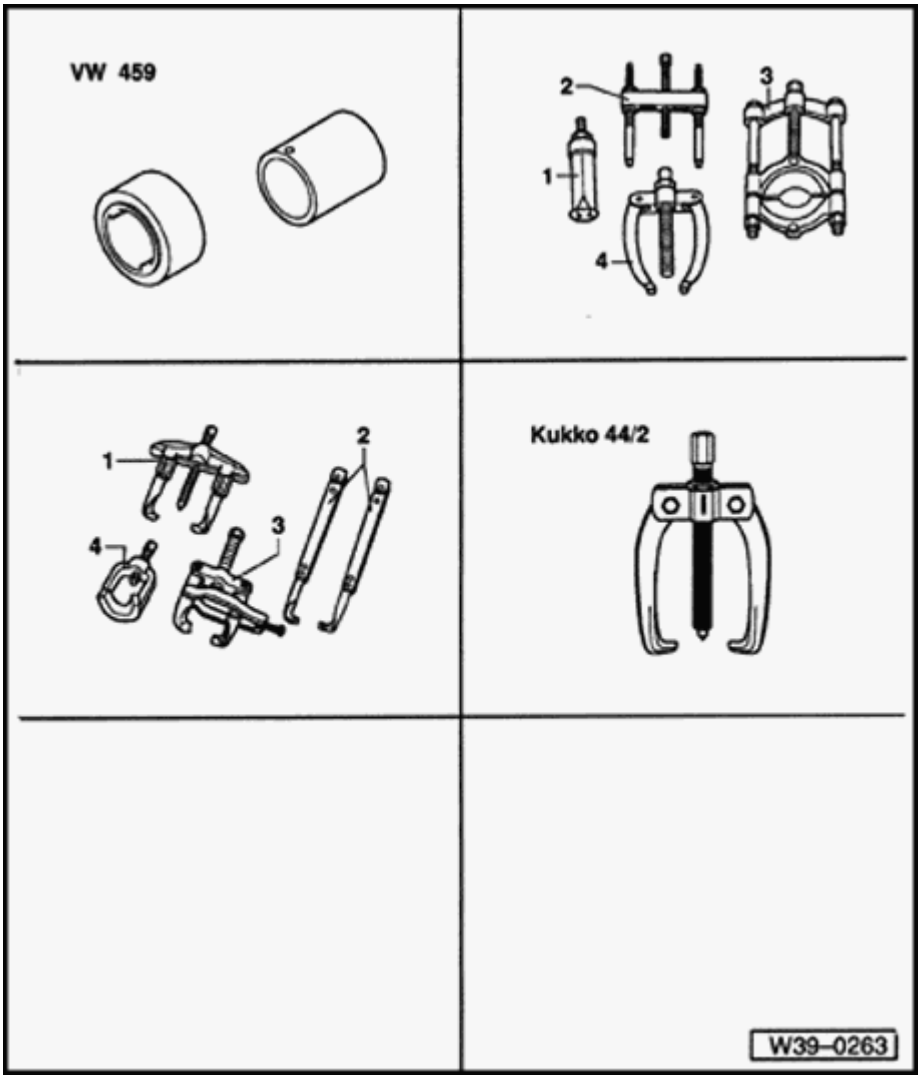


Fig. 250: Identifying Special Tools - Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 459 Installation and removal tool
- 1 - Kukko 21/7 Internal puller
- 3 - Kukko 204/2 Puller
- 4 - Kukko 22/2 Counter-support
- Kukko 44-2 Two-arm puller

NOTE:

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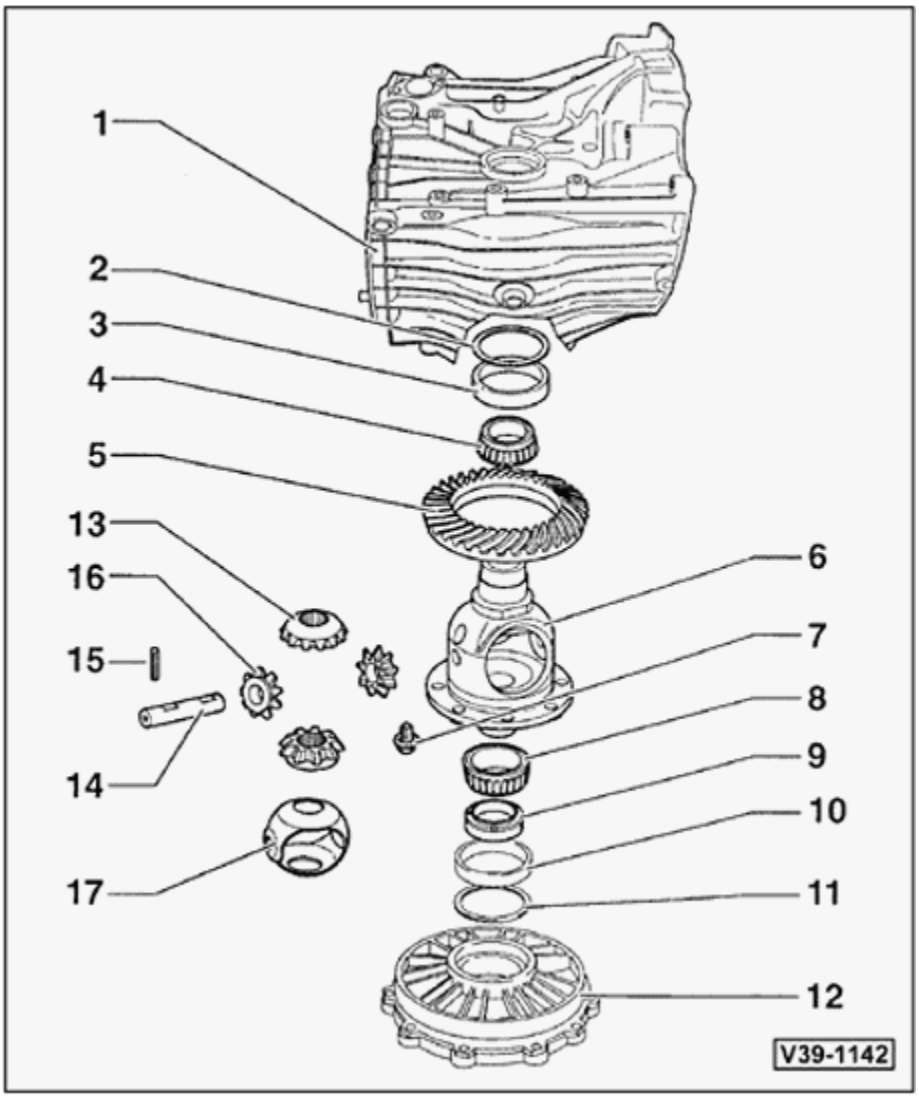


Fig. 251: Differential, Disassembling And Assembling, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Removing and installing differential. Refer to **Differential, removing and installing**.
- Replace both tapered roller bearings.
- Adjustments are required when replacing components marked 1).

1 - Transmission housing 1)

2 - Shim "S2"

- Note thickness

3 - Outer race for right tapered roller bearing 1)

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- Pulling out. See **Extracting tapered roller bearing outer race from transmission housing**
- Pressing in. See **Pressing tapered roller bearing outer race into transmission housing**

4 - Inner race for right tapered roller bearing 1)

- Pulling off. See **Pulling off inner race for right tapered roller bearing**
- Pressing on. See **Pressing on inner race for right tapered roller bearing**

5 - Ring gear 1)

- Paired with drive pinion (final drive set)
- Select according to transmission code letters. Refer to **Code letters, application, ratios, capacities**
- With a mandrel drive off housing. See **Driving ring gear off housing**
- Install to differential housing. See **HEAT THE RING GEAR TO APPROX. 100 ° C and position**

6 - Differential housing 1)

- Select according to transmission code letters. Refer to **Code letters, application, ratios, capacities**
- Allocation

7 - Bolt - 60 Nm + turn 45 ° further

- Always replace
- Lightly tighten bolts then tighten diagonally to specified torque.

8 - Inner race for left tapered roller bearing 1)

- Pulling off. See **Pulling off inner race for left tapered roller bearing**
- Allocation

9 - Speedometer drive wheel

- Removing and installing. Refer to **Speedometer drive wheel, removing and installing**
- Carefully install the drive wheel onto the differential, make sure that it is kept straight. The drive wheel can break using excessive force

10 - Outer race for left tapered roller bearing 1)

- Tapping out. See **Driving out outer race for left tapered roller bearing out of cover**
- Pressing in. See **Driving outer race for left tapered roller bearing into cover**
- Allocation

11 - Shim "S1"

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- Note thickness

12 - Cover for final drive 1)

- Apply thin coat of sealing paste AMV 188 001 02 to sealing surfaces

13 - Large differential bevel gear

- Installing. See **Installing bevel gears**

14 - Shaft for bevel gears

- Remove spring sleeve knocking out with drift

15 - Spring pin

- For securing shaft for bevel gears
- With annular groove: Removing and installing. See **Removing and installing spring sleeve**
- Without annular groove: Drive out with mandrel

16 - Small differential bevel gear

- Installing. See **Installing bevel gears**

17 - One-piece thrust washer

- When installing coat with transmission oil

Extracting tapered roller bearing outer race from transmission housing

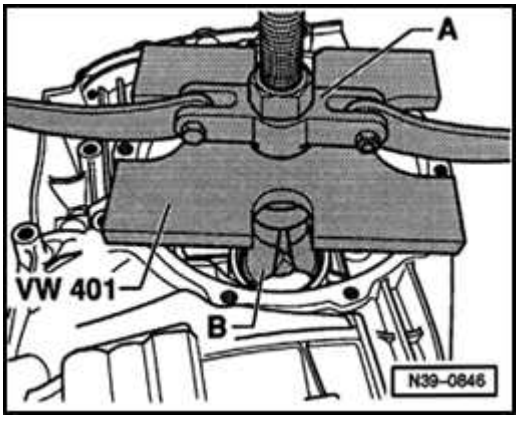


Fig. 252: Pulling Outer Race/Tapered Roller Bearing Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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B - Internal puller 46...58 mm, e.g. Kukko 21/7

- Check shims for damage after removing.

