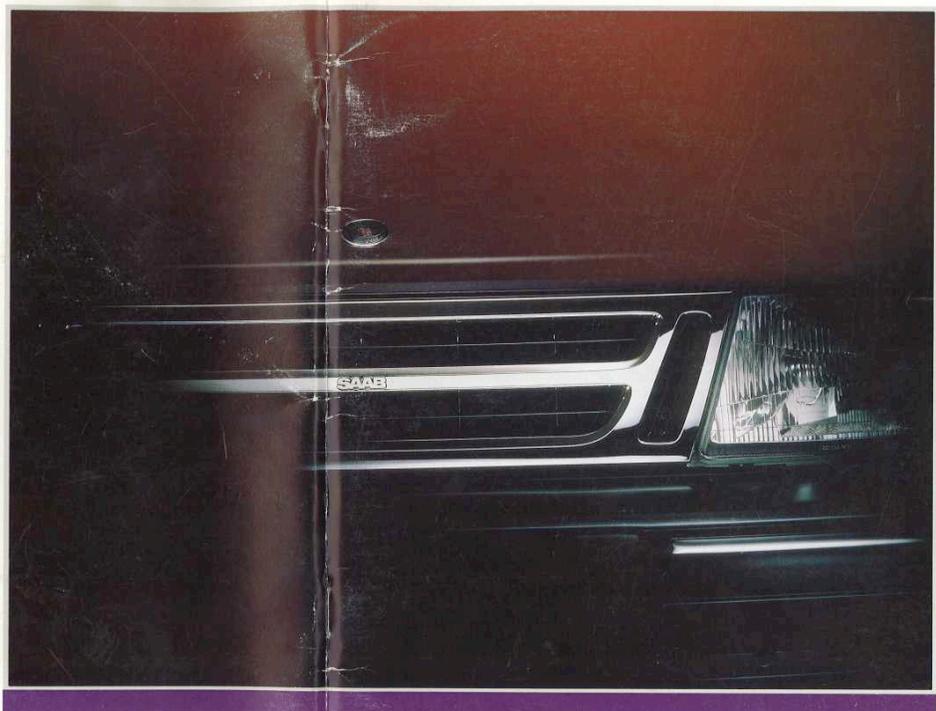


Saab

Technical Training



SAAB



Saab Cars USA, Inc.
Saab Drive, P.O. Box 697
Orange, CT 06477

8/90

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900 5 SPEED

Foreword

The information in this book is intended to supplement rather than replace the service manual. The manuals are constantly updated as changes are made to the transmission and should be considered the final authority.

As a convenience we have listed part numbers for shims, synchros and a few other components. This information is accurate as of spring 1990 but may change at any time, when in doubt check the parts fiche and S.I. books.

Many of the operations in this book call for you to make a judgement as to whether or not a part should be reused. We have provided as many guidelines as we can to help you make these decisions but in the end it is your experience that will be the determining factor. Some parts (pinion bearings for example) should always be replaced but there are many others such as gears and synchro components that are often needlessly replaced "just in case". Finding and fixing the real cause of the problem will lower costs, reduce come backs and give you the satisfaction of knowing you are a technician, not just a parts changer.

900 5 Speed



Transmission Identification

I.D. Tag

All transmissions carry an identification tag on the top of the primary housing. This plate shows the transmission type and serial numbers. The type code shown below for 1984 and later cars (see shop manual for older models) allows you to match the transmission to the appropriate parts listing in the microfiche and determine gear ratios and proper application without having to open up the box.



Transmission type numbers, 1984 models onwards

GM = Manual transmission
GA = Automatic transmission

Transmission version

Number of forward gears

- 3 = 3-speed
- 4 = 4-speed
- 5 = 5-speed

Primary gear ratio (see table)

Variant

GM 4 5 7 06

Gear ratio number

Primary gear	Manual				
	4	5	6	7	8
Number of teeth, input/output gear	31/30	30/27	31/26	32/25	33/24
Gear ratio	0.97	0.90	0.84	0.78	0.72

Anti-Theft Marking

Beginning with the 1987 model year all major components and body parts carry an anti-theft marking label. This label is the subject of a two page Service Information 08/86-872, Section A-0, Page 21. Found in Supplement 6-A.

The central theme of this bulletin is that the labels must not be removed or defaced in any way even when installing the component in a vehicle with a different V.I.N. number.



900 5 Speed



Specifications

Lubricants

Transmission Fluid – Engine oil 10W30 or 10W40,
3 U.S. qt.,

Alternate

Gear oil SAE EP 75 API GL4 or GL5
Saab part no. 99 00 754 (5 gallons)

Inner U joint grease – Saab "J" grease
Saab part no. 02 70 025 (7 1/2 lb can).

