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Automatic TransmissionSPECIFICATIONS

6.76

Model

320 i A

Automatic Transmission

Make Zahnradfabrik Friedrichshafen

Type 3 speed transmission 3 HP 22

Color of data plate red

No. of speed ranges 3 forward and 1 reverse range

Ratios, mechanical 1st gear 2.478

2nd gear 1.478

3rd gear 1.000

Reverse 2.090

Speedometer drive 2.500

Torque converter hydrodynamic torque converter according to "Trilok" principle

Torque converter diameter 240 (9.449) mm (in.)

Torque converter identification green dot of paint

Stall speed 2050

Initial ratio 2.28

Max. unbalance 15.0 gcm

Max. out-of-true for welded tabs 0.3 (0.012) mm (in.)

Total Oil Capacity (transmission + oil cooler) 5.3 (11) ltr (pts)

Amount of oil betw. marks on dipstick approx. 0.25 (0.5) ltr (pts)

Oil change

at 30,000 km (18,000 miles) and every following 30,000 km (18,000 miles) on engine at operating temperature and selector lever at P (move selector lever through all ranges)

Capacity for oil change approx. 2.0 (4) ltr (pts)

Model

320 i A

1)
Upshift points

Selector lever position A

1st/2nd gear

Accelerator pedal position

Full ThrottleKickdown

Shift point at

road speed

39 ± 4 (24 ± 2.5)

62 ± 4 (38.5 ± 2.5)

engine speed

3720 ± 340

5650 ± 330

Selector lever position A

2nd/3rd gear

Accelerator pedal position

Full ThrottleKickdown

Shift point at

road speed

91 ± 5 (56.5 ± 3)

103 ± 4 (64 ± 2.5)

engine speed

5030 ± 250

5610 ± 180

Downshift Points

Selector lever position

3rd/2nd gear

Shift point²⁾ at

road speed

Full ThrottleKickdown

engine speed

3010 ± 110

99 ± 4 (61.5 ± 2.5)
3830 ± 140Downshift Points

Selector lever position

2nd/1st gear

Shift point at

road speed

Kickdown

52 ± 5 (32 ± 3)

KPH (MPH)

engine speed

3130 ± 210

Manual downshift points²⁾ at

road speed

from 3rd to 2nd gear
105 ± 4 (65 ± 2.5)

KPH (MPH)

engine speed

4030 ± 150

1) Check on level surface; speed data does not allow for speedometer error.

2) Downshift points cannot be exceeded.

Automatic Transmission

SPECIFICATIONS

6.76

Model	320 i A
Manual downshift points ¹⁾ at	from 2nd to 1st gear
road speed	63 ± 4 (39 ± 2.5)
engine speed	3630 ± 210
<u>Main Pressure in Selector Lever Position</u>	
<u>P. R. O.</u>	
Idle	13.2 ... 14.5 (188 ... 206)
Kickdown	17.1 ... 19.0 (243 ... 270)
<u>Main Pressure and Clutch A in Selector</u>	
<u>Lever Position A, 2, 1</u>	
Idle	5.8 ... 6.35 (83 ... 90)
Kickdown	7.5 ... 8.3 (107 ... 118)
Set distance between control unit housing and needle on throttle pressure piston	11.5 (0.453)
Radial play between driven pump gear and housing	0.072 ... 0.161 (0.003 ... 0.006) not adjustable
Axial play of pump gears to housing	0.03 ... 0.065 (0.001 ... 0.002) not adjustable
<u>Towing</u>	
Max. towing distance	50 (30)
Max. towing speed	50 (30)
Distances further than 50 km (30 miles)	Add 1 liter (2 pints) of ATF in addition to specified transmission oil capacity ²⁾ or detach propeller shaft at final drive and tie up

1) Downshift points cannot be exceeded.

2) After car has been repaired it is essential to reduce transmission oil content to correct level.

Model

320 i A

Approved Oil Grades

For Initial Filling or Adding to Oil of New and Reconditioned Transmissions

<u>Product Designation</u>	<u>Manufacturer</u>	<u>Product Designation</u>	<u>Manufacturer</u>
AGIP F. 1 ATF Dexron	Agip	Mobil ATF 220	Mobil Oil
BP AUTRAN DX	BP	Shell ATF Dexron	Shell
CASTROL TQ Dexron	Castrol	Sunamatic 128	Sunoi
Chevron ATF	Chevron	Sunamatic 128	Sunoi
ESSO AUTOM. TRANSM. FLUID (D)	Esso	Texamatic Fluid 6673	Texaco

Only For Adding to Oil

Product Designation

<u>Product Designation</u>	<u>Manufacturer</u>
AERO-LINE ATF Dexron	Prinz-Schulte
AMALIE ATF DEXRON	Usoco
Amoco ATF DEXRON	Amoco
ANTAR DEXRON	Antar
ARAL Getriebeöl ATF Dexron	Aral
ASEOL DEXRON 16-712	Aseol
Auto - DEXRON	Auto-Werke
Austrumatic B Dexron	Elan
AVIA FLUID ATF 68 DEXRON	Avia
Aviaticon ATF/DEXRON	Finke
Baylla Automatic TF 25	Baylla
BECHEM Fluid-Getriebeöl ATF DEXRON	Bechem
BEVEROL DEXRON ATF	Beverol
CALTEX TEXAMATIC Fluid 6673	Caltex
CALYPSOL Fluid ATF-AA Dexron	Calypsol
CASTROL TQ Dexron	Castrol
COFRAMATIC DEXRON	Cofran
CONDOR FLUID B-Getriebeöl (DEXRON)	Condor

Product Designation

<u>Product Designation</u>	<u>Manufacturer</u>
Deltinol Getriebeöl ATF Dexron	Merk
DEUTZ OEL Dexron	Deutzer Öl
DIVINOL Fluid Dexron B 92	Zeller + Gmein
Duckham D-MATIC	Duckham
ECUMATIC Dexron	Wenzel and Weidmann
ELFMATIC G	Elf Union
ELIMO Fluid Dexron	Eller
ESA AUTOMATIC TRANSMISSION FLUID Dexron	Esa
ESSO AUTOM. Transm. Fluid (D)	Esso
ETERNA Transmatic ATF D	Eterna
EXACTOL HFL DEXRON	Minera
FANAL ATF Dexron	Stinnes
FINA DEXRON ATF	Fina
FLEET MATIC CD	Duckham
FLUID B 2846	Condat
Frontol Getriebeöl DKS Dexron	Schindler
FUCHS AUTOMATIC TF 25	Fuchs

Automatic Transmission

SPECIFICATIONS

Model

320 i A

Continuation of Approved Oil Grades

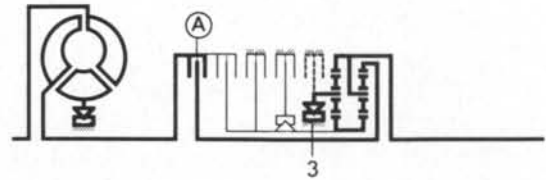
<u>Product Designation</u>	<u>Manufacturer</u>	<u>Product Designation</u>	<u>Manufacturer</u>
GIROMATIC DEXRON	B-10 752	Optinol Dexron B 92 Fluid	B-10 631
Golden Fleece Dexron	B-10 314	ORVEMATIC	B-10 588
Gulf ATF Dexron	B-10 486	Pennzoiil Hydra Flo Dexron	B-11 493/B-11 583
HAFIA TRANSMATIC	B-10 611	B-11 510/B-10 643	B-11 510/B-10 643
HOMBERG Getriebe-Fluid	B-11 081	Quaker State Dexron ATF	B-11 336
IROKAL Dexron	B-11 081	Selectol Fluid Getriebeöl, Dexron B 334	B-11 051
Kendall ATF DEXRON	B-10 166	Sonol "Dexron"	B-10 574
LABO DEXRON	B-10 647	Texamatic Fluid 6673	B-10 844/B-10 334
Lubrication Engineers Dexron ATF	B-11 033	TOTAL Dexron	B-10 631
MIHAG ATF DB 1140	B-10 653	UNIL-MATIC DEXRON	B-10 787
Mobil ATF 220	B-10 104	Valvomatic ATF Type B Dexron	B-10 756
MOTOREX ATF DEXRON	B-10 494	Veedol ATF Dexron	B-10 579
MOTUL AUTOMATIC B DEXRON	B-10 608	WESTFALEN Getriebeflüssigkeit ATF Dexron	B-10 752
NYNÁS ATF Dexron	B-11 219	WEVAG Automatic Getr.-Öel Dexron	B-11 026
ÖMW Automatic Dexron	B-10 848	YACCO ATF DEXRON	B-10 666
OEST ATF DEXRON	B-10 752		

	<u>Torque Specifications in Nm / kpm (ft. lbs.)</u>	
Transmission to engine	M 10	43 ... 48 / 4.3 ... 4.8 (31 ... 35)
Transmission to engine	M 8	22 ... 24 / 2.2 ... 2.4 (16 ... 17)
Converter to drive plate	M 8	25 ... 27 / 2.5 ... 2.7 (18 ... 19)
Guard to converter housing	M 6	8 ... 10 / 0.8 ... 1.0 (6 ... 7)
Converter housing to transm.	M 8	23 ... 25 / 2.3 ... 2.5 (17 ... 18)
Oil filler neck holding bar	M 6	8 ... 10 / 0.8 ... 1.0 (6 ... 7)
Selector lever to transmission	M 8	8 ... 10 / 0.8 ... 1.0 (6 ... 7)
Oil sump to transmission	M 6	8 ... 9 / 0.8 ... 0.9 (6 ... 6.5)
Transmission plug	M 18	40 ... 45 / 4.0 ... 4.5 (29 ... 32)
Oil sump plug	M 10	35 ... 39 / 3.5 ... 3.9 (25 ... 28)
Control unit Phillips screws	M 5	5 ... 6 / 0.5 ... 0.6 (3.5 ... 4)
Oil cooler line connection		25 ... 30 / 2.5 ... 3.0 (18 ... 21)

	<u>Torque Specifications in Nm / kpm (ft. lbs.)</u>	
Oil filler neck to oil sump		100 ... 120 / 10 ... 12 (72 ... 86)
Governor flange to transm. case	M 8	15 ... 17 / 1.5 ... 1.7 (11 ... 12)
Transm. extension to transmission	M 8	23 ... 25 / 2.3 ... 2.5 (17 ... 18)
Stud on centrifugal governor	M 6	7 ... 8 / 0.7 ... 0.8 (5 ... 6)
Control unit to transmission	M 6	10 ... 11 / 1.0 ... 1.1 (7 ... 8)
Screw on centrifugal governor	M 6	10 ... 11 / 1.0 ... 1.1 (7 ... 8)
Oil pump mounting screw	M 8	10 ... 11 / 1.0 ... 1.1 (7 ... 8)
Interm. plate to converter hsg.	M 6	10 ... 11 / 1.0 ... 1.1 (7 ... 8)
Intermediate plate plug	M 10	15 ... 17 / 1.5 ... 1.7 (11 ... 12)
Speedometer bushing screw		23 ... 25 / 2.3 ... 2.5 (17 ... 18)
Output shaft collar nut		100 ... 120 / 10 ... 12 (72 ... 86)

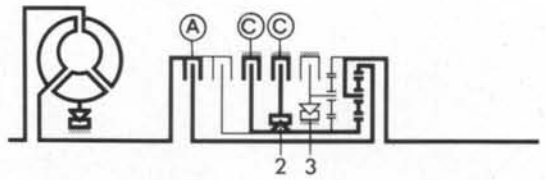
1st Gear

Clutch A is engaged. Planetary gear carrier bears on one-way clutch 3 during acceleration and is cancelled while coasting. With selector lever in position 1 clutch D also engages in 1st gear, so that engine braking force can be utilized.



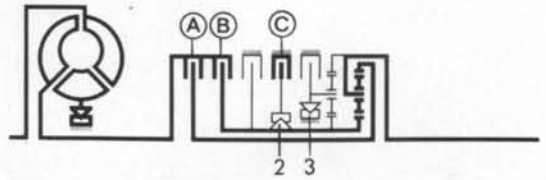
2nd Gear

Clutches A, C' and C are engaged. One-way clutch 3 is cancelled. Hollow shaft is fixed with sun gear.



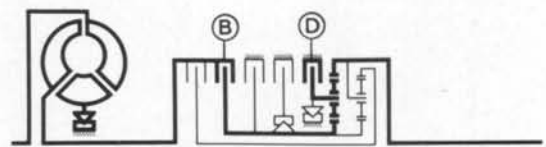
3rd Gear

Clutches A, B and C are engaged. One-way clutches 2 and 3 are cancelled. The entire set of planetary gears turns as a unit at a ratio of 1 : 1.

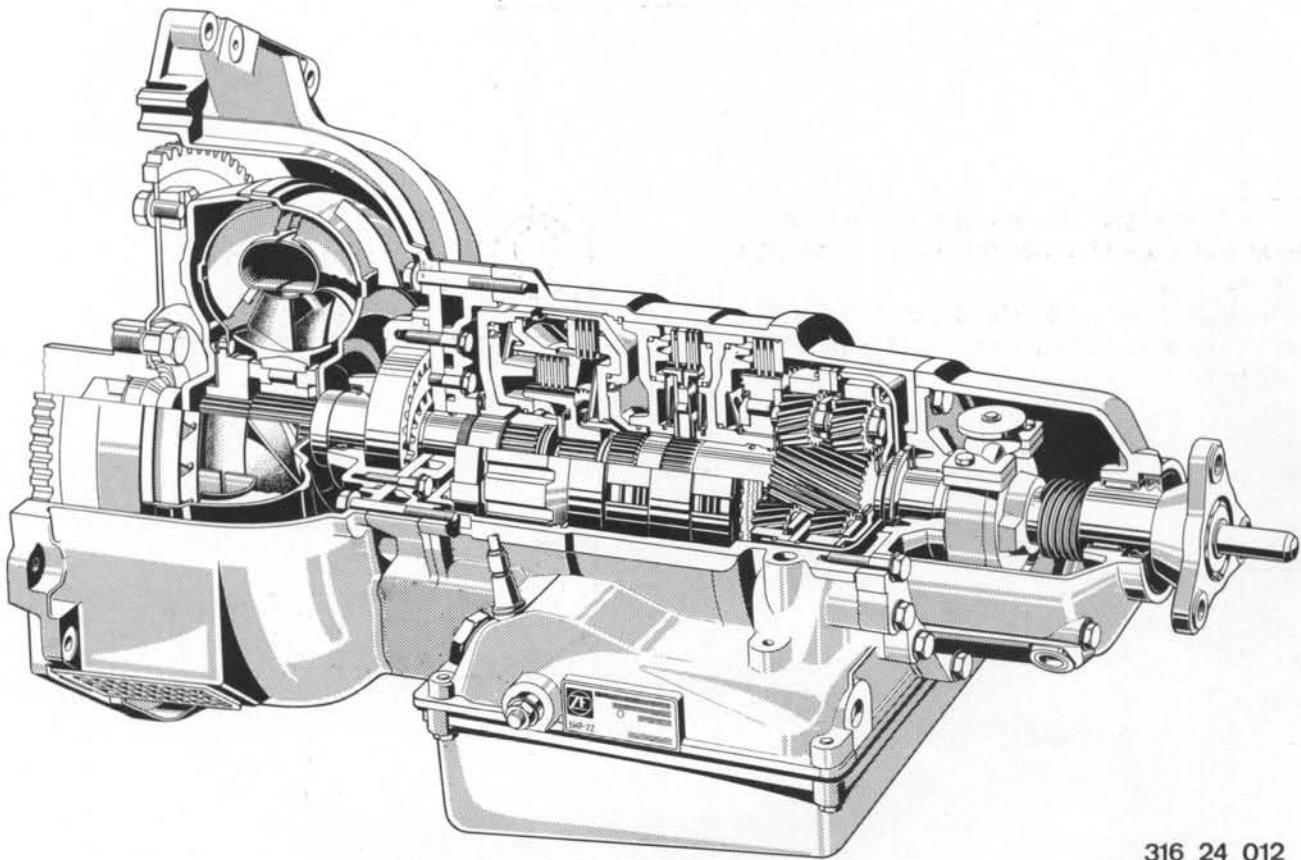


Reverse Gear

Clutches B and D are engaged. The output shaft's direction of rotation is reversed by way of the locked planetary gear carrier.



316 24 011



316 24 012



316 24 013

The fully automatic 3-HP-22 transmission is equipped with a torque converter and Simpson planetary gear set.

Selector Lever Positions:

- P Parking
- R Reverse
- O Neutral
- A 1st, 2nd and 3rd gear
- 2 1st and 2nd gear; 3rd gear locked
- 1 1st gear; 2nd and 3rd gear locked

With selector lever at "P" a locking pawl will lock transmission's output shaft mechanically.

R - Reverse gear

Engine is started with lever in "O" or "P", where power is not transmitted to rear wheels.

Selector lever is placed at "A" for normal driving conditions to reach a good fuel consumption figure.

Early downshifts are possible with the kickdown.

Selector lever position "2" is chosen for driving in mountainous regions to avoid unwanted shifts from 2nd to 3rd. Besides engine's braking effect is better.

Range "1" is for continuous braking on downhill roads where engine brake is required.

Ranges "1" and "2" can be engaged at any road speed.

If driving too fast, it will merely mean shifting up to next higher gear automatically.

The torque converter functions as a fluid coupling and a torque booster. The impeller (P) turns at engine speed and directs the oil clockwise into turbine (T). When a range is selected the turbine and input shaft are connected with set of planetary gears via the clutches. As the engine speed increases the oil - due to shape of turbine blades - will be slung counterclockwise out of the turbine into the supported stator (L) running opposite the engine direction of rotation and thus it is conducted back to impeller with as little disturbance as possible. The back pressure caused by diverting direction will boost the torque. The maximum torque boost occurs on a stationary car when an impeller driven at full throttle is forced to drive a stopped turbine.

As the road speed picks up the difference in speed between impeller and turbine drops until ratio is 1 : 1. At this point the stator is released by the one-way clutch and turns in oil flow direction from impeller and turbine. As road speeds increase further or when car is coasting the torque converter acts as a fluid coupling. Consequently when coasting the engine's braking force can be exploited.

The primary pump is driven at engine speed by the torque converter. It has the task of supplying oil to the torque converter, the control unit and the clutches.

Explanation of Hydraulic Valve Body

The main pressure valve controls the pressure level in the hydraulic valve body. As soon as the control unit is filled with oil, the supply of oil to the torque converter is released. If the delivery rate increases, any excessive oil is returned to the primary pump via the intake port.

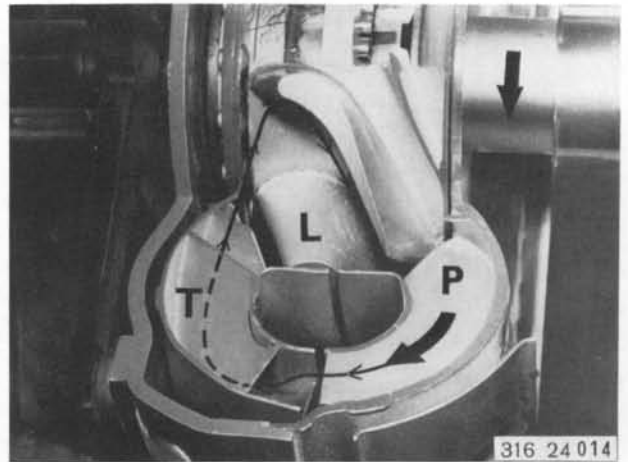
The converter pressure valve has been given the task of preventing excessive pressures in the torque converter.

The selector slide valve is operated mechanically by the selector lever. This valve directs the oil pressure in the control unit to the desired driving ranges.

The governor determines in conjunction with the shift valves the shift points depending on the throttle pressure. The governor pressure is produced in accordance with the output shaft's speed.

If the governor piston or governor bushing seize due to dirt, there will be neither upshifts nor downshifts. Clean governor (see 24 32 503).

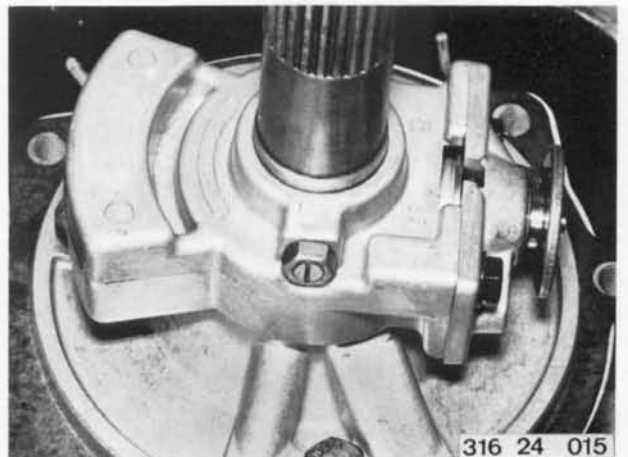
The throttle pressure valve is connected with the accelerator cable and determines with the governor the shift points depending on the throttle valve position.