Pressing tapered roller bearing outer race into transmission housing

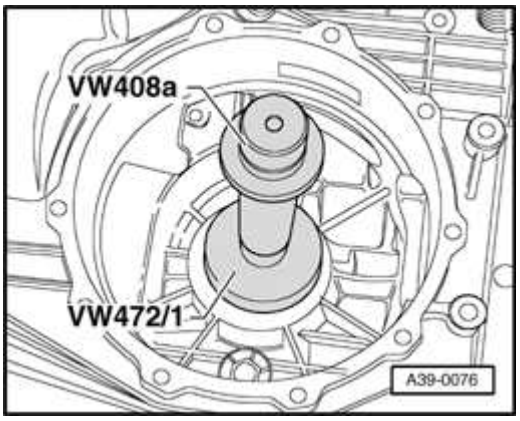


Fig. 253: Pressing Outer Race/Tapered Roller Bearing Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install thrust pad VW 472/1 with taper in outer race.
- Support transmission directly beneath bearing support with VW 459/2.

Pulling off inner race for right tapered roller bearing

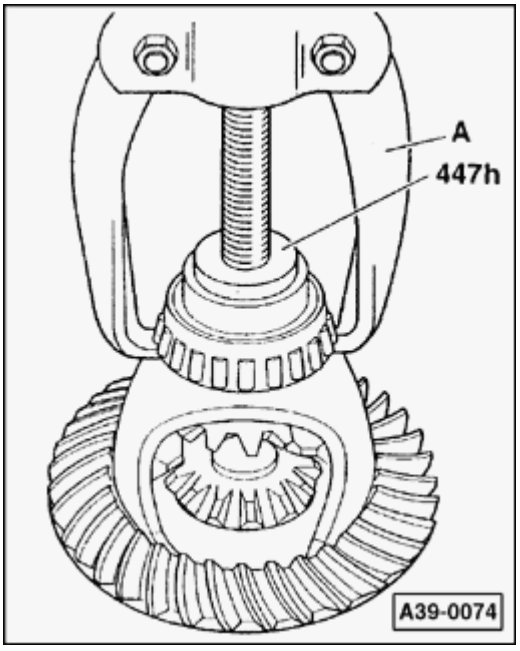


Fig. 254: Pulling Off Right Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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A - Available two-arm puller, e.g. Kukko 44/2 or Kukko 20/10

NOTE: In the differential housing there is a slot in the bearing seat for applying puller - A-.

Pressing on inner race for right tapered roller bearing

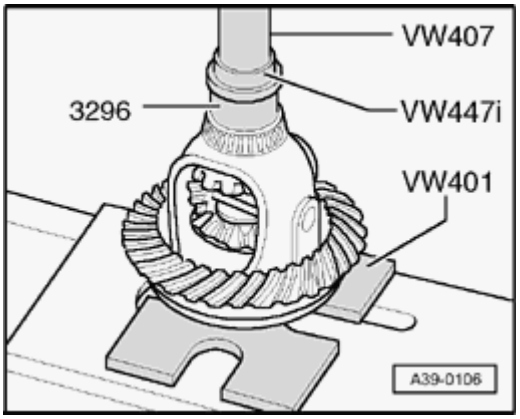


Fig. 255: Pressing On Right Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

WARNING: Wear protective gloves.

- Heat inner race to approx. 100 ° C, and push to final position.

Pulling off inner race for left tapered roller bearing

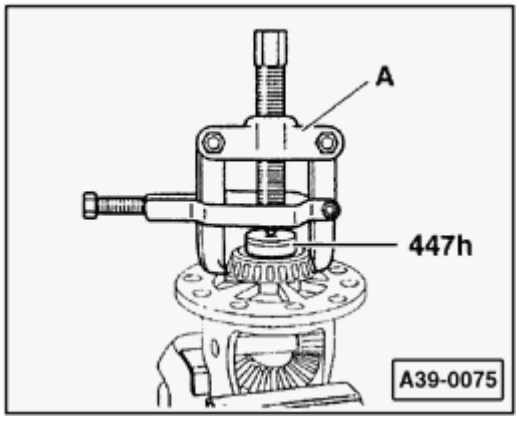


Fig. 256: Pulling Off Left Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Two arm puller, e.g. Kukko 204/2

NOTE: In the differential housing there is a slot in the bearing seat for applying puller -

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A-.

Installing inner race for left tapered roller bearing

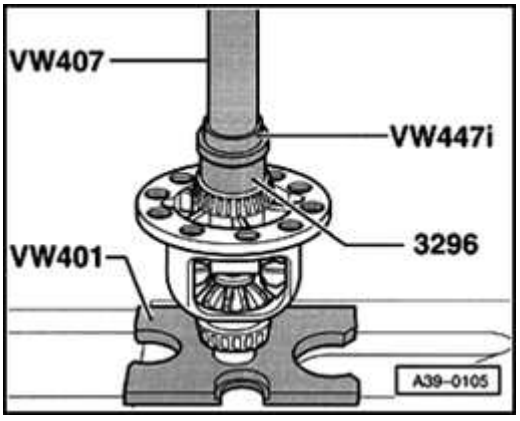


Fig. 257: Installing Left Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

WARNING: Attention:

Wear protective gloves.

- Heat inner race to approx. 100 ° C, and push to final position.

Driving out outer race for left tapered roller bearing out of cover

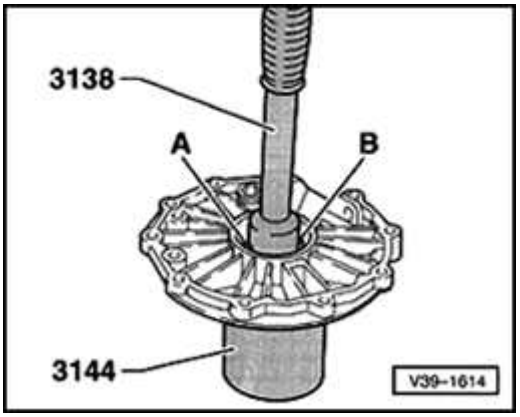


Fig. 258: Driving Out Outer Race Of Left Tapered Roller Bearing From Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Turn webs -A- and -B- out until they sit on outer race within recess in transmission.
- Check shims for damage after removing.

Driving outer race for left tapered roller bearing into cover

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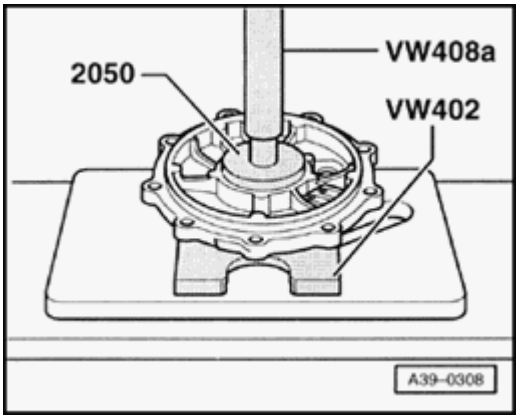


Fig. 259: Driving In Outer Race Of Tapered Roller Bearing Into Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use thrust piece 2050 to press outer race for left tapered roller bearing into cover.
- Install thrust piece 2050 with taper in outer race.

Driving ring gear off housing

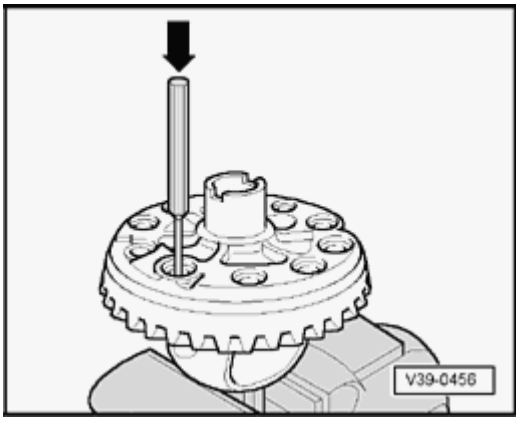


Fig. 260: Driving Out Ring Gear From Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Heat the ring gear to approx. 100 ° C and position

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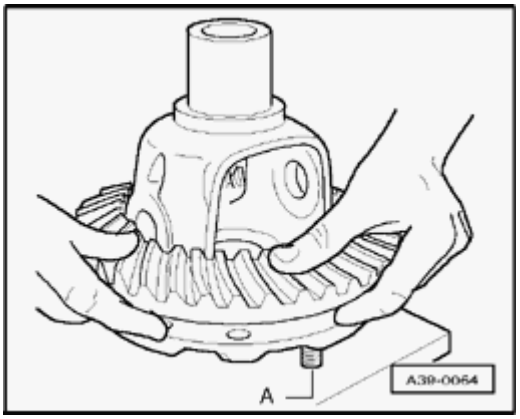


Fig. 261: Installing Ring Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

WARNING: Wear protective gloves.

- Install ring gear guide on centering pins -A- (locally made).
- Allow ring gear to cool off slightly before inserting bolts. Then tighten to specified torque.

Installing bevel gears

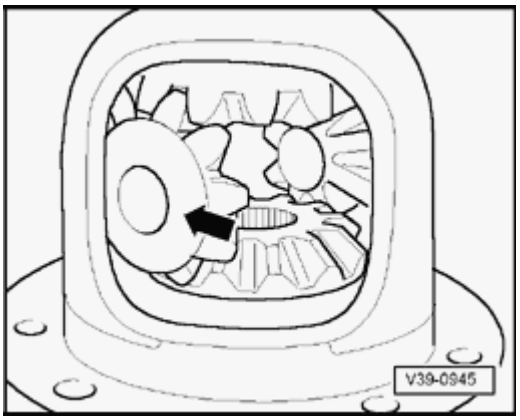


Fig. 262: Installing Small Differential Bevel Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lubricate one-piece thrust washer with transmission oil and install.
- Insert large differential bevel gears.
- Insert small differential bevel gears at 180 ° from their final position and rotate into place -arrow-.
- Drive in differential bevel gear shaft into final position and secure.

Removing and installing spring sleeve

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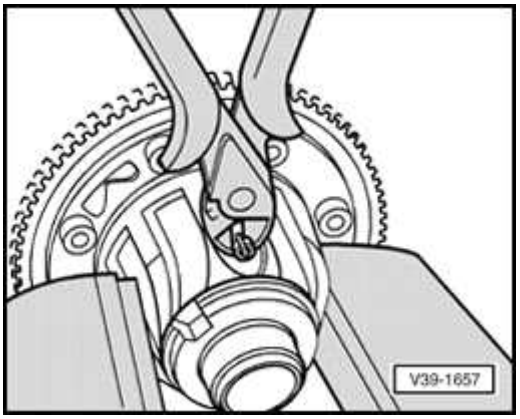


Fig. 263: Pulling Out Spring Pin With Side Cutting Pliers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Using side-cutting pliers pull out spring sleeve with annular groove.
- Using a mandrel drive out from behind the spring sleeve without annular groove.

