TRANSMISSION

6 Spd. Manual Transmission 01E All Wheel Drive

00 GENERAL, TECHNICAL DATA

TRANSMISSION IDENTIFICATION

Transmission identification

The 6-speed manual transmission 01E all wheel drive is installed in the Audi A4 2002 > in conjunction with the V6 gasoline engine.

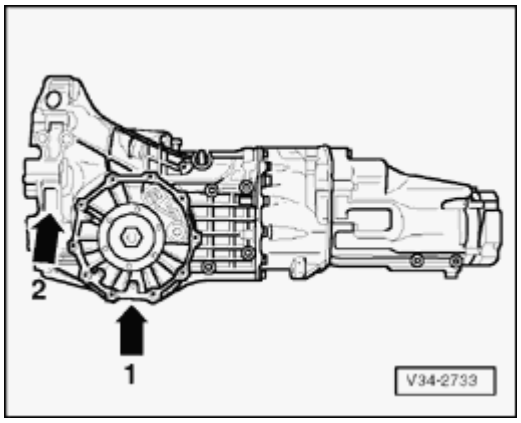


Fig. 1: Locations On Transmission Identification
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Location on transmission

- Code letters and serial number -arrow 1-
- Manual transmission 01E -arrow 2-

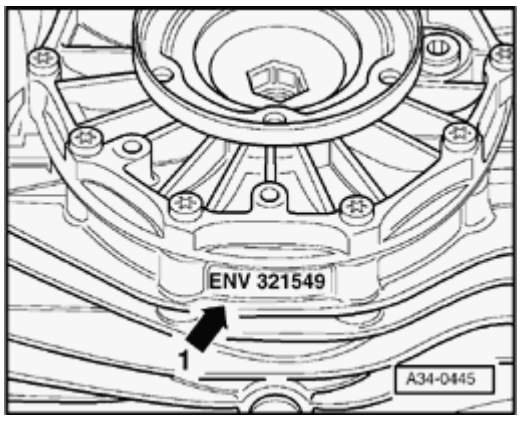


Fig. 2: Code Letters And Transmission Consecutive Serial Number
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Code letters and transmission consecutive serial number -arrow 1-

Example:	**ENV**	**321549**
	I	I
	Code letters	Transmission consecutive serial number

Additional data is production-related

NOTE: The code letters for the transmission are also given on the vehicle data stickers.

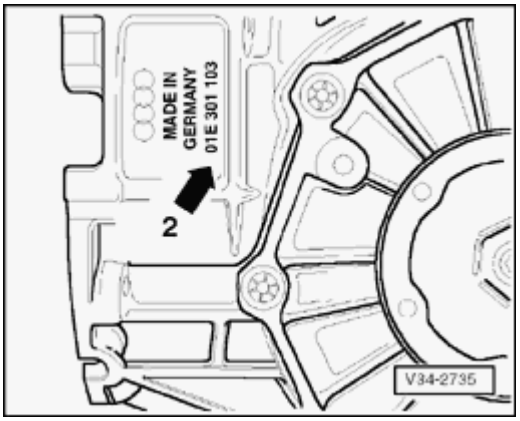


Fig. 3: Manual Transmission 01E
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Manual transmission 01E -arrow 2-

Code letters, mechanical unit assignment, transmission ratios, capacities

Manual transmission		**6-speed 01E, all wheel drive**
Code letters		**FRE**
Production	from	04.01
	to	
Allocation	Model	**Audi A4 2001 >**
	Engine	3.0 l - 162 kW
Ratio	Final drive	35 : 8 = 4.375
Z2 : Z1 =i	1st gear	28 : 8 = 3.500
	2nd gear	34 : 18 = 1.889
	3rd gear	33 : 25 = 1.320
	4th gear	30 : 29 = 1.034
	5th gear	30 : 35 = 0.857
	6th gear	27 : 37 = 0.730
	Reverse gear	38 : 11 = 3.455

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Code letters	**FRE**
Speedometer	electronic
Capacity	2.5 liters
Specification	Gear oil G 052 911 A SAE 75 W 90 (synthetic oil)
Clutch mechanism	hydraulic
Clutch plate Ø	240 mm
Drive axle flange Ø	75.5 mm
Overall ratio iov. in top gear	3.193
Assignment of rear final drive Code letters	FUB

REAR FINAL DRIVE IDENTIFICATION

Rear final drive identification

Final drive 01R is assigned to manual transmission 01E, all wheel drive.

Mechanical unit assignment:

Refer to **00 - GENERAL, TECHNICAL DATA**

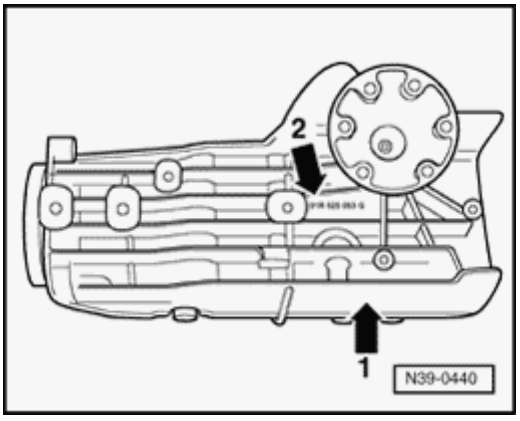


Fig. 4: Locations Of Final Drive Identification
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Location on final drive

Code letters and date of manufacture (arrow 1)

Final drive 01R (arrow 2)

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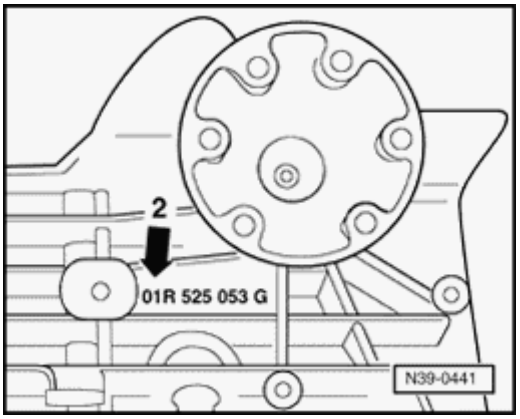


Fig. 5: Final Drive 01R
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Final drive 01R (arrow 2)

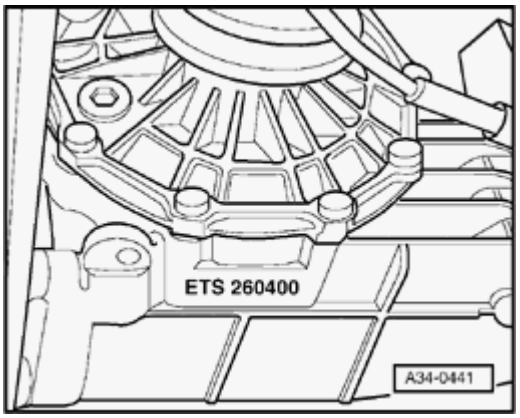


Fig. 6: Code Letters And Manufacturing Data For The Final Drive
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Code letters and manufacturing data for the final drive

Example:	ETS	26	04	00
	I	I	I	I
	I	I	I	I
	Code letters	Day	Month	Year (2000) of manufacture

Additional data is production-related

Code letters, transmission ratios, capacities

Refer to **00 - GENERAL, TECHNICAL DATA**

TRANSMISSION LAYOUT

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Transmission layout

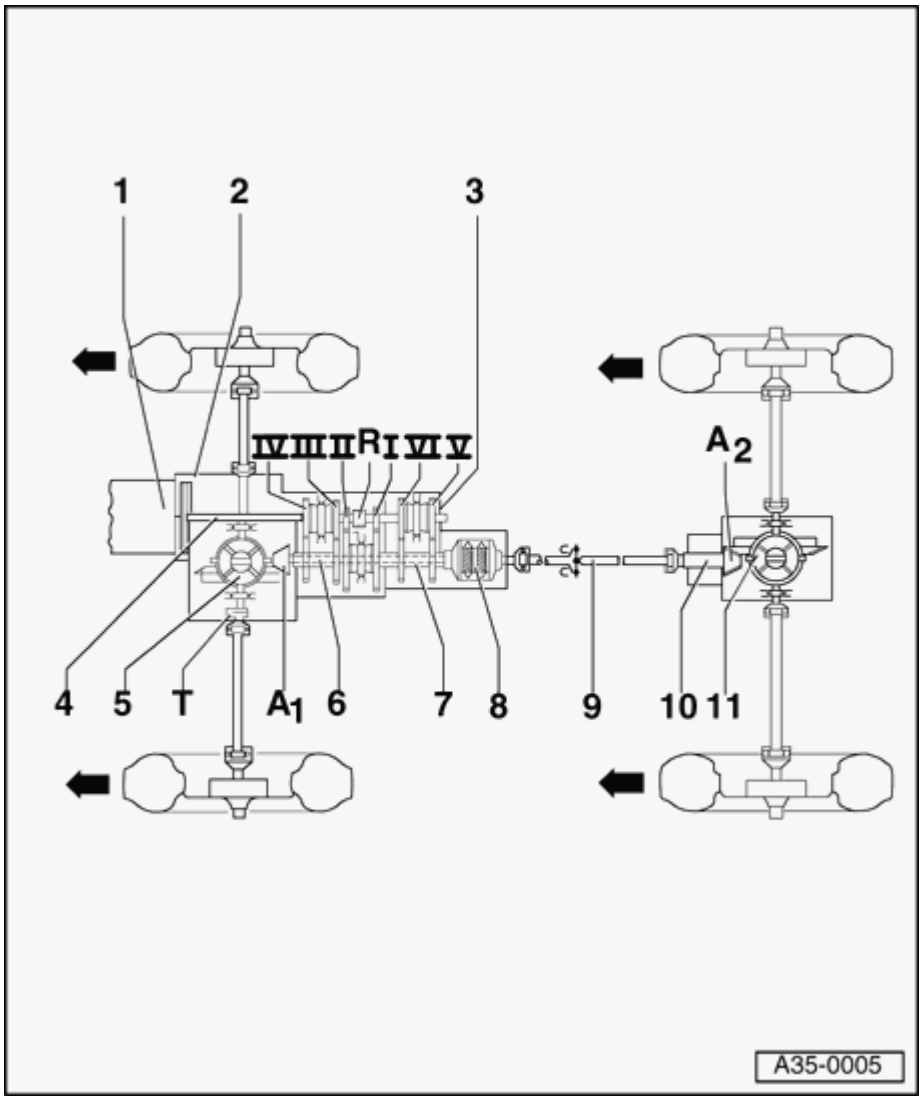


Fig. 7: Transmission, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Engine

2 - Clutch

3 - Manual transmission

4 - Input shaft (main shaft)

5 - Front differential

6 - Front drive pinion (output shaft)

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7 - Hollow shaft

8 - Torsen differential

9 - Driveshaft

10 - Rear drive pinion

11 - Rear differential

NOTE: Arrows face in direction of travel.

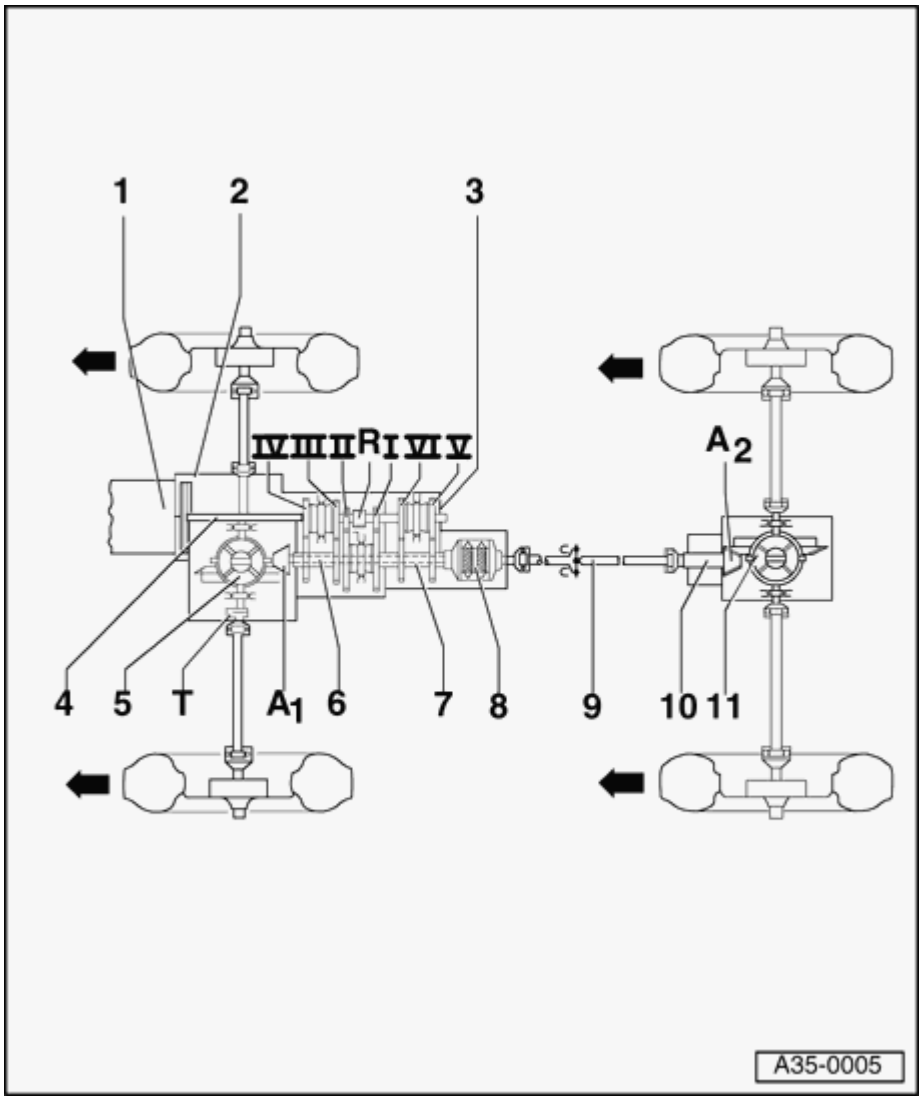


Fig. 8: Transmission, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

I - 1st gear

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II - 2nd gear

III - 3rd gear

IV - 4th gear

V - 5th gear

VI - 6th gear

R - Reverse gear

A1 - Front final drive

A2 - Rear final drive

T - Speedometer drive, electronic

NOTE: Arrows face in direction of travel.

CALCULATING OVERALL RATIO (I)

Calculating overall ratio (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	=	Final drive ratio	ZA2 : ZA1
iov	=	overall ratio	iG x iA

Example:		
	6. gear	**Final drive**
Drive gear	ZG1 = 41	ZA1 = 9
Driven gear	ZG2 = 23	ZA2 = 35

Calculations:		
iG	=	23 : 41 = 0.561
iA	=	35 : 9 = 3.889
iov	=	0.561 x 3.889 = 2.182

GENERAL REPAIR INSTRUCTIONS

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General repair instructions

The maximum possible care and cleanliness and proper tools are essential to ensure satisfactory and successful transmission repairs. The usual basic safety precautions also naturally apply when carrying out vehicle repairs.

A number of generally applicable 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

Transmission

- When installing a new transmission, the oil level must be checked and oil added if necessary. Refer to **Transmission oil level, checking**.
- Capacities and specifications. Refer to **Code letters, mechanical unit assignment, transmission ratios, capacities** onward.
- When exchanging the rear final drive the oil level in rear final drive must be checked and, if necessary, corrected.

Refer to **39 - FINAL DRIVE, DIFFERENTIAL**

- Thoroughly clean all unions and the adjacent areas before disconnecting.
- When installing transmission, ensure that the dowel sleeves are installed correctly.

O-rings, seals, gaskets

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

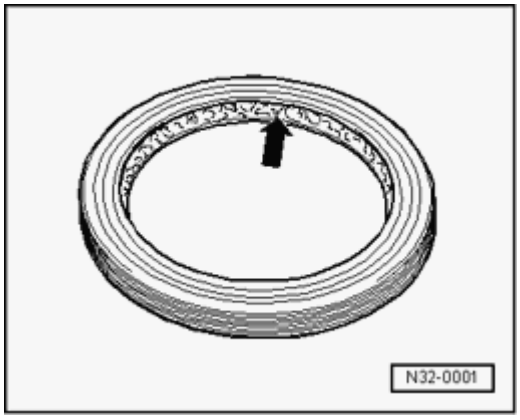


Fig. 9: Identifying Space Between Oil Seal Sealing Lips

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before installing radial shaft seals, lightly oil outer circumference and pack space between sealing lips - arrow- half-full with sealing grease G 052 128 A1.
- The open side of the seals faces toward the side with fluid filling.
- When replacing seals, always vary the point at which the sealing lips make contact (use insertion depth tolerances).
- Lightly oil O-rings before installing to prevent them being trapped and damaged when assembling.
- After replacing seals and gaskets check oil level in transmission. Refer to **Transmission oil level, checking**.

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.

Locking elements

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

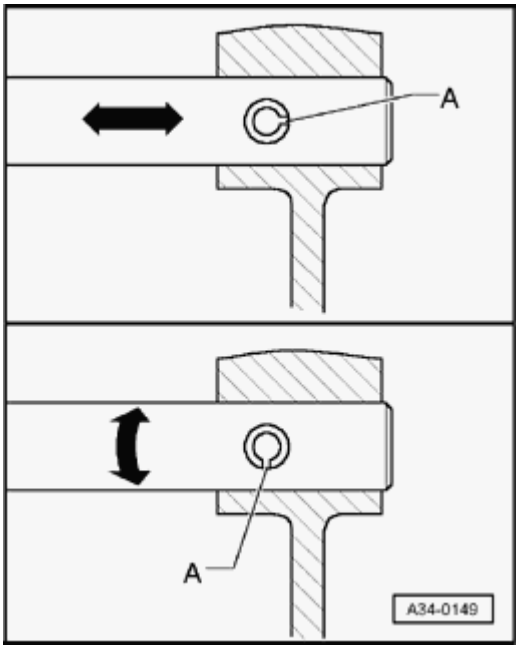


Fig. 10: Identifying Locking Elements
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Nuts, bolts

- Slacken the nuts and bolts in reverse sequence to the specified tightening sequence.
- Nuts and bolts which secure covers and housings should be slackened and tightened diagonally.
- Parts which are particularly sensitive (e.g. clutch pressure plates) must be kept straight and slackened and tightened diagonally in stages.
- The tightening torques stated apply to non-oiled nuts and bolts.

- Replace self-locking bolts and nuts.
- The threads of bolts which are secured by a locking fluid should be cleaned with a wire brush. 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.

Mount

- Attach the needle bearing with the written side (greater plate thickness) to the installing tool.
- Grease needle bearing for transmission rear input shaft in flywheel.
- Lubricate all bearings in transmission housing with gear oil before installing.
- Heat inner races of taper roller bearings to approx. 100 ° C before installing. Press in onto stop when installing so there is no axial play.

- Do not interchange inner or outer races of bearings of the same size.
- Always replace the taper roller bearings on one shaft together and use new bearings from a single manufacturer.
- The taper roller bearings for the output shaft and the differential in the transmission are low-friction bearings. Do not additionally oil new taper roller bearings when measuring friction torque. The bearings are pre-treated at the factory with a special type of oil for this purpose.

Adjustment 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.
- Only install perfect, undamaged shims.

Gears, synchros, inner races for sliding gears

- Heat gears and synchros to approx. 100 ° C before installing. Press in onto stop when installing so there is no axial play.
- Heat inner races for sliding gears to approx. 100 ° C when installing.

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- Temperature can be checked with temperature tester V.A.G 1558.
- Note installation position.

Sliding gears

- After installing, check 1st to 6th sliding gears and reverse sliding gear for axial play of 0.15 to 0.35 mm and check that they rotate freely.

Synchronizer rings

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

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 pipe is still connected. Otherwise the piston will be pressed out of the slave cylinder.
- Do not tilt clutch pressure plate, loosen and tighten diagonally in small steps.
- If the clutch has burnt out, thoroughly clean the bell housing, flywheel and parts of the engine facing the transmission in order to reduce the smell.

30 CLUTCH

CLUTCH MECHANISM, SERVICING

Clutch mechanism, servicing

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**

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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**

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Clutch mechanism, servicing

See Caution before beginning repairs on the electrical system. Refer to **Clutch mechanism, servicing**

Refer to

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

NOTE:

- **Disconnect battery Ground strap with the ignition switched off.**
- **Lubricate all bearings and contact surfaces with polycarbamide grease G 052 142 A 2.**
- **Before working on pedal cluster, remove cover below dash panel:**

  Refer to
  - **68 - INTERIOR EQUIPMENT**
  - **68 - INTERIOR EQUIPMENT for Cabriolet**

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

Pedal cluster assembly, overview

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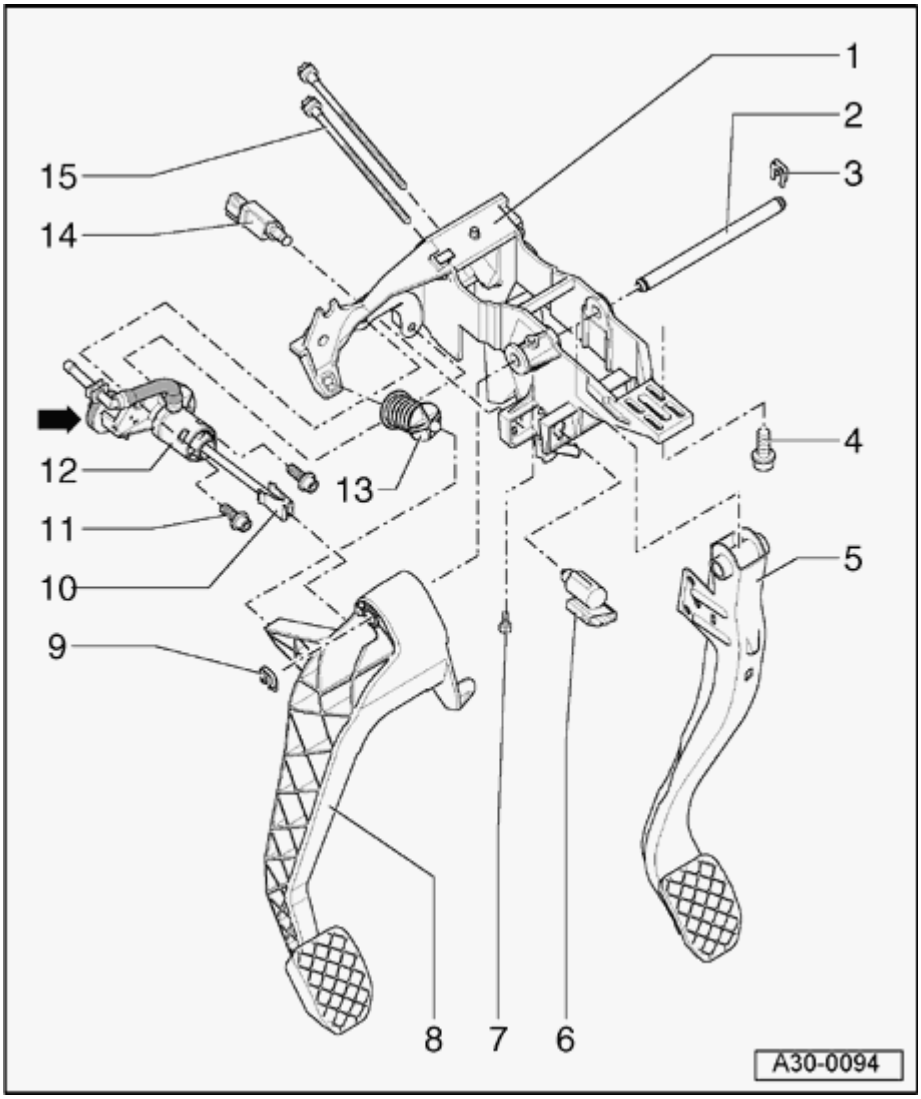


Fig. 11: Pedal Cluster, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bracket

- Removing and installing:

Refer to **46 - BRAKES - MECHANICAL COMPONENTS**

2 - Pivot pin for clutch and brake pedal

3 - Securing clip

4 - Hex socket-head bolt - 25 Nm

5 - Brake pedal

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- Maintenance-free mount, do not grease

6 - Clutch Vacuum Vent Valve Switch -F36-

- In order to assure sufficiently secure installation, switch must not be installed more than once

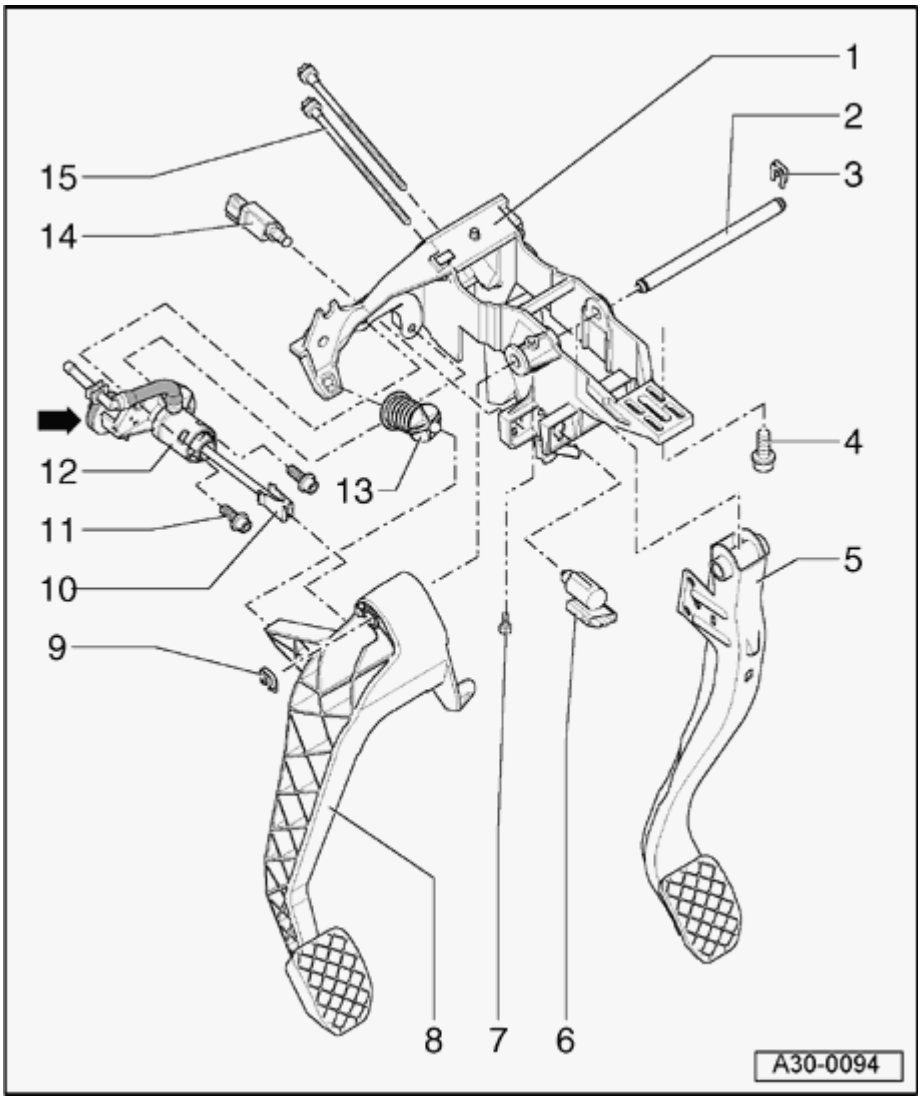


Fig. 12: Pedal Cluster, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

7 - Hex socket-head bolt - 5Nm

- Secures clutch and brake pedal pivot pin

8 - Clutch pedal

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

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9 - Securing clip

10 - Mount

- Removing and installing. Refer to **Hydraulic system, exploded view**

11 - Hex socket-head bolt - 20Nm

12 - Master cylinder

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

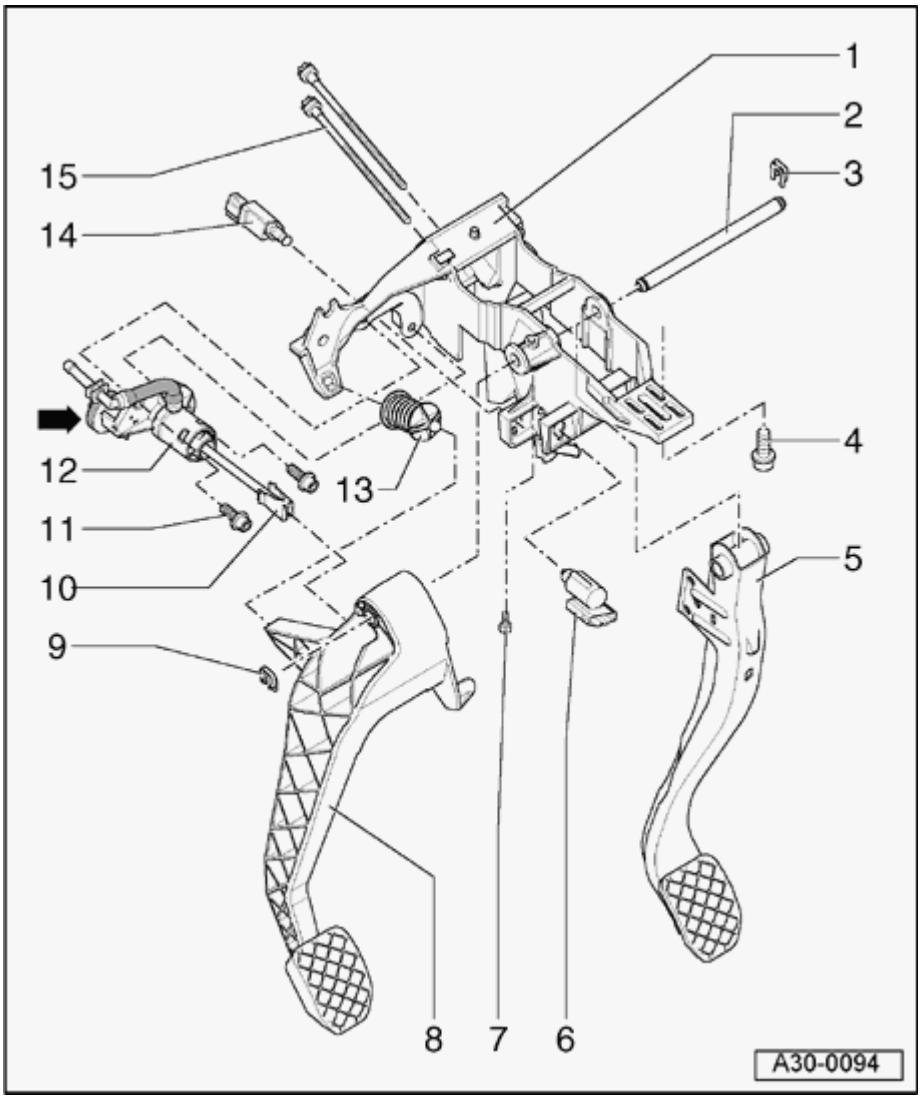


Fig. 13: Pedal Cluster, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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13 - Over-center spring

- Black side faces clutch pedal
- Removing and installing. Refer to **Over center spring, removing and installing**
- Allocation

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

- In order to assure sufficiently secure installation, switch must not be installed more than once

15 - TORX-screw - 25 Nm

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

Over center spring, removing and installing

Special tools and workshop equipment required

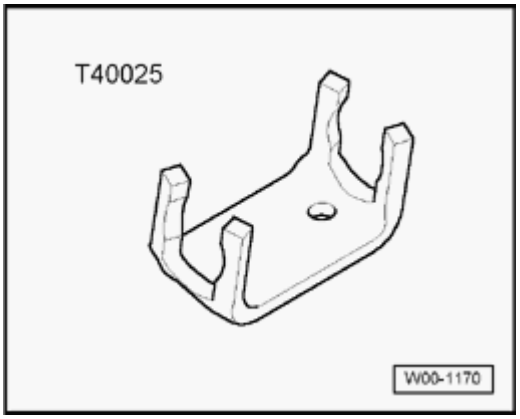


Fig. 14: T40025 Installation Clamp
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- T40025 retaining clamp

Removing

- Remove driver's side tray:

Refer to

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

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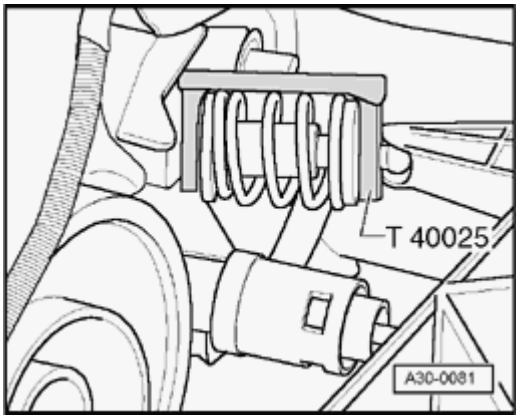


Fig. 15: Installation Clamp T40025 Installed On Over-Center Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tension over-center spring with clutch pedal and press on retaining clamp T40025.
- Bring clutch pedal to rest position and remove over-center spring downward together with retaining clamp T40025.

Installing

- Pull clutch pedal into the passenger compartment.

Installation position of over-center spring:

- Black side of over-center spring faces clutch pedal.

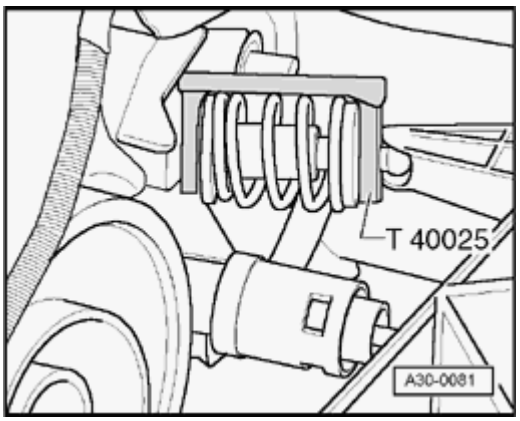


Fig. 16: Installation Clamp T40025 Installed On Over-Center Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Hydraulic system, exploded view

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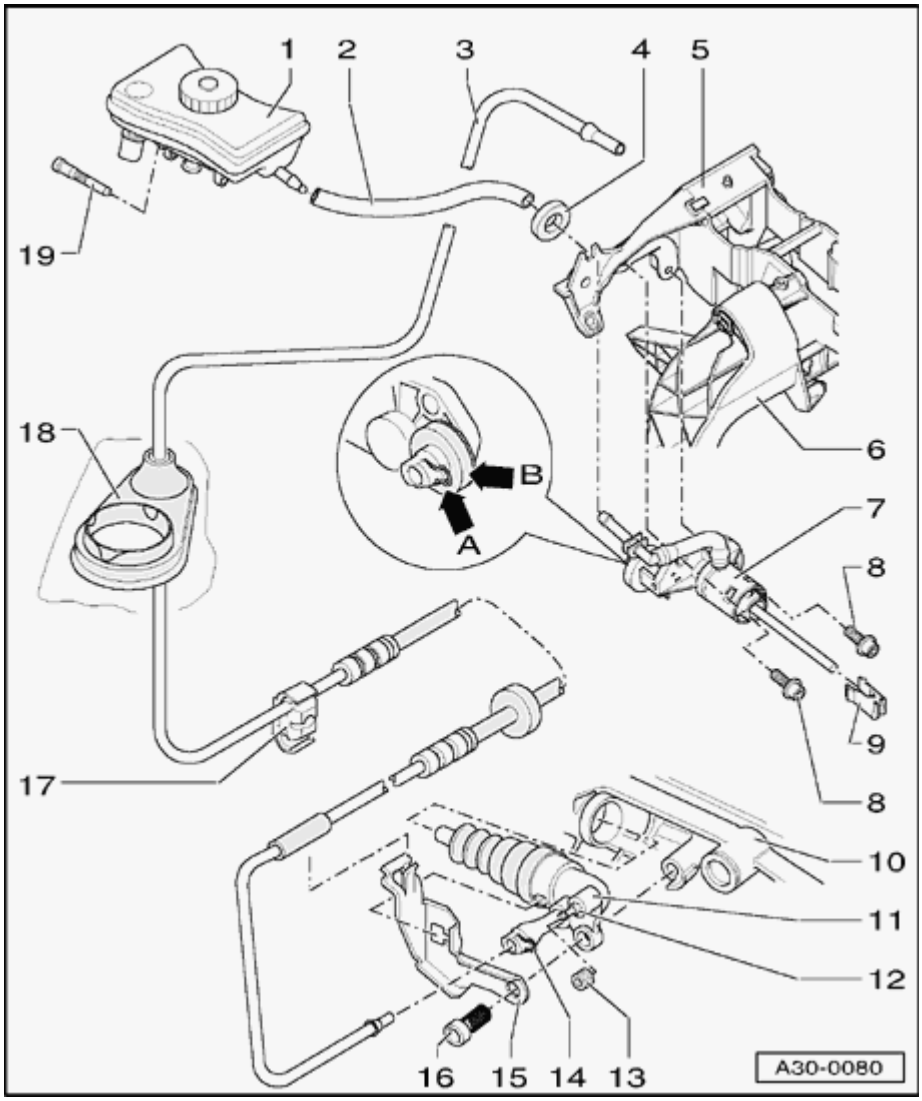


Fig. 17: Hydraulic System, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Brake fluid reservoir

2 - Supply hose

- For master cylinder

3 - Hose assembly

- For plug connections on master/slave cylinders
- Detaching from master cylinder and installing. Refer to **Master cylinder, removing and installing**
- Detaching from slave cylinder. See **Detaching slave cylinder from hose/pipe assembly**

4 - Grommet

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5 - Bracket

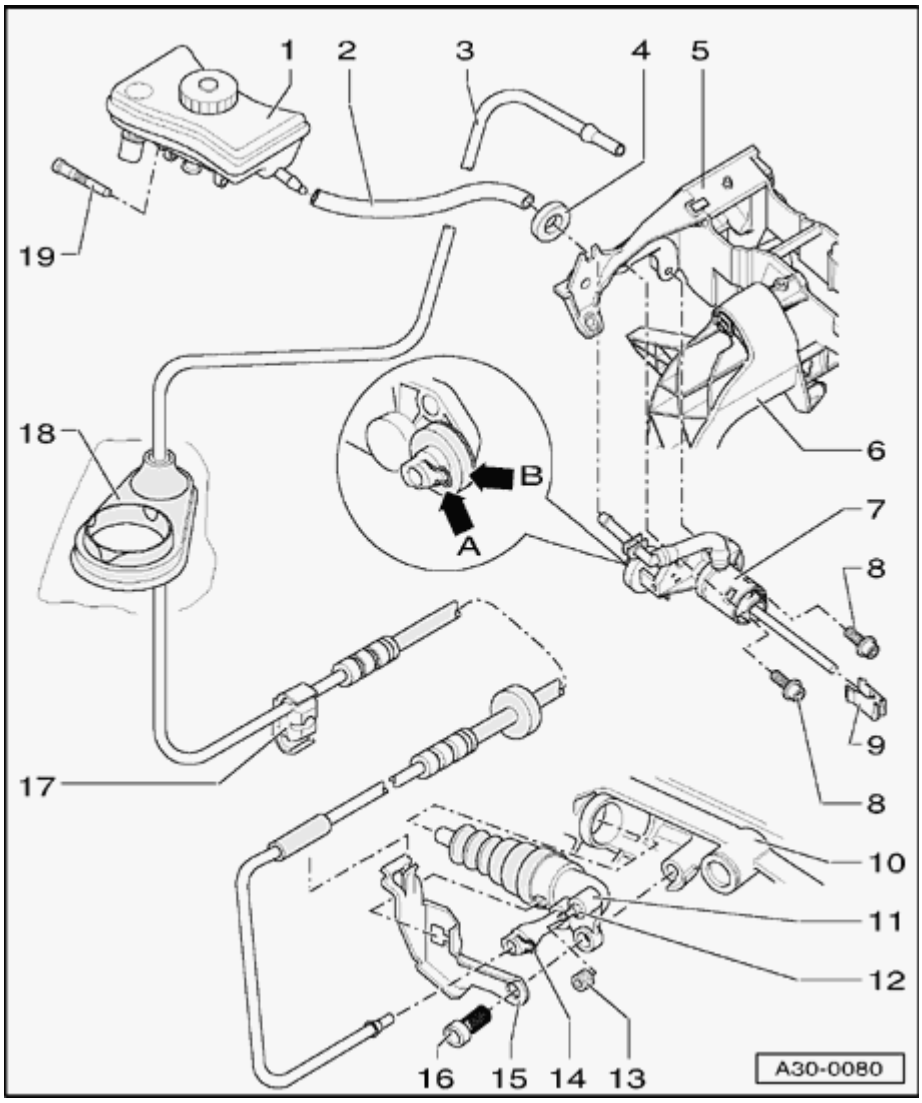


Fig. 18: Hydraulic System, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

6 - Clutch pedal

7 - Master cylinder

- Removing and installing. Refer to **Master cylinder, removing and installing**
- Clips (arrow A) and seal (arrow B) must not be removed
- To remove the hose/pipe assembly, pull out the clip (arrow A) up to the stop. Refer to **Fig. 34**

8 - Hex socket-head bolt - 20Nm

9 - Mount

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- Replace only with master cylinder removed
- Prying off. See **Lever off mount**
- Pressing on. See **Press master cylinder operating rod into mount**

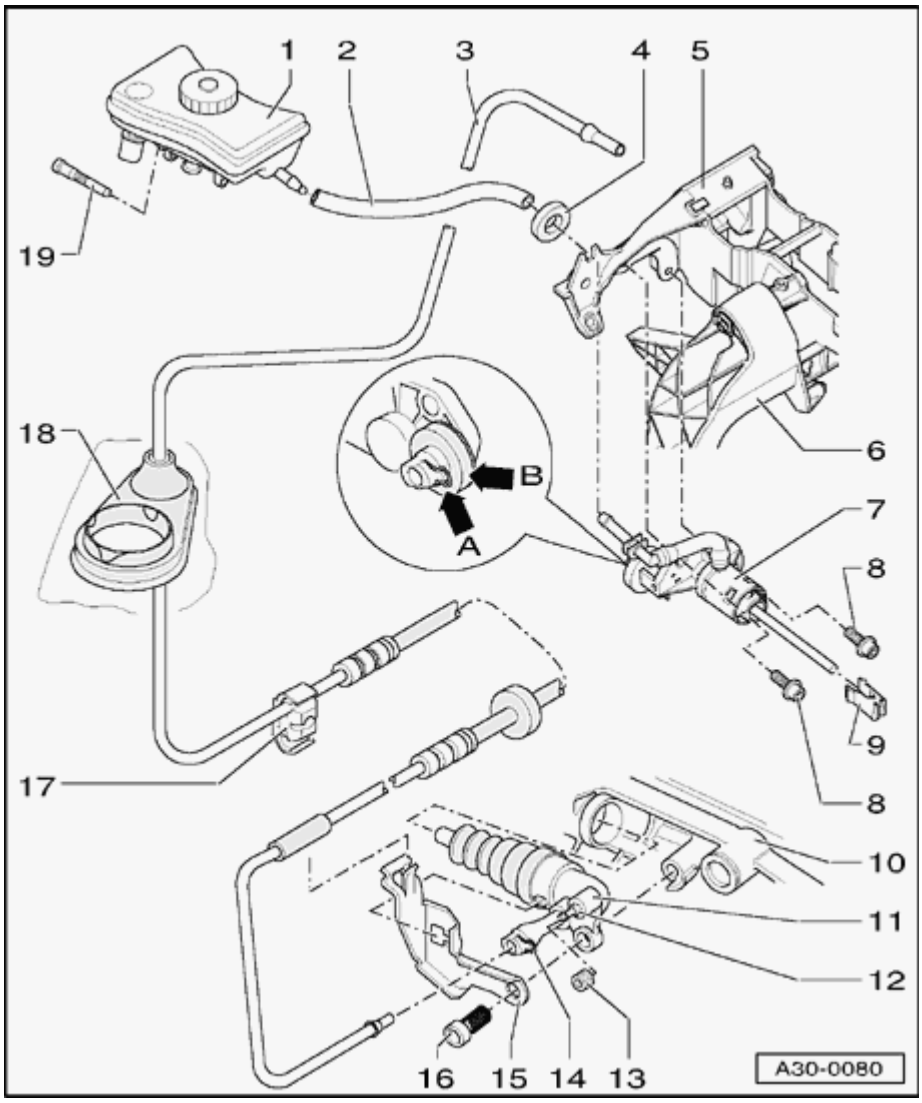


Fig. 19: Hydraulic System, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

10 - Transmission

11 - Slave cylinder

- Removing. See **Removing clutch slave cylinder**
- Installing. See **Installing clutch slave cylinder** and see **Coat clutch slave cylinder with grease before installing**
- Do not operate clutch pedal after slave cylinder has been removed.

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- After working on hydraulic clutch mechanism, bleed slave cylinder. Refer to **Clutch system, bleeding**
- Detach from hose/pipe assembly. See **Detaching slave cylinder from hose/pipe assembly**

12 - Bleeder valve

- Tighten to 4.5 Nm
- Follow correct work sequence when bleeding. Refer to **Clutch system, bleeding**
- A broken bleeder valve can be screwed out with a 3mm hex socket wrench

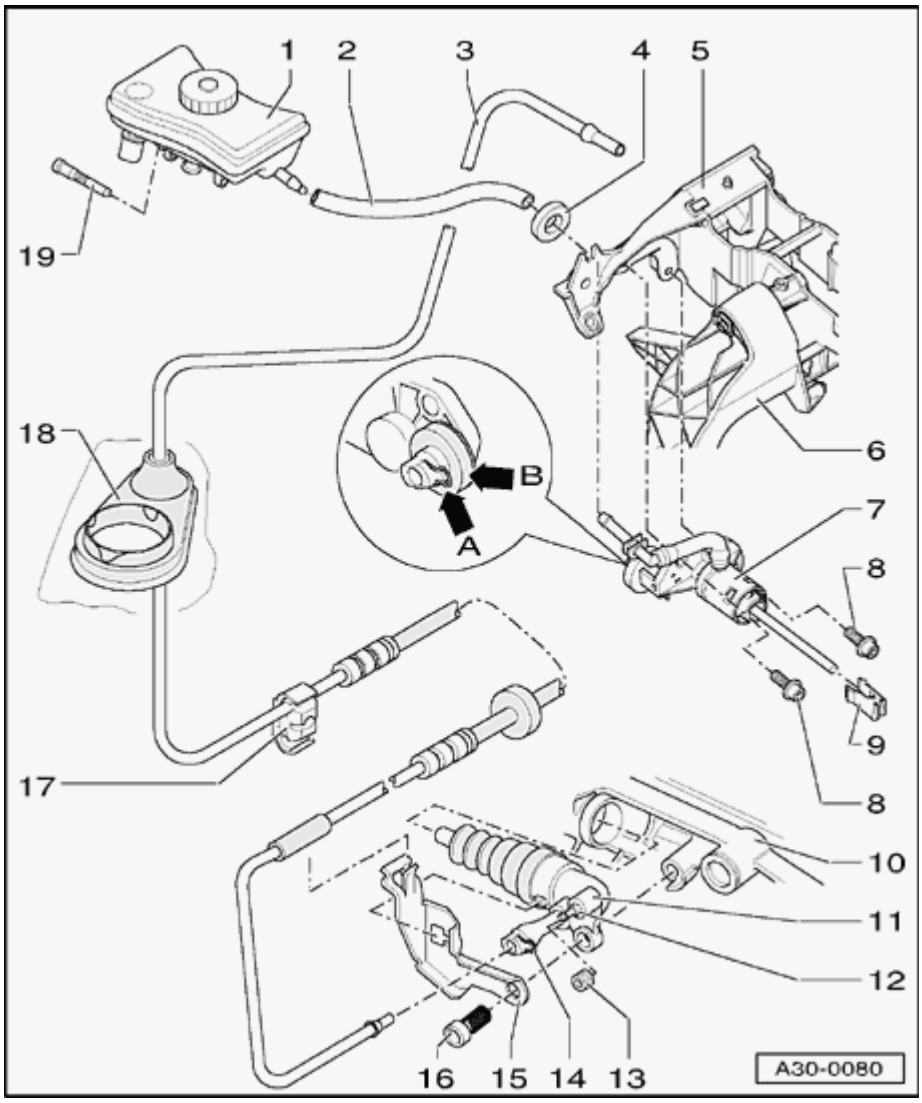


Fig. 20: Hydraulic System, Assembly Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

13 - Dust cap

14 - Clamp

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- To remove the line, pull out the clamp to the stop. See **Detaching slave cylinder from hose/pipe assembly**

15 - Bracket

- For hose/pipe assembly
- Fastened together with slave cylinder to transmission

16 - Hex socket-head bolt - 25 Nm

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

17 - Retaining clip

18 - Gasket

19 - Bolt

- For brake fluid reservoir

Lever off mount

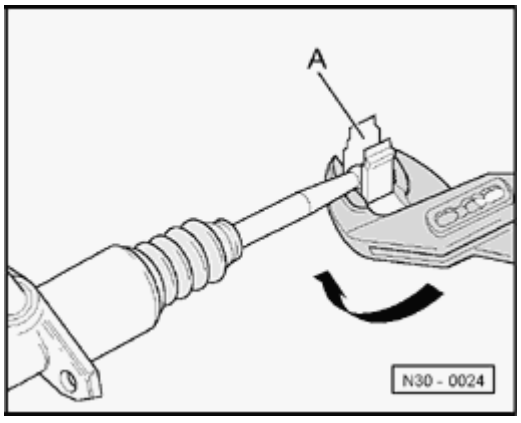


Fig. 21: Removing Retainer By Prying
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Press master cylinder operating rod into mount

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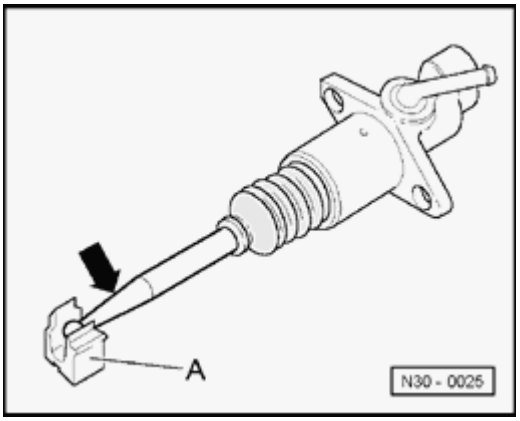


Fig. 22: Installing Clutch Master Cylinder Operating Rod In Retainer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Detaching slave cylinder from hose/pipe assembly

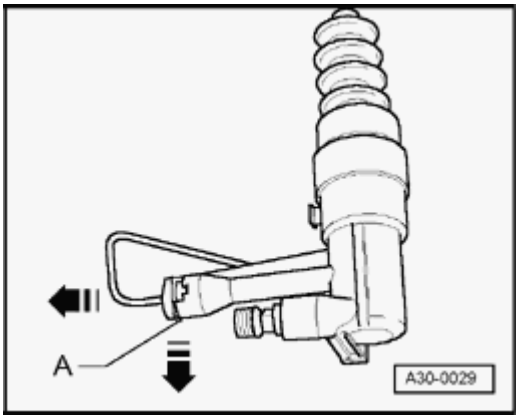


Fig. 23: Removing Hydraulic Line From Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- To remove the hose/pipe assembly, lever out the clip -A- up to the stop using a screwdriver. Only then can the hose/pipe assembly be pulled out.

Installing

- Press in clip -A- to stop.
- Push hose/pipe assembly into slave cylinder until it engages audibly.
- To check, pull on the hose/pipe assembly.

Master cylinder, removing and installing

Special tools, testers and auxiliary equipment required

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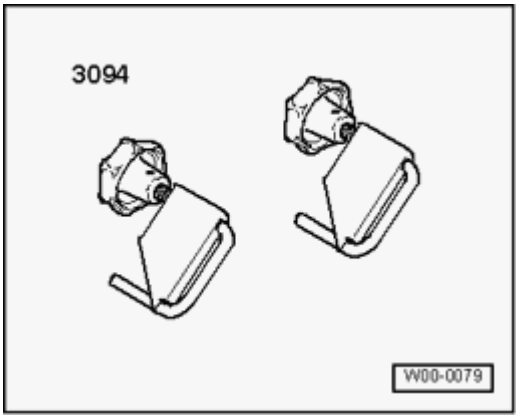


Fig. 24: Identifying Hose Clamps 3094
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3094 Hose clip

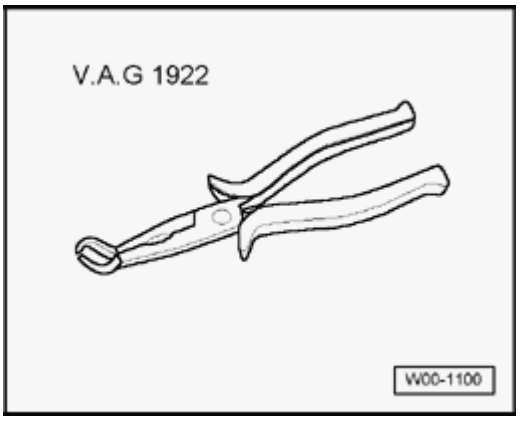


Fig. 25: Identifying Spark Plug Connector Pliers V.A.G 1922
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- V.A.G 1922 Pliers

Removing

WARNING: Observe safety precautions when disconnecting the battery.

Refer to

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

See Caution before beginning repairs on the electrical system. Refer to **Clutch mechanism, servicing**

- With the ignition switched off disconnect the battery Ground strap.

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- Pull the rubber gasket off plenum chamber in direction of arrow.

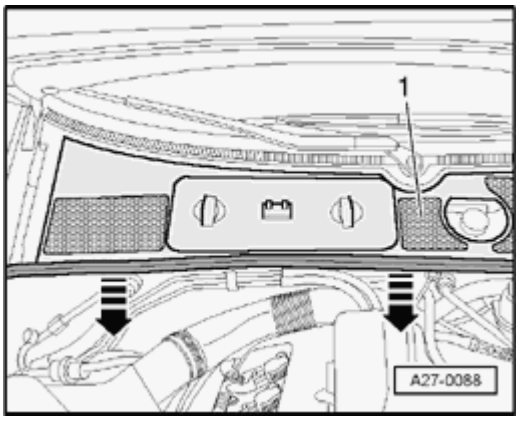


Fig. 26: Identifying Plenum Chamber Cover & Removing Rubber Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover -1- above plenum chamber.

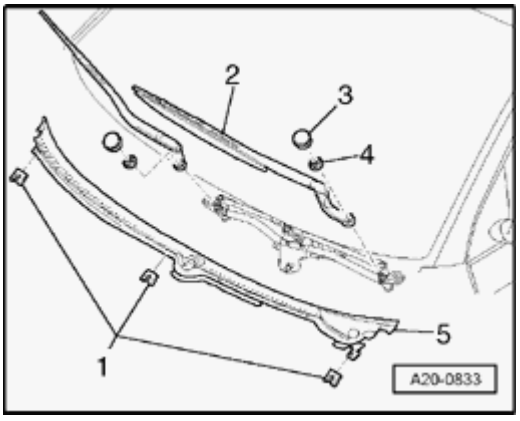


Fig. 27: Removing Securing Clips And Cowl
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lever off both trim caps -3- with a screwdriver.
- Unscrew nuts -4- and remove both wiper arms -2-.
- Pull off clips -1- and remove cowl grille -5-.

Remove the electronics box from the plenum chamber as follows:

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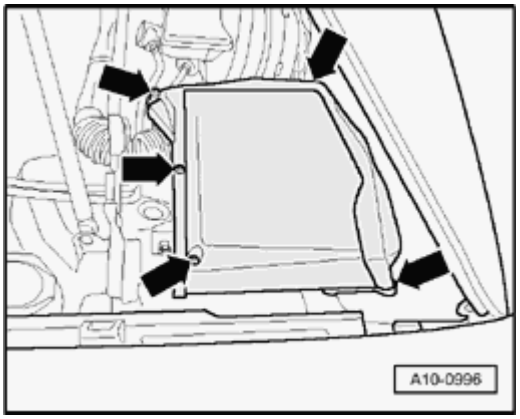


Fig. 28: Removing Screws And Cover From E-Box In Plenum Chamber
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew the bolts -arrows- and pull off the sealing cap.

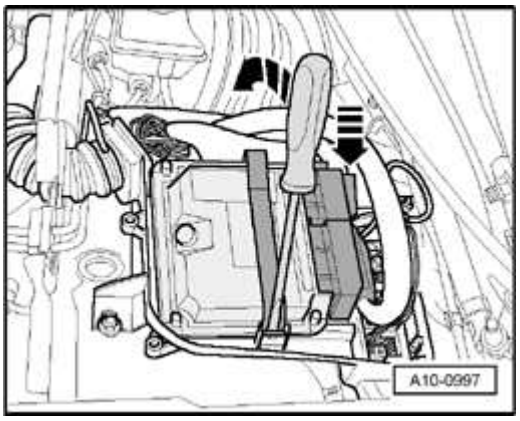


Fig. 29: Using Screwdriver To Remove Retainer Bar And Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully lever off the retainer bar with a screwdriver -arrow-.

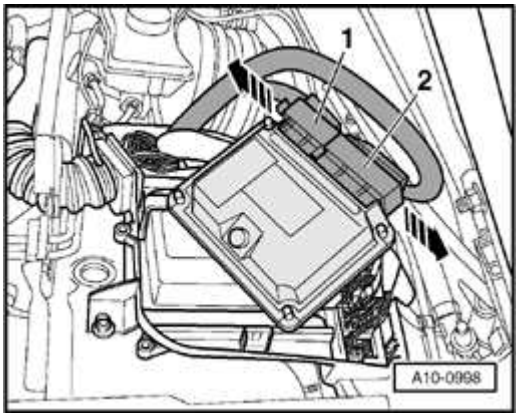


Fig. 30: Releasing Connector Latches And Pulling Off Connectors On Engine Control Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Release the connector catches -arrows- and detach connectors -1- and -2- of engine control unit.

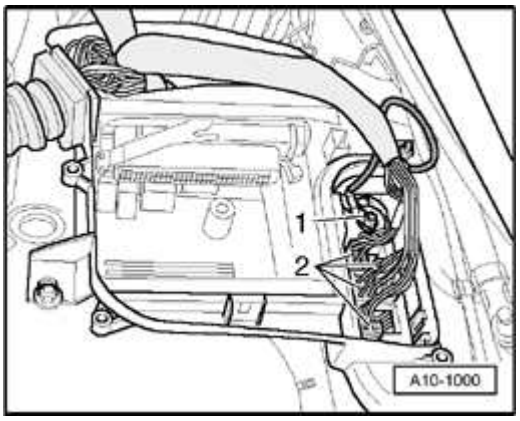


Fig. 31: Connector At Connector Rail And Wire
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach connectors -2- on connector console.
- Unscrew the electrical wiring connection -1-.

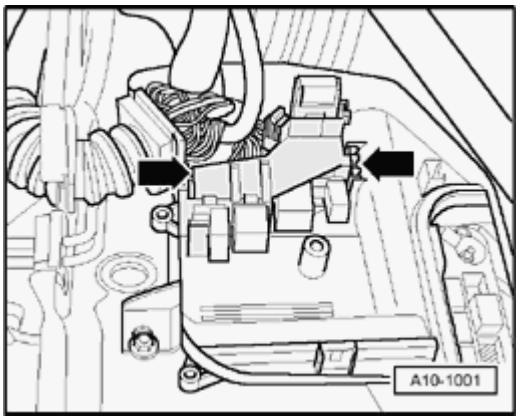


Fig. 32: Locating Auxiliary Relay Carrier Catches
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release catch -arrow- and detach additional relay carrier in electronics box upward.
- Pull engine wiring harness together with rubber grommet through opening in electronics box.

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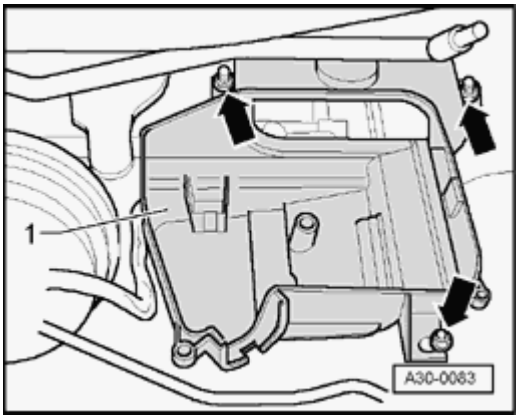


Fig. 33: Electronics Box Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

NOTE:

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

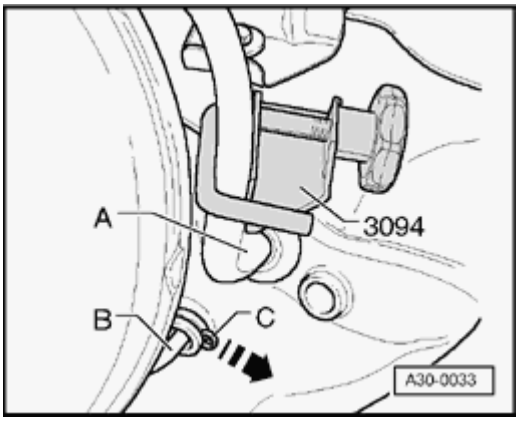


Fig. 34: Identifying Brake Fluid Reservoir Return Hose Grommet
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 cross panel above connection pipe for supply hose.
- Pry out retaining clip -C- with a screwdriver and then pull out pipe -B- slightly.

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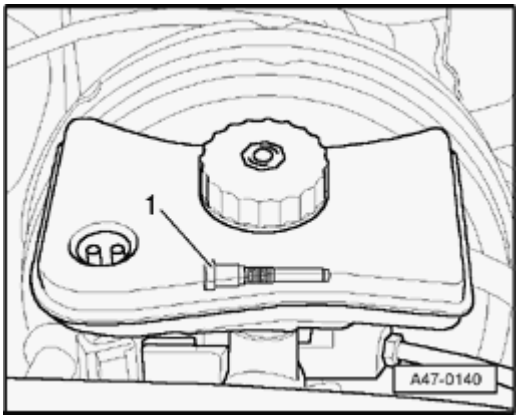


Fig. 35: Location Of Brake Fluid Reservoir Dowel Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew bolt for brake fluid reservoir -1- and detach fluid level connector downward.

NOTE: The brake fluid reservoir is not removed.

NOTE:

- **For the sake of clarity, the brake fluid reservoir is not shown here.**
- **To remove the upper Torx bolt, the brake fluid reservoir must be swivelled slightly to one side.**

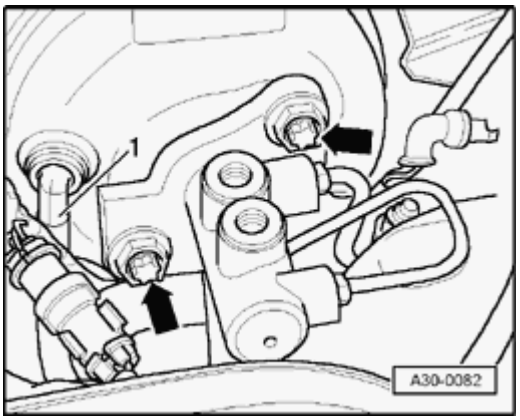


Fig. 36: Location Of Brake Servo Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Refer to

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

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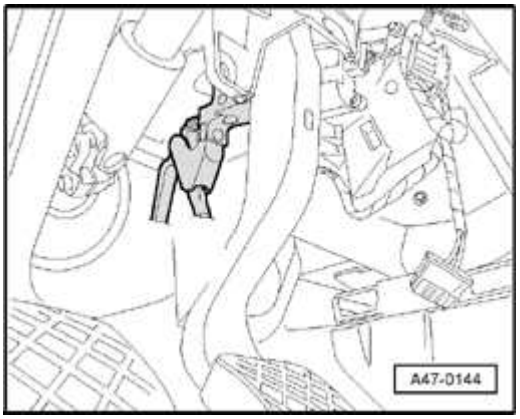


Fig. 37: Brake Pedal At Brake Servo
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach brake pedal from brake servo.

Refer to **46 - BRAKES - MECHANICAL COMPONENTS**

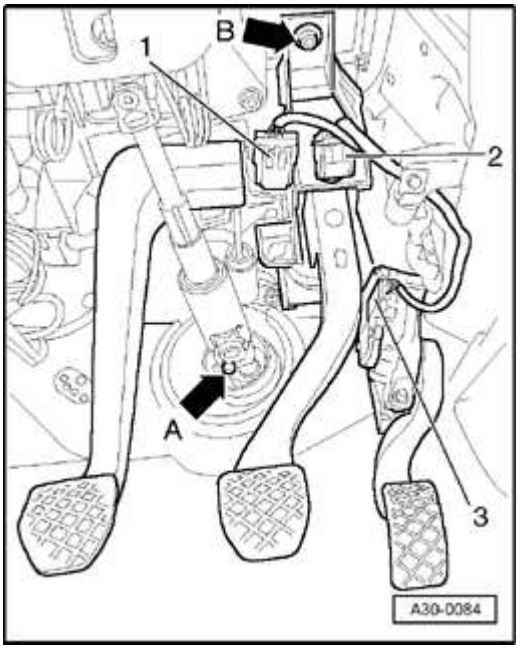


Fig. 38: Locating Steering Column At Steering Gear And Disconnecting Connector On Clutch Pedal Switch, Brake Pedal Switch And On Accelerator Pedal Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach steering column from steering box -arrow A-.

Refer to **48 - STEERING** .

- Detach connectors from clutch pedal switch -1-, brake pedal switch -2- and from accelerator pedal module -3-.

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- Unscrew retaining bolts for mounting bracket -arrow B- and remove the complete pedal cluster.

Separate master cylinder operating rod from clutch pedal as follows:

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

NOTE:

- **In order to assure sufficiently secure installations of Clutch Vacuum Vent Valve Switch -F36- -Item 6-: Refer to Pedal cluster assembly, overview and of Clutch Pedal Position (CPP) Switch -F194- -Item 14-: Refer to Pedal cluster assembly, overview (Interlock switch) in the pedal assembly, these switches must not be installed more than once.**

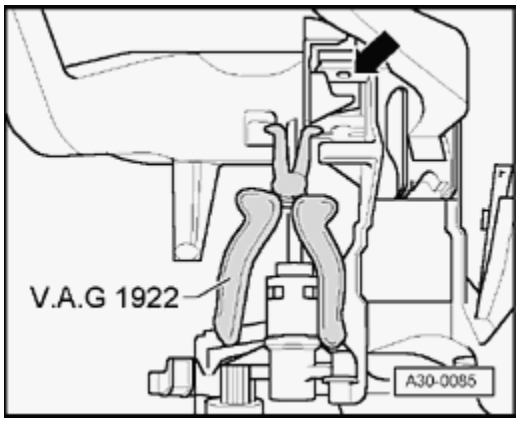


Fig. 39: Pressing Retainer Together And Detaching Clutch Pedal From Master Cylinder Using VAG 1922
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **When releasing, make sure that the clutch pedal does not knock against the mount for the clutch pedal switch -arrow-. The mount could break off.**

- Position pliers VAG 1922 in the clutch pedal recesses, press the mount together -arrow- and detach clutch pedal from master cylinder.

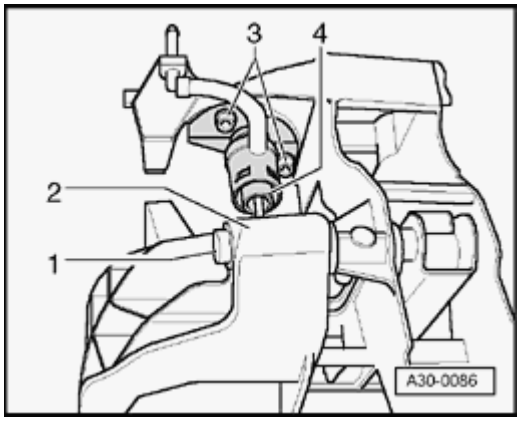


Fig. 40: Identifying Retaining Clip, Clutch Pedal, Bolts And Master Cylinder

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release securing clip -1- and remove clutch pedal -2-.
- Screw out bolts -3- and remove master cylinder -4-.

Installing

Installation is carried out in the reverse order, when doing this note the following:

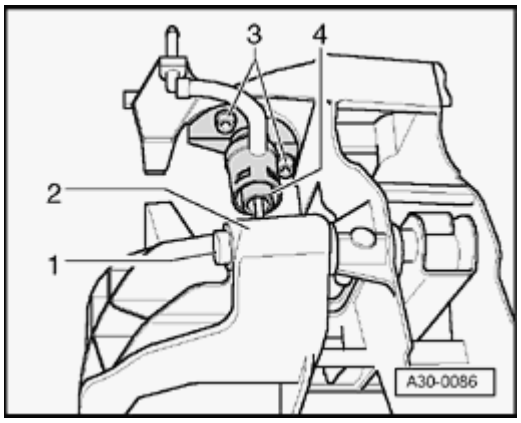


Fig. 41: Identifying Retaining Clip, Clutch Pedal, Bolts And Master Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

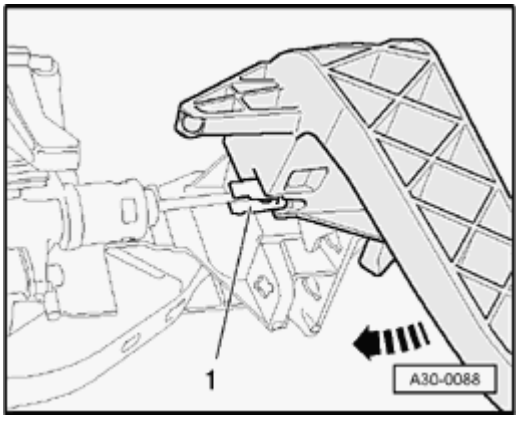


Fig. 42: Pushing Clutch Pedal To Lock Into Place, While Making Sure Mount Is Properly Secured In Clutch Pedal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install mount -1- in clutch pedal.
- Press the clutch pedal in direction of arrow until it engages; ensure correct locking of the mount -1- in the clutch pedal.
- Installing over-center spring. Refer to **Over center spring, removing and installing**.

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A second mechanic is required for the next step.

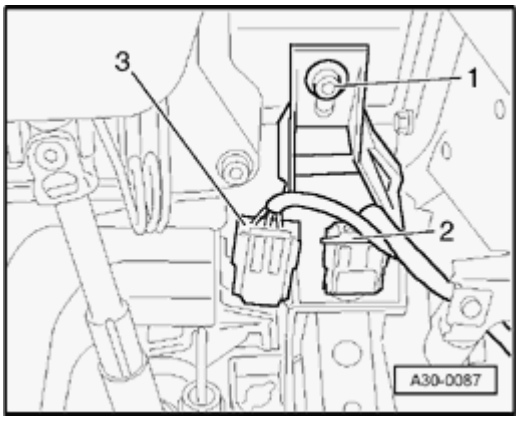


Fig. 43: Location Of Clutch Pedal Switch F36 And Pedal Assembly Securing Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert complete pedal cluster and tighten bolt -1- finger tight. The second mechanic should guide the pipe into the master cylinder starting from the plenum chamber.

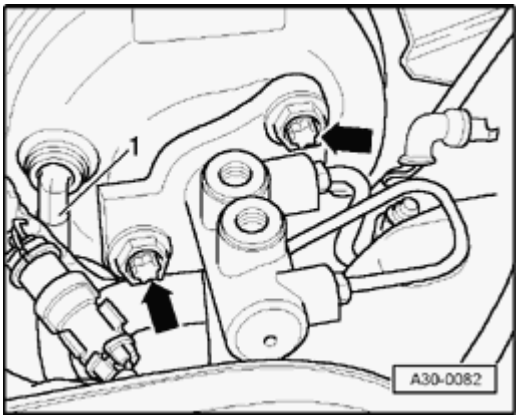


Fig. 44: Location Of Brake Servo Securing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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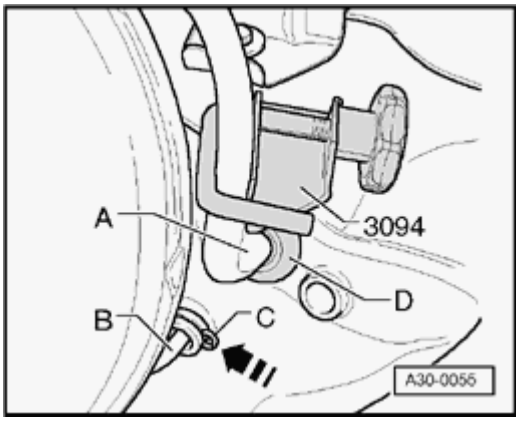


Fig. 45: Installing Rubber Grommet And After-Run Hose
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press retaining clip -C- home.
- Push pipe -B- into master cylinder until it audibly locks in place.
- Insert rubber grommet -D- over connection pipe/supply hose -A- into the cross panel.
- Slide supply hose -A- for the brake fluid reservoir on as far as its stop.

- Remove special tool 3094.
- Screw in securing bolt for brake fluid reservoir.

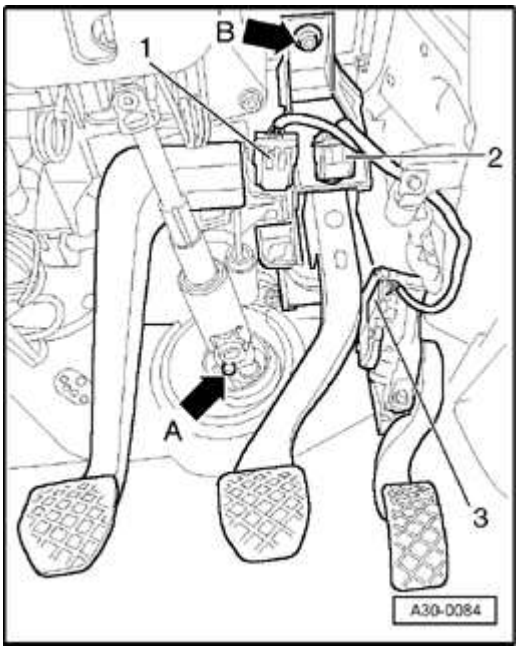


Fig. 46: Locating Steering Column At Steering Gear And Disconnecting Connector On Clutch Pedal Switch, Brake Pedal Switch And On Accelerator Pedal Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten the hex socket head bolt -arrow B- for securing pedal cluster to dash panel crossmember to 25

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Nm.

- Plug in connectors -1-, -2- and -3-.
- Connect brake pedal to brake servo.

Refer to **46 - BRAKES - MECHANICAL COMPONENTS**

- Attach steering column to steering box -arrow A-.

Refer to **48 - STEERING**

- Install storage compartment for driver's side:

Refer to

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

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

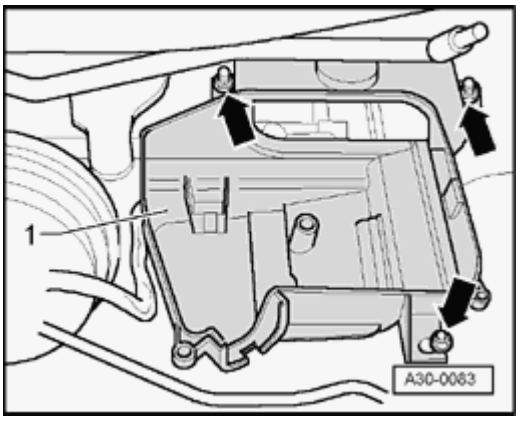


Fig. 47: Electronics Box Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert the electronics box and tighten nuts -arrows- to 4 Nm.
- Route the engine wiring harness and join the connector in the connector station.
- Install the engine control unit and, if removed, also the auxiliary relay carrier and the auxiliary fuse box.

Refer to

- **97 WIRING**
- **97 WIRING** for Cabriolet

- Press on sealing cap hand-tight and tighten bolts in diagonal sequence - 4 Nm.

See Caution for disconnecting Telematics battery. Refer to **Clutch mechanism, servicing**

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- Observe safety precautions after connecting the battery.

Refer to

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

Clutch system, bleeding

Special tools, testers and auxiliary equipment required

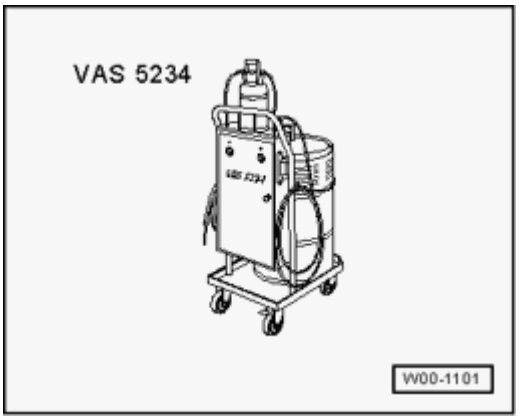


Fig. 48: Identifying Brake Filler And Bleeder Unit VAS 5234
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAS 5234 Brake filler and bleeder unit

- Brake fluid specification.

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

NOTE:

- **Open the bleeder valve before switching on the bleeder unit.**
- **When performing the following steps, make sure that no brake fluid escapes onto the transmission.**
- **The clutch system must be bled after performing work on the hydraulic clutch mechanism.**
- **Before bleeding, pull out clutch pedal and fill brake fluid reservoir with brake fluid up to "max." marking.**

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

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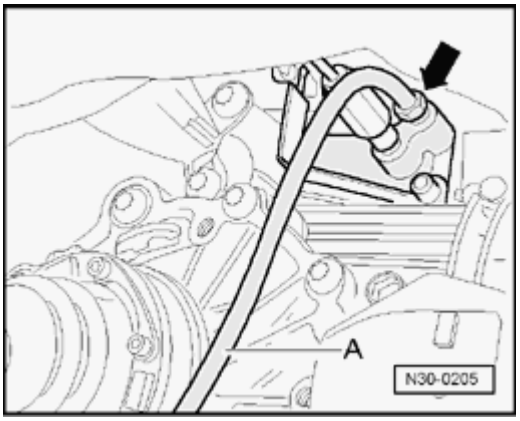


Fig. 49: Connecting Bleeder Hose To Clutch Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

- Working pressure 2.5 bar

NOTE: Ensure bleeder hose is correctly installed during bleeding operation.

- Close bleeder valve and tighten to 4.5 Nm.
- Depress clutch pedal several times after completion of bleeding process.
- Bleed again if necessary.

CLUTCH RELEASE MECHANISM, SERVICING

Clutch release mechanism, servicing

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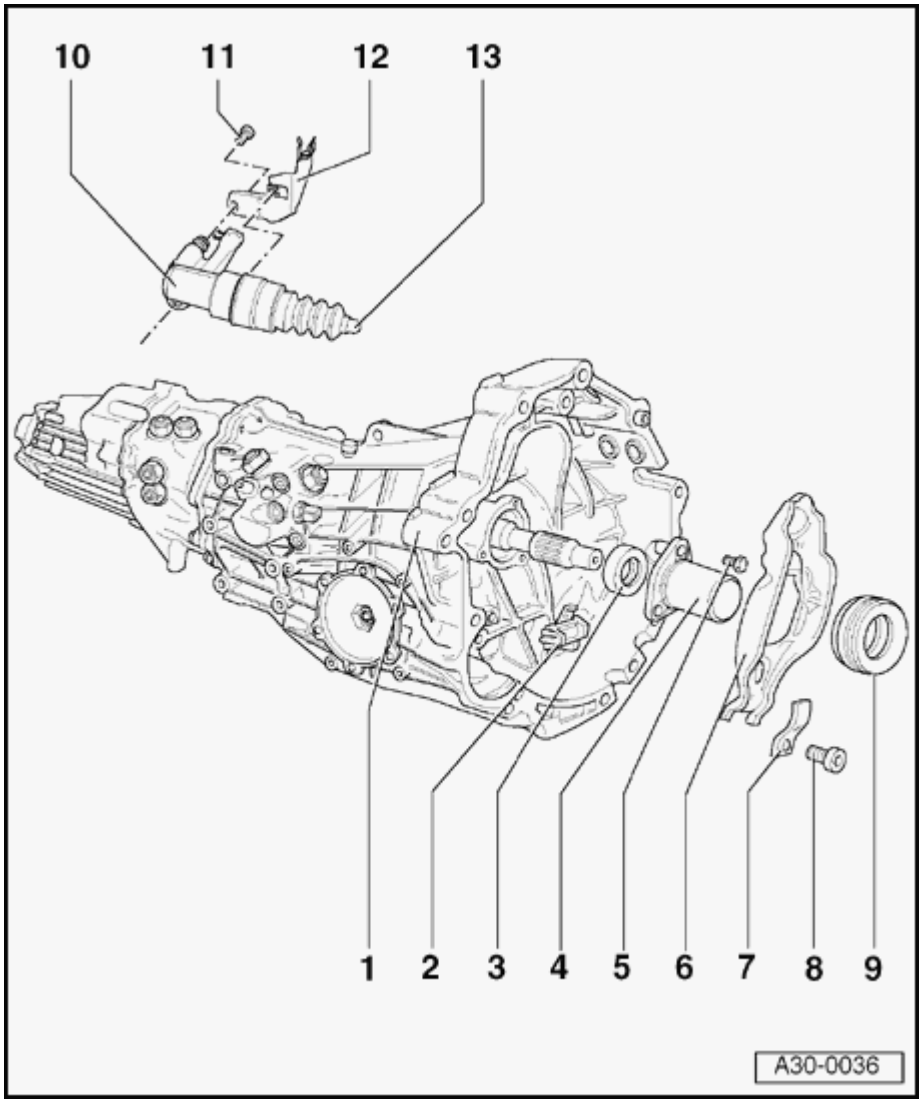


Fig. 50: Identifying Clutch Release Mechanism Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission

2 - Intermediate piece

- Replace, if damaged

3 - Shaft seal

- For input shaft
- Removing. See **Removing shaft seal for input shaft**
- Installing. See **Installing shaft seal for input shaft**
- Standard insertion depth: 3.5 mm, insertion depth for repairs: 4.5 mm

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4 - Locating sleeve

5 - Bolt -15 Nm

- 3 pieces

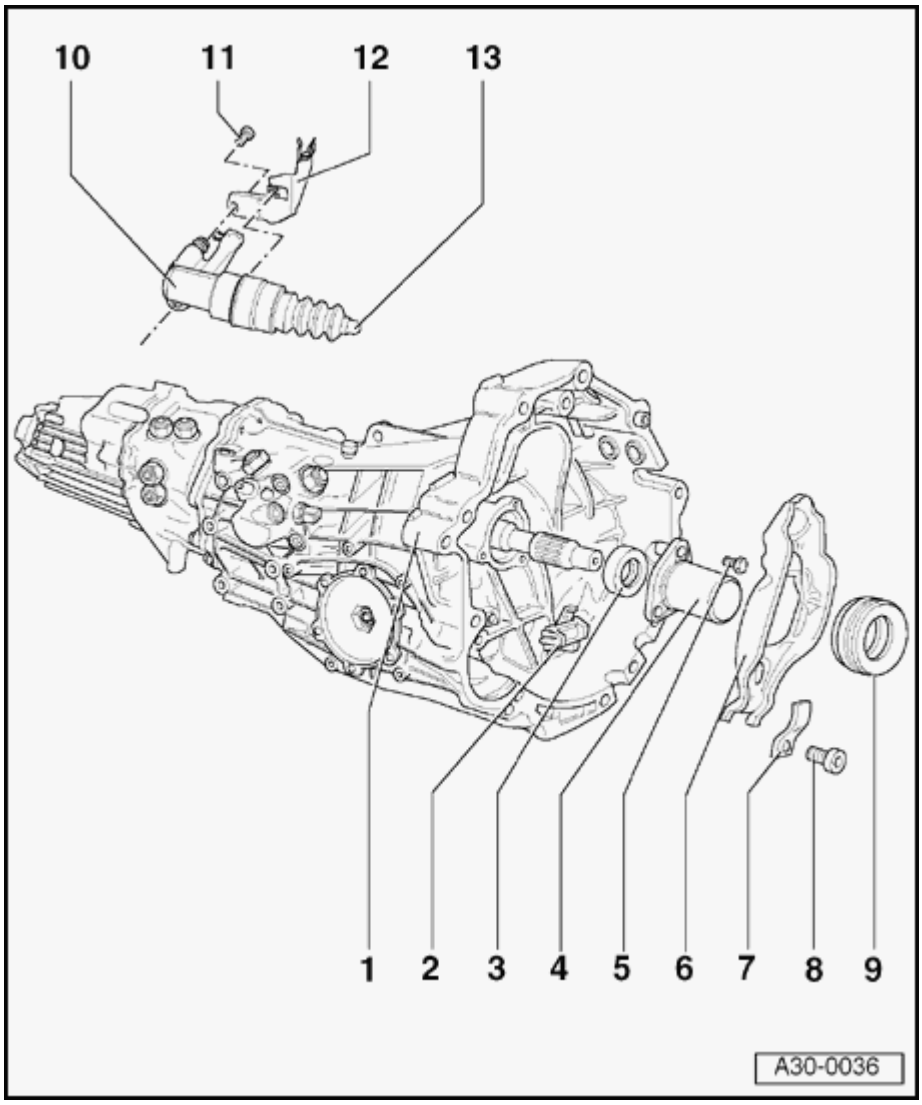


Fig. 51: Identifying Clutch Release Mechanism Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

6 - Clutch release lever

- Removing. See **Removing clutch release lever**
- Must engage in lugs in intermediate piece when installed. See **Installing clutch release lever**
- Before installing, coat contact surface of clutch slave cylinder push rod with copper grease, e.g. Z 381 351 TE.

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7 - Leaf spring

8 - Release and tighten bolt - 25 Nm

- Self-locking
- Always replace

9 - Release bearing

- With or without plastic ring, depending on version. See **Repairing release bearing with plastic ring**
- Cement detached plastic ring. See **Repairing release bearing with plastic ring**
- Do not wash out, wipe clean only
- Replace noisy bearings

- Engage retaining latches at the release bearing in contact release lever

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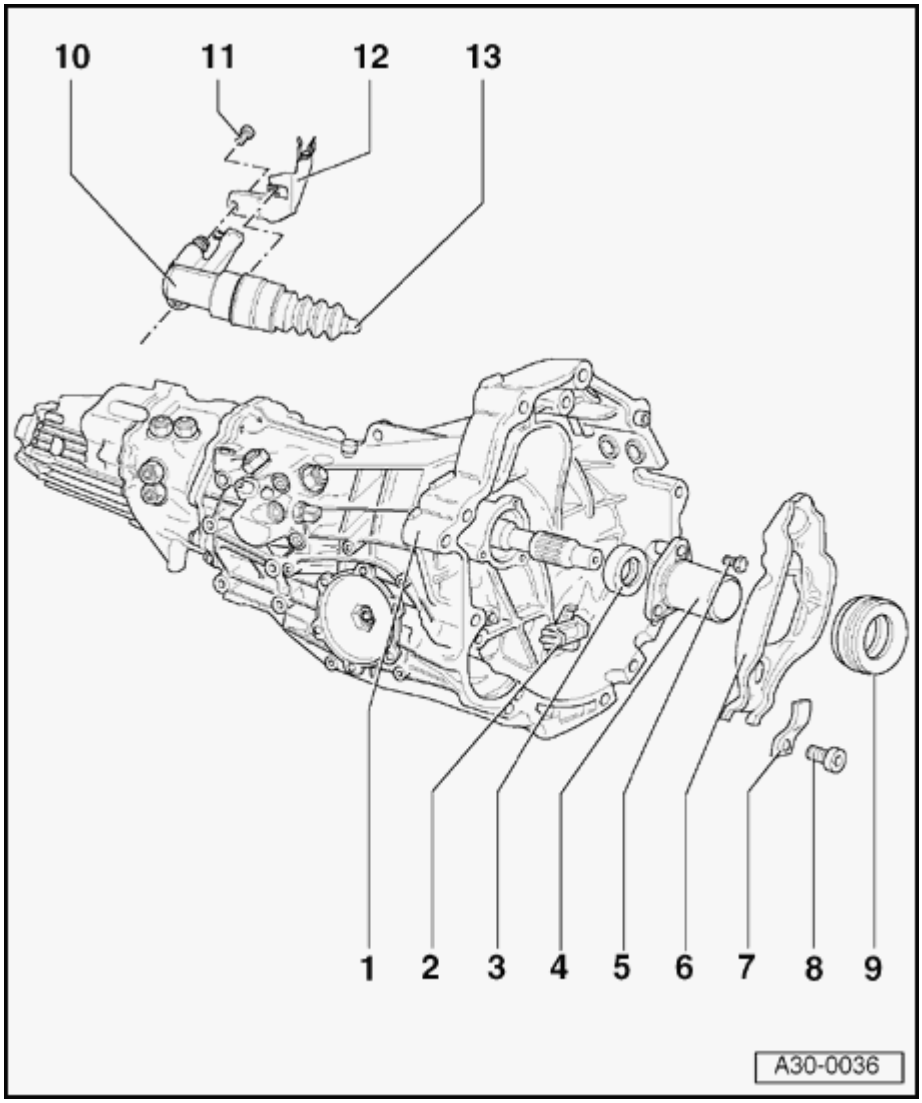


Fig. 52: Identifying Clutch Release Mechanism Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

10 - Clutch slave cylinder

- Do not operate clutch pedal after slave cylinder has been removed.
- Follow correct work sequence when bleeding. Refer to **Clutch system, bleeding**
- Tighten bleed valve to 4.5 Nm
- Detach from hose/pipe assembly. See **Detaching slave cylinder from hose/pipe assembly**

- Removing. See **Removing clutch slave cylinder**
- Installing. See **Installing clutch slave cylinder** and see **Coat clutch slave cylinder with grease before installing**
- When installing, push on until the securing bolt can be fitted

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11 - Hex socket-head bolt, 23Nm

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

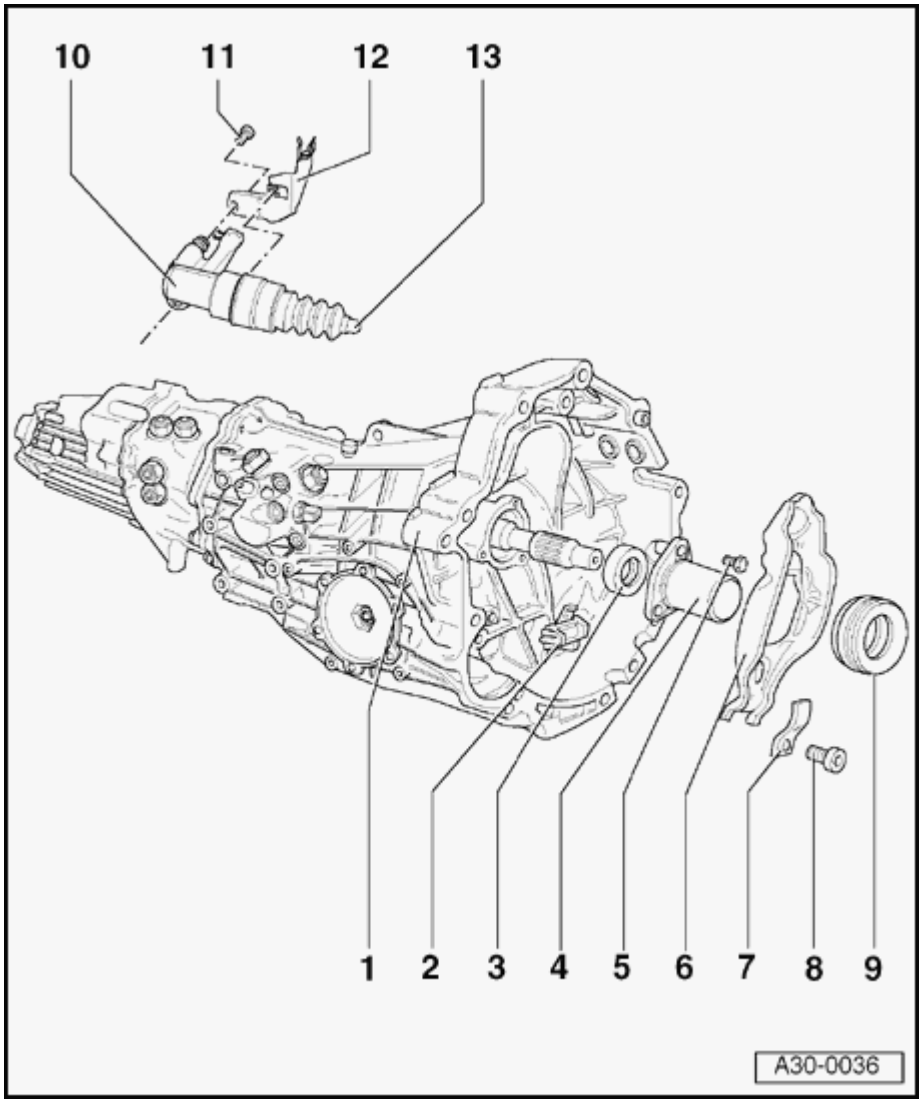


Fig. 53: Identifying Clutch Release Mechanism Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

12 - Bracket

- For hose/pipe assembly
- Fastened together to transmission with slave cylinder
- Installing. See **Installing clutch slave cylinder**
- Bolt onto transmission with clutch slave cylinder

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13 - Push rod

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

Removing shaft seal for input shaft

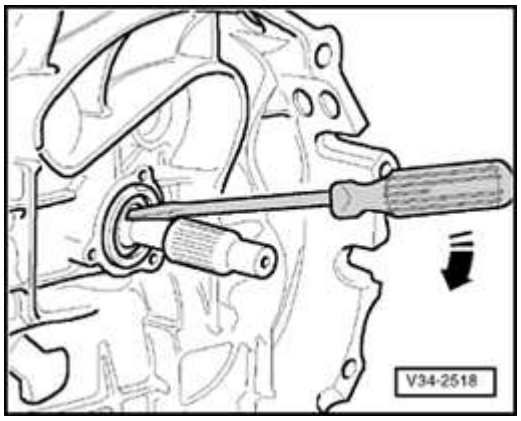


Fig. 54: Removing Shaft Seal For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lever out seal carefully with a screwdriver.

NOTE: Do not damage bearing surface on input shaft for shaft seal.

Installing shaft seal for input shaft

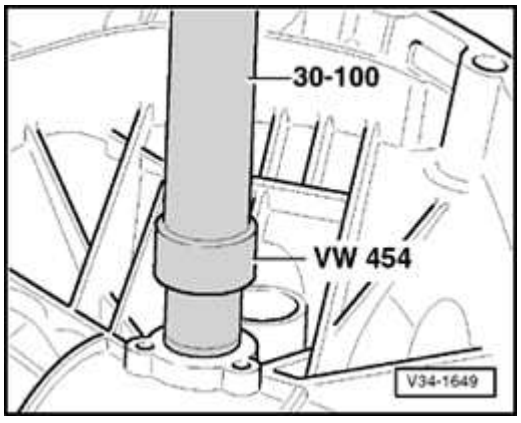


Fig. 55: Installing Shaft Seal For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil outer circumference of seal.
- Fill space between sealing and dust lips with sealing grease G 052 128 A1.
- Pull a thin protective hose tightly onto splines of input shaft.
- Tapping in input shaft seal.

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- Standard insertion depth: 3.5 mm
- Standard insertion depth: 4.5 mm

- Remove protective hose.

Removing clutch release lever

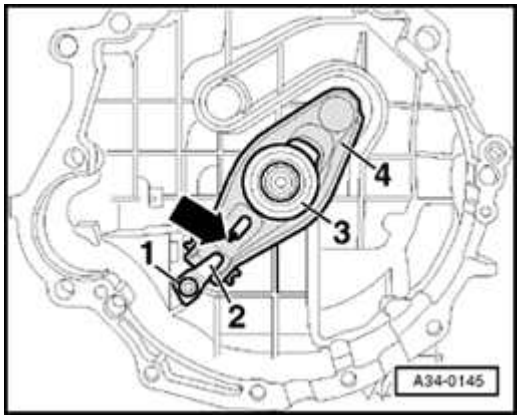


Fig. 56: Removing Clutch Release Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release bolt -1-, remove leaf spring - 2- and press back the detent -arrow-.
- Remove clutch release lever -4- together with release bearing -3-.
- Disengage the retaining latches of the release bearing at release lever.

Installing clutch release lever

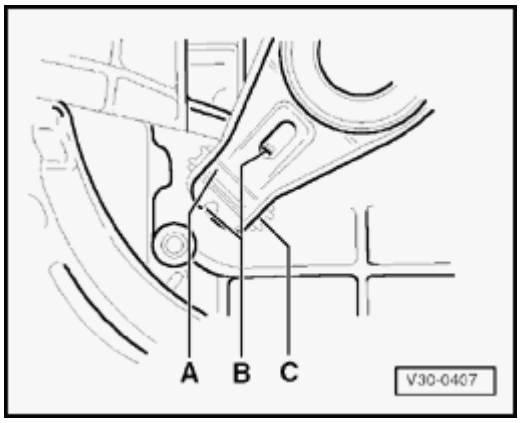


Fig. 57: Installing Clutch Release Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Before installing the clutch release lever, the contact surface of clutch slave cylinder push rod must be coated with a thin layer of copper paste.
- Insert clutch release lever -A- into the intermediate piece -C- and allow it to engage (detent -B- becomes visible).

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- Insert leaf spring -Item 7: Refer to **Clutch release mechanism, servicing**, tighten retaining bolt -Item : Refer to 8 **Clutch release mechanism, servicing** to 25 Nm.

Detaching slave cylinder from hose/pipe assembly

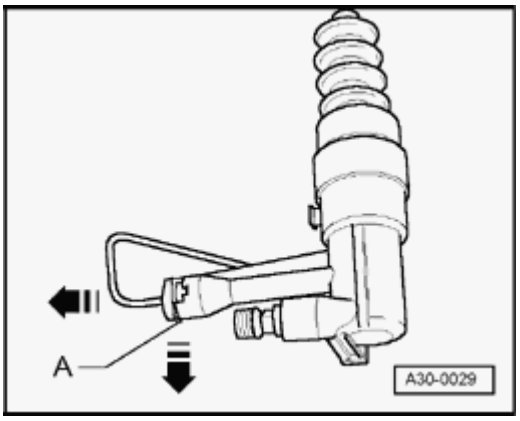


Fig. 58: Removing Hydraulic Line From Slave Cylinder
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- To remove the hose/pipe assembly, lever out clip -A- to the stop using a screwdriver. Only then can the hose/pipe assembly be pulled out.

Installing

- Press in clip -A- to stop.
- Push hose/pipe assembly into slave cylinder until it engages audibly.
- To check, pull on the hose/pipe assembly.

Removing clutch slave cylinder

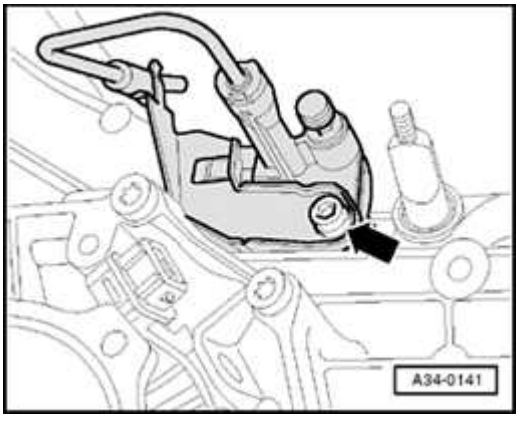


Fig. 59: Removing/Installing Slave Cylinder Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove bolt -arrow-, remove clutch slave cylinder rearward.

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

Installing clutch slave cylinder

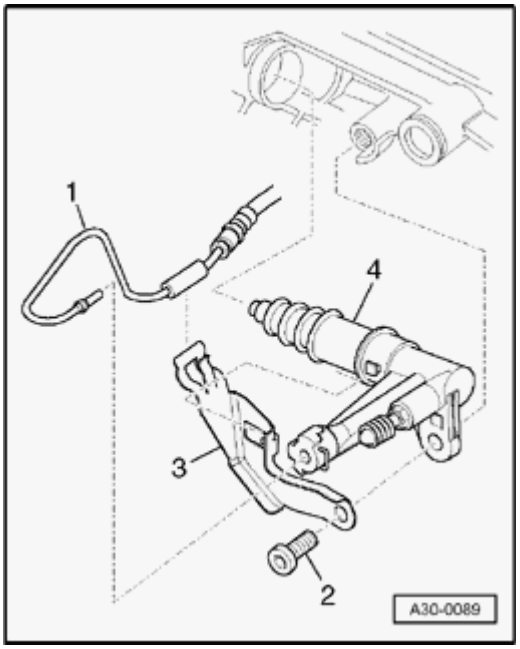


Fig. 60: Clutch Slave Cylinder, Bracket And Hose/Line Assembly
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Coat clutch slave cylinder with lithium grease G 052 150 A2. See **Coat clutch slave cylinder with grease before installing**.
- Engage bracket for hose/pipe assembly -3- at the slave cylinder -4-.
- When inserting the clutch slave cylinder into the mounting hole of the transmission housing, keep it as far as possible in line with the direction of operation of the push rod.

NOTE:

- **If the clutch slave cylinder -4- is inserted off-line there is a danger that the push rod will be guided past the clutch release lever.**
- **When installing, press in the clutch slave cylinder far enough so that the securing bolt can be fitted easily.**
- **Replace securing bolt -2-.**

- Tighten bracket for hose/line assembly together with slave cylinder on transmission.

Coat clutch slave cylinder with grease before installing

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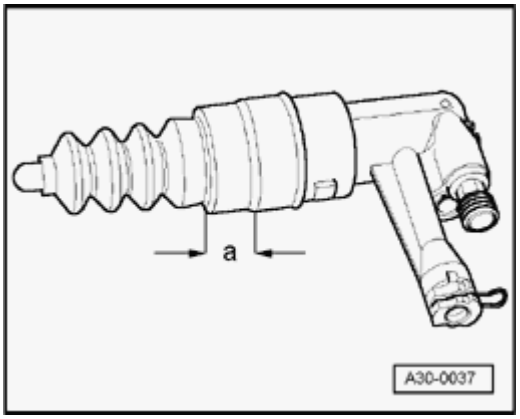


Fig. 61: Coat Boot Area Of Clutch Slave Cylinder With Lithium Grease
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Repairing release bearing with plastic ring

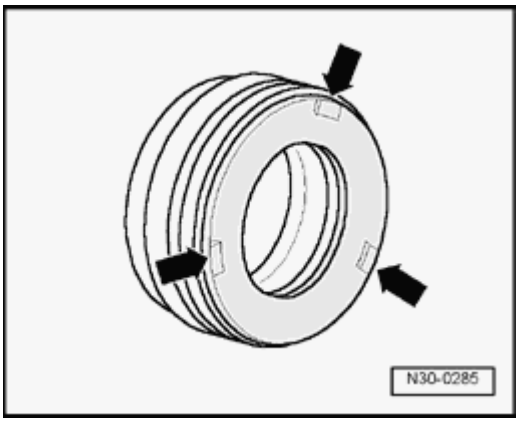


Fig. 62: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

In the case of release bearings with plastic ring it is possible that the plastic ring detaches from the release bearing during removal of the transmission. This does not signify that replacement of the release bearing is necessary.

- Cement the loose plastic ring to the bearing ring the with adhesive AMV 195 KD1 01 before installing the transmission.

Three rectangular lugs -arrows- on the plastic ring engage into recesses in the bearing ring.

NOTE: If the plastic ring has become embedded deeper than 0.5 mm in the bearing

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surface, the bearing ring must be replaced.

CLUTCH, SERVICING

Clutch, servicing

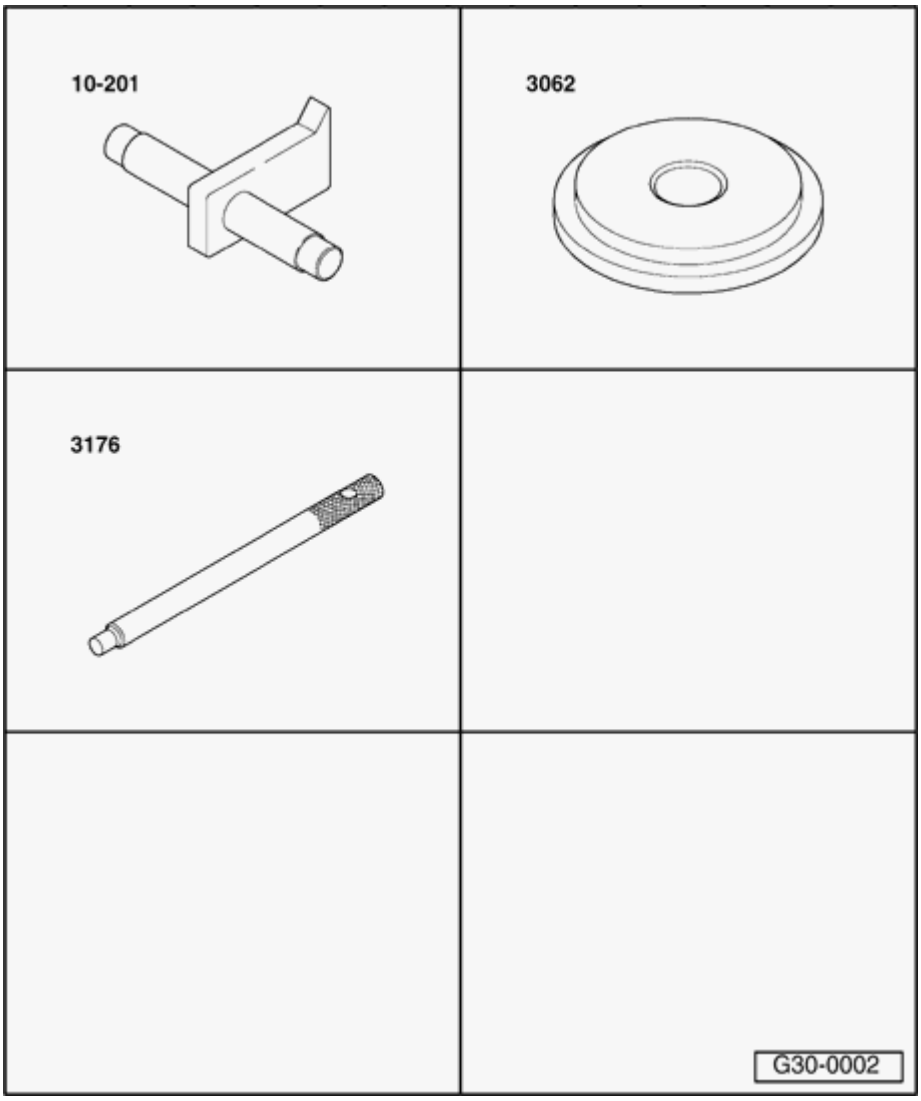


Fig. 63: Identifying Special Tools - Clutch, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- Retainer 10-201
- Thrust pad 3062
- Centering mandrel 3176
- Grease G 000 100

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NOTE:

- **Observe the general repair instructions. Refer to General repair instructions.**
- **The adjuster ring for the SAC-clutch pressure plate (self-adjusting clutch pressure plate) must be reset before assembly when the clutch ring is replaced exclusively. Refer to SAC clutch pressure plate adjuster ring, resetting onward.**
- **Replace clutch plates and pressure plates with damaged or loose rivets.**
- **Select the correct clutch plate and pressure plate according to engine code.**
- **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 to and for on input shaft until hub moves freely on shaft. Excess grease must be removed.**
- **Pressure plates are protected against corrosion and greased. Only the contact surface may be cleaned, otherwise the service life of the clutch will be considerably reduced.**
- **If the clutch has burnt out, thoroughly clean the bell housing, flywheel and parts of the engine facing the transmission in order to reduce the smell.**

Clutch with SAC pressure plate

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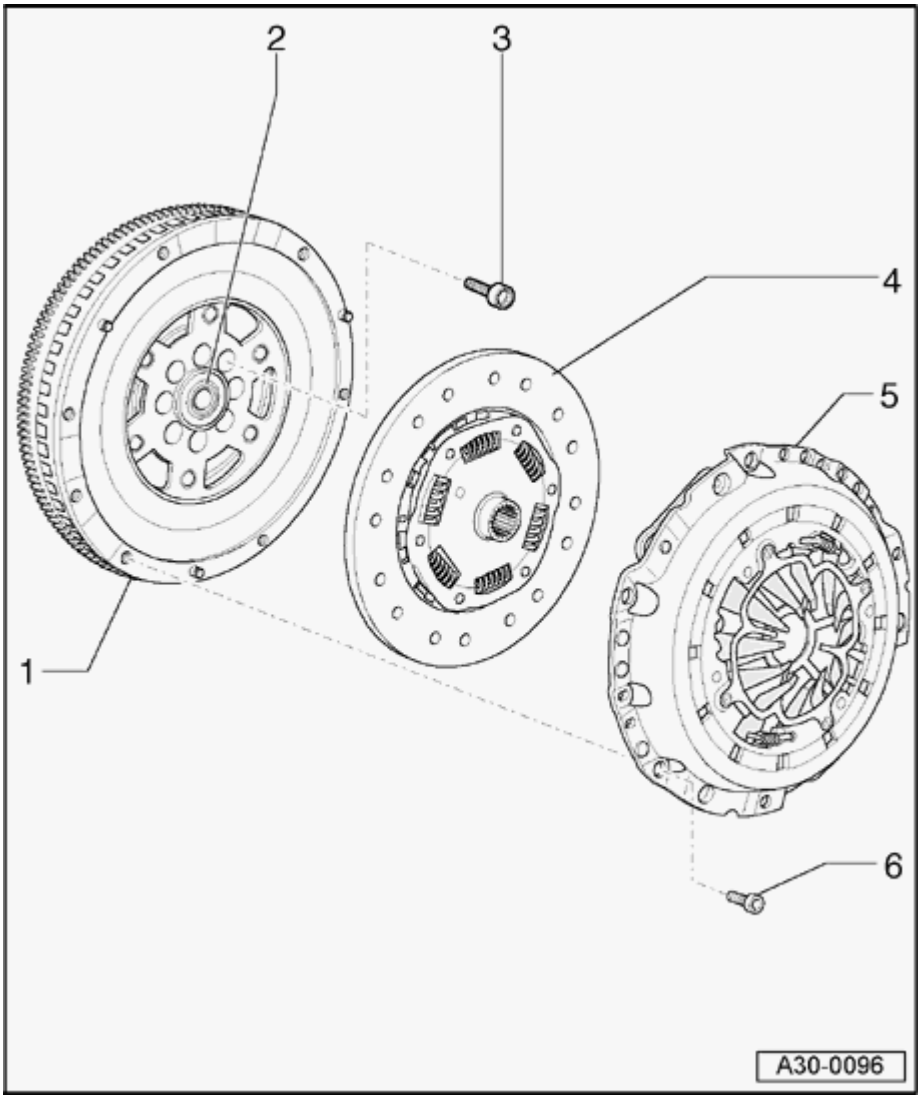


Fig. 64: Clutch With SAC Pressure Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

1 - 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** for 1.8 LITER 4-CYL. 5V TURBO ENGINE MECHANICAL, ENGINE CODE(S): AMB
- **13 ENGINE - CRANKSHAFT, CYLINDER BLOCK** for 3.0 LITER 6-CYL. 5V ENGINE

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MECHANICAL, ENGINE CODE(S): AVK, BGN

- **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK** for 4.2 LITER V8 5V ENGINE MECHANICAL, ENGINE CODE(S): BHF

2 - Needle bearing

- Driving off and on

Refer to

- **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK** for 1.8 LITER 4-CYL. 5V TURBO ENGINE MECHANICAL, ENGINE CODE(S): AMB
- **13 ENGINE - CRANKSHAFT, CYLINDER BLOCK** for 3.0 LITER 6-CYL. 5V ENGINE MECHANICAL, ENGINE CODE(S): AVK, BGN
- **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK** for 4.2 LITER V8 5V ENGINE MECHANICAL, ENGINE CODE(S): BHF

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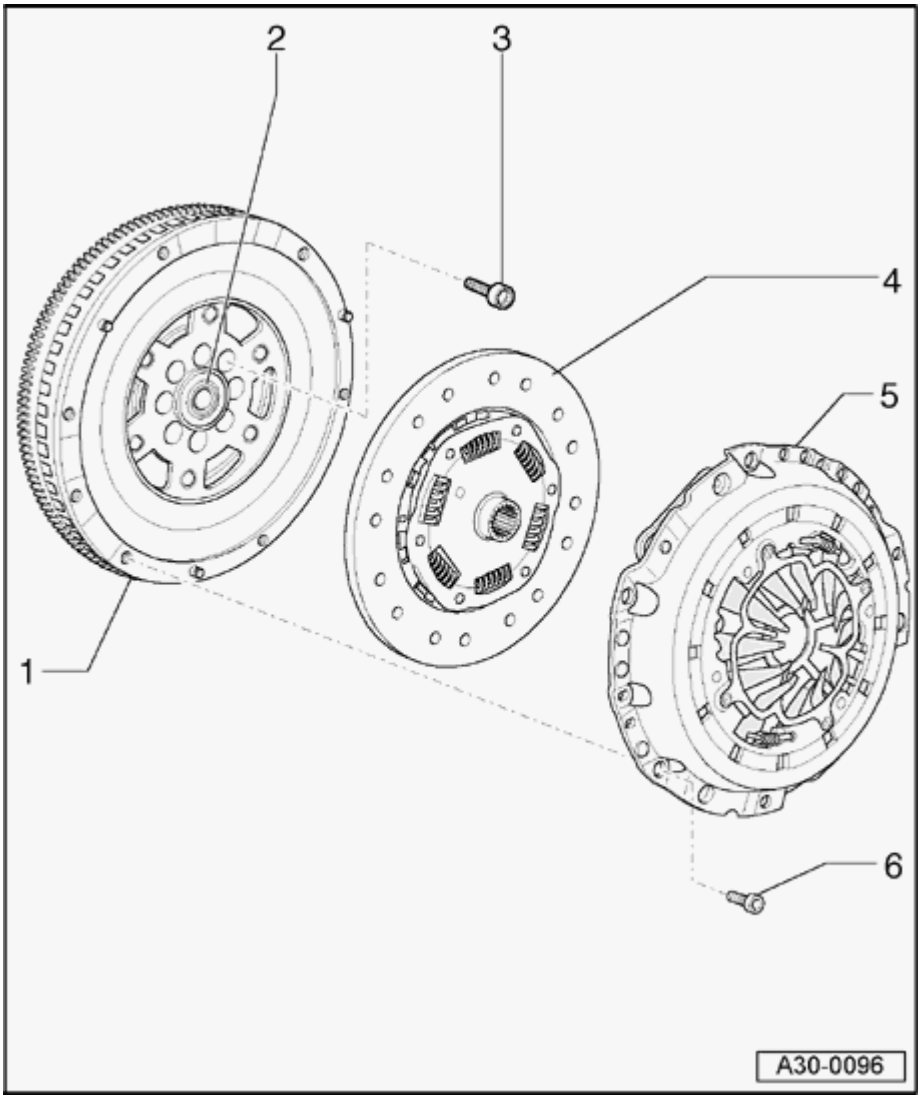


Fig. 65: Clutch With SAC Pressure Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

3 - Bolt for flywheel

- Always replace
- Screw length 43 mm 60 Nm plus additional 180 ° turn
- Screw length 22.5 mm 60 Nm plus additional 90 ° turn

4 - Clutch plate

- Installation position:

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

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- Spring pack (coil springs) toward pressure plate and transmission

- Centering. See **Removing and installing clutch with SAC pressure plate**
- Do not grease
- Clutch plate diameter. Refer to **Code letters, mechanical unit assignment, transmission ratios, capacities**onward

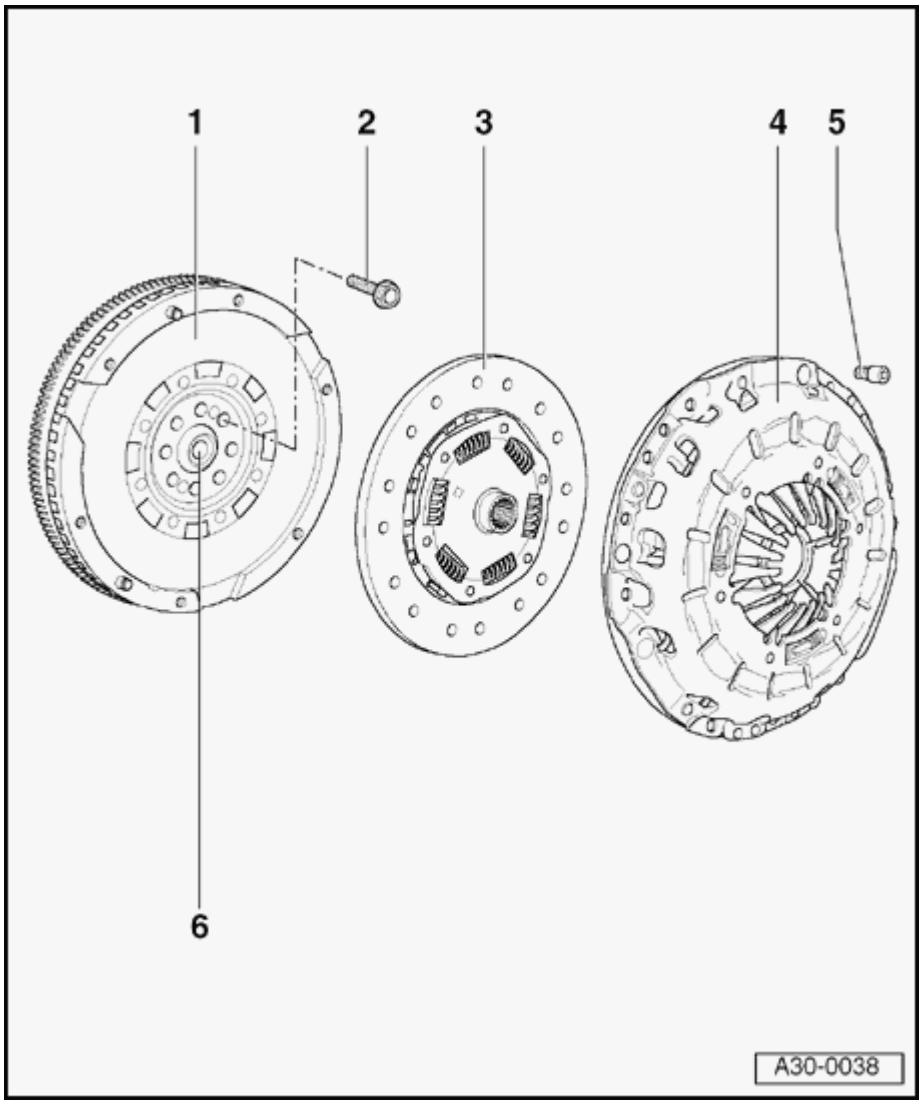


Fig. 66: Identifying Clutch Components (SAC Pressure Plate)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - SAC pressure plate

- Resetting adjuster ring. Refer to **SAC clutch pressure plate adjuster ring, resetting**
- Removing and installing. See **Removing and installing clutch with SAC pressure plate**
- Check ends of diaphragm spring. See **Checking ends of the diaphragm spring**

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- Check spring connection and riveted fastenings

6 - Bolt, 25 Nm

- Tighten in small stages and in diagonal sequence

Removing and installing clutch with SAC pressure plate

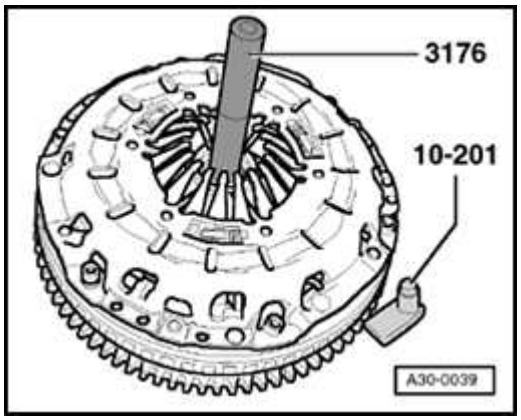


Fig. 67: Removing And Installing Of Clutch With SAC Pressure Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **The SAC pressure plate adjuster ring must be turned back prior to installation when the clutch plate is replaced exclusively. Refer to SAC clutch pressure plate adjuster ring, resetting onward.**
- **The clutch plate lining and the contact surface of the pressure plate must make full contact with the flywheel before the securing bolts are inserted.**
- **Tighten securing bolts evenly and in diagonal sequence in small steps to avoid damaging centering holes in pressure plate and centering pins on flywheel.**

- Installation position of clutch plate: spring pack (coil springs) or marking "Getriebeseite" toward pressure plate and transmission.
- Loosen and tighten bolts gradually in several stages working diagonally. Tightening torque: 25 Nm.
- Re-position Retainer 10-201 when removing.
- Use mandrel 3176 to center clutch plate.

Checking ends of the diaphragm spring

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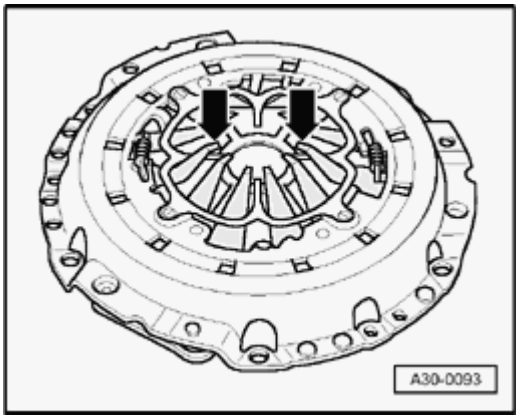


Fig. 68: Checking Ends Of The Diaphragm Spring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

SAC clutch pressure plate adjuster ring, resetting

"SAC" stands for self-adjusting clutch.

When installing a new clutch plate with a used SAC pressure plate, the pressure plate adjuster ring must be turned back to the limit stop. If the pressure plate adjuster ring is not turned back, the SAC pressure plate functions at a reduced pressure, resulting in increased wear of the clutch and in particular of the clutch plate (clutch slips).

If the clutch plate is not replaced, the adjuster ring does not require resetting.

New SAC pressure plates are pre-set and consequently do not require resetting.

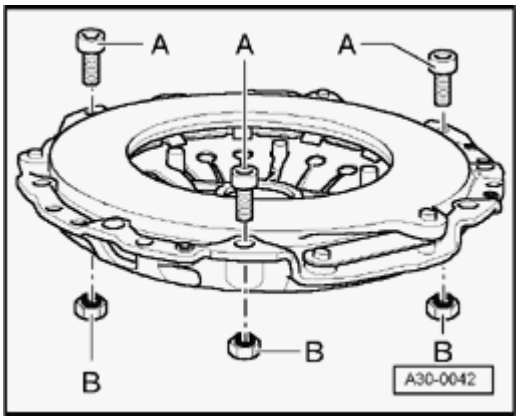


Fig. 69: Inserting Securing Bolts Into Mounting Holes On Pressure Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Insert 3 pressure plate securing bolts -A- in the fixing holes of the pressure plate at a 120 ° offset (1/3 turn) as indicated in the illustration.
- Screw 3 nuts -B- (M8) onto bolts -A-and tighten slightly.

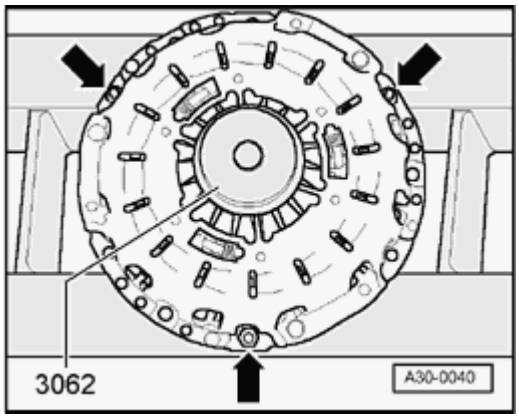


Fig. 70: Placing SAC Pressure Plate Onto Press
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position SAC pressure plate on the pressing tool in such a way that only the 3 bolt heads rest upon it.
- Center special tool 3062 on the center of the pressure plate.

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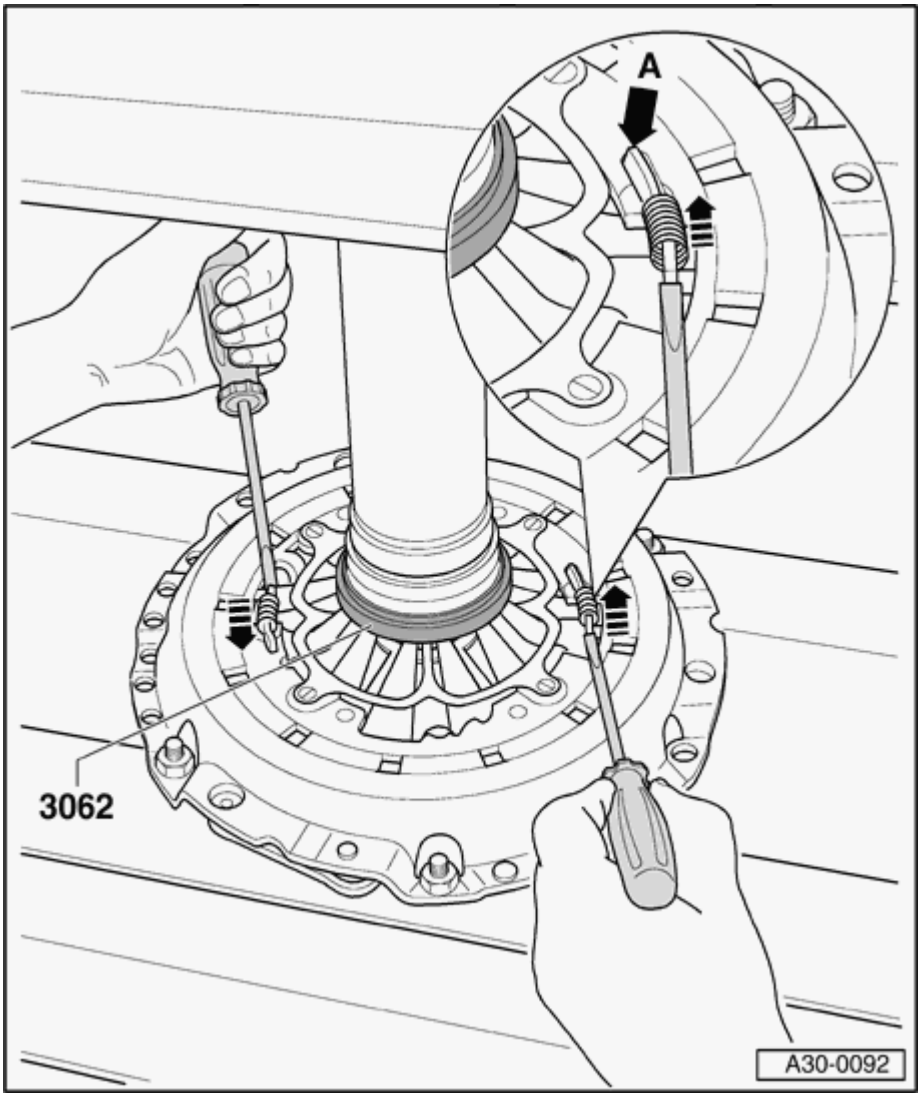


Fig. 71: Turning The Adjuster Ring Evenly Using Both Screwdrivers Until It Reaches The Limit Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position two screwdrivers at the adjuster ring. Press against the pressure plate with the pressing tool until the adjuster ring can just be moved.
- Turn the adjuster ring evenly using both screwdrivers in direction of arrow until it reaches the limit stop - arrow A-.
- Hold the adjuster ring at the stop while reducing the pressure of the pressing tool so that the adjuster ring remains in position.

34 MANUAL TRANSMISSION - CONTROLS, HOUSING

SHIFT MECHANISM, SERVICING

Gear shift lever mechanism, installation position

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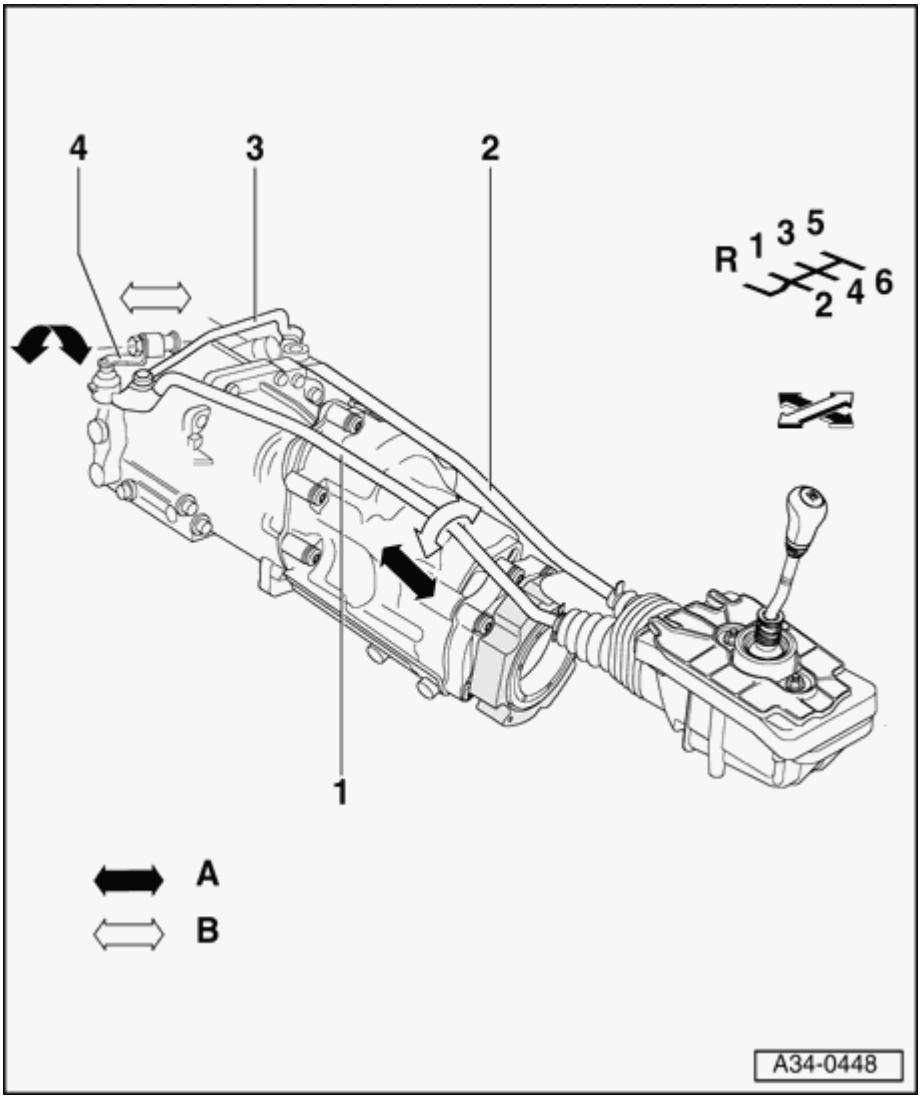


Fig. 72: Gear Shift Lever Mechanism, Installation Position
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector rod

2 - Front push rod

3 - Connecting rod

4 - Gear selector lever

Arrow -A- Gear selection movement

Arrow -B- Gate selection movement

Component overview

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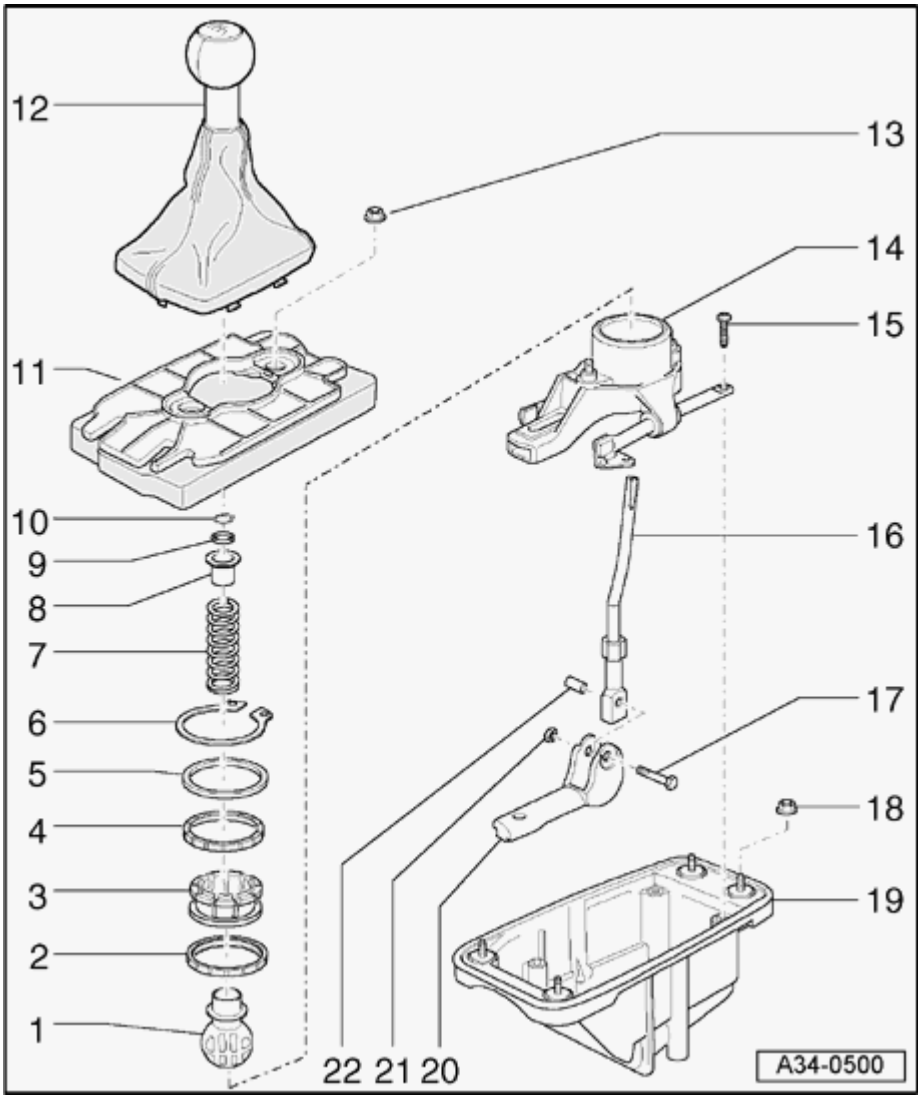


Fig. 73: Shift Mechanism Remove/Install Components - Part 1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Part 1

NOTE: Lubricate bearing areas and slide surfaces with polycarbamide grease, Part No. G 052 142 A2.

1 - Ball

2 - Rubber ring

3 - Ball guide

4 - Rubber ring

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5 - Washer

- Shoulder faces ball guide (Item 3 **Component overview**)

6 - Snap ring

- Remove to remove the ball

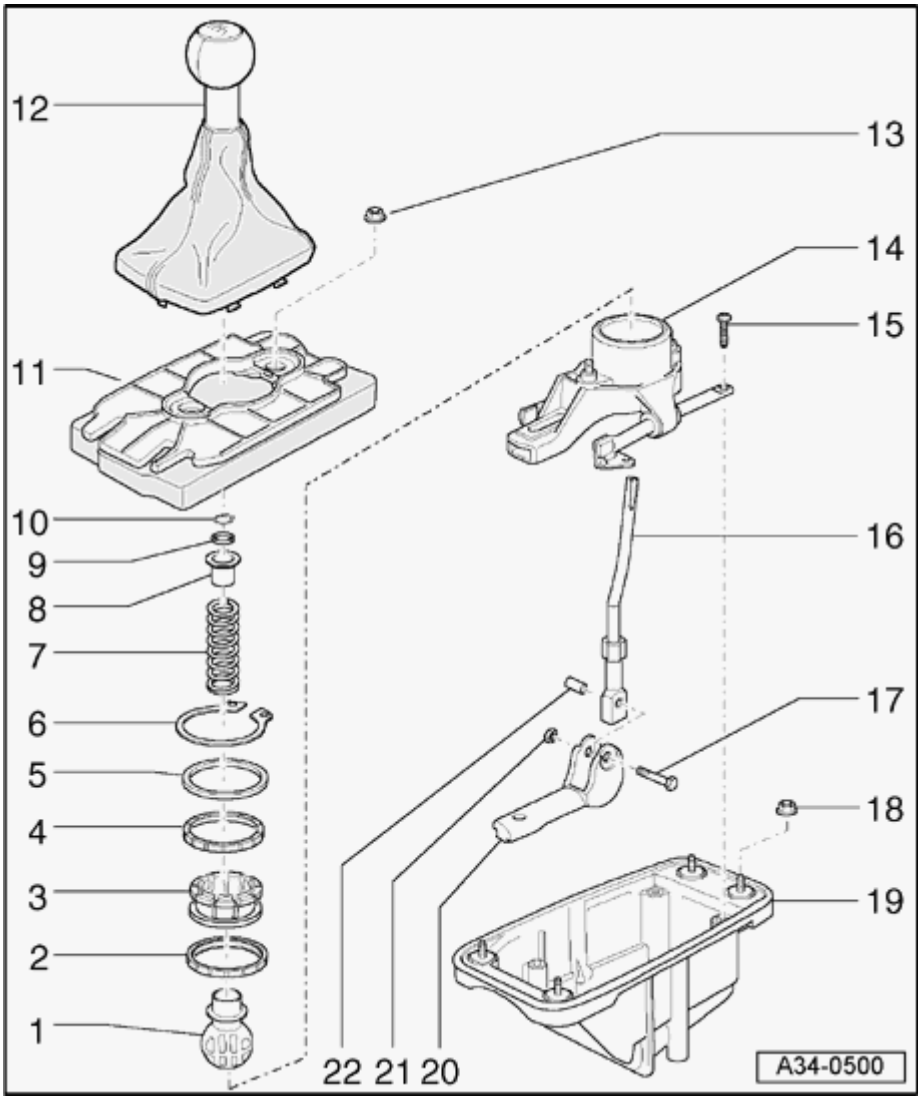


Fig. 74: Shift Mechanism Remove/Install Components - Part 1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

7 - Compression spring

8 - Spacer bushing

9 - Washer

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10 - Snap ring

11 - Noise insulation cover

12 - Shift knob

- with cover
- Removing and installing. Refer to **Shift knob and cover, removing and installing**

13 - Nut - 10 Nm

14 - Ball housing

15 - Inner Torx bolt

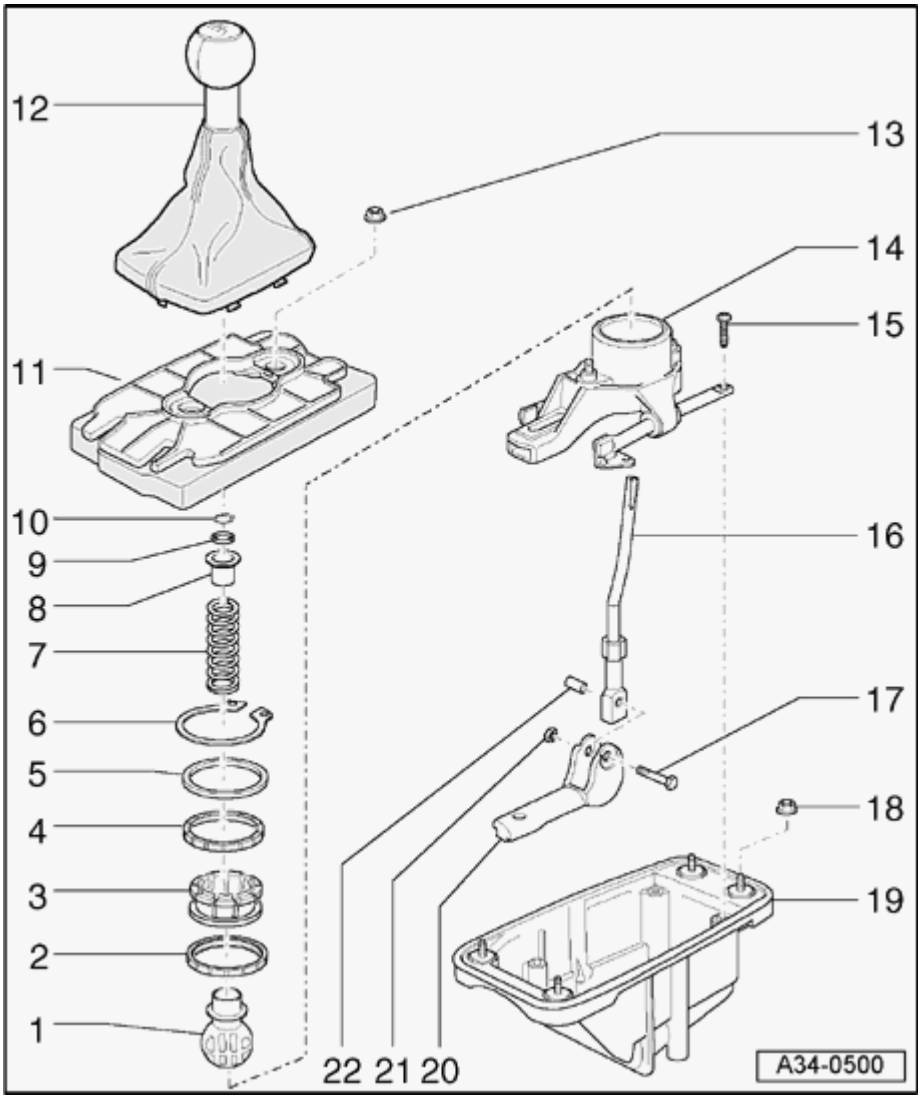


Fig. 75: Shift Mechanism Remove/Install Components - Part 1

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

16 - Shift lever

- Angled area faces rear

17 - Bolt

18 - Nut - 10 Nm

19 - Shift mechanism housing

20 - Shift fork

21 - Nut - 10 Nm

- Self-locking
- Always replace

22 - Bushing

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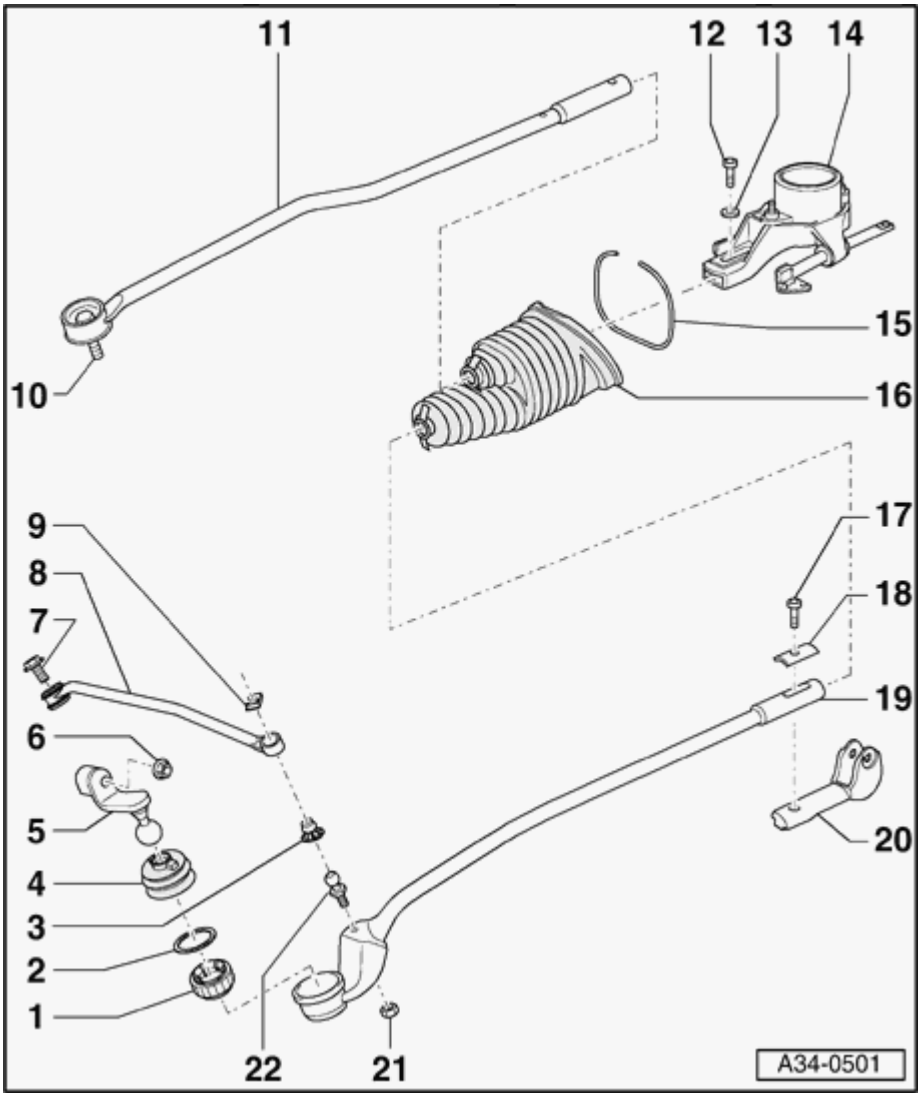


Fig. 76: Shift Mechanism Remove/Install Components - Part 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Part 2

1 - Ball socket

- To remove, bend back peenings on shift rod -Item 19 **Component overview**

2 - Washer

3 - Ball socket

- To remove, remove locking clips -Item 9- **Component overview**

4 - Boot

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5 - Transmission shift lever

6 - Nut - 23 Nm

7 - Bolt - 23 Nm

8 - Operating rod

- To remove, remove locking clips -Item 9- **Component overview**

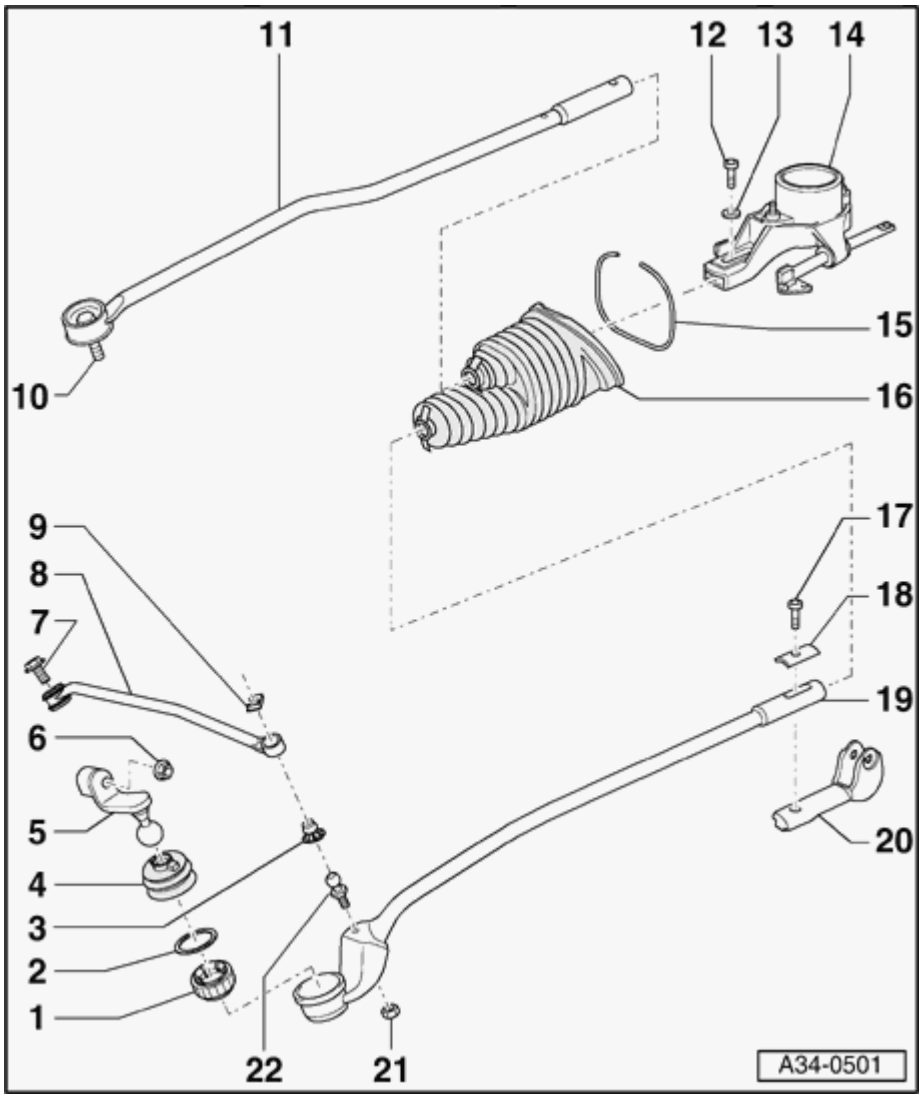


Fig. 77: Shift Mechanism Remove/Install Components - Part 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

9 - Locking clamp

10 - Bolt - 40 Nm

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11 - Pivot rod

- with bushing, bolt and washers

12 - Socket head bolt- 23 Nm

13 - Washer

14 - Ball housing

15 - Tensioning ring

16 - Boot

- Carefully pull over shift rods when removing
- When installing, place on markings of shift rod and pivot rod

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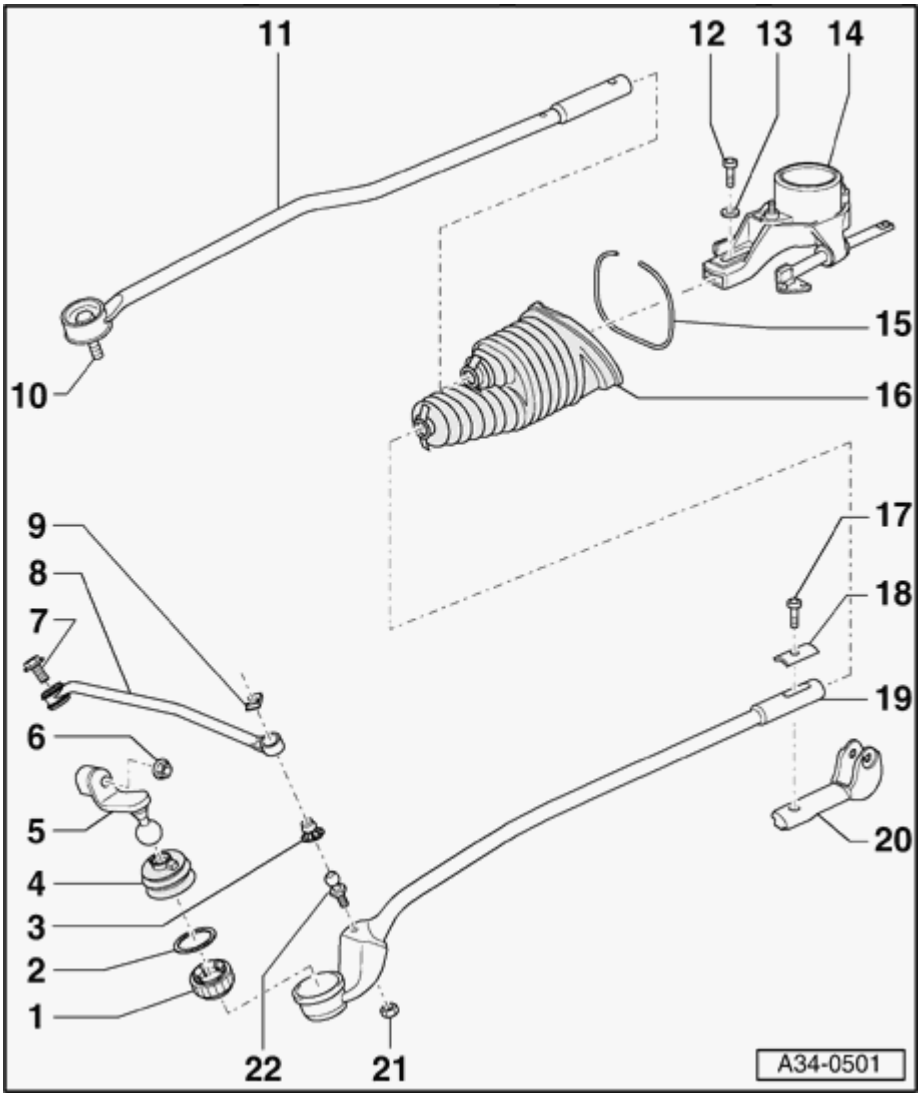


Fig. 78: Shift Mechanism Remove/Install Components - Part 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

17 - Socket head bolt- 23 Nm

18 - Clamping piece

19 - Shift rod

20 - Shift fork

21 - Nut - 10 Nm

22 - Nipple

Shift knob and cover, removing and installing

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Removing

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

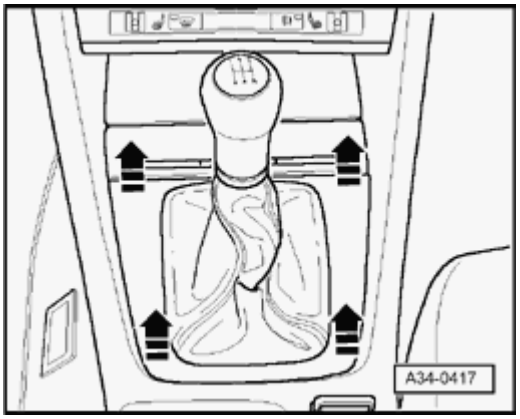


Fig. 79: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unclip cover for center console and lift this out upward -arrows-.

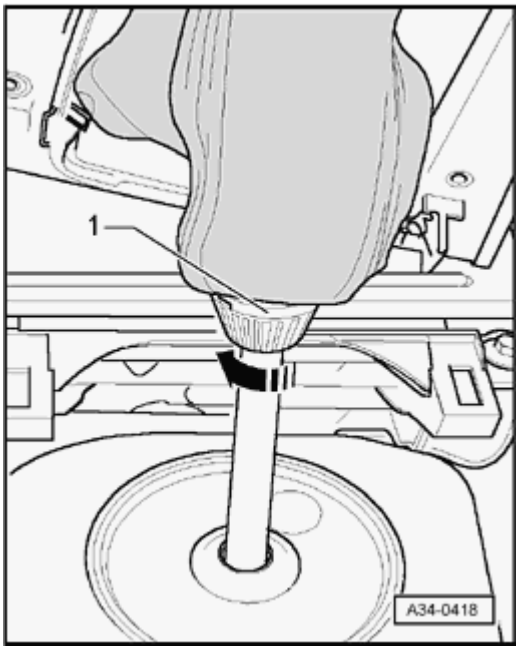


Fig. 80: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach connecting part -1- in direction of arrow and pull off shift knob together with shift lever cover upward.

Installing

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Installation is the reverse of removal.

Shift mechanism, removing and installing

Special Tools and Equipment

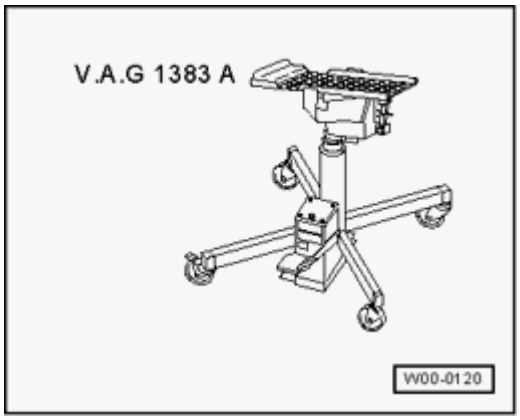


Fig. 81: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG1383A engine/transmission hoist

Removing

- Remove shift knob with cover. Refer to **Shift knob and cover, removing and installing**.

Vehicles with large radio compartment:

- Remove A/C Control Head.

Refer to **87 AIR CONDITIONING**

Vehicles with small radio compartment:

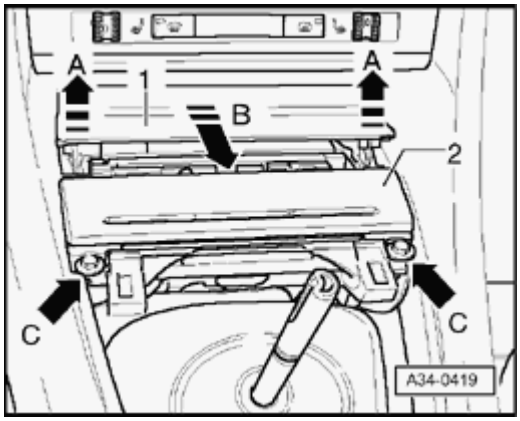


Fig. 82: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift up panel -1- first in direction of arrow -A- and pull it out in the direction of arrow -B-.

All:

- Remove bolts -arrows C- and then remove ashtray -2- from center console.
- Disconnect electrical harness connector for ashtray lighting.
- Remove foam wedges from center console.
- Lift out noise insulation upward.

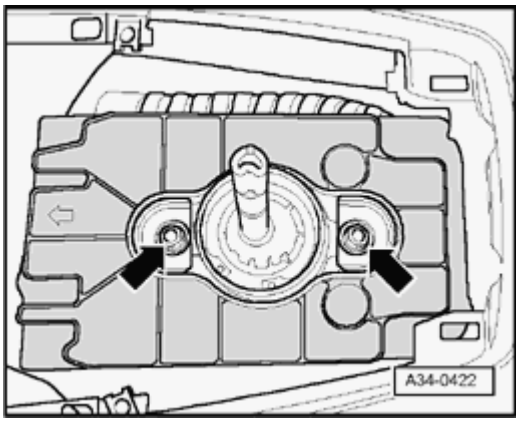


Fig. 83: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation cover for shift mechanism housing (arrows).

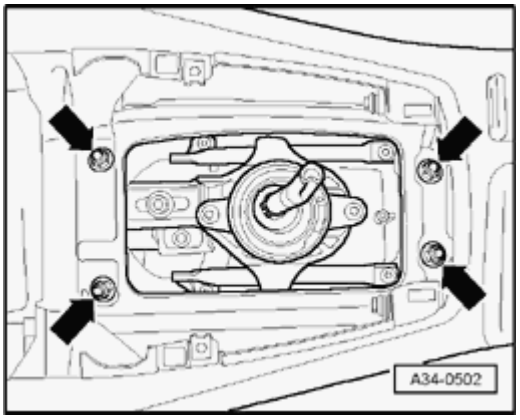


Fig. 84: Shift Lever Housing Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nuts (arrows).

NOTE: The flex joint in front exhaust pipe must not be bent more than 10 ° , otherwise

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it may be damaged.

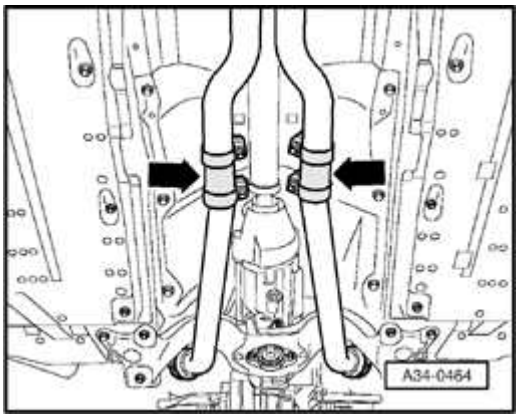


Fig. 85: Exhaust System At Double Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at double clamps -arrows-.
- Detach rear part of exhaust system on retaining loops and remove it.

NOTE: A second technician is required to remove the rear part of exhaust system.

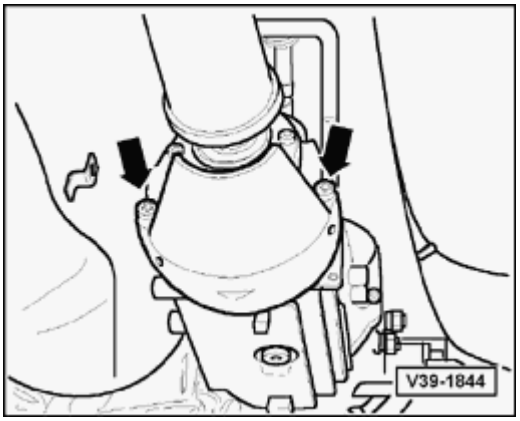


Fig. 86: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield for drive axle -arrows-.

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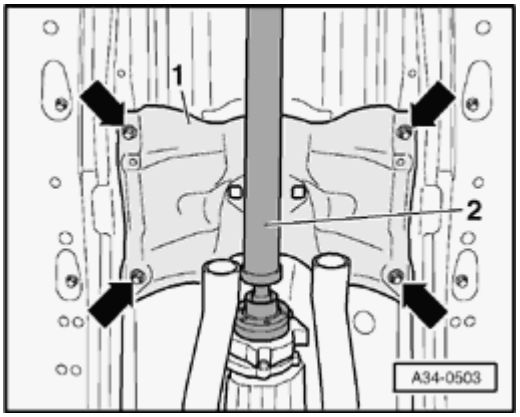


Fig. 87: Heatshield Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts at flange of transmission/drive axle.
- Remove heat shield -1- -arrows-.
- Push driveshaft to rear final drive together. The constant velocity joints can be adjusted axially.
- Remove heat shield.

- Tie up the drive axle -2- on transmission to the side.

