VOLVO

Service Manual Supplement

Design and Function
Fault Tracing
Repairs and Maintenance
Reconditioning

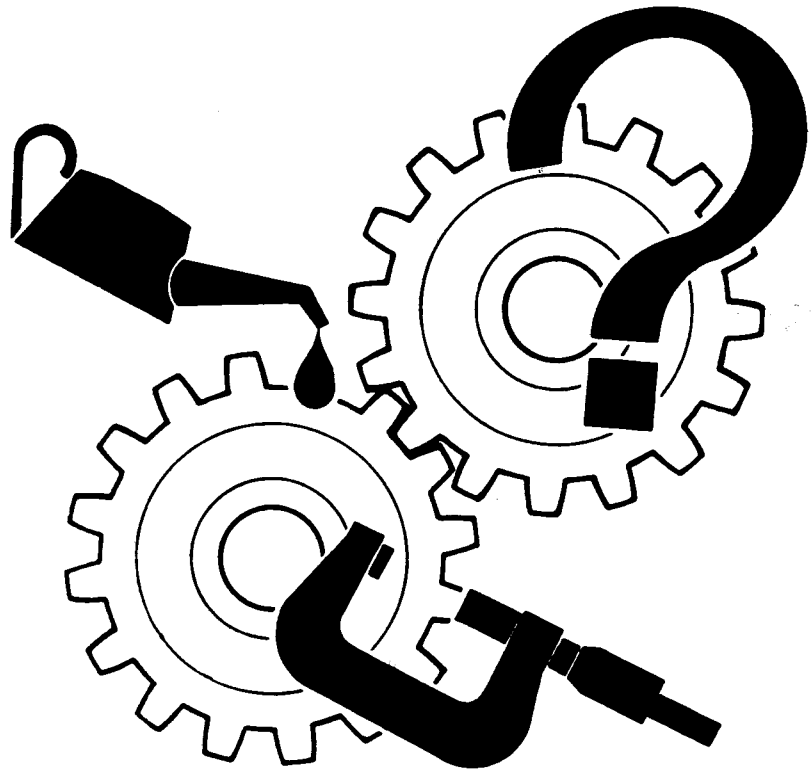
TP 30941/1S

Section 4 (40-49)

Manual transmissions
M46, M47, M47II
including types J & P
Overdrives

200/700

January 1991



Volvo North America Corporation

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Order No. TP 30941/1S

Foreword

The supplemental information contained within this manual has been compiled from various Volvo information sources and must be used in conjunction with service manual TP 30941/1 (Reconditioning manual) and TP 30687/1 (Fault tracing, repair and maintenance manual). This manual supplement will only address certain revised repair, checking procedures and new information not found in the above mentioned manuals. Also when using service manual TP 30941/1, ensure to refer to the **reprint edition** of this manual dated July 1989.

The supplemental information is separated into three catagories, a new Fault tracing Overdrive Type J and P diagnosis procedure, revised information with reference to where to locate the original information in TP 3094/1 or TP 30687/1 and new service procedures and specifications.

Fault Tracing Overdrive Type J and P

NOTE: Only the most common and relatively easy to find fault symptoms are included in the following procedures. Before proceeding with the diagnosis procedure, check fluid level and top off if necessary.

Excessive noise in direct drive which disappears in overdrive

1. Check cone clutch bearing.

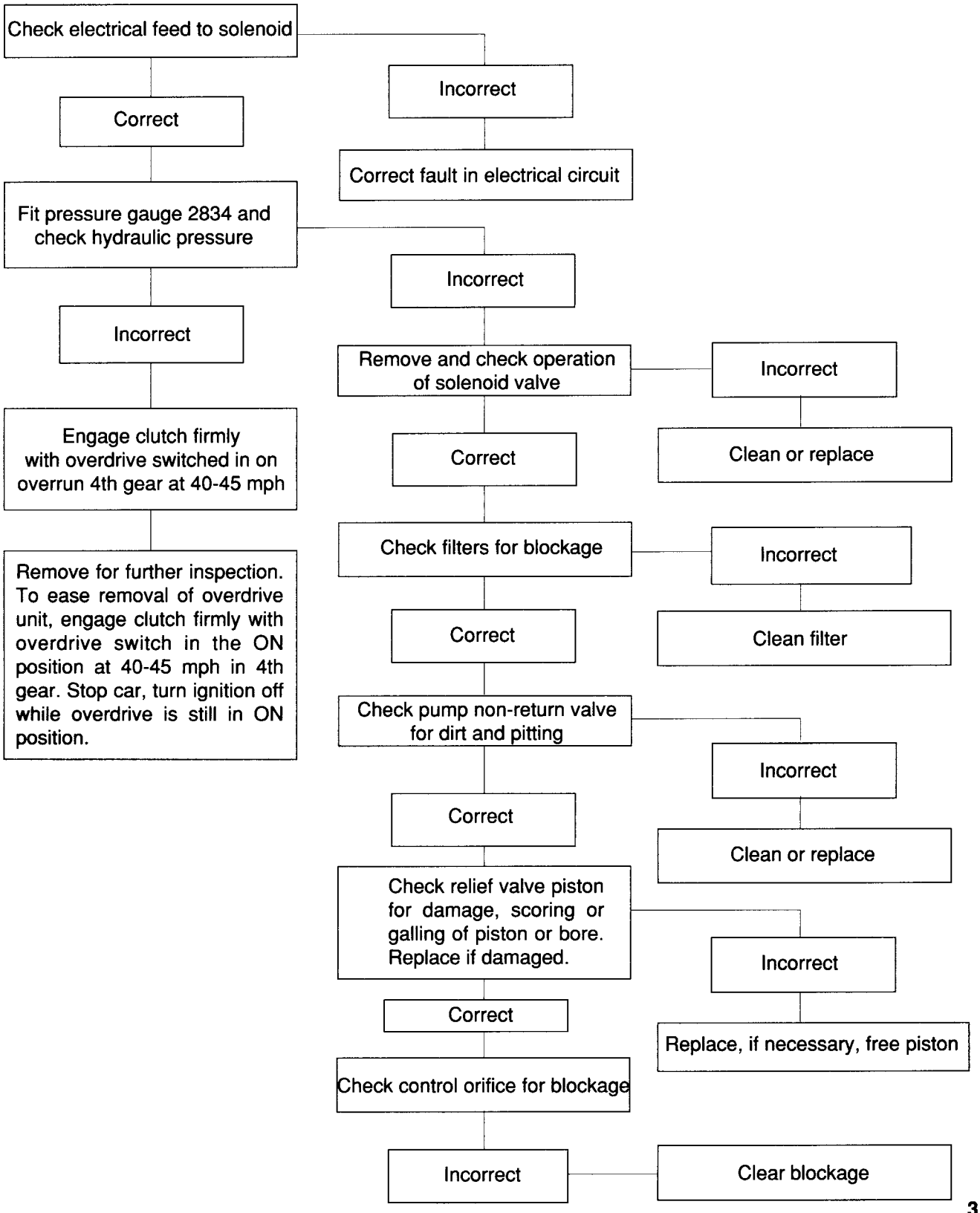
Excessive noise in both direct and overdrive but disappears 1.5--2 seconds during engagement of overdrive (speeds above 65 Km/h, 40 mph)