Installing

- Drive in spring sleeve to stop.

DRIVE PINION AND RING GEAR, ADJUSTING

Drive pinion and ring gear, adjusting

NOTE:

- **Carefully adjust the drive pinion and ring gear for the service life and smooth running of the final drive. For this reason, the drive pinion and ring gear are matched together during manufacturing, and checked to make sure a good mesh pattern and quiet running. The position of quietest running is found by moving the drive pinion in an axial direction and at the same time lifting the ring gear out of the zero-play mesh position by maintaining the backlash within the specified tolerance.**
- **The deviation "r" based on master gauge "Ro" is measured and marked on the outer circumference of the ring gear. Final drive set (drive pinion and ring gear) may only be replaced together!**

Adjusting final drive sets; identification

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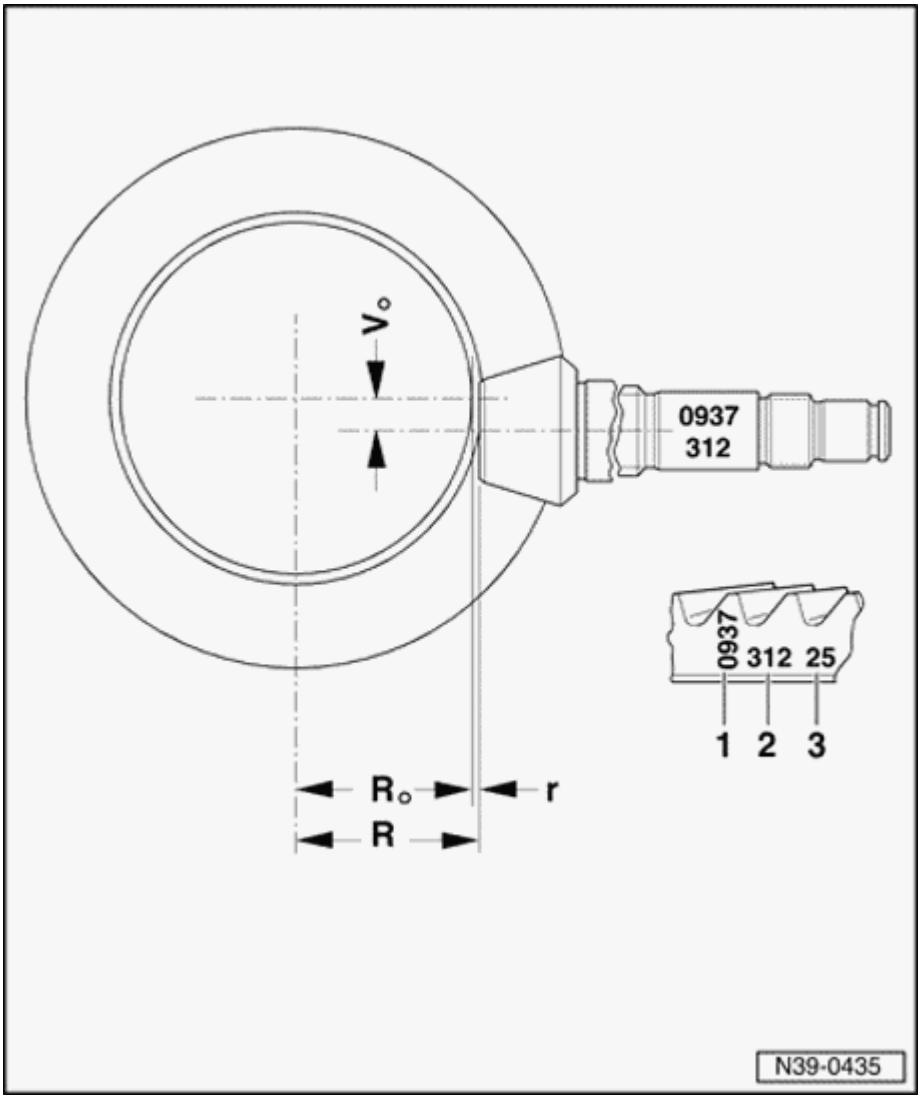


Fig. 264: Identifying Gear Set Markings And Adjustment Dimensions
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - "0937" indicates Oerlikon final drive set with a ratio of 37 : 9.

2 - Pairing number (312) of final drive set

3 - Deviation (tolerance) "r" based on the test machine master gauge used in production. The deviation "r" is always given in 1/100 mm. Example: "25" means r = 0.25 mm

Ro - Length of test machine master gauge used.

Ro - Ring gear diameter 170 mm = 54.95 mm

Ro - Ring gear diameter 180 mm = 59.65 mm

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R - Actual dimension between ring gear and face of drive pinion at point with quietest running for this gear set

Vo - Hypoid offset

Shims position

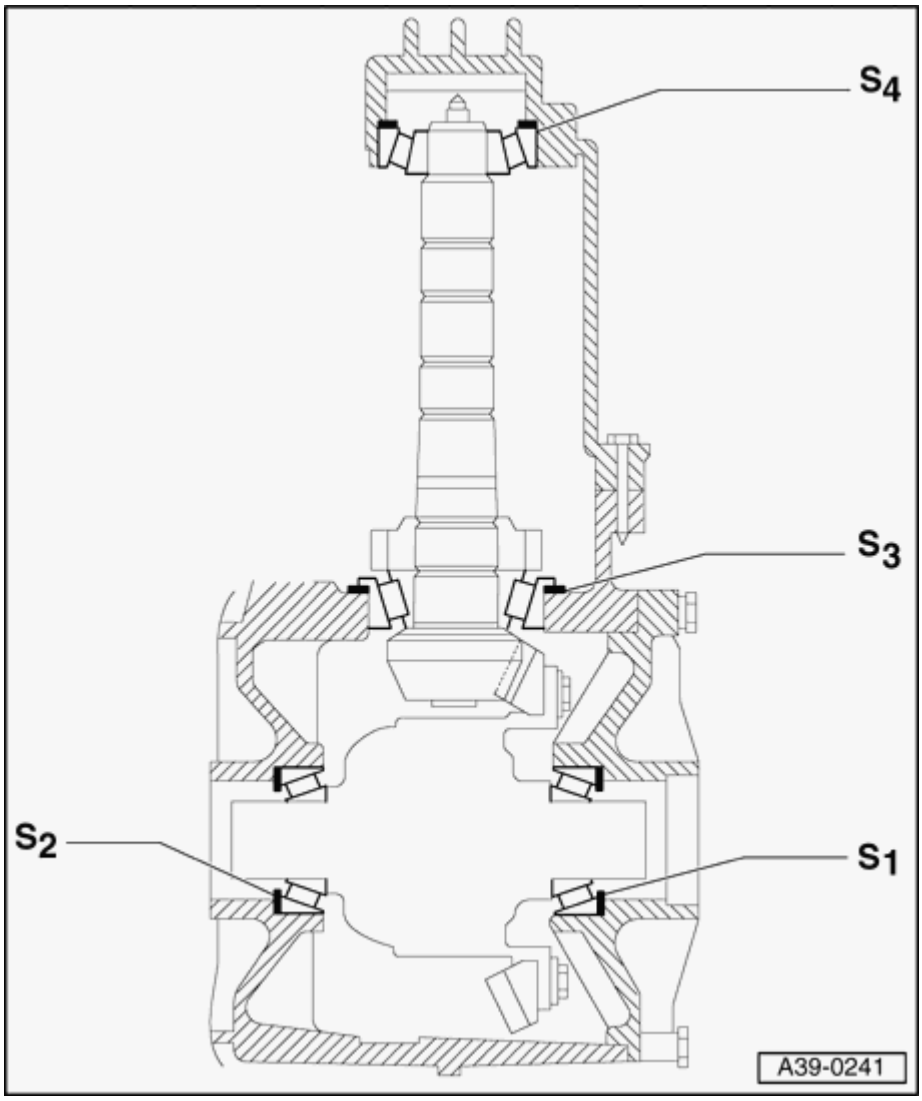


Fig. 265: Identifying Shim Locations
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: Adjustment overview when replacing individual components of transmission. .

S1 - Shim for ring gear in cover for final drive

S2 - Shim for ring gear in transmission housing

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S3 - Shim for drive pinion in transmission housing

S4 - Shim for drive pinion in transmission cover

Adjustment overview

NOTE: If repairs have been carried out on the transmission adjust drive pinion, ring gear or final drive set if components have been replaced which directly effect the adjustments of the final drive. Refer to following table to avoid unnecessary adjustments:

	To be adjusted:			
Parts replaced: ?	Ring gear "S1"+"S2" 1) Refer to **Ring gear, adjusting**	Drive pinion "S3"+"S4" 1) using deviation "r" Refer to **Drive pinion, adjusting**	Drive pinion "S4" 1) Refer to **Re-determining "S4" shim when installing new transmission cover**	Backlash Refer to **Measuring backlash**
Transmission housing 3)	X	X		X
Transmission cover			X	
Differential housing	X			X
tapered roller bearings for drive pinion		X		X
tapered roller bearing for differential	X			X
Final drive set 2)	**X**	X		X
Cover for final drive	X			X

1) Shims; installation position.

2) Drive pinion and ring gear; only replace together

3) If the transmission housing is replaced the input shaft also needs to be adjusted. Refer to **Input shaft, adjusting**, adjusting input shaft.