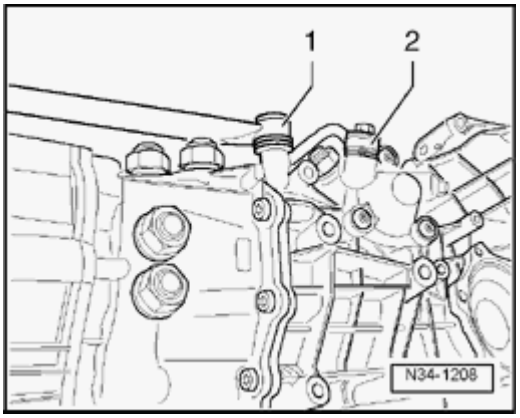


Fig. 88: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connecting rod -2- of shift rod.
- Remove pivot rod -1-, to do this unbolt socket-head bolts.

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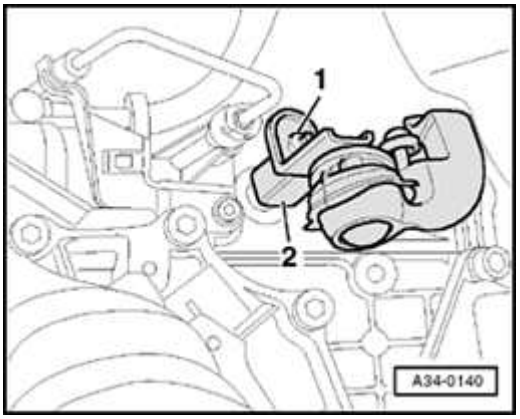


Fig. 89: Identifying Selector Mechanism Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut -1- and pull transmission shift lever -2- from shift rod of transmission.

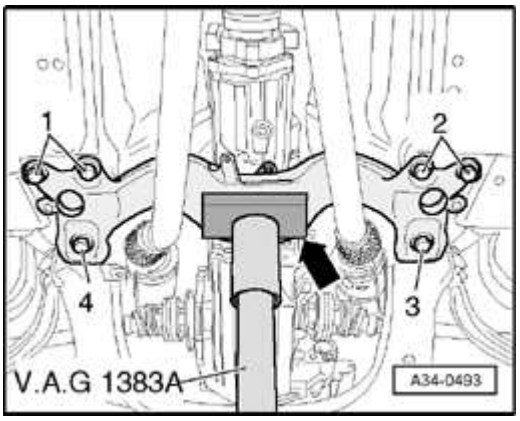


Fig. 90: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove VAG1359/2 universal mount from VAG1383A engine/transmission jack and place a piece of wood -arrow- onto punch instead.
- Support tunnel cross member using VAG1383A engine/transmission lift.
- First remove bolts -1- and -2-, then bolts -3- and -4-.
- Remove shift mechanism toward rear.

Installing

Installation is reverse of removal, noting the following:

NOTE: Always replace gaskets and self-locking nuts.

- Install tunnel cross member.

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Refer to **40 - FRONT SUSPENSION**

- Secure driveshaft to transmission.

Refer to **39 - FINAL DRIVE, DIFFERENTIAL**

- Install and adjust exhaust system free of stress.

Refer to

- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 1.8 LITER 4-CYL. 5V TURBO ENGINE MECHANICAL, ENGINE CODE(S): AMB
- **26 EXHAUST SYSTEM, EMISSION CONTROLS** for 3.0 LITER 6-CYL. 5V ENGINE MECHANICAL, ENGINE CODE(S): AVK, BGN
- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 4.2 LITER V8 5V ENGINE MECHANICAL, ENGINE CODE(S): BHF

- Adjust shift mechanism. Refer to **Shift lever mechanism, adjusting**.

Tightening torques

Component		Nm
Pivot rod to transmission		40
Transmission shift lever to transmission		23
Transmission shift lever to shift rod		23

Shift lever mechanism, adjusting

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

- **Perfect gear linkage operating and transfer elements.**
- **Gear shift lever mechanism moves smoothly.**
- **Transmission, clutch and clutch mechanism must be in proper condition.**
- **Transmission in neutral.**

Work sequence

- Remove shift knob with cover. Refer to **Shift knob and cover, removing and installing**.

Vehicles with large radio compartment:

- Remove A/C control head.

Refer to **87 AIR CONDITIONING**

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Vehicles with small radio compartment:

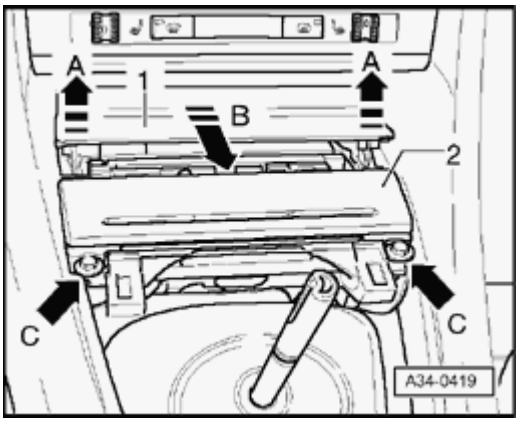


Fig. 91: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift panel -1- first in direction of arrow -A- and pull out in direction of arrow -B-.

All:

- Unscrew the bolts -arrows C- and pull out the ashtray -2- from the center console.
- Disconnect electrical harness connector for ashtray lighting.
- Remove foam wedges from center console.
- Lift out the noise insulation upward.

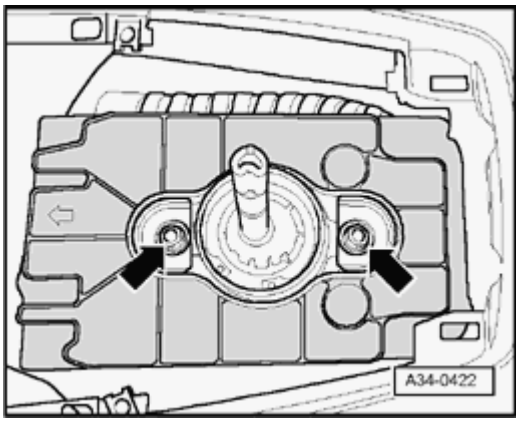


Fig. 92: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew noise insulation cover for shift lever housing -arrows-.

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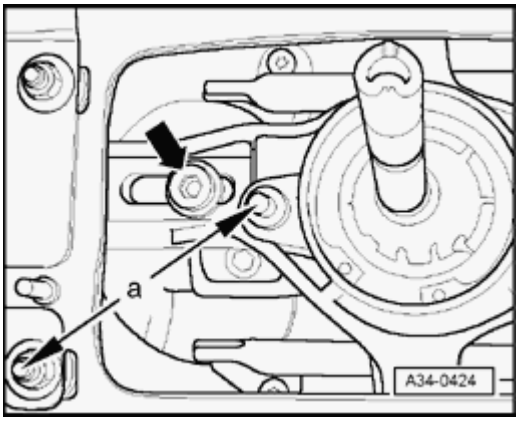


Fig. 93: Shift Mechanism Measurement And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure distance -a- between the two threaded studs in the shift lever mechanism
- Specified value: Distance a = 85 mm

NOTE: Measure from the centers of the two threaded studs.

- If this is not the case, adjust distance -a- as follows:
- Loosen push rod bolt (arrow).
- Rear push rod (in shift lever mechanism) should move freely in both directions on slide.
- Set distance -a- by moving rear push rod (in shift lever mechanism).
- Tighten push rod bolt -arrow- to 23 Nm.

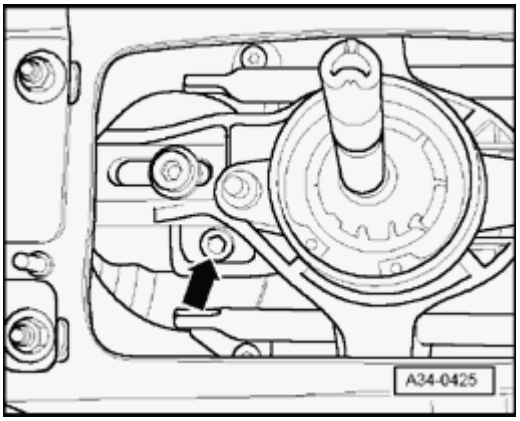


Fig. 94: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt for selector rod -arrow-.
- Connection between selector rod and shift lever mechanism should move freely.

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Align the shift lever as follows:

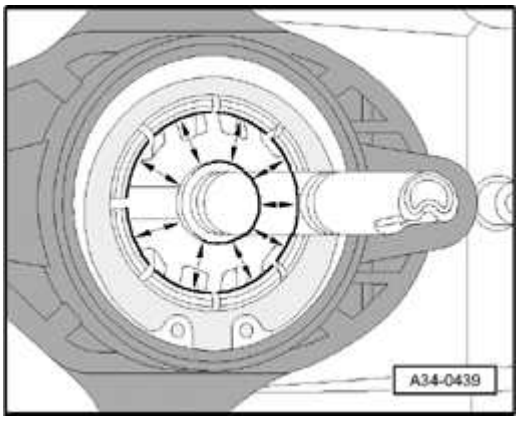


Fig. 95: Centering Bottom Of Shift Lever Centered In Ball Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Center the bottom of the gear lever in the center of the ball housing.

- The distance between the ball housing and the bottom of the gear lever -arrows- must be equal at all points.
- Shift lever in vertical position to direction of travel.

- Shift lever held in this position.

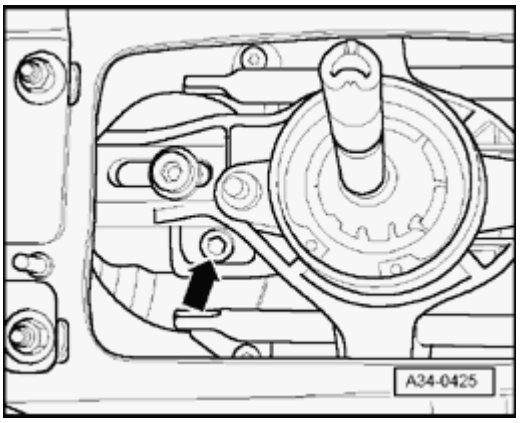


Fig. 96: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten selector rod bolt -arrow- to 23 Nm.

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

Shift lever alignment, checking

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- 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.
  - Check operation of reverse gear lock.

- It should only be possible to engage the R gear after releasing the block.
- The gear lever must return automatically from the R gear gate to the 3rd/4th gear gate.

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

  - Install covers and shift lever knob

TRANSMISSION, REMOVING AND INSTALLING

Transmission, removing and installing

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**

  .

Transmission, removing and installing

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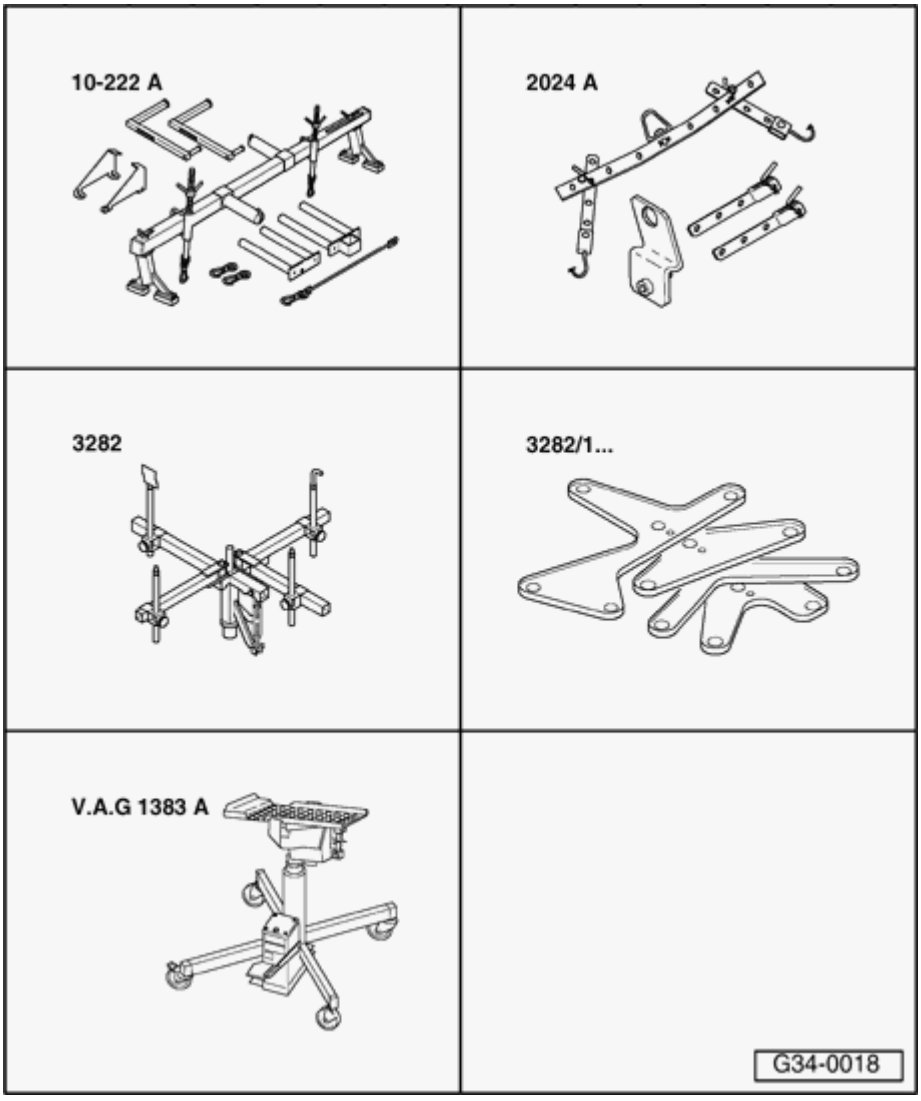


Fig. 97: Identifying Special Tools - Transmission, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special Tools and Equipment

- 10-222A Engine support bridge
- 2024A Engine Sling
- 3282 transmission support
- 3282/12 adjustment plate
- VAG 1383 A Engine/transmission hoist

Removing

WARNING: Observe safety precautions when disconnecting the battery.

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Refer to

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

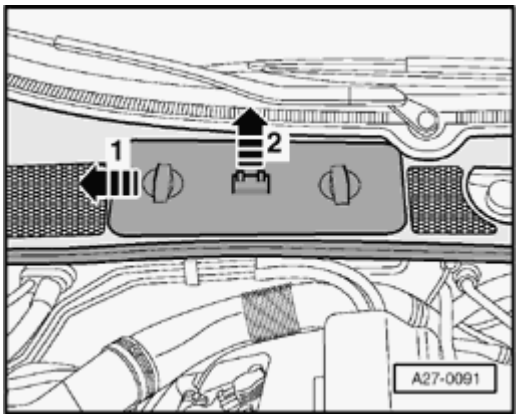


Fig. 98: Removing Battery Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide cover over the battery to the right (arrow 1) and pull it off upward (arrow 2).

See Caution before beginning repairs on the electrical system. Refer to **Transmission, removing and installing**

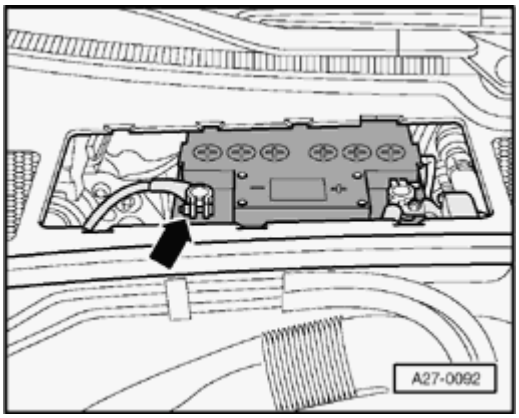


Fig. 99: Locating Battery Ground Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect battery Ground (GND) strap (arrow) with the ignition switched off.

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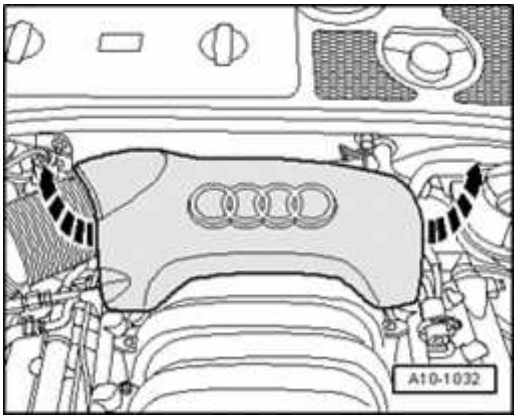


Fig. 100: Removing Rear Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover (arrows).

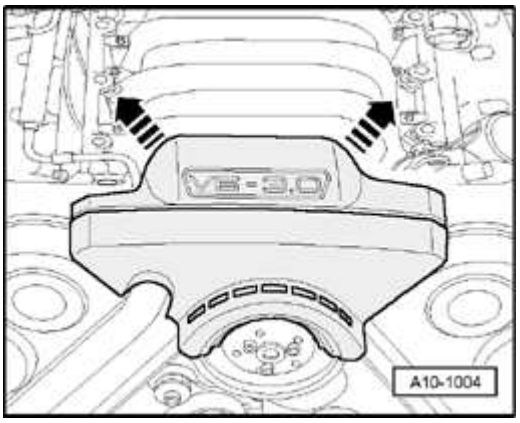


Fig. 101: Removing Front Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover (arrows).

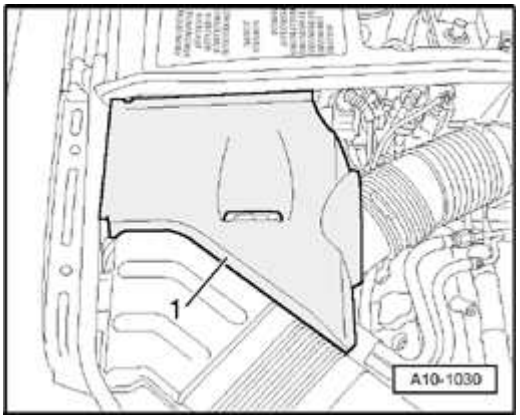


Fig. 102: Removing Cover In Engine Compartment (Right Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove cover -1- in engine compartment (right side).

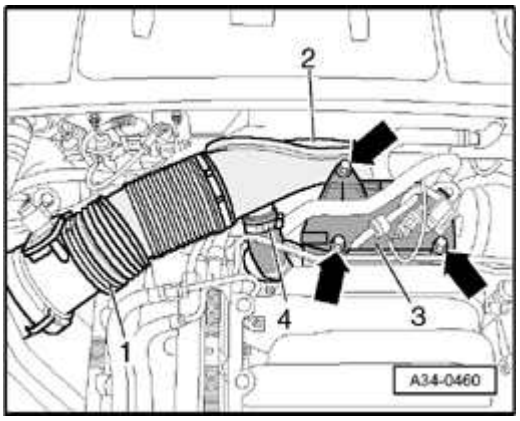


Fig. 103: Identifying Holding Plate, Intake Air Hose, Hose & Air Duct
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts for holding plate -3- for solenoid valves (arrows).
- Disconnect intake air hose -1- at Mass Air Flow (MAF) sensor.
- Remove hose -4- of crankshaft housing ventilation from air duct -2-.

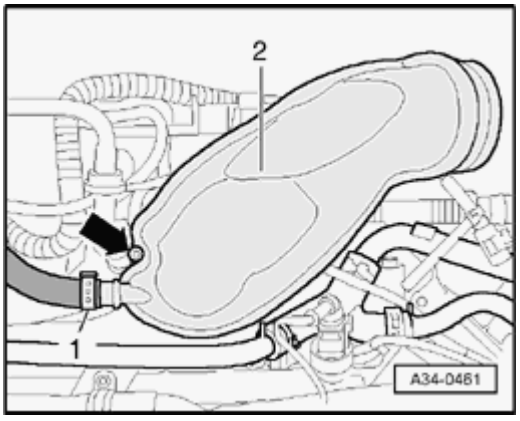


Fig. 104: Removing Bolt And Disconnect Air Duct At Throttle Valve Control Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt (arrow) and disconnect air duct -2- at throttle valve control module.
- Disconnect hose -1- from air duct.

NOTE: Illustration depicts air guide with the removed engine from rear.

- Remove engine/transmission connecting bolts accessible from above.

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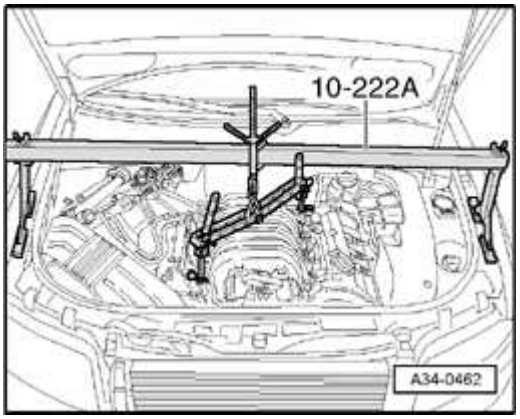


Fig. 105: Positioning 10-222A Engine Support Bridge On Bolted Flanges Of Fenders
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position 10-222A engine support bridge on bolted flanges of fenders.

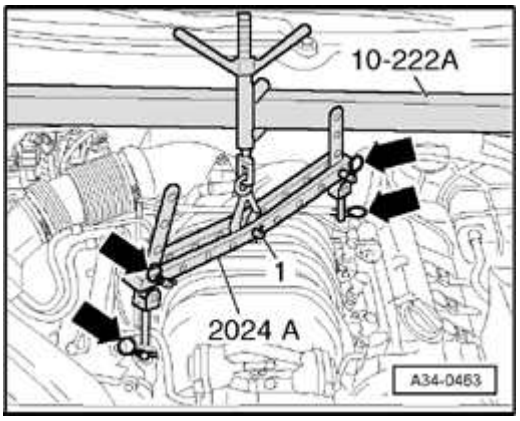


Fig. 106: Removing Eyelet For 2024A Engine Sling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove eyelet for 2024A engine sling.
- Insert bolt -1- in the center bore of 2024A Engine Sling and secure with a cotter pin.
- Attach bolt for 2024A engine sling at 10-222A engine support bridge spindle.
- Attach 2024A Engine Sling to sling clamps at front and rear of engine.

WARNING: Take-up hooks and pins at engine sling must be secured using securing pins (arrows) as shown in illustration.

- Slightly pre-tension engine using engine support bridge spindle.

Vehicles with auxiliary heater:

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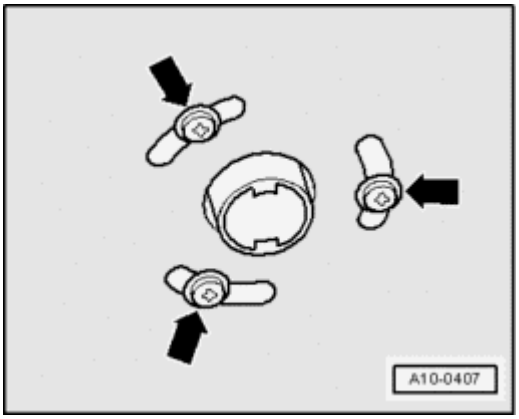


Fig. 107: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts (arrows) for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All:

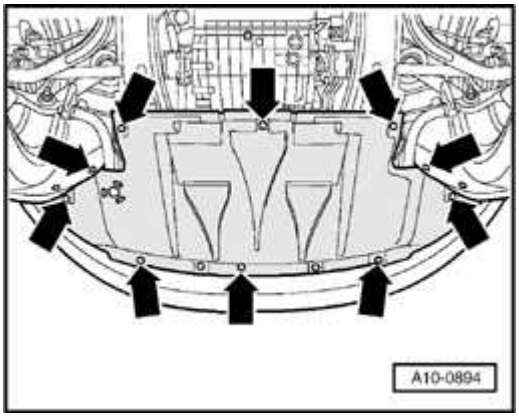
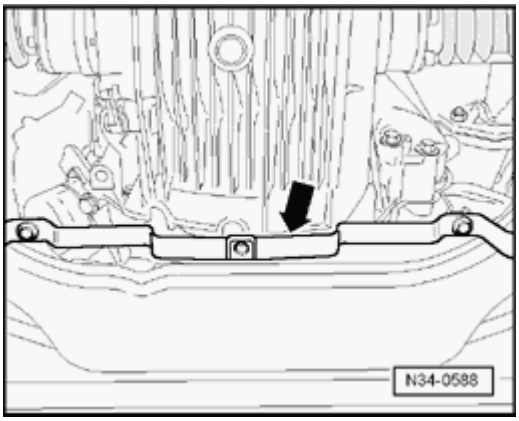


Fig. 108: Removing Sound Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the sound-proofing material (arrows).



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Fig. 109: Removing Noise Insulation Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt bracket for noise insulation panel (arrow).

NOTE: The flex joint in front exhaust pipe must not be bent more than 10 ° , otherwise it may be damaged.

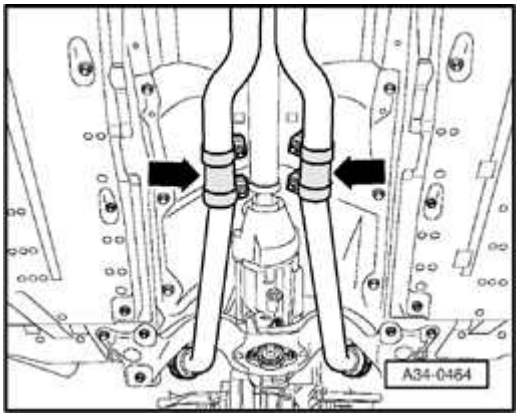


Fig. 110: Exhaust System At Double Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at double clamps -arrows-.
- Detach rear part of exhaust system on retaining loops and remove it.

NOTE: A second technician is required to remove the rear part of exhaust system.

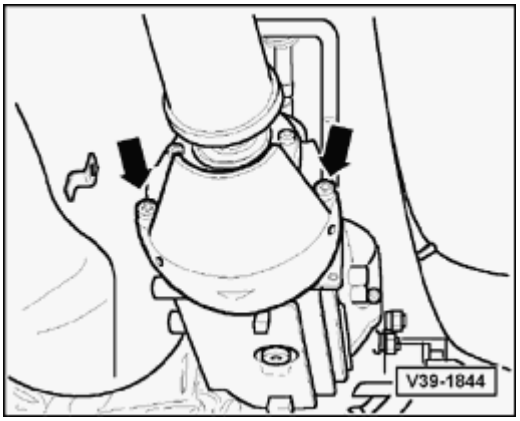


Fig. 111: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield for drive axle -arrows-.
- Remove bolts at flange of transmission/drive axle.
- Push driveshaft to rear final drive together. The constant velocity joints can be adjusted axially.

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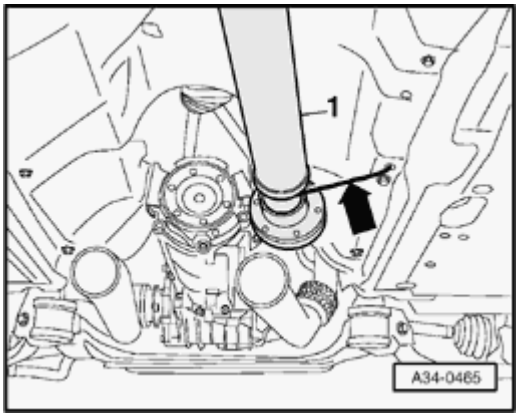


Fig. 112: Driveshaft Secured With Wire To Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure driveshaft -1- with wire (arrow) to heat shield.

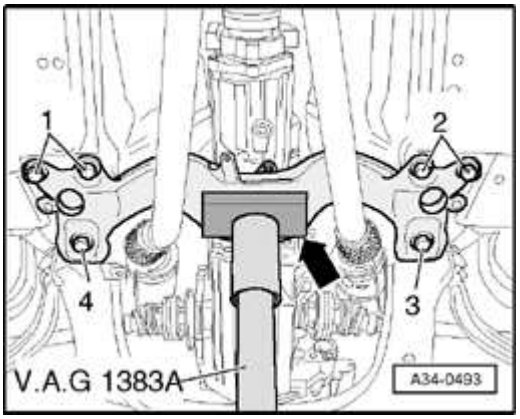


Fig. 113: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove VAG1359/2 universal mount from VAG1383A engine/transmission jack and place a piece of wood -arrow- onto punch instead.
- Support tunnel cross member using VAG1383A engine/transmission lift.

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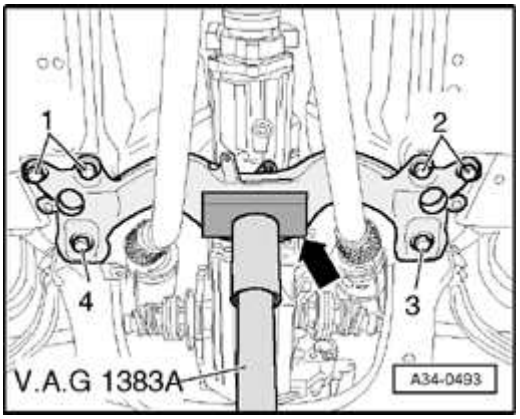


Fig. 114: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First remove bolts -1- and -2-, then bolts -3- and -4-.
- Release slowly the tunnel cross member using VAG1383A engine/transmission hoist.

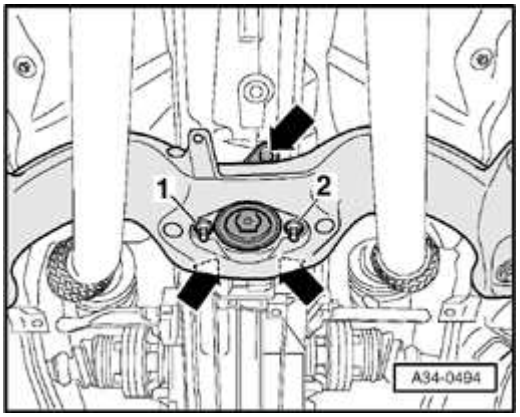


Fig. 115: Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts -1- and -2-.
- Remove bolts (arrows) and remove tunnel cross member downward using transmission mount.

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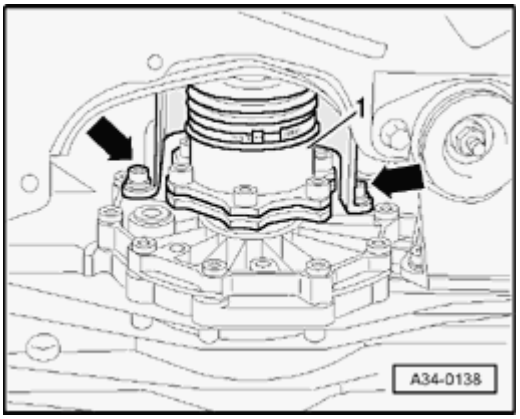


Fig. 116: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left and right heat shields for drive axles (arrows).
- Remove drive axles from transmission drive flange.

NOTE: Take care not to damage protective coating on drive axles.

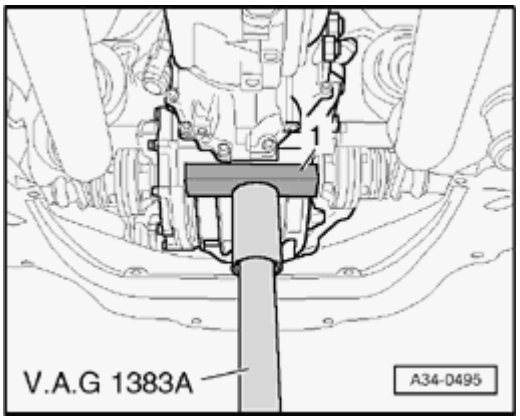


Fig. 117: Transmission Raised Using Punch Of VAG 1383 A So That A Piece Of Wood Can Be Placed In Between
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Raise transmission using punch of VAG 1383 A engine/transmission hoist high enough, so that a piece of wood (arrow) can be placed in between.

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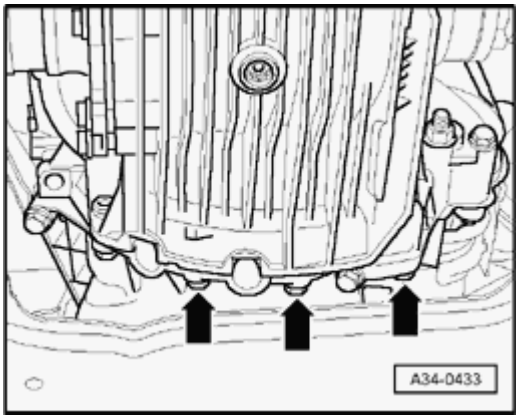


Fig. 118: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the three bottom engine/transmission connecting bolts (arrows).
- Lower transmission again.

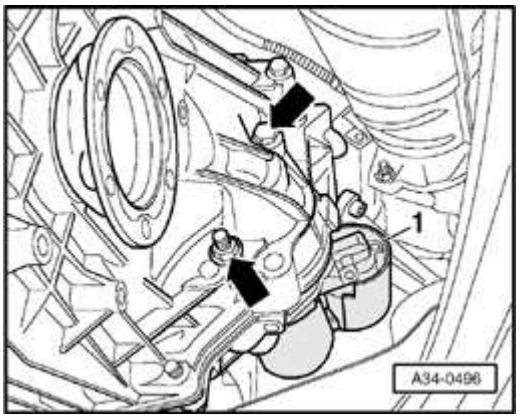
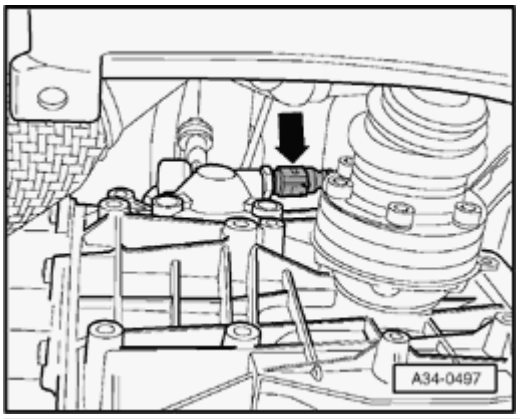


Fig. 119: Starter And Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt starter -1- (arrows) and remove it from transmission bell housing.
- Remove remaining mounting bolts for engine/transmission. One bolt remains tightened by hand.



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Fig. 120: Disconnecting Harness Connector For Back-Up Light Switch At Right Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect harness connector for back-up light switch at right of transmission and set aside electrical wire.

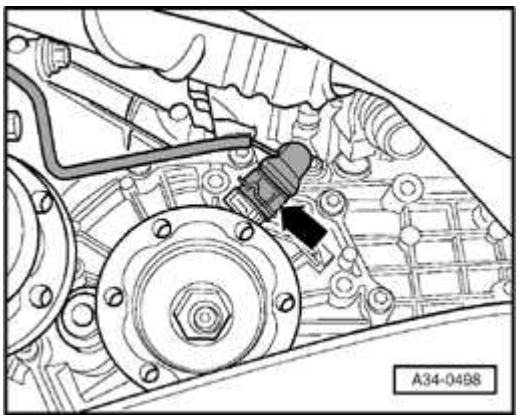


Fig. 121: Disconnecting Harness Connector From Speedometer Vehicle Speed Sensor (VSS) -G22- At Left Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect harness connector (arrow) from Speedometer Vehicle Speed Sensor (VSS) -G22- at left of transmission.
- Unbolt heat shield for engine speed (RPM) sensor.

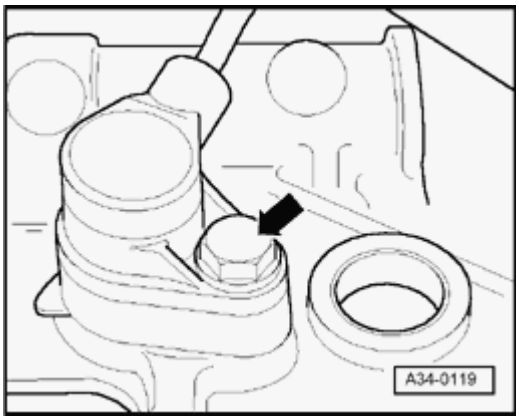


Fig. 122: Location Of Engine Speed (RPM) Sensor G28 On Coupling Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Engine Speed (RPM) sensor -G28- on left of transmission (arrow) and lay to side.

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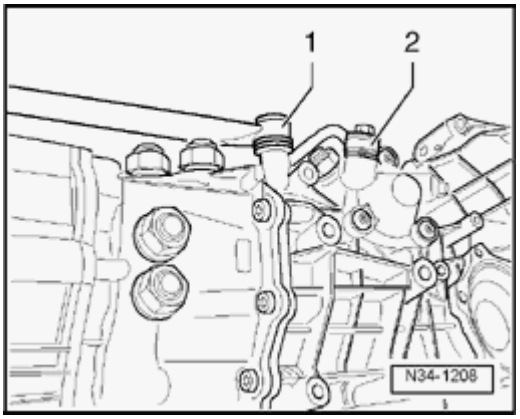


Fig. 123: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connecting rod -2- of shift rod.
- Remove pivot rod -1-, to do this unbolt socket-head bolts.

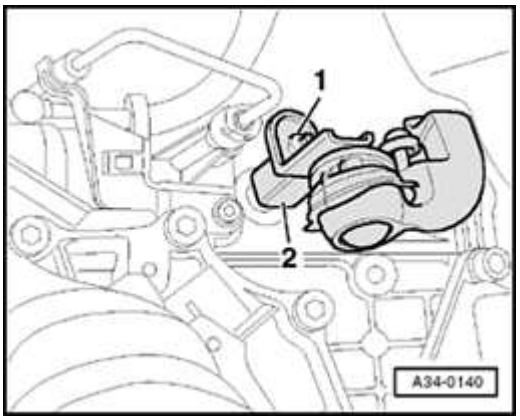


Fig. 124: Identifying Selector Mechanism Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut -1- and pull transmission shift lever -2- from shift rod of transmission.

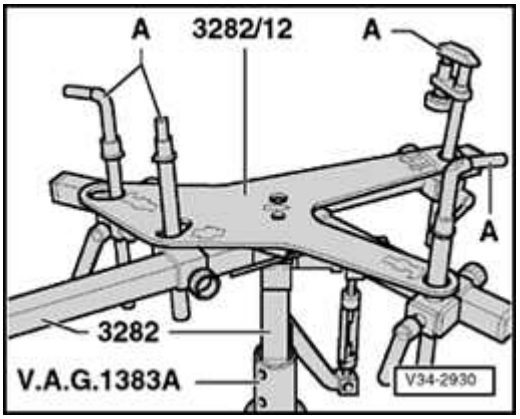


Fig. 125: 3282 Transmission Support, 3282/12 Adjustment Plate And VAG1383A Engine/Transmission

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Hoist
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up 3282 transmission support for removing manual transmission 01E all wheel drive using 3282/12 adjustment plate and VAG1383A engine/transmission hoist.

A - Attachments

NOTE:

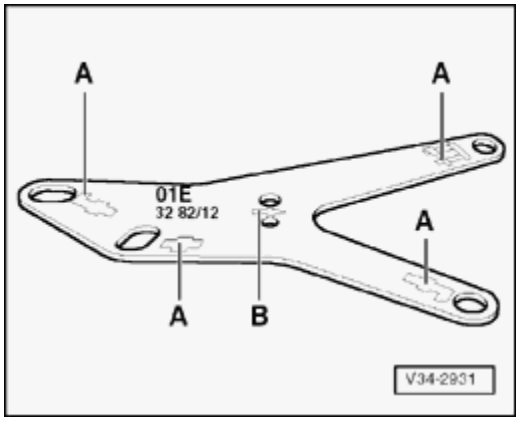


Fig. 126: Identifying Attachments Symbols On Adjustment Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **Attachments -A- are shown in schematic form, arrow -B- points in the direction of travel.**
- **3282/12 adjustment plate only fits in one position.**

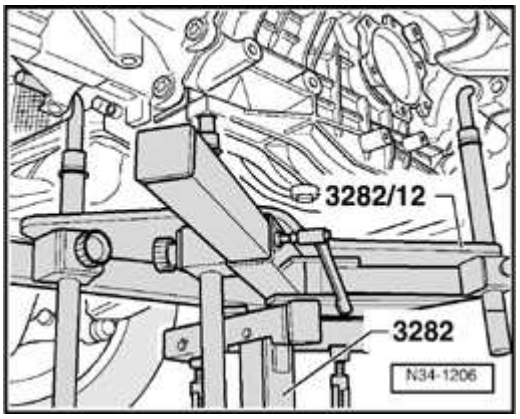


Fig. 127: Place Transmission Jack And Adjustment Plate 3282/12 Under Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Roll VAG 1383 A engine/transmission hoist underneath transmission. Arrow B (Refer to Illustration **Fig. 126**) on adjustment plate 3282/12 points in the direction of travel.

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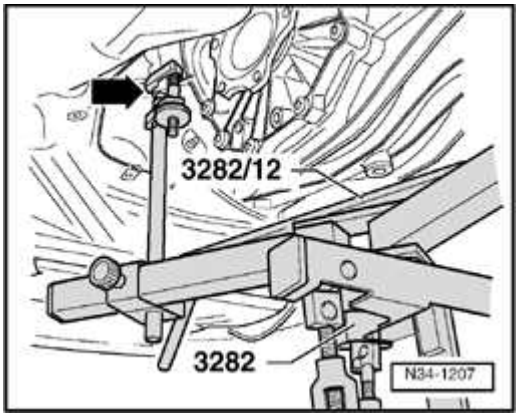


Fig. 128: Align Adjustment Plate 3282/12 Parallel To Transmission And Lock Safety Supports On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align adjustment plate parallel to transmission and lock safety support (arrow) on transmission.
- Remove last mounting bolts for engine/transmission.
- Press transmission off dowel sleeves and lower carefully using VAG 1383 A engine/transmission hoist just enough for access to slave cylinder.

NOTE: When lowering the transmission, make sure the hydraulic line/hose to clutch slave cylinder is not damaged.

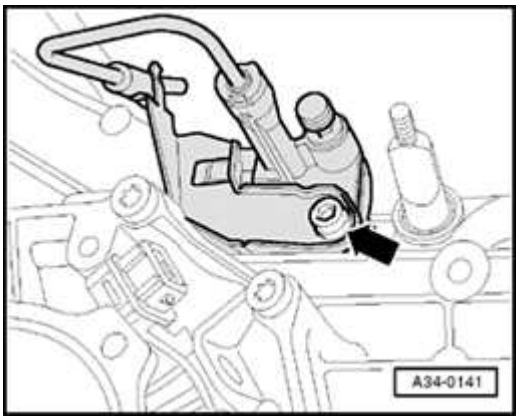


Fig. 129: Removing/Installing Slave Cylinder Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clutch slave cylinder (arrow) and secure with wire, do not disconnect line.
- Lower transmission completely.

NOTE: Ensure freedom of movement of drive axles when lowering.

Installing

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Installation is reverse of removal, noting the following:

NOTE: Always replace seals, gaskets and self-locking nuts.

- Clean input shaft splines and (in case of used clutch plates) clean hub splines. remove corrosion and apply only a very thin coating of lubricant G 000 100 on splines. Do not grease guide sleeve.
- Check clutch release bearing for wear and replace if necessary.
- Coat contact surface of clutch release lever plunger with a thin layer of copper grease, e.g. Z 381 351 TE.

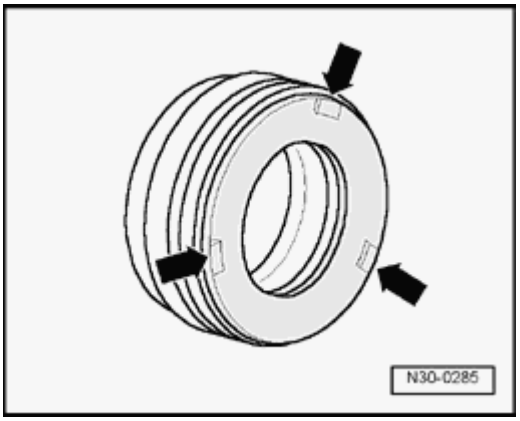


Fig. 130: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If the plastic ring of the release bearing is loose, adhere it to the bearing ring again using adhesive AMV-195-KD1-01.

- 3 rectangular tabs (arrows) of the plastic ring reach into the cutouts of the bearing ring.
- If grooves with depth of more than 0.5 mm are present, the release bearing must be replaced.

- All threaded bores in which self-locking bolts are threaded must be cleaned of remaining locking fluid using a tap.
- Make sure centering sleeves for engine to transmission are correctly installed in cylinder block. Install or replace if necessary.
- Place intermediate plate onto the dowel sleeves on engine flange.
- Tie electrical wires off to the side before installing, so that they are not pinched between engine and transmission.

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

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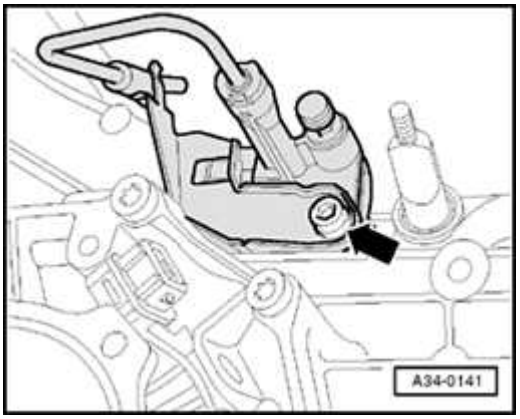


Fig. 131: Removing/Installing Slave Cylinder Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure slave cylinder with a new bolt (arrow).
- Install starter and secure connecting bolts for engine/transmission on left and right side.
- Install connecting rods and pivot rods for shift mechanism.

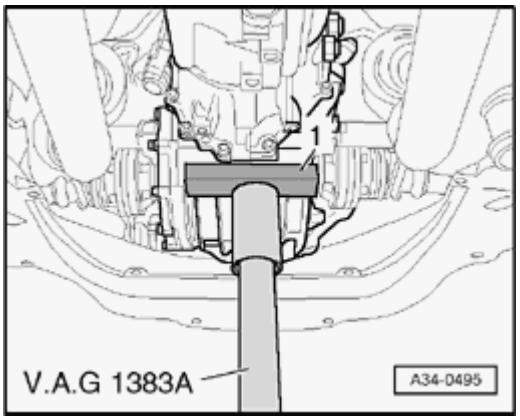


Fig. 132: Transmission Raised Using Punch Of VAG 1383 A So That A Piece Of Wood Can Be Placed In Between
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place a piece of wood (arrow) onto punch of VAG 1383 A engine/transmission hoist and raise transmission slightly.

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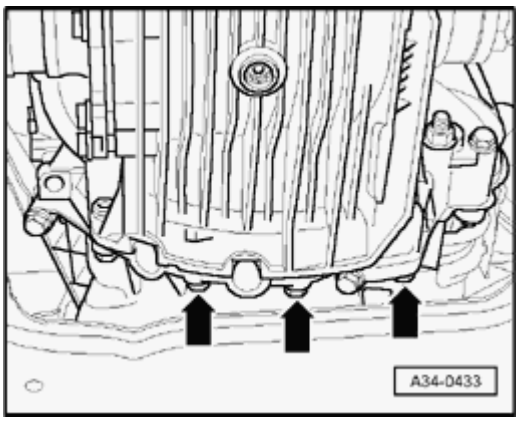


Fig. 133: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten the three bottom engine/transmission connecting bolts (arrows).
- Lower transmission again.
- Guide the tunnel cross member with loosely inserted transmission mount over front exhaust pipes.

NOTE: The flex joint in front exhaust pipe must not be bent more than 10 ° , otherwise it may be damaged.

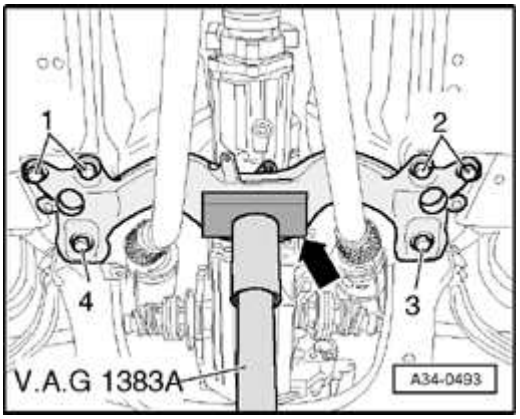


Fig. 134: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place a piece of wood (arrow) onto punch of VAG 1383 A engine/transmission hoist and raise tunnel cross member and transmission slightly.
- Next, tighten bolts -1- to -4- hand-tight.
- Release slowly the VAG 1383 A engine/transmission hoist.
- Tighten bolts for tunnel cross member.

Refer to **40 - FRONT SUSPENSION**

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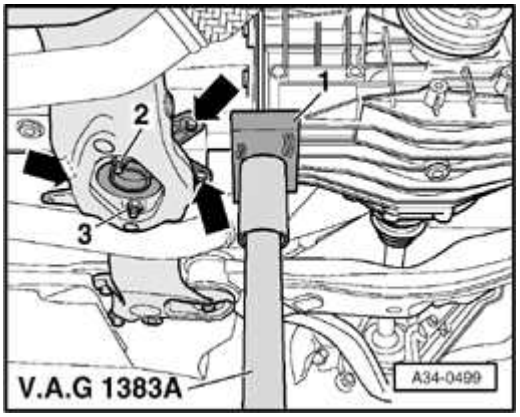


Fig. 135: Identifying Transmission Raised Using Punch Of VAG 1383 A, A Piece Of Wood And Transmission Mount Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For tension-free installation, raise transmission using punch of VAG 1383 A engine/transmission hoist high enough so that a piece of wood -1- can be placed in between.
- Tighten bolts (arrows) for transmission mount.
- Slowly lower transmission again.
- Tighten nuts -2- and -3-.
- Bolt drive axles on drive flange.

Refer to **40 - FRONT SUSPENSION**

- Secure driveshaft to transmission.

Refer to **39 - FINAL DRIVE, DIFFERENTIAL**

- Check adjustment of shift mechanism and adjust if necessary. Refer to **Shift lever mechanism, adjusting**.
- Install and adjust exhaust system free of stress.

Refer to

- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 1.8 LITER 4-CYL. 5V TURBO ENGINE MECHANICAL, ENGINE CODE(S): AMB
- **26 EXHAUST SYSTEM, EMISSION CONTROLS** for 3.0 LITER 6-CYL. 5V ENGINE MECHANICAL, ENGINE CODE(S): AVK, BGN
- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 4.2 LITER V8 5V ENGINE MECHANICAL, ENGINE CODE(S): BHF

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

See Caution for disconnecting Telematics battery. Refer to **Transmission, removing and installing**

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- Observe safety precautions after connecting the battery.

Refer to

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

Tightening torques

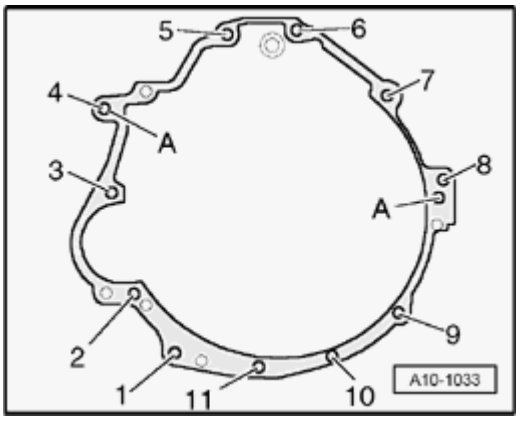


Fig. 136: Identifying Engine/Transmission Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Securing engine/transmission for manual transmission with All Wheel Drive (with intermediate plate)

Item no.	Bolt	Nm
1, 10, 11	M10 x 60	45
2	M12 x 130	65
3	M10 x 150	45
4	M12 x 80	65
5, 6, 8	M12 x 80	65
7	M12 x 105	65
9	M10 x 59	45

A: Alignment bushing

Component		Nm
Clutch slave cylinder to transmission		23 1)
Pivot rod to transmission		40
Transmission shift lever to transmission		23
Connecting rod for shift rod to transmission		23
Engine Speed (RPM) sensor -G28-		10
Transmission mount with console to transmission		23

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Heat shields above drive axles to transmission	23
Heat shield for drive axle to cover for Torsen differential	25
Bracket for noise insulation to subframe	10
Air duct to throttle valve supports	10

1) Always replace bolt

TRANSMISSION OIL LEVEL, CHECKING

Transmission oil level, checking

NOTE:

- **The vehicle should be absolutely horizontal when checking transmission oil level. This work is best performed over an inspection pit or using a 4 - column lifting platform.**
- **The prescribed oil level is to be adhered to exactly; the transmission reacts very sensitively to overfilling.**

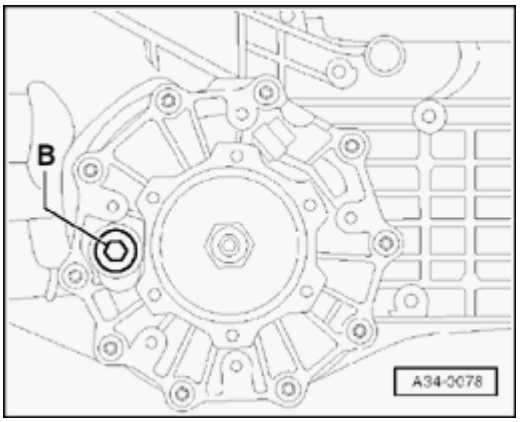


Fig. 137: Location Of Sealing Plug For Gear Oil Inspection
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil filler plug -B- to check final drive oil level.
- Check oil level using a shop-built tool, e.g. a piece of angled wire.

- Specification: Oil level 4 mm ± 1 below bottom edge of oil filler hole

- Top up with gear oil, if necessary: Specification. Refer to **Code letters, mechanical unit assignment, transmission ratios, capacities**.
- Install oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	40

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TRANSMISSION, DISASSEMBLING AND ASSEMBLING

Transmission, disassembling and assembling

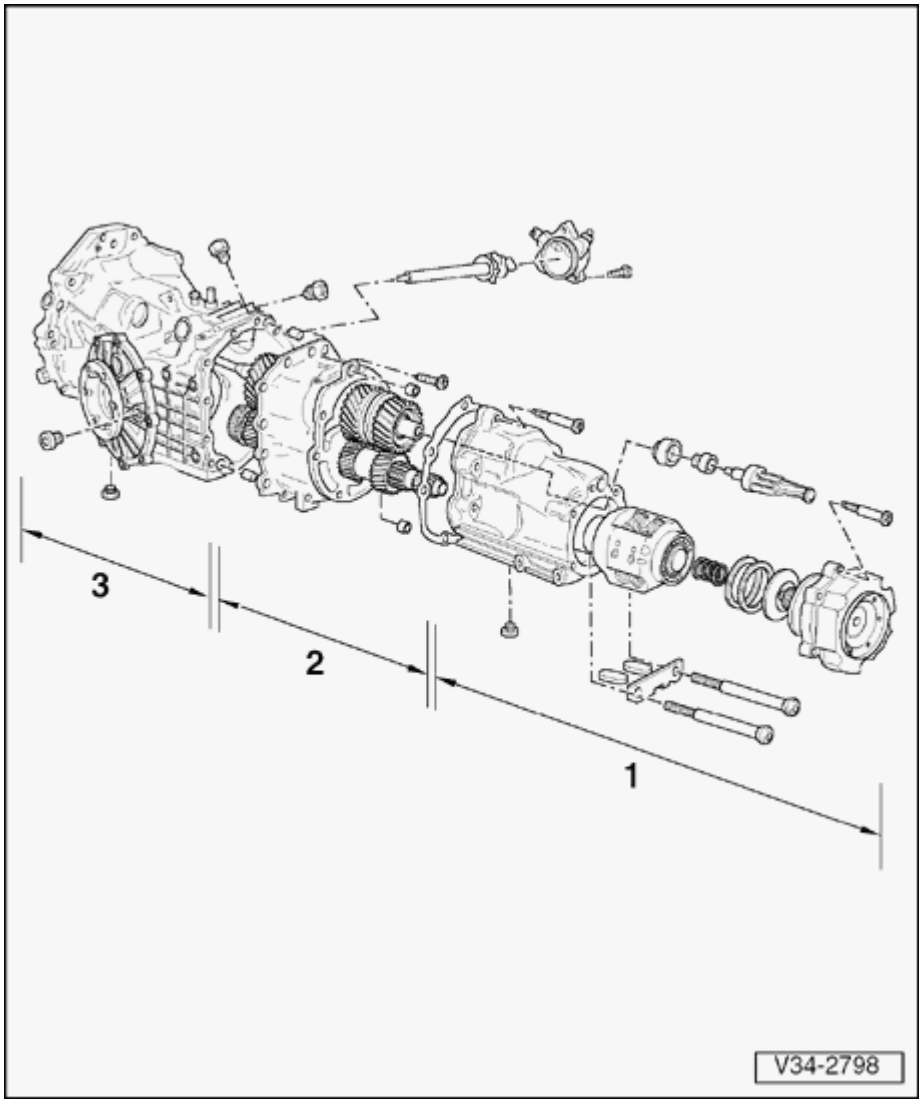


Fig. 138: Transmission, Disassembling And Assembling, Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Assembly sequence. Refer to **Assembly sequence**

1 - Bearing housing, Torsen differential and end cover

- Removing and installing. Refer to **Bearing housing, Torsen differential and end cover, removing and installing**

2 - Manual transmission and selector shaft

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- Removing and installing. Refer to **Manual transmission and selector shaft, removing and installing**

3 - Transmission housing and differential

- Removing and installing differential. Refer to **Differential, removing and installing**
- Servicing transmission housing. Refer to **Transmission housing, servicing**

Bearing housing, Torsen differential and end cover, removing and installing

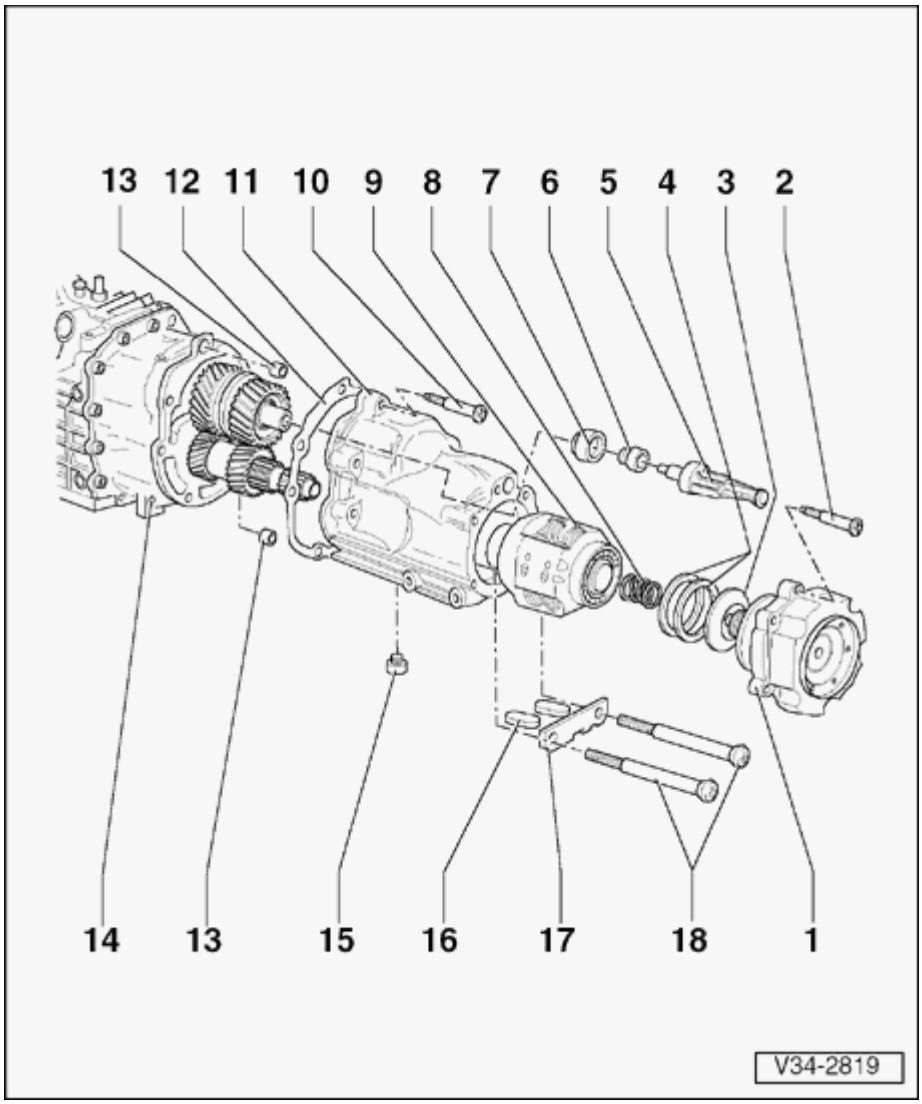


Fig. 139: Bearing Housing, Torsen Differential And End Cover, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

- Disassembling and assembling. Refer to **Bearing housing, disassembling and assembling**

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2 - Bolt, 25 Nm

- 6 pieces

3 - Dished washer

- Installation position: Large diameter (concave side) facing shims

4 - Washer

- Qty. 2 or 3
- Re-determining thickness. Refer to **Fig. 213**

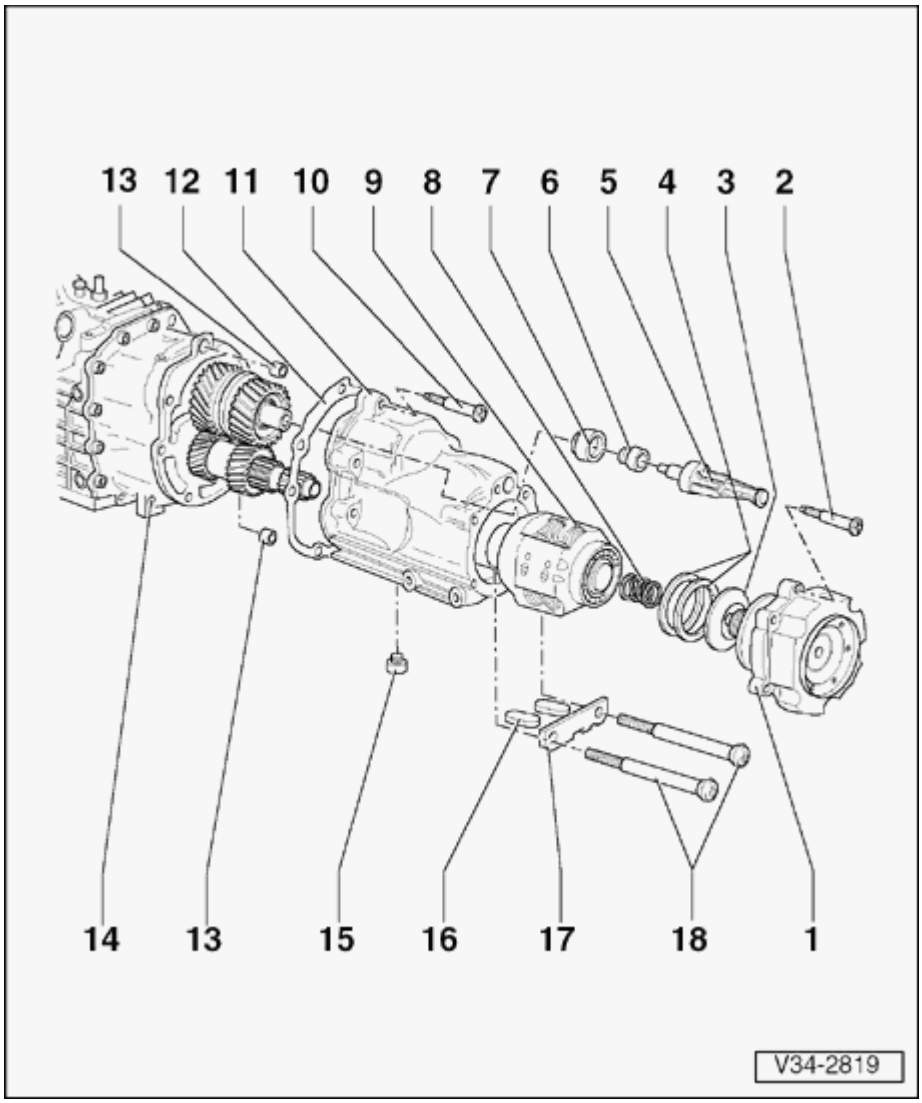


Fig. 140: Bearing Housing, Torsen Differential And End Cover, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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5 - Oil collector

- Disassembling and assembling. Refer to **Fig. 208**
- Removing. Refer to **Fig. 163**
- Installing. Refer to **Fig. 209**

6 - Multi-point socket head bolt, 150 Nm

- Loosening. Refer to **Fig. 166**
- Tightening. Refer to **Fig. 207**

7 - 2nd inner race for four-point bearing

- Roller bearing side
- Pulling off. Refer to **Fig. 168**
- Driving on. Refer to **Fig. 206**

8 - Spring

9 - Torsen differential

- Servicing only possible at manufacturer
- Servicing mount for Torsen differential. Refer to **Mount for Torsen differential, servicing**

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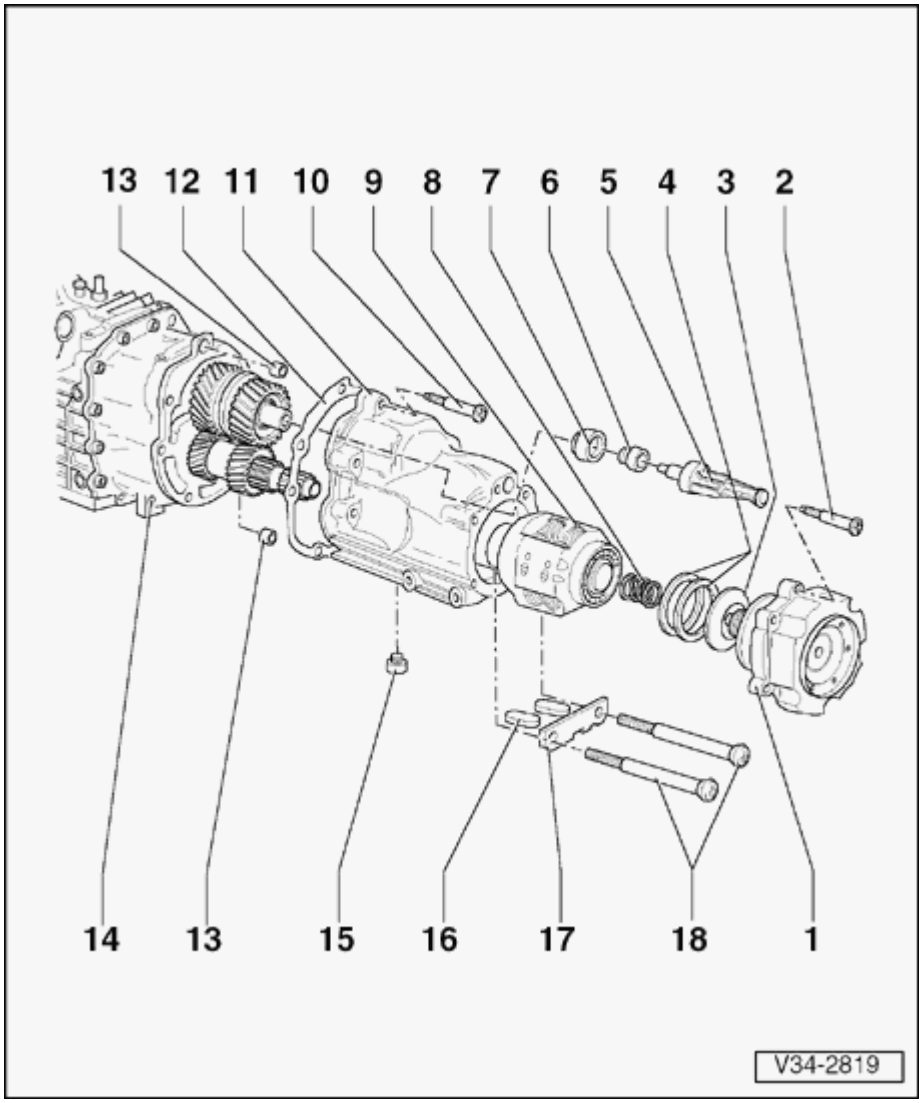


Fig. 141: Bearing Housing, Torsen Differential And End Cover, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

10 - Bolt, 25 Nm

- 5 pieces

11 - End cover

- Servicing. Refer to **End cover, servicing**

12 - Gasket

- Always replace

13 - Dowel sleeve

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- 2 pieces

14 - Manual transmission

- Removing and installing 5th and 6th gear. Refer to **5th and 6th gear, removing and installing**
- Removing and installing input shaft, drive pinion, hollow shaft and shift mechanism in transmission. Refer to **Input shaft, drive pinion, hollow shaft and shift lever mechanism in transmission, removing and installing**

15 - Oil drain plug, 40 Nm

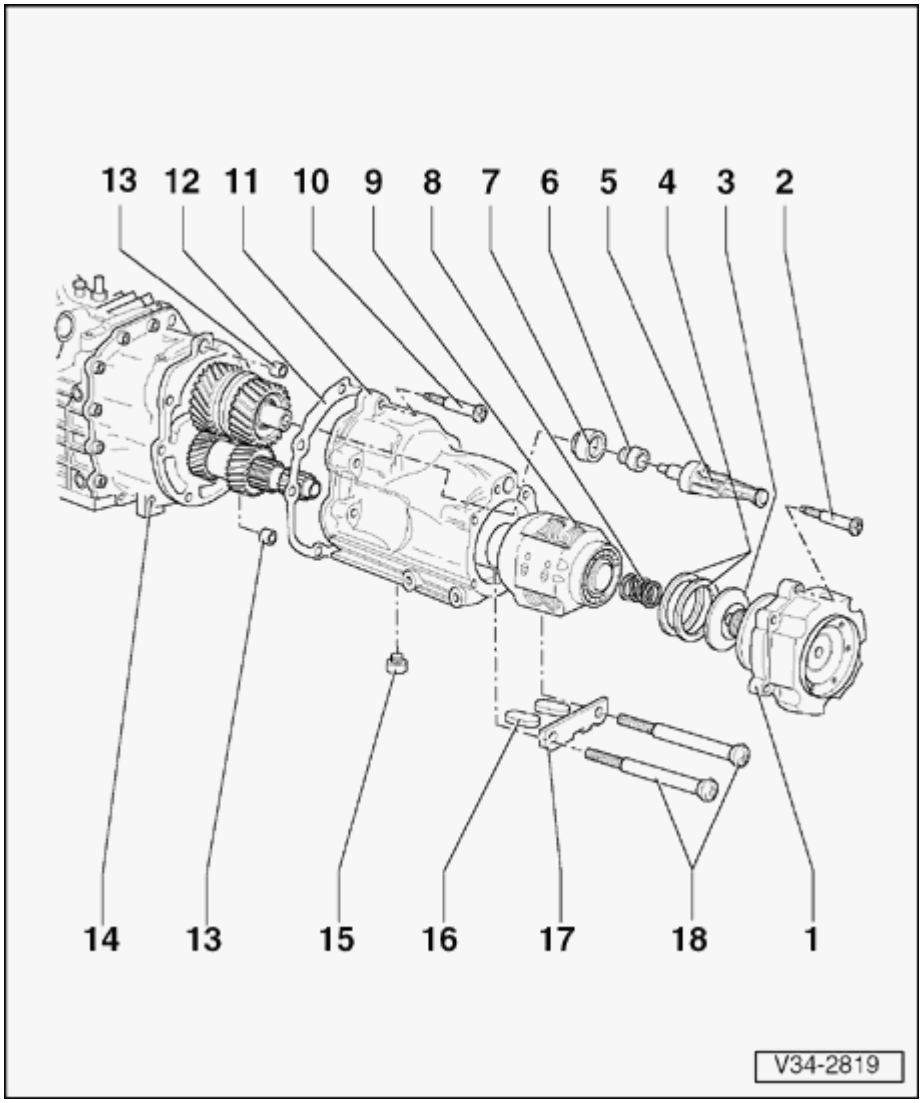


Fig. 142: Bearing Housing, Torsen Differential And End Cover, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

16 - Solenoid

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- 2 pieces
- Clean

17 - Supporting plate

- Installation position: Lug faces magnet

18 - Bolt, 25 Nm

- 2 pieces

Manual transmission and selector shaft, removing and installing

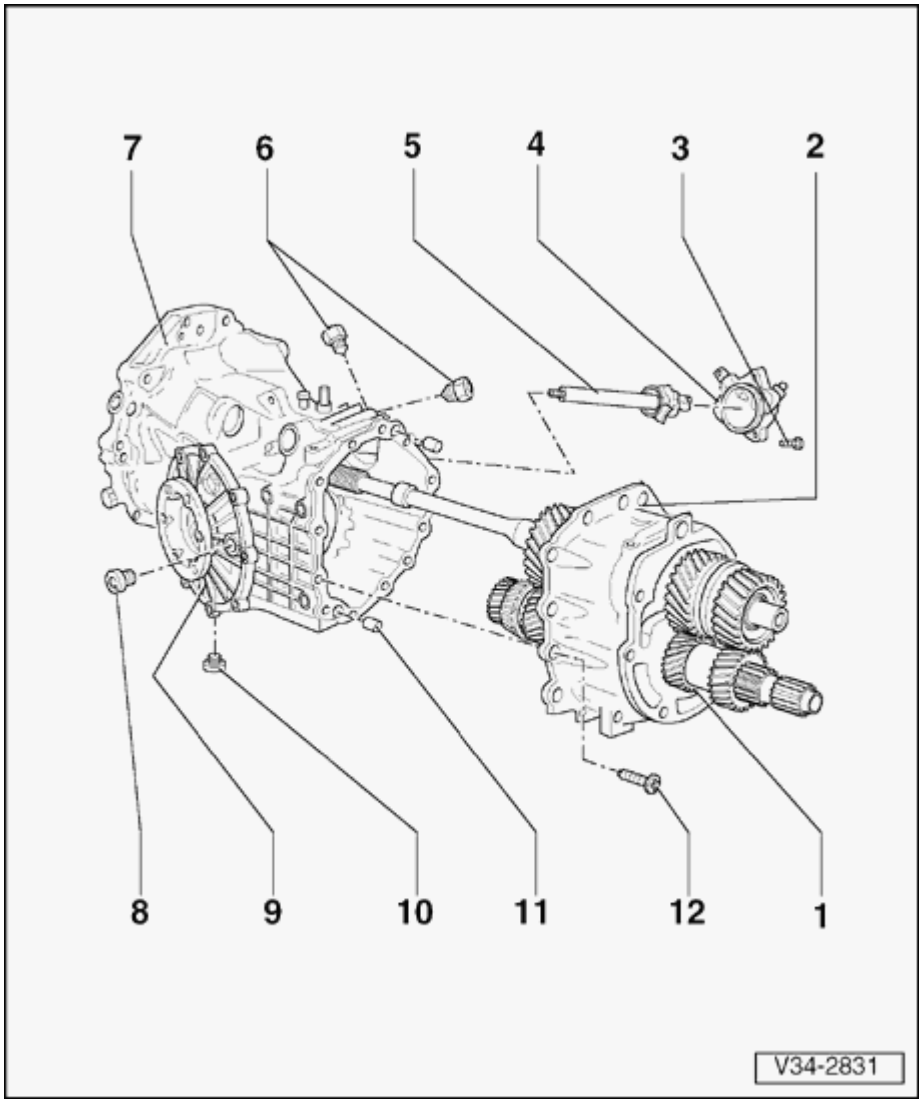


Fig. 143: Manual Transmission And Selector Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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1 - 5th and 6th gear

- Transmission remains flanged to transmission housing
- Removing and installing. Refer to **5th and 6th gear, removing and installing**

2 - Manual transmission

- Removing and installing input shaft, drive pinion, hollow shaft and shift mechanism in transmission. Refer to **Input shaft, drive pinion, hollow shaft and shift lever mechanism in transmission, removing and installing**

3 - Bolt, 25 Nm

- 3 pieces
- Inserted with sealing paste AMV 188 001 02

4 - Cover for selector shaft

- Removing. Refer to **Fig. 164**
- Installing. Refer to **Fig. 212**

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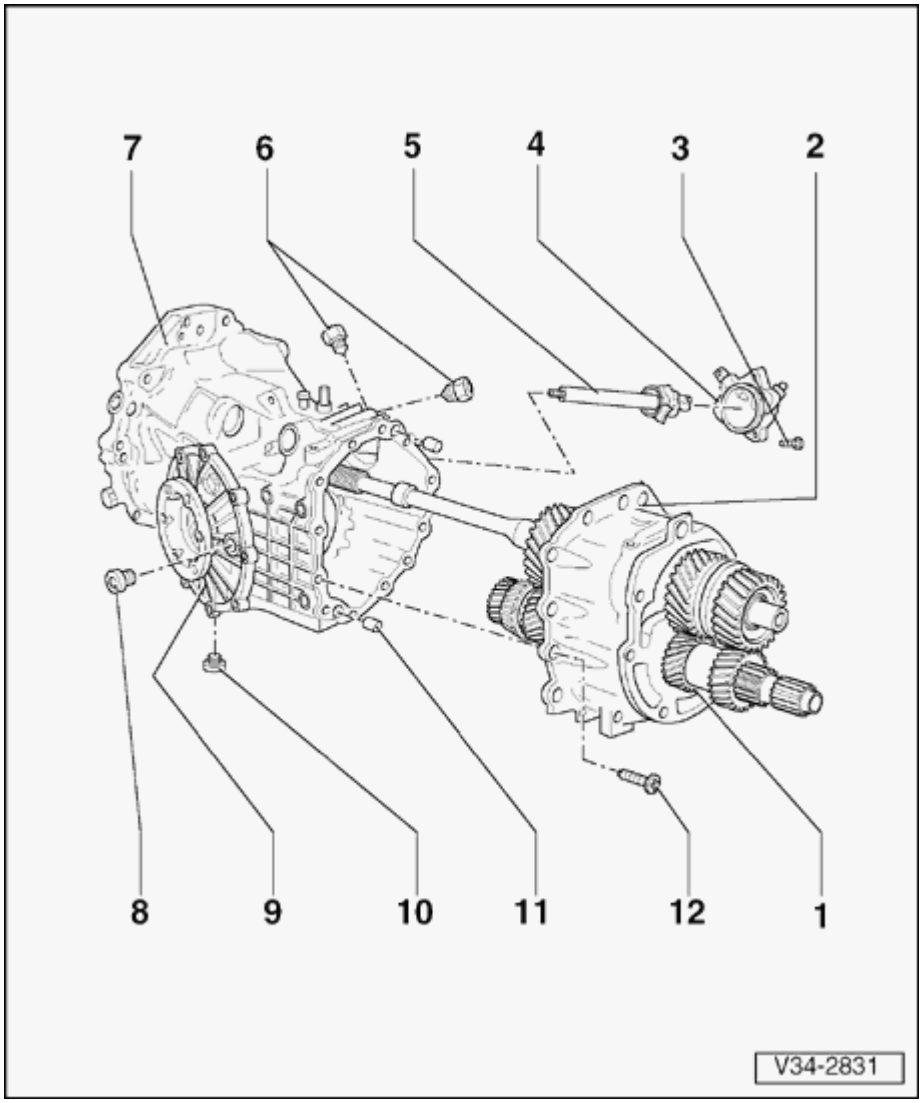


Fig. 144: Manual Transmission And Selector Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Selector shaft with selector cylinder

- Removing. Refer to **Fig. 164**
- Installing. Refer to **Fig. 212**
- Disassembling and assembling. Refer to **Selector shaft, disassembling and assembling**

6 - Locking bolt, 50 Nm

- 4 pieces
- Insert with sealing paste AMV 188 001 02

7 - Transmission housing

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- Servicing. Refer to **Transmission housing, servicing**

8 - Oil filler plug, 40 Nm

9 - Differential

- Covered by final drive cover.
- Removing and installing. Refer to **Differential, removing and installing**

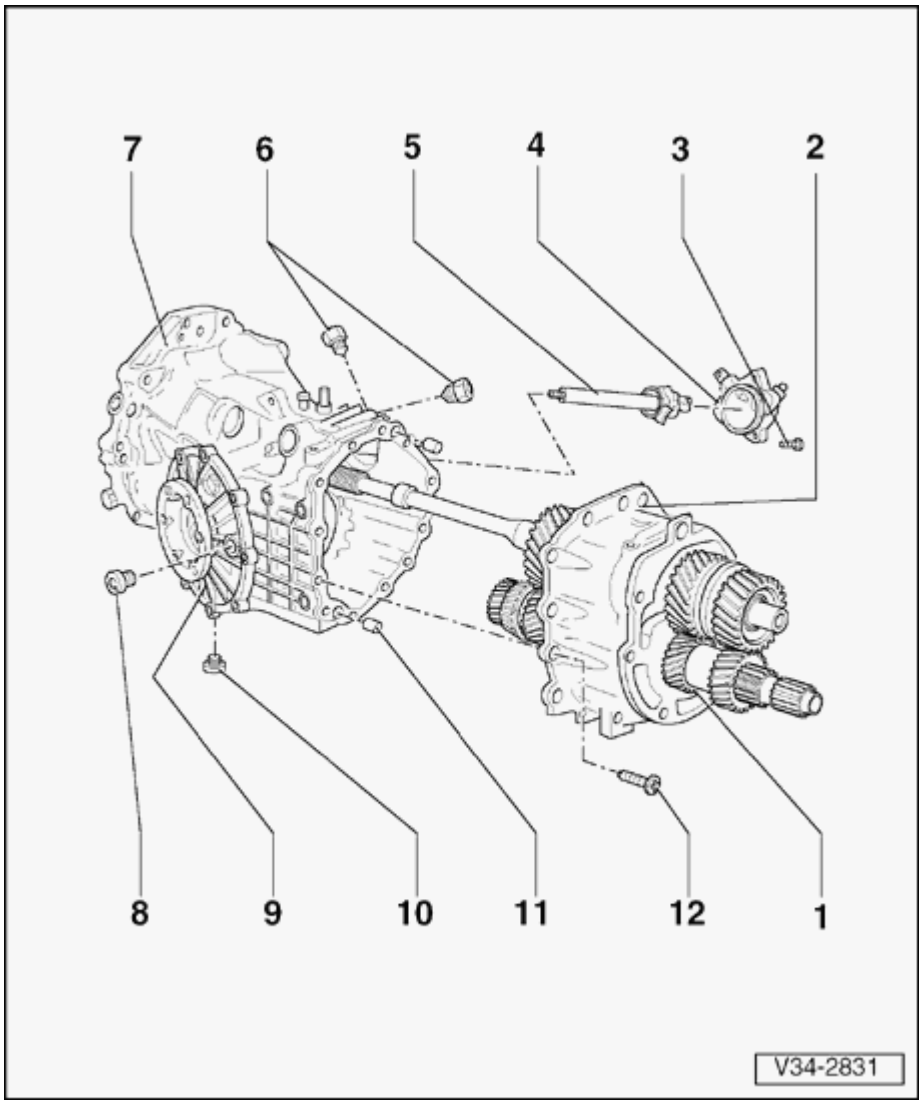


Fig. 145: Manual Transmission And Selector Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

10 - Oil drain plug, 40 Nm

11 - Dowel sleeve

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- 2 pieces

12 - Bolt, 25 Nm

- 12 pieces

5th and 6th gear, removing and installing

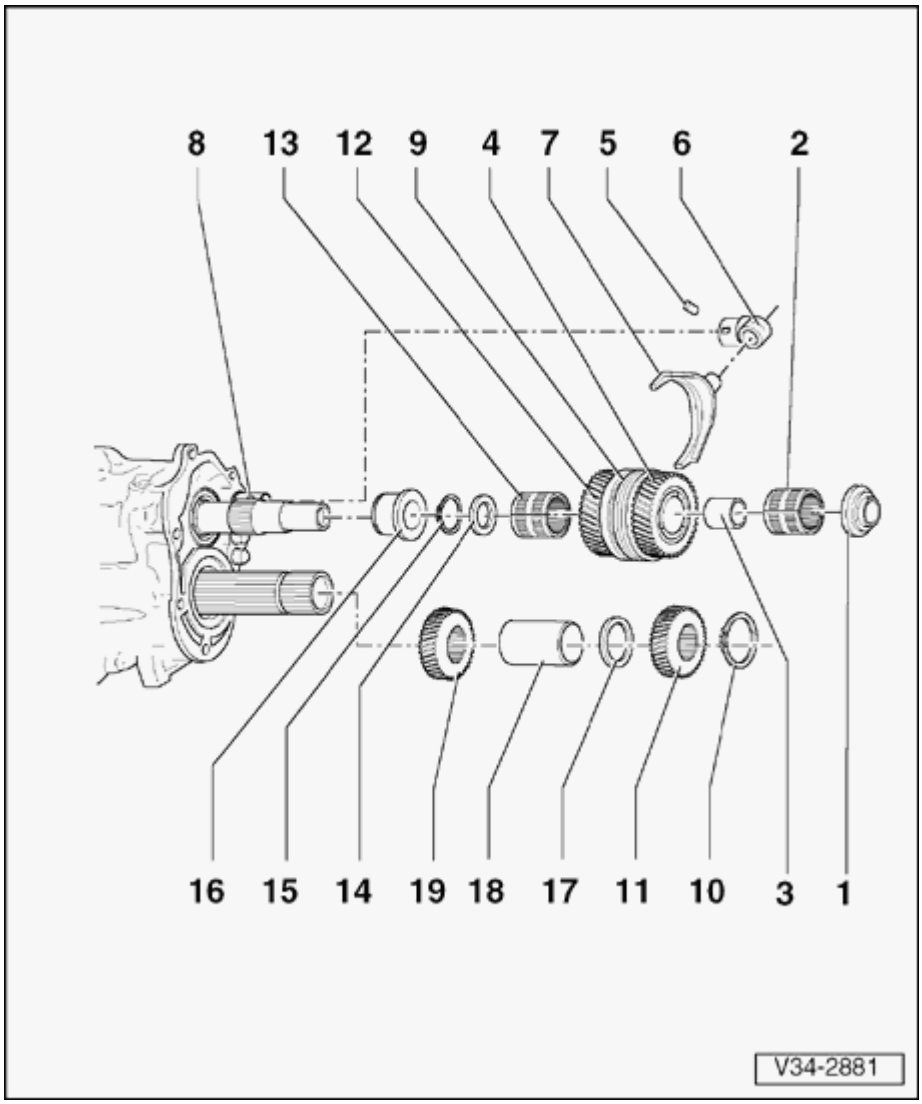


Fig. 146: 5Th And 6Th Gear, Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 1st inner race for four-point bearing

- Pulling off. Refer to **Fig. 169**
- Driving on. Refer to **Fig. 204**

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2 - Needle bearing for 5th gear

3 - Inner race for 5th sliding gear

- Pulling off. Refer to **Fig. 174**
- Driving on. Refer to **Fig. 203**

4 - 5th sliding gear

- Pulling off. Refer to **Fig. 169**
- Installing. Refer to **Fig. 203**

5 - Spring pin

- Pressing out. Refer to **Fig. 171**
- Pressing in. Refer to **Fig. 198**

6 - Follower for 5th and 6th gear

- Only replace complete with selector rod for 5th and 6th gear -Item 8- **5th and 6th gear, removing and installing**
- Pulling off. Refer to **Fig. 174**

7 - Selector fork, 5th and 6th gear

- Can be replaced separately

8 - Selector rod for 5th and 6th gear

- Only replace complete with follower for 5th and 6th gear
- Removing. Refer to **Fig. 172**
- Installing. Refer to **Fig. 190**

9 - Locking collar/synchro-hub for 5th and 6th gear

- Removing. Refer to **Fig. 172**
- Installing. Refer to **Fig. 196**

10 - Circlip

- Re-determining thickness. Refer to **Fig. 202**

11 - 5th gear wheel

- Pulling off. Refer to **Fig. 170**

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- Driving on. Refer to **Fig. 201**

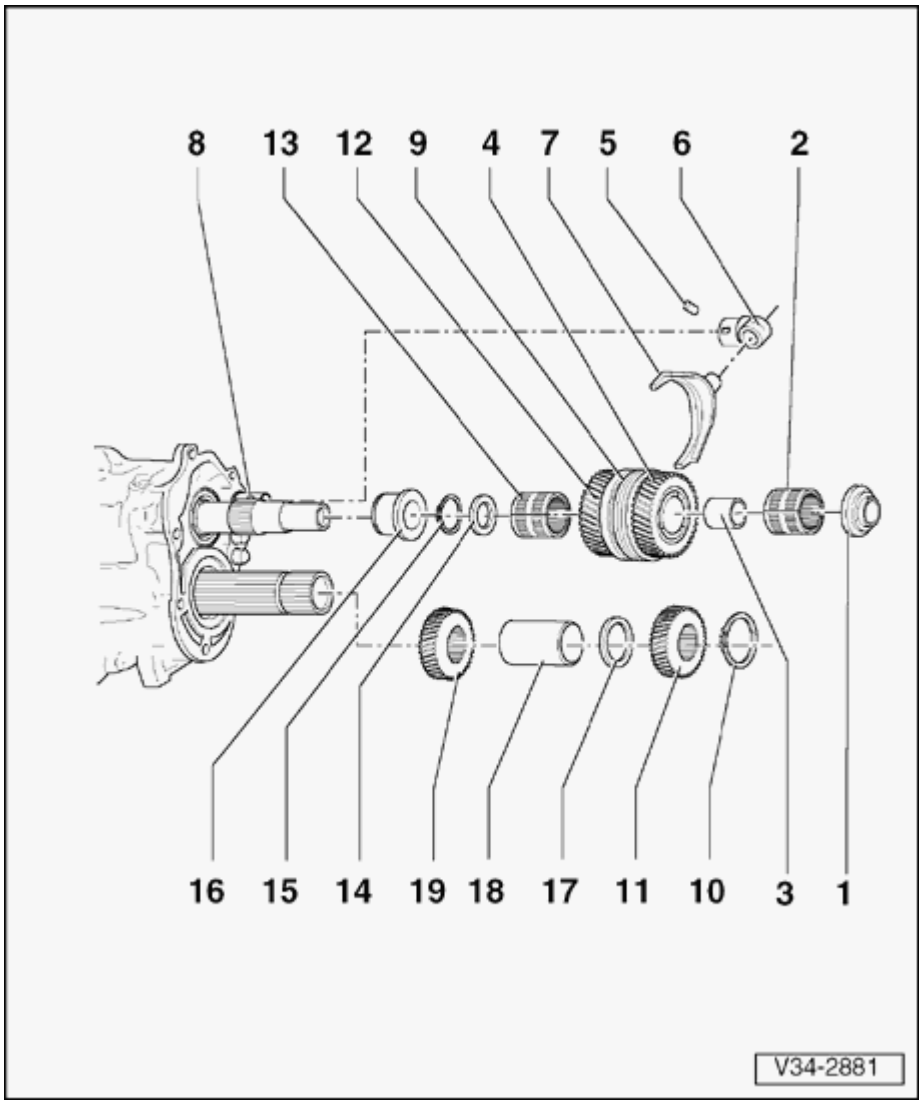


Fig. 147: 5Th And 6Th Gear, Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

12 - 6th sliding gear

- Pull off together with synchro-hub and inner race for 5th gear. Refer to **Fig. 174**

13 - Needle bearing

- For 6th gear

14 - Thrust washer

- For needle bearing for 6th sliding gear

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- Installation position: Grooves face circlip, smooth face contact surface toward needle bearing

15 - Circlip

16 - Inner race

- For cylinder roller bearing
- Remove by hand. Refer to **Fig. 178**

17 - Washer

- Re-determining thickness. Refer to **Fig. 199**

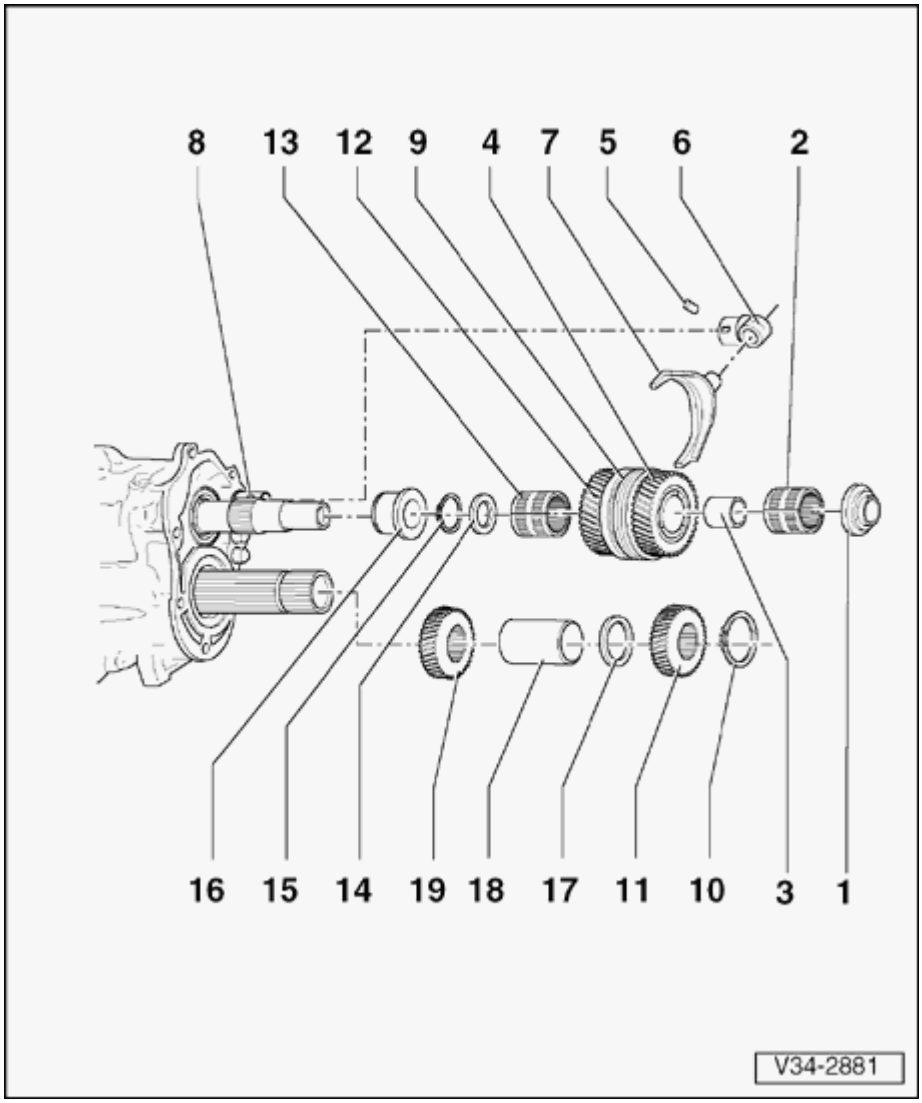


Fig. 148: 5Th And 6Th Gear, Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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18 - Spacer sleeve

- Length 39.6 mm

19 - 6th gear wheel

- To press off, remove bearing plate. Refer to **Fig. 176**
- Pressing off. Refer to **Fig. 182**
- Pressing on. Refer to **Assembling**

Input shaft, drive pinion, hollow shaft and shift lever mechanism in transmission, removing and installing

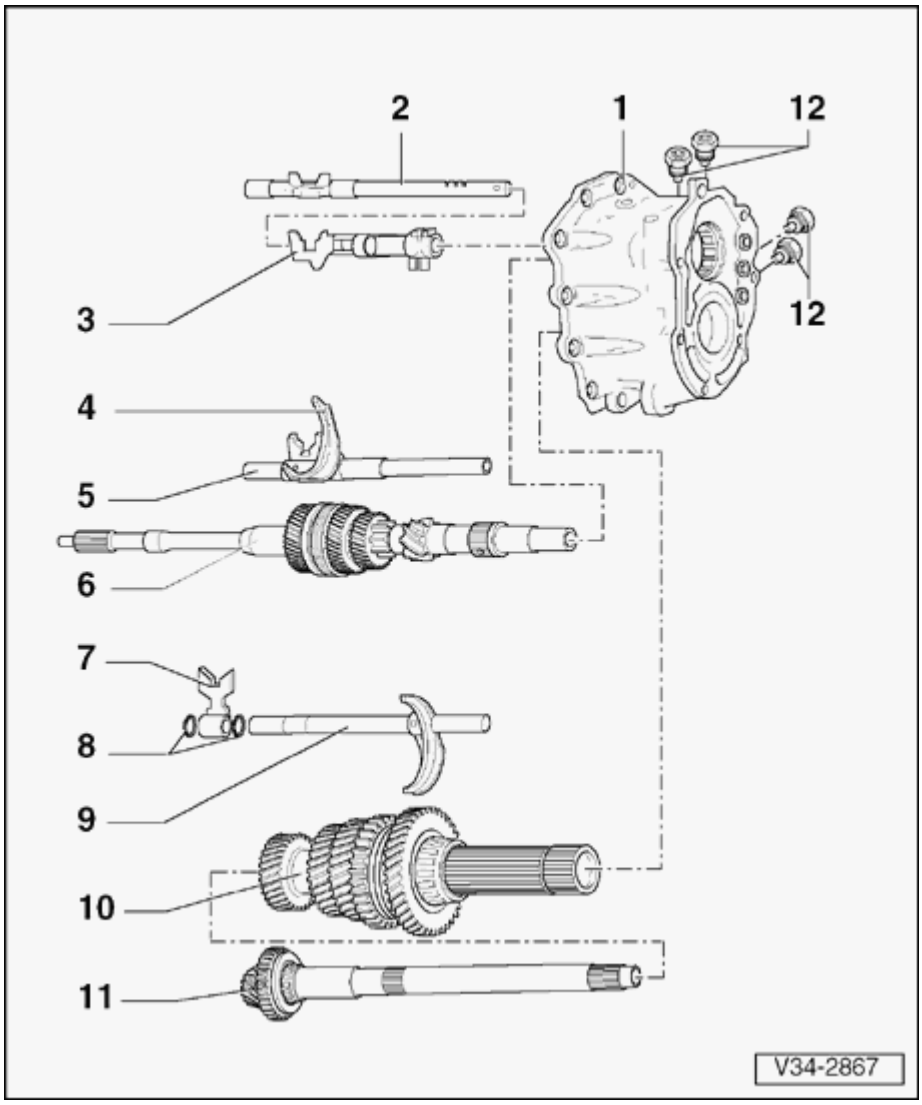


Fig. 149: Input Shaft, Pinion, Hollow Shaft And Selector Mechanism (Transmission Side), Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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1 - Bearing plate

- Servicing. Refer to **Bearing plate, servicing**

2 - Selector rod for 5th and 6th gear

- Only replace complete with follower for 5th and 6th gear. Refer to **5th and 6th gear, removing and installing**, Item 6

3 - Follower for reverse gear

- Pulling out ball housing. Refer to **Pulling ball sleeve out of follower for reverse gear**
- Driving in ball housing. Refer to **Driving ball sleeve flush into follower for reverse gear**

4 - Selector fork, 3rd and 4th gear

- Can be replaced separately.
- Installation position: Rib toward follower

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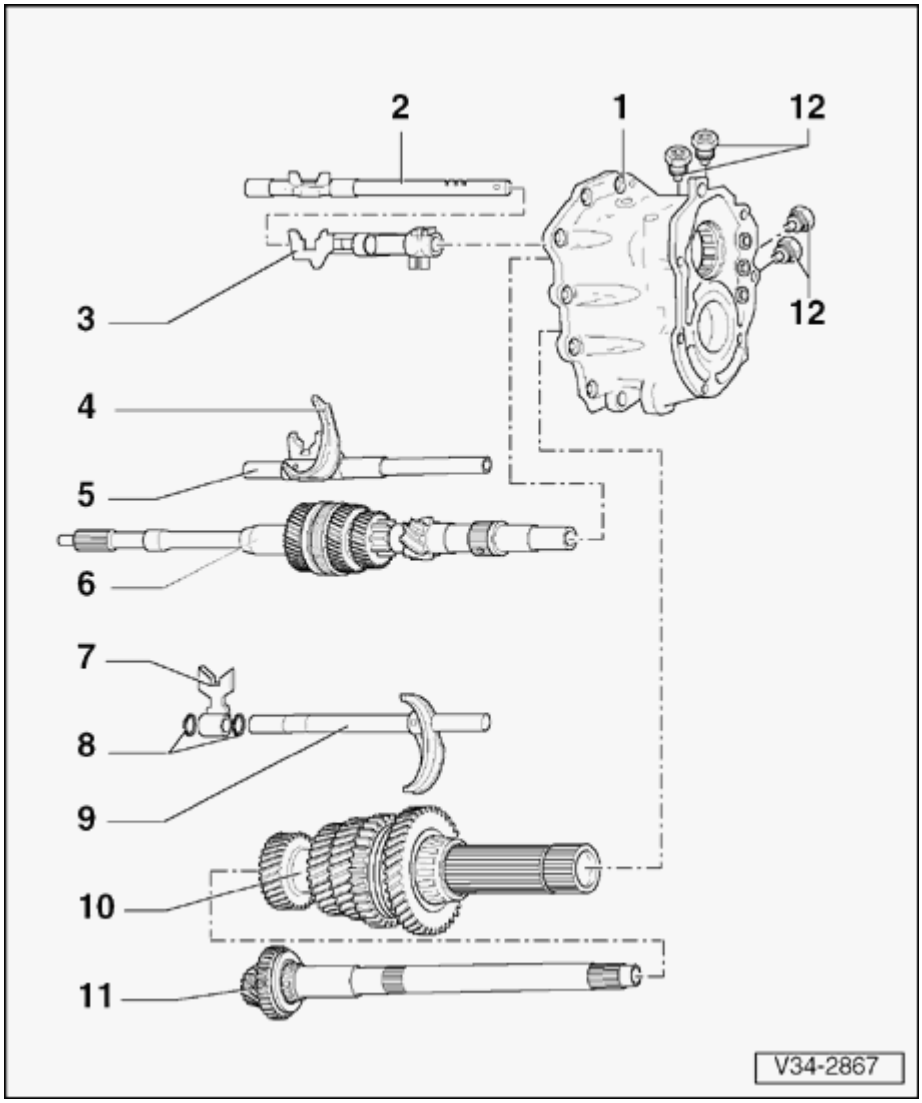


Fig. 150: Input Shaft, Pinion, Hollow Shaft And Selector Mechanism (Transmission Side), Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Selector rod for 3rd and 4th gear

- Only replace complete with follower for 3rd and 4th gear

6 - Input shaft

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

7 - Follower for 1st and 2nd gear

- Can be replaced separately.

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8 - Circlip

- 2 pieces

9 - Selector rod for 1st and 2nd gear

- Only replace complete with pinned selector fork for 1st and 2nd gear

10 - Hollow shaft

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

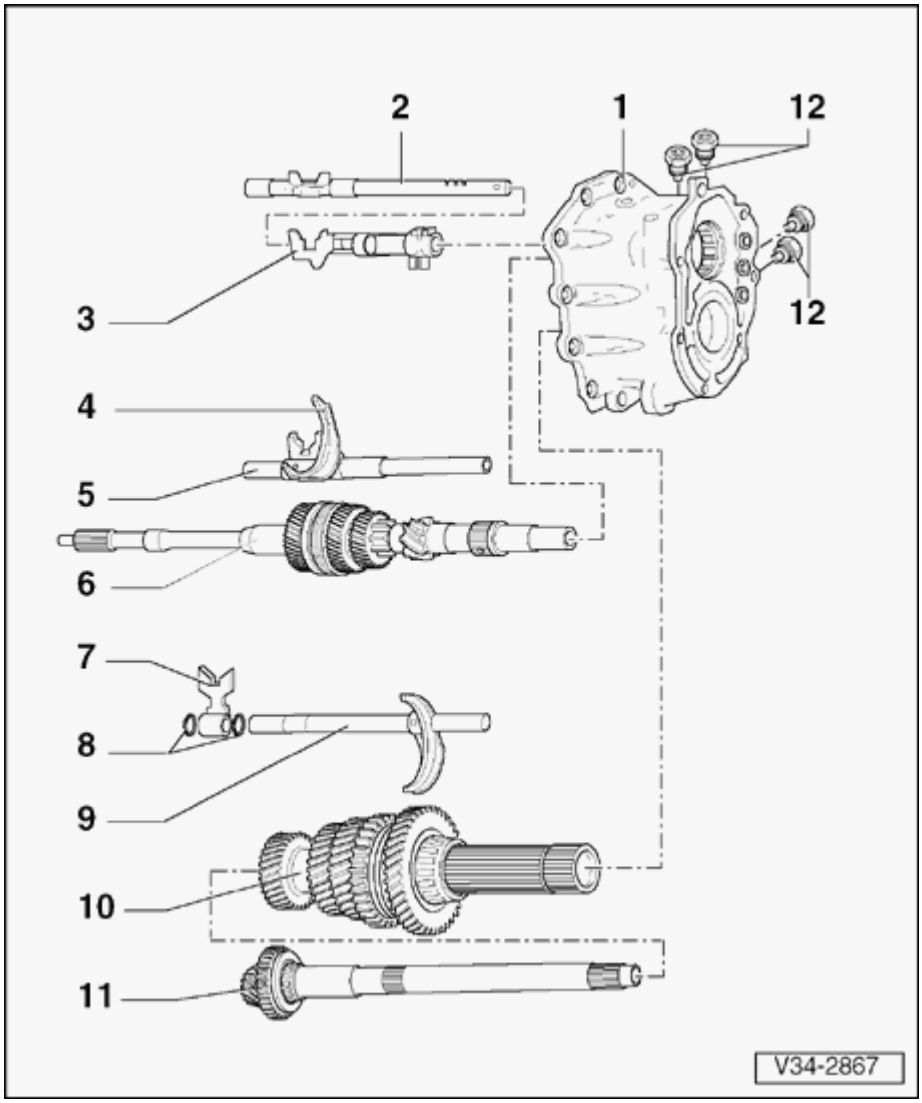


Fig. 151: Input Shaft, Pinion, Hollow Shaft And Selector Mechanism (Transmission Side), Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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11 - Pinion shaft

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

12 - Locking bolt, 50 Nm

- 4 pieces
- Insert with sealing paste AMV 188 001 02

Assembly sequence

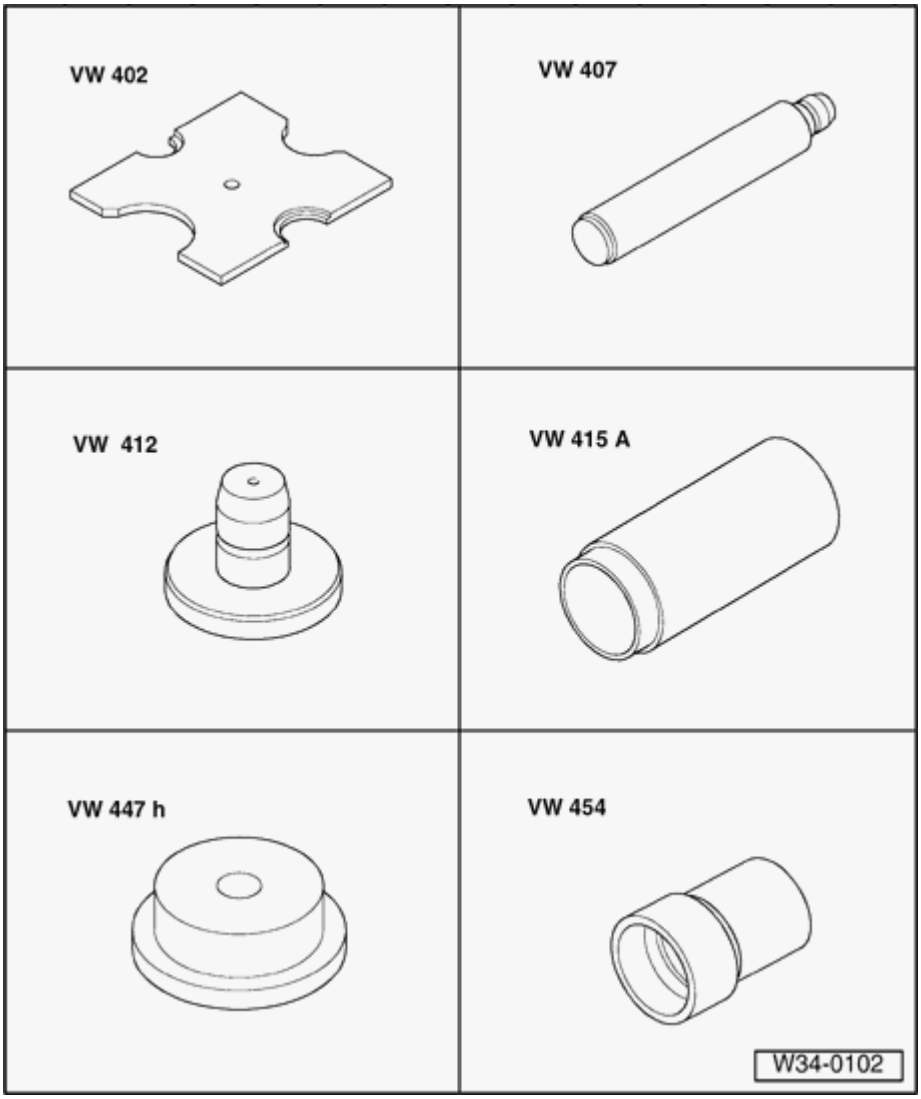


Fig. 152: Identifying Special Tools - Bearing Housing, Torsen Differential, End Cover, Selector Mechanism, Assembly Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing and installing bearing housing, Torsen differential, end cover, shift lever mechanism in

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transmission, input shaft, drive pinion and hollow shaft

Special tools and equipment

- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 412 Thrust tool
- VW 415 A Tube
- VW 447 H Thrust plate
- VW 454 Thrust pad

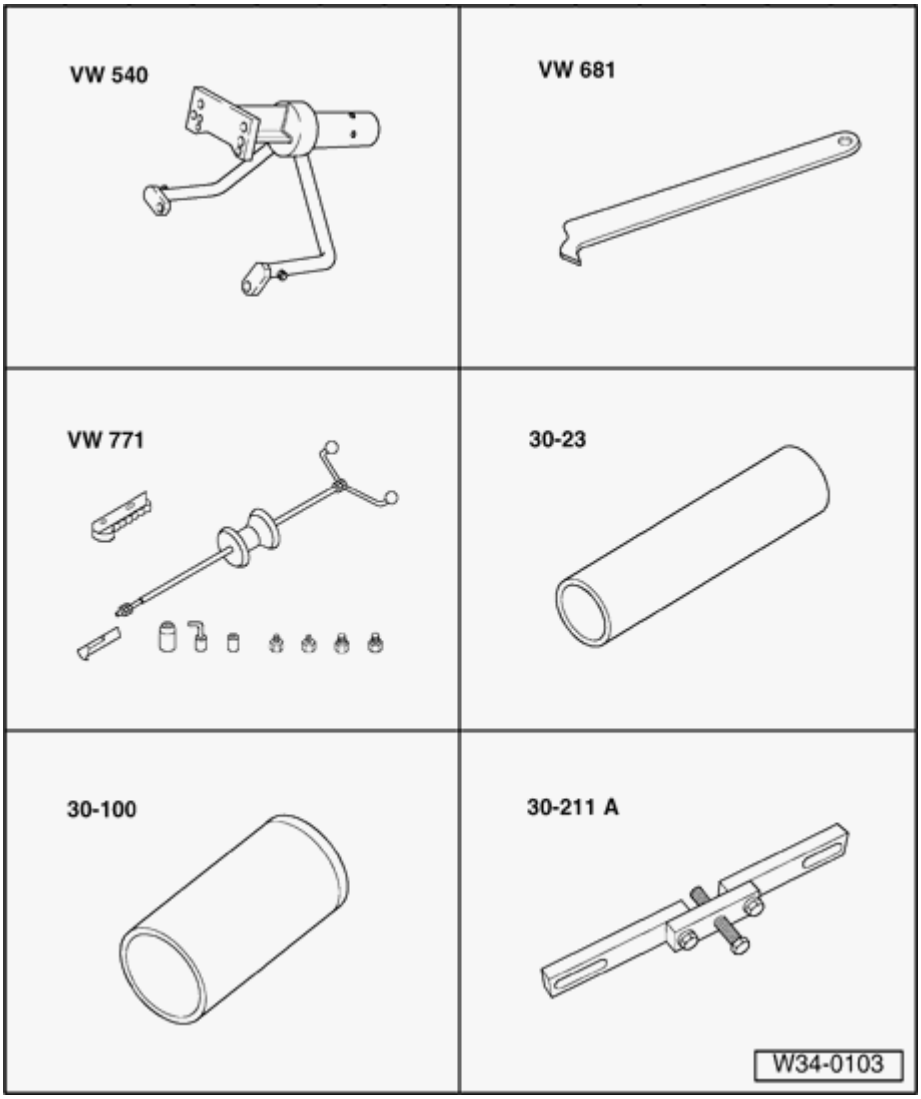


Fig. 153: Identifying Special Tools - Bearing Housing, Torsen Differential, End Cover, Selector Mechanism, Assembly Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- VW 540 Engine and transmission support
- VW 681 Seal extractor
- VW 771 Multi-purpose tool
- 30-23 Extension
- 30-100 Thrust sleeve
- 30-211 A Support bridge

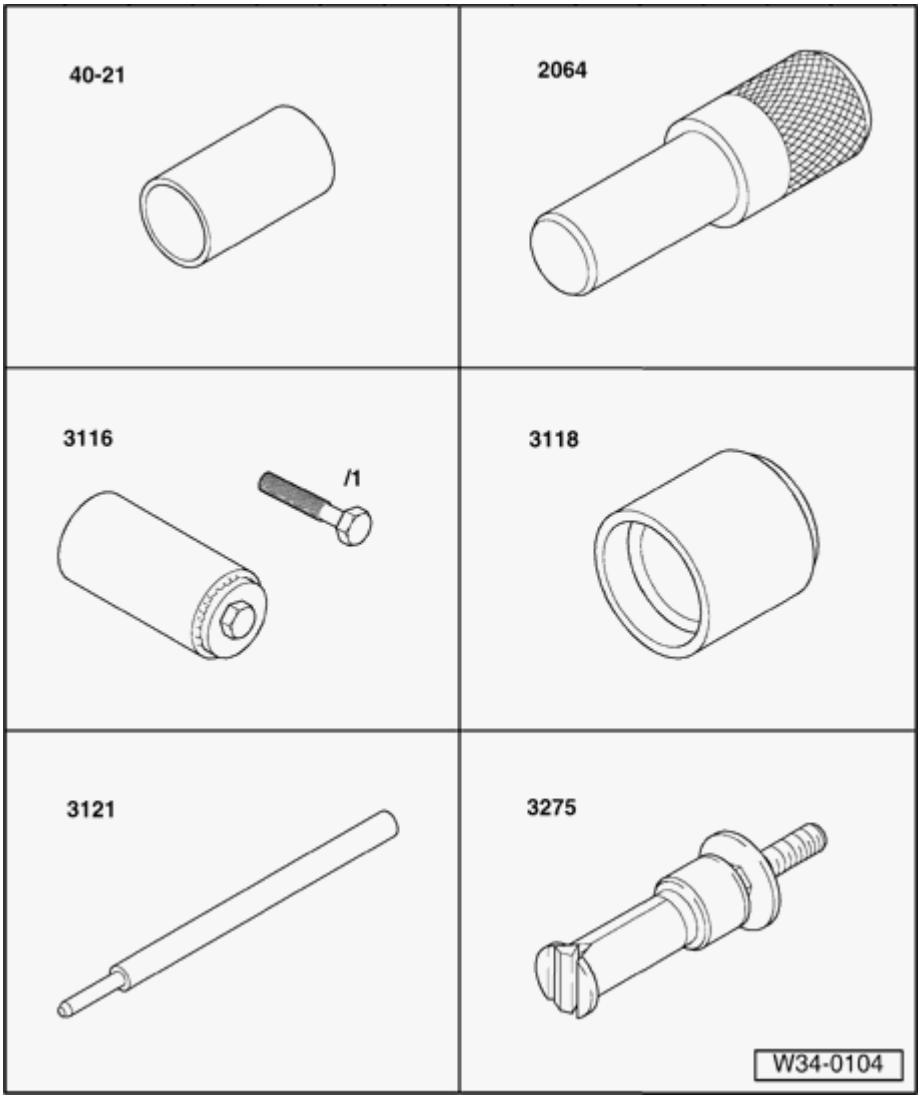


Fig. 154: Identifying Special Tools - Bearing Housing, Torsen Differential, End Cover, Selector Mechanism, Assembly Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 40-21 Thrust sleeve
- 2064 Setting pin
- 3116 Spring pin

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- 3118 Thrust piece
- 3121 Drift
- 3275 Internal puller

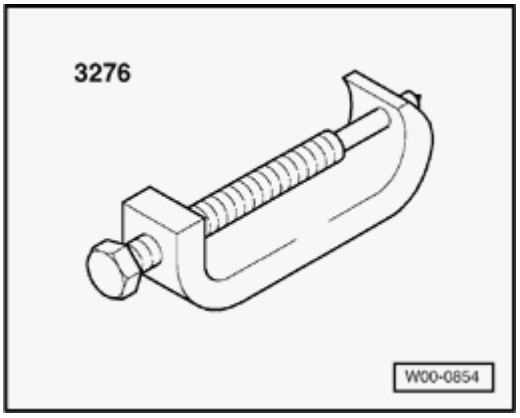


Fig. 155: Pressure Device 3276
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressure device 3276

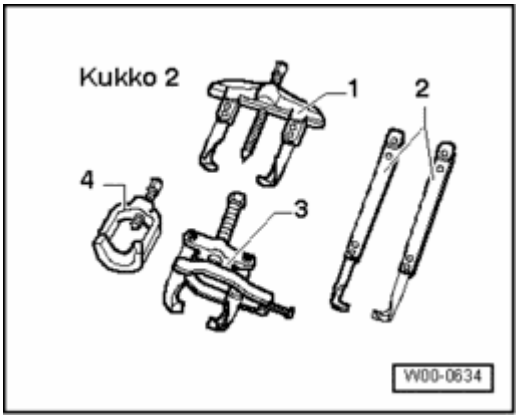


Fig. 156: Identifying Special Tools - Kukko 20/10 Puller Set
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - 2-Arm puller Kukko 20/10
- 2 - Puller hooks V/170
- Container
- Depth gauge

Disassembling

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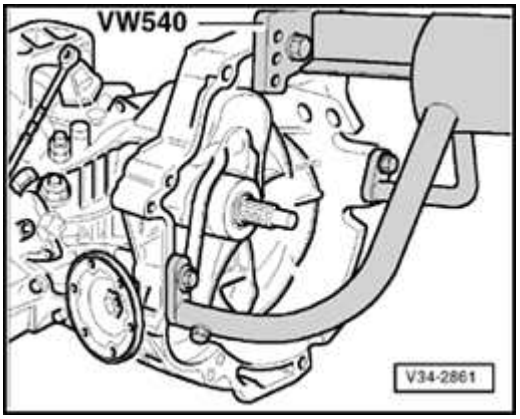


Fig. 157: Transmission In Assembly Fixture
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp transmission in VW 540 holding fixture.
- Place container under the transmission.
- Drain gear oil.

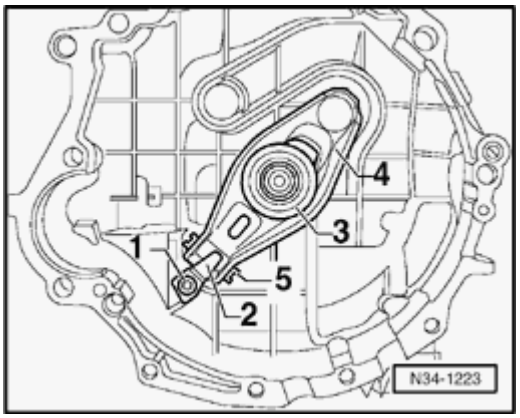


Fig. 158: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Screw out bolts -1- and detach leaf spring -2-.
- Remove clutch release lever -4- together with release bearing -3- and intermediate piece -5-.
- Unbolt guide sleeve.

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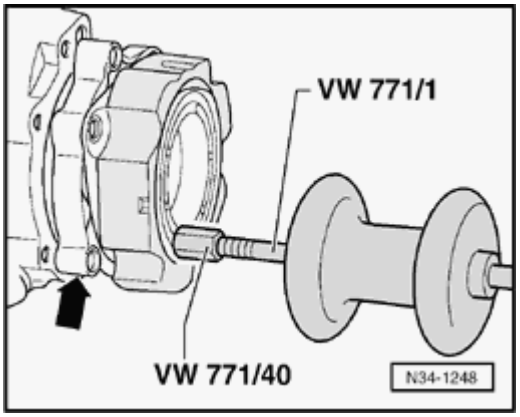


Fig. 159: Unbolt Bearing Housing And Pull Off
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew bearing housing -arrow- and pull off.

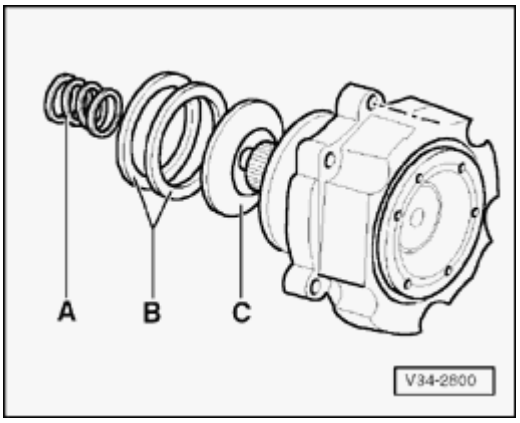


Fig. 160: Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Bearing housing is pushed away slightly from end cover by coil spring -A- when it is being pulled off.

- When detaching bearing housing, observe installation position of dished washer -C-.
- Installation position: Outside diameter (concave side) facing shims -B-
- Remove shims -B-, note thickness and re-determine if necessary. Refer to **Fig. 213**.

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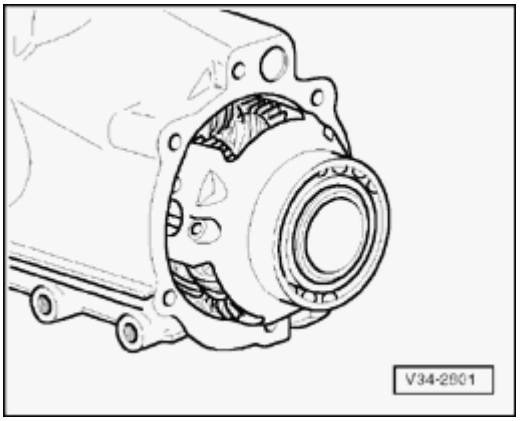


Fig. 161: Identifying Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull Torsen differential out of end cover.

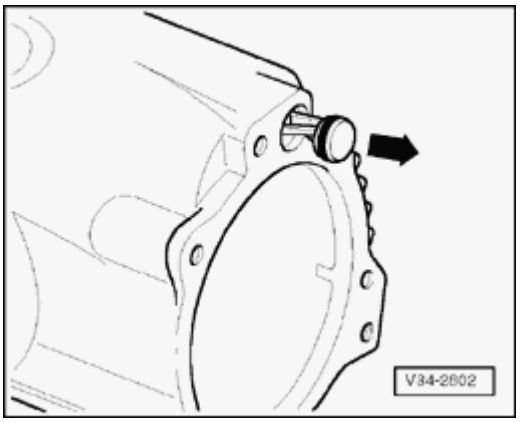


Fig. 162: Identifying Oil Diverter At End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull oil collector sufficiently far out of end cover -arrow- until it moves freely.

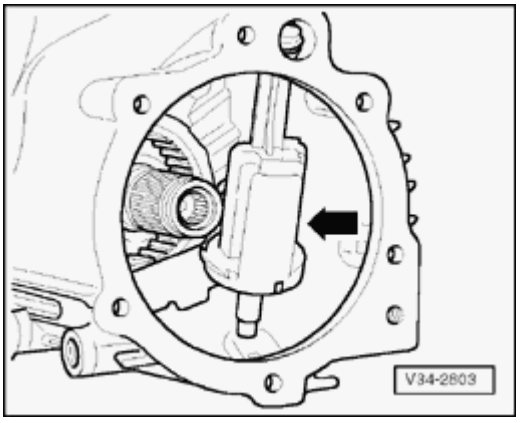


Fig. 163: Removing Oil Diverter Out End Cover Hole
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Swivel oil collector -arrow- down and guide it out through hole of end cover.
- Remove oil collector.

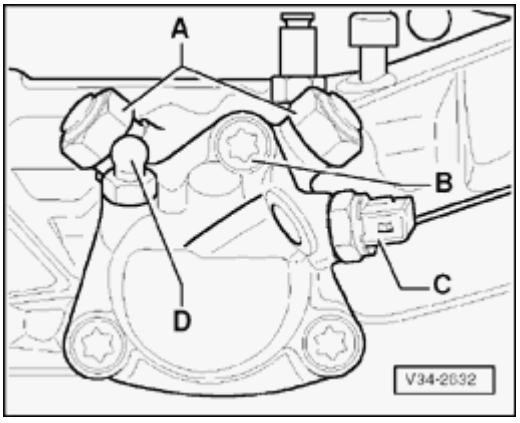


Fig. 164: Identifying Locking Bolts And Selector Shaft Cover & Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking bolts -A- for selector shaft from transmission housing.
- Remove 3 bolts -B- for cover for selector shaft, remove cover.
- Pull out selector shaft.

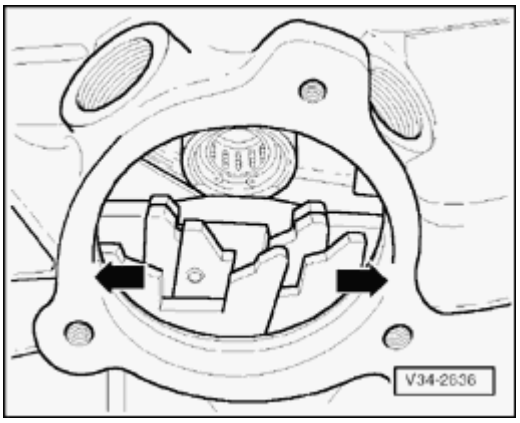


Fig. 165: Lock Input Shaft By Engaging 2 Gears (E.G. Reverse And 2nd Gear) By Moving 2 Selector Rails
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lock input shaft by engaging 2 gears (e.g. reverse and 2nd gear) do this by moving 2 selector plates -arrows-.

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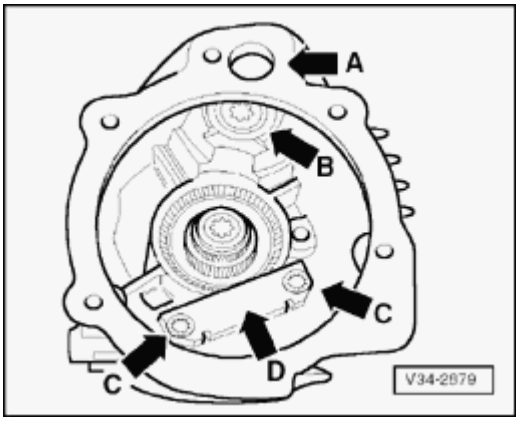


Fig. 166: Remove Support Plate For Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slacken multi-point socket head bolt -arrow B- in input shaft through hole -arrow A- in end cover and unscrew.
- Remove supporting plate.
- Remove supporting plate for needle bearing.

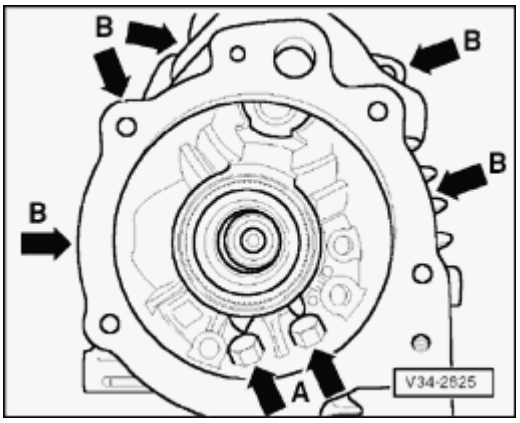


Fig. 167: Identifying Magnets -A - And End Cover Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 2 magnets -arrows A- and clean.
- Slacken 5 bolts -arrows B- for attaching end cover to manual transmission and remove.

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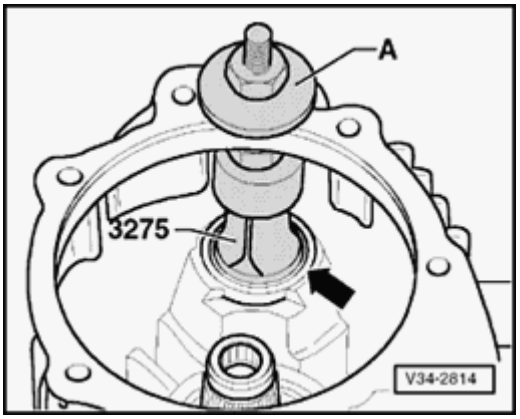


Fig. 168: Pull 2nd Inner Race For 4-Point Bearing (Roller Bearing Side) Off From Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 2nd inner race of four-point bearing (roller bearing side) for input shaft.

NOTE: Internal puller 3275 engages in a circular groove in the inner race when pulling off -arrow-.

- Remove end cover together with end cover/bearing plate gasket.
- Pull dowel sleeves out of bearing plate.

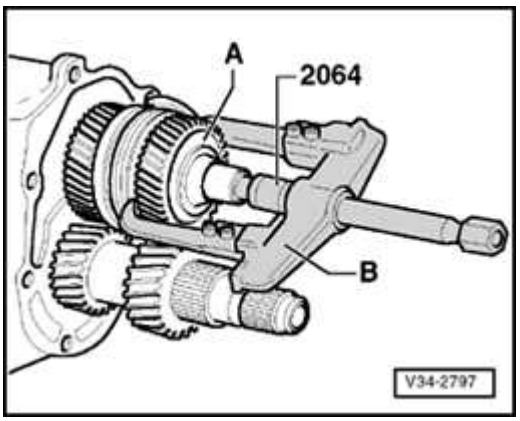


Fig. 169: Pulling Off Selector Gear For 5th Gear With Spring Together With 1st Inner Race For 4-Point Bearing (Ball Bearing Side) For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 5th sliding gear and spring together with 1st inner race -A- of four-point bearing (ball bearing side) for input shaft.

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

- Remove 5th gear synchro-ring.
- Remove circlip for 5th gear wheel.
- Lock hollow shaft in position by engaging two gears. Refer to **Fig. 165**

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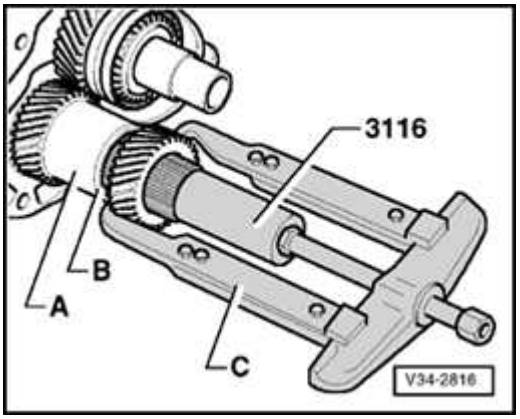


Fig. 170: Pull Off Drive Gear For 5th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 5th gear wheel.

NOTE: Only use hexagon bolt of spring sleeve 3116, length 50 mm

C - Two arm puller, e.g. Kukko 20/10 with 200 mm hooks

- Remove shim -B- for 5th gear wheel, note thickness and re-determine if necessary. Refer to **Fig. 199**.
- Remove spacer sleeve -A-.

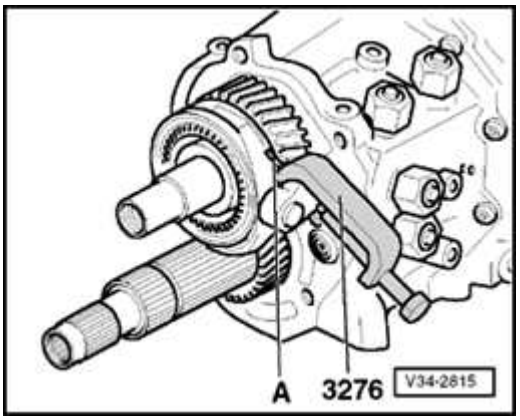


Fig. 171: Pressing Out Spring Pin For Selector Fork For 5th and 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press out spring pin -A- for selector fork for 5th and 6th gear.

NOTE:

- **Do not damage synchro-ring for 6th gear when pressing out spring pin.**
- **Do not drive out spring pin, otherwise selector rod bearing will be damaged.**

- Pull selector rod on follower together with selector fork for 5th and 6th gear and locking collar as far as

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possible away from bearing plate (until stop is felt).

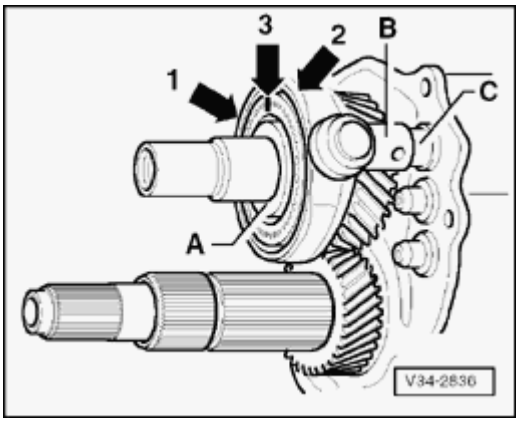


Fig. 172: Alignment Marks On, Locking Collar For 5th and 6th Gear And Synchronizer Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark relative positions -arrow 3- of locking collar for 5th and 6th gears -arrow 1- and synchro-hub -A- (paired) -arrow 1-.

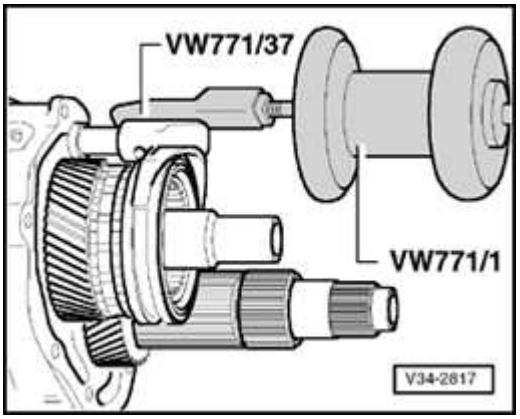


Fig. 173: Pulling Off Yoke Together With Selector Fork And Locking Collar From Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull follower together with selector fork and locking collar off selector rod.

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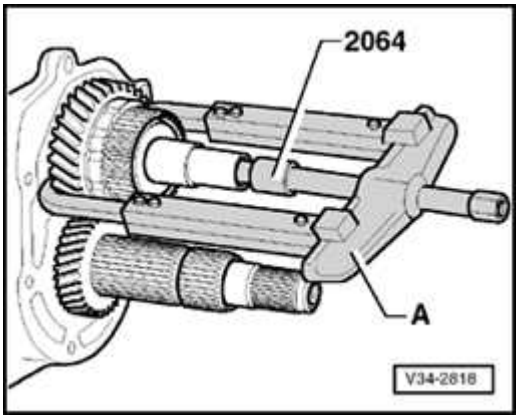


Fig. 174: Pull Off 6th Gear Selector Gear, 6th Gear Synchronizer Ring, 5th And 6th Gear Synchronizer Hub And Needle Bearing Inner Race For 5th Gear Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 6th sliding gear, synchro-ring for 6th gear, synchro-hub for 5th and 6th gears and inner race for 5th sliding gear needle bearing.

A - Two-arm puller, e.g. Kukko 20/10 with 200 mm hooks

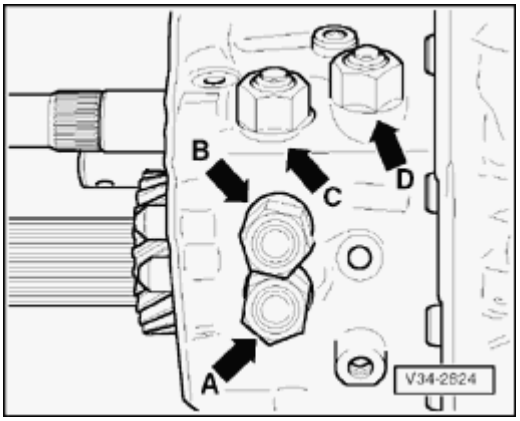


Fig. 175: Identifying Locking Bolts For Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew selector rod locking bolts.

A - 1st and 2nd gear

B - 3rd and 4th gear

C - 5th and 6th gear

D - Reverse gear

- Drive out dowel sleeves on bearing plate and remove bearing plate from transmission housing.

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- Secure drive pinion opposite hollow shaft e.g. with hose strap, to prevent it slipping out.
- Detach bearing plate with input shaft, drive pinion and hollow shaft and with shift lever mechanism in transmission from transmission housing.

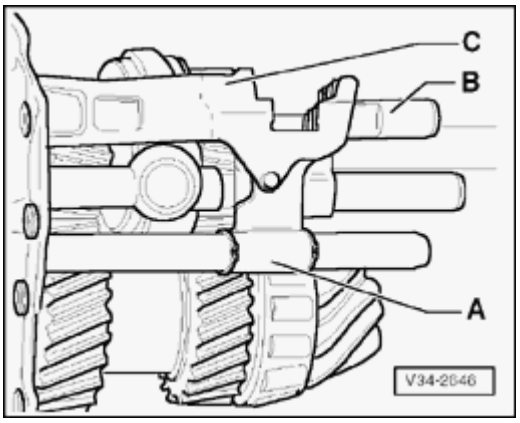


Fig. 176: Identifying Yoke, 5th and 6th Gear Selector Rod , and Reverse Gear Yoke
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip from selector rod for 1st and 2nd gear and remove follower -A-.
- Pull out selector rod -B- for 5th and 6th gear.
- Remove follower -C- for reverse gear.

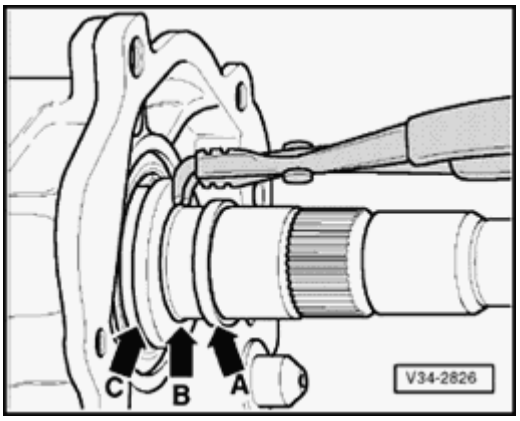


Fig. 177: Removing/Installing Inner Race For Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull thrust washer -arrow A- for needle bearing for 6th gear off shaft.
- Remove circlip -arrow B- for cylinder roller bearing inner race with pliers.
- Take out inner race -arrow C- for cylinder roller bearing (not a press fit).

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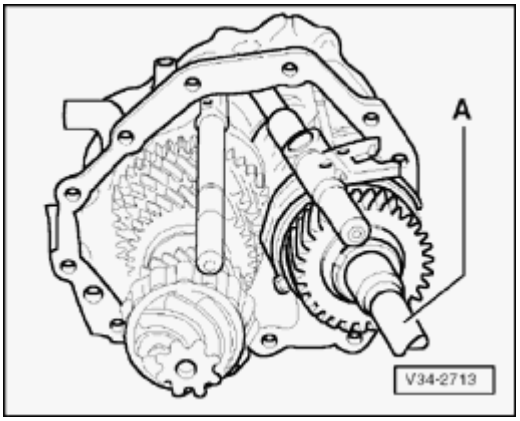


Fig. 178: Removing/Installing Input Shaft With 3rd and 4th Gear Selector Rod And Selector Fork
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Take input shaft -A- with selector rod and selector fork for 3rd and 4th gear out at an angle from bearing plate.

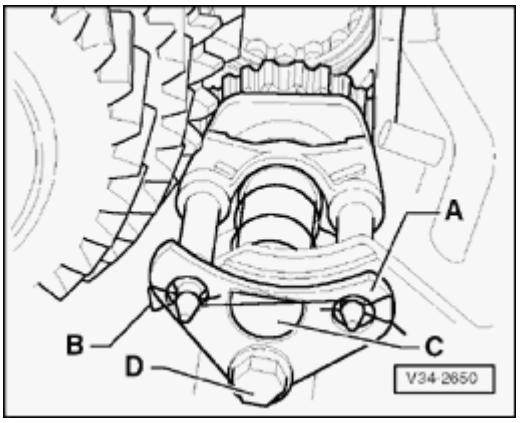


Fig. 179: Removing/Installing Reverse Gear Relay Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew hexagon bolt -D-, remove spring clasp -B- and retaining plate -A-, pull out shaft -C- for reverse idler gear.
- Take out spring, synchro-ring and reverse idler gear.
- Remove relay lever for reverse gear.

NOTE:

- **Drive pinion and hollow shaft can be removed complete if it is possible to easily lever off 6th gear wheel.**
- **If, however, it is necessary to press off 6th gear wheel, the drive pinion must be pulled out from hollow shaft.**

- Remove temporary locking element preventing drive pinion from slipping out.

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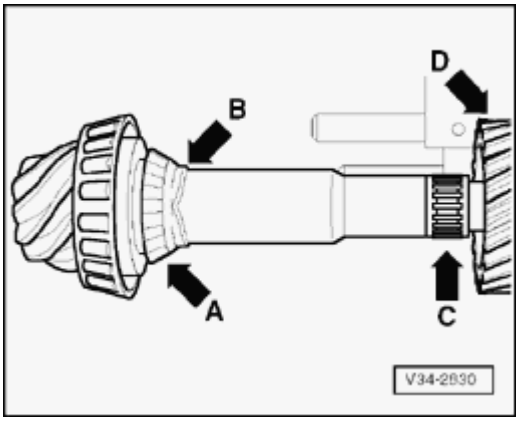


Fig. 180: Identifying Pinion, Hollow Shaft , Taper Rollers, Waved Washer And Needle Bearing Cage
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull drive pinion out of hollow shaft -D- collect taper rollers -A- (23 off) when carrying out this step.
- Remove corrugated spring -B- and needle roller assembly -C-.

NOTE: Carefully protect mount from contamination, clean if necessary.

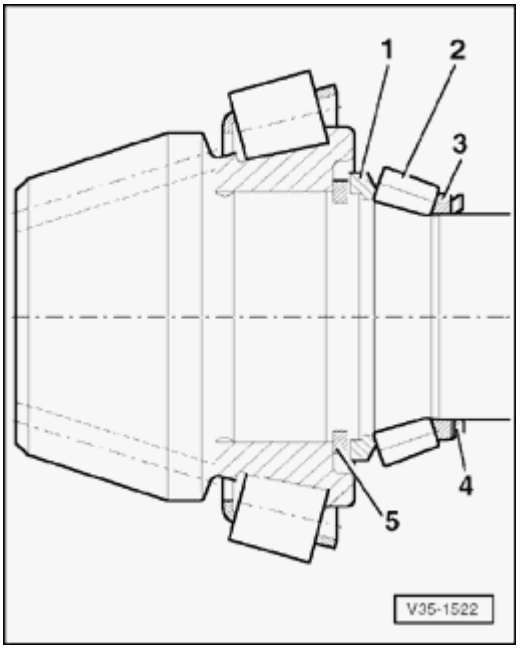


Fig. 181: Checking Pinion/Hollow Shaft Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check drive pinion/hollow shaft bearing.

1 - Flange ring (conical contact surface facing taper rollers)

2 - Taper rollers (23 off) with large diameter facing drive pinion head

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3 - Supporting ring (conical contact surface facing taper rollers)

4 - Corrugated spring

5 - Circlip for taper roller bearings for drive pinion

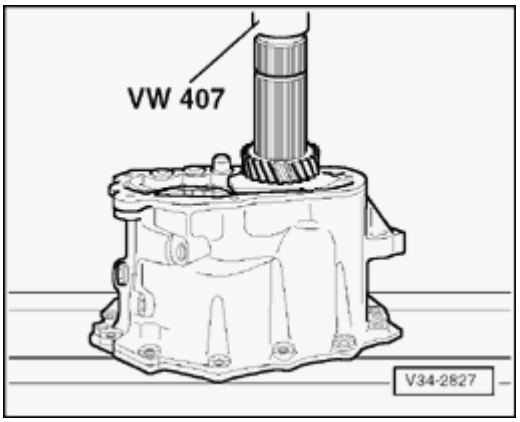


Fig. 182: Pressing Off Drive Gear For 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing off 6th gear wheel

NOTE: Because of the type of fit, it may be possible to press gear off easily.

- Remove hollow shaft or drive pinion and hollow shaft from bearing plate together with selector rod and selector fork for 1st and 2nd gears.

Assembling

- Install hollow shaft with selector fork and selector rod for 1st and 2nd gear (without follower) into bearing plate.

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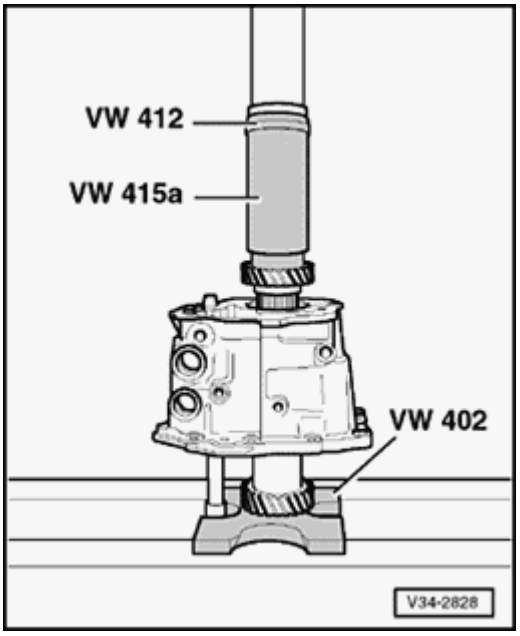


Fig. 183: Press On To Stop So That There Is No Play
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 6th gear to approx. 100 ° C and install.
- Installation position: Shoulder toward taper roller bearing

WARNING: Wear protective gloves!

- Press fully in until zero play.
- Insert taper roller bearing of drive pinion/hollow shaft with multi-purpose grease.
- Arrangement: Refer to **Fig. 181**

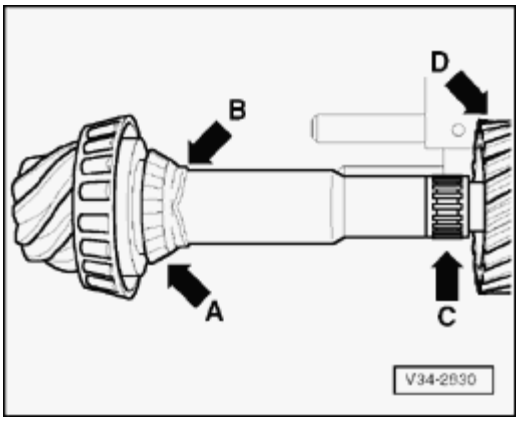


Fig. 184: Identifying Pinion, Hollow Shaft , Taper Rollers, Waved Washer And Needle Bearing Cage
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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A - Flange ring, taper roller (23 off) and supporting ring

B - Corrugated spring

C - Needle roller assembly

D - Hollow shaft

- Oil needle bearing well.
- Insert drive pinion into hollow shaft and secure with hose strap, to prevent it from slipping down.

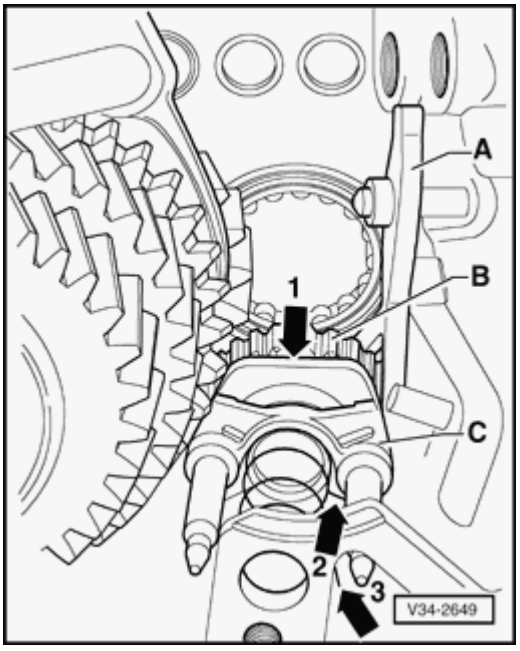


Fig. 185: Install Synchronizer Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install relay lever -A- for reverse gear over relay lever bolt. paying attention to pin (for limiting movement of relay lever relevant to synchro-ring).
- Insert reverse idler gear -B- and engage relay lever with groove on reverse idler gear.
- Insert synchro-ring -C-.

- Installation position: Position flat on synchro-ring circumference to face input shaft (not as yet installed) - arrow 1-.

- Insert spring.

- Installation position: Hook single angled end into recess on synchro-ring -arrow 2-. Turn double angled end anti-clockwise and insert into opening on bearing plate -arrow 3-.

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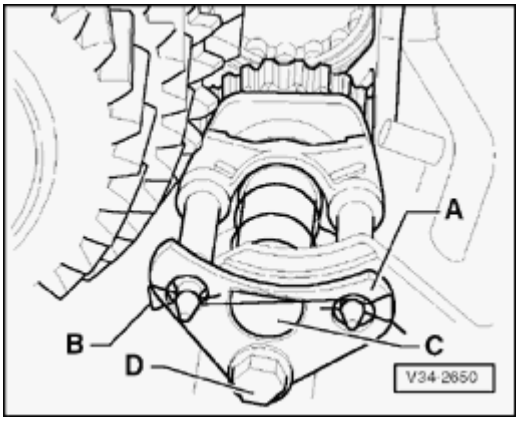


Fig. 186: Removing/Installing Reverse Gear Relay Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert shaft for reverse idler gear -C-.
- Install retaining plate -A-.

- Installation position: Chamfers of holes for locking pins of synchro-ring face bearing plate

- Insert spring clasp -B- into locking pins of synchro-ring.
- Replace self-locking nut -D- and tighten to 25 Nm.

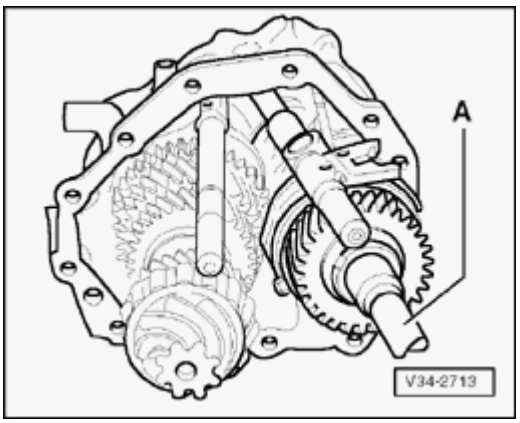


Fig. 187: Removing/Installing Input Shaft With 3rd and 4th Gear Selector Rod And Selector Fork
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide input shaft -A- with selector rod and selector fork for 3rd and 4th gear at an angle into bearing plate.

- Selector fork installation position: Rib toward follower. Refer to **Input shaft, drive pinion, hollow shaft and shift lever mechanism in transmission, removing and installing**, Item 4-

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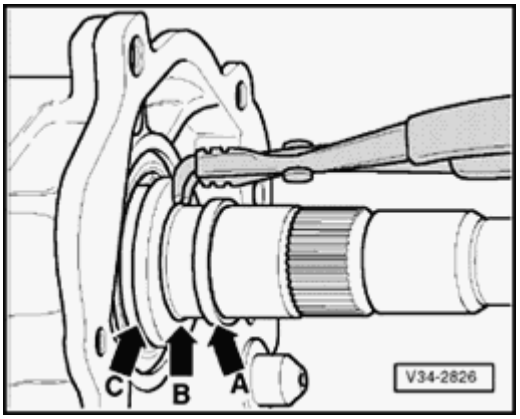


Fig. 188: Removing/Installing Inner Race For Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press inner race -arrow C- for cylinder roller bearing onto input shaft.
- Install circlip -arrow B- using pliers.

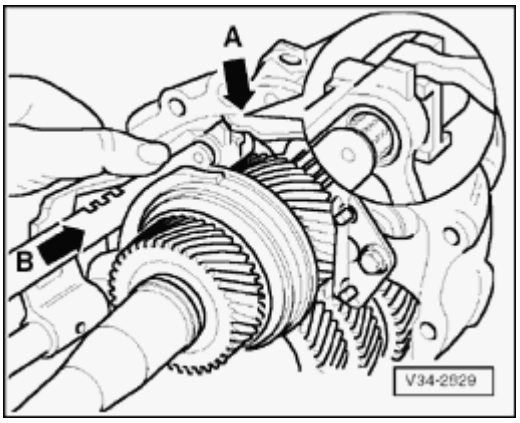
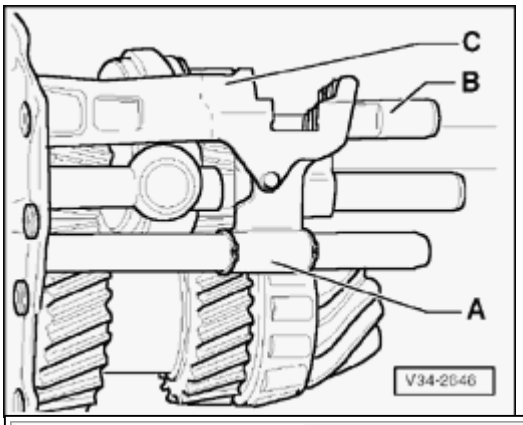


Fig. 189: Engage Free End Of Relay Lever Into Notch In Reverse Gear Yoke
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engage recess in follower for reverse gear with the free end of relay lever -arrow A-.
- Slide selector rod for 5th and 6th through follower for reverse gear in direction of -arrow B-.



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Fig. 190: Identifying Yoke, 5th and 6th Gear Selector Rod , and Reverse Gear Yoke
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide follower -A- for 1st and 2nd gear onto selector rod and secure with circlips.
- Lubricate selector rods and all bearings of input shaft and drive pinion in transmission housing and bearing plate with gear oil.

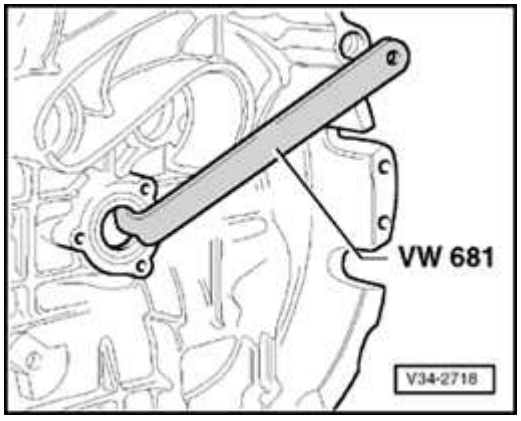


Fig. 191: Prying Input Shaft Seal Out Of Disassembled Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lever used input shaft seal carefully out of transmission housing with VW 681.
- Coat sealing surfaces between bearing plate and transmission housing with sealing paste AMV 188 001 02.
- Insert complete bearing plate into transmission housing.

NOTE: When inserting the complete bearing plate, ensure that the selector rods align with their mounting points.

- Drive in 2 dowel sleeves for bearing plate/transmission housing.
- Tighten bolts in diagonal sequence to 25 Nm.

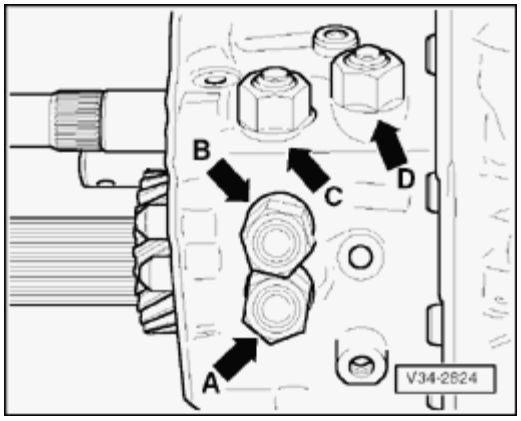


Fig. 192: Identifying Locking Bolts For Selector Rods

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert locking bolts for selector rods with sealing paste AMV 188 001 02 and tighten to 50 Nm.

A - 1st and 2nd gear

B - 3rd and 4th gear

C - 5th and 6th gear

D - Reverse gear

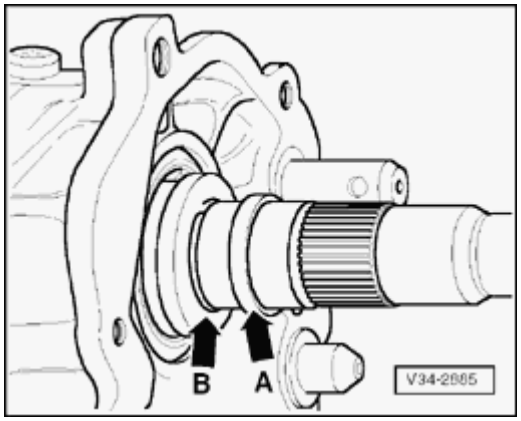


Fig. 193: Identifying Thrust Washer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install thrust washer -arrow A- for needle bearing for 6th gear.

- Installation position: Shoulder toward circlip -arrow B-, smooth contact surface to shaft end

- Lubricate needle bearing for 6th sliding gear with gear oil and install.
- Slide on 6th sliding gear with spring and synchro-ring.

- Installation position: The lugs of synchro-ring engage into recesses below in sliding gear.

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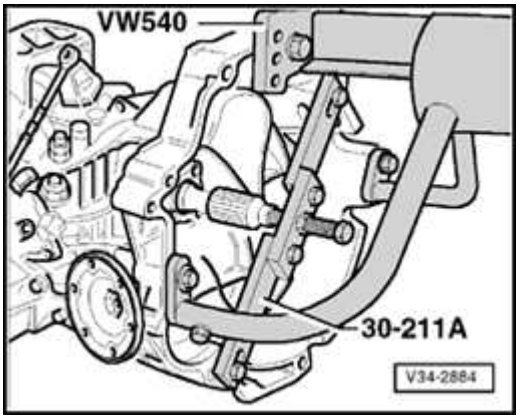


Fig. 194: Supporting Input Shaft With Bracket 30-211 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Support input shaft with support bridge 30-211 A.

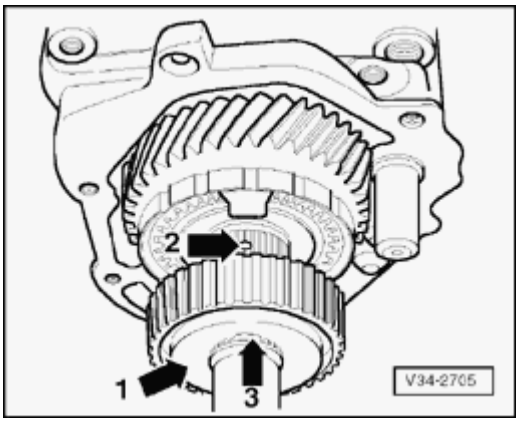


Fig. 195: Installation Location Of Synchronizer Hub For 5th and 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of 5th and 6th gear synchro-hubs:

- Side with projecting face -arrow 1- faces shaft end.
- The input shaft oil bore -arrow 2- and the synchro-hub oil groove -arrow 3- are aligned.

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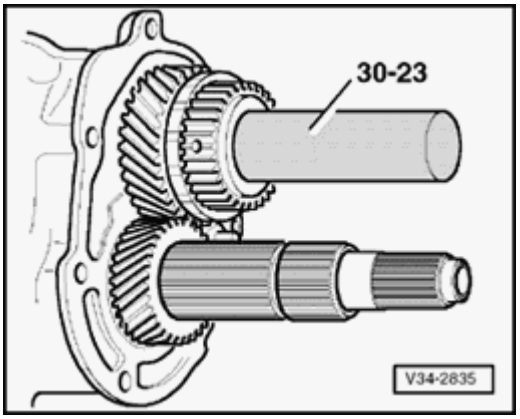


Fig. 196: Driving On 5th and 6th Gear Synchronizer Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat synchro-hub for 5th and 6th gears to approx. 100 ° C, install and drive on up to stop.

  WARNING: Wear protective gloves!

- Check 6th sliding gear for axial play.

- Permissible axial play: 0.15 to 0.35 mm

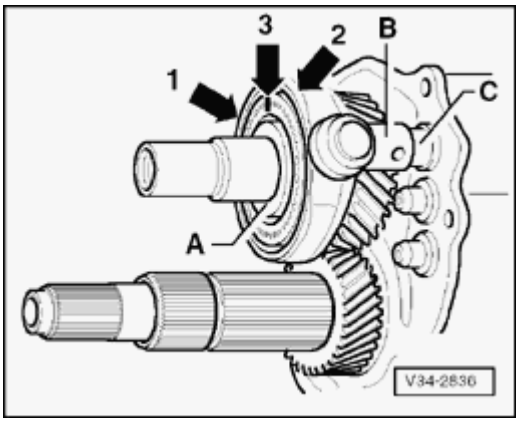


Fig. 197: Alignment Marks On, Locking Collar For 5th and 6th Gear And Synchronizer Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align markings -arrow 3- on paired synchro -hub -A- and locking collar for 5th and 6th gears -arrow 1-.
- Install locking collar -arrow 1- with selector fork -arrow 2- onto synchro-hub -A-, and at the same time install follower for 5th and 6th gears -B- onto selector rod -C-.