1. Check front and rear output shaft bearings.

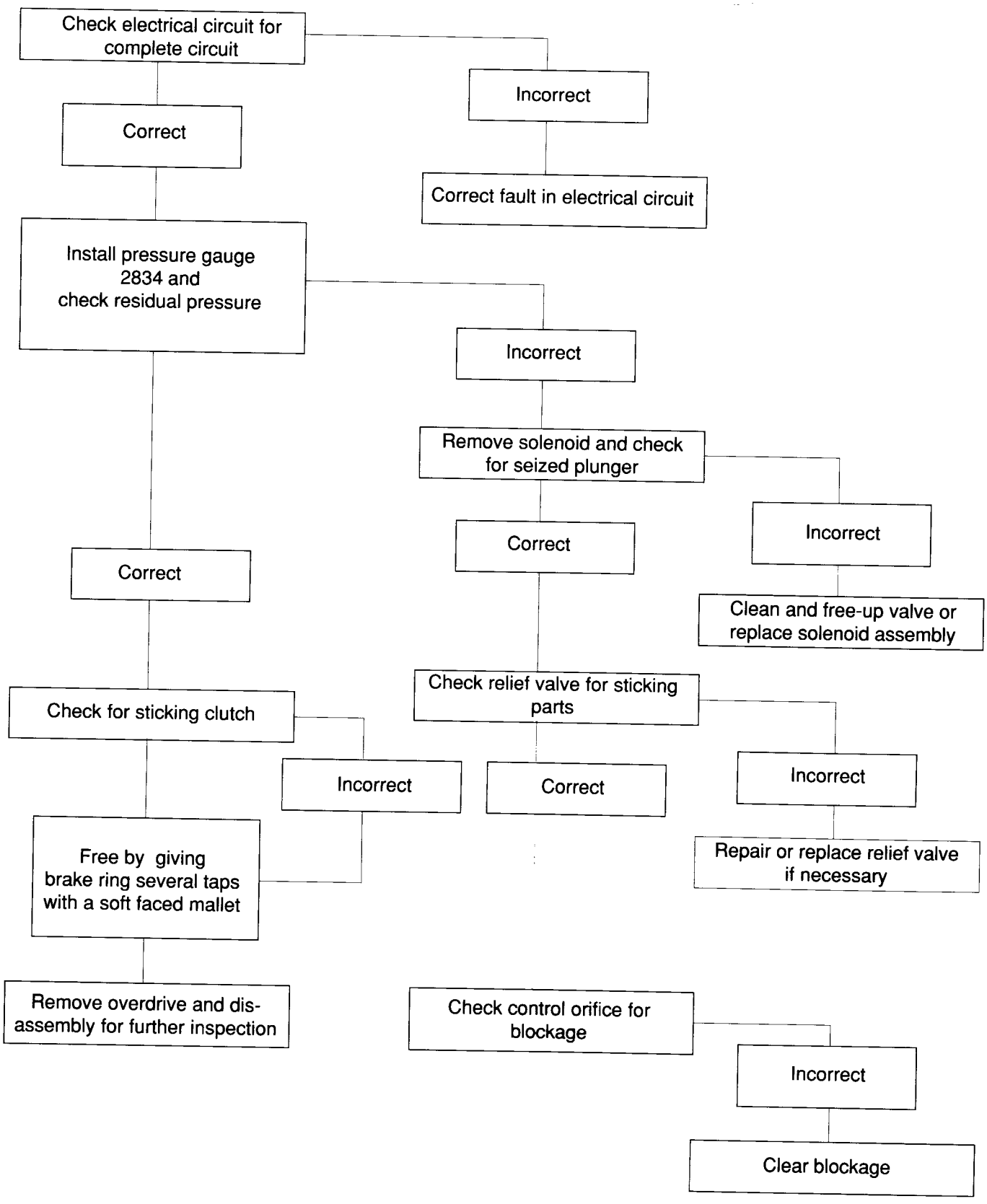
Excessive noise which reduces in frequency once overdrive is engaged