Final drive set sequence for re-adjusting

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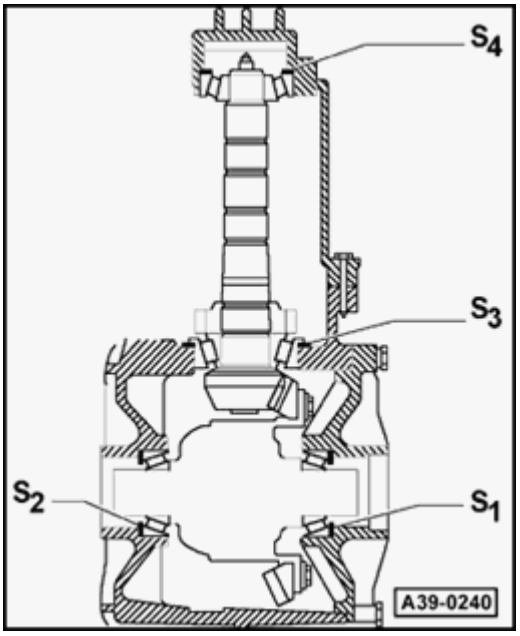


Fig. 266: Drive Pinion And Gear Ring Adjusting Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

When ring gear and drive pinion have to be adjusted, in the interests of a rational sequence, keep to the following order:

1.)	Determine total shim thickness "Stotal" for "S1" + "S2" (sets pre-load for tapered roller bearings for differential). Refer to **Determining total shim thickness "Stotal" for shims "S1" + "S2"** onward.
2.)	Determine total shim thickness "Stotal" for "S3" + "S4" (sets pre-load for tapered roller bearings for drive pinion). Refer to **Determining total shim thickness "Stotal" for shims "S3" + "S4"**
3.)	Distribute total shim thickness "Stotal" for "S3" + "S4" so that the distance from center of ring gear to face of drive pinion is the same as distance "R" which was determined during production. Refer to **Determining thickness of shim "S3"**
4.)	Distribute total shim thickness "Stotal" for "S1" + "S2" so that specified backlash exists between ring gear and drive pinion. Refer to **Determining thickness of shim "S2"**

NOTE: Overview of components and shims.

Drive pinion, adjusting

Special tools and workshop equipment required

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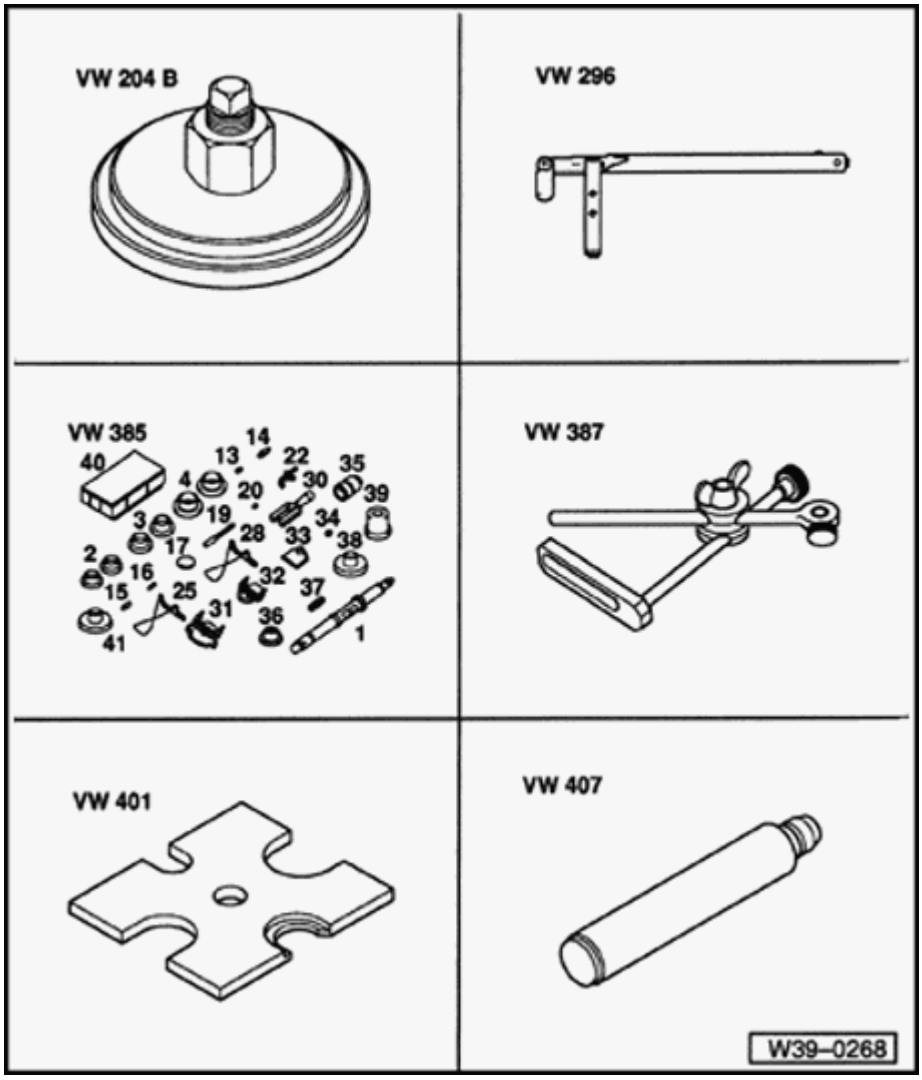


Fig. 267: Identifying Special Tools - Drive Pinion, Adjusting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Crankshaft seal installing tool VW 204 B Crankshaft seal installing tool
- VW 296 Oil seal extractor
- VW 385 Universal measuring tool
- VW 387 Universal dial gauge holder

- VW 401 Thrust plate
- VW 407 Thrust tool

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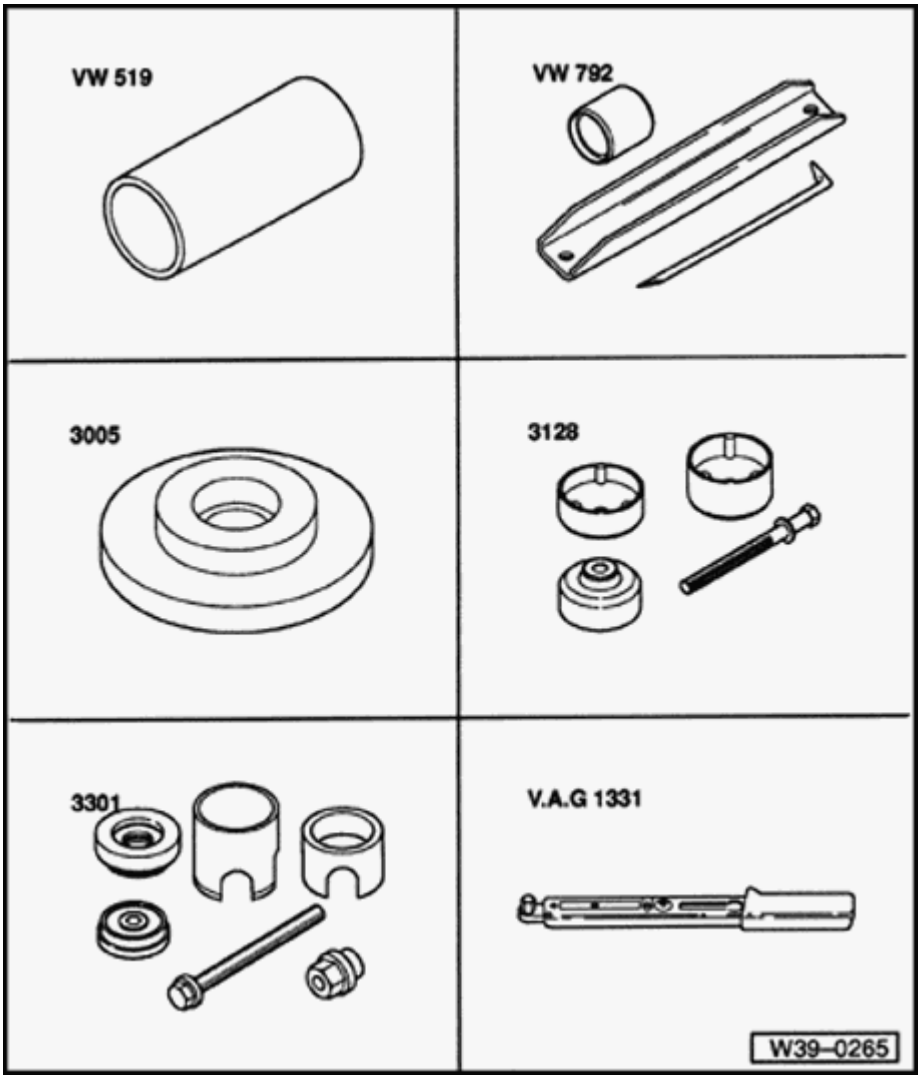


Fig. 268: Identifying Special Tools - Drive Pinion, Adjusting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 519 Tube
- VW 792 Assembly device
- 3005 Thrust plate
- 3128 Puller
- 3301 Assembly equipment
- V.A.G 1331 Torque wrench

Re-adjustment of the drive pinion is only necessary if the final drive set, tapered roller bearing for drive pinion or transmission housing is replaced. .

The object of the adjustment is to reproduce the setting for quietest possible running, as obtained on the test machine in production. Maximum care and cleanliness are essential when performing repairs and taking

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measurements for achieving good results.

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

(adjusting pre-load of tapered roller bearing for drive pinion)

- Differential removed.

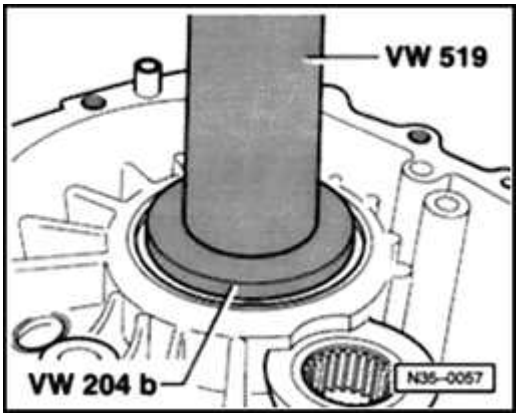


Fig. 269: Pressing In Double Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Without shims press large tapered roller bearing outer race into transmission housing.
- Insert rubber disc-item 40 and pressure plate-item 39 into transmission cover. Refer to **Drive pinion, disassembling and assembling**

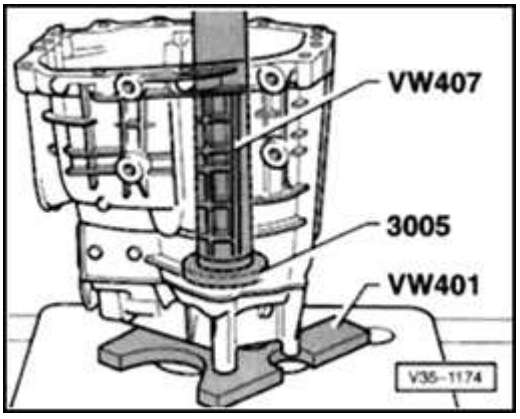


Fig. 270: Pressing In Outer Race For Small Tapered Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press small tapered roller bearing outer race together with a 1.00 mm thick preliminary shim S4* into transmission cover.