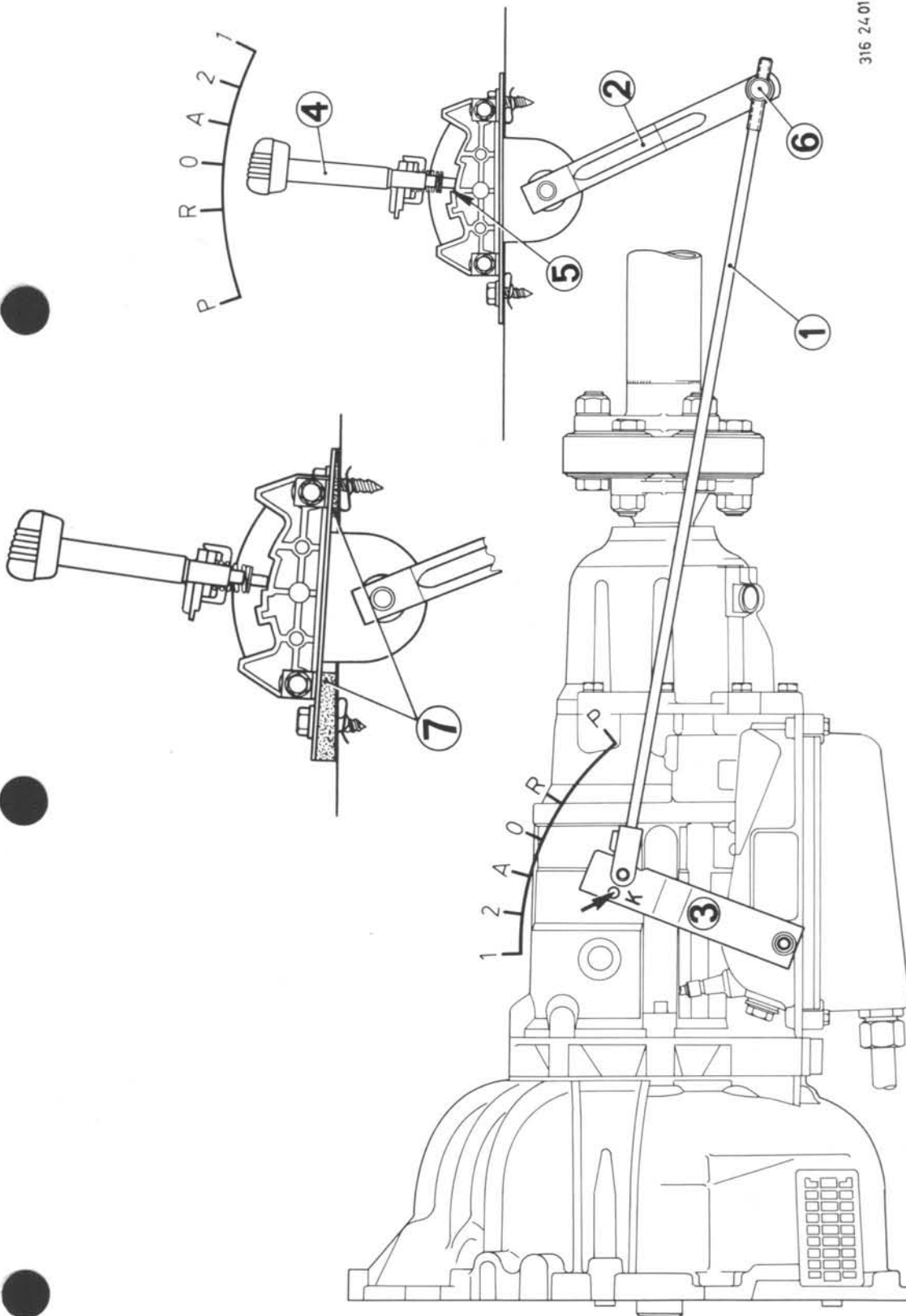


The locking valves have the task of initiating the downshifts into the different gears regardless of the throttle valve position. Further the locking valves will prevent that other gears are engaged automatically when selector lever is positioned at 1 or 2.

The shift valves determine which gear is engaged. If the spring pressure in a shift valve is overcome by governor pressure, the oil pressure goes to the clutch valves and shuts the pertinent clutches. When kick-down is operated, the spring pressure receives more support from the throttle pressure. Because of this the engine speed must pick up, so that the governor pressure can overcome the spring and throttle pressures.

The clutch valves and dampers are meant to make gear shifts as smooth as possible.





316 24.016

A) Adjusting Selector Lever

Check tightness of bearing bracket before adjusting.

Detach selector rod (1) at selector lever lower section (2).

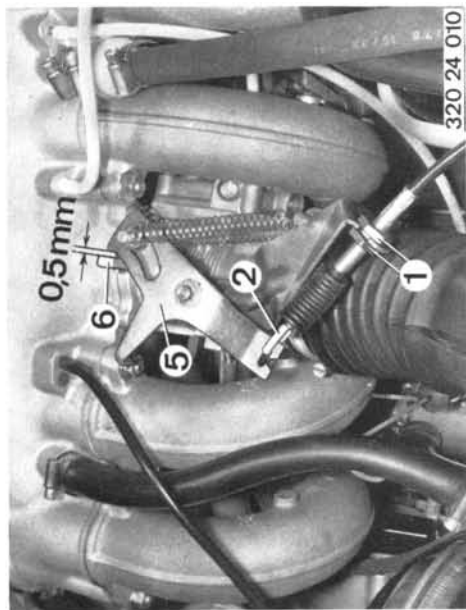
Move selector lever (3) on transmission to position 0.

Press selector lever (4) against stop (5) on shift gate.

Alter length of selector rod (1) until pin (6) aligns with bore in selector lever lower section (2).

Now shorten selector rod length by one turn at pin (6). Attach and secure selector rod.

Caution! If car is equipped with an air conditioner, plates (7) must be installed between bearing bracket and floor plate; further selector rod (1) must be attached in bore K of selector lever (3).



24-00/2

B) Adjusting Accelerator Cable

This requires that basic throttle valve setting be correct (see 13 50 009).

Adjust accelerator cable at nuts (1) until accelerator cable eye (2) has a play of 0.2 ... 0.3 mm (0.008 ... 0.012").

Depress accelerator pedal (3) to full throttle stop screw (4), whereas now there must be 0.5 mm (0.020") play between operating lever (5) and stop (6).

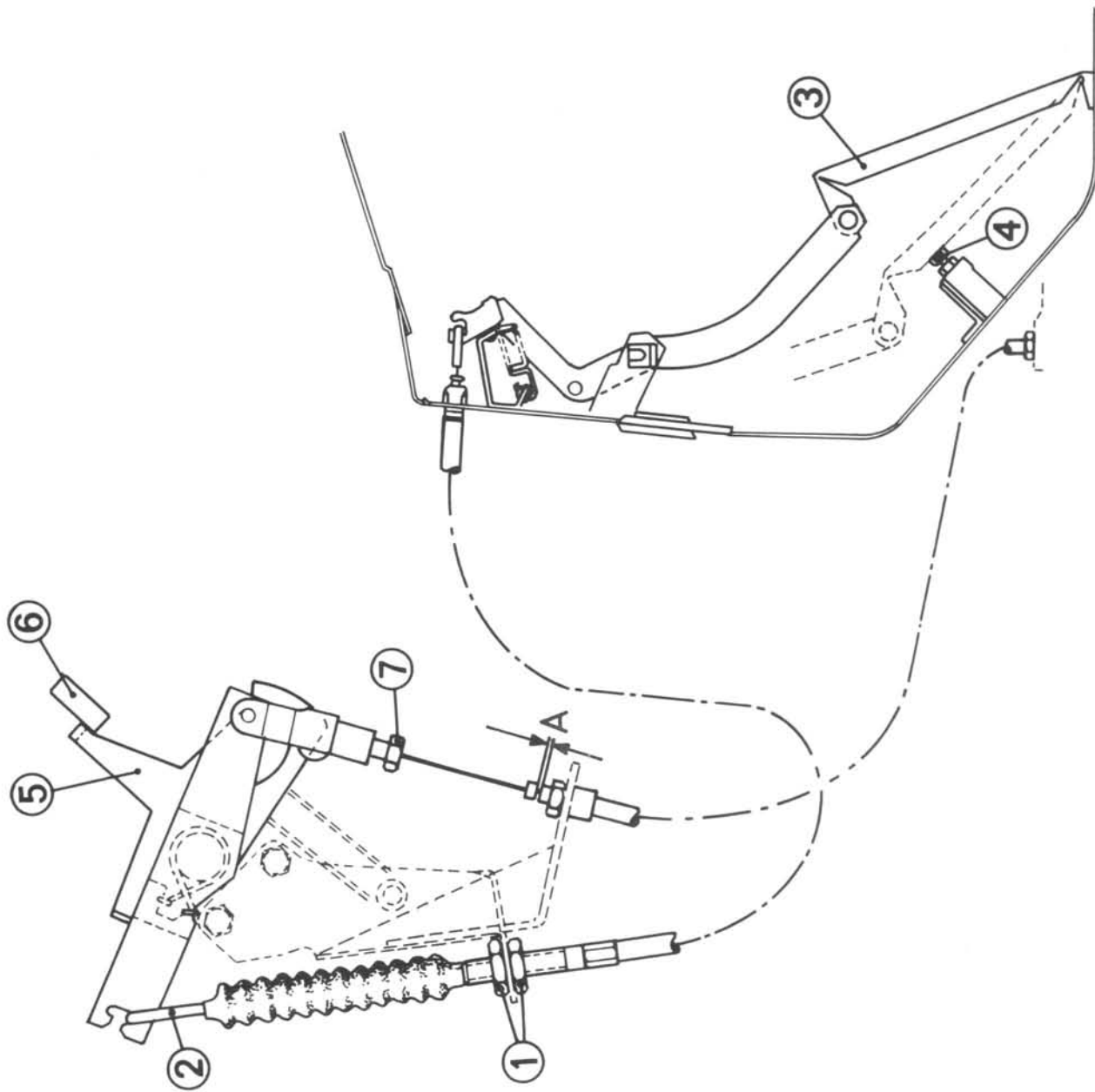
Make corrections by loosening or tightening full throttle stop screw (4).

C) Adjusting Transmission Cable

This requires a correctly adjusted accelerator cable.

In neutral position adjust play (A) to 0.25 ... 0.75 mm (0.010 ... 0.030") with screw (7).

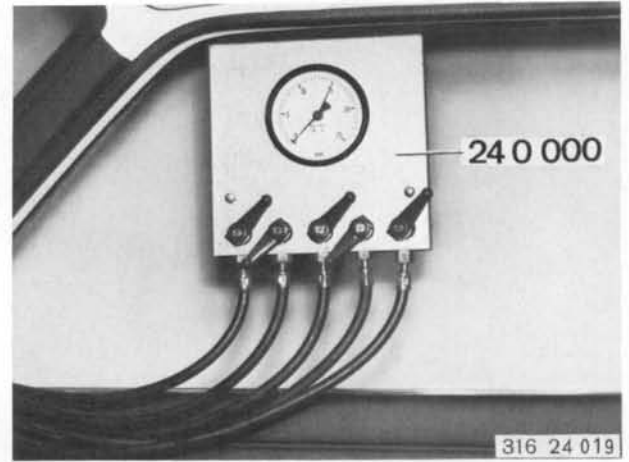
Depress accelerator pedal (3) to kickdown stop; play (A) must now be 43.5 ... 51.5 mm (1.712 ... 2.027"). Make corrections with screw (4).



320 24 011

24 00 009 CHECKING HYDRAULIC PRESSURE VALUES

Mount tester 24 0 000 on door window.



Detach oil cooler lines and insert 2 plugs 24 0 029 in connection bores.
Connect tester 24 0 000 or 24 0 020 and check pressure values.

1 Main Pressure

Adaptor 24 0 022 and elbow pipe 24 0 023

2 Clutch A

Adaptor 24 0 022 and elbow pipe 24 0 023

Test:

Detach accelerator cable. Selector

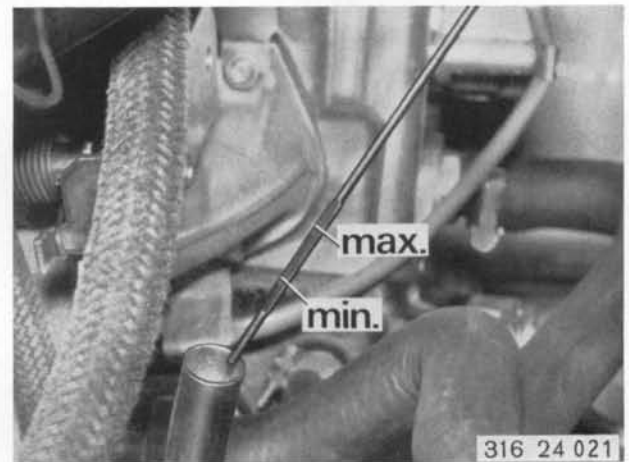
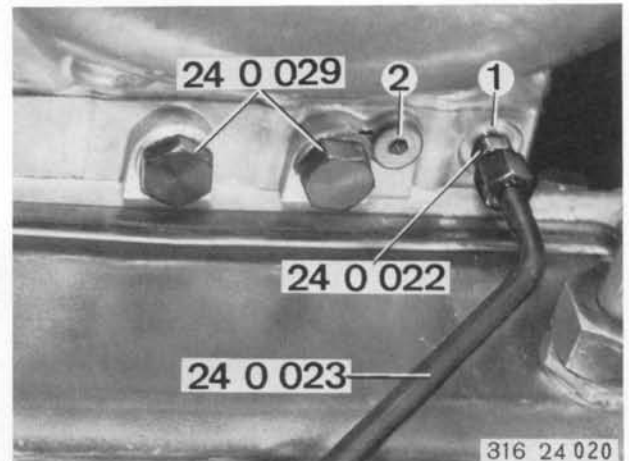
Engine speed: Lever

1500 RPM Position Accelerator Cable Position

Main pressure ¹⁾	0	1. Idle 2. Pulled to kickdown
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Main pressure ¹⁾	A	Brake pedal pressed down
		Parking brake applied
		1. Idle
		2. Pulled to kickdown

Clutch A ¹⁾	A	Brake pedal pressed down
		Parking brake applied
		1. Idle
		2. Pulled to kickdown



Installation Note! Correct oil level of transmission at operating temperature, engine running at idle speed and selector lever at "P".

Park car on level surface.

Cold oil level must be about 1/4 above minimum mark on oil dipstick.

Amount of oil between min. and max. marks is about 0.25 liters (1/2 pint).

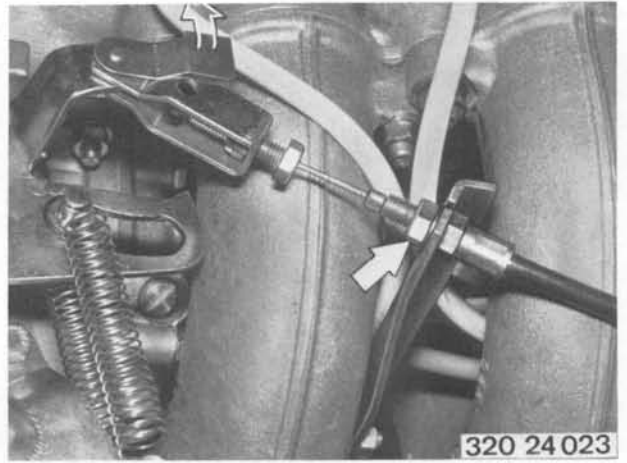
Caution! Oil level too high: serious foaming, oil loss by splashing, temperature rises at high speeds.
Oil level too low: valves rattle, foaming, engine spins when driving in bends.

1) See Specifications

24 00 020 REMOVING AND INSTALLING TRANSMISSION

Detach accelerator cable and take it out of counterholder.

Installation Note! Adjust accelerator cable (see 24 00 004).

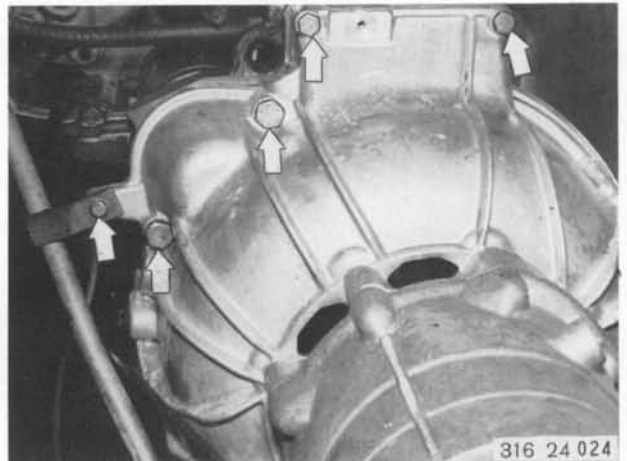


Unscrew all automatic transmission mounting bolts accessible from above.
Detach oil filler neck.
Drain oil.

Caution! Never reuse drained oil.

Installation Note! If oil smells burnt and is black, disassemble transmission. If oil has a gray shimmer, this concerns aluminum or steel abrasion. In contradiction to steel abrasion, aluminum abrasion cannot be held by magnets.

Caution! If transmission is defective, clean oil cooler and lines with compressed air and then flush twice with ATF.



Detach exhaust support.

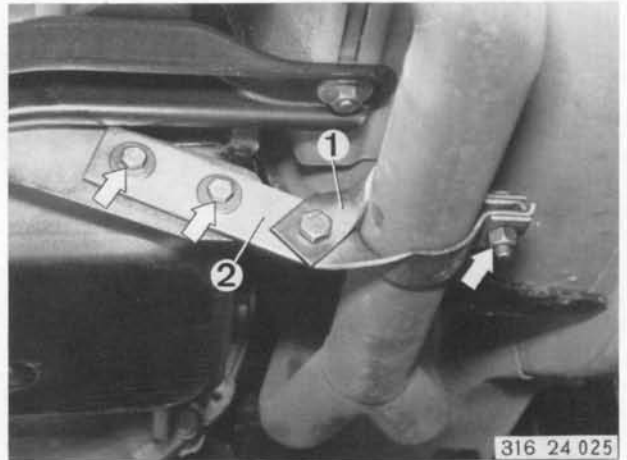
Installation Note!

Attach exhaust pipe to exhaust manifold.

Loosen holder (1).

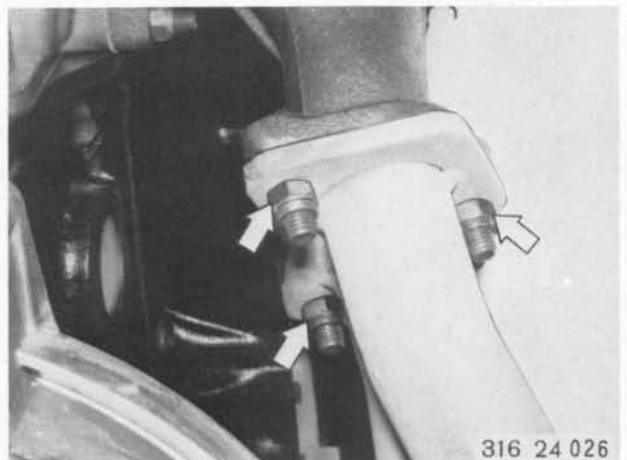
Press support (2) against exhaust pipe to remove tension and secure.

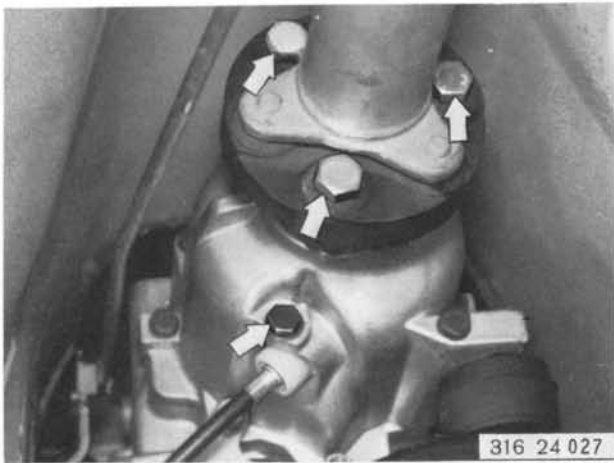
Any other sequence of installation could result in loud drumming noise.



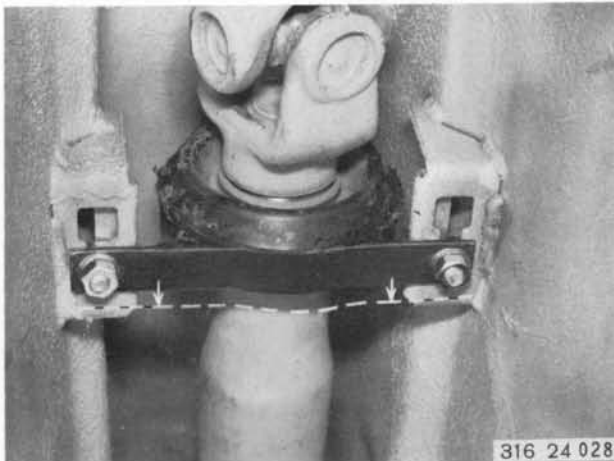
Detach exhaust pipe at exhaust manifold.

Installation Note! Check gasket, replace if necessary.



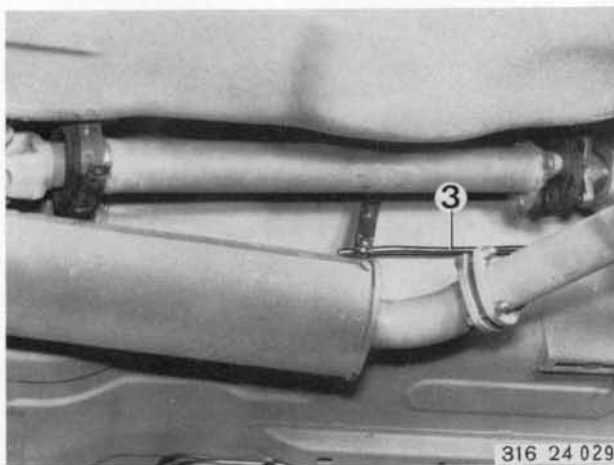


Detach propeller shaft at transmission.
Remove speedometer shaft and pull it out of holder
on oil pan.