Torques

All 8mm Case Bolts	15-18 ft lbs
Slave Cylinder Bolts	4-10
8mm Ring Gear Bolts	37
10mm Ring Gear Bolts	66
Lower Chain Sprocket Nut, 32mm Hex	67-81
Forward Pinion Shaft Nut, 24mm Hex	37

Bearing Preloads

New Pinion Bearings	18-27 in lbs ●	... 4.7-7.0 KGF ■
Used Pinion Brgs. (Over 1,200 Miles)	7-16 in lbs ●	... 1.9-4.3 KGF ■
New Differential Bearings	16-24 in lbs ●	... 8-28 KGFCM ●
Used Differential Brgs. (Over 1,200 Miles)	7-11 in lbs ●	... 8-3 KGFCM ●

■ Using Spring Scale and String (KGF = KG = KP)	● Using Torque Wrench (KGFCM = KGCM)
--	---

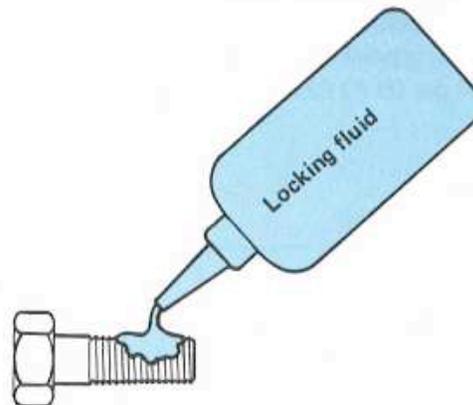
Sealants/Locking Fluid

Many of the bolts in the transmission are precoated with thread sealant or locking fluid. The shop manual draws your attention to these bolts with the picture shown to the right. The accompanying bolt length chart also highlights the coated bolts. Failure to recoat these bolts with the proper compound when rebuilding can result in leakage of gear oil or major mechanical failures.

Locking Fluids

Loctite 270 (Red)

- Pinion bearing nut
- Lower chain sprocket nut
- Forward pinion shaft nut



Loctite 242 (Blue)

- Ring gear bolts
- Torx head bolts for the stamped steel primary case bearing retainer
- Cluster gear and reverse idler shaft retaining plate bolt
- Reverse idler actuating arm pivot bolt
- Reverse selector shaft retaining bolt (older models before roll pin)
- Pinion housing bolts
- All other bolts calling for "Locking Fluid" in the shop manual

900 5 Speed



Specifications

Sealants

Loctite 510 (Gasket eliminator)

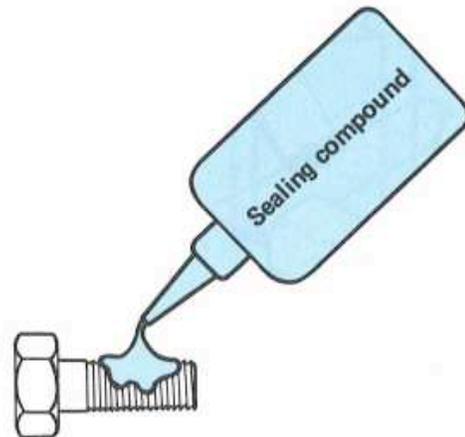
- Main case to primary housing surface

Permatex Aviation

- Two chain tensioner bolts
- Two upper allen (not torx) head primary case bearing retainer bolts
- Twelve differential bearing side cover bolts
- Three slave cylinder mounting bolts
- Six engine to gearbox bolts with tapped holes drilled through into the transmission section of the maincase

High Temperature Silicon

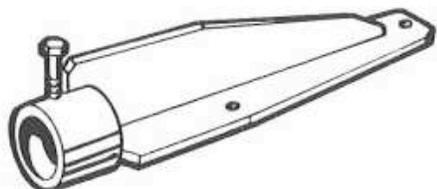
- Slotted portion of engine sump gasket - DO NOT use on the solid portion of the steel gasket, it is precoated at the factory.