NOTE:

- **Selector fork rib -arrow 2- must face toward shaft end.**
- **When sliding follower onto selector rod for 5th and 6th gear, note holes for spring pin.**

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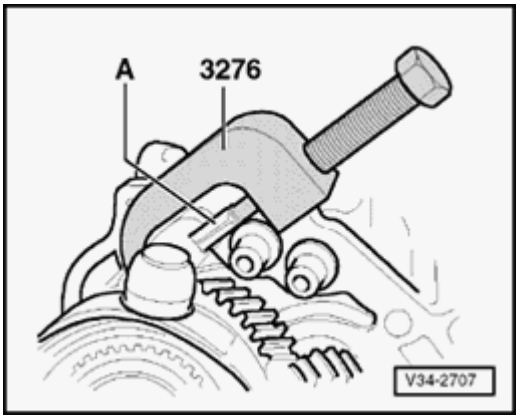


Fig. 198: Pressing In Spring Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in spring pin -A- flush.

NOTE:

- **Do not drive in spring pin, otherwise selector rod bearing will be damaged.**
- **Mount spring pin groove in direction of force as shown in illustration.**

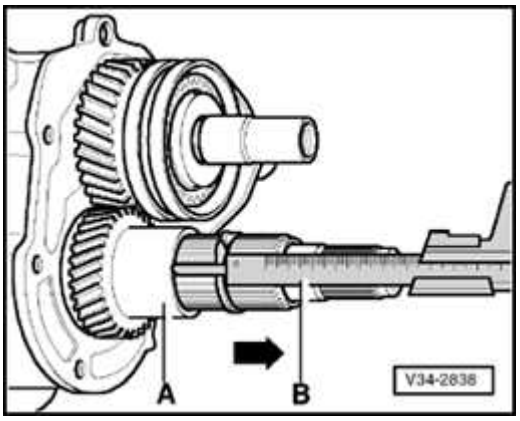


Fig. 199: Determine Shim For 5th Gear Drive Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Re-determine shim for 5th gear wheel:

- Install spacer sleeve -A- (length 39.6 mm) onto hollow shaft.
- When installing circlip, press indirection of arrow until fully home.
- Measure size between sleeve and installed circlip using depth gauge -B-.

The following shims are available

Measured range (mm)	Shim thickness (mm)
31.01 to 31.11	1.05
31.11 to 31.21	1.15

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31.21 to 31.31	1.25
31.31 to 31.41	1.35

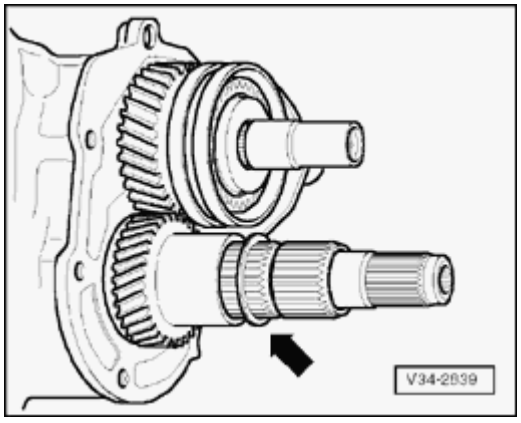


Fig. 200: Set Selected Shim Onto Hollow Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install selected size of shim -arrow- onto hollow shaft.

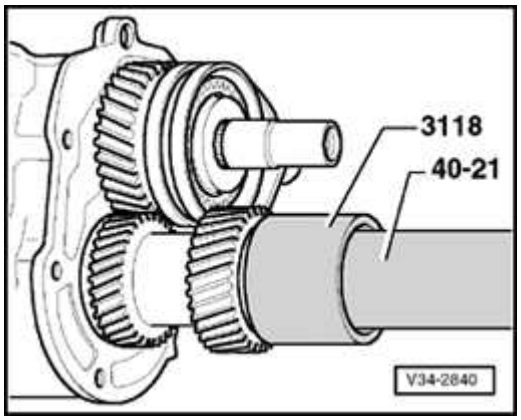


Fig. 201: Driving On 5th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 5th gear to approx. 100 ° C, install and drive on up to stop.
- Installation position: Shoulder toward spacer sleeve

WARNING: Wear protective gloves!

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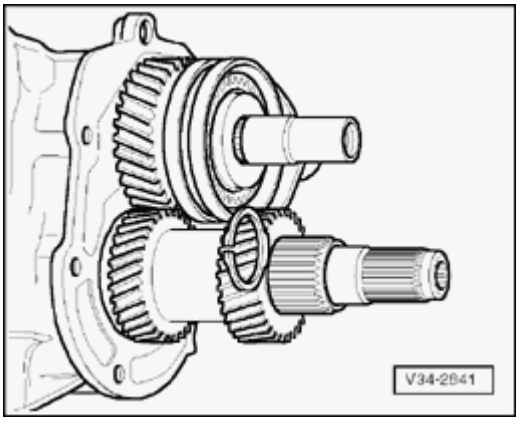


Fig. 202: Redetermine Shim For 5th Gear Drive Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Re-determine circlip for 5th gear wheel:
- Determine and attach the thickest 2nd circlip that will still just fit.

Available circlips

Circlip thickness (mm)		
2.32	2.40	2.48
2.34	2.42	2.50
2.36	2.44	
2.38	2.46	

- Install circlip.

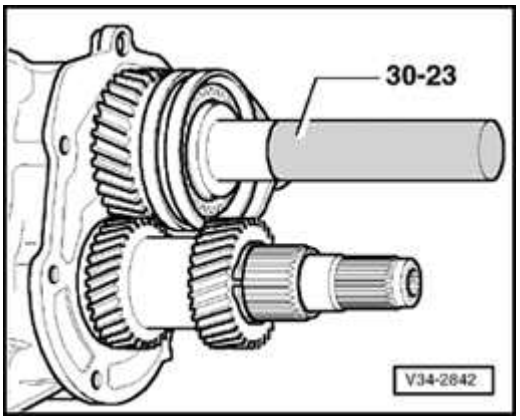


Fig. 203: Drive On Inner Race Of Needle Bearing For 5th Gear Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive on inner race for 5th sliding gear free of axial play.
- Oil needle bearing with gear oil and install.

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- Place synchro-ring for 5th gear in locking collar.
- Slide on 5th sliding gear with spring.

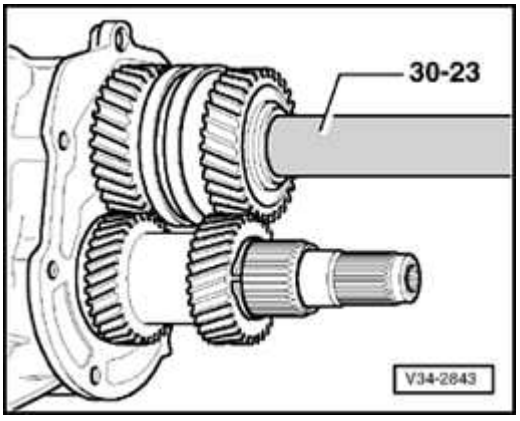


Fig. 204: Installing 1st Inner Race For Four-Point Bearing For Input Shaft Onto Input Shaft And Drive On Up To Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 1st inner race for four-point bearing (ball bearing side) for input shaft to approx. 100 ° C, install onto input shaft and drive on up to stop.

WARNING: Wear protective gloves!

- Check 5th sliding gear for axial play.

- Permissible axial play: 0.15 to 0.35 mm

- Insert dowel sleeves into bearing plate.
- Install new gasket for end cover.

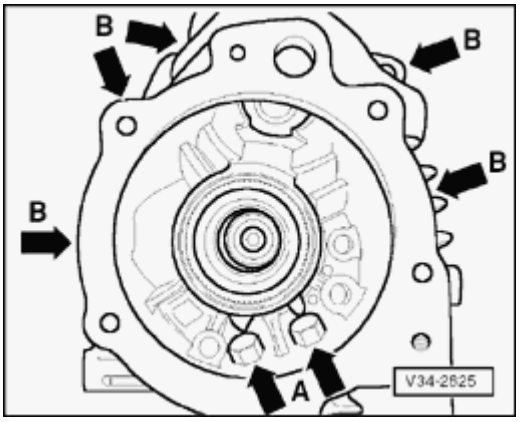


Fig. 205: Identifying Magnets -A - And End Cover Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Install end cover and insert securing bolts -arrows B-.

NOTE: Do not tighten bolts at this stage.

- Clean 2 magnets -arrow A- and insert.
- Insert supporting plate. Refer to **Fig. 166** and tighten by hand.

- Installation position: Lugs face magnets.

- Tighten bolts for end cover in diagonal sequence.

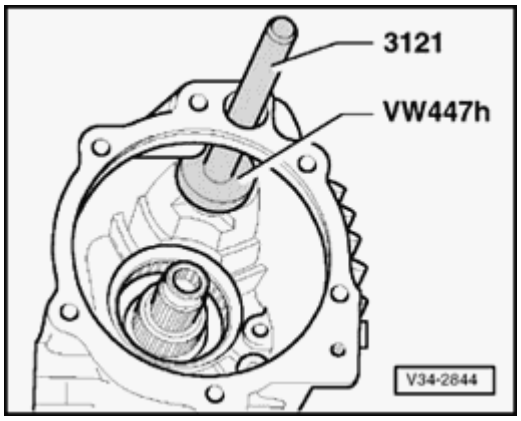


Fig. 206: Installing 2nd Inner Race Of The 4-Point Bearing (Roller Bearing Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lubricate 2nd inner race for four-point bearing (roller bearing side) and insert onto input shaft with track for ball facing four-point bearing of input shaft and drive over hole in end cover.

- Remove support bridge 30-211 A.

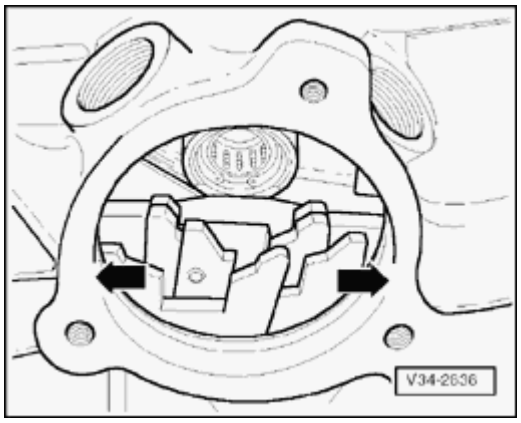


Fig. 207: Lock Input Shaft By Engaging 2 Gears (E.G. Reverse And 2nd Gear) By Moving 2 Selector Rails
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Lock input shaft by engaging 2 gears (e.g. reverse and 2nd gear) do this by moving 2 selector plates -arrows-.
- Tighten multi-point socket head bolt to 150 Nm.
- Check neutral position of followers.

- Gear gates must align.

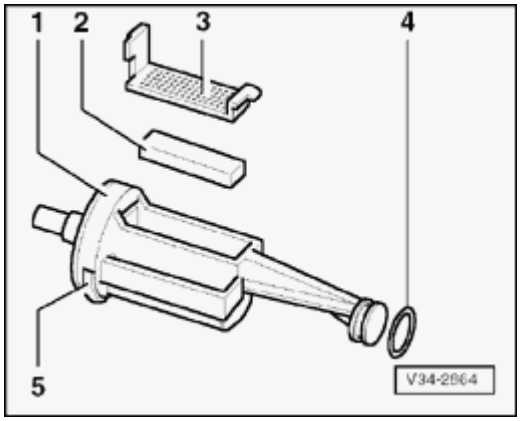


Fig. 208: Identifying Oil Diverter
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use screwdriver to unclip cover for oil collector -3- from oil collector -1- at long end and remove magnet -2-.

4 - O-ring

5 - Positioning segment

- Clean oil collector.
- Assemble oil collector.

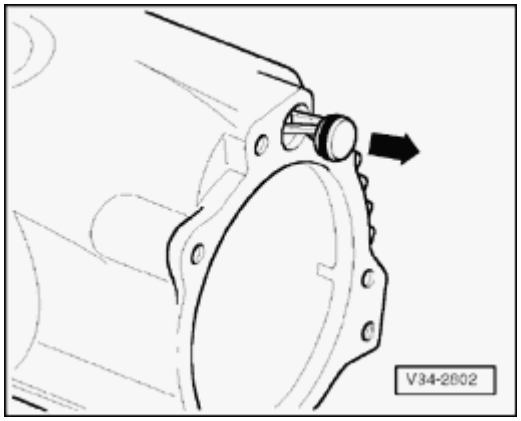


Fig. 209: Identifying Oil Diverter At End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Guide oil collector, with supporting arm ahead, from interior of end cover through hole of end cover sufficiently far -arrow-, so that the new O-ring can be installed onto oil collector from outside.

- Lightly oil new O-ring and insert.
- Insert oil pipe of oil collector in input shaft.

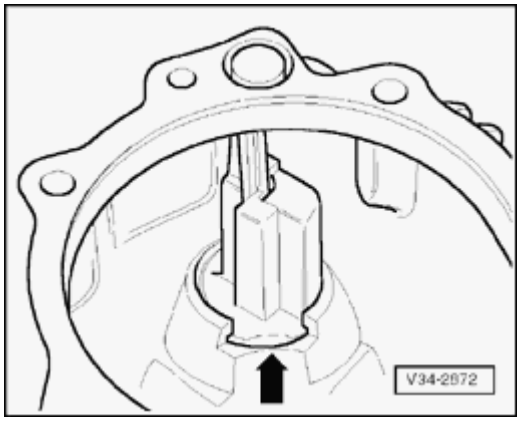


Fig. 210: Turning Oil Diverter Until Positioning Segment Lies In The Recess Of End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate oil collector until positioning segment is positioned in milled recess of end cover -arrow-.
- Press in oil collector onto stop.

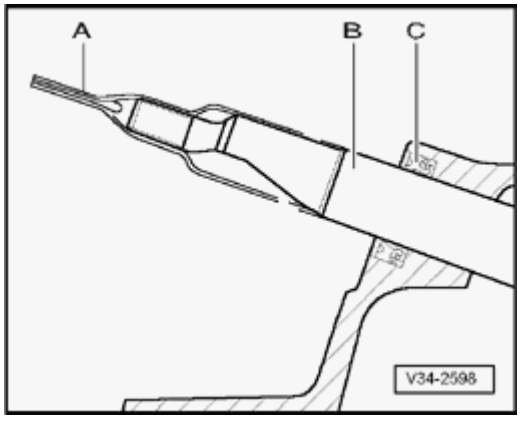


Fig. 211: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide assembly sleeve -A-, Part No. 01E 311 120, onto selector shaft -B-.
- Install complete selector shaft.

- Installation position: Flat of selector shaft faces downward

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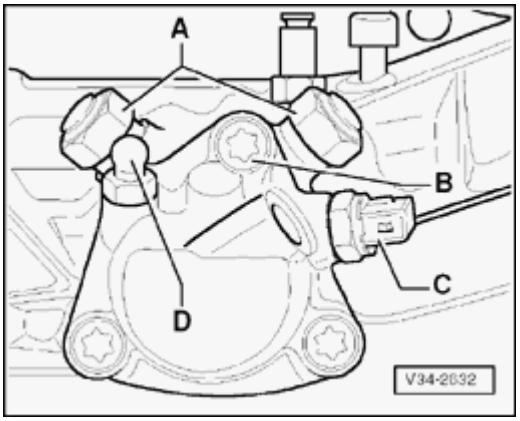


Fig. 212: Identifying Locking Bolts And Selector Shaft Cover & Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert locking bolts -A- for selector rod with sealing paste AMV 188 001 02 and tighten to 50 Nm.
- Lightly oil new O-ring for selector shaft cover and install.
- Install cover for selector shaft.
- Install bolts -B- (x 3) with sealing paste AMV 188 001 02 and tighten to 25 Nm.
- Push Torsen differential onto splines of hollow shaft.

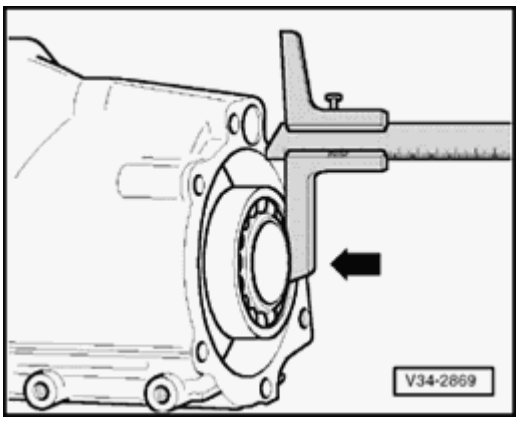


Fig. 213: Determine Required Shim(s), Press Torsen Differential In Direction Of Arrow
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press Torsen differential in direction of arrow; measure distance between top edge of bolted end cover and front edge of outer race of ball bearing for Torsen differential.
- Determine shim(s) required according to table.

The following adjustment shims are available:

Measured range mm	Qty.	Shim thickness (mm)
7.05 to 7.30	1	1.65

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	1 1	1.45 1.20
7.30 to 7.55	1 1 1	1.65 1.45 0.95
7.55 to 7.80	1 1 1	1.65 1.45 0.70
7.80 to 8.05	1 1 1	1.65 1.45 0.45
8.05 to 8.25	2	1.65
8.25 to 8.50	1 1	1.65 1.45
8.50 to 8.75	1 1	1.65 1.20

Measured range mm	Qty.	Shim thickness (mm)
8.75 to 9.00	1 1	1.65 0.95
9.00 to 9.25	1 1	1.65 0.70
9.25 to 9.50	1 1	1.65 0.45

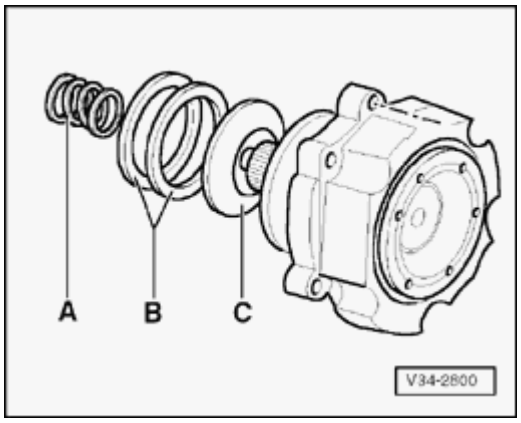


Fig. 214: Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert dished washer -C- into bearing housing.
- Installation position: Large diameter (concave side) facing shims
- Install shims determined from table -B-.

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- Install spring -A- onto end of flanged shaft.
- Lightly oil new O-ring for bearing housing and insert.
- Oil small needle bearing in drive pinion.

- Insert complete bearing housing and pre-tighten evenly.
- Tighten bolts in diagonal sequence.
- Pack space between sealing lip and dust lip of new seal for input shaft with sealing grease.
- Pull a thin protective hose tightly onto splines of input shaft.

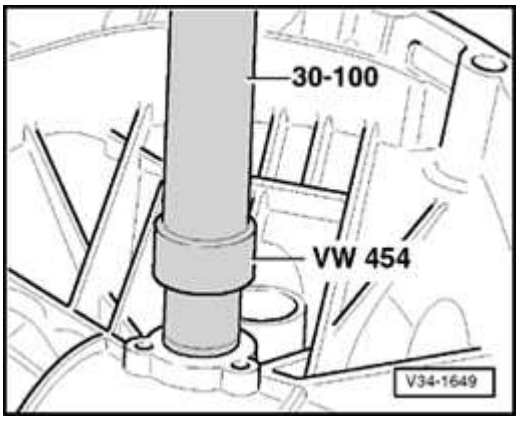


Fig. 215: Installing Shaft Seal For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tap in input shaft seal.

- Insertion depth: 3.5 mm

NOTE: Insertion depth for repairs is 4.5 mm when a used input shaft is employed.

- Remove protective hose.
- Install release bearing, clutch release lever and guide sleeve. Refer to **Clutch release mechanism, servicing**.
- Select all gears.
- Install connecting rod.

- Top off manual transmission with gear oil and check oil level. Refer to **Transmission oil level, checking**.

BEARING HOUSING, DISASSEMBLING AND ASSEMBLING

Bearing housing, disassembling and assembling

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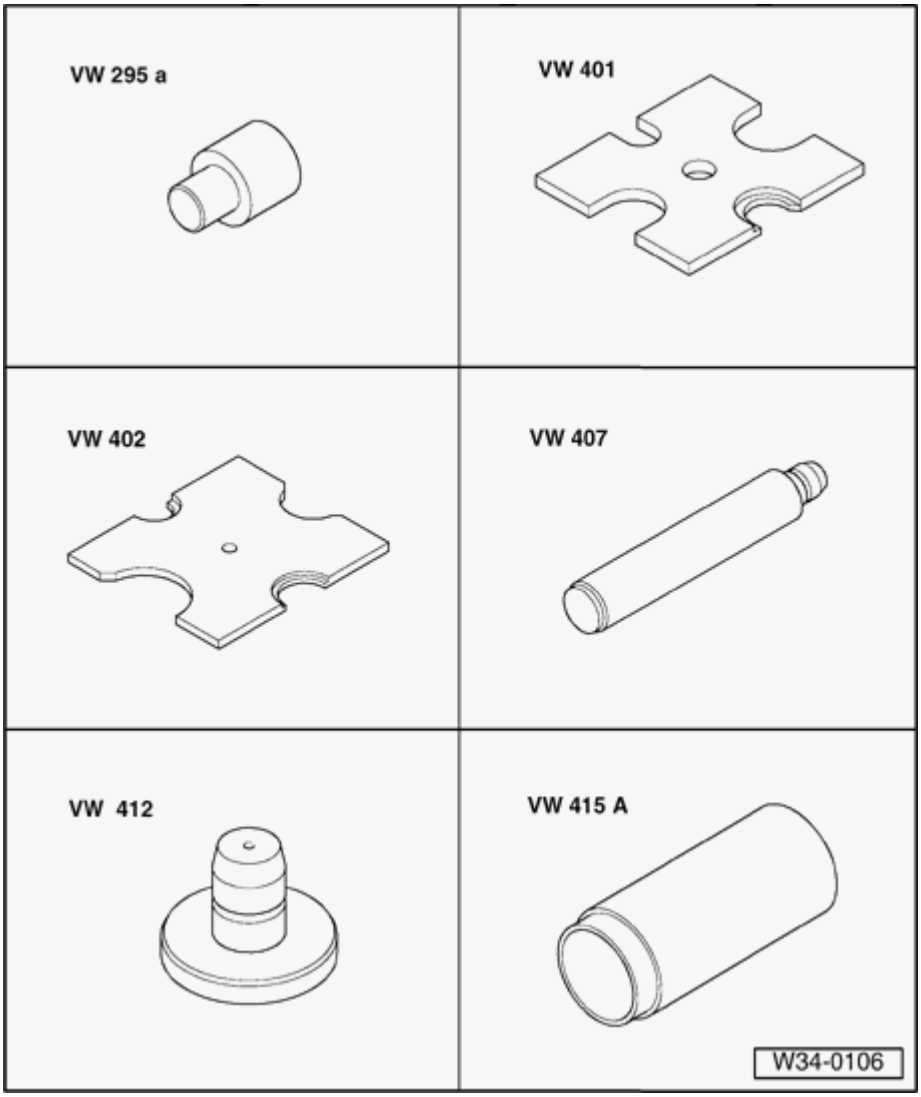


Fig. 216: Identifying Special Tools - Bearing Housing, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 295a Adapter
- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 412 Thrust tool
- VW 415 A Tube

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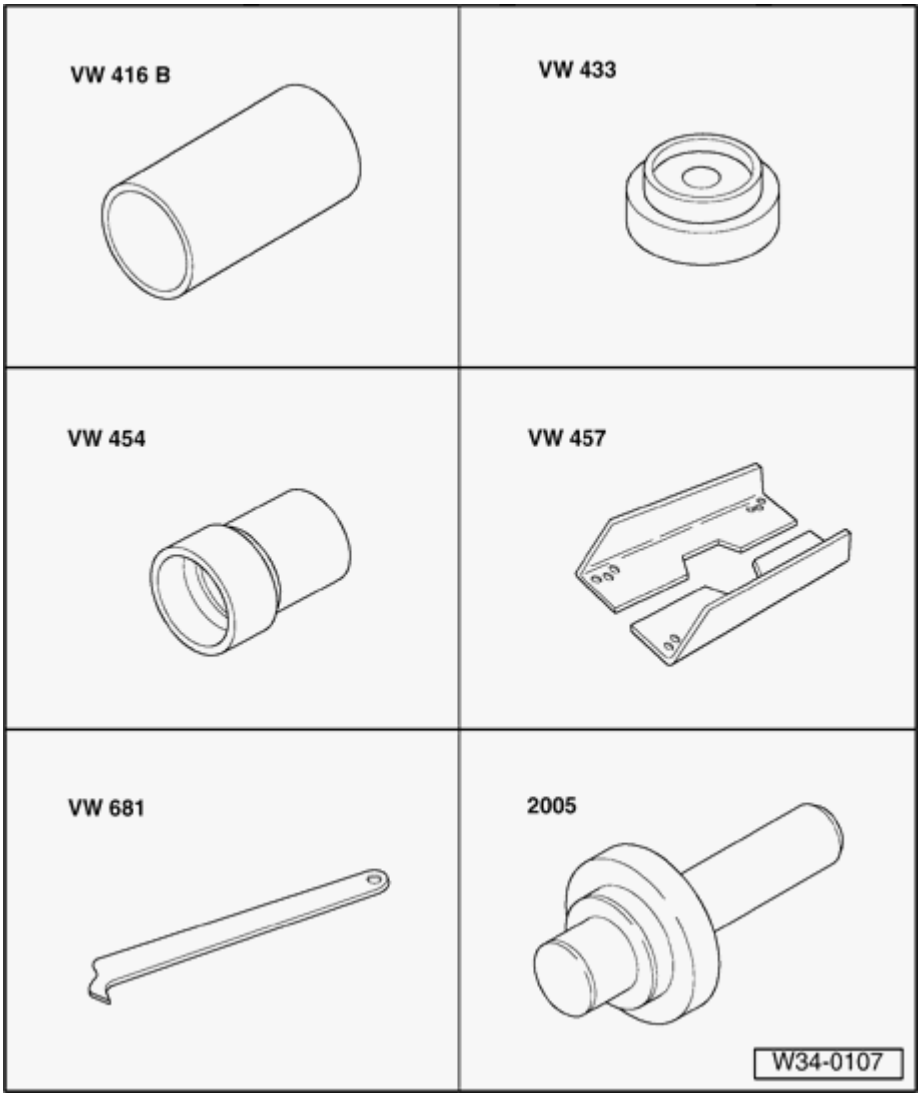


Fig. 217: Identifying Special Tools - Bearing Housing, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 416 B Tube
- VW 433 Thrust pad
- VW 454 Thrust pad
- VW 457 Mounting rail
- VW 681 Seal extractor
- 2005 Drift

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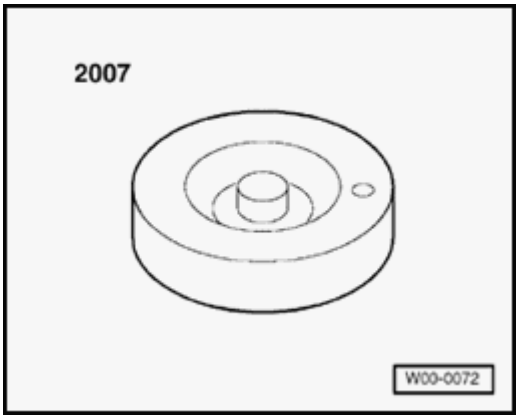


Fig. 218: Thrust Pad 2007
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Thrust pad 2007
- Adjustment shim Part No. 016 311 391 B

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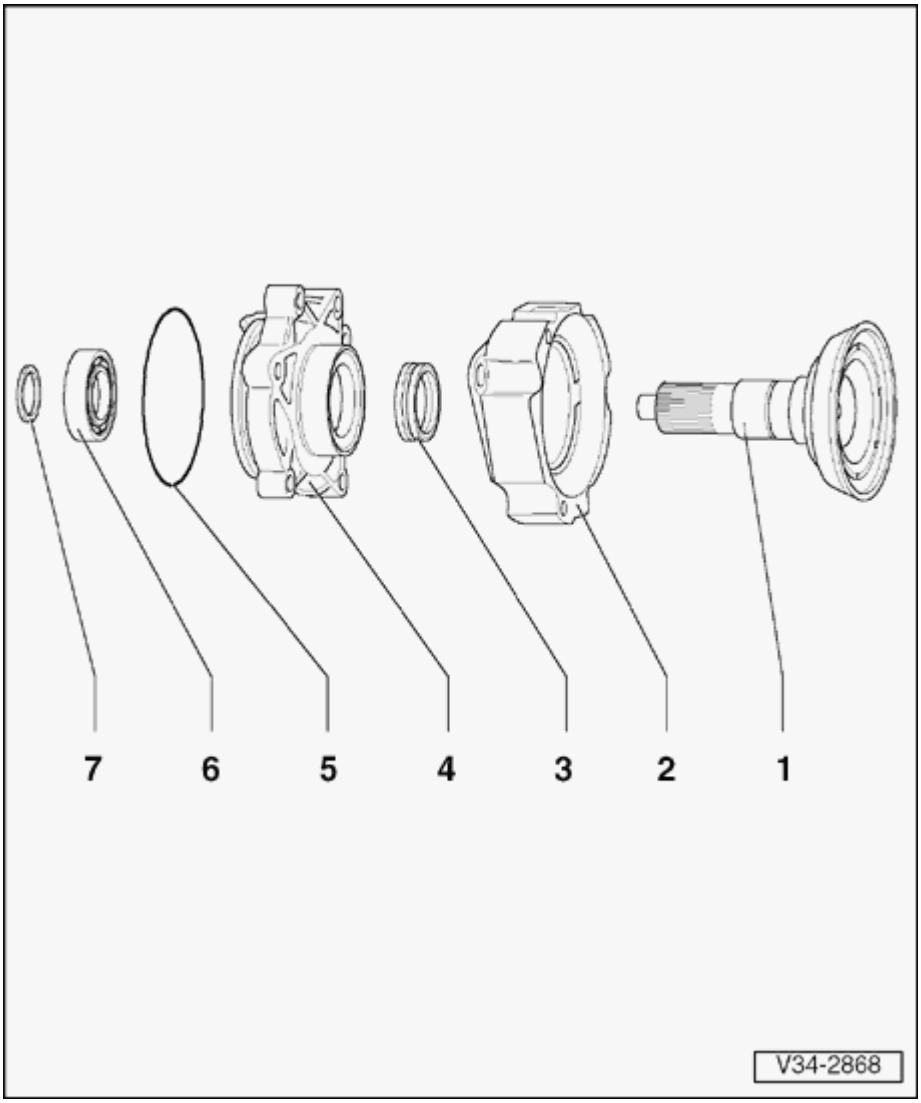


Fig. 219: Bearing housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Flanged shaft

- Pressing out. See **Pressing out flanged shaft**
- Pressing in. See **Pressing cylinder roller bearing for input shaft into end cover**

2 - Vibration damper

- Pressing off. See **Pressing off vibration damper**
- Pressing on. See **Pressing on vibration damper**

3 - Seal

- Pulling out. See **Removing seal**

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- Preparing for installation. See **Preparing seal for installing**
- Tapping in. See **Inserting seal**

4 - Bearing housing

5 - O-ring

- Replace
- Coat lightly with gear oil when installing

6 - Ball bearing

- For flanged shaft
- Pressing out. See **Pressing out ball bearing for flanged shaft**
- Pressing in. See **Pressing in ball bearing for flanged shaft**

7 - Circlip

Pressing out flanged shaft

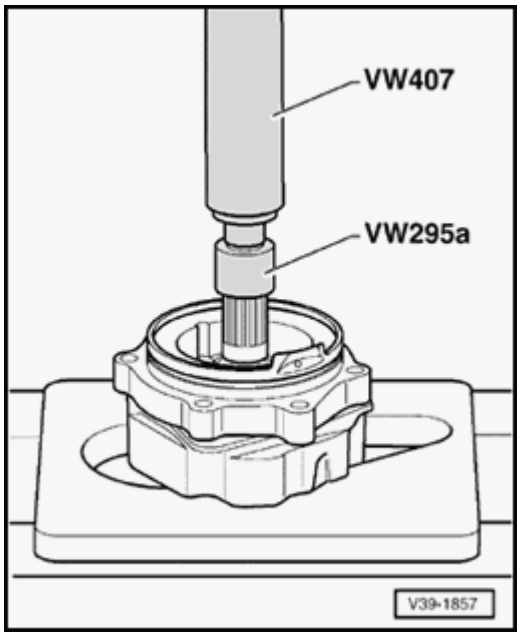


Fig. 220: Pressing Out Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing out flanged shaft.

Pressing in flanged shaft

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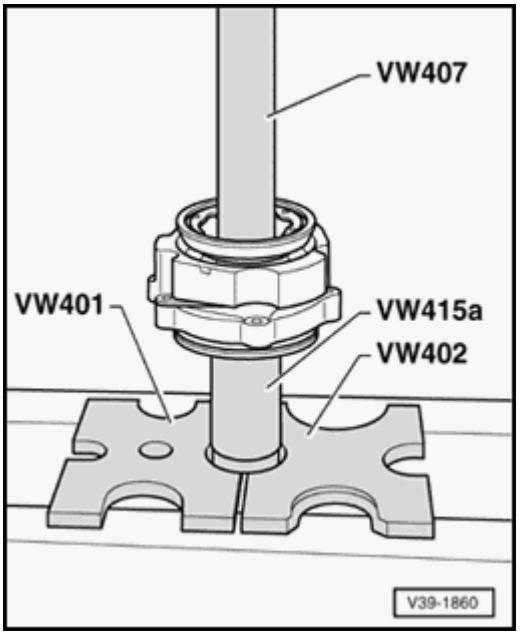


Fig. 221: Pressing In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on vibration damper before pressing in flanged shaft. See **Pressing on vibration damper**.
- Install circlip.

Pressing off vibration damper

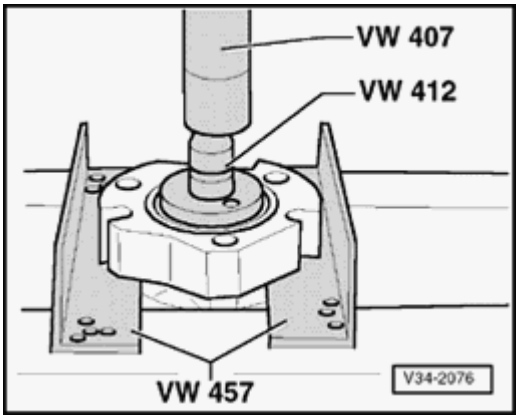


Fig. 222: Pressing Off Vibration Damper
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing on vibration damper

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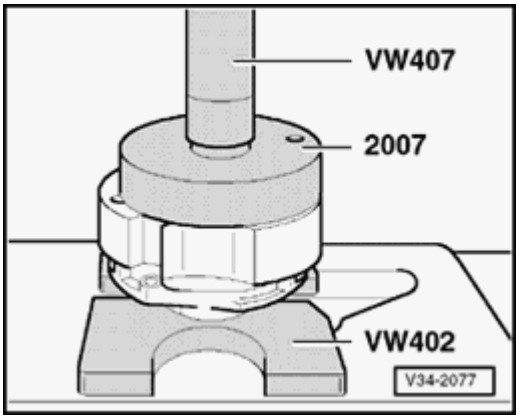


Fig. 223: Pressing On Vibration Damper
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: Observe position of holes.

Removing seal

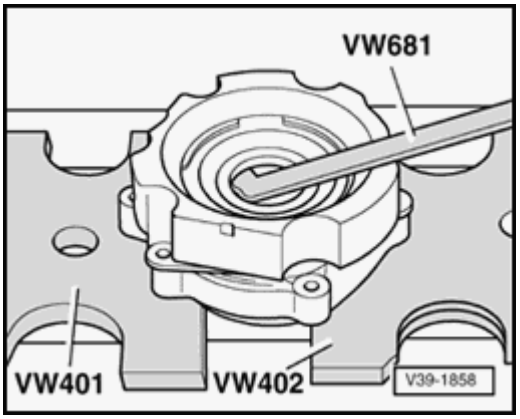
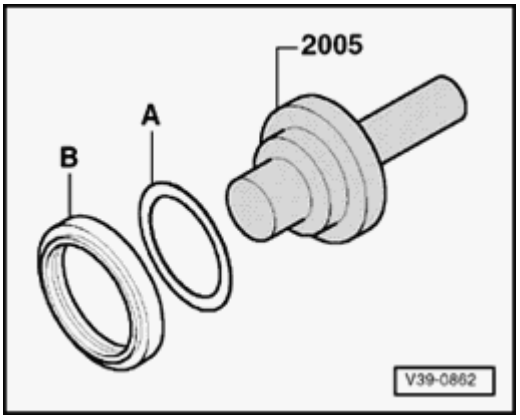


Fig. 224: Pulling Out Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Preparing seal for installing



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Fig. 225: Preparing Seal For Installation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Washer

Part no. 016 311 391 B (1.7 mm thick)

B - Seal

- Pack space between sealing and dust lips half full with sealing grease.
- Install washer and seal onto tool as illustrated.

- Installation position: Open side of seal faces toward bearing housing

Inserting seal

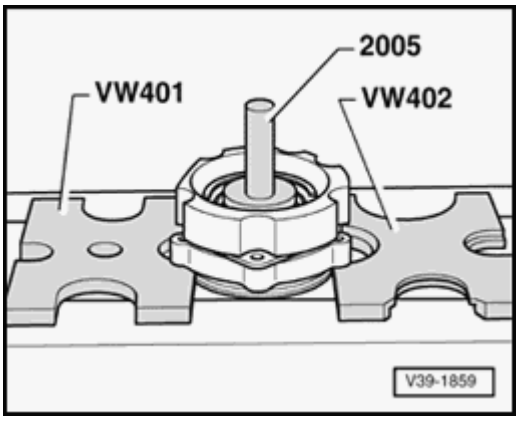


Fig. 226: Driving In Flange Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove washer.

Pressing out ball bearing for flanged shaft

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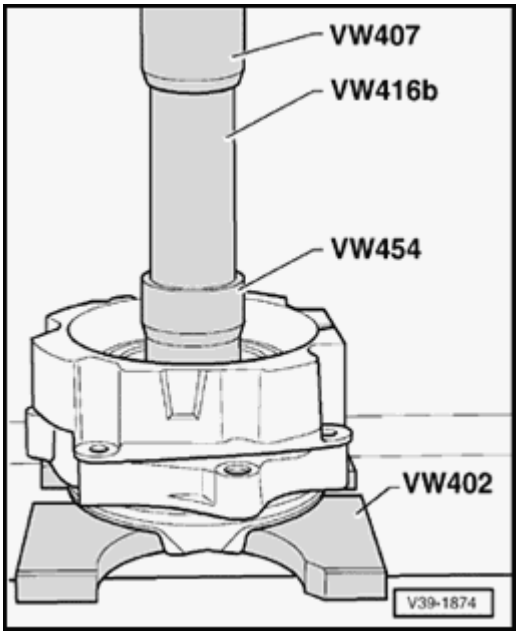


Fig. 227: Pressing On Grooved Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing in ball bearing for flanged shaft

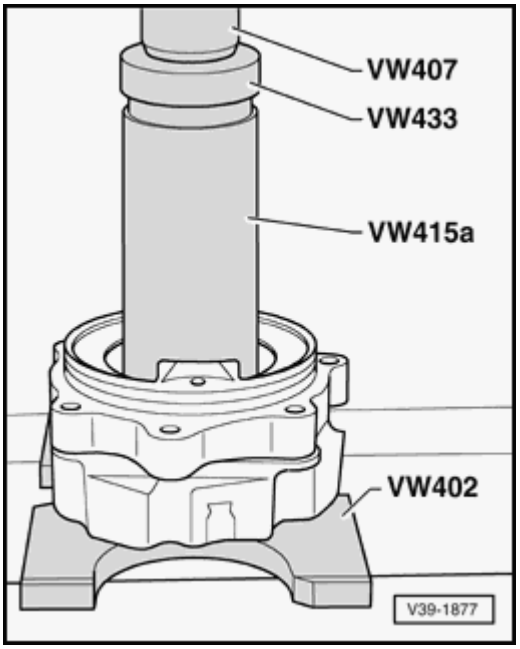


Fig. 228: Pressing In Grooved Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

MOUNT FOR TORSEN DIFFERENTIAL, SERVICING

Mount for Torsen differential, servicing

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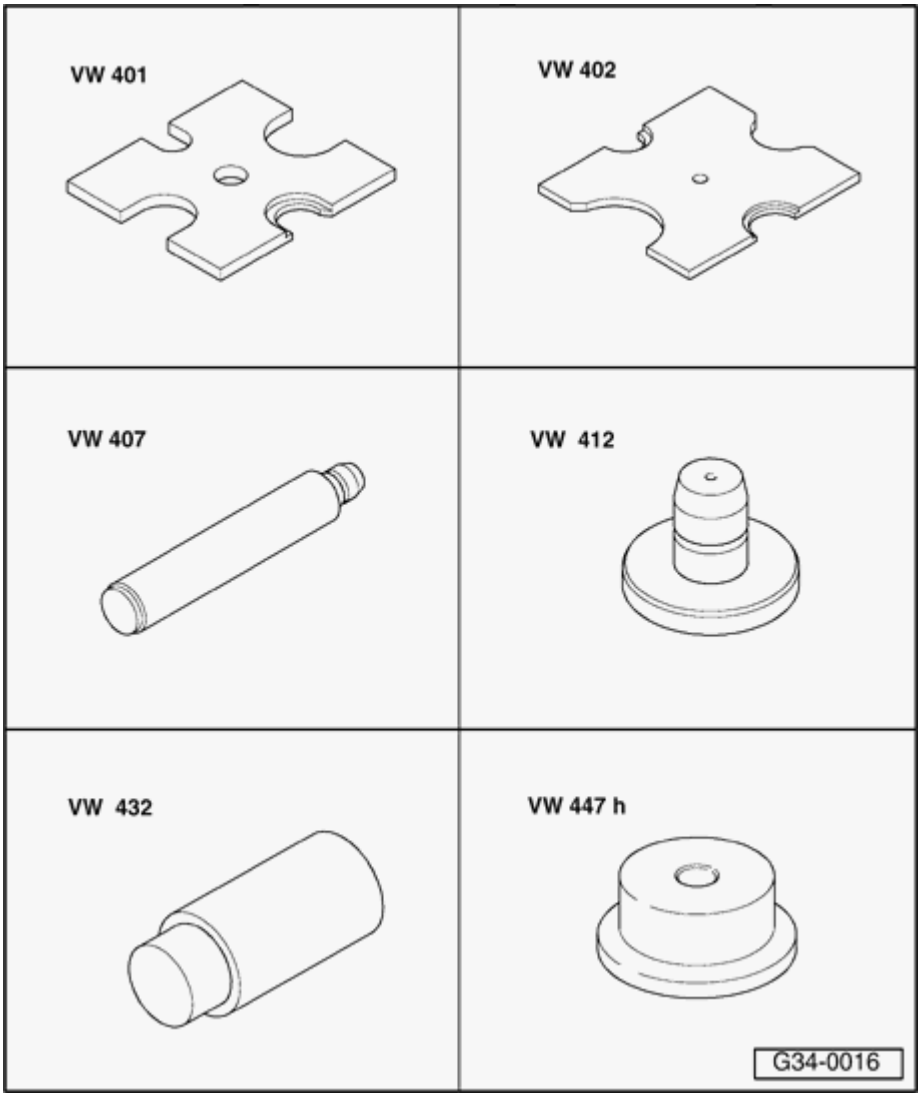


Fig. 229: Identifying Special Tools - Mount For Torsen Differential, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 412 Thrust tool
- VW 432 Thrust pad
- VW 447 H Thrust pad

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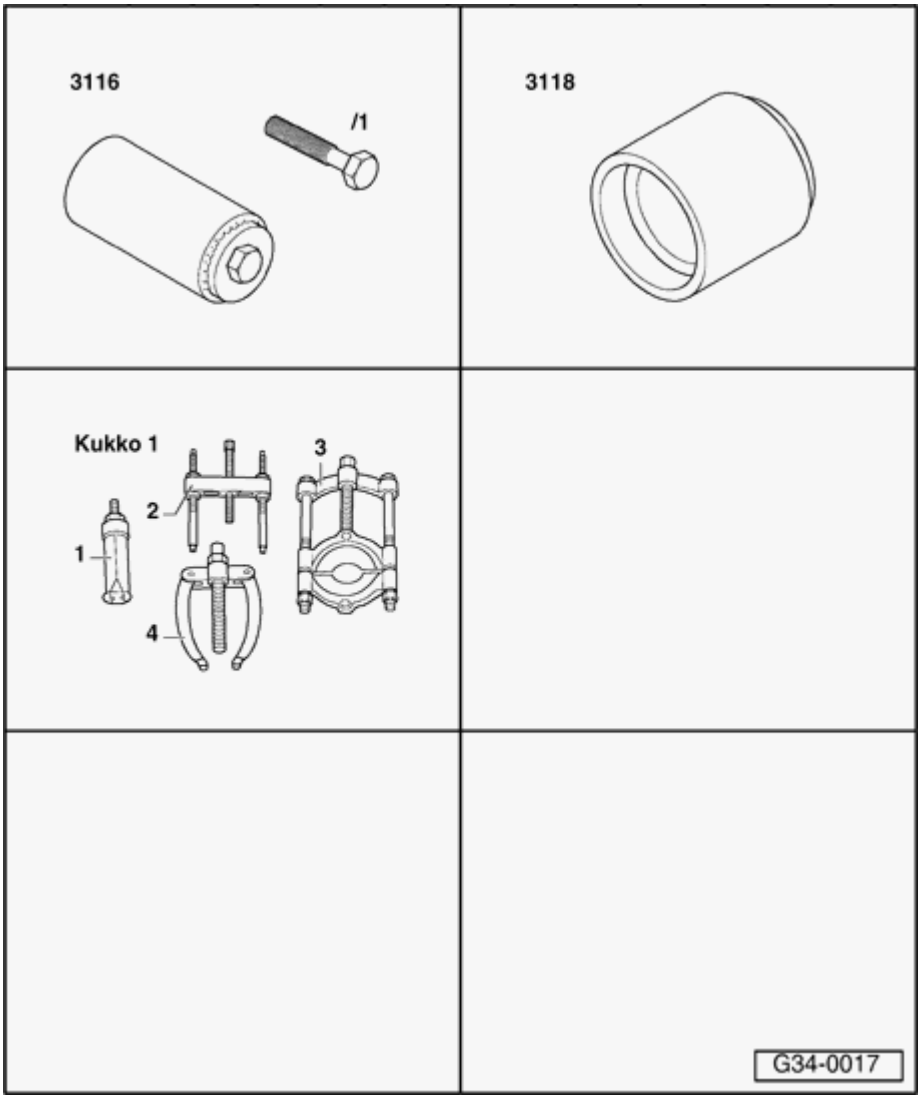


Fig. 230: Identifying Special Tools - Mount For Torsen Differential, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3116 Spring pin
- 3118 Thrust piece
- 1 - Kukko 21/5 Internal puller
- 3 - Kukko 17/2 Separating tool
- 4 - Kukko 22/1 Counter support

NOTE: The shims for Torsen differential have to be re-determined after replacing following components. Refer to Fig. 213:

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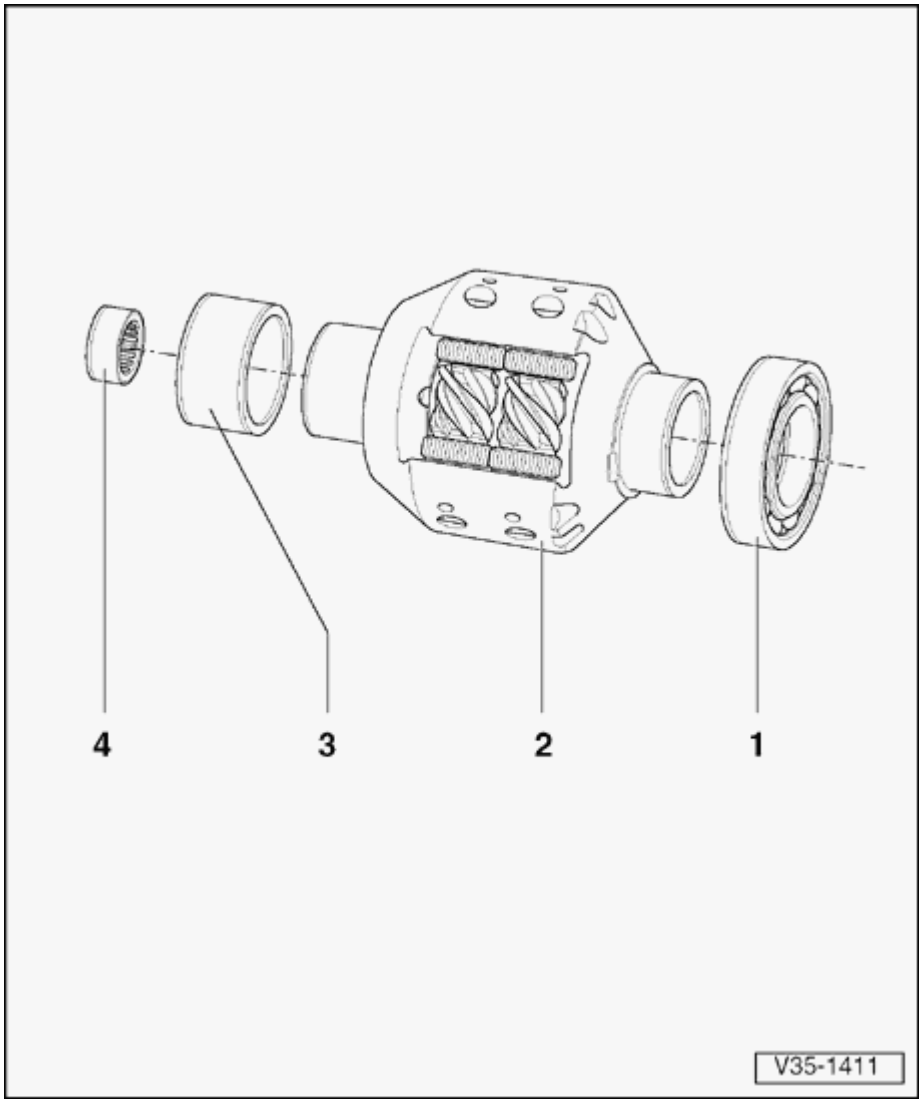


Fig. 231: Torsen Differential Bearing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- End cover
- Inner race for needle bearing
- Torsen differential
- Torsen differential ball bearing

1 - Ball bearing

- For Torsen differential
- Pressing off. See **Pressing off ball bearing from Torsen differential**
- Pressing on. See **Pressing ball bearing onto Torsen differential**

2 - Torsen differential

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- Do not disassemble
- Servicing only at manufacturer
- Replace, if damaged

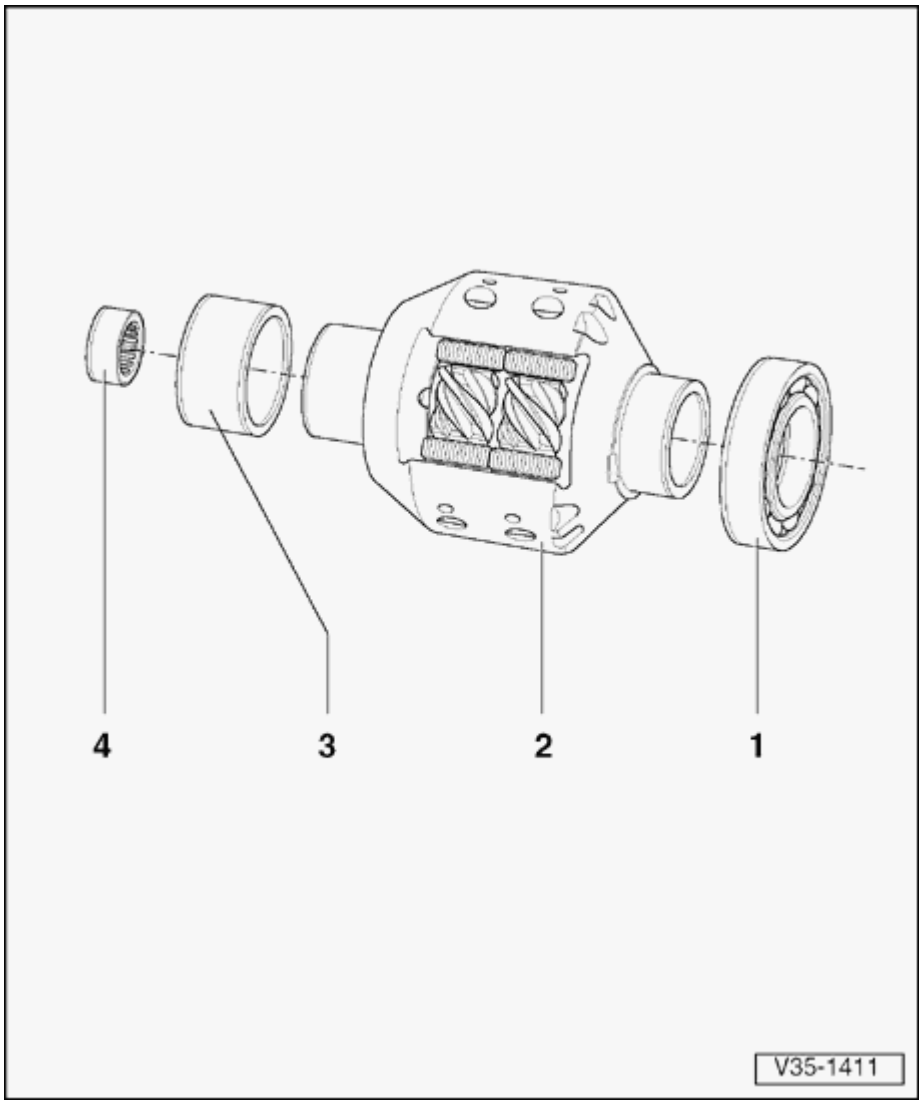


Fig. 232: Torsen Differential Bearing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

3 - Inner race

- For Torsen differential needle bearing
- Pulling off. See **Pulling off inner race for Torsen differential needle bearing**
- Pressing on. See **Pressing on inner race for Torsen differential needle bearing**

4 - Needle bearing

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- For drive pinion/Torsen differential
- Pulling out. See **Removing needle bearing for drive pinion/Torsen differential**
- Pressing in. See **Inserting needle bearing for drive pinion/Torsen differential**

Pressing off ball bearing from Torsen differential

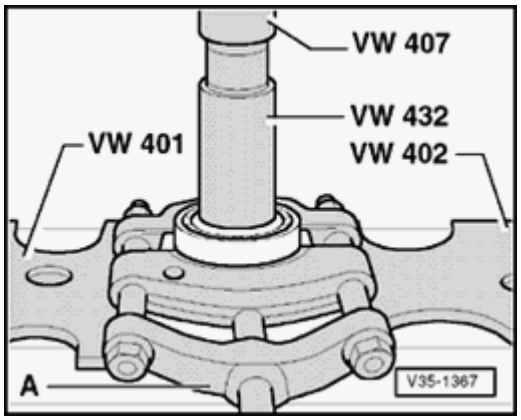


Fig. 233: Pressing Off Grooved Ball Bearing From Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Pressing ball bearing onto Torsen differential

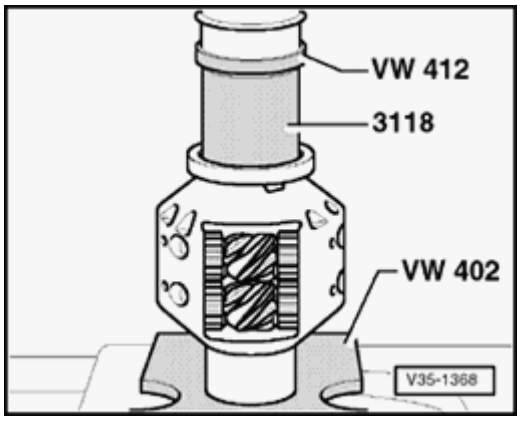


Fig. 234: Pressing Grooved Ball Bearing Onto Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position: Thrust pad 3118 with shoulder facing press tool VW 412

Pulling off inner race for Torsen differential needle bearing

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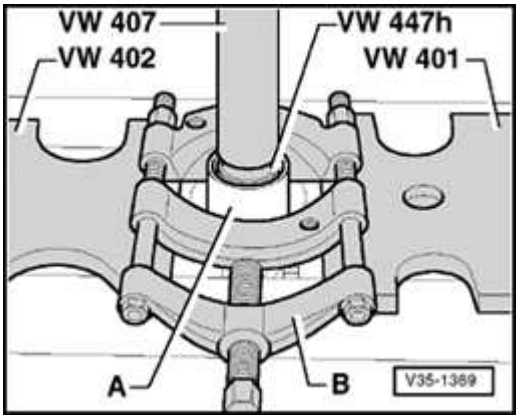


Fig. 235: Pulling Off Inner Race Of Torsen Differential Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Inner race

B - Separating tool 22 to 115 mm, e.g. Kukko 17/2

Pressing on inner race for Torsen differential needle bearing

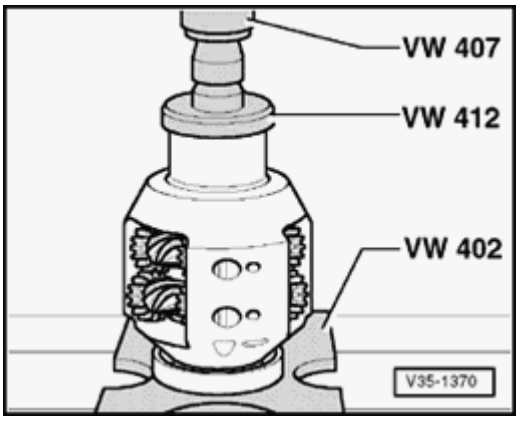


Fig. 236: Pressing On Inner Race Of Torsen Differential Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing needle bearing for drive pinion/Torsen differential

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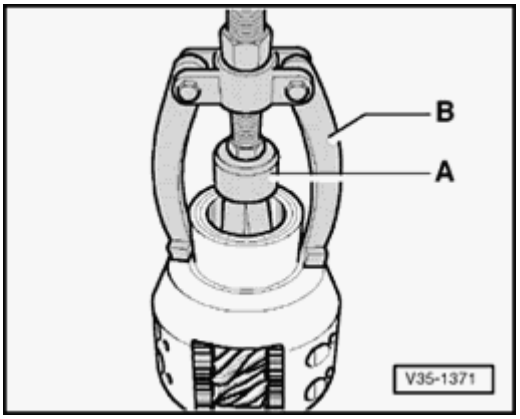


Fig. 237: Pulling Out Needle Bearing For Pinion/Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Inserting needle bearing for drive pinion/Torsen differential

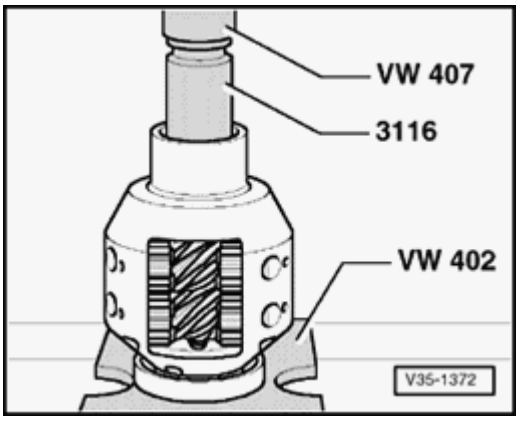


Fig. 238: Pressing In Needle Bearing For Pinion/Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing in needle bearing flush with inner edge.

END COVER, SERVICING

End cover, servicing

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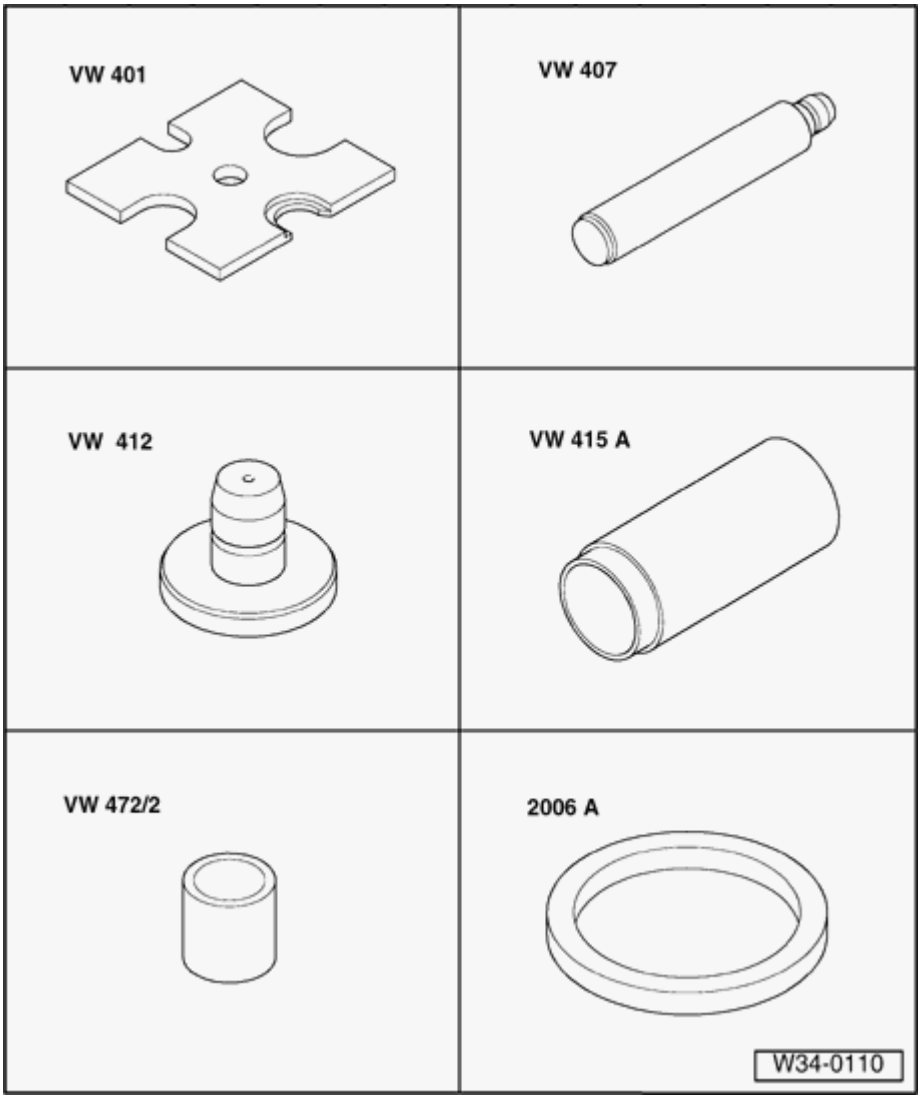


Fig. 239: Identifying Special Tools - End Cover, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 412 Thrust tool
- VW 415 A Tube
- VW 472/2 Spacer sleeve
- 2006 A Supporting ring

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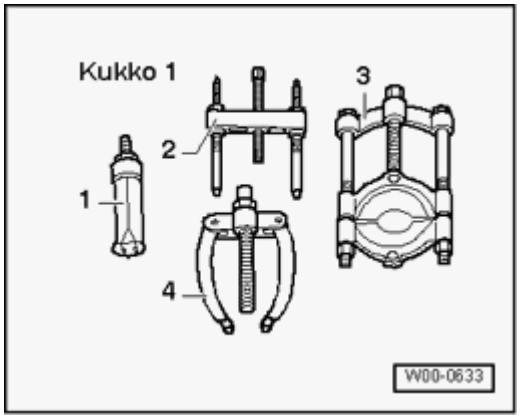


Fig. 240: Kukko 21/2 Internal puller, Kukko 21/4 Internal puller, Kukko 22/2 Counter support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Kukko 21/6 Internal puller and Kukko 21/7 Internal puller
- 4 - Kukko 22/2 Counter support

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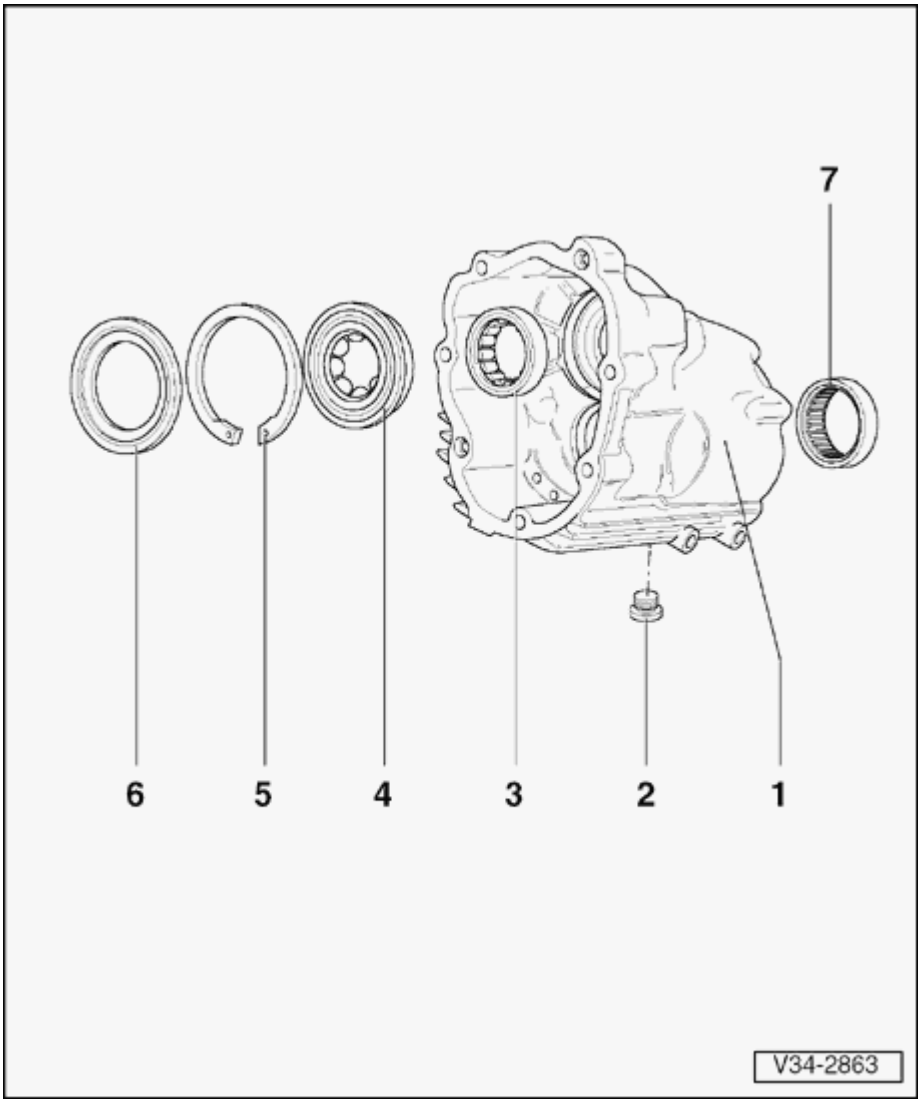


Fig. 241: End Cover, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - End cover

- If replaced, the thickness of the circlip - **End cover, servicing** must be re-determined
- Re-determine shims for Torsen differential. Refer to **Fig. 213**

2 - Oil drain plug, 40 Nm

3 - Cylinder roller bearing for input shaft

- Pressing out. See **Pressing cylinder roller bearing for input shaft out of end cover**
- Pressing in flush. See **Pressing cylinder roller bearing for input shaft into end cover**

4 - Four-point bearing for input shaft

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- Removing. See **Removing ball bearing for input shaft out of end cover**
- Installing. See **Installing ball bearing for input shaft in end cover**
- If replaced, the thickness of the circlip - **End cover, servicing** must be re-determined

5 - Circlip

- Re-determining thickness. Refer to **Available circlips**
- Installing. See **Installing ball bearing for input shaft in end cover**

6 - Baffle plate

- Replace
- Removing. See **Removing ball bearing for input shaft out of end cover**
- Installing and peening in position when replacing four-point bearing for input shaft. See **Peening baffle plate in position when replacing ball bearing for input shaft**
- Installing and peening in position when replacing end cover. See **Peening baffle plate in position when replacing end cover**

7 - Needle bearing

- For Torsen differential
- Pulling out. See **Removing needle bearing for Torsen differential from end cover**
- Tapping in. See **Insert needle bearing of Torsen differential flush in end cover.**

Pressing cylinder roller bearing for input shaft out of end cover

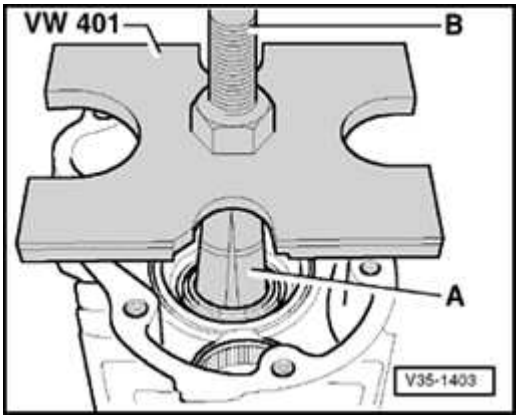


Fig. 242: Pressing Roller Bearing For Input Shaft Out Of End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal extractor 37 to 46 mm, e.g. Kukko 21/6

B - Counter support spindle, e.g. Kukko 22/2

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Pressing cylinder roller bearing for input shaft into end cover

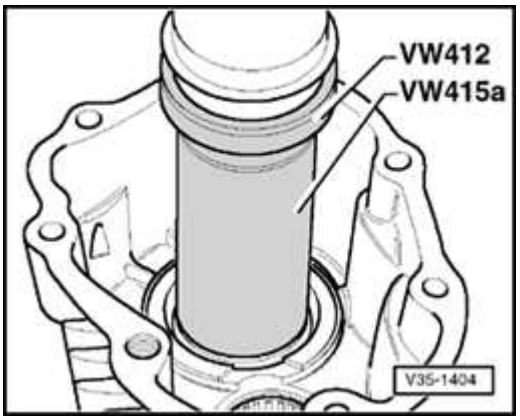


Fig. 243: Pressing Roller Bearing For Input Shaft Into End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Shoulder of pipe section VW 415 A faces toward press tool VW 412.

Removing ball bearing for input shaft out of end cover

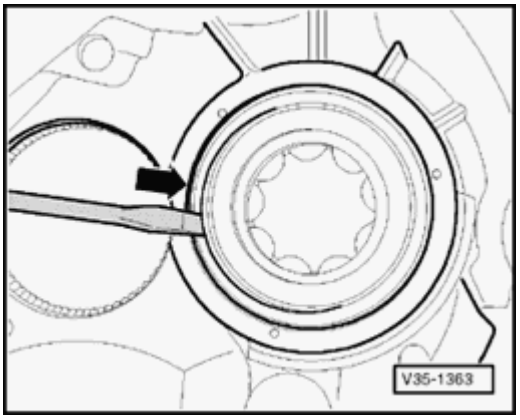


Fig. 244: Set Screwdriver In Place As Shown, Drive It Into Baffle Ring And Pry It Out
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position screwdriver as illustrated, drive into baffle plate -arrow- and lever out.
- Remove circlip.
- Take out bearing, remove peening indentations if necessary.

Installing ball bearing for input shaft in end cover

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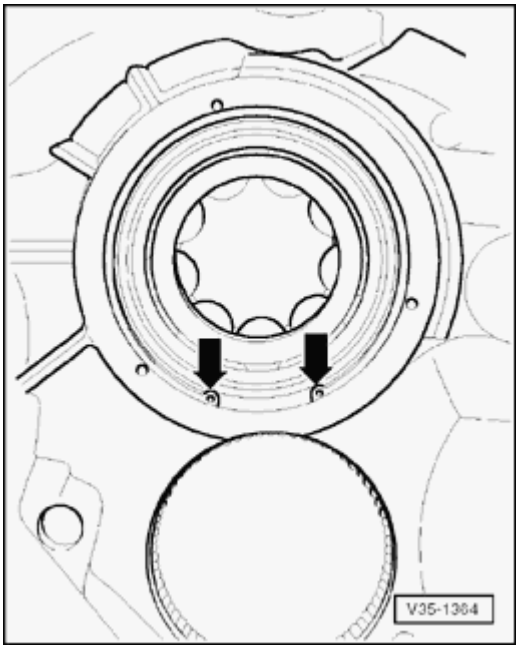


Fig. 245: Installation Position Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of circlip:

- Ends of circlip -arrows- face toward roller sleeve for drive pinion.

NOTE: The thickness of the circlip must be re-determined if the bearing or the end cover are replaced.

- Determining thickness of circlip for four-point bearing for input shaft:

- Press outer race of four-point bearing onto stop.
- Determine the thickest circlip that will just fit and install it.

- Axial play: no more than 0.08 mm

Available circlips

Circlip thickness (mm)	
2.55	2.65
2.60	2.70

Peening baffle plate in position when replacing ball bearing for input shaft

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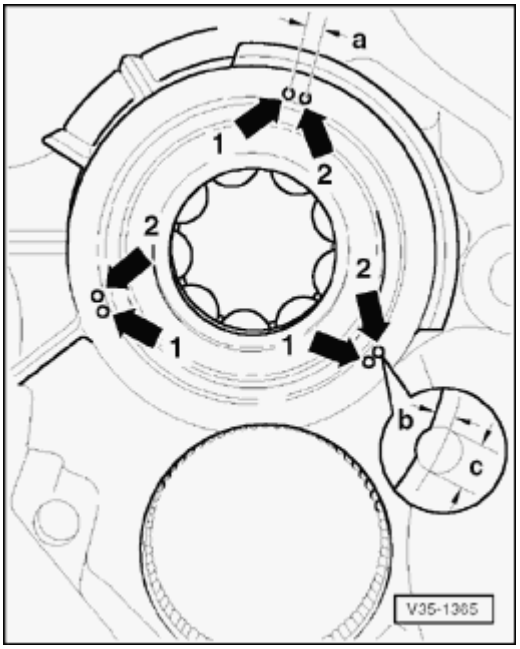


Fig. 246: Peening Baffle Ring When Replacing 4-Point Bearing For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use a blunt punch with a ball-shaped end (ball-diameter 5 mm) to peen in position.
- Insert baffle plate.
- First peen at points marked with -arrows 1-.
- Then peen at points marked with -arrows 2- at distance -a- from first position.

- Distance a = 5 mm

- Observe position and diameter of peening positions:

- Distance b = 2 mm
- Dimension c = 3 mm

Peening baffle plate in position when replacing end cover

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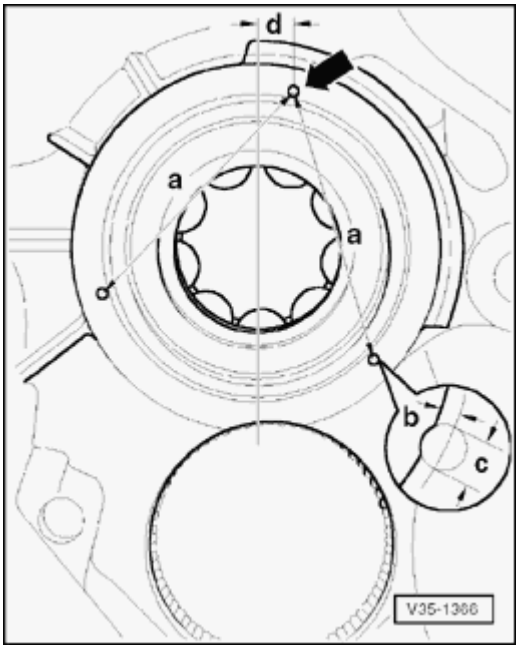


Fig. 247: Peening Baffle Ring When Replacing End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use a blunt punch with a ball shaped end (ball-diameter 5 mm) to peen in position.
- Insert baffle plate.
- Peen in first peening point -arrow- at distance -d- from the center line of the two shafts.

- Dimension d = 10 mm

- Observe position and diameter of peening positions:

- Distance b = 2 mm
- Dimension c = 3 mm

- Peen in second and third peening points in same manner at distance -a-.

- Distance a = 70 mm

Removing needle bearing for Torsen differential from end cover

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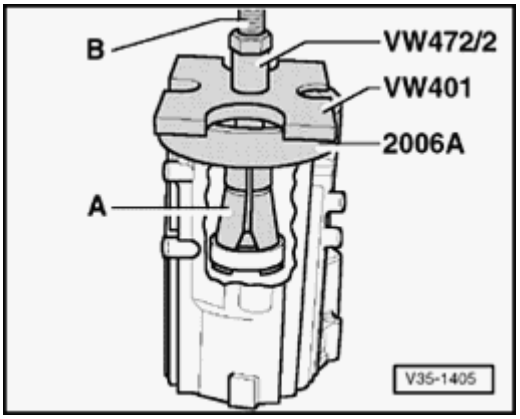


Fig. 248: Pulling Torsen Differential Needle Bearing Out Of End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Spindle from counter support, e.g. Kukko 22/2

Insert needle bearing of Torsen differential flush in end cover.

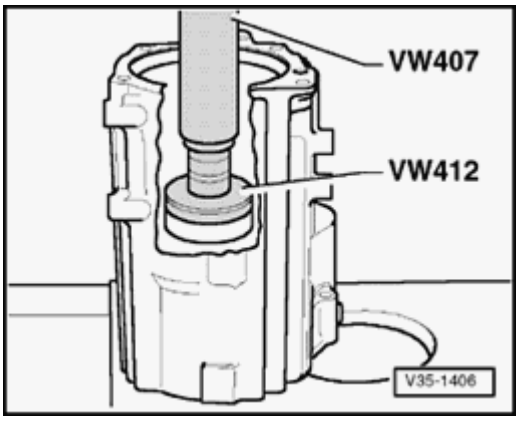


Fig. 249: Driving Torsen Differential Needle Bearing Flush Into End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install pressure plate VW 412 onto bearing with shoulder facing up.

BEARING PLATE, SERVICING

Bearing plate, servicing

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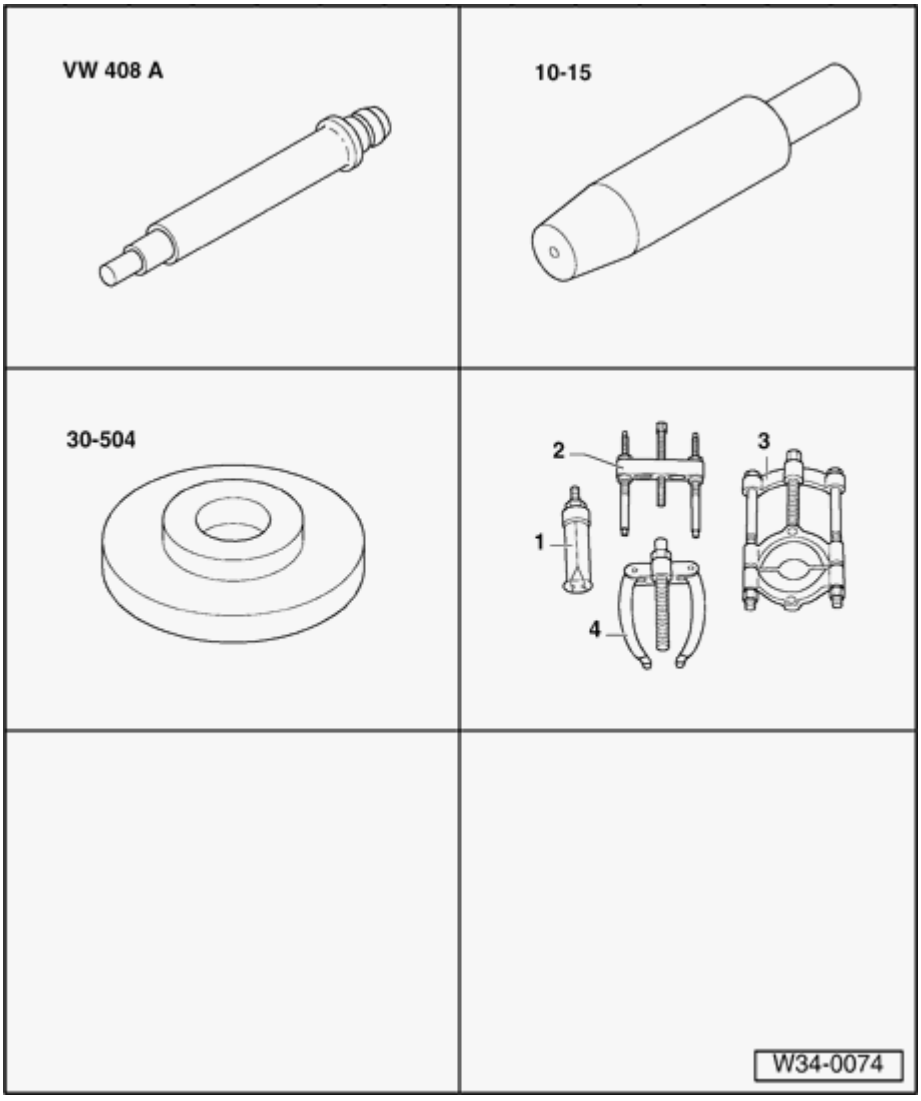


Fig. 250: Identifying Special Tools - Gear Carrier, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 408 A Press tool
- 10-15 Guide pins
- 30-504 Press tool
- 1 - Kukko 21/3 Internal puller
- 4 - Kukko 22/1 Counter support
- Depth gauge

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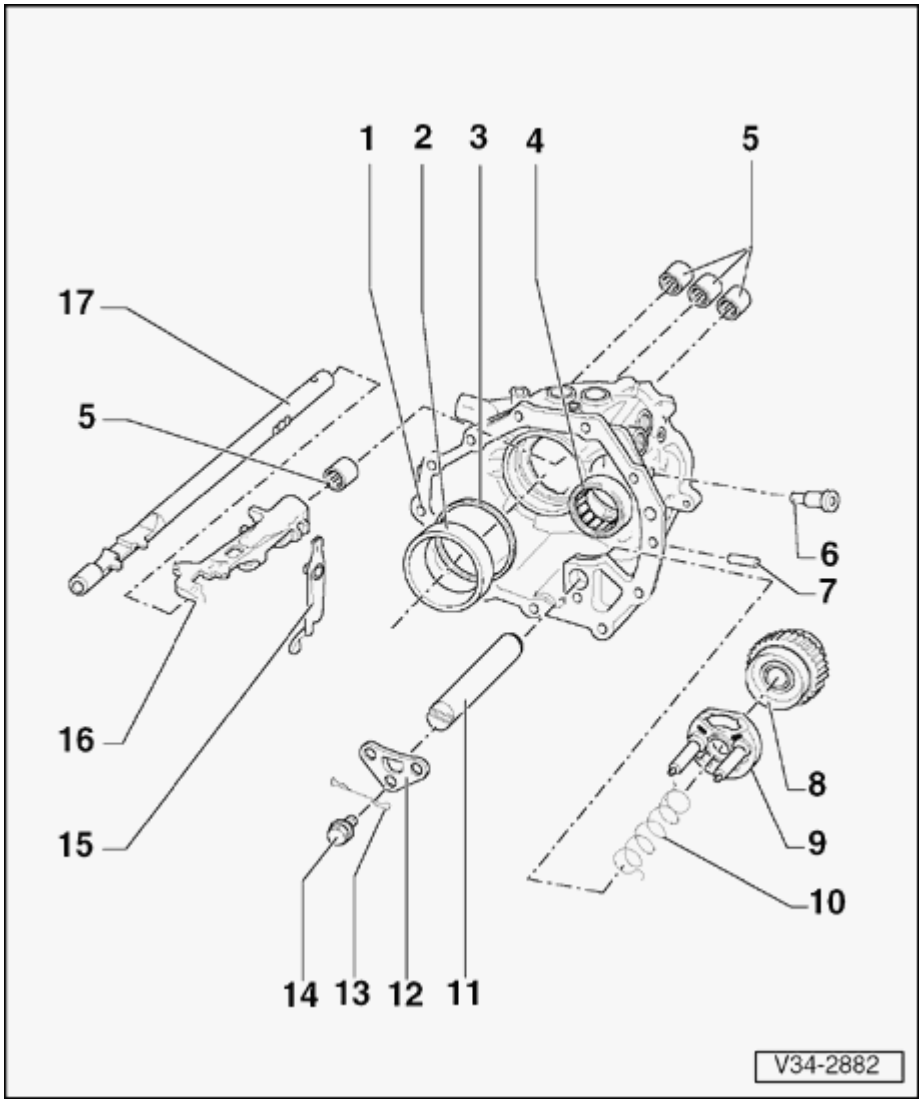


Fig. 251: Gear Carrier, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing plate

- Re-determine shim S4 when replacing

2 - Outer race/small taper roller bearing for drive pinion

- Driving out. Refer to **Driving out outer race for small taper roller bearing**
- Pressing in. Refer to **Pressing in outer race/small taper roller bearing**
- Re-determine shim S4 when replacing

3 - Shim S4

- Adjustment overview. Refer to **Adjustment overview**

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- Re-determining thickness. Refer to **Re-determining shim S4**

4 - Cylinder roller bearing for input shaft

- Pressing out. See **Pressing cylinder roller bearing for input shaft out of bearing plate**
- Pressing in. See **Pressing cylinder roller bearing for input shaft into bearing plate**
- Measuring insertion depth. See **Measuring insertion depth of cylinder roller bearing for input shaft**

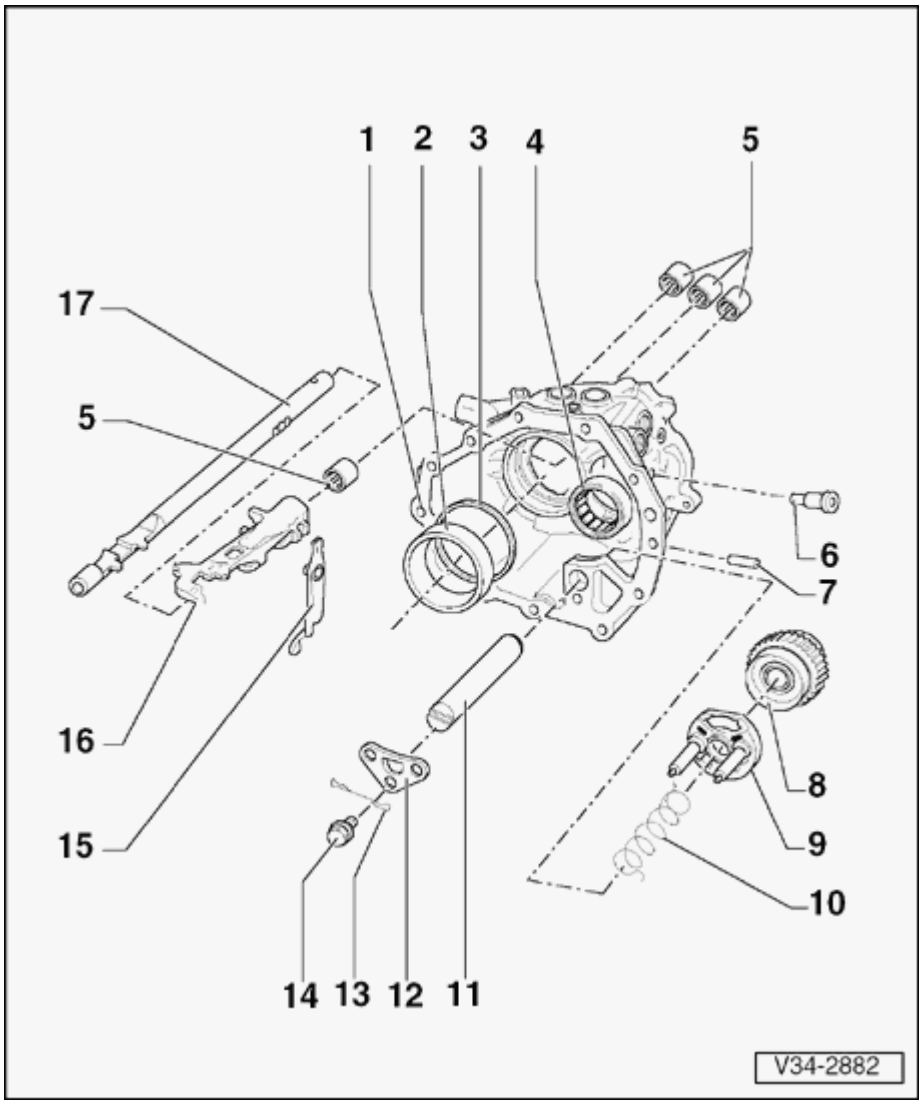


Fig. 252: Gear Carrier, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Ball sleeves

- 4 pieces
- Removing and driving in. See **Driving out and driving in ball sleeves for selector rods**

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For follower for reverse gear:

- Pulling out. See **Pulling ball sleeve out of follower for reverse gear**
- Tapping in. See **Driving ball sleeve flush into follower for reverse gear**

6 - Bolt, 35 Nm

- For relay lever

7 - Dowel pin (7 x 28)

- Drive in and drive out with drift

8 - Reverse idler gear

- For reverse gear

9 - Reverse gear synchro-ring

- With locking pins
- Checking for wear. See **Checking synchro-ring for wear**
- Installation position: Position flat on synchro-ring circumference to face input shaft. Refer to **Fig. 185**

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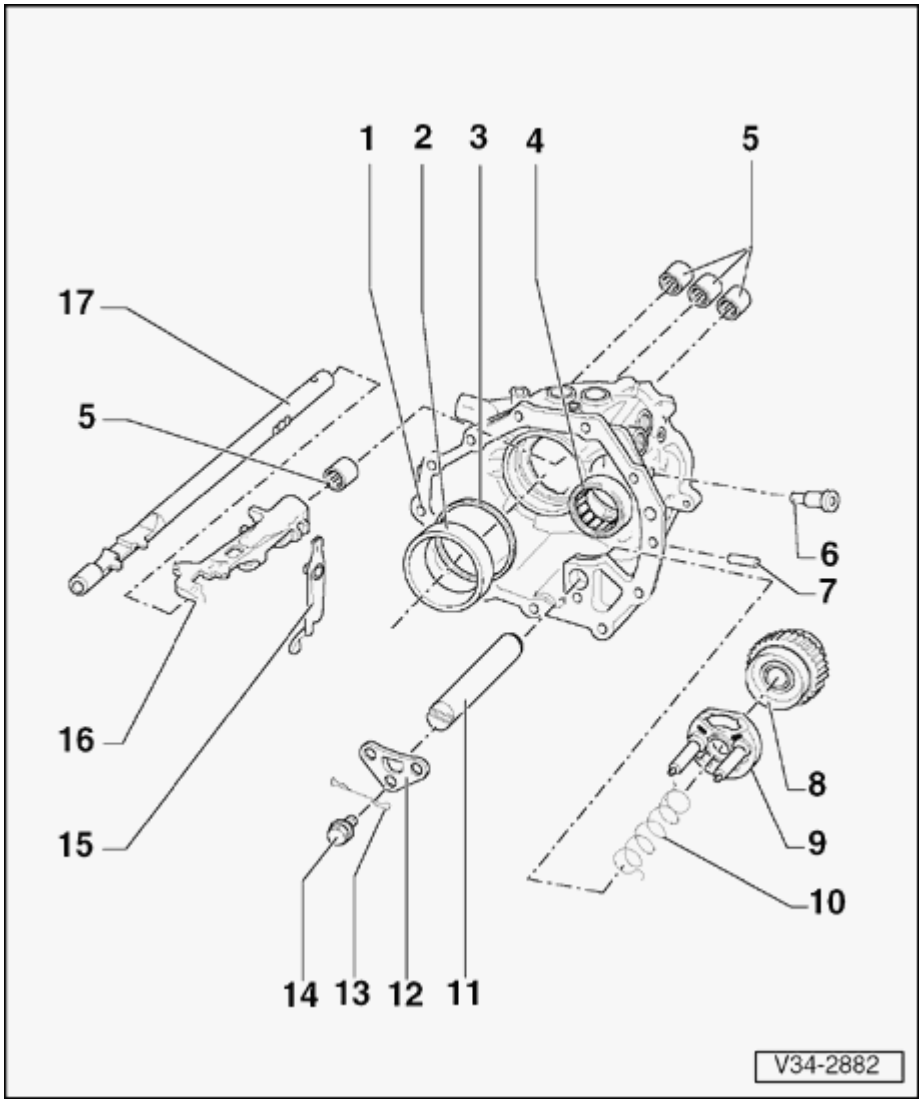


Fig. 253: Gear Carrier, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

10 - Spring

- Installation position: Hook single angled end into recess on synchro-ring. Turn double angled end anti-clockwise and insert into opening on bearing plate

11 - Reverse idler gear axle

12 - Retaining plate

- Installation position: Chamfers of holes for locking pins of synchro-ring face bearing plate. Refer to **Fig. 186**

13 - Spring clasp

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14 - Bolt, 25 Nm

- Self-locking
- Always replace

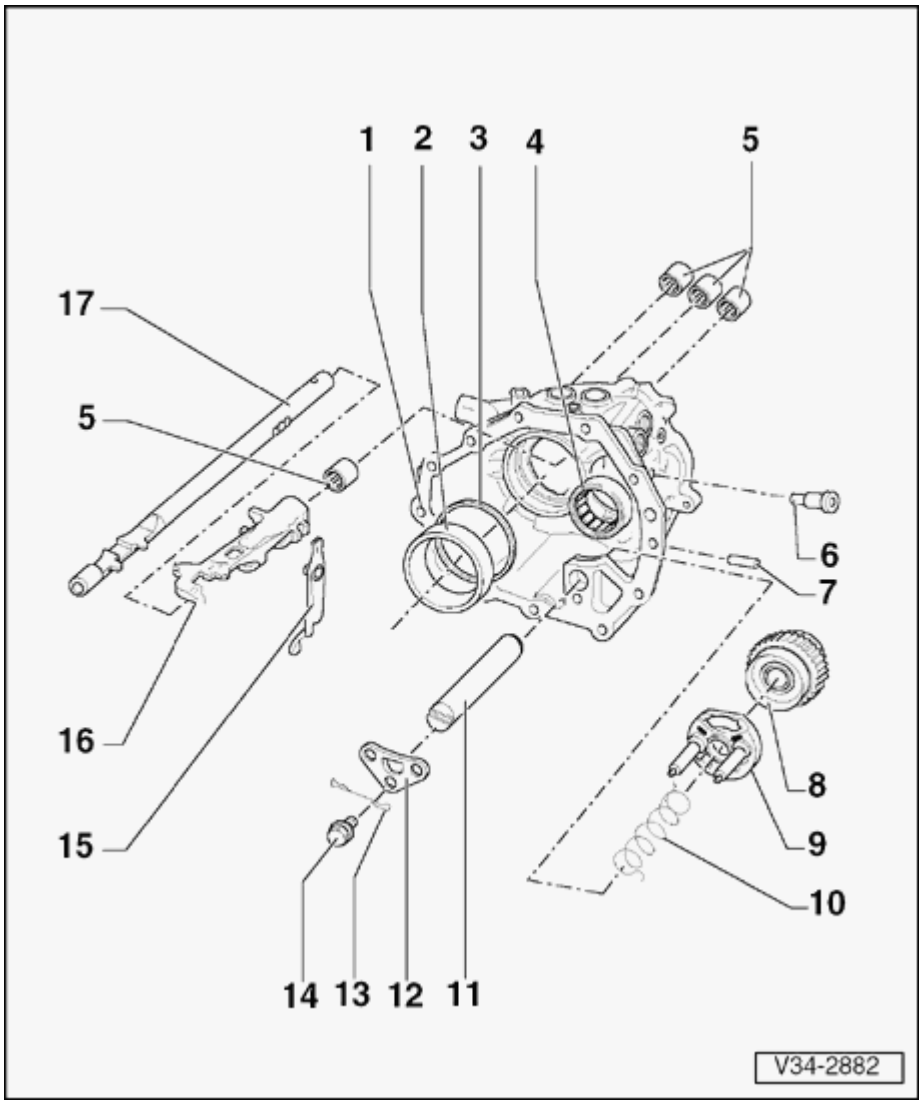


Fig. 254: Gear Carrier, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

15 - Relay lever for reverse gear

16 - Follower for reverse gear

- Pulling out ball sleeve. See **Pulling ball sleeve out of follower for reverse gear**
- Driving in ball sleeve. See **Driving ball sleeve flush into follower for reverse gear**

17 - Selector rod for 5th and 6th gear

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- Replace only together with follower. Refer to **5th and 6th gear, removing and installing**, Item 6

Driving out and driving in ball sleeves for selector rods

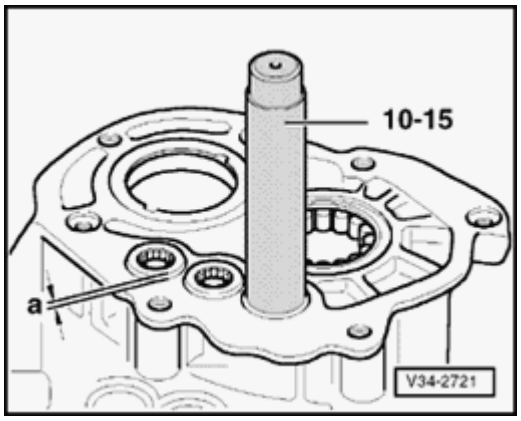


Fig. 255: Driving Selector Rod Ball Sleeves Out And In
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve with the inscribed side (thicker metal) facing the drift.

- Insertion depth a = 2.5 mm

Checking synchro-ring for wear

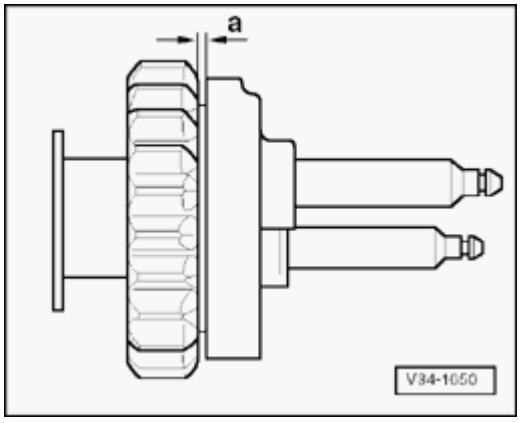


Fig. 256: Checking Synchronizer Ring For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchro-ring onto reverse idler gear cone and measure gap "a" with feeler gauge.

- Dimension, new: 0.75 to 2.3 mm
- Wear limit: 0.2 mm

Pulling ball sleeve out of follower for reverse gear

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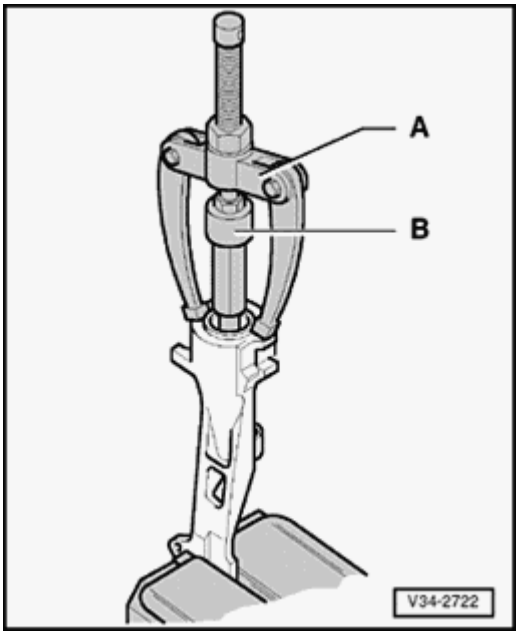


Fig. 257: Pulling Reverse Gear Ball Sleeve Out Of Yoke
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Internal extractor 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving ball sleeve flush into follower for reverse gear

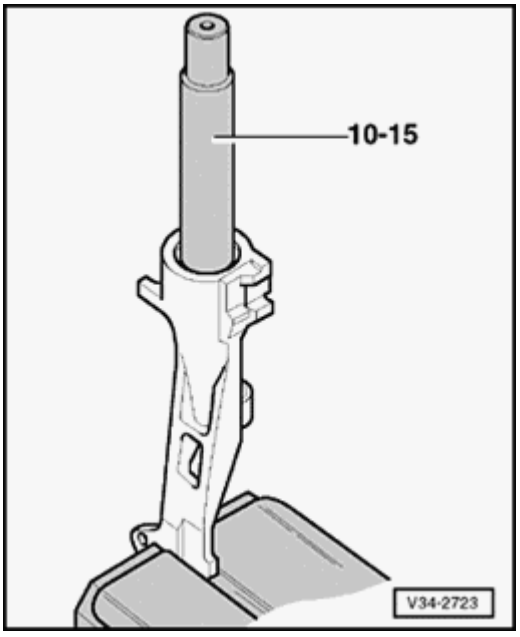


Fig. 258: Driving Ball Sleeve Flush Into Reverse Gear Yoke
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Install ball sleeve with the inscribed side (thicker metal) facing the drift.

Pressing cylinder roller bearing for input shaft out of bearing plate

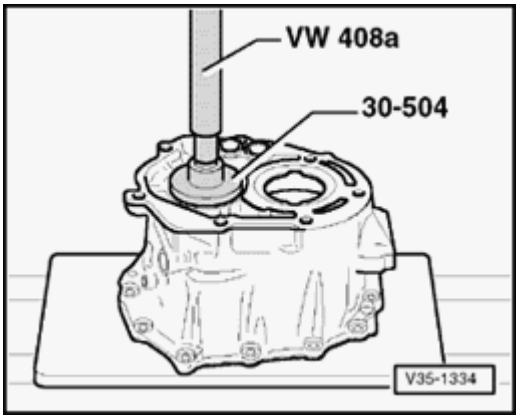


Fig. 259: Pressing Roller Bearing For Input Shaft Out Of/Into Gear Carrier
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing cylinder roller bearing for input shaft into bearing plate

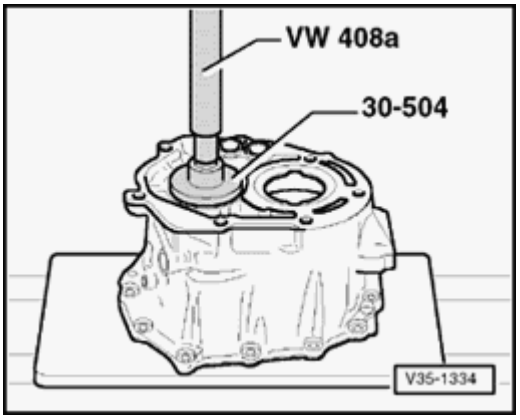


Fig. 260: Pressing Roller Bearing For Input Shaft Out Of/Into Gear Carrier
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measuring insertion depth. See **Measuring insertion depth of cylinder roller bearing for input shaft**

Measuring insertion depth of cylinder roller bearing for input shaft

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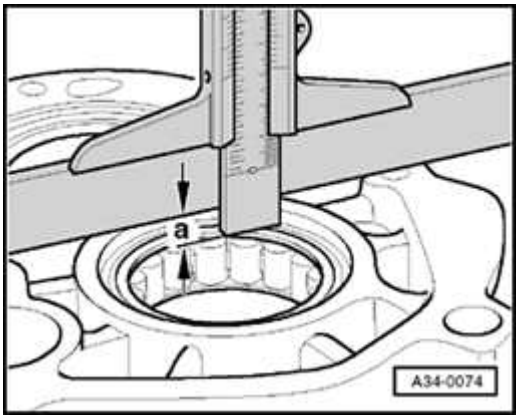


Fig. 261: Measuring Press-In Depth Of Input Shaft Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Dimension a = 7 mm

Re-determining shim S4

Special tools and equipment

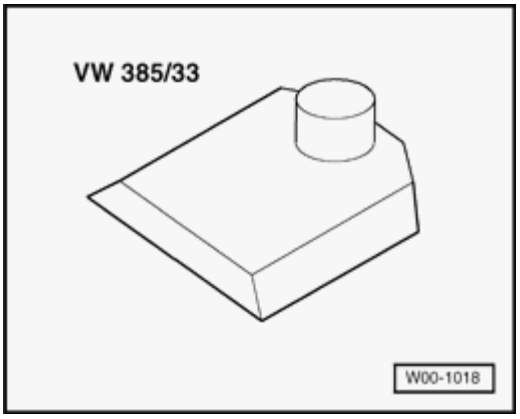


Fig. 262: VW 385/32 End Measuring Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 385/32 End measuring plate

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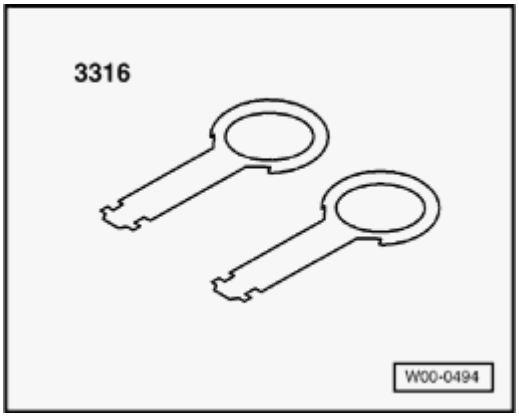


Fig. 263: 3116 Spring Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3116 Spring pin
- Digital depth gauge accurate to within at least 5/100 mm.

Determining New Shim S 4, Overview

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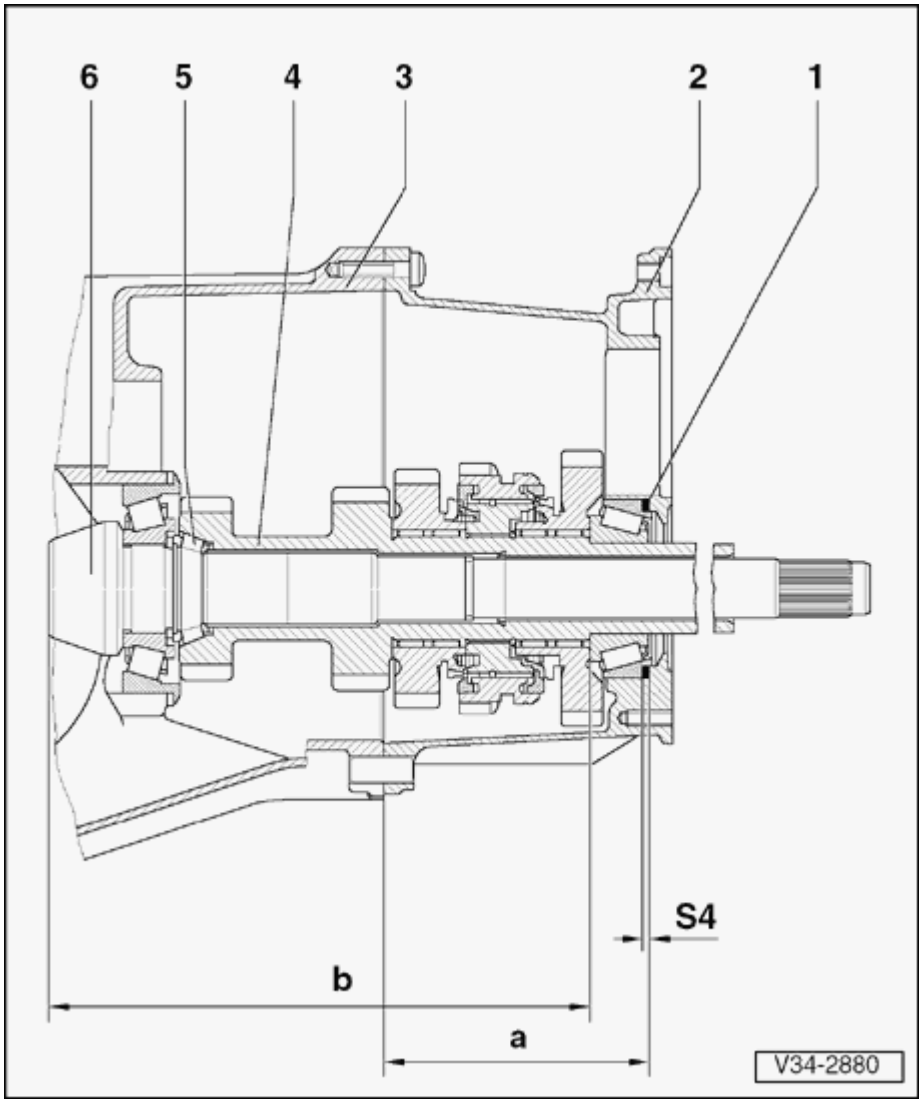


Fig. 264: Determining New Shim S 4, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

This procedure must be carried out when replacing the following components:

- Bearing plate. Refer to **Determining thickness of shim when replacing bearing plate**
- Hollow shaft. Refer to **Determining thickness of shim when replacing hollow shaft**

The procedure restores the required preload of the taper roller bearings for the drive pinion and hollow shaft.

1 - Shim S4

2 - Bearing plate

3 - Transmission housing

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4 - Hollow shaft

5 - Taper roller bearing of drive pinion/hollow shaft

6 - Pinion shaft

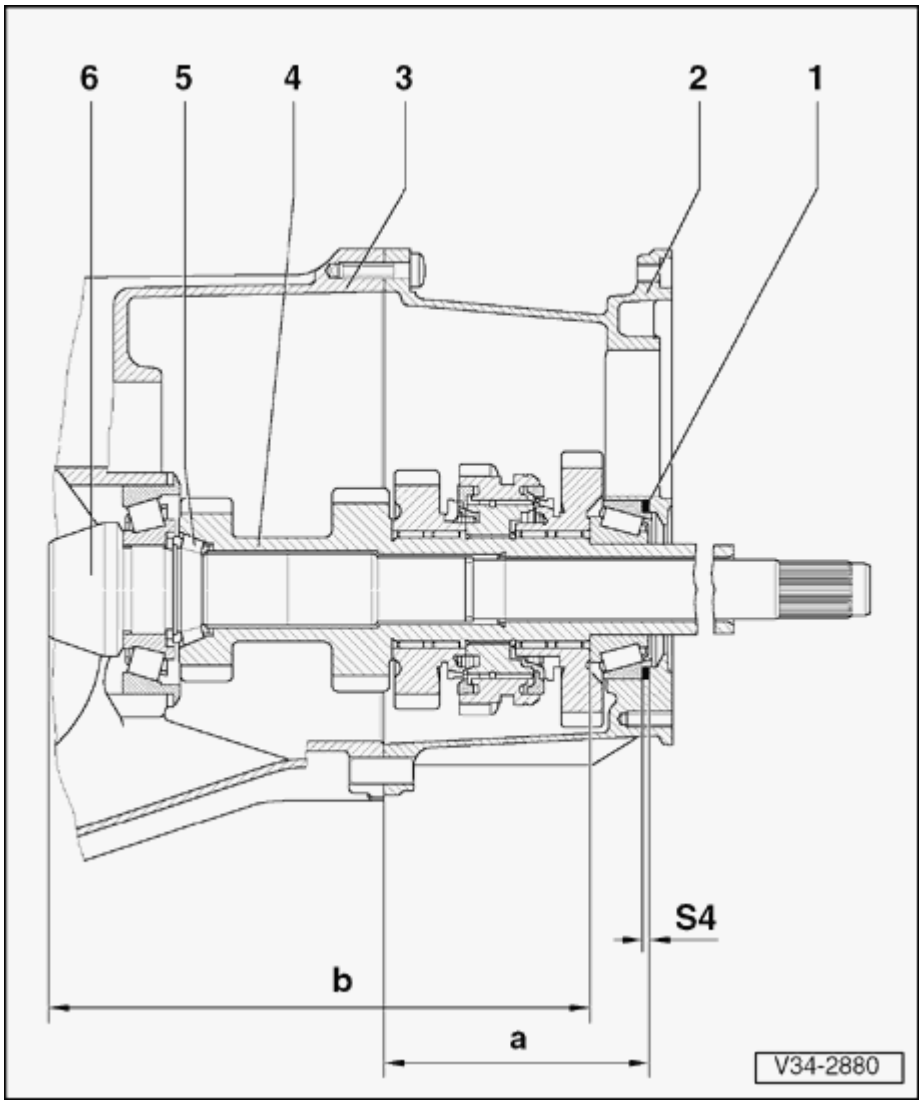


Fig. 265: Determining New Shim S 4, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

a - Bearing plate housing depth

b - Dimension from drive pinion head to shoulder of taper roller bearing on hollow shaft

- Taper roller bearing (drive pinion/hollow shaft) pre-tensioned to 10 Nm

S4 - Thickness of shim S4

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NOTE: When replacing the drive pinion (final drive set), observe adjustment overview. Refer to Adjustment overview.

Determining thickness of shim when replacing bearing plate

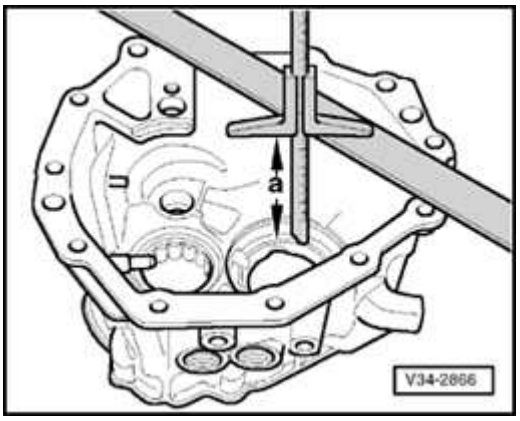


Fig. 266: Measuring Difference In Depths Between Old And New Gear Carriers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure difference of depth "a" on old and new bearing plates.

Example:

Depth "a" of old bearing plate	124.40 mm
Depth "a" of new bearing plate	124.65 mm
Difference	= 0.25 mm

- If new bearing plate is deeper, install a thicker S4 shim.
- If old bearing plate was deeper, install a thinner S4 shim.

Example:

Previous shim S4	0.95 mm
Difference	+0.25 mm
New shim S4	= 1.20 mm

Available shims. Refer to table. Refer to **Available shims for S4**.

Determining thickness of shim when replacing hollow shaft

- Use a caliper gauge accurate to within at least 5/100 mm.

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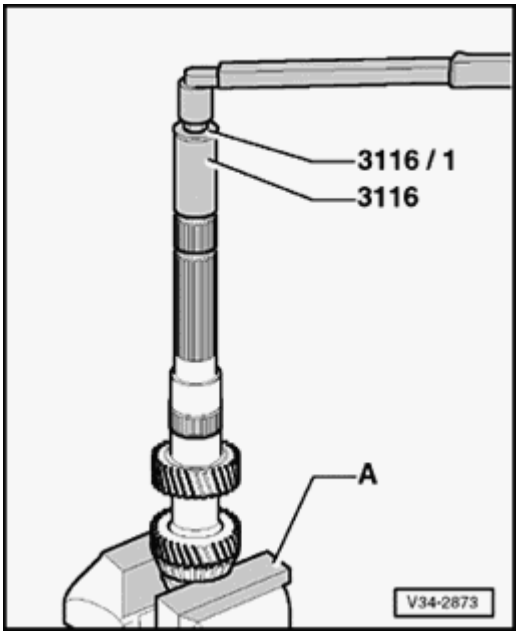


Fig. 267: Tighten Clamping Sleeve To Exactly 10 Nm
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten spring pin to exactly 10 Nm.

A - Vice clamps

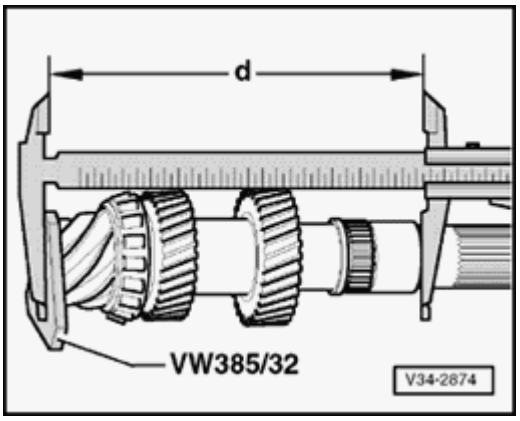


Fig. 268: Setting End Gauge VW 385/32 Onto Pinion Face
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place end measuring plate VW 385/32 onto drive pinion head and measure dimension "d".

- Top measuring point is shoulder for inner race of small taper roller bearing.
- Example: 248.50 mm

- Install new hollow shaft and once again measure dimension "d".

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- Example: 248.70 mm

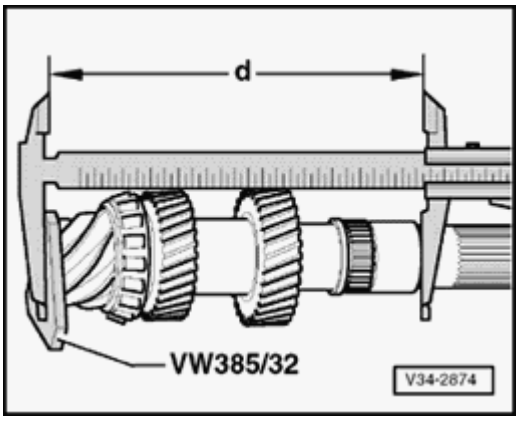


Fig. 269: Setting End Gauge VW 385/32 Onto Pinion Face
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine the difference:

Dimension "d" of old hollow shaft	248.50 mm
Dimension "d" of new hollow shaft	248.70 mm
Difference	= 0.20 mm

- Install appropriately thinner shim S4 if dimension "d" of new hollow shaft is larger.
- Install appropriately thicker shim S4 if dimension "d" of new hollow shaft is smaller.

Available shims for S4

Shim thickness (mm)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

Different tolerances make it possible to obtain the exact shim thickness required, if necessary, install 2 shims.

TRANSMISSION HOUSING, SERVICING

Transmission housing, servicing

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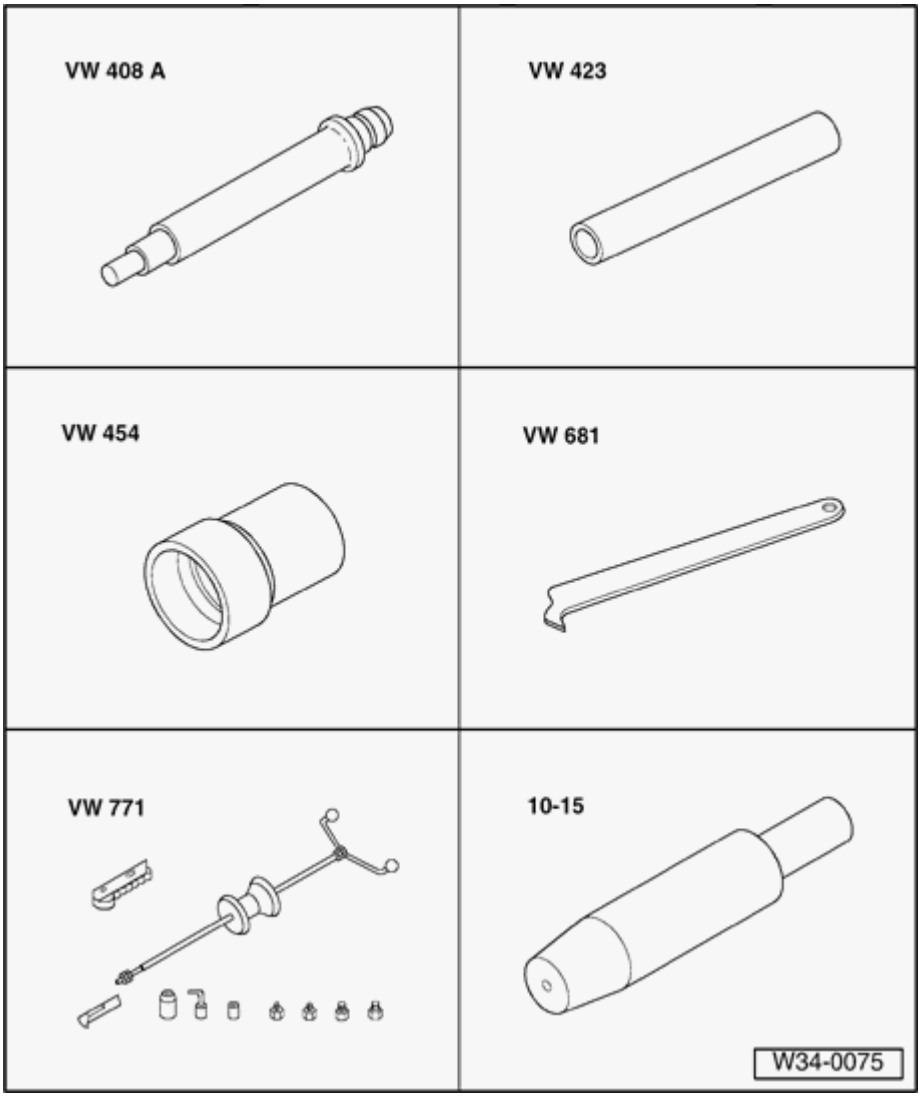


Fig. 270: Identifying Special Tools - Transmission Housing, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 408 A Press tool
- VW 423 Tube
- VW 454 Thrust pad
- VW 681 Seal extractor
- VW 771 Multi-purpose tool
- 10-15 Guide pins

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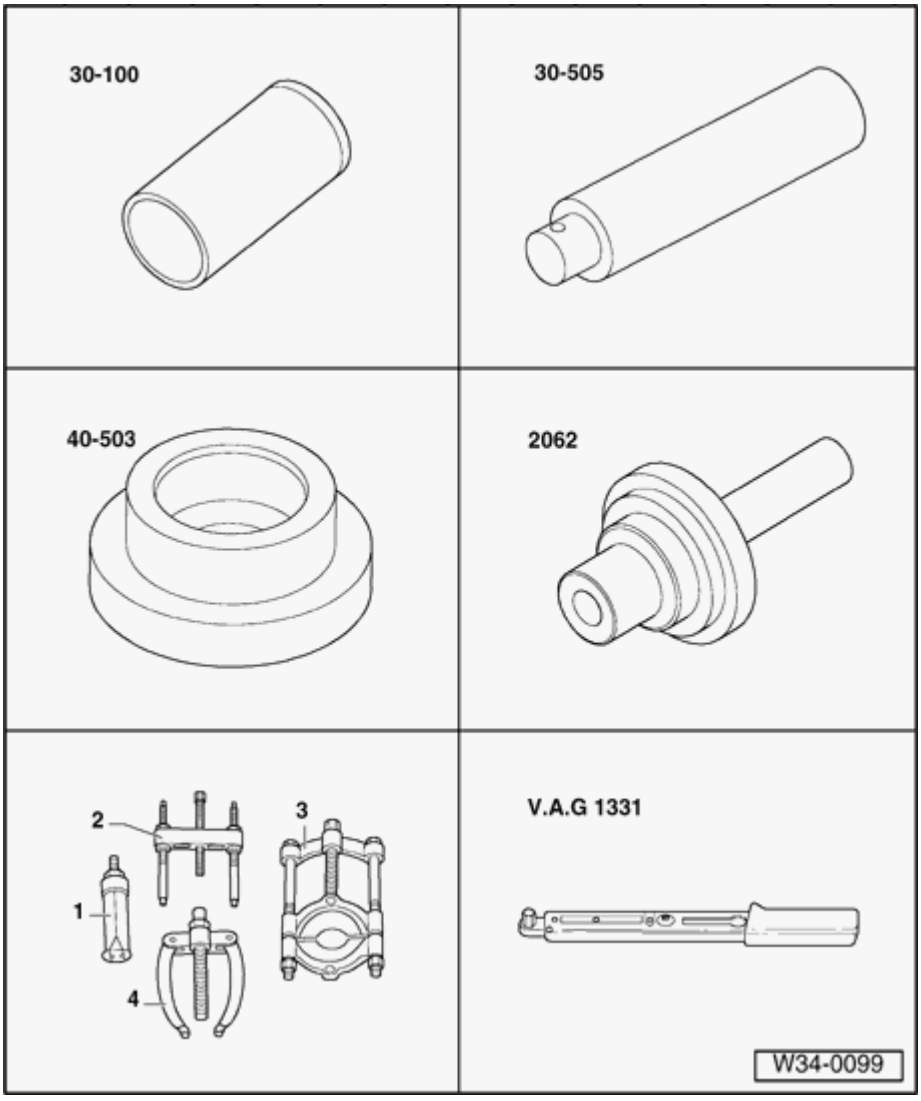


Fig. 271: Identifying Special Tools - Transmission Housing, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 30-100 Thrust sleeve
- 30-505 Fitting mandrel
- 40-503 Inserting drift
- 2062 Fitting drift

- 1 - Kukko 21/2 Internal puller and Kukko 21/5 Internal puller
- VAG 1331 Torque wrench (5 to 50 Nm)
- Depth gauge
- Assembly sleeve Part No. 01E 311 120

1) Adjustments are required if these components are replaced. Refer to Adjustment overview: Refer to **Adjustment overview**.

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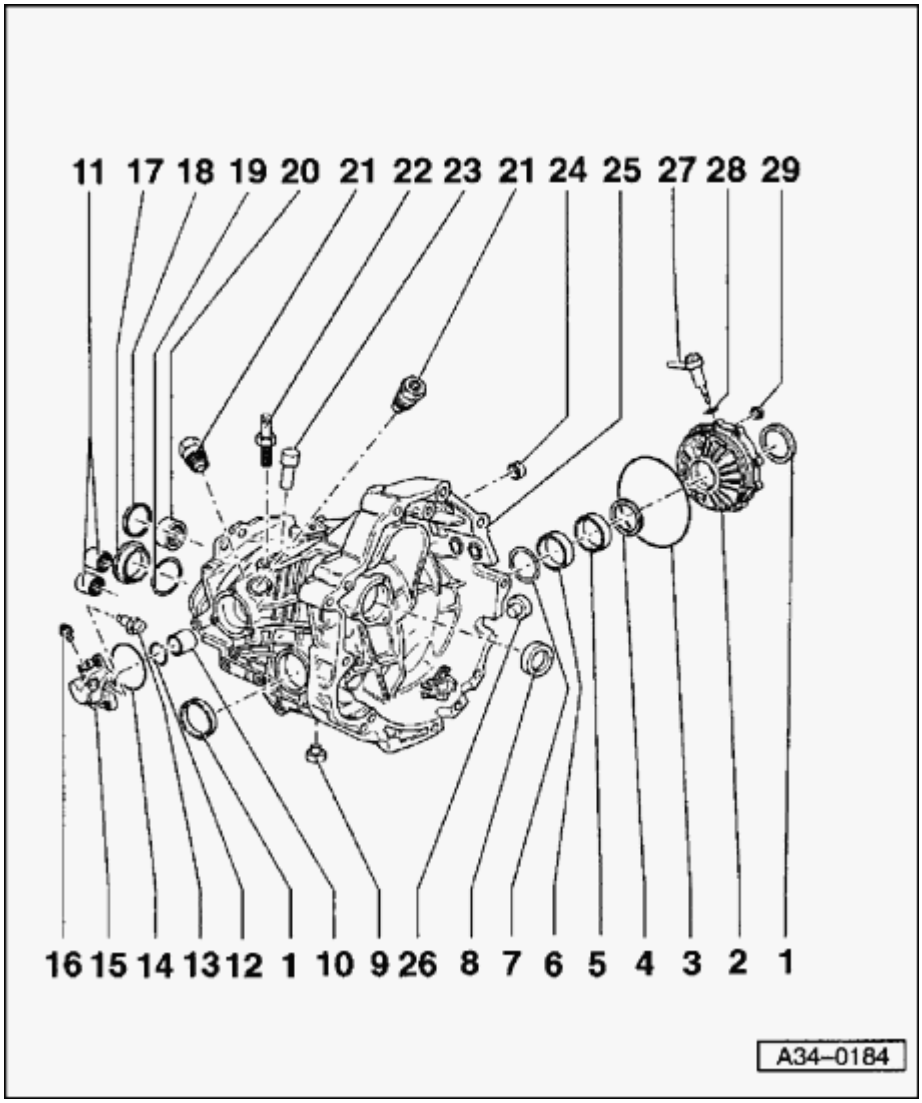


Fig. 272: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Seal for flanged shaft

- Pulling out. See **Pulling out seal for flanged shaft**
- Tapping in. See **Driving in seal for flanged shaft**
- Pack space between sealing lips with sealing grease
- Replacing with transmission installed. Refer to **Removing input shaft seal when transmission is not disassembled**

2 - Cover1)

- For final drive

3 - O-ring

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- For cover for final drive
- Always replace

4 - Shim S1

- Note thickness
- Adjustment overview. Refer to **Adjustment overview**

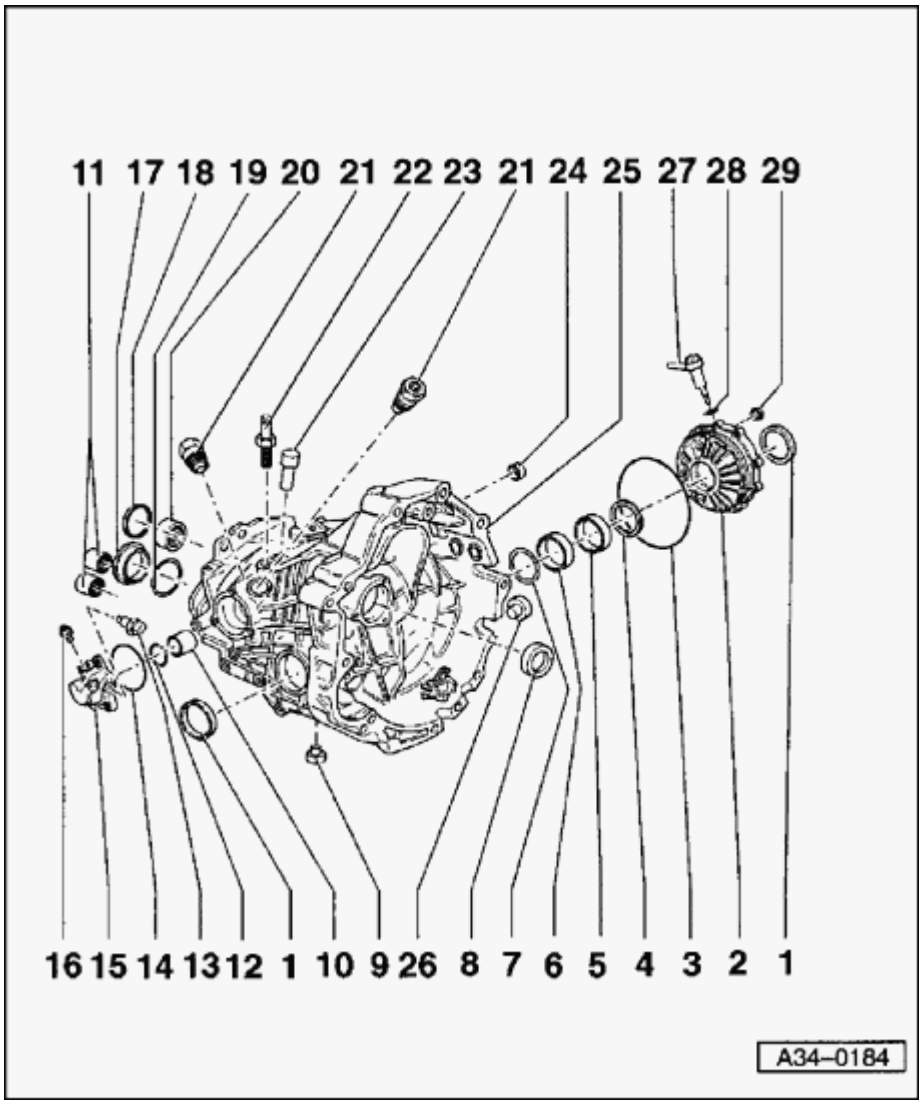


Fig. 273: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Taper roller bearing outer race, large1)

- For differential
- Removing and installing. Refer to **Driving outer race for large taper roller bearing out of cover**and

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Driving outer race for large taper roller bearing into cover

6 - Taper roller bearing outer race, small1)

- For differential
- Removing and installing. Refer to **Driving outer race for small taper roller bearing out of transmission housing** and **Pressing outer race for small taper roller bearing into transmission housing**

7 - Shim S2

- Note thickness
- Adjustment overview. Refer to **Adjustment overview**

8 - Seal

- For input shaft
- Levering out. See **Levering out input shaft seal when transmission is disassembled**
- Tapping in. See **Drive in input shaft seal flush**
- Always replace when removing input shaft
- Replacing when transmission is not disassembled. See **Removing input shaft seal when transmission is not disassembled** and **Drive in input shaft seal flush**

9 - Oil drain plug, 40 Nm

10 - Ball sleeve for selector shaft

- Pulling out. See **Pulling out ball sleeve**
- Tapping in. See **Driving in ball sleeve**

11 - Ball sleeves for selector rods

- Pulling out as -Item 10 **Transmission housing, servicing**. See **Pulling out ball sleeve**
- Driving in as -Item 10 **Transmission housing, servicing**. See **Driving in ball sleeve**

12 - Circlip

- Installation position: Eyes facing up

13 - Switch for reversing light, 20 Nm

- Removing and installing. See **Removing and installing reversing light switch**

14 - O-ring

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- For selector shaft cover
- Always replace
- Coat with gear oil when installing

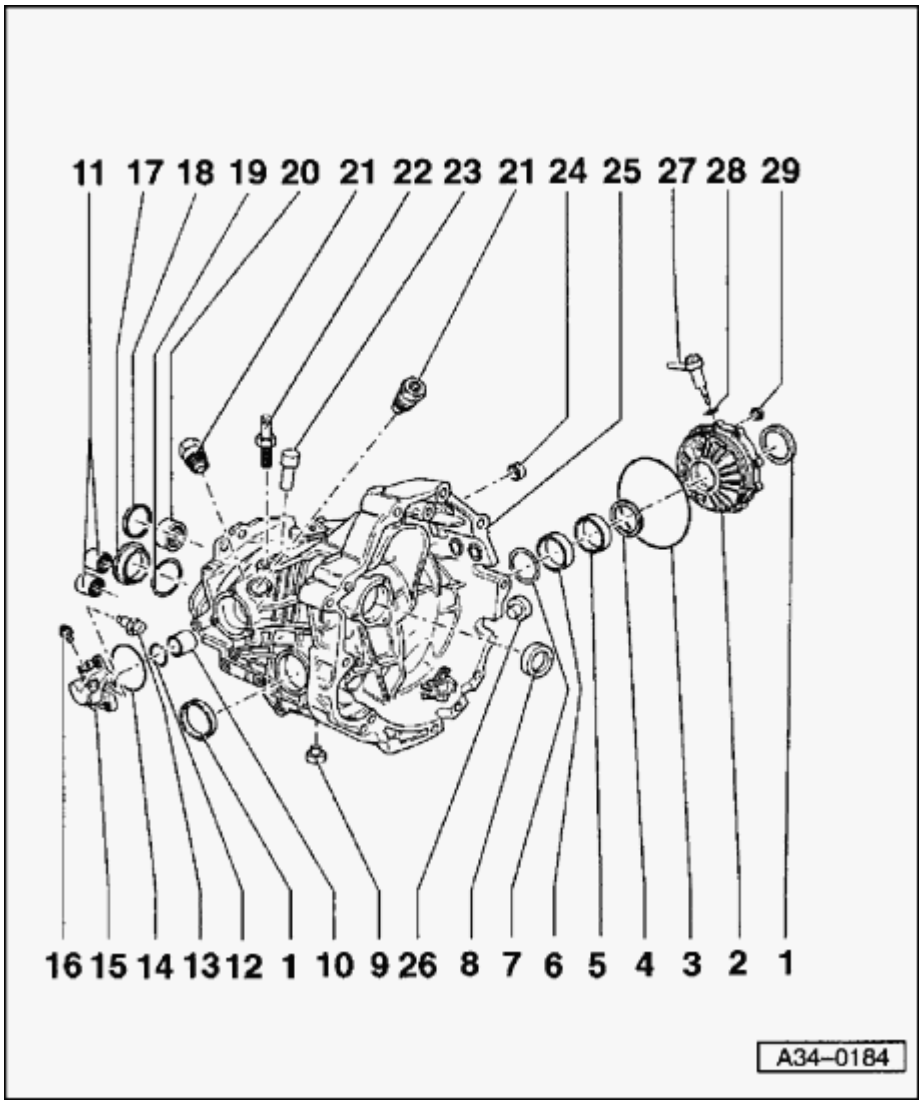


Fig. 274: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

15 - Cover for selector shaft

- Removing. Refer to **Fig. 164**
- Installing. Refer to **Fig. 212**

16 - Ball stud, 20 Nm

- For connecting rod

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17 - Taper roller bearing outer race, large1)

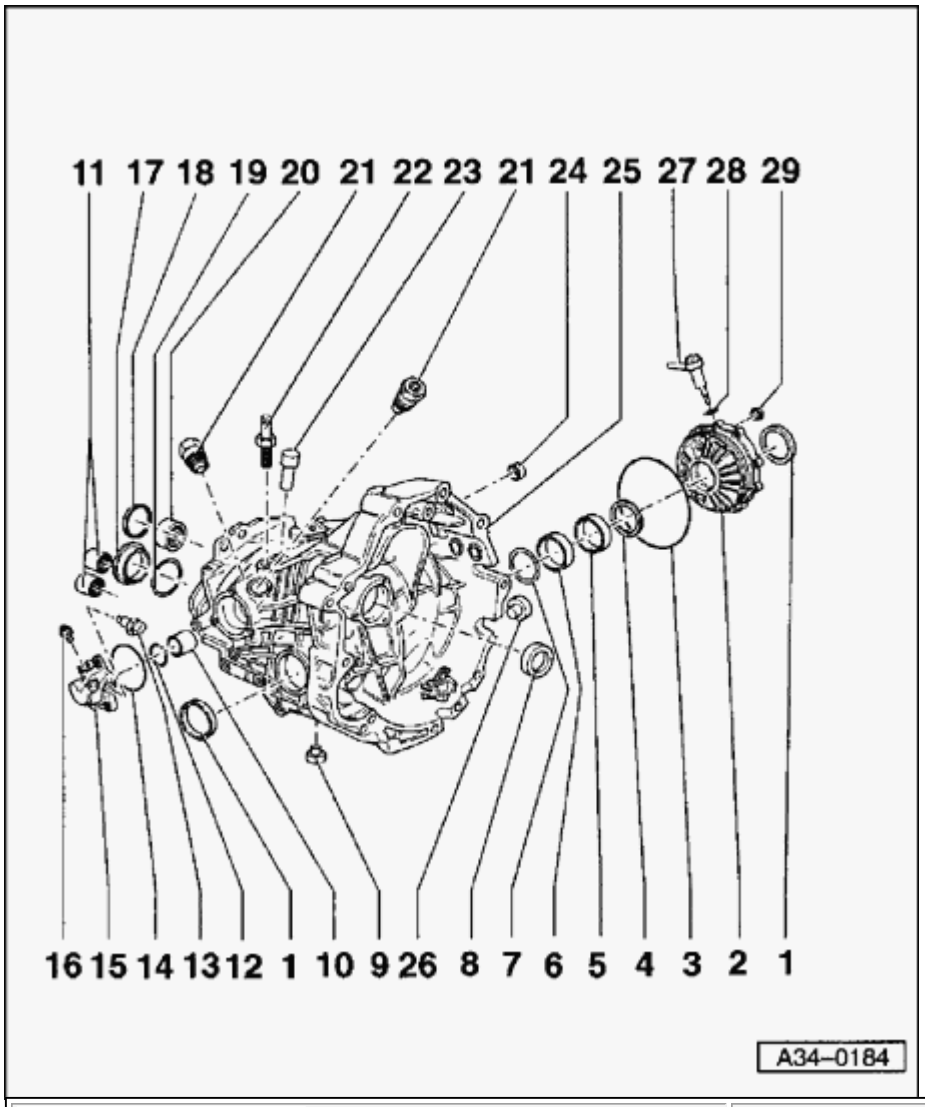
- For drive pinion
- Pulling out. Refer to **Pulling out large taper roller bearing outer race**
- Pressing in. Refer to **Heating transmission housing in order to install outer race for taper roller bearing**

18 - Circlip

- Removing. See **Removing circlip**

19 - Shim S3

- Note thickness
- Adjustment overview. Refer to **Adjustment overview**



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Fig. 275: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

20 - Needle bearing for input shaft

- Pulling out. See **Pulling needle bearing out of transmission housing**
- Tapping in. See **Driving needle bearing into transmission housing**
- Measuring insertion depth. See **Insertion depth of needle bearing**

21 - Locking bolt for selector shaft, 50 Nm

- Removing. Refer to **Fig. 164**
- Insert in transmission housing with sealing paste AMV 188 001 02

22 - Trunnion bolt, 40 Nm

- For push rod

23 - Breather

- Insertion depth of sleeve. See **Insertion depth of breather sleeve**
- Clip cap on

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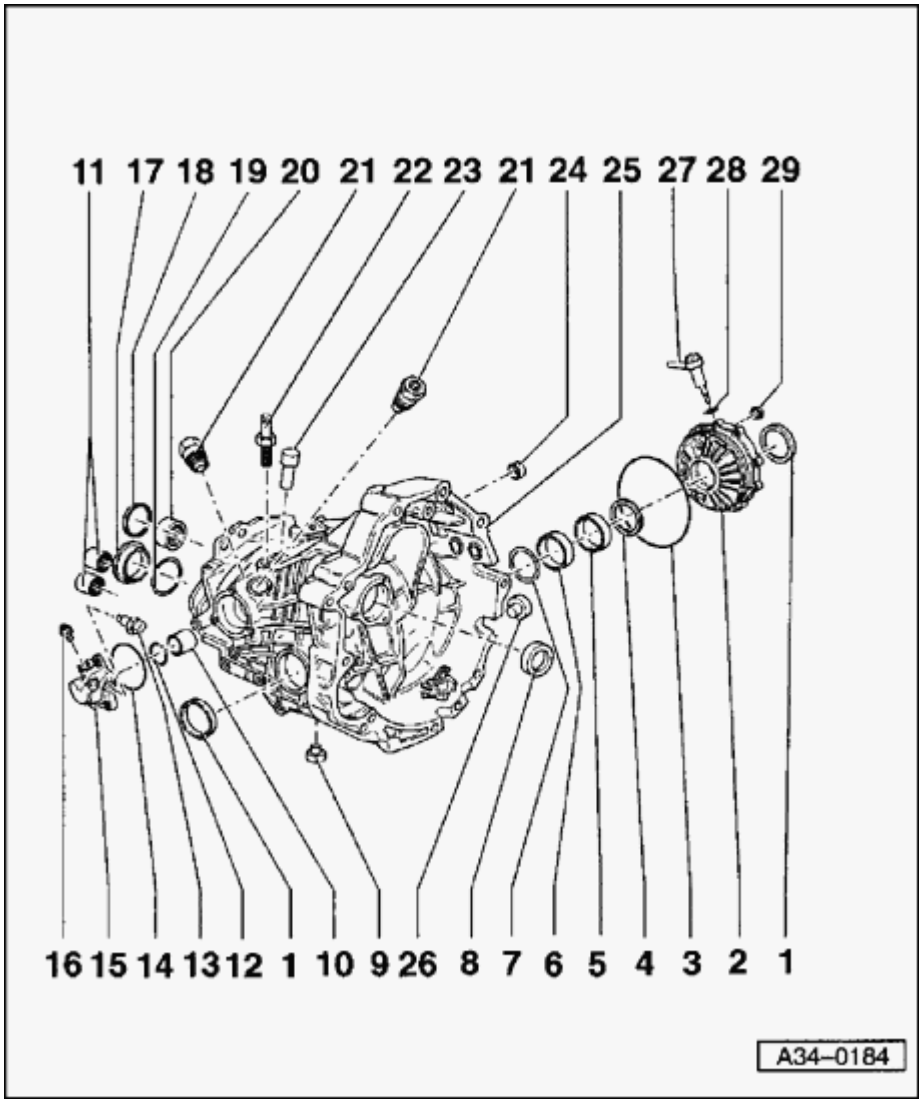


Fig. 276: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

24 - Selector shaft seal

- Can be replaced when transmission is removed but not disassembled
- Always replace
- Pulling out. See **Pulling out selector shaft seal**
- Tapping in. See **Driving in selector shaft seal**

- Always use assembly sleeve for installing. See **Installing seal and selector shaft with assembly sleeve**

25 - Transmission housing 1)

26 - Solenoid

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- Clean
- Drive in (for example, with press tool VW 408 A) when replacing transmission

27 - Speedometer vehicle speed sensor -G22-

- Replacing. Refer to **Speedometer vehicle speed sensor -G22-, removing and installing**

28 - O-ring

- Always replace

29 - Oil filler plug, 40 Nm

Pulling out seal for flanged shaft

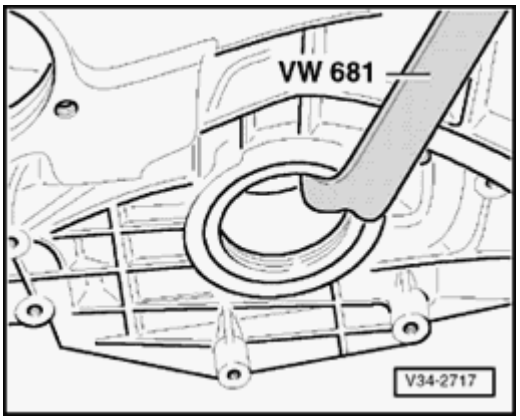
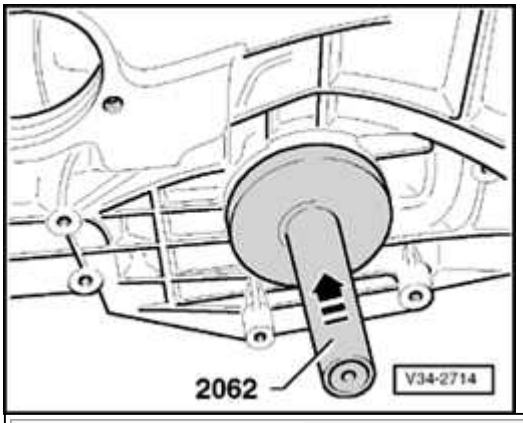


Fig. 277: Removing Drive Flange Seal Using Extractor Lever VW 681
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Figure shows removing seal on right-hand side of transmission.**
- **The procedure is identical for left and right-hand seals.**

Driving in seal for flanged shaft



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Fig. 278: Driving In Flange Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insertion depth: 5.5 mm

NOTE:

- **Figure shows installing seal on right-hand side of transmission.**
- **The procedure is identical for left and right-hand seals.**
- **Insertion depth for repairs is 6.5 mm when a used flanged shaft is employed.**

Levering out input shaft seal when transmission is disassembled

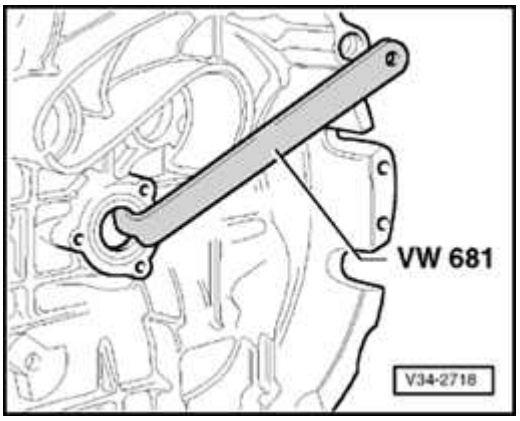


Fig. 279: Prying Input Shaft Seal Out Of Disassembled Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing input shaft seal when transmission is not disassembled

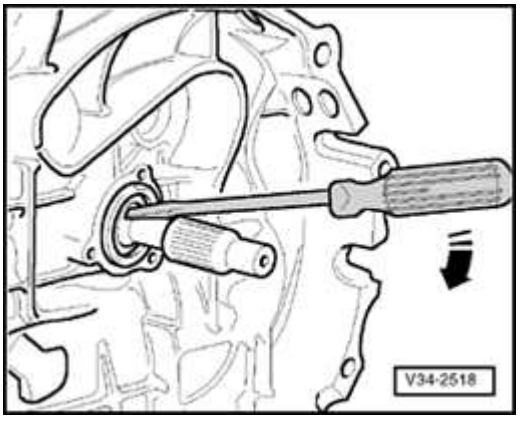


Fig. 280: Removing Shaft Seal For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lever out seal carefully with a screwdriver.

NOTE: Do not damage bearing surface on input shaft for shaft seal.

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Drive in input shaft seal flush

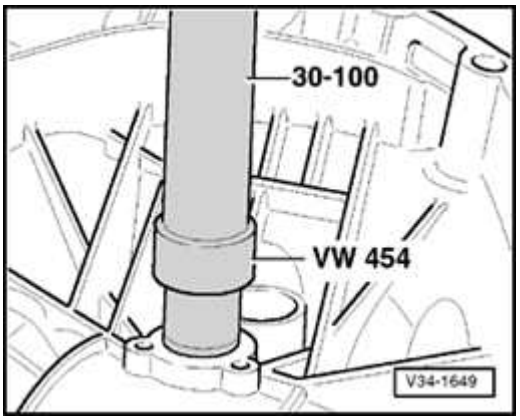


Fig. 281: Installing Shaft Seal For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pack new seal for input shaft between sealing lip and dust lip half full with sealing grease.
- Pull a thin protective hose tightly onto splines of input shaft.
- Tapping in input shaft seal.

- Insertion depth: 3.5 mm

NOTE: Insertion depth for repairs is 4.5 mm when a used input shaft is employed.

- Remove protective hose.

Pulling out ball sleeve

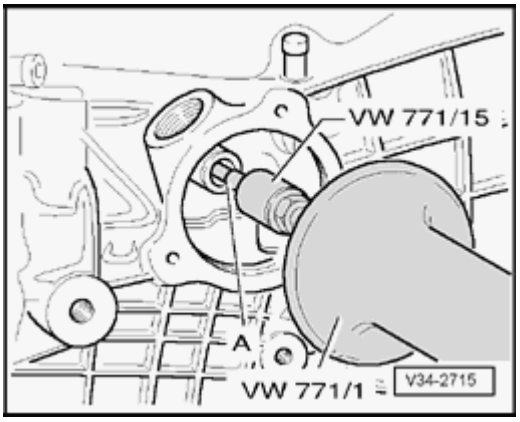


Fig. 282: Pulling Out Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip.

A - Internal extractor 14.5 to 18.5 mm, e.g. Kukko 21/2

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Driving in ball sleeve

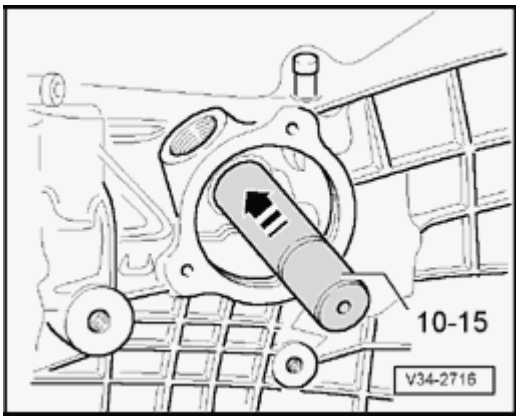


Fig. 283: Driving In Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install ball sleeve with the inscribed side (thicker metal) facing the drift.
- Drive in onto stop.
- Install circlip.

Pulling out selector shaft seal

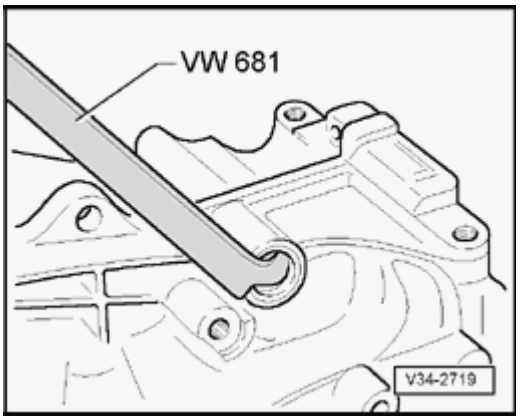


Fig. 284: Removing Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: With transmission removed but not disassembled, carefully lever out seal without damaging the shaft with a screwdriver.

Driving in selector shaft seal

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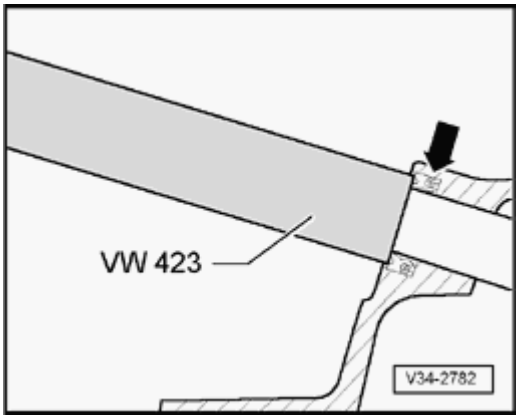


Fig. 285: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Selector shaft installed or removed

  - Pack space between sealing and dust lips half full with sealing grease.
  - Pull assembly sleeve onto selector shaft. See **Installing seal and selector shaft with assembly sleeve**
  - Drive seal into housing onto stop.

Installing seal and selector shaft with assembly sleeve

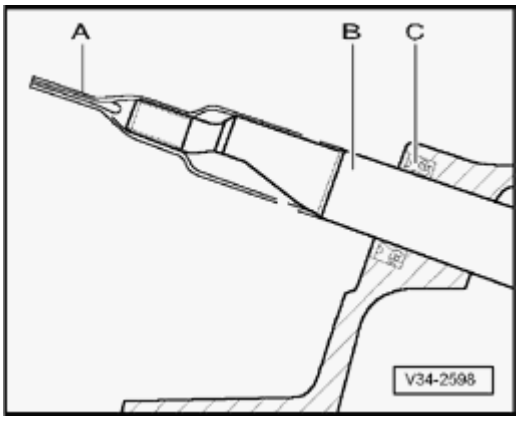


Fig. 286: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

  - To avoid damaging seal -C- always use assembly sleeve -A-, Part No. 01E 311 120, to install seal or selector shaft.

Insertion depth of breather sleeve

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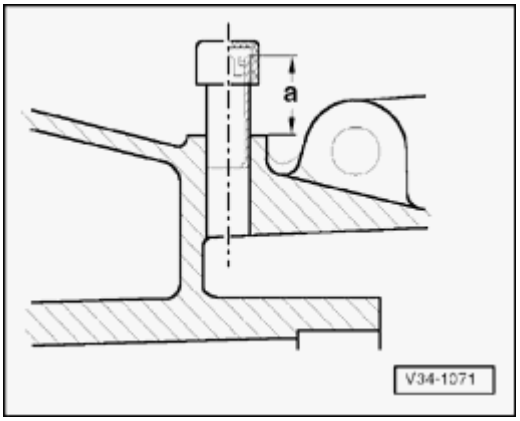


Fig. 287: Press-In Depth Of Breather Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Distance a = 21 mm

Removing and installing reversing light switch

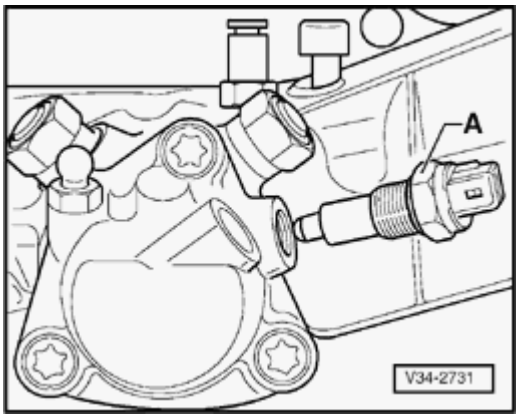


Fig. 288: Removing And Installing Back-Up Light Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten reversing light switch -A- to 20 Nm when installing.

Pulling needle bearing out of transmission housing

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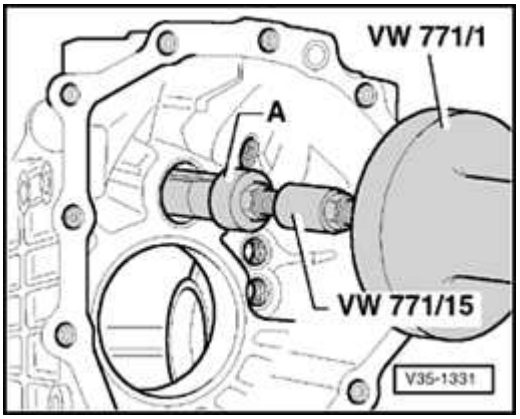


Fig. 289: Pulling Needle Bearing Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal extractor 30 to 37 mm, e.g. Kukko 21/5

Driving needle bearing into transmission housing

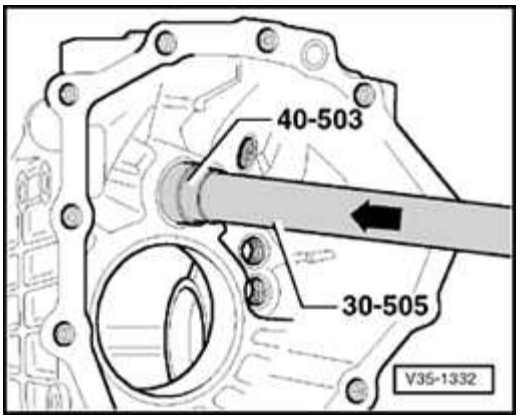


Fig. 290: Driving Needle Bearing Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position: Inscription on bearing faces drift
- Insertion depth. See **Insertion depth of needle bearing**

Insertion depth of needle bearing

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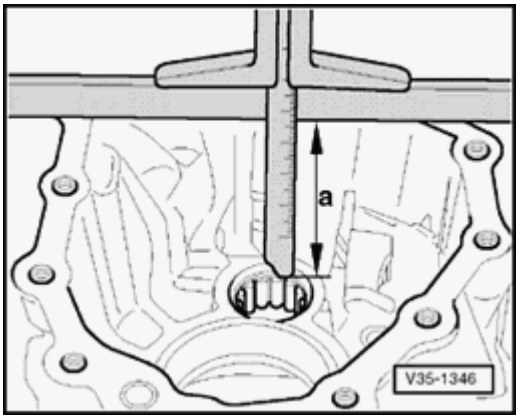


Fig. 291: Drive-In Depth Of Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Distance a = 105 mm

Removing circlip

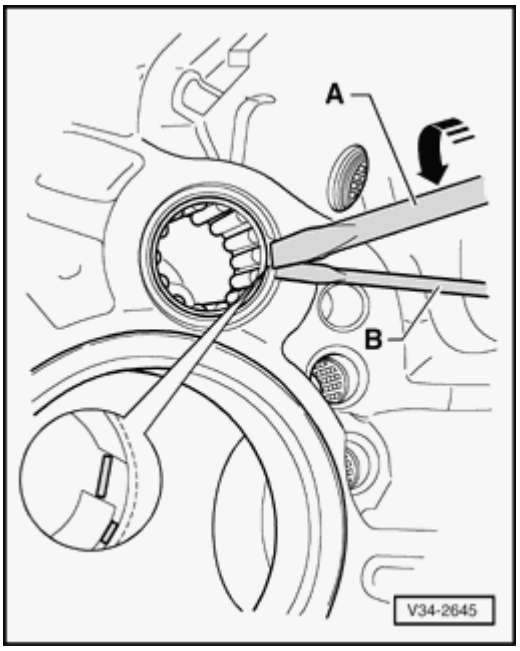


Fig. 292: Removing Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift circlip out of the groove by turning one end of circlip with a screwdriver -A-.
- Secure this end with a screwdriver -B-.
- Lever circlip out further by repositioning screwdriver -A-.