Detach heat guard.
Detach center bearing.

Installation Note! Preload center bearing in forward direction by 2 mm (0.079").



Bend down propeller shaft between tunnel and exhaust,
and pull off of centering journal.
Detach selector rod (3) at selector lever.



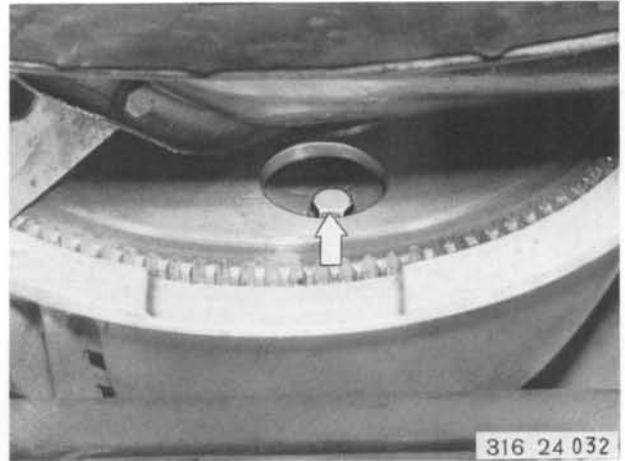
Detach oil filler neck.
Detach oil cooler lines at transmission.

Installation Notes! Check gaskets, replace if
necessary.

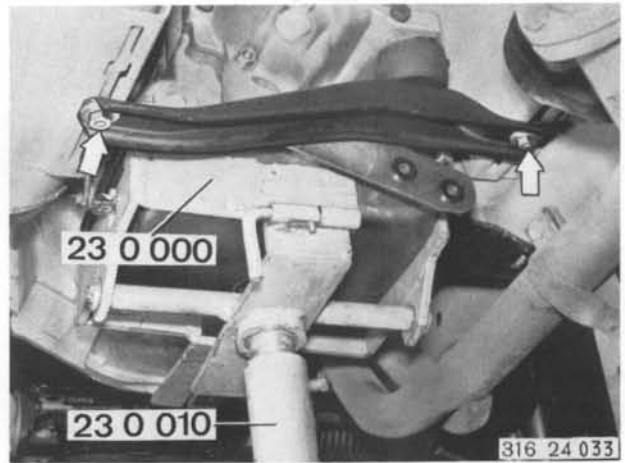
Remove guard.



Detach torque converter from drive plate at four points.
Turn engine on pulley for this work.

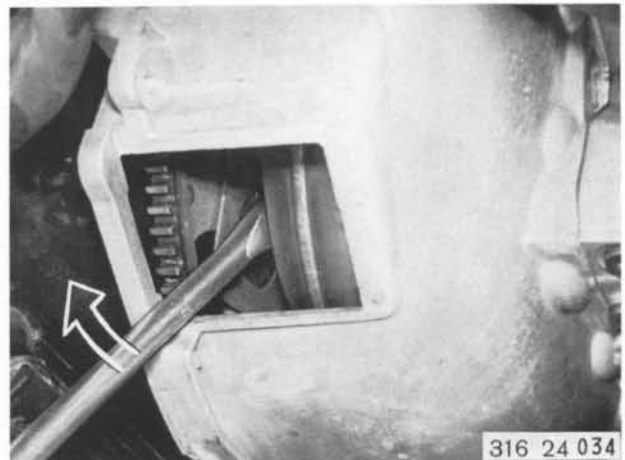


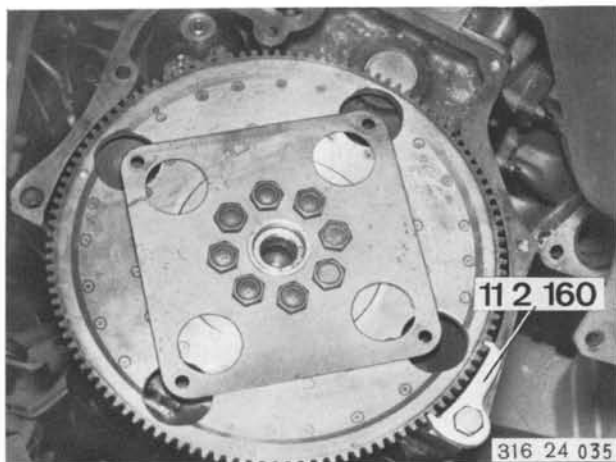
Support transmission with Special Tools 23 0 000 and 23 0 010.
Detach cross member at body.
Unscrew rest of transmission mounting bolts.



Lift off grill.
Pull transmission off of engine and also press off torque converter at same time.

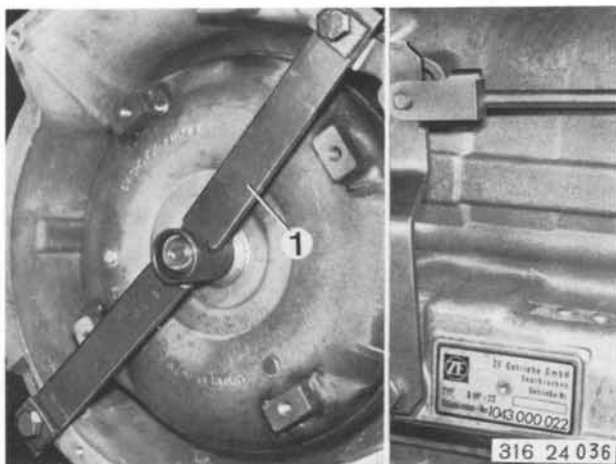
Caution! Be sure that torque converter is positioned correctly before installing (see 24 40 000).





Installation Note! Check drive plate for breaks and cracks, replace if necessary.
Block flywheel with holder 11 2 160.
Loosen stretch bolts.

Caution! Replace stretch bolts and install with Loctite Code No. 270.
Clean threaded bores thoroughly.



24 00 040 INSTALLING RECONDITIONED TRANSMISSION

Remove transmission - 24 00 020.

Caution! Always clean oil cooler and lines with compressed air and flush twice with ATF before installing a reconditioned transmission.

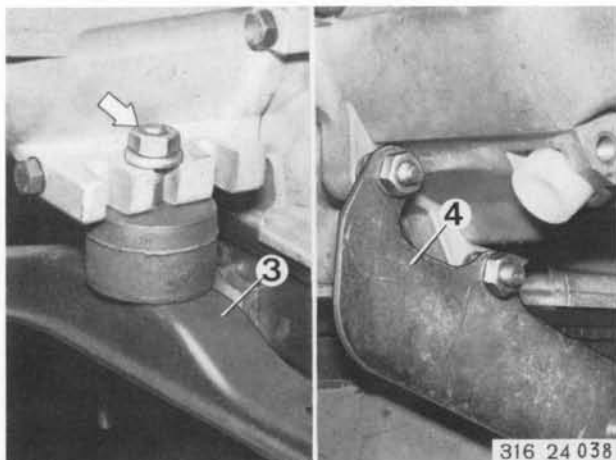
Transmission identification¹⁾ on data plate.
Take off transport holder (1).



Transfer linkage (2) to new transmission.

Installation Note! Attach clamp springs from top to bottom.

Caution! If car has air conditioner, linkage (2) is attached in bore K of selector lever.



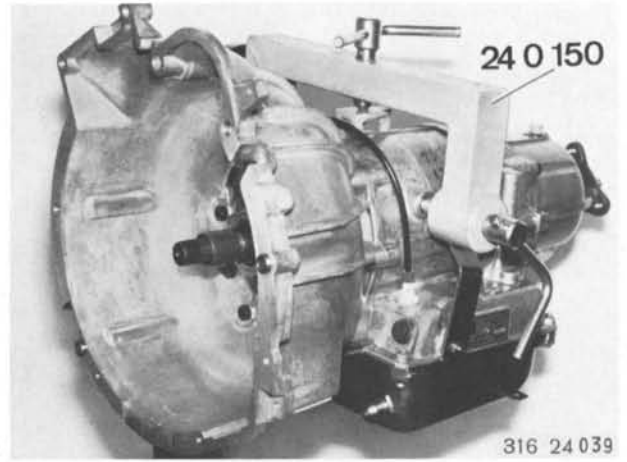
Transfer cross member (3) and exhaust holder (4) to new transmission.

1) See Specifications

24 00 080 DISASSEMBLING AND ASSEMBLING TRANSMISSION

Remove transmission - 24 00 020.
Detach torque converter - 24 40 000.
Bolt transmission on Special Tool 24 0 150 in conjunction with assembly stand.

Caution! Tighten clamping bolts only slightly to prevent any damage on transmission case.



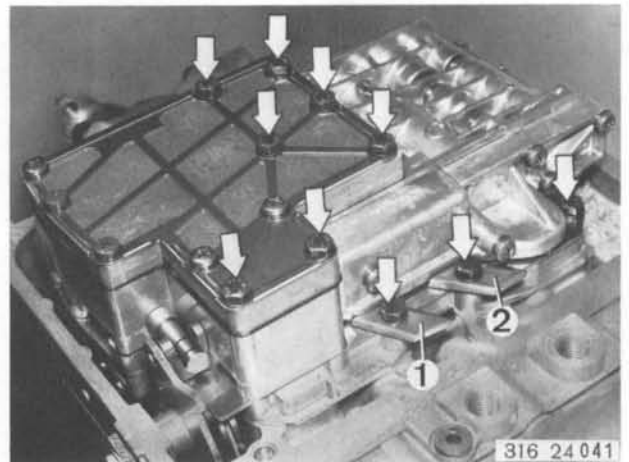
A) Disassembling

Take off oil sump.

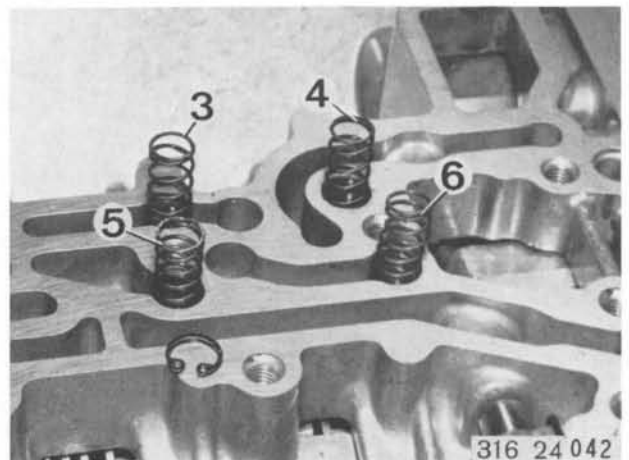


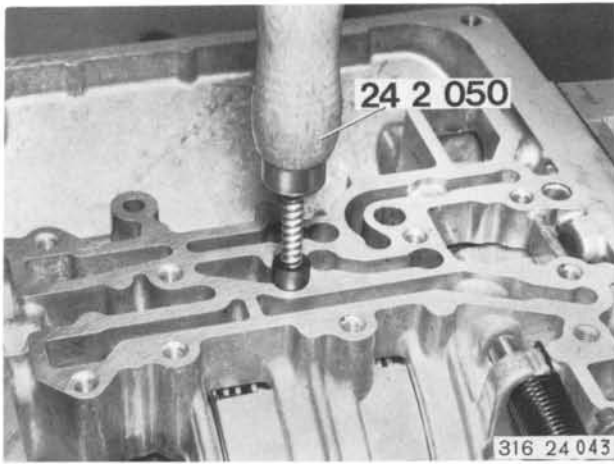
Remove control unit.

Caution! Note supports (1).

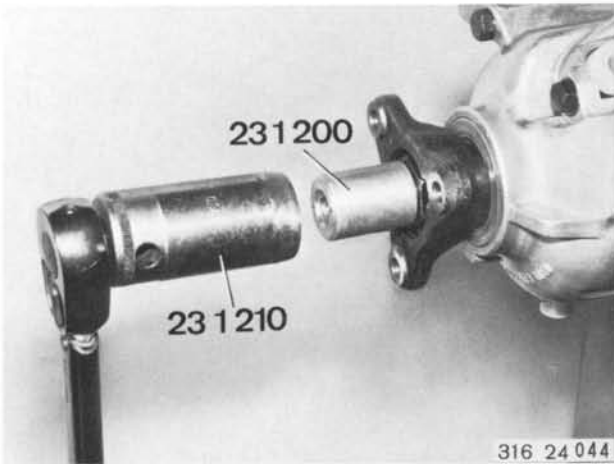


Remove circlips.
Take out springs (3 ... 6).

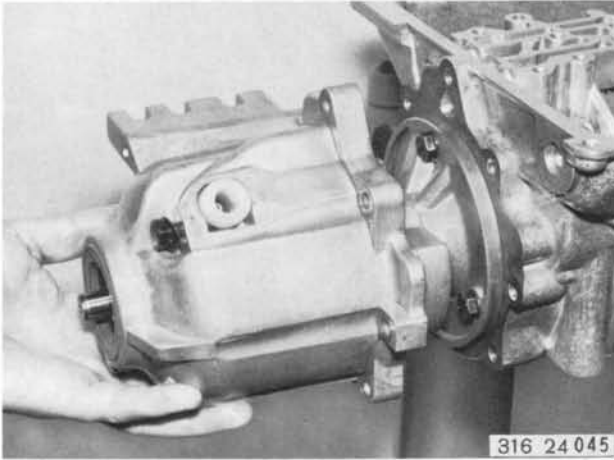




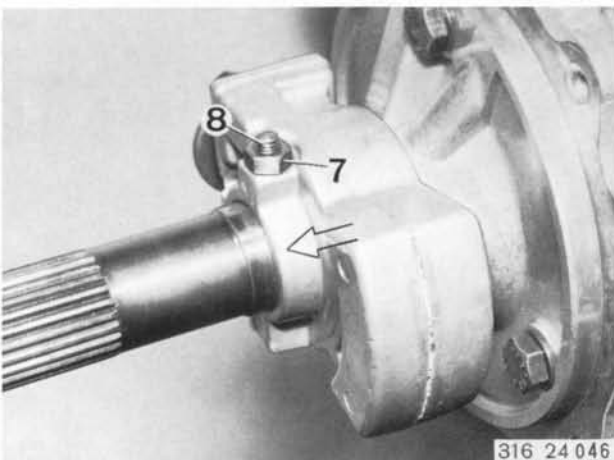
Pull out sealing sleeves with Special Tool 24 2 050.



Engage parking lock.
Install Special Tool 23 1 200.
Loosen collar nut with Special Tool 23 1 210.
Pull off output flange.



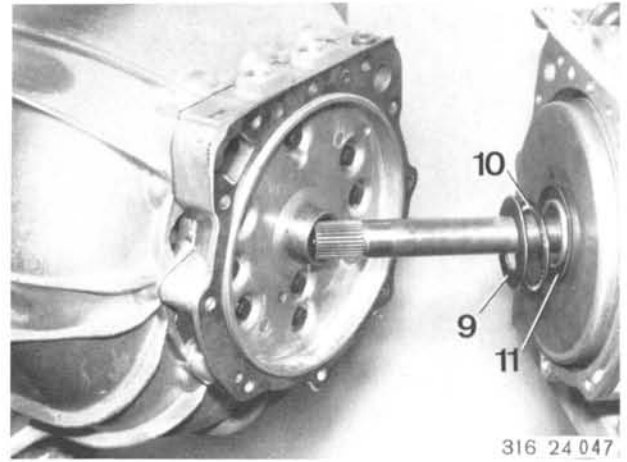
Detach exhaust holder.
Detach transmission extension.



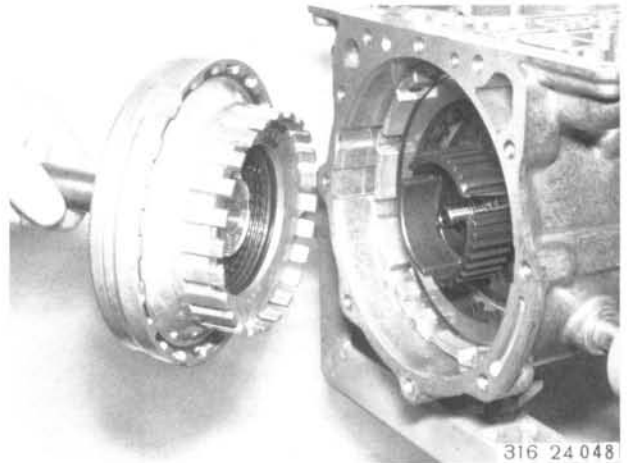
Loosen nut (7) and back off stud (8) by about 3 turns.
Pull off governor.

Detach converter bell housing with intermediate plate.

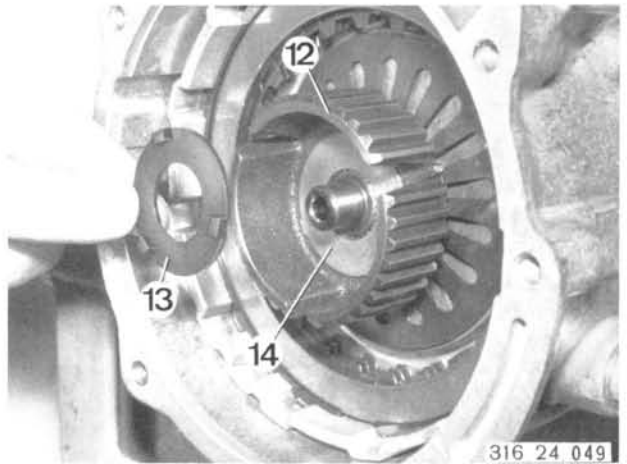
Caution! Thrust washer (9), needle bearing (10) and angled disc (11).



Take out input shaft with clutch A.

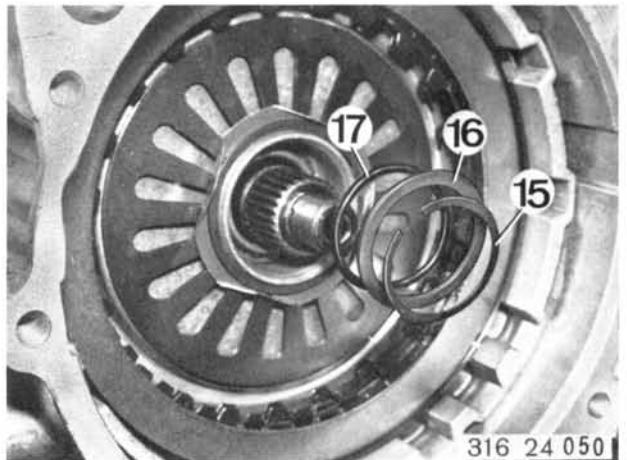


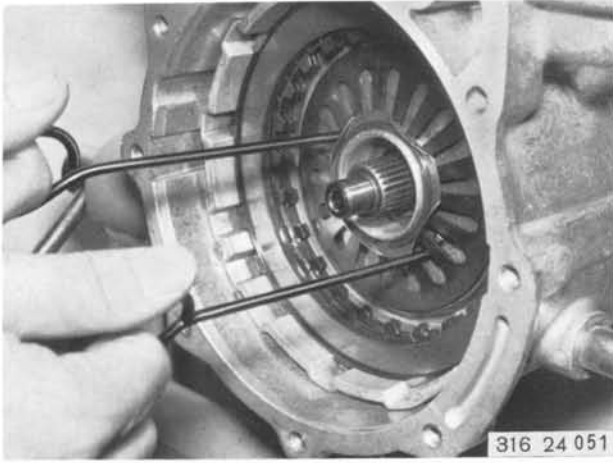
Remove plate carrier (12) for clutch A with thrust washer (13) - plastic - and thrust washer (14) - metal.



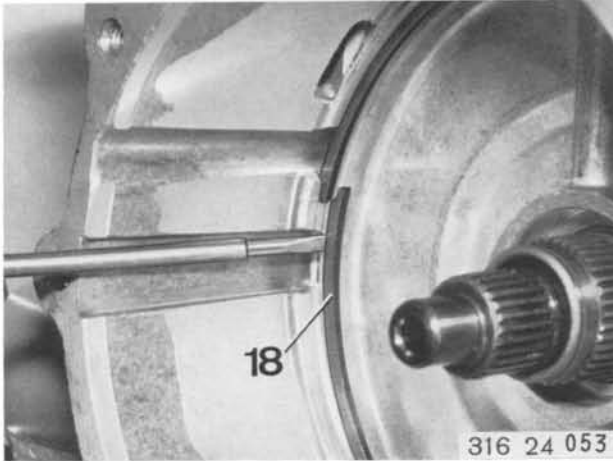
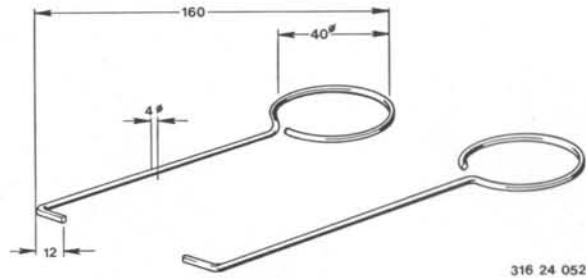
Remove circlip (15).

When clutch B is removed, cover disc (16) and seal (17) will also be pulled out.