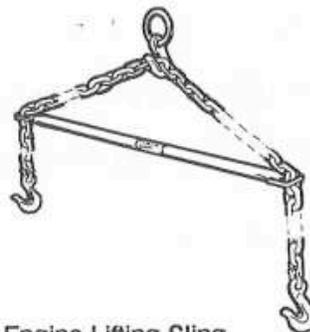
900 5 Speed

Special Tools

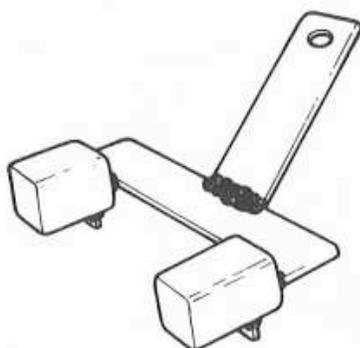
SAAB



Transmission Holding Fixture
83 90 460



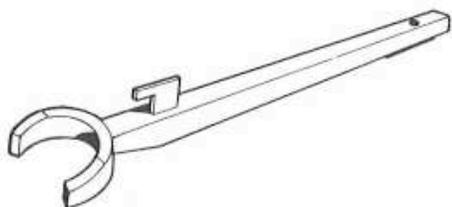
Engine Lifting Sling
83 92 409



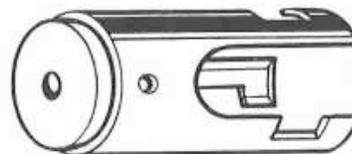
Suspension Block
83 93 209



Pressure Plate Spacer Ring
83 90 023 (small diameter)
87 91 618 (large diameter)



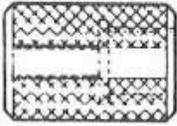
Clutch Removal Lever
83 93 175



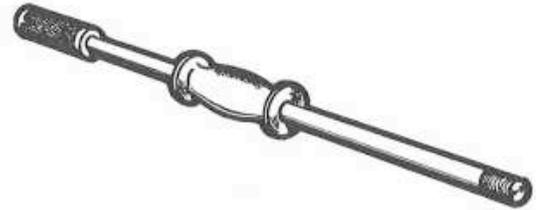
Upper Chain Sprocket Puller
87 90 891

900 5 Speed

Special Tools



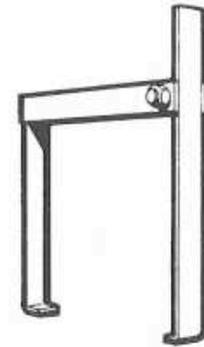
Input Shaft Puller
87 90 917



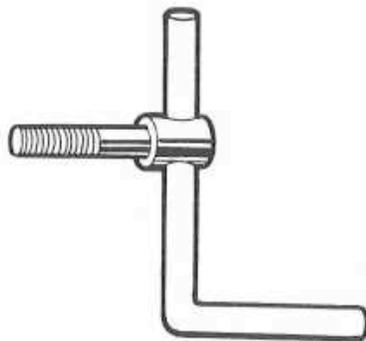
Slide Hammer
83 90 270



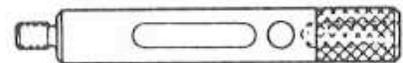
Layshaft Puller
83 90 049



Differential Side Cover Puller
87 90 776



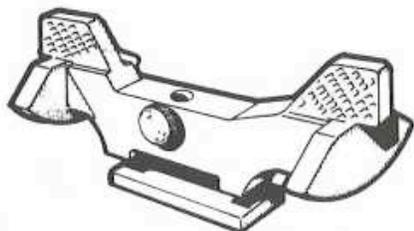
Pinion Shaft Press
87 90 511



Pinion Shaft Press Spacers (4)
87 90 909

900 5 Speed

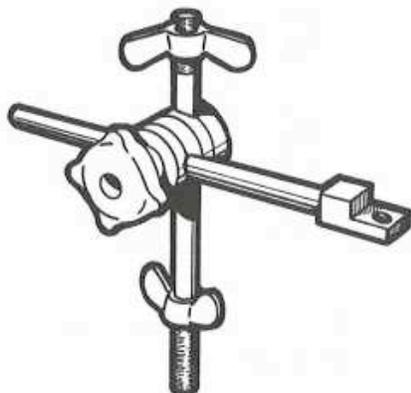
Special Tools



Pinion Depth Gauge
83 90 155



Dial Indicator
78 40 622



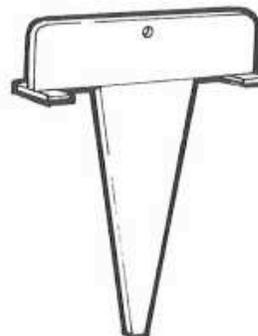
Dial Indicator Holder
87 90 727



Spring Scale
83 90 130



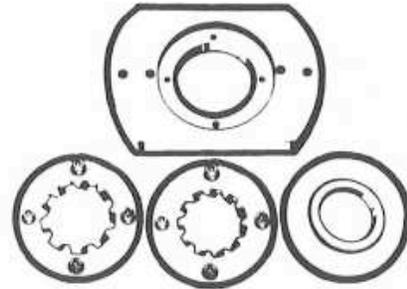
Differential Bearing Preload Tool
87 90 818