Selector shaft, disassembling and assembling

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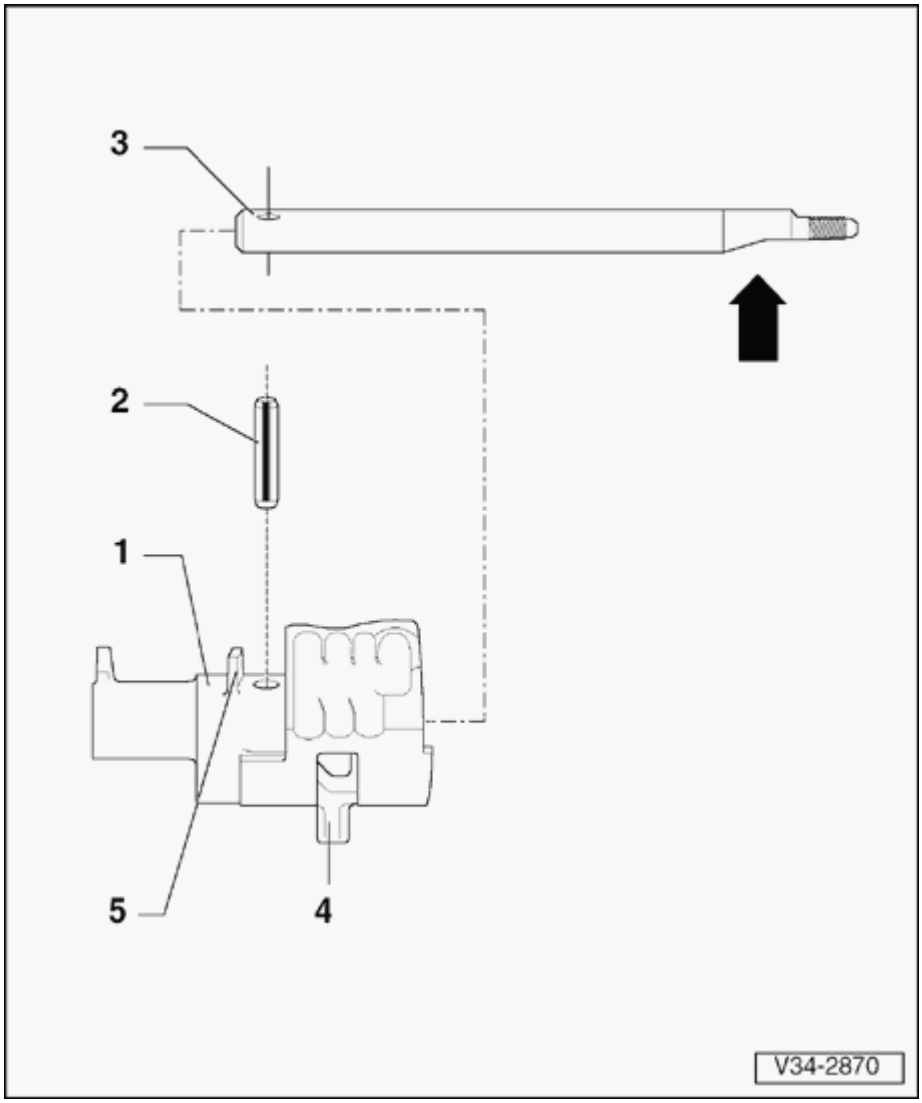


Fig. 293: Selector Shaft, Completely Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector cylinder

2 - Spring pin

- Removing and driving in flush. See **Removing and installing spring pin flush**
- Installation position of spring sleeve: Slot longitudinal to line of force

3 - Selector shaft

- Tapping out. See **Driving out selector shaft**
- Tapping in. See **Driving in selector shaft**
- Installation position: Flat (arrow) and selector finger -Item 4 face in same direction

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4 - Selector finger

- Observe installation position to -Item 3

5 - Toggle for reversing light switch

Removing and installing spring pin flush

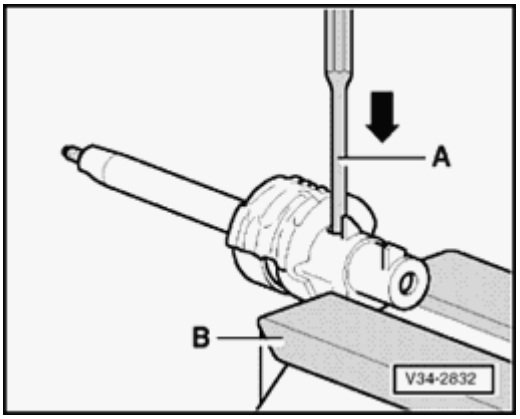


Fig. 294: Driving Out Spring Pin/Roll Pin And Driving In Flush
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Drift

B - Vice clamps

Driving out selector shaft

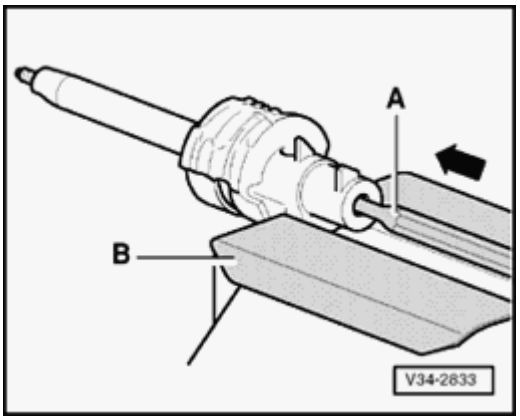


Fig. 295: Driving Out Selector Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Drift

B - Vice clamps

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Driving in selector shaft

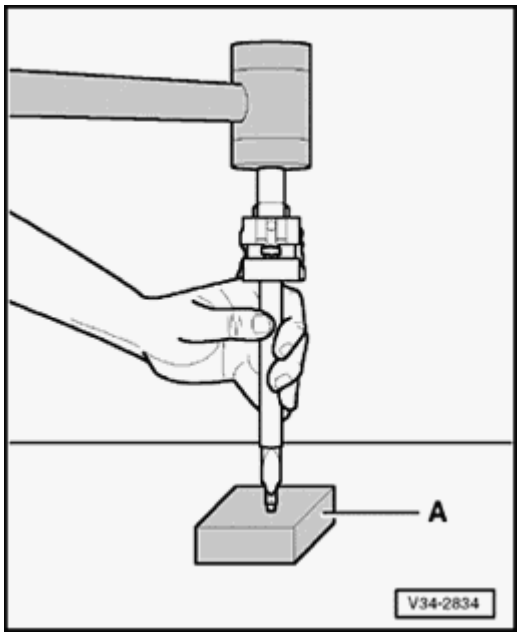


Fig. 296: Driving In Selector Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Wooden packing

NOTE:

- **Bring selector shaft/selector cylinder bores into alignment.**
- **Flat on selector shaft and selector finger point in same direction.**

35 MANUAL TRANSMISSION - GEARS, SHAFTS

INPUT SHAFT, DISASSEMBLING AND ASSEMBLING

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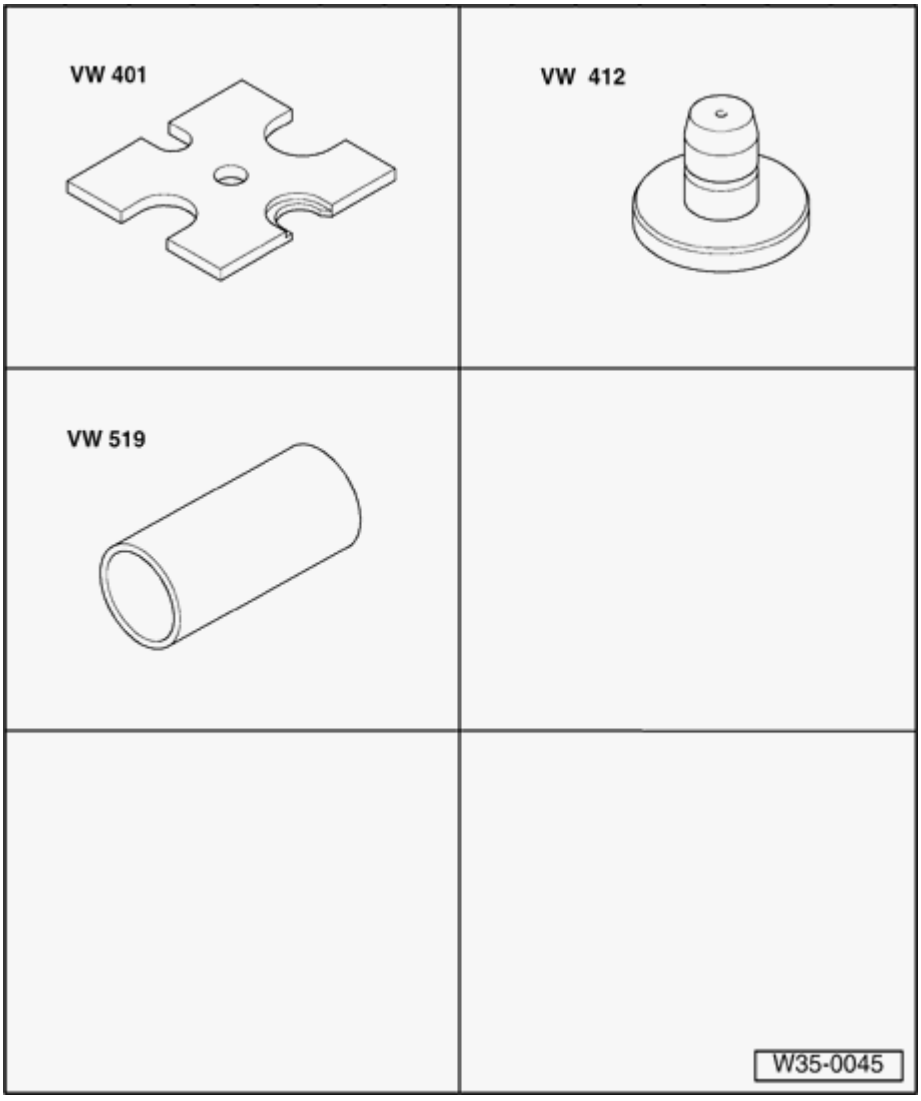


Fig. 297: Identifying Special Tools - Input Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 401 Thrust plate
- VW 412 Thrust tool
- VW 519 Tube
- Feeler gauge

NOTE:

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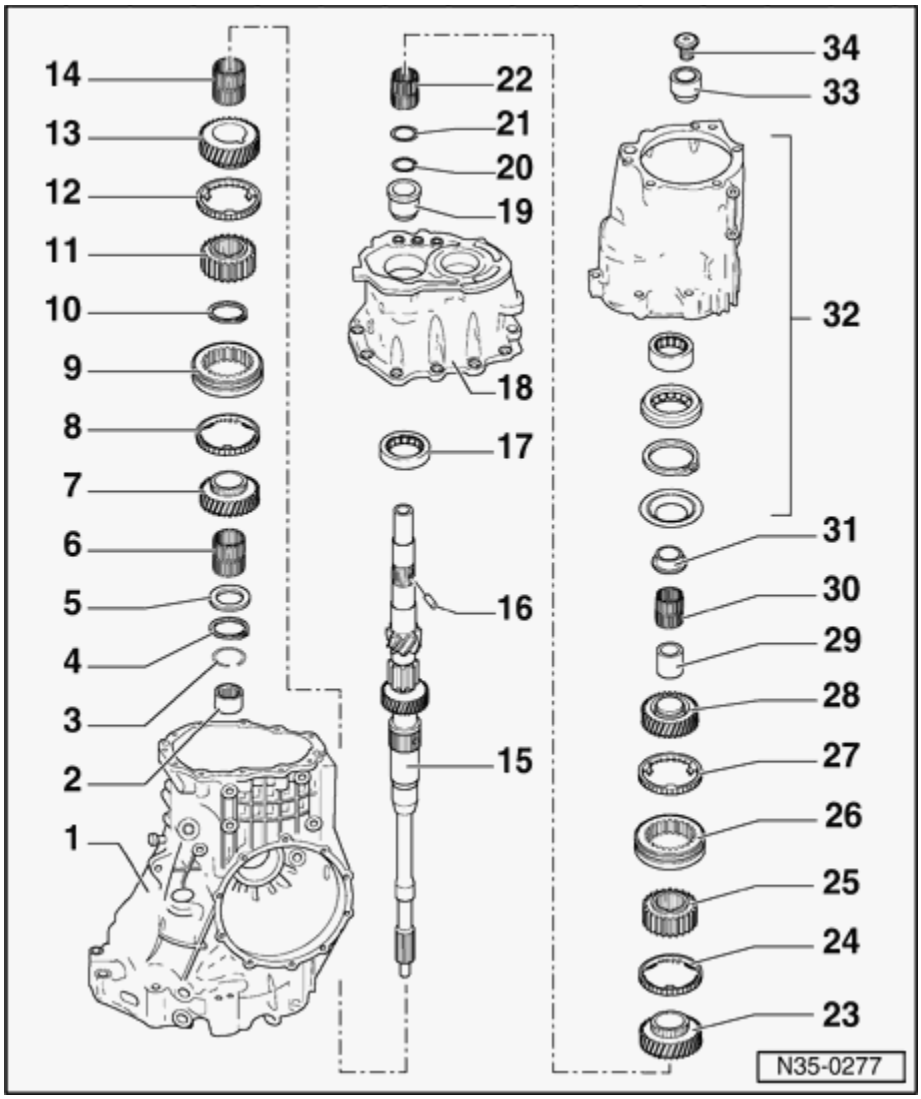


Fig. 298: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **When installing new gears or the input shaft consult technical data. Refer to Code letters, mechanical unit assignment, transmission ratios, capacities.**

1 - Transmission housing

- Servicing. Refer to **Transmission housing, servicing**

2 - Needle bearing

- For input shaft
- Pulling out. Refer to **Pulling needle bearing out of transmission housing**
- Driving in. Refer to **Driving needle bearing into transmission housing**

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3 - Circlip

- For needle bearing

4 - Circlip

- For input shaft

5 - Thrust washer

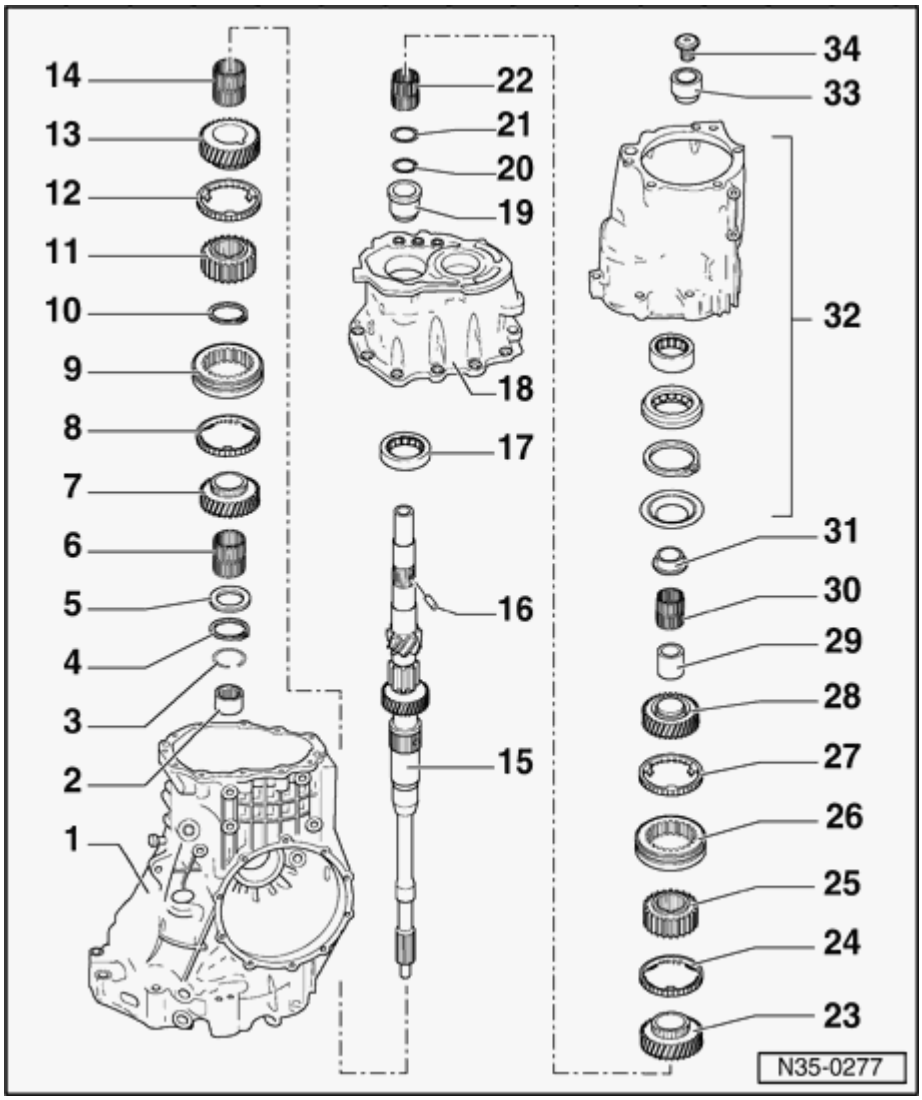


Fig. 299: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

6 - Needle bearing

- For 5th gear

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- Mark before removing
- Do not interchange with needle bearing for 3rd gear
- Oil with gear oil before installing

7 - 4th sliding gear

- Before installing, insert spring. See **Inserting spring in sliding gear**

8 - 4th gear synchro-ring

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

9 - Locking collar

- Paired with synchro-hub
- Mark before removing. Refer to **Fig. 172**

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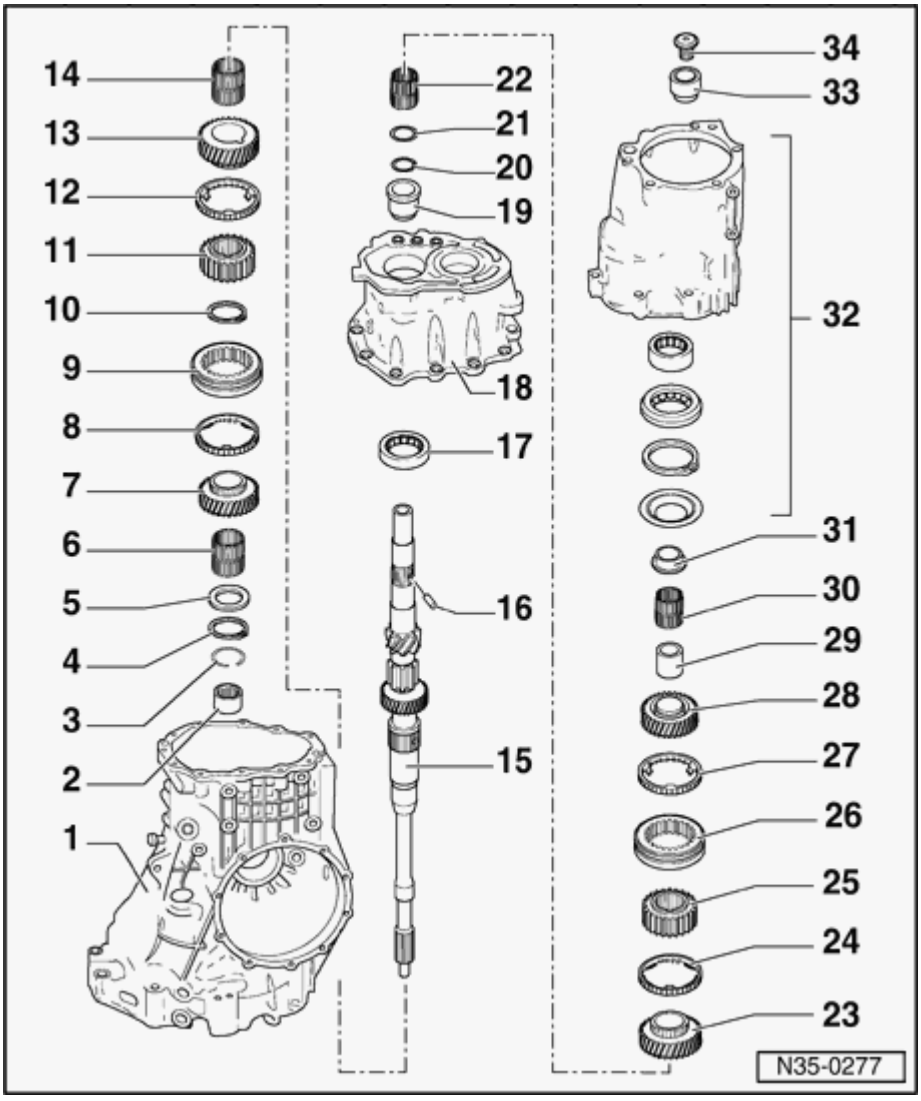


Fig. 300: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

10 - Circlip

- When replacing synchro-hub, re-determine thickness. See **Determining thickness of circlip**
- Installation position: Ends align with groove of synchro-hub

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

- Pressing off. See **Pressing off synchro hub for 3rd and 4th gear**
- Installation position. See **Installation position of synchro-hub**
- Pressing on. See **Pressing on synchro hub for 3rd and 4th gear**

12 - 3rd gear synchro-ring

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- Coated with molybdenum
- Checking for wear. See **Checking synchro-ring for wear**

13 - 3rd sliding gear

- Before installing, insert spring. See **Inserting spring in sliding gear**
- After pressing on -Item 11 check axial play using feeler gauge (0.15 to 0.35 mm)

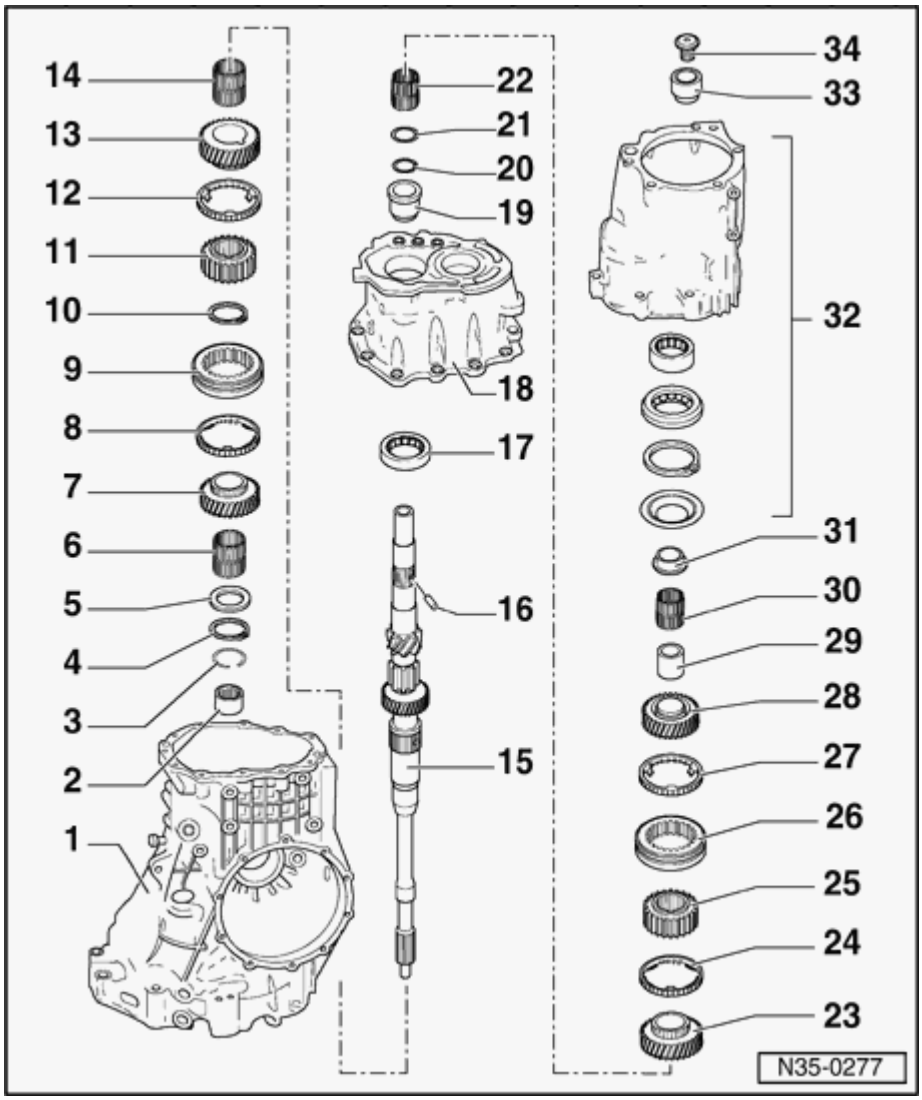


Fig. 301: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

14 - Needle bearing

- For 3rd gear
- Mark before removing

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- Do not interchange with needle bearing for 4th gear
- Lubricate with gear oil before installing

15 - Input shaft

16 - Spring pin

- Replace
- Drive in when replacing input shaft. See **Driving spring sleeve into input shaft**

17 - Cylindrical roller bearing

- For input shaft
- Pressing out. Refer to **Pressing cylinder roller bearing for input shaft out of bearing plate**
- Pressing in. Refer to **Pressing cylinder roller bearing for input shaft into bearing plate**

18 - Bearing plate

- Servicing. Refer to **Bearing plate, servicing**

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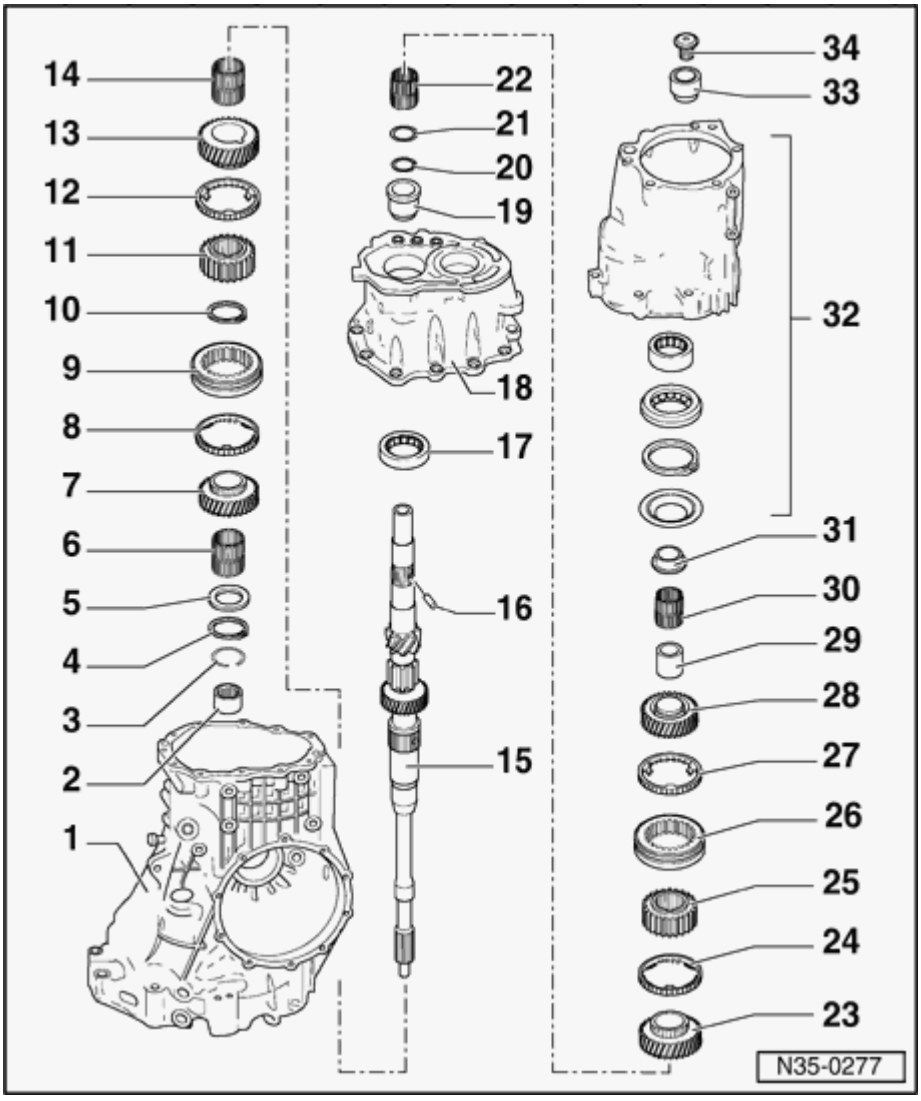


Fig. 302: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

19 - Inner race

- For cylinder roller bearing
- Remove and install by hand

20 - Circlip

21 - Thrust washer

- For needle bearing for 6th sliding gear
- Installation position: Shoulder toward circlip, smooth face contact surface toward needle bearing. Refer to **Fig. 193**

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22 - Needle bearing

- For 6th gear
- Oil with gear oil before installing

23 - 6th sliding gear

- Before installing, insert spring. See **Inserting spring in sliding gear**
- After installing, check axial play. Refer to **Fig. 197**

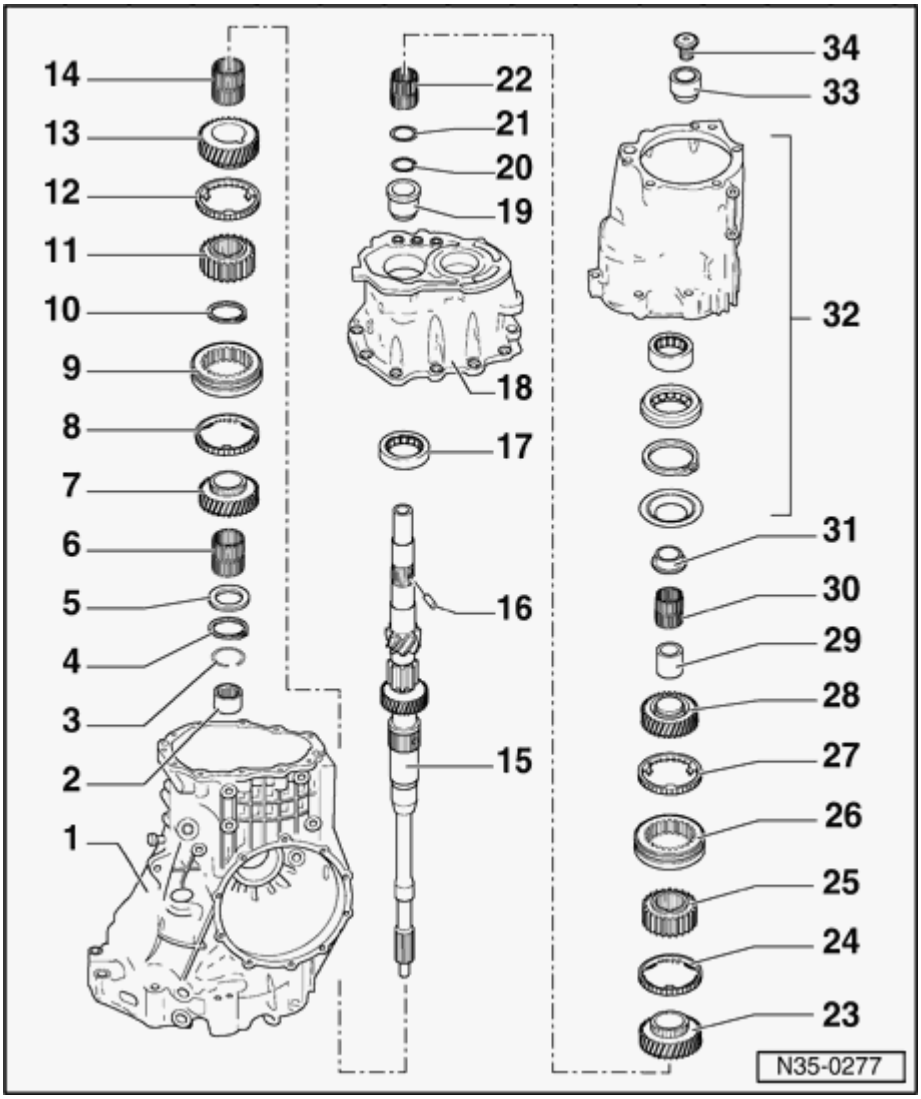


Fig. 303: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

24 - 6th gear synchro-ring

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

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25 - Synchro-hub for 5th and 6th gear

- Pulling off. Refer to **Fig. 174**
- Driving on. Refer to **Fig. 196**
- Installation position: Projecting hub toward 5th sliding gear

26 - Locking collar

- Paired with synchro-hub
- Mark before removing. Refer to **Fig. 172**

27 - 5th gear synchro-ring

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

28 - 5th sliding gear

- Before installing, insert spring. See **Inserting spring in sliding gear**
- After installing, check axial play. Refer to **Assembling**

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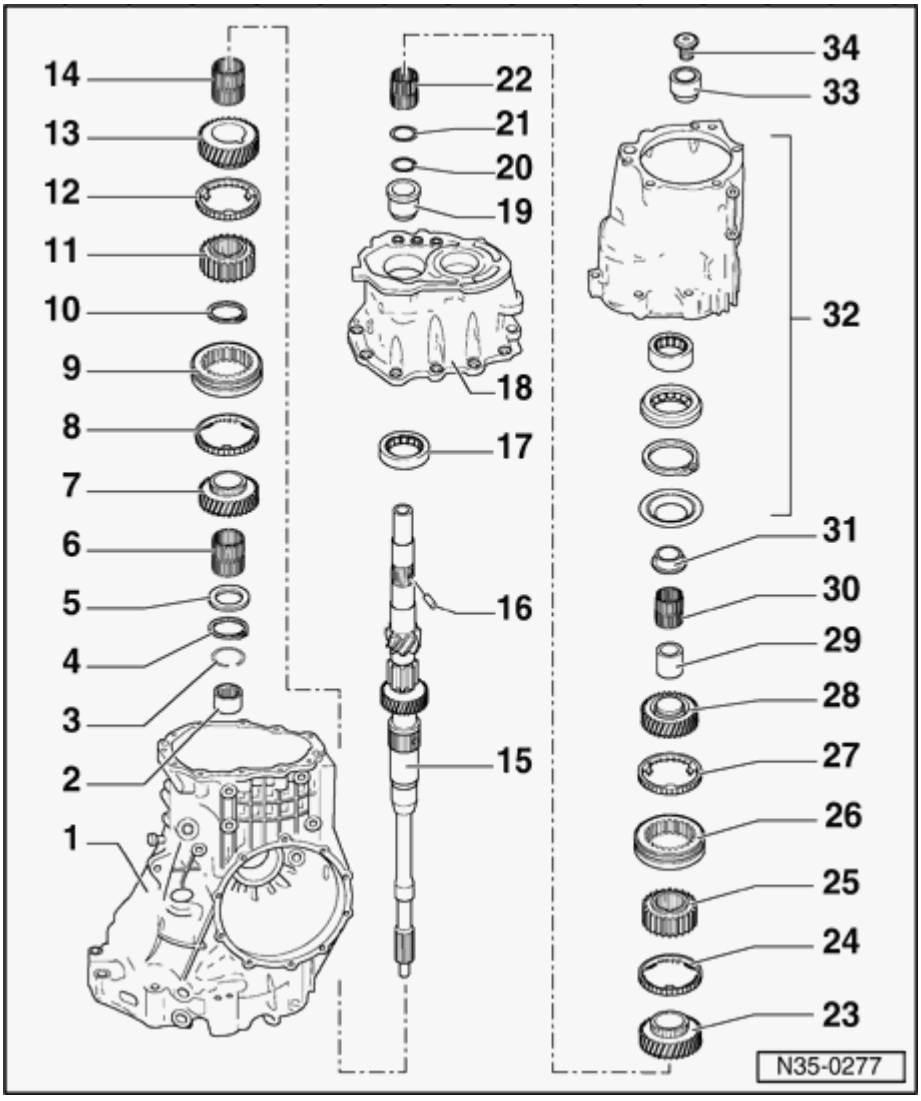


Fig. 304: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

29 - Inner race for needle bearing

- For 5th sliding gear
- Pulling off. Refer to **Fig. 174**
- Driving on. Refer to **Fig. 203**

30 - Needle bearing

- For 5th gear
- Oil with gear oil before installing

31 - 1st inner race for four-point bearing

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- Ball bearing side
- Pulling off. Refer to **Fig. 169**
- Driving on. Refer to **Fig. 204**

32 - End cover

- Servicing. Refer to **End cover, servicing**

33 - 2nd inner race for ball bearing

- Pulling off. Refer to **Fig. 168**
- Driving on. Refer to **Fig. 206**

34 - Multi-point socket head bolt, 150 Nm

- Loosening. Refer to **Fig. 166**
- Tightening. Refer to **Fig. 207**

Inserting spring in sliding gear

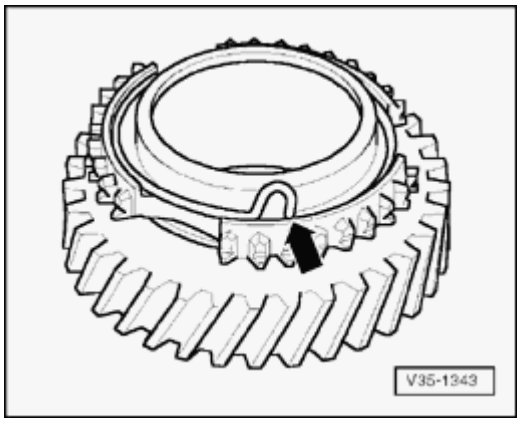


Fig. 305: Inserting Spring Into Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Checking synchro-ring for wear

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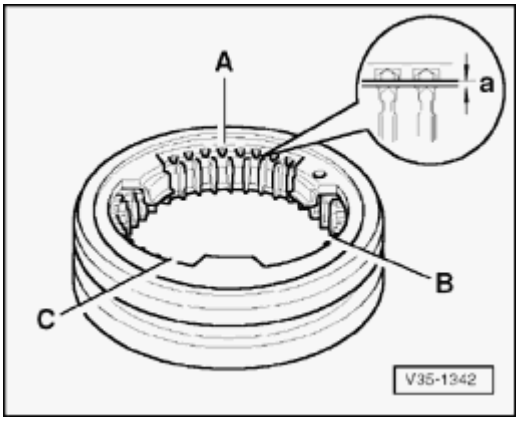


Fig. 306: Checking Synchronizer Ring For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 calculated value must not be less than 0.5 mm.

Determining thickness of circlip

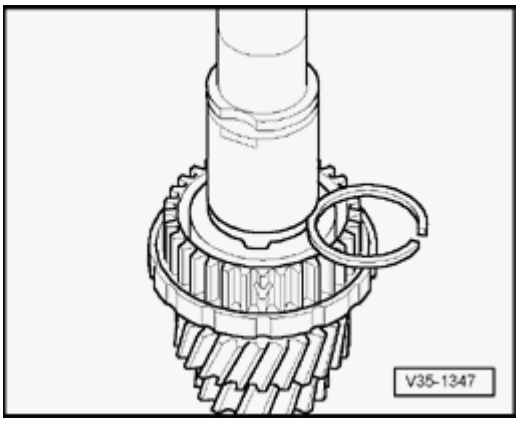


Fig. 307: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Synchro-hub pressed onto stop

- Determine the thickest circlip that will just fit and install it.

NOTE: The opening of circlip must align with groove in synchro-hub.

The following circlips are available:

Circlip thickness (mm)

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1.90	1.96	2.02
1.93	1.99	2.05

Pressing off synchro hub for 3rd and 4th gear

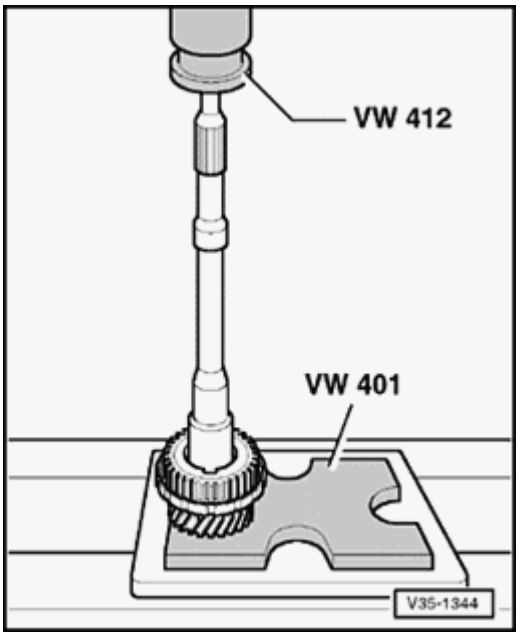


Fig. 308: Pressing Off Synchronizer Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of synchro-hub

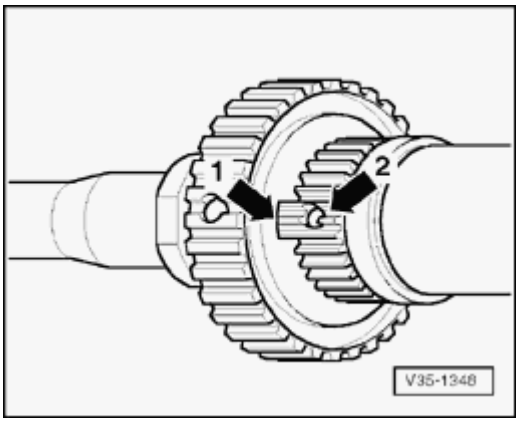


Fig. 309: Installed Position Of Synchronizer Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Oil groove in synchro-hub -arrow 1- must align with oil drilling -arrow 2- in input shaft

Pressing on synchro hub for 3rd and 4th gear

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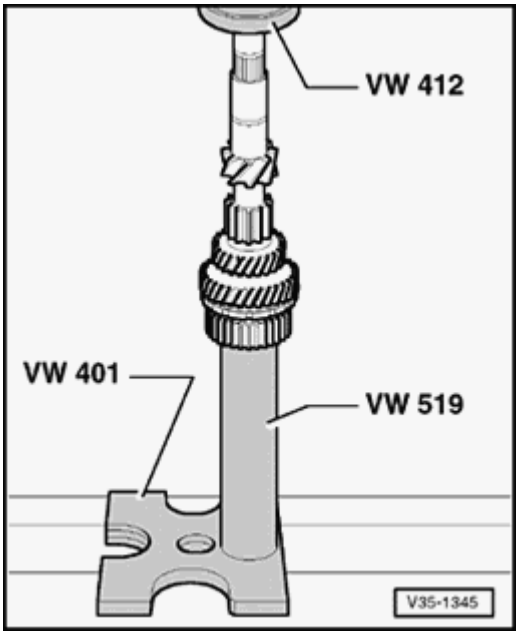


Fig. 310: Pressing On Synchronizer Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat synchro-hub to approx. 100 ° C, position and press home.

  WARNING: Wear protective gloves!

- Determine circlip and install. See **Determining thickness of circlip**.

Driving spring sleeve into input shaft

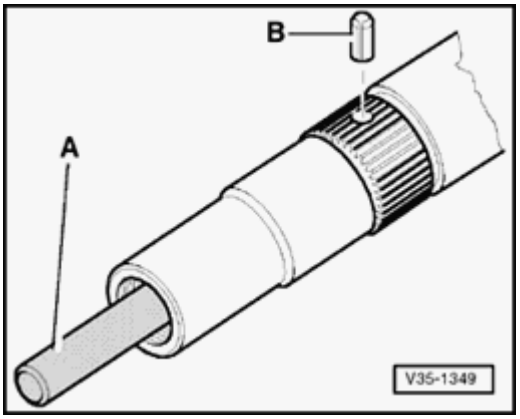


Fig. 311: Driving Roll Pin Into Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Guide a 9 mm diameter drift -A- into oil drilling and drive spring sleeve -B- in until it touches drift.

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DRIVE PINION AND HOLLOW SHAFT, DISASSEMBLING AND ASSEMBLING

Drive pinion and hollow shaft, disassembling and assembling

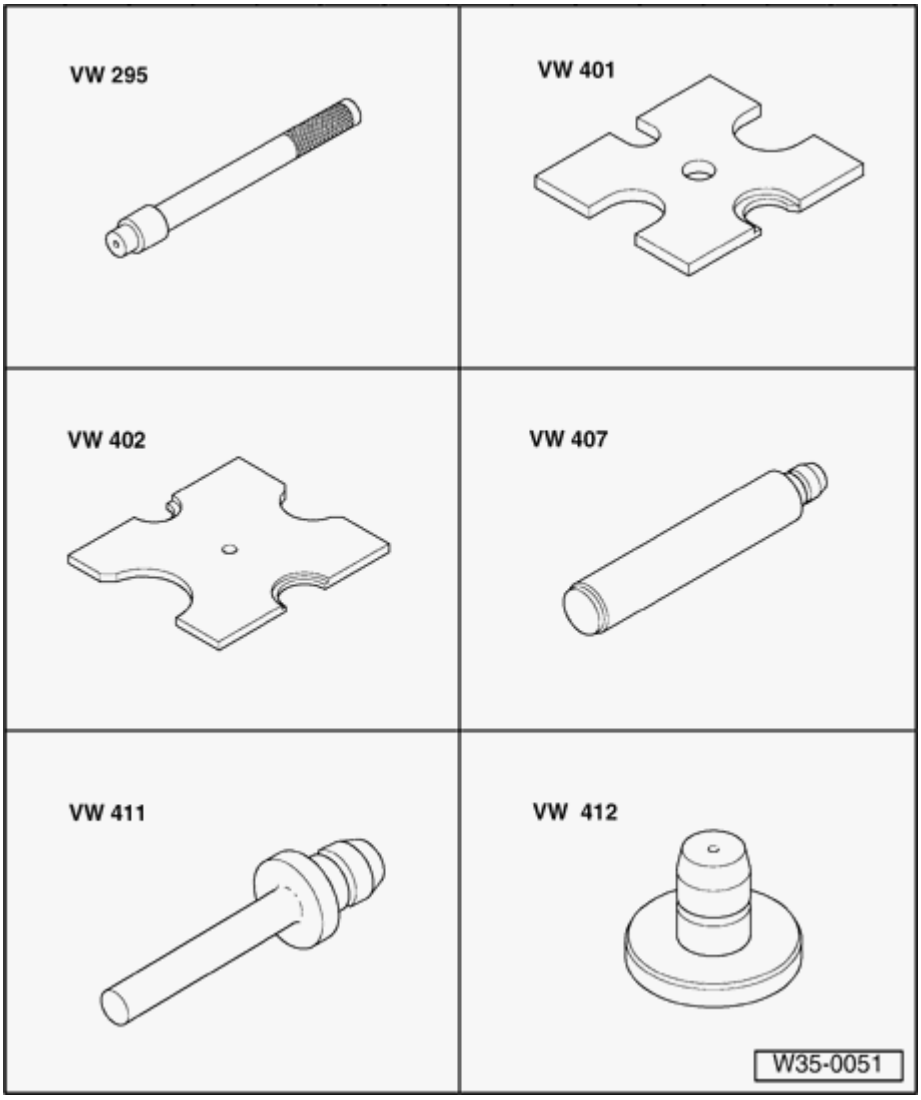


Fig. 312: Identifying Special Tools - Pinion And Hollow Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 295 Drift
- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 411 Thrust tool

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- VW 412 Thrust tool

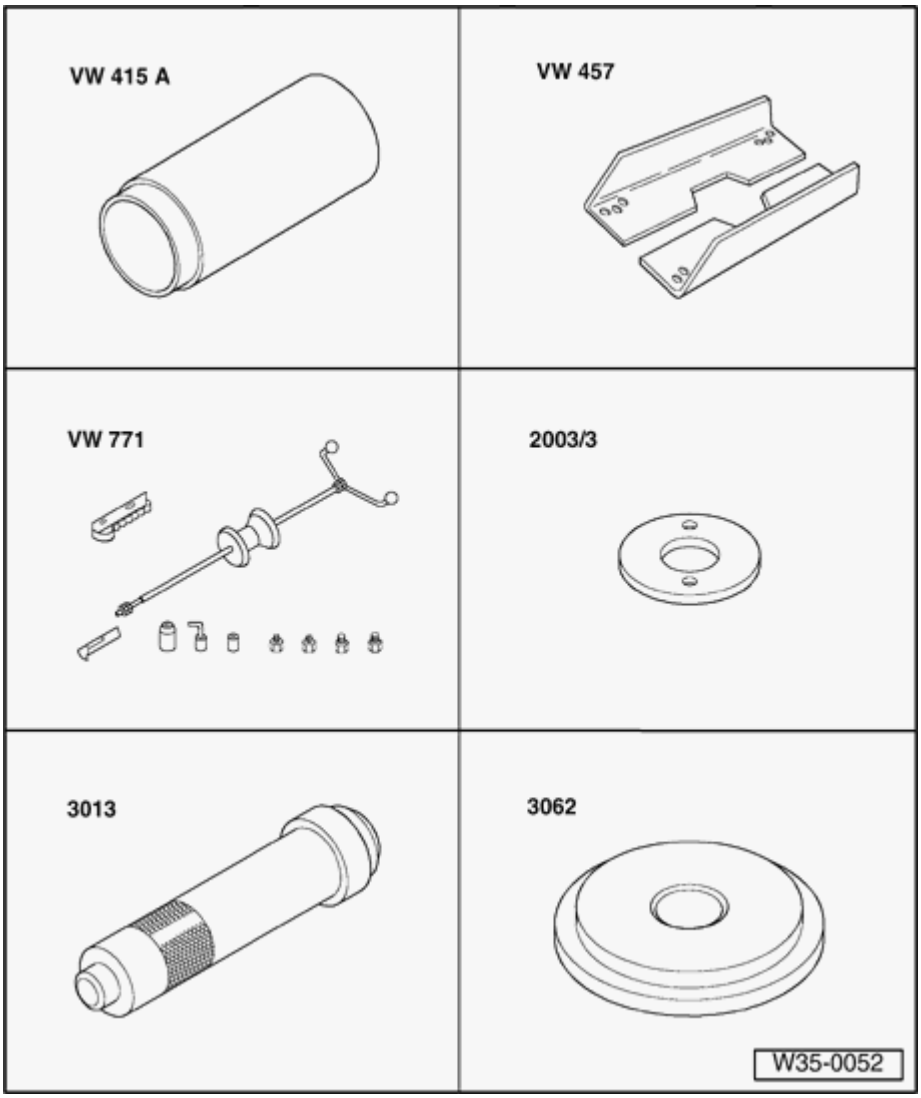


Fig. 313: Identifying Special Tools - Pinion And Hollow Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 415 A Tube
- VW 457 Mount rails
- VW 771 Multi-purpose tool
- 2003/3 Inserter ring
- 3013 Fitting drift
- 3062 Thrust disk

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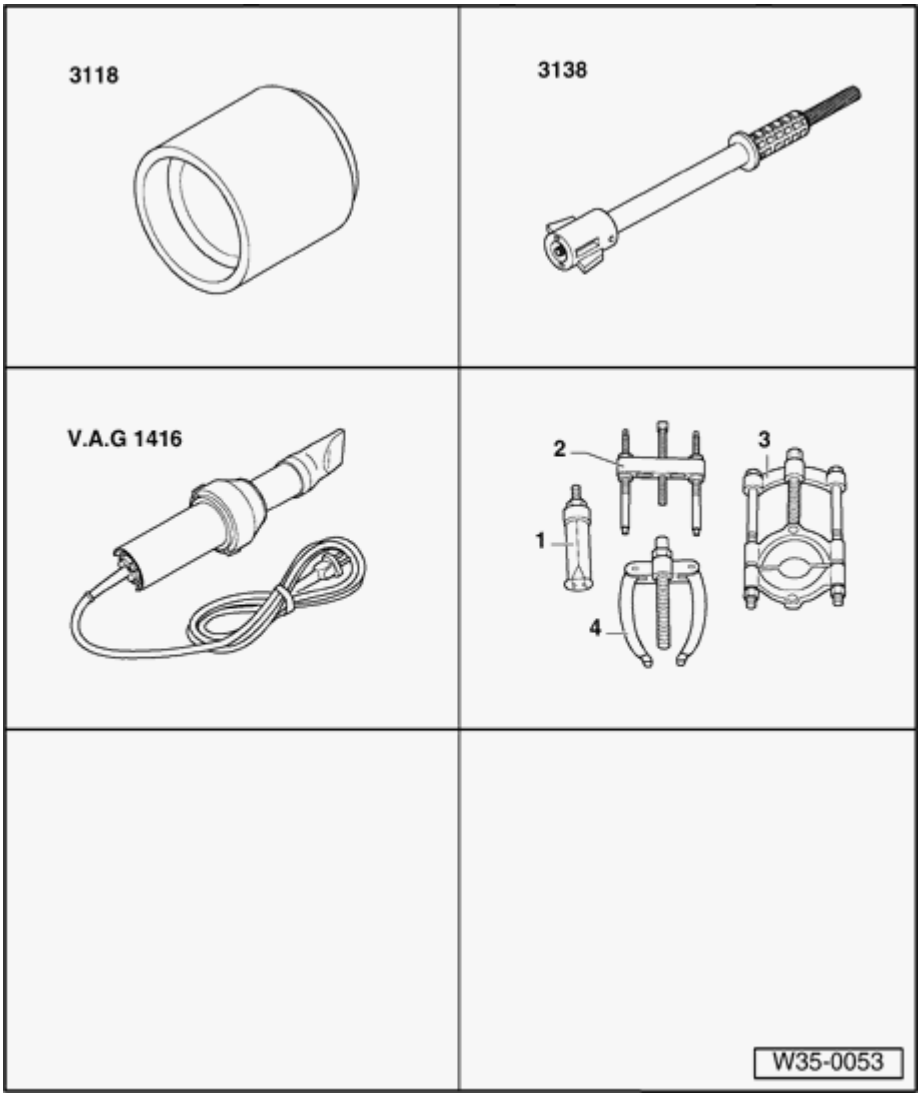


Fig. 314: Identifying Special Tools - Pinion And Hollow Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3118 Tube
- 3138 Drift
- VAG 1416 Hot-air blower
- 1 - Internal puller 21/1
- 3 - Kukko 17/2 Separating tool

NOTE:

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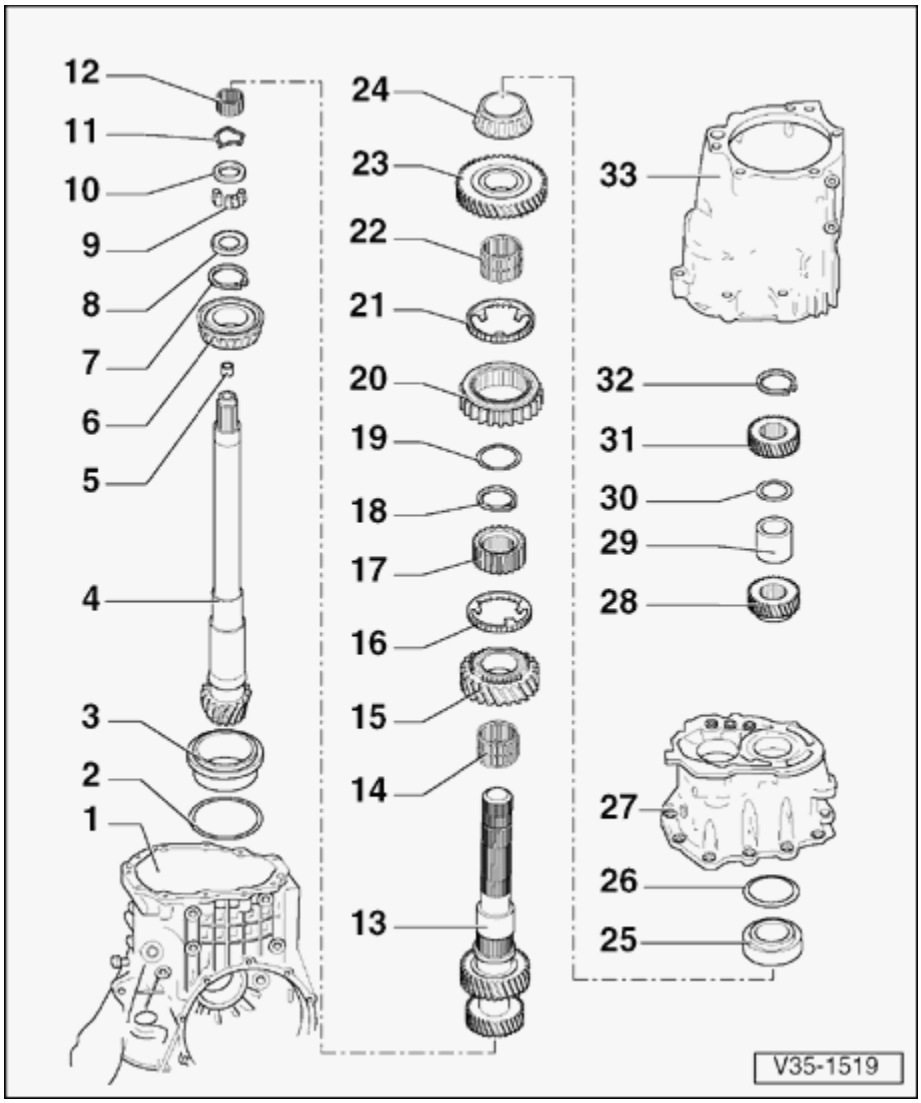


Fig. 315: Pinion and Hollow Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **When installing new gears or the final drive set consult technical data. Refer to Code letters, mechanical unit assignment, transmission ratios, capacities.**

1) Adjustments are required if these components are replaced. Refer to **Adjustment overview**.

1 - Transmission housing

- Servicing. Refer to **Transmission housing, servicing**

2 - Shim S3

- Adjustment overview. Refer to **Adjustment overview**

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3 - Taper roller bearing outer race, large1)

- Pulling out. See **Pulling out large taper roller bearing outer race**
- Pressing in. See **Inserting outer race for large taper roller bearing in transmission housing and pressing home**

4 - Drive pinion1)

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

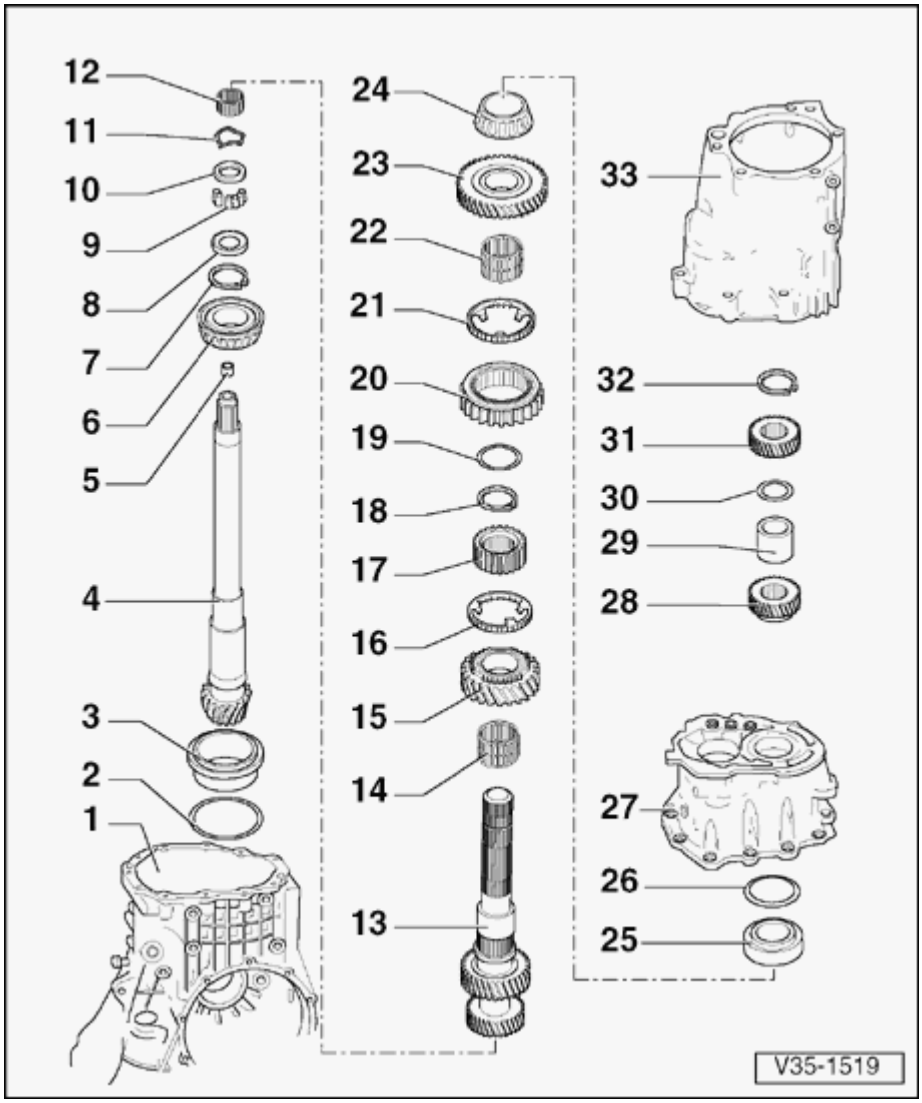


Fig. 316: Pinion and Hollow Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Needle bearing

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- For flanged shaft/drive pinion
- Pulling out. See **Removing needle bearing for flanged shaft/drive pinion**
- Tapping in. See **Inserting needle bearing for flanged shaft/drive pinion flush**

6 - Taper roller bearing inner race, large1)

- Pressing off. See **Pressing off large taper roller bearing inner race**
- Pressing on. See **Pressing on inner race for taper roller bearing**
- Low friction bearing; do not oil when measuring frictional torque

7 - Circlip

- Redefine thickness. See **Determining thickness of circlip**

8 - Flange ring

- Installation position. Refer to **Fig. 181**

9 - Taper rollers

- 23 pieces
- Installation position. Refer to **Fig. 181**

10 - Supporting ring

- Installation position. Refer to **Fig. 181**

11 - Corrugated spring

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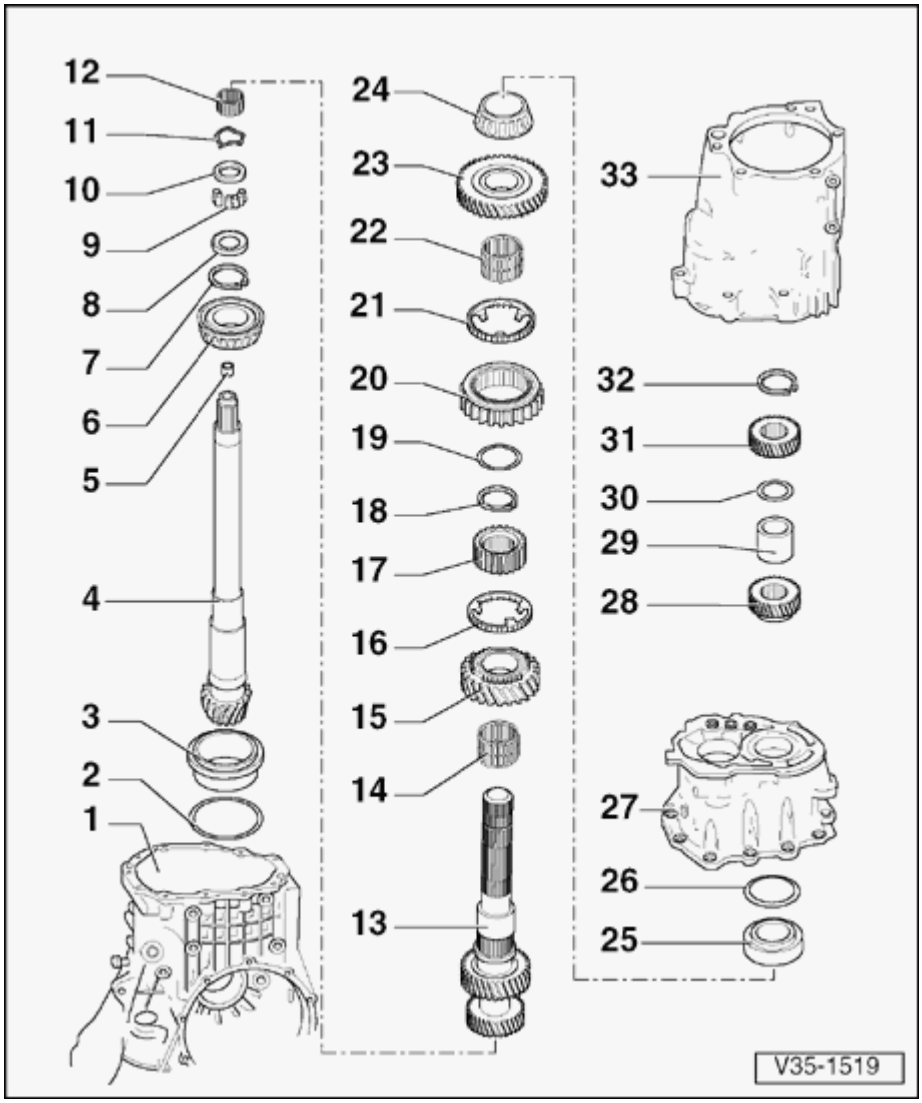


Fig. 317: Pinion and Hollow Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

12 - Needle bearing

- For drive pinion/hollow shaft
- Oil with gear oil before installing

13 - Hollow shaft 1)

- With gear wheels for 3rd and 4th gear

14 - Needle bearing

- For 2nd sliding gear
- Oil with gear oil before installing

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15 - 2nd sliding gear

- Pressing off. See **Pressing off 2nd gear sliding wheel with synchro-hub for 1st and 2nd gear**
- Before installing, insert spring and slide needle bearing onto hollow shaft
- After installation, check axial play using feeler gauge (0.15 to 0.35 mm)

16 - 2nd gear synchro-ring

- Coated with molybdenum
- Checking for wear. Refer to **Checking synchro-ring for wear**

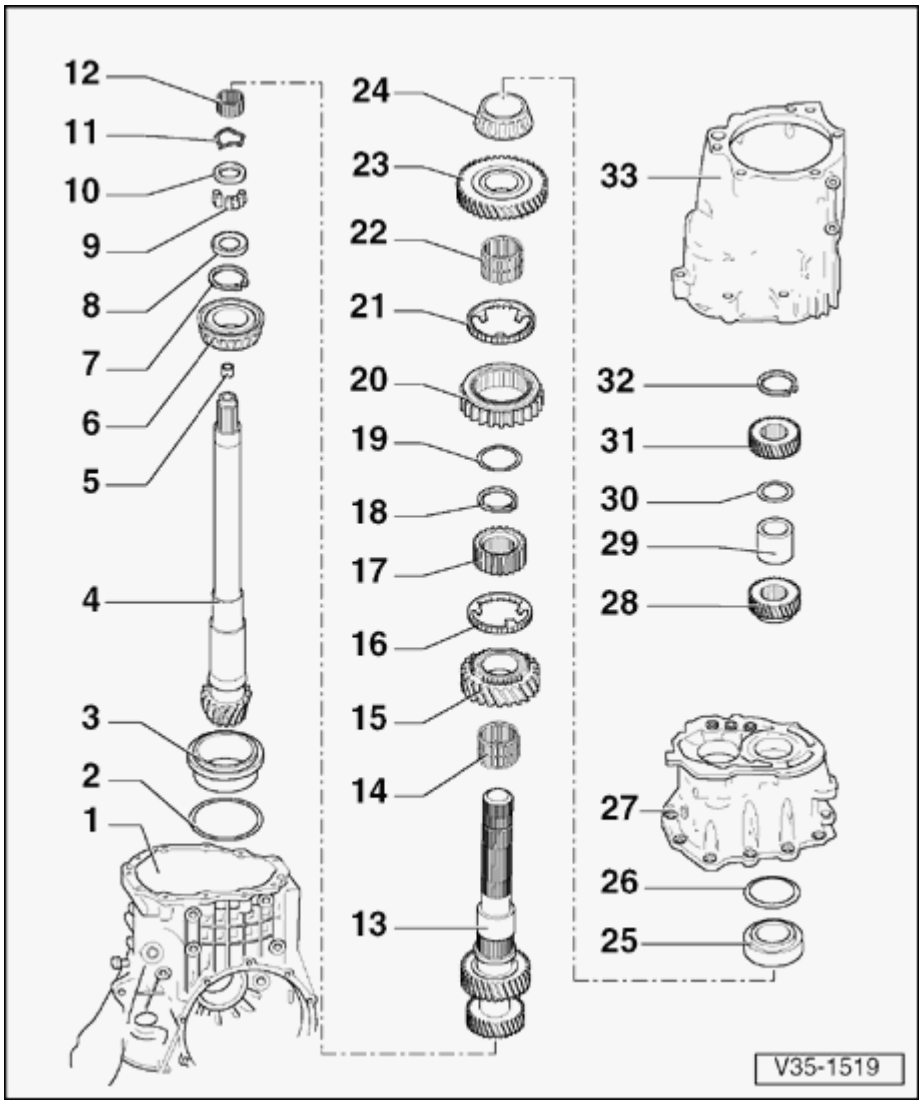


Fig. 318: Pinion and Hollow Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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- Pressing off. See **Pressing off 2nd gear sliding wheel with synchro-hub for 1st and 2nd gear**
- Pressing on. See **Installing 2nd sliding gear, pressing on synchro-hub for 1st and 2nd gear**
- Installation position: Flush hub toward 2nd sliding gear

18 - Circlip

- Removing and installing. See **Removing and installing circlip of synchro-hub and washer of 1st sliding gear**
- Redefine thickness. See **Determining thickness of circlip**

19 - Washer

- For needle bearing for 1st sliding gear
- Removing and installing. See **Removing and installing circlip of synchro-hub and washer of 1st sliding gear**

20 - Locking collar, 1st and 2nd gear

- Installation position: Splines for reverse gear facing synchro-ring for 2nd gear

21 - 1st gear synchro-ring

- Checking for wear. Refer to **Checking synchro-ring for wear**

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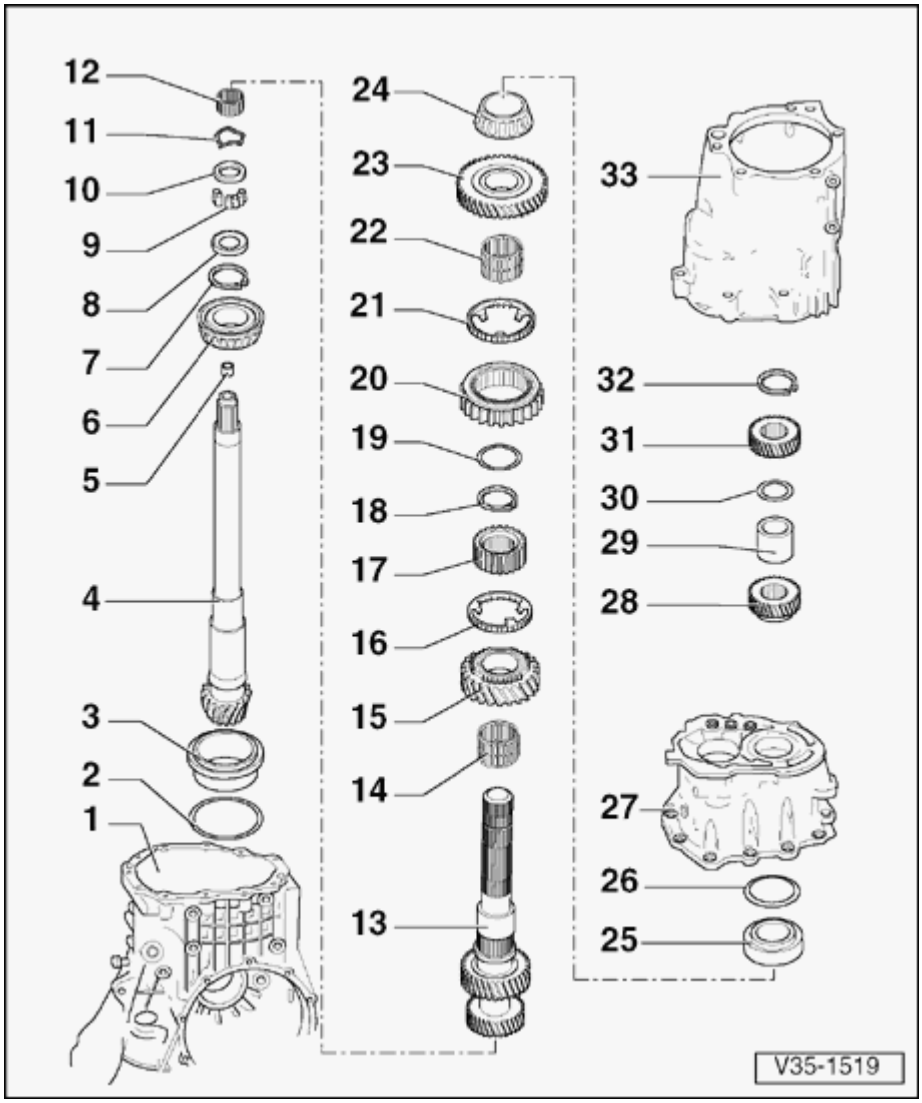


Fig. 319: Pinion and Hollow Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

22 - Needle bearing

- For 1st sliding gear
- Oil with gear oil before installing

23 - 1st sliding gear

- Before installing, insert spring. Refer to **Inserting spring in sliding gear**
- After pressing on -Item 24, check axial play using feeler gauge (0.15 to 0.35 mm)

24 - Taper roller bearing inner race, small1)

- Pressing off. See **Pressing off inner race of small taper roller bearing together with 1st sliding gear**

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- Pressing on. See **Pressing on inner race for small taper roller bearing**
- Low friction bearing; do not oil when measuring frictional torque

25 - Taper roller bearing outer race, small1)

- Tapping out. See **Driving out outer race for small taper roller bearing**
- Pressing in. See **Pressing in outer race/small taper roller bearing**

26 - Shim S4

- Adjustment overview. Refer to **Adjustment overview**

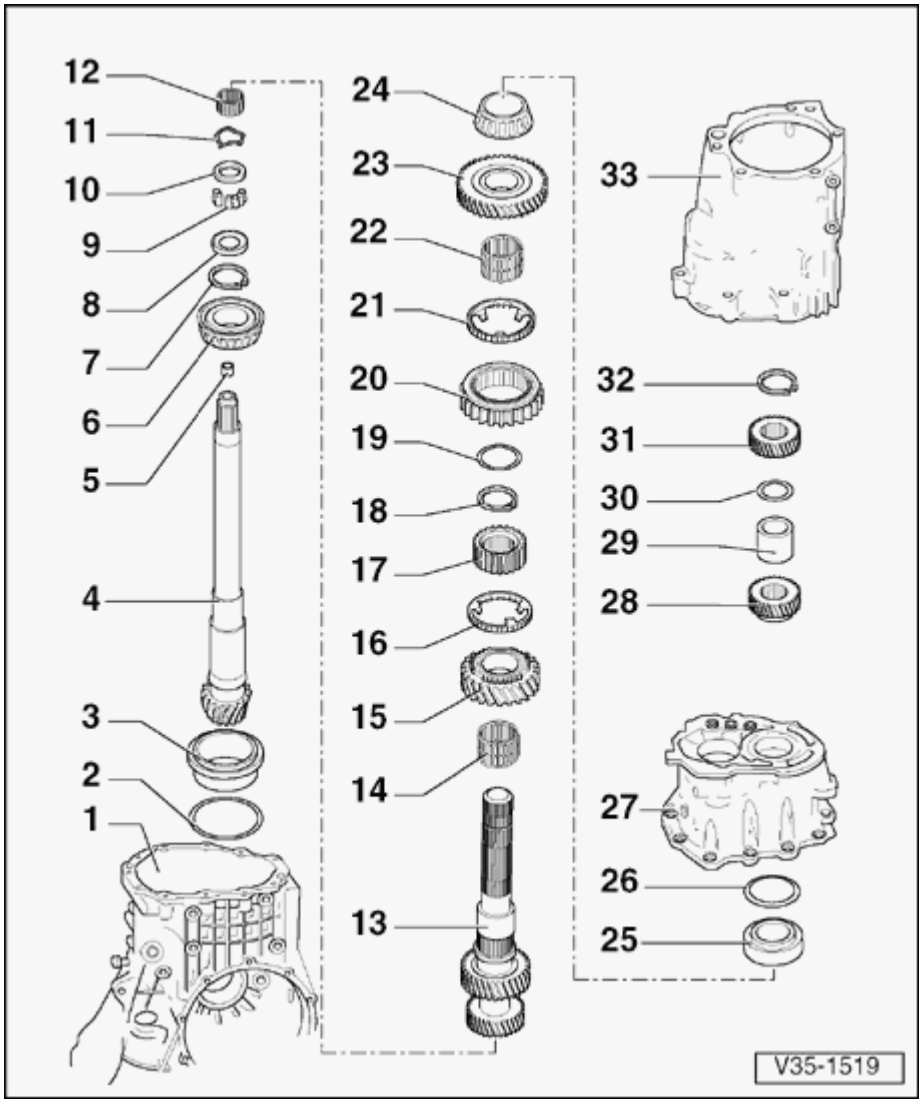


Fig. 320: Pinion and Hollow Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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27 - Bearing plate 1)

- Servicing. Refer to **Bearing plate, servicing**

28 - 6th gear wheel

- Pressing off. Refer to **Fig. 182**
- Pressing on. Refer to **Assembling**
- Installation position: Shoulder faces toward inner race of small taper roller bearing

29 - Spacer sleeve

30 - Washer

- Re-determining thickness. Refer to **Fig. 199**

31 - 5th gear wheel

- Pulling off. Refer to **Fig. 170**
- Driving on. Refer to **Fig. 201**

32 - Circlip

- For 5th gear wheel
- Re-determining thickness. Refer to **Fig. 202**

33 - End cover

- Servicing. Refer to **End cover, servicing**

Pulling out large taper roller bearing outer race

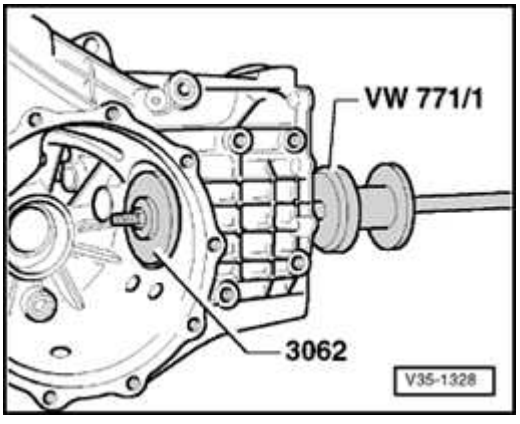


Fig. 321: Pulling Out Outer Race Of Large Tapered Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Stepped side of thrust pad 3062 rests against the outer race

Heating transmission housing in order to install outer race for taper roller bearing

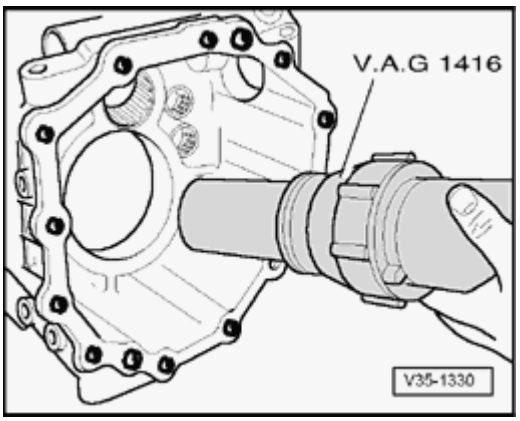


Fig. 322: Heating Transmission Housing To Insert Outer Race Of Large Taper Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat transmission housing in area of bearing seat for approx. 15 minutes, to approx. 100 ° C, with a hot air blower.

WARNING: Wear protective gloves!

Inserting outer race for large taper roller bearing in transmission housing and pressing home

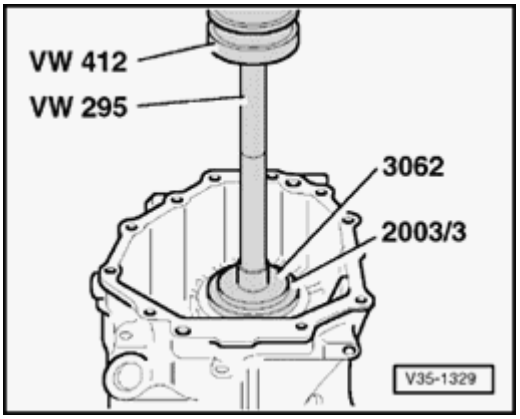


Fig. 323: Inserting And Pressing Outer Race Of Large Taper Roller Bearing Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert outer race only after heating transmission housing and push into position under workshop press until heat exchange has taken place.

WARNING: Wear protective gloves!

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Removing needle bearing for flanged shaft/drive pinion

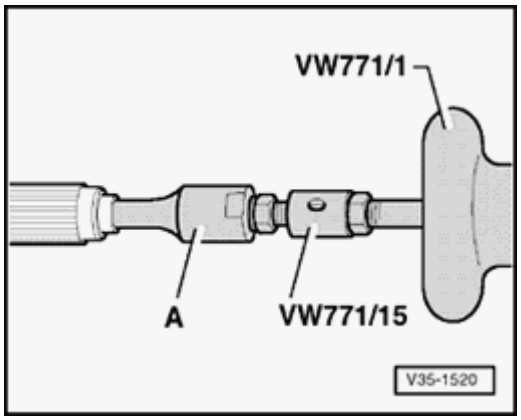


Fig. 324: Pulling Out Flange Shaft/Pinion Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal extractor 12 to 14.5 mm, e.g. Kukko 21/1

Inserting needle bearing for flanged shaft/drive pinion flush

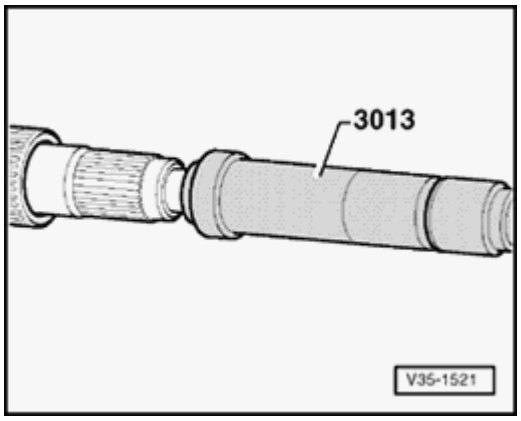


Fig. 325: Driving In Flange Shaft/Pinion Needle Bearing Flush
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing off large taper roller bearing inner race

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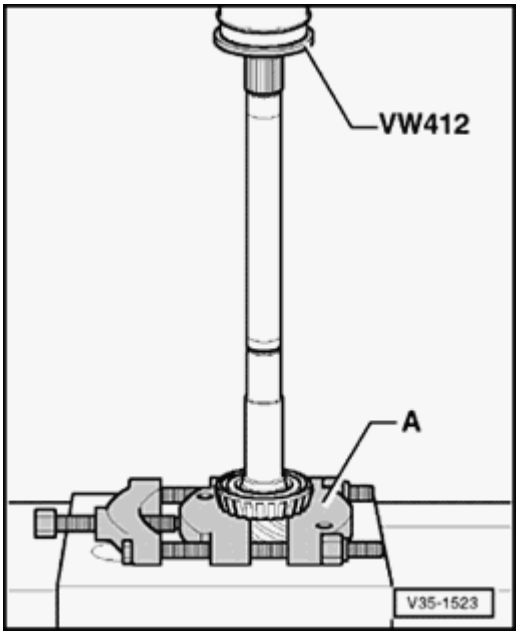


Fig. 326: Pressing Off Inner Race Of Large Taper Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Bearing is destroyed when pressing off.

Pressing on inner race for taper roller bearing

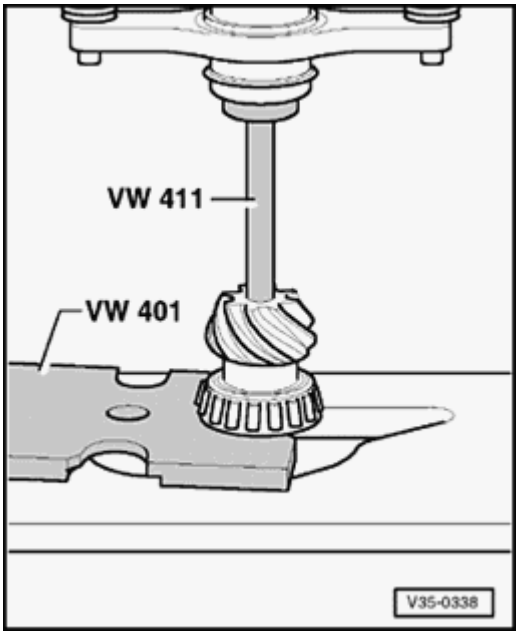


Fig. 327: Pressing On Inner Race Of Large Taper Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Heat inner race to approx. 100 ° C and install.

  WARNING: Wear protective gloves!

- Press home ensuring there is no axial play.

Determining thickness of circlip

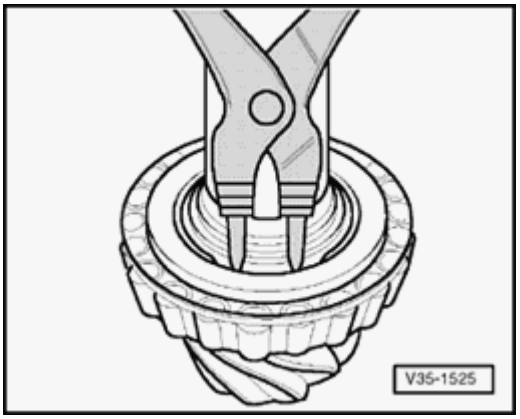


Fig. 328: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine the thickest circlip that will still just fit and install.

The following circlips are available:

Circlip thickness (mm)		
2.34	2.40	2.46
2.36	2.42	2.48
2.38	2.44	

Pressing off inner race of small taper roller bearing together with 1st sliding gear

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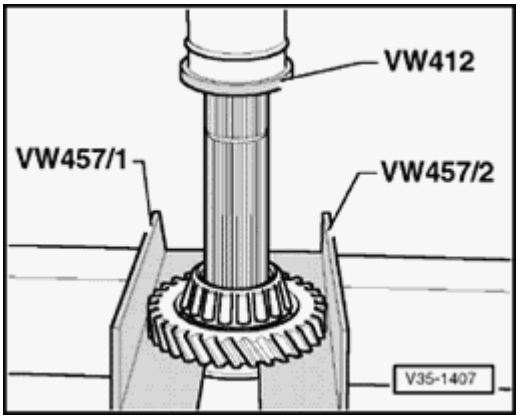


Fig. 329: Pressing Off Inner Race Of Small Taper Roller Bearing Together With Selector Gear Of 1st Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: Do not press off together with synchro-hub for 1st and 2nd gear and 2nd gear sliding wheel.

Pressing on inner race for small taper roller bearing

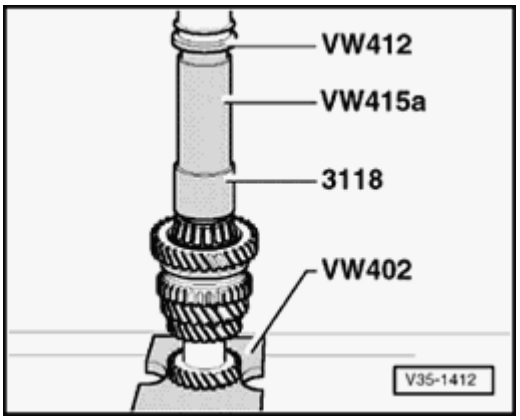


Fig. 330: Pressing On Small Tapered Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Oil needle bearing.
- Install circlip, washer for 1st/2nd gear synchro-hub, synchro-ring for 1st gear and 1st sliding gear together with spring and needle bearing.
- Heat inner race to approx. 100 ° C and install.

WARNING: Wear protective gloves!

- Press home ensuring there is no axial play.

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NOTE:

- **Press down only on bearing inner race with collar of thrust pad 3118.**
- **Position shoulder of pipe section VW 415 A facing up toward press tool VW 412**
- **After pressing on, check axial play of 1st sliding gear.**

Removing and installing circlip of synchro-hub and washer of 1st sliding gear

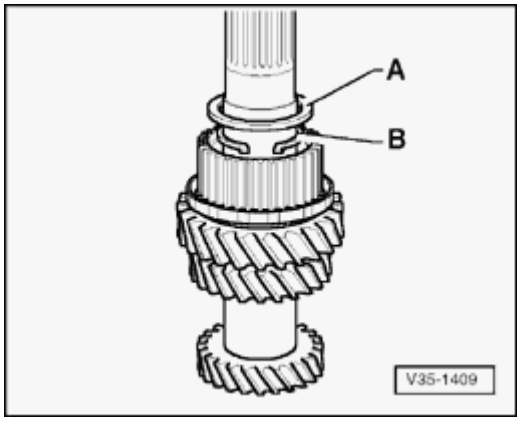


Fig. 331: Removing And Installing Circlip For Synchronizer Hub And Shim For 1st Gear Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove circlip, remove washer -A- and then circlip -B-.
- To install circlip, install on circlip -B- and then washer -A-.

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

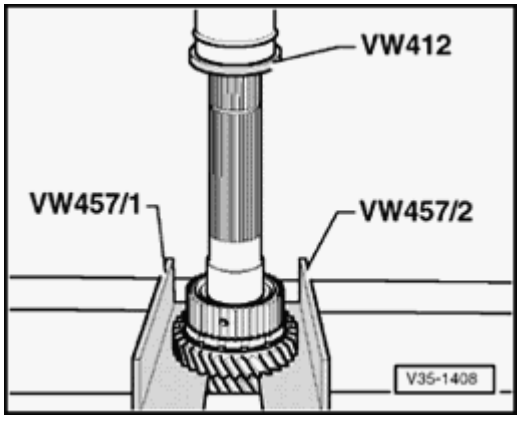


Fig. 332: Pressing Off 2nd Gear Selector Gear With 1st And 2nd Gear Synchronizer Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking collar for 1st and 2nd gear and synchro-ring for 1st gear.
- Remove washer and circlip for synchro-hub.
- Press off 2nd speed sliding wheel with synchro-hub for 1st and 2nd gear

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NOTE: **Do not press off together with 1st sliding gear and inner race of small taper roller bearing.**

Installing 2nd sliding gear, pressing on synchro-hub for 1st and 2nd gear

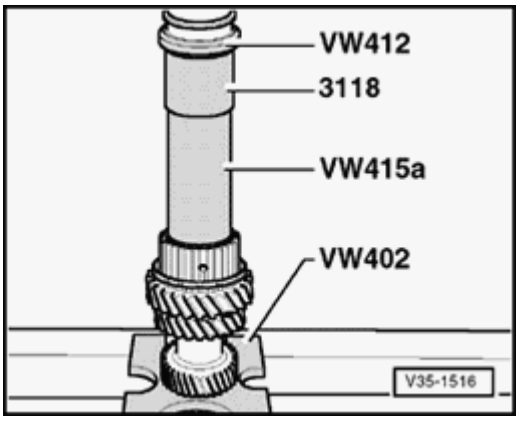


Fig. 333: Identifying Special Tools - Installing Selector Gear For 2nd Gear And Pressing On Synchronizer Hub For 1st And 2nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install needle bearing, sliding gear (with spring) and synchro-ring for 2nd gear.
- Oil needle bearing.
- Heat synchro-hub to approx. 100 ° C and install.

WARNING: **Wear protective gloves!**

- Press home ensuring there is no axial play.

NOTE:

- **Install on pipe section VW 415 A with shoulder facing synchro-hub.**
- **Position thrust pad 3118 with shoulder facing press tool VW 412.**

Determining size of circlip for synchro-hub for 1st and 2nd gear

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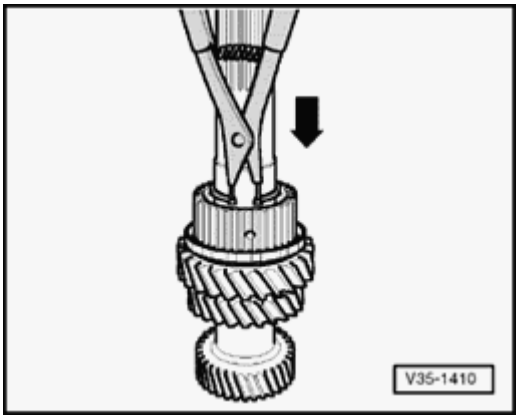


Fig. 334: Determining Thickest Circlip That Can Just Still Be Installed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine the thickest circlip that will still just fit.
- Insert circlip in direction of arrow to synchro-hub.

The following circlips are available:

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	

Driving out outer race for small taper roller bearing

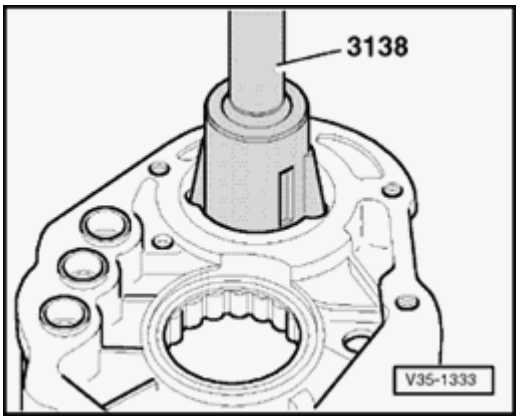


Fig. 335: Driving Out Outer Race Of Small Taper Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing in outer race/small taper roller bearing

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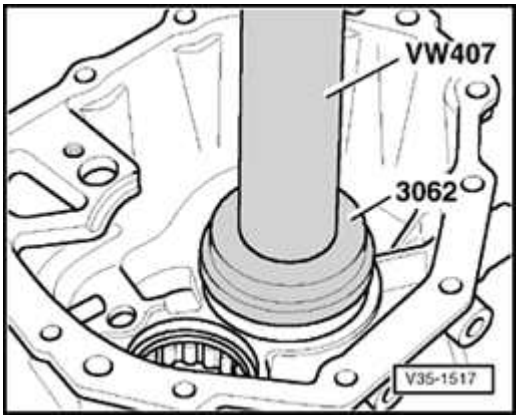


Fig. 336: Pressing In/Out Small Outer Race/Tapered Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert shim S4 into bearing plate behind bearing seat.
- Position thrust pad 3062 with shoulder facing press tool VW 407.
- Pressing in outer race for small taper roller bearing onto stop

39 FINAL DRIVE, DIFFERENTIAL

FLANGED SHAFT SEALS, REPLACING

Special tools and equipment

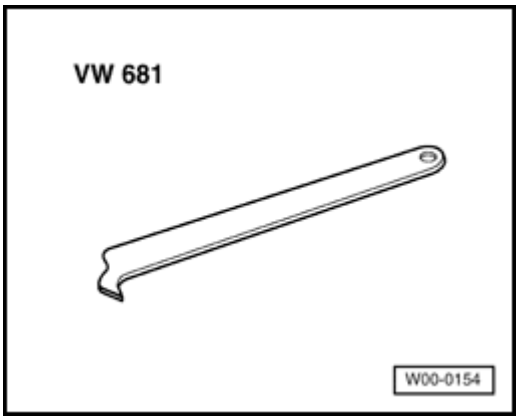


Fig. 337: Special Tool - Oil Seal Extractor Lever VW 681
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 681 Seal extractor

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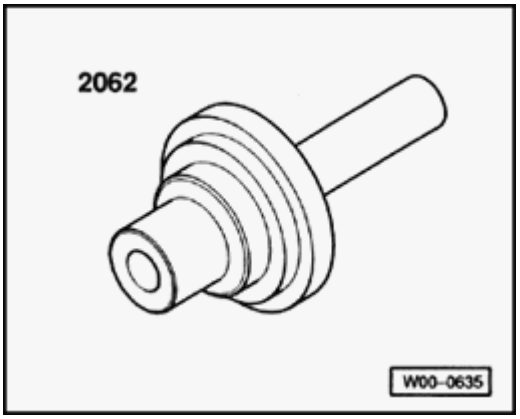


Fig. 338: Fitting Drift 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 2062 Driver
- Container

Removing

- Transmission installed

  - Remove shield, if installed, from underneath transmission.

When replacing left seal:

  - If necessary, partially remove the front part of the exhaust system.

Refer to

- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 1.8 LITER 4-CYL. 5V TURBO ENGINE MECHANICAL, ENGINE CODE(S): AMB
- **26 EXHAUST SYSTEM, EMISSION CONTROLS** for 3.0 LITER 6-CYL. 5V ENGINE MECHANICAL, ENGINE CODE(S): AVK, BGN
- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 4.2 LITER V8 5V ENGINE MECHANICAL, ENGINE CODE(S): BHF

Continuation for both seals:

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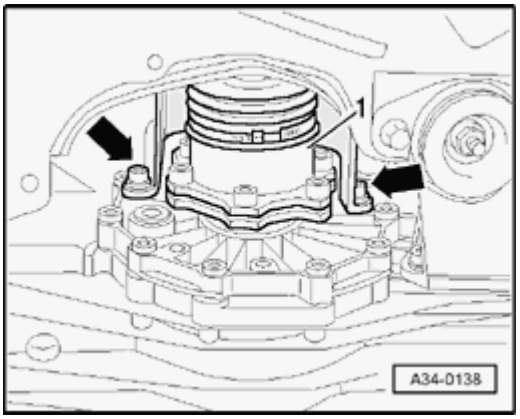


Fig. 339: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove splash plate, if installed, above drive axles (arrows).
- Detach drive axles -1- from flanged shafts, and tie up as high as possible; do not damage surface protection.
- Place drip tray underneath.
- Unscrew flanged shaft securing bolt; for this purpose, screw two bolts into the flange and counterhold the flanged shaft using a tire lever.
- Pull out flanged shaft.

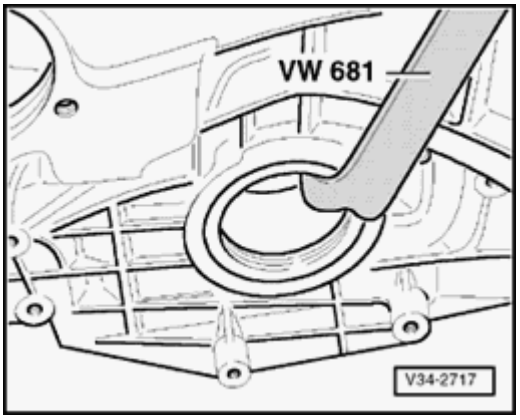


Fig. 340: Removing Drive Flange Seal Using Extractor Lever VW 681
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out flanged shaft seal with VW 681.

Installing

- Lightly oil outer circumference of seal.

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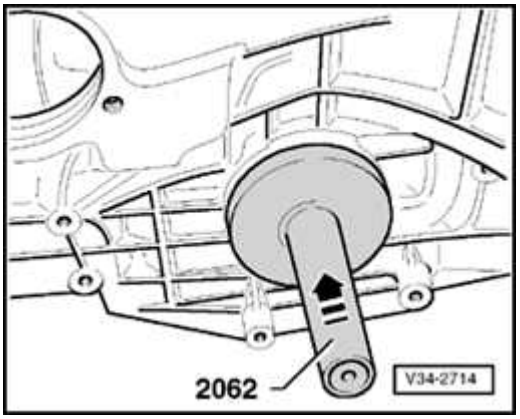


Fig. 341: Driving In Flange Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive in new seal for right-hand flanged shaft to a depth of 5.5 mm below surface of housing and for left-hand flange to a depth of 5.5 below surface of cover.

NOTE:

- **Figure shows installation on right-hand side of the transmission.**
- **The procedure is identical for left and right-hand seals.**
- **Do not cant seal when driving in.**
- **Insertion depth for repairs is 6.5 mm when a used flanged shaft is employed.**

- Pack space between sealing and dust lips with sealing grease G 052 128 A1.
- Insert flanged shaft.
- Fasten flanged shaft with cone head bolt.
- Bolt drive axle to flanged shaft.

Refer to **40 - FRONT SUSPENSION**

- Bolt on cover plates for drive axle if present.
- If necessary, reinstall exhaust system and align free of stress.

Refer to

- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 1.8 LITER 4-CYL. 5V TURBO ENGINE MECHANICAL, ENGINE CODE(S): AMB
- **26 EXHAUST SYSTEM, EMISSION CONTROLS** for 3.0 LITER 6-CYL. 5V ENGINE MECHANICAL, ENGINE CODE(S): AVK, BGN
- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 4.2 LITER V8 5V ENGINE MECHANICAL, ENGINE CODE(S): BHF

- Top up oil in transmission and check oil level. Refer to **Transmission oil level, checking**.

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- Install shield.

Tightening torques

Component		Nm
Flanged shaft to transmission		10 + 90 °
Drive axle heat shields		23

DRIVESHAFT FLANGE AT TRANSMISSION, REPLACING SEAL AND GROOVED BALL BEARING

Driveshaft flange at transmission, replacing seal and grooved ball bearing

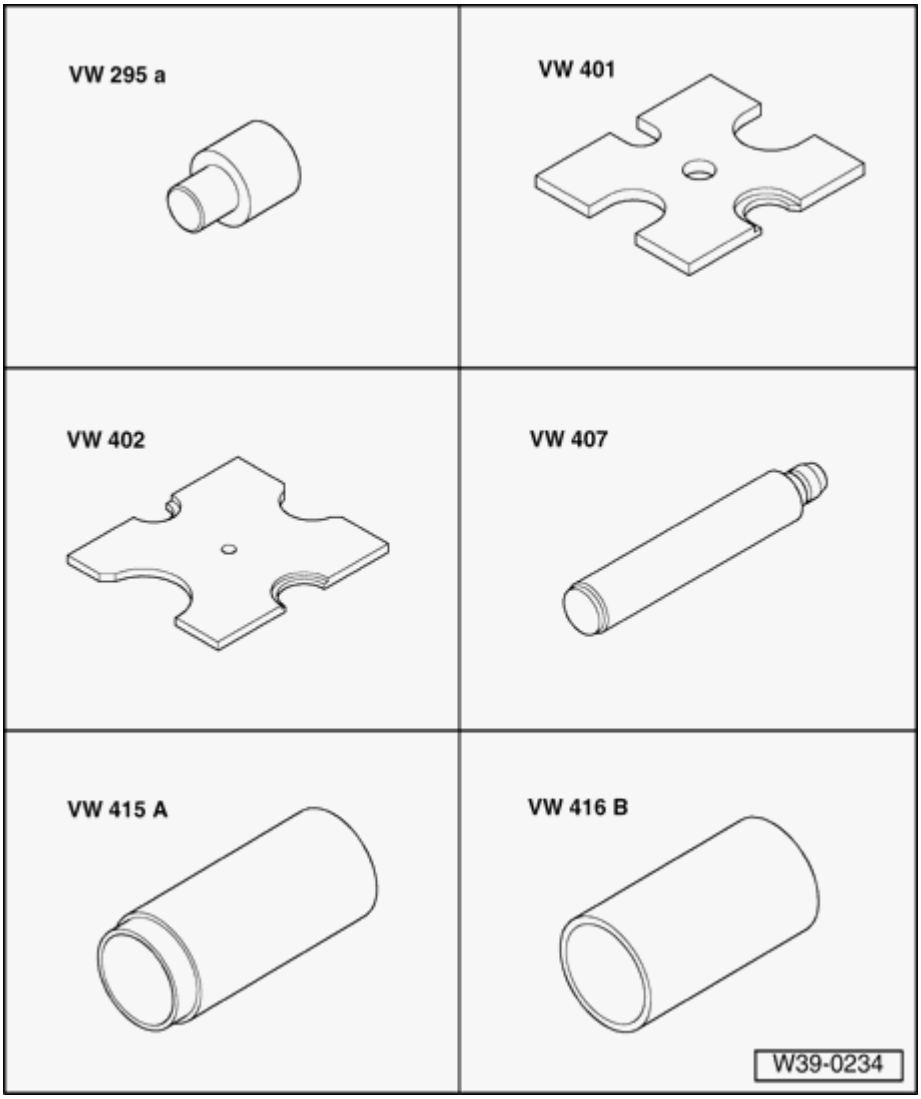


Fig. 342: Identifying Special Tools - Driveshaft Flange Seal And Grooved Ball Bearing At Transmission, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Special tools and equipment

- VW 295a Adapter
- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 415 A Tube
- VW 416 B Tube

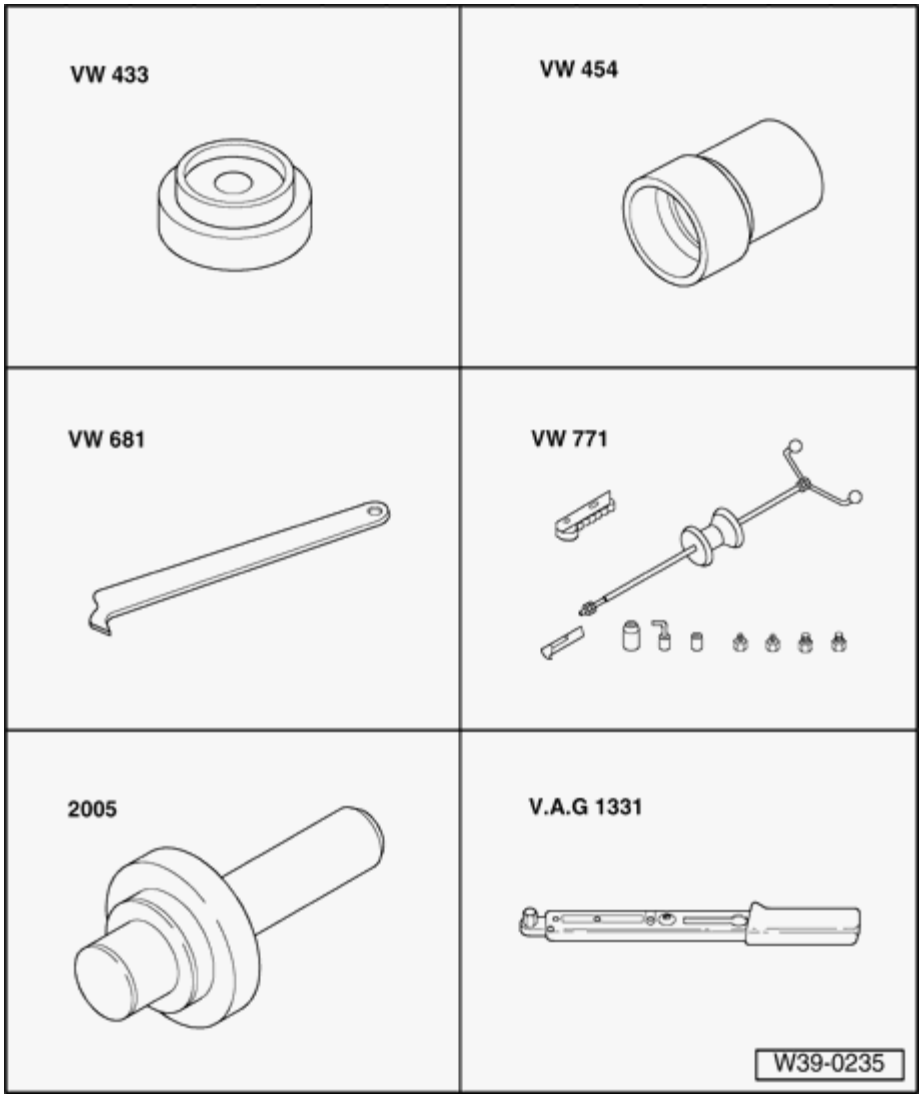


Fig. 343: Identifying Special Tools - Driveshaft Flange Seal And Grooved Ball Bearing At Transmission, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 433 Thrust pad

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- VW 454 Thrust pad
- VW 681 Seal extractor
- VW 771 Multi-purpose tool

- 2005 Drift
- VAG 1331 Torque wrench (5 to 50 Nm)
- Adjustment shim Part No. 016 311 391 B

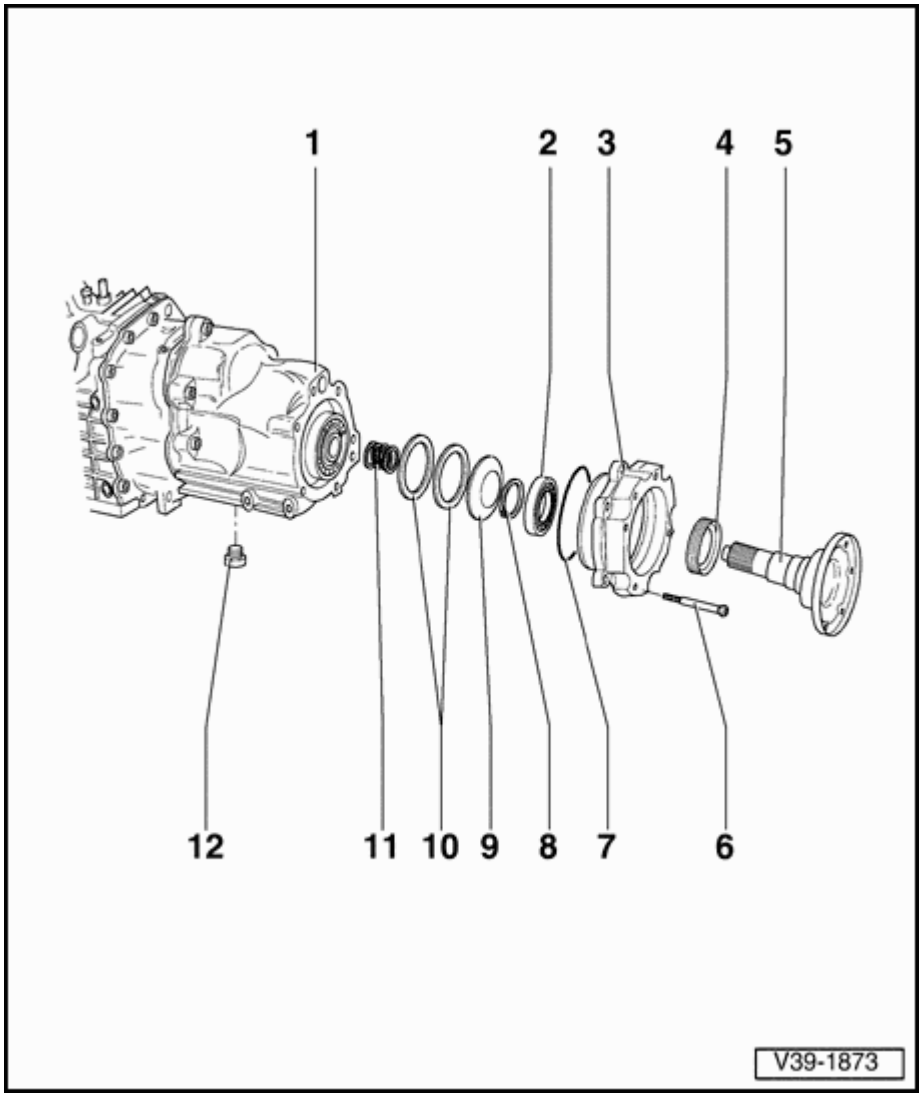


Fig. 344: Driveshaft Flange Seal And Grooved Ball Bearing At Transmission, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission

2 - Grooved ball bearing

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3 - Bearing housing at vibration damper

4 - Seal

- Driving in. Refer to **Fig. 354**

5 - Flanged shaft

6 - Bolt, 25 Nm

- 6 pieces

7 - O-ring

- Always replace

8 - Circlip

9 - Dished washer

- Mark installation position when removing: Large diameter (concave side) facing shims -Item 10

10 - Washers

11 - Spring

12 - Oil drain plug, 40 Nm

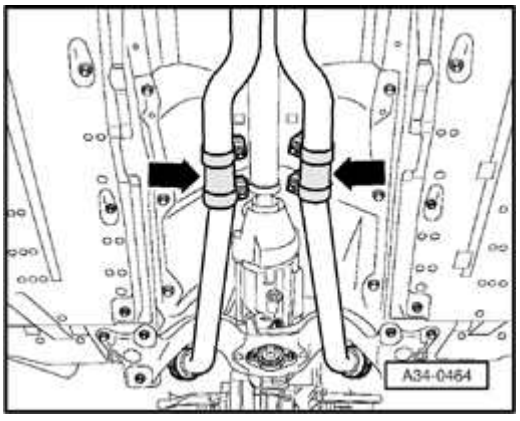


Fig. 345: Exhaust System At Double Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Transmission installed

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NOTE: The flex joint in front exhaust pipe must not be bent more than 10 ° , otherwise it may be damaged.

- Remove exhaust system from the clamps.
- Detach rear part of exhaust system from hangers and remove.

NOTE: A second technician is required to remove the rear part of exhaust system.

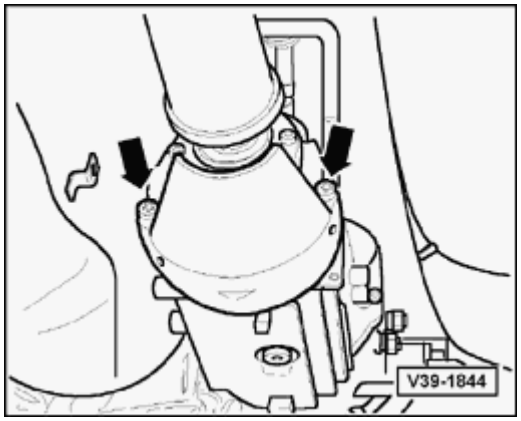


Fig. 346: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt heat shield for driveshaft -arrows-.
- Remove bolts at flange of transmission/drive axle.
- Push driveshaft to rear final drive together. The constant velocity joints can be adjusted axially.

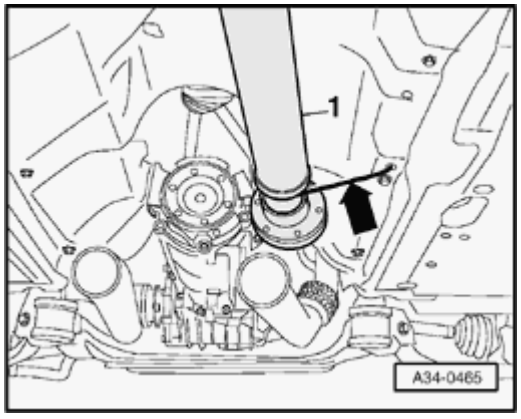


Fig. 347: Driveshaft Secured With Wire To Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure driveshaft -1- with wire (arrow) to heat shield.
- Place container under the transmission.
- Unscrew rear oil drain plug (at end cover) and drain gear oil.

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- Unscrew bolts attaching bearing housing.

NOTE: Bearing housing is pressed slightly off end cover by spiral spring when mounting bolts are loosened.

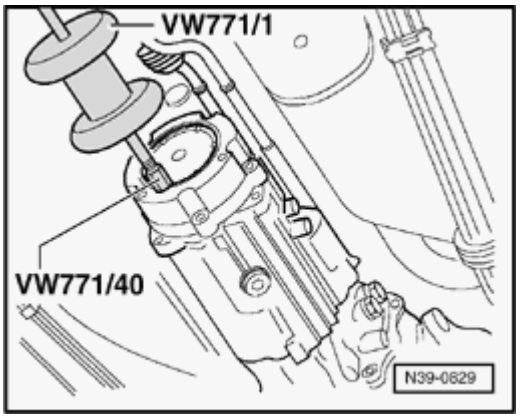


Fig. 348: Pull Off Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull flanged shaft together with bearing housing and vibration damper off end cover.
- Remove bearing housing.
- Remove circlip from flanged shaft.

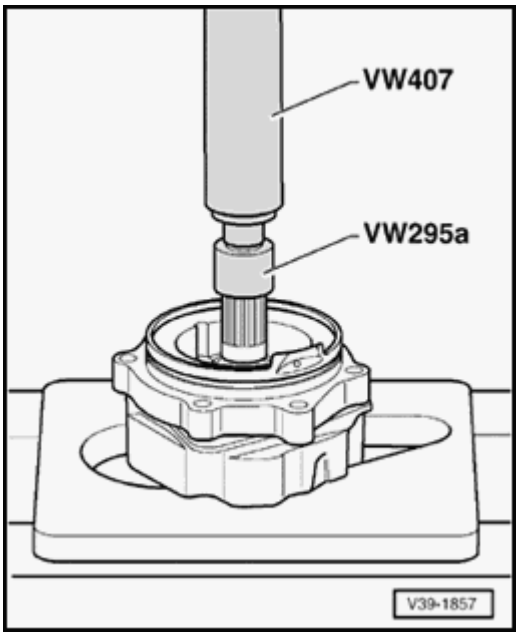


Fig. 349: Pressing Out Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press out flanged shaft.

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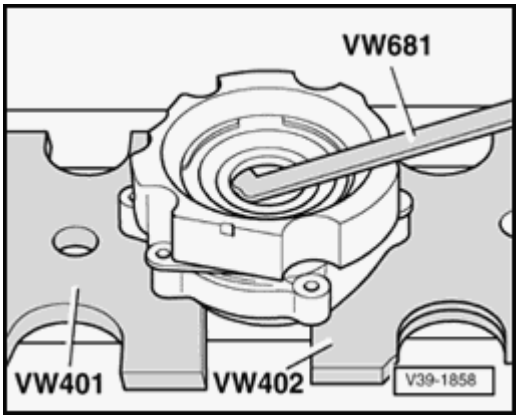


Fig. 350: Pulling Out Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out flanged shaft seal.
- Thoroughly clean seat for seal.

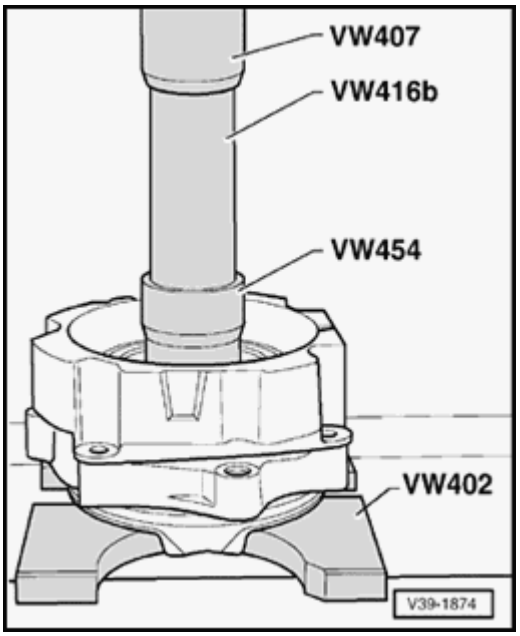


Fig. 351: Pressing On Grooved Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press out grooved ball bearing.

Installing

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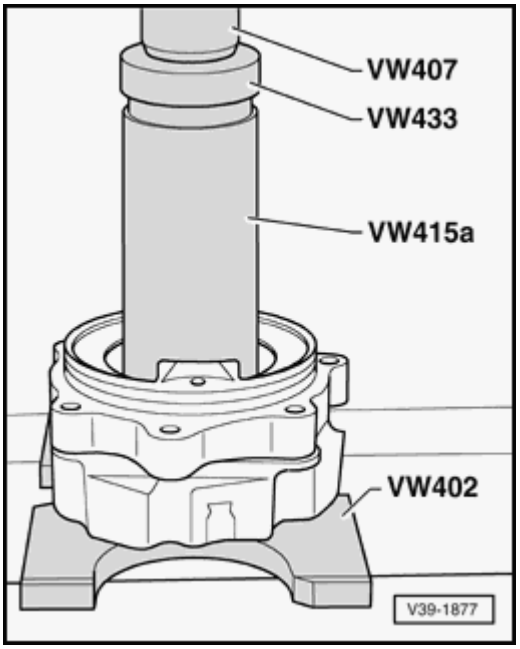


Fig. 352: Pressing In Grooved Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press grooved ball bearing into bearing housing.

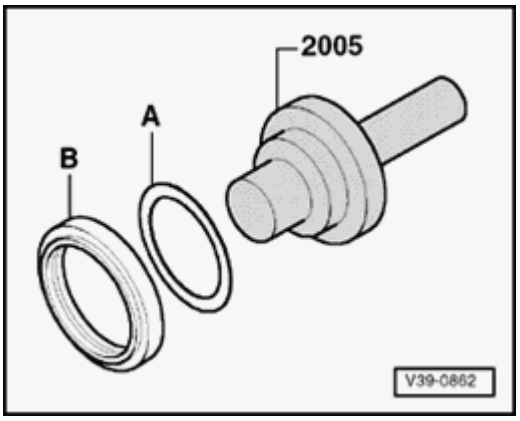


Fig. 353: Preparing Seal For Installation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil diameter of seal -B-.
- Install seal together with washer -A- Part No. 016 311 391 B (thickness 1.7 mm) onto drift 2005.

- Installation position: Open side of seal faces toward transmission.

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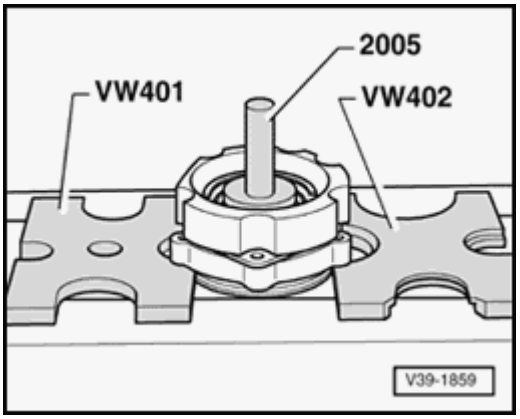


Fig. 354: Driving In Flange Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive in flanged shaft seal.
- Remove washer after inserting seal.
- Pack space between sealing and dust lips with sealing grease G 052 128 A1.

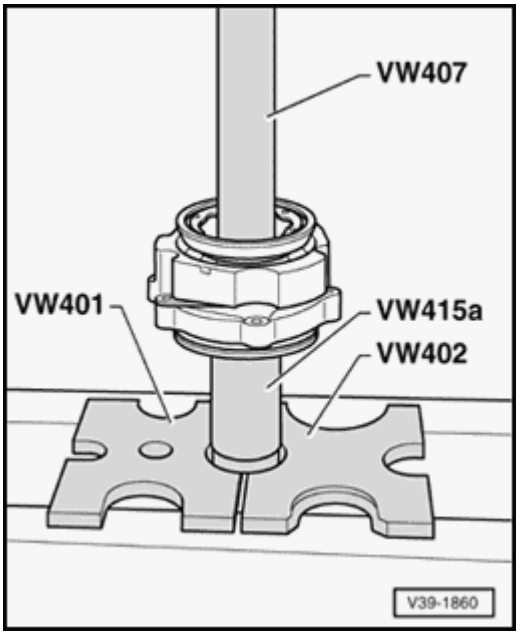


Fig. 355: Pressing In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in flanged shaft.
- Install circlip onto flanged shaft.
- Lightly oil O-ring and insert into groove of bearing housing.
- Insert dished washer and shims into bearing housing.

- Installation position. Refer to Item 9.

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- Install spiral spring onto flanged shaft.
- Tighten bolts attaching bearing housing in stages and diagonally.
- Bolt on driveshaft.

Refer to **39 - FINAL DRIVE, DIFFERENTIAL**

- Top up oil in transmission and check oil level. Refer to **Transmission oil level, checking**.

SPEEDOMETER VEHICLE SPEED SENSOR -G22- AND TRIGGER WHEEL, REMOVING AND INSTALLING

Speedometer vehicle speed sensor -G22-, removing and installing

- Transmission installed

- Remove left front wheel.

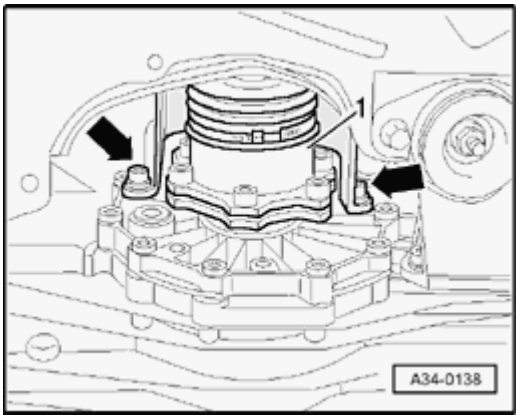


Fig. 356: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove splash plate above left drive axle -1- if installed (arrows).

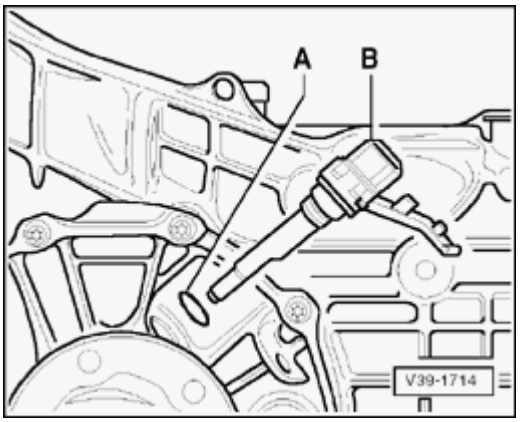


Fig. 357: Identifying Vehicle Speed Sensor (VSS)

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unplug connector from sender -B-.
- Press retaining clip down, turn sender sideways and pull out upward.

Installing

- Replace O-ring -A-.
- Handle sender carefully. If it is damaged it is possible that the speedometer will not indicate exactly.

Tightening torques

Component	Nm
Heat shield for drive axle	23 Nm

Trigger wheel for speedometer vehicle speed sensor -G22-, removing and installing

Special tools and workshop equipment required

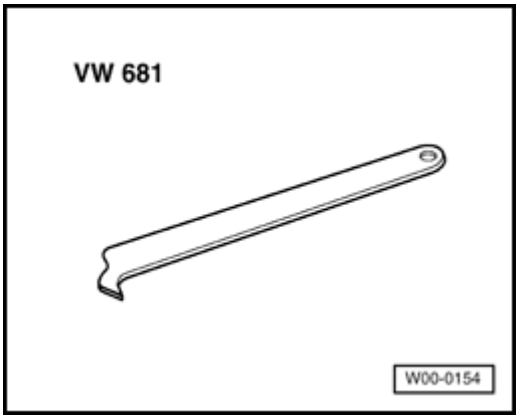


Fig. 358: Special Tool - Oil Seal Extractor Lever VW 681
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 681 Seal extractor

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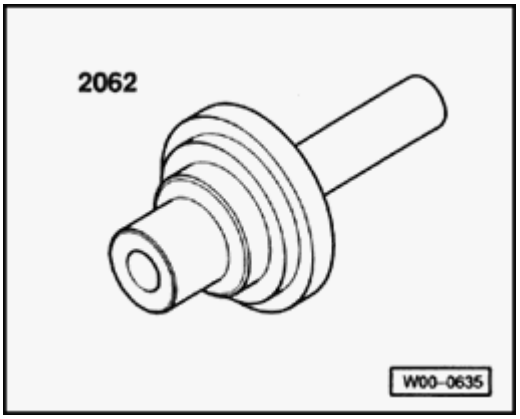


Fig. 359: Fitting Drift 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 2062 Fitting drift
- Container

Removing

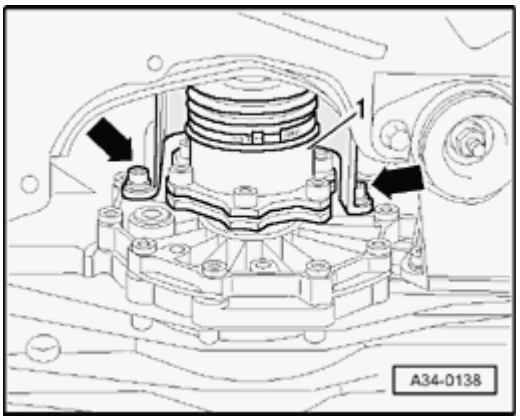
- Transmission installed

  - Partially remove front part of exhaust system.

Refer to

- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 1.8 LITER 4-CYL. 5V TURBO ENGINE MECHANICAL, ENGINE CODE(S): AMB
- **26 EXHAUST SYSTEM, EMISSION CONTROLS** for 3.0 LITER 6-CYL. 5V ENGINE MECHANICAL, ENGINE CODE(S): AVK, BGN
- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 4.2 LITER V8 5V ENGINE MECHANICAL, ENGINE CODE(S): BHF

  - Remove shield, if installed, from underneath transmission.



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Fig. 360: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove splash plate above left drive axle -1- (arrows).
- Unbolt drive axle from flanged shaft.
- Place drip tray underneath transmission.

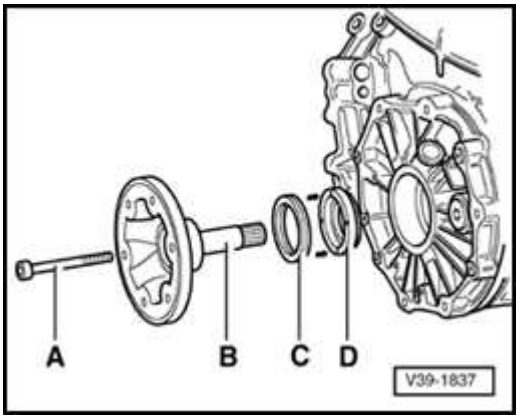


Fig. 361: Removing/Installing Speedometer Drive Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove fastening screw -A- for flanged shaft -B-.
- Pull out flanged shaft.
- Pull out flanged shaft seal -C- with VW 681.
- Remove speedometer vehicle speed sensor. Refer to **Speedometer vehicle speed sensor -G22-, removing and installing**.

Remove speedometer trigger wheel -D-:

- Lever out the trigger wheel from the grooves in the differential at the drive pegs -arrows- on alternate sides.

Installing

Installation is carried out in the reverse order to removal, noting the following:

Installation position:

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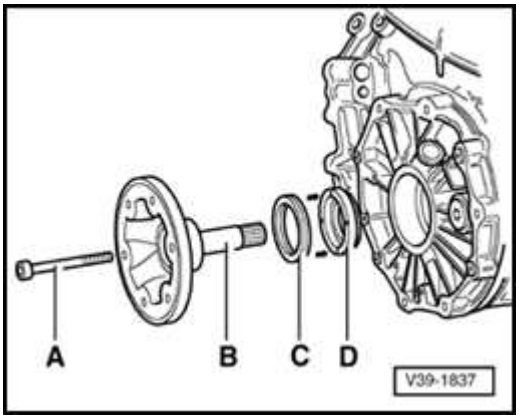


Fig. 362: Removing/Installing Speedometer Drive Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The drive pegs -arrows- of the trigger wheel -D- must engage in the grooves of the differential.

- Drive in seal -C- for flanged shaft and install flanged shaft.

Tightening torque:

Component		Nm
Drive axle heat shield		23

DIFFERENTIAL, REMOVING AND INSTALLING

Differential, removing and installing

NOTE: The differential can be removed and installed with the transmission installed.

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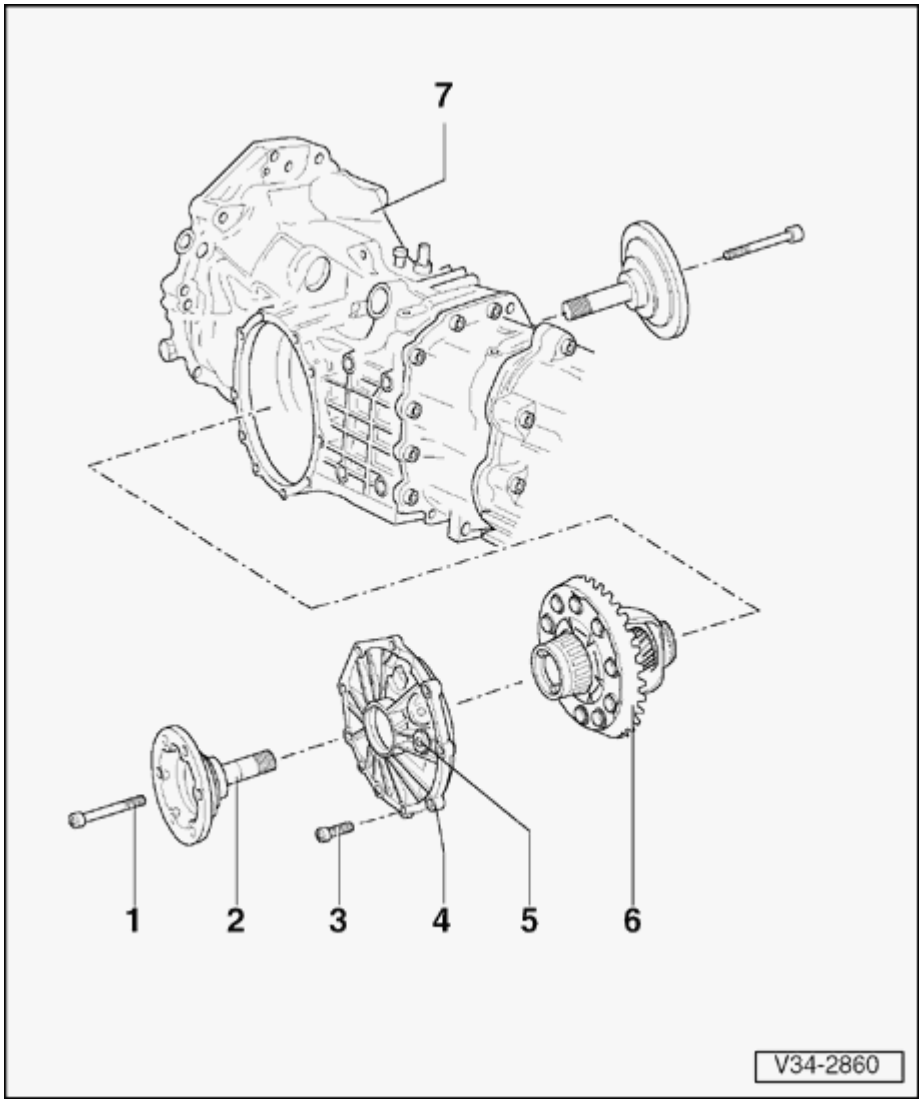


Fig. 363: Differential, Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bolt, 10 Nm and turn 90 ° further

2 - Flanged shaft

- When removing, secure with a drift to prevent it turning

3 - Bolt, 25 Nm

- 10 pieces

4 - Final drive cover

- Removing and installing speedometer trigger wheel. Refer to **Trigger wheel for speedometer vehicle**

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speed sensor -G22-, removing and installing

- If replaced: Adjust ring gear. Refer to **Ring gear, adjusting**

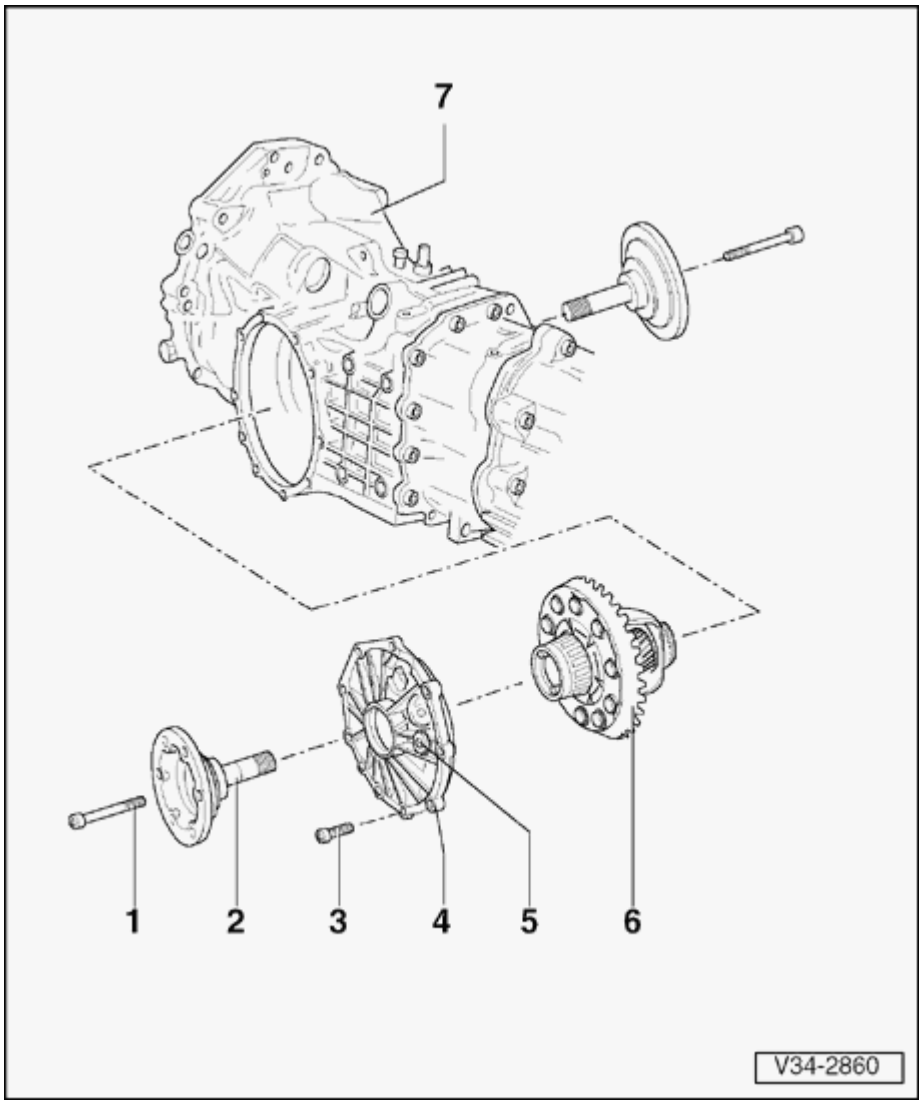


Fig. 364: Differential, Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Oil filler plug, 40 Nm

- Checking gear oil. Refer to **Transmission oil level, checking**

6 - Differential

- Disassembling and assembling. Refer to **Differential, disassembling and assembling**
- If replaced: Adjust ring gear. Refer to **Ring gear, adjusting**

7 - Transmission housing

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- Servicing. Refer to **Transmission housing, servicing**

DIFFERENTIAL, DISASSEMBLING AND ASSEMBLING

Differential, disassembling and assembling

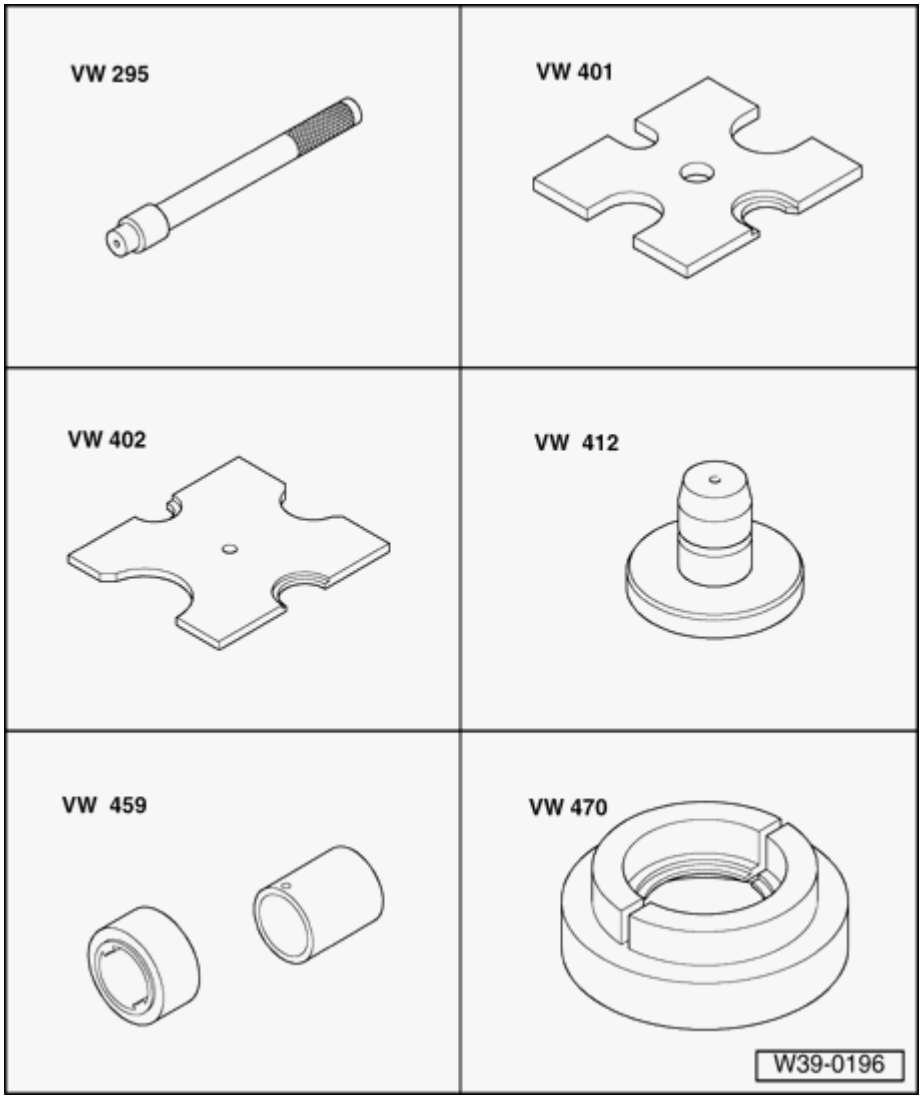


Fig. 365: Identifying Special Tools - Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 295 Drift
- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 412 Thrust tool

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- Installation and removal tool VW 459
- VW 470 Thrust ring for drive pinion bearings

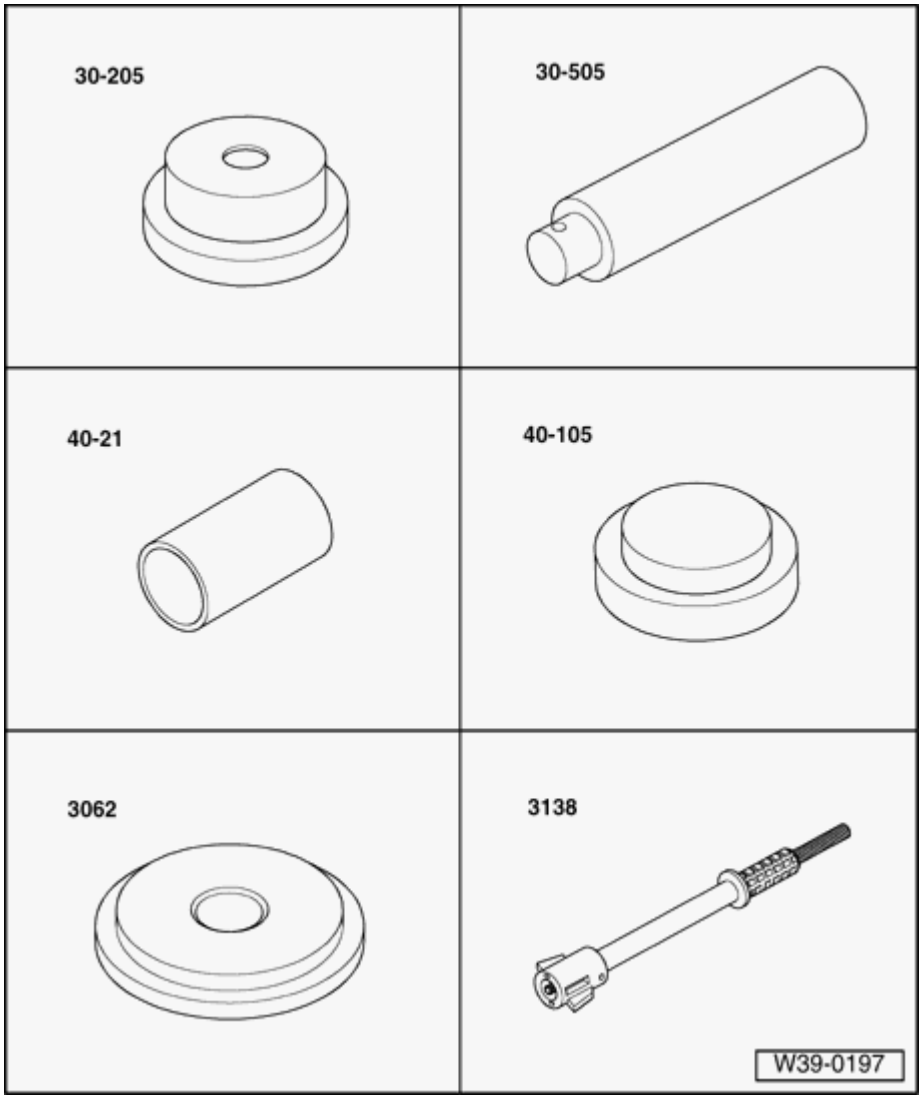


Fig. 366: Identifying Special Tools - Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 30-205 Thrust plate
- 30-505 Fitting mandrel
- 40-21 Thrust sleeve
- 40-105 Thrust plate
- 3062 Thrust disk
- 3138 Driver

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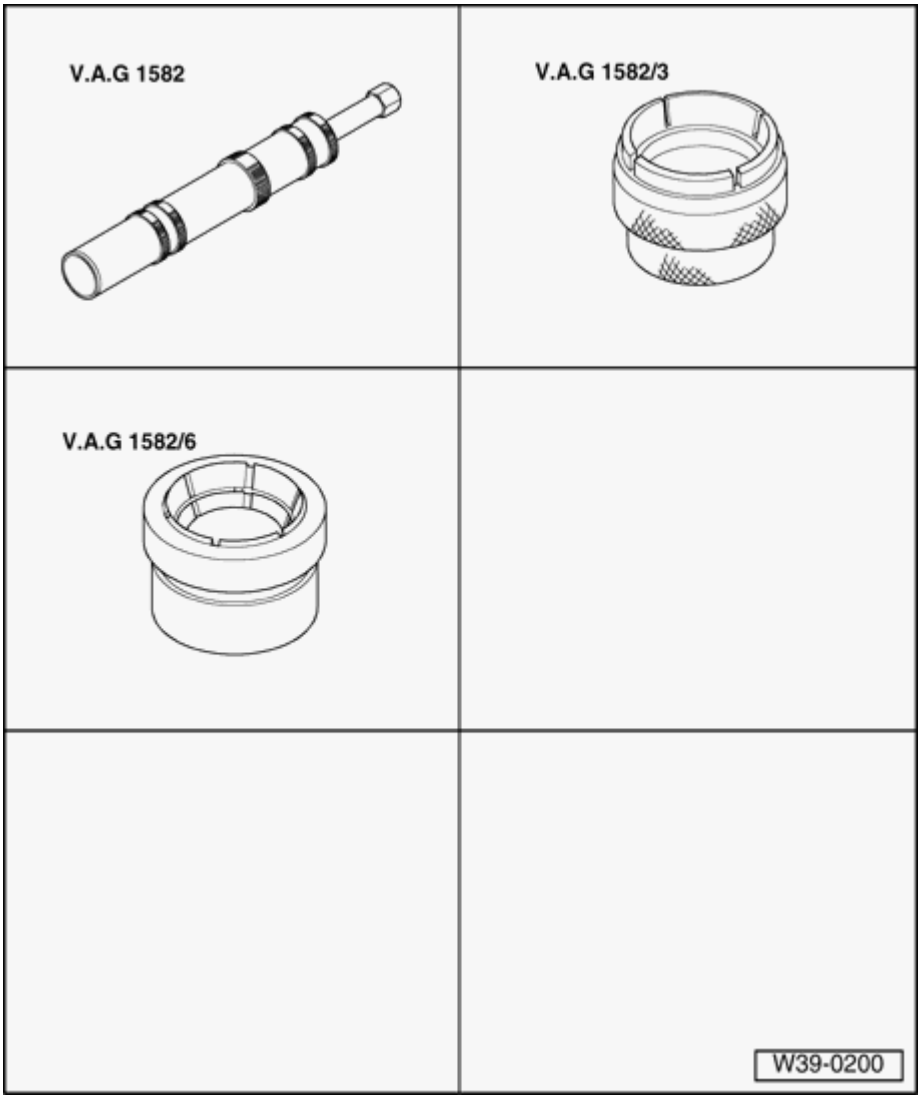


Fig. 367: Identifying Special Tools - Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1582 Taper roller bearing puller
- VAG 1582/3 Grip piece
- VAG 1582/6 Grip piece

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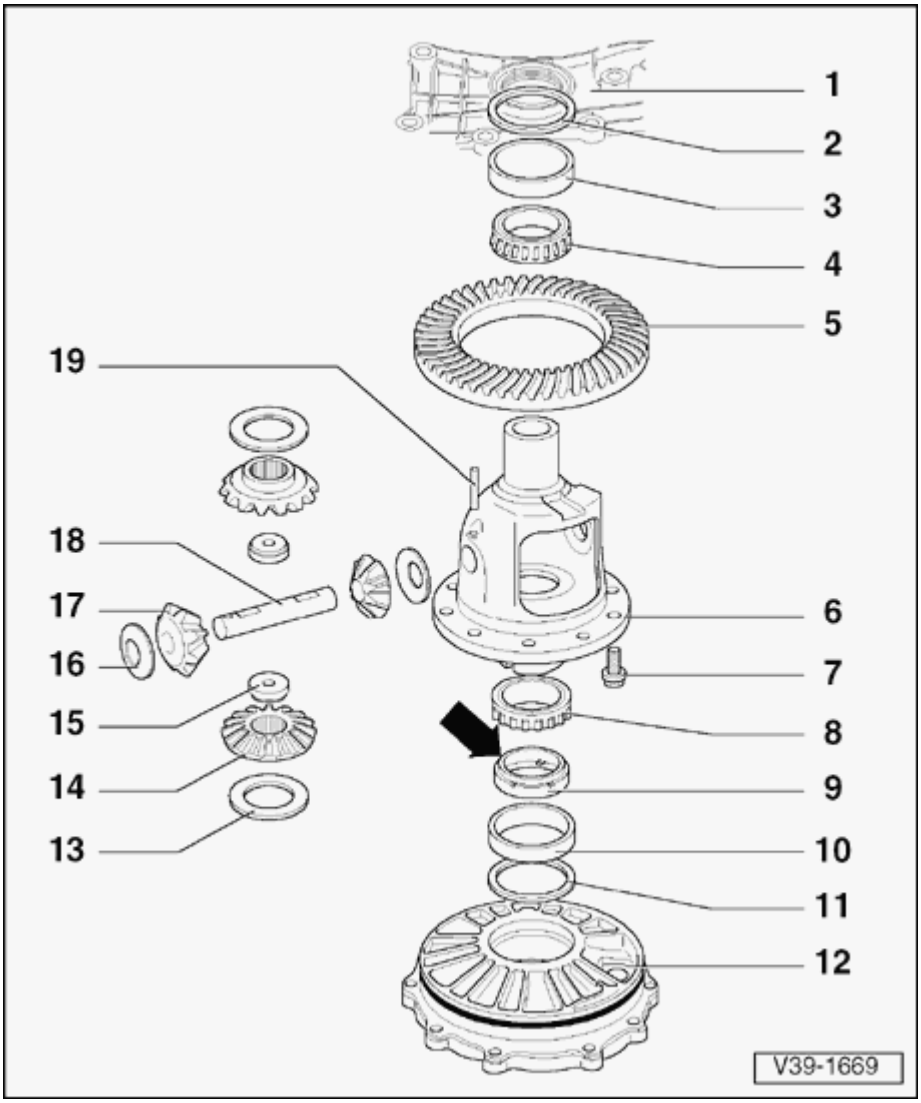


Fig. 368: Differential (Transmission Without Oil Pump), Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing 1)

2 - Shim S2

- Note thickness
- Adjustment overview. Refer to **Adjustment overview**

3 - Taper roller bearing outer race, small1)

- Tapping out. See **Driving outer race for small taper roller bearing out of transmission housing**
- Tapping in. See **Pressing outer race for small taper roller bearing into transmission housing**

4 - Taper roller bearing inner race, small1)

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- Pulling off. See **Removing inner race for small taper roller bearing**
- Pressing on. See **Pressing on inner race for small taper roller bearing**

1) Adjustments are required if these components are replaced. Refer to **Adjustment overview**.

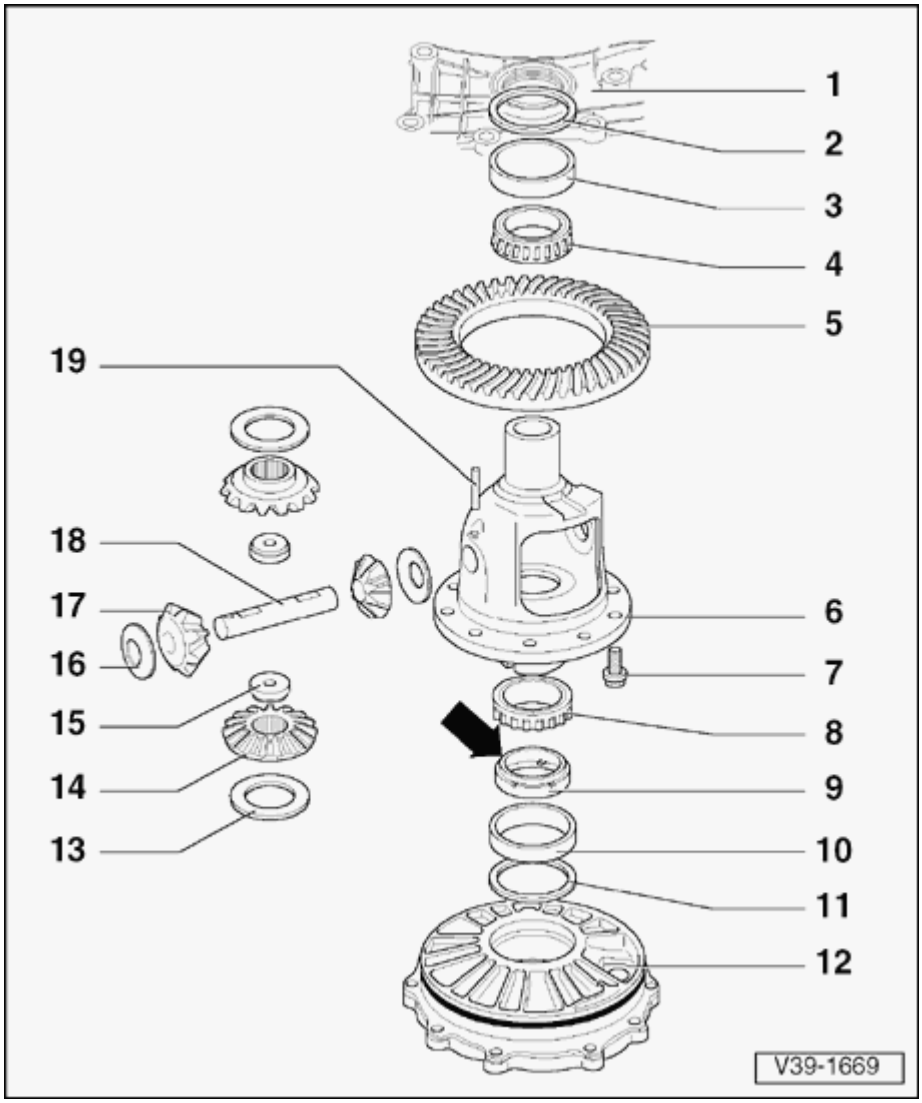


Fig. 369: Differential (Transmission Without Oil Pump), Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Ring gear1)

- Paired with pinion shaft (final drive set)
- Drive off with a drift. See **Driving ring gear off housing**
- Fit to differential housing. See **Heat The Ring Gear To Approx. 100 ° C and install**

6 - Differential housing 1)

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7 - Ring gear bolts - 60 Nm plus additional 45 ° turn

- Always replace
- Use only the original bolts

8 - Taper roller bearing inner race, large1)

- Pulling off. See **Removing inner race for large taper roller bearing**
- Pressing on. See **Pressing on inner race for taper roller bearing**

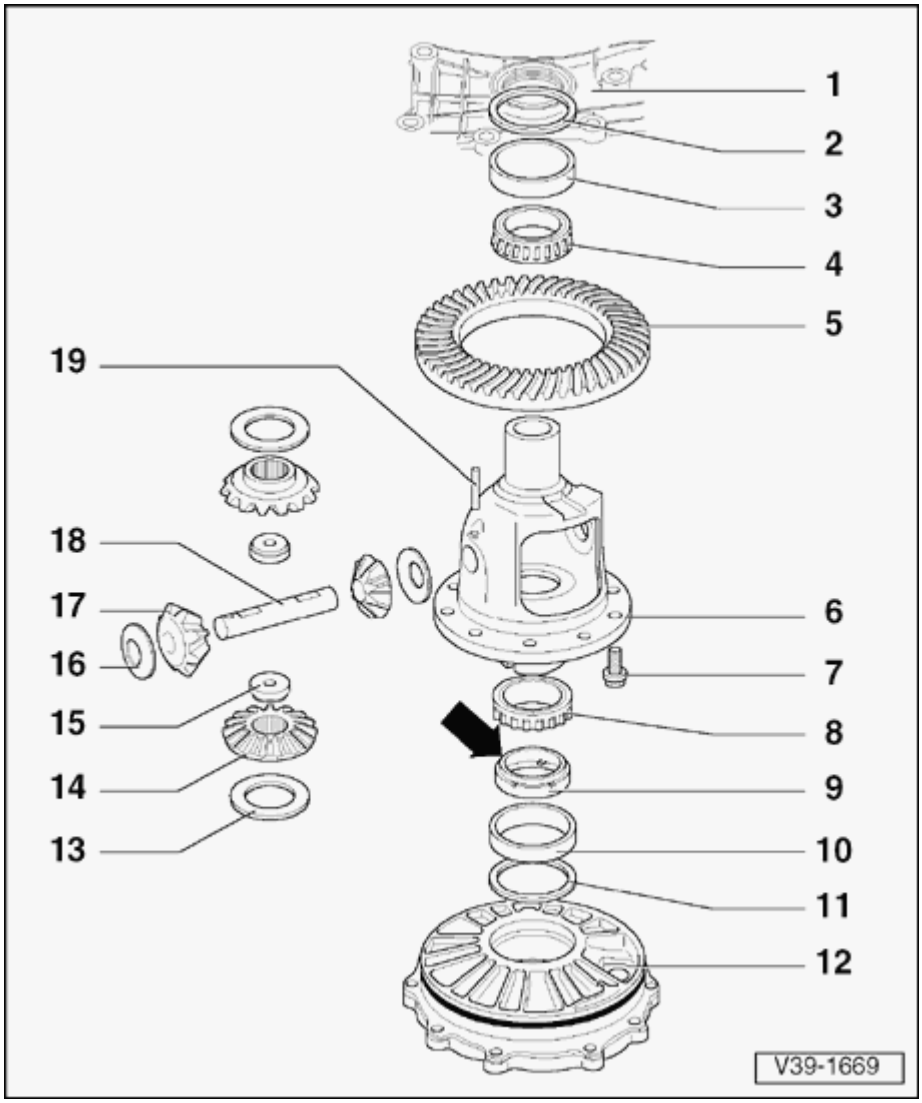


Fig. 370: Differential (Transmission Without Oil Pump), Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

9 - Speedometer trigger wheel

- Removing and installing. Refer to **Trigger wheel for speedometer vehicle speed sensor -G22-,**

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removing and installing

- Installation position: Shoulder -arrow- faces toward differential; do not cant drive pegs in recess of differential housing
-

10 - Taper roller bearing outer race, large1)

- Tapping out. See **Driving outer race for large taper roller bearing out of cover**
- Tapping in. See **Driving outer race for large taper roller bearing into cover**

11 - Shim S1

- Note thickness
- Adjustment overview. Refer to **Adjustment overview**

12 - Cover for final drive 1)

- With O-ring
- Replace O-ring
- Lubricate O-ring before installing

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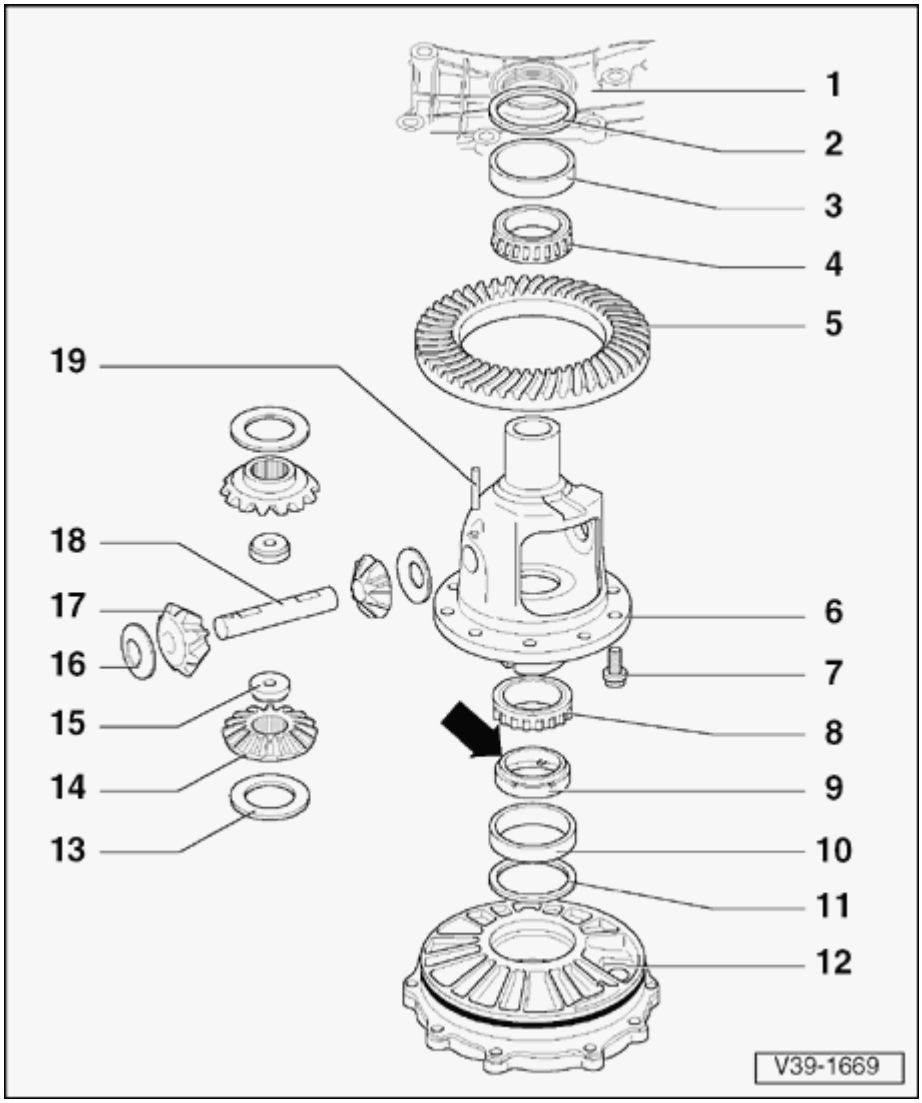


Fig. 371: Differential (Transmission Without Oil Pump), Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

13 - Adjustment shim

- Redefine thickness. See **Adjusting differential bevel gears**

14 - Large bevel gear

- Installing. See **Installing bevel gears**
- Adjusting. See **Adjusting differential bevel gears**

15 - Threaded piece

16 - Thrust washer

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- Check for cracks and chipping

17 - Small bevel gear

- Installing. See **Installing bevel gears**
- Adjusting. See **Adjusting differential bevel gears**

18 - Shaft for small bevel gears

- Drive out with drift after removing spring pin
- Before driving in, align thrust washers

19 - Roll pin

- Replace
- Drive in flush

Removing inner race for small taper roller bearing

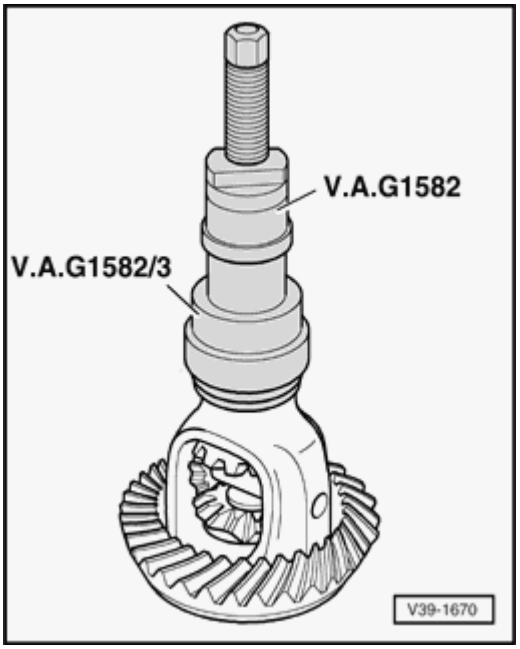


Fig. 372: Pulling Off Small Inner Race/Tapered Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install thrust plate 40-105 onto differential housing before installing puller.