NOTE: A shim "S4" with a thickness of 1.0 mm is installed for initial measurements. It is referred to as "S4*" in the following. After determining measurement "e",

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"S4*" will be replaced by the correct shim "S4".

- Pressing on inner race for tapered roller bearing. Refer to **Drive pinion, disassembling and assembling**.

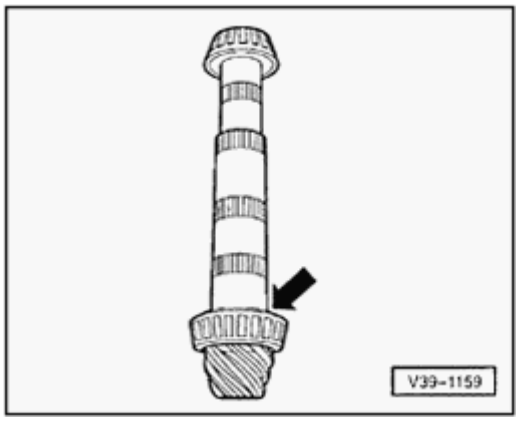


Fig. 271: Identifying Lower Tapered Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure lower tapered roller bearing (arrow). See **Determining thickness of circlip**

NOTE: Illustration shows drive pinion without gear wheels.

- Insert assembled drive pinion in transmission housing.
- Install transmission cover and tighten bolts to 22 Nm.
- Turn transmission so that transmission cover is downward.

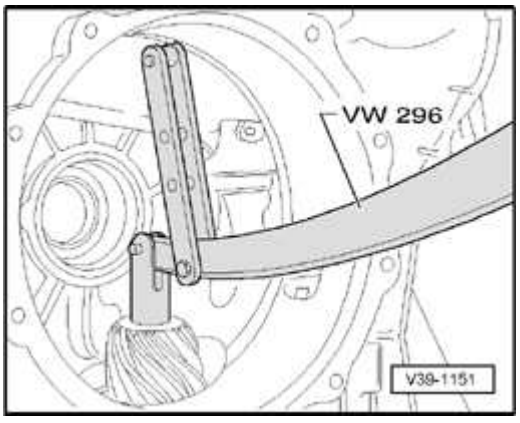


Fig. 272: Pressing Down On Drive Pinion Head Using Removal Tool VW 296
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press down on face of drive pinion head with lever VW 296 until the tapered roller bearing outer race contacts the transmission cover.
- Continue pressing on face of drive pinion head, at the same time turn drive pinion 8 turns by hand, so tapered roller bearing can settle.

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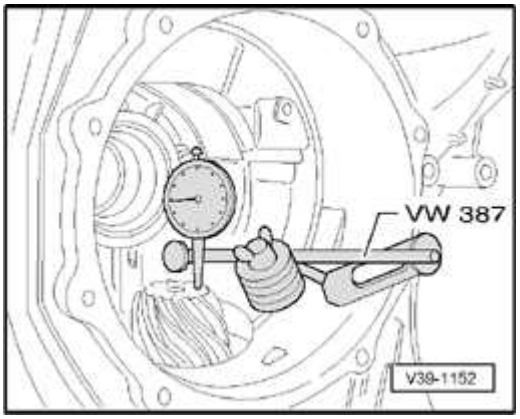


Fig. 273: Installing Dial Gauge (3 Mm Range) And Set To "0" With 2 Mm Pre-Load
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install dial gauge (3 mm measuring range) and set to "0" with 2 mm pre-load.

NOTE:

- **Use dial gauge extension 30 mm long.**
- **The dial gauge extension must contact the machined surface on the face of pinion.**

- Turn transmission 180 ° so that the transmission cover is upward.
- Rotate drive pinion 5 turns in both directions to settle the tapered roller bearing.

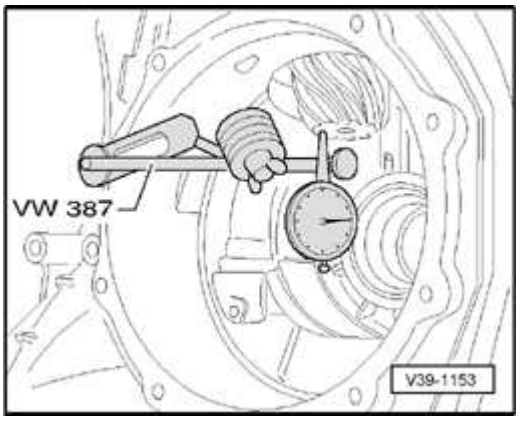


Fig. 274: Turn Transmission 180 Degrees, Settle Tapered Roller Bearing And Read Play On Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Read play on dial gauge and note reading.

- Measurement in example: 0.45 mm

NOTE: **If the measurement has to be repeated, drive pinion must first be rotated another5 turns in each direction to settle the tapered roller bearing. Reset dial gauge to "0" with 2 mm pre-load.**

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Formula: **"Stotal"**	=	**"S4*" + measurement + bearing pre-load**

Example:		
	Inserted shim "S4*"	1.00 mm
+	Measurement (example)	0.45 mm
+	Bearing pre-load (constant)	0.15 mm
=	Total shim thickness "Stotal" for "S3" + "S4"	1.60 mm

Determining thickness of preliminary shim S3*

Formula: **"S3*"**	=	**"Stotal" - "S4*"**

Example:		
	Total shim thickness "Stotal" for "S3" + "S4"	1.60 mm
-	Inserted shim "S4*"	1.00 mm
=	Thickness of shim "S3*"	0.60 mm

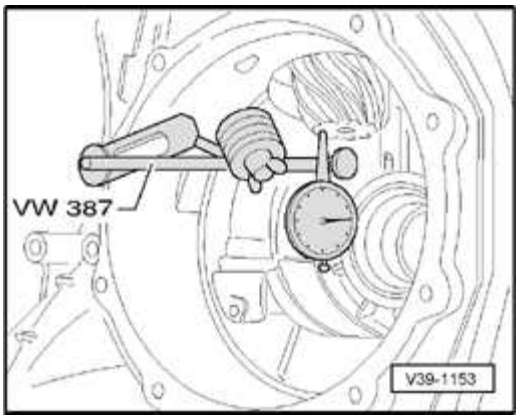


Fig. 275: Turn Transmission 180 Degrees, Settle Tapered Roller Bearing And Read Play On Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Extract large tapered roller bearing outer race. See **Pulling out outer race for large tapered roller bearing**..
- Insert preliminary shim S3* into transmission housing and re-install outer race. See **Pressing in outer race for large tapered roller bearing**..
- Insert assembled drive pinion in transmission housing.
- Install transmission cover and tighten bolts to 22 Nm.

Checking pre-load of tapered roller bearing for drive pinion

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- Rotate drive pinion 5 turns in both directions to settle tapered roller bearing.

NOTE:

- **If drive pinion cannot be turned by hand, insert a bolt M10 x 20 in drive pinion head and turn pinion by using a tool on this bolt.**
- **Remove bolt again.**

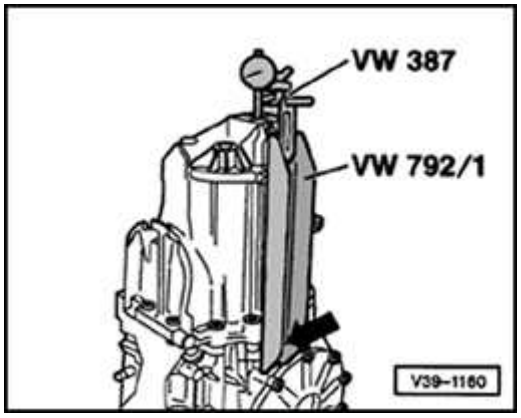


Fig. 276: Checking Preload For Tapered Roller Bearing For Drive Pinion
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install measuring tools and secure with bolt (arrow) to transmission housing.
- Position dial gauge (3 mm measuring range) center on transmission cover and set to "0" with 2 mm pre-load.
- Loosen transmission cover bolts and turn drive pinion several times.
- If correct shims have been selected dial gauge will now indicate following value:

- 0.05... 0.15 mm

- Retighten transmission cover bolts to 22 Nm.
- Remove measuring tools.
- Secure bolt M10 x 20 on drive pinion head and turn drive pinion 8 turns to allow tapered roller bearing to settle.
- Remove bolt.

Determining dimension "e"

NOTE: **Measurement "e" is required to determine the final shim thickness of "S3" and "S4".**

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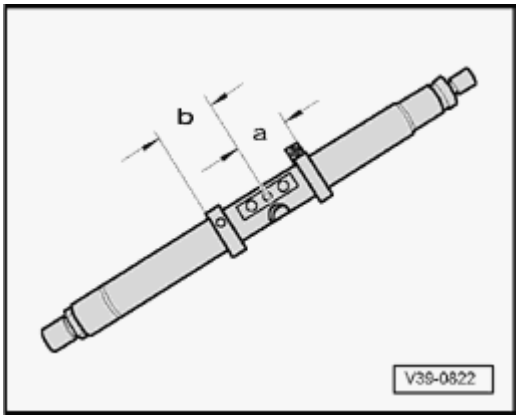


Fig. 277: Setting Adjusting Rings Of Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set adjustment rings of universal mandrel VW 385/1 to following measurements:

- Dimension a = 35 mm
- Dimension b = 75 mm

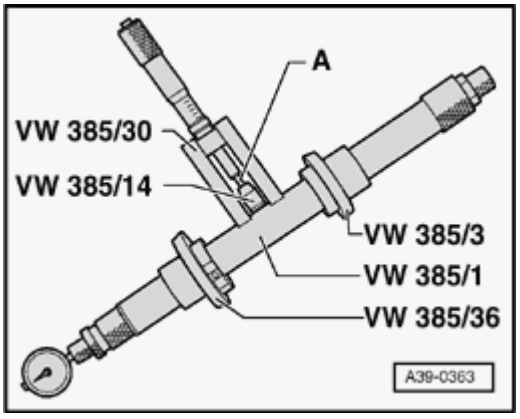


Fig. 278: Assembling Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble universal mandrel VW 385/1 according to illustration.

Dial gauge extension A	Ro	Ring gear diameter
6.5 mm	54.95	170 mm
9.3 mm	59.65	180 mm

- Set master gauge VW 385/30 to Ro according to ring gear diameter and install onto mandrel.