Stack Height Gauge
87 90 552



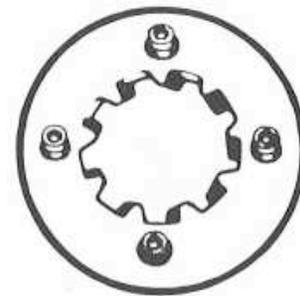
Pinion Shaft Holder
83 90 064



Pinion Holding Fixture
87 90 636



Pinion Nut Wrench
87 90 453

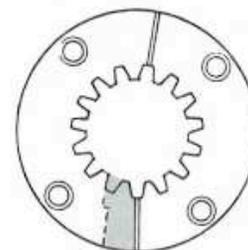


9:33 Pinion Fixture Insert
87 91 097

9:35 Pinion Fixture Insert
87 90 651



Pinion Bearing Installation Tool
87 90 925 (-88)
87 91 972 (89-)



Input Shaft Bearing Puller
87 90 933

(Shaded area shows shop modification for M89 transmission)

900 5 Speed

Special Tools

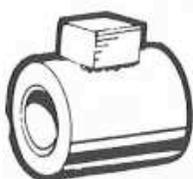
SAAB



Reverse Gear Lock
87 90 503



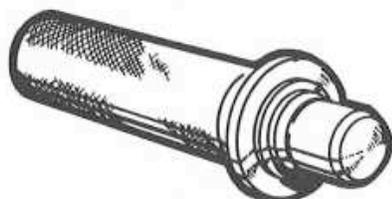
Selector Shaft Seal Remover
87 90 677



Selector Shaft Seal Installer
87 90 685



Drift, Bearing Installation
83 90 189



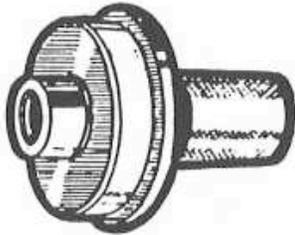
Inner Driver Seal Installer
87 90 800



Input Shaft Bearing Drift
78 41 075

900 5 Speed

Special Tools



Inner Driver Support Bearing Drift
78 41 141



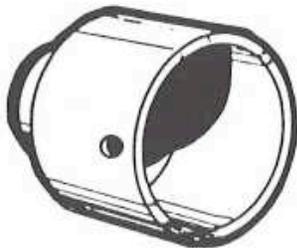
Inner Driver Installation Drift
78 41 067



Pinion Shaft Drift
83 90 148



Input Shaft Housing Support
Pinion Bearing Housing Support
83 90 098



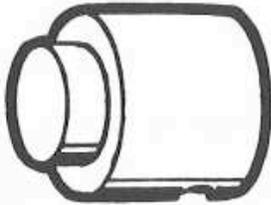
Differential Bearing Race Drift
83 90 114



Pinion Bearing Race Drift
87 90 461

900 5 Speed

Special Tools



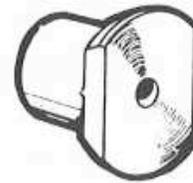
Differential Bearing Race Drift
87 90 487



Clutch Seal Driver
83 91 997



Input Shaft Bearing Race Drift
83 90 312



Pinion Bearing Race Remover
83 90 106 (-88)
87 91 964 (89-)