1. Check transmission output shaft bearing.

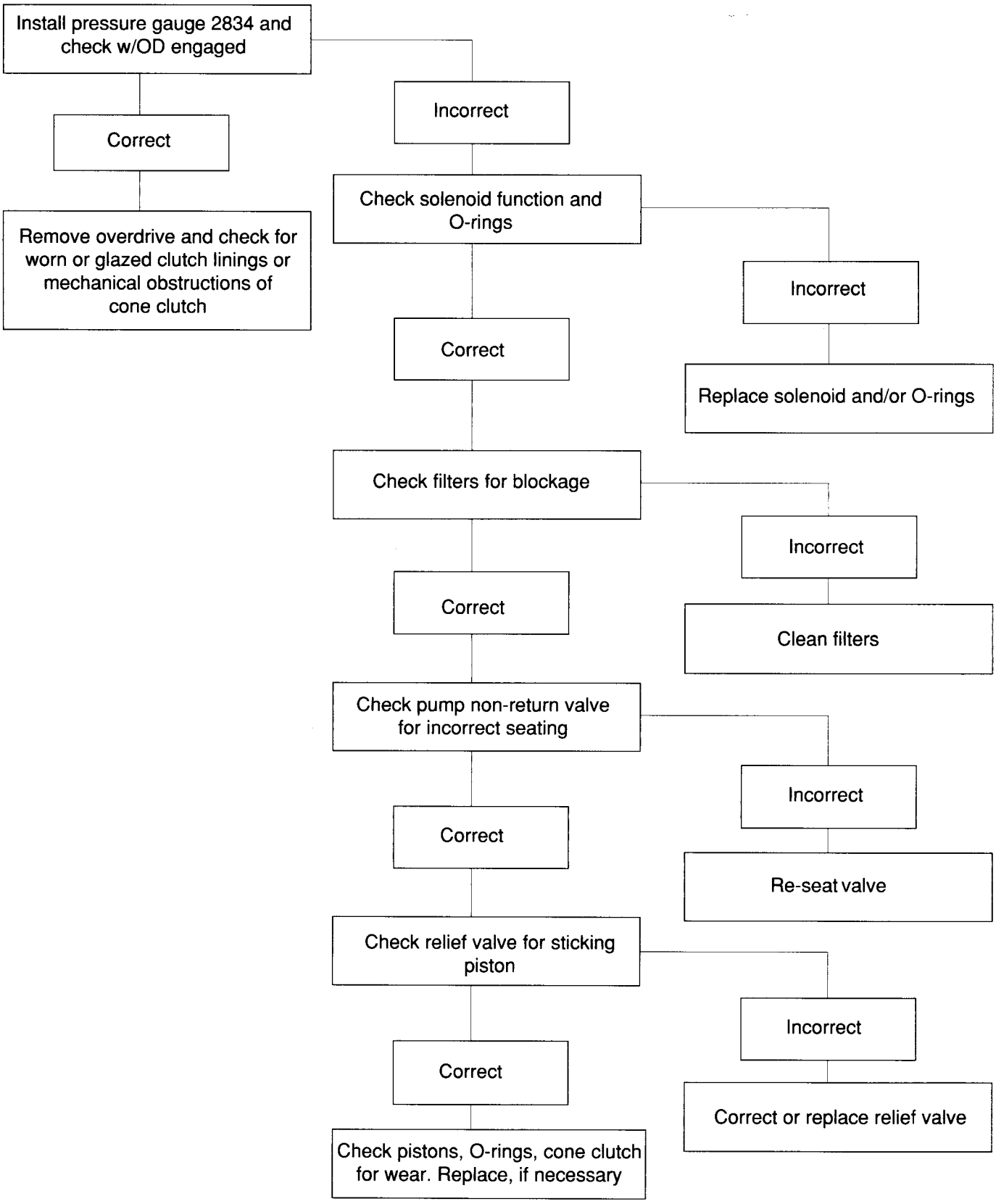
Overdrive does not engage



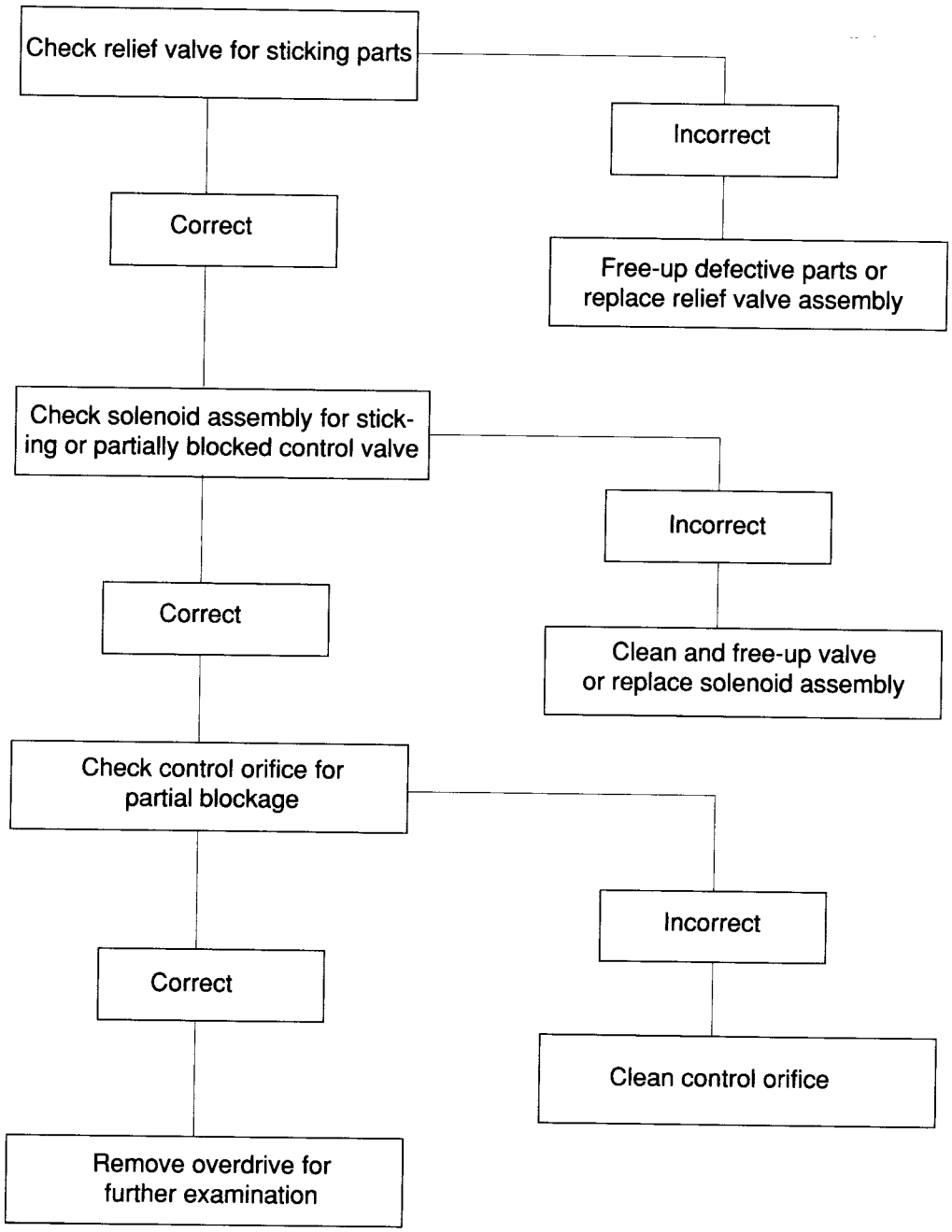
Overdrive does not disengage



Overdrive slips when engaging



Overdrive dis-engagement slow and/or slips on disengagement



Revised Service Information and Specifications

NOTE: Refer to the service manual TP 30941/1 (reprinted July 1989) when using the following information.