Removing inner race for large taper roller bearing

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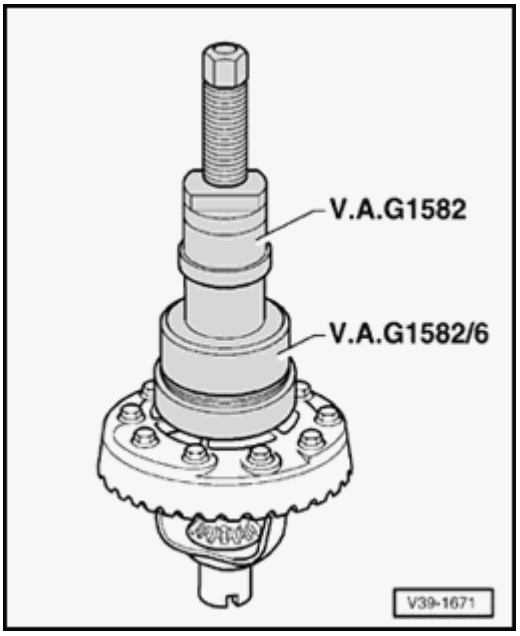


Fig. 373: Pulling Off Large Inner Race/Tapered Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove speedometer trigger wheel
- Install thrust plate 40-105 onto differential housing before installing puller.

Pressing on inner race for small taper roller bearing

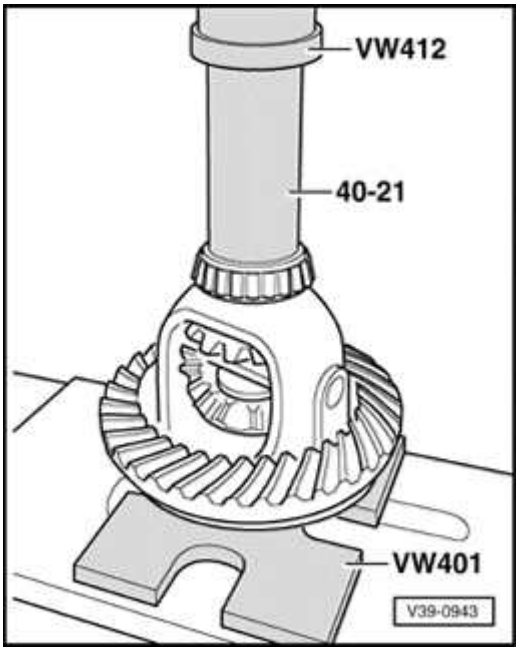


Fig. 374: Pressing On Small Tapered Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Heat inner race to approx. 100 C, position and install.

WARNING: Wear protective gloves!

Pressing on inner race for taper roller bearing

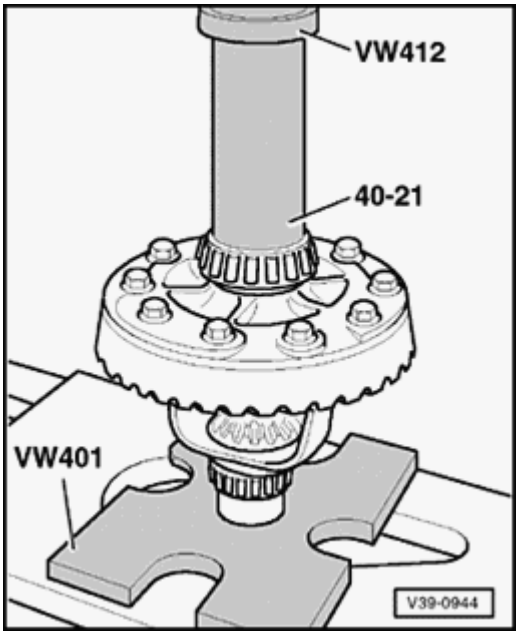


Fig. 375: Pressing On Inner Race Of Large Taper Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat inner race to approx. 100 C, position and install.

WARNING: Wear protective gloves!

Driving ring gear off housing

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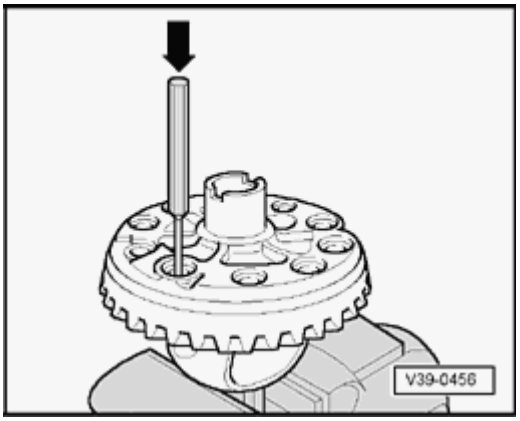


Fig. 376: Driving Out Ring Gear From Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Heat the ring gear to approx. 100 ° C and install

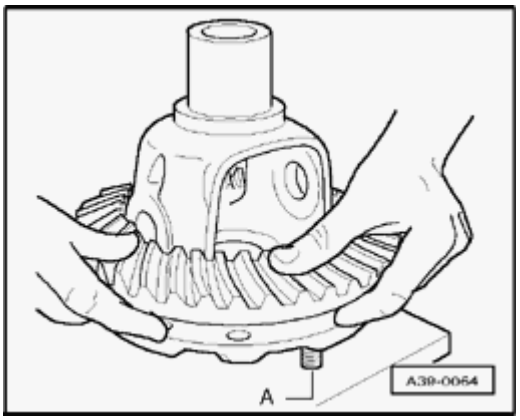


Fig. 377: Installing Ring Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing ring gear guide it on centering pins -A- (locally made).

  WARNING: Wear protective gloves!

- Allow the ring gear to cool off slightly before inserting the bolts. Then tighten to the specified torque.

Installing bevel gears

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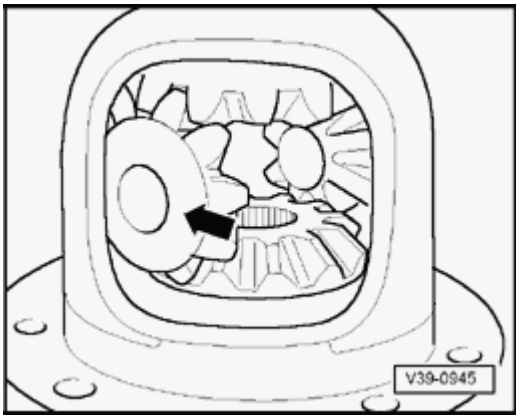


Fig. 378: Installing Small Differential Bevel Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert thrust washers for small bevel gear with a small amount of grease.
- Insert large bevel gears with correct shims. See **Adjusting differential bevel gears**
- Insert planet pinions turned through 180 ° and pivot into position (arrow).
- Insert threaded pieces.

- Installation position: Step toward large bevel gear

- Align thrust washers with hole.
- Drive small bevel gear shaft into final position and secure.

Adjusting differential bevel gears

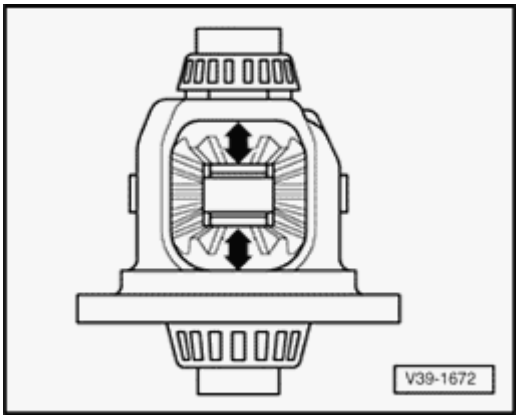


Fig. 379: Differential Planetary Gears, Adjusting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert large bevel gears with thinnest shims (0.5 mm).
- Insert small bevel gears with thrust washers and press in shaft.

NOTE: Do not now interchange large bevel gears and thrust washers.

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- Press small bevel gears outward and check play of large bevel gears by hand -arrows-.
- Adjust play by inserting an appropriate shim. Refer to **The following shims are available**.

- Specification: no more than 0.10 mm

NOTE:

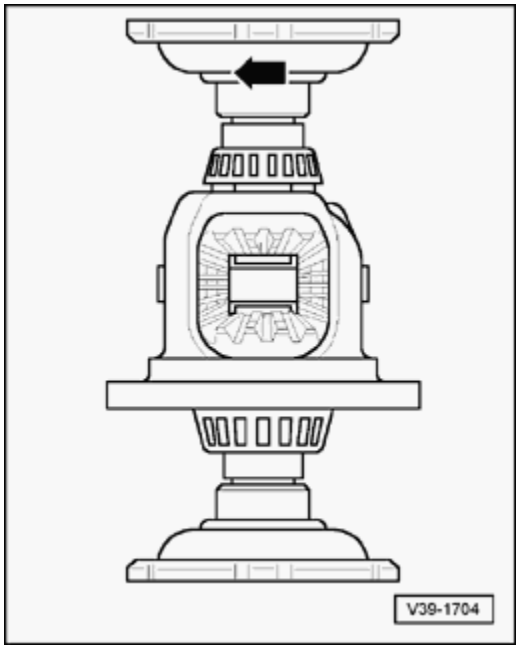


Fig. 380: Installing Differential Bevel Gear Shim
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The adjustment is also correct if no further play is perceptible, although it is still possible to rotate the differential bevel gears -arrow-.

The following shims are available

Shim thickness (mm)		
0.50	0.70	0.90
0.60	0.80	1.00

Driving outer race for small taper roller bearing out of transmission housing

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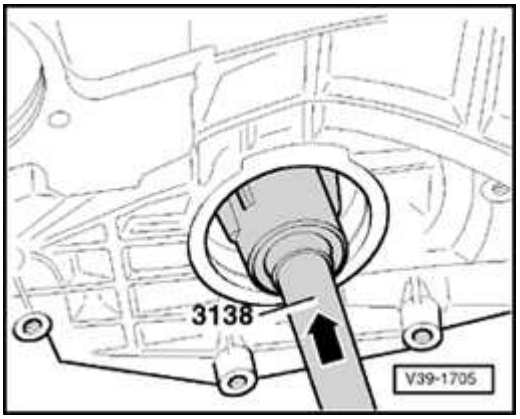


Fig. 381: Driving Out Small Taper Roller Bearing Outer Race From Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing outer race for small taper roller bearing into transmission housing

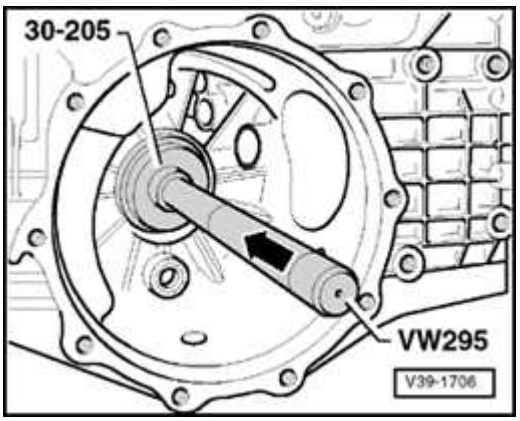


Fig. 382: Driving Small Taper Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving outer race for large taper roller bearing out of cover

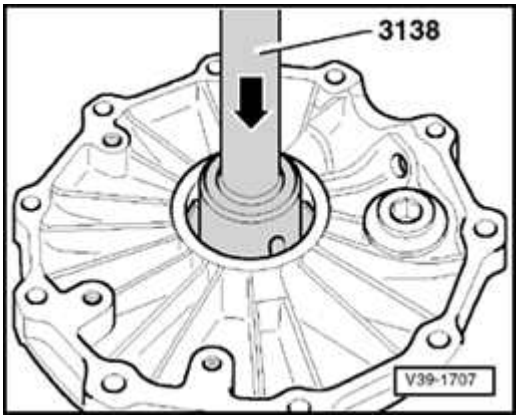


Fig. 383: Driving Out Large Taper Roller Bearing Outer Race From Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Use suitable base, e.g. VW 470 with recess toward cover.

Driving outer race for large taper roller bearing into cover

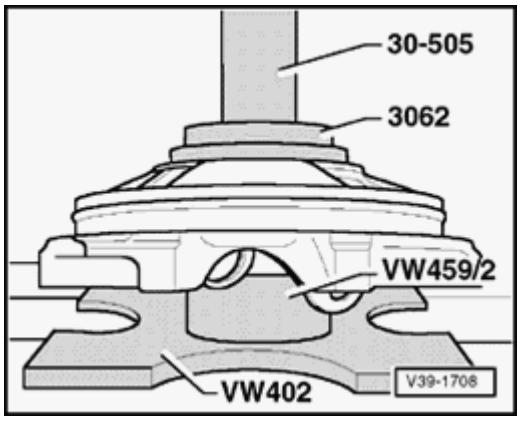


Fig. 384: Driving Large Taper Roller Bearing Outer Race Into Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DRIVE PINION AND RING GEAR, ADJUSTING

General notes

Careful adjustment of the drive pinion and ring gear is important for the service life and smooth running of the final drive. For this reason, drive pinions and ring gears are paired up during manufacturing and are checked with a tester for correct positioning of carrier pattern and low noise emission. The position for quietest possible running is achieved by moving the drive pinion in an axial direction, whereby the backlash remains within the specified tolerance.

Deviation "r" with reference to the master gauge "Ro" is recorded on the outer circumference of the ring gear. Final drive set (drive pinion and ring gear) must only be replaced together.

Gear sets, adjusting and marking

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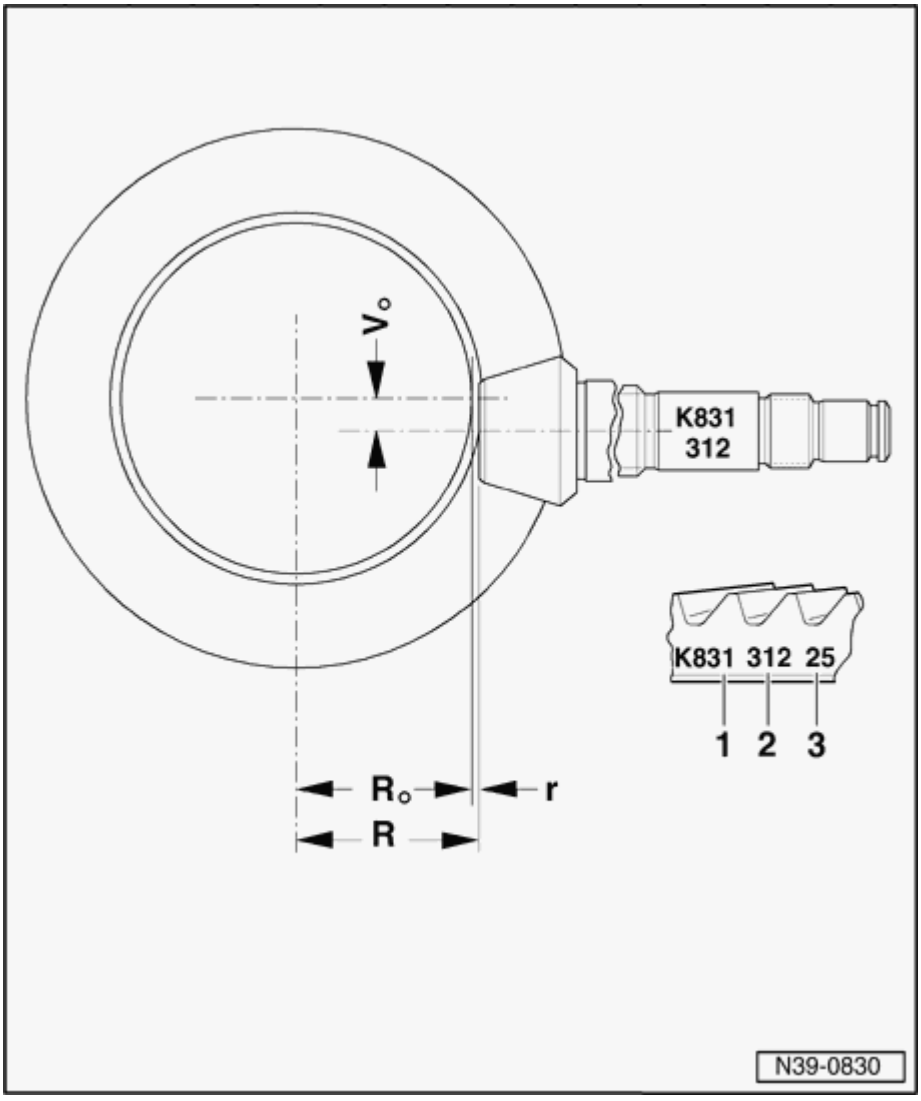


Fig. 385: Gear Sets, Adjustments And Markings
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Marking "K831" indicates Klingelnberg final drive set with transmission ratio 31 : 8.

2 - Gear set pairing number (312).

3 - Deviation (tolerance) "r" is 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" = 59.65 mm

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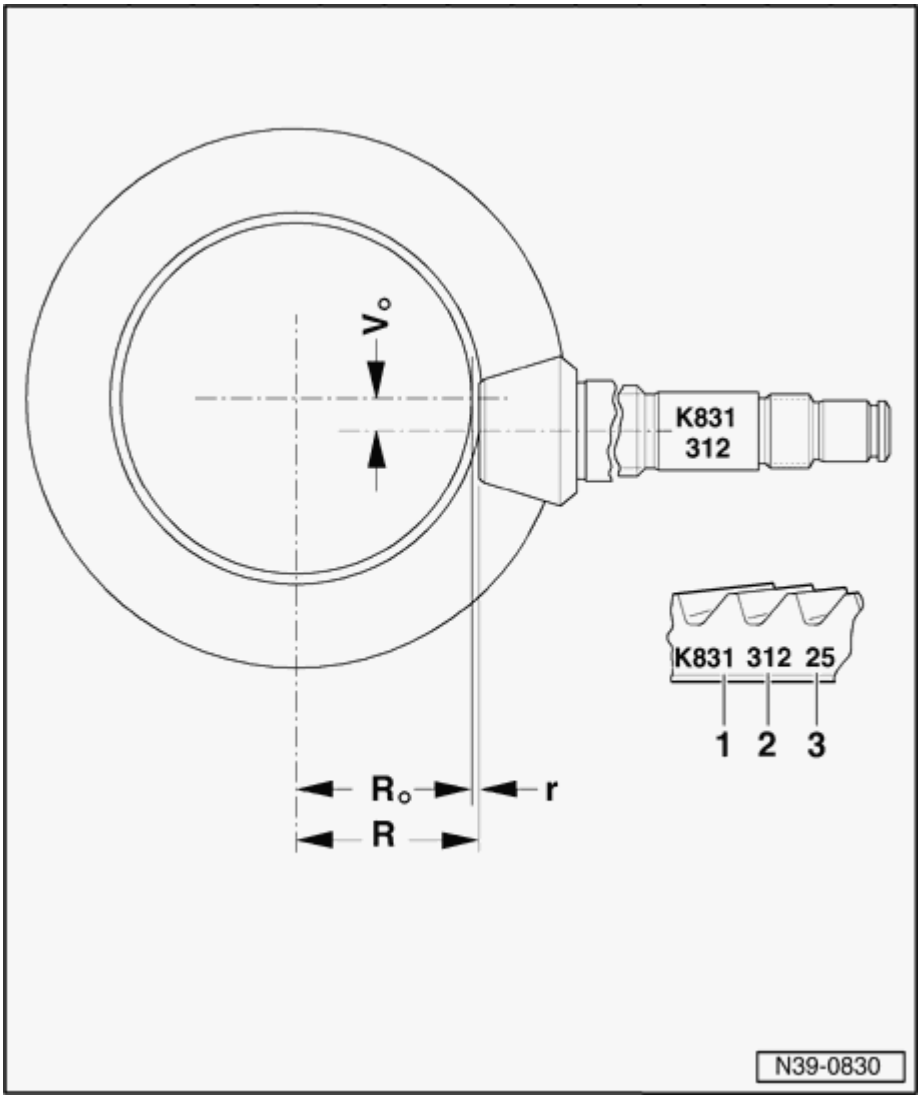


Fig. 386: Gear Sets, Adjustments And Markings
Courtesy of VOLKSWAGEN UNITED STATES, INC.

R - Actual dimension between ring gear and face of pinion shaft at point with quietest running for this pinion set.

Vo - Hypoid offset

Position of shims

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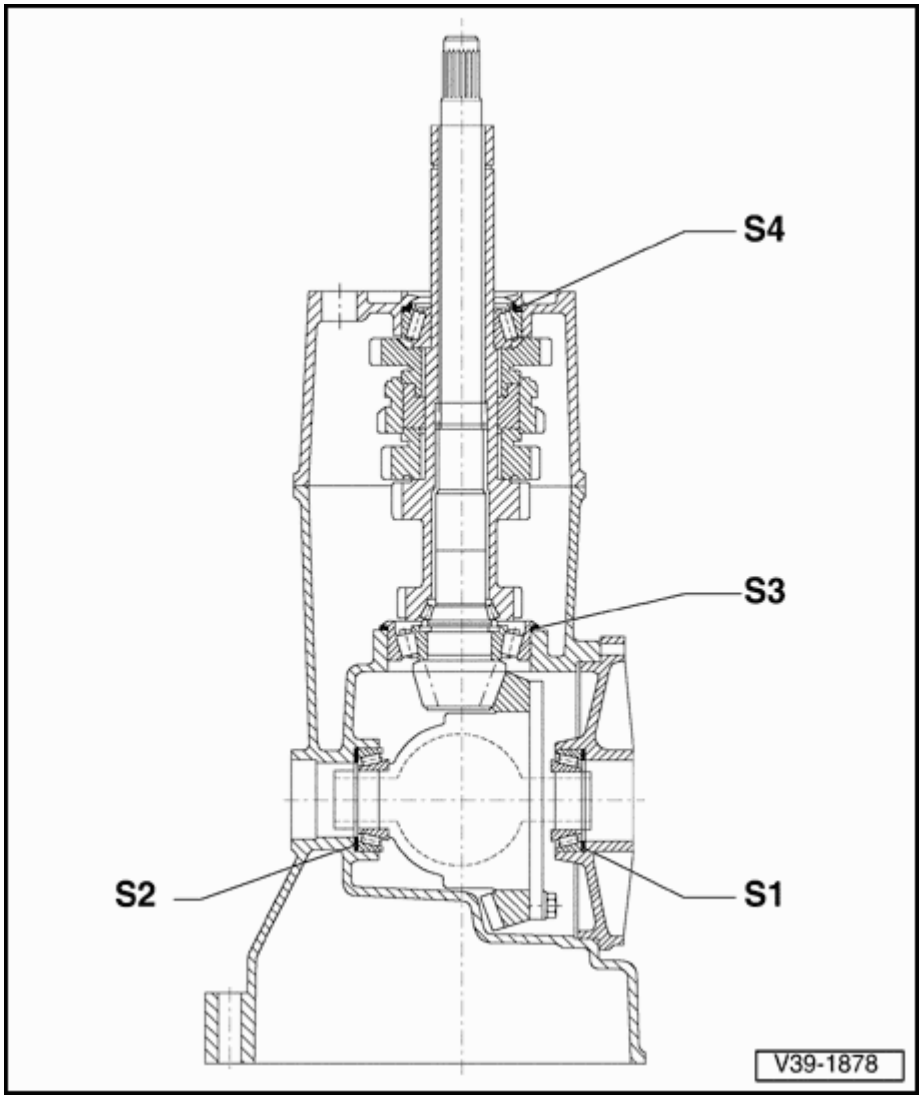


Fig. 387: Location Of Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

S1 - Adjustment shim for ring gear in transmission housing cover

S2 - Adjustment shim for ring gear in transmission housing

S3 - Adjustment shim for drive pinion in transmission housing

S4 - Adjustment shim for drive pinion in bearing plate

Adjustment overview

NOTE: In the case of repairs to the transmission it is only necessary to adjust the pinion shaft, ring gear or final drive set if components have been replaced which have a direct effect on the adjustments of the final drive. To eliminate

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unnecessary adjustments observe following table:

To adjust:	Ring gear	Pinion shaft	Pinion shaft	Backlash
	(S1 and S2)	(S3 and S4)	shim only	0.12 -0.22 mm
		using deviation "r"	S4	
	Refer to **Ring gear, adjusting**	Refer to **Drive pinion, adjusting**	Refer to **Re-determining shim S4**	Refer to **Adjusting backlash**
Component replaced				
Transmission housing	X	X		X
Bearing plate			X	X
Differential housing	X			X
Taper roller bearings for pinion shaft		X		X
Taper roller bearing for differential	X			X
Final drive	X	X		X
Hollow shaft			X	X
Final drive cover	X			X

Gear set, recommended adjustment sequence

When ring gear and pinion shaft have to be adjusted, in the interests of a rational sequence, keep to the following order:

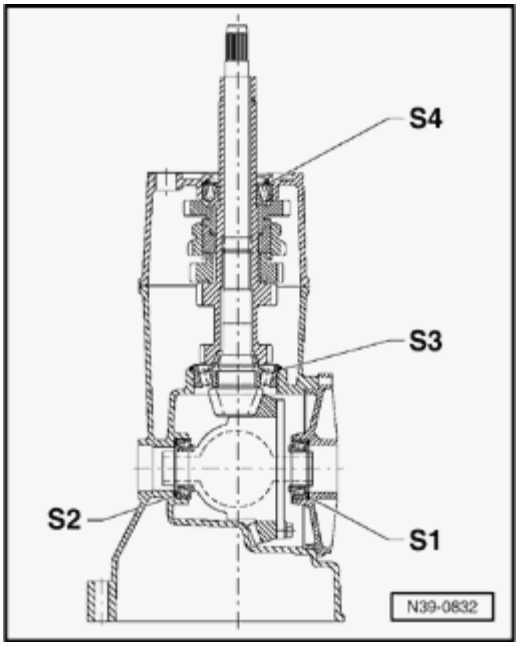


Fig. 388: Recommended Sequence For Adjusting Gear Set
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Determine total shim thickness "Stotal" (S1 plus S2) for the specified preload of taper roller bearings for differential.
- Determine total shim thickness "Stotal" (S3 plus S4) for the specified preload for taper roller bearings for drive pinion.
- Distribute total shim thickness "Stotal" (S3 plus S4) so that the distance from center of ring gear to face of pinion shaft is the same as distance "R" determined during production.
- Distribute total shim thickness "Stotal" (S1 plus S2) so that the specified backlash exists between ring gear and drive pinion.

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 for achieving good results when performing repairs and taking measurements.

Drive pinion, adjusting

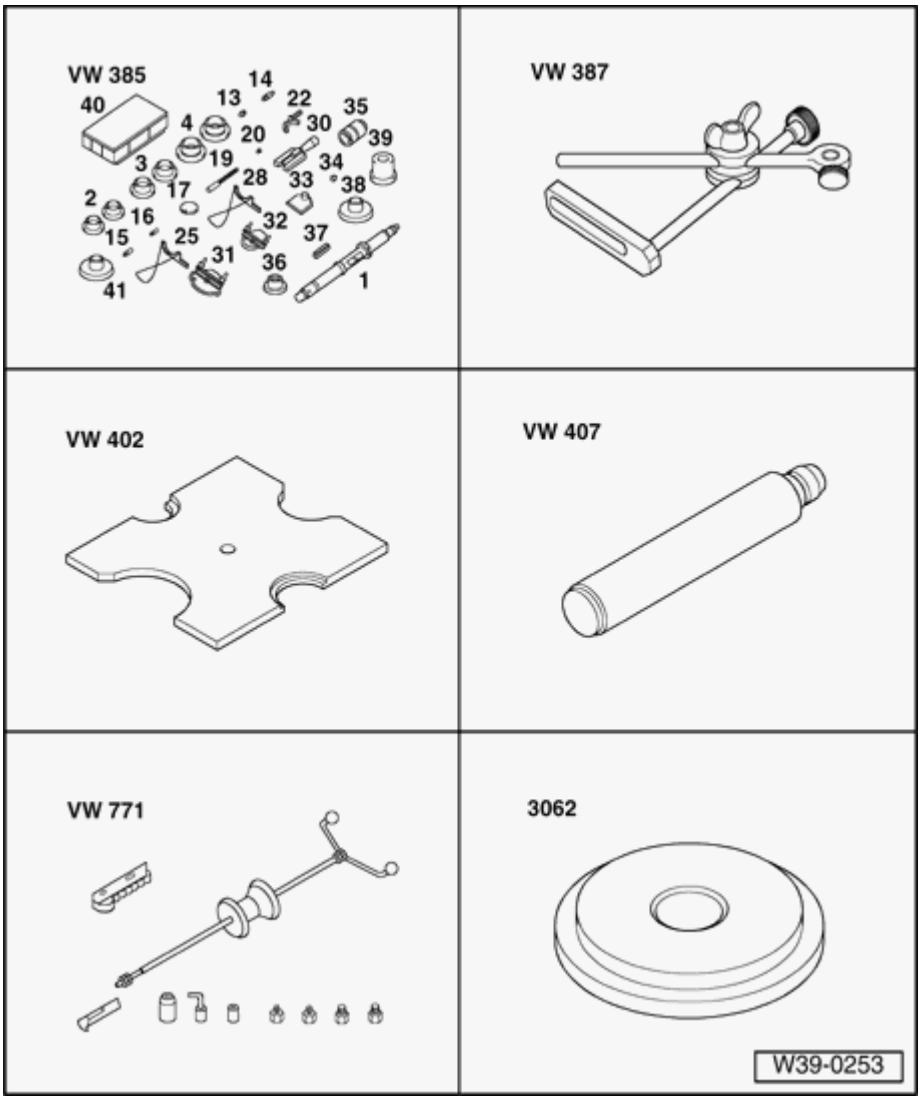


Fig. 389: Identifying Special Tools - Pinion, Adjusting

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

(Adjusting drive pinion and hollow wheel)

Special tools and equipment

- VW 385 Universal measuring tool
- VW 387 Universal dial gauge holder
- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 771 Multi-purpose tool
- 3062 Thrust disc

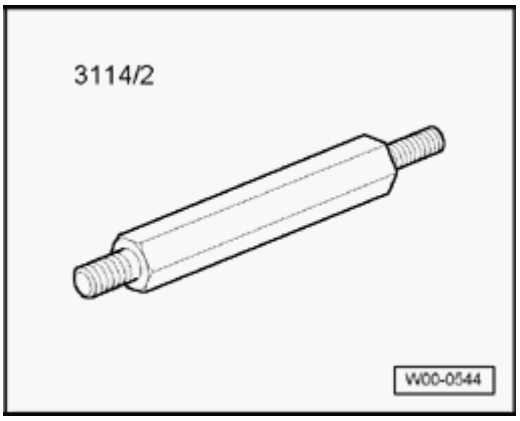


Fig. 390: 3114/2 Straightening Tool
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3114/2 Straightening tool

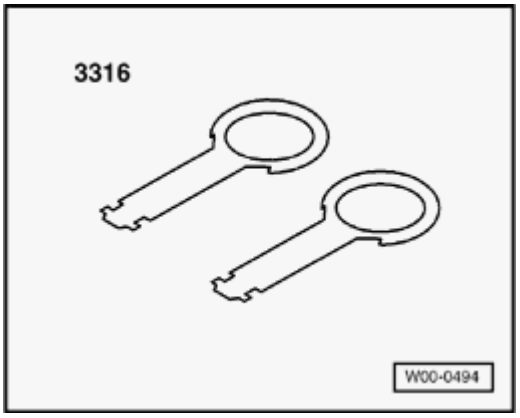


Fig. 391: 3116 Spring Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3116 Spring pin

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- Torque gauge 0 to 600 Ncm
- Dial gauge
- Dial gauge extension 6.5 mm
- Dial gauge extension 30 mm

Re-adjustment of the drive pinion according to the following instructions is only necessary if the final drive set, taper roller bearing for drive pinion and transmission housing are being replaced. Refer to **Adjustment overview**.

Determine total shim thickness "Stotal"(S3 plus S4)

(Setting preload of taper roller bearing for drive pinion).

- Differential is removed.

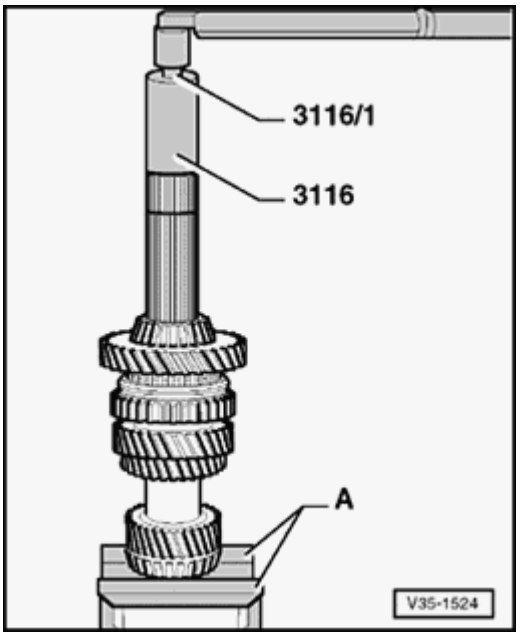


Fig. 392: Preloading Pinion/Hollow Shaft To 10 Nm, While Holding Hollow Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp drive pinion in vice using vice clamps -A-.
- Insert taper rollers with grease, assemble drive pinion and hollow shaft.
- Rotate hollow shaft against drive pinion 5 turns in both directions to settle taper roller bearing.
- Preload drive pinion/hollow shaft to 10 Nm, hold hollow shaft tight for this step.
- Install large taper roller bearing outer race into transmission housing without shim. Refer to **Heating transmission housing in order to install outer race for taper roller bearing** and **Inserting outer race for large taper roller bearing in transmission housing and pressing home**

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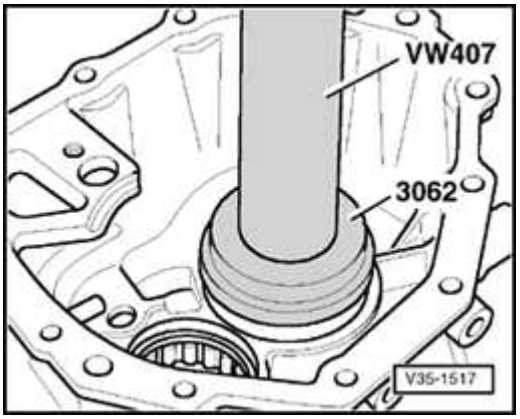


Fig. 393: Pressing In/Out Small Outer Race/Tapered Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press small taper roller bearing outer race together with a 1.00 mm thick provisional shim S4* fully into bearing plate.

NOTE: For measurement purposes a shim S4 with a thickness of 1.00 mm is inserted provisionally. It is referred to as S4* in the following. After determining measurement "e", S4* is replaced by the final shim S4.

- Insert completely assembled pinion shaft in transmission housing.
- Install bearing plate with dowel sleeves and tighten bolts to tightening torque.
- Rotate drive pinion and hollow shaft 8 turns in both directions prior to each measurement in order to settle taper roller bearing.

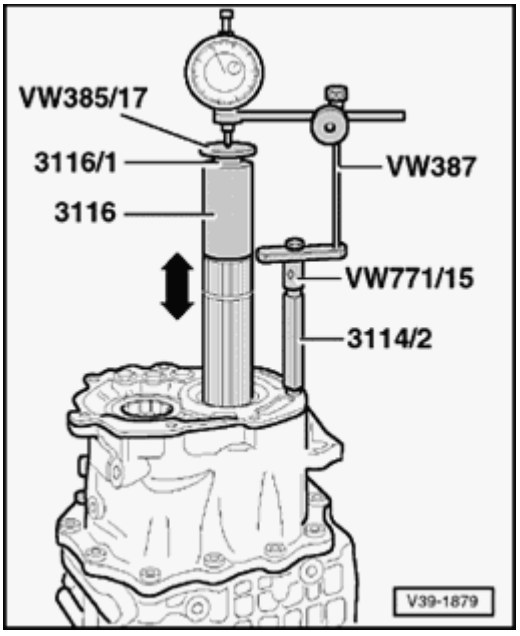


Fig. 394: Installing Measuring Tools
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Install measuring tools.
- Use 30 mm dial gauge extension
- Position dial gauge extension in middle of measuring plate VW 385/17.
- Set dial gauge (3 mm measuring range) to zero with 2 mm preload.
- Move drive pinion upward and downward without turning; read off play on dial gauge and note.

(Example: 0.90 mm)

- Before each measuring procedure the drive pinion must be turned together with the hollow shaft in order to avoid obtaining a false reading.

The specified bearing pre-load is obtained by adding a constant pre-load value (0.15 mm) to reading obtained (0.90 mm) and thickness of shim S4* (1.0 mm).

Stotal = S4* + reading obtained + pre-load

Example:

Inserted shim S4*	1.00 mm
Pre-load (constant value)	+0.15 mm
Reading obtained (Example)	+0.90 mm
Stotal	= 2.05 mm

Determining thickness of provisional shim S3*

Provisional shim S3* = Stotal - S4*

Example:

Total shim thickness Stotal (S3 + S4)	2.05 mm
Inserted shim S4*	-1.00 mm
Provisional shim thickness S3*	= 1.05 mm

- Removing outer race for large taper roller bearing. Refer to **Pulling out large taper roller bearing outer race**, Inserting provisional shim S3* into transmission housing and re-installing outer race. Refer to **Heating transmission housing in order to install outer race for taper roller bearing** and **Inserting outer race for large taper roller bearing in transmission housing and pressing home**.
- Insert completely assembled pinion shaft in transmission housing again.
- Install bearing plate with dowel sleeves and tighten to 25 Nm.
- Rotate drive pinion and hollow shaft 8 turns in both directions prior to each measurement to settle taper roller bearing.

Determining measurement "e"

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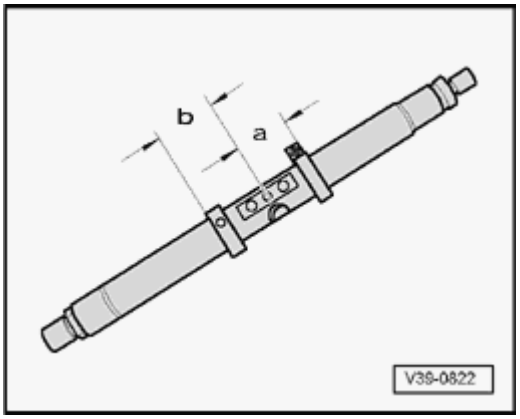


Fig. 395: Setting Adjusting Rings Of Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set universal mandrel VW 385/1 setting ring to dimension a = 65 mm.
- Adjust moveable setting ring to measure b = 55 mm.

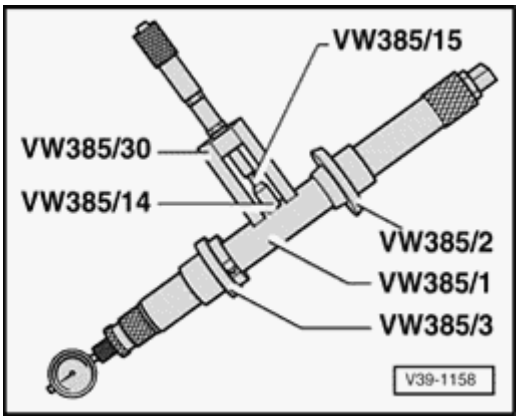


Fig. 396: Assemble Measuring Bar According
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Arrange universal mandrel as illustrated. Dial gauge extension VW 385/15 = 9.3 mm. Set master gauge VW 385/30 to Ro = 59.65 mm and install onto mandrel.
- Set dial gauge (3 mm measuring range) to zero with 2 mm preload.
- Place end measuring plate VW 385/17 onto drive pinion head.

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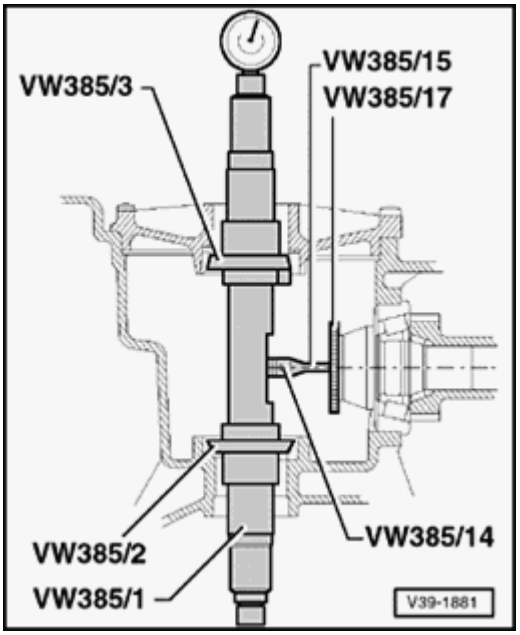


Fig. 397: Insert Measuring Mandrel Into Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove master gauge and insert measuring mandrel in the housing. Centering disc VW385/3 faces toward cover for final drive.
- Install final drive cover and tighten 4 bolts to 25 Nm.
- Using sliding setting ring to pull 2nd centering disc VW 385/2 outward until mandrel can still just be turned by hand.

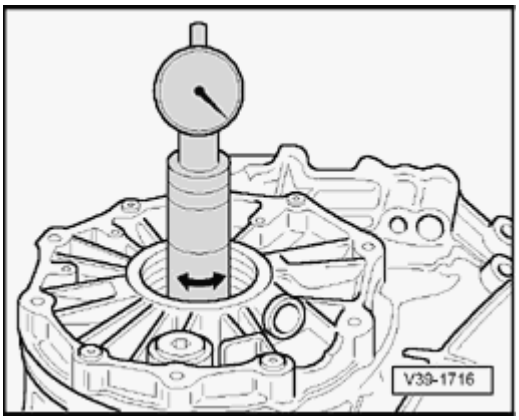


Fig. 398: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure dimension "e".

Turn mandrel until the dial gauge extension touches the final measuring plate on pinion shaft head, then measure maximum deflection (return point). The measured value is dimension "e".

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Example:

0.16 mm (red scale)

- 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" = 0.16 mm (in red scale on dial)

Determining thickness of shim S3

S3 = S3* + r + e

("e" in black scale)

S3 = S3* + r + e

("e" in red scale)

NOTE:

- **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.**
- **If dial gauge reading is in red scale, subtract dimension "e".**
- **If dial gauge reading is in black scale, add dimension "e".**

Example:

Inserted shim S3*	1.05 mm
Dimension "r" indicated on ring gear	+0.38 mm
Determined value "e" (red scale)	-0.16 mm
Shim thickness S3	= 1.27 mm

Available shims for S3

Shim thickness (mm)		
0.45	0.60	0.75
0.50	0.65	0.80
0.55	0.70	0.85

- Different tolerances make it possible to obtain exact shim thickness required.

Determining thickness of shim S4

S4 = Stotal - S3

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Example:

Total shim thickness "Stotal"	2.05 mm
Thickness of shim S3	-1.27 mm
Thickness of shim S4	= 0.78 mm

Available shims for S4

Shim thickness (mm)		
0.45	0.65	0.85
0.50	0.70	1.25
0.55	0.75	
0.60	0.80	

- Different tolerances make it possible to obtain exact shim thickness required.

Carry out check measurement - checking dimension "r"

- Install pinion shaft with measured shims S3 and S4 and turn several times in both directions.

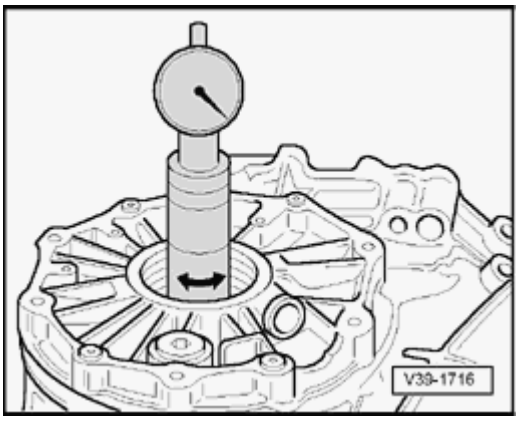


Fig. 399: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Insert universal mandrel and measure dimension "r".

If the correct shims have been selected the D.T.I. must now indicate the mark dimension "r" (reading anti-clockwise on red scale) within a tolerance of ± 0.04 mm.

Measuring frictional torque (check)

NOTE: Taper roller bearings for drive pinion/hollow shaft are low friction bearings. Therefore the frictional torque only has a limited use as a check. Correct

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adjustment is only possible by determining the total shim thickness Stotal.



Fig. 400: Do Not Use Additional Oil
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install new taper roller bearings in delivery condition and do not oil additionally.

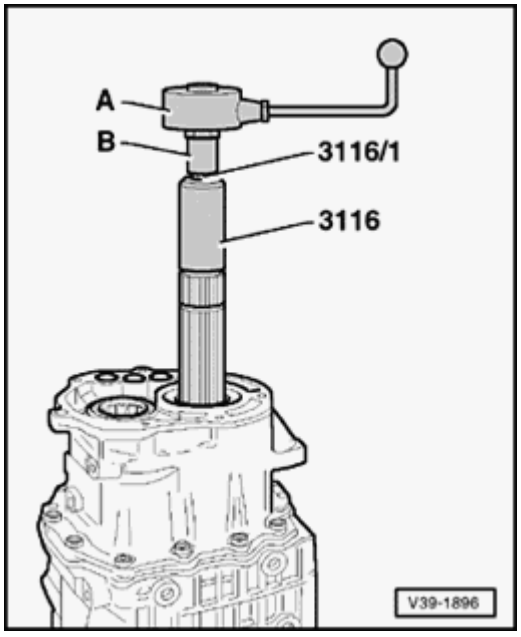


Fig. 401: Measure Friction Torque
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measuring frictional torque

With torque gauge -A-, 0 to 600 Ncm, standard commercially available

New bearings	Used bearings 1)
80 to 150 Ncm	30 to 60 Ncm

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1) with at least 50 km service

Ring gear, adjusting

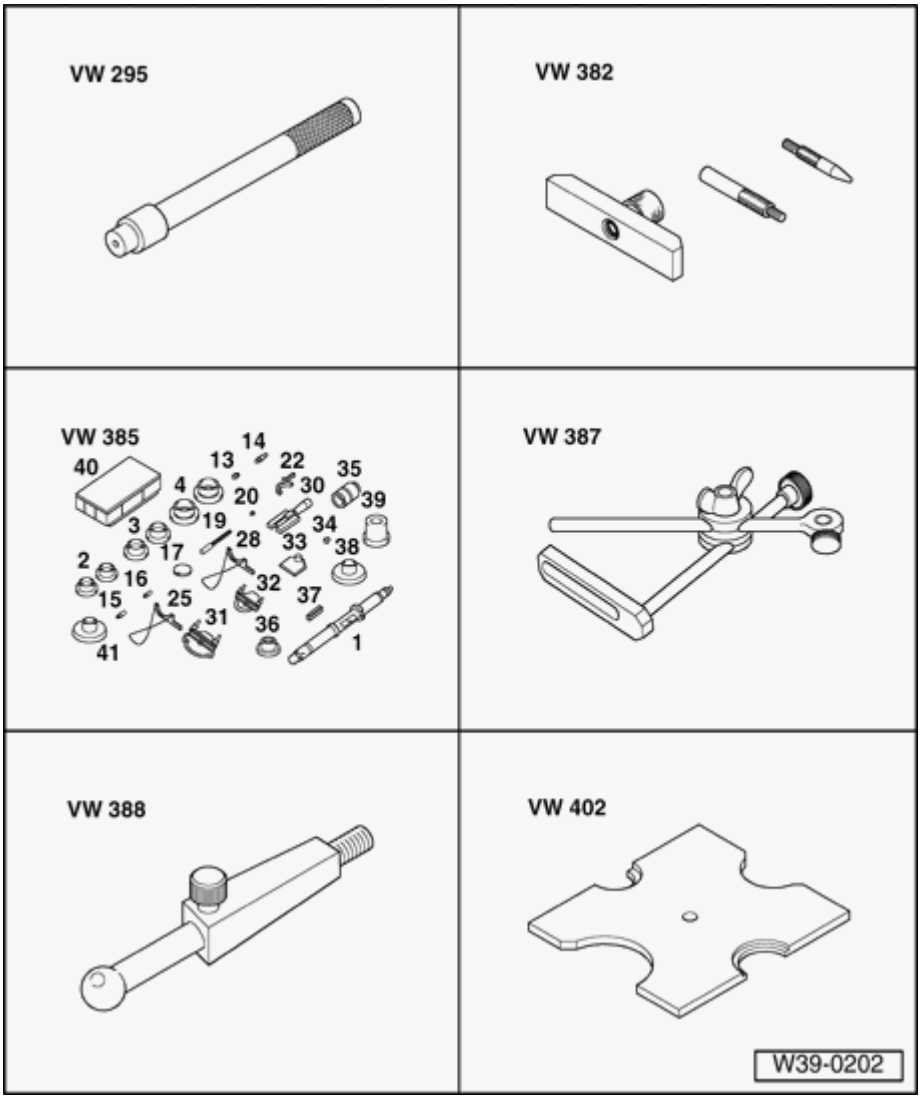


Fig. 402: Identifying Special Tools - Ring Gear, Adjusting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

(Adjusting differential)

Special tools and equipment

- VW 295 Drift
- VW 382 Special socket and measuring tools
- VW 385 Universal measuring tool
- VW 387 Universal dial gauge holder

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- VW 388 Test lever
- VW 402 Thrust plate

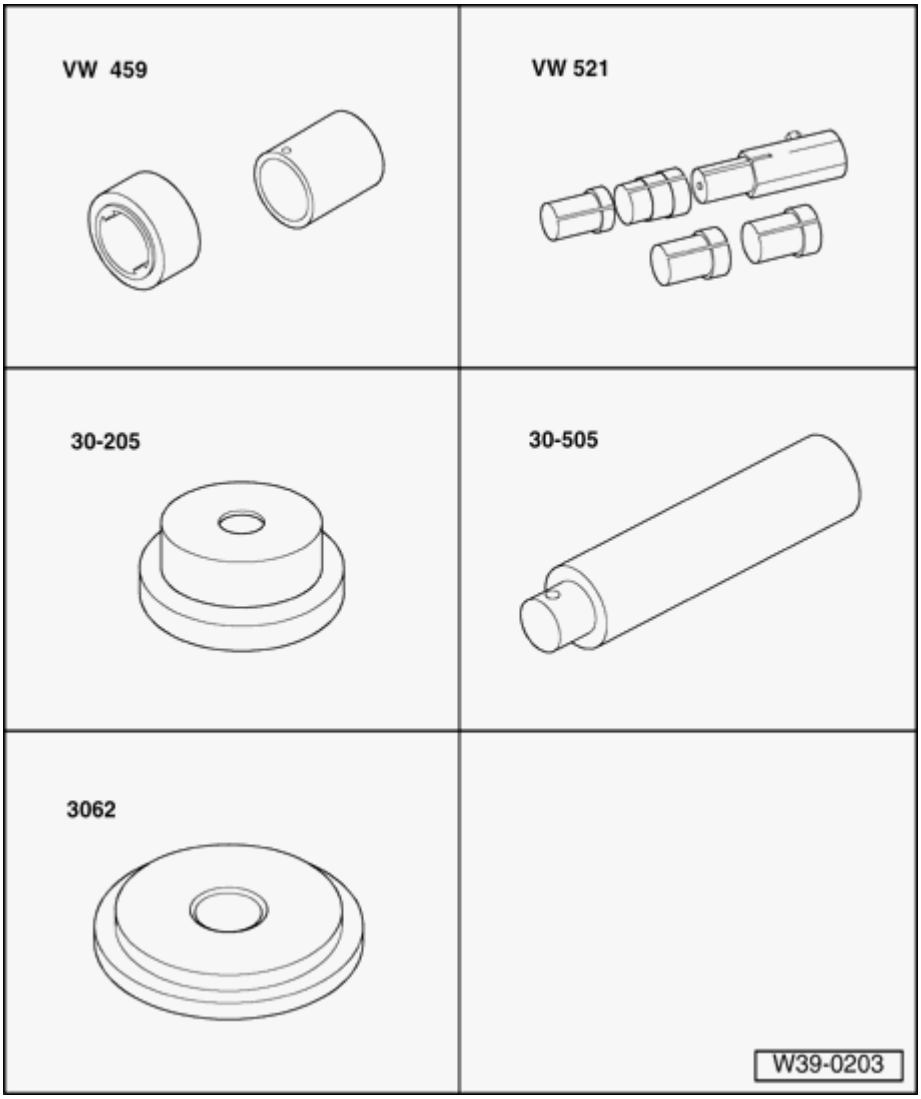


Fig. 403: Identifying Special Tools - Ring Gear, Adjusting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 459 Installation and removal tool
- VW 521 Adjustment tool for ring gear
- 30-205 Thrust plate
- 30-505 Fitting mandrel
- 3062 Thrust disc
- Torque gauge 0 to 600 Ncm
- Dial gauge

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- Dial gauge extension

It is necessary to readjust the ring gear when:

Transmission housing, cover for final drive, taper roller bearing outer race for differential, final drive housing or final drive set are replaced.

Adjustment overview. Refer to **Adjustment overview**

Determine total shim thickness "Stotal" (S1 plus S2)

(Setting preload of taper roller bearing for differential)

- Drive pinion is removed.

  - Pull out flanged shaft seal with VW 681.
  - Remove outer races of differential taper roller bearings and remove shims. Refer to **Differential, disassembling and assembling**.

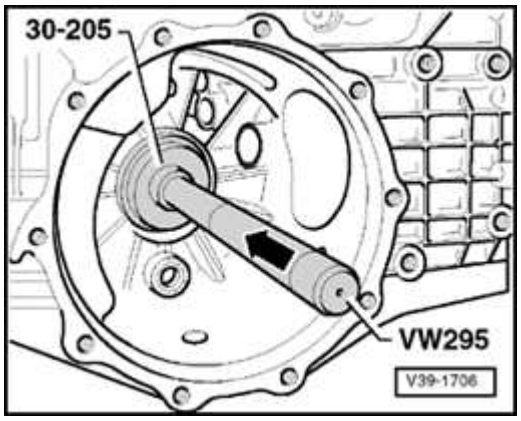


Fig. 404: Driving Small Taper Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

  - Drive outer race for taper 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 inserted provisionally. It is referred to as S2* in the following. After determining the backlash, S2* is replaced by the final shim S2.

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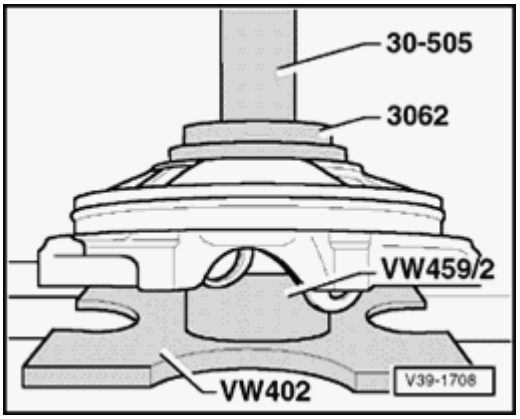


Fig. 405: Driving Large Taper Roller Bearing Outer Race Into Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press taper roller bearing outer race without shim into cover for differential.
- Insert differential into housing without speedometer trigger wheel.

The side of the ring gear is positioned on the right side (cover side).

- Install cover and tighten bolts to 25 Nm.
- Turn transmission so that cover for differential faces up.
- Turn differential 8 turns in both directions so that the taper roller bearings settle.
- Place measuring plate VW 385/17 onto differential.

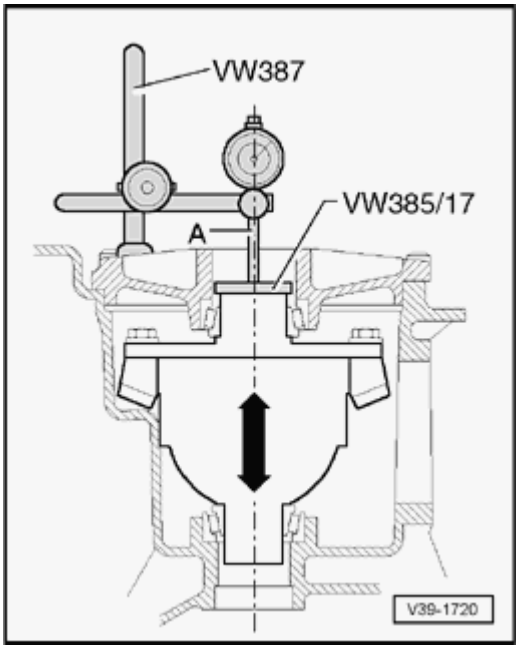


Fig. 406: Installing Magnetic Plate 50Mm Dia. VW 385/17 And Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Install measuring tools.
- Position dial gauge extension in middle of measuring plate VW 385/17.
- Set dial gauge (3 mm measuring range) to zero with 2 mm preload.

A - Dial gauge extension 30 mm

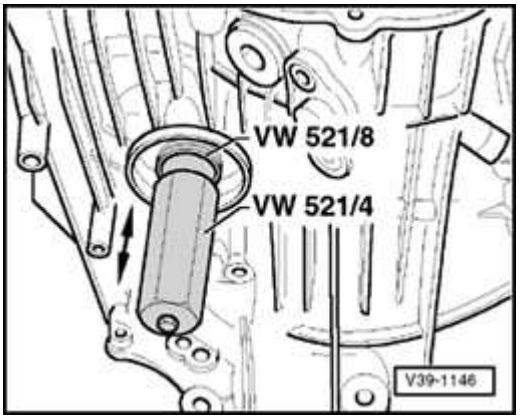


Fig. 407: Move Differential With Ring Gear Adjuster VW 521 Up And Down
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Move differential up and down with special tool VW 521 (direction of arrow).
- Read off play from dial gauge

Example:

0.62 mm

"Stotal" = S2* + reading obtained + pre load

Example:

Inserted shim(s) S2*	1.20 mm
Reading obtained (Example)	+0.62 mm
Pre-load (constant value)	+0.25 mm
Stotal	= 2.07 mm

Determining thickness of shim S1*

NOTE:

- **After determining the backlash, provisional shim S1* is replaced by the final shim S1.**
- **The total shim thickness "Stotal" remains the same.**

S1* = Stotal - S2*

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Example:

Total shim thickness "Stotal"	2.07 mm
Inserted shim(s) S2*	-1.20 mm
Thickness of shim S1*	= 0.87 mm

Adjusting backlash

Drive pinion inserted with S3 and S4

- Differential with ring gear: S1* is installed in the cover side, S2* in the transmission housing.
- Install final drive cover and tighten bolts to 25 Nm.
- Turn differential several times in both directions so that the taper roller bearings settle.

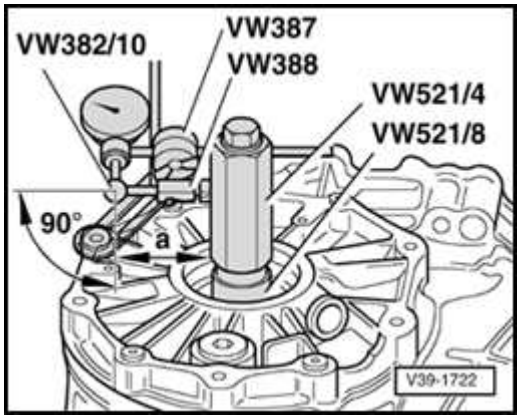


Fig. 408: Installing Measuring Tools
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install measuring tools.
- Use dial gauge extension VW 382/10 (6 mm flat).

Set measuring lever VW 388 to dimension "a" = 79 mm.

- Turn ring gear to stop. Set dial gauge to zero, turn back ring gear and read off backlash. Note value.
- After turning ring gear through a further 90 ° , repeat measuring process a further 3 times. Add up the four measured values and calculate average backlash

Calculating average backlash

Example:

	1st measurement	0.49 mm
+	2nd measurement	0.48 mm
+	3rd measurement	0.50 mm

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+	4th measurement	0.49 mm
Total		1.96 mm

Center backlash = 1.96 mm: 4 = 0.49 mm

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

Determining shim thickness S2

(opposite ring gear)

S2*	=	Inserted shim(s)
	-	Average backlash
	+	Lift (constant)

Lift = 0.15 mm

Example:

S2*= Inserted shim(s)		1.20 mm
-	Average backlash	0.49 mm
		= 0.71 mm
+	Lift (constant)	0.15 mm
Thickness of shim S2		= 0.86 mm

Available shims for S2

Shim thickness (mm)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

- Different tolerances make it possible to obtain exact shim thickness required.

Determining adjustment shim thickness S1

(Ring gear side)

S1 = Stotal - S2

Example:

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Total shim thickness "Stotal"	2.07 mm
Thickness of shim S2	-0.86 mm
Thickness of shim S1	= 1.21 mm

Available shims for S1

Shim thickness (mm)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

- Different tolerances make it possible to obtain exact shim thickness required.

Install determined shims, S1 on the ring gear side, S2 opposite ring gear, use 2 shims if necessary.

Performing check measurement

Measuring backlash. Refer to **Adjusting backlash**

- It must be 0.12 to 0.22 mm.

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34 MANUAL TRANSMISSION - CONTROLS, HOUSING

SHIFT MECHANISM, SERVICING

Gear shift lever mechanism, installation position

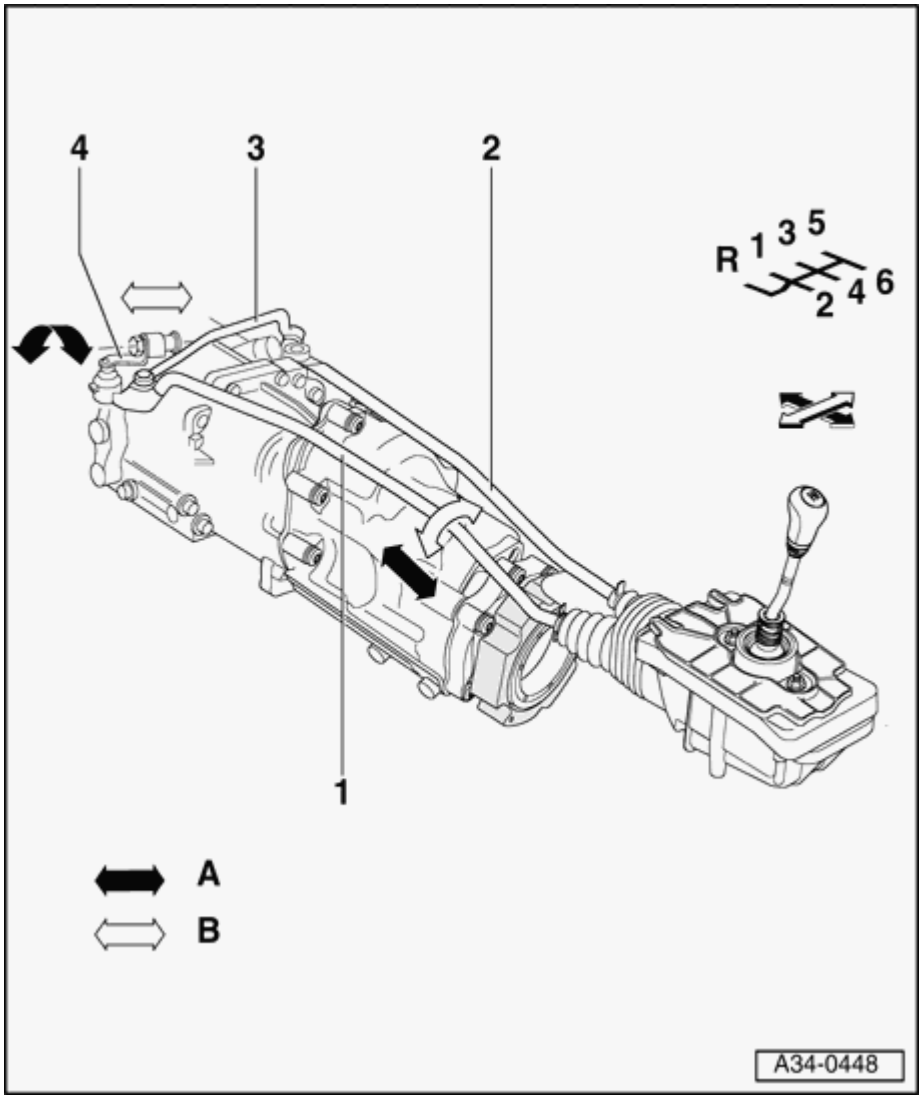


Fig. 72: Gear Shift Lever Mechanism, Installation Position
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector rod

2 - Front push rod

3 - Connecting rod

4 - Gear selector lever

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Arrow -A- Gear selection movement

Arrow -B- Gate selection movement

Component overview

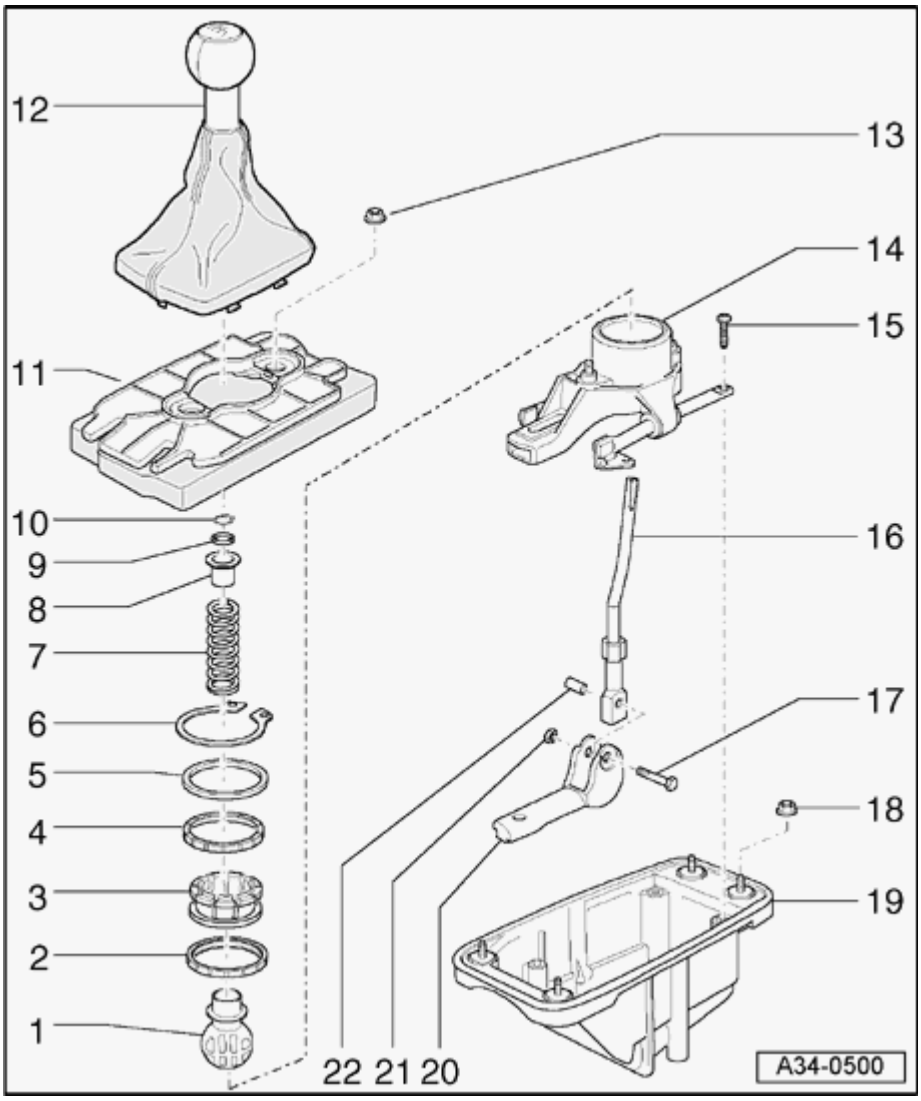


Fig. 73: Shift Mechanism Remove/Install Components - Part 1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Part 1

NOTE: Lubricate bearing areas and slide surfaces with polycarbamide grease, Part No. G 052 142 A2.

1 - Ball

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2 - Rubber ring

3 - Ball guide

4 - Rubber ring

5 - Washer

- Shoulder faces ball guide (Item 3 **Component overview**)

6 - Snap ring

- Remove to remove the ball

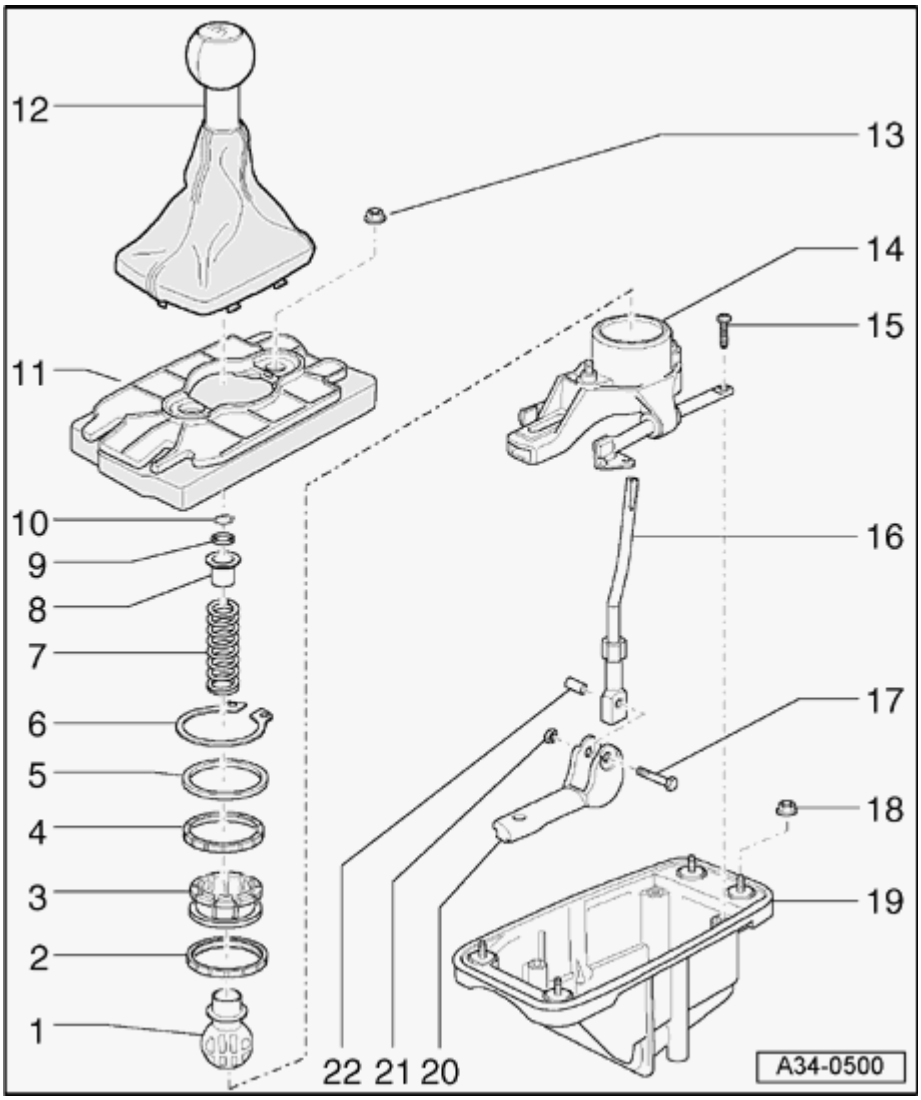


Fig. 74: Shift Mechanism Remove/Install Components - Part 1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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7 - Compression spring

8 - Spacer bushing

9 - Washer

10 - Snap ring

11 - Noise insulation cover

12 - Shift knob

- with cover
- Removing and installing. Refer to **Shift knob and cover, removing and installing**

13 - Nut - 10 Nm

14 - Ball housing

15 - Inner Torx bolt

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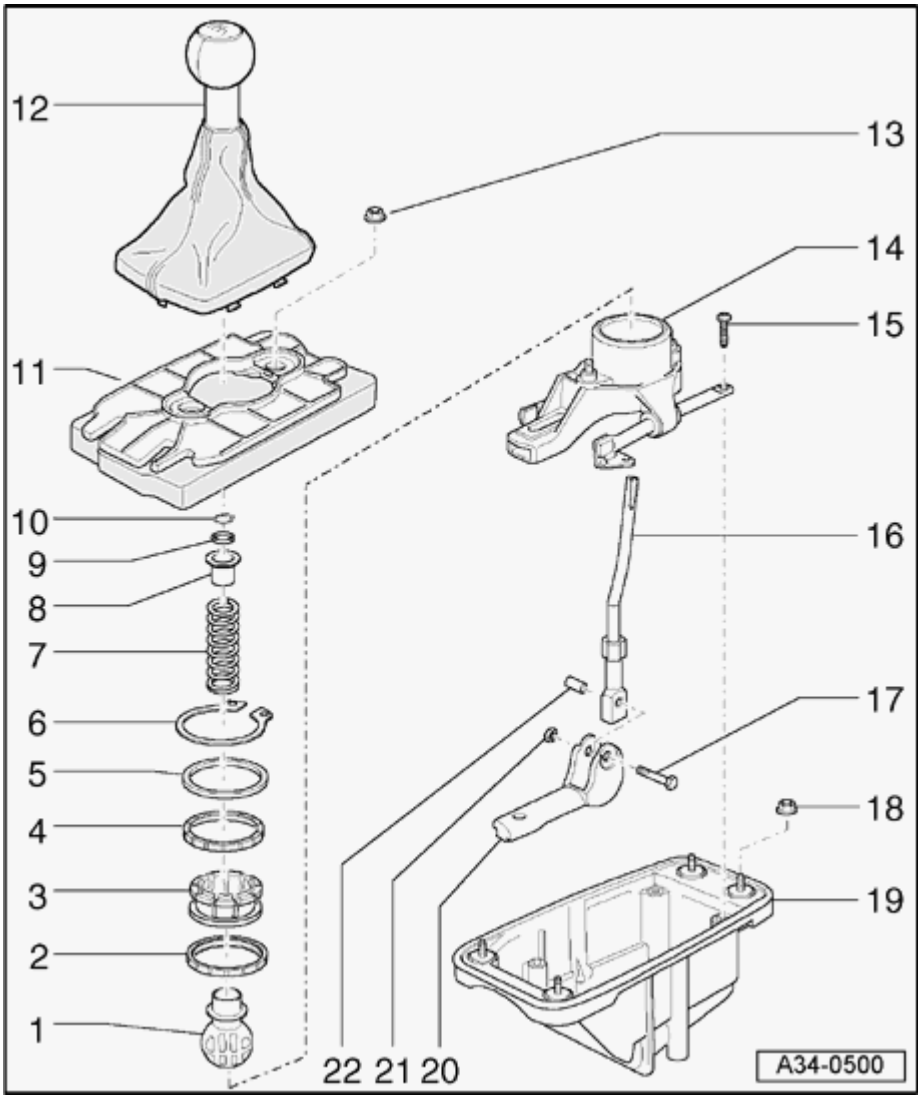


Fig. 75: Shift Mechanism Remove/Install Components - Part 1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

16 - Shift lever

- Angled area faces rear

17 - Bolt

18 - Nut - 10 Nm

19 - Shift mechanism housing

20 - Shift fork

21 - Nut - 10 Nm

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- Self-locking
- Always replace

22 - Bushing

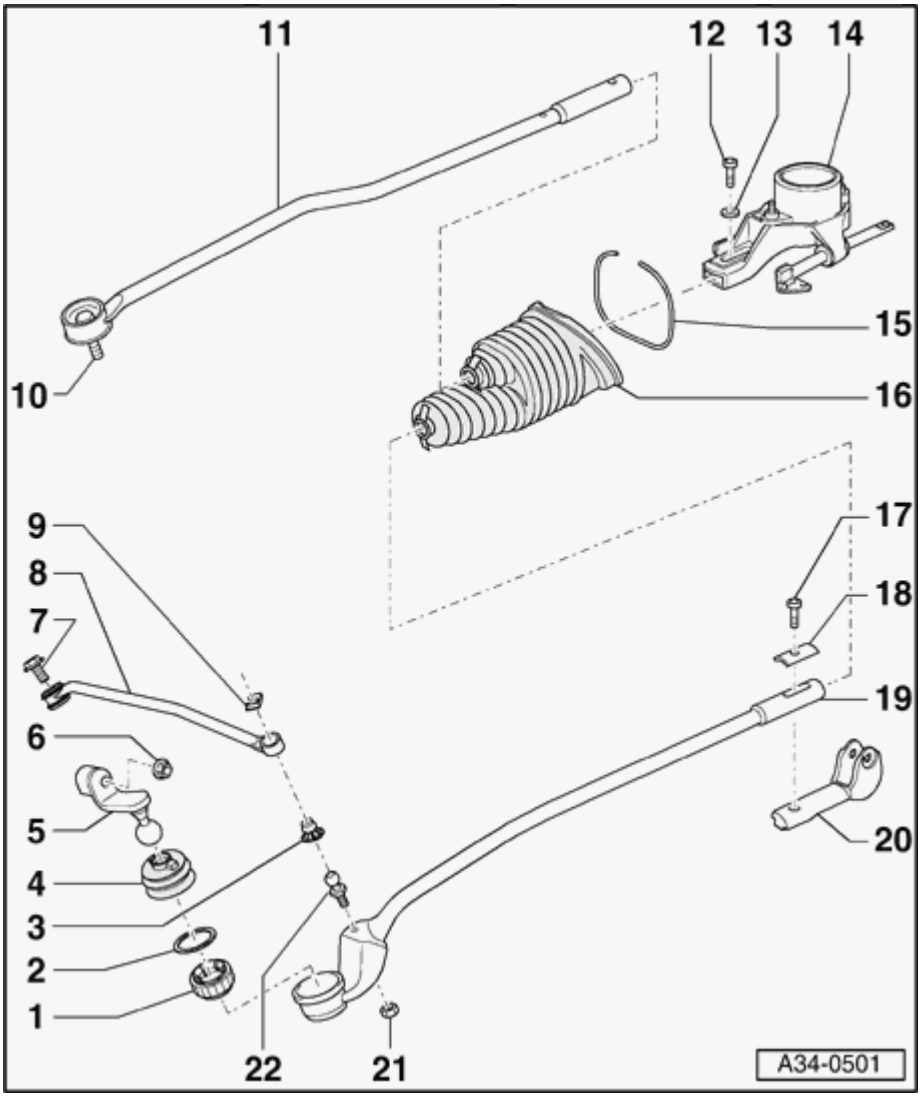


Fig. 76: Shift Mechanism Remove/Install Components - Part 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Part 2

1 - Ball socket

- To remove, bend back peenings on shift rod -Item 19 **Component overview**

2 - Washer

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3 - Ball socket

- To remove, remove locking clips -Item 9- **Component overview**

4 - Boot

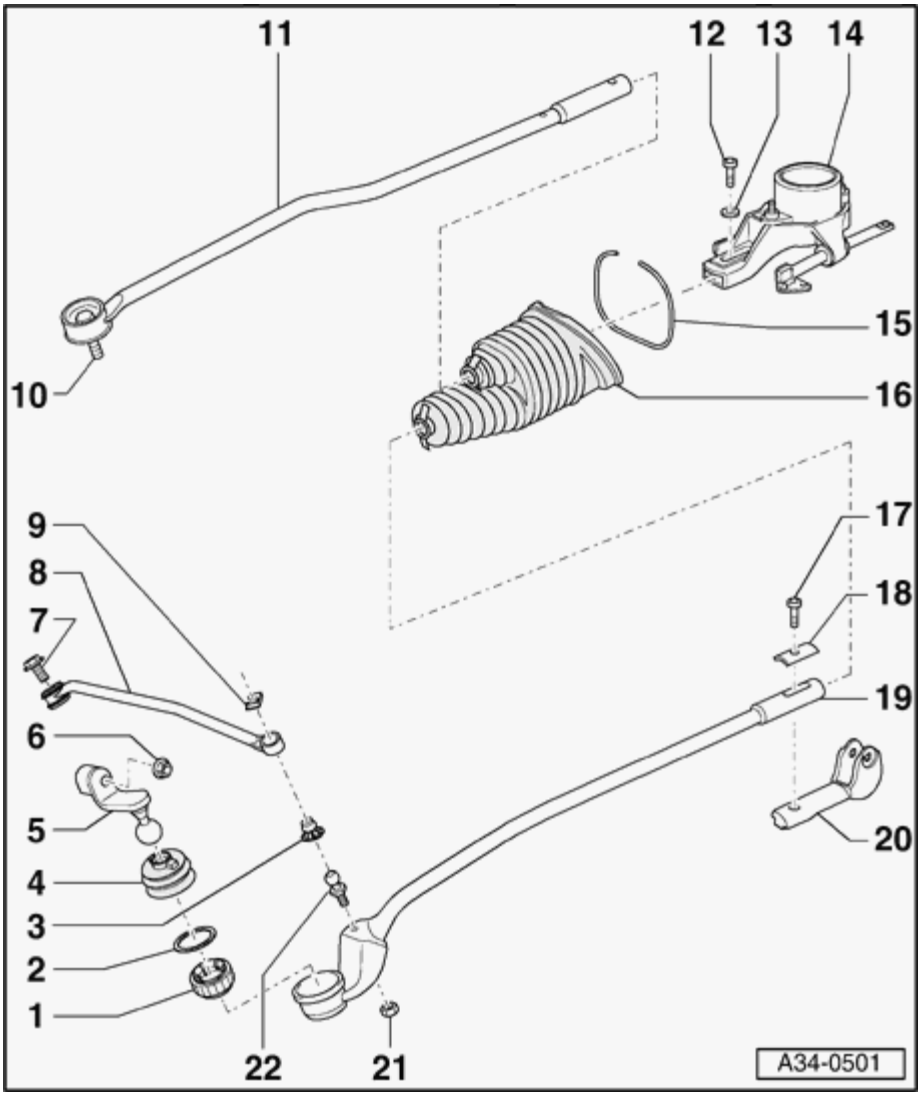
5 - Transmission shift lever

6 - Nut - 23 Nm

7 - Bolt - 23 Nm

8 - Operating rod

- To remove, remove locking clips -Item 9- **Component overview**



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Fig. 77: Shift Mechanism Remove/Install Components - Part 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

9 - Locking clamp

10 - Bolt - 40 Nm

11 - Pivot rod

- with bushing, bolt and washers

12 - Socket head bolt- 23 Nm

13 - Washer

14 - Ball housing

15 - Tensioning ring

16 - Boot

- Carefully pull over shift rods when removing
- When installing, place on markings of shift rod and pivot rod

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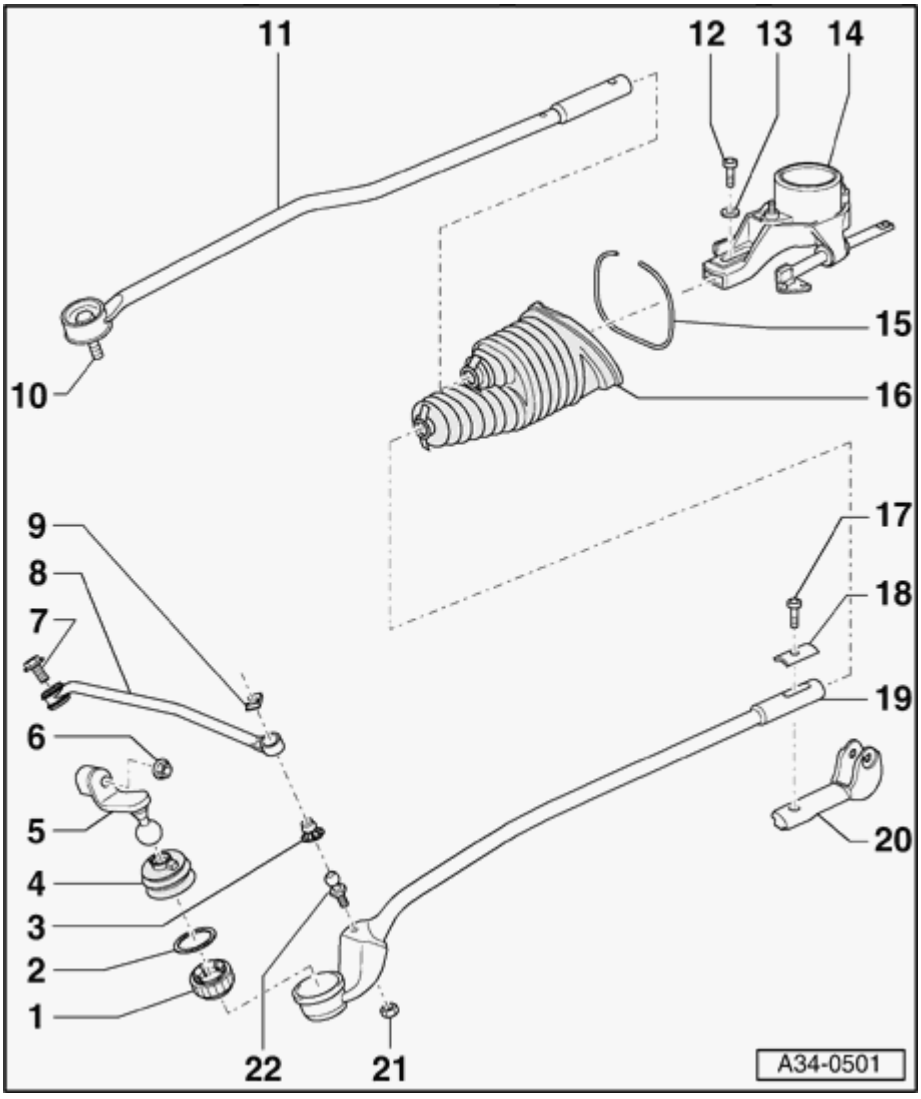


Fig. 78: Shift Mechanism Remove/Install Components - Part 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

17 - Socket head bolt- 23 Nm

18 - Clamping piece

19 - Shift rod

20 - Shift fork

21 - Nut - 10 Nm

22 - Nipple

Shift knob and cover, removing and installing

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Removing

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

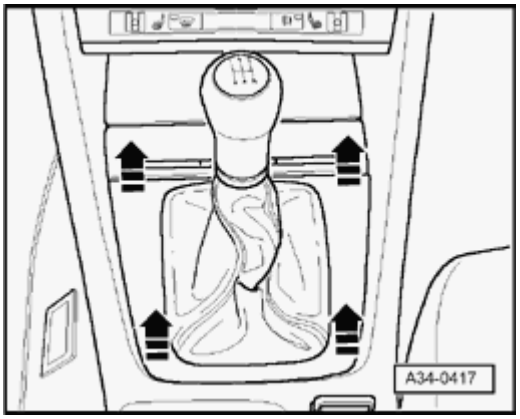


Fig. 79: Lifting Cover For Center Console Upward
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unclip cover for center console and lift this out upward -arrows-.

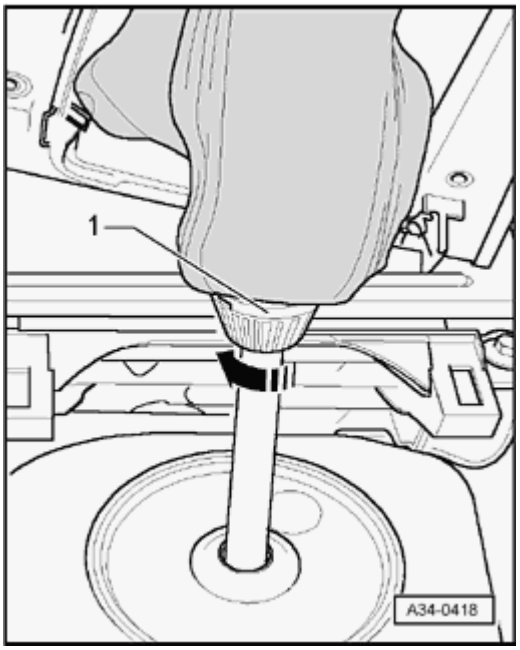


Fig. 80: Releasing Connector Piece
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Detach connecting part -1- in direction of arrow and pull off shift knob together with shift lever cover upward.

Installing

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Installation is the reverse of removal.

Shift mechanism, removing and installing

Special Tools and Equipment

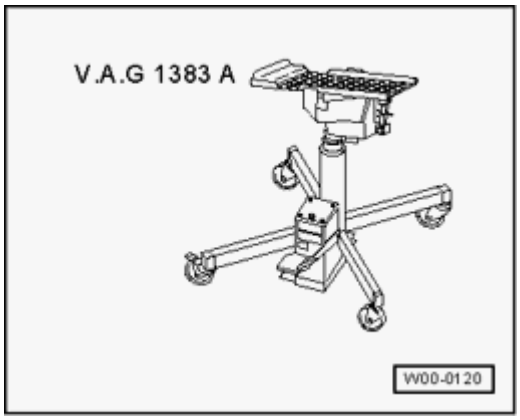


Fig. 81: Identifying Engine/Transmission Jack V.A.G. 1383 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG1383A engine/transmission hoist

Removing

- Remove shift knob with cover. Refer to **Shift knob and cover, removing and installing**.

Vehicles with large radio compartment:

- Remove A/C Control Head.

Refer to **87 AIR CONDITIONING**

Vehicles with small radio compartment:

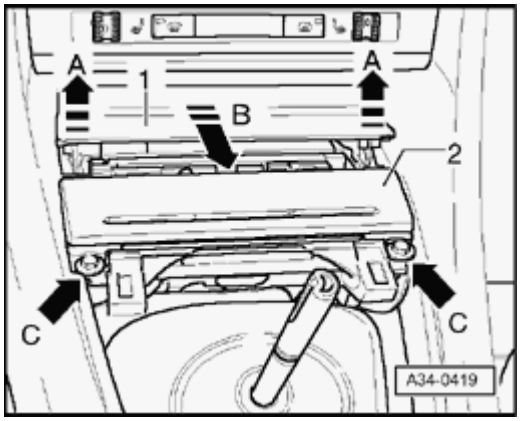


Fig. 82: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift up panel -1- first in direction of arrow -A- and pull it out in the direction of arrow -B-.

All:

- Remove bolts -arrows C- and then remove ashtray -2- from center console.
- Disconnect electrical harness connector for ashtray lighting.
- Remove foam wedges from center console.
- Lift out noise insulation upward.

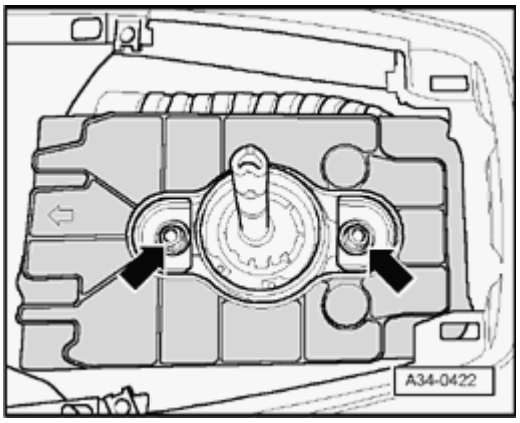


Fig. 83: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove noise insulation cover for shift mechanism housing (arrows).

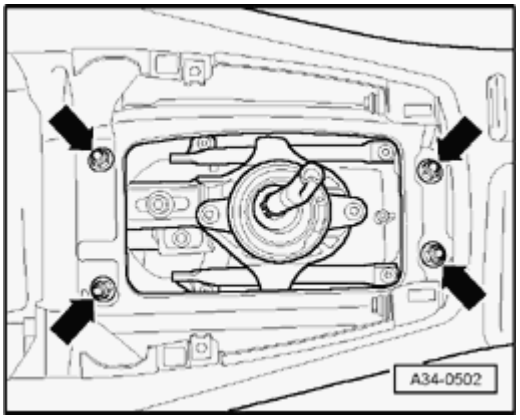


Fig. 84: Shift Lever Housing Nuts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew nuts (arrows).

NOTE: The flex joint in front exhaust pipe must not be bent more than 10 ° , otherwise

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it may be damaged.

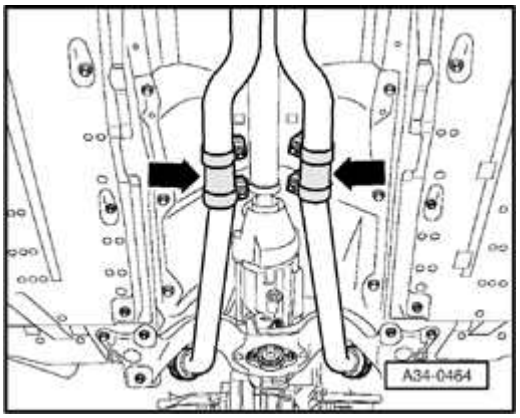


Fig. 85: Exhaust System At Double Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at double clamps -arrows-.
- Detach rear part of exhaust system on retaining loops and remove it.

NOTE: A second technician is required to remove the rear part of exhaust system.

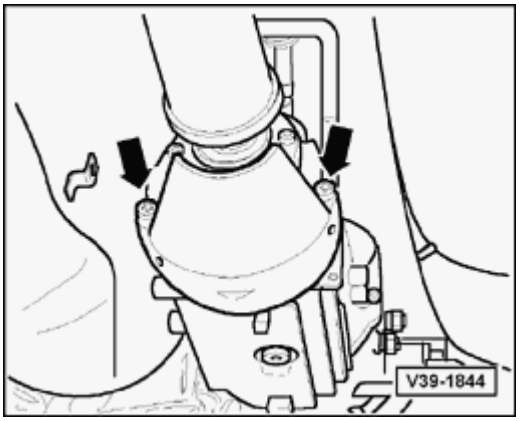


Fig. 86: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield for drive axle -arrows-.

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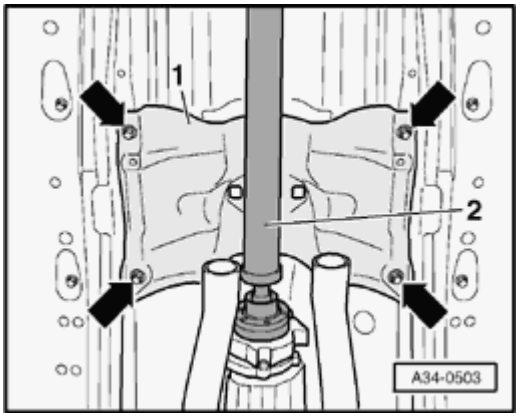


Fig. 87: Heatshield Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts at flange of transmission/drive axle.
- Remove heat shield -1- -arrows-.
- Push driveshaft to rear final drive together. The constant velocity joints can be adjusted axially.
- Remove heat shield.

- Tie up the drive axle -2- on transmission to the side.

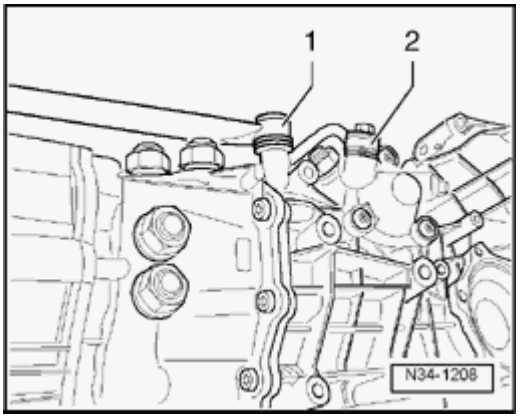


Fig. 88: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connecting rod -2- of shift rod.
- Remove pivot rod -1-, to do this unbolt socket-head bolts.

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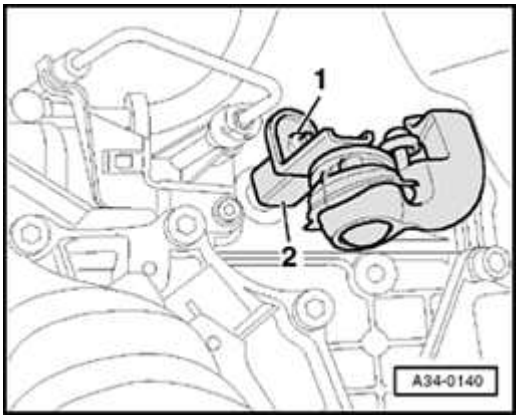


Fig. 89: Identifying Selector Mechanism Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut -1- and pull transmission shift lever -2- from shift rod of transmission.

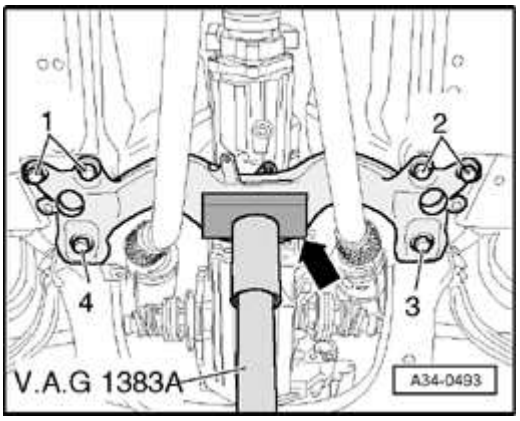


Fig. 90: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove VAG1359/2 universal mount from VAG1383A engine/transmission jack and place a piece of wood -arrow- onto punch instead.
- Support tunnel cross member using VAG1383A engine/transmission lift.
- First remove bolts -1- and -2-, then bolts -3- and -4-.
- Remove shift mechanism toward rear.

Installing

Installation is reverse of removal, noting the following:

NOTE: Always replace gaskets and self-locking nuts.

- Install tunnel cross member.

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Refer to **40 - FRONT SUSPENSION**

- Secure driveshaft to transmission.

Refer to **39 - FINAL DRIVE, DIFFERENTIAL**

- Install and adjust exhaust system free of stress.

Refer to

- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 1.8 LITER 4-CYL. 5V TURBO ENGINE MECHANICAL, ENGINE CODE(S): AMB
- **26 EXHAUST SYSTEM, EMISSION CONTROLS** for 3.0 LITER 6-CYL. 5V ENGINE MECHANICAL, ENGINE CODE(S): AVK, BGN
- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 4.2 LITER V8 5V ENGINE MECHANICAL, ENGINE CODE(S): BHF

- Adjust shift mechanism. Refer to **Shift lever mechanism, adjusting**.

Tightening torques

Component		Nm
Pivot rod to transmission		40
Transmission shift lever to transmission		23
Transmission shift lever to shift rod		23

Shift lever mechanism, adjusting

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

- **Perfect gear linkage operating and transfer elements.**
- **Gear shift lever mechanism moves smoothly.**
- **Transmission, clutch and clutch mechanism must be in proper condition.**
- **Transmission in neutral.**

Work sequence

- Remove shift knob with cover. Refer to **Shift knob and cover, removing and installing**.

Vehicles with large radio compartment:

- Remove A/C control head.

Refer to **87 AIR CONDITIONING**

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Vehicles with small radio compartment:

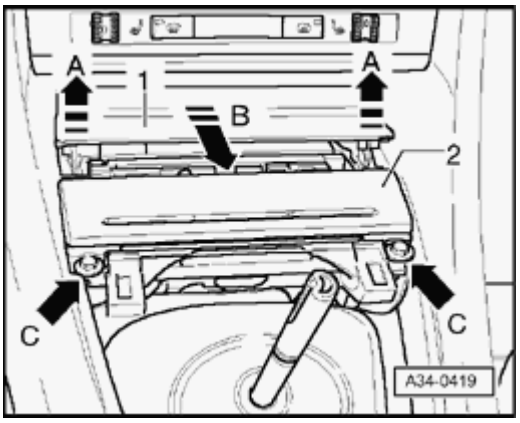


Fig. 91: Lifting Cover And Pulling Out And Removing Bolts And Pulling Ashtray From Center Console
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift panel -1- first in direction of arrow -A- and pull out in direction of arrow -B-.

All:

- Unscrew the bolts -arrows C- and pull out the ashtray -2- from the center console.
- Disconnect electrical harness connector for ashtray lighting.
- Remove foam wedges from center console.
- Lift out the noise insulation upward.

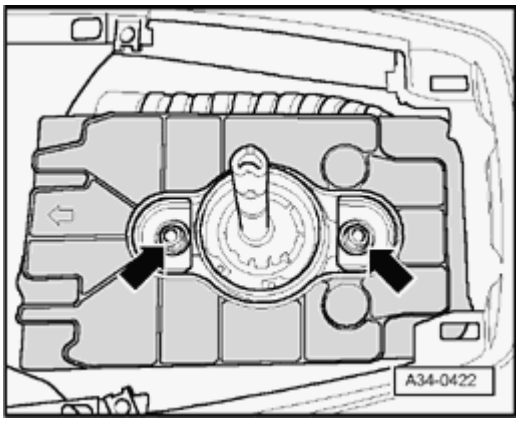


Fig. 92: Locating Noise Insulation For Shift Lever Housing Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew noise insulation cover for shift lever housing -arrows-.

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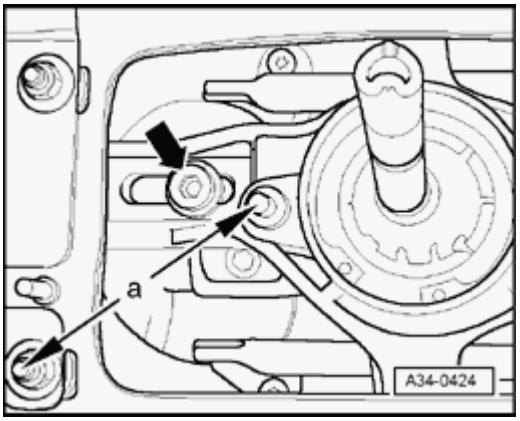


Fig. 93: Shift Mechanism Measurement And Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure distance -a- between the two threaded studs in the shift lever mechanism
- Specified value: Distance a = 85 mm

NOTE: Measure from the centers of the two threaded studs.

- If this is not the case, adjust distance -a- as follows:
- Loosen push rod bolt (arrow).
- Rear push rod (in shift lever mechanism) should move freely in both directions on slide.
- Set distance -a- by moving rear push rod (in shift lever mechanism).
- Tighten push rod bolt -arrow- to 23 Nm.

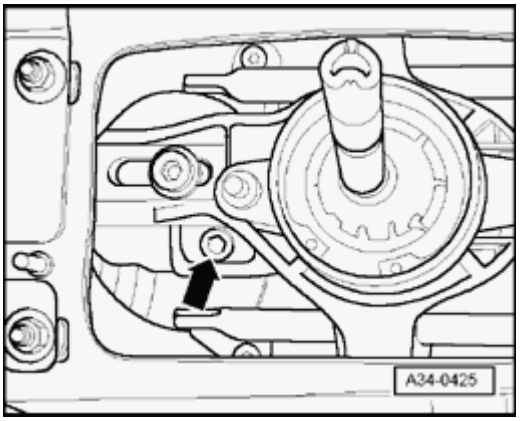


Fig. 94: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen bolt for selector rod -arrow-.
- Connection between selector rod and shift lever mechanism should move freely.

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Align the shift lever as follows:

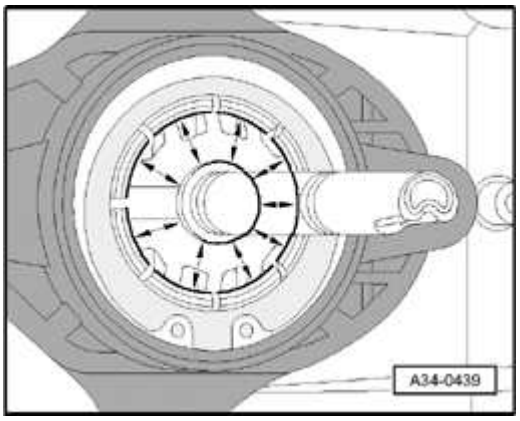


Fig. 95: Centering Bottom Of Shift Lever Centered In Ball Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Center the bottom of the gear lever in the center of the ball housing.

- The distance between the ball housing and the bottom of the gear lever -arrows- must be equal at all points.
- Shift lever in vertical position to direction of travel.

- Shift lever held in this position.

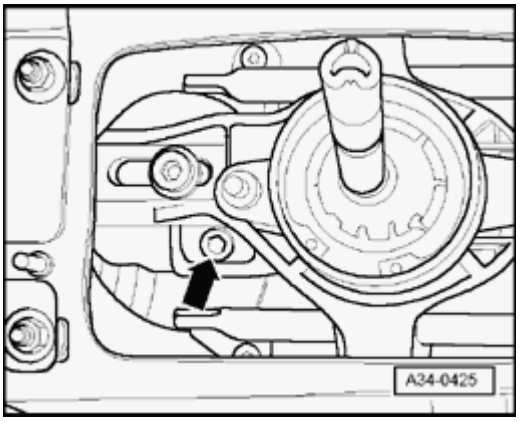


Fig. 96: Selector Rod Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten selector rod bolt -arrow- to 23 Nm.

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

Shift lever alignment, checking

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- 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.
- Check operation of reverse gear lock.

- It should only be possible to engage the R gear after releasing the block.
- The gear lever must return automatically from the R gear gate to the 3rd/4th gear gate.

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

- Install covers and shift lever knob

TRANSMISSION, REMOVING AND INSTALLING

Transmission, removing and installing

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**

  .

Transmission, removing and installing

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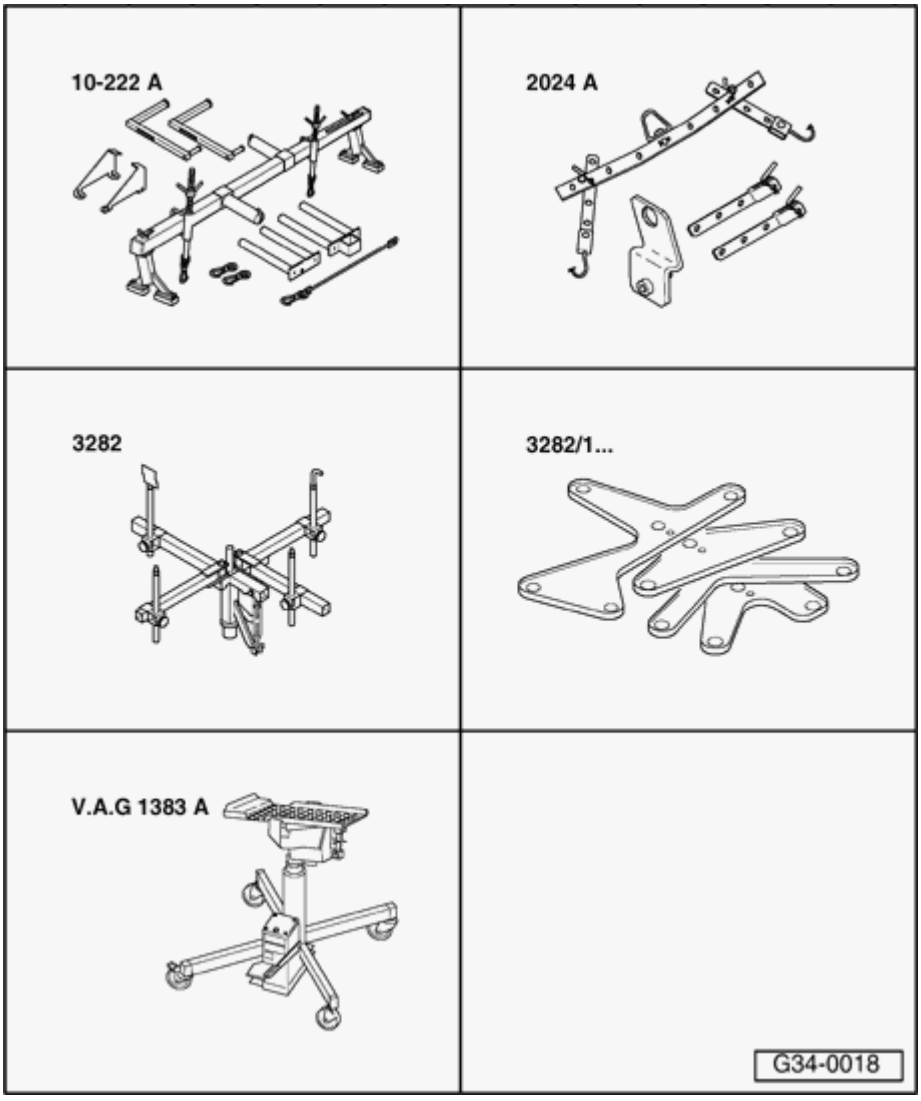


Fig. 97: Identifying Special Tools - Transmission, Removing And Installing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special Tools and Equipment

- 10-222A Engine support bridge
- 2024A Engine Sling
- 3282 transmission support
- 3282/12 adjustment plate
- VAG 1383 A Engine/transmission hoist

Removing

WARNING: Observe safety precautions when disconnecting the battery.

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Refer to

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

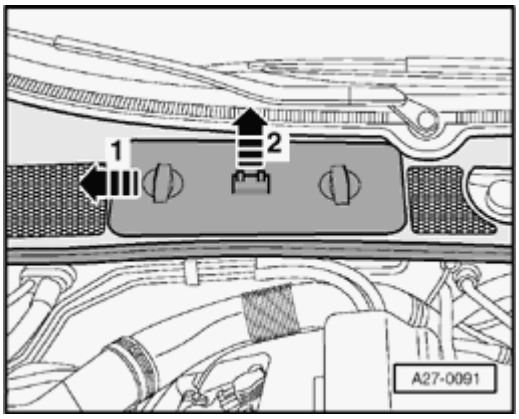


Fig. 98: Removing Battery Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide cover over the battery to the right (arrow 1) and pull it off upward (arrow 2).

See Caution before beginning repairs on the electrical system. Refer to **Transmission, removing and installing**

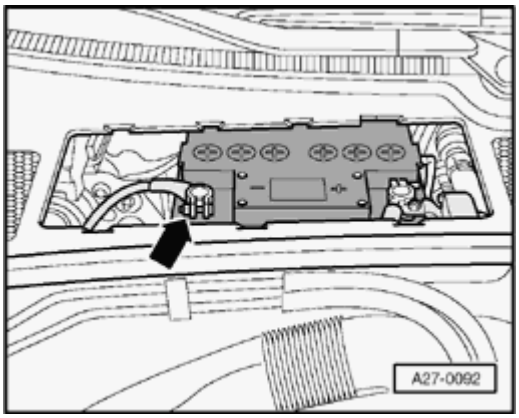


Fig. 99: Locating Battery Ground Strap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect battery Ground (GND) strap (arrow) with the ignition switched off.

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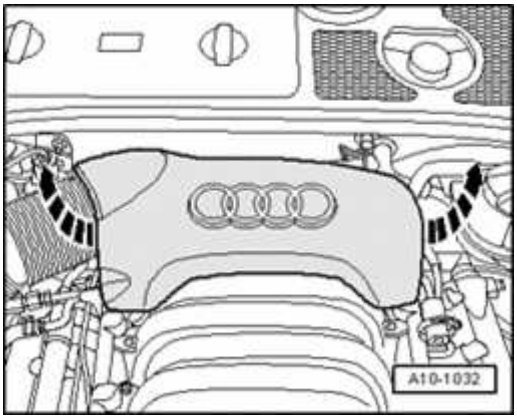


Fig. 100: Removing Rear Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rear engine cover (arrows).

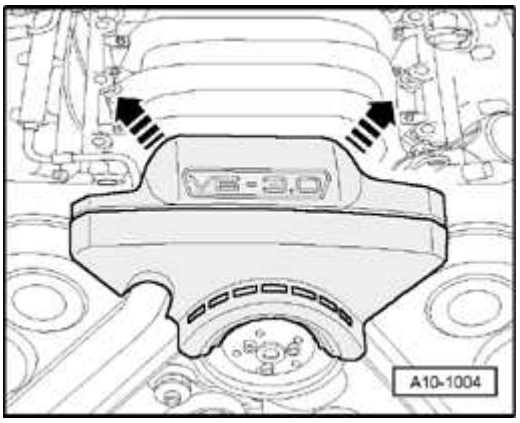


Fig. 101: Removing Front Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove front engine cover (arrows).

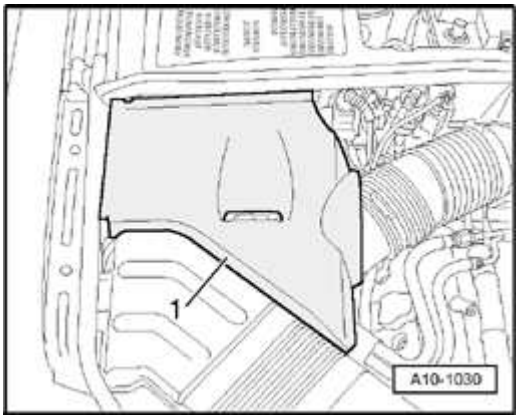


Fig. 102: Removing Cover In Engine Compartment (Right Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Remove cover -1- in engine compartment (right side).

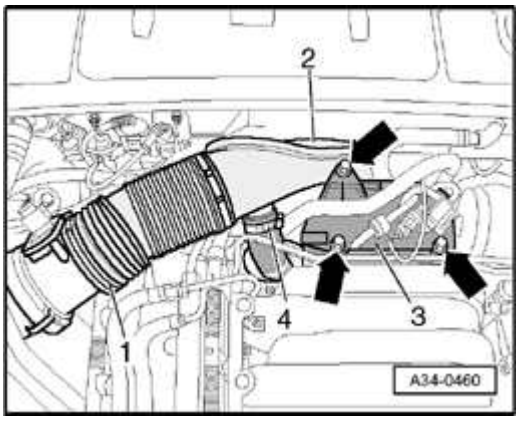


Fig. 103: Identifying Holding Plate, Intake Air Hose, Hose & Air Duct
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts for holding plate -3- for solenoid valves (arrows).
- Disconnect intake air hose -1- at Mass Air Flow (MAF) sensor.
- Remove hose -4- of crankshaft housing ventilation from air duct -2-.

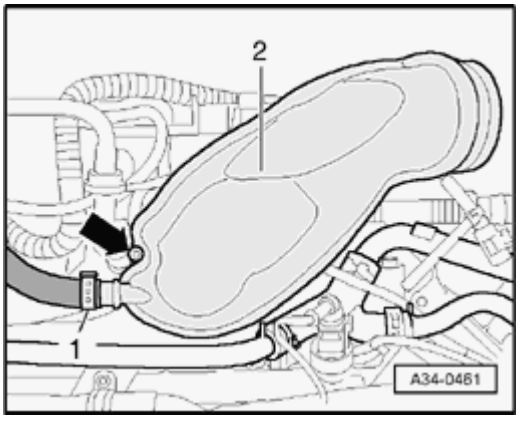


Fig. 104: Removing Bolt And Disconnect Air Duct At Throttle Valve Control Module
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt (arrow) and disconnect air duct -2- at throttle valve control module.
- Disconnect hose -1- from air duct.

NOTE: Illustration depicts air guide with the removed engine from rear.

- Remove engine/transmission connecting bolts accessible from above.

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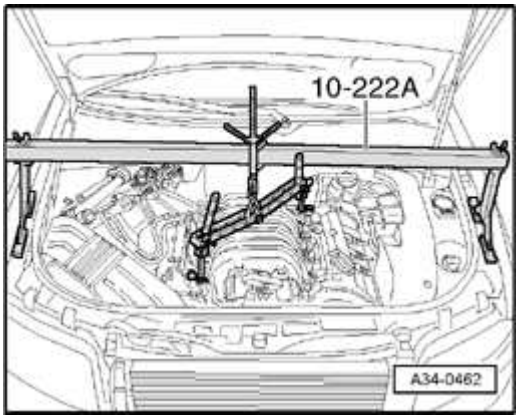


Fig. 105: Positioning 10-222A Engine Support Bridge On Bolted Flanges Of Fenders
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position 10-222A engine support bridge on bolted flanges of fenders.

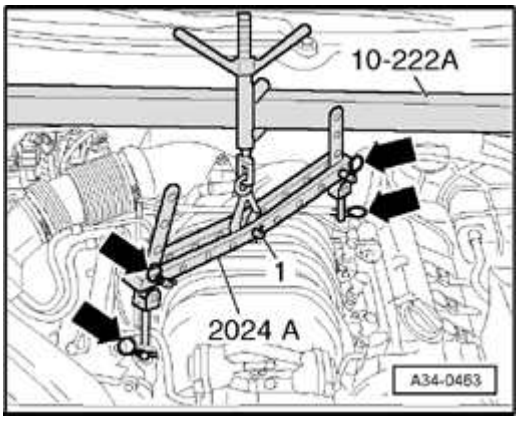


Fig. 106: Removing Eyelet For 2024A Engine Sling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove eyelet for 2024A engine sling.
- Insert bolt -1- in the center bore of 2024A Engine Sling and secure with a cotter pin.
- Attach bolt for 2024A engine sling at 10-222A engine support bridge spindle.
- Attach 2024A Engine Sling to sling clamps at front and rear of engine.

WARNING: Take-up hooks and pins at engine sling must be secured using securing pins (arrows) as shown in illustration.

- Slightly pre-tension engine using engine support bridge spindle.

Vehicles with auxiliary heater:

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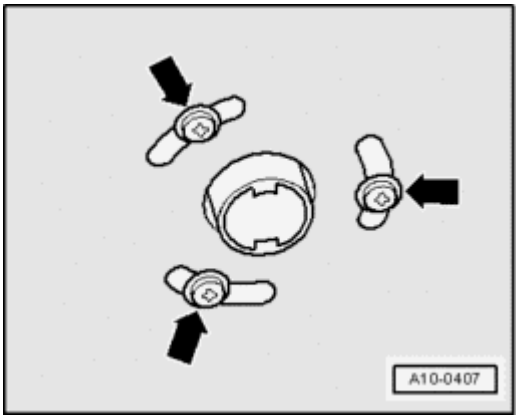


Fig. 107: Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolts (arrows) for exhaust pipe of parking heater/auxiliary heater on noise insulation.

All:

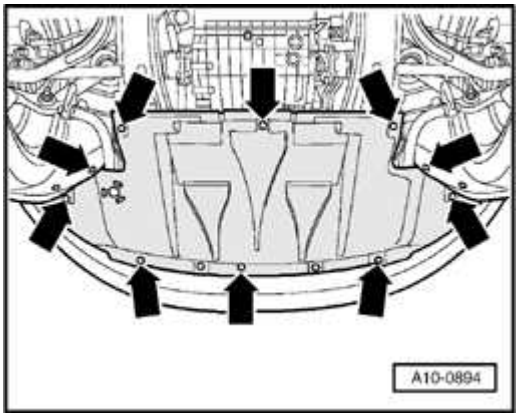
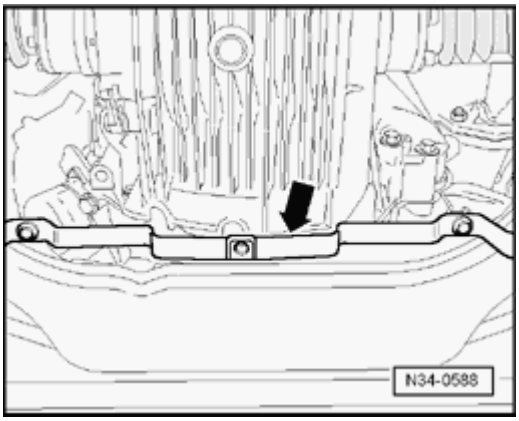


Fig. 108: Removing Sound Insulation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the sound-proofing material (arrows).



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Fig. 109: Removing Noise Insulation Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt bracket for noise insulation panel (arrow).

NOTE: The flex joint in front exhaust pipe must not be bent more than 10 ° , otherwise it may be damaged.

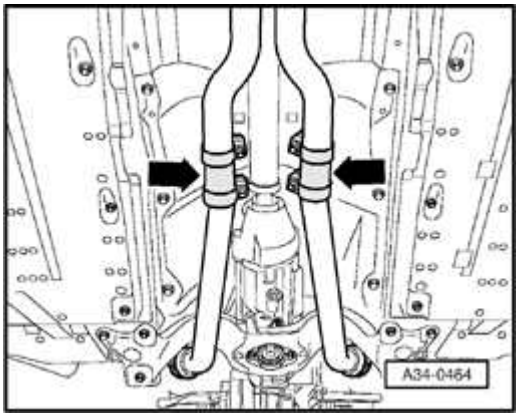


Fig. 110: Exhaust System At Double Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect exhaust system at double clamps -arrows-.
- Detach rear part of exhaust system on retaining loops and remove it.

NOTE: A second technician is required to remove the rear part of exhaust system.

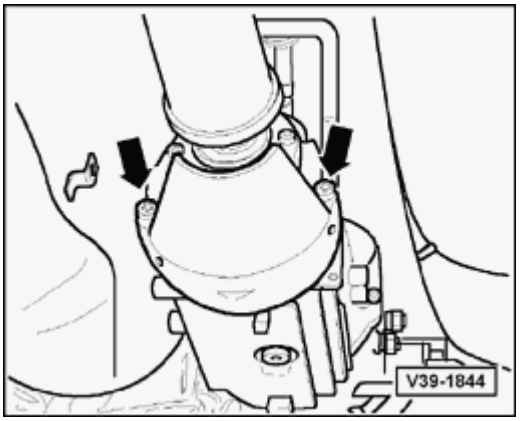


Fig. 111: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove heat shield for drive axle -arrows-.
- Remove bolts at flange of transmission/drive axle.
- Push driveshaft to rear final drive together. The constant velocity joints can be adjusted axially.

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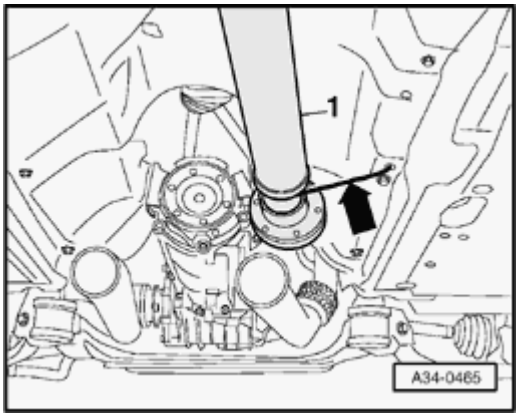


Fig. 112: Driveshaft Secured With Wire To Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure driveshaft -1- with wire (arrow) to heat shield.

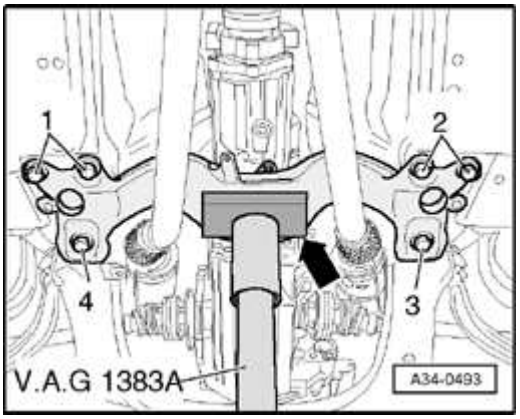


Fig. 113: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove VAG1359/2 universal mount from VAG1383A engine/transmission jack and place a piece of wood -arrow- onto punch instead.
- Support tunnel cross member using VAG1383A engine/transmission lift.

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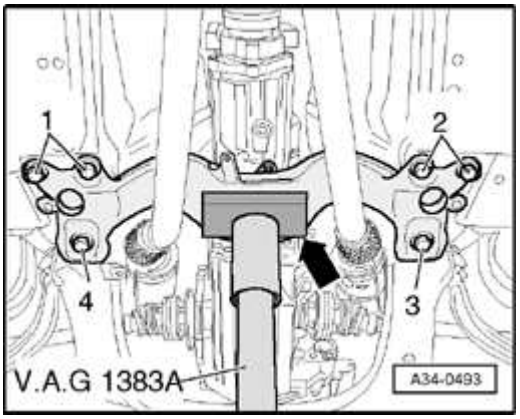


Fig. 114: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- First remove bolts -1- and -2-, then bolts -3- and -4-.
- Release slowly the tunnel cross member using VAG1383A engine/transmission hoist.

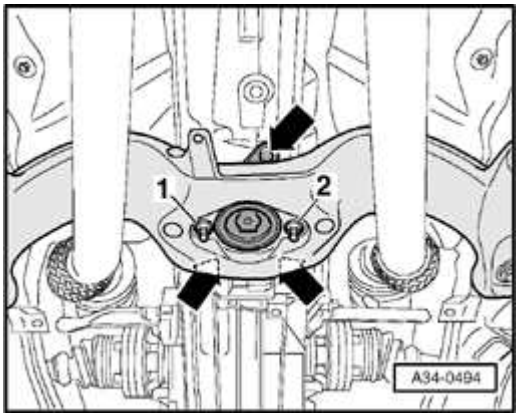


Fig. 115: Tunnel Cross Member Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nuts -1- and -2-.
- Remove bolts (arrows) and remove tunnel cross member downward using transmission mount.

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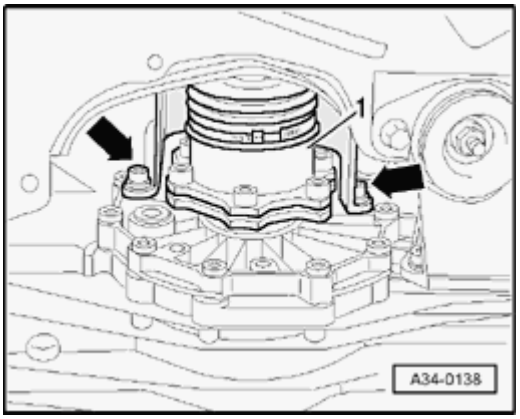


Fig. 116: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove left and right heat shields for drive axles (arrows).
- Remove drive axles from transmission drive flange.

NOTE: Take care not to damage protective coating on drive axles.

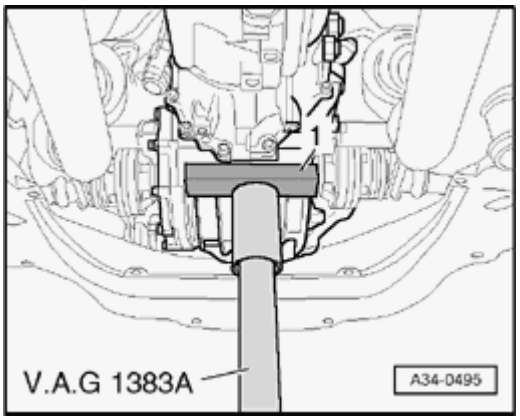


Fig. 117: Transmission Raised Using Punch Of VAG 1383 A So That A Piece Of Wood Can Be Placed In Between
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Raise transmission using punch of VAG 1383 A engine/transmission hoist high enough, so that a piece of wood (arrow) can be placed in between.

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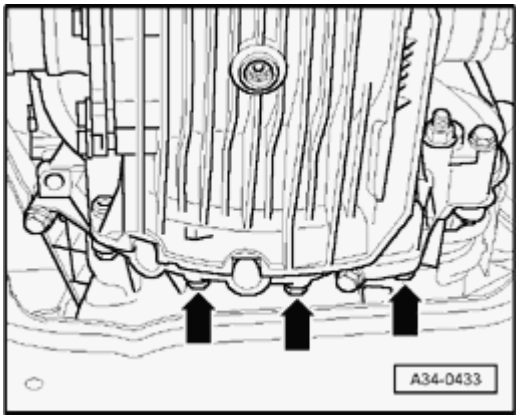


Fig. 118: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the three bottom engine/transmission connecting bolts (arrows).
- Lower transmission again.

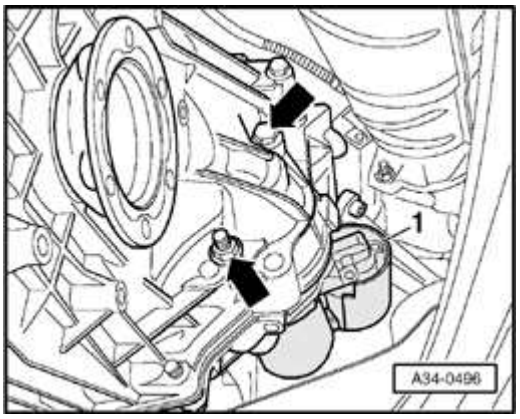
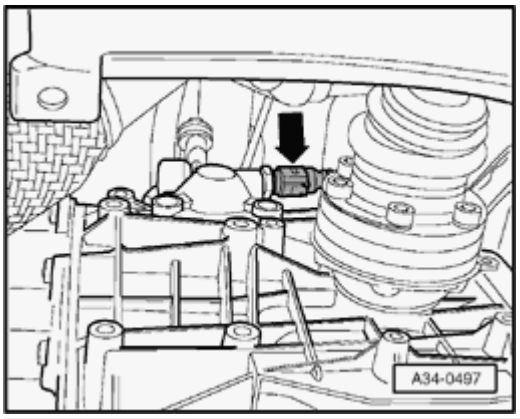


Fig. 119: Starter And Mounting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt starter -1- (arrows) and remove it from transmission bell housing.
- Remove remaining mounting bolts for engine/transmission. One bolt remains tightened by hand.



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Fig. 120: Disconnecting Harness Connector For Back-Up Light Switch At Right Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect harness connector for back-up light switch at right of transmission and set aside electrical wire.

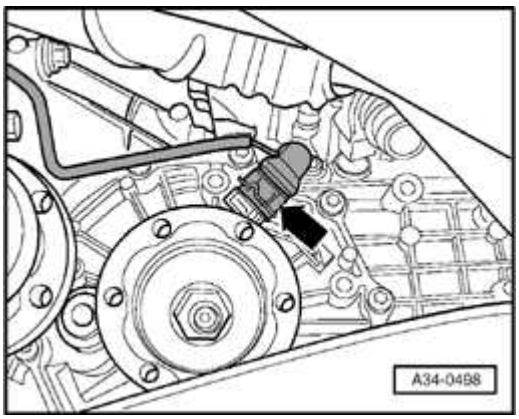


Fig. 121: Disconnecting Harness Connector From Speedometer Vehicle Speed Sensor (VSS) -G22- At Left Of Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect harness connector (arrow) from Speedometer Vehicle Speed Sensor (VSS) -G22- at left of transmission.
- Unbolt heat shield for engine speed (RPM) sensor.

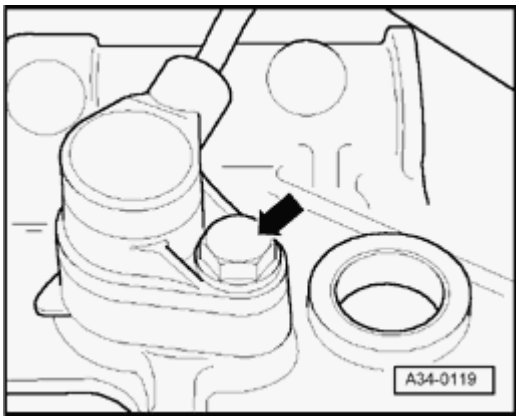


Fig. 122: Location Of Engine Speed (RPM) Sensor G28 On Coupling Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Engine Speed (RPM) sensor -G28- on left of transmission (arrow) and lay to side.

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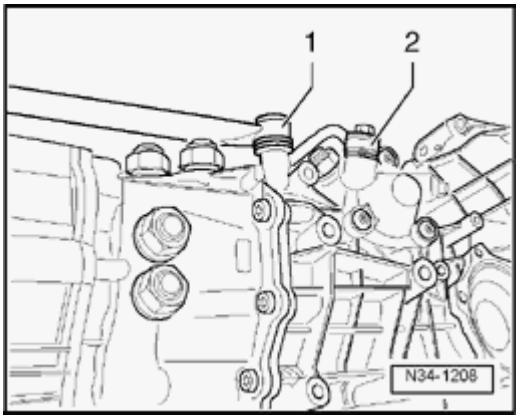


Fig. 123: Identifying Push Rod And Connecting Rod For Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connecting rod -2- of shift rod.
- Remove pivot rod -1-, to do this unbolt socket-head bolts.

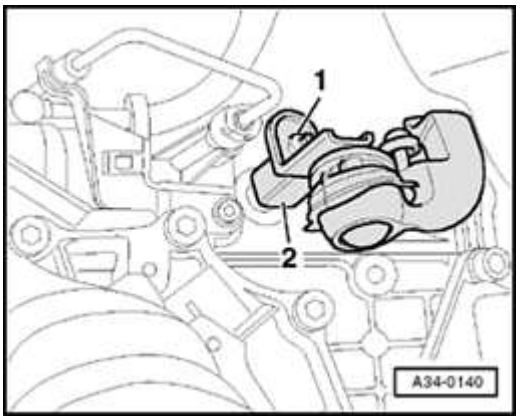


Fig. 124: Identifying Selector Mechanism Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut -1- and pull transmission shift lever -2- from shift rod of transmission.

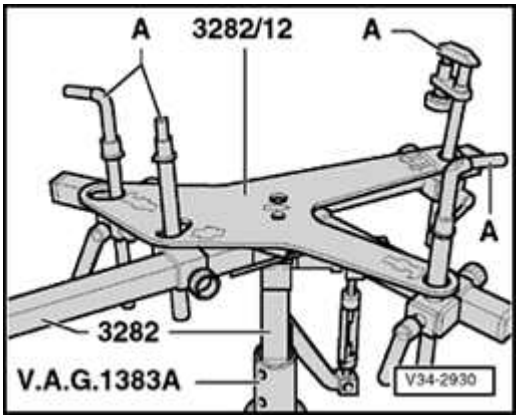


Fig. 125: 3282 Transmission Support, 3282/12 Adjustment Plate And VAG1383A Engine/Transmission

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Hoist
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set up 3282 transmission support for removing manual transmission 01E all wheel drive using 3282/12 adjustment plate and VAG1383A engine/transmission hoist.

A - Attachments

NOTE:

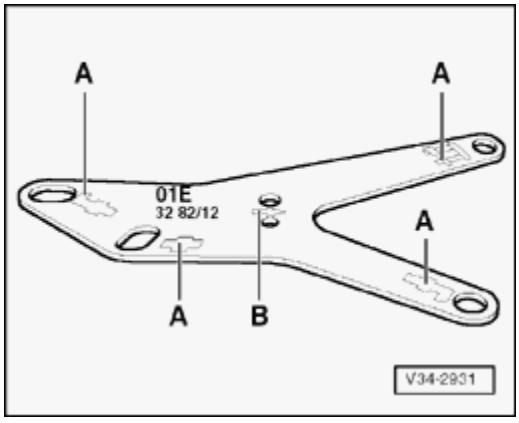


Fig. 126: Identifying Attachments Symbols On Adjustment Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **Attachments -A- are shown in schematic form, arrow -B- points in the direction of travel.**
- **3282/12 adjustment plate only fits in one position.**

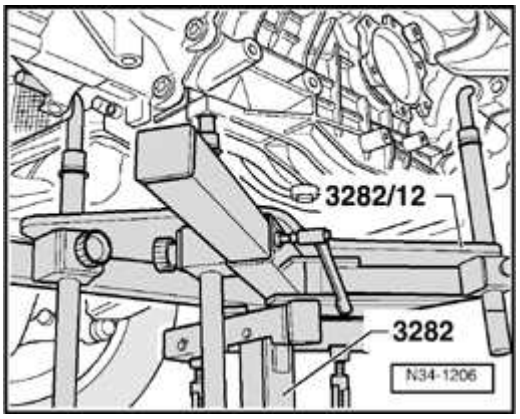


Fig. 127: Place Transmission Jack And Adjustment Plate 3282/12 Under Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Roll VAG 1383 A engine/transmission hoist underneath transmission. Arrow B (Refer to Illustration **Fig. 126**) on adjustment plate 3282/12 points in the direction of travel.

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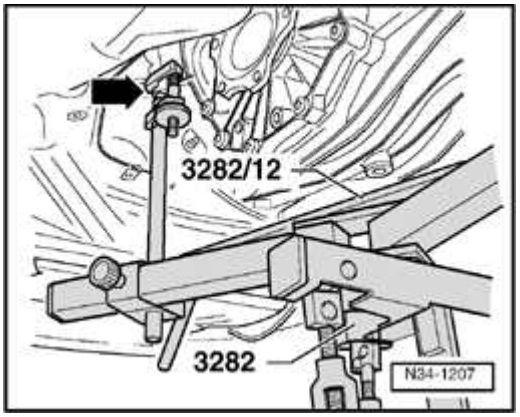


Fig. 128: Align Adjustment Plate 3282/12 Parallel To Transmission And Lock Safety Supports On Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align adjustment plate parallel to transmission and lock safety support (arrow) on transmission.
- Remove last mounting bolts for engine/transmission.
- Press transmission off dowel sleeves and lower carefully using VAG 1383 A engine/transmission hoist just enough for access to slave cylinder.

NOTE: When lowering the transmission, make sure the hydraulic line/hose to clutch slave cylinder is not damaged.

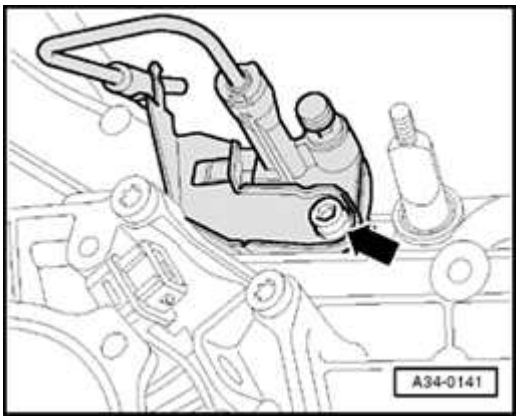


Fig. 129: Removing/Installing Slave Cylinder Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove clutch slave cylinder (arrow) and secure with wire, do not disconnect line.
- Lower transmission completely.

NOTE: Ensure freedom of movement of drive axles when lowering.

Installing

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Installation is reverse of removal, noting the following:

NOTE: Always replace seals, gaskets and self-locking nuts.

- Clean input shaft splines and (in case of used clutch plates) clean hub splines. remove corrosion and apply only a very thin coating of lubricant G 000 100 on splines. Do not grease guide sleeve.
- Check clutch release bearing for wear and replace if necessary.
- Coat contact surface of clutch release lever plunger with a thin layer of copper grease, e.g. Z 381 351 TE.

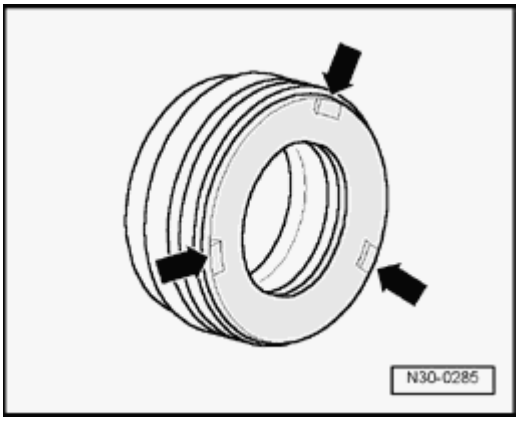


Fig. 130: Servicing Release Bearing With Plastic Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If the plastic ring of the release bearing is loose, adhere it to the bearing ring again using adhesive AMV-195-KD1-01.

- 3 rectangular tabs (arrows) of the plastic ring reach into the cutouts of the bearing ring.
- If grooves with depth of more than 0.5 mm are present, the release bearing must be replaced.

- All threaded bores in which self-locking bolts are threaded must be cleaned of remaining locking fluid using a tap.
- Make sure centering sleeves for engine to transmission are correctly installed in cylinder block. Install or replace if necessary.
- Place intermediate plate onto the dowel sleeves on engine flange.
- Tie electrical wires off to the side before installing, so that they are not pinched between engine and transmission.

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

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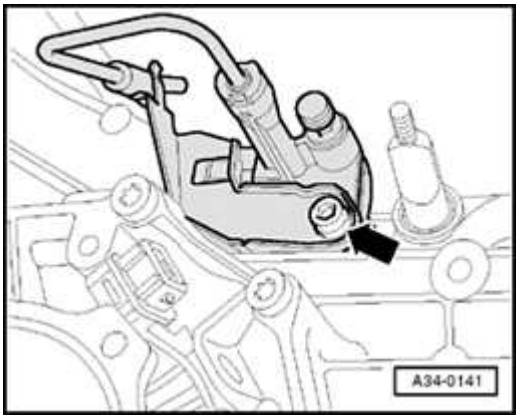


Fig. 131: Removing/Installing Slave Cylinder Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure slave cylinder with a new bolt (arrow).
- Install starter and secure connecting bolts for engine/transmission on left and right side.
- Install connecting rods and pivot rods for shift mechanism.

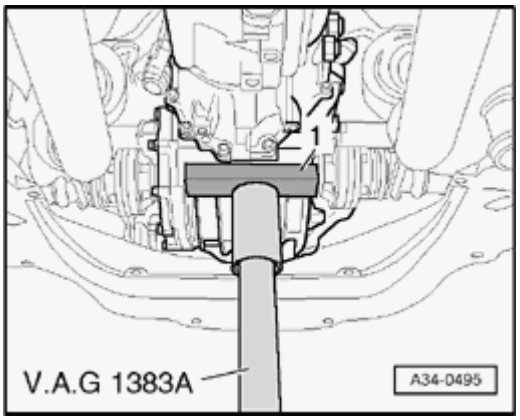


Fig. 132: Transmission Raised Using Punch Of VAG 1383 A So That A Piece Of Wood Can Be Placed In Between
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place a piece of wood (arrow) onto punch of VAG 1383 A engine/transmission hoist and raise transmission slightly.

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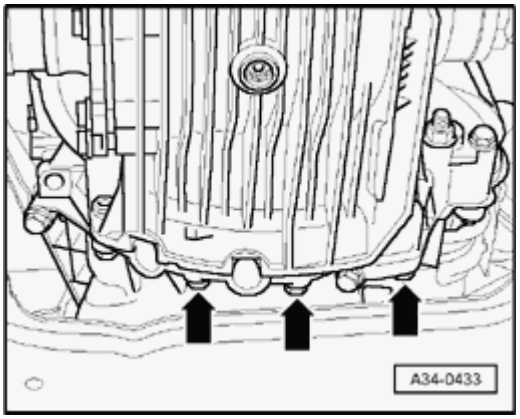


Fig. 133: Three Lower Engine And Transmission Connecting Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten the three bottom engine/transmission connecting bolts (arrows).
- Lower transmission again.
- Guide the tunnel cross member with loosely inserted transmission mount over front exhaust pipes.

NOTE: The flex joint in front exhaust pipe must not be bent more than 10 ° , otherwise it may be damaged.

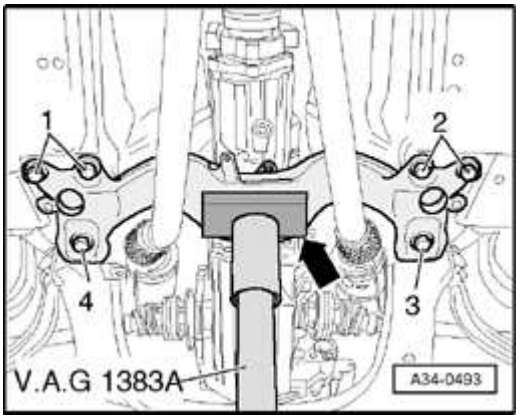


Fig. 134: Supporting Tunnel Cross Member Using VAG1383A Engine/Transmission Lift And A Piece Of Wood
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place a piece of wood (arrow) onto punch of VAG 1383 A engine/transmission hoist and raise tunnel cross member and transmission slightly.
- Next, tighten bolts -1- to -4- hand-tight.
- Release slowly the VAG 1383 A engine/transmission hoist.
- Tighten bolts for tunnel cross member.

Refer to **40 - FRONT SUSPENSION**

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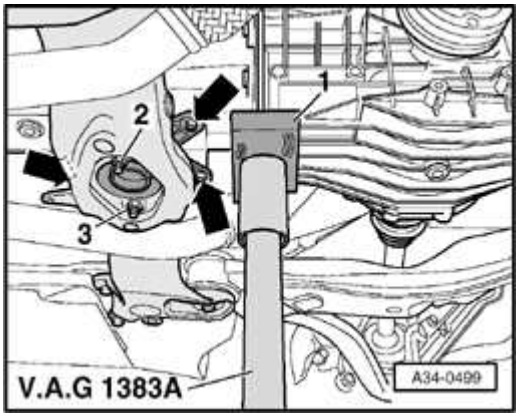


Fig. 135: Identifying Transmission Raised Using Punch Of VAG 1383 A, A Piece Of Wood And Transmission Mount Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- For tension-free installation, raise transmission using punch of VAG 1383 A engine/transmission hoist high enough so that a piece of wood -1- can be placed in between.
- Tighten bolts (arrows) for transmission mount.
- Slowly lower transmission again.
- Tighten nuts -2- and -3-.
- Bolt drive axles on drive flange.

Refer to **40 - FRONT SUSPENSION**

- Secure driveshaft to transmission.

Refer to **39 - FINAL DRIVE, DIFFERENTIAL**

- Check adjustment of shift mechanism and adjust if necessary. Refer to **Shift lever mechanism, adjusting**.
- Install and adjust exhaust system free of stress.

Refer to

- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 1.8 LITER 4-CYL. 5V TURBO ENGINE MECHANICAL, ENGINE CODE(S): AMB
- **26 EXHAUST SYSTEM, EMISSION CONTROLS** for 3.0 LITER 6-CYL. 5V ENGINE MECHANICAL, ENGINE CODE(S): AVK, BGN
- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 4.2 LITER V8 5V ENGINE MECHANICAL, ENGINE CODE(S): BHF

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

See Caution for disconnecting Telematics battery. Refer to **Transmission, removing and installing**

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- Observe safety precautions after connecting the battery.

Refer to

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

Tightening torques

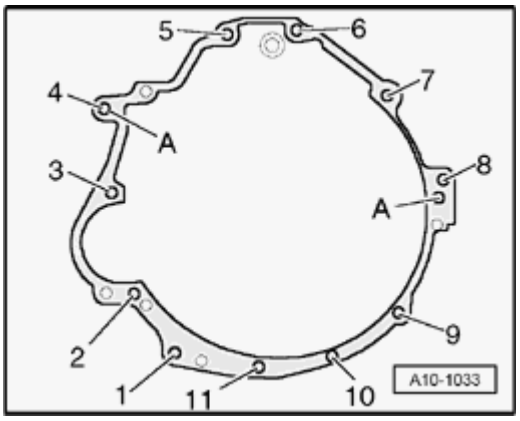


Fig. 136: Identifying Engine/Transmission Tightening Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Securing engine/transmission for manual transmission with All Wheel Drive (with intermediate plate)

Item no.	Bolt	Nm
1, 10, 11	M10 x 60	45
2	M12 x 130	65
3	M10 x 150	45
4	M12 x 80	65
5, 6, 8	M12 x 80	65
7	M12 x 105	65
9	M10 x 59	45

A: Alignment bushing

Component		Nm
Clutch slave cylinder to transmission		23 1)
Pivot rod to transmission		40
Transmission shift lever to transmission		23
Connecting rod for shift rod to transmission		23
Engine Speed (RPM) sensor -G28-		10
Transmission mount with console to transmission		23

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Heat shields above drive axles to transmission	23
Heat shield for drive axle to cover for Torsen differential	25
Bracket for noise insulation to subframe	10
Air duct to throttle valve supports	10

1) Always replace bolt

TRANSMISSION OIL LEVEL, CHECKING

Transmission oil level, checking

NOTE:

- **The vehicle should be absolutely horizontal when checking transmission oil level. This work is best performed over an inspection pit or using a 4 - column lifting platform.**
- **The prescribed oil level is to be adhered to exactly; the transmission reacts very sensitively to overfilling.**

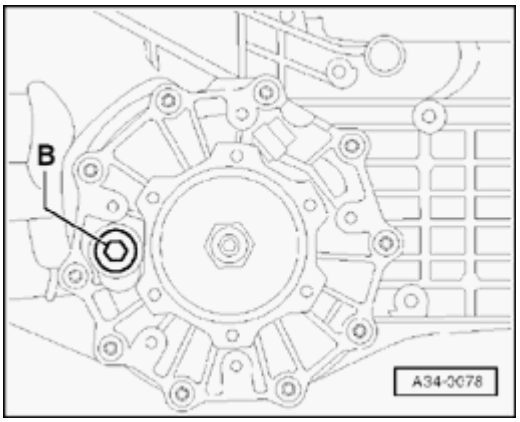


Fig. 137: Location Of Sealing Plug For Gear Oil Inspection
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove oil filler plug -B- to check final drive oil level.
- Check oil level using a shop-built tool, e.g. a piece of angled wire.

- Specification: Oil level 4 mm ± 1 below bottom edge of oil filler hole

- Top up with gear oil, if necessary: Specification. Refer to **Code letters, mechanical unit assignment, transmission ratios, capacities**.
- Install oil filler plug.