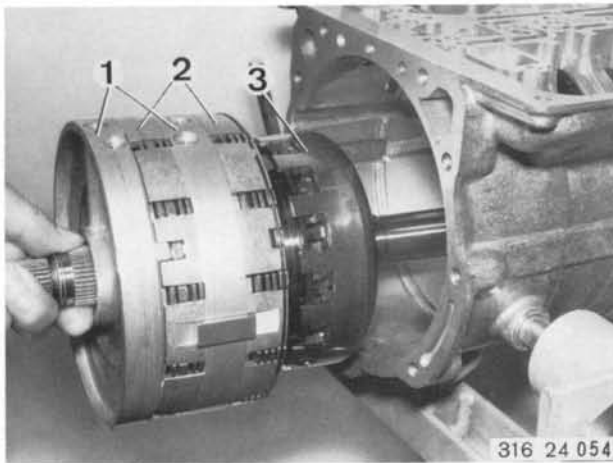




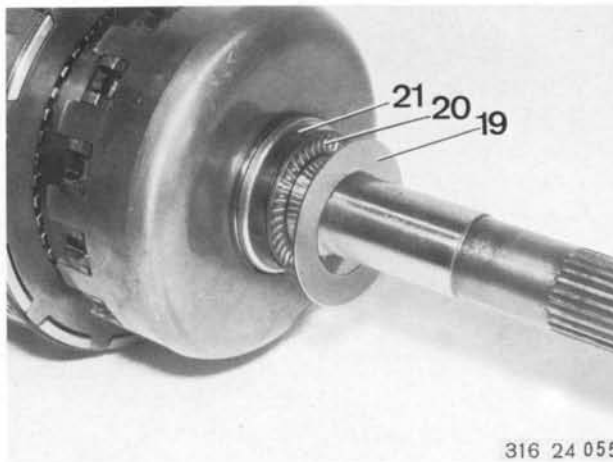
Pull out clutch B with two locally manufactured hooks.
 Sketch for local manufacture shows all dimensions in mm.



Remove circlip (18).

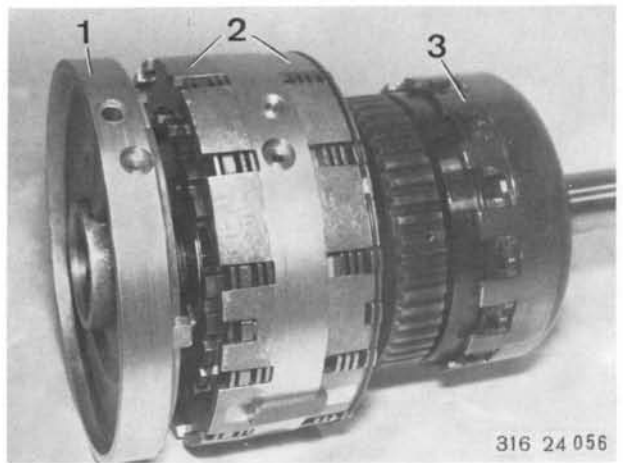


Pull out entire packet of parts.
 Centering plates (1), clutches C', C and D (2),
 planetary gears with output shaft (3).

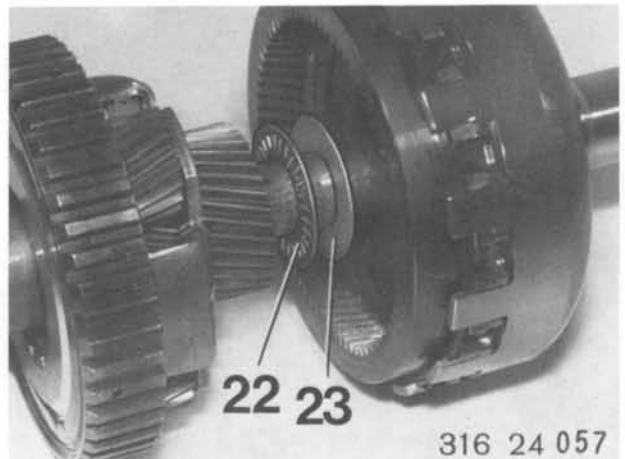


Caution! Thrust washer (19), needle bearing (20)
 and angled disc (21).

Pull centering plate (1), packet of clutches (2) with clutches C', C and D off of output shaft (3).

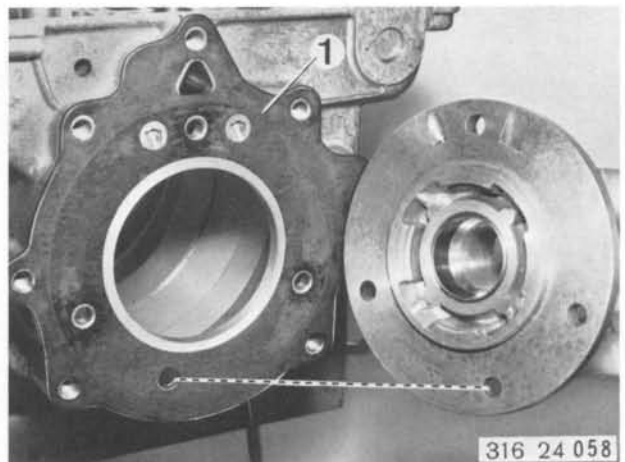


Remove set of planetary gears with sun gear shaft.
Caution! Needle bearing (22) and thrust washer (23).

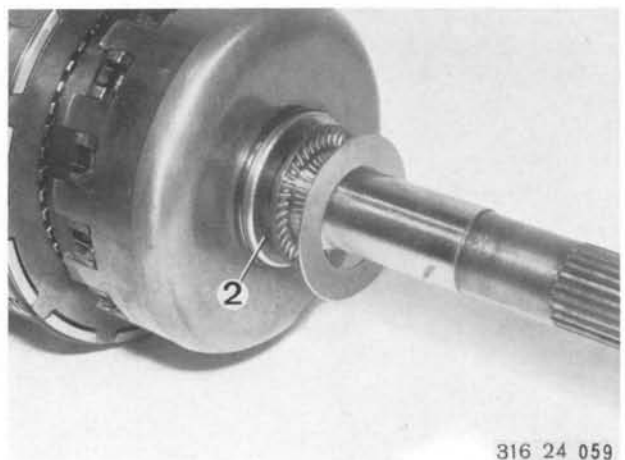


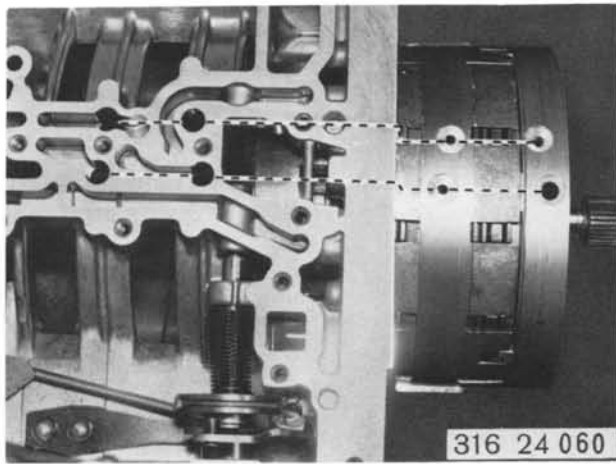
B) Assembling

Detach governor flange.
Replace gasket (1).

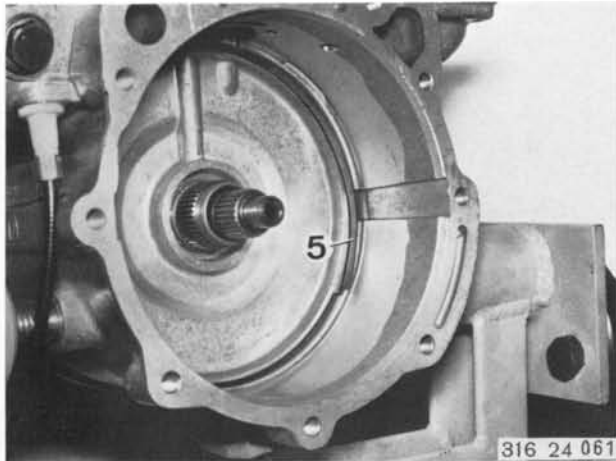


Stick angled disc (2) with angled side against output shaft, using grease.
Place needle bearing and thrust washer on output shaft.

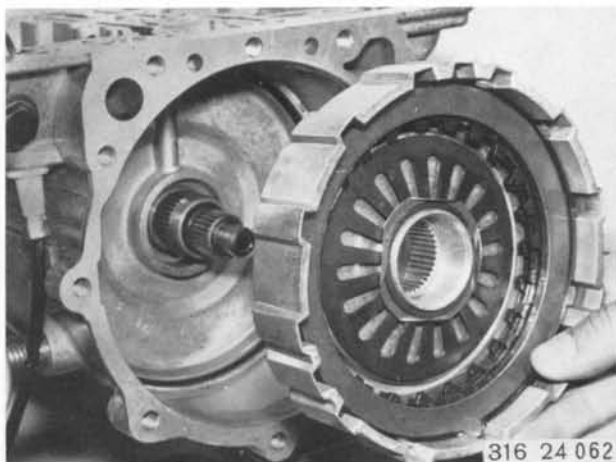




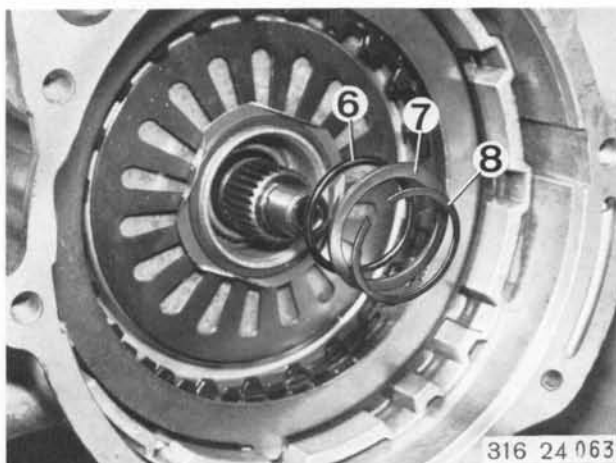
Caution! Keys must be centered in groove of cylinder. Parking lock must not be engaged.
Insert entire output packet into transmission case that 4 oil bores in output packet align with bores in underside of transmission case.



Insert circlip (5).

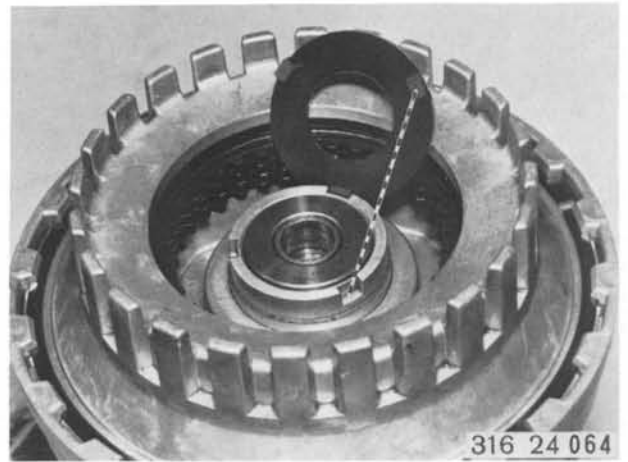


Install clutch B.

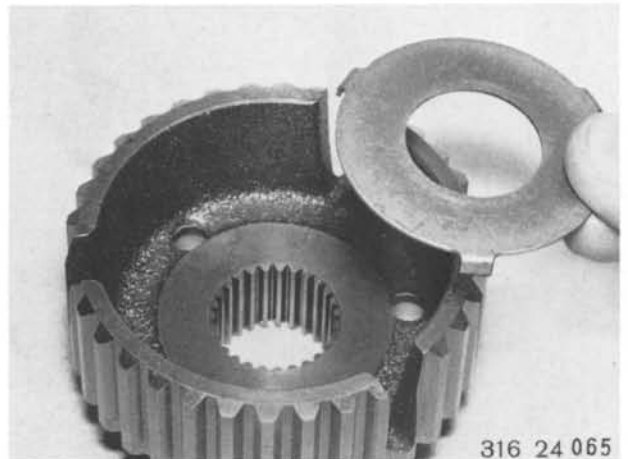


Install seal (6) and press it with support disc (7) up to stop.
Insert circlip (8).

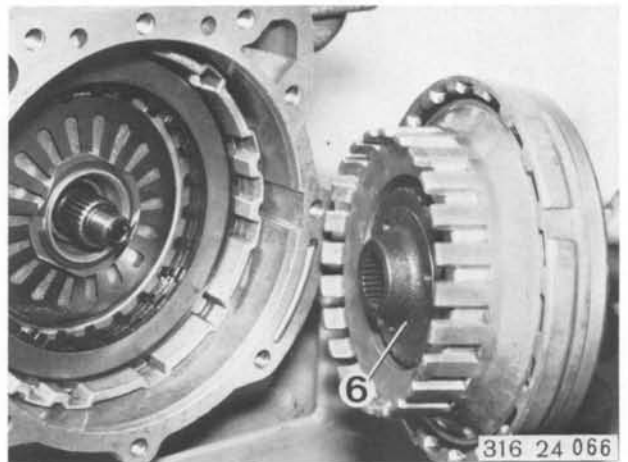
Install plastic thrust washer with grease so that tabs engage in openings of cylinder A.



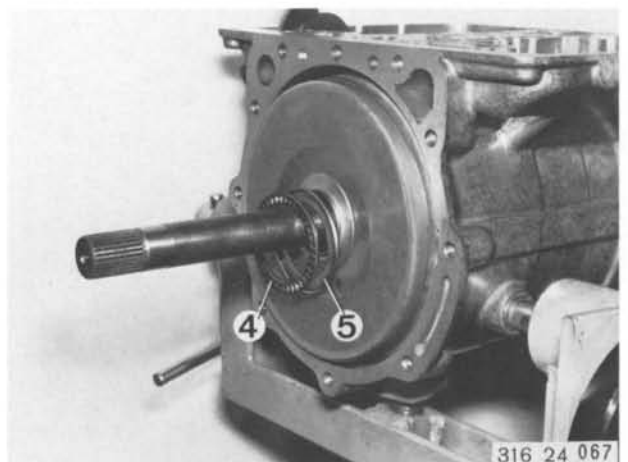
Stick metal thrust washer in plate carrier with grease.

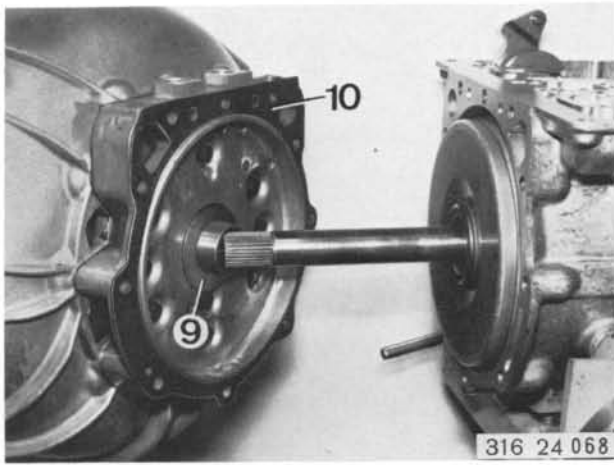


Install plate carrier (6) in clutch A by turning back and forth slightly.

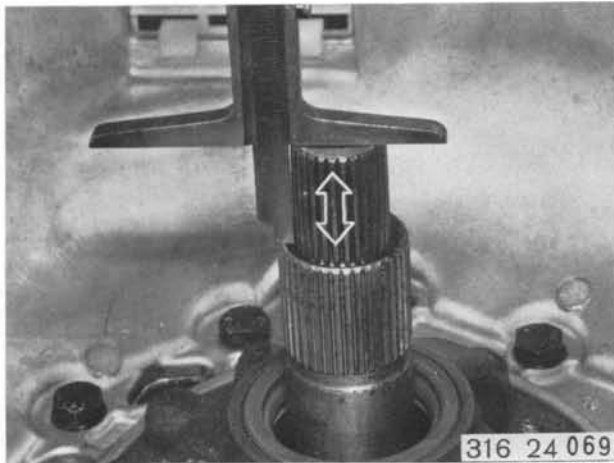


Place angled disc (5) on input shaft with its collar facing needle bearing (4).

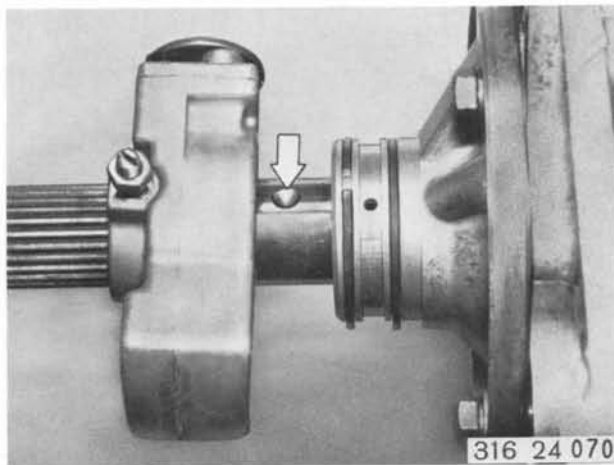




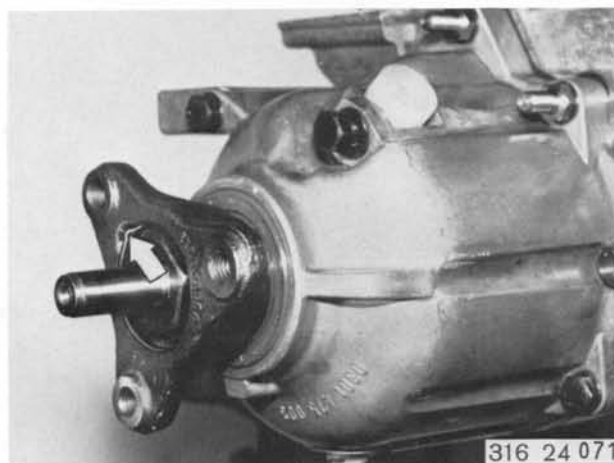
Stick thrust washer (9) and gasket (10) on converter bell housing.
Slide converter bell housing onto input shaft and secure.



Check axial play of input shaft.
Specification: 0.3 ... 1.5 mm (0.012 ... 0.059")



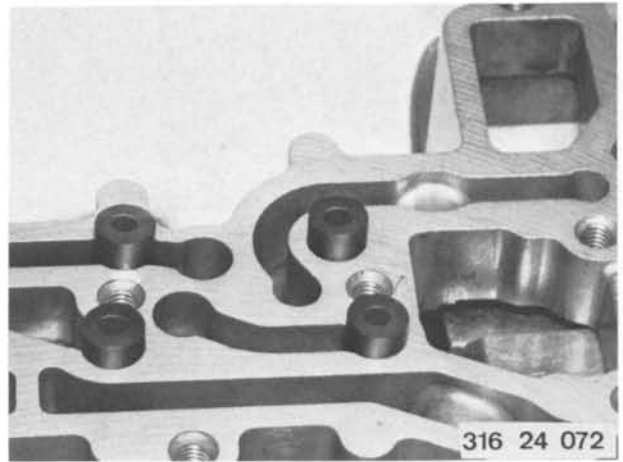
Press piston rings together slightly and then slide governor onto governor flange.
Unscrew stud to facilitate locating the countersink in the output shaft.
Secure governor in countersink of output shaft with stud and lock by counterpunching.



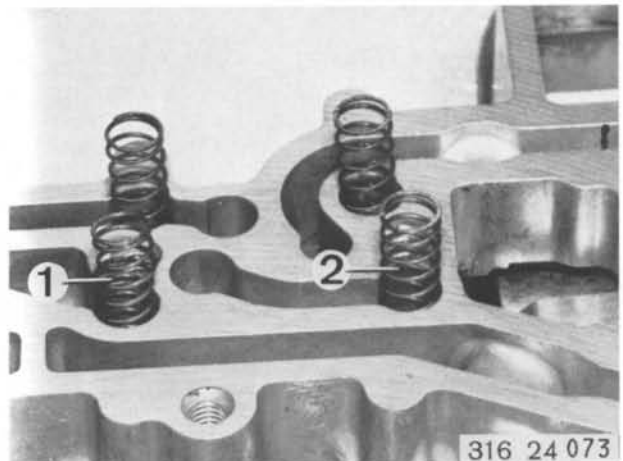
Fill cavity between sealing lips of radial oil seal with grease.
Attach transmission extension and output flange.
Engage parking lock and tighten nut. 1)
Place lockplate on nut and secure in groove in output flange.

1) See Specifications for specified torque.

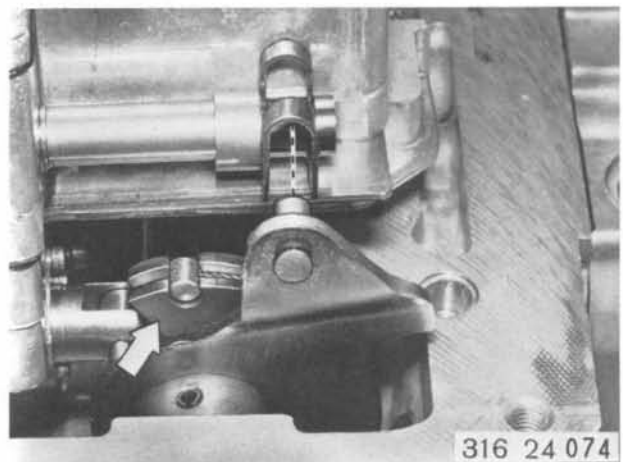
Drive on 4 sealing sleeves to stop with an appropriate mandrel.



Install and secure springs. Both short springs (1 and 2) will be on selector lever end.