Upper Sprocket Bearing Driver
87 90 859



Pinion Housing Guide Pins
87 90 438

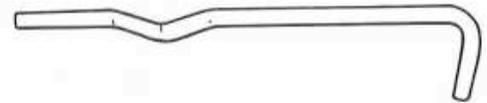
900 5 Speed

Special Tools

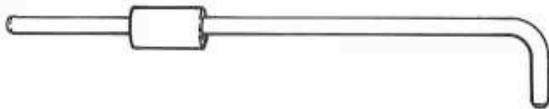
SAAB



Selector Housing Nut Socket
87 90 370



1986 1/2 - 1989 Selector Shaft Lock
87 91 576

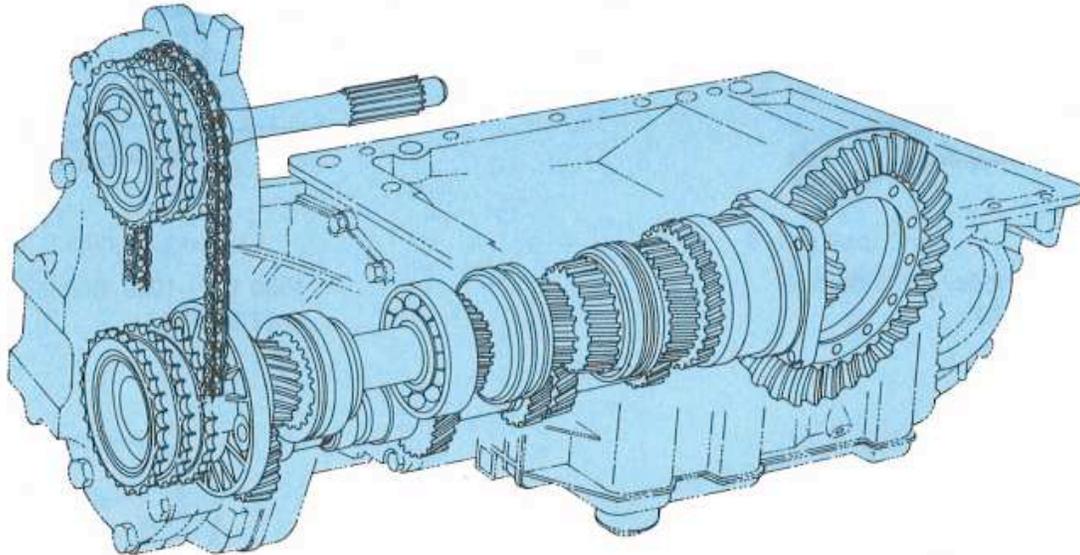


1990- Selector Shaft Lock
87 91 998

900 5 Speed

SAAB

Gearbox Description

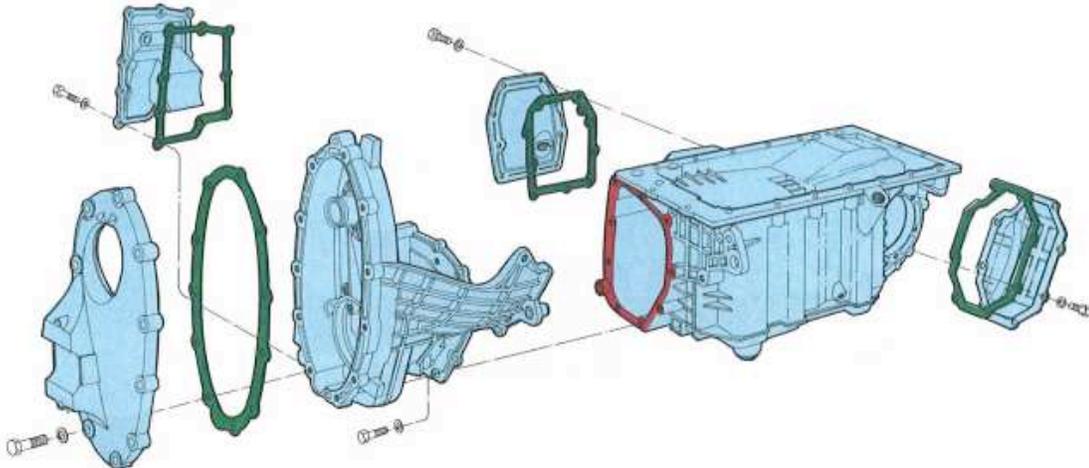


The 900 5 speed transmission is designed and produced by Saab. Notable features of this design are the chain primary drive and "backwards" engine placement. The chain drive makes it possible to easily alter drive ratios without changing the ring and pinion and the unusual engine orientation permits you to quickly change the clutch without removing either the engine or transmission. The maincase casting forms the engine crankcase but engine and gear oils are separate.

900 5 Speed

SAAB

Gaskets and Sealing Surfaces



GASKETS

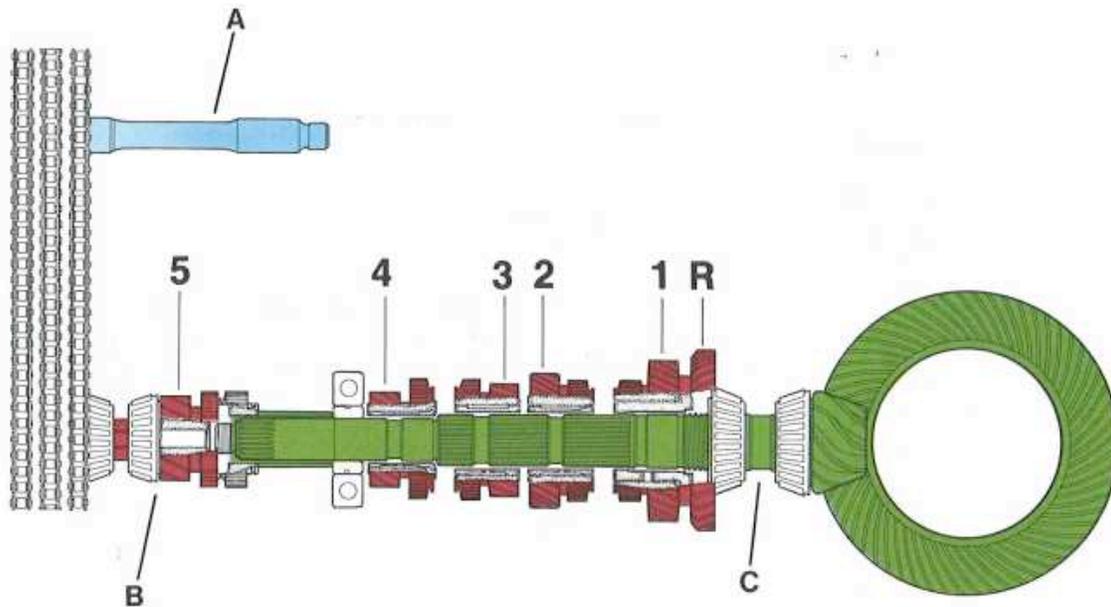
The front, rear and side covers are sealed with gaskets. No additional gasket compound is necessary.