Transmission fluid recommendations

Refer to pg 4, Specifications, and note the following:

On M46 and M47 II manual transmissions, Volvo synthetic transmission fluid P/N 1161324 or Type F transmission fluid is recommended. Under no circumstance should Dexron II be used in these transmissions.

By using Dexron II, the first gear brake will not operate properly and/or result in noisy operation. On M46 transmission models, the overdrive unit may slip.

Tool modification for removing rear mainshaft bearing

Refer to pg. 34, step C34, and note the following:

The correct extension tool number is 5148 as shown in the illustration and not 5248 as described in the procedure text. Also, extension tool 5148 has been modified in production. The modification consists of increasing the tool hole inside diameter from 29mm (1.14 inch) to 30--30.5mm (1.18--1.20 inch). **Also, refer to special tool bulletin No. 30 for further information.**

Overdrive operating piston rings

Refer to pgs. 55 through 62, Type J/Type P Overdrives, and note the following:

The teflon sealing rings located on the operating pistons have been discontinued. When ordering new operating pistons please be aware that the operating piston will be supplied only. The operating piston O-ring is ordered as a separate item.

Aluminum housing countershaft preload (Applies to M46 transmission models)

Refer to pg. 17, Determining thickness of countershaft shims, and note the following:

The information on pg. 17 indicates that the countershaft should have a preload of 0.03-0.05 mm (0.0012-0.0020 in). If countershaft, countershaft bearing or rear end bearing was replaced, shim thickness must be determined.
The correct preload specification values should be +0.03 to -0.05 (end float 0.05 to a preload 0.03) mm (+0.0012 to -0.0020 in.). If the transmission assembly is equipped with a 1st gear brake, the end float should be 0.0 to +0.05 mm (0.0 to +0.0020 in.).

Revised service procedures

Refer to page 33 and 41, operation C31 and D17, and note the following:

The text presently states; Remove washer on 5th gear synchronizer hub, for operation C31. The washer should be referred to as a retainer, since that is it's actual function. When installing the retainer, ensure raised portion of retainer is flush with the inner raised portion of the hub. If the retainer is pressed too far onto the hub the synchronizer dogs (tangs) will cause the synchronizer ring to drag against the gear after assembly. This will make it difficult to correctly shim the countershaft.

Refer to page 42, operation D21, and note the following:

After tightening the attaching nut to the correct torque specification, ensure that the 5th gear spins freely on the shaft. Use a new nut to retain the assembly. This will eliminate the need to check the torque during the tightening process.

Refer to page 43, operation D27, and note the following:

The present text states; Install rear countershaft bearing race. Use drift 2413. Note: Top of race must be **below** housing face. race will take correct position when cage is installed. The revised text is; Install rear countershaft bearing race using drift tool 2413. Note: Top of race must be **above.** Race will take correct position when cage is installed. (This information was corrected in reprint edition dated July 1989.)

Refer to page 49, operation D56, and note the following:

The present text states; Place support **2985** under nut when pressing bearing into position. Then install correct washer with old shim pack and tighten bearing to the bottom. The revised text is; Using support tool **2985**, press bearing halfway onto fifth gear shaft. If the bearing is driven too far onto the shaft, it will be impossible to correctly shim the countershaft. Install correct washer with a .55 mm shim, P/N 3204069-3, then tighten bearing into correct position.

Refer to page 50, operation D60, and note the following:

Disregard the sentence stating; If no play exists, select a thinner shim.

Refer to page 43, operation D27, and note the following:

The present text states; Note: Top of race must be below housing face. Race will take correct position when cage is installed. The word "**below**" should actually read "**above**", and appears in the first release of this manual dated June 1986. The reprint edition of the manual, dated **July 1989**, has the correct information. Please refer to the reprint edition of this manual when conducting service procedures.

General tips and suggestions

Using a depth mircometer
When using any measuring devise such as a depth micrometer, it is adviseable to take readings in at least three (3) areas around the measured object such as a bearing. This is to ensure you have an accurate reading. Also, true accurate readings can be obtained, when using a depth micrometer, if both the inner and outer bearing races are used as footings for the measuring devise.

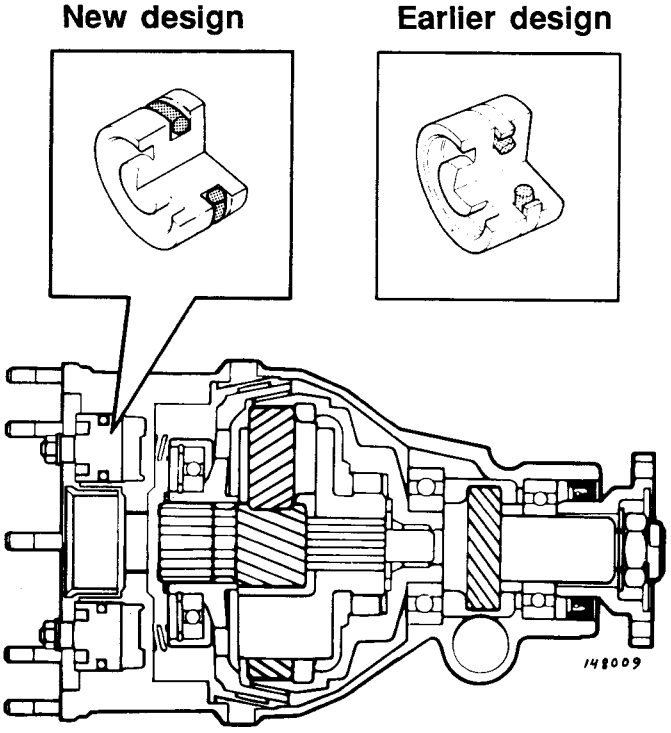
Calculation of shim thickness/notation of readings
It is recommended when performing any disassembly procedure, to calculate shim thicknesses and to notate any measured clearance or distance.

New hydraulic plungers in J, J/P and P overdrives

Hydraulic pistons with improved seals were introduced progressively in type J, J/P and P overdrive units during model year 1988.

The new seal consists of a heavy O-ring, replacing the existing O-ring and Teflon sealing ring. The seal is made of a more durable material and reduces the risk of fluid leakage.