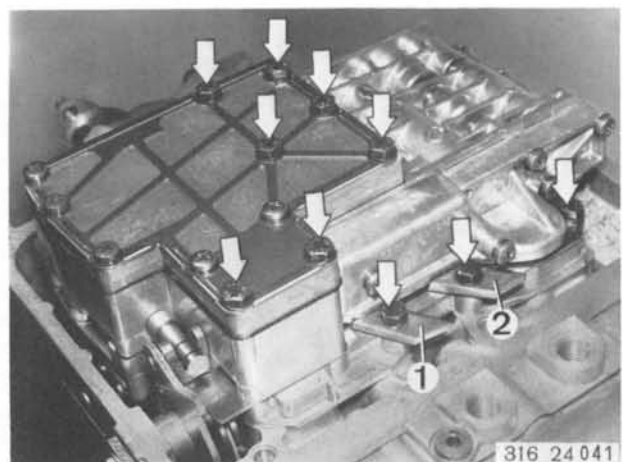


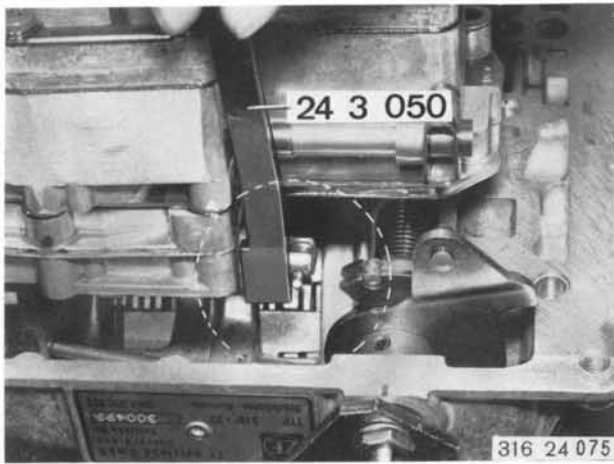
Install control unit that clip on selector sliding valve can be engaged in operating arm of pawl. This requires tightening transmission cable somewhat so that throttle cam will not interfere with throttle pressure valve.



Bolt control unit, but do not tighten screws.

Caution! Note supports (1 and 2).

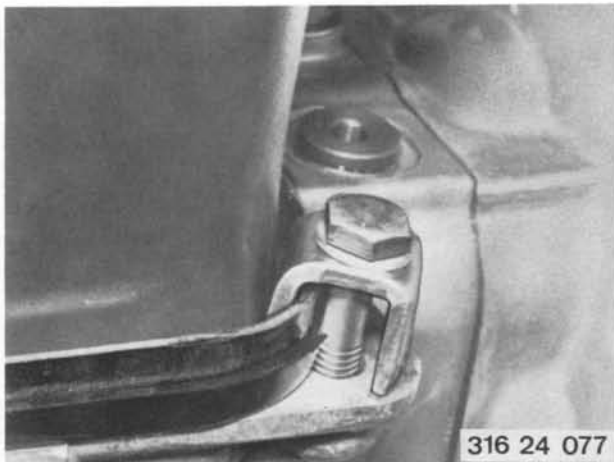




Align control unit with gauge 24 3 050.
If this gauge is not available, distance from control unit housing to pin in throttle pressure piston must be 11.5 mm (0.453").



Install gasket on oil sump.
Install magnetic disc.
Installed position: next to oil filter screen.



Bolt oil sump with retaining brackets.
Short arm of retaining bracket presses against oil sump.

24 11 000 REMOVING AND INSTALLING OIL SUMP

Drain oil.

Caution! Never reuse drained oil.

Installation Note! If oil smells burnt or is black, disassemble transmission. If oil has a gray shimmer, this concerns aluminum or steel abrasion. In contradiction to steel abrasion, aluminum abrasion cannot be held by magnets.

Park car on level surface.

Correct oil level of transmission at operating temperature, with selector lever at "P" and engine running at idle speed.

Cold oil level is about 1/4 above minimum mark on oil dipstick.

Amount of oil between min. and max. marks is about 0.25 liters (1/2 pint).

Oil level too high: serious foaming, oil loss due to splashing, temperature rises at high road speeds.

Oil level too low: valves rattle, foaming, engine spins.

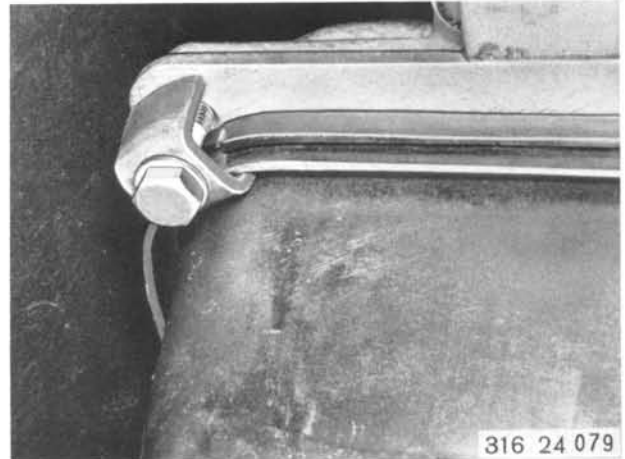
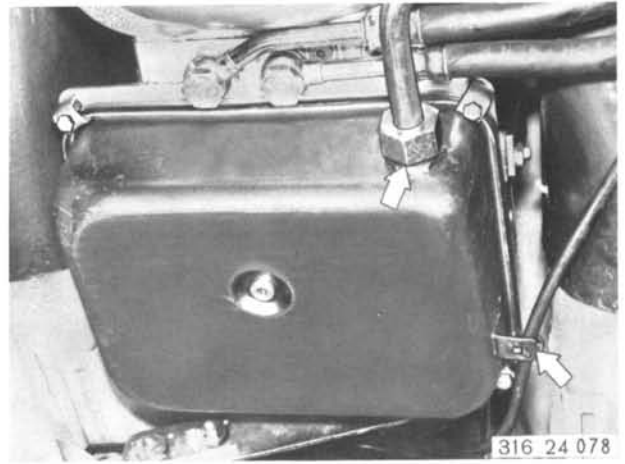
Detach oil filler neck at oil sump.

Take transmission cable out of holders.

Remove oil sump.

Installation Note! Install oil sump with retaining brackets, that short arms press against oil sump.

Caution! Place magnetic disc (1) in oil sump next to oil filter screen. Install gasket (2).



24 11 050 REMOVING AND INSTALLING/SEALING COVER OF TRANSMISSION

Detach exhaust holder.

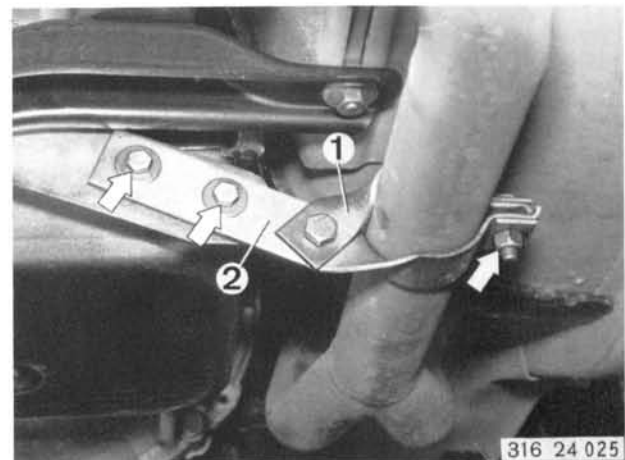
Installation Note!

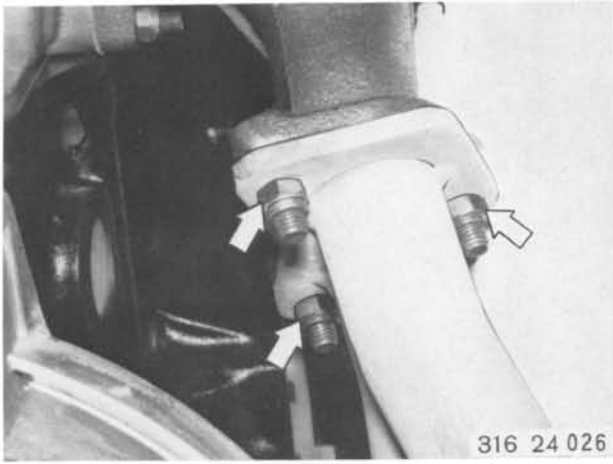
Attach exhaust pipe to exhaust manifold.

Loosen holder (1).

Press holder (2) against exhaust pipe to remove tension and secure.

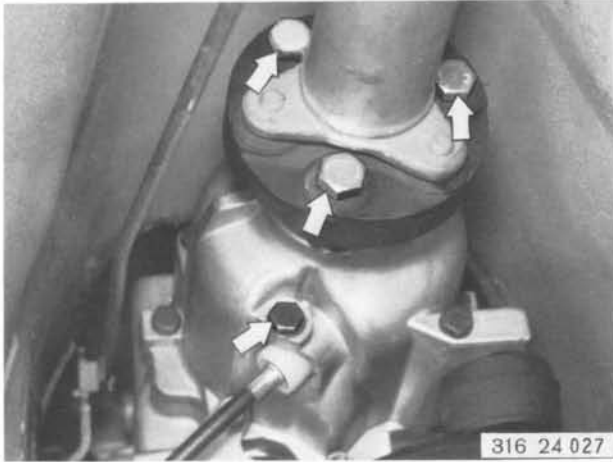
Any other sequence of installation could result in loud drumming noise.





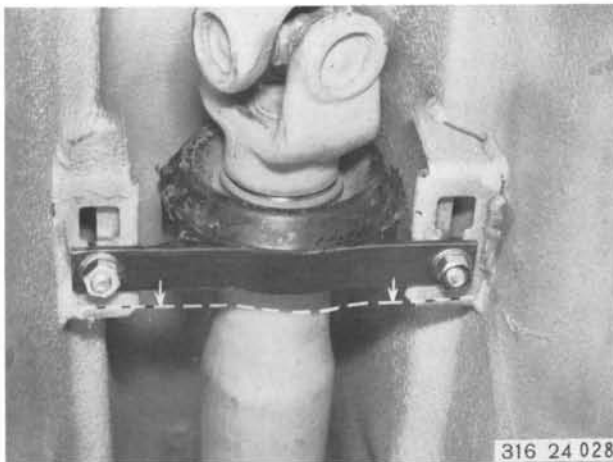
Detach exhaust pipe at exhaust manifold.

Installation Note! Check gasket, replace if necessary.



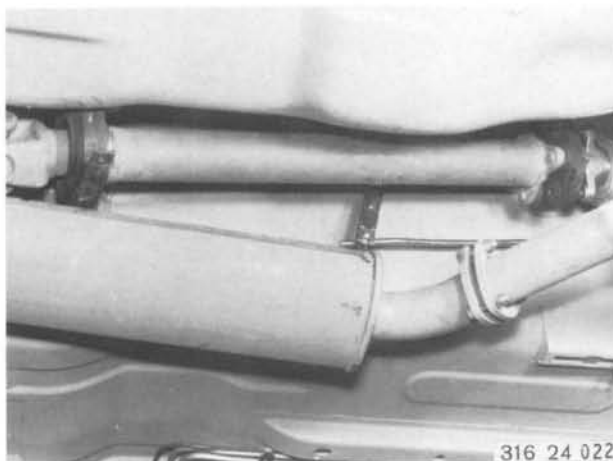
Detach propeller shaft at transmission.

Remove speedometer shaft.



Detach heat guard.
Detach center bearing.

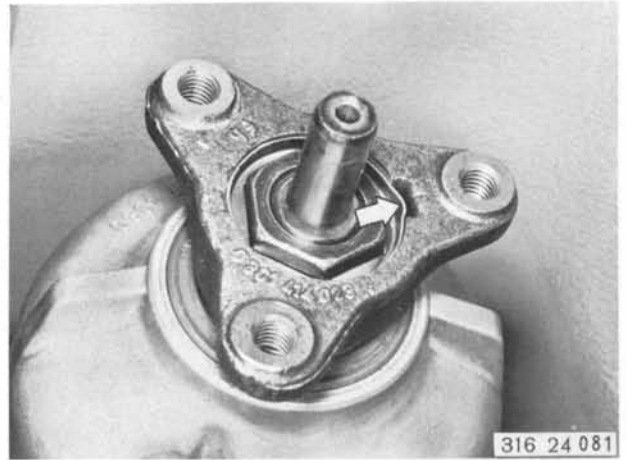
Installation Note! Preload center bearing in forward direction by 2 mm (0.079").



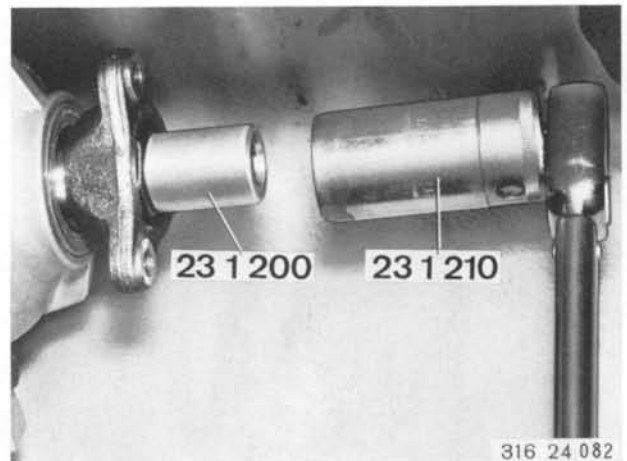
Bend down propeller shaft between tunnel and exhaust, and pull off of centering journal.

Lift out lockplate.

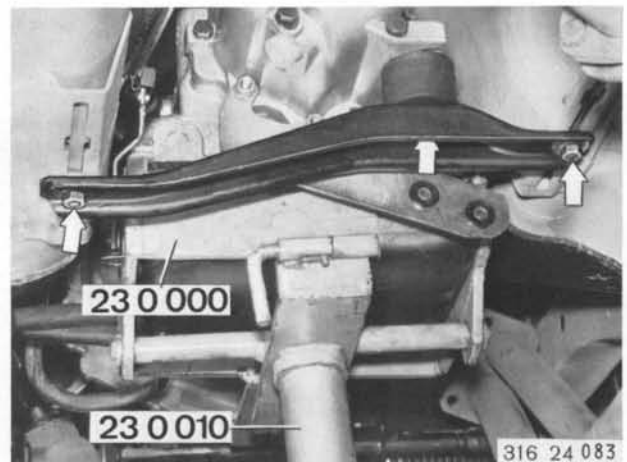
Installation Note! Jam lockplate in output flange groove.



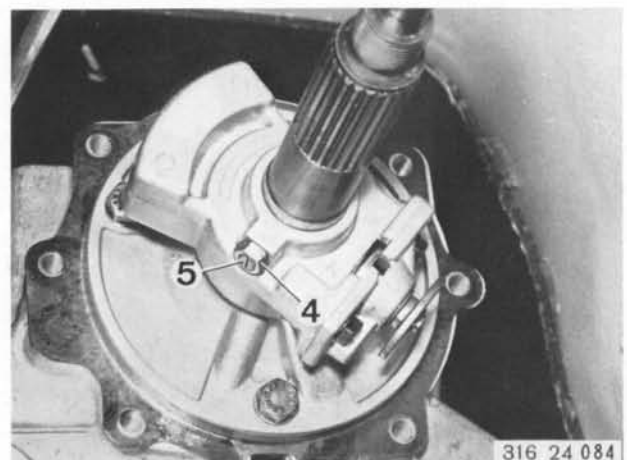
Engage parking lock.
Install Special Tool 23 1 200.
Loosen collar nut 1) with Special Tool 23 1 210.
Pull off output flange.



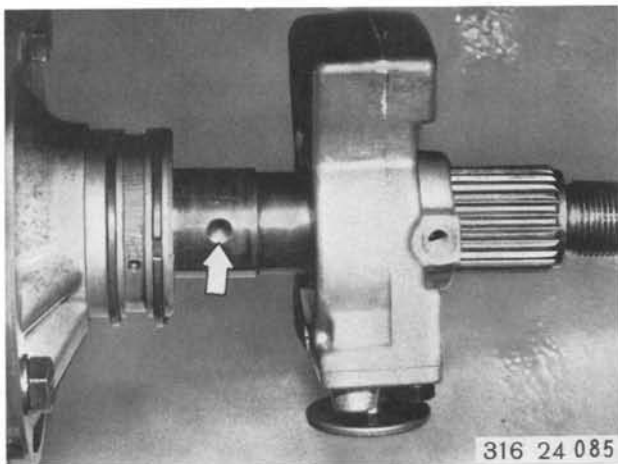
Support transmission with Special Tools 23 0 000 and 23 0 010.
Remove cross member.
Lower transmission.
Remove transmission cover.



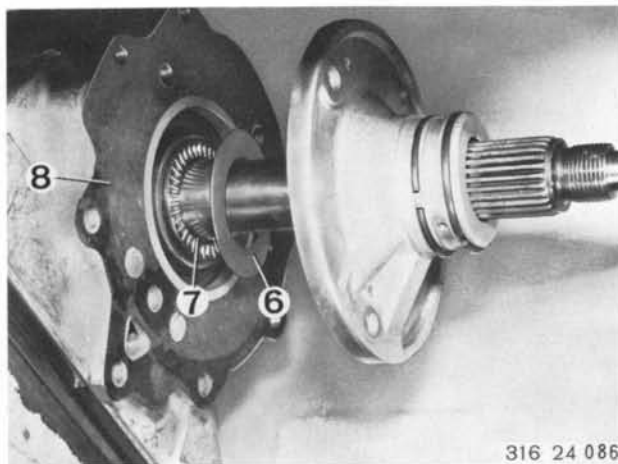
Loosen nuts (4) and unscrew stud (5) by about 3 turns.
Pull off governor.



1) See Specifications for specified torque.



Installation Note! Press piston rings together slightly and slide governor onto governor flange at same time.
Remove stud to facilitate locating countersink in output shaft.
Secure governor in countersink of output shaft with stud and lock by counterpunching.



Detach bearing flange.

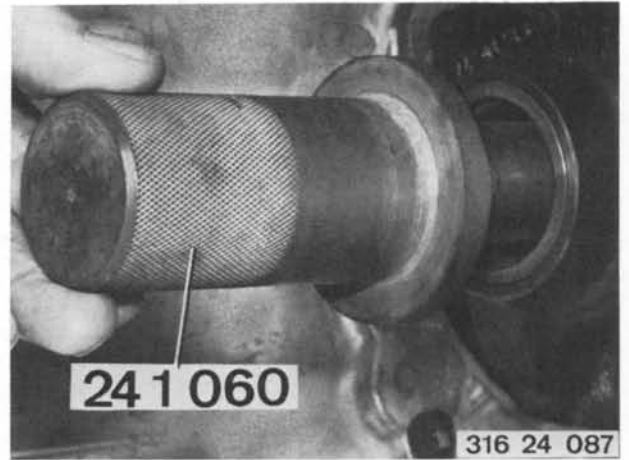
Caution! Thrust washer (6) and needle bearing (7).
Replace gasket (8).

24 12 001 REPLACING TORQUE CONVERTER RADIAL OIL SEAL

Remove and install torque converter - 24 40 000.
Remove radial oil seal.

Installation Note! Fill cavity between sealing lips with grease.

Drive on radial oil seal with Special Tool 24 1 060 until it fits tight.

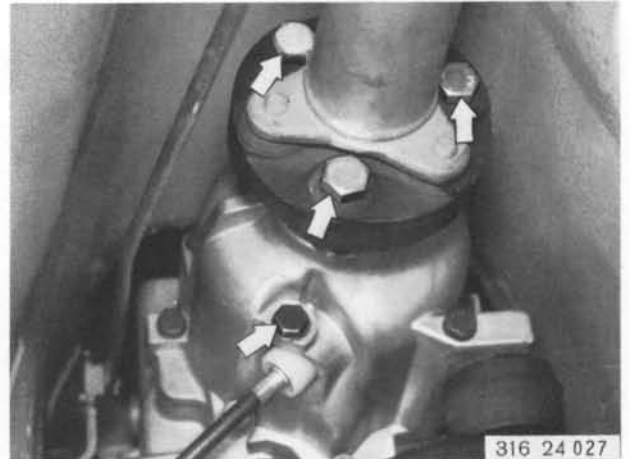


24 12 011 REPLACING OUTPUT FLANGE RADIAL OIL SEAL

Detach exhaust pipe at exhaust manifold and holder at transmission.

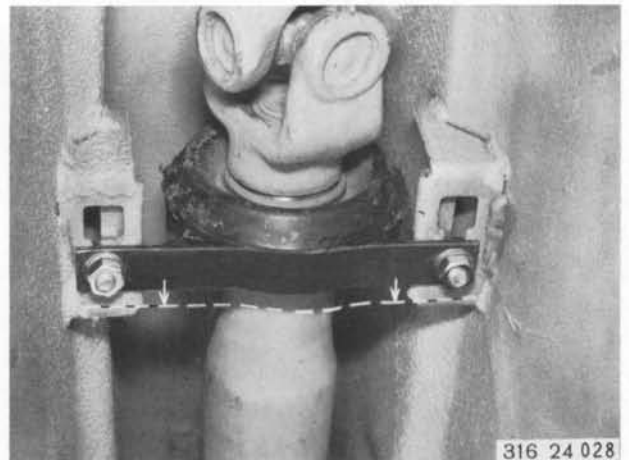
Detach propeller shaft at transmission.

Remove speedometer shaft.