Tightening torque

Component	Nm
Oil filler plug	40

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TRANSMISSION, DISASSEMBLING AND ASSEMBLING

Transmission, disassembling and assembling

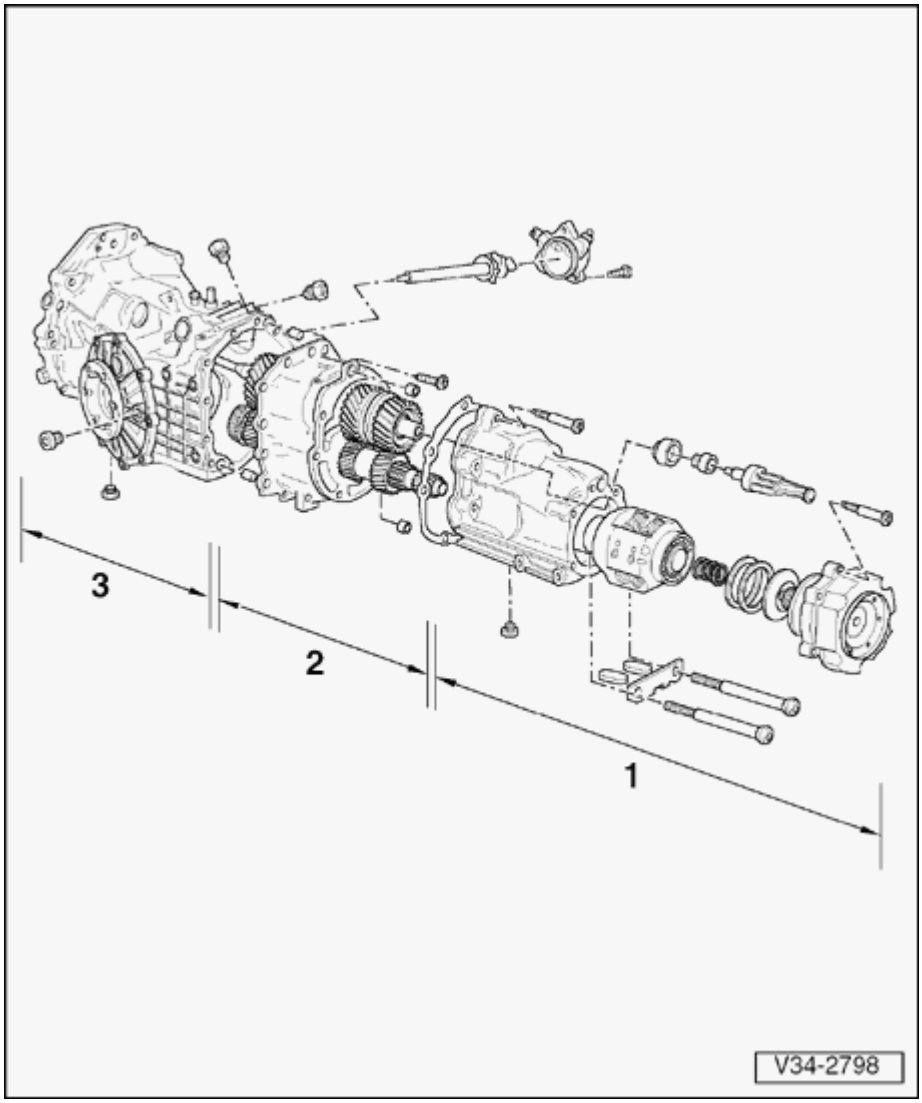


Fig. 138: Transmission, Disassembling And Assembling, Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Assembly sequence. Refer to **Assembly sequence**

1 - Bearing housing, Torsen differential and end cover

- Removing and installing. Refer to **Bearing housing, Torsen differential and end cover, removing and installing**

2 - Manual transmission and selector shaft

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- Removing and installing. Refer to **Manual transmission and selector shaft, removing and installing**

3 - Transmission housing and differential

- Removing and installing differential. Refer to **Differential, removing and installing**
- Servicing transmission housing. Refer to **Transmission housing, servicing**

Bearing housing, Torsen differential and end cover, removing and installing

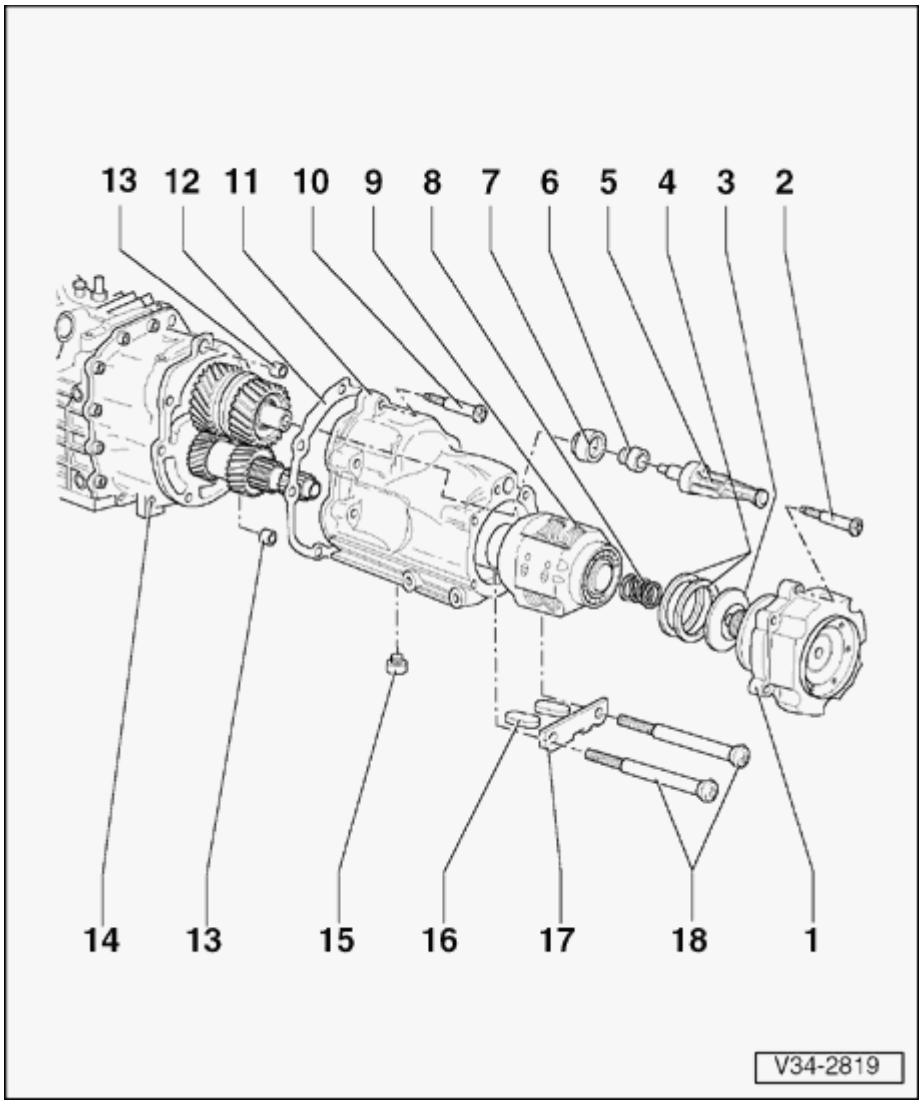


Fig. 139: Bearing Housing, Torsen Differential And End Cover, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing housing

- Disassembling and assembling. Refer to **Bearing housing, disassembling and assembling**

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2 - Bolt, 25 Nm

- 6 pieces

3 - Dished washer

- Installation position: Large diameter (concave side) facing shims

4 - Washer

- Qty. 2 or 3
- Re-determining thickness. Refer to **Fig. 213**

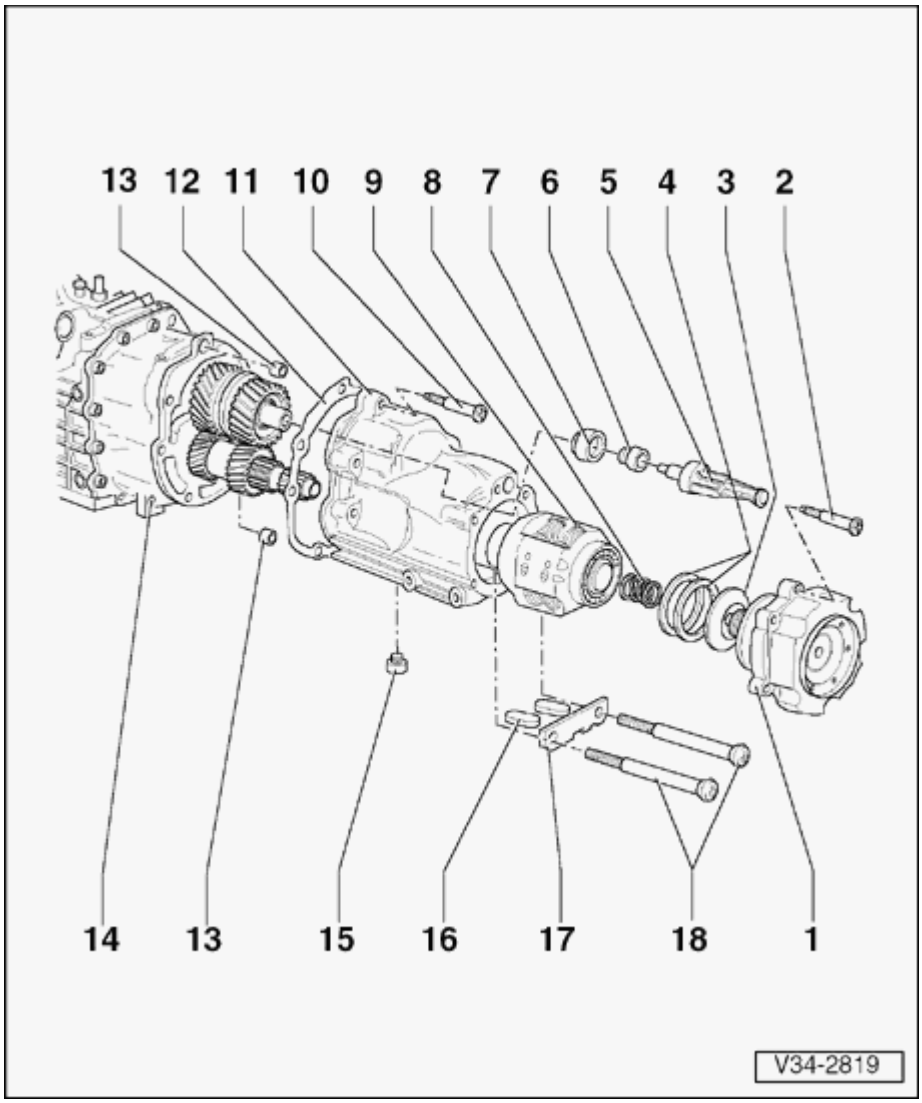


Fig. 140: Bearing Housing, Torsen Differential And End Cover, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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5 - Oil collector

- Disassembling and assembling. Refer to **Fig. 208**
- Removing. Refer to **Fig. 163**
- Installing. Refer to **Fig. 209**

6 - Multi-point socket head bolt, 150 Nm

- Loosening. Refer to **Fig. 166**
- Tightening. Refer to **Fig. 207**

7 - 2nd inner race for four-point bearing

- Roller bearing side
- Pulling off. Refer to **Fig. 168**
- Driving on. Refer to **Fig. 206**

8 - Spring

9 - Torsen differential

- Servicing only possible at manufacturer
- Servicing mount for Torsen differential. Refer to **Mount for Torsen differential, servicing**

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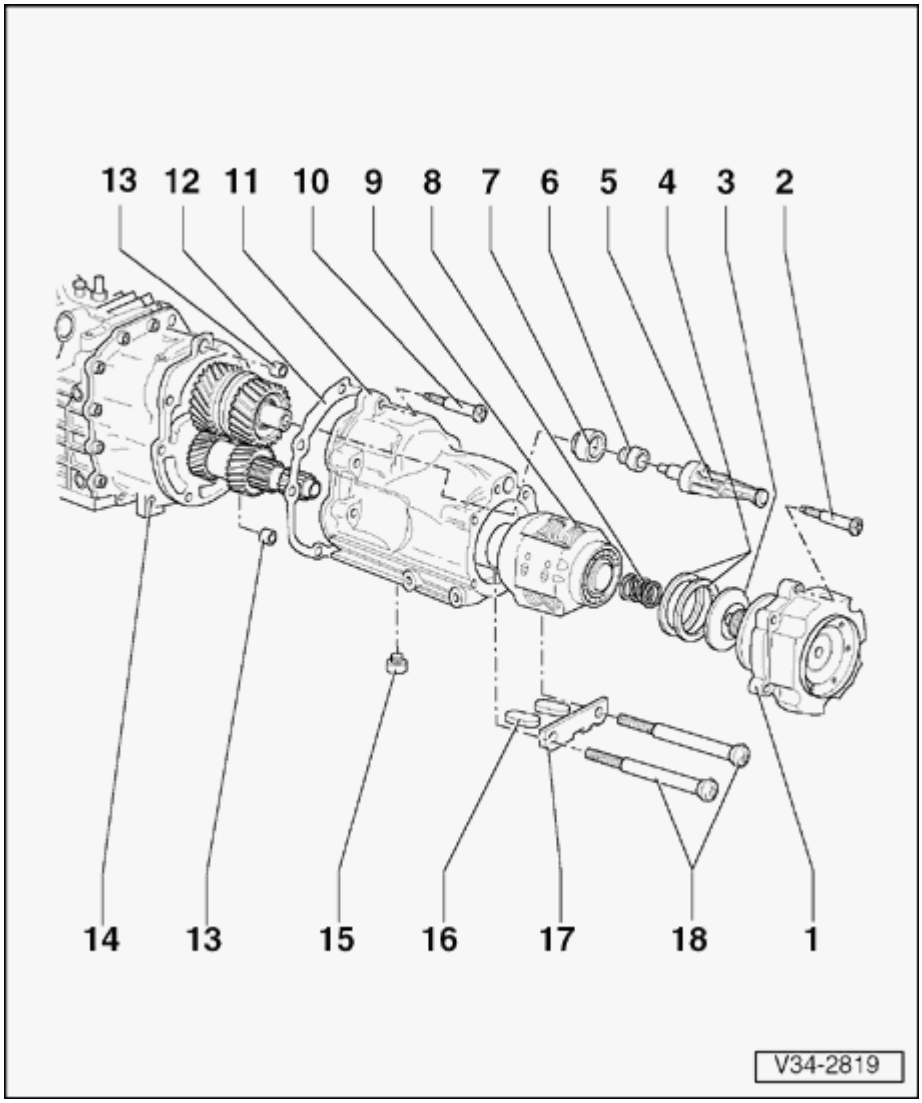


Fig. 141: Bearing Housing, Torsen Differential And End Cover, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

10 - Bolt, 25 Nm

- 5 pieces

11 - End cover

- Servicing. Refer to **End cover, servicing**

12 - Gasket

- Always replace

13 - Dowel sleeve

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- 2 pieces

14 - Manual transmission

- Removing and installing 5th and 6th gear. Refer to **5th and 6th gear, removing and installing**
- Removing and installing input shaft, drive pinion, hollow shaft and shift mechanism in transmission. Refer to **Input shaft, drive pinion, hollow shaft and shift lever mechanism in transmission, removing and installing**

15 - Oil drain plug, 40 Nm

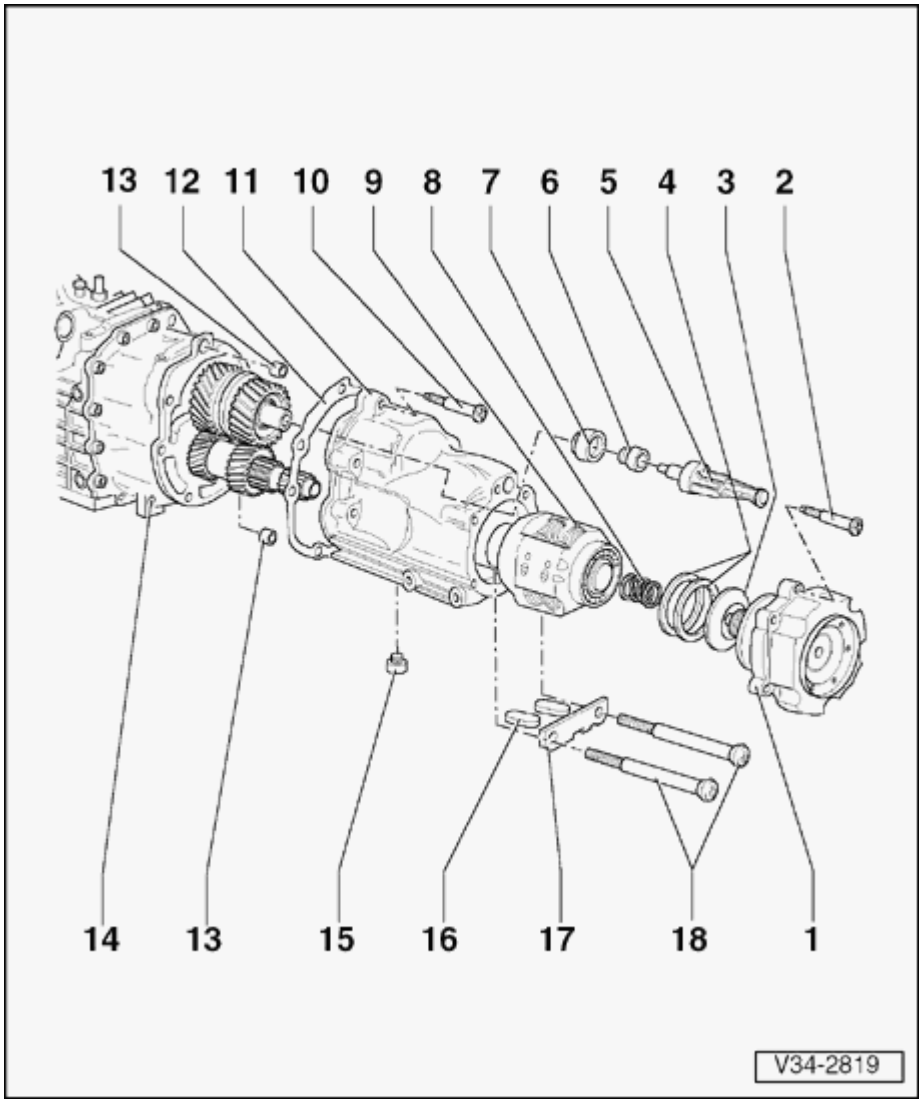


Fig. 142: Bearing Housing, Torsen Differential And End Cover, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

16 - Solenoid

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- 2 pieces
- Clean

17 - Supporting plate

- Installation position: Lug faces magnet

18 - Bolt, 25 Nm

- 2 pieces

Manual transmission and selector shaft, removing and installing

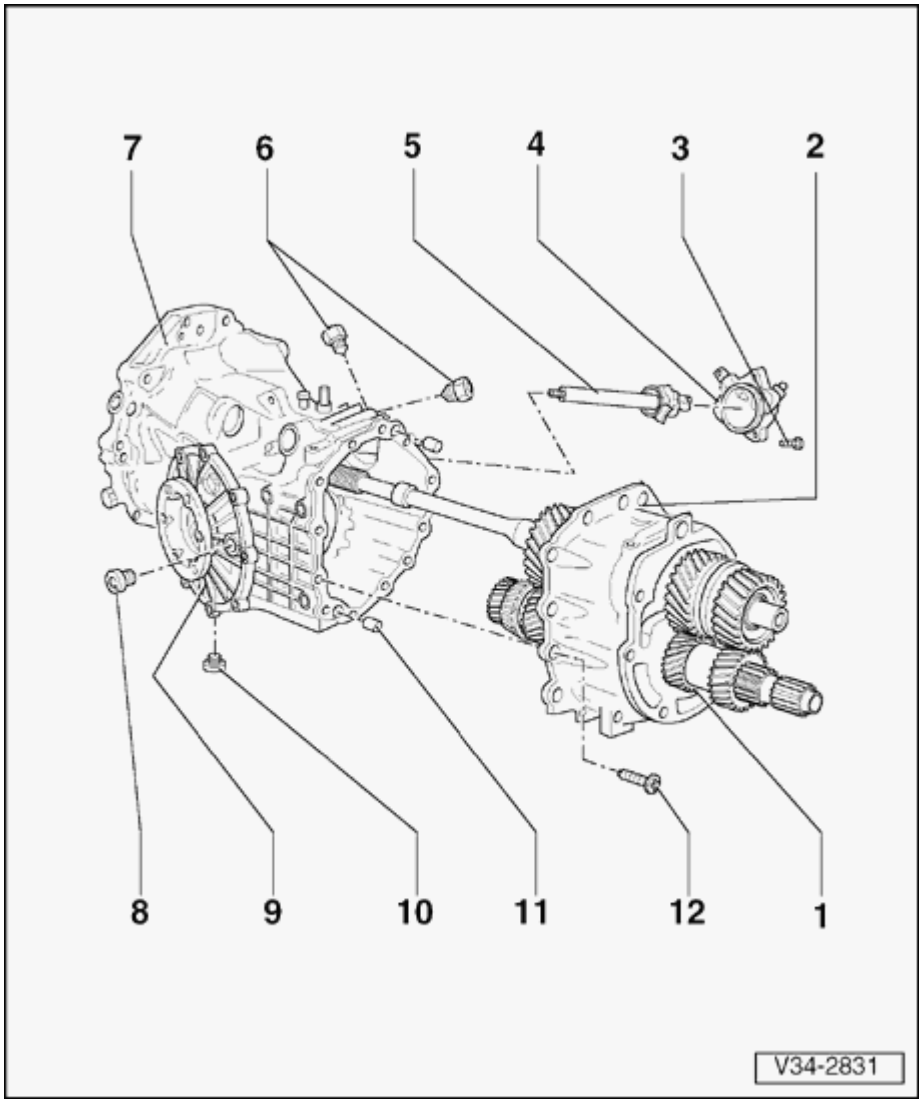


Fig. 143: Manual Transmission And Selector Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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1 - 5th and 6th gear

- Transmission remains flanged to transmission housing
- Removing and installing. Refer to **5th and 6th gear, removing and installing**

2 - Manual transmission

- Removing and installing input shaft, drive pinion, hollow shaft and shift mechanism in transmission. Refer to **Input shaft, drive pinion, hollow shaft and shift lever mechanism in transmission, removing and installing**

3 - Bolt, 25 Nm

- 3 pieces
- Inserted with sealing paste AMV 188 001 02

4 - Cover for selector shaft

- Removing. Refer to **Fig. 164**
- Installing. Refer to **Fig. 212**

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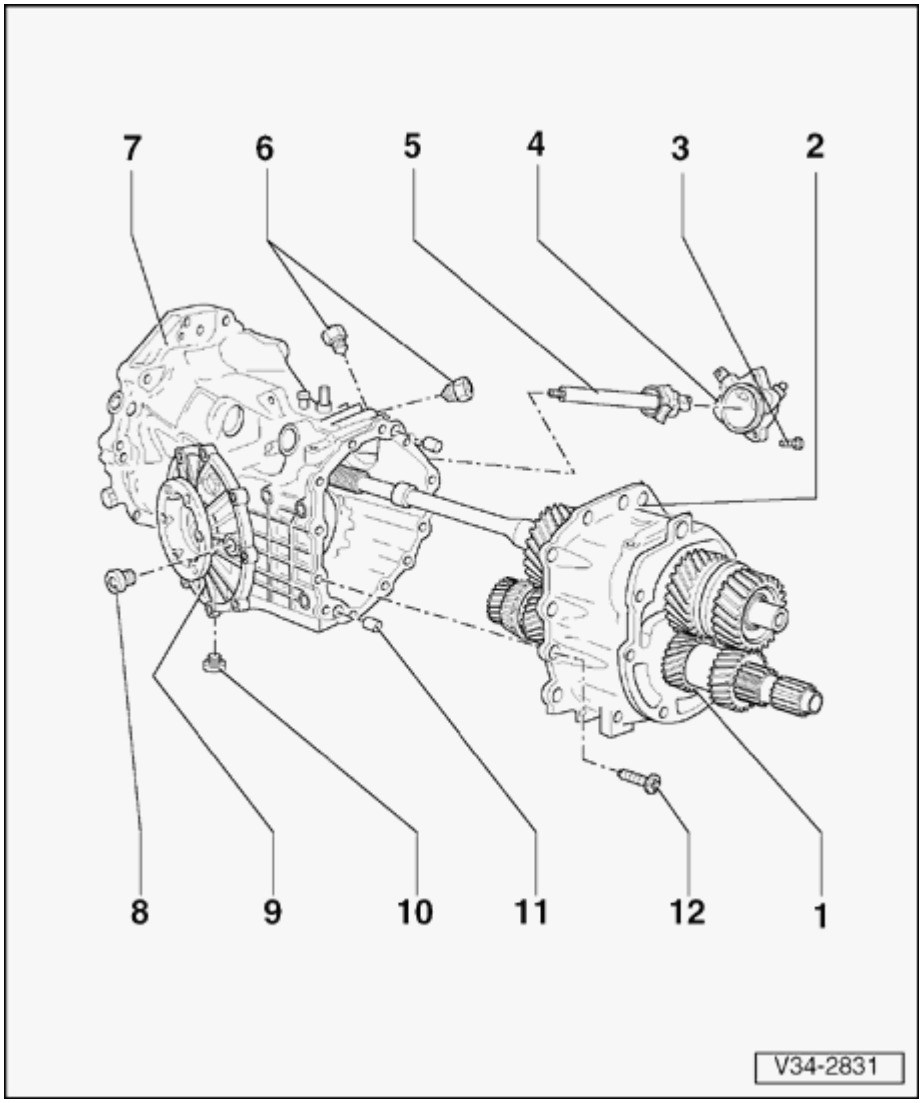


Fig. 144: Manual Transmission And Selector Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Selector shaft with selector cylinder

- Removing. Refer to **Fig. 164**
- Installing. Refer to **Fig. 212**
- Disassembling and assembling. Refer to **Selector shaft, disassembling and assembling**

6 - Locking bolt, 50 Nm

- 4 pieces
- Insert with sealing paste AMV 188 001 02

7 - Transmission housing

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- Servicing. Refer to **Transmission housing, servicing**

8 - Oil filler plug, 40 Nm

9 - Differential

- Covered by final drive cover.
- Removing and installing. Refer to **Differential, removing and installing**

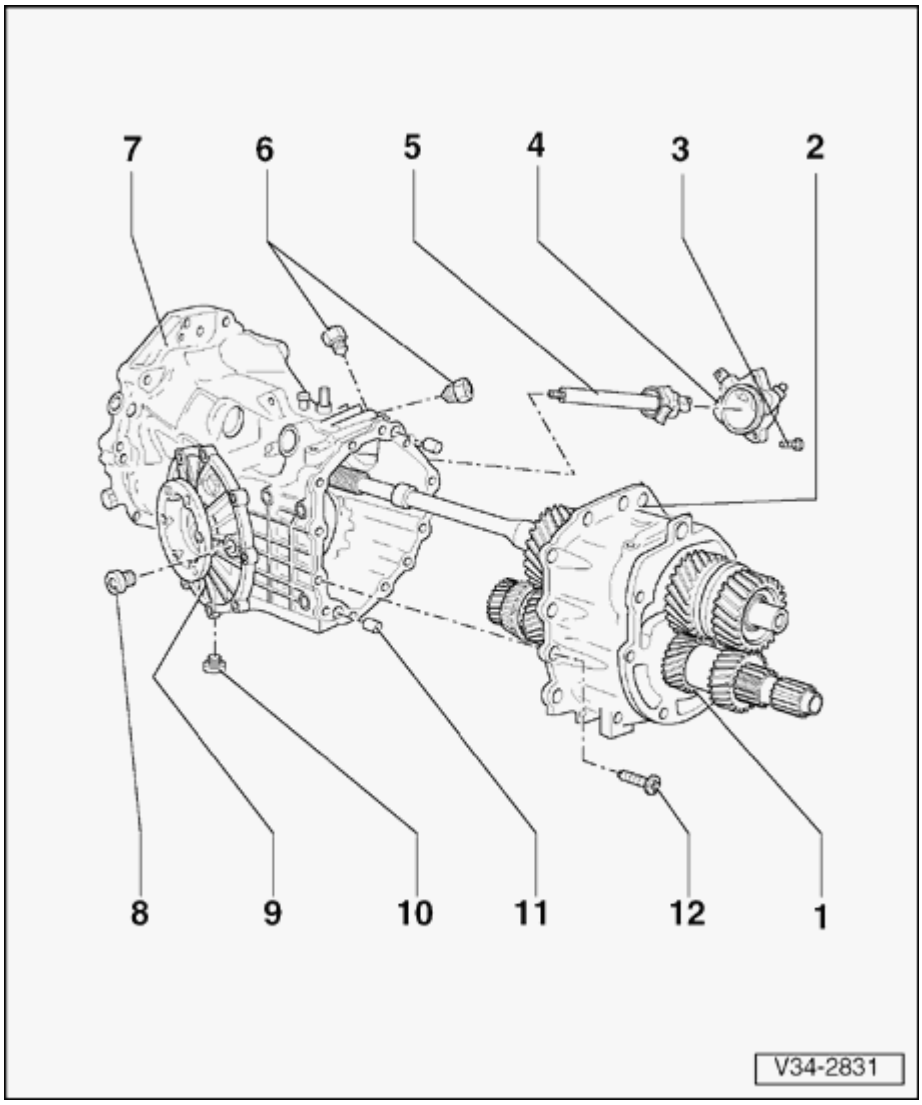


Fig. 145: Manual Transmission And Selector Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

10 - Oil drain plug, 40 Nm

11 - Dowel sleeve

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- 2 pieces

12 - Bolt, 25 Nm

- 12 pieces

5th and 6th gear, removing and installing

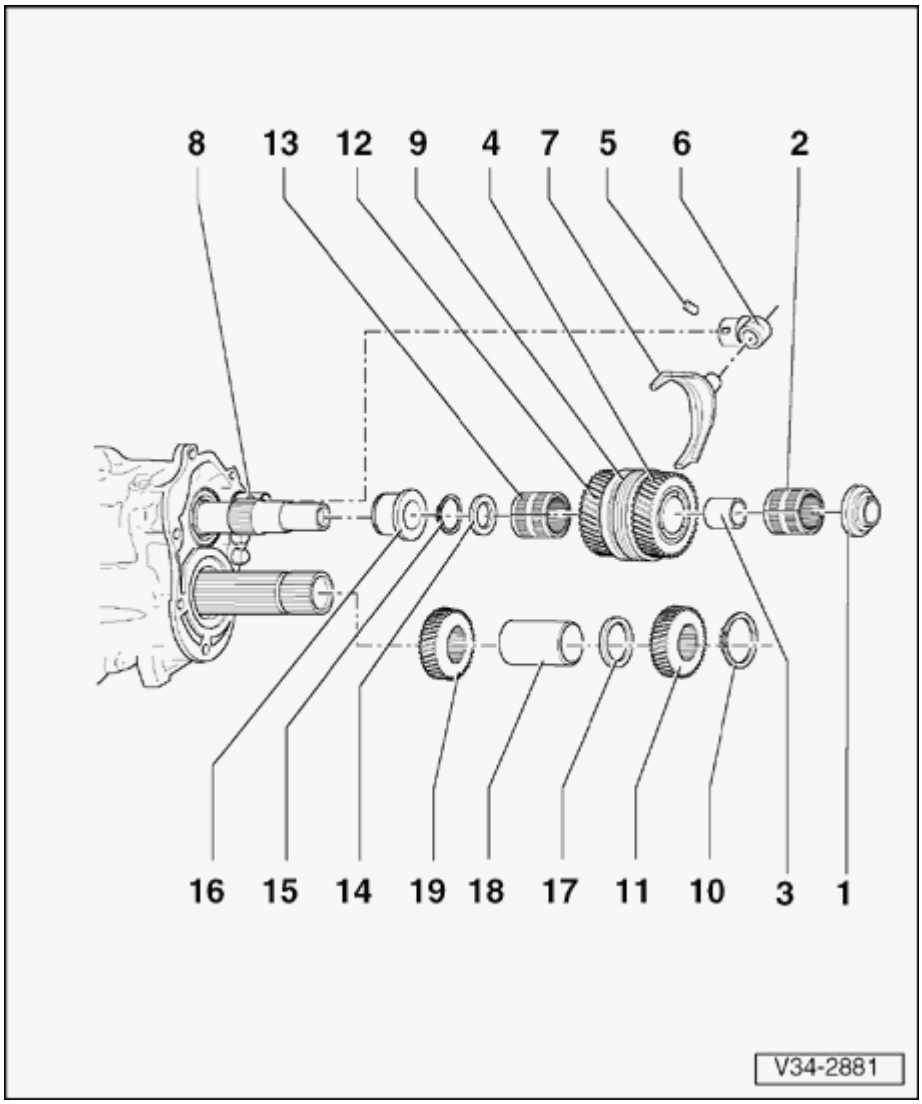


Fig. 146: 5Th And 6Th Gear, Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - 1st inner race for four-point bearing

- Pulling off. Refer to **Fig. 169**
- Driving on. Refer to **Fig. 204**

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2 - Needle bearing for 5th gear

3 - Inner race for 5th sliding gear

- Pulling off. Refer to **Fig. 174**
- Driving on. Refer to **Fig. 203**

4 - 5th sliding gear

- Pulling off. Refer to **Fig. 169**
- Installing. Refer to **Fig. 203**

5 - Spring pin

- Pressing out. Refer to **Fig. 171**
- Pressing in. Refer to **Fig. 198**

6 - Follower for 5th and 6th gear

- Only replace complete with selector rod for 5th and 6th gear -Item 8- **5th and 6th gear, removing and installing**
- Pulling off. Refer to **Fig. 174**

7 - Selector fork, 5th and 6th gear

- Can be replaced separately

8 - Selector rod for 5th and 6th gear

- Only replace complete with follower for 5th and 6th gear
- Removing. Refer to **Fig. 172**
- Installing. Refer to **Fig. 190**

9 - Locking collar/synchro-hub for 5th and 6th gear

- Removing. Refer to **Fig. 172**
- Installing. Refer to **Fig. 196**

10 - Circlip

- Re-determining thickness. Refer to **Fig. 202**

11 - 5th gear wheel

- Pulling off. Refer to **Fig. 170**

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- Driving on. Refer to **Fig. 201**

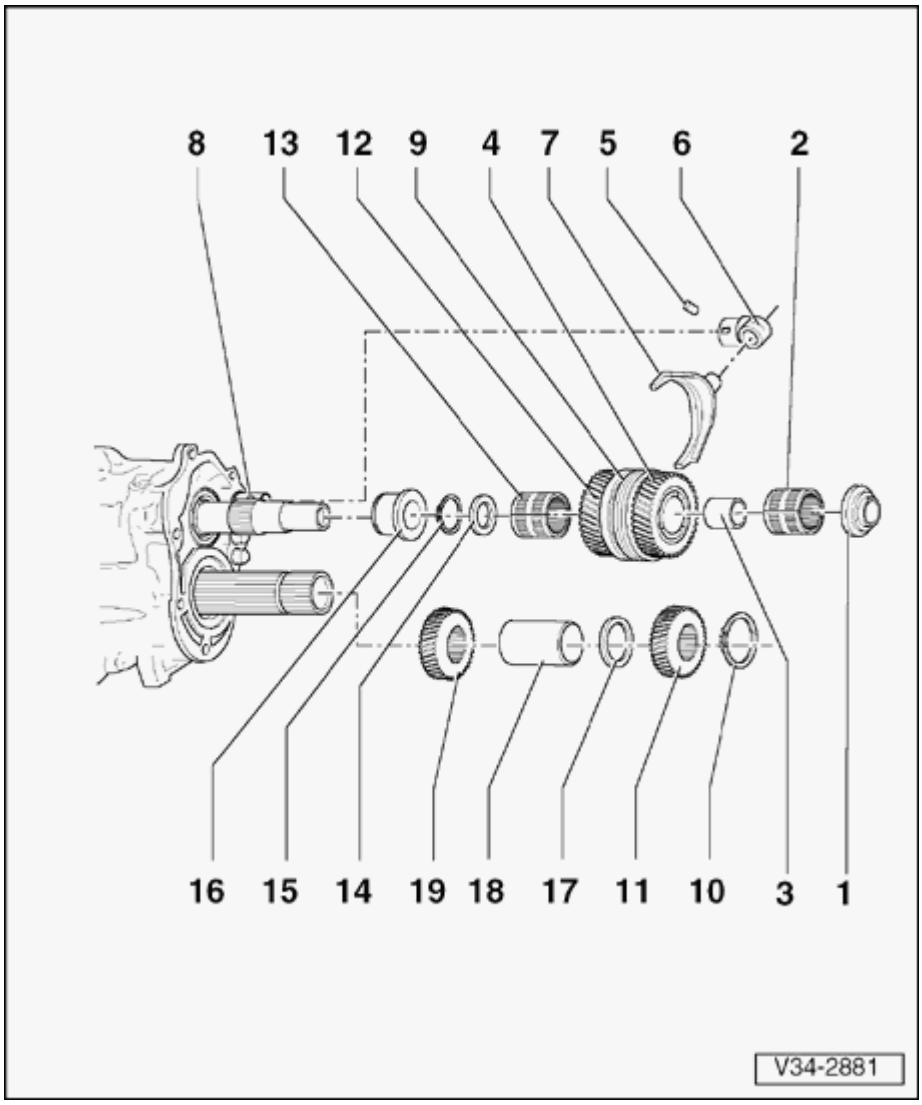


Fig. 147: 5Th And 6Th Gear, Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

12 - 6th sliding gear

- Pull off together with synchro-hub and inner race for 5th gear. Refer to **Fig. 174**

13 - Needle bearing

- For 6th gear

14 - Thrust washer

- For needle bearing for 6th sliding gear

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- Installation position: Grooves face circlip, smooth face contact surface toward needle bearing

15 - Circlip

16 - Inner race

- For cylinder roller bearing
- Remove by hand. Refer to **Fig. 178**

17 - Washer

- Re-determining thickness. Refer to **Fig. 199**

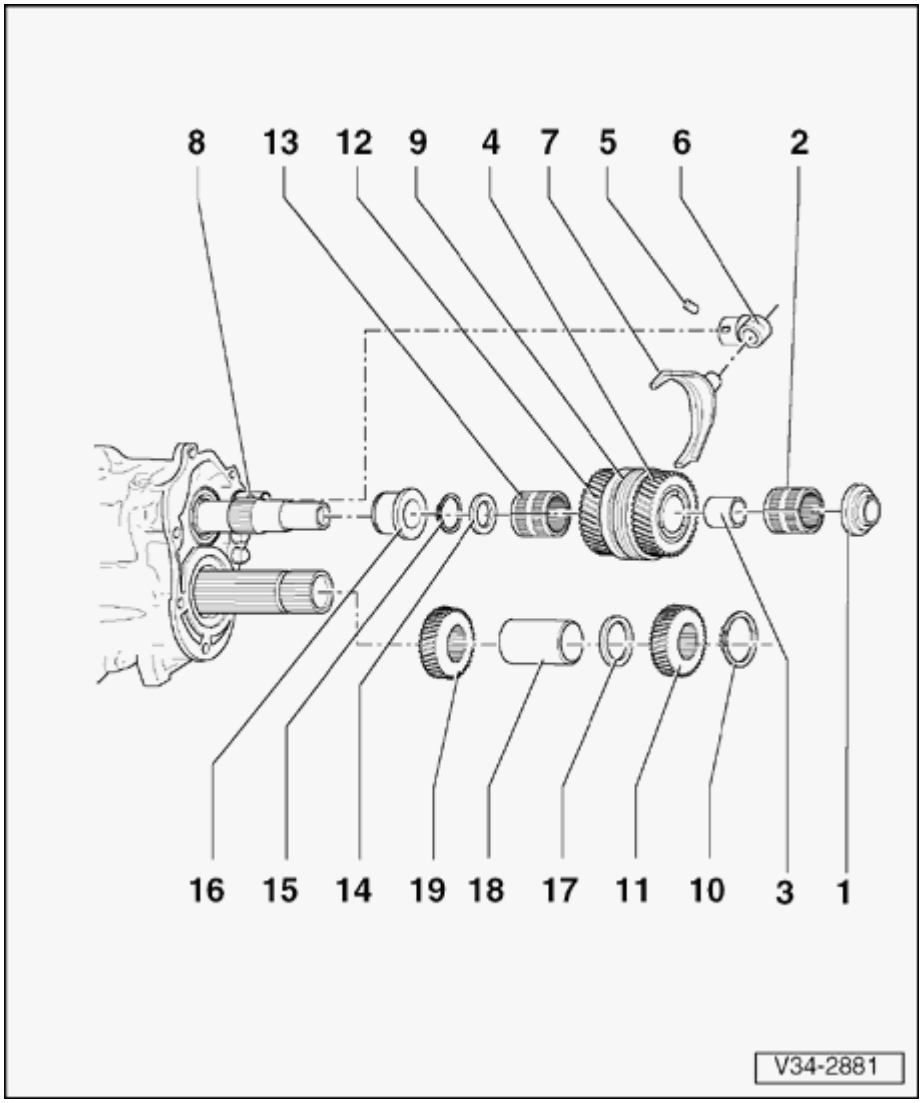


Fig. 148: 5Th And 6Th Gear, Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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18 - Spacer sleeve

- Length 39.6 mm

19 - 6th gear wheel

- To press off, remove bearing plate. Refer to **Fig. 176**
- Pressing off. Refer to **Fig. 182**
- Pressing on. Refer to **Assembling**

Input shaft, drive pinion, hollow shaft and shift lever mechanism in transmission, removing and installing

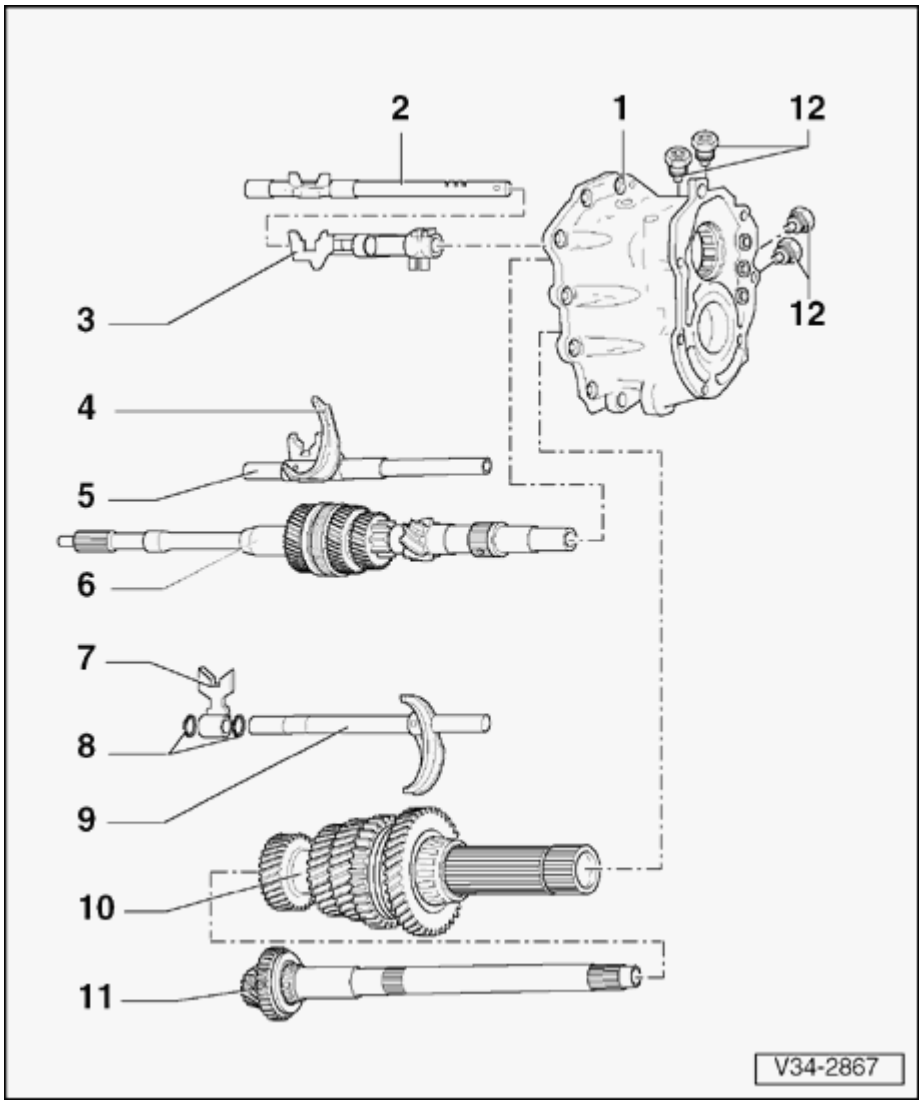


Fig. 149: Input Shaft, Pinion, Hollow Shaft And Selector Mechanism (Transmission Side), Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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1 - Bearing plate

- Servicing. Refer to **Bearing plate, servicing**

2 - Selector rod for 5th and 6th gear

- Only replace complete with follower for 5th and 6th gear. Refer to **5th and 6th gear, removing and installing**, Item 6

3 - Follower for reverse gear

- Pulling out ball housing. Refer to **Pulling ball sleeve out of follower for reverse gear**
- Driving in ball housing. Refer to **Driving ball sleeve flush into follower for reverse gear**

4 - Selector fork, 3rd and 4th gear

- Can be replaced separately.
- Installation position: Rib toward follower

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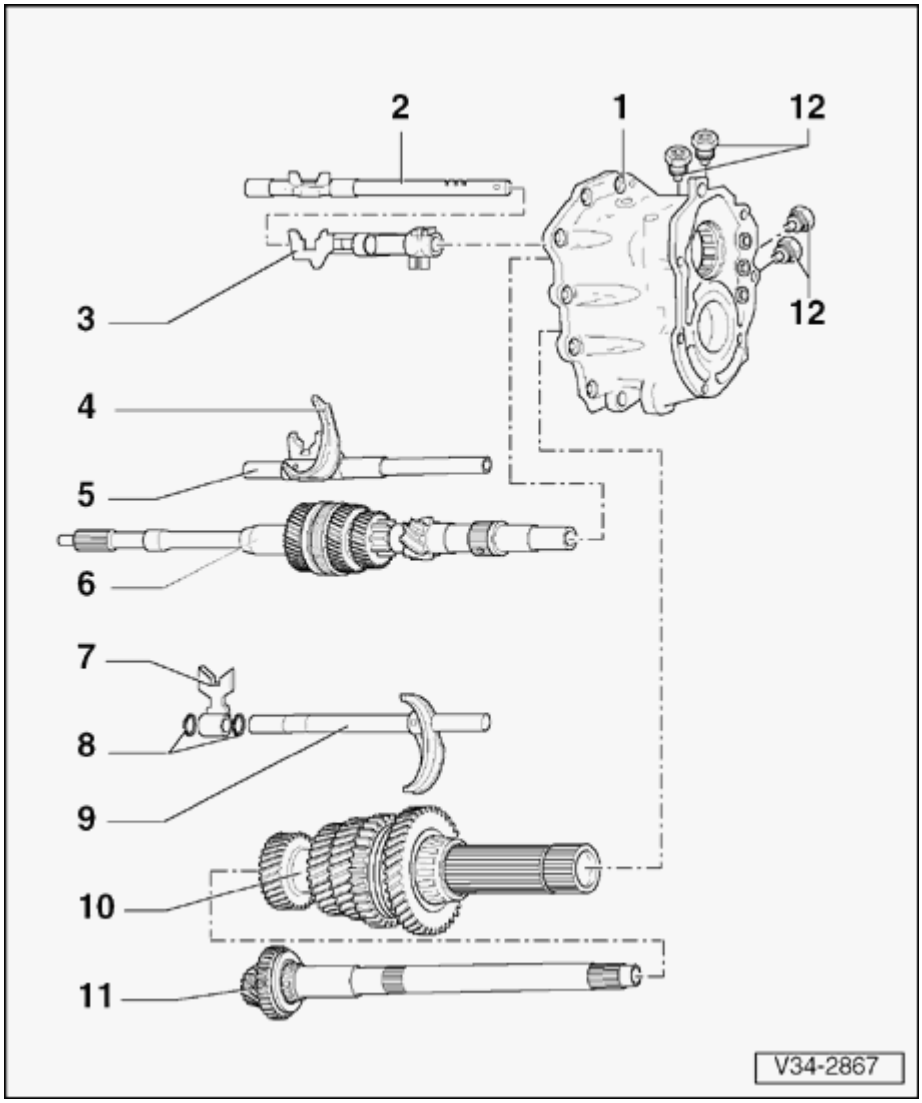


Fig. 150: Input Shaft, Pinion, Hollow Shaft And Selector Mechanism (Transmission Side), Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Selector rod for 3rd and 4th gear

- Only replace complete with follower for 3rd and 4th gear

6 - Input shaft

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

7 - Follower for 1st and 2nd gear

- Can be replaced separately.

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8 - Circlip

- 2 pieces

9 - Selector rod for 1st and 2nd gear

- Only replace complete with pinned selector fork for 1st and 2nd gear

10 - Hollow shaft

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

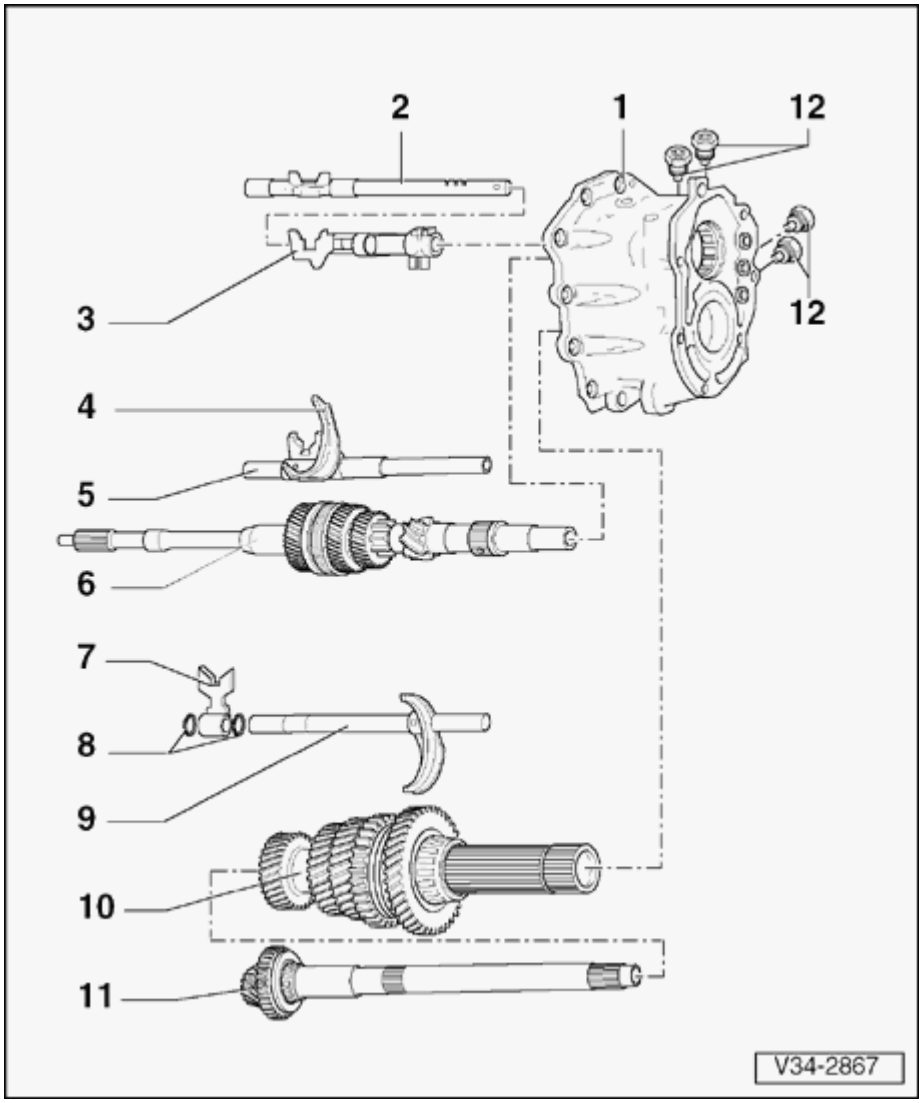


Fig. 151: Input Shaft, Pinion, Hollow Shaft And Selector Mechanism (Transmission Side), Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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11 - Pinion shaft

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

12 - Locking bolt, 50 Nm

- 4 pieces
- Insert with sealing paste AMV 188 001 02

Assembly sequence

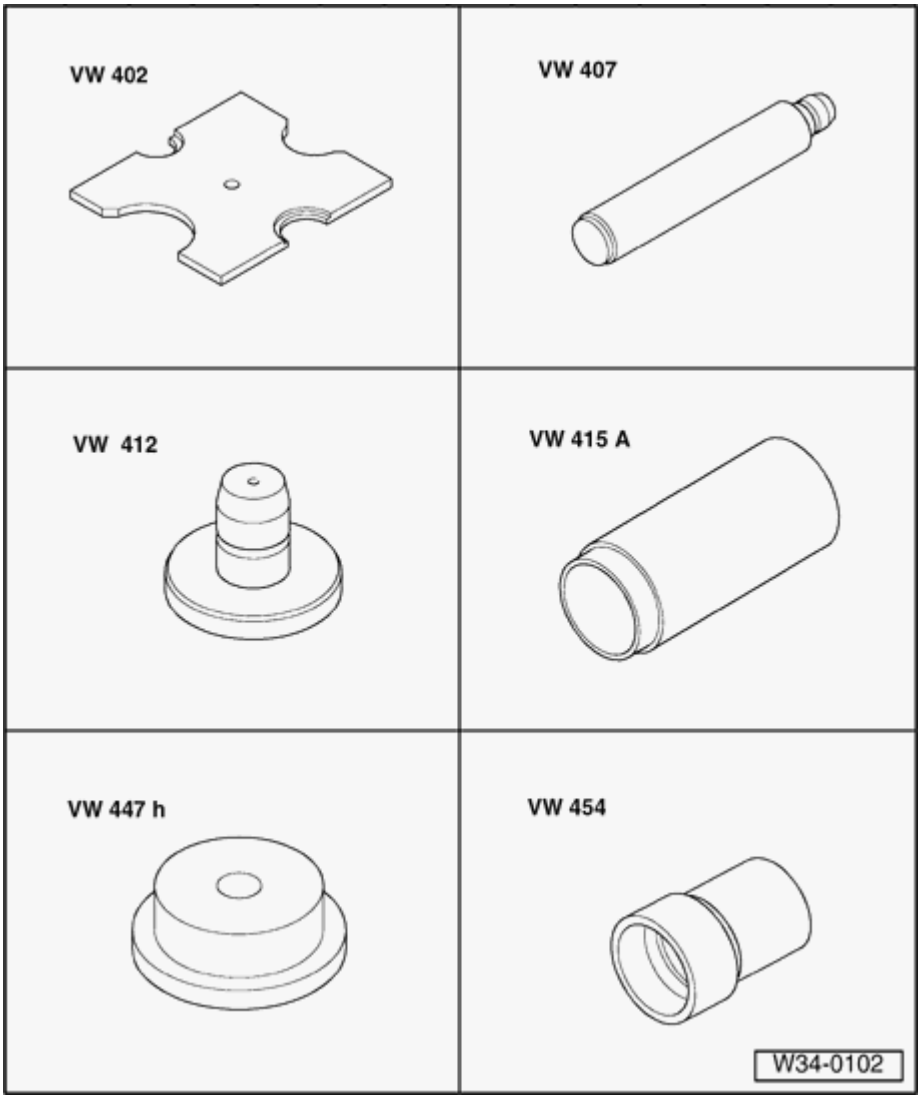


Fig. 152: Identifying Special Tools - Bearing Housing, Torsen Differential, End Cover, Selector Mechanism, Assembly Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing and installing bearing housing, Torsen differential, end cover, shift lever mechanism in

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transmission, input shaft, drive pinion and hollow shaft

Special tools and equipment

- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 412 Thrust tool
- VW 415 A Tube
- VW 447 H Thrust plate
- VW 454 Thrust pad

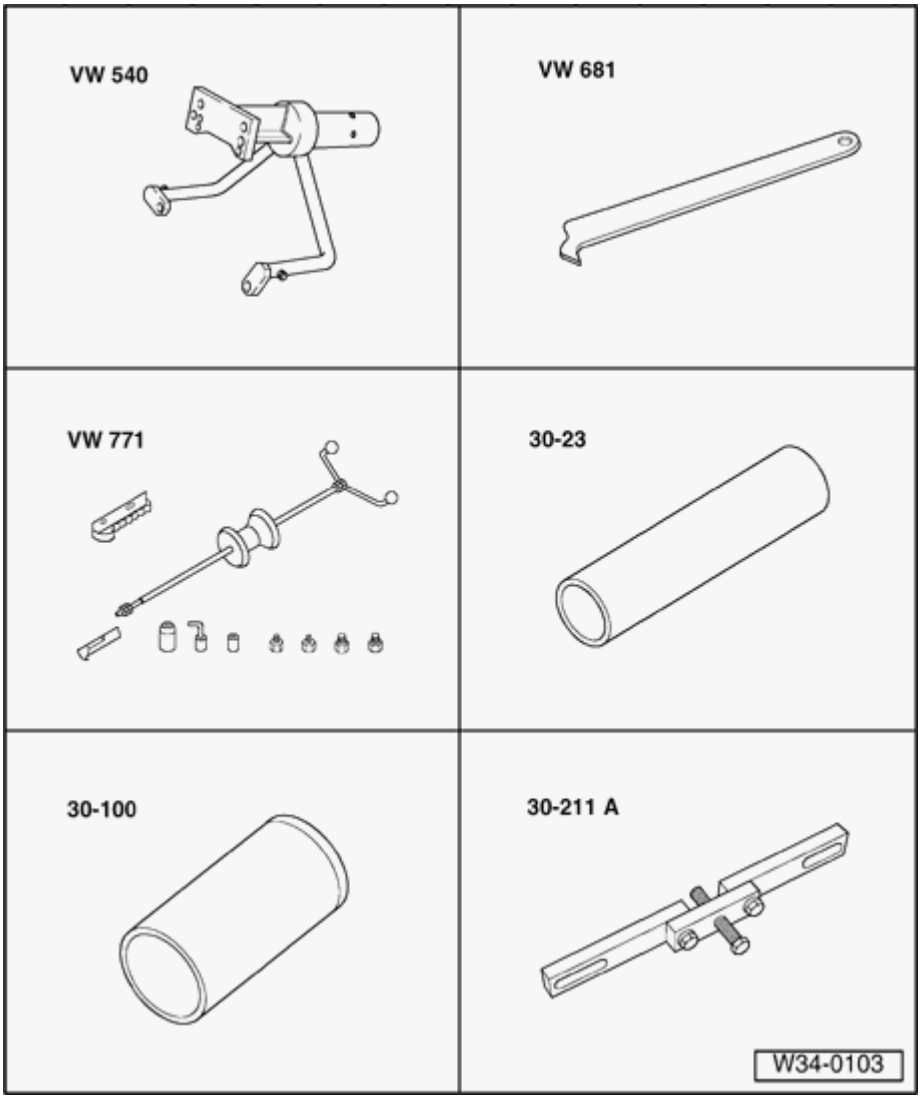


Fig. 153: Identifying Special Tools - Bearing Housing, Torsen Differential, End Cover, Selector Mechanism, Assembly Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- VW 540 Engine and transmission support
- VW 681 Seal extractor
- VW 771 Multi-purpose tool
- 30-23 Extension
- 30-100 Thrust sleeve
- 30-211 A Support bridge

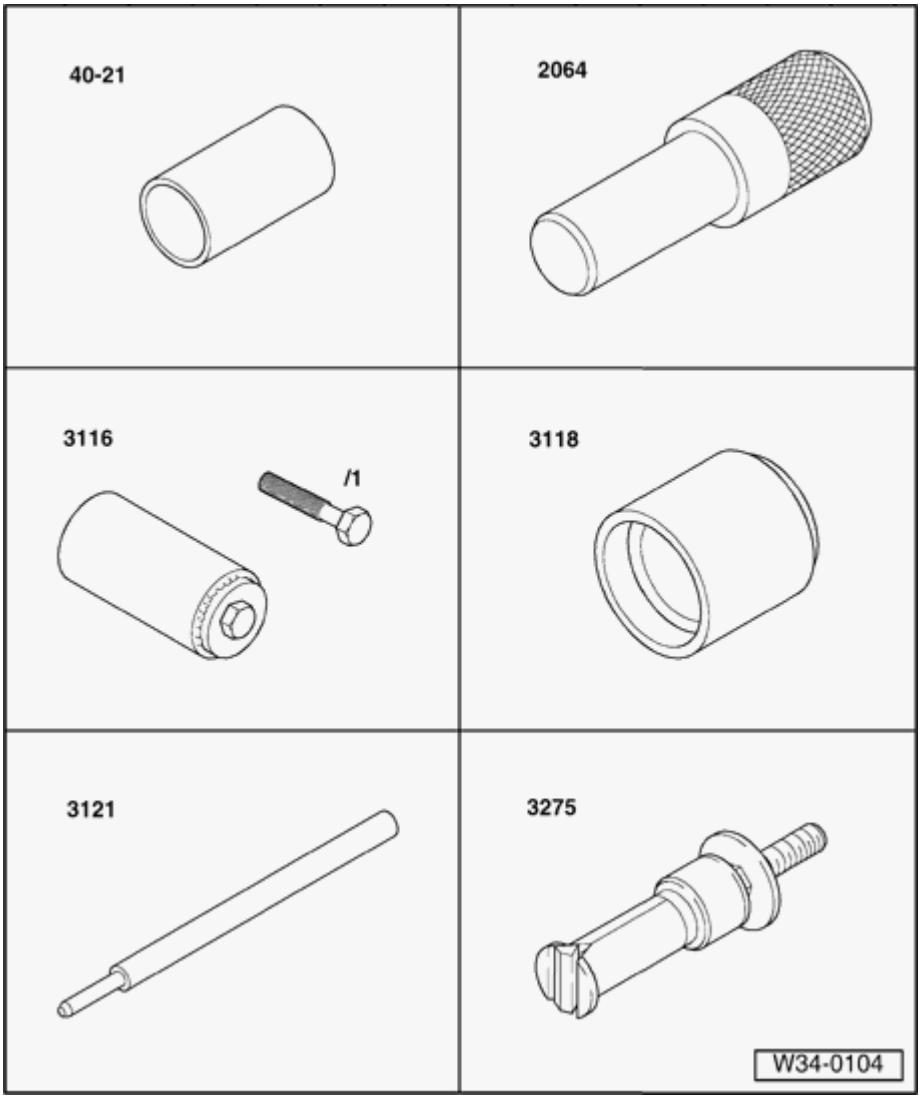


Fig. 154: Identifying Special Tools - Bearing Housing, Torsen Differential, End Cover, Selector Mechanism, Assembly Sequence
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 40-21 Thrust sleeve
- 2064 Setting pin
- 3116 Spring pin

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- 3118 Thrust piece
- 3121 Drift
- 3275 Internal puller

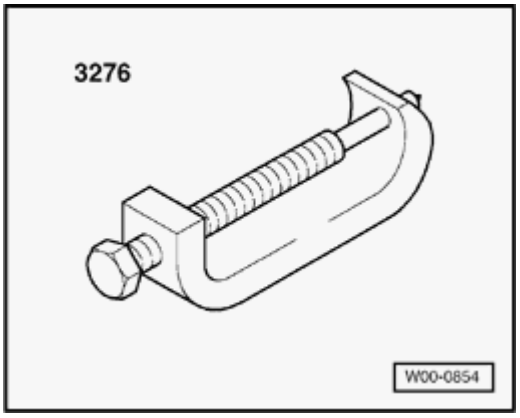


Fig. 155: Pressure Device 3276
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressure device 3276

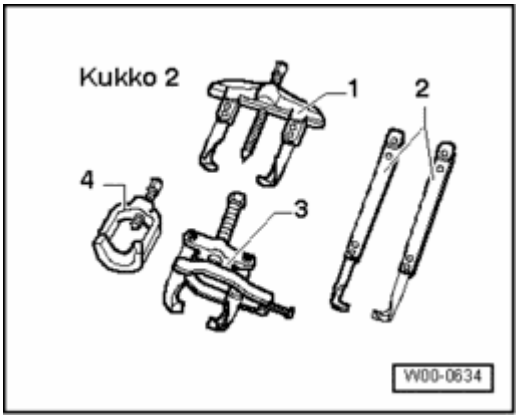


Fig. 156: Identifying Special Tools - Kukko 20/10 Puller Set
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - 2-Arm puller Kukko 20/10
- 2 - Puller hooks V/170
- Container
- Depth gauge

Disassembling

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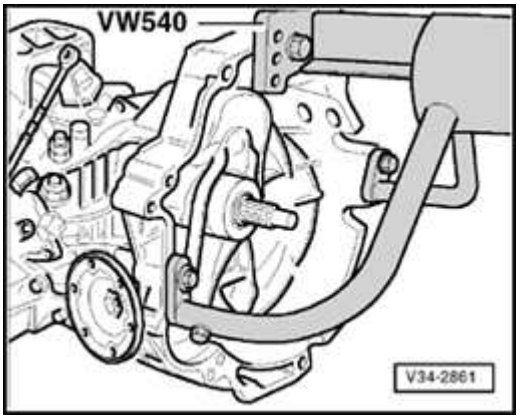


Fig. 157: Transmission In Assembly Fixture
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp transmission in VW 540 holding fixture.
- Place container under the transmission.
- Drain gear oil.

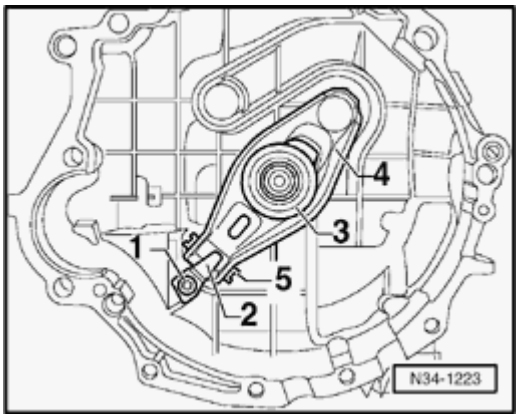


Fig. 158: Clutch Release Lever Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Screw out bolts -1- and detach leaf spring -2-.
- Remove clutch release lever -4- together with release bearing -3- and intermediate piece -5-.
- Unbolt guide sleeve.

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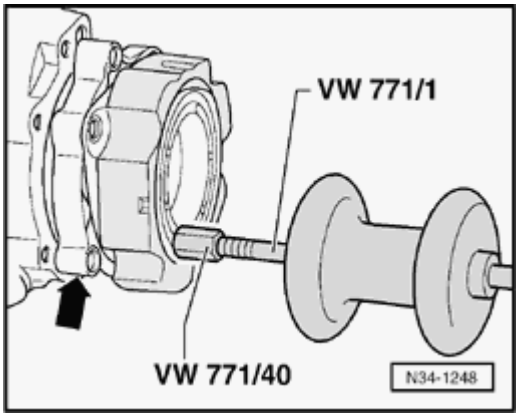


Fig. 159: Unbolt Bearing Housing And Pull Off
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew bearing housing -arrow- and pull off.

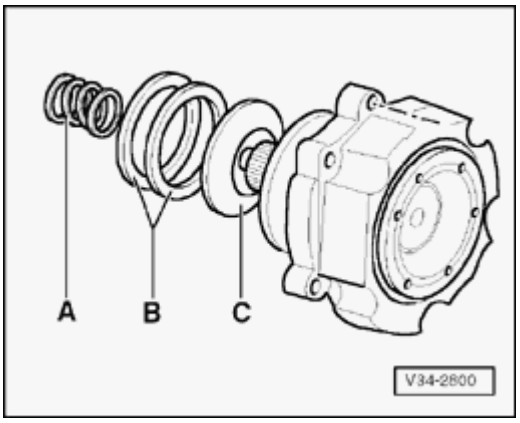


Fig. 160: Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Bearing housing is pushed away slightly from end cover by coil spring -A- when it is being pulled off.

- When detaching bearing housing, observe installation position of dished washer -C-.
- Installation position: Outside diameter (concave side) facing shims -B-
- Remove shims -B-, note thickness and re-determine if necessary. Refer to **Fig. 213**.

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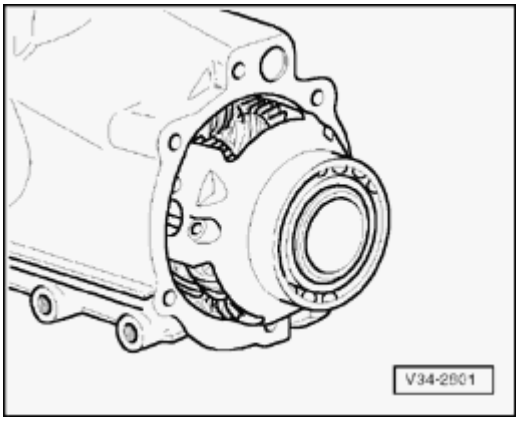


Fig. 161: Identifying Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull Torsen differential out of end cover.

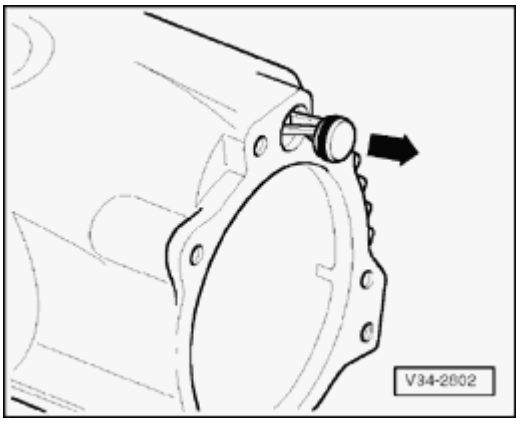


Fig. 162: Identifying Oil Diverter At End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull oil collector sufficiently far out of end cover -arrow- until it moves freely.

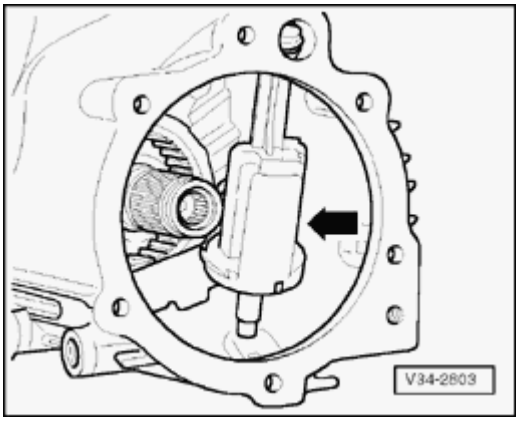


Fig. 163: Removing Oil Diverter Out End Cover Hole
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Swivel oil collector -arrow- down and guide it out through hole of end cover.
- Remove oil collector.

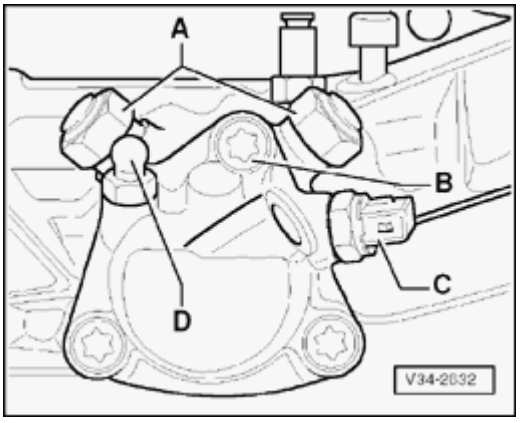


Fig. 164: Identifying Locking Bolts And Selector Shaft Cover & Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking bolts -A- for selector shaft from transmission housing.
- Remove 3 bolts -B- for cover for selector shaft, remove cover.
- Pull out selector shaft.

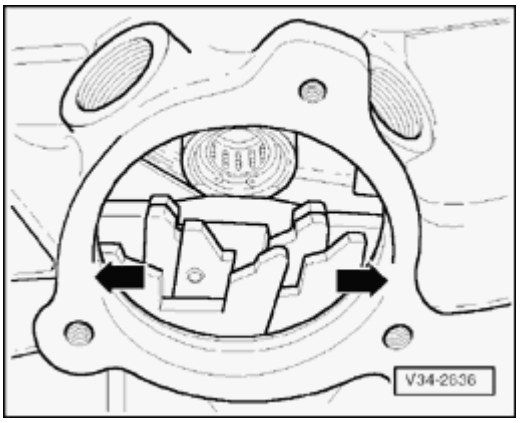


Fig. 165: Lock Input Shaft By Engaging 2 Gears (E.G. Reverse And 2nd Gear) By Moving 2 Selector Rails
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lock input shaft by engaging 2 gears (e.g. reverse and 2nd gear) do this by moving 2 selector plates -arrows-.

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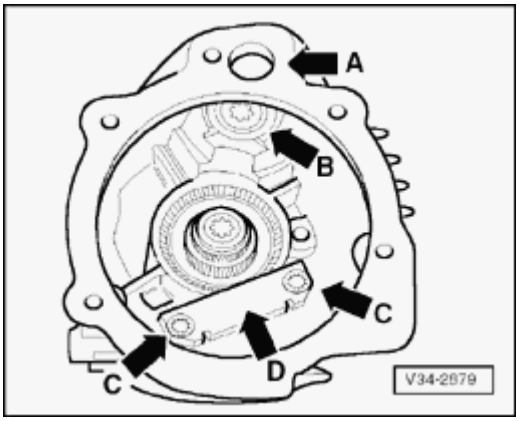


Fig. 166: Remove Support Plate For Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slacken multi-point socket head bolt -arrow B- in input shaft through hole -arrow A- in end cover and unscrew.
- Remove supporting plate.
- Remove supporting plate for needle bearing.

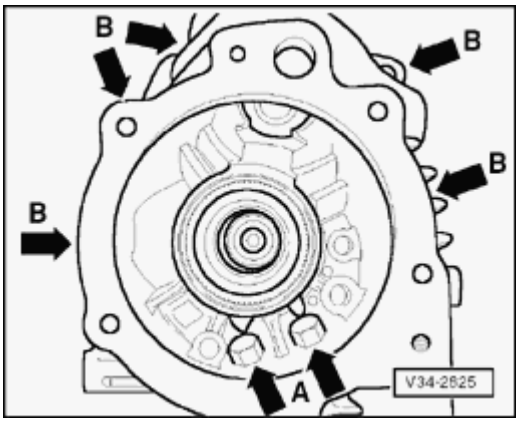


Fig. 167: Identifying Magnets -A - And End Cover Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 2 magnets -arrows A- and clean.
- Slacken 5 bolts -arrows B- for attaching end cover to manual transmission and remove.

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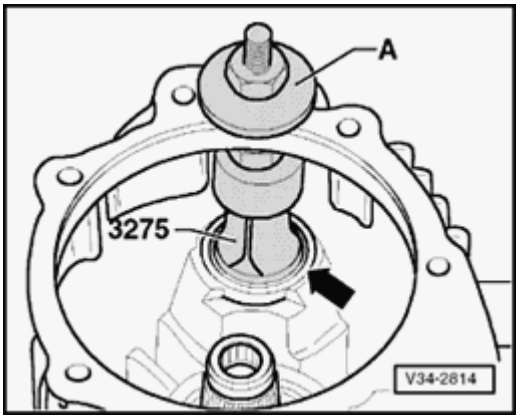


Fig. 168: Pull 2nd Inner Race For 4-Point Bearing (Roller Bearing Side) Off From Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 2nd inner race of four-point bearing (roller bearing side) for input shaft.

NOTE: Internal puller 3275 engages in a circular groove in the inner race when pulling off -arrow-.

- Remove end cover together with end cover/bearing plate gasket.
- Pull dowel sleeves out of bearing plate.

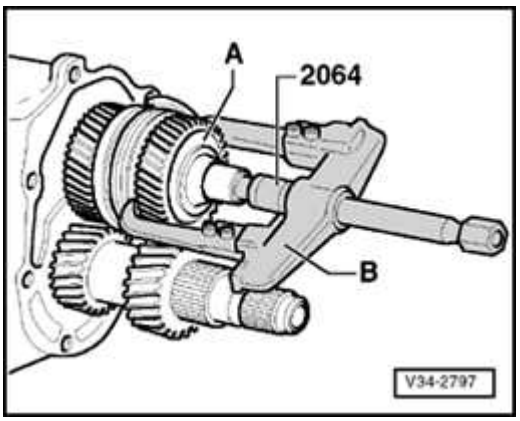


Fig. 169: Pulling Off Selector Gear For 5th Gear With Spring Together With 1st Inner Race For 4-Point Bearing (Ball Bearing Side) For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 5th sliding gear and spring together with 1st inner race -A- of four-point bearing (ball bearing side) for input shaft.

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

- Remove 5th gear synchro-ring.
- Remove circlip for 5th gear wheel.
- Lock hollow shaft in position by engaging two gears. Refer to **Fig. 165**

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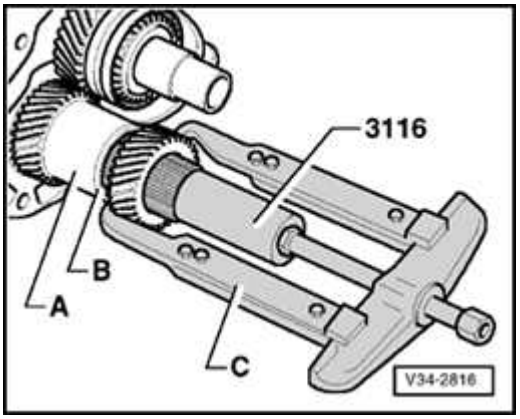


Fig. 170: Pull Off Drive Gear For 5th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 5th gear wheel.

NOTE: Only use hexagon bolt of spring sleeve 3116, length 50 mm

C - Two arm puller, e.g. Kukko 20/10 with 200 mm hooks

- Remove shim -B- for 5th gear wheel, note thickness and re-determine if necessary. Refer to **Fig. 199**.
- Remove spacer sleeve -A-.

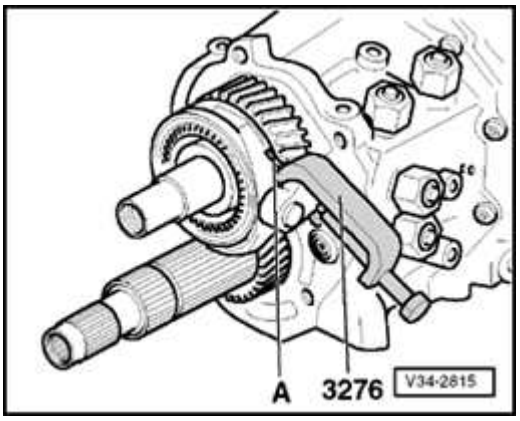


Fig. 171: Pressing Out Spring Pin For Selector Fork For 5th and 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press out spring pin -A- for selector fork for 5th and 6th gear.

NOTE:

- **Do not damage synchro-ring for 6th gear when pressing out spring pin.**
- **Do not drive out spring pin, otherwise selector rod bearing will be damaged.**

- Pull selector rod on follower together with selector fork for 5th and 6th gear and locking collar as far as

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possible away from bearing plate (until stop is felt).

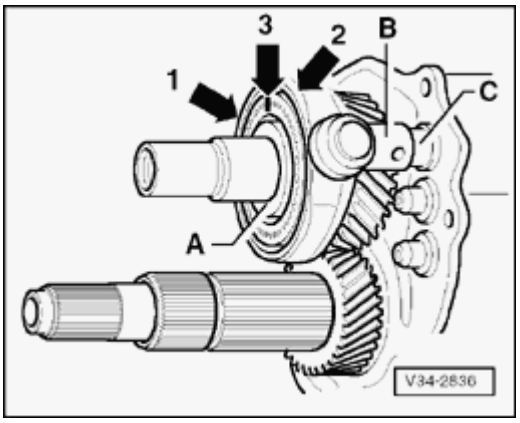


Fig. 172: Alignment Marks On, Locking Collar For 5th and 6th Gear And Synchronizer Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Mark relative positions -arrow 3- of locking collar for 5th and 6th gears -arrow 1- and synchro-hub -A- (paired) -arrow 1-.

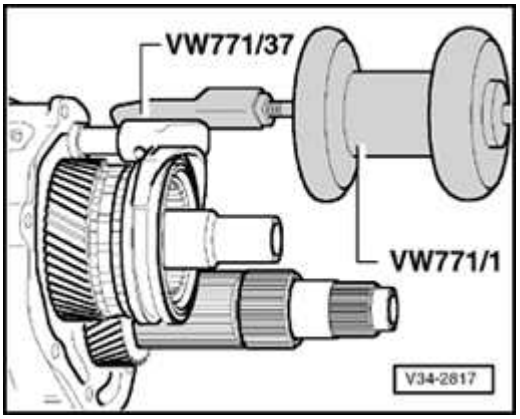


Fig. 173: Pulling Off Yoke Together With Selector Fork And Locking Collar From Selector Rod
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull follower together with selector fork and locking collar off selector rod.

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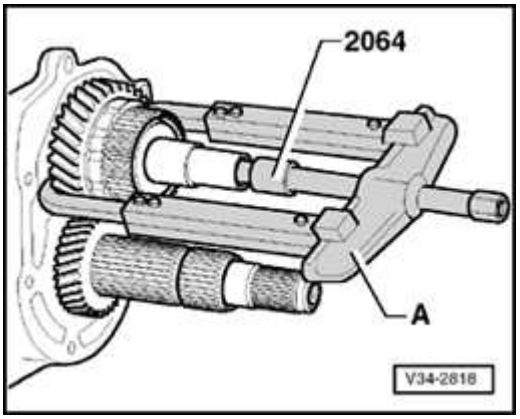


Fig. 174: Pull Off 6th Gear Selector Gear, 6th Gear Synchronizer Ring, 5th And 6th Gear Synchronizer Hub And Needle Bearing Inner Race For 5th Gear Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off 6th sliding gear, synchro-ring for 6th gear, synchro-hub for 5th and 6th gears and inner race for 5th sliding gear needle bearing.

A - Two-arm puller, e.g. Kukko 20/10 with 200 mm hooks

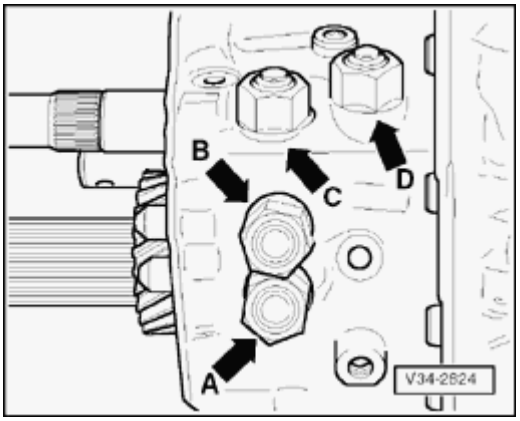


Fig. 175: Identifying Locking Bolts For Selector Rods
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew selector rod locking bolts.

A - 1st and 2nd gear

B - 3rd and 4th gear

C - 5th and 6th gear

D - Reverse gear

- Drive out dowel sleeves on bearing plate and remove bearing plate from transmission housing.

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- Secure drive pinion opposite hollow shaft e.g. with hose strap, to prevent it slipping out.
- Detach bearing plate with input shaft, drive pinion and hollow shaft and with shift lever mechanism in transmission from transmission housing.

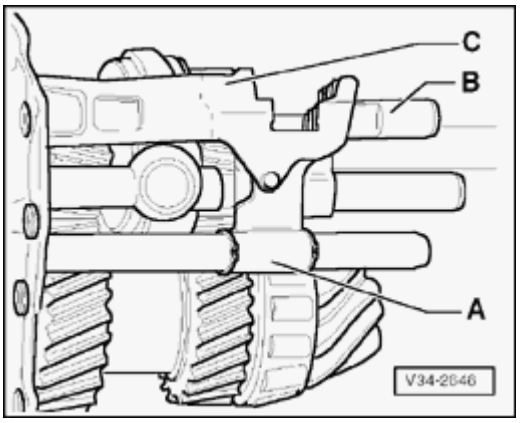


Fig. 176: Identifying Yoke, 5th and 6th Gear Selector Rod , and Reverse Gear Yoke
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip from selector rod for 1st and 2nd gear and remove follower -A-.
- Pull out selector rod -B- for 5th and 6th gear.
- Remove follower -C- for reverse gear.

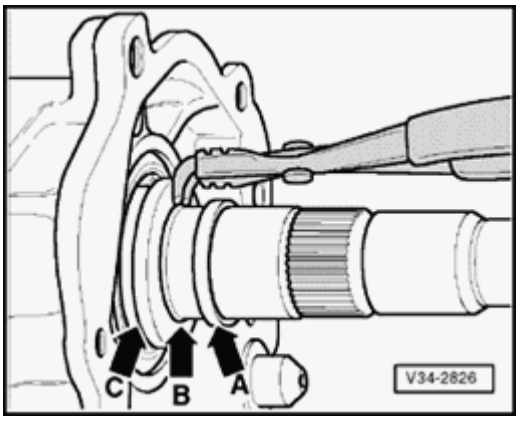


Fig. 177: Removing/Installing Inner Race For Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull thrust washer -arrow A- for needle bearing for 6th gear off shaft.
- Remove circlip -arrow B- for cylinder roller bearing inner race with pliers.
- Take out inner race -arrow C- for cylinder roller bearing (not a press fit).

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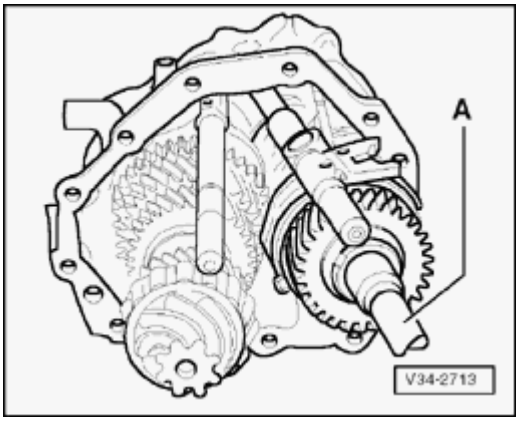


Fig. 178: Removing/Installing Input Shaft With 3rd and 4th Gear Selector Rod And Selector Fork
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Take input shaft -A- with selector rod and selector fork for 3rd and 4th gear out at an angle from bearing plate.

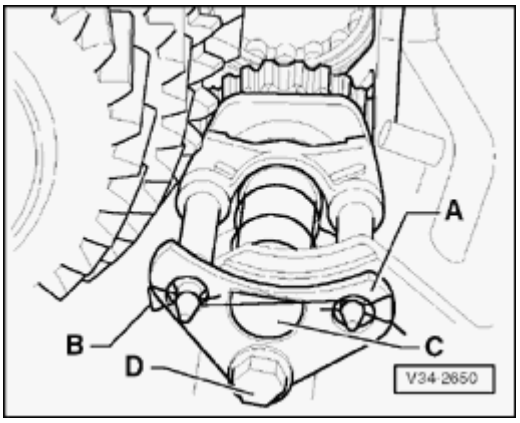


Fig. 179: Removing/Installing Reverse Gear Relay Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew hexagon bolt -D-, remove spring clasp -B- and retaining plate -A-, pull out shaft -C- for reverse idler gear.
- Take out spring, synchro-ring and reverse idler gear.
- Remove relay lever for reverse gear.

NOTE:

- **Drive pinion and hollow shaft can be removed complete if it is possible to easily lever off 6th gear wheel.**
- **If, however, it is necessary to press off 6th gear wheel, the drive pinion must be pulled out from hollow shaft.**

- Remove temporary locking element preventing drive pinion from slipping out.

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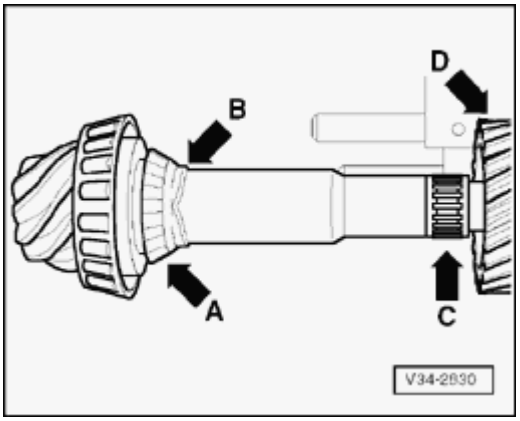


Fig. 180: Identifying Pinion, Hollow Shaft , Taper Rollers, Waved Washer And Needle Bearing Cage
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull drive pinion out of hollow shaft -D- collect taper rollers -A- (23 off) when carrying out this step.
- Remove corrugated spring -B- and needle roller assembly -C-.

NOTE: Carefully protect mount from contamination, clean if necessary.

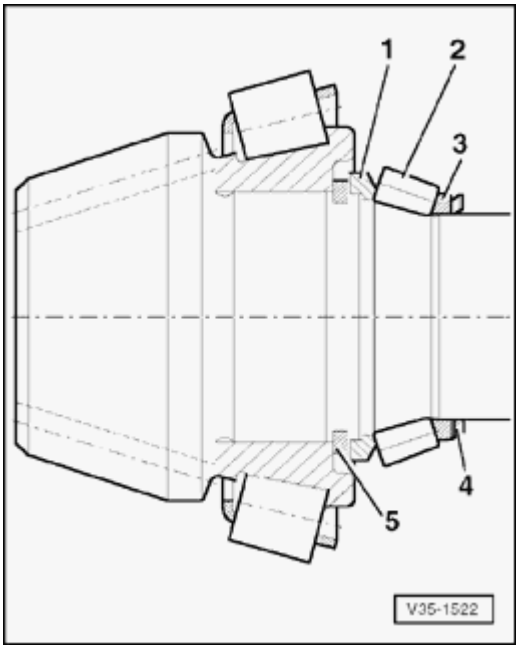


Fig. 181: Checking Pinion/Hollow Shaft Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check drive pinion/hollow shaft bearing.

1 - Flange ring (conical contact surface facing taper rollers)

2 - Taper rollers (23 off) with large diameter facing drive pinion head

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3 - Supporting ring (conical contact surface facing taper rollers)

4 - Corrugated spring

5 - Circlip for taper roller bearings for drive pinion

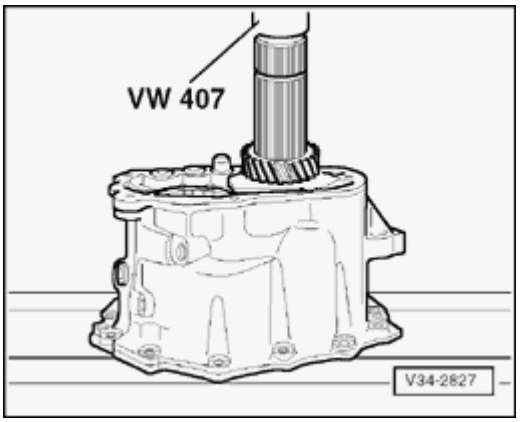


Fig. 182: Pressing Off Drive Gear For 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing off 6th gear wheel

NOTE: Because of the type of fit, it may be possible to press gear off easily.

- Remove hollow shaft or drive pinion and hollow shaft from bearing plate together with selector rod and selector fork for 1st and 2nd gears.

Assembling

- Install hollow shaft with selector fork and selector rod for 1st and 2nd gear (without follower) into bearing plate.

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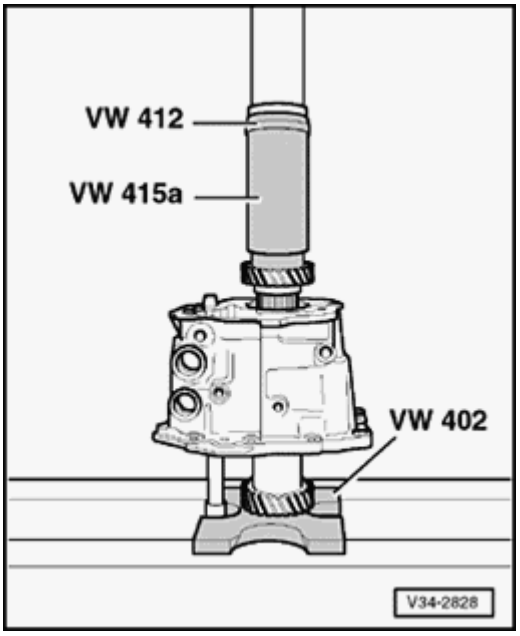


Fig. 183: Press On To Stop So That There Is No Play
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 6th gear to approx. 100 ° C and install.
- Installation position: Shoulder toward taper roller bearing

WARNING: Wear protective gloves!

- Press fully in until zero play.
- Insert taper roller bearing of drive pinion/hollow shaft with multi-purpose grease.
- Arrangement: Refer to **Fig. 181**

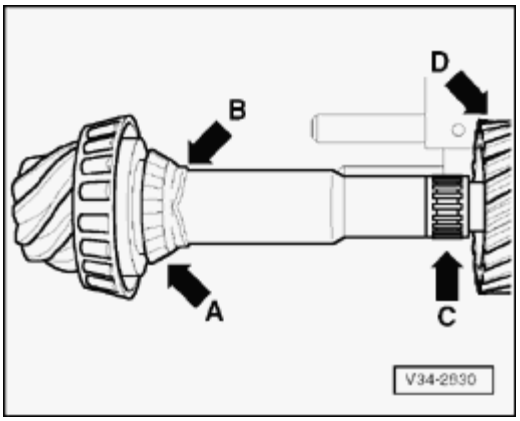


Fig. 184: Identifying Pinion, Hollow Shaft , Taper Rollers, Waved Washer And Needle Bearing Cage
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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A - Flange ring, taper roller (23 off) and supporting ring

B - Corrugated spring

C - Needle roller assembly

D - Hollow shaft

- Oil needle bearing well.
- Insert drive pinion into hollow shaft and secure with hose strap, to prevent it from slipping down.

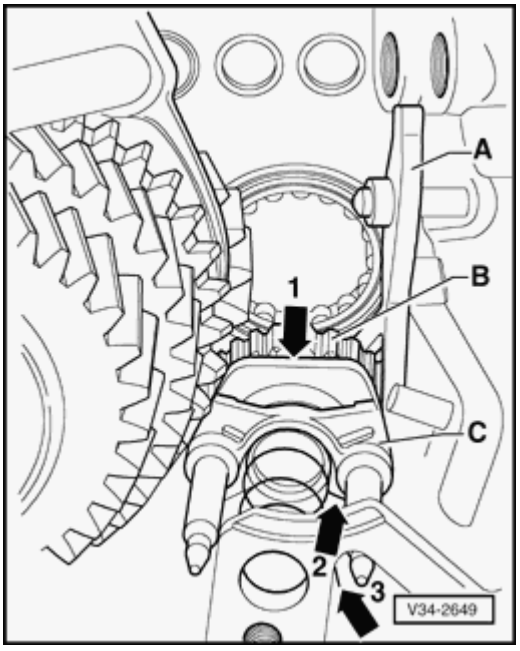


Fig. 185: Install Synchronizer Ring
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install relay lever -A- for reverse gear over relay lever bolt. paying attention to pin (for limiting movement of relay lever relevant to synchro-ring).
- Insert reverse idler gear -B- and engage relay lever with groove on reverse idler gear.
- Insert synchro-ring -C-.

- Installation position: Position flat on synchro-ring circumference to face input shaft (not as yet installed) - arrow 1-.

- Insert spring.

- Installation position: Hook single angled end into recess on synchro-ring -arrow 2-. Turn double angled end anti-clockwise and insert into opening on bearing plate -arrow 3-.

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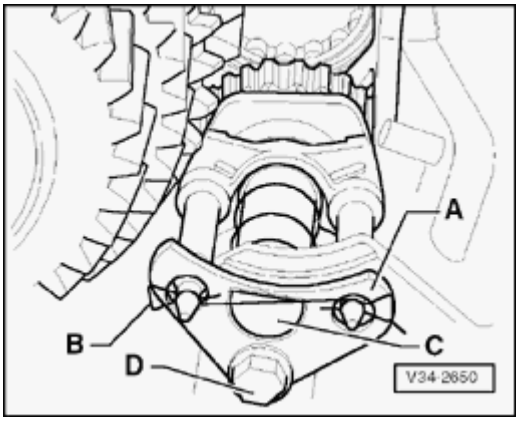


Fig. 186: Removing/Installing Reverse Gear Relay Lever
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert shaft for reverse idler gear -C-.
- Install retaining plate -A-.

- Installation position: Chamfers of holes for locking pins of synchro-ring face bearing plate

- Insert spring clasp -B- into locking pins of synchro-ring.
- Replace self-locking nut -D- and tighten to 25 Nm.

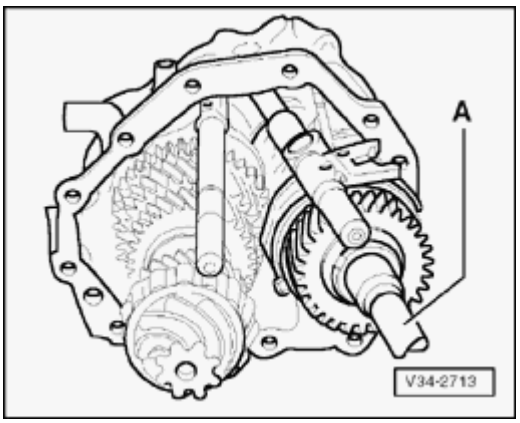


Fig. 187: Removing/Installing Input Shaft With 3rd and 4th Gear Selector Rod And Selector Fork
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide input shaft -A- with selector rod and selector fork for 3rd and 4th gear at an angle into bearing plate.

- Selector fork installation position: Rib toward follower. Refer to **Input shaft, drive pinion, hollow shaft and shift lever mechanism in transmission, removing and installing**, Item 4-

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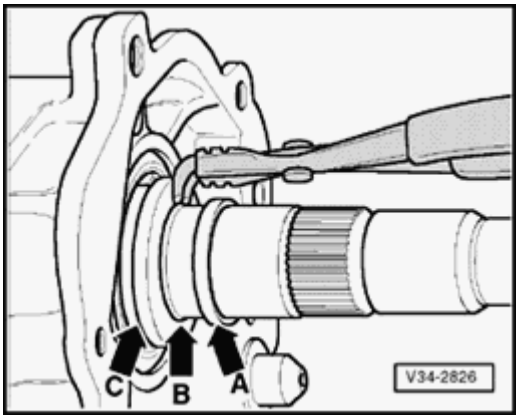


Fig. 188: Removing/Installing Inner Race For Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press inner race -arrow C- for cylinder roller bearing onto input shaft.
- Install circlip -arrow B- using pliers.

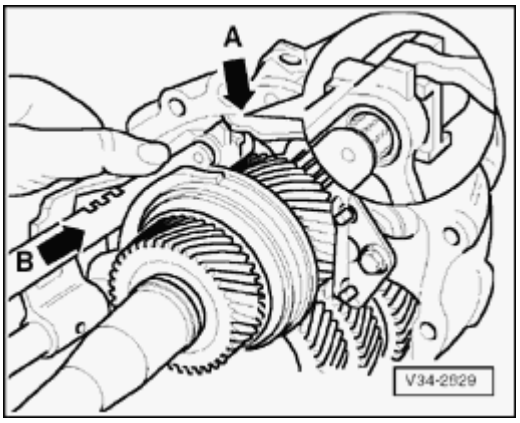
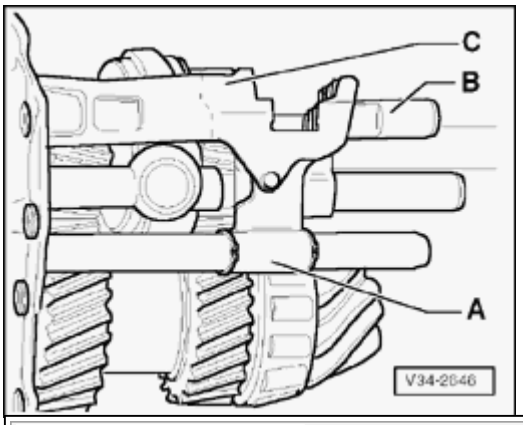


Fig. 189: Engage Free End Of Relay Lever Into Notch In Reverse Gear Yoke
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Engage recess in follower for reverse gear with the free end of relay lever -arrow A-.
- Slide selector rod for 5th and 6th through follower for reverse gear in direction of -arrow B-.



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Fig. 190: Identifying Yoke, 5th and 6th Gear Selector Rod , and Reverse Gear Yoke
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide follower -A- for 1st and 2nd gear onto selector rod and secure with circlips.
- Lubricate selector rods and all bearings of input shaft and drive pinion in transmission housing and bearing plate with gear oil.

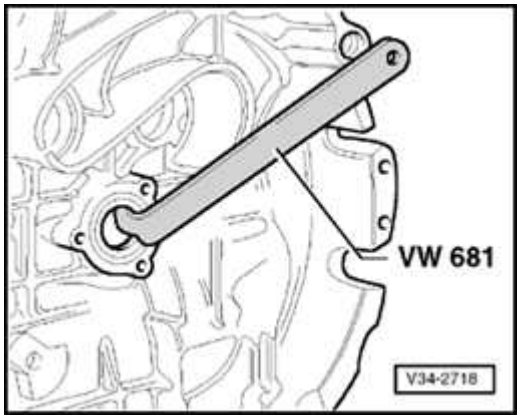


Fig. 191: Prying Input Shaft Seal Out Of Disassembled Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lever used input shaft seal carefully out of transmission housing with VW 681.
- Coat sealing surfaces between bearing plate and transmission housing with sealing paste AMV 188 001 02.
- Insert complete bearing plate into transmission housing.

NOTE: When inserting the complete bearing plate, ensure that the selector rods align with their mounting points.

- Drive in 2 dowel sleeves for bearing plate/transmission housing.
- Tighten bolts in diagonal sequence to 25 Nm.

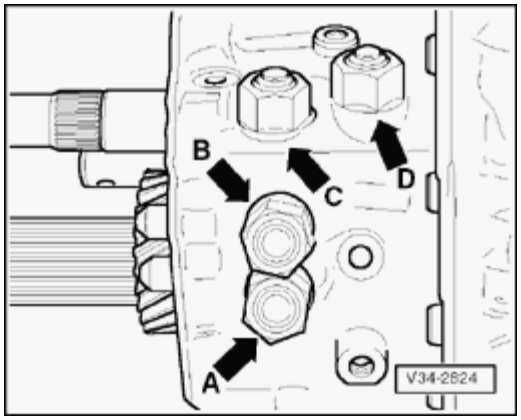


Fig. 192: Identifying Locking Bolts For Selector Rods

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert locking bolts for selector rods with sealing paste AMV 188 001 02 and tighten to 50 Nm.

A - 1st and 2nd gear

B - 3rd and 4th gear

C - 5th and 6th gear

D - Reverse gear

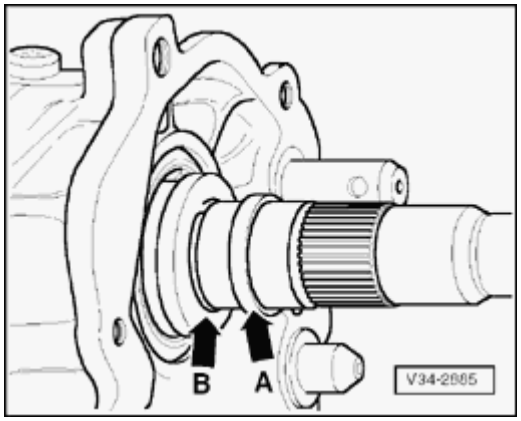


Fig. 193: Identifying Thrust Washer
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install thrust washer -arrow A- for needle bearing for 6th gear.

- Installation position: Shoulder toward circlip -arrow B-, smooth contact surface to shaft end

- Lubricate needle bearing for 6th sliding gear with gear oil and install.
- Slide on 6th sliding gear with spring and synchro-ring.

- Installation position: The lugs of synchro-ring engage into recesses below in sliding gear.

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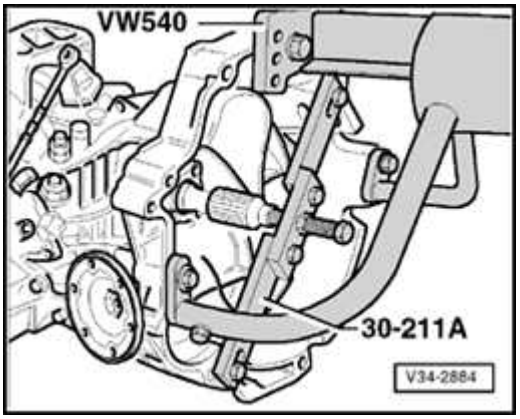


Fig. 194: Supporting Input Shaft With Bracket 30-211 A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Support input shaft with support bridge 30-211 A.

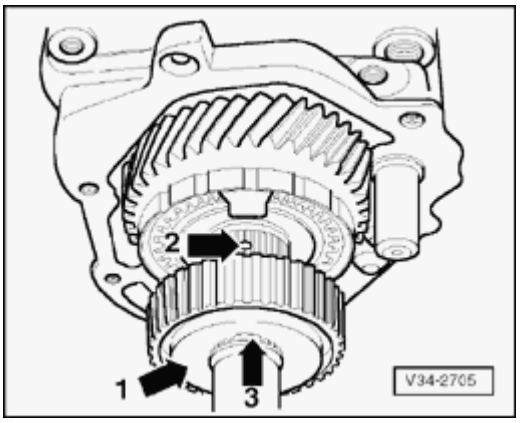


Fig. 195: Installation Location Of Synchronizer Hub For 5th and 6th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of 5th and 6th gear synchro-hubs:

- Side with projecting face -arrow 1- faces shaft end.
- The input shaft oil bore -arrow 2- and the synchro-hub oil groove -arrow 3- are aligned.

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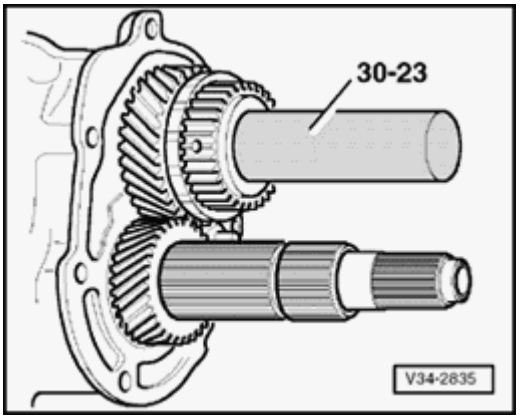


Fig. 196: Driving On 5th and 6th Gear Synchronizer Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat synchro-hub for 5th and 6th gears to approx. 100 ° C, install and drive on up to stop.

  WARNING: Wear protective gloves!

- Check 6th sliding gear for axial play.

- Permissible axial play: 0.15 to 0.35 mm

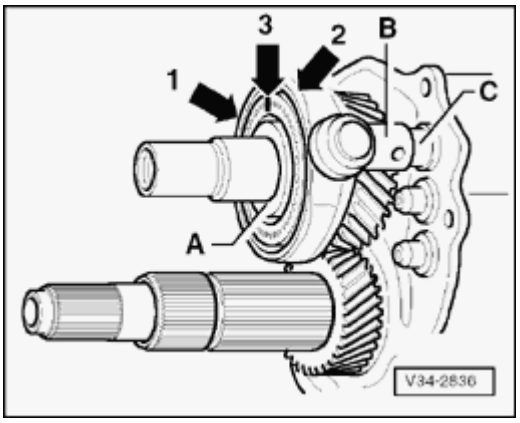


Fig. 197: Alignment Marks On, Locking Collar For 5th and 6th Gear And Synchronizer Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align markings -arrow 3- on paired synchro -hub -A- and locking collar for 5th and 6th gears -arrow 1-.
- Install locking collar -arrow 1- with selector fork -arrow 2- onto synchro-hub -A-, and at the same time install follower for 5th and 6th gears -B- onto selector rod -C-.

NOTE:

- **Selector fork rib -arrow 2- must face toward shaft end.**
- **When sliding follower onto selector rod for 5th and 6th gear, note holes for spring pin.**

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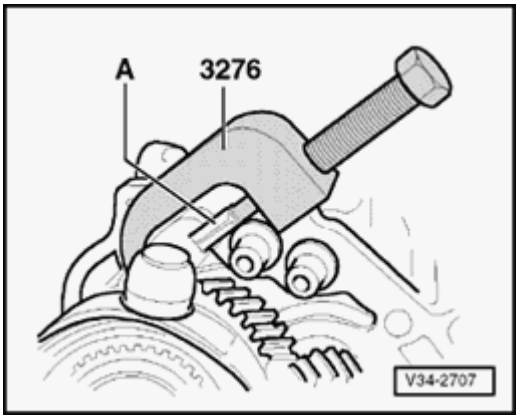


Fig. 198: Pressing In Spring Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in spring pin -A- flush.

NOTE:

- **Do not drive in spring pin, otherwise selector rod bearing will be damaged.**
- **Mount spring pin groove in direction of force as shown in illustration.**

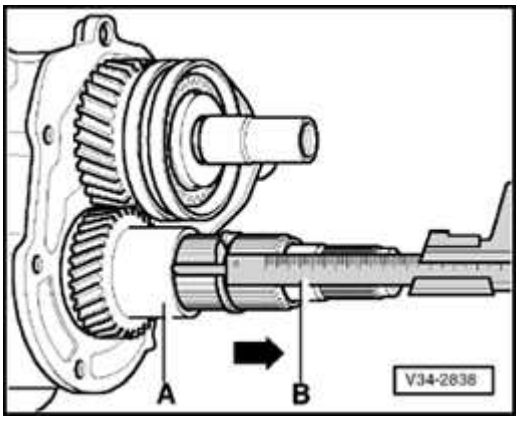


Fig. 199: Determine Shim For 5th Gear Drive Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Re-determine shim for 5th gear wheel:

- Install spacer sleeve -A- (length 39.6 mm) onto hollow shaft.
- When installing circlip, press indirection of arrow until fully home.
- Measure size between sleeve and installed circlip using depth gauge -B-.

The following shims are available

Measured range (mm)	Shim thickness (mm)
31.01 to 31.11	1.05
31.11 to 31.21	1.15

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31.21 to 31.31	1.25
31.31 to 31.41	1.35

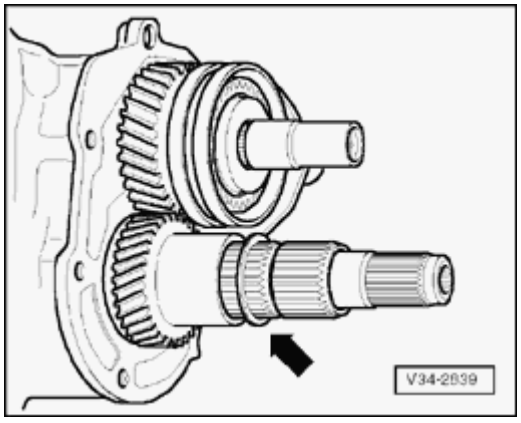


Fig. 200: Set Selected Shim Onto Hollow Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install selected size of shim -arrow- onto hollow shaft.

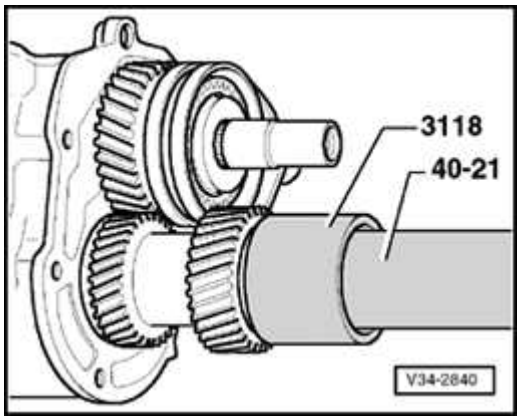


Fig. 201: Driving On 5th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 5th gear to approx. 100 ° C, install and drive on up to stop.
- Installation position: Shoulder toward spacer sleeve

WARNING: Wear protective gloves!

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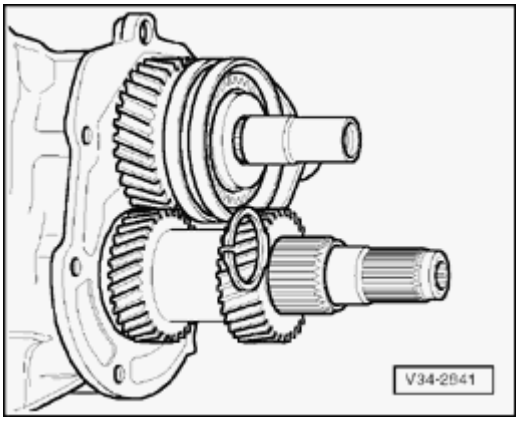


Fig. 202: Redetermine Shim For 5th Gear Drive Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Re-determine circlip for 5th gear wheel:
- Determine and attach the thickest 2nd circlip that will still just fit.

Available circlips

Circlip thickness (mm)		
2.32	2.40	2.48
2.34	2.42	2.50
2.36	2.44	
2.38	2.46	

- Install circlip.

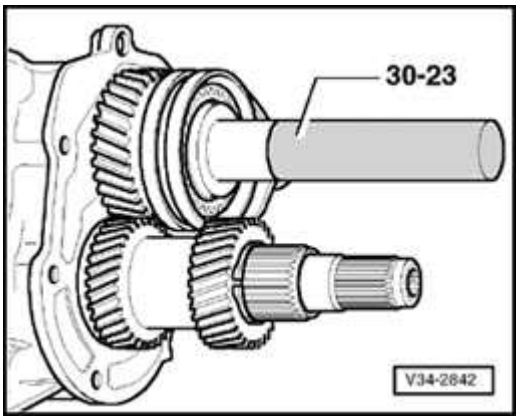


Fig. 203: Drive On Inner Race Of Needle Bearing For 5th Gear Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive on inner race for 5th sliding gear free of axial play.
- Oil needle bearing with gear oil and install.

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- Place synchro-ring for 5th gear in locking collar.
- Slide on 5th sliding gear with spring.

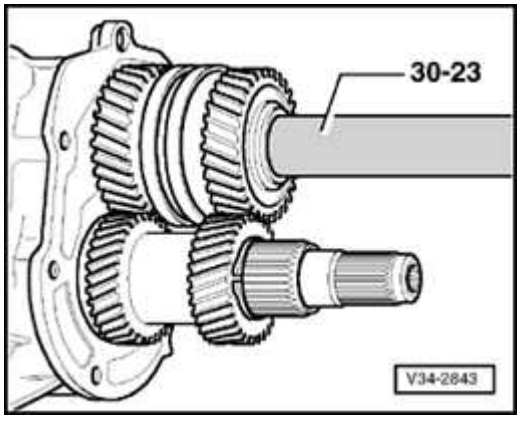


Fig. 204: Installing 1st Inner Race For Four-Point Bearing For Input Shaft Onto Input Shaft And Drive On Up To Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat 1st inner race for four-point bearing (ball bearing side) for input shaft to approx. 100 ° C, install onto input shaft and drive on up to stop.

WARNING: Wear protective gloves!

- Check 5th sliding gear for axial play.

- Permissible axial play: 0.15 to 0.35 mm

- Insert dowel sleeves into bearing plate.
- Install new gasket for end cover.

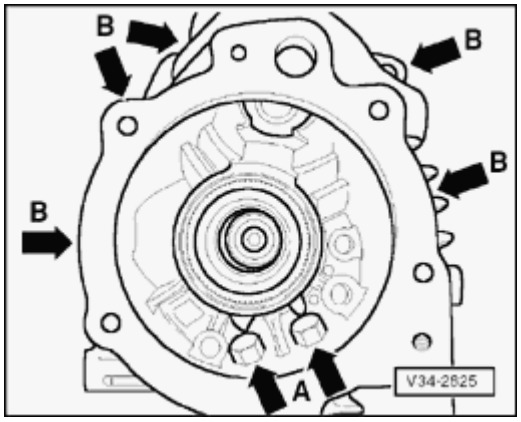


Fig. 205: Identifying Magnets -A - And End Cover Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Install end cover and insert securing bolts -arrows B-.

NOTE: Do not tighten bolts at this stage.

- Clean 2 magnets -arrow A- and insert.
- Insert supporting plate. Refer to **Fig. 166** and tighten by hand.

- Installation position: Lugs face magnets.

- Tighten bolts for end cover in diagonal sequence.

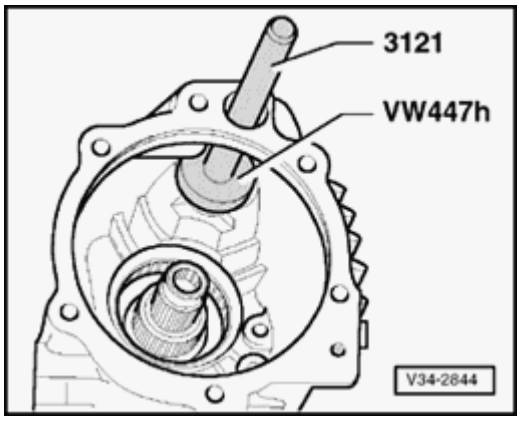


Fig. 206: Installing 2nd Inner Race Of The 4-Point Bearing (Roller Bearing Side)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lubricate 2nd inner race for four-point bearing (roller bearing side) and insert onto input shaft with track for ball facing four-point bearing of input shaft and drive over hole in end cover.

- Remove support bridge 30-211 A.

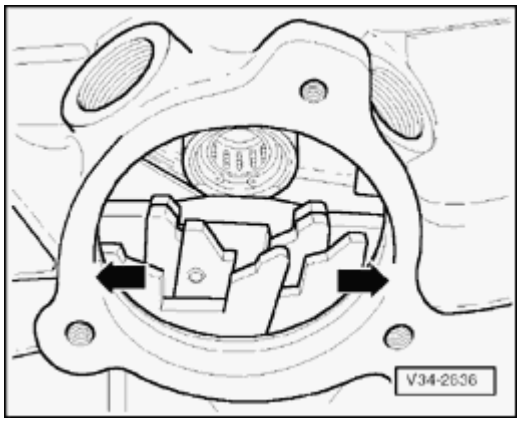


Fig. 207: Lock Input Shaft By Engaging 2 Gears (E.G. Reverse And 2nd Gear) By Moving 2 Selector Rails
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Lock input shaft by engaging 2 gears (e.g. reverse and 2nd gear) do this by moving 2 selector plates -arrows-.
- Tighten multi-point socket head bolt to 150 Nm.
- Check neutral position of followers.

- Gear gates must align.

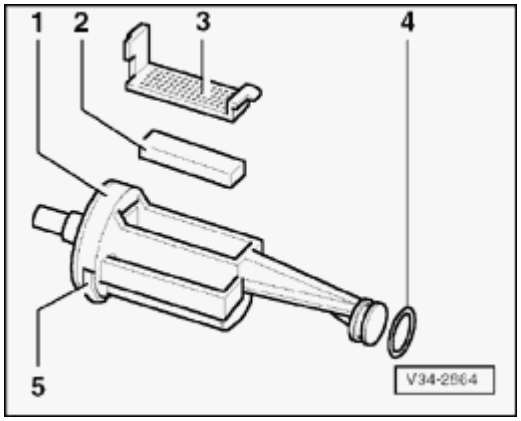


Fig. 208: Identifying Oil Diverter
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use screwdriver to unclip cover for oil collector -3- from oil collector -1- at long end and remove magnet -2-.

4 - O-ring

5 - Positioning segment

- Clean oil collector.
- Assemble oil collector.

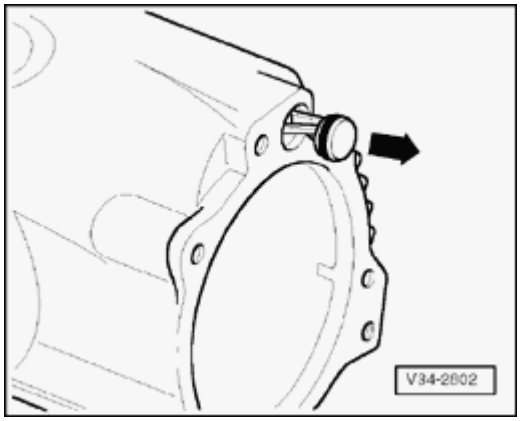


Fig. 209: Identifying Oil Diverter At End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Guide oil collector, with supporting arm ahead, from interior of end cover through hole of end cover sufficiently far -arrow-, so that the new O-ring can be installed onto oil collector from outside.

- Lightly oil new O-ring and insert.
- Insert oil pipe of oil collector in input shaft.

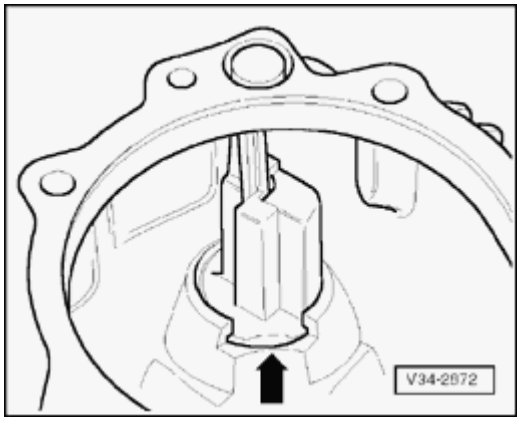


Fig. 210: Turning Oil Diverter Until Positioning Segment Lies In The Recess Of End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Rotate oil collector until positioning segment is positioned in milled recess of end cover -arrow-.
- Press in oil collector onto stop.

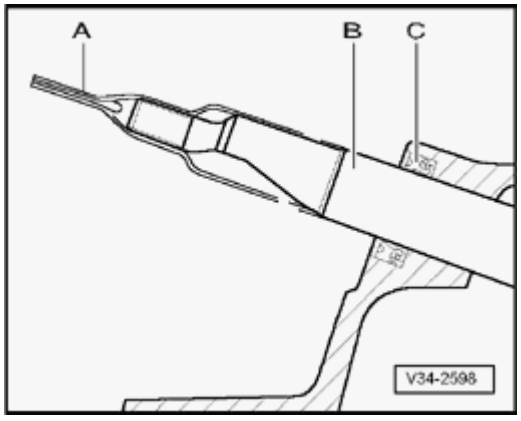


Fig. 211: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Slide assembly sleeve -A-, Part No. 01E 311 120, onto selector shaft -B-.
- Install complete selector shaft.

- Installation position: Flat of selector shaft faces downward

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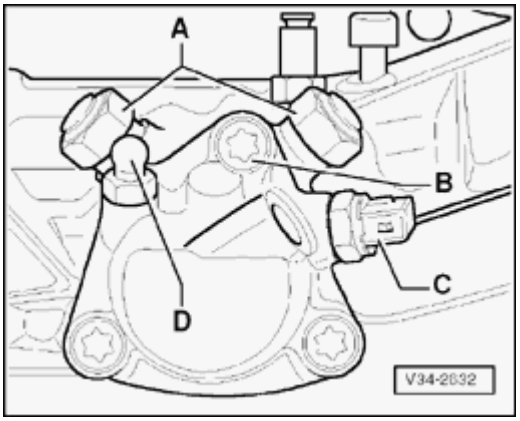


Fig. 212: Identifying Locking Bolts And Selector Shaft Cover & Fasteners
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert locking bolts -A- for selector rod with sealing paste AMV 188 001 02 and tighten to 50 Nm.
- Lightly oil new O-ring for selector shaft cover and install.
- Install cover for selector shaft.
- Install bolts -B- (x 3) with sealing paste AMV 188 001 02 and tighten to 25 Nm.
- Push Torsen differential onto splines of hollow shaft.

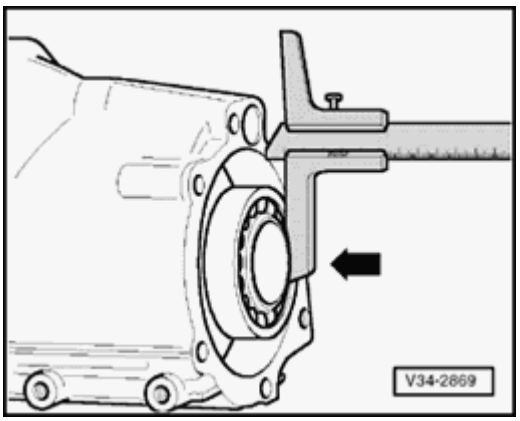


Fig. 213: Determine Required Shim(s), Press Torsen Differential In Direction Of Arrow
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press Torsen differential in direction of arrow; measure distance between top edge of bolted end cover and front edge of outer race of ball bearing for Torsen differential.
- Determine shim(s) required according to table.

The following adjustment shims are available:

Measured range mm	Qty.	Shim thickness (mm)
7.05 to 7.30	1	1.65

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	1 1	1.45 1.20
7.30 to 7.55	1 1 1	1.65 1.45 0.95
7.55 to 7.80	1 1 1	1.65 1.45 0.70
7.80 to 8.05	1 1 1	1.65 1.45 0.45
8.05 to 8.25	2	1.65
8.25 to 8.50	1 1	1.65 1.45
8.50 to 8.75	1 1	1.65 1.20

Measured range mm	Qty.	Shim thickness (mm)
8.75 to 9.00	1 1	1.65 0.95
9.00 to 9.25	1 1	1.65 0.70
9.25 to 9.50	1 1	1.65 0.45

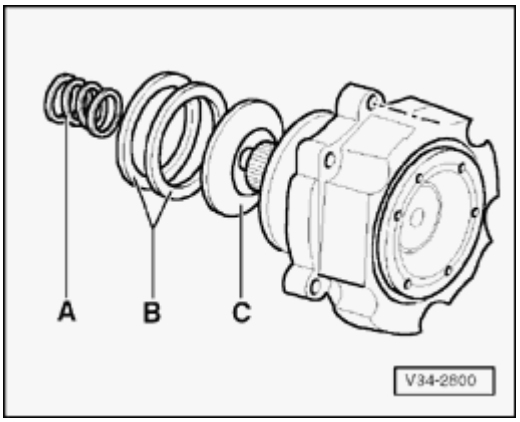


Fig. 214: Bearing Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert dished washer -C- into bearing housing.
- Installation position: Large diameter (concave side) facing shims
- Install shims determined from table -B-.

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- Install spring -A- onto end of flanged shaft.
- Lightly oil new O-ring for bearing housing and insert.
- Oil small needle bearing in drive pinion.

- Insert complete bearing housing and pre-tighten evenly.
- Tighten bolts in diagonal sequence.
- Pack space between sealing lip and dust lip of new seal for input shaft with sealing grease.
- Pull a thin protective hose tightly onto splines of input shaft.

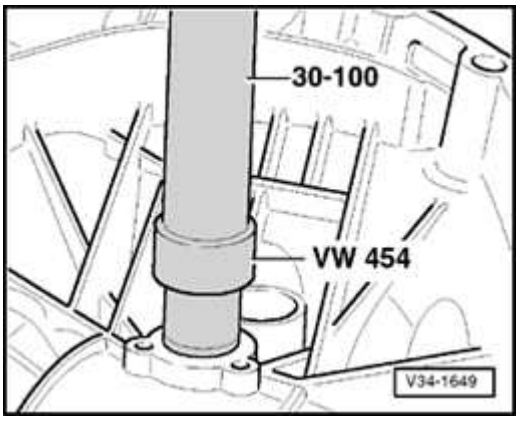


Fig. 215: Installing Shaft Seal For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tap in input shaft seal.

- Insertion depth: 3.5 mm

NOTE: Insertion depth for repairs is 4.5 mm when a used input shaft is employed.

- Remove protective hose.
- Install release bearing, clutch release lever and guide sleeve. Refer to **Clutch release mechanism, servicing**.
- Select all gears.
- Install connecting rod.

- Top off manual transmission with gear oil and check oil level. Refer to **Transmission oil level, checking**.

BEARING HOUSING, DISASSEMBLING AND ASSEMBLING

Bearing housing, disassembling and assembling

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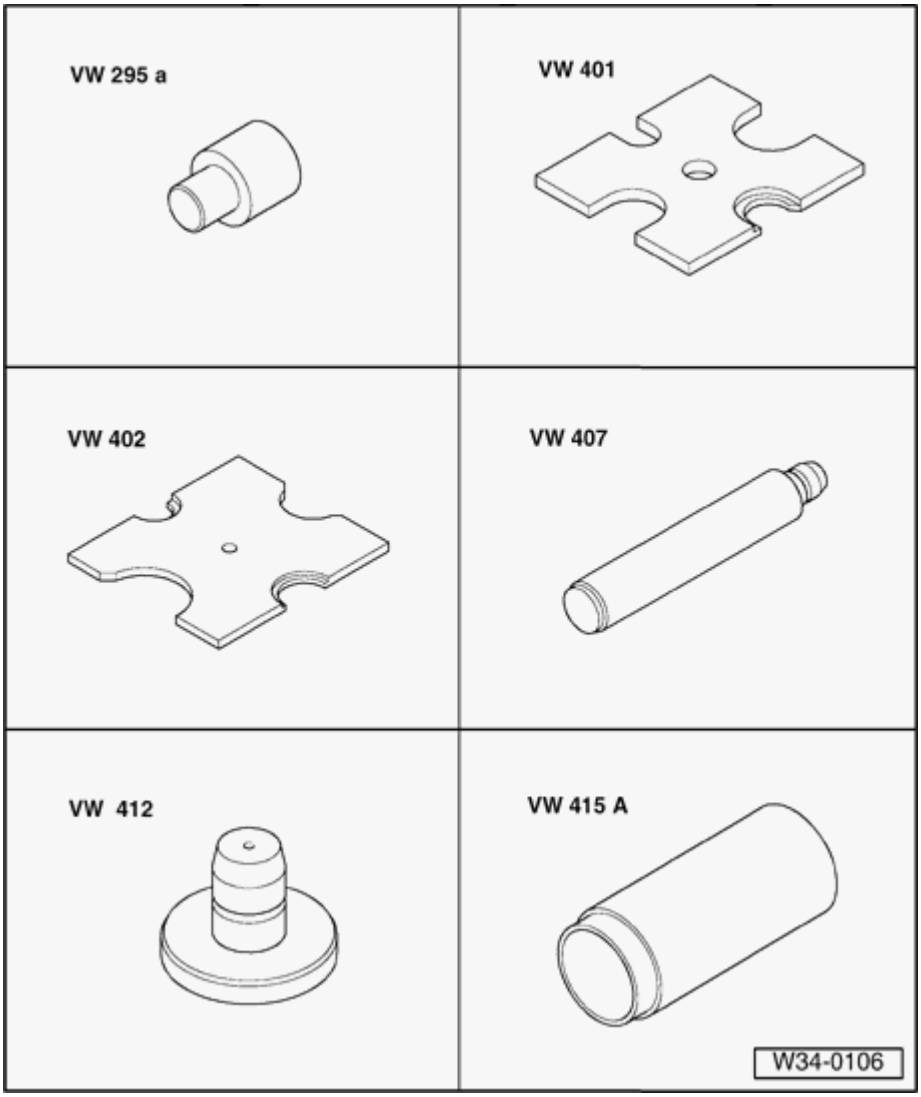


Fig. 216: Identifying Special Tools - Bearing Housing, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 295a Adapter
- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 412 Thrust tool
- VW 415 A Tube

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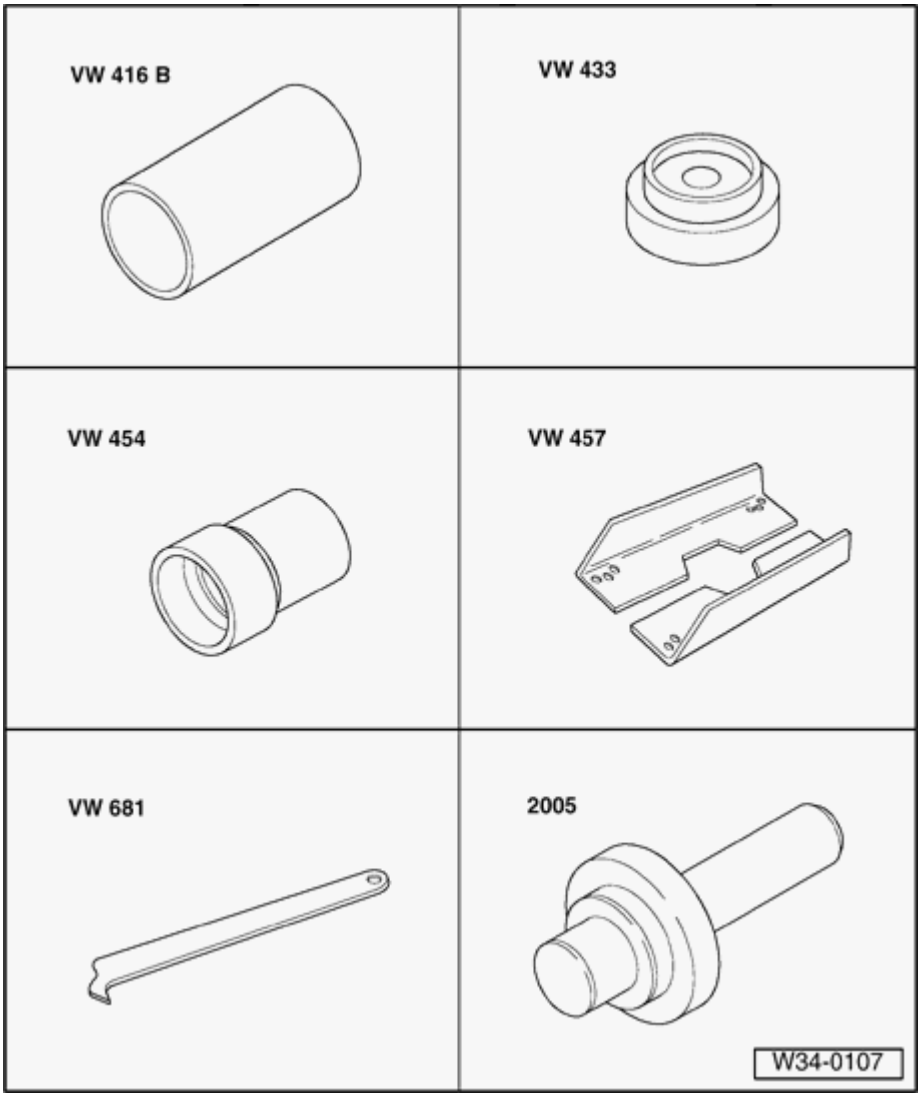


Fig. 217: Identifying Special Tools - Bearing Housing, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 416 B Tube
- VW 433 Thrust pad
- VW 454 Thrust pad
- VW 457 Mounting rail
- VW 681 Seal extractor
- 2005 Drift

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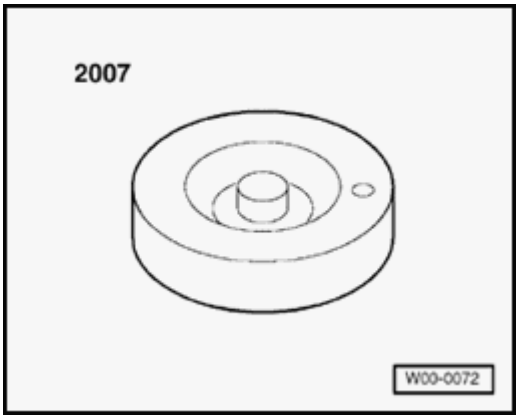


Fig. 218: Thrust Pad 2007
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Thrust pad 2007
- Adjustment shim Part No. 016 311 391 B

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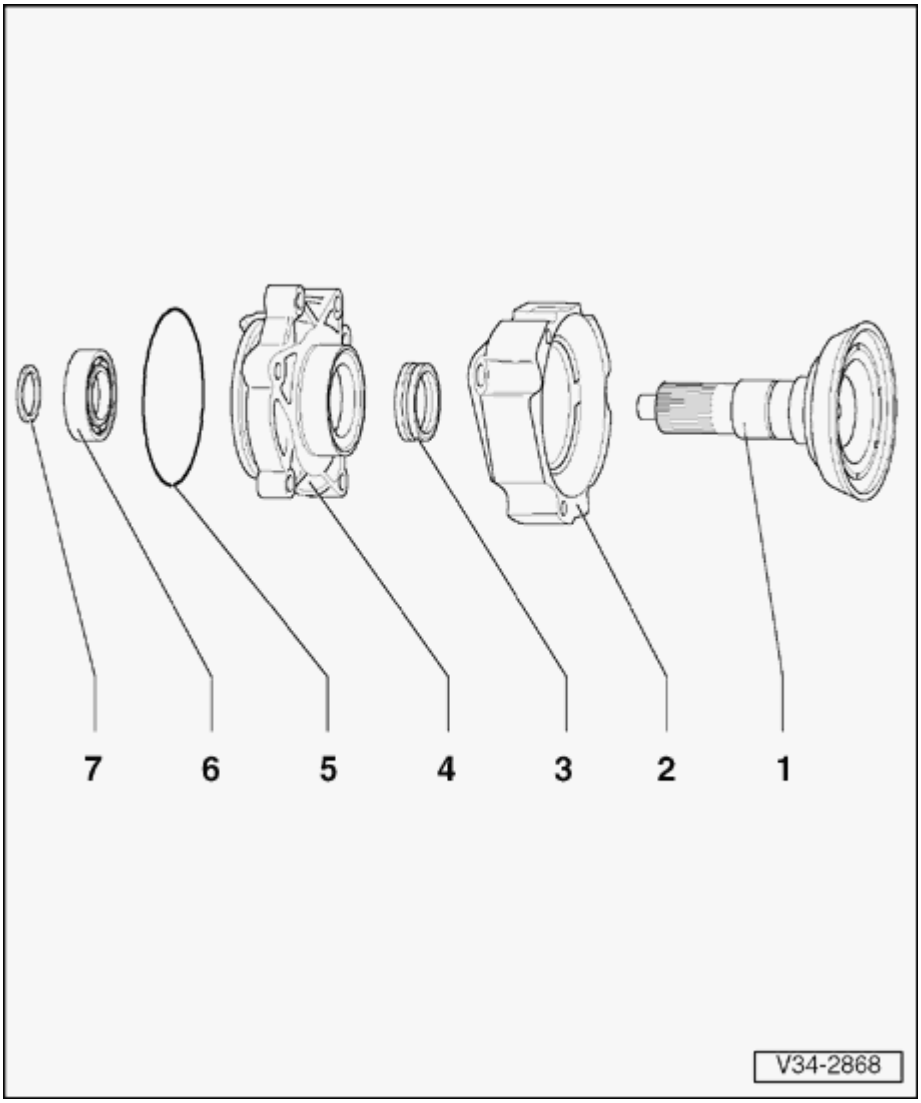


Fig. 219: Bearing housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Flanged shaft

- Pressing out. See **Pressing out flanged shaft**
- Pressing in. See **Pressing cylinder roller bearing for input shaft into end cover**

2 - Vibration damper

- Pressing off. See **Pressing off vibration damper**
- Pressing on. See **Pressing on vibration damper**

3 - Seal

- Pulling out. See **Removing seal**

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- Preparing for installation. See **Preparing seal for installing**
- Tapping in. See **Inserting seal**

4 - Bearing housing

5 - O-ring

- Replace
- Coat lightly with gear oil when installing

6 - Ball bearing

- For flanged shaft
- Pressing out. See **Pressing out ball bearing for flanged shaft**
- Pressing in. See **Pressing in ball bearing for flanged shaft**

7 - Circlip

Pressing out flanged shaft

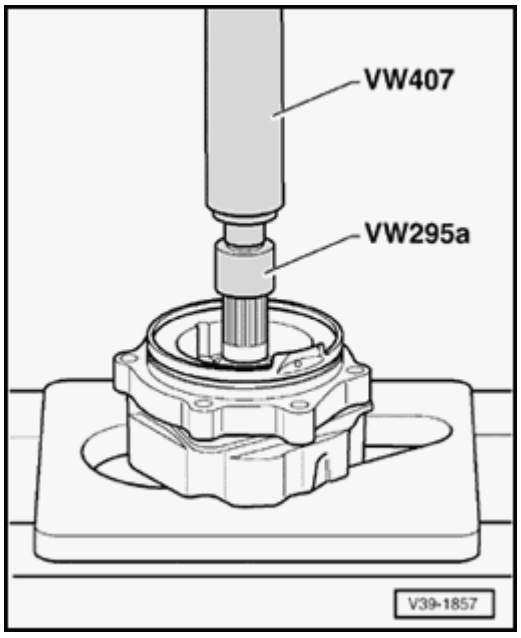


Fig. 220: Pressing Out Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip before pressing out flanged shaft.

Pressing in flanged shaft

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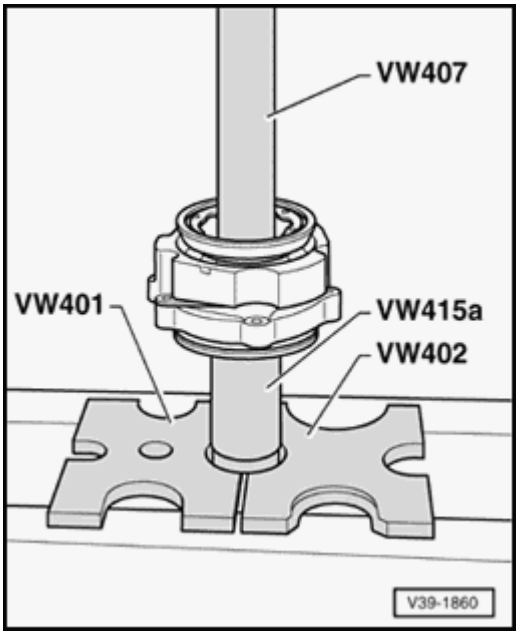


Fig. 221: Pressing In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press on vibration damper before pressing in flanged shaft. See **Pressing on vibration damper**.
- Install circlip.

Pressing off vibration damper

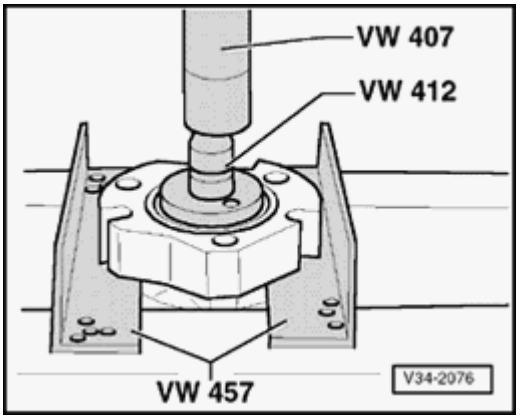


Fig. 222: Pressing Off Vibration Damper
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing on vibration damper

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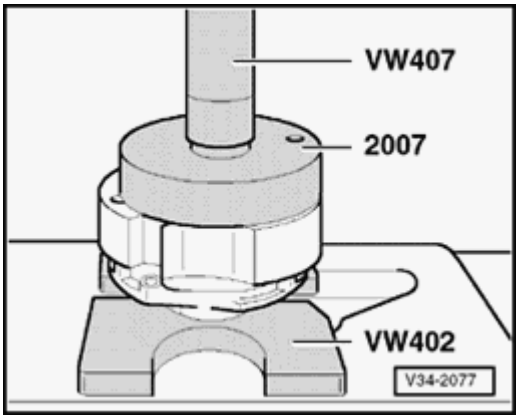


Fig. 223: Pressing On Vibration Damper
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: Observe position of holes.

Removing seal

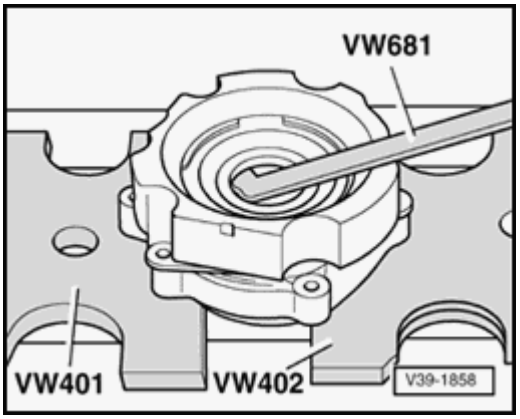
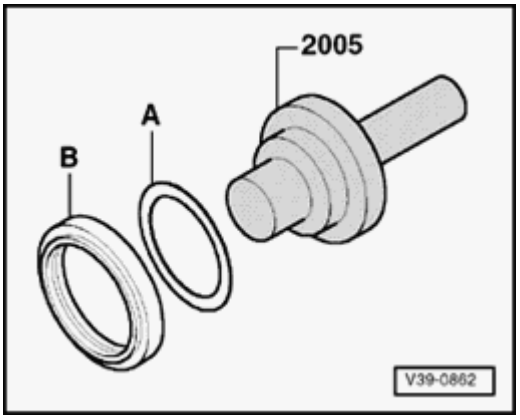


Fig. 224: Pulling Out Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Preparing seal for installing



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Fig. 225: Preparing Seal For Installation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Washer

Part no. 016 311 391 B (1.7 mm thick)

B - Seal

- Pack space between sealing and dust lips half full with sealing grease.
- Install washer and seal onto tool as illustrated.

- Installation position: Open side of seal faces toward bearing housing

Inserting seal

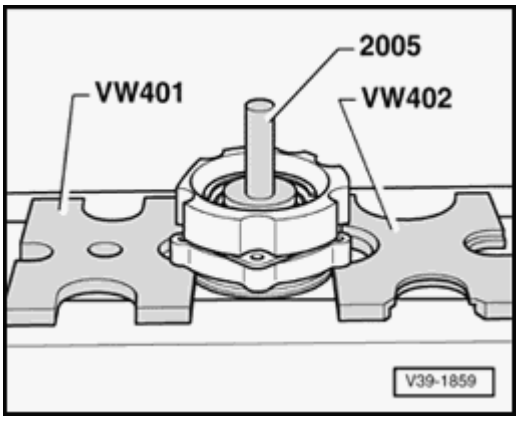


Fig. 226: Driving In Flange Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove washer.

Pressing out ball bearing for flanged shaft

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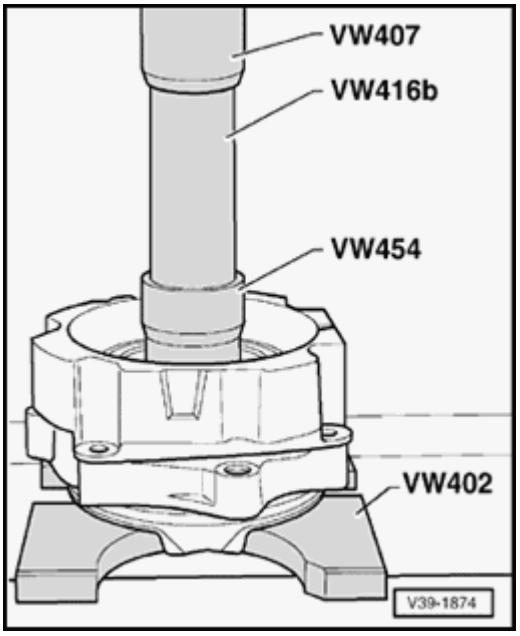


Fig. 227: Pressing On Grooved Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing in ball bearing for flanged shaft

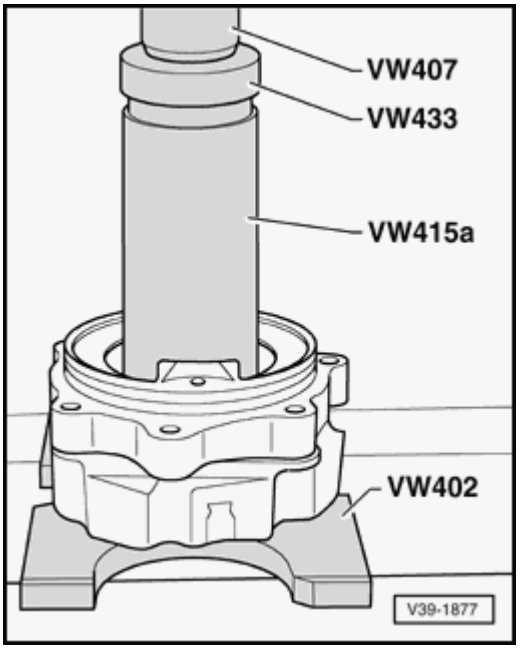


Fig. 228: Pressing In Grooved Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

MOUNT FOR TORSEN DIFFERENTIAL, SERVICING

Mount for Torsen differential, servicing

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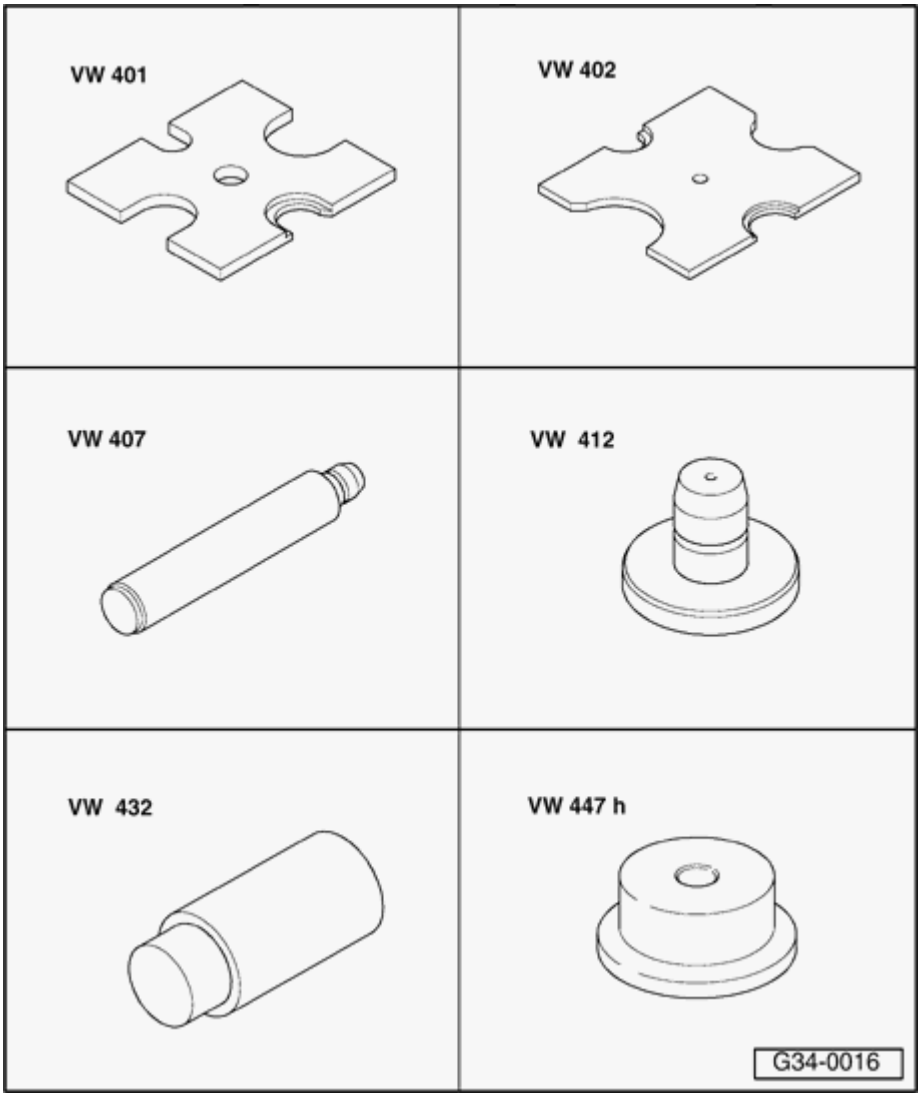


Fig. 229: Identifying Special Tools - Mount For Torsen Differential, Servicing (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 412 Thrust tool
- VW 432 Thrust pad
- VW 447 H Thrust pad

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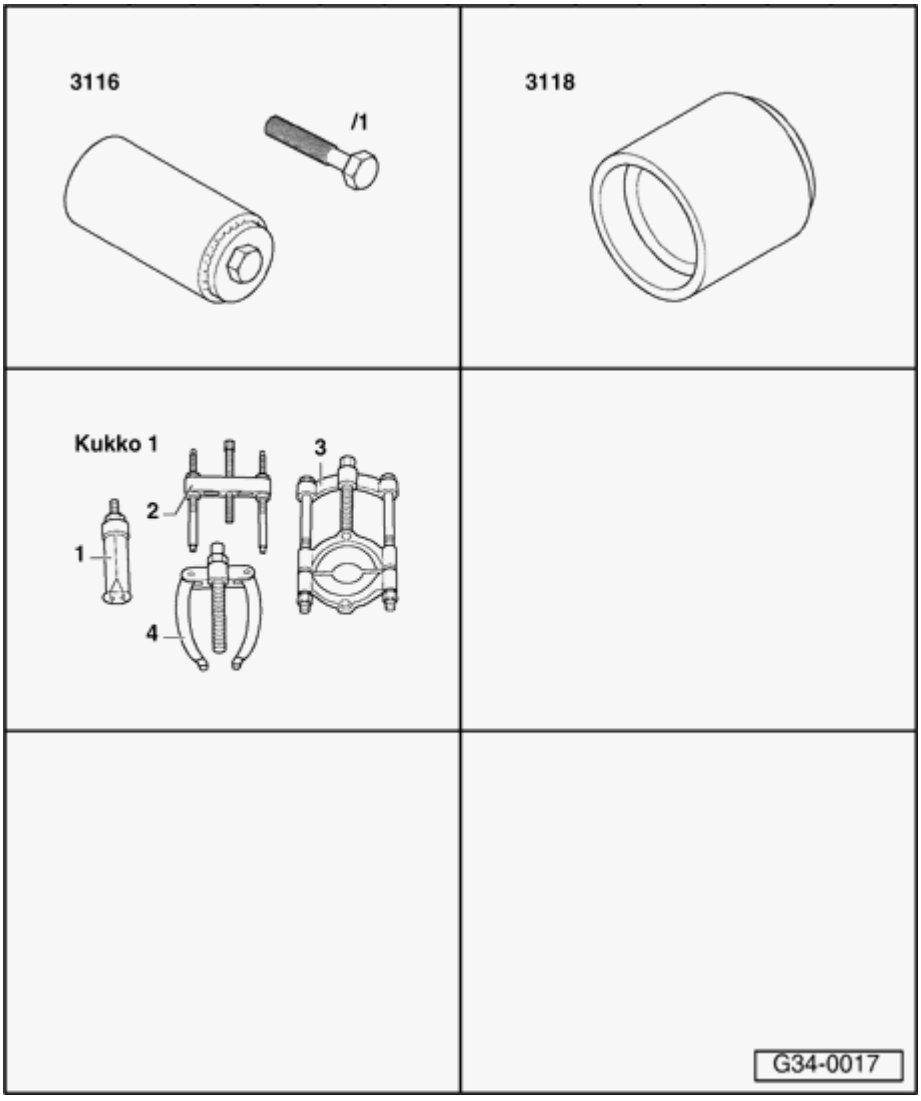


Fig. 230: Identifying Special Tools - Mount For Torsen Differential, Servicing (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3116 Spring pin
- 3118 Thrust piece
- 1 - Kukko 21/5 Internal puller
- 3 - Kukko 17/2 Separating tool
- 4 - Kukko 22/1 Counter support

NOTE: The shims for Torsen differential have to be re-determined after replacing following components. Refer to Fig. 213:

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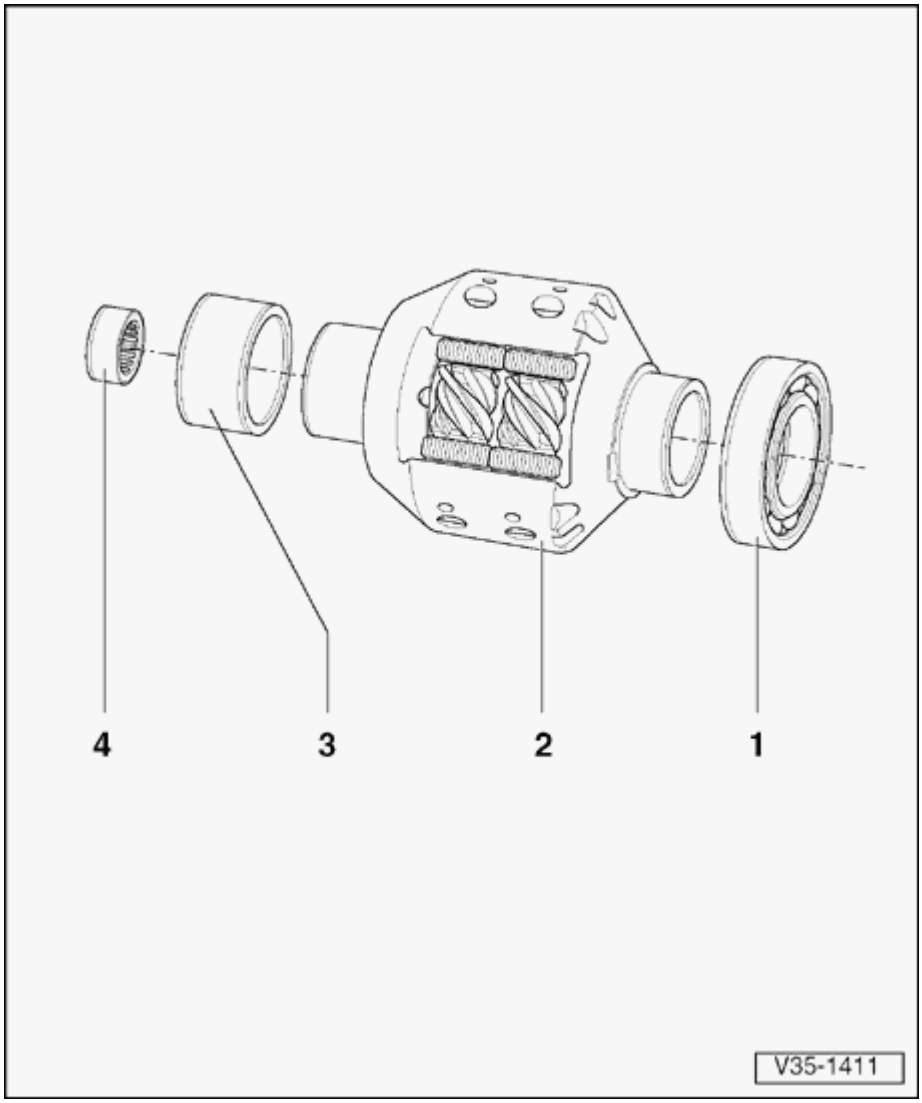


Fig. 231: Torsen Differential Bearing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- End cover
- Inner race for needle bearing
- Torsen differential
- Torsen differential ball bearing

1 - Ball bearing

- For Torsen differential
- Pressing off. See **Pressing off ball bearing from Torsen differential**
- Pressing on. See **Pressing ball bearing onto Torsen differential**

2 - Torsen differential

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- Do not disassemble
- Servicing only at manufacturer
- Replace, if damaged

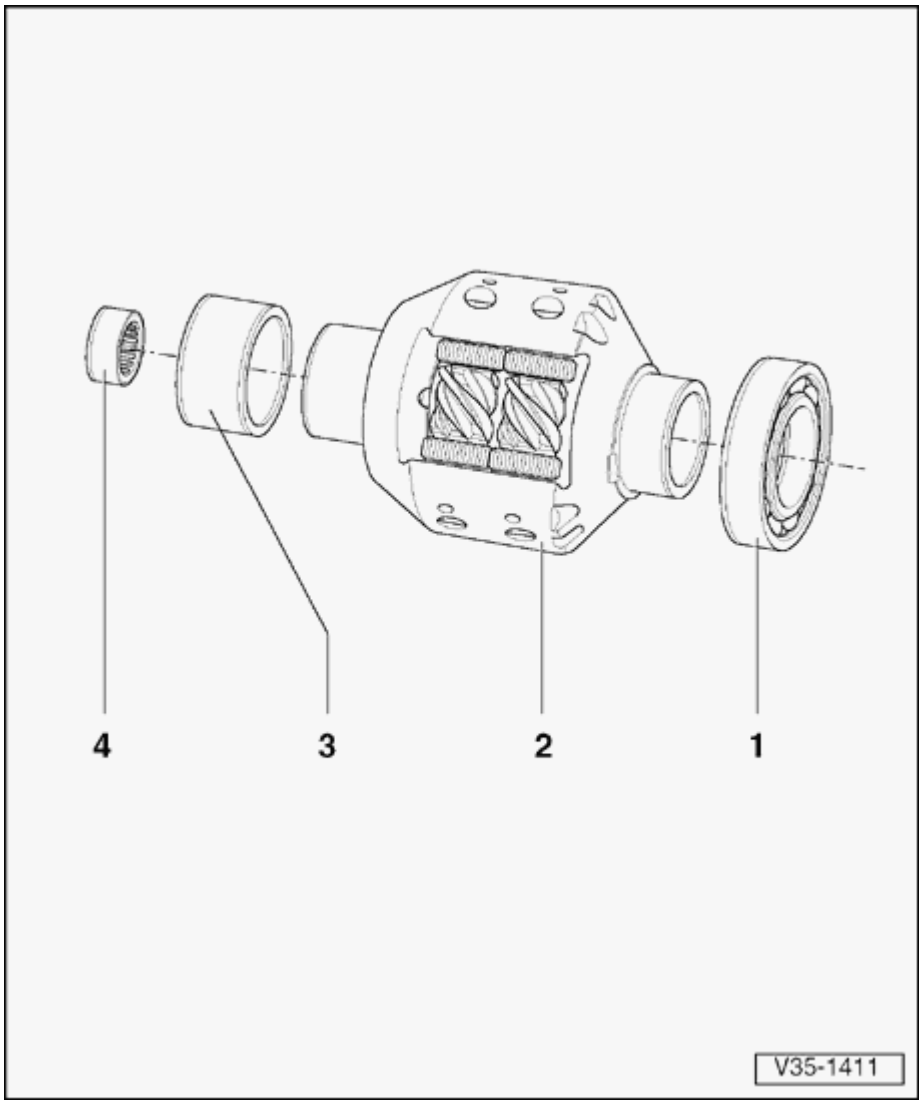


Fig. 232: Torsen Differential Bearing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

3 - Inner race

- For Torsen differential needle bearing
- Pulling off. See **Pulling off inner race for Torsen differential needle bearing**
- Pressing on. See **Pressing on inner race for Torsen differential needle bearing**

4 - Needle bearing

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- For drive pinion/Torsen differential
- Pulling out. See **Removing needle bearing for drive pinion/Torsen differential**
- Pressing in. See **Inserting needle bearing for drive pinion/Torsen differential**

Pressing off ball bearing from Torsen differential

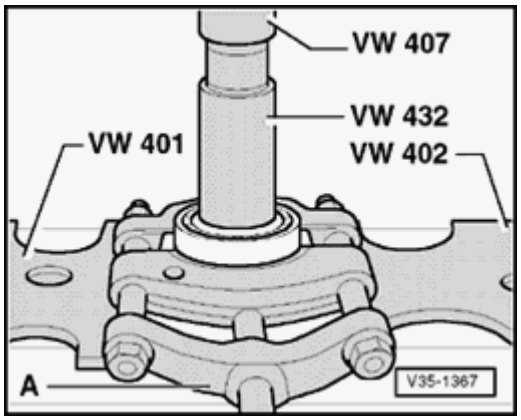


Fig. 233: Pressing Off Grooved Ball Bearing From Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Pressing ball bearing onto Torsen differential

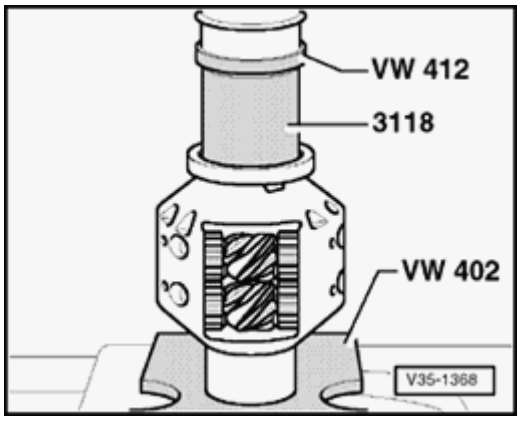


Fig. 234: Pressing Grooved Ball Bearing Onto Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position: Thrust pad 3118 with shoulder facing press tool VW 412

Pulling off inner race for Torsen differential needle bearing

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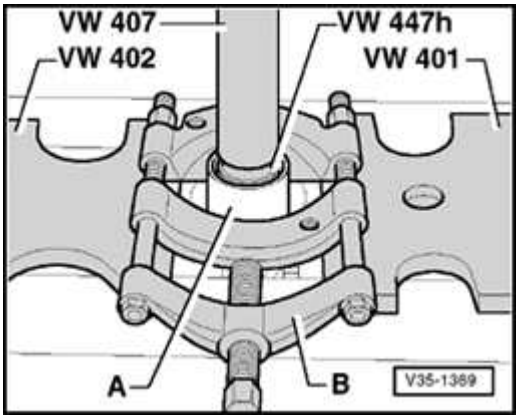


Fig. 235: Pulling Off Inner Race Of Torsen Differential Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Inner race

B - Separating tool 22 to 115 mm, e.g. Kukko 17/2

Pressing on inner race for Torsen differential needle bearing

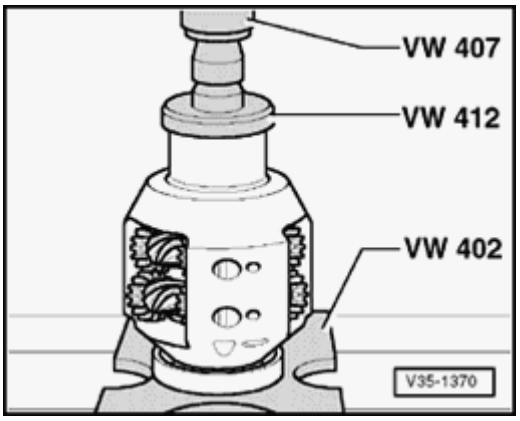


Fig. 236: Pressing On Inner Race Of Torsen Differential Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing needle bearing for drive pinion/Torsen differential

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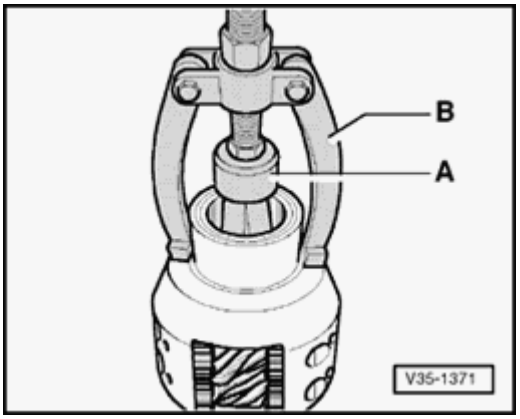


Fig. 237: Pulling Out Needle Bearing For Pinion/Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Inserting needle bearing for drive pinion/Torsen differential

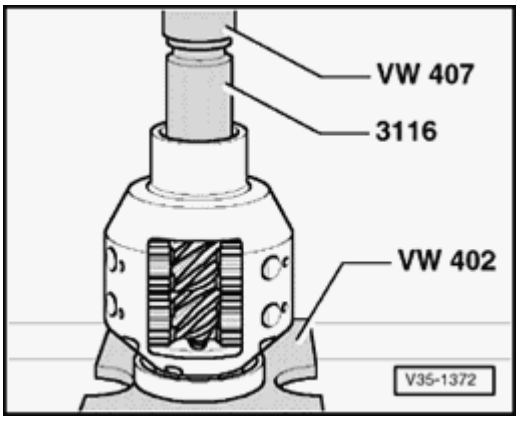


Fig. 238: Pressing In Needle Bearing For Pinion/Torsen Differential
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pressing in needle bearing flush with inner edge.