METAL TO METAL

The joint between the maincase and primary housing is a metal to metal fit. Use of a gasket would alter internal clearances. The surfaces must be clean and undamaged. Use **Loctite 518**, an anaerobic compound, *(red above)* not blue goo.

BOLT THREADS

All bolts with holes drilled into the transmission portion of the case must be treated with **Permatex Aviation Gasket Compound** (not needed on new pretreated bolts).



Power is transmitted through the transmission via the following shafts and gears.

- A. Clutch shaft; splined to the upper primary chain sprocket, easily removable for clutch work.
- B. Input shaft; splined to the lower primary chain sprocket. Fifth gear (actually the cluster shaft input gear) is part of this shaft.
- C. Pinion shaft; reverse gear and the synchro hubs are splined to this shaft. First, second, third and fourth gears turn on bushings which slip over the pinion shaft.

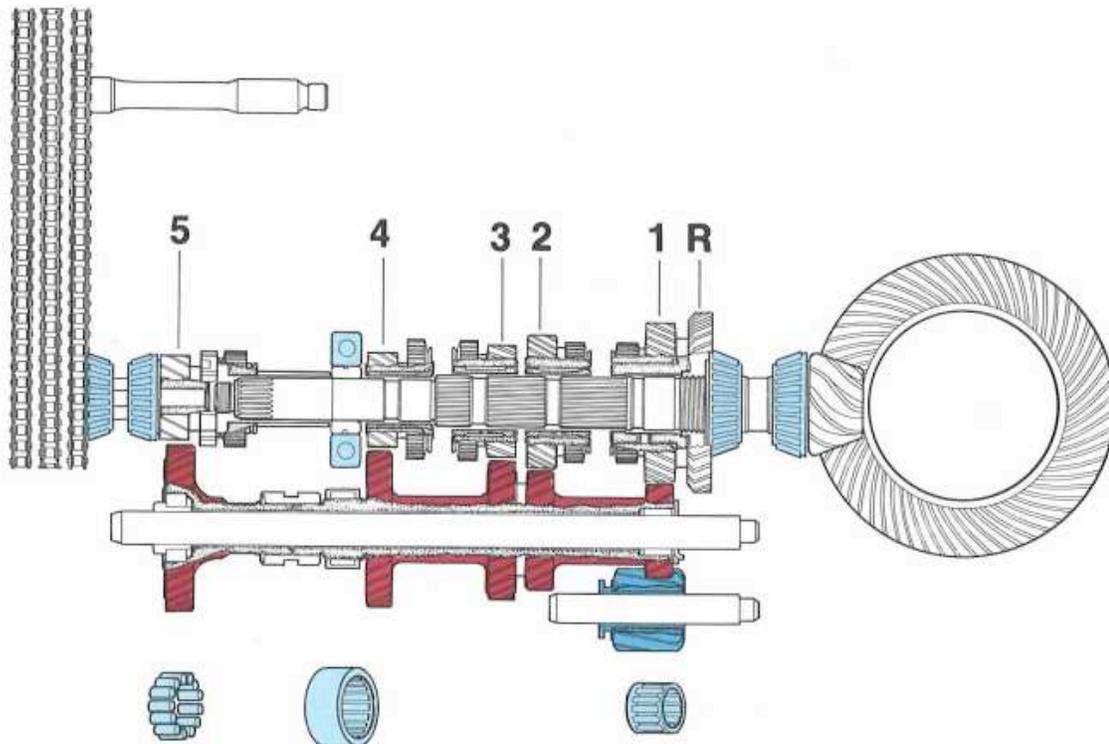
Matched Gears

Only the ring and pinion are a matched set, all others may be replaced individually.

900 5 Speed

Construction - Cluster Gear

SAAB



Cluster Gear

Also known as countershaft or layshaft. The cluster gear is built up of two segments. The input or fifth gear portion is joined to the main section by a splined bushing locked in position with a snap ring.