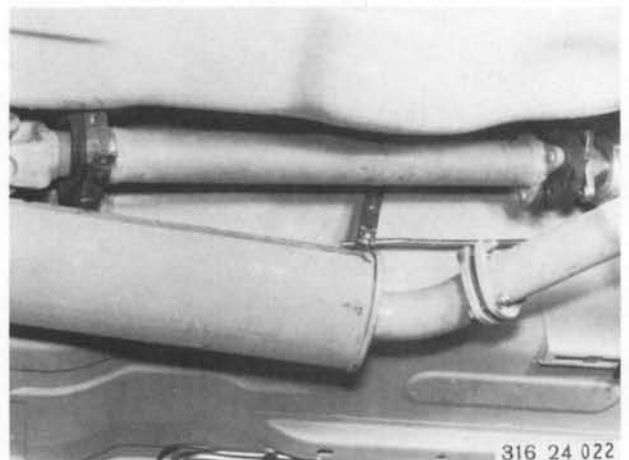


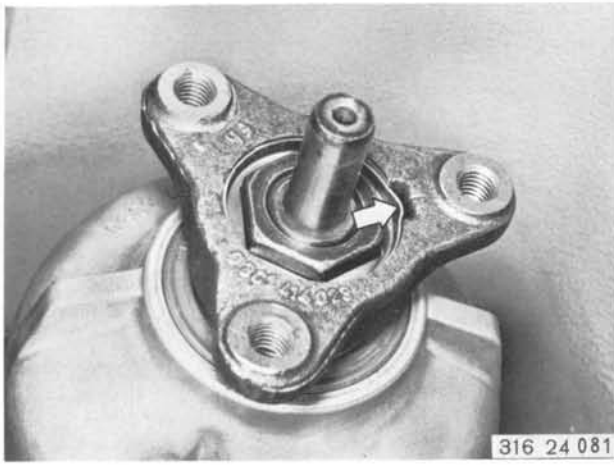
Detach heat guard.
Detach center bearing.

Installation Note! Preload center bearing in forward direction by 2 mm (0.079").



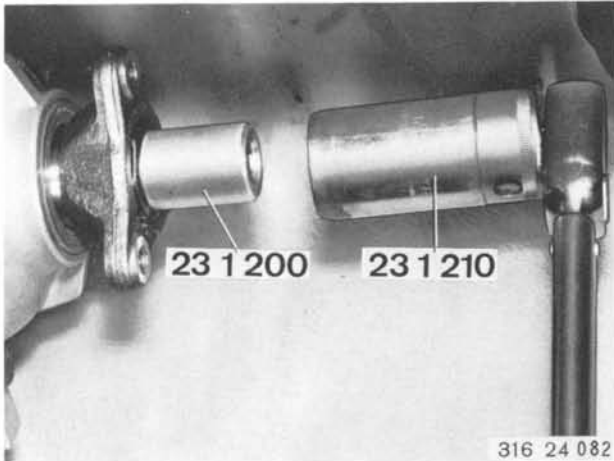
Bend down propeller shaft between tunnel and exhaust, and pull it off of centering journal.





Remove lockplate.

Installation Note! Jam lockplate in input flange groove.

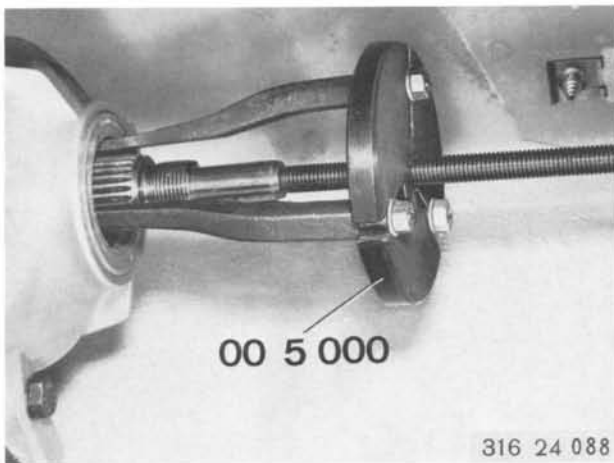


Engage parking lock.

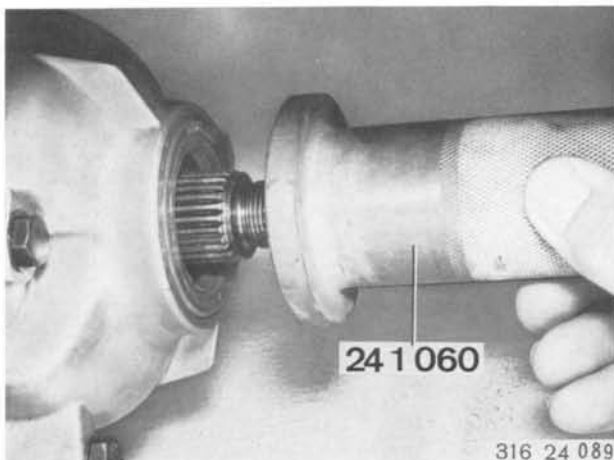
Install Special Tool 23 1 200.

Loosen collar nut 1) with Special Tool 23 1 210.

Pull off output flange.



Extract radial oil seal with Special Tool 00 5 000.



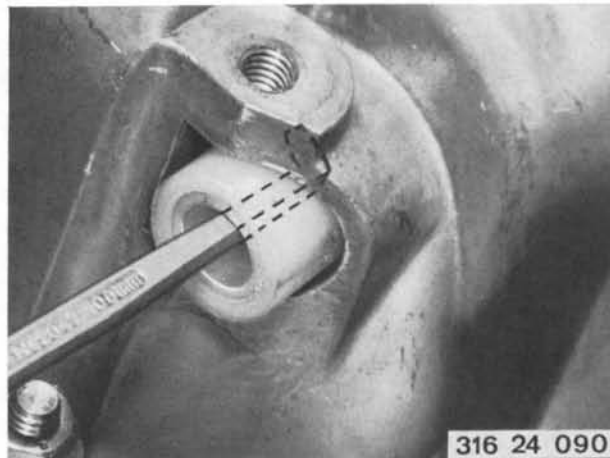
Installation Note! Fill cavity between sealing lips grease.

Drive on radial oil seal with Special Tool 24 1 060 until it has a tight fit.

1) See Specifications for specified torque.

24 12 031 REPLACING SPEEDOMETER BUSHING O-RING

Detach speedometer shaft.
Pull out speedometer bushing with an angled screwdriver.



Replace o-ring (1).
Also replace speedometer bushing (2), if radial oil seal leaks.



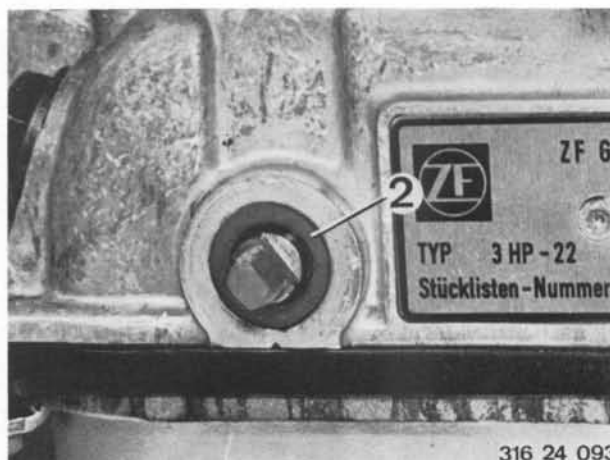
24 12 101 REPLACING MANUAL SHIFT VALVE SHAFT RADIAL OIL SEAL

Detach selector lever (1) at transmission.



Remove radial oil seal (2).

Installation Note! Drive in radial oil seal until flush.



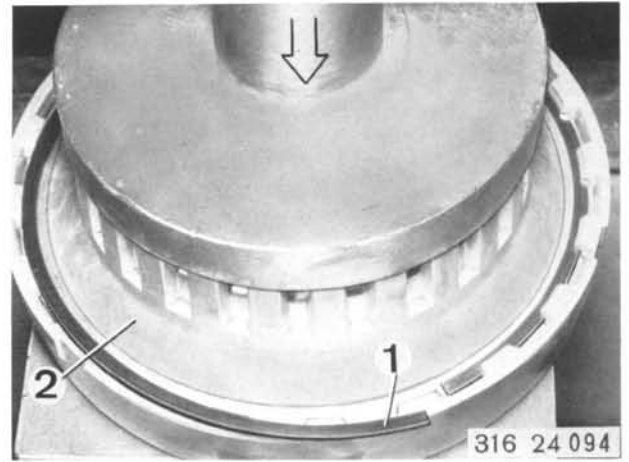
24 23 020 REPLACING PLATE CLUTCHES AND BRAKES

Disassemble transmission - 24 00 080.

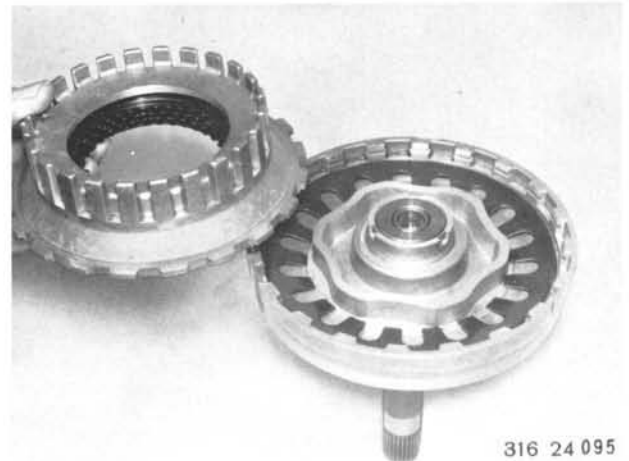
Clutch A

Compress packet of clutch plates and remove circlip (1).

Remove plate carrier (2).



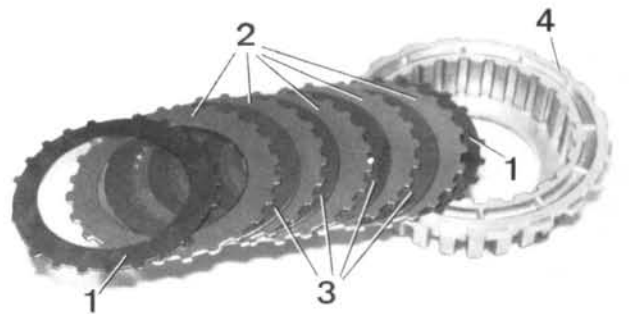
Lift out packet of plates and diaphragm spring.



Sequence of Installation

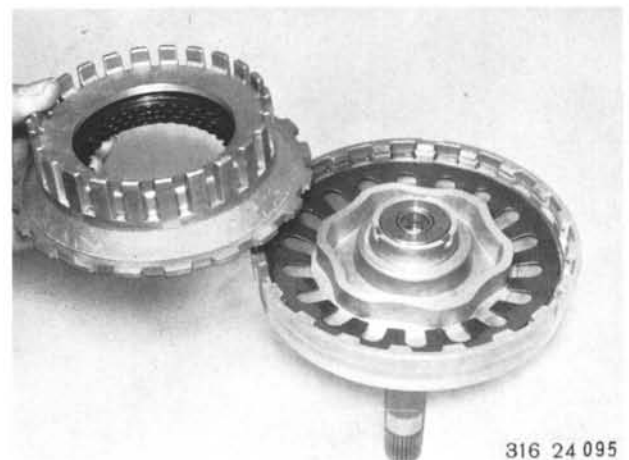
- 1 Corrugated outer plates (two)
- 2 Outer plates (five)
- 3 Lined plates (four)
- 4 Plate carrier

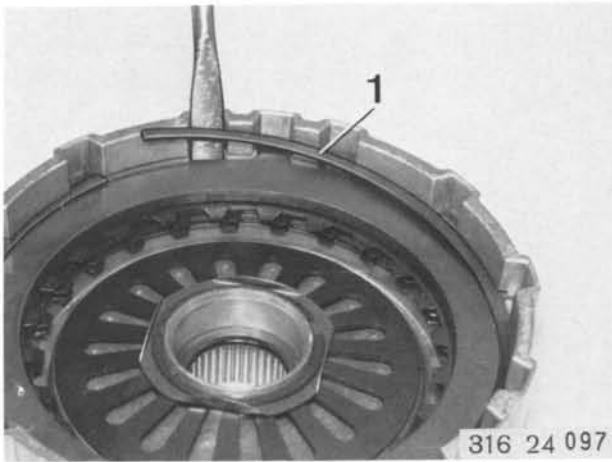
Installation Note! Place new lined plates in ATF having temperature of 70° C (160° F) for about 20 minutes.



Place diaphragm spring in input shaft housing with its convex side facing down.

Install packet of plates with plate carrier.
Compress packet of plates and insert circlip.

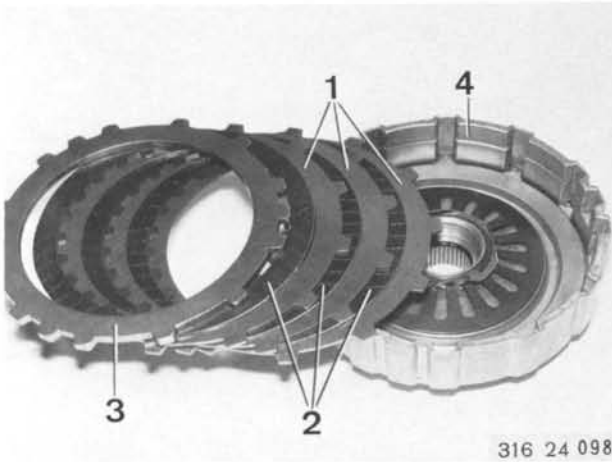




Clutch B

Remove circlip (1).

Remove outer and lined plates.



Sequence of Installation

1 2.0 mm (0.079") outer plates (three)

2 TOP DOG inner plates (three)

3 4.5 mm (0.177") outer plate (one)

4 Housing

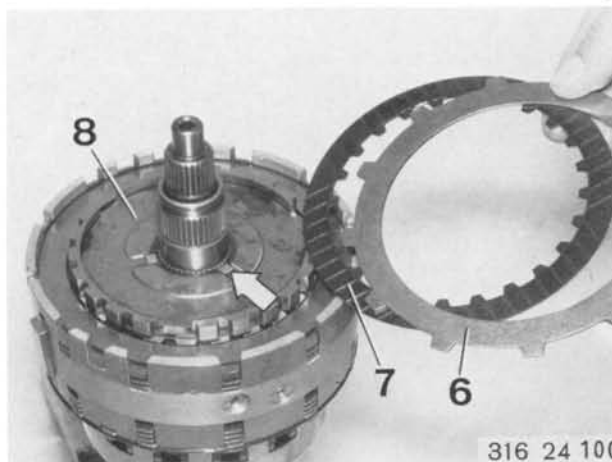
Installation Note! Place new lined plates in ATF having temperature of 70° C (160° F) for about 20 minutes.



Clutch C'

To facilitate operations insert a 29 mm (1.142") inside diameter pipe through entire packet and clamp in a vise.

Take off centering plate (5).



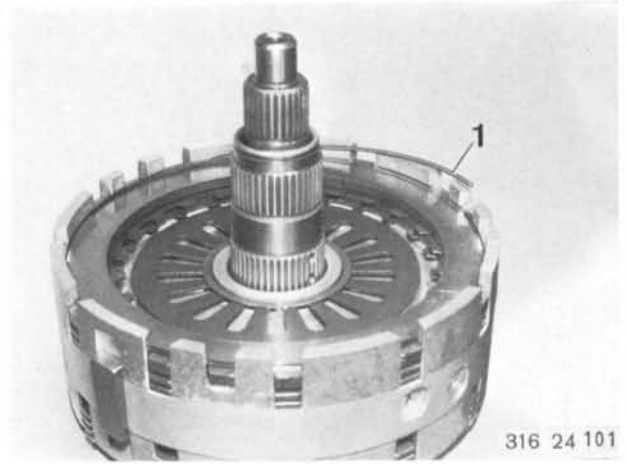
Remove outer plate (6), TOP DOG inner plate (7) and one-way clutch (8) for 2nd gear.

Installation Note! Install one-way clutch (8) that bent tab of retainer is visible on top.

Place new lined plates in ATF having temperature of 70° C (160° F) for about 20 minutes.

Clutch C

Remove circlip (1).

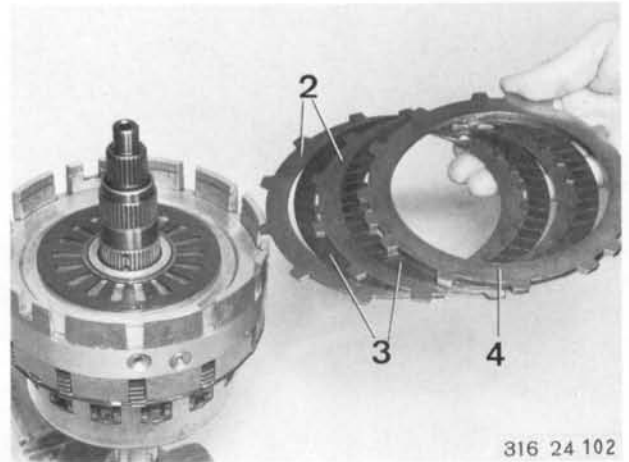


Remove plates.

Sequence of Installation

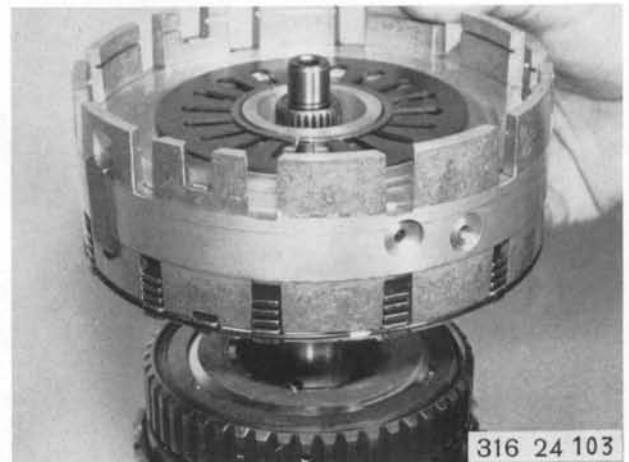
- 2 1.8 mm (0.071") outer plates (two)
- 3 TOP DOG inner plates (two)
- 4 4.5 mm (0.177") outer plates (one)

Installation Note! Place new lined plates in ATF having temperature of 70° C (160° F) for about 20 minutes.

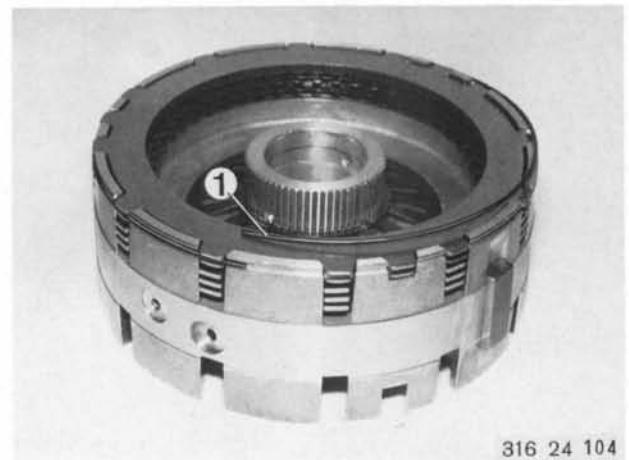


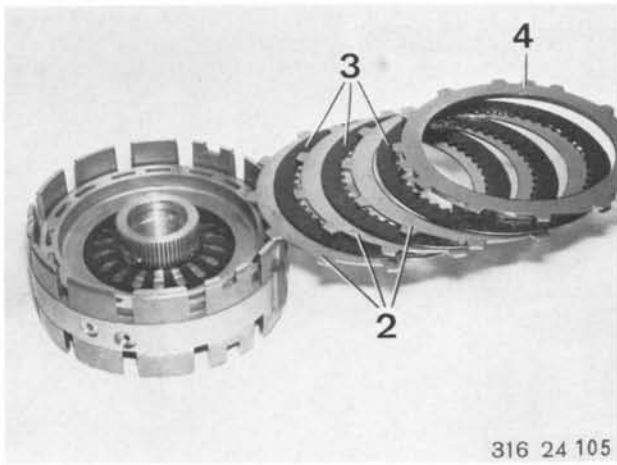
Clutch D

Lift clutch body with clutch D off of set of planetary gears.



Remove circlip (1).





Remove packet of plates.

Sequence of Installation

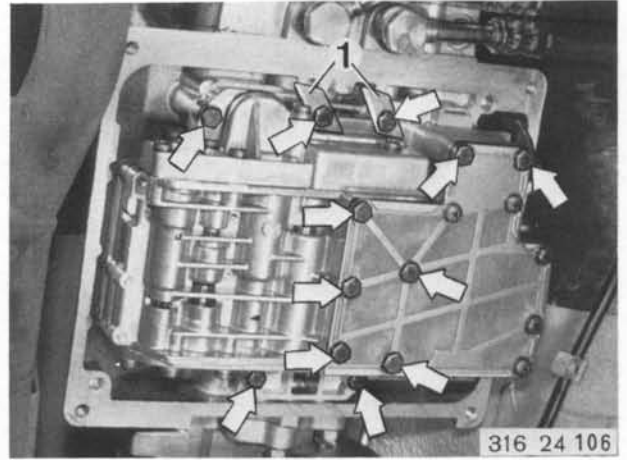
- 2 1.8 mm (0.071") outer plates (three)
- 3 TOP DOG inner plates (three)
- 4 4.5 mm (0.177") outer plate (one)

Installation Note! Place new lined plates in ATF having temperature of 70⁰ C (160⁰ F) for about 20 minutes.

24 30 000 REMOVING AND INSTALLING CONTROL UNIT

Remove oil sump - 24 11 000.
Remove control unit.