END COVER, SERVICING

End cover, servicing

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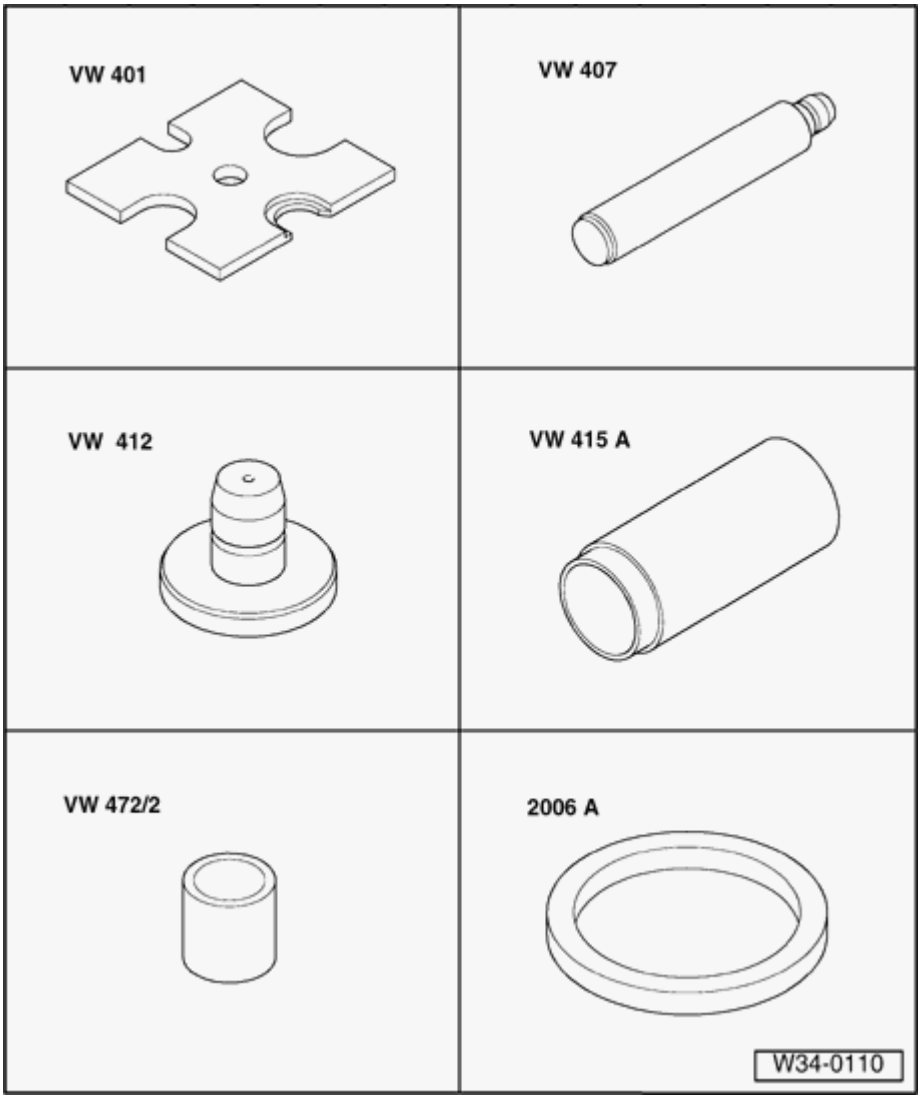


Fig. 239: Identifying Special Tools - End Cover, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 412 Thrust tool
- VW 415 A Tube
- VW 472/2 Spacer sleeve
- 2006 A Supporting ring

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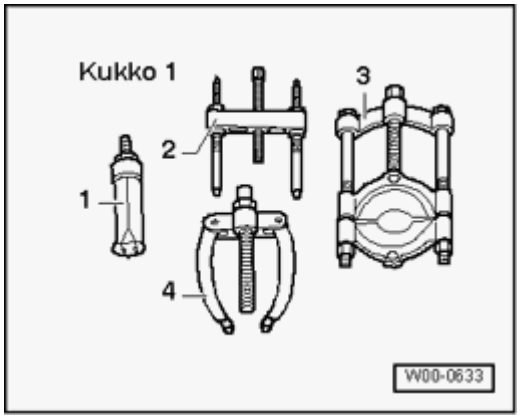


Fig. 240: Kukko 21/2 Internal puller, Kukko 21/4 Internal puller, Kukko 22/2 Counter support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Kukko 21/6 Internal puller and Kukko 21/7 Internal puller
- 4 - Kukko 22/2 Counter support

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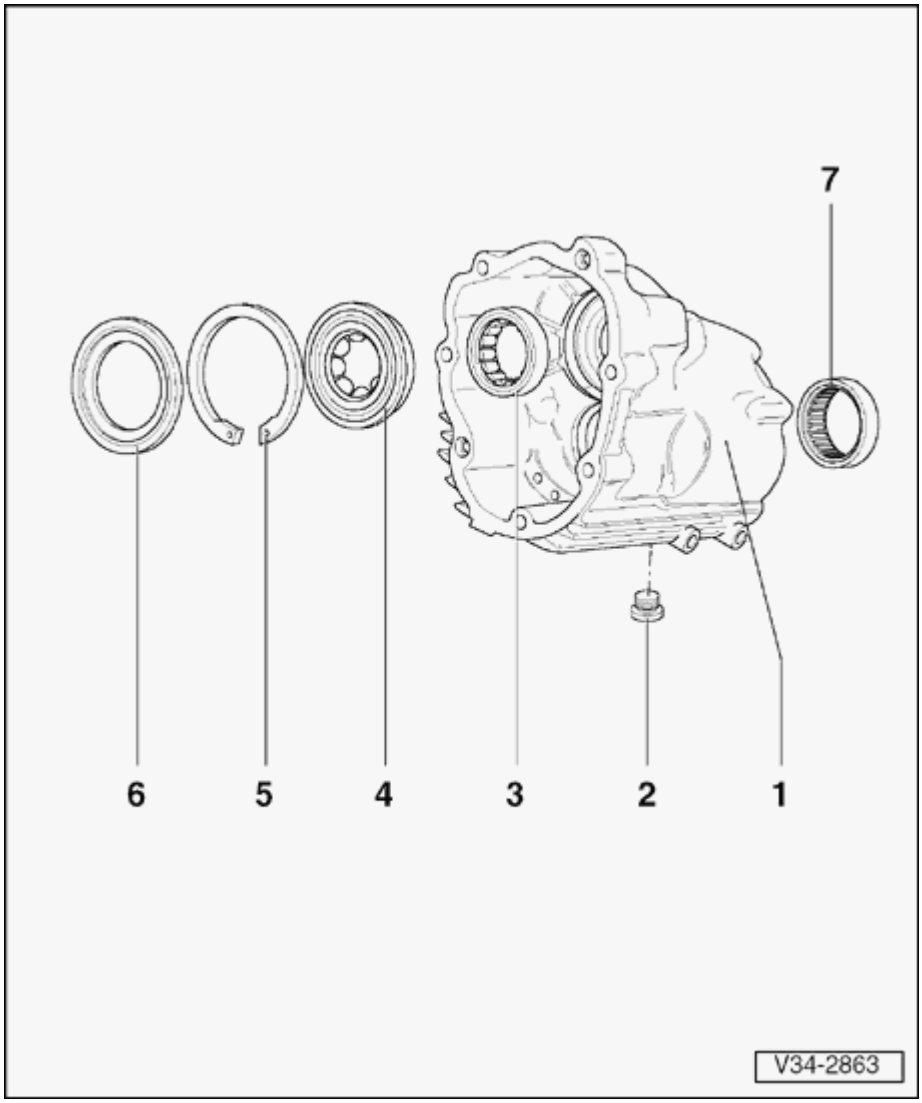


Fig. 241: End Cover, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - End cover

- If replaced, the thickness of the circlip - **End cover, servicing** must be re-determined
- Re-determine shims for Torsen differential. Refer to **Fig. 213**

2 - Oil drain plug, 40 Nm

3 - Cylinder roller bearing for input shaft

- Pressing out. See **Pressing cylinder roller bearing for input shaft out of end cover**
- Pressing in flush. See **Pressing cylinder roller bearing for input shaft into end cover**

4 - Four-point bearing for input shaft

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- Removing. See **Removing ball bearing for input shaft out of end cover**
- Installing. See **Installing ball bearing for input shaft in end cover**
- If replaced, the thickness of the circlip - **End cover, servicing** must be re-determined

5 - Circlip

- Re-determining thickness. Refer to **Available circlips**
- Installing. See **Installing ball bearing for input shaft in end cover**

6 - Baffle plate

- Replace
- Removing. See **Removing ball bearing for input shaft out of end cover**
- Installing and peening in position when replacing four-point bearing for input shaft. See **Peening baffle plate in position when replacing ball bearing for input shaft**
- Installing and peening in position when replacing end cover. See **Peening baffle plate in position when replacing end cover**

7 - Needle bearing

- For Torsen differential
- Pulling out. See **Removing needle bearing for Torsen differential from end cover**
- Tapping in. See **Insert needle bearing of Torsen differential flush in end cover.**

Pressing cylinder roller bearing for input shaft out of end cover

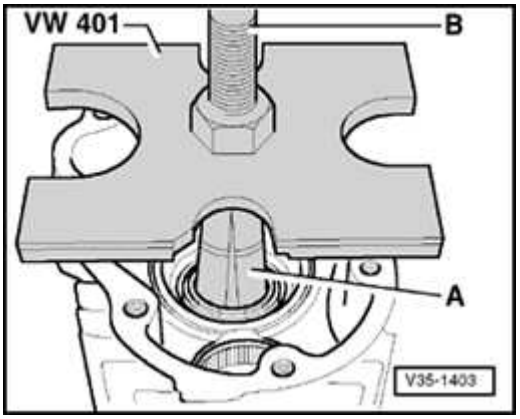


Fig. 242: Pressing Roller Bearing For Input Shaft Out Of End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal extractor 37 to 46 mm, e.g. Kukko 21/6

B - Counter support spindle, e.g. Kukko 22/2

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Pressing cylinder roller bearing for input shaft into end cover

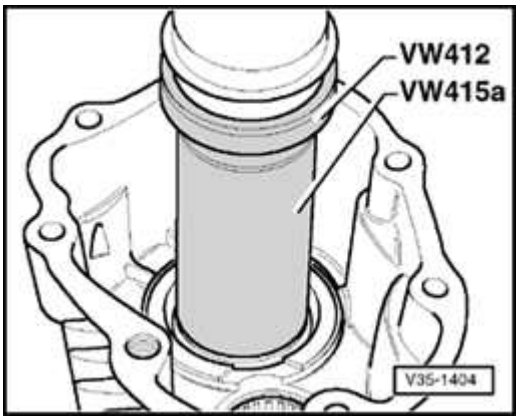


Fig. 243: Pressing Roller Bearing For Input Shaft Into End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Shoulder of pipe section VW 415 A faces toward press tool VW 412.

Removing ball bearing for input shaft out of end cover

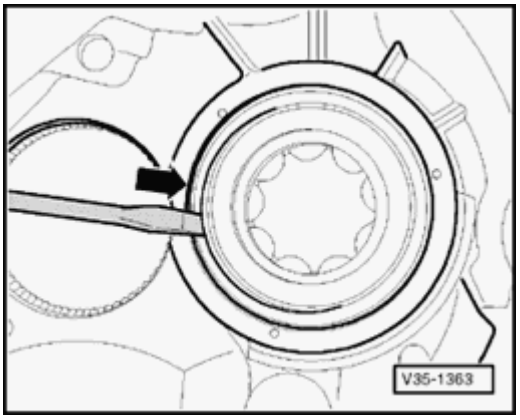


Fig. 244: Set Screwdriver In Place As Shown, Drive It Into Baffle Ring And Pry It Out
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Position screwdriver as illustrated, drive into baffle plate -arrow- and lever out.
- Remove circlip.
- Take out bearing, remove peening indentations if necessary.

Installing ball bearing for input shaft in end cover

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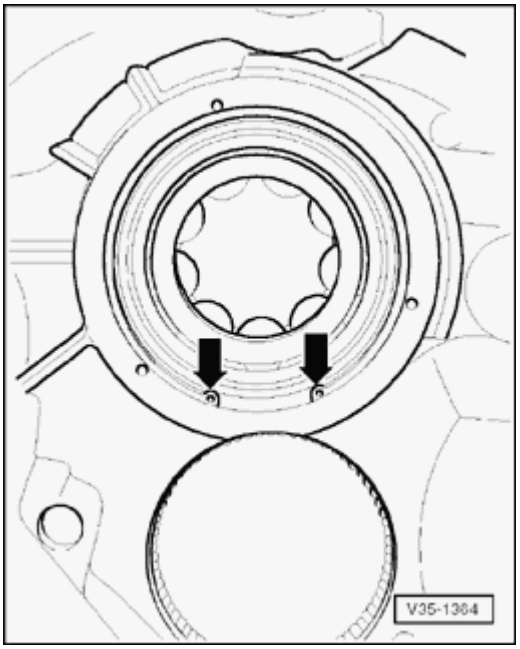


Fig. 245: Installation Position Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of circlip:

- Ends of circlip -arrows- face toward roller sleeve for drive pinion.

NOTE: The thickness of the circlip must be re-determined if the bearing or the end cover are replaced.

- Determining thickness of circlip for four-point bearing for input shaft:
- Press outer race of four-point bearing onto stop.
- Determine the thickest circlip that will just fit and install it.
- Axial play: no more than 0.08 mm

Available circlips

Circlip thickness (mm)	
2.55	2.65
2.60	2.70

Peening baffle plate in position when replacing ball bearing for input shaft

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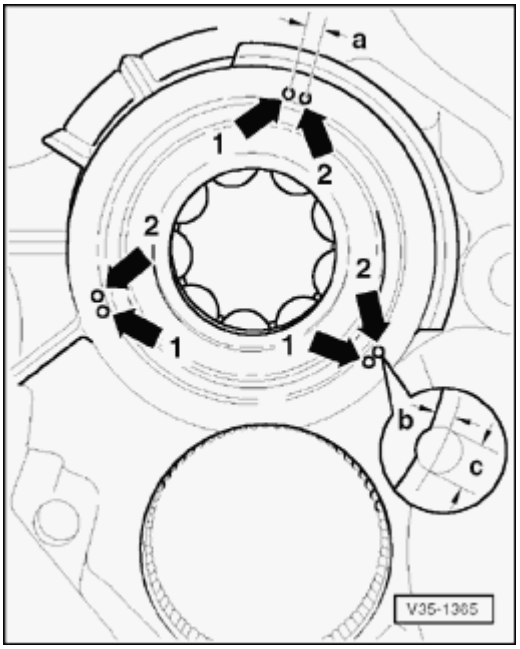


Fig. 246: Peening Baffle Ring When Replacing 4-Point Bearing For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use a blunt punch with a ball-shaped end (ball-diameter 5 mm) to peen in position.
- Insert baffle plate.
- First peen at points marked with -arrows 1-.
- Then peen at points marked with -arrows 2- at distance -a- from first position.

- Distance a = 5 mm

- Observe position and diameter of peening positions:

- Distance b = 2 mm
- Dimension c = 3 mm

Peening baffle plate in position when replacing end cover

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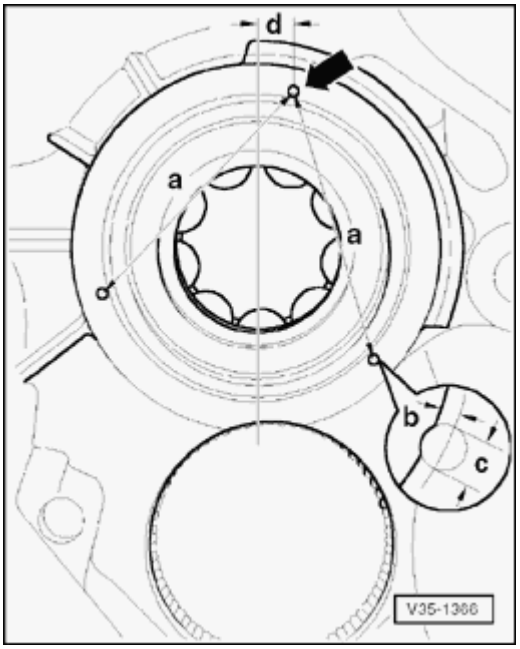


Fig. 247: Peening Baffle Ring When Replacing End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Use a blunt punch with a ball shaped end (ball-diameter 5 mm) to peen in position.
- Insert baffle plate.
- Peen in first peening point -arrow- at distance -d- from the center line of the two shafts.

- Dimension d = 10 mm

- Observe position and diameter of peening positions:

- Distance b = 2 mm
- Dimension c = 3 mm

- Peen in second and third peening points in same manner at distance -a-.

- Distance a = 70 mm

Removing needle bearing for Torsen differential from end cover

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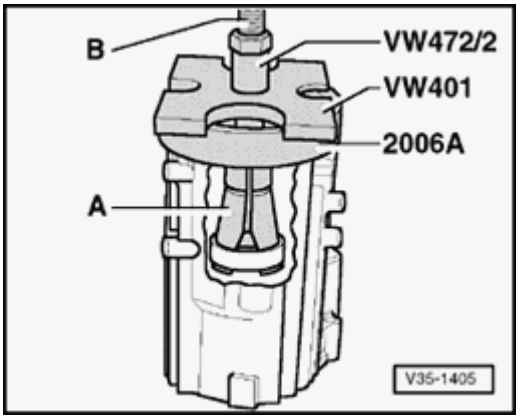


Fig. 248: Pulling Torsen Differential Needle Bearing Out Of End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Spindle from counter support, e.g. Kukko 22/2

Insert needle bearing of Torsen differential flush in end cover.

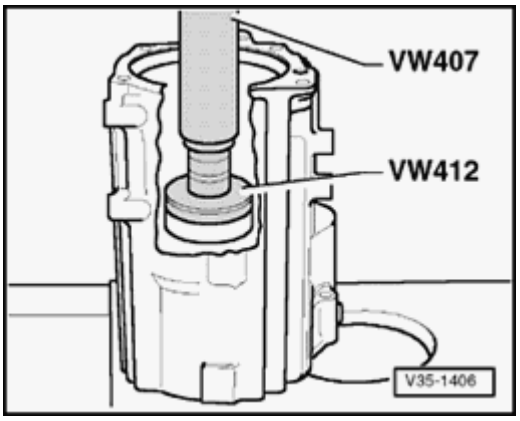


Fig. 249: Driving Torsen Differential Needle Bearing Flush Into End Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install pressure plate VW 412 onto bearing with shoulder facing up.

BEARING PLATE, SERVICING

Bearing plate, servicing

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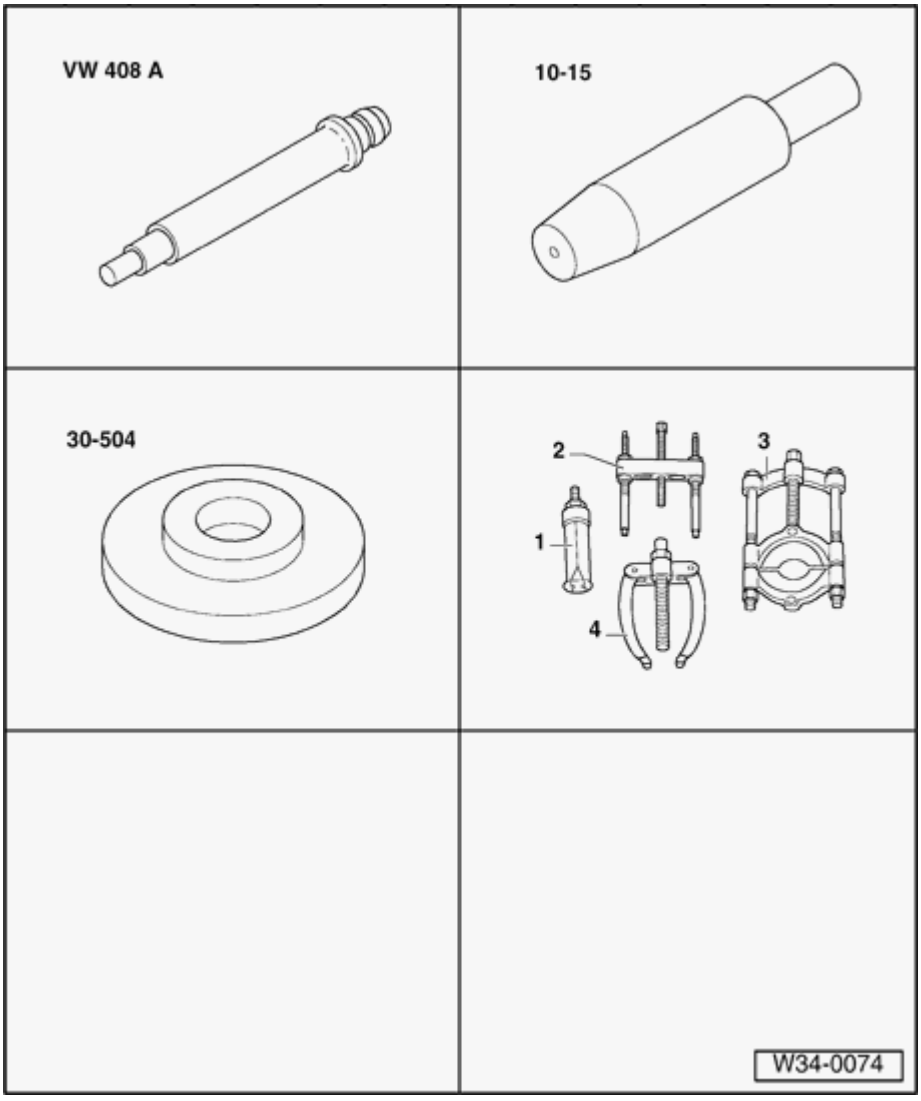


Fig. 250: Identifying Special Tools - Gear Carrier, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 408 A Press tool
- 10-15 Guide pins
- 30-504 Press tool
- 1 - Kukko 21/3 Internal puller
- 4 - Kukko 22/1 Counter support
- Depth gauge

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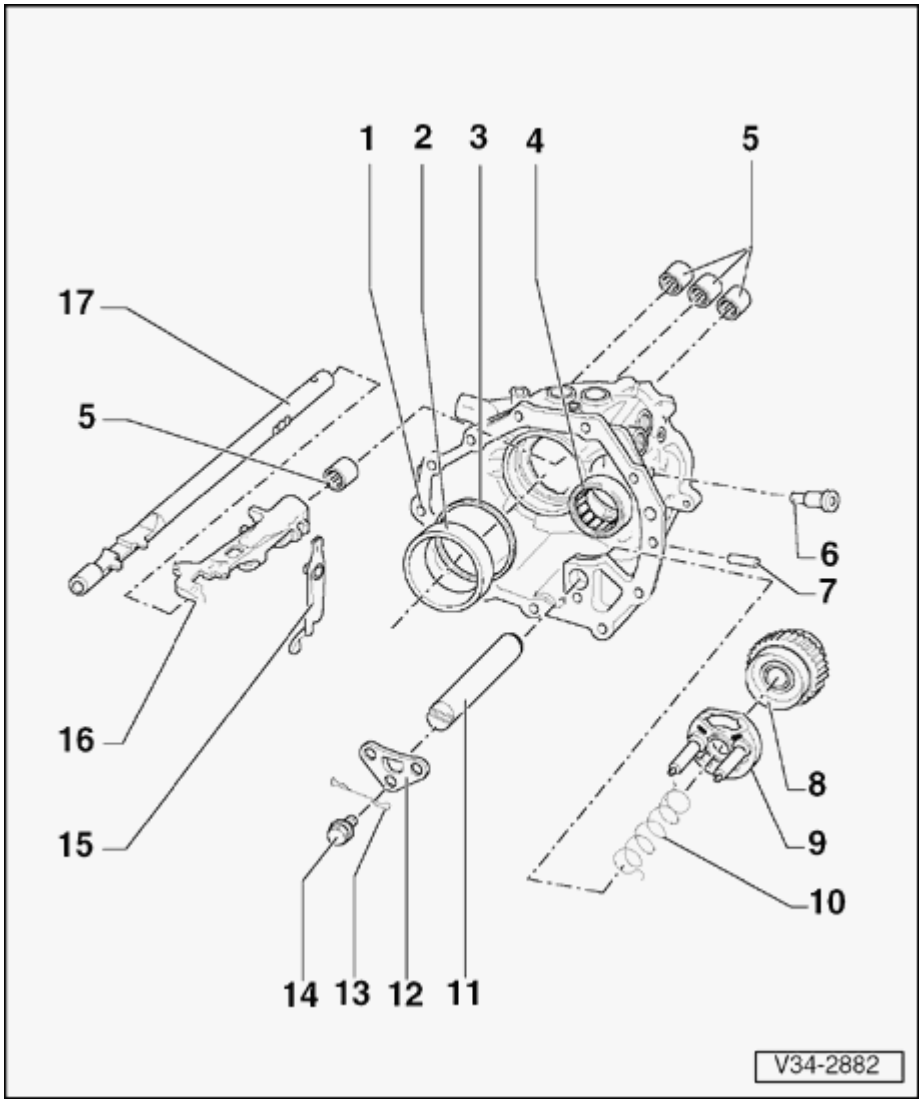


Fig. 251: Gear Carrier, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bearing plate

- Re-determine shim S4 when replacing

2 - Outer race/small taper roller bearing for drive pinion

- Driving out. Refer to **Driving out outer race for small taper roller bearing**
- Pressing in. Refer to **Pressing in outer race/small taper roller bearing**
- Re-determine shim S4 when replacing

3 - Shim S4

- Adjustment overview. Refer to **Adjustment overview**

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- Re-determining thickness. Refer to **Re-determining shim S4**

4 - Cylinder roller bearing for input shaft

- Pressing out. See **Pressing cylinder roller bearing for input shaft out of bearing plate**
- Pressing in. See **Pressing cylinder roller bearing for input shaft into bearing plate**
- Measuring insertion depth. See **Measuring insertion depth of cylinder roller bearing for input shaft**

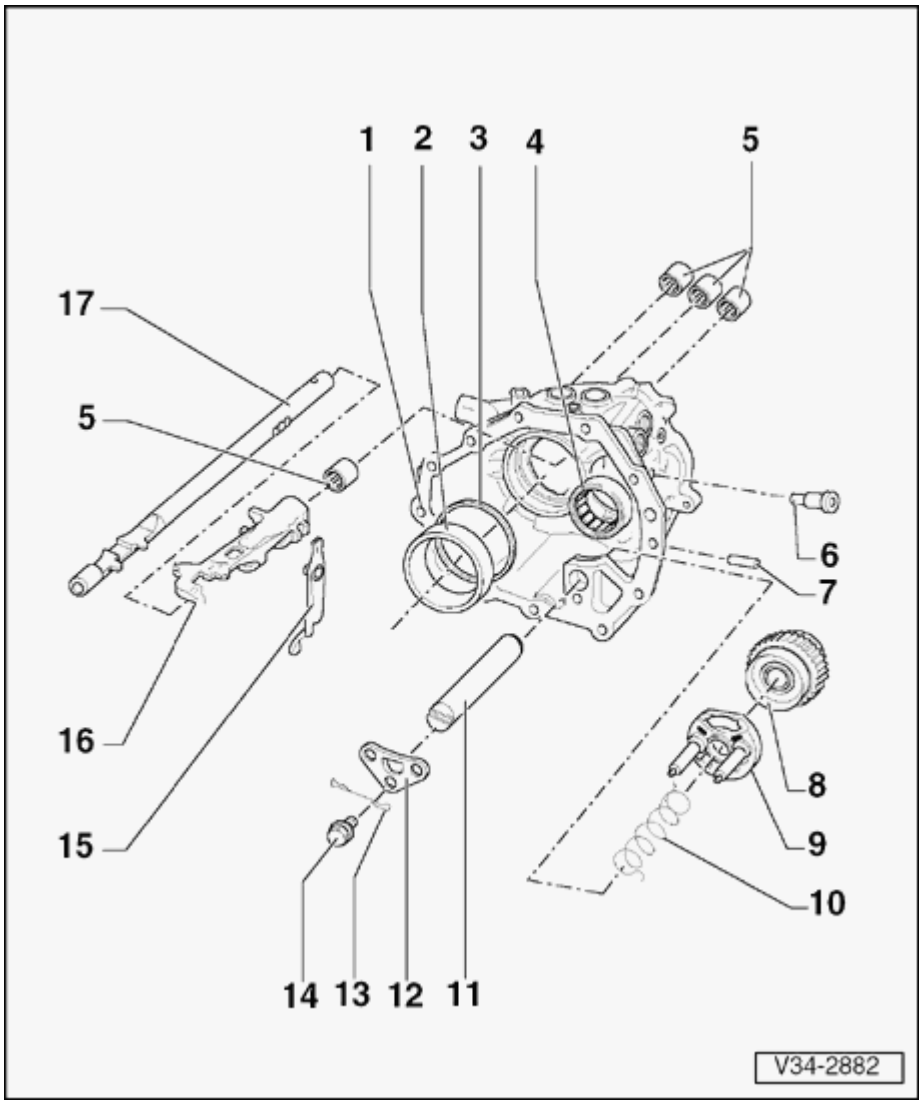


Fig. 252: Gear Carrier, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Ball sleeves

- 4 pieces
- Removing and driving in. See **Driving out and driving in ball sleeves for selector rods**

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For follower for reverse gear:

- Pulling out. See **Pulling ball sleeve out of follower for reverse gear**
- Tapping in. See **Driving ball sleeve flush into follower for reverse gear**

6 - Bolt, 35 Nm

- For relay lever

7 - Dowel pin (7 x 28)

- Drive in and drive out with drift

8 - Reverse idler gear

- For reverse gear

9 - Reverse gear synchro-ring

- With locking pins
- Checking for wear. See **Checking synchro-ring for wear**
- Installation position: Position flat on synchro-ring circumference to face input shaft. Refer to **Fig. 185**

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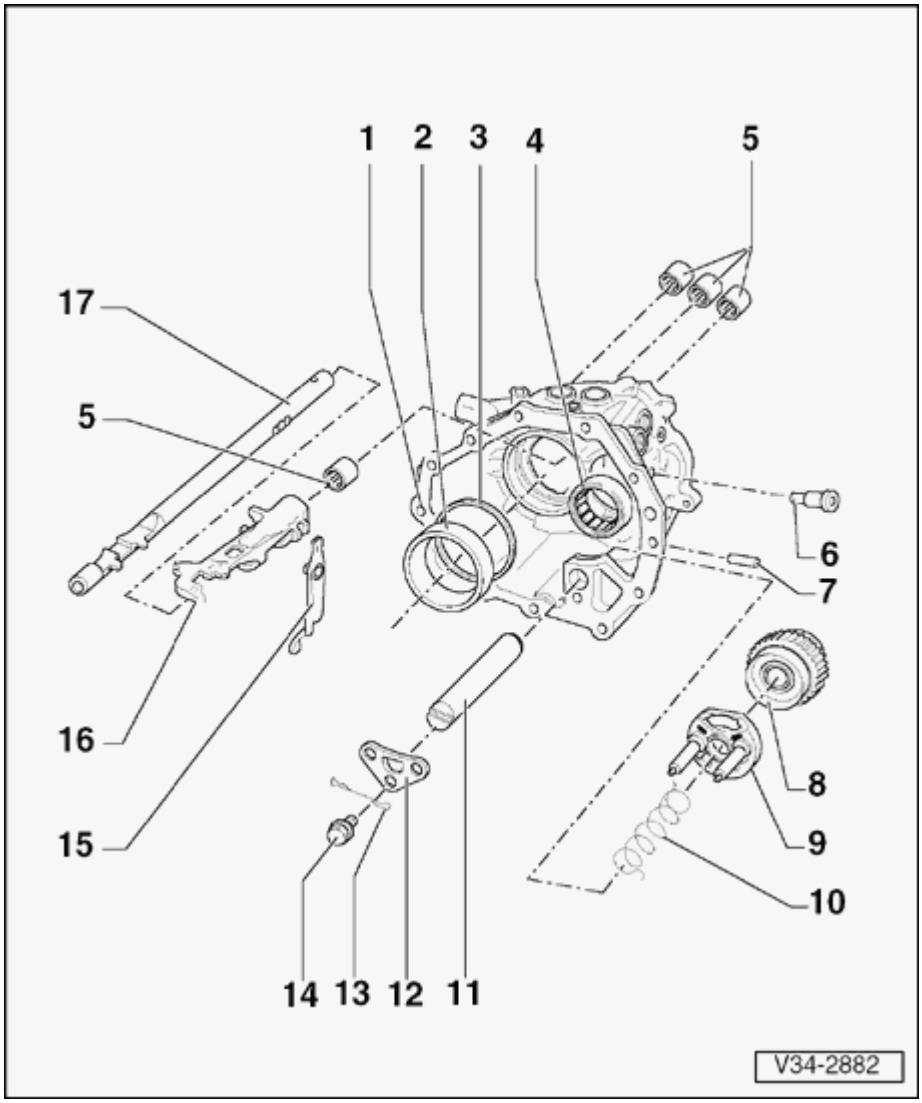


Fig. 253: Gear Carrier, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

10 - Spring

- Installation position: Hook single angled end into recess on synchro-ring. Turn double angled end anti-clockwise and insert into opening on bearing plate

11 - Reverse idler gear axle

12 - Retaining plate

- Installation position: Chamfers of holes for locking pins of synchro-ring face bearing plate. Refer to **Fig. 186**

13 - Spring clasp

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14 - Bolt, 25 Nm

- Self-locking
- Always replace

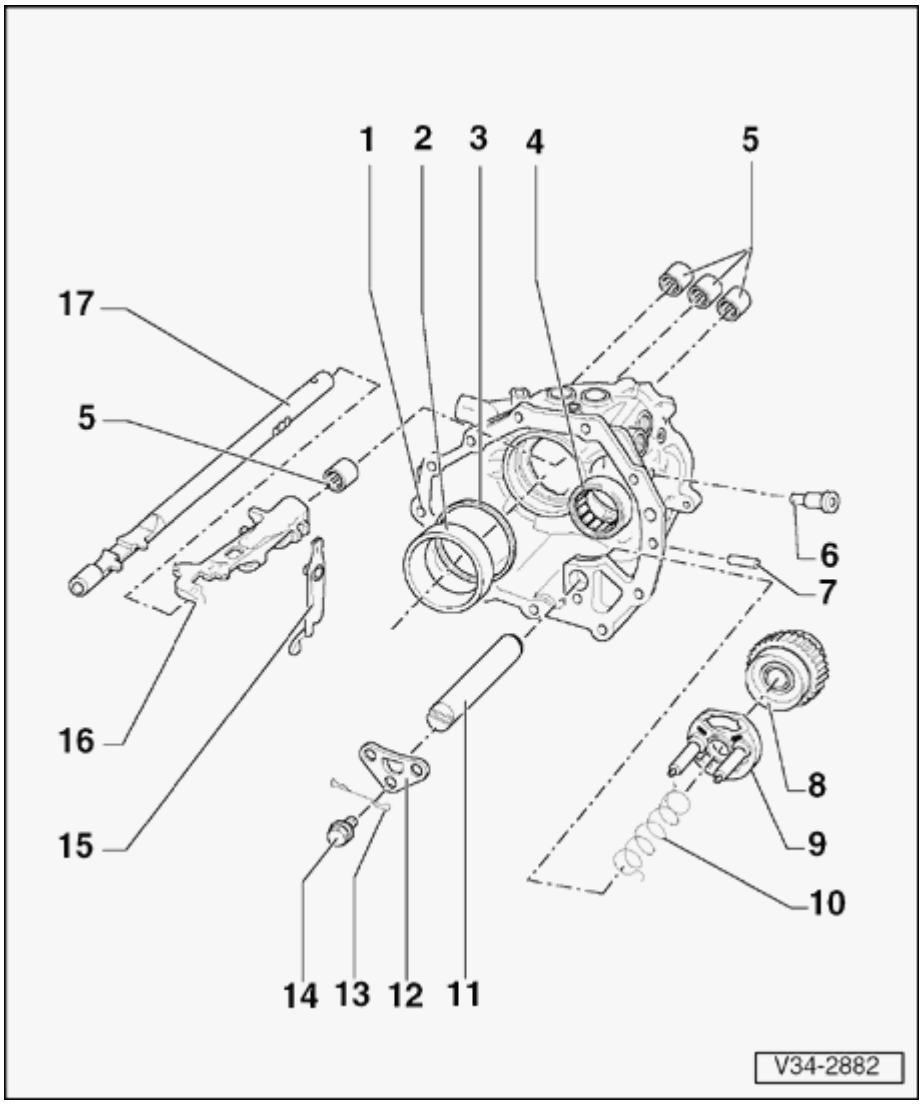


Fig. 254: Gear Carrier, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

15 - Relay lever for reverse gear

16 - Follower for reverse gear

- Pulling out ball sleeve. See **Pulling ball sleeve out of follower for reverse gear**
- Driving in ball sleeve. See **Driving ball sleeve flush into follower for reverse gear**

17 - Selector rod for 5th and 6th gear

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- Replace only together with follower. Refer to **5th and 6th gear, removing and installing**, Item 6

Driving out and driving in ball sleeves for selector rods

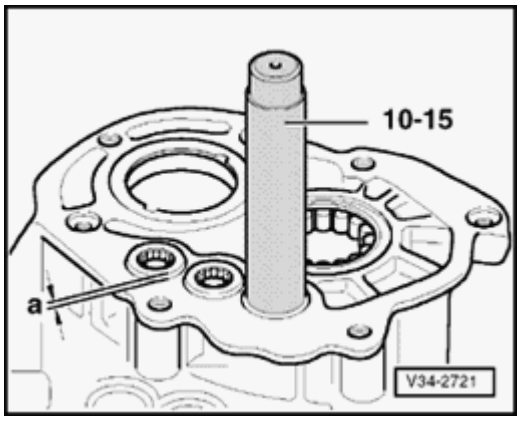


Fig. 255: Driving Selector Rod Ball Sleeves Out And In
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Install ball sleeve with the inscribed side (thicker metal) facing the drift.

- Insertion depth a = 2.5 mm

Checking synchro-ring for wear

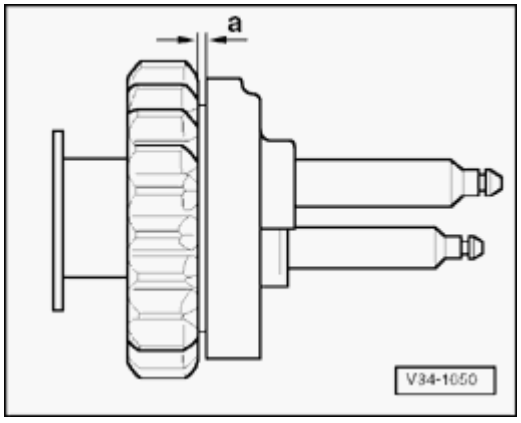


Fig. 256: Checking Synchronizer Ring For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press synchro-ring onto reverse idler gear cone and measure gap "a" with feeler gauge.

- Dimension, new: 0.75 to 2.3 mm
- Wear limit: 0.2 mm

Pulling ball sleeve out of follower for reverse gear

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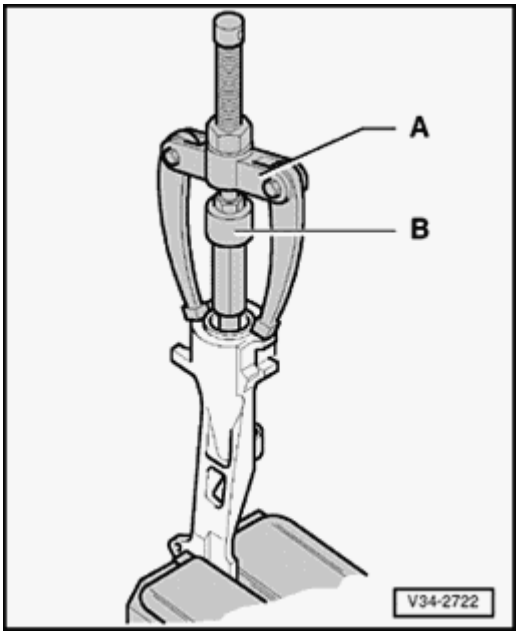


Fig. 257: Pulling Reverse Gear Ball Sleeve Out Of Yoke
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

B - Internal extractor 14.5 to 18.5 mm, e.g. Kukko 21/2

Driving ball sleeve flush into follower for reverse gear

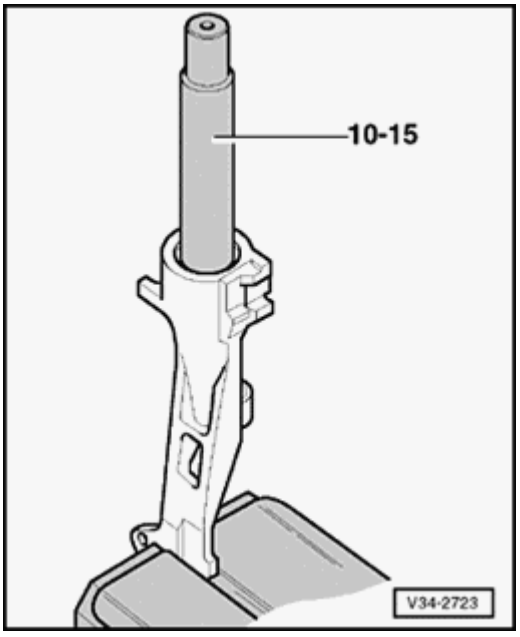


Fig. 258: Driving Ball Sleeve Flush Into Reverse Gear Yoke
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Install ball sleeve with the inscribed side (thicker metal) facing the drift.

Pressing cylinder roller bearing for input shaft out of bearing plate

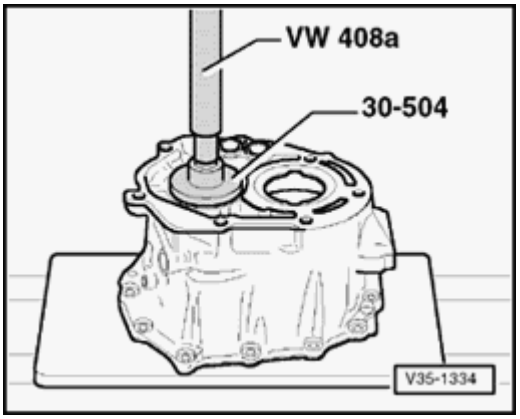


Fig. 259: Pressing Roller Bearing For Input Shaft Out Of/Into Gear Carrier
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing cylinder roller bearing for input shaft into bearing plate

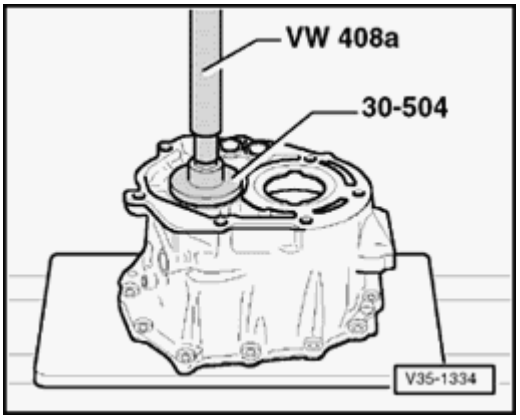


Fig. 260: Pressing Roller Bearing For Input Shaft Out Of/Into Gear Carrier
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measuring insertion depth. See **Measuring insertion depth of cylinder roller bearing for input shaft**

Measuring insertion depth of cylinder roller bearing for input shaft

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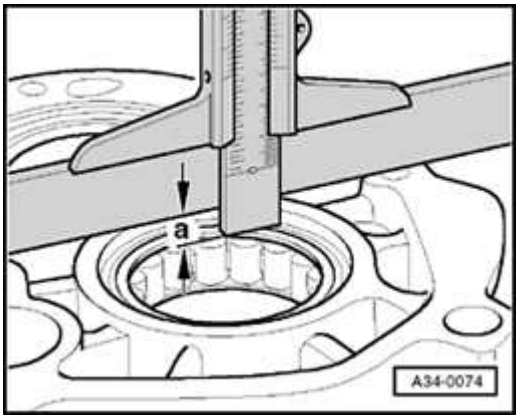


Fig. 261: Measuring Press-In Depth Of Input Shaft Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Dimension a = 7 mm

Re-determining shim S4

Special tools and equipment

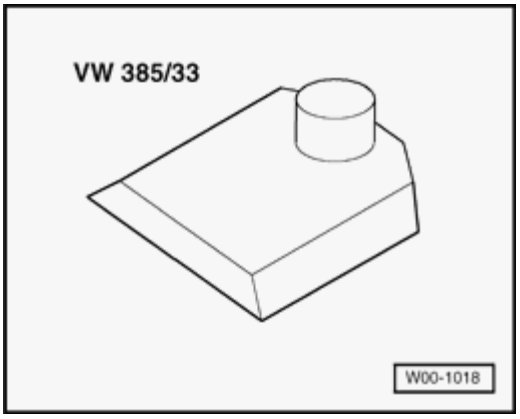


Fig. 262: VW 385/32 End Measuring Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 385/32 End measuring plate

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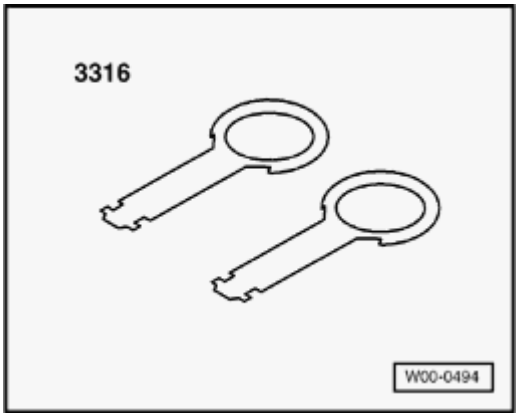


Fig. 263: 3116 Spring Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3116 Spring pin
- Digital depth gauge accurate to within at least 5/100 mm.

Determining New Shim S 4, Overview

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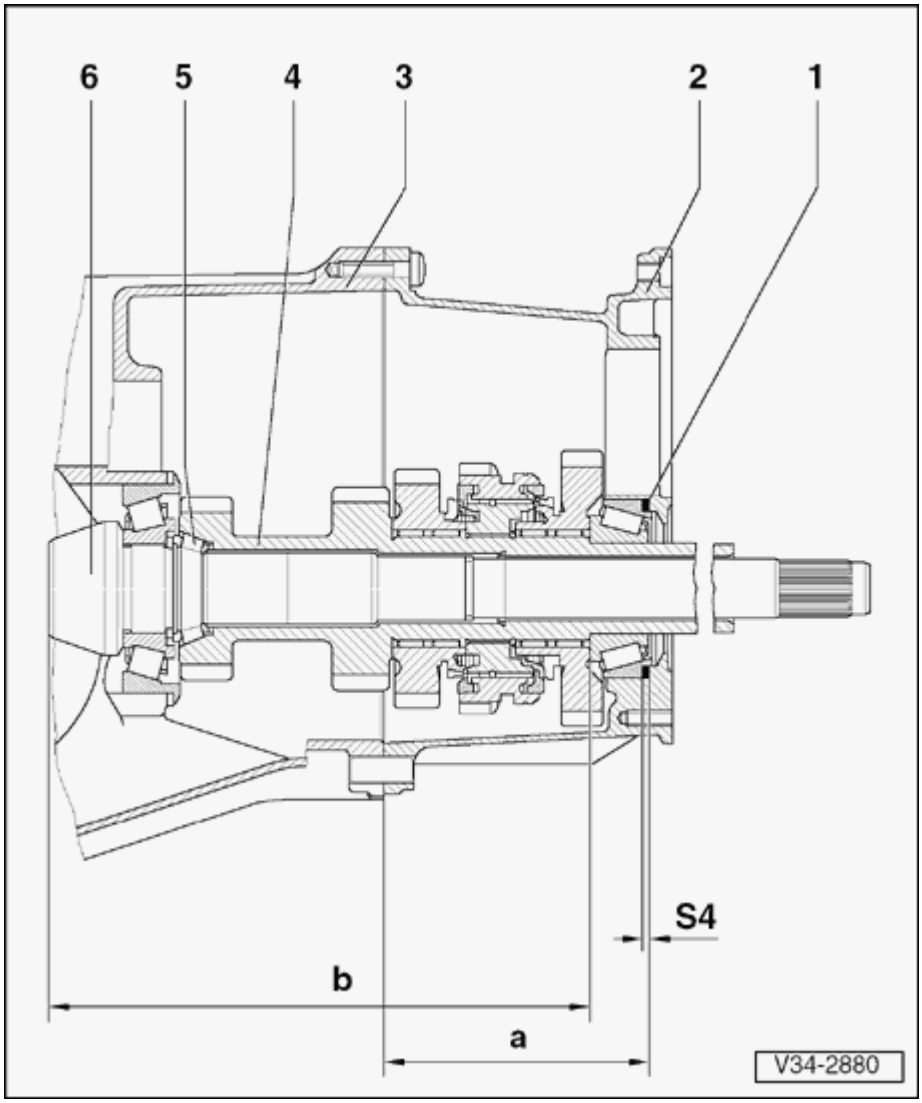


Fig. 264: Determining New Shim S 4, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

This procedure must be carried out when replacing the following components:

- Bearing plate. Refer to **Determining thickness of shim when replacing bearing plate**
- Hollow shaft. Refer to **Determining thickness of shim when replacing hollow shaft**

The procedure restores the required preload of the taper roller bearings for the drive pinion and hollow shaft.

1 - Shim S4

2 - Bearing plate

3 - Transmission housing

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4 - Hollow shaft

5 - Taper roller bearing of drive pinion/hollow shaft

6 - Pinion shaft

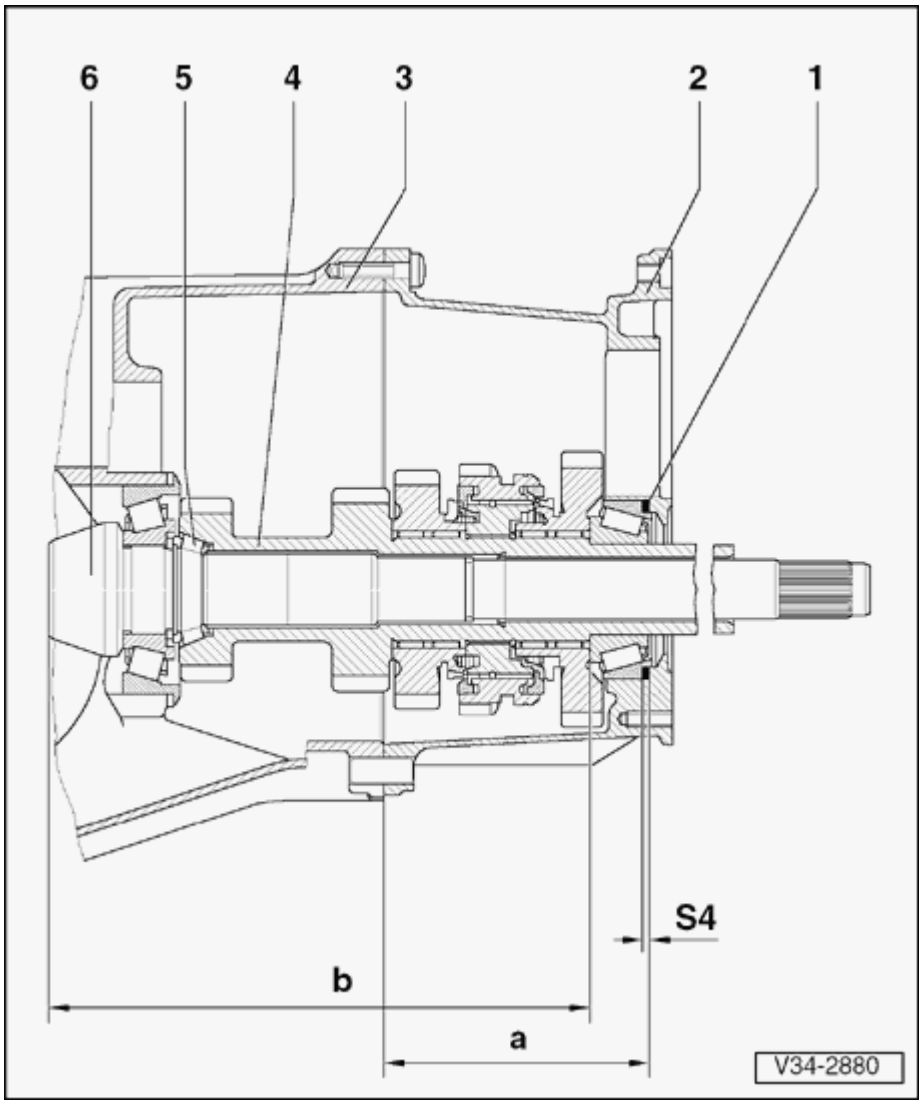


Fig. 265: Determining New Shim S 4, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

a - Bearing plate housing depth

b - Dimension from drive pinion head to shoulder of taper roller bearing on hollow shaft

- Taper roller bearing (drive pinion/hollow shaft) pre-tensioned to 10 Nm

S4 - Thickness of shim S4

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NOTE: When replacing the drive pinion (final drive set), observe adjustment overview. Refer to Adjustment overview.

Determining thickness of shim when replacing bearing plate

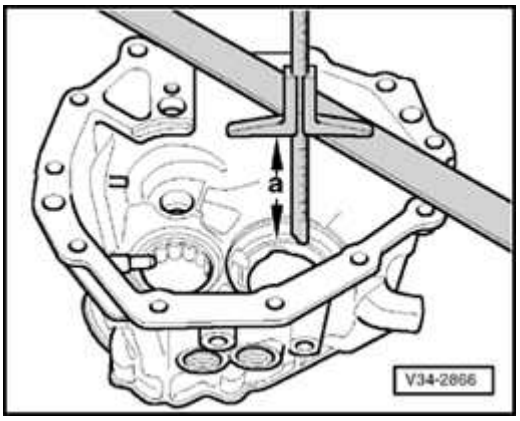


Fig. 266: Measuring Difference In Depths Between Old And New Gear Carriers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure difference of depth "a" on old and new bearing plates.

Example:

Depth "a" of old bearing plate	124.40 mm
Depth "a" of new bearing plate	124.65 mm
Difference	= 0.25 mm

- If new bearing plate is deeper, install a thicker S4 shim.
- If old bearing plate was deeper, install a thinner S4 shim.

Example:

Previous shim S4	0.95 mm
Difference	+0.25 mm
New shim S4	= 1.20 mm

Available shims. Refer to table. Refer to **Available shims for S4**.

Determining thickness of shim when replacing hollow shaft

- Use a caliper gauge accurate to within at least 5/100 mm.

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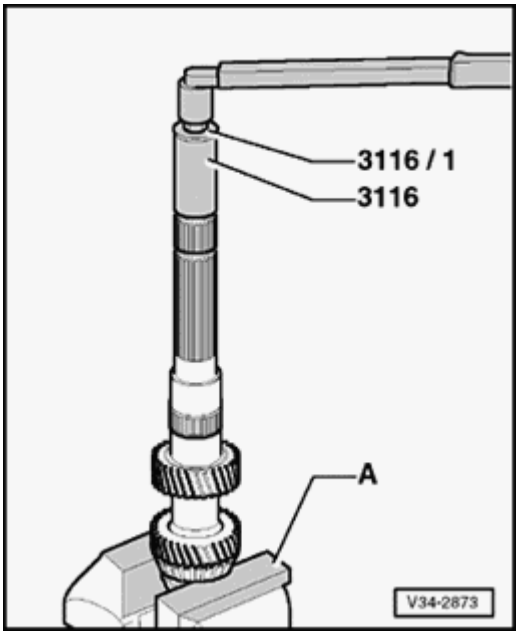


Fig. 267: Tighten Clamping Sleeve To Exactly 10 Nm
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten spring pin to exactly 10 Nm.

A - Vice clamps

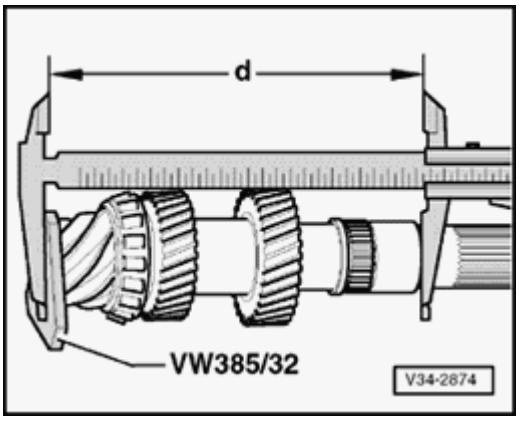


Fig. 268: Setting End Gauge VW 385/32 Onto Pinion Face
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place end measuring plate VW 385/32 onto drive pinion head and measure dimension "d".

- Top measuring point is shoulder for inner race of small taper roller bearing.
- Example: 248.50 mm

- Install new hollow shaft and once again measure dimension "d".

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- Example: 248.70 mm

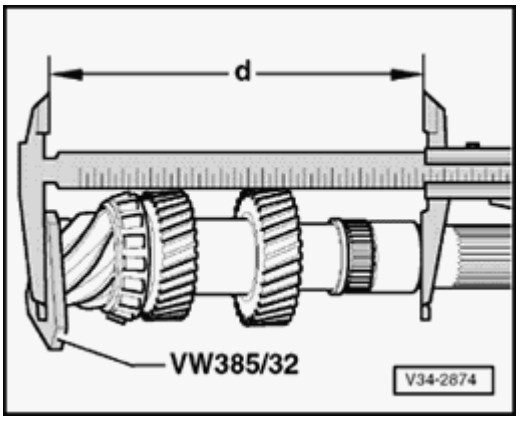


Fig. 269: Setting End Gauge VW 385/32 Onto Pinion Face
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine the difference:

Dimension "d" of old hollow shaft	248.50 mm
Dimension "d" of new hollow shaft	248.70 mm
Difference	= 0.20 mm

- Install appropriately thinner shim S4 if dimension "d" of new hollow shaft is larger.
- Install appropriately thicker shim S4 if dimension "d" of new hollow shaft is smaller.

Available shims for S4

Shim thickness (mm)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

Different tolerances make it possible to obtain the exact shim thickness required, if necessary, install 2 shims.

TRANSMISSION HOUSING, SERVICING

Transmission housing, servicing

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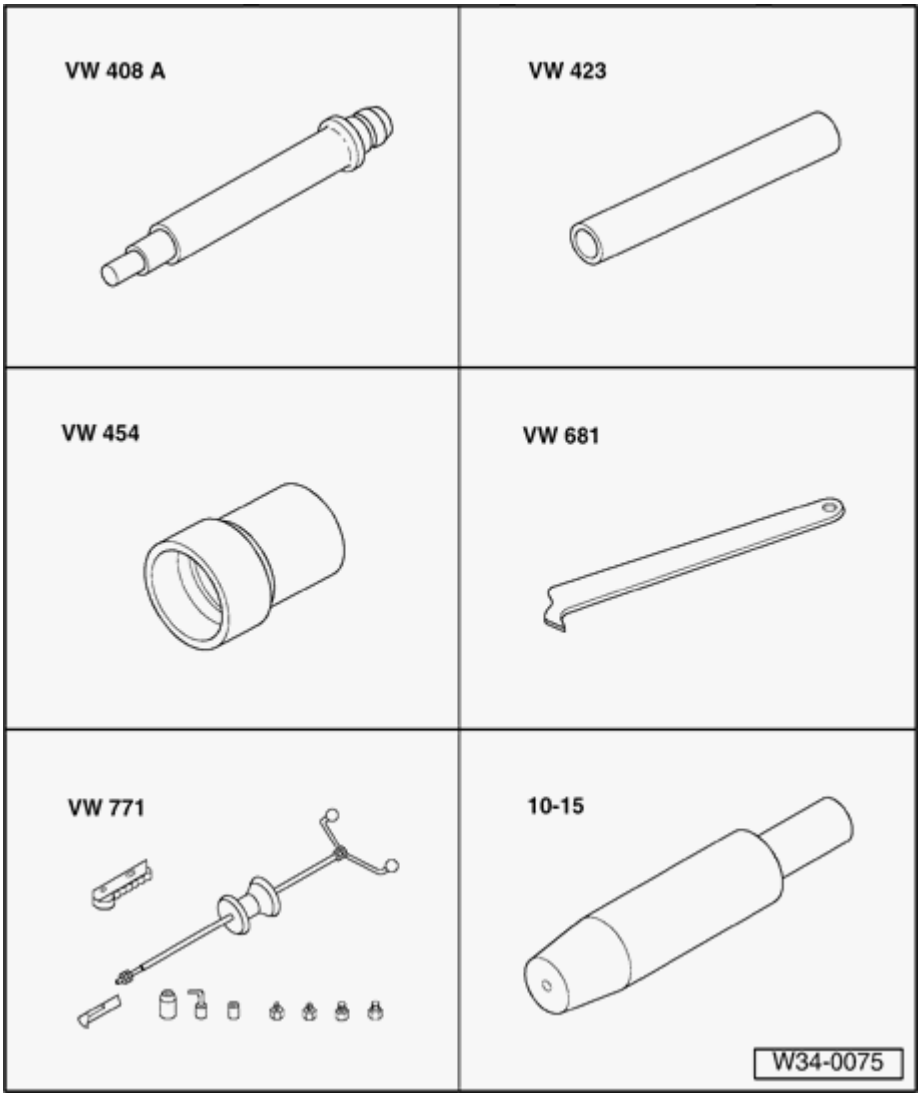


Fig. 270: Identifying Special Tools - Transmission Housing, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 408 A Press tool
- VW 423 Tube
- VW 454 Thrust pad
- VW 681 Seal extractor
- VW 771 Multi-purpose tool
- 10-15 Guide pins

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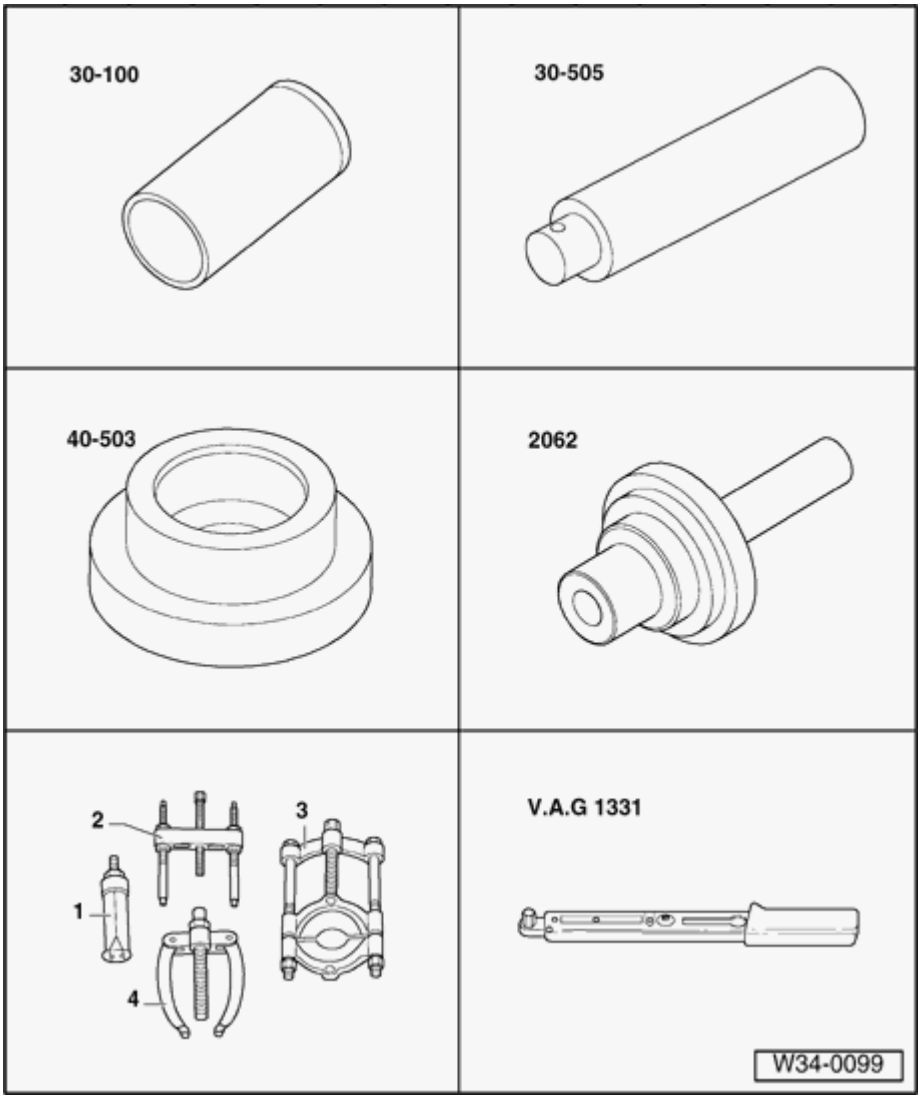


Fig. 271: Identifying Special Tools - Transmission Housing, Servicing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 30-100 Thrust sleeve
- 30-505 Fitting mandrel
- 40-503 Inserting drift
- 2062 Fitting drift

- 1 - Kukko 21/2 Internal puller and Kukko 21/5 Internal puller
- VAG 1331 Torque wrench (5 to 50 Nm)
- Depth gauge
- Assembly sleeve Part No. 01E 311 120

1) Adjustments are required if these components are replaced. Refer to Adjustment overview: Refer to **Adjustment overview**.

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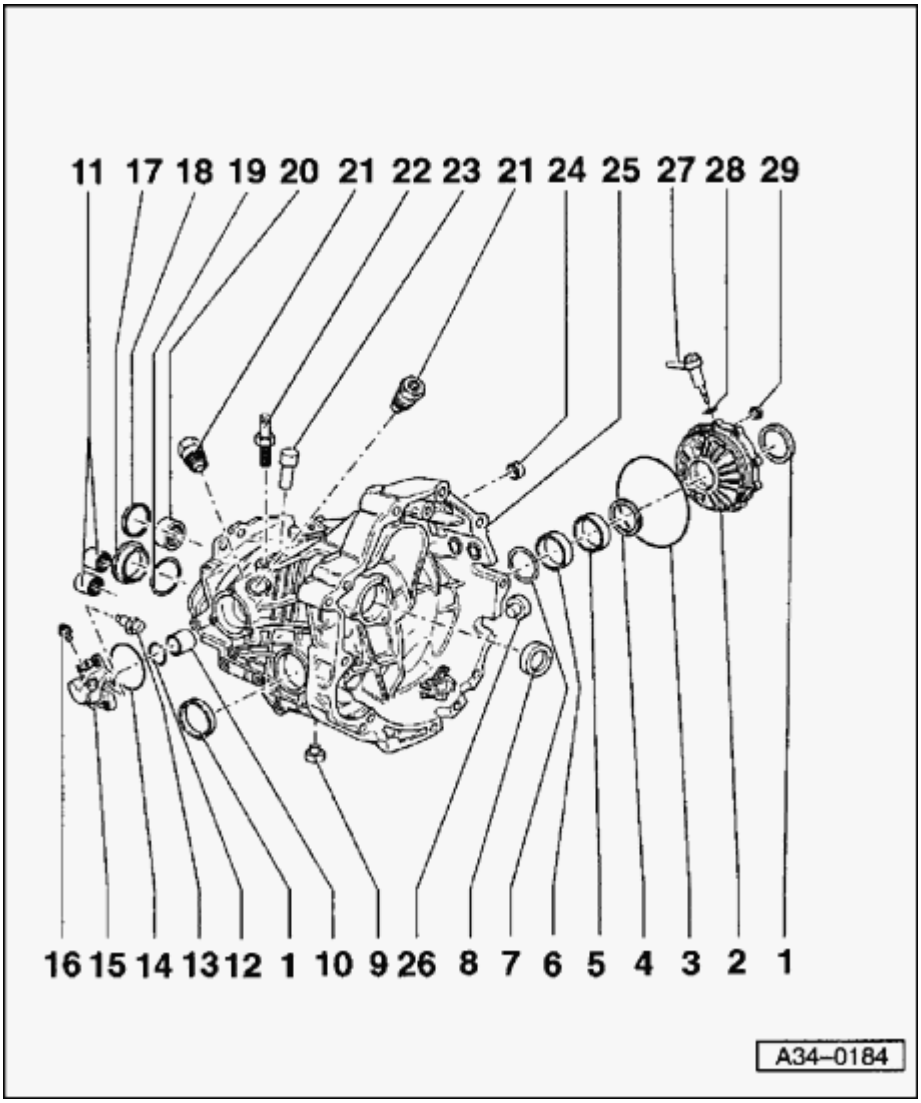


Fig. 272: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Seal for flanged shaft

- Pulling out. See **Pulling out seal for flanged shaft**
- Tapping in. See **Driving in seal for flanged shaft**
- Pack space between sealing lips with sealing grease
- Replacing with transmission installed. Refer to **Removing input shaft seal when transmission is not disassembled**

2 - Cover1)

- For final drive

3 - O-ring

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- For cover for final drive
- Always replace

4 - Shim S1

- Note thickness
- Adjustment overview. Refer to **Adjustment overview**

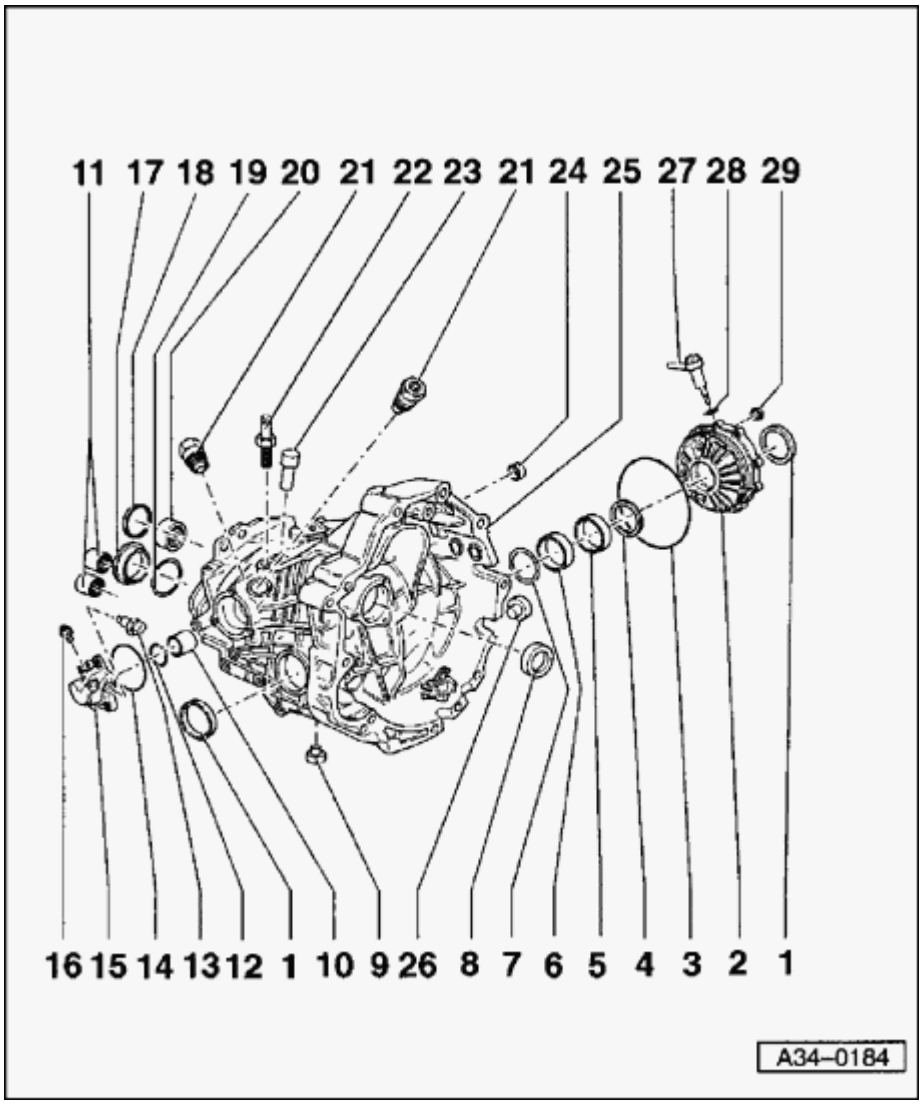


Fig. 273: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Taper roller bearing outer race, large1)

- For differential
- Removing and installing. Refer to **Driving outer race for large taper roller bearing out of cover**and

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Driving outer race for large taper roller bearing into cover

6 - Taper roller bearing outer race, small1)

- For differential
- Removing and installing. Refer to **Driving outer race for small taper roller bearing out of transmission housing** and **Pressing outer race for small taper roller bearing into transmission housing**

7 - Shim S2

- Note thickness
- Adjustment overview. Refer to **Adjustment overview**

8 - Seal

- For input shaft
- Levering out. See **Levering out input shaft seal when transmission is disassembled**
- Tapping in. See **Drive in input shaft seal flush**
- Always replace when removing input shaft
- Replacing when transmission is not disassembled. See **Removing input shaft seal when transmission is not disassembled** and **Drive in input shaft seal flush**

9 - Oil drain plug, 40 Nm

10 - Ball sleeve for selector shaft

- Pulling out. See **Pulling out ball sleeve**
- Tapping in. See **Driving in ball sleeve**

11 - Ball sleeves for selector rods

- Pulling out as -Item 10 **Transmission housing, servicing**. See **Pulling out ball sleeve**
- Driving in as -Item 10 **Transmission housing, servicing**. See **Driving in ball sleeve**

12 - Circlip

- Installation position: Eyes facing up

13 - Switch for reversing light, 20 Nm

- Removing and installing. See **Removing and installing reversing light switch**

14 - O-ring

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- For selector shaft cover
- Always replace
- Coat with gear oil when installing

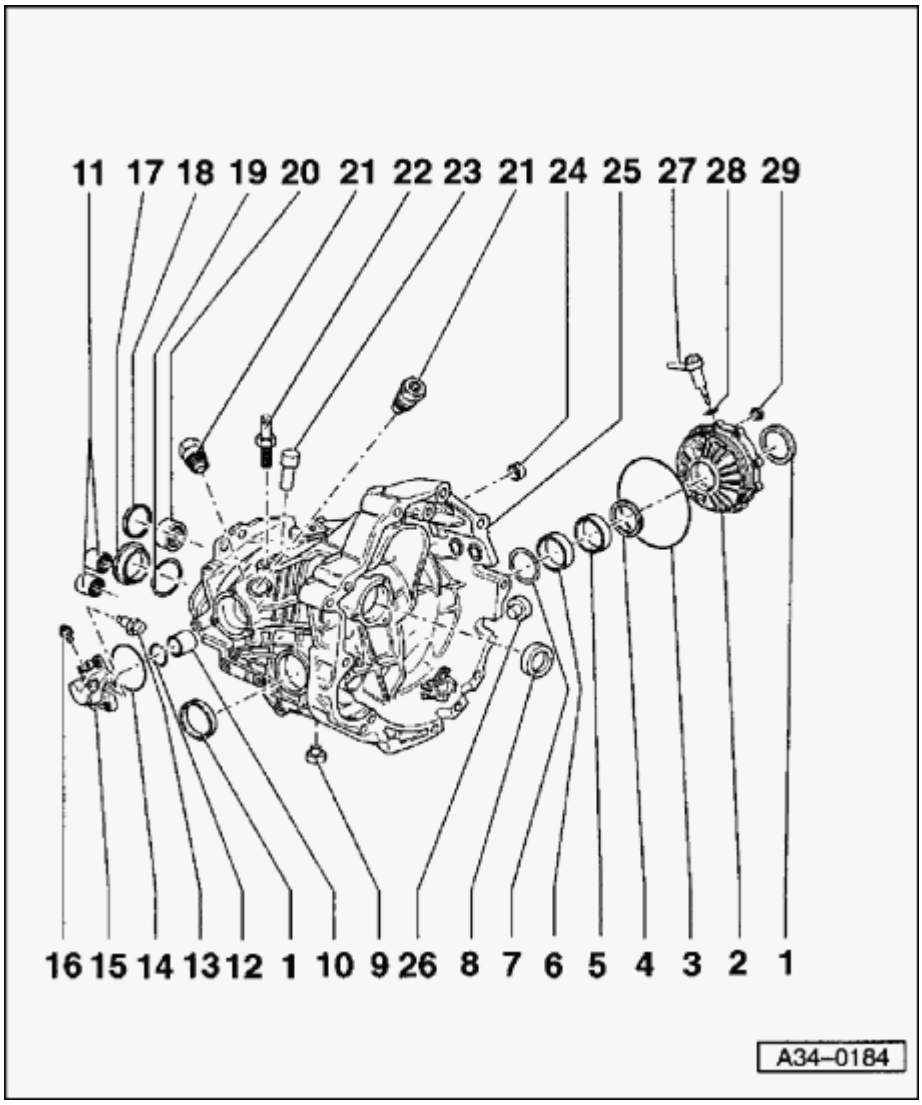


Fig. 274: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

15 - Cover for selector shaft

- Removing. Refer to **Fig. 164**
- Installing. Refer to **Fig. 212**

16 - Ball stud, 20 Nm

- For connecting rod

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17 - Taper roller bearing outer race, large1)

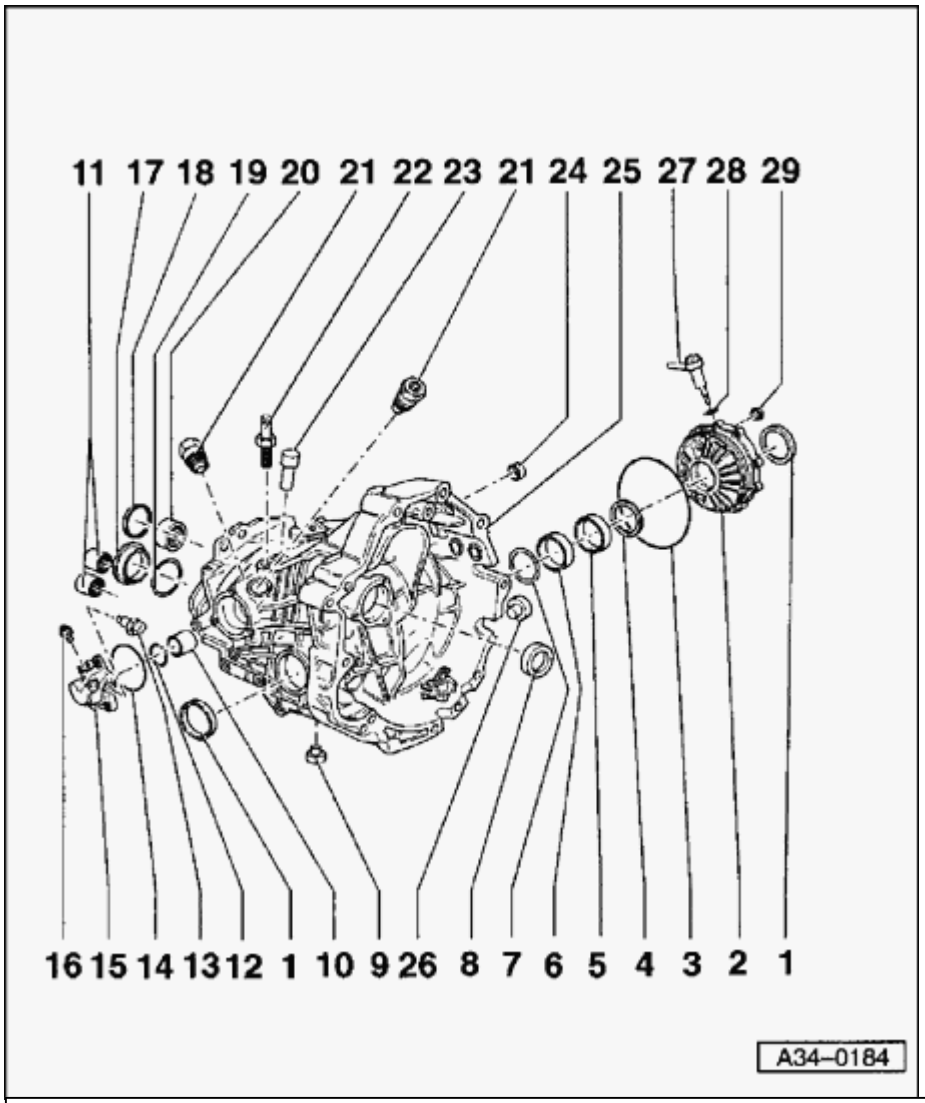
- For drive pinion
- Pulling out. Refer to **Pulling out large taper roller bearing outer race**
- Pressing in. Refer to **Heating transmission housing in order to install outer race for taper roller bearing**

18 - Circlip

- Removing. See **Removing circlip**

19 - Shim S3

- Note thickness
- Adjustment overview. Refer to **Adjustment overview**



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Fig. 275: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

20 - Needle bearing for input shaft

- Pulling out. See **Pulling needle bearing out of transmission housing**
- Tapping in. See **Driving needle bearing into transmission housing**
- Measuring insertion depth. See **Insertion depth of needle bearing**

21 - Locking bolt for selector shaft, 50 Nm

- Removing. Refer to **Fig. 164**
- Insert in transmission housing with sealing paste AMV 188 001 02

22 - Trunnion bolt, 40 Nm

- For push rod

23 - Breather

- Insertion depth of sleeve. See **Insertion depth of breather sleeve**
- Clip cap on

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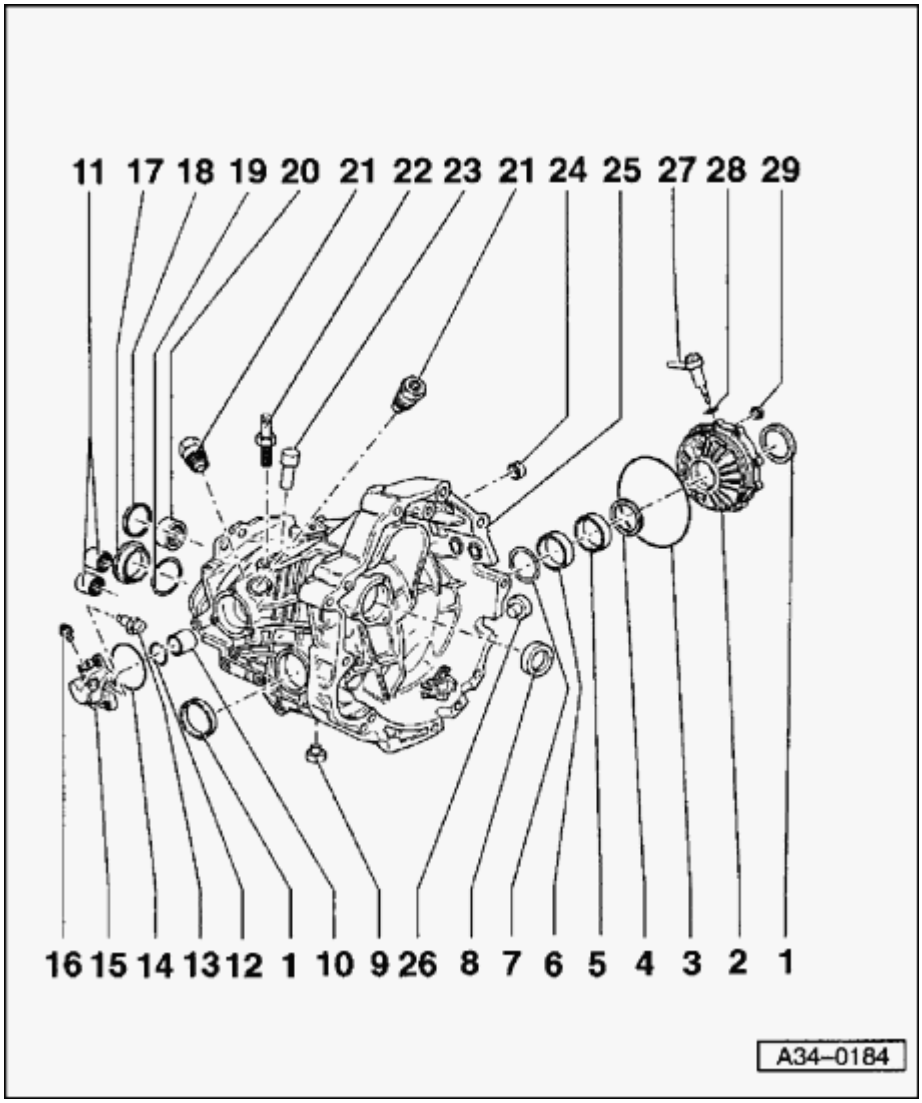


Fig. 276: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

24 - Selector shaft seal

- Can be replaced when transmission is removed but not disassembled
- Always replace
- Pulling out. See **Pulling out selector shaft seal**
- Tapping in. See **Driving in selector shaft seal**

- Always use assembly sleeve for installing. See **Installing seal and selector shaft with assembly sleeve**

25 - Transmission housing 1)

26 - Solenoid

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- Clean
- Drive in (for example, with press tool VW 408 A) when replacing transmission

27 - Speedometer vehicle speed sensor -G22-

- Replacing. Refer to **Speedometer vehicle speed sensor -G22-, removing and installing**

28 - O-ring

- Always replace

29 - Oil filler plug, 40 Nm

Pulling out seal for flanged shaft

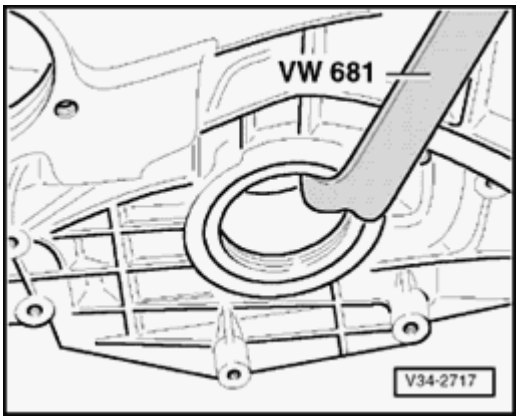
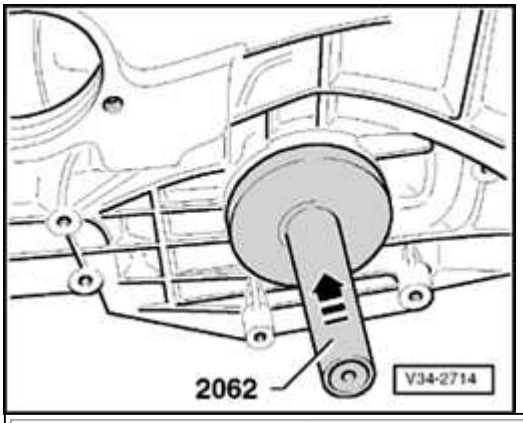


Fig. 277: Removing Drive Flange Seal Using Extractor Lever VW 681
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **Figure shows removing seal on right-hand side of transmission.**
- **The procedure is identical for left and right-hand seals.**

Driving in seal for flanged shaft



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Fig. 278: Driving In Flange Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insertion depth: 5.5 mm

NOTE:

- **Figure shows installing seal on right-hand side of transmission.**
- **The procedure is identical for left and right-hand seals.**
- **Insertion depth for repairs is 6.5 mm when a used flanged shaft is employed.**

Levering out input shaft seal when transmission is disassembled

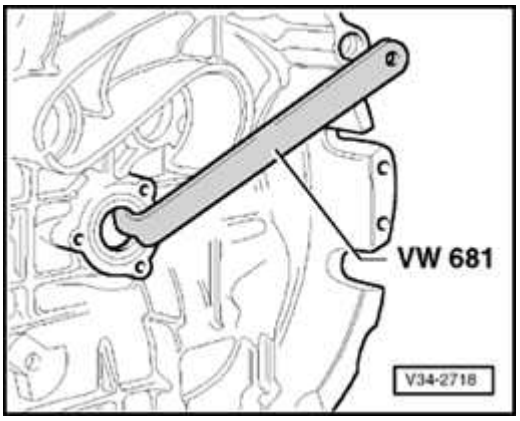


Fig. 279: Prying Input Shaft Seal Out Of Disassembled Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing input shaft seal when transmission is not disassembled

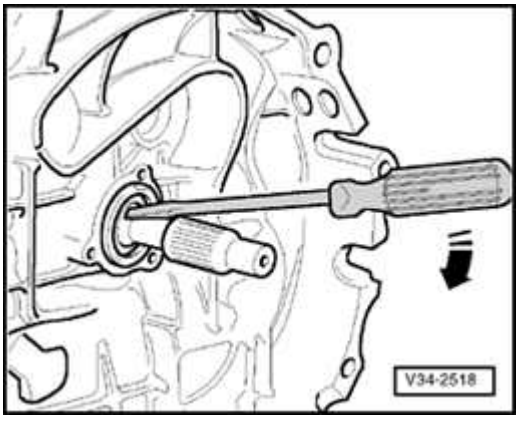


Fig. 280: Removing Shaft Seal For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lever out seal carefully with a screwdriver.

NOTE: Do not damage bearing surface on input shaft for shaft seal.

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Drive in input shaft seal flush

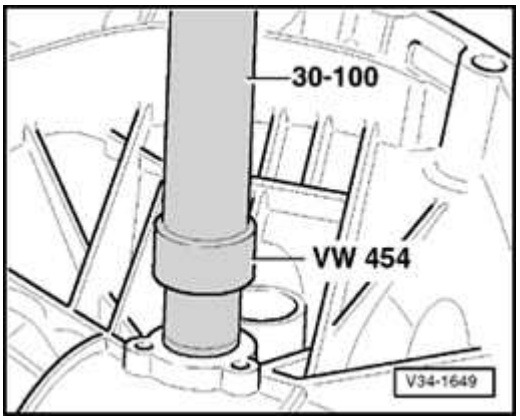


Fig. 281: Installing Shaft Seal For Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pack new seal for input shaft between sealing lip and dust lip half full with sealing grease.
- Pull a thin protective hose tightly onto splines of input shaft.
- Tapping in input shaft seal.

- Insertion depth: 3.5 mm

NOTE: Insertion depth for repairs is 4.5 mm when a used input shaft is employed.

- Remove protective hose.

Pulling out ball sleeve

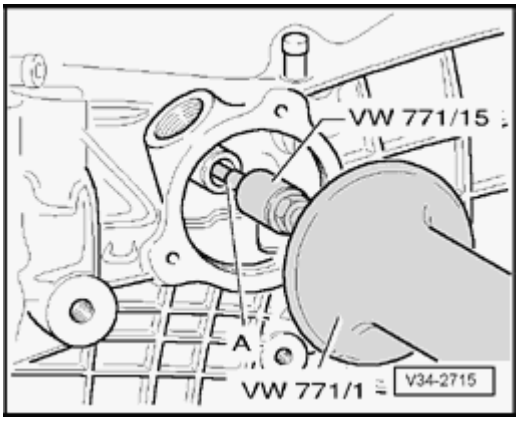


Fig. 282: Pulling Out Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove circlip.

A - Internal extractor 14.5 to 18.5 mm, e.g. Kukko 21/2

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Driving in ball sleeve

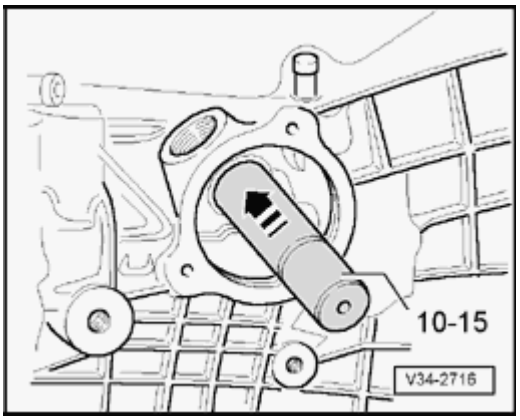


Fig. 283: Driving In Ball Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install ball sleeve with the inscribed side (thicker metal) facing the drift.
- Drive in onto stop.
- Install circlip.

Pulling out selector shaft seal

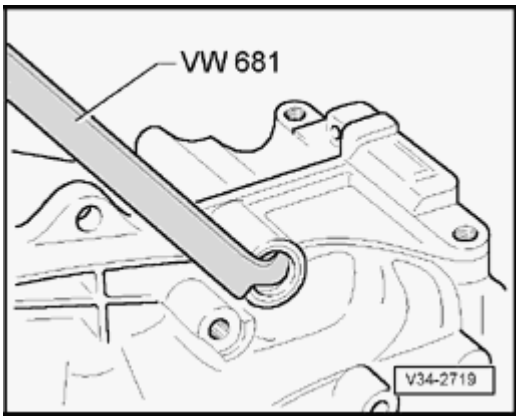


Fig. 284: Removing Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: With transmission removed but not disassembled, carefully lever out seal without damaging the shaft with a screwdriver.

Driving in selector shaft seal

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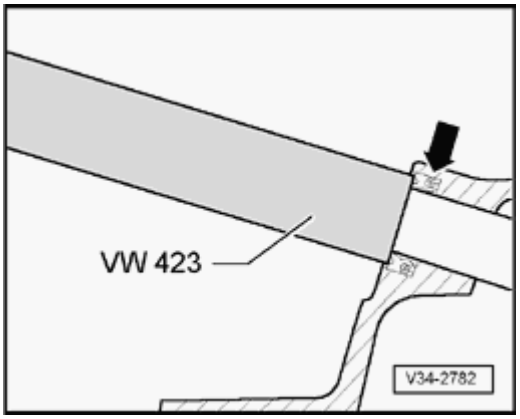


Fig. 285: Driving In Selector Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Selector shaft installed or removed

  - Pack space between sealing and dust lips half full with sealing grease.
  - Pull assembly sleeve onto selector shaft. See **Installing seal and selector shaft with assembly sleeve**
  - Drive seal into housing onto stop.

Installing seal and selector shaft with assembly sleeve

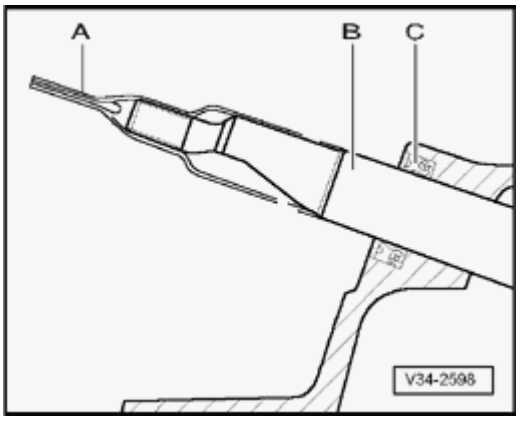


Fig. 286: Installing Seal And Selector Shaft With Assembly Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

  - To avoid damaging seal -C- always use assembly sleeve -A-, Part No. 01E 311 120, to install seal or selector shaft.

Insertion depth of breather sleeve

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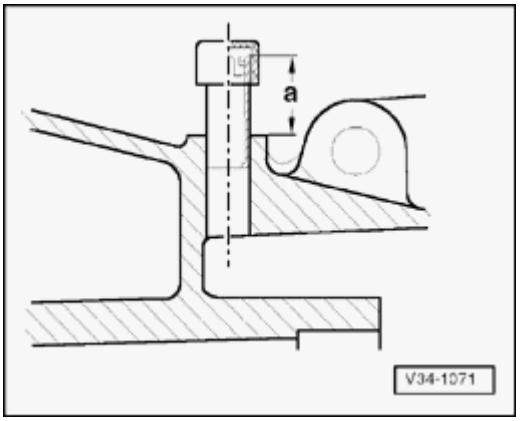


Fig. 287: Press-In Depth Of Breather Sleeve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Distance a = 21 mm

Removing and installing reversing light switch

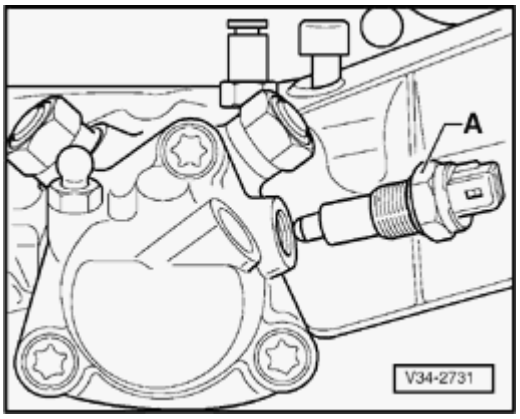


Fig. 288: Removing And Installing Back-Up Light Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten reversing light switch -A- to 20 Nm when installing.

Pulling needle bearing out of transmission housing

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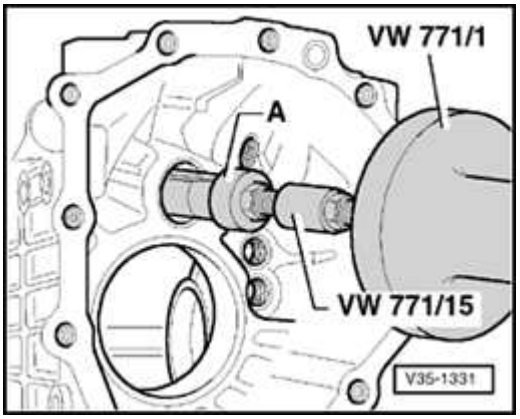


Fig. 289: Pulling Needle Bearing Out Of Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal extractor 30 to 37 mm, e.g. Kukko 21/5

Driving needle bearing into transmission housing

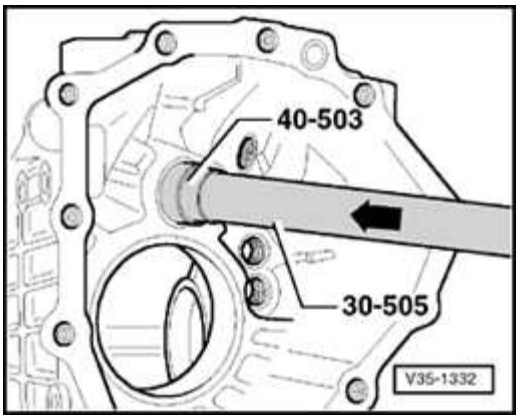


Fig. 290: Driving Needle Bearing Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Installation position: Inscription on bearing faces drift
- Insertion depth. See **Insertion depth of needle bearing**

Insertion depth of needle bearing

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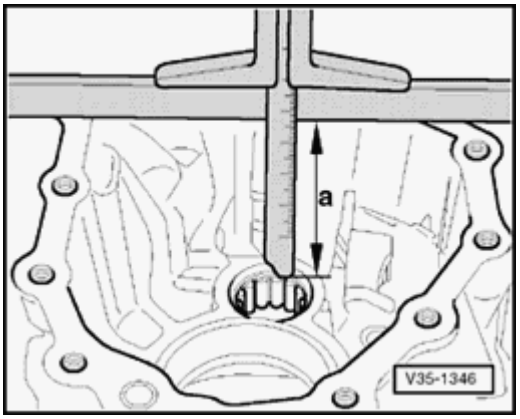


Fig. 291: Drive-In Depth Of Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Distance a = 105 mm

Removing circlip

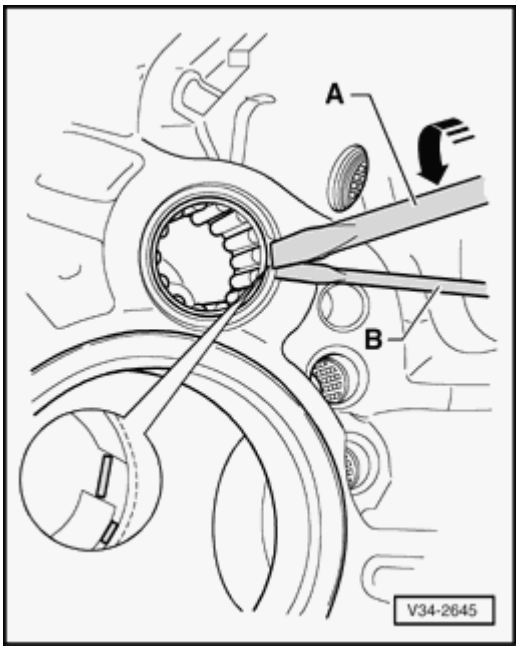


Fig. 292: Removing Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift circlip out of the groove by turning one end of circlip with a screwdriver -A-.
- Secure this end with a screwdriver -B-.
- Lever circlip out further by repositioning screwdriver -A-.

Selector shaft, disassembling and assembling

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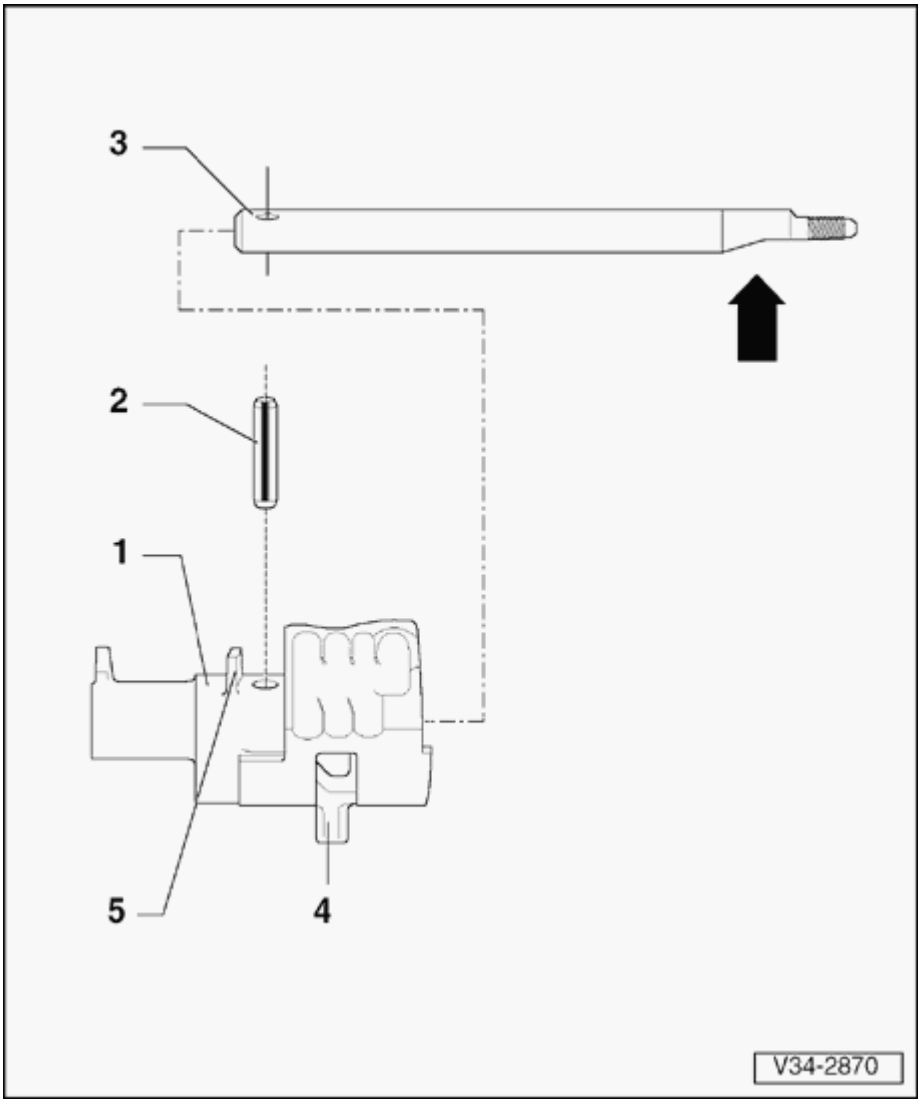


Fig. 293: Selector Shaft, Completely Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Selector cylinder

2 - Spring pin

- Removing and driving in flush. See **Removing and installing spring pin flush**
- Installation position of spring sleeve: Slot longitudinal to line of force

3 - Selector shaft

- Tapping out. See **Driving out selector shaft**
- Tapping in. See **Driving in selector shaft**
- Installation position: Flat (arrow) and selector finger -Item 4 face in same direction

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4 - Selector finger

- Observe installation position to -Item 3

5 - Toggle for reversing light switch

Removing and installing spring pin flush

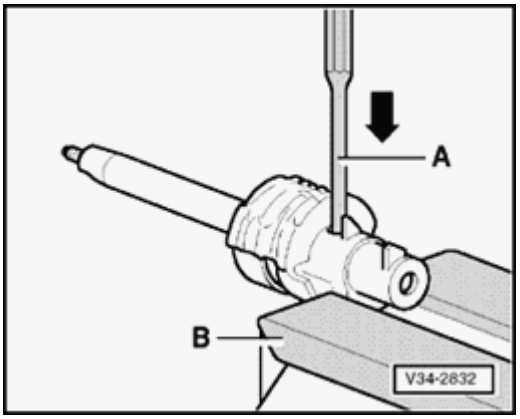


Fig. 294: Driving Out Spring Pin/Roll Pin And Driving In Flush
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Drift

B - Vice clamps

Driving out selector shaft

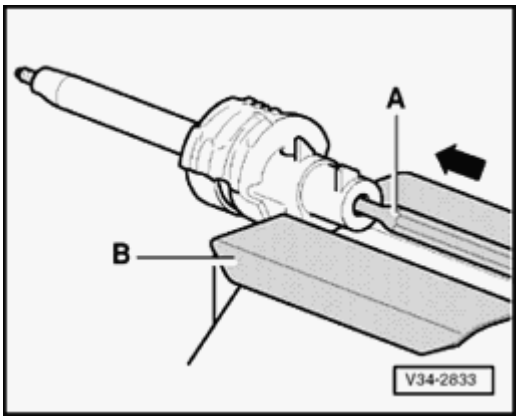


Fig. 295: Driving Out Selector Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Drift

B - Vice clamps

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Driving in selector shaft

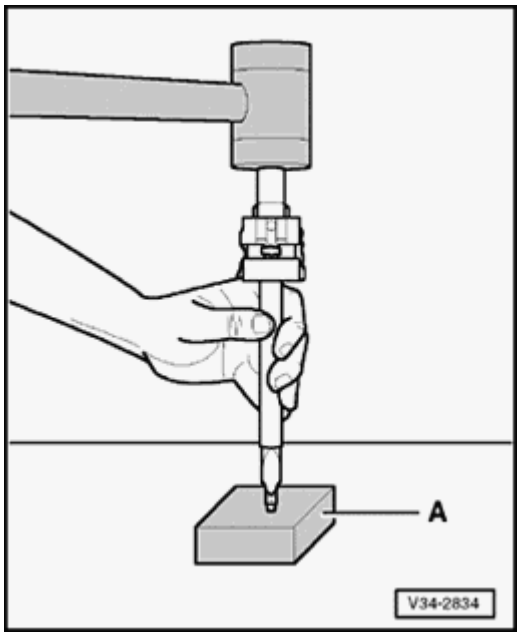


Fig. 296: Driving In Selector Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Wooden packing

NOTE:

- **Bring selector shaft/selector cylinder bores into alignment.**
- **Flat on selector shaft and selector finger point in same direction.**

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35 MANUAL TRANSMISSION - GEARS, SHAFTS

INPUT SHAFT, DISASSEMBLING AND ASSEMBLING

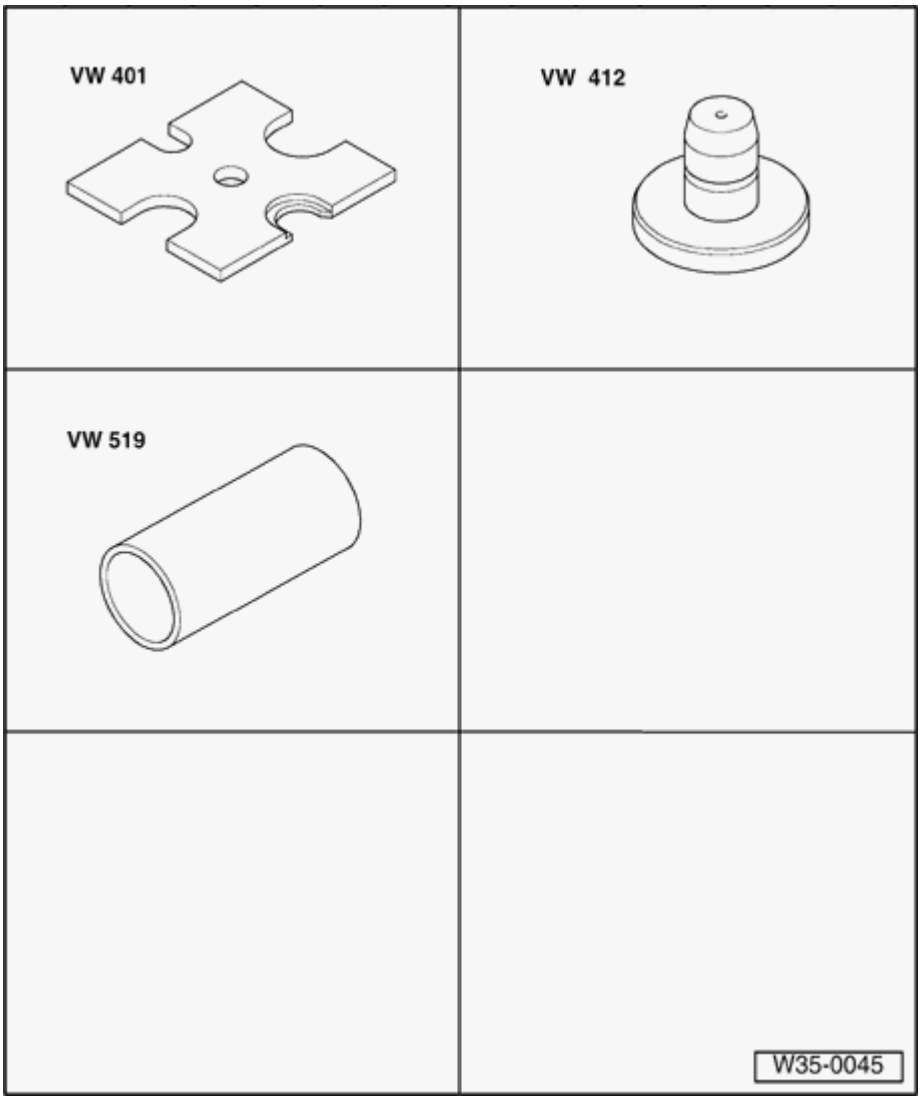


Fig. 297: Identifying Special Tools - Input Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 401 Thrust plate
- VW 412 Thrust tool
- VW 519 Tube
- Feeler gauge

NOTE:

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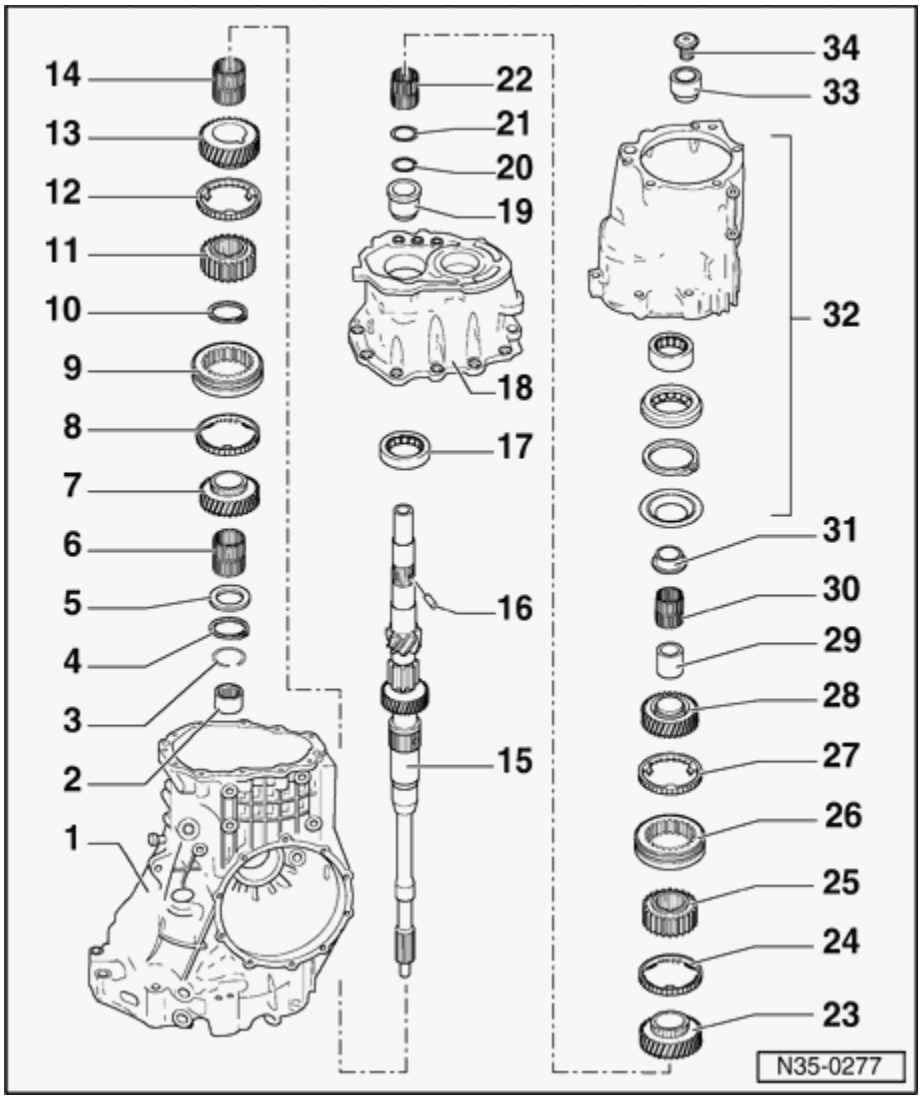


Fig. 298: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **When installing new gears or the input shaft consult technical data. Refer to Code letters, mechanical unit assignment, transmission ratios, capacities.**

1 - Transmission housing

- Servicing. Refer to **Transmission housing, servicing**

2 - Needle bearing

- For input shaft
- Pulling out. Refer to **Pulling needle bearing out of transmission housing**
- Driving in. Refer to **Driving needle bearing into transmission housing**

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3 - Circlip

- For needle bearing

4 - Circlip

- For input shaft

5 - Thrust washer

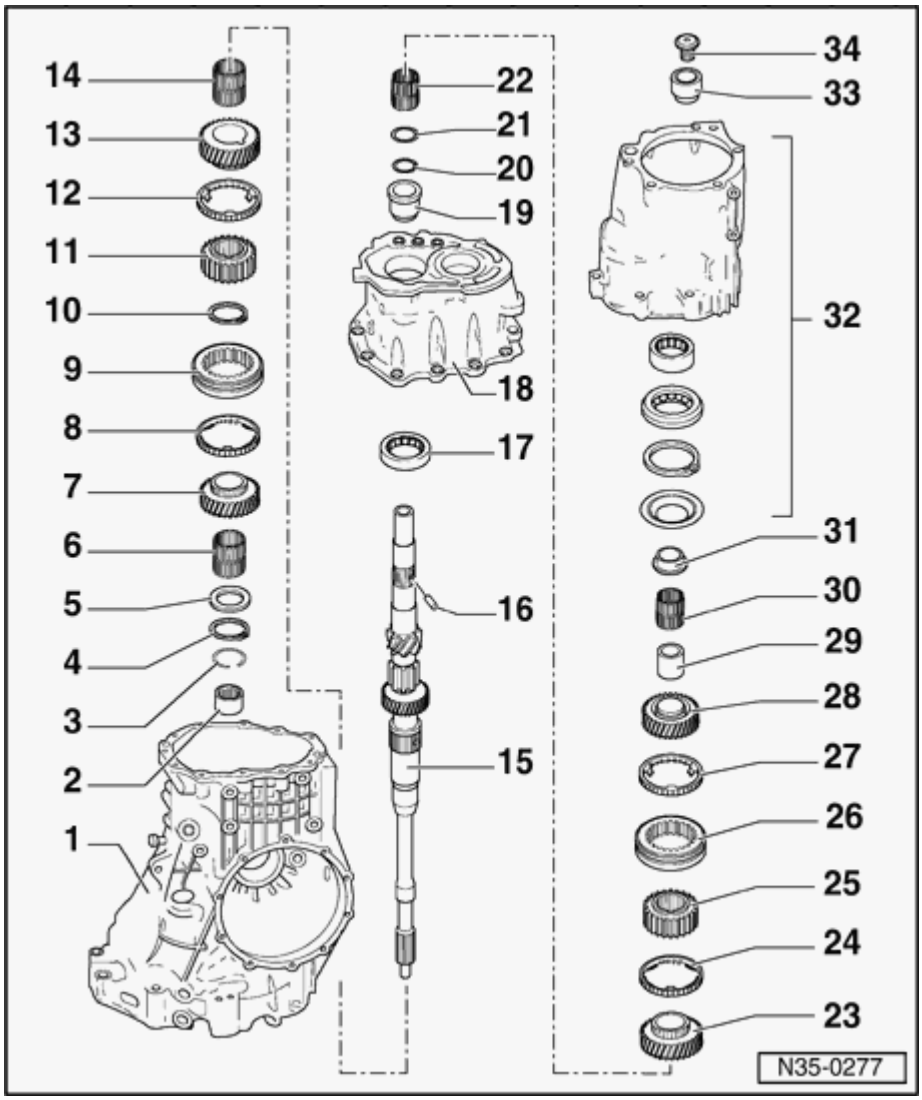


Fig. 299: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

6 - Needle bearing

- For 5th gear

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- Mark before removing
- Do not interchange with needle bearing for 3rd gear
- Oil with gear oil before installing

7 - 4th sliding gear

- Before installing, insert spring. See **Inserting spring in sliding gear**

8 - 4th gear synchro-ring

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

9 - Locking collar

- Paired with synchro-hub
- Mark before removing. Refer to **Fig. 172**

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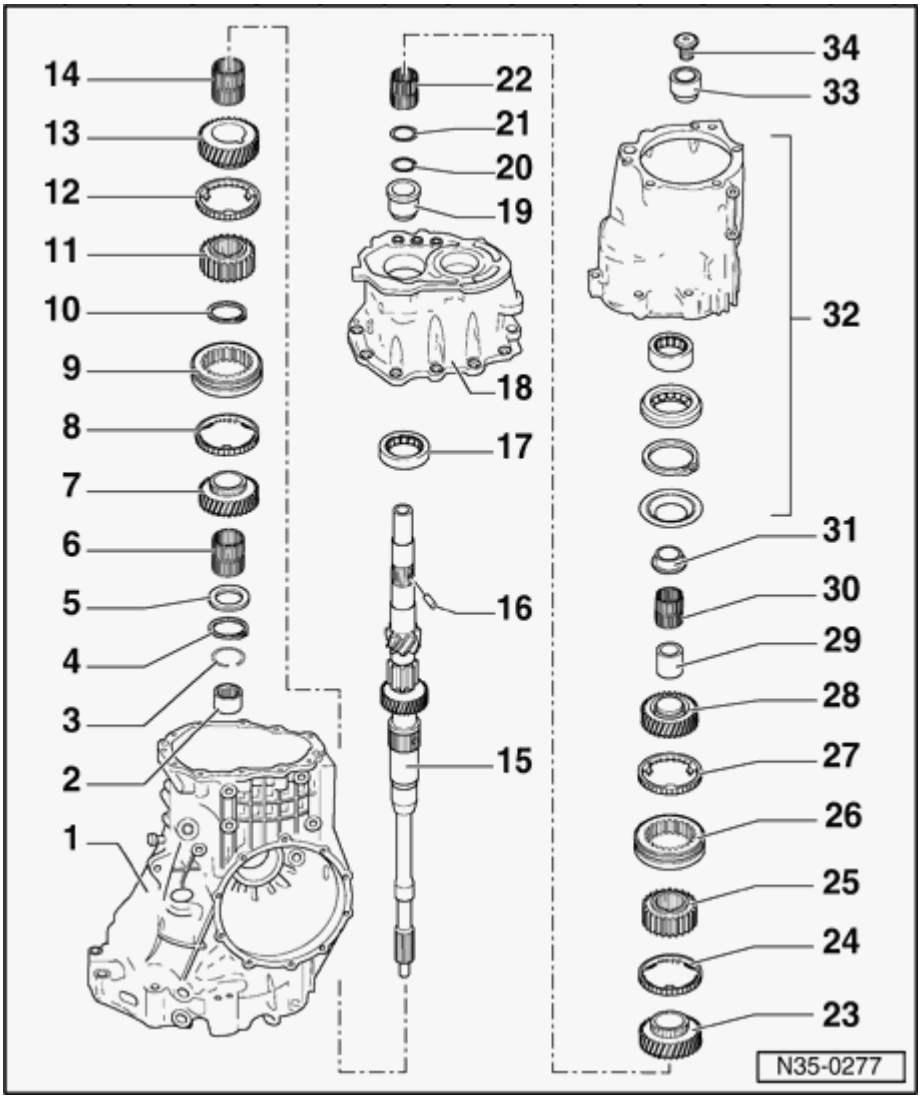


Fig. 300: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

10 - Circlip

- When replacing synchro-hub, re-determine thickness. See **Determining thickness of circlip**
- Installation position: Ends align with groove of synchro-hub

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

- Pressing off. See **Pressing off synchro hub for 3rd and 4th gear**
- Installation position. See **Installation position of synchro-hub**
- Pressing on. See **Pressing on synchro hub for 3rd and 4th gear**

12 - 3rd gear synchro-ring

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- Coated with molybdenum
- Checking for wear. See **Checking synchro-ring for wear**

13 - 3rd sliding gear

- Before installing, insert spring. See **Inserting spring in sliding gear**
- After pressing on -Item 11 check axial play using feeler gauge (0.15 to 0.35 mm)

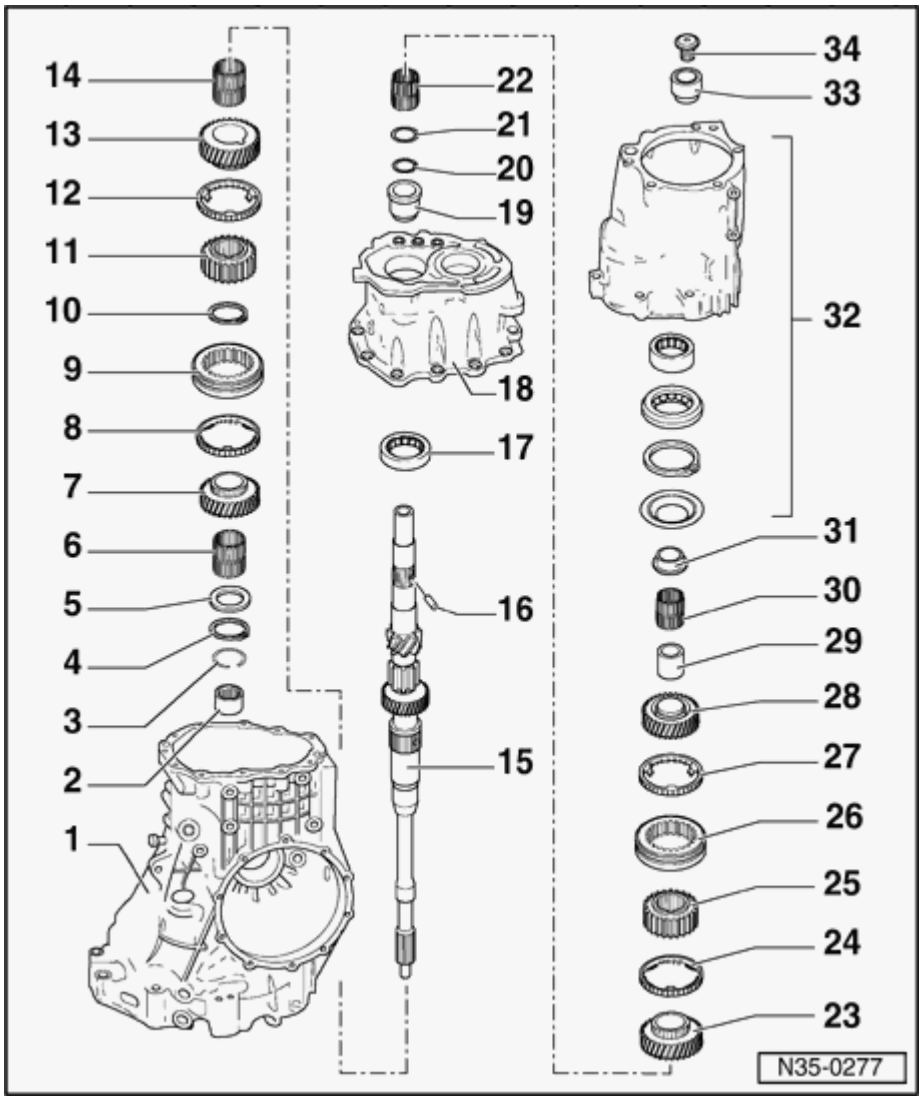


Fig. 301: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

14 - Needle bearing

- For 3rd gear
- Mark before removing

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- Do not interchange with needle bearing for 4th gear
- Lubricate with gear oil before installing

15 - Input shaft

16 - Spring pin

- Replace
- Drive in when replacing input shaft. See **Driving spring sleeve into input shaft**

17 - Cylindrical roller bearing

- For input shaft
- Pressing out. Refer to **Pressing cylinder roller bearing for input shaft out of bearing plate**
- Pressing in. Refer to **Pressing cylinder roller bearing for input shaft into bearing plate**

18 - Bearing plate

- Servicing. Refer to **Bearing plate, servicing**

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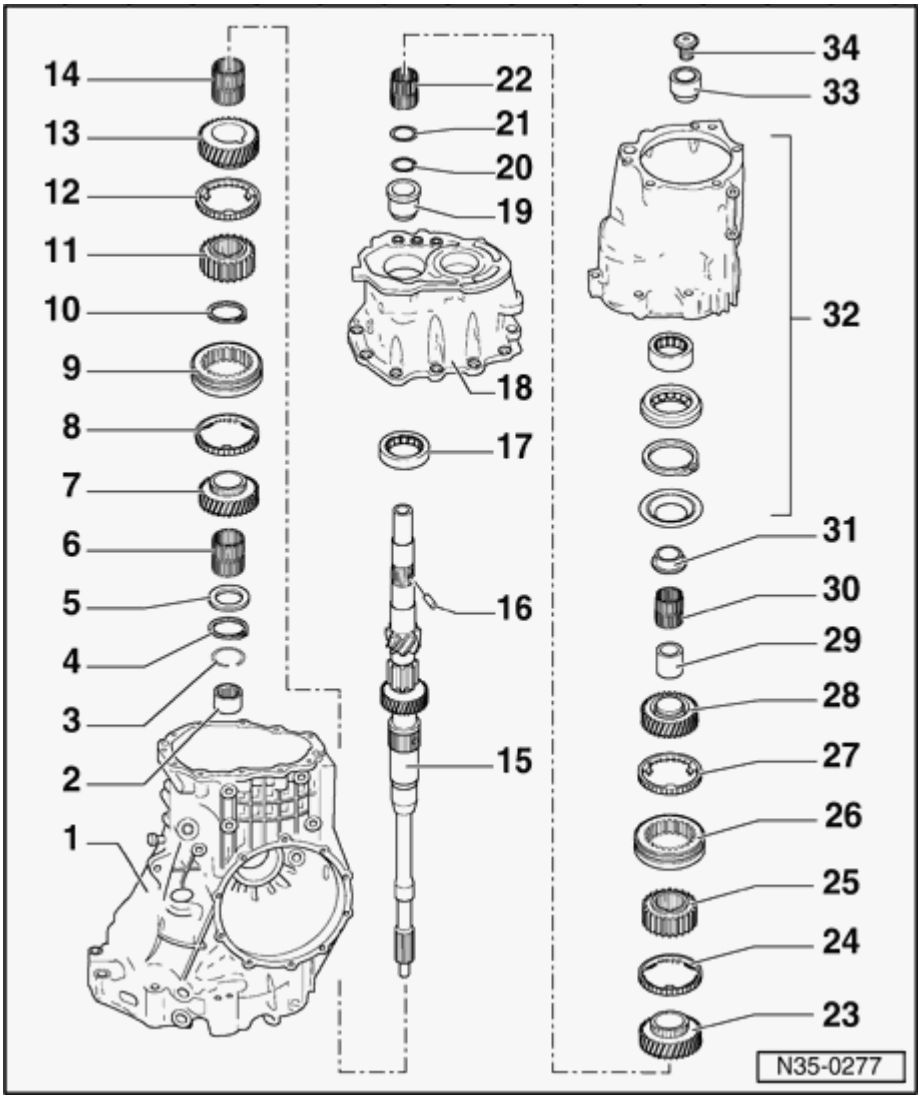


Fig. 302: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

19 - Inner race

- For cylinder roller bearing
- Remove and install by hand

20 - Circlip

21 - Thrust washer

- For needle bearing for 6th sliding gear
- Installation position: Shoulder toward circlip, smooth face contact surface toward needle bearing. Refer to **Fig. 193**

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22 - Needle bearing

- For 6th gear
- Oil with gear oil before installing

23 - 6th sliding gear

- Before installing, insert spring. See **Inserting spring in sliding gear**
- After installing, check axial play. Refer to **Fig. 197**

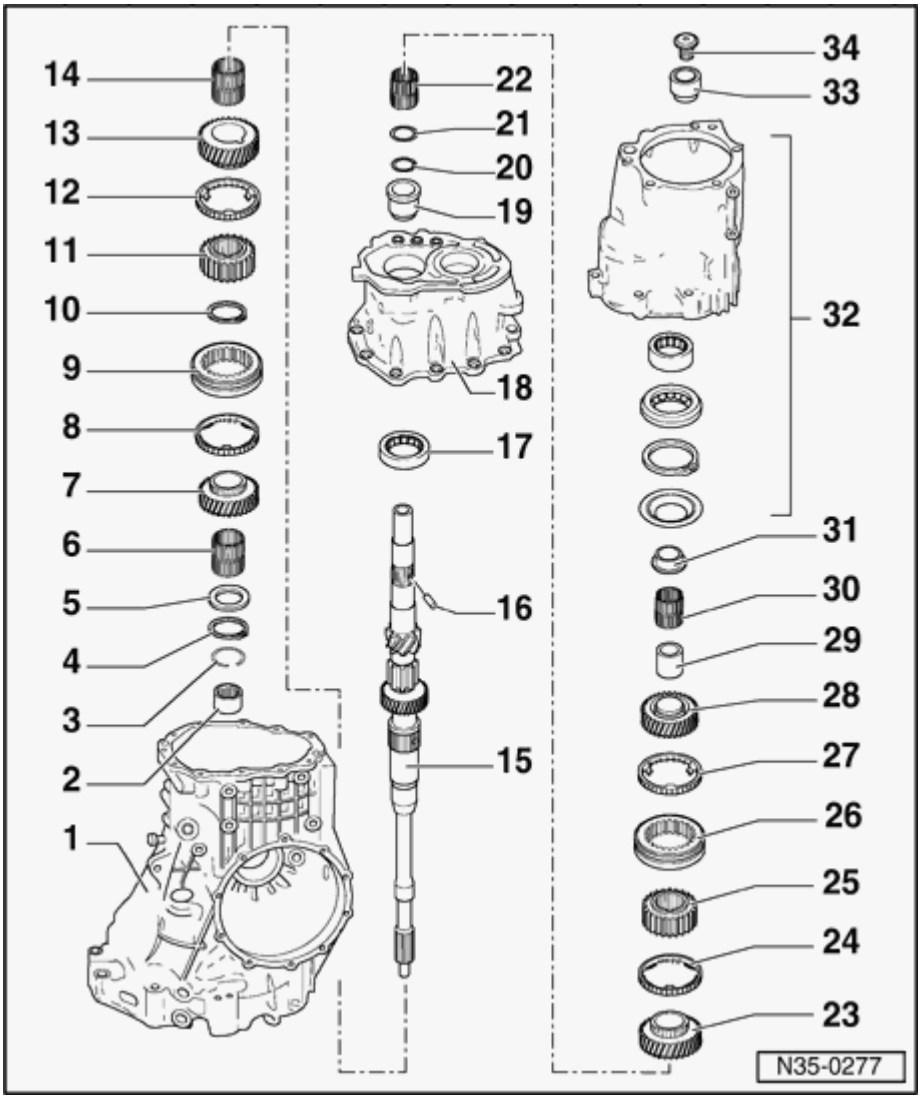


Fig. 303: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

24 - 6th gear synchro-ring

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

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25 - Synchro-hub for 5th and 6th gear

- Pulling off. Refer to **Fig. 174**
- Driving on. Refer to **Fig. 196**
- Installation position: Projecting hub toward 5th sliding gear

26 - Locking collar

- Paired with synchro-hub
- Mark before removing. Refer to **Fig. 172**

27 - 5th gear synchro-ring

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

28 - 5th sliding gear

- Before installing, insert spring. See **Inserting spring in sliding gear**
- After installing, check axial play. Refer to **Assembling**

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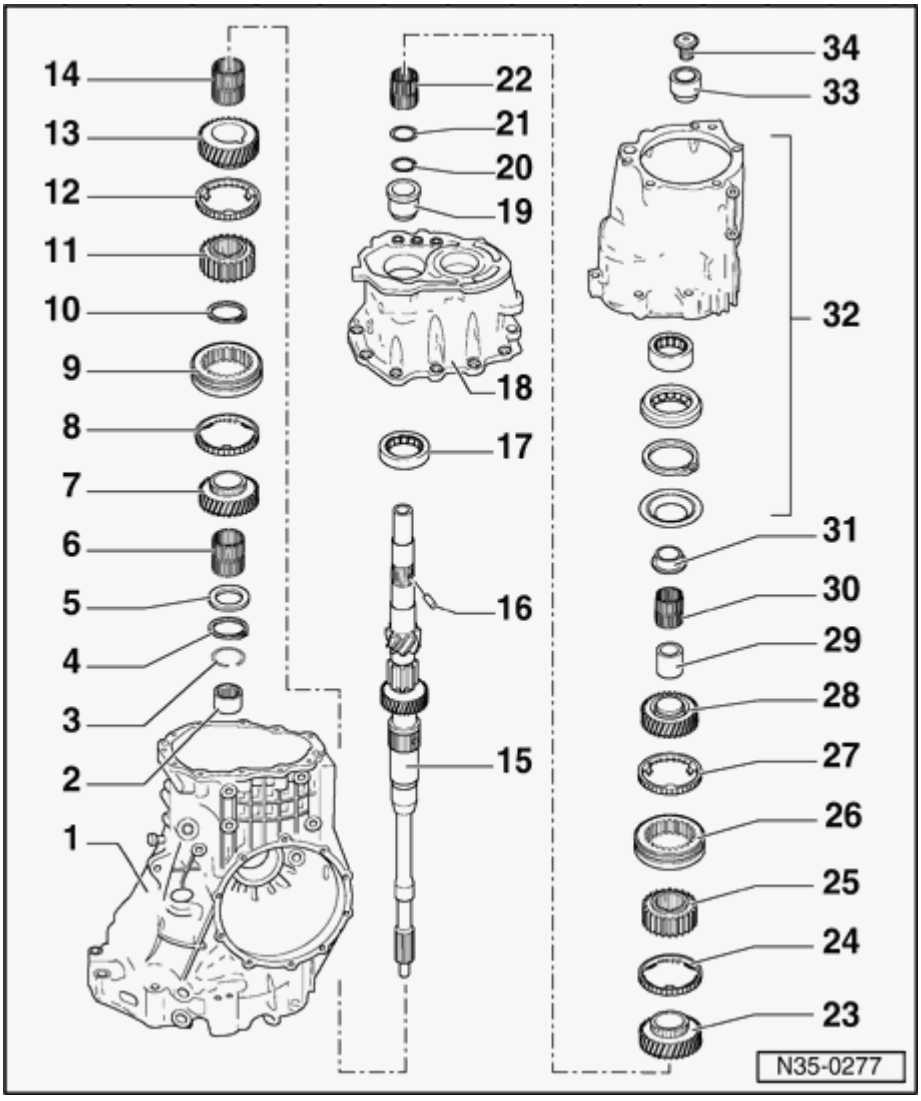


Fig. 304: Transmission Housing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

29 - Inner race for needle bearing

- For 5th sliding gear
- Pulling off. Refer to **Fig. 174**
- Driving on. Refer to **Fig. 203**

30 - Needle bearing

- For 5th gear
- Oil with gear oil before installing

31 - 1st inner race for four-point bearing

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- Ball bearing side
- Pulling off. Refer to **Fig. 169**
- Driving on. Refer to **Fig. 204**

32 - End cover

- Servicing. Refer to **End cover, servicing**

33 - 2nd inner race for ball bearing

- Pulling off. Refer to **Fig. 168**
- Driving on. Refer to **Fig. 206**

34 - Multi-point socket head bolt, 150 Nm

- Loosening. Refer to **Fig. 166**
- Tightening. Refer to **Fig. 207**

Inserting spring in sliding gear

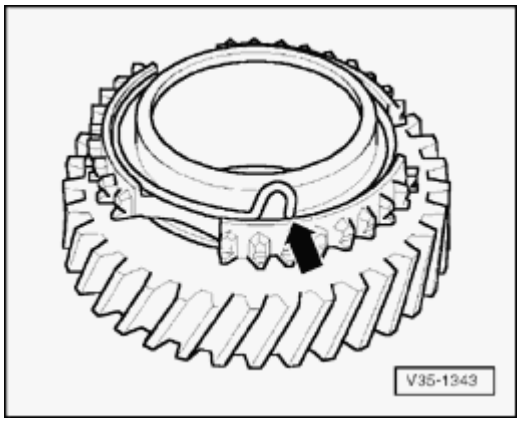


Fig. 305: Inserting Spring Into Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Checking synchro-ring for wear

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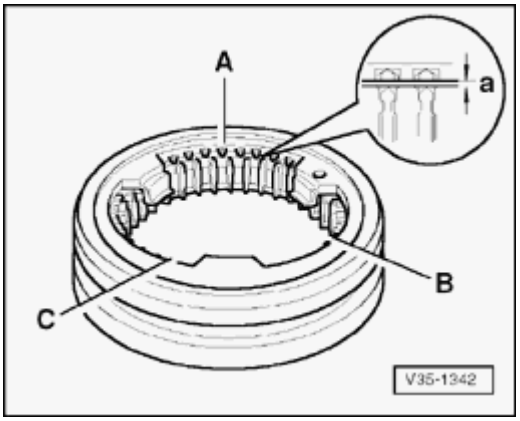


Fig. 306: Checking Synchronizer Ring For Wear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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 calculated value must not be less than 0.5 mm.

Determining thickness of circlip

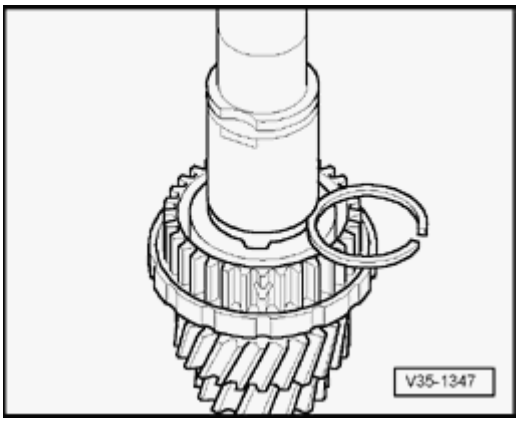


Fig. 307: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Synchro-hub pressed onto stop

- Determine the thickest circlip that will just fit and install it.

NOTE: The opening of circlip must align with groove in synchro-hub.

The following circlips are available:

Circlip thickness (mm)

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1.90	1.96	2.02
1.93	1.99	2.05

Pressing off synchro hub for 3rd and 4th gear

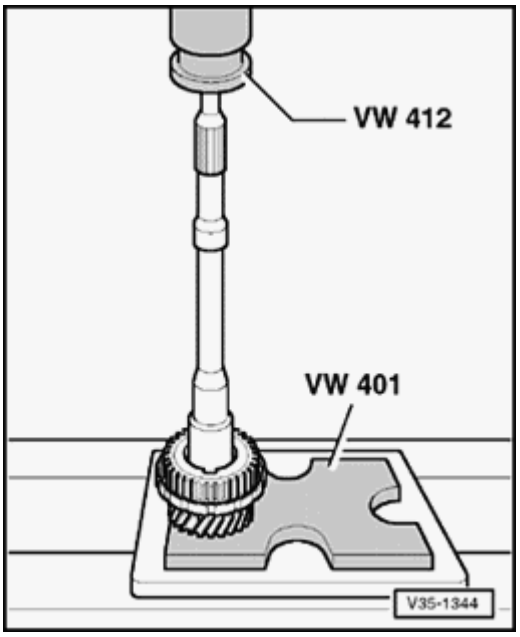


Fig. 308: Pressing Off Synchronizer Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installation position of synchro-hub

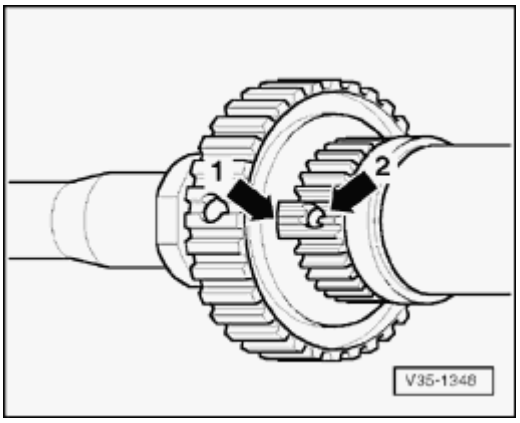


Fig. 309: Installed Position Of Synchronizer Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Oil groove in synchro-hub -arrow 1- must align with oil drilling -arrow 2- in input shaft

Pressing on synchro hub for 3rd and 4th gear

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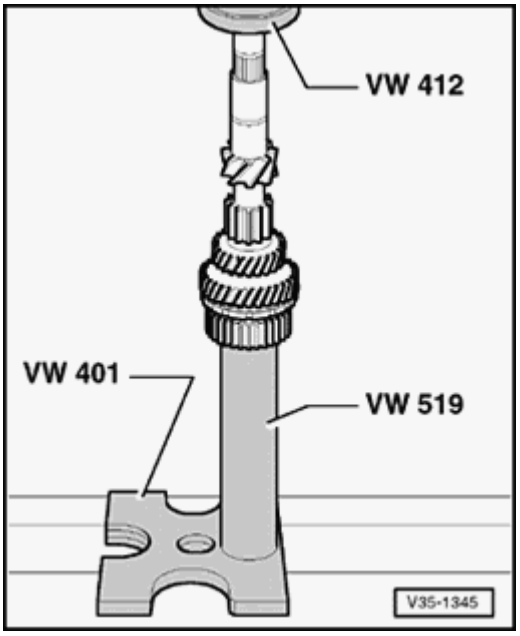


Fig. 310: Pressing On Synchronizer Hub For 3rd And 4th Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat synchro-hub to approx. 100 ° C, position and press home.

  WARNING: Wear protective gloves!

- Determine circlip and install. See **Determining thickness of circlip**.

Driving spring sleeve into input shaft

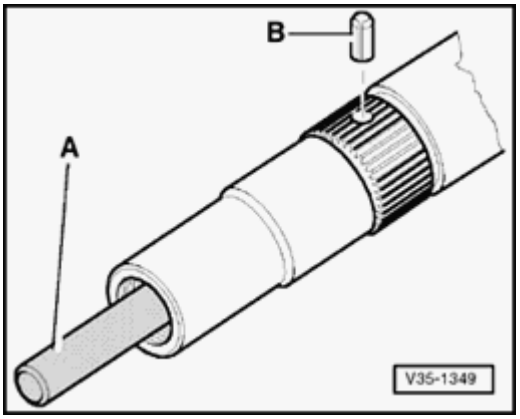


Fig. 311: Driving Roll Pin Into Input Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Guide a 9 mm diameter drift -A- into oil drilling and drive spring sleeve -B- in until it touches drift.

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DRIVE PINION AND HOLLOW SHAFT, DISASSEMBLING AND ASSEMBLING

Drive pinion and hollow shaft, disassembling and assembling

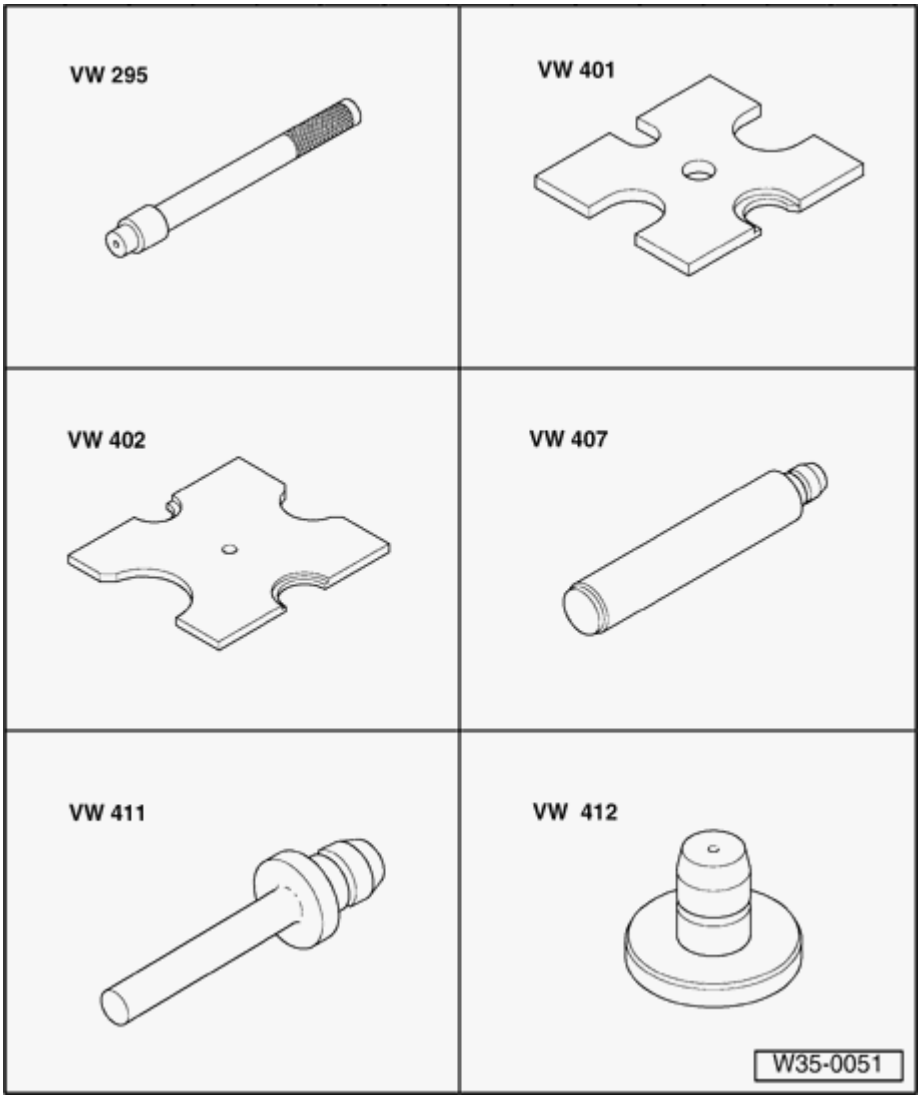


Fig. 312: Identifying Special Tools - Pinion And Hollow Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 295 Drift
- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 411 Thrust tool

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- VW 412 Thrust tool

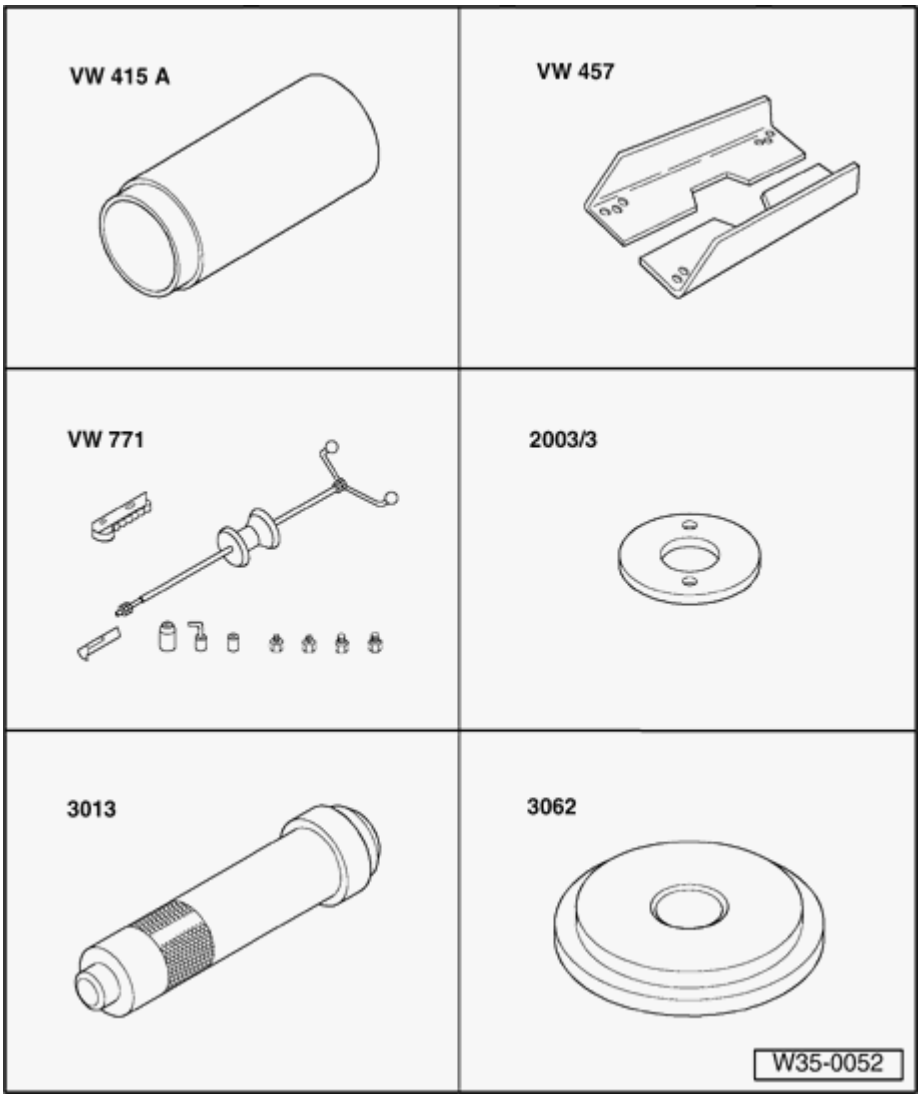


Fig. 313: Identifying Special Tools - Pinion And Hollow Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 415 A Tube
- VW 457 Mount rails
- VW 771 Multi-purpose tool
- 2003/3 Inserter ring
- 3013 Fitting drift
- 3062 Thrust disk

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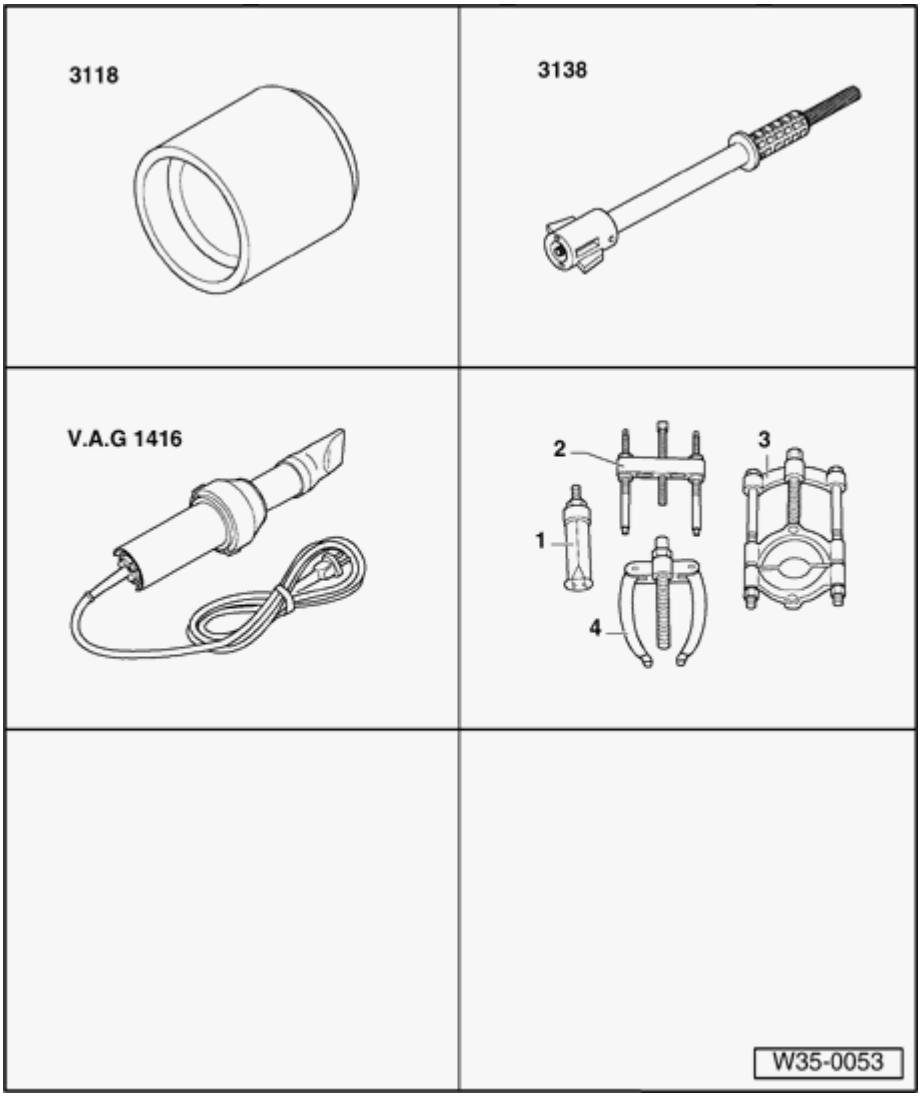


Fig. 314: Identifying Special Tools - Pinion And Hollow Shaft, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3118 Tube
- 3138 Drift
- VAG 1416 Hot-air blower
- 1 - Internal puller 21/1
- 3 - Kukko 17/2 Separating tool

NOTE:

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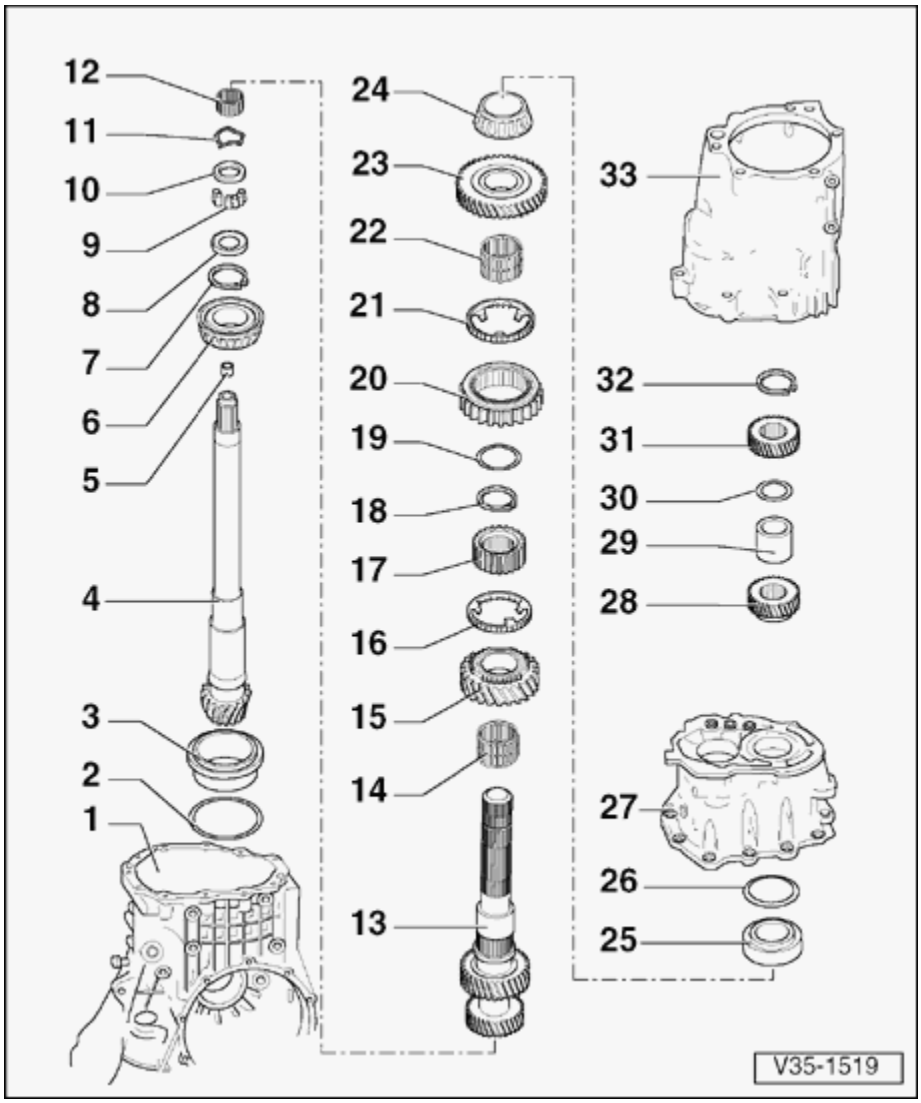


Fig. 315: Pinion and Hollow Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **When installing new gears or the final drive set consult technical data. Refer to Code letters, mechanical unit assignment, transmission ratios, capacities.**

1) Adjustments are required if these components are replaced. Refer to **Adjustment overview**.