The modification is effective from the following type, part and serial numbers:



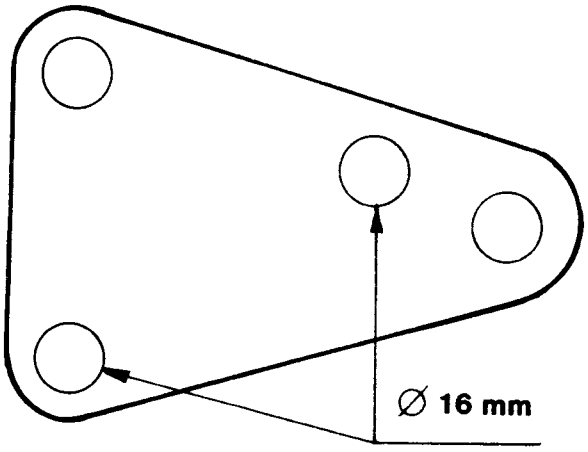
Type	Part No.	Serial No.
P	1208605	6787
P	1208606	1273
P	1208607	6446
J/P	1208608	9821
J	1208628	870
J/P	1208639	60
J/P	1208650	1

Reconditioning

When reconditioning type J and J/P overdrive units incorporating the earlier design hydraulic pistons and it is noticed that the Teflon rings are worn, the pistons should be replaced by the new type pistons P/N 6814454-2 and new O-ring seal, P/N 6814455-9.

Note: If slippage occurs when engaging or dis-engaging, or when reversing, the clutch plate should be replaced or a service kit installed. Service kit P/N 271183-6, should be installed to correct the fault on overdrive units not bearing one of the listed part number listed above.

Replacement of hydraulic pistons



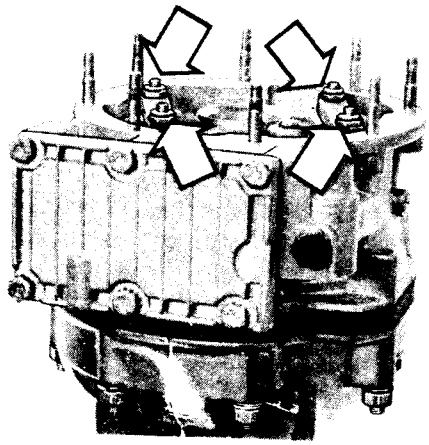
141 314

A1

Remove overdrive unit from vehicle

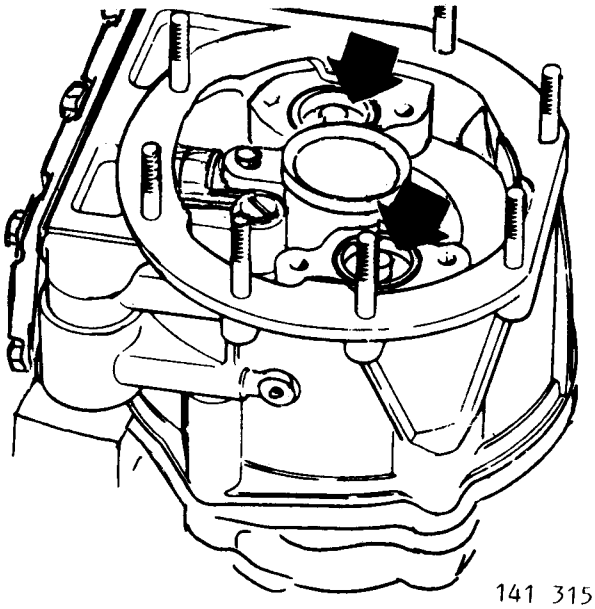
Tool 2709 must be modified if it will be used on a three-pin carrier.

To modify the tool, drill out the two existing holes on the tool to 16 mm (as shown in the illustration).



A2

Remove gasket and pressure plate assembly.



141 315

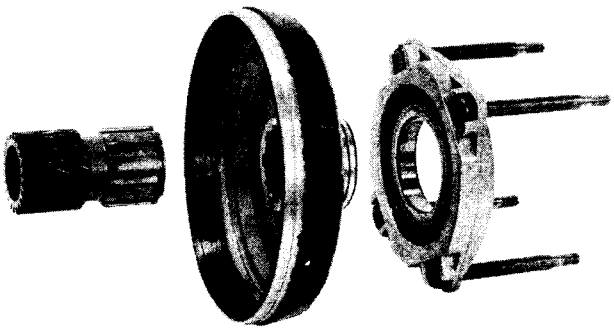
A3

Using pliers, remove hydraulic pistons

Install new hydraulic pistons and O-rings.
Install pressure plates, using new nuts. Torque nuts alternately and evenly to 7.5 ft. lbs (10Nm).

Install overdrive unit.

Clutch plate replacement/service kit installation



134 331

A4

Remove overdrive unit from vehicle.

Tool 2709 can be used for this purpose. If this tool will be used on a three-pin carrier, it must be modified as described previously.

Disassembly overdrive unit.

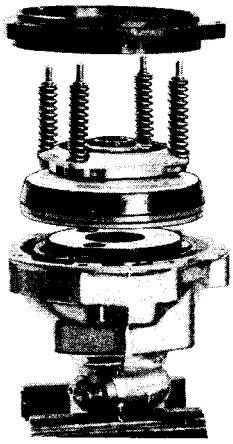
Refer to Reconditioning repair manual TP30941/1 for service procedure.

Disassembly clutch assembly.

Remove retaining rings and withdraw sun wheel and clutch plate from bearing carrier.

Replace clutch plate and lubricate new plate friction lining using automatic transmission fluid **Type F**.

Assembly clutch as per appropriate service procedure.



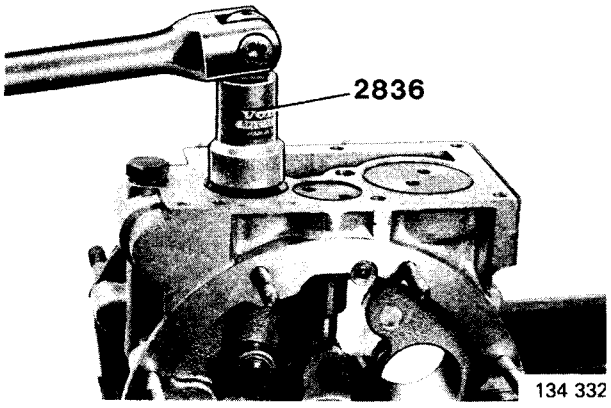
134 336

A5

Install clutch assembly and springs (use new springs if installing the service kit.)