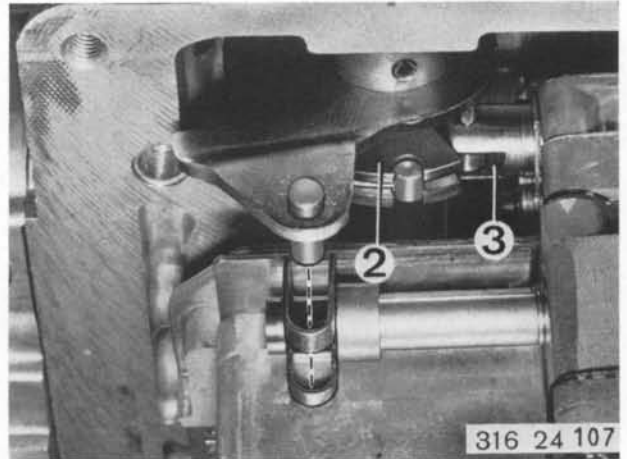
Caution! Note supports (1).



316 24 106

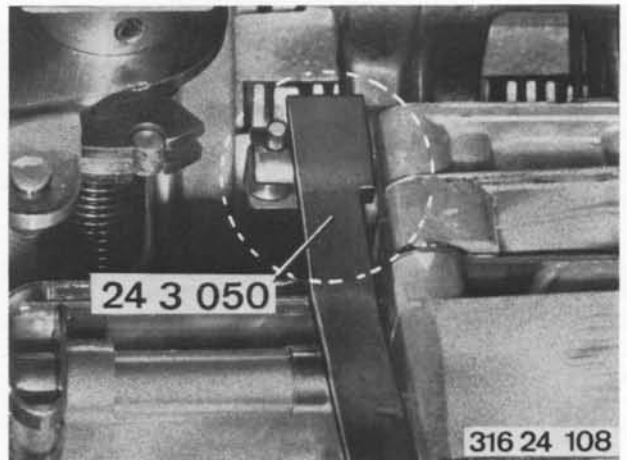
Installation Note! Install control unit that clip on selector sliding valve can be engaged in operating arm of pawl.

This requires tightening transmission cable slightly so that throttle cam (2) cannot interfere with throttle pressure valve (3).



316 24 107

Install control unit, but only tighten bolts slightly. Align control unit with gauge 24 3 050. If this gauge is not available, distance from control unit housing to pin in throttle pressure piston must be 11.5 mm (0.453"). Tighten control unit bolts.



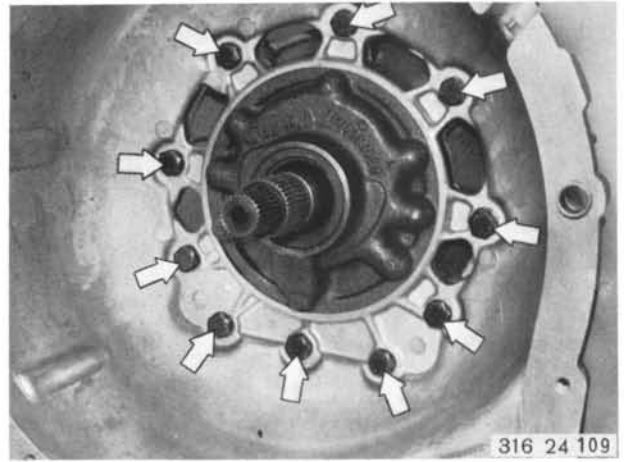
316 24 108

24 30 001 REPLACING CONTROL UNIT

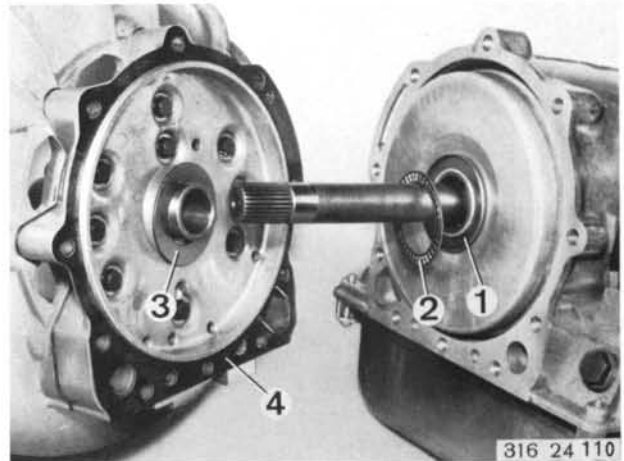
Same procedure as for removal of control unit - 24 30 000.

24 31 000 REMOVING AND INSTALLING PRIMARY PUMP

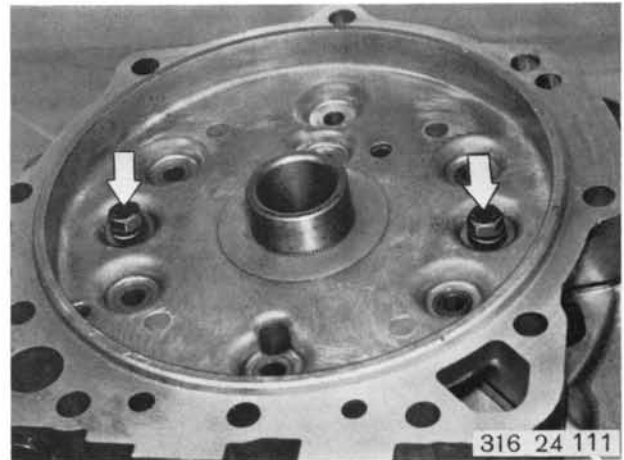
Remove torque converter - 24 40 000.
Detach converter bell housing with intermediate plate.



Installation Note! Place angled disc (1) on input shaft with collar facing needle bearing (2).
Stick thrust washer (3) on converter bell housing with grease.
Replace gasket (4).

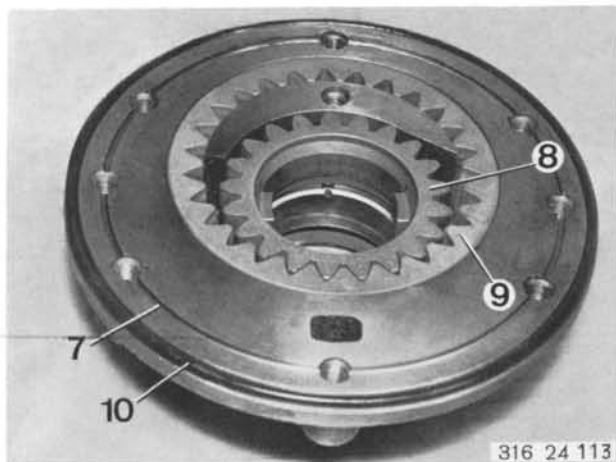


Detach intermediate plate at converter bell housing.
Loosen two bolts opposite each other by just several turns.
Detach primary pump from converter bell housing by applying light knocks.
Unscrew bolts and remove primary pump.

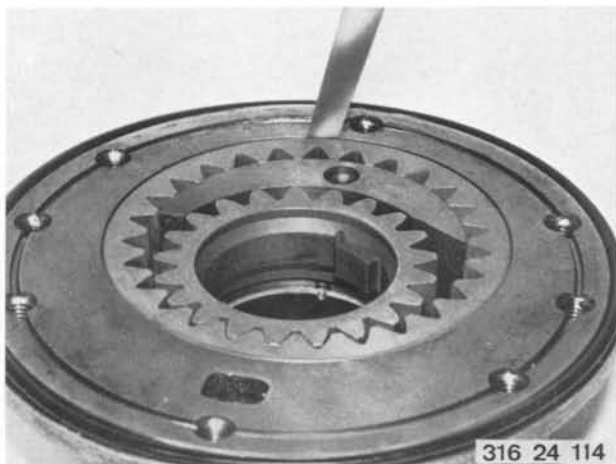


Installation Note! Lift off intermediate plate (5).
Replace gasket (6).

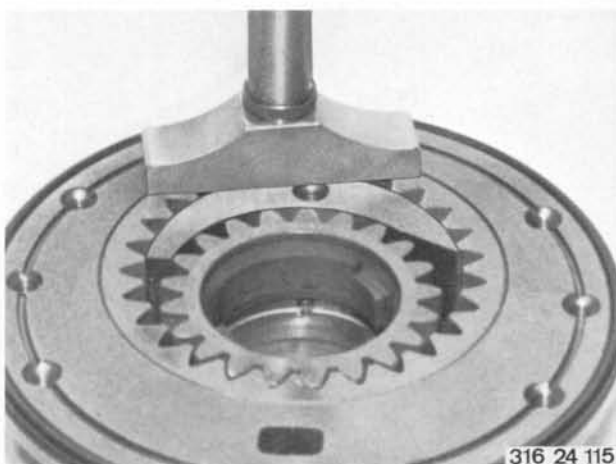




Installation Note! Primary pump, consisting of pump body (7), hollow gear wheel (8) and impeller (9), can only be replaced as a complete unit. Check o-ring (10), replace if necessary.



Check radial play¹⁾ between driven gear and pump body.
This requires turning gear wheel 360°.



Check axial play¹⁾ of both gear wheels to face surface with a micrometer depth gauge.



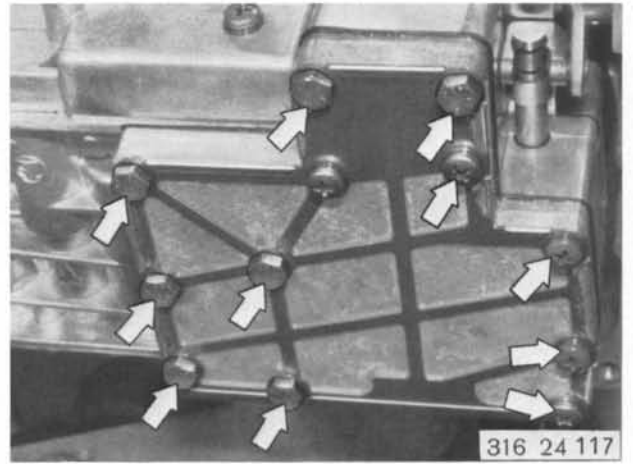
Check primary pump for free running movement with Special Tool 24 3 140.
Recheck this condition after installation of the intermediate plate.

1) See Specifications

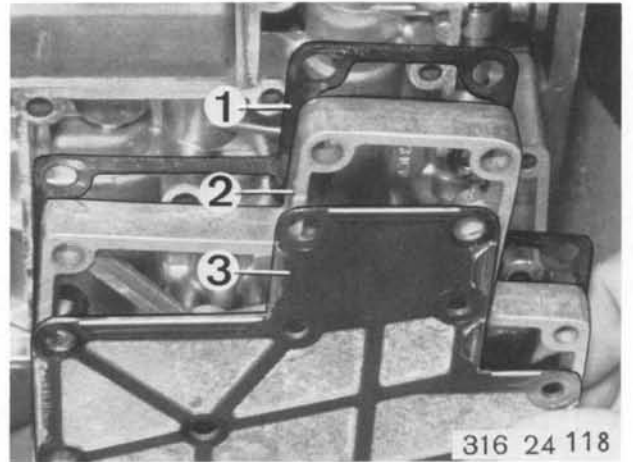
24 31 150 DETACHING AND ATTACHING CONTROL UNIT
OIL FILTER SCREEN

Remove oil sump - 24 11 000.
Detach oil filter screen.

Installation Note! Clean oil filter screen.
Replace oil filter screen when it starts to have
deposits of brown burnt resin.

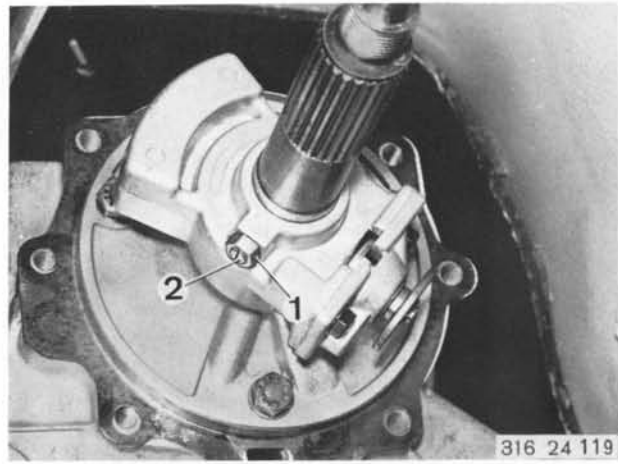


Installed position: Gasket (1)
Spacer (2)
Oil filter screen (3)

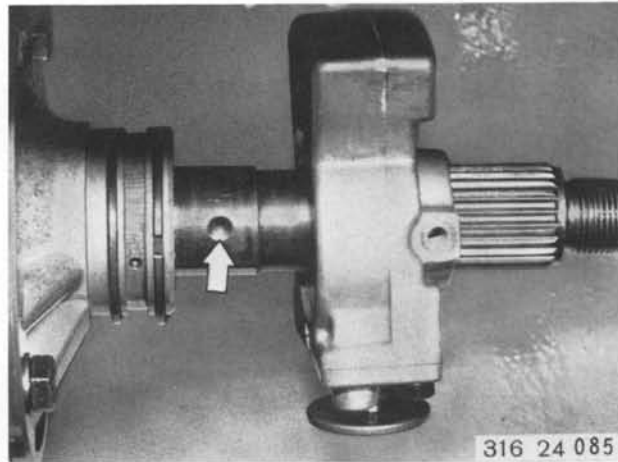


24 32 000 REMOVING AND INSTALLING CENTRIFUGAL GOVERNOR

Remove transmission cover - 24 11 050.
Loosen nut (1) and unscrew stud (2) by about 3 turns.
Pull off governor.



Installation Note! Compress piston rings slightly and slide governor onto governor flange at same time.
Unscrew stud to facilitate locating countersink in output shaft.
Secure governor in countersink of output shaft and lock by counterpunching.

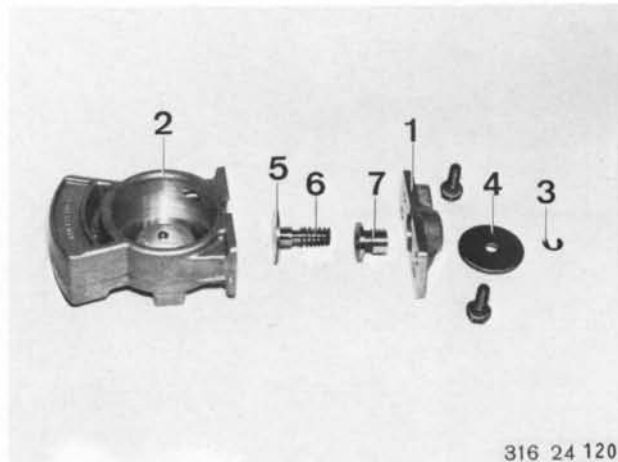


24 32 503 DISASSEMBLING AND ASSEMBLING CENTRIFUGAL GOVERNOR

- Centrifugal Governor Removed -

Take cover (1) off of housing (2).
Remove circlip (3) and disc (4).
Remove governor piston (5), spring (6) and governor bushing (7).

Installation Note! Governor piston must slide into governor bushing easily.



24 34 000 REMOVING AND INSTALLING PARKING LOCK PAWL

Remove control unit - 24 30 000.

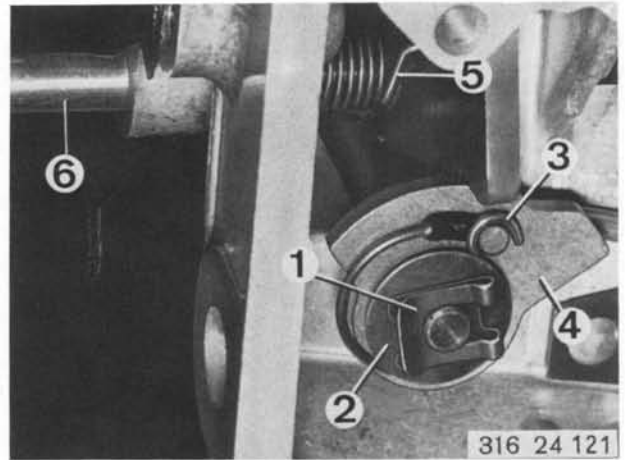
Remove transmission cover - 24 11 050.

Lift off circlip (1).

Remove disc (2).

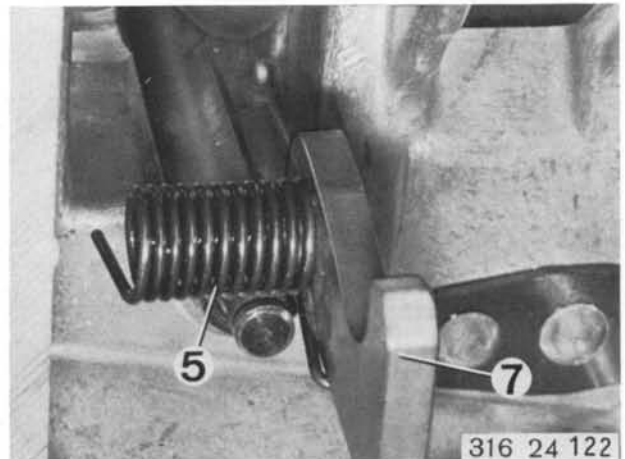
Disengage spring (3) and pull off parking lock cam (4).

Disengage spring (5) and remove pin (6) by pressing with screwdriver from inside to outside, or pull it out.



Installation Note! Press in pin and slide spring (5) with pawl (7) onto pin at same time.

Straight end of spring faces up on transmission case. Front end of spring is behind pawl on left-hand side.



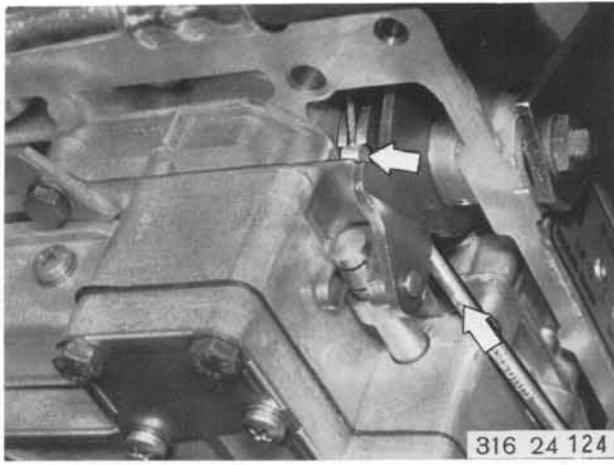
Connect front end of spring to pawl on right-hand side.



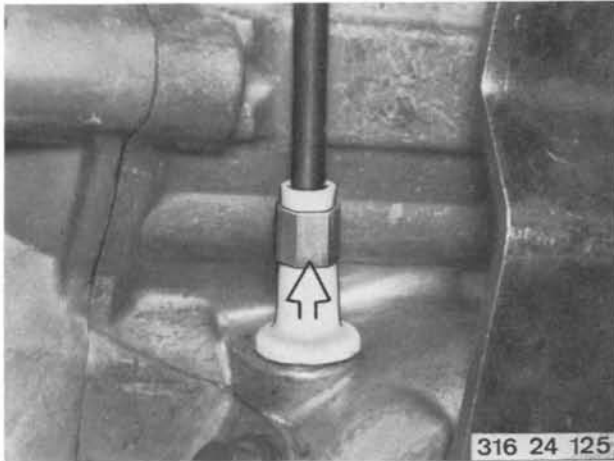
24 34 101 REPLACING ACCELERATOR CABLE

Detach accelerator cable and take out of counter-holder.

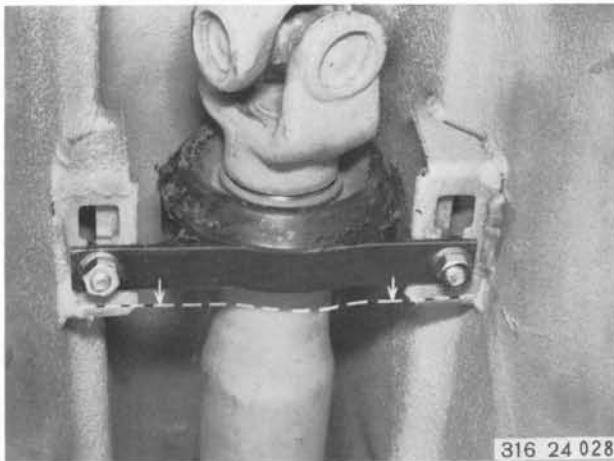




Remove oil sump - 24 11 000.
 Move selector lever to "0".
 Press throttle cam forward and detach cable at throttle cam.



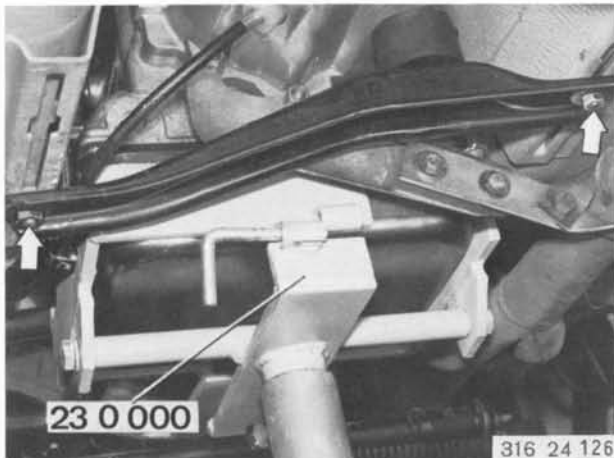
Press accelerator cable up and out of case.
Installation Note! Adjust accelerator cable (see 24 00 004).