Reverse Idler

The reverse idler is in constant mesh with the cluster gear and acts as a bridge between the cluster gear and reverse gear on the pinion shaft. These are the only sliding mesh gears in the transmission and, accordingly, the first to be damaged by abuse.

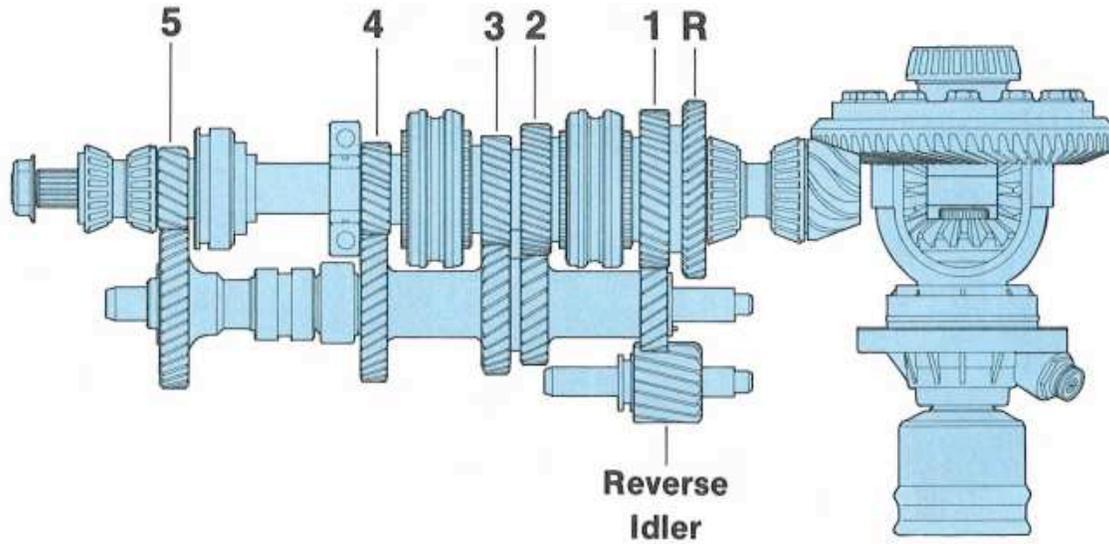
Bearings And Thrust Washers

The transmission utilizes taper roller bearings, straight loose rollers, ball bearings, needle bearings, bushings and metal to metal (oil film) designs. The size, design and roller count of these bearings has changed as the transmission evolved. Always carefully compare bearing numbers and roller counts when rebuilding.

900 5 Speed



Power Flow



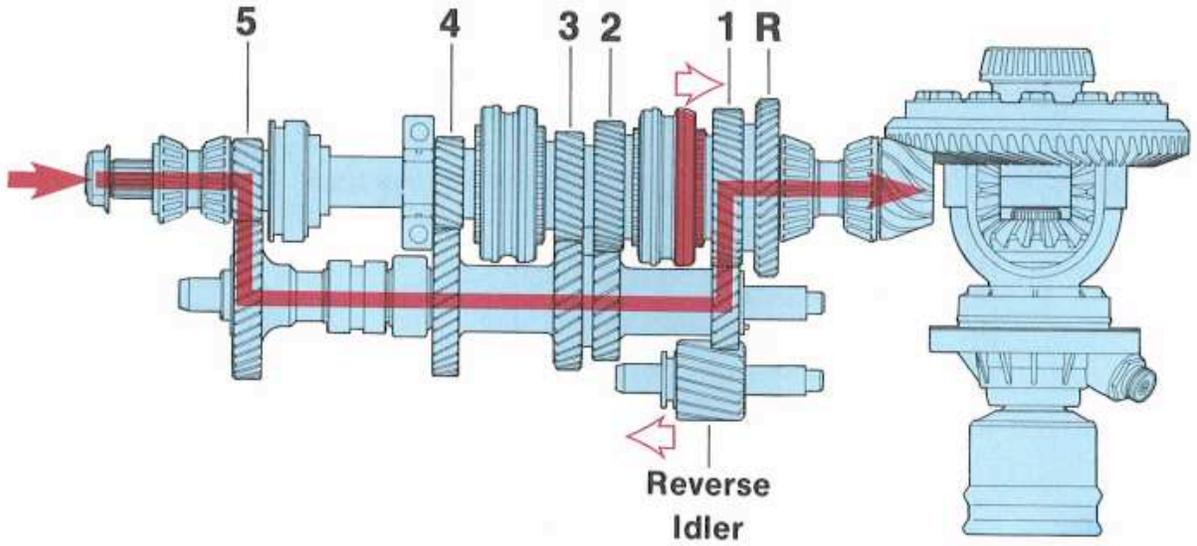
An important part of analyzing transmission complaints is understanding which components are involved in the affected gear(s). The following pages show the applied gears and synchronizers in each range.