Install rear housing to brake drum gasket. Ensure gasket is properly positioned. install brake drum assembly.

Replacement of reducing valve spring (when installing service kit)



134 332

A6

Remove oil sump, primary valves and reducing valve plug.

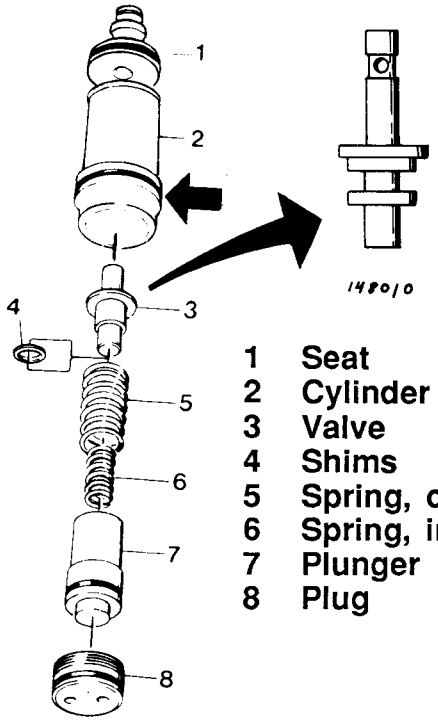
Use plug wrench 2836 (as shown in the illustration), then tap plug using a plastic mallet to assist in loosening.

A6

Remove relief valve and components.

Remove all shims from assembly, then install new valve. Install the most recent version with new inner spring.

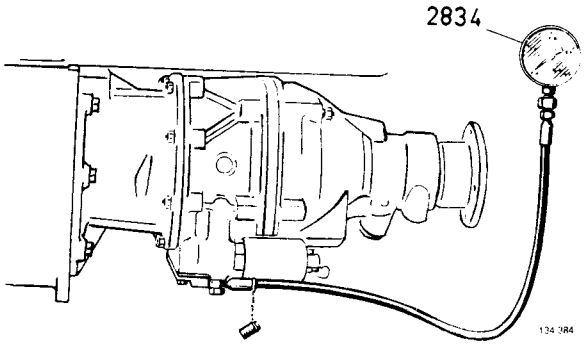
Re-assemble overdrive unit, then install overdrive unit into vehicle.



1 Seat
2 Cylinder
3 Valve
4 Shims
5 Spring, outer
6 Spring, inner
7 Plunger
8 Plug

A7

Connect oil pressure gauge 2834 as shown in illustration.



Remove plug located under solenoid valve and connect gauge. Raise and properly support vehicle, then start engine.

Note pressure reading obtained while operating in direct drive at approximately 45 mph (70 kph). Reading should be aprroximately 0.15 MPa (21.8 psi).

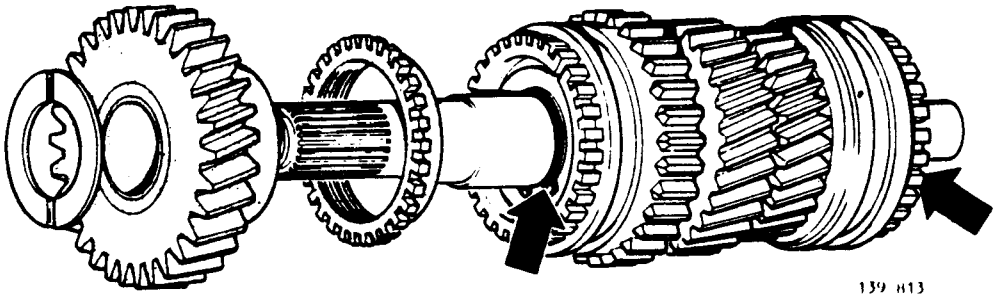
Engage overdrive and note pressure reading obtained. Readings obtained should be 2.8-3.1 MPa (405-450 psi) for all turbocharged models (gas/diesel) using **asbestos-free** friction linings or 2.7-2.9 MPa (390-420 psi) for all other types.

Mainshaft modifications and new circlips

Note the following information when conducting transmission assembly procedures.

Mainshaft modifications and new circlips have been introduced and in production since transmission part number 1208427-3 (running number 138176), 1208428-1 (running number 104767) and 1208430-7 (running number 134471). These modifications have been done to counteract loose or broken circlips. The new circlips are 1.75 mm thick; original equipment circlips were 1.50 mm thick. To accomodate the thicker circlips, the mainshaft circlip grooves (as shown in the illustration below) were also made wider.

If during transmission assembly, the original circlips show signs of wear, install the new circlip P/N 968700-5 onto the original mainshaft with a narrow groove. In such a case, ensure that the circlips are firmly pressed into position.



139 H13

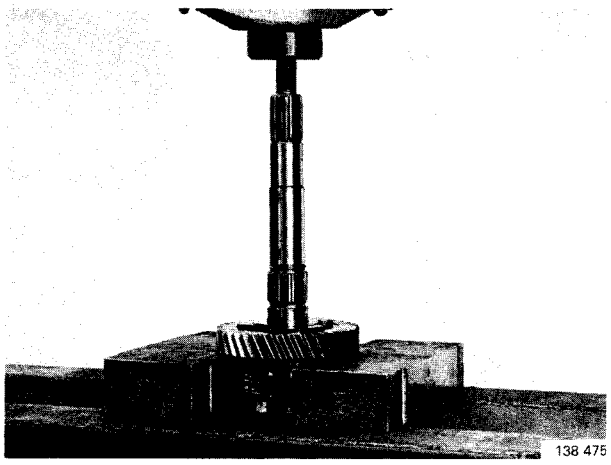
Replacement needle bearing and adjustment shims

Note the following when conducting service on transmission 1st gear bushing and adjustment shims.

To reduce excessive side play in the 1st gear bushings, replace the 1st gear bushing with a needle bearing and install adjustment shims. This repair can only be accomplished on transmission assemblies incorporating a brass ring attached to the rear of the 1st/2nd synchronizer hub, and applies to transmissions with or without a vibration damper. The adjustment shims should be installed beneath the brass ring.