Ring gear diameter 180 mm Ro = 59.65 mm

Ring gear diameter 170 mm Ro = 54.95 mm

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- Set dial gauge (3 mm measuring range) to zero with 2 mm pre-load.

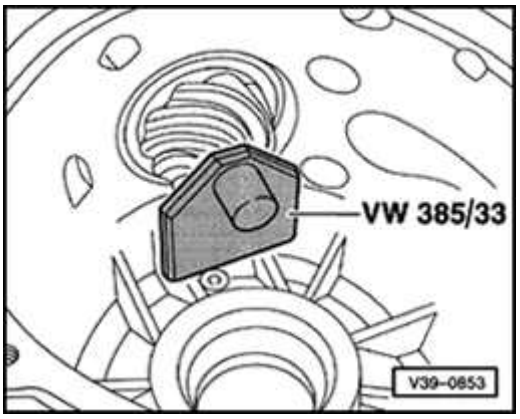


Fig. 279: Placing End Gauge On Drive Pinion Face
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place end measuring plate on face of drive pinion head.

NOTE: Make sure plate contact surface fits exactly and is free of oil.

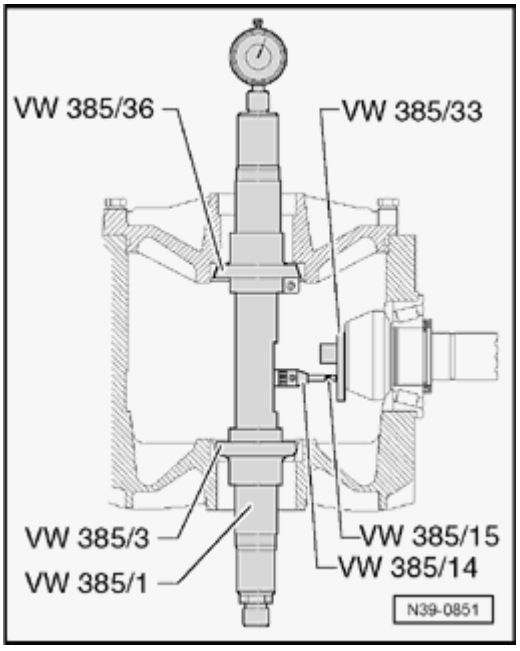


Fig. 280: Inserting Measuring Mandrel VW 385/1 Into Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove master gauge and insert measuring mandrel in housing.

- With Ro = 54.95 mm, a dial gauge extension = 6.5 mm length must be screwed in instead of dial gauge extension VW 385/15.

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- The dial gauge faces cover for final drive

- Install cover for final drive and tighten 4 bolts to 22 Nm.
- Using sliding setting ring to pull 2nd centering disc outward until mandrel can still be turned by hand.

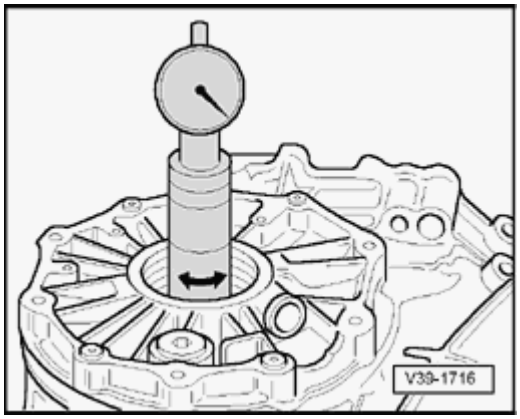


Fig. 281: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

NOTE: After removing universal mandrel check again that the dial gauge, with master gauge VW 385/30 in place, indicates "0" with 2 mm pre-load.

Determining thickness of shim "S3"

- If dial gauge reading is in red scale, subtract dimension "e".
- If dial gauge reading is in black scale, add dimension "e".
- The deviation "r", which is related to the master gauge "Ro" is measured for the final drive sets supplied as replacement parts and marked on the outer circumference of the ring gear.

Formula:		
"S3"	**=**	**"S3*" + "r" + "e"**
("e" in black scale)		
"S3"	**=**	**"S3*" + "r" - "e"**
("e" in red scale)		

Example:		
	Inserted shim "S3*"	0.60 mm

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+	Deviation "r"	0.38 mm
-	Determined value "e" (red scale)	0.26 mm
=	Thickness of shim "S3"	0.72 mm

- Determine shim(s) as accurately as possible from table. Part numbers

The following shims are available for "S3"

Shim thickness (mm) 1)		
0.40	0.55	0.70
0.45	0.60	0.75
0.50	0.65	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

Determining thickness of shim "S4"

Formula:		
"S4"	**=**	**"Stotal" - "S3"**

Example:

Total shim thickness "Stotal"	1.60 mm
Shim thickness S3	- 0.72 mm
Shim thickness S4	= 0.88 mm

- Determine shim(s) as accurately as possible from table. Part numbers

The following shims are available for "S4"

Shim thickness (mm) 1)		
0.49	0.69	0.85
0.57	0.73	0.89
0.61	0.77	0.97
0.65	0.81	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

Performing check measurement

Checking dimension "r"

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- Install drive pinion with determined shims "S3" and "S4" and turn 5 turns in both directions.

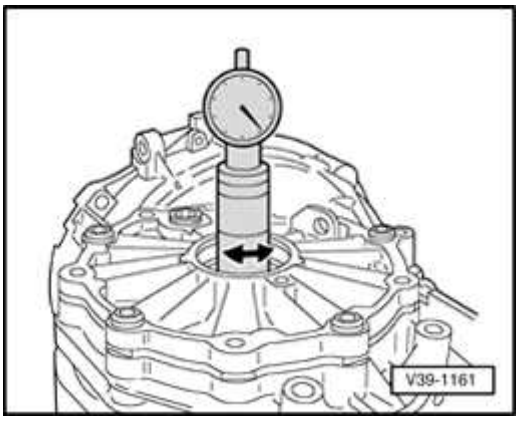


Fig. 282: Insert Universal Mandrel And Perform Check Measurement
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert universal mandrel "Determining measurement `e'". Refer to **Determining dimension "e"**, and perform check measurement.
- Read off dial gauge counterclockwise (red scale).

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

Re-determining "S4" shim when installing new transmission cover

Special tools, testers and auxiliary items required

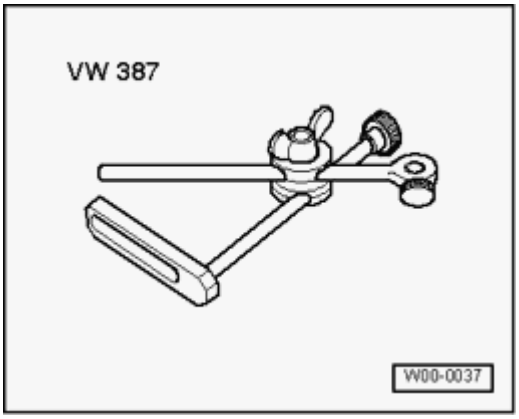


Fig. 283: Identifying Dial Gauge Holder VW 387
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 387 Universal dial gauge holder

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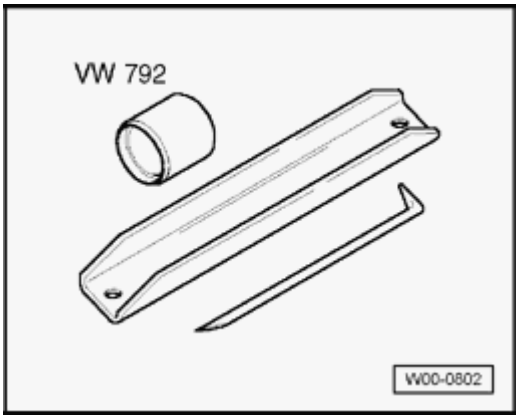


Fig. 284: Installation Arbor VW 792
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 792 Assembly device
- Dial gauge
- Dial gauge extension

- Use depth gauge to within at least 5/100 mm.
- Clean housing flange.

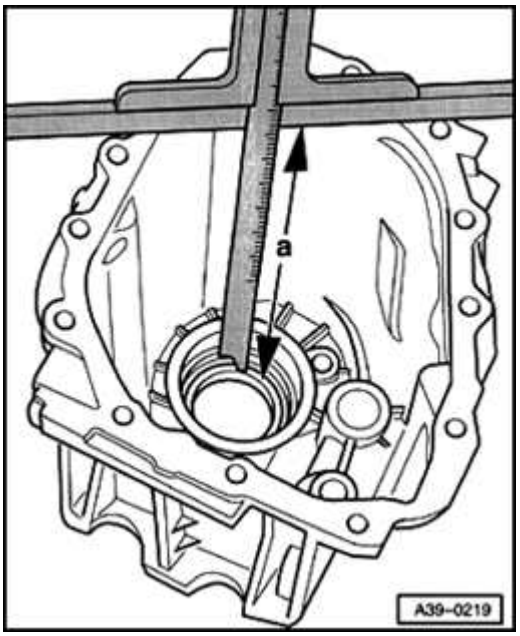


Fig. 285: Measuring Difference In Depth On Old And New Transmission Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure difference in depth "a" on old and new transmission cover.

Example:

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	Depth "a" on old transmission cover	257.40 mm
	Depth "a" on new transmission cover	257.55 mm
=	Difference	0.15 mm

- Install thicker shim "S4" if new transmission cover is deeper.
- Install thinner shim "S4" if the old transmission cover is deeper.

Example:

	Previous shim "S4"	0.95 mm
+	Difference	0.15 mm
=	New "S4" shim	1.10 mm

Available shims. Refer to table under **The following shims are available for "S4"**.

- Install outer race for tapered roller bearing with shim "S4" in transmission cover. See **Pressing in outer race for small tapered roller bearing**
- Insert completely assembled drive pinion in transmission housing again.
- Install transmission cover and tighten bolts to 22 Nm.

Checking pre-load of tapered roller bearing for drive pinion

- Rotate drive pinion 5 turns in both directions to settle the tapered roller bearing.

NOTE: Drive pinion can be rotated by simultaneously turning both flange shafts.