24 34 701 REPLACING ACCELERATOR CABLE SPRING

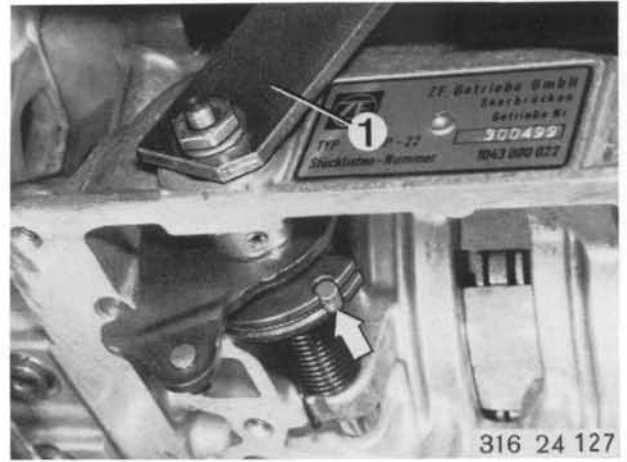
Detach exhaust at triangular flange.
 Detach heat guard.
 Detach propeller shaft center bearing.

Installation Note! Preload center bearing in forward direction by 2 mm (0.079")

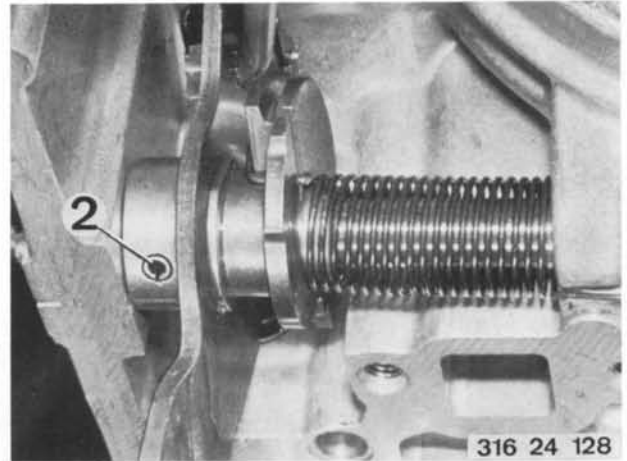


Support transmission with Special Tool 23 0 000.
 Detach cross member at body.
 Lower transmission to front axle carrier.

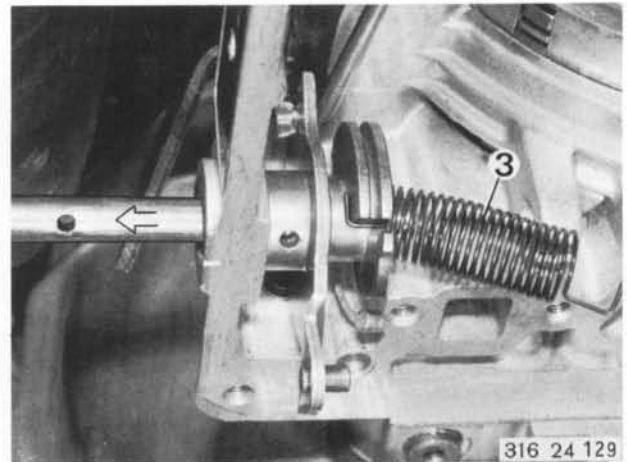
Remove control unit - 24 30 000.
Detach selector lever (1) at transmission.
Detach accelerator cable.



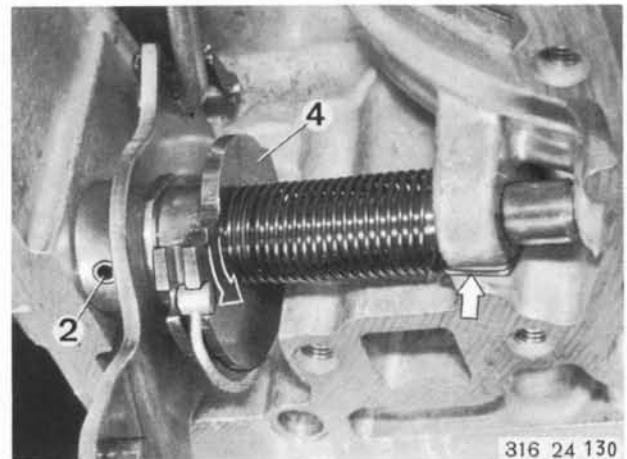
Drive out pin (2) in position 0.



Pull out selector shaft far enough to be able to remove spring (3).



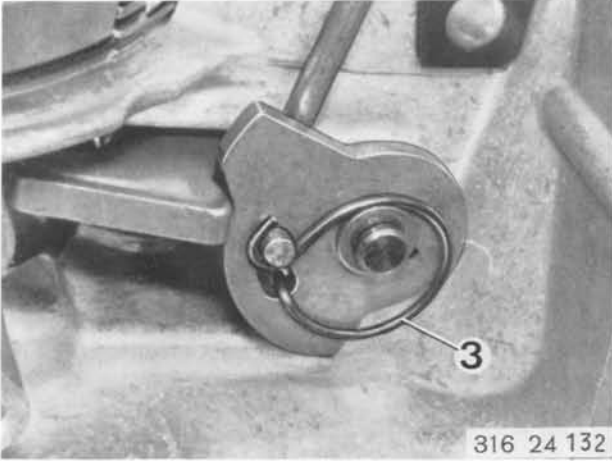
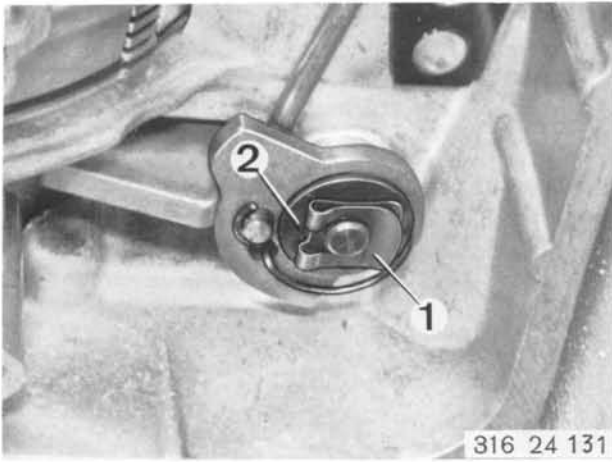
Installation Note! Engage short arm of spring on throttle cam (4).
Place long arm of spring in groove on case.
Install selector lever.
Tension spring by turning throttle cam (4) counter-clockwise by one turn.
Attach accelerator cable and lock detent pawl with pin (2).



24 34 730 REPLACING PARKING LOCK CAM SPRING

Remove control unit - 24 30 000.

Remove circlip (1) and take out disc (2).

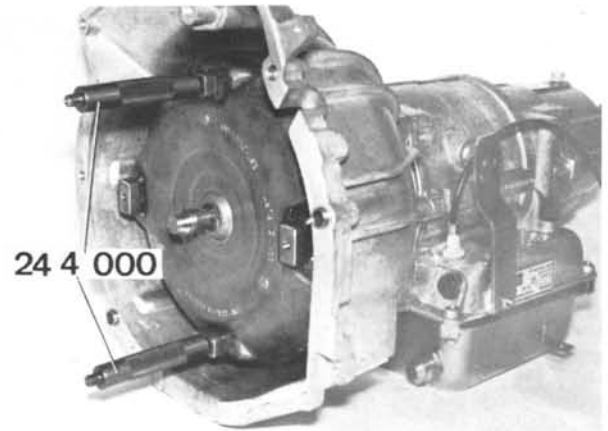


Remove spring (3).

24 40 000 REMOVING AND INSTALLING TORQUE CONVERTER

Remove and install transmission - 24 00 020.
Carefully pull torque converter out of primary pump
with Special Tools 24 4 000.

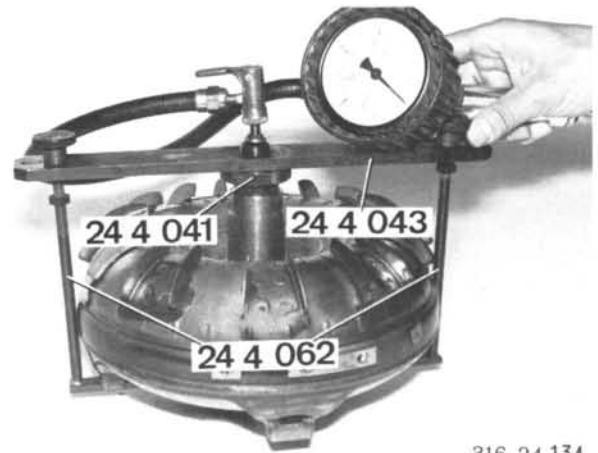
Caution! Escaping transmission fluid.



316 24 133

Installation Note! Check torque converter for leaks
with Special Tools 24 4 041, 24 4 043 and 24 4 062.
Test pressure: 0.5 bar (7 psi).

Caution! Danger of injuries. Use of retaining
bracket 24 4 043 is essential.



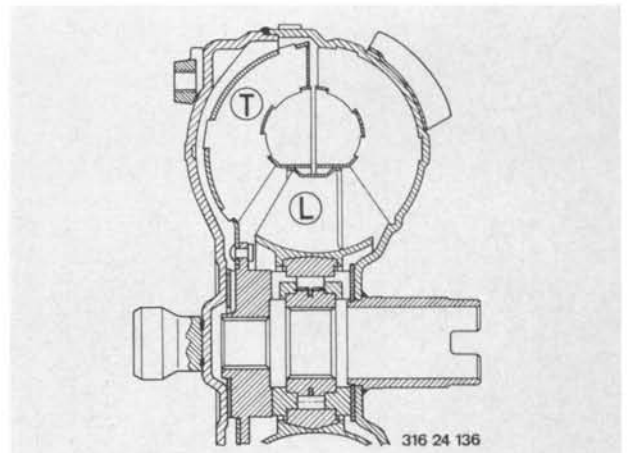
316 24 134

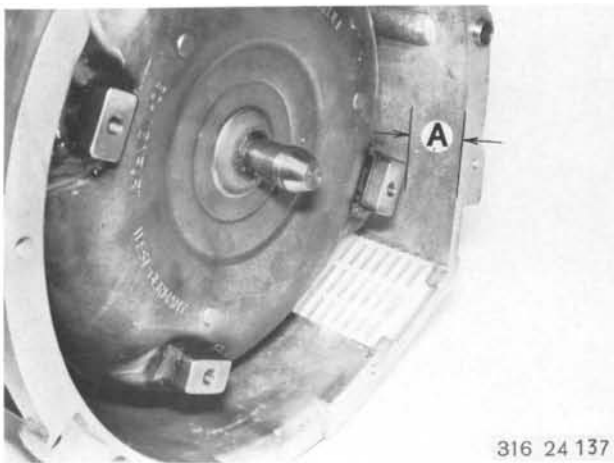
Replace torque converter, if bearing surface of
converter shaft is damaged.



316 24 135

If stator (L) or turbine (T) cannot be turned by
hand, replace torque converter - 24 40 001.





By turning slightly carefully guide openings on torque converter into primary pump. This requires using Special Tool 24 4 000.

Caution! Don't damage converter bearings or seal. Slide in converter up to stop. Converter is positioned correctly, if driver dogs A are about 12 mm (0.472") below edge of housing.



24 40 001 REPLACING TORQUE CONVERTER

Check torque converter as follows before removing. Engine and transmission oil must be at operating temperature.

Engine must give off full power.

Start engine.

Apply parking brake and depress brake pedal fully. Move selector lever to "R" or "1" and floor accelerator pedal.

Read stall speed ¹⁾ on tachometer.

Caution! Never test stall speed longer than 10 seconds because of danger of overheating.

Stall speed considerably below specifications ¹⁾:

- a) Converter oil filling inadequate; correct level.
- b) Clutches slip; check clutches.

Stall speed considerably above specifications ¹⁾:

- a) Stator one-way clutch slips; replace torque converter.

Remove torque converter - 24 40 000.

Torque converter cannot be cleaned with normal workshop facilities and must be replaced when transmission was damaged or oil filter screen was torn.

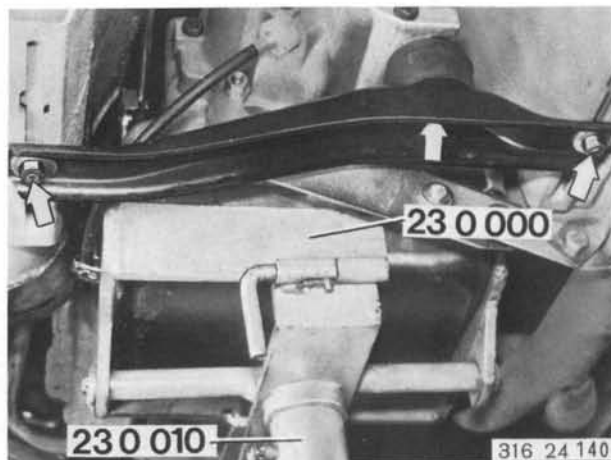
Torque converter diameter 240 mm (9.449") with white paint identification.



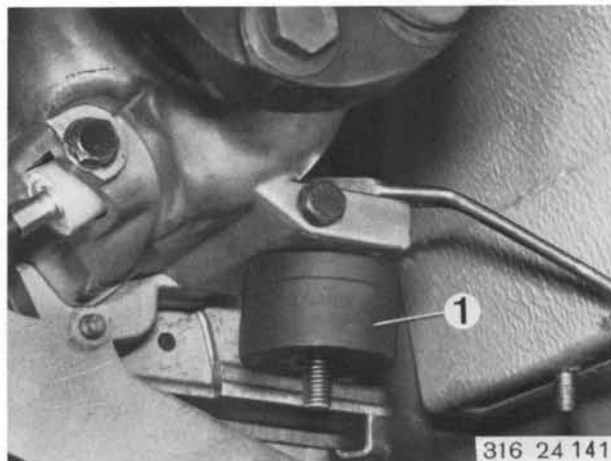
1) See Specifications

24 71 001 REPLACING TRANSMISSION SUSPENSION RUBBER

Support transmission with Special Tools 23 0 000 and 23 0 010.
Remove cross member.
Lower transmission.



Detach rubber mount (1) with a slightly angled open-ended wrench.



TROUBLESHOOTING AUTOMATIC TRANSMISSION 3 HP-22

Condition	Cause	Correction
Shift points ¹⁾ too high	a) Accelerator cable setting wrong b) Governor bushing seized c) Governor piston rings defective or worn d) Throttle pressure valve malfunctions e) Shift valves jammed	a) Adjust accelerator cable b) Clean or replace governor c) Replace piston rings d) Replace control unit e) Replace control unit
Shift points ¹⁾ too low	a) Accelerator cable setting wrong b) Governor bushing seized c) Throttle pressure valve malfunctions d) Plastic balls in transfer plate leak	a) Adjust accelerator cable b) Clean or replace governor c) Replace control unit d) Replace control unit
Shift points too high or too low and shift movements too long and too soft	a) Clutch C + C' damaged by 1-2 gear shifts b) Clutch B damaged by 2-3 gear shifts	a) Replace clutches C and C' b) Replace clutch B
No kickdown shifts	a) Accelerator cable setting wrong b) Control unit setting wrong c) Throttle pressure valve sticks d) Plastic balls in transfer plate leak	a) Adjust accelerator cable b) Adjust control unit c) Replace control unit d) Replace control unit
Selector lever cannot be moved to P	a) Selector linkage setting wrong b) Locking device defective	a) Adjust selector linkage b) Repair locking device
Parking position will not disengage	a) Parking lock pawl caught in teeth of output shell b) Excessive friction in parking lock device	a) Replace parking lock pawl b) Repair parking lock device
Parking position does not hold (slips)	a) Selector rod setting wrong	a) Adjust selector rod
No forward or reverse drive	a) Oil level insufficient b) Pump drive defective c) Drive plate broken d) Parking lock pawl stuck e) Clutches A and B defective	a) Correct oil level b) Replace converter and pump c) Replace drive plate d) Replace pawl e) Disassemble transmission
No forward drive	a) Selector linkage setting wrong b) Clutch A defective or oil lost through leak in supply line	a) Adjust selector linkage b) Replace clutch A
No reverse drive	a) Selector linkage setting wrong b) Clutch B or D defective c) Clutch valve and damper B malfunction d) Oil level too low, pump cannot draw in oil	a) Adjust selector linkage b) Disassemble transmission c) Replace control unit d) Correct oil level
Slipping or shaking in reverse gear	a) Clutch B or D damaged b) Serious loss of oil in supply line to B or D	a) Disassemble transmission b) Disassemble transmission

1) See Specifications

TROUBLESHOOTING AUTOMATIC TRANSMISSION 3 HP-22

Condition	Cause	Correction
No drive in reverse and 2nd gear	a) Shift valve stuck in 3rd gear position	a) Replace control unit Disassemble transmission if metal particles or abrasion are found in oil sump
Hard engagement jolt or definite double knock when engaging reverse gear	a) Damper B defective or wrong cover parts	a) Replace control unit
Car cannot be started in 0	a) Transmission switch defective	a) Replace transmission switch
Car creeps or runs in 0	a) Selector rod setting wrong b) Clutch A aired too slowly c) Clutch A defective (bonded)	a) Adjust selector rod b) Disassemble transmission c) Disassemble transmission
Drive in 1st gear only when in A	a) 1st - 2nd shift valve stuck b) Governor bushing seized	a) Replace control unit b) Clean or replace governor
Drive in 1st and 2nd gear only when in A	a) 2nd - 3rd shift valve stuck	a) Replace control unit
Drive in 2nd gear only	a) 1st - 2nd and 2nd - 3rd shift valves stuck	a) Replace control unit
Drive in 3rd gear only	a) 1st - 2nd and 2nd - 3rd shift valves stuck b) Governor bushing seized	a) Replace control unit b) Clean or replace governor
Grinding shifts	a) Accelerator cable disengaged or maladjusted b) Oil level too low c) Throttle pressure valve stuck d) Clutch A defective	a) Connect or adjust accelerator cable b) Correct oil level c) Replace control unit d) Disassemble transmission
Grinding shifts from 1st to 2nd gear	a) Clutches C and C' slip b) Clutch valve and damper C malfunction c) Accelerator cable disengaged or maladjusted d) Oil level too low e) Throttle pressure valve stuck f) One-way clutch F defective	a) Disassemble transmission b) Disassemble transmission c) Connect or adjust accelerator cable d) Correct oil level e) Replace control unit f) Disassemble transmission
Grinding shifts from 2nd to 3rd gear	a) Clutch B slips b) Accelerator cable disengaged or maladjusted c) Oil level too low d) Oil pressure too low e) Throttle pressure valve stuck f) One-way clutch E defective	a) Replace clutch B b) Connect or adjust accelerator cable c) Correct oil level d) Disassemble transmission e) Replace control unit f) Disassemble transmission
3rd gear slips	a) Clutch B slips b) Accelerator cable disengaged or maladjusted c) Oil level too low d) Oil pressure too low e) Throttle pressure valve stuck	a) Disassemble transmission b) Connect or adjust accelerator cable c) Correct oil level d) Disassemble transmission e) Replace control unit

TROUBLESHOOTING AUTOMATIC TRANSMISSION 3 HP-22

Condition	Cause	Correction
Stall speed ¹⁾ too high	a) Oil level too low b) Engaged clutch slips c) One-way clutch (F or G) slips	a) Correct oil level b) Disassemble transmission c) Disassemble transmission
Stall speed ¹⁾ too low	a) Torque converter defective b) Engine output insufficient	a) Replace torque converter b) Test engine
Transmission vibrates at fast move-offs	a) Clutch A defective b) Propeller shaft center bearing defective c) One-way clutch F or G defective	a) Replace clutch A b) Replace center bearing c) Disassemble transmission
Transmission shifts hard or down	a) Accelerator cable setting wrong b) Clutch A defective	a) Adjust accelerator cable
Drive in 0	a) Selector linkage setting wrong b) Clutch A (forward) bonded c) Clutch B (reverse) bonded	a) Adjust selector linkage b) Disassemble transmission c) Disassemble transmission
No braking effect from 1st gear when in 2 and 1	a) Clutch valve and damper D defective b) Clutch D defective	a) Replace control unit b) Replace clutch D
No braking effect from 2nd gear when in 2 and 1	a) Clutch C' defective	a) Replace clutch C'
Transmission shifts too early when downshifting from 2nd to 1st gear manually	a) Locking valve pressure too high b) Loss of pressure in governor supply line between governor and shift valves	a) Replace control unit b) Disassemble transmission
Transmission shifts too late when downshifting from 2nd to 1st gear manually	a) Locking valve pressure too low b) Governor pressure too high	a) Replace control unit b) Disassemble transmission
Stall speed ¹⁾ in forward too high	a) Clutch A or 1st gear one-way clutch slips	a) Disassemble transmission
Stall speed ¹⁾ in forward too low	a) Engine output not sufficient b) Converter one-way clutch defective	a) Check engine tuning b) Replace converter
Whining depending on speed and load	a) Center bearing of propeller shaft defective	a) Replace center bearing
Rattling noise in neutral	a) Drive plate broken b) Welded drive dogs on converter damaged	a) Replace drive plate b) Replace converter
Growling noise in neutral, eliminated when accelerating in 0	a) Valve chatter in control unit b) Oil pump draws in air	a) Correct oil level b) Tighten valve body mounting screws, check gasket
Oil on torque converter bell housing	a) Shaft seal shot b) Primary pump body o-ring shot c) Converter leaks at welded seams d) Plug leaks	a) Replace shaft seal b) Replace o-ring c) Replace converter d) Replace seal

1) See Specifications
6.76

TROUBLESHOOTING AUTOMATIC TRANSMISSION 3 HP-22

Condition	Cause	Correction
Oil on output flange	a) Shaft seal shot	a) Replace shaft seal
Oil on speedometer drive	a) O-ring shot b) Shaft seal in speedometer bushing shot	a) Replace o-ring b) Replace speedometer bushing