Note the following required parts, special tools and material to perform the following repair:

	Description	Part No.	Quantity
Required Parts	Needle bearing	1381565-9	1
	Hub	1220976-3	1
	Brass ring	1220977-1	1
	Adjustment shims .10 mm	940366-8	As required
	Adjustment shims .35 mm	940367-6	As required
Special Tools	Support ring	9992852-5	
	Counterhold	9992853-3	
	Rear axle tool	9995242-6	
	Drift	9995080-0	
	Front end tool	9995294-7	
Material	Assembly paste (spray)	1161006-0	
	Assembly paste (can)	1161078-9	



Service Procedure

A1

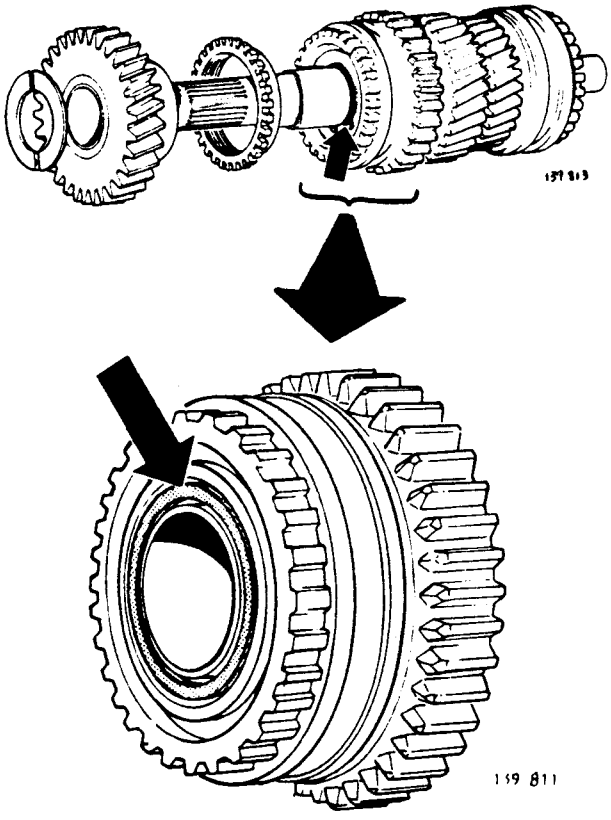
With transmission removed from vehicle, remove mainshaft assembly from transmission.

On M46 transmissions, refer to page 10, operations A1-A18, on M47 transmissions, refer to page 29, operations C1-C36.

Transmissions with vibration damper

A2

Press off vibration damper.



A3

Remove 1st gear and 1st gear synchronizer ring. Check if 1st gear is fitted with a needle bearing. If 1st gear is fitted with a bushing, the bushing must be replaced with a needle bearing as described in operations A12 and A13. Also check information regarding Mainshaft modification and new circlips as described on the previous page.

A4

Check if brass ring is fitted to the synchronizer hub.
If brass ring is fitted to synchronizer hub, proceed to operation A15.
If brass ring is not fitted to the synchronizer hub, the synchronizer hub must be replaced with a new hub incorporating a brass ring and proceed to operation A5 through A11.

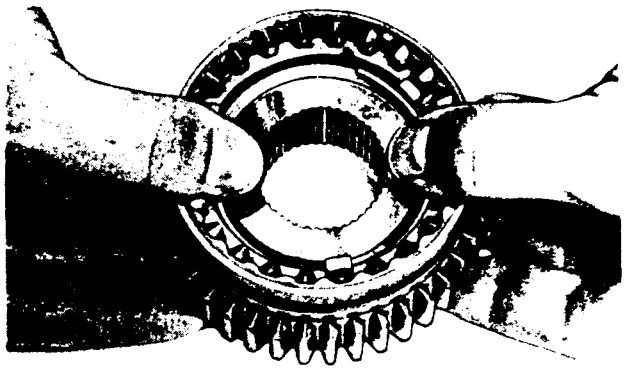
Replacement of hub

A5

Using counterhold tool 2853 , press off 1st-2nd synchronizer hub and 2nd gear and synchronizer ring.

A6

Reinstall 2nd gear.

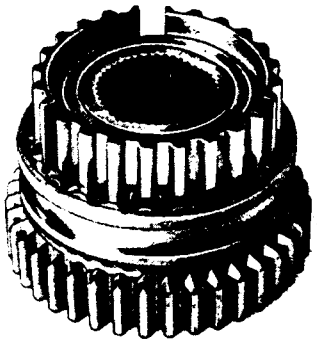


141036

A7

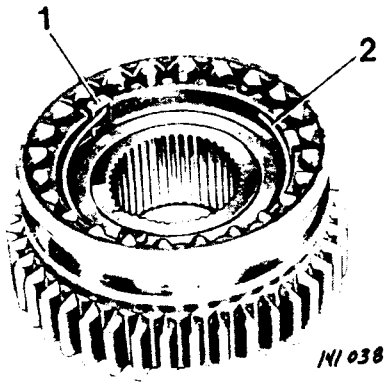
Disassemble synchronizer.

A8



Assemble synchronizer.
Place synchronizer hub into the operating sleeve.

A9

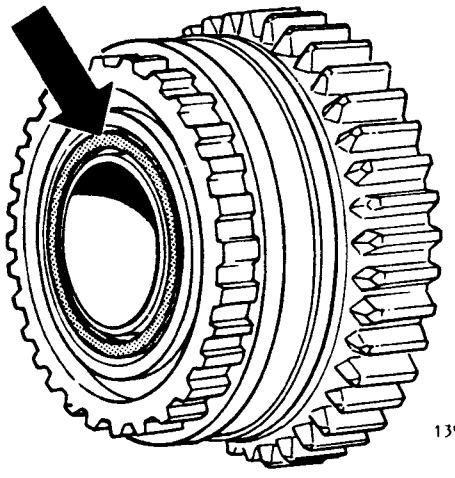


141038

Insert sliding keys (1) and spring rings (2).

Lock the sliding keys using the spring rings. Both spring rings should be hooked onto the same key. Engage the first spring ring counterclockwise. Turn the synchronizer over and engage the second spring ring counterclockwise. The spring rings should start in the same key and extend in opposite directions. If the spring ring is bent, the free end of the spring ring must point outward (away from synchronizer hub).

A10

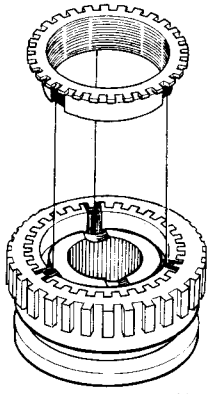


139 811

Lubricate mainshaft, then install synchronizer.