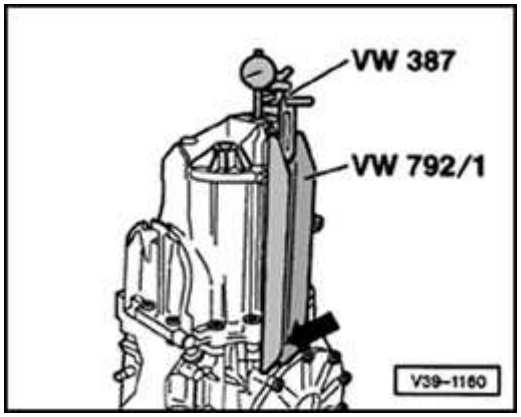


Fig. 286: Checking Preload For Tapered Roller Bearing For Drive Pinion
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install measuring tools and secure with bolt (arrow) to transmission housing.
- Position dial gauge (3 mm measuring range) center on transmission cover and set to "0" with 2 mm pre-

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load.

- Loosen transmission cover bolts and turn drive pinion several times.

If the correct shims have been selected the dial gauge will now indicate the following value:

- 0.05... 0.15 mm

- Remove measuring tools.
- Apply thin coat of sealant AMV 188 001 02 to sealing surfaces.
- Retighten transmission cover bolts to 22 Nm.

Ring gear, adjusting

Special tools and workshop equipment required

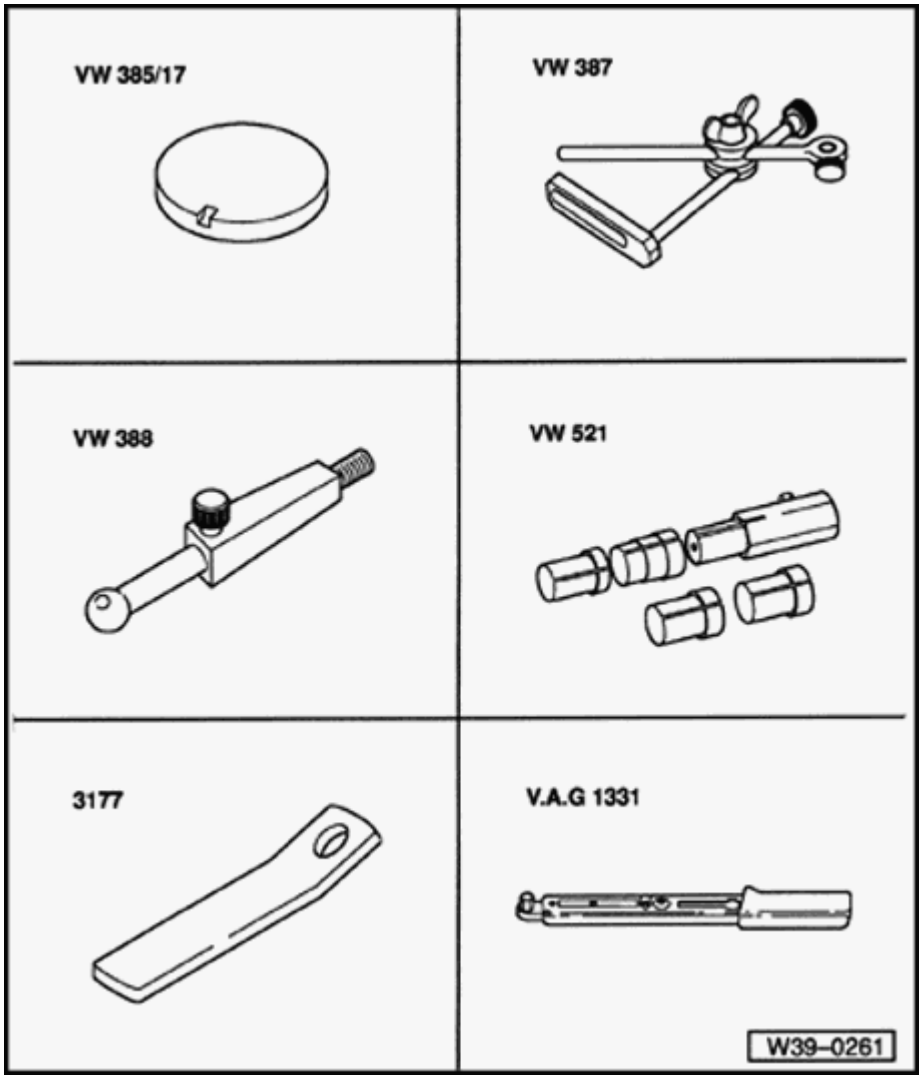


Fig. 287: Identifying Special Tools - Ring Gear, Adjusting

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

(Adjusting differential)

- VW 385/17 End measuring plate
- VW 387 Universal dial gauge holder
- VW 388 Measuring lever
- VW 521 Adjustment tool

- 3177 Clamp
- V.A.G 1331 Torque wrench

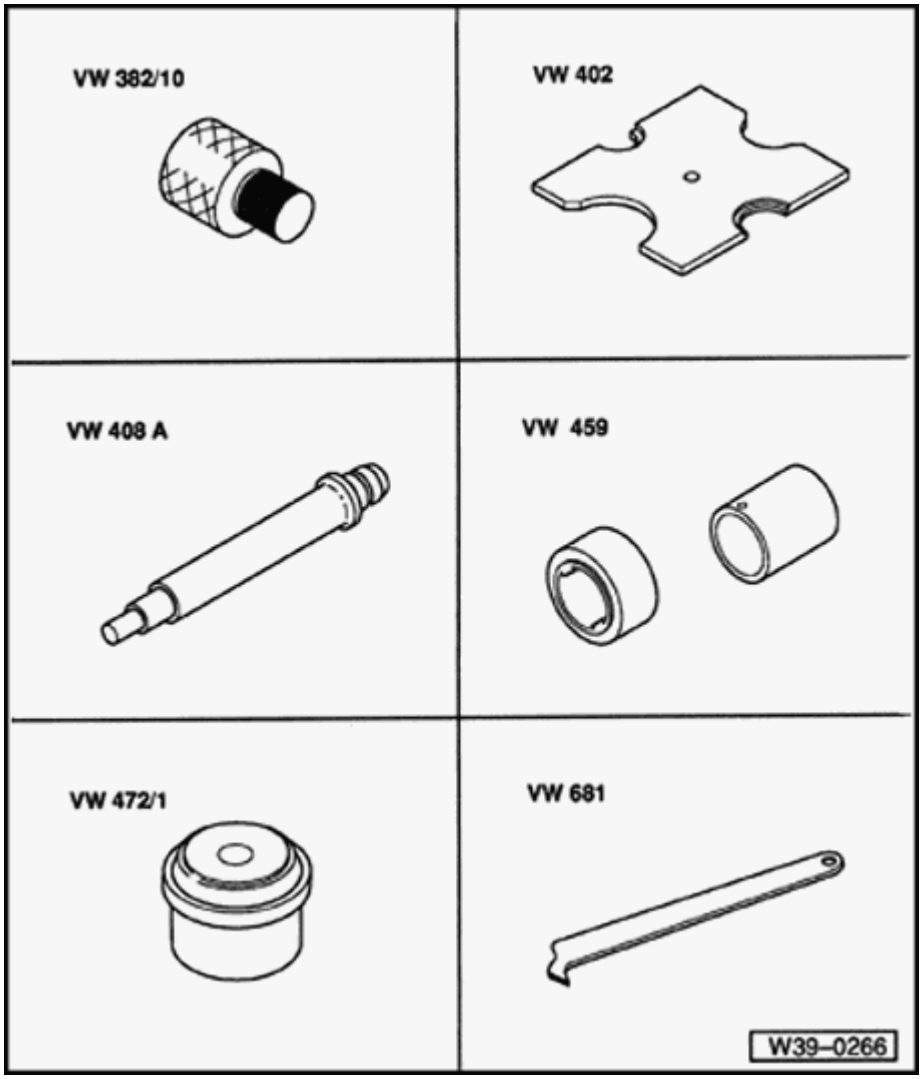


Fig. 288: Identifying Special Tools - Ring Gear, Adjusting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

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- VW 382/10 Dial gauge extension
- VW 402 Thrust plate
- VW 408 A Pressure tool
- VW 459/2 Installing and removing tool
- VW 472/1 Thrust piece
- VW 681 Extractor lever

Special tools and workshop equipment required

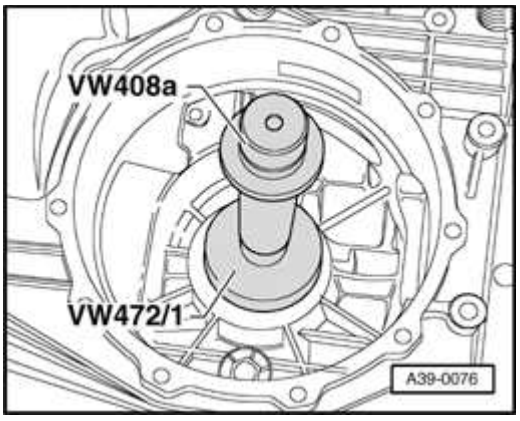


Fig. 289: Pressing Outer Race/Tapered Roller Bearing Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 2050 Thrust plate

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

(adjusting pre-load of tapered roller bearing for differential)

- Drive pinion removed

  - Pull out flange shaft oil seal with oil seal extractor VW 681.
  - Remove tapered roller bearing outer race for differential and remove shims. Refer to **Differential, disassembling and assembling**.

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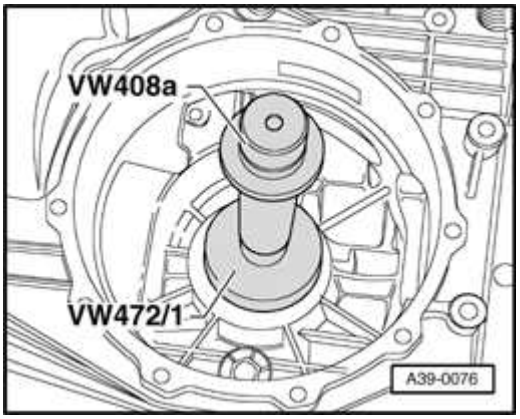


Fig. 290: Pressing Outer Race/Tapered Roller Bearing Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive outer race for small tapered roller bearing with shim "S2" into transmission housing. For measurement purposes use a 1.20 mm thick "S2*" shim (2 shims of 0.60 mm).

NOTE: For measurement purposes a shim "S2" with a thickness of 1.20 mm is initially inserted. It is referred to as "S2*" in the following. After determining the backlash "S2*" will be replaced by the correct "S2".