1 - Transmission housing

- Servicing. Refer to **Transmission housing, servicing**

2 - Shim S3

- Adjustment overview. Refer to **Adjustment overview**

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3 - Taper roller bearing outer race, large1)

- Pulling out. See **Pulling out large taper roller bearing outer race**
- Pressing in. See **Inserting outer race for large taper roller bearing in transmission housing and pressing home**

4 - Drive pinion1)

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

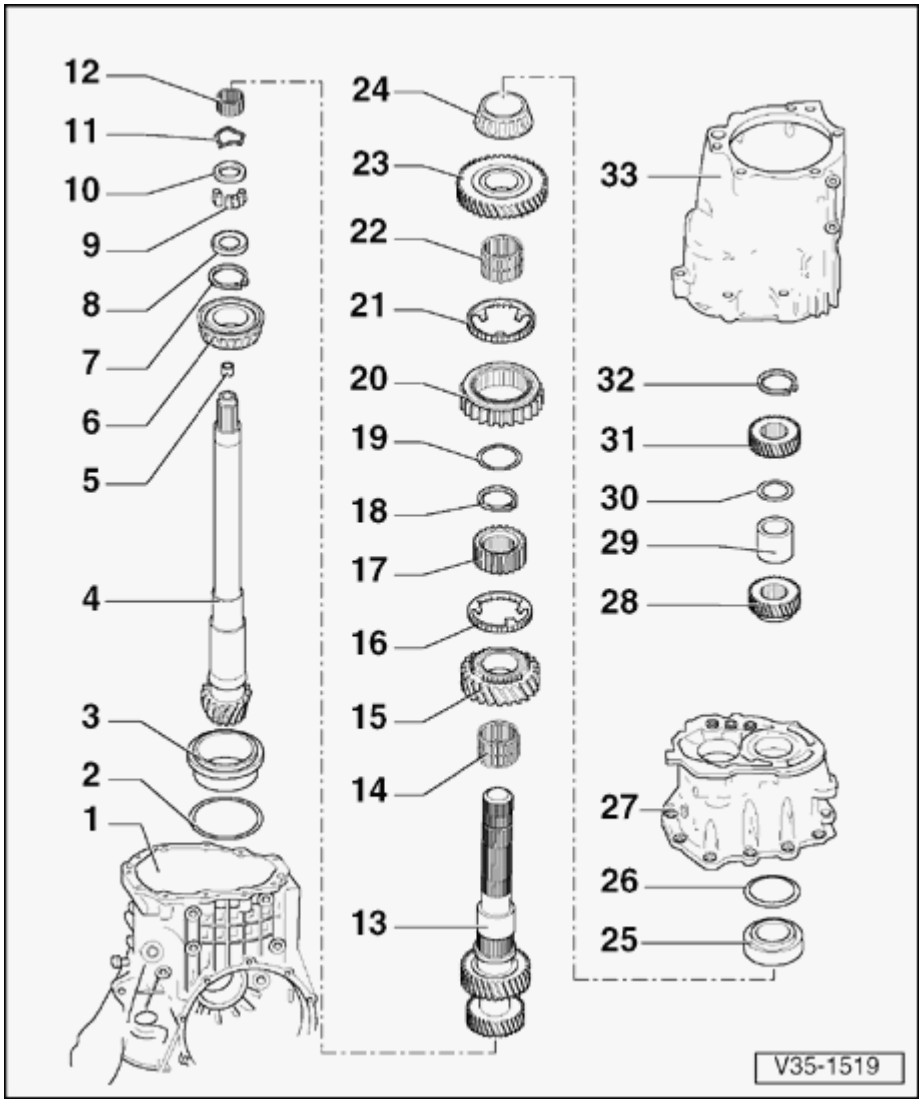


Fig. 316: Pinion and Hollow Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Needle bearing

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- For flanged shaft/drive pinion
- Pulling out. See **Removing needle bearing for flanged shaft/drive pinion**
- Tapping in. See **Inserting needle bearing for flanged shaft/drive pinion flush**

6 - Taper roller bearing inner race, large1)

- Pressing off. See **Pressing off large taper roller bearing inner race**
- Pressing on. See **Pressing on inner race for taper roller bearing**
- Low friction bearing; do not oil when measuring frictional torque

7 - Circlip

- Redefine thickness. See **Determining thickness of circlip**

8 - Flange ring

- Installation position. Refer to **Fig. 181**

9 - Taper rollers

- 23 pieces
- Installation position. Refer to **Fig. 181**

10 - Supporting ring

- Installation position. Refer to **Fig. 181**

11 - Corrugated spring

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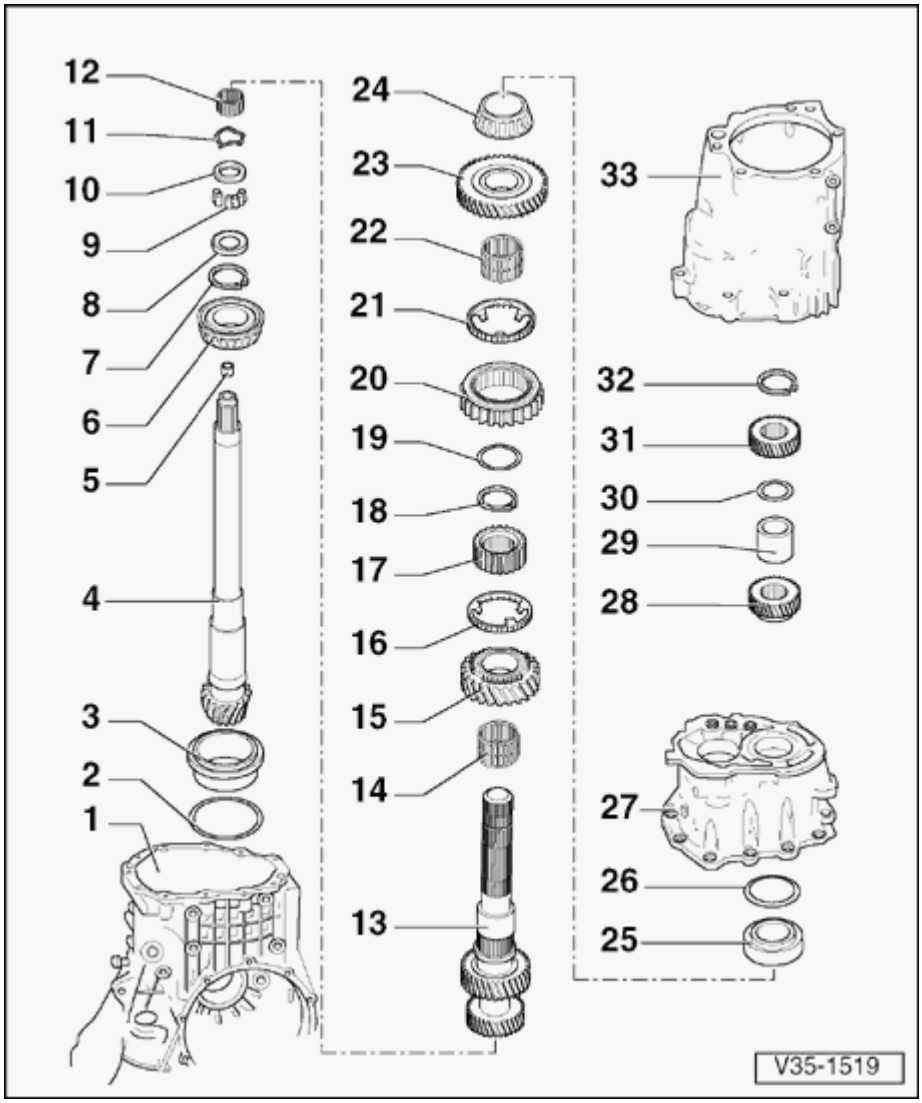


Fig. 317: Pinion and Hollow Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

12 - Needle bearing

- For drive pinion/hollow shaft
- Oil with gear oil before installing

13 - Hollow shaft 1)

- With gear wheels for 3rd and 4th gear

14 - Needle bearing

- For 2nd sliding gear
- Oil with gear oil before installing

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15 - 2nd sliding gear

- Pressing off. See **Pressing off 2nd gear sliding wheel with synchro-hub for 1st and 2nd gear**
- Before installing, insert spring and slide needle bearing onto hollow shaft
- After installation, check axial play using feeler gauge (0.15 to 0.35 mm)

16 - 2nd gear synchro-ring

- Coated with molybdenum
- Checking for wear. Refer to **Checking synchro-ring for wear**

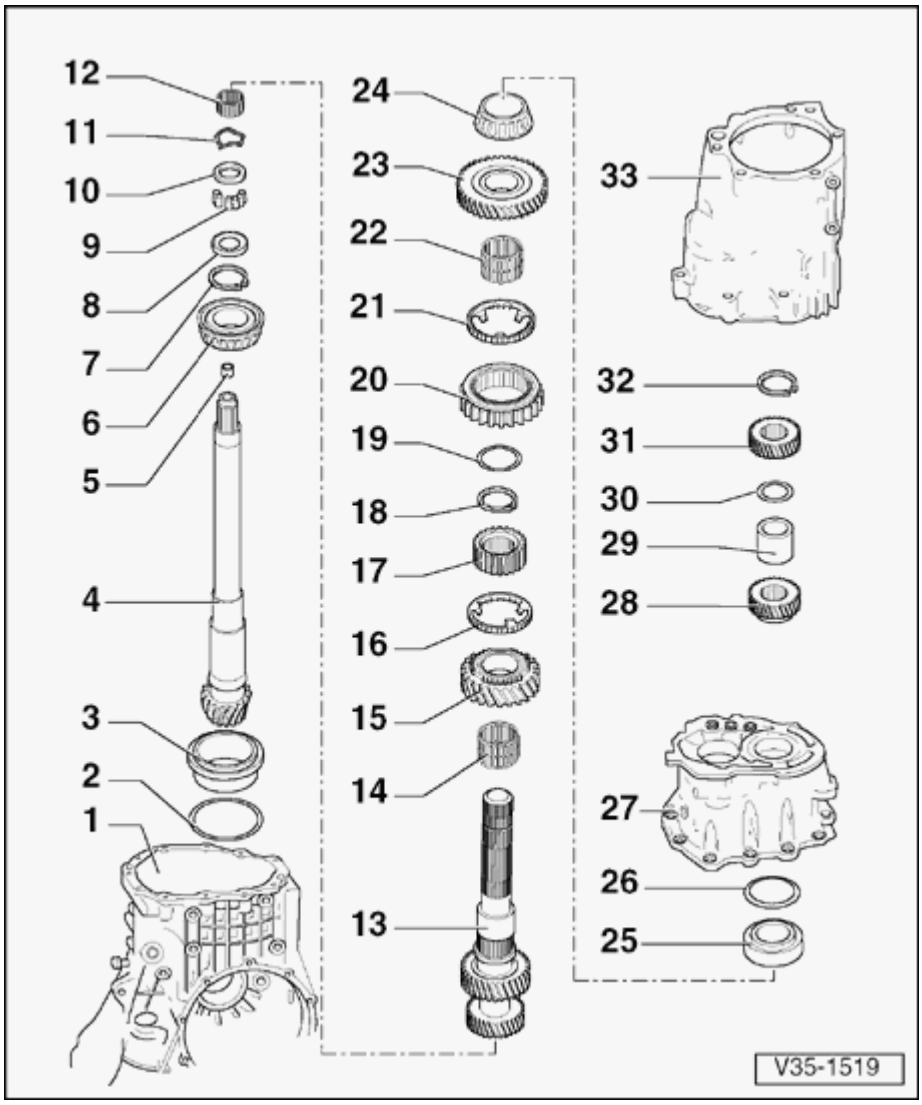


Fig. 318: Pinion and Hollow Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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- Pressing off. See **Pressing off 2nd gear sliding wheel with synchro-hub for 1st and 2nd gear**
- Pressing on. See **Installing 2nd sliding gear, pressing on synchro-hub for 1st and 2nd gear**
- Installation position: Flush hub toward 2nd sliding gear

18 - Circlip

- Removing and installing. See **Removing and installing circlip of synchro-hub and washer of 1st sliding gear**
- Redefine thickness. See **Determining thickness of circlip**

19 - Washer

- For needle bearing for 1st sliding gear
- Removing and installing. See **Removing and installing circlip of synchro-hub and washer of 1st sliding gear**

20 - Locking collar, 1st and 2nd gear

- Installation position: Splines for reverse gear facing synchro-ring for 2nd gear

21 - 1st gear synchro-ring

- Checking for wear. Refer to **Checking synchro-ring for wear**

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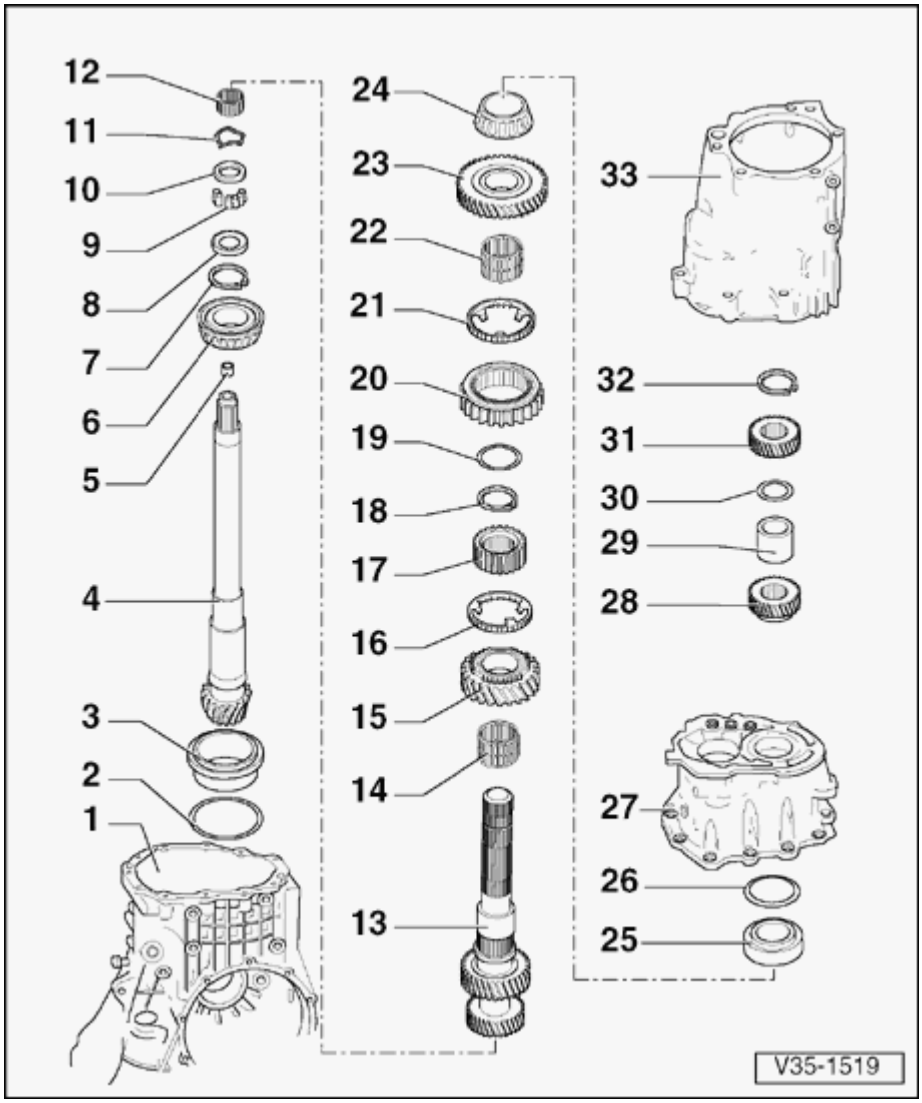


Fig. 319: Pinion and Hollow Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

22 - Needle bearing

- For 1st sliding gear
- Oil with gear oil before installing

23 - 1st sliding gear

- Before installing, insert spring. Refer to **Inserting spring in sliding gear**
- After pressing on -Item 24, check axial play using feeler gauge (0.15 to 0.35 mm)

24 - Taper roller bearing inner race, small1)

- Pressing off. See **Pressing off inner race of small taper roller bearing together with 1st sliding gear**

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- Pressing on. See **Pressing on inner race for small taper roller bearing**
- Low friction bearing; do not oil when measuring frictional torque

25 - Taper roller bearing outer race, small1)

- Tapping out. See **Driving out outer race for small taper roller bearing**
- Pressing in. See **Pressing in outer race/small taper roller bearing**

26 - Shim S4

- Adjustment overview. Refer to **Adjustment overview**

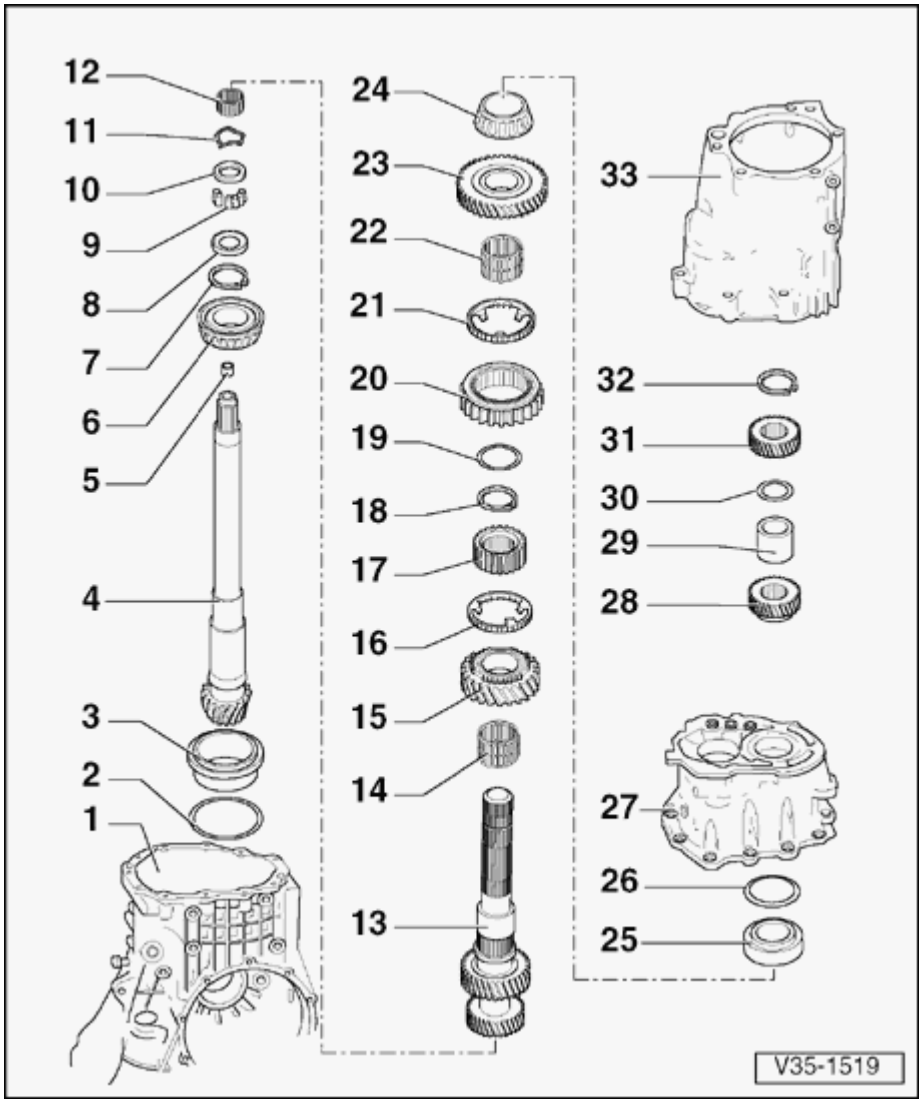


Fig. 320: Pinion and Hollow Shaft, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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27 - Bearing plate 1)

- Servicing. Refer to **Bearing plate, servicing**

28 - 6th gear wheel

- Pressing off. Refer to **Fig. 182**
- Pressing on. Refer to **Assembling**
- Installation position: Shoulder faces toward inner race of small taper roller bearing

29 - Spacer sleeve

30 - Washer

- Re-determining thickness. Refer to **Fig. 199**

31 - 5th gear wheel

- Pulling off. Refer to **Fig. 170**
- Driving on. Refer to **Fig. 201**

32 - Circlip

- For 5th gear wheel
- Re-determining thickness. Refer to **Fig. 202**

33 - End cover

- Servicing. Refer to **End cover, servicing**

Pulling out large taper roller bearing outer race

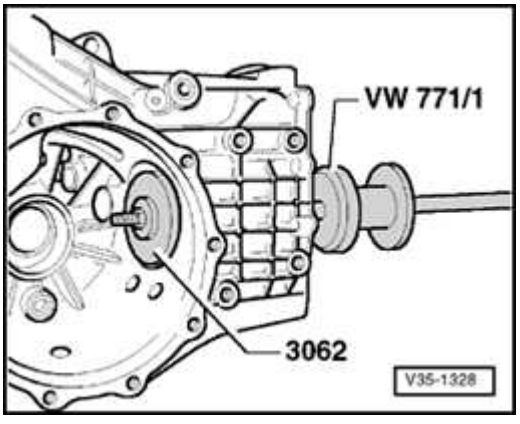


Fig. 321: Pulling Out Outer Race Of Large Tapered Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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Stepped side of thrust pad 3062 rests against the outer race

Heating transmission housing in order to install outer race for taper roller bearing

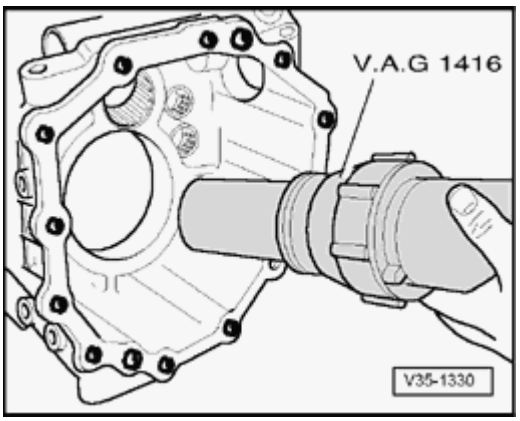


Fig. 322: Heating Transmission Housing To Insert Outer Race Of Large Taper Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat transmission housing in area of bearing seat for approx. 15 minutes, to approx. 100 ° C, with a hot air blower.

WARNING: Wear protective gloves!

Inserting outer race for large taper roller bearing in transmission housing and pressing home

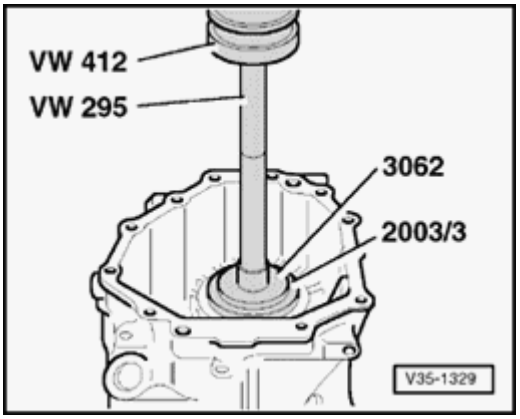


Fig. 323: Inserting And Pressing Outer Race Of Large Taper Roller Bearing Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert outer race only after heating transmission housing and push into position under workshop press until heat exchange has taken place.

WARNING: Wear protective gloves!

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Removing needle bearing for flanged shaft/drive pinion

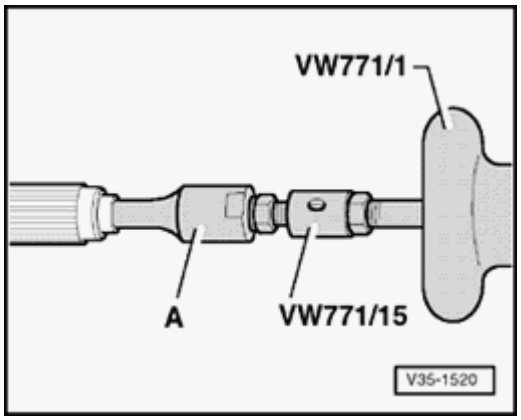


Fig. 324: Pulling Out Flange Shaft/Pinion Needle Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A - Internal extractor 12 to 14.5 mm, e.g. Kukko 21/1

Inserting needle bearing for flanged shaft/drive pinion flush

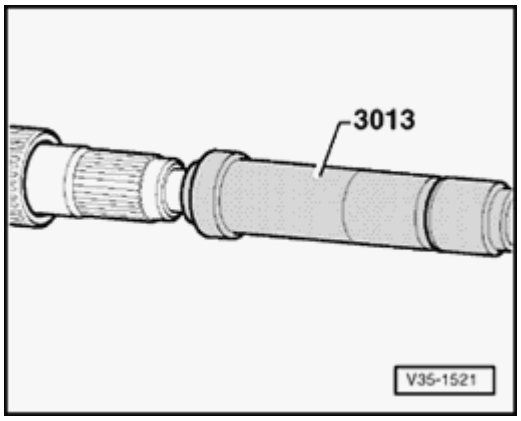


Fig. 325: Driving In Flange Shaft/Pinion Needle Bearing Flush
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing off large taper roller bearing inner race

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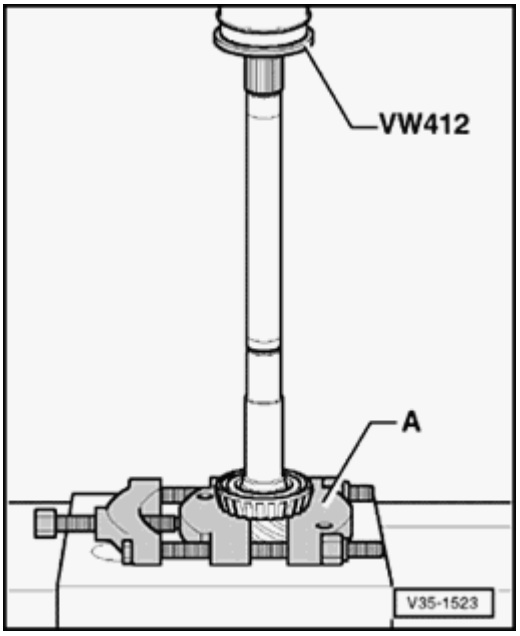


Fig. 326: Pressing Off Inner Race Of Large Taper Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

Bearing is destroyed when pressing off.

Pressing on inner race for taper roller bearing

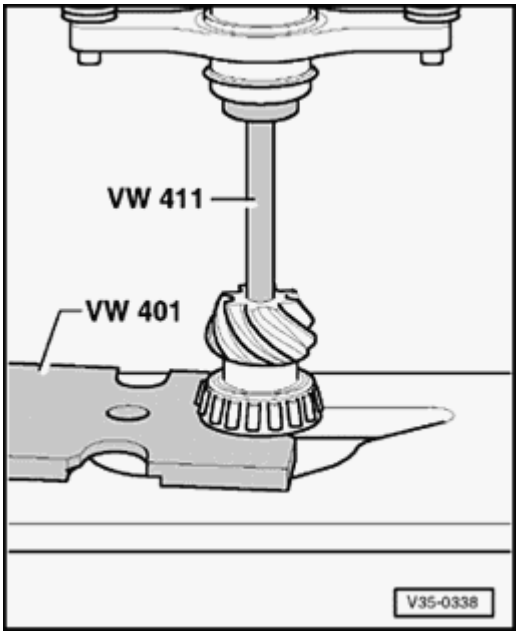


Fig. 327: Pressing On Inner Race Of Large Taper Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Heat inner race to approx. 100 ° C and install.

  WARNING: Wear protective gloves!

- Press home ensuring there is no axial play.

Determining thickness of circlip

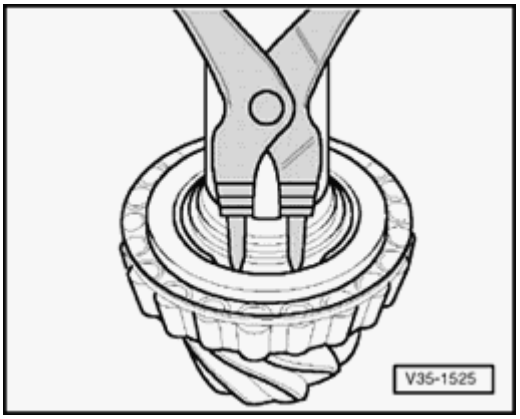


Fig. 328: Determining Thickness Of Circlip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine the thickest circlip that will still just fit and install.

The following circlips are available:

Circlip thickness (mm)		
2.34	2.40	2.46
2.36	2.42	2.48
2.38	2.44	

Pressing off inner race of small taper roller bearing together with 1st sliding gear

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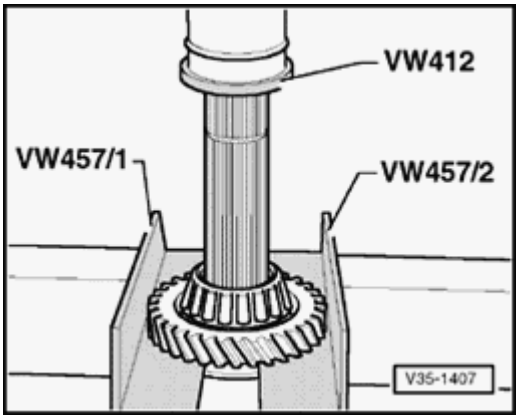


Fig. 329: Pressing Off Inner Race Of Small Taper Roller Bearing Together With Selector Gear Of 1st Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: Do not press off together with synchro-hub for 1st and 2nd gear and 2nd gear sliding wheel.

Pressing on inner race for small taper roller bearing

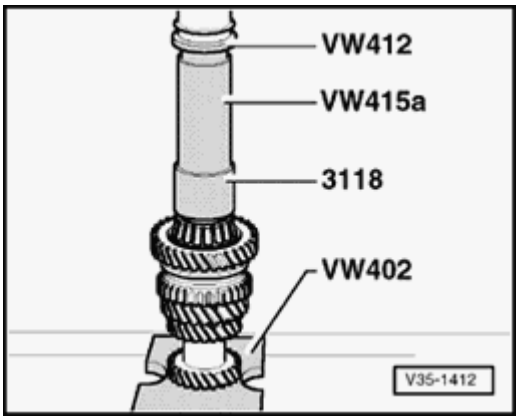


Fig. 330: Pressing On Small Tapered Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Oil needle bearing.
- Install circlip, washer for 1st/2nd gear synchro-hub, synchro-ring for 1st gear and 1st sliding gear together with spring and needle bearing.
- Heat inner race to approx. 100 ° C and install.

WARNING: Wear protective gloves!

- Press home ensuring there is no axial play.

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NOTE:

- **Press down only on bearing inner race with collar of thrust pad 3118.**
- **Position shoulder of pipe section VW 415 A facing up toward press tool VW 412**
- **After pressing on, check axial play of 1st sliding gear.**

Removing and installing circlip of synchro-hub and washer of 1st sliding gear

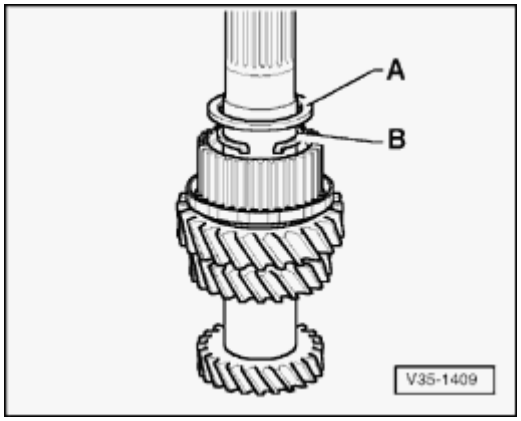


Fig. 331: Removing And Installing Circlip For Synchronizer Hub And Shim For 1st Gear Selector Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To remove circlip, remove washer -A- and then circlip -B-.
- To install circlip, install on circlip -B- and then washer -A-.

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

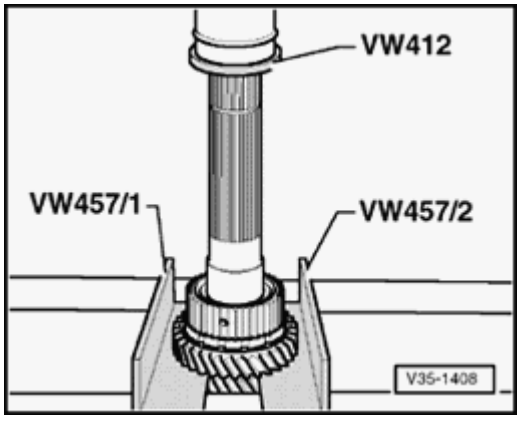


Fig. 332: Pressing Off 2nd Gear Selector Gear With 1st And 2nd Gear Synchronizer Hub
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking collar for 1st and 2nd gear and synchro-ring for 1st gear.
- Remove washer and circlip for synchro-hub.
- Press off 2nd speed sliding wheel with synchro-hub for 1st and 2nd gear

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NOTE: **Do not press off together with 1st sliding gear and inner race of small taper roller bearing.**

Installing 2nd sliding gear, pressing on synchro-hub for 1st and 2nd gear

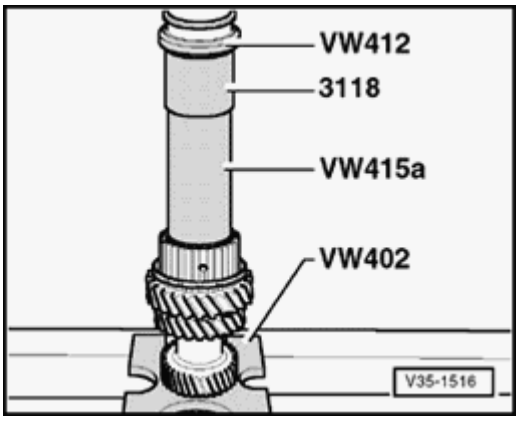


Fig. 333: Identifying Special Tools - Installing Selector Gear For 2nd Gear And Pressing On Synchronizer Hub For 1st And 2nd Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install needle bearing, sliding gear (with spring) and synchro-ring for 2nd gear.
- Oil needle bearing.
- Heat synchro-hub to approx. 100 ° C and install.

WARNING: **Wear protective gloves!**

- Press home ensuring there is no axial play.

NOTE:

- **Install on pipe section VW 415 A with shoulder facing synchro-hub.**
- **Position thrust pad 3118 with shoulder facing press tool VW 412.**

Determining size of circlip for synchro-hub for 1st and 2nd gear

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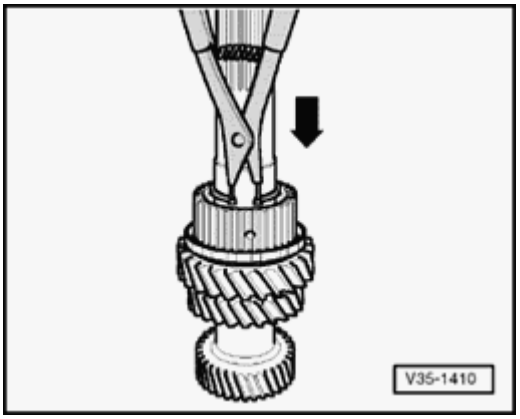


Fig. 334: Determining Thickest Circlip That Can Just Still Be Installed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Determine the thickest circlip that will still just fit.
- Insert circlip in direction of arrow to synchro-hub.

The following circlips are available:

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	

Driving out outer race for small taper roller bearing

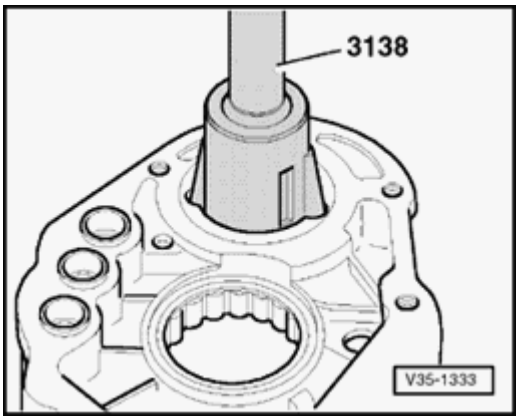


Fig. 335: Driving Out Outer Race Of Small Taper Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing in outer race/small taper roller bearing

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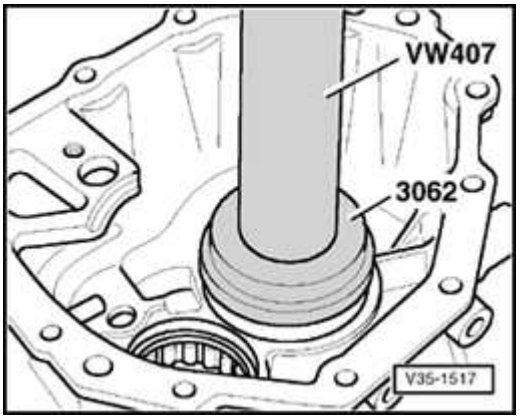


Fig. 336: Pressing In/Out Small Outer Race/Tapered Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert shim S4 into bearing plate behind bearing seat.
- Position thrust pad 3062 with shoulder facing press tool VW 407.
- Pressing in outer race for small taper roller bearing onto stop

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39 FINAL DRIVE, DIFFERENTIAL

FLANGED SHAFT SEALS, REPLACING

Special tools and equipment

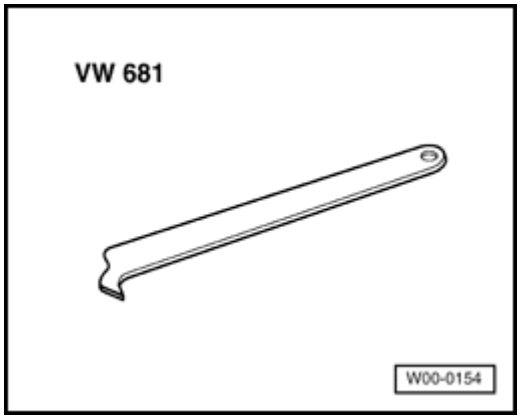


Fig. 337: Special Tool - Oil Seal Extractor Lever VW 681
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 681 Seal extractor

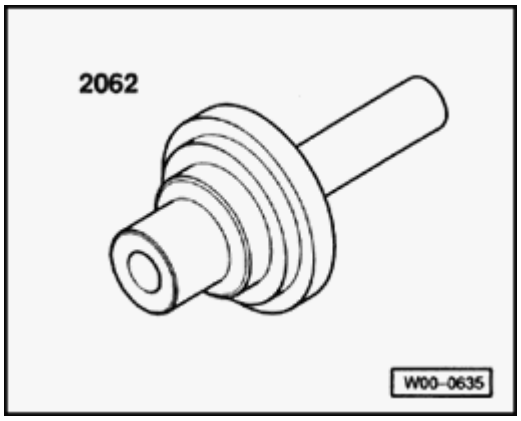


Fig. 338: Fitting Drift 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 2062 Driver
- Container

Removing

- Transmission installed

  - Remove shield, if installed, from underneath transmission.

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When replacing left seal:

- If necessary, partially remove the front part of the exhaust system.

Refer to

- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 1.8 LITER 4-CYL. 5V TURBO ENGINE MECHANICAL, ENGINE CODE(S): AMB
- **26 EXHAUST SYSTEM, EMISSION CONTROLS** for 3.0 LITER 6-CYL. 5V ENGINE MECHANICAL, ENGINE CODE(S): AVK, BGN
- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 4.2 LITER V8 5V ENGINE MECHANICAL, ENGINE CODE(S): BHF

Continuation for both seals:

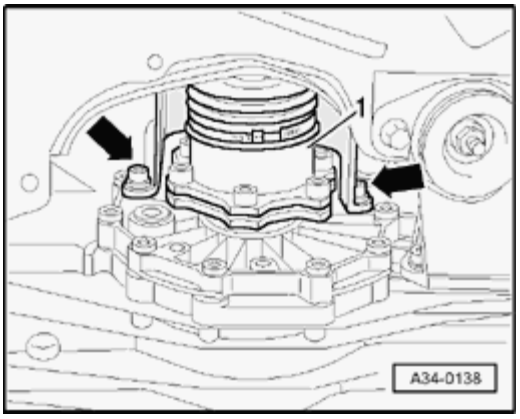


Fig. 339: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove splash plate, if installed, above drive axles (arrows).
- Detach drive axles -1- from flanged shafts, and tie up as high as possible; do not damage surface protection.
- Place drip tray underneath.
- Unscrew flanged shaft securing bolt; for this purpose, screw two bolts into the flange and counterhold the flanged shaft using a tire lever.
- Pull out flanged shaft.

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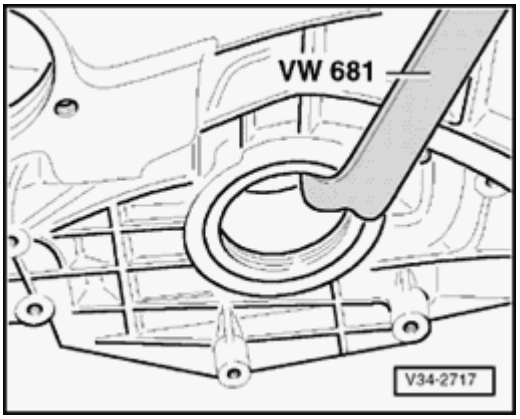


Fig. 340: Removing Drive Flange Seal Using Extractor Lever VW 681
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out flanged shaft seal with VW 681.

Installing

- Lightly oil outer circumference of seal.

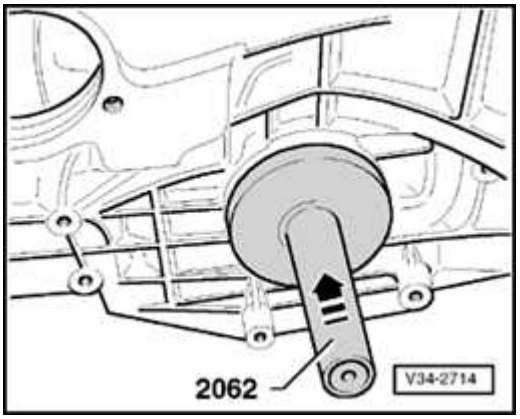


Fig. 341: Driving In Flange Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive in new seal for right-hand flanged shaft to a depth of 5.5 mm below surface of housing and for left-hand flange to a depth of 5.5 below surface of cover.

NOTE:

- **Figure shows installation on right-hand side of the transmission.**
- **The procedure is identical for left and right-hand seals.**
- **Do not cant seal when driving in.**
- **Insertion depth for repairs is 6.5 mm when a used flanged shaft is employed.**

- Pack space between sealing and dust lips with sealing grease G 052 128 A1.

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- Insert flanged shaft.
- Fasten flanged shaft with cone head bolt.
- Bolt drive axle to flanged shaft.

Refer to **40 - FRONT SUSPENSION**

- Bolt on cover plates for drive axle if present.
- If necessary, reinstall exhaust system and align free of stress.

Refer to

- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 1.8 LITER 4-CYL. 5V TURBO ENGINE MECHANICAL, ENGINE CODE(S): AMB
- **26 EXHAUST SYSTEM, EMISSION CONTROLS** for 3.0 LITER 6-CYL. 5V ENGINE MECHANICAL, ENGINE CODE(S): AVK, BGN
- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 4.2 LITER V8 5V ENGINE MECHANICAL, ENGINE CODE(S): BHF

- Top up oil in transmission and check oil level. Refer to **Transmission oil level, checking**.
- Install shield.

Tightening torques

Component		Nm
Flanged shaft to transmission		10 + 90 °
Drive axle heat shields		23

DRIVESHAFT FLANGE AT TRANSMISSION, REPLACING SEAL AND GROOVED BALL BEARING

Driveshaft flange at transmission, replacing seal and grooved ball bearing

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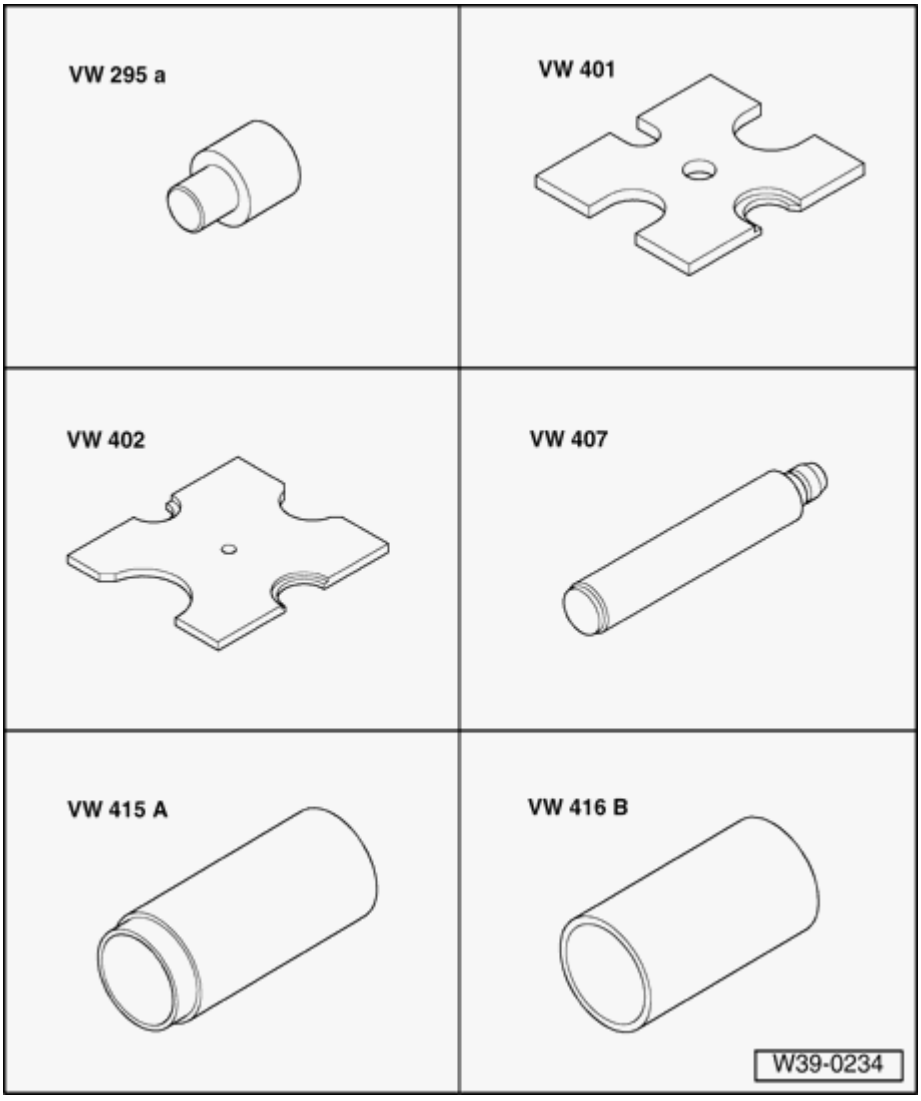


Fig. 342: Identifying Special Tools - Driveshaft Flange Seal And Grooved Ball Bearing At Transmission, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and equipment

- VW 295a Adapter
- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 415 A Tube
- VW 416 B Tube

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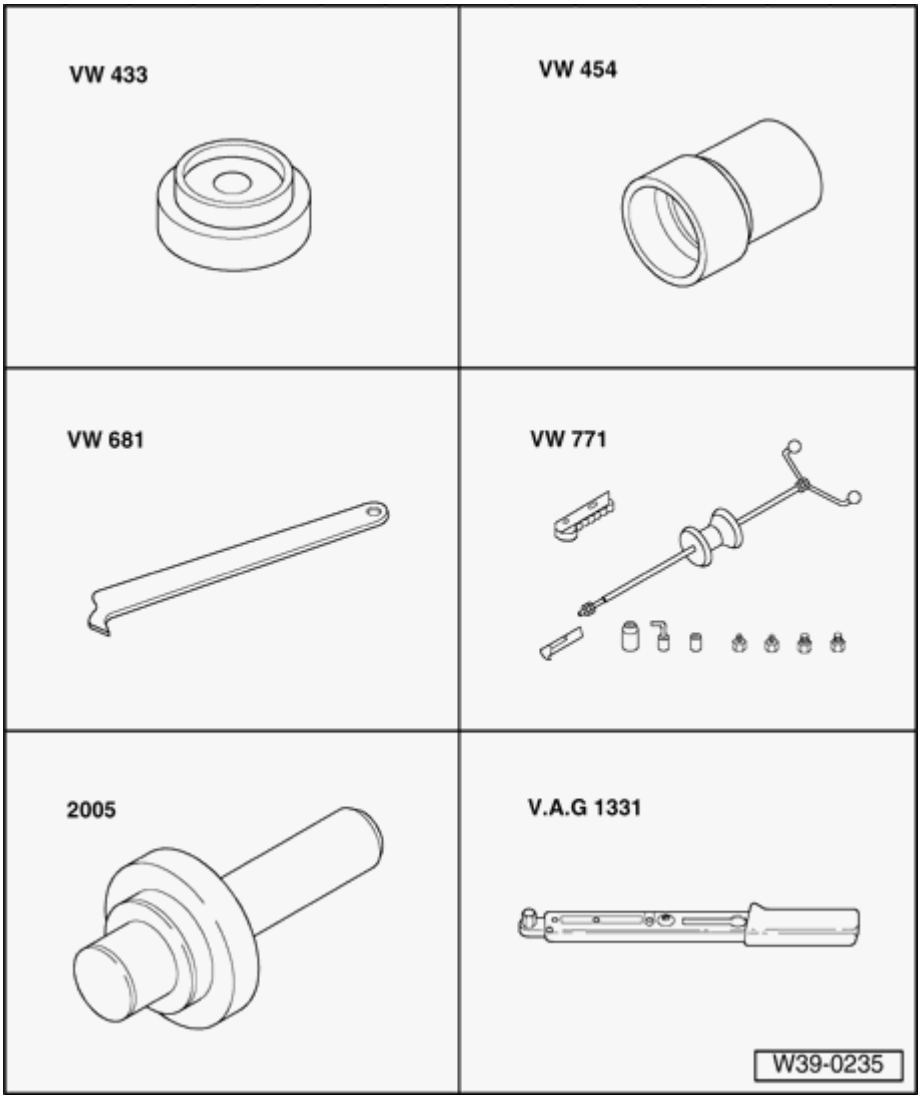


Fig. 343: Identifying Special Tools - Driveshaft Flange Seal And Grooved Ball Bearing At Transmission, Replacing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 433 Thrust pad
- VW 454 Thrust pad
- VW 681 Seal extractor
- VW 771 Multi-purpose tool

- 2005 Drift
- VAG 1331 Torque wrench (5 to 50 Nm)
- Adjustment shim Part No. 016 311 391 B

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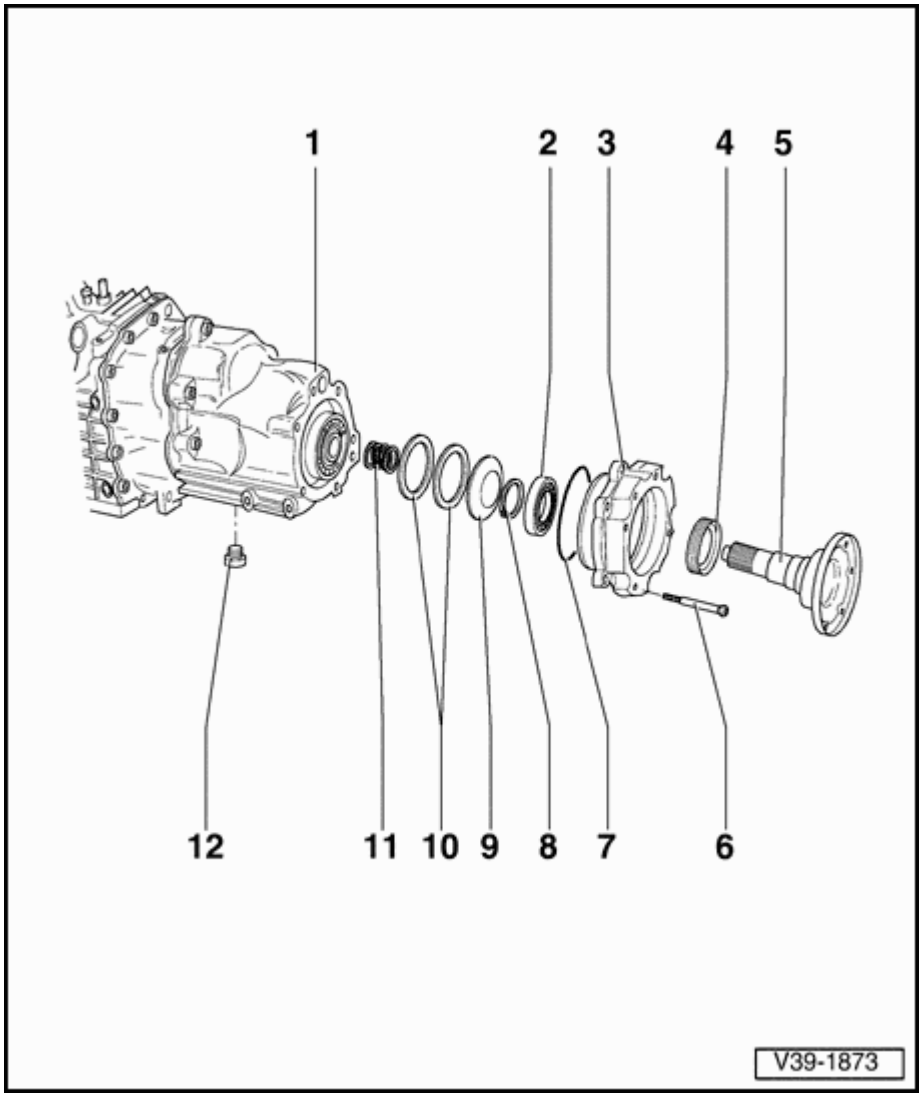


Fig. 344: Driveshaft Flange Seal And Grooved Ball Bearing At Transmission, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission

2 - Grooved ball bearing

3 - Bearing housing at vibration damper

4 - Seal

- Driving in. Refer to **Fig. 354**

5 - Flanged shaft

6 - Bolt, 25 Nm

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- 6 pieces

7 - O-ring

- Always replace

8 - Circlip

9 - Dished washer

- Mark installation position when removing: Large diameter (concave side) facing shims -Item 10

10 - Washers

11 - Spring

12 - Oil drain plug, 40 Nm

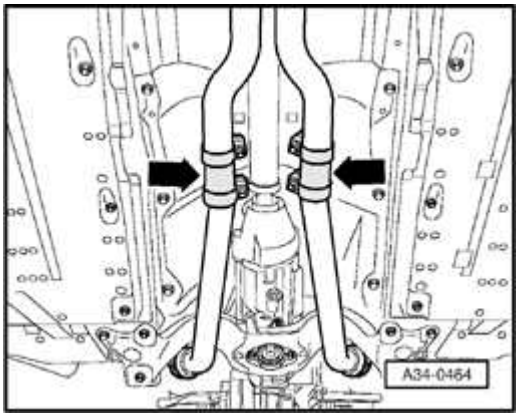


Fig. 345: Exhaust System At Double Clamps
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removing

- Transmission installed

NOTE: The flex joint in front exhaust pipe must not be bent more than 10 ° , otherwise it may be damaged.

- Remove exhaust system from the clamps.
- Detach rear part of exhaust system from hangers and remove.

NOTE: A second technician is required to remove the rear part of exhaust system.

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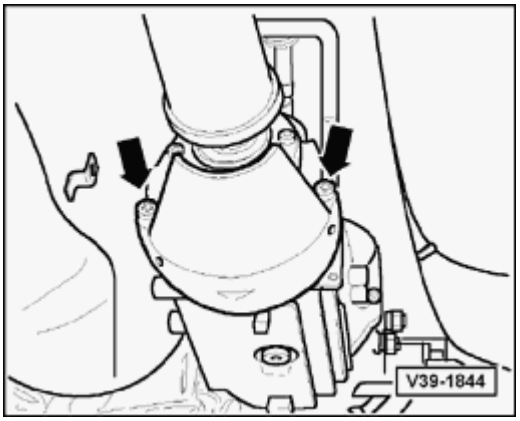


Fig. 346: Identifying Driveshaft Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt heat shield for driveshaft -arrows-.
- Remove bolts at flange of transmission/drive axle.
- Push driveshaft to rear final drive together. The constant velocity joints can be adjusted axially.

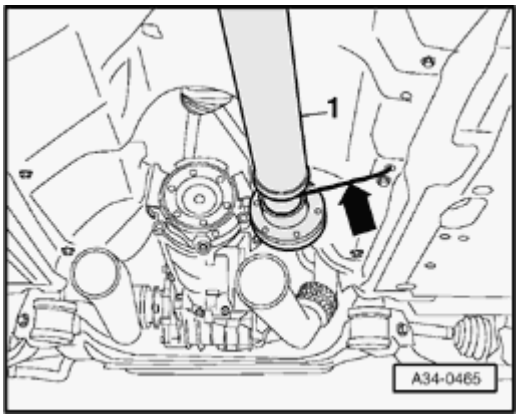


Fig. 347: Driveshaft Secured With Wire To Heat Shield
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure driveshaft -1- with wire (arrow) to heat shield.
- Place container under the transmission.
- Unscrew rear oil drain plug (at end cover) and drain gear oil.
- Unscrew bolts attaching bearing housing.

NOTE: Bearing housing is pressed slightly off end cover by spiral spring when mounting bolts are loosened.

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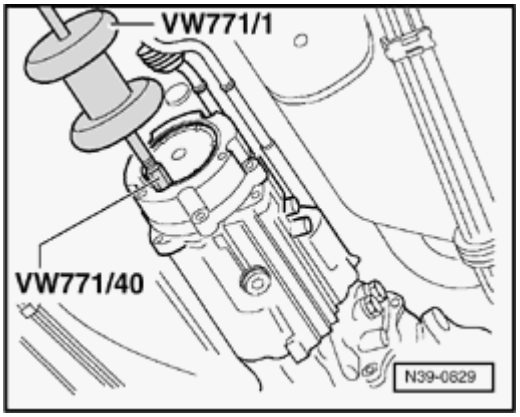


Fig. 348: Pull Off Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull flanged shaft together with bearing housing and vibration damper off end cover.
- Remove bearing housing.
- Remove circlip from flanged shaft.

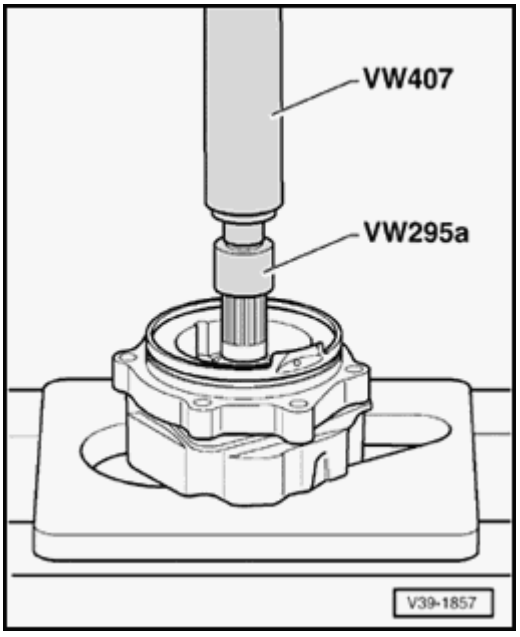


Fig. 349: Pressing Out Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press out flanged shaft.

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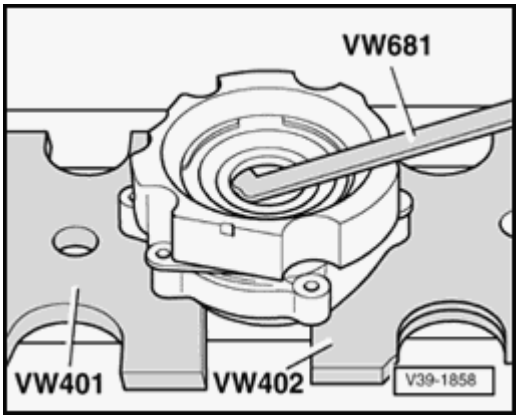


Fig. 350: Pulling Out Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull out flanged shaft seal.
- Thoroughly clean seat for seal.

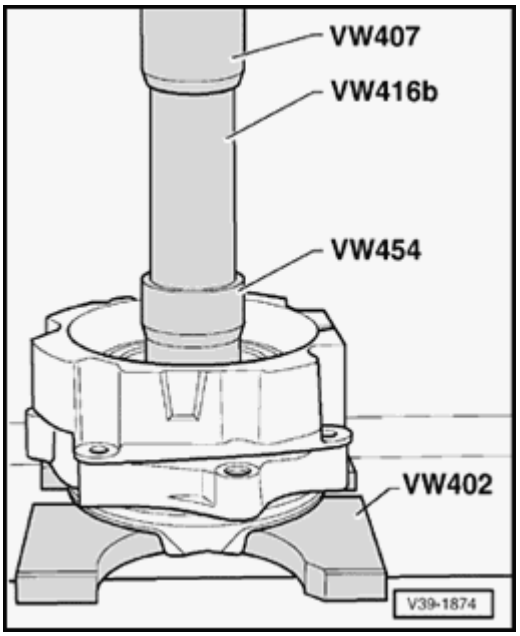


Fig. 351: Pressing On Grooved Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press out grooved ball bearing.

Installing

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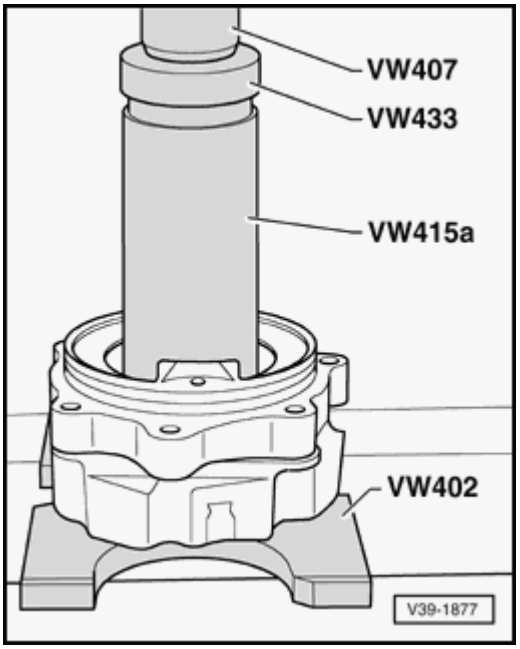


Fig. 352: Pressing In Grooved Ball Bearing For Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press grooved ball bearing into bearing housing.

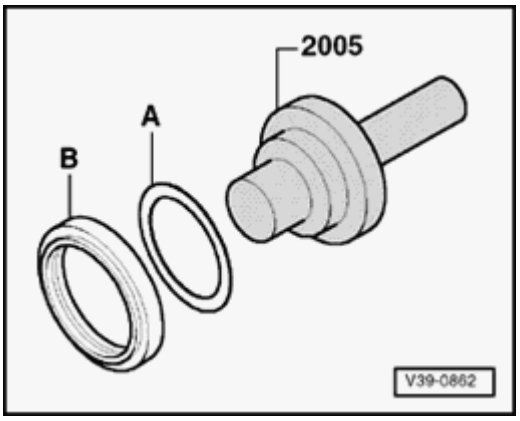


Fig. 353: Preparing Seal For Installation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lightly oil diameter of seal -B-.
- Install seal together with washer -A- Part No. 016 311 391 B (thickness 1.7 mm) onto drift 2005.

- Installation position: Open side of seal faces toward transmission.

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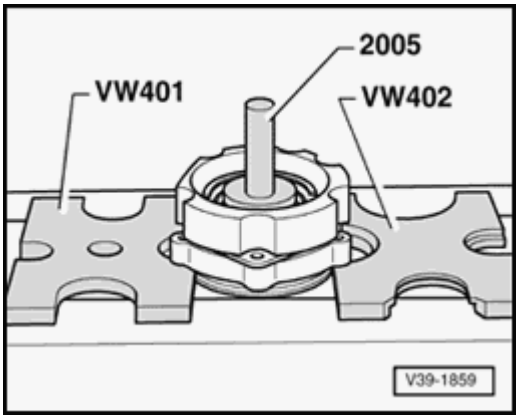


Fig. 354: Driving In Flange Shaft Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive in flanged shaft seal.
- Remove washer after inserting seal.
- Pack space between sealing and dust lips with sealing grease G 052 128 A1.

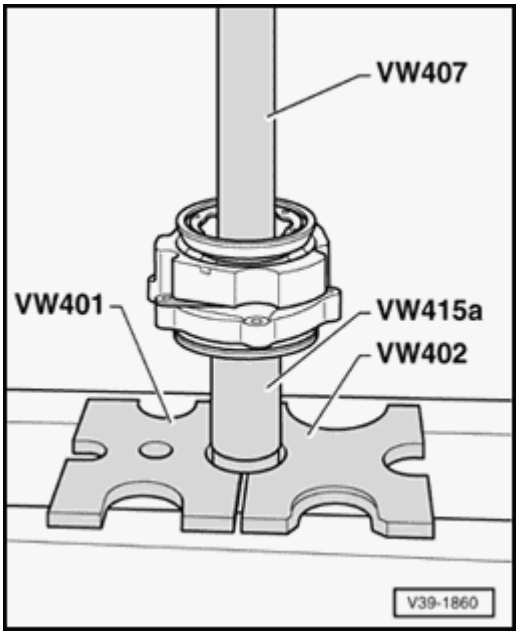


Fig. 355: Pressing In Flange Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press in flanged shaft.
- Install circlip onto flanged shaft.
- Lightly oil O-ring and insert into groove of bearing housing.
- Insert dished washer and shims into bearing housing.

- Installation position. Refer to Item 9.

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- Install spiral spring onto flanged shaft.
- Tighten bolts attaching bearing housing in stages and diagonally.
- Bolt on driveshaft.

Refer to **39 - FINAL DRIVE, DIFFERENTIAL**

- Top up oil in transmission and check oil level. Refer to **Transmission oil level, checking**.

SPEEDOMETER VEHICLE SPEED SENSOR -G22- AND TRIGGER WHEEL, REMOVING AND INSTALLING

Speedometer vehicle speed sensor -G22-, removing and installing

- Transmission installed

- Remove left front wheel.

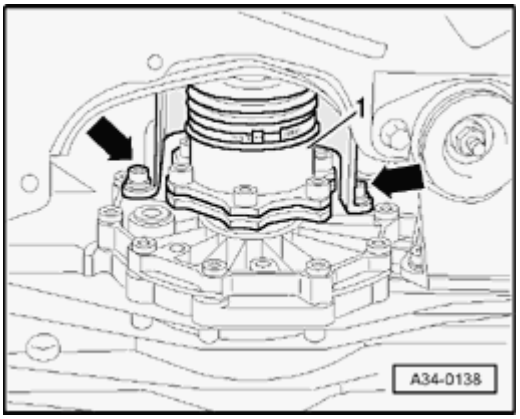


Fig. 356: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove splash plate above left drive axle -1- if installed (arrows).

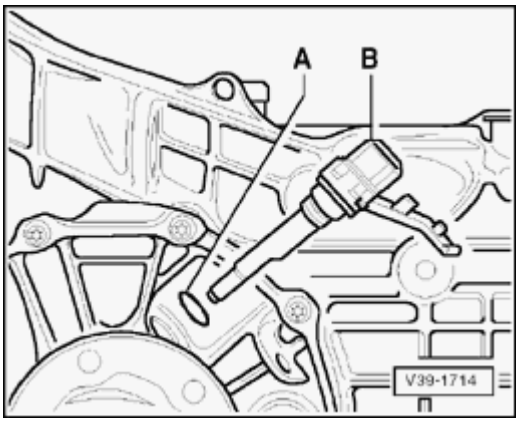


Fig. 357: Identifying Vehicle Speed Sensor (VSS)

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unplug connector from sender -B-.
- Press retaining clip down, turn sender sideways and pull out upward.

Installing

- Replace O-ring -A-.
- Handle sender carefully. If it is damaged it is possible that the speedometer will not indicate exactly.

Tightening torques

Component	Nm
Heat shield for drive axle	23 Nm

Trigger wheel for speedometer vehicle speed sensor -G22-, removing and installing

Special tools and workshop equipment required

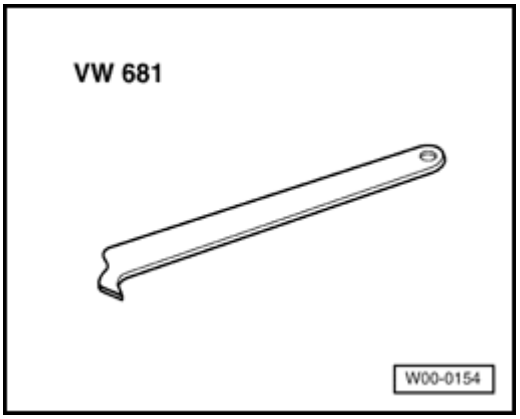


Fig. 358: Special Tool - Oil Seal Extractor Lever VW 681
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 681 Seal extractor

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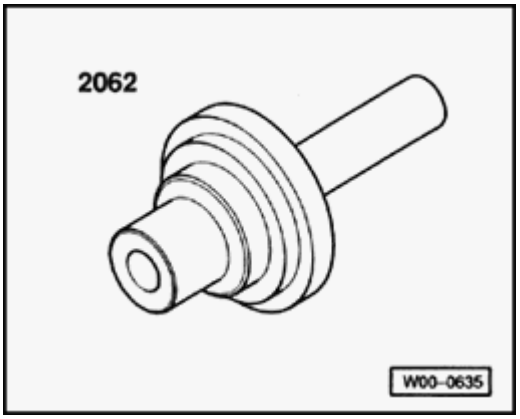


Fig. 359: Fitting Drift 2062
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 2062 Fitting drift
- Container

Removing

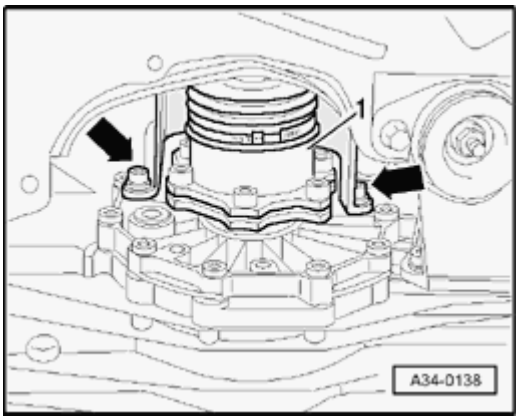
- Transmission installed

  - Partially remove front part of exhaust system.

Refer to

- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 1.8 LITER 4-CYL. 5V TURBO ENGINE MECHANICAL, ENGINE CODE(S): AMB
- **26 EXHAUST SYSTEM, EMISSION CONTROLS** for 3.0 LITER 6-CYL. 5V ENGINE MECHANICAL, ENGINE CODE(S): AVK, BGN
- **26 - EXHAUST SYSTEM, EMISSION CONTROLS** for 4.2 LITER V8 5V ENGINE MECHANICAL, ENGINE CODE(S): BHF

  - Remove shield, if installed, from underneath transmission.



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Fig. 360: Axle Shaft Shielding Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If installed, remove splash plate above left drive axle -1- (arrows).
- Unbolt drive axle from flanged shaft.
- Place drip tray underneath transmission.

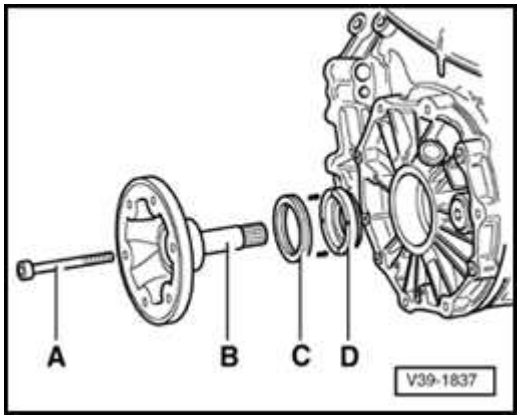


Fig. 361: Removing/Installing Speedometer Drive Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove fastening screw -A- for flanged shaft -B-.
- Pull out flanged shaft.
- Pull out flanged shaft seal -C- with VW 681.
- Remove speedometer vehicle speed sensor. Refer to **Speedometer vehicle speed sensor -G22-, removing and installing**.

Remove speedometer trigger wheel -D-:

- Lever out the trigger wheel from the grooves in the differential at the drive pegs -arrows- on alternate sides.

Installing

Installation is carried out in the reverse order to removal, noting the following:

Installation position:

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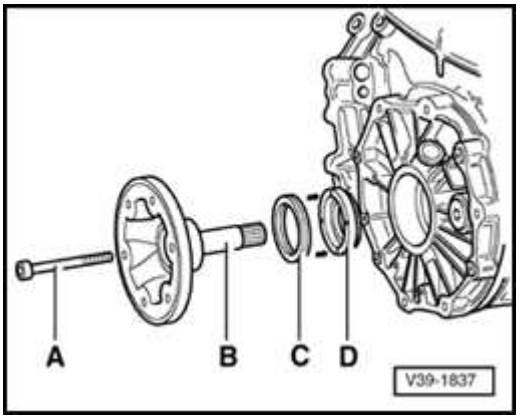


Fig. 362: Removing/Installing Speedometer Drive Wheel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The drive pegs -arrows- of the trigger wheel -D- must engage in the grooves of the differential.

- Drive in seal -C- for flanged shaft and install flanged shaft.

Tightening torque:

Component		Nm
Drive axle heat shield		23

DIFFERENTIAL, REMOVING AND INSTALLING

Differential, removing and installing

NOTE: The differential can be removed and installed with the transmission installed.

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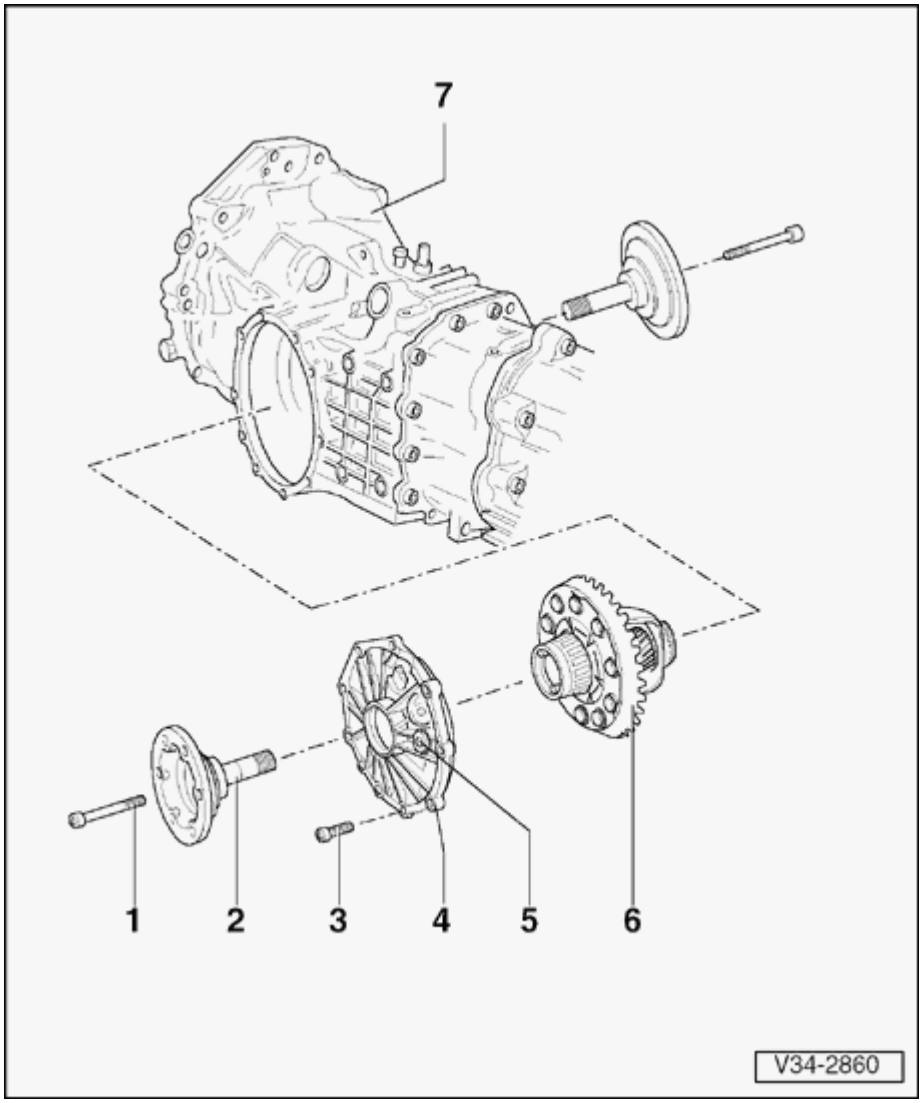


Fig. 363: Differential, Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Bolt, 10 Nm and turn 90 ° further

2 - Flanged shaft

- When removing, secure with a drift to prevent it turning

3 - Bolt, 25 Nm

- 10 pieces

4 - Final drive cover

- Removing and installing speedometer trigger wheel. Refer to **Trigger wheel for speedometer vehicle**

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speed sensor -G22-, removing and installing

- If replaced: Adjust ring gear. Refer to **Ring gear, adjusting**

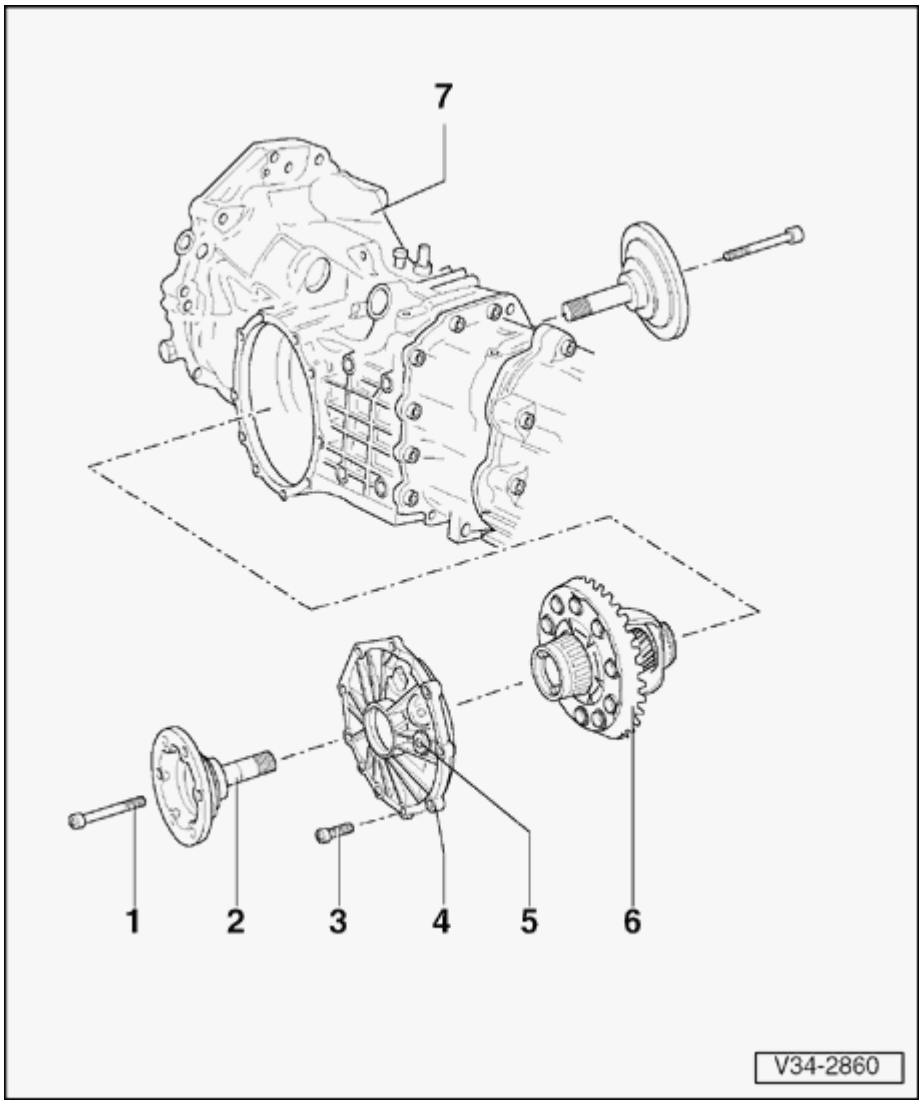


Fig. 364: Differential, Removing And Installing, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Oil filler plug, 40 Nm

- Checking gear oil. Refer to **Transmission oil level, checking**

6 - Differential

- Disassembling and assembling. Refer to **Differential, disassembling and assembling**
- If replaced: Adjust ring gear. Refer to **Ring gear, adjusting**

7 - Transmission housing

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- Servicing. Refer to **Transmission housing, servicing**

DIFFERENTIAL, DISASSEMBLING AND ASSEMBLING

Differential, disassembling and assembling

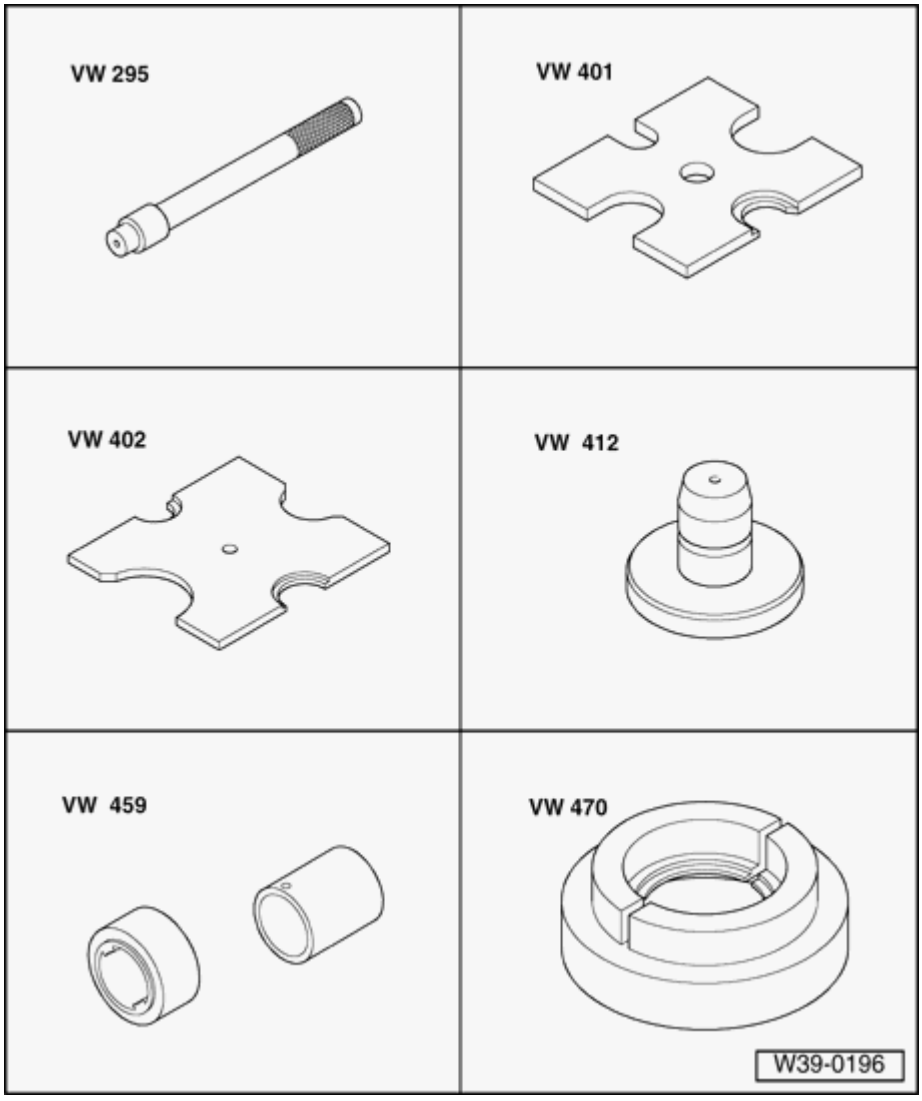


Fig. 365: Identifying Special Tools - Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- VW 295 Drift
- VW 401 Thrust plate
- VW 402 Thrust plate
- VW 412 Thrust tool

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- Installation and removal tool VW 459
- VW 470 Thrust ring for drive pinion bearings

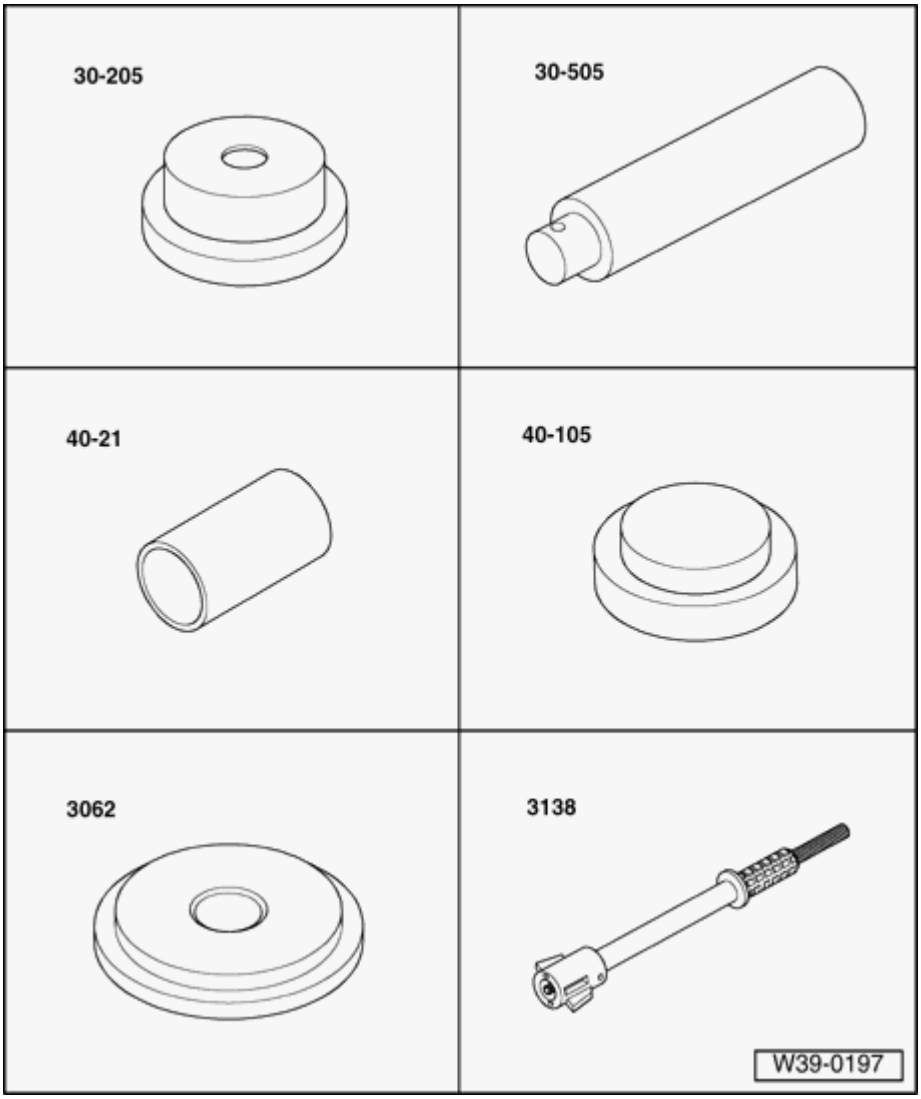


Fig. 366: Identifying Special Tools - Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 30-205 Thrust plate
- 30-505 Fitting mandrel
- 40-21 Thrust sleeve
- 40-105 Thrust plate
- 3062 Thrust disk
- 3138 Driver

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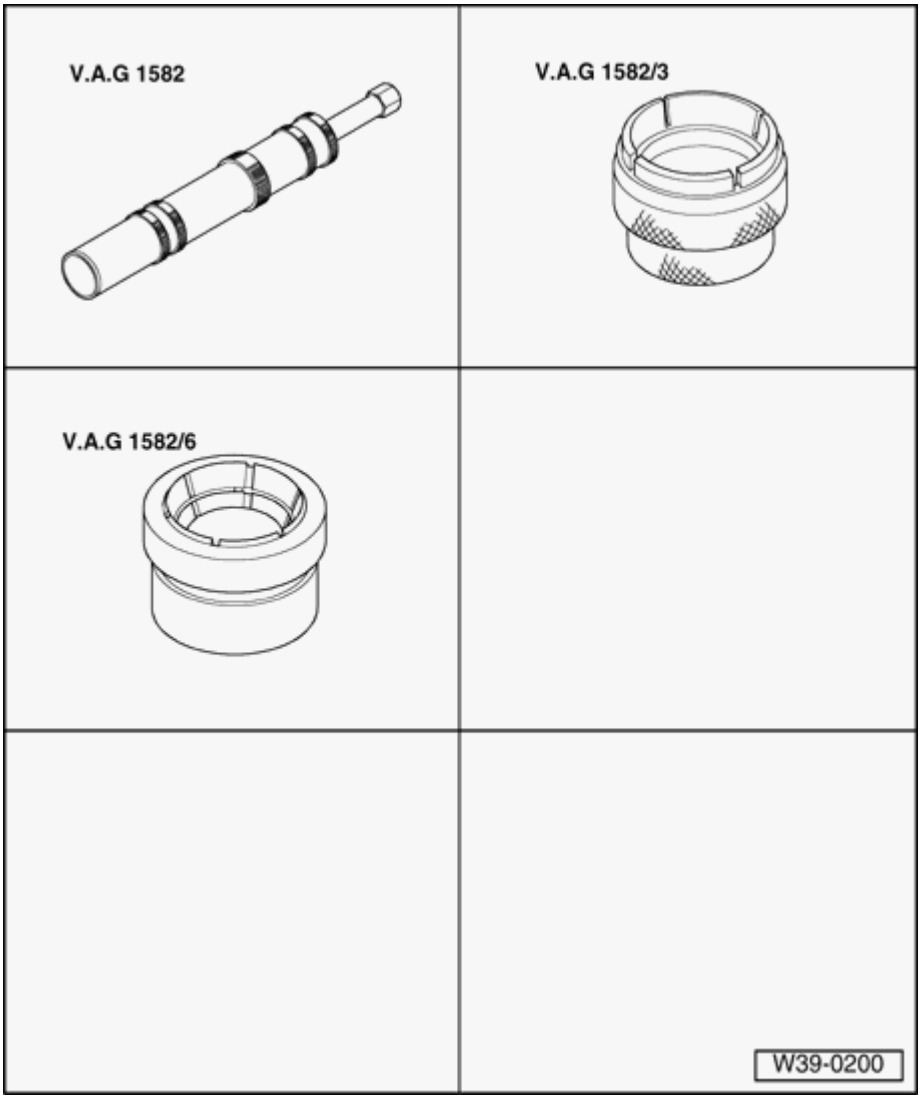


Fig. 367: Identifying Special Tools - Differential, Disassembling And Assembling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAG 1582 Taper roller bearing puller
- VAG 1582/3 Grip piece
- VAG 1582/6 Grip piece

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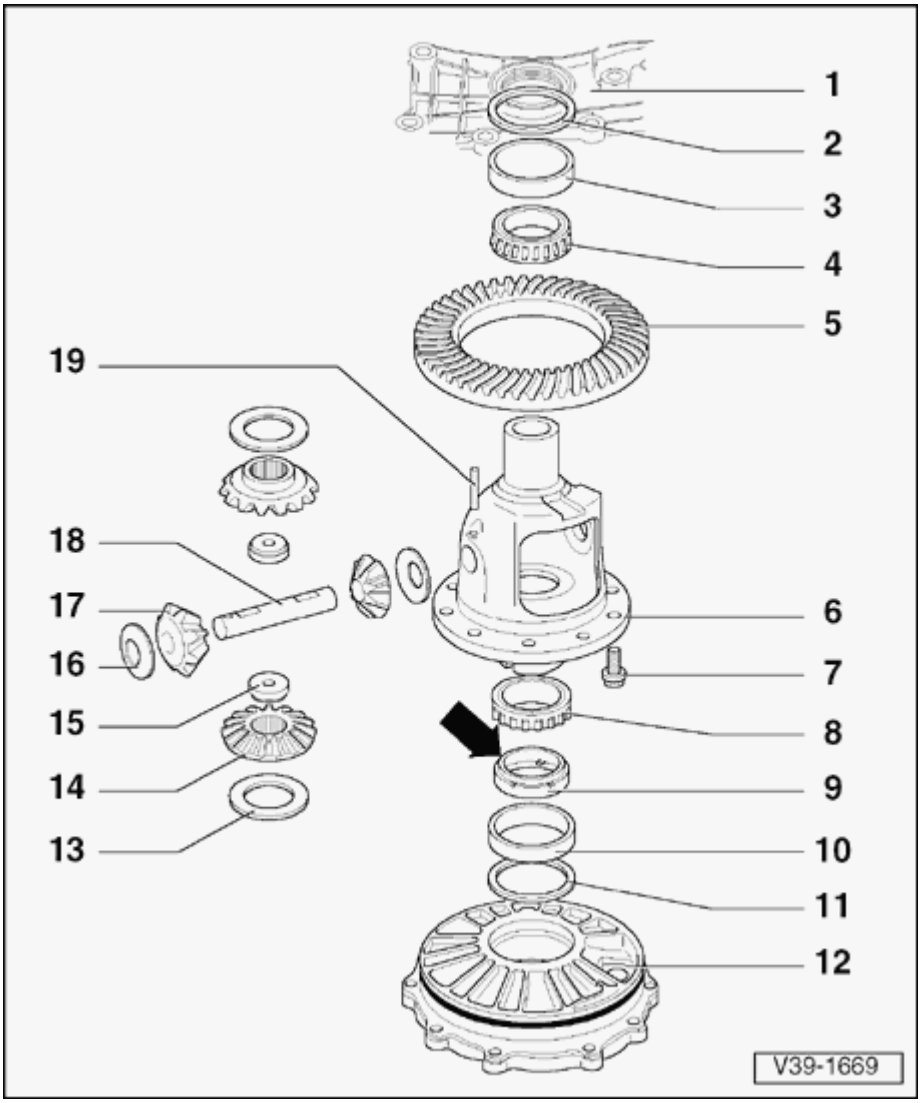


Fig. 368: Differential (Transmission Without Oil Pump), Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Transmission housing 1)

2 - Shim S2

- Note thickness
- Adjustment overview. Refer to **Adjustment overview**

3 - Taper roller bearing outer race, small1)

- Tapping out. See **Driving outer race for small taper roller bearing out of transmission housing**
- Tapping in. See **Pressing outer race for small taper roller bearing into transmission housing**

4 - Taper roller bearing inner race, small1)

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- Pulling off. See **Removing inner race for small taper roller bearing**
- Pressing on. See **Pressing on inner race for small taper roller bearing**

1) Adjustments are required if these components are replaced. Refer to **Adjustment overview**.

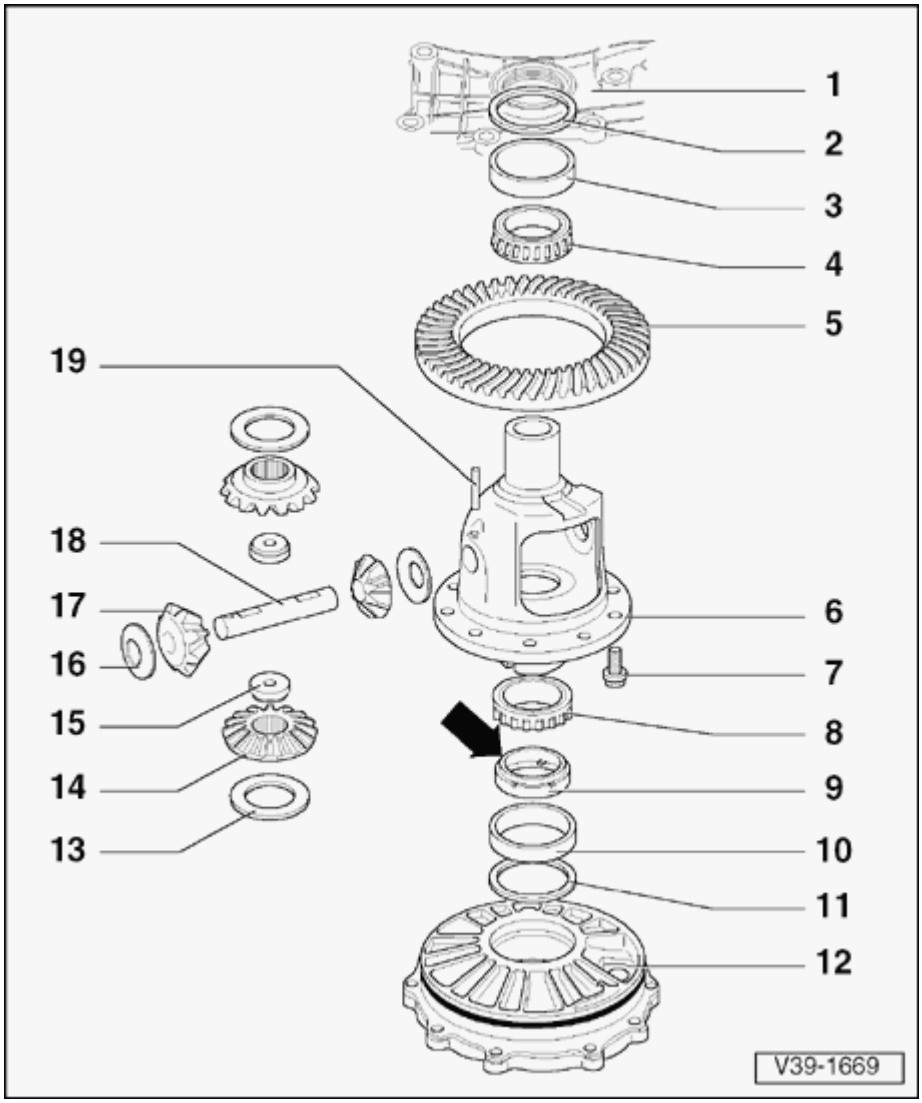


Fig. 369: Differential (Transmission Without Oil Pump), Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5 - Ring gear1)

- Paired with pinion shaft (final drive set)
- Drive off with a drift. See **Driving ring gear off housing**
- Fit to differential housing. See **Heat The Ring Gear To Approx. 100 ° C and install**

6 - Differential housing 1)

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7 - Ring gear bolts - 60 Nm plus additional 45 ° turn

- Always replace
- Use only the original bolts

8 - Taper roller bearing inner race, large1)

- Pulling off. See **Removing inner race for large taper roller bearing**
- Pressing on. See **Pressing on inner race for taper roller bearing**

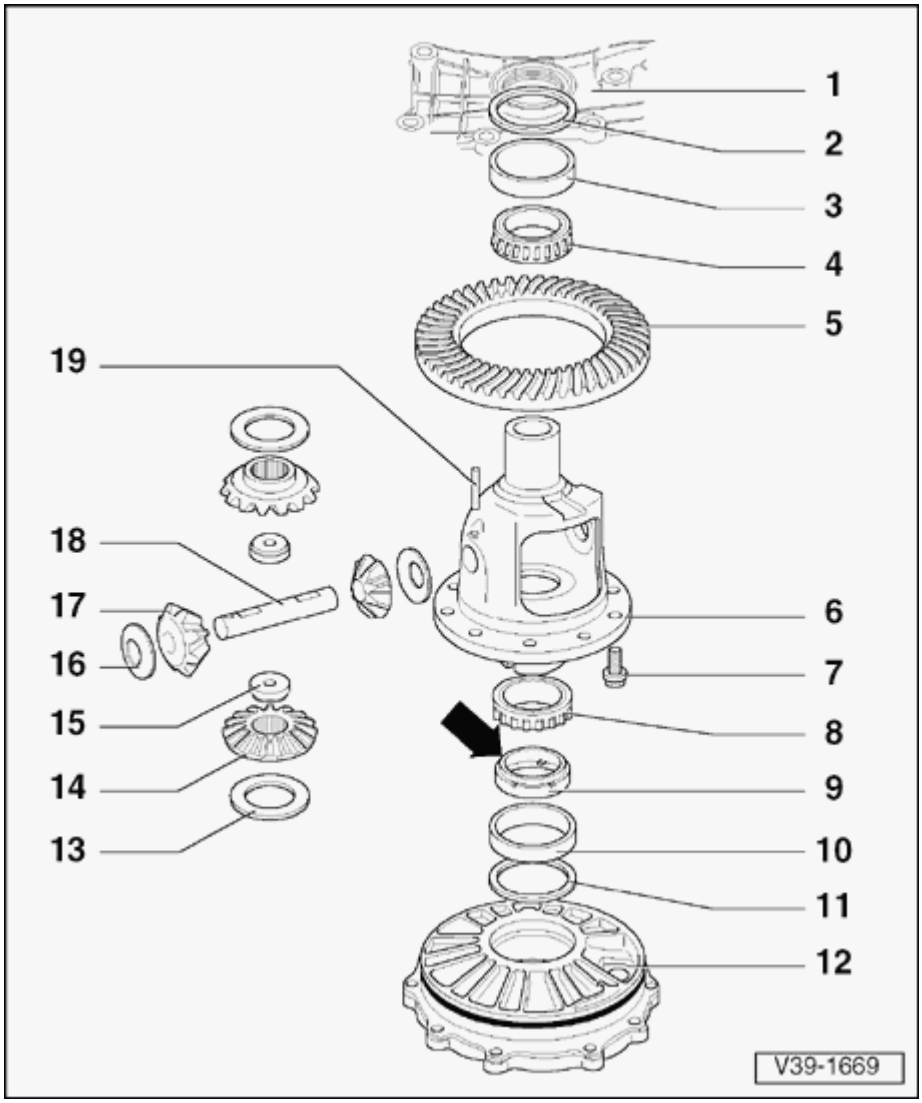


Fig. 370: Differential (Transmission Without Oil Pump), Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

9 - Speedometer trigger wheel

- Removing and installing. Refer to **Trigger wheel for speedometer vehicle speed sensor -G22-,**

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removing and installing

- Installation position: Shoulder -arrow- faces toward differential; do not cant drive pegs in recess of differential housing
-

10 - Taper roller bearing outer race, large1)

- Tapping out. See **Driving outer race for large taper roller bearing out of cover**
- Tapping in. See **Driving outer race for large taper roller bearing into cover**

11 - Shim S1

- Note thickness
- Adjustment overview. Refer to **Adjustment overview**

12 - Cover for final drive 1)

- With O-ring
- Replace O-ring
- Lubricate O-ring before installing

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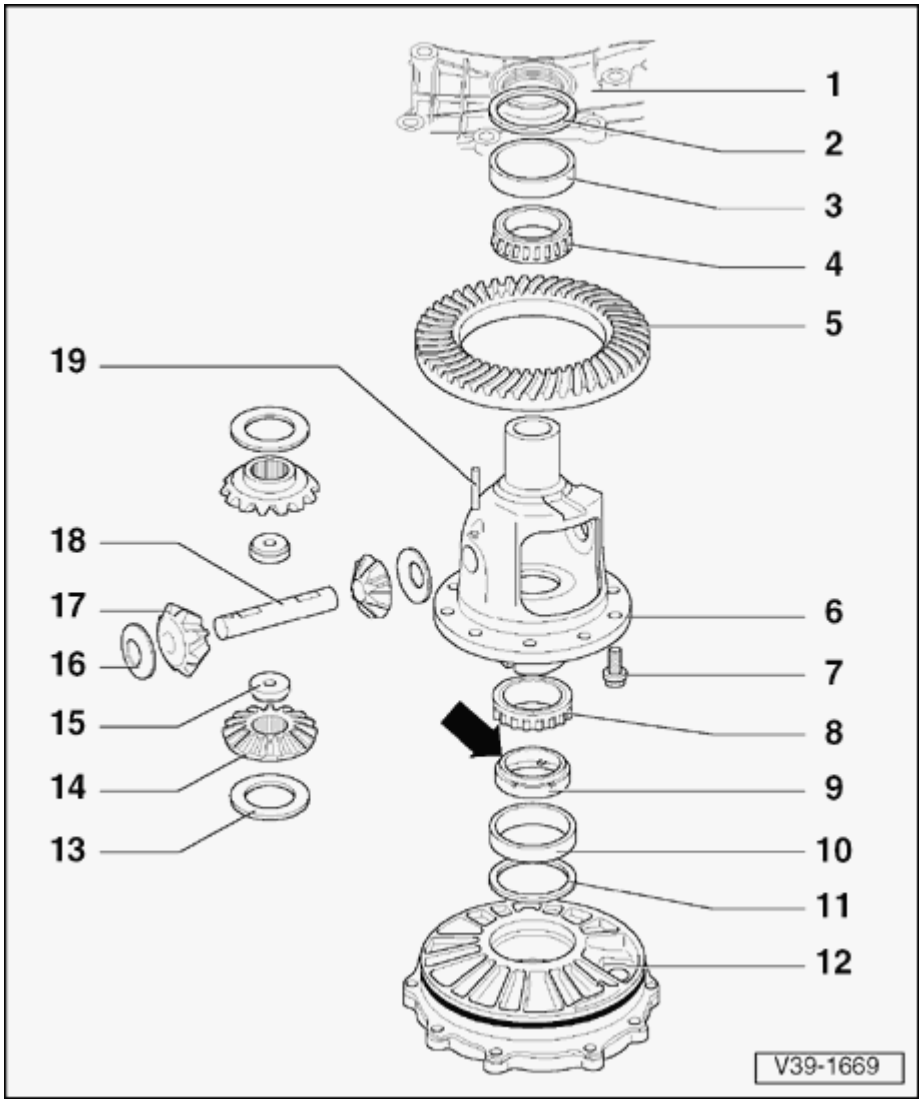


Fig. 371: Differential (Transmission Without Oil Pump), Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

13 - Adjustment shim

- Redefine thickness. See **Adjusting differential bevel gears**

14 - Large bevel gear

- Installing. See **Installing bevel gears**
- Adjusting. See **Adjusting differential bevel gears**

15 - Threaded piece

16 - Thrust washer

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- Check for cracks and chipping

17 - Small bevel gear

- Installing. See **Installing bevel gears**
- Adjusting. See **Adjusting differential bevel gears**

18 - Shaft for small bevel gears

- Drive out with drift after removing spring pin
- Before driving in, align thrust washers

19 - Roll pin

- Replace
- Drive in flush

Removing inner race for small taper roller bearing

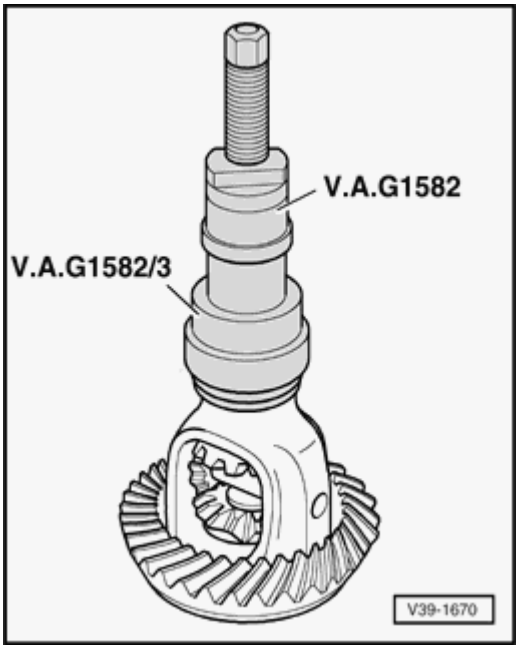


Fig. 372: Pulling Off Small Inner Race/Tapered Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install thrust plate 40-105 onto differential housing before installing puller.

Removing inner race for large taper roller bearing

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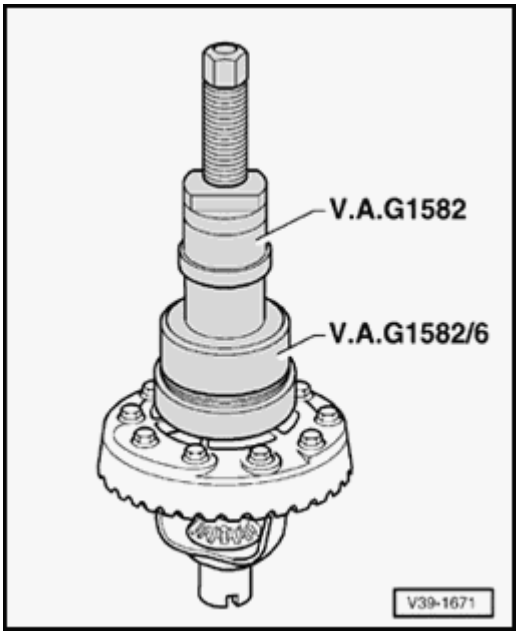


Fig. 373: Pulling Off Large Inner Race/Tapered Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove speedometer trigger wheel
- Install thrust plate 40-105 onto differential housing before installing puller.

Pressing on inner race for small taper roller bearing

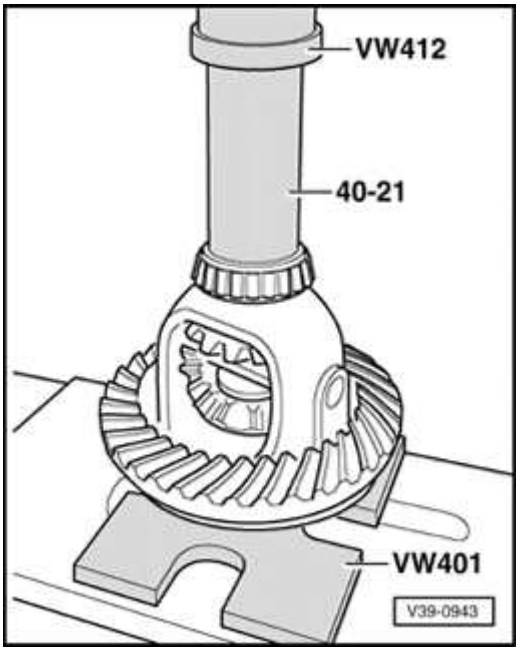


Fig. 374: Pressing On Small Tapered Bearing Inner Race
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Heat inner race to approx. 100 C, position and install.

WARNING: Wear protective gloves!

Pressing on inner race for taper roller bearing

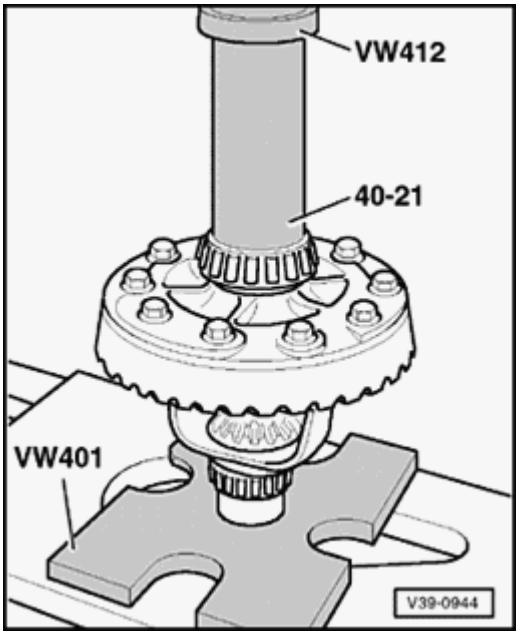


Fig. 375: Pressing On Inner Race Of Large Taper Roller Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat inner race to approx. 100 C, position and install.

WARNING: Wear protective gloves!

Driving ring gear off housing

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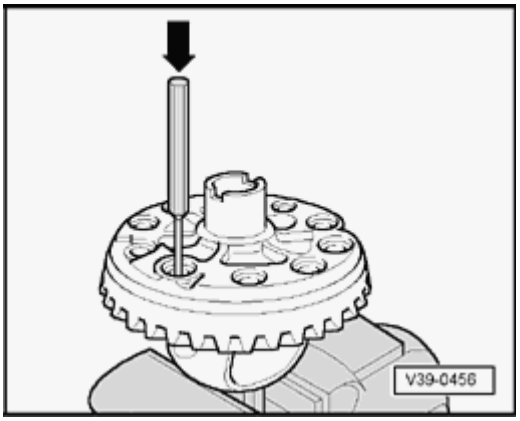


Fig. 376: Driving Out Ring Gear From Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Heat the ring gear to approx. 100 ° C and install

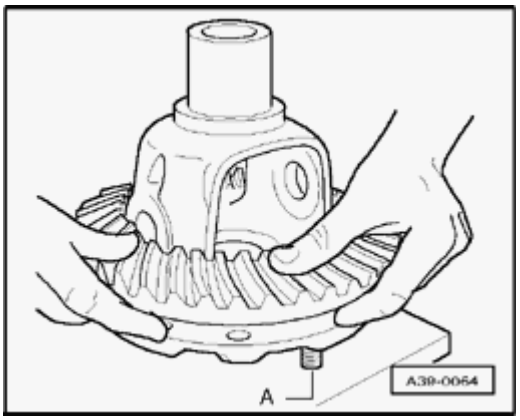


Fig. 377: Installing Ring Gear
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- When installing ring gear guide it on centering pins -A- (locally made).

  WARNING: Wear protective gloves!

- Allow the ring gear to cool off slightly before inserting the bolts. Then tighten to the specified torque.

Installing bevel gears

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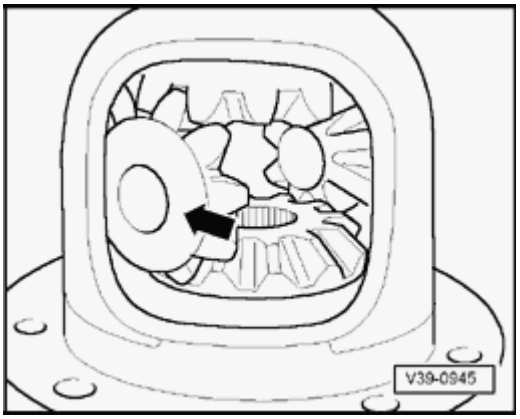


Fig. 378: Installing Small Differential Bevel Gears
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert thrust washers for small bevel gear with a small amount of grease.
- Insert large bevel gears with correct shims. See **Adjusting differential bevel gears**
- Insert planet pinions turned through 180 ° and pivot into position (arrow).
- Insert threaded pieces.

- Installation position: Step toward large bevel gear

- Align thrust washers with hole.
- Drive small bevel gear shaft into final position and secure.

Adjusting differential bevel gears

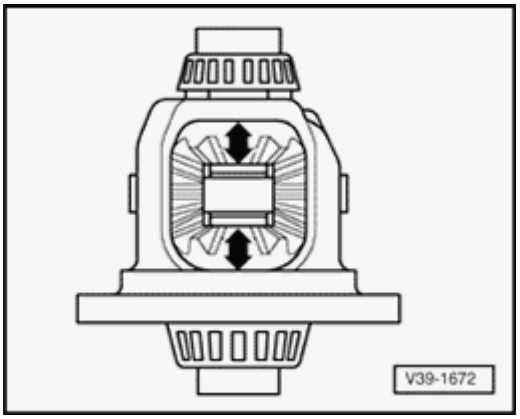


Fig. 379: Differential Planetary Gears, Adjusting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Insert large bevel gears with thinnest shims (0.5 mm).
- Insert small bevel gears with thrust washers and press in shaft.

NOTE: Do not now interchange large bevel gears and thrust washers.

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- Press small bevel gears outward and check play of large bevel gears by hand -arrows-.
- Adjust play by inserting an appropriate shim. Refer to **The following shims are available**.

- Specification: no more than 0.10 mm

NOTE:

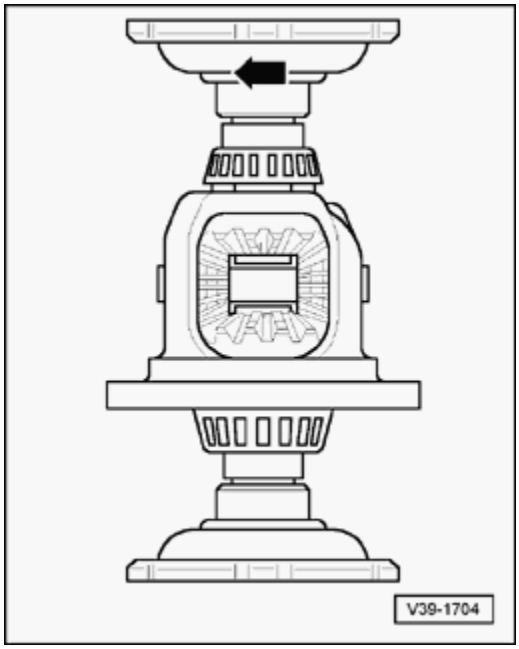


Fig. 380: Installing Differential Bevel Gear Shim
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The adjustment is also correct if no further play is perceptible, although it is still possible to rotate the differential bevel gears -arrow-.

The following shims are available

Shim thickness (mm)		
0.50	0.70	0.90
0.60	0.80	1.00

Driving outer race for small taper roller bearing out of transmission housing

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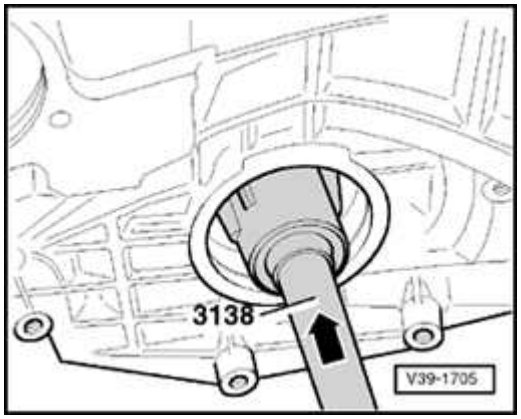


Fig. 381: Driving Out Small Taper Roller Bearing Outer Race From Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressing outer race for small taper roller bearing into transmission housing

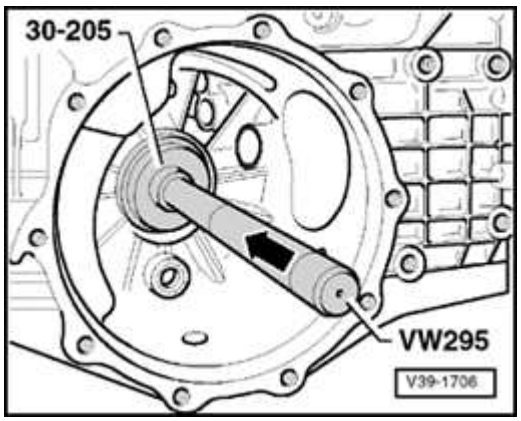


Fig. 382: Driving Small Taper Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Driving outer race for large taper roller bearing out of cover

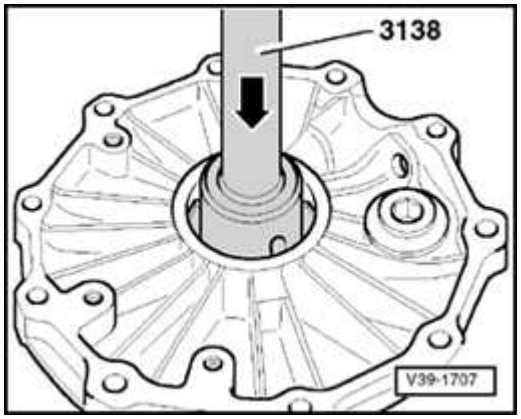


Fig. 383: Driving Out Large Taper Roller Bearing Outer Race From Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Use suitable base, e.g. VW 470 with recess toward cover.

Driving outer race for large taper roller bearing into cover

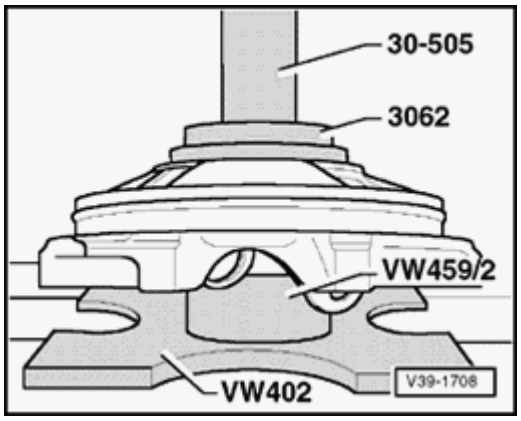


Fig. 384: Driving Large Taper Roller Bearing Outer Race Into Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DRIVE PINION AND RING GEAR, ADJUSTING

General notes

Careful adjustment of the drive pinion and ring gear is important for the service life and smooth running of the final drive. For this reason, drive pinions and ring gears are paired up during manufacturing and are checked with a tester for correct positioning of carrier pattern and low noise emission. The position for quietest possible running is achieved by moving the drive pinion in an axial direction, whereby the backlash remains within the specified tolerance.

Deviation "r" with reference to the master gauge "Ro" is recorded on the outer circumference of the ring gear. Final drive set (drive pinion and ring gear) must only be replaced together.

Gear sets, adjusting and marking

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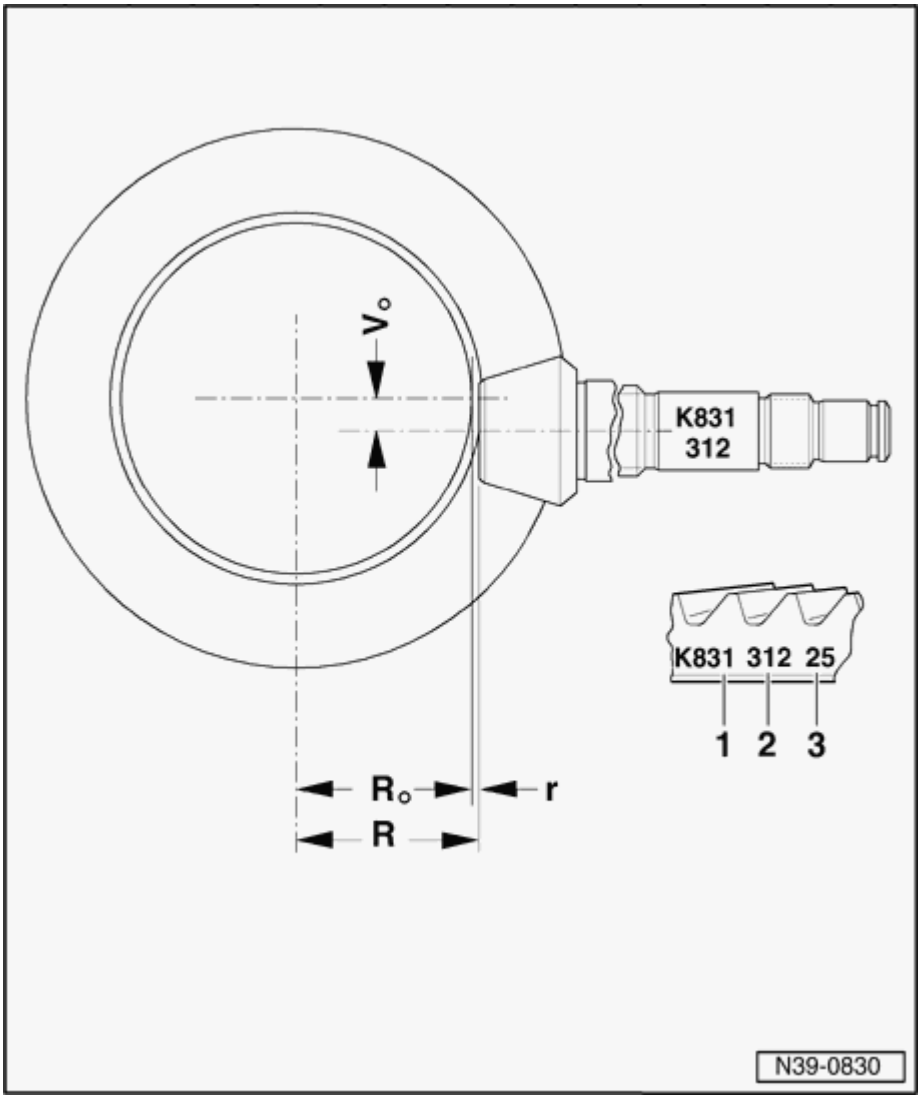


Fig. 385: Gear Sets, Adjustments And Markings
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Marking "K831" indicates Klingelnberg final drive set with transmission ratio 31 : 8.

2 - Gear set pairing number (312).

3 - Deviation (tolerance) "r" is 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" = 59.65 mm

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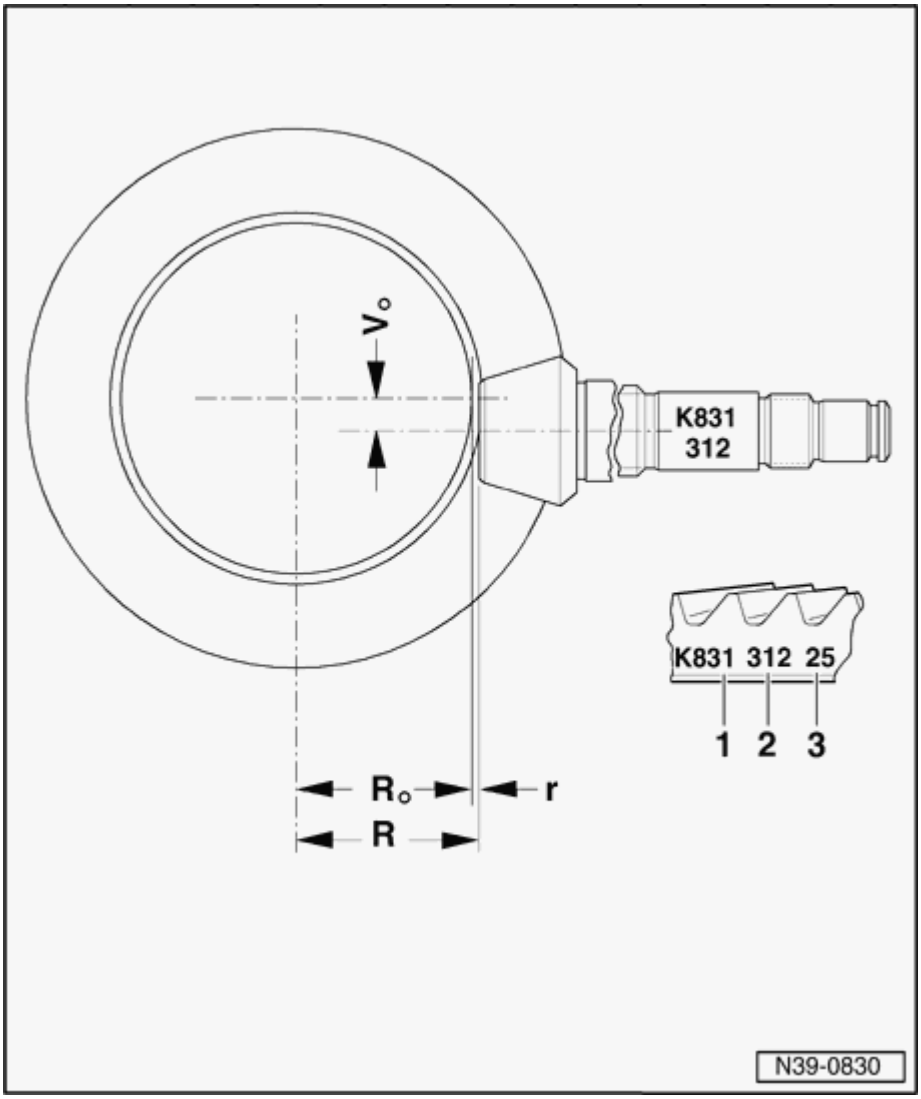


Fig. 386: Gear Sets, Adjustments And Markings
Courtesy of VOLKSWAGEN UNITED STATES, INC.

R - Actual dimension between ring gear and face of pinion shaft at point with quietest running for this pinion set.

Vo - Hypoid offset

Position of shims

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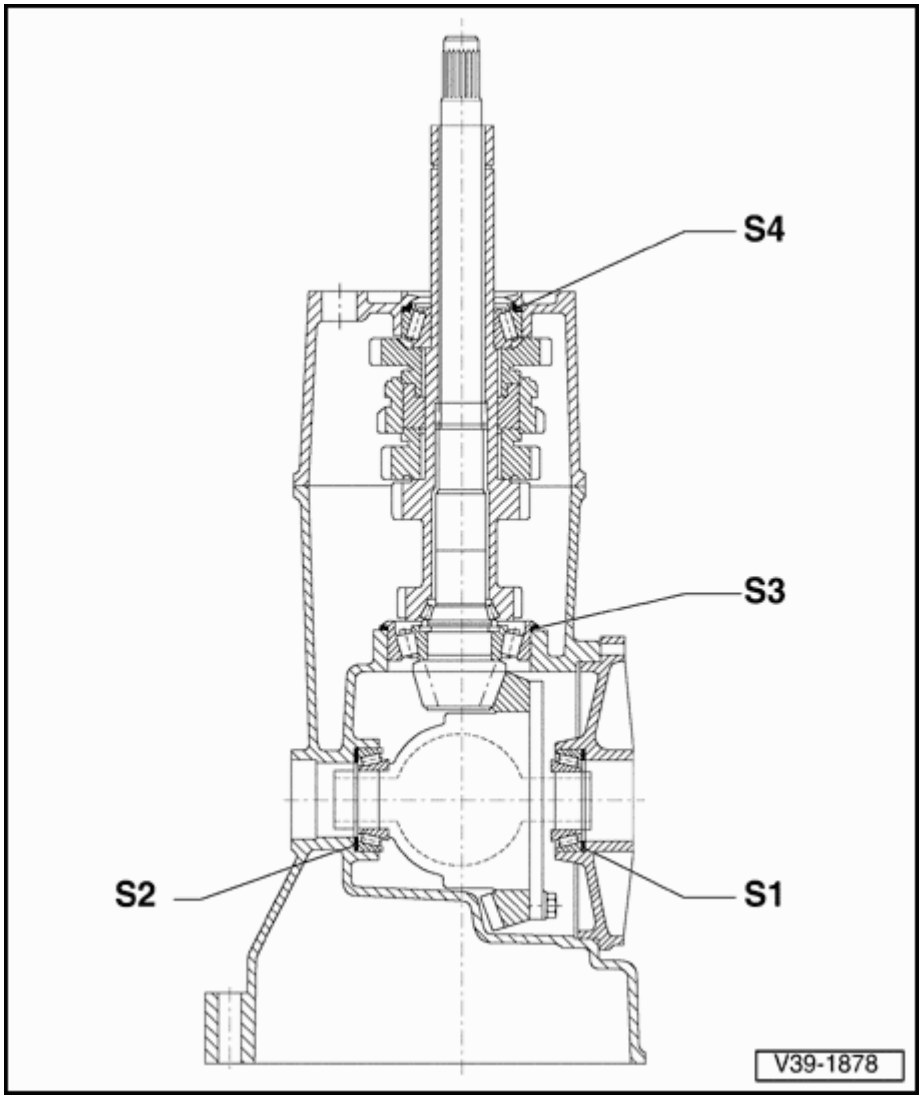


Fig. 387: Location Of Shims
Courtesy of VOLKSWAGEN UNITED STATES, INC.

S1 - Adjustment shim for ring gear in transmission housing cover

S2 - Adjustment shim for ring gear in transmission housing

S3 - Adjustment shim for drive pinion in transmission housing

S4 - Adjustment shim for drive pinion in bearing plate

Adjustment overview

NOTE: In the case of repairs to the transmission it is only necessary to adjust the pinion shaft, ring gear or final drive set if components have been replaced which have a direct effect on the adjustments of the final drive. To eliminate

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unnecessary adjustments observe following table:

To adjust:	Ring gear	Pinion shaft	Pinion shaft	Backlash
	(S1 and S2)	(S3 and S4)	shim only	0.12 -0.22 mm
		using deviation "r"	S4	
	Refer to **Ring gear, adjusting**	Refer to **Drive pinion, adjusting**	Refer to **Re-determining shim S4**	Refer to **Adjusting backlash**
Component replaced				
Transmission housing	X	X		X
Bearing plate			X	X
Differential housing	X			X
Taper roller bearings for pinion shaft		X		X
Taper roller bearing for differential	X			X
Final drive	X	X		X
Hollow shaft			X	X
Final drive cover	X			X

Gear set, recommended adjustment sequence

When ring gear and pinion shaft have to be adjusted, in the interests of a rational sequence, keep to the following order:

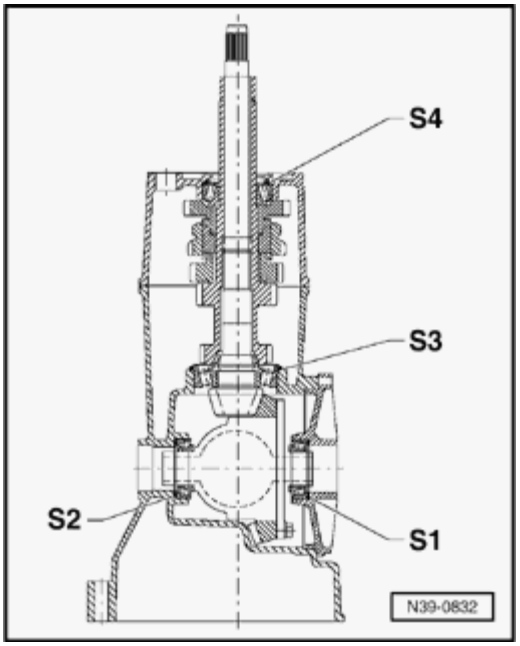


Fig. 388: Recommended Sequence For Adjusting Gear Set
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Determine total shim thickness "Stotal" (S1 plus S2) for the specified preload of taper roller bearings for differential.
- Determine total shim thickness "Stotal" (S3 plus S4) for the specified preload for taper roller bearings for drive pinion.
- Distribute total shim thickness "Stotal" (S3 plus S4) so that the distance from center of ring gear to face of pinion shaft is the same as distance "R" determined during production.
- Distribute total shim thickness "Stotal" (S1 plus S2) so that the specified backlash exists between ring gear and drive pinion.

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 for achieving good results when performing repairs and taking measurements.

Drive pinion, adjusting

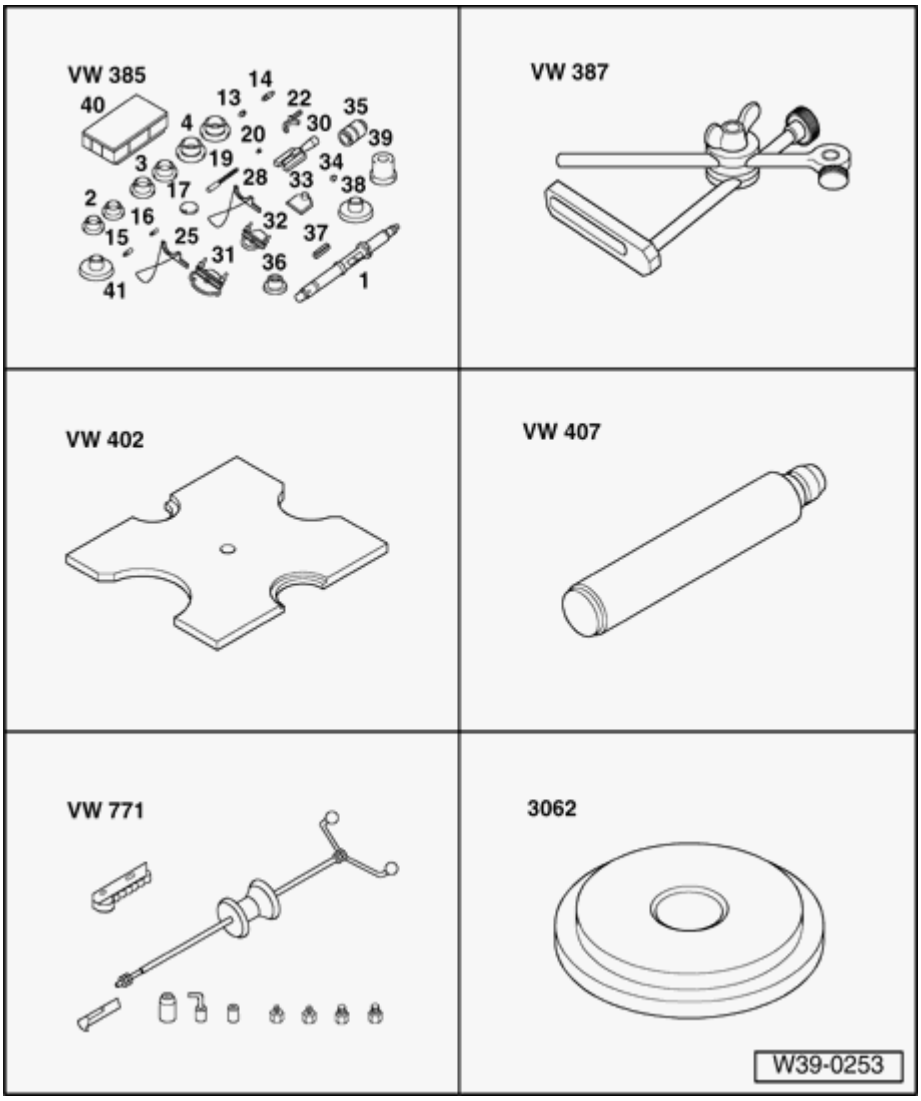


Fig. 389: Identifying Special Tools - Pinion, Adjusting

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

(Adjusting drive pinion and hollow wheel)

Special tools and equipment

- VW 385 Universal measuring tool
- VW 387 Universal dial gauge holder
- VW 402 Thrust plate
- VW 407 Thrust tool
- VW 771 Multi-purpose tool
- 3062 Thrust disc

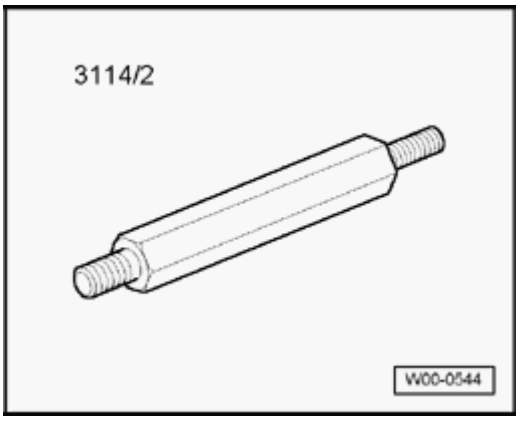


Fig. 390: 3114/2 Straightening Tool
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3114/2 Straightening tool

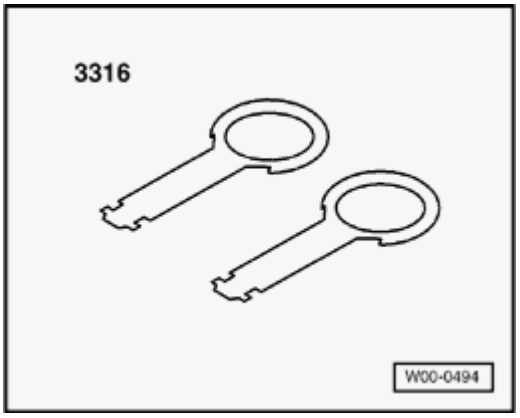


Fig. 391: 3116 Spring Pin
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 3116 Spring pin

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- Torque gauge 0 to 600 Ncm
- Dial gauge
- Dial gauge extension 6.5 mm
- Dial gauge extension 30 mm

Re-adjustment of the drive pinion according to the following instructions is only necessary if the final drive set, taper roller bearing for drive pinion and transmission housing are being replaced. Refer to **Adjustment overview**.

Determine total shim thickness "Stotal"(S3 plus S4)

(Setting preload of taper roller bearing for drive pinion).

- Differential is removed.

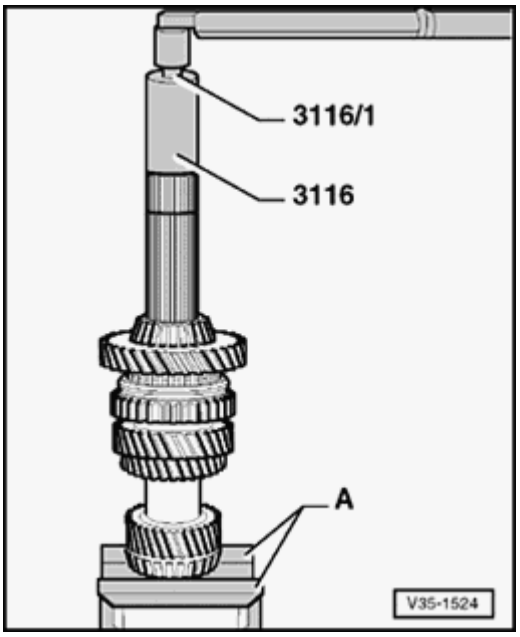


Fig. 392: Preloading Pinion/Hollow Shaft To 10 Nm, While Holding Hollow Shaft
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Clamp drive pinion in vice using vice clamps -A-.
- Insert taper rollers with grease, assemble drive pinion and hollow shaft.
- Rotate hollow shaft against drive pinion 5 turns in both directions to settle taper roller bearing.
- Preload drive pinion/hollow shaft to 10 Nm, hold hollow shaft tight for this step.
- Install large taper roller bearing outer race into transmission housing without shim. Refer to **Heating transmission housing in order to install outer race for taper roller bearing** and **Inserting outer race for large taper roller bearing in transmission housing and pressing home**

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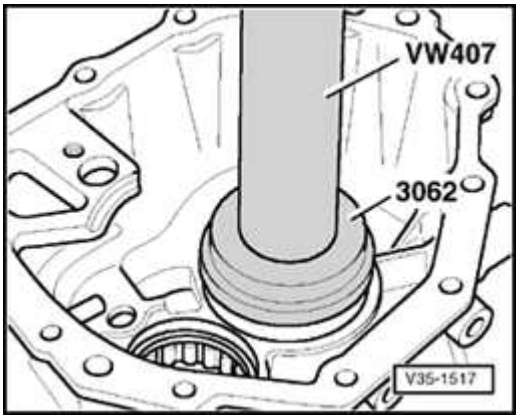


Fig. 393: Pressing In/Out Small Outer Race/Tapered Bearing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press small taper roller bearing outer race together with a 1.00 mm thick provisional shim S4* fully into bearing plate.

NOTE: For measurement purposes a shim S4 with a thickness of 1.00 mm is inserted provisionally. It is referred to as S4* in the following. After determining measurement "e", S4* is replaced by the final shim S4.

- Insert completely assembled pinion shaft in transmission housing.
- Install bearing plate with dowel sleeves and tighten bolts to tightening torque.
- Rotate drive pinion and hollow shaft 8 turns in both directions prior to each measurement in order to settle taper roller bearing.

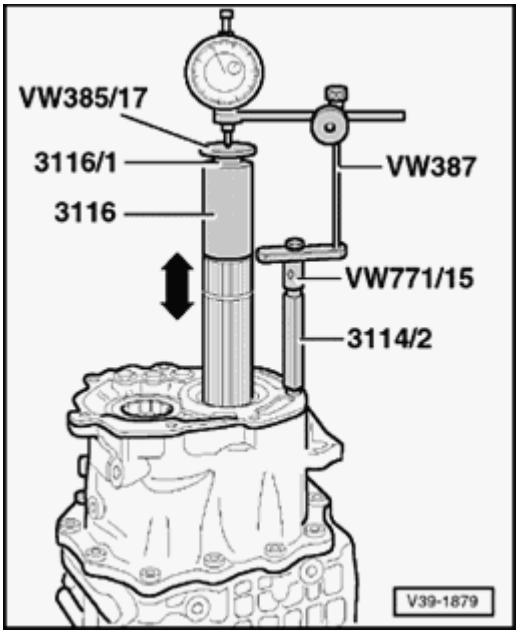


Fig. 394: Installing Measuring Tools
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Install measuring tools.
- Use 30 mm dial gauge extension
- Position dial gauge extension in middle of measuring plate VW 385/17.
- Set dial gauge (3 mm measuring range) to zero with 2 mm preload.
- Move drive pinion upward and downward without turning; read off play on dial gauge and note.

(Example: 0.90 mm)

- Before each measuring procedure the drive pinion must be turned together with the hollow shaft in order to avoid obtaining a false reading.

The specified bearing pre-load is obtained by adding a constant pre-load value (0.15 mm) to reading obtained (0.90 mm) and thickness of shim S4* (1.0 mm).

Stotal = S4* + reading obtained + pre-load

Example:

Inserted shim S4*	1.00 mm
Pre-load (constant value)	+0.15 mm
Reading obtained (Example)	+0.90 mm
Stotal	= 2.05 mm

Determining thickness of provisional shim S3*

Provisional shim S3* = Stotal - S4*

Example:

Total shim thickness Stotal (S3 + S4)	2.05 mm
Inserted shim S4*	-1.00 mm
Provisional shim thickness S3*	= 1.05 mm

- Removing outer race for large taper roller bearing. Refer to **Pulling out large taper roller bearing outer race**, Inserting provisional shim S3* into transmission housing and re-installing outer race. Refer to **Heating transmission housing in order to install outer race for taper roller bearing** and **Inserting outer race for large taper roller bearing in transmission housing and pressing home**.
- Insert completely assembled pinion shaft in transmission housing again.
- Install bearing plate with dowel sleeves and tighten to 25 Nm.
- Rotate drive pinion and hollow shaft 8 turns in both directions prior to each measurement to settle taper roller bearing.

Determining measurement "e"

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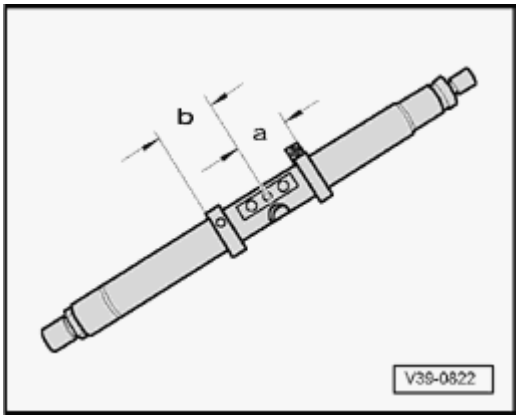


Fig. 395: Setting Adjusting Rings Of Measuring Bar VW 385/1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set universal mandrel VW 385/1 setting ring to dimension a = 65 mm.
- Adjust moveable setting ring to measure b = 55 mm.

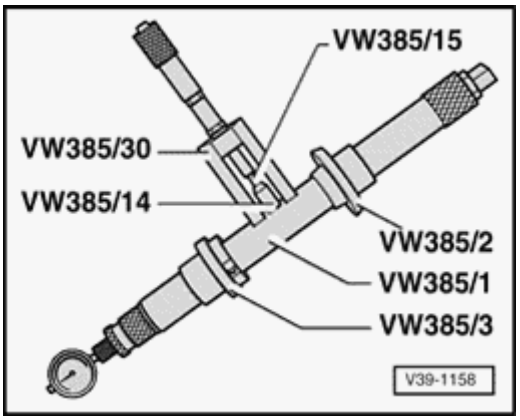


Fig. 396: Assemble Measuring Bar According
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Arrange universal mandrel as illustrated. Dial gauge extension VW 385/15 = 9.3 mm. Set master gauge VW 385/30 to Ro = 59.65 mm and install onto mandrel.
- Set dial gauge (3 mm measuring range) to zero with 2 mm preload.
- Place end measuring plate VW 385/17 onto drive pinion head.

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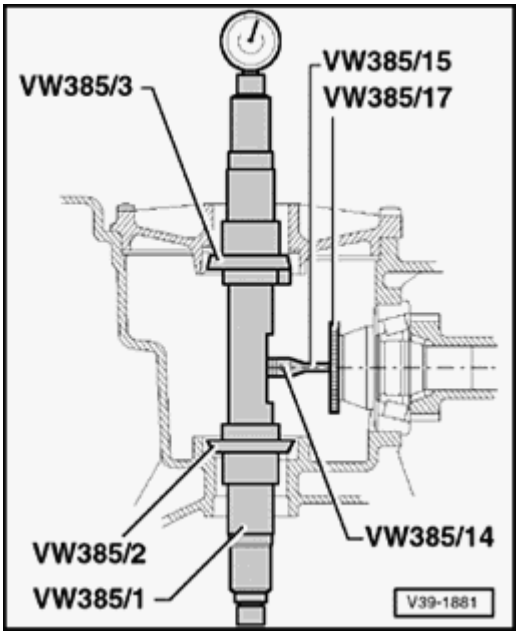


Fig. 397: Insert Measuring Mandrel Into Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove master gauge and insert measuring mandrel in the housing. Centering disc VW385/3 faces toward cover for final drive.
- Install final drive cover and tighten 4 bolts to 25 Nm.
- Using sliding setting ring to pull 2nd centering disc VW 385/2 outward until mandrel can still just be turned by hand.

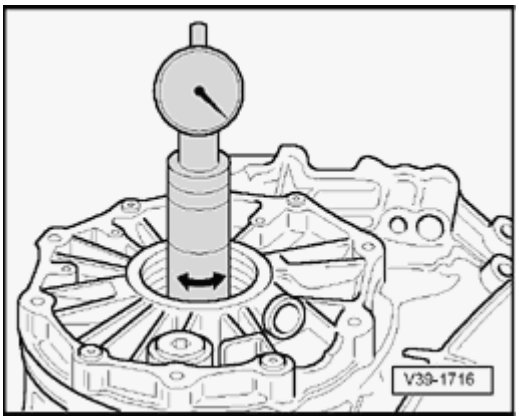


Fig. 398: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measure dimension "e".

Turn mandrel until the dial gauge extension touches the final measuring plate on pinion shaft head, then measure maximum deflection (return point). The measured value is dimension "e".

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Example:

0.16 mm (red scale)

- 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" = 0.16 mm (in red scale on dial)

Determining thickness of shim S3

S3 = S3* + r + e

("e" in black scale)

S3 = S3* + r + e

("e" in red scale)

NOTE:

- **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.**
- **If dial gauge reading is in red scale, subtract dimension "e".**
- **If dial gauge reading is in black scale, add dimension "e".**

Example:

Inserted shim S3*	1.05 mm
Dimension "r" indicated on ring gear	+0.38 mm
Determined value "e" (red scale)	-0.16 mm
Shim thickness S3	= 1.27 mm

Available shims for S3

Shim thickness (mm)		
0.45	0.60	0.75
0.50	0.65	0.80
0.55	0.70	0.85

- Different tolerances make it possible to obtain exact shim thickness required.

Determining thickness of shim S4

S4 = Stotal - S3

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Example:

Total shim thickness "Stotal"	2.05 mm
Thickness of shim S3	-1.27 mm
Thickness of shim S4	= 0.78 mm

Available shims for S4

Shim thickness (mm)		
0.45	0.65	0.85
0.50	0.70	1.25
0.55	0.75	
0.60	0.80	

- Different tolerances make it possible to obtain exact shim thickness required.

Carry out check measurement - checking dimension "r"

- Install pinion shaft with measured shims S3 and S4 and turn several times in both directions.

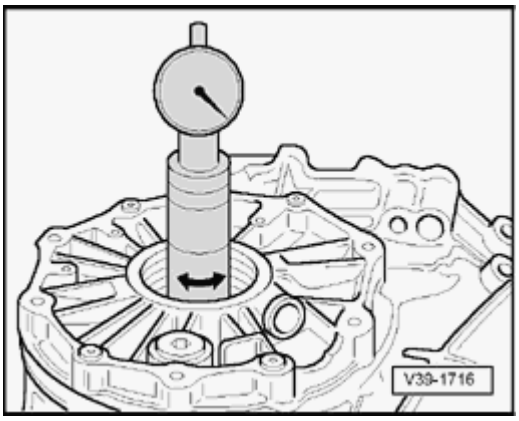


Fig. 399: Turning Measuring Mandrel Until Dial Gauge Plunger Tip Touches End Gauge On Pinion Shaft Head And Measure Maximum Runout
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Insert universal mandrel and measure dimension "r".

If the correct shims have been selected the D.T.I. must now indicate the mark dimension "r" (reading anti-clockwise on red scale) within a tolerance of ± 0.04 mm.

Measuring frictional torque (check)

NOTE: Taper roller bearings for drive pinion/hollow shaft are low friction bearings. Therefore the frictional torque only has a limited use as a check. Correct

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adjustment is only possible by determining the total shim thickness Stotal.



Fig. 400: Do Not Use Additional Oil
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install new taper roller bearings in delivery condition and do not oil additionally.

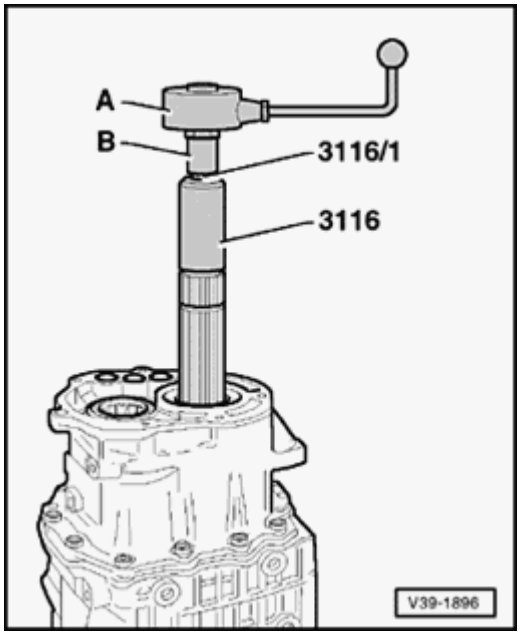


Fig. 401: Measure Friction Torque
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Measuring frictional torque

With torque gauge -A-, 0 to 600 Ncm, standard commercially available

New bearings	Used bearings 1)
80 to 150 Ncm	30 to 60 Ncm

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1) with at least 50 km service

Ring gear, adjusting

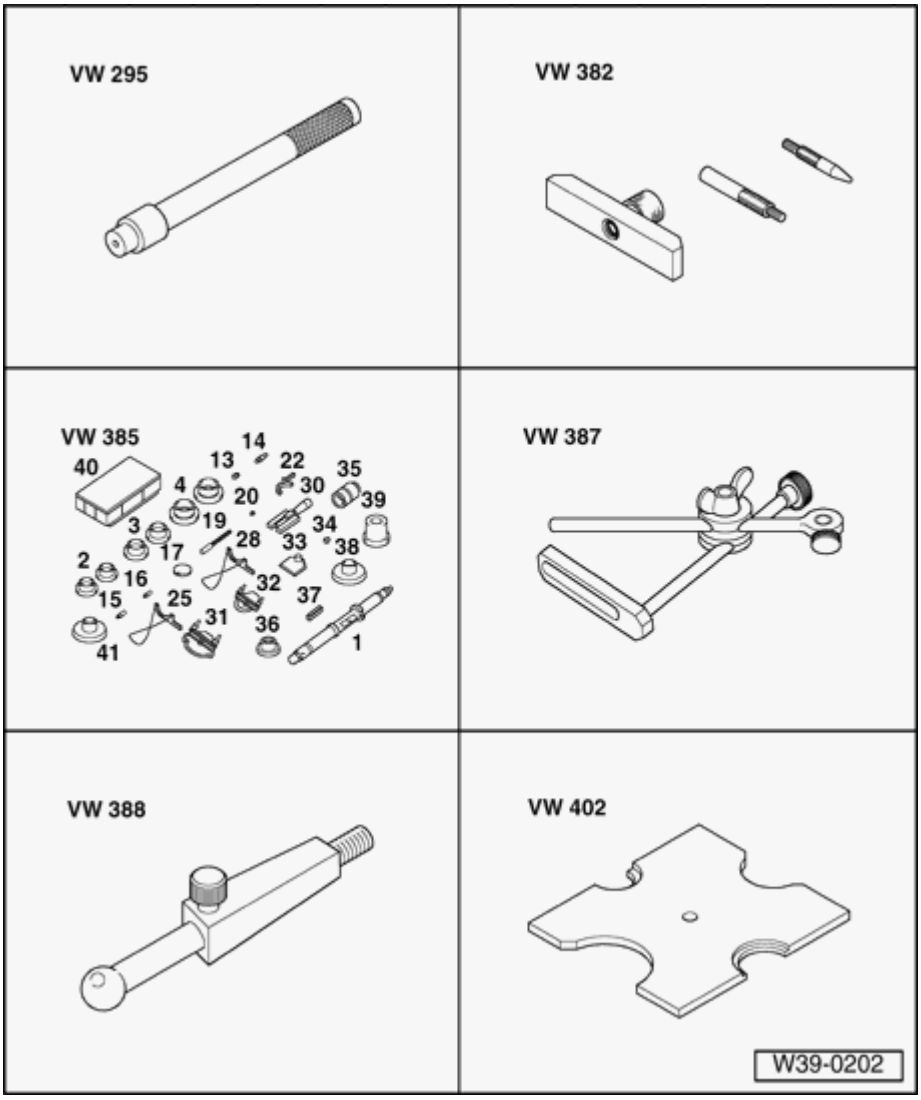


Fig. 402: Identifying Special Tools - Ring Gear, Adjusting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

(Adjusting differential)

Special tools and equipment

- VW 295 Drift
- VW 382 Special socket and measuring tools
- VW 385 Universal measuring tool
- VW 387 Universal dial gauge holder

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- VW 388 Test lever
- VW 402 Thrust plate

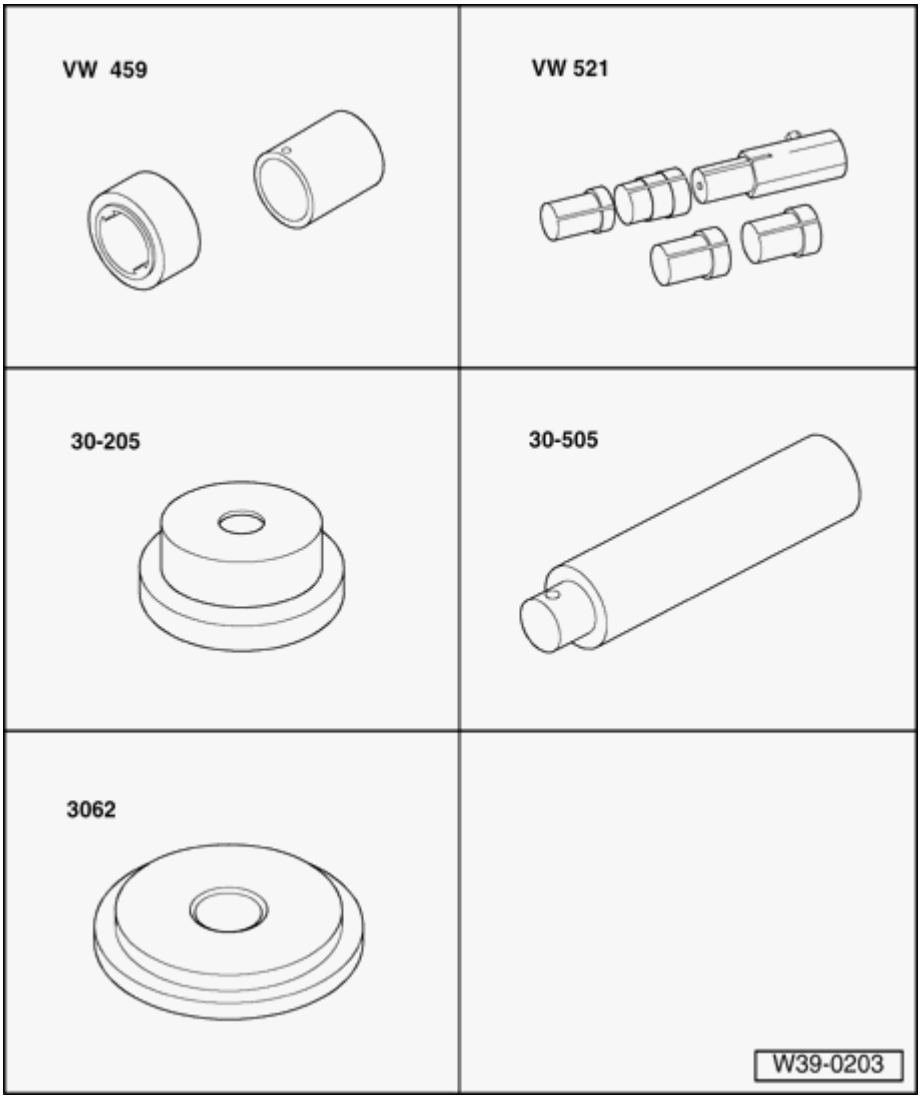


Fig. 403: Identifying Special Tools - Ring Gear, Adjusting
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VW 459 Installation and removal tool
- VW 521 Adjustment tool for ring gear
- 30-205 Thrust plate
- 30-505 Fitting mandrel
- 3062 Thrust disc
- Torque gauge 0 to 600 Ncm
- Dial gauge

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- Dial gauge extension

It is necessary to readjust the ring gear when:

Transmission housing, cover for final drive, taper roller bearing outer race for differential, final drive housing or final drive set are replaced.

Adjustment overview. Refer to **Adjustment overview**

Determine total shim thickness "Stotal" (S1 plus S2)

(Setting preload of taper roller bearing for differential)

- Drive pinion is removed.

- Pull out flanged shaft seal with VW 681.
- Remove outer races of differential taper roller bearings and remove shims. Refer to **Differential, disassembling and assembling**.

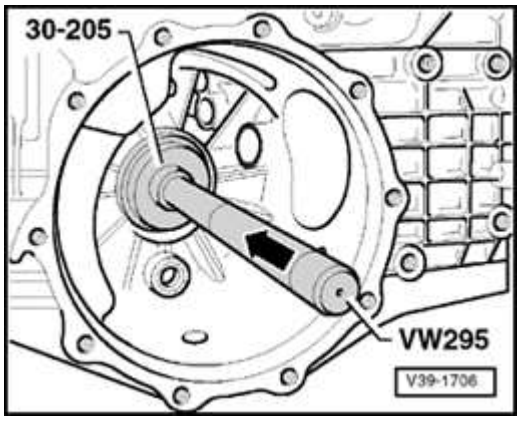


Fig. 404: Driving Small Taper Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Drive outer race for taper 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 inserted provisionally. It is referred to as S2* in the following. After determining the backlash, S2* is replaced by the final shim S2.

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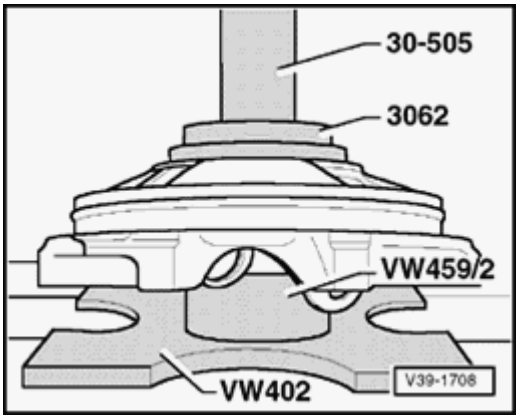


Fig. 405: Driving Large Taper Roller Bearing Outer Race Into Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Press taper roller bearing outer race without shim into cover for differential.
- Insert differential into housing without speedometer trigger wheel.

The side of the ring gear is positioned on the right side (cover side).

- Install cover and tighten bolts to 25 Nm.
- Turn transmission so that cover for differential faces up.
- Turn differential 8 turns in both directions so that the taper roller bearings settle.
- Place measuring plate VW 385/17 onto differential.

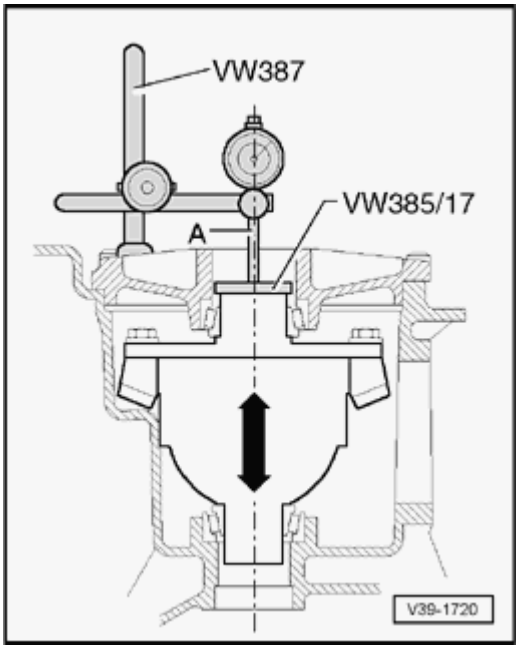


Fig. 406: Installing Magnetic Plate 50Mm Dia. VW 385/17 And Dial Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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- Install measuring tools.
- Position dial gauge extension in middle of measuring plate VW 385/17.
- Set dial gauge (3 mm measuring range) to zero with 2 mm preload.

A - Dial gauge extension 30 mm

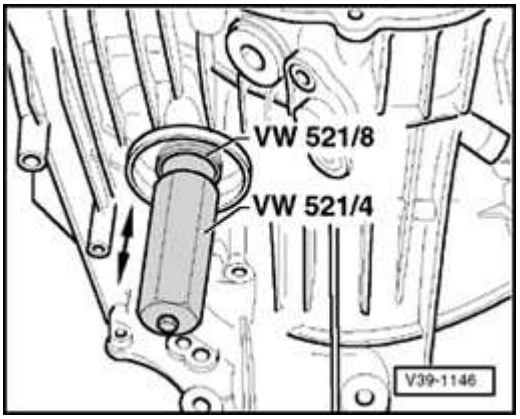


Fig. 407: Move Differential With Ring Gear Adjuster VW 521 Up And Down
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Move differential up and down with special tool VW 521 (direction of arrow).
- Read off play from dial gauge

Example:

0.62 mm

"Stotal" = S2* + reading obtained + pre load

Example:

Inserted shim(s) S2*	1.20 mm
Reading obtained (Example)	+0.62 mm
Pre-load (constant value)	+0.25 mm
Stotal	= 2.07 mm

Determining thickness of shim S1*

NOTE:

- **After determining the backlash, provisional shim S1* is replaced by the final shim S1.**
- **The total shim thickness "Stotal" remains the same.**

S1* = Stotal - S2*

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Example:

Total shim thickness "Stotal"	2.07 mm
Inserted shim(s) S2*	-1.20 mm
Thickness of shim S1*	= 0.87 mm

Adjusting backlash

Drive pinion inserted with S3 and S4

- Differential with ring gear: S1* is installed in the cover side, S2* in the transmission housing.
- Install final drive cover and tighten bolts to 25 Nm.
- Turn differential several times in both directions so that the taper roller bearings settle.

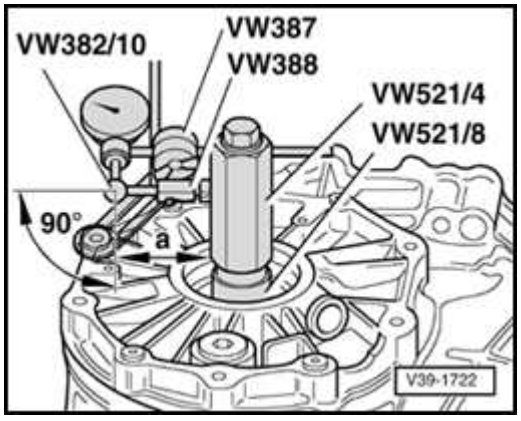


Fig. 408: Installing Measuring Tools
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install measuring tools.
- Use dial gauge extension VW 382/10 (6 mm flat).

Set measuring lever VW 388 to dimension "a" = 79 mm.

- Turn ring gear to stop. Set dial gauge to zero, turn back ring gear and read off backlash. Note value.
- After turning ring gear through a further 90 ° , repeat measuring process a further 3 times. Add up the four measured values and calculate average backlash

Calculating average backlash

Example:

	1st measurement	0.49 mm
+	2nd measurement	0.48 mm
+	3rd measurement	0.50 mm

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+	4th measurement	0.49 mm
Total		1.96 mm

Center backlash = 1.96 mm: 4 = 0.49 mm

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

Determining shim thickness S2

(opposite ring gear)

S2*	=	Inserted shim(s)
	-	Average backlash
	+	Lift (constant)

Lift = 0.15 mm

Example:

S2*= Inserted shim(s)		1.20 mm
-	Average backlash	0.49 mm
		= 0.71 mm
+	Lift (constant)	0.15 mm
Thickness of shim S2		= 0.86 mm

Available shims for S2

Shim thickness (mm)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

- Different tolerances make it possible to obtain exact shim thickness required.

Determining adjustment shim thickness S1

(Ring gear side)

S1 = Stotal - S2

Example:

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Total shim thickness "Stotal"	2.07 mm
Thickness of shim S2	-0.86 mm
Thickness of shim S1	= 1.21 mm

Available shims for S1

Shim thickness (mm)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

- Different tolerances make it possible to obtain exact shim thickness required.

Install determined shims, S1 on the ring gear side, S2 opposite ring gear, use 2 shims if necessary.

Performing check measurement

Measuring backlash. Refer to **Adjusting backlash**

- It must be 0.12 to 0.22 mm.

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