Turn hub so that groove for brass ring is facing 1st gear.

Do not install the brass ring at this time.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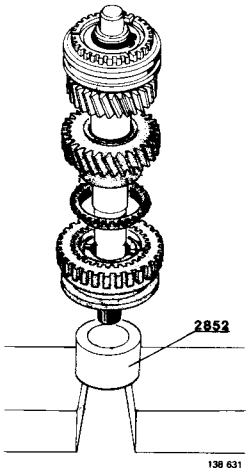


138 631

A11

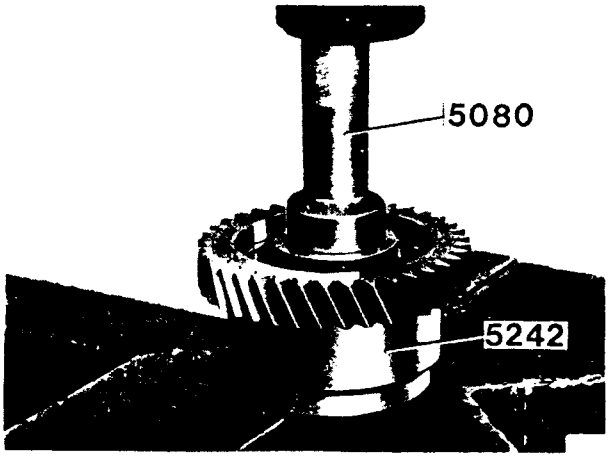
Check position of synchronizing ring.

Using tool 2852, support mainshaft, then install snap ring.

Replacing bushing with needle bearing, 1st gear

A12

Using a press, remove bushing from 1st gear.

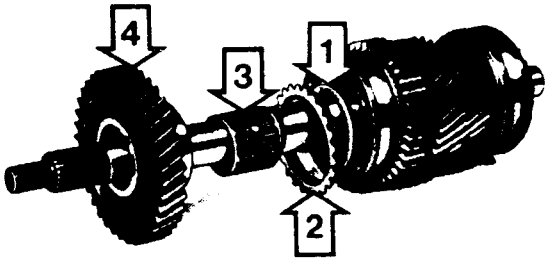


Use tool 5242 (rear axle special; tool) to support shaft assembly when removing bushing.

Using tool 5080, press bushing off of shaft.

A13

Clean all components thoroughly.



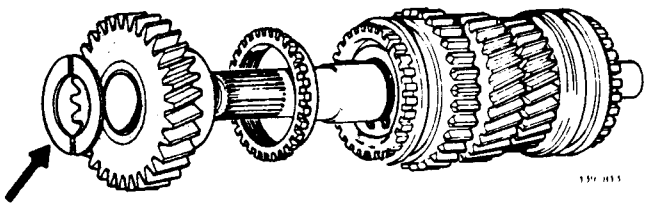
A14

Install brass ring (1), synchronizer ring (2), needle bearing (3), and 1st gear (4).

Install and properly engage snap ring.

Clearance adjustment

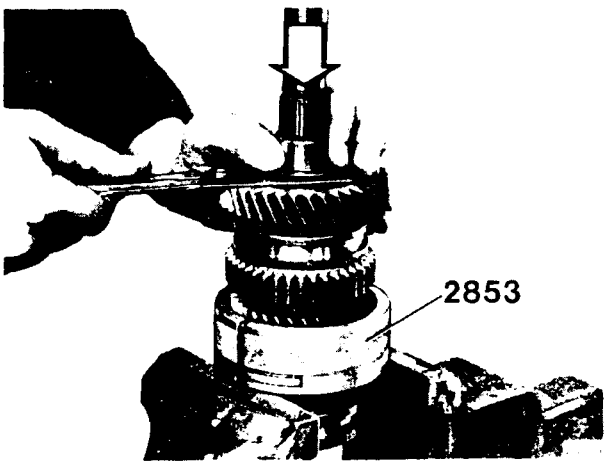
A15



Remove thrust washer from rear of 1st gear.

The thrust washer is not installed in transmission assemblies incorporating a vibration damper. Use thrust washer, P/N 1220333-7. This washer will be used only to measure clearance. Remove thrust washer before assembling transmission.

A16



Position support tool 2853 under 2nd gear. Place mainshaft into a soft jaw vise (do not tighten the vise).

Firmly push down on mainshaft to press lock ring into hub. Install thrust washer and press into position.

Using a feeler gauge, measure clearance between thrust washer and gear.

Minimum allowable clearance should be .10 mm.

The measured clearance should be as close to the specified minimum clearance as possible.

To adjust the measured clearance, note the following example:

Measured clearance is .85 mm.

Install two (2) .35 mm adjustment shims under the brass ring. Total thickness of the two adjustment shims is .70 mm.

Subtract the total thickness of the two adjustment shims from the measured clearance to obtain a reading as close as possible to the specified minimum clearance given above.

.85 mm (measured clearance) - .70 mm (thickness of the two adjustment shims) = .15 mm (adjusted measured clearance).

Transmissions with vibration damper

A17

Press on vibration damper.

Using tool 5294 (small end of tool facing downward), press vibration damper into position.

A18

Check to ensure that the washer is properly positioned on mainshaft. This is especially important if washer has been removed and installed. It should not be possible to turn the washer if it is installed properly.

Transmission assembly

A19

During assembly of transmission, aluminum mating surfaces should be treated with assembly paste prior to bearing and shaft installation.

On M46 transmissions, refer to page 19, operations B27 through B66 for assembly procedure and note the following:

On transmissions incorporating aluminum housings, the intermediate shaft should have a 0-.05 mm measured end play clearance. Excessive preload may contribute to stiff gear shifting. Also, during assembly, the original adjustment shims can be reused.

On M47 transmissions, refer to page 42, operations D23 through D84 for assembly procedure and note the following:

During transmission assembly, the original adjustment shims can be reused.

A20

Install transmission, then fill using specified fluid.

A21

After adding fluid to the transmission, ensure not to crossthread the transmission drain plugs.

Torque transmission drain plugs to 20-30 ft. lbs. (27-40 Nm). Do not over tighten the drain plugs. Transmission housing damage may result (applies to aluminum or cast iron transmission housings) if drain plug tightening torque is exceeded.

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