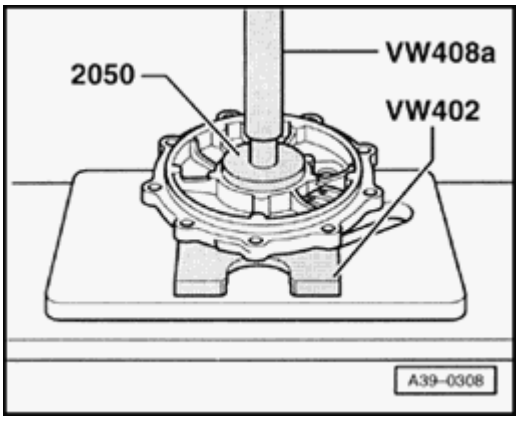


Fig. 291: Driving In Outer Race Of Tapered Roller Bearing Into Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press outer race for tapered roller bearing without shim "S1" into cover for differential.
- Insert differential without drive wheel for speedometer sensor -G22- into transmission housing.
- Install cover for differential with 4 bolts (25 Nm).
- Position transmission so that cover for differential faces up.

- Turn differential 5 turns in both directions to settle the tapered roller bearing.
- Place measuring plate VW 385/17 onto differential.

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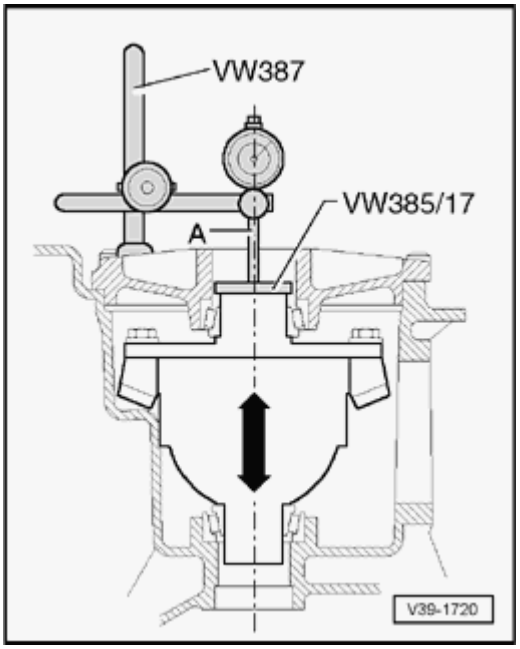


Fig. 292: Installing Magnetic Plate 50Mm Dia. VW 385/17 And Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble measuring equipment, use a 30 mm dial gauge extension.
- Set dial gauge (3 mm measuring range) to zero with 2 mm pre-load.

NOTE: The tip of the dial gauge must be positioned on center of differential.

- Lift differential without turning; read play on dial gauge and note.

- Measurement in following example: 0.62 mm

NOTE:

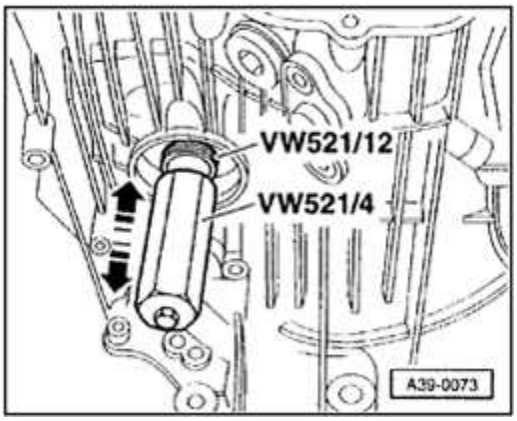


Fig. 293: Securing Special Tools VW 521/4 And VW 521/12 At Right On Differential (Housing Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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If measurement has to be repeated, differential must again be turned 5 turns in each direction to settle the tapered roller bearing.

Formula: **"Stotal"**	=	**"S2*" + measurement + bearing pre-load**

Example:		
	Inserted shim(s) "S2*"	1.20 mm
+	Measurement	0.62 mm
+	Bearing pre-load (constant)	0.30 mm
=	Total shim thickness "Stotal" for "S1" + "S2"	2.12 mm

Determining thickness of shim "S1*"

NOTE:

- **The preliminary adjustment shim "S1*" will be replaced with the final shim "S1" after determining the backlash.**
- **The total shim thickness "Stotal" remains the same.**

Formula:		
"S1*"	=	**"Stotal" - "S2*"**

Example:		
	Total shim thickness "Stotal" for "S1" + "S2"	2.12 mm
-	Inserted shim(s) "S2*"	1.20 mm
=	Thickness of shim "S1*"	0.92 mm

Measuring backlash

- Drive pinion and shims "S3*" and "S4*" installed

  - Installing differential with ring gear: S1* is installed on cover side, S2* in transmission housing.
  - Install final drive cover and tighten bolts to 25 Nm.
  - Turn differential 5 turns in both directions so that the tapered roller bearings settle.

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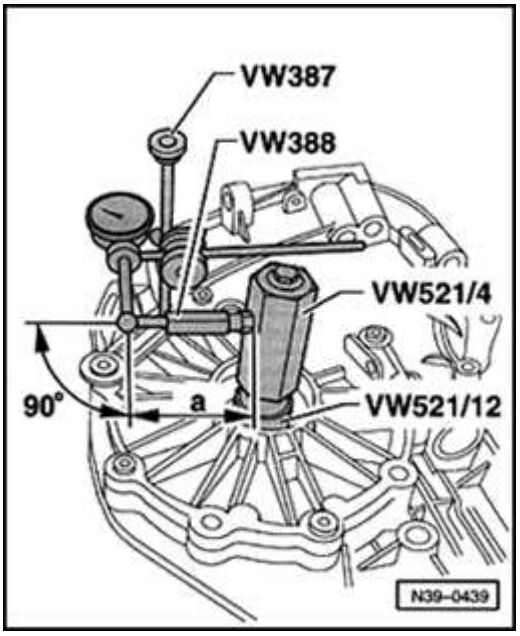


Fig. 294: Measuring Backlash
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure dial gauge holder VW 387 on housing.
- Install dial gauge with dial gauge extension VW 382/10 (6 mm flat).
- Set measuring lever VW 388 to dimension "a":

Dimension "a"	Ring gear diameter
67 mm	170 mm
72 mm	180 mm

- Measure play between teeth flanks (backlash) as follows:
- Turn ring gear until it makes contact with a tooth flank (end of backlash travel).
- Set dial gauge to "0" with 2 mm pre-load.
- Turn ring gear back until lying against an opposite tooth flank (backlash).

- Read backlash and note value.
- Turn ring gear 90 ° and repeat measurements another 3 times.

NOTE:

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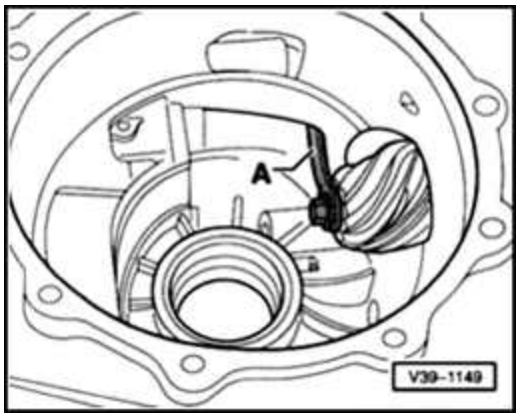


Fig. 295: Installing Clamp 3177 "A"
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If drive pinion rotates when the differential is turned, install bracket VW 3177 -A- so that backlash can be measured exactly.
- Loosen the clamp in order to turn the ring gear.
- Cut-out for large differential bevel gears must point toward drive pinion when differential is inserted.

- With holder 3177 inserted, install differential offset by 180 ° and repeat measurement.

Determining average backlash

- Add 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 divided by 4 = 0.29 mm

NOTE: If the individual measurements differ by more than 0.06 mm this means that the installation of the ring gear is not correct or that the final drive set itself is defective. Check installation, replace final drive set if necessary.

Determining thickness of shim "S2"

Formula: **"S2"**	**=**	**"S2*" - backlash + lift**

Example:	

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	Inserted shim "S2*"	1.20 mm
-	Average backlash	0.29 mm
+	Lift (constant)	0.15 mm
=	Thickness of shim "S2"	1.06 mm

- Determine shim(s) as accurately as possible from table. Part numbers

The following shims are available for "S2"

Shim thickness (mm) 1)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

Determining thickness of shim "S1"

Formula: **"S1"**	=	**"Stotal" - "S2"**

Example:		
	Total shim thickness "Stotal" for "S1" + "S2"	2.12 mm
-	Thickness of shim "S2"	1.06 mm
=	Thickness of shim "S1"	1.06 mm

- Determine shim(s) as accurately as possible from table. Part numbers

The following shims are available for "S1"

Shim thickness (mm) 1)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

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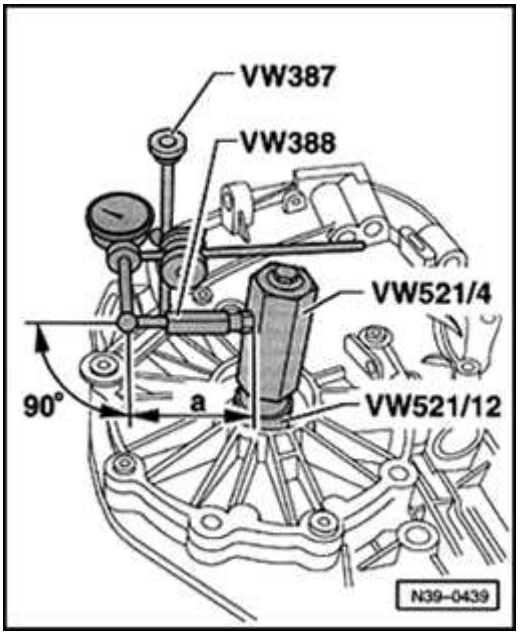


Fig. 296: Measuring Backlash
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Performing check measurement

- After installing shims "S1" and "S2", turn differential 5 turns in both directions so that tapered roller bearings settle.
- Measure backlash four times on circumference.

- Specification: 0.12... 0.22 mm

NOTE:

- **If the backlash is beyond the tolerance, the adjustments must be repeated. The total shim thickness "Stotal" must not be changed when the adjustment is repeated.**
- **The individual measurements must not differ by more than 0.06 mm from each other.**

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