900 5 Speed

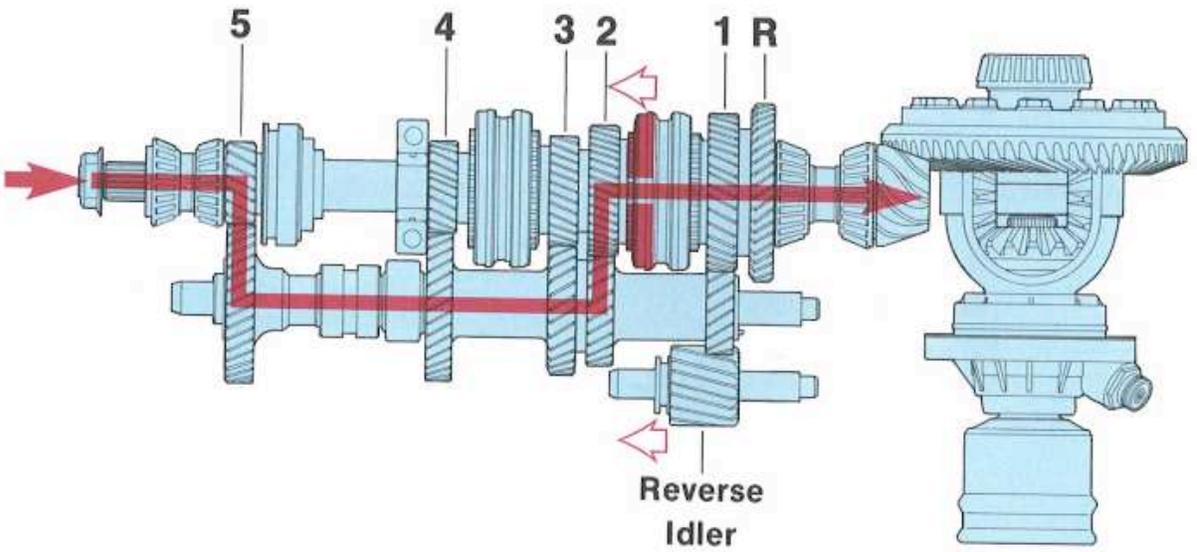


Power Flow

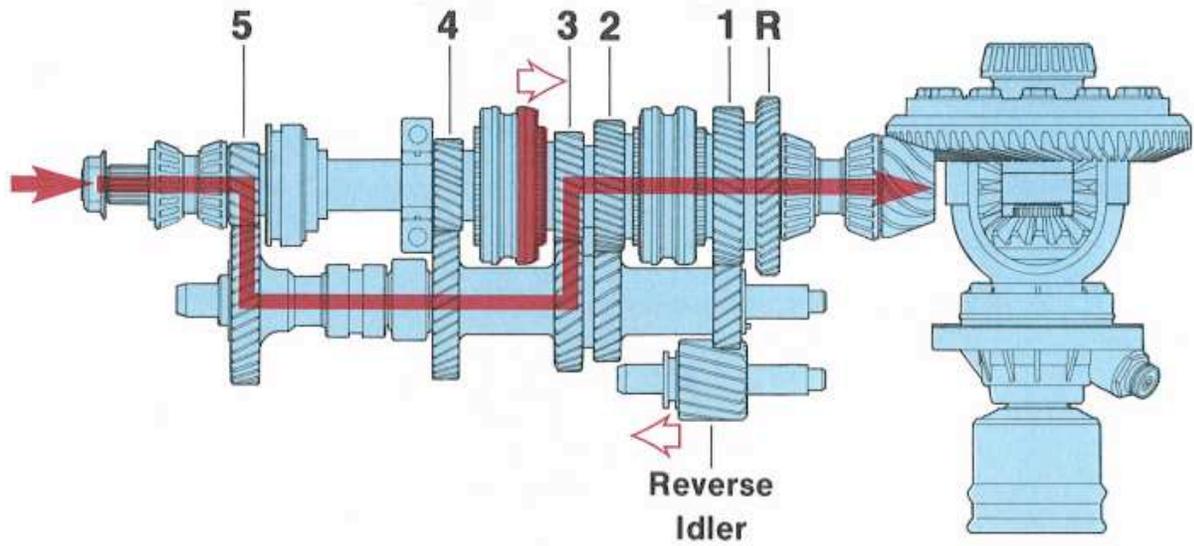
First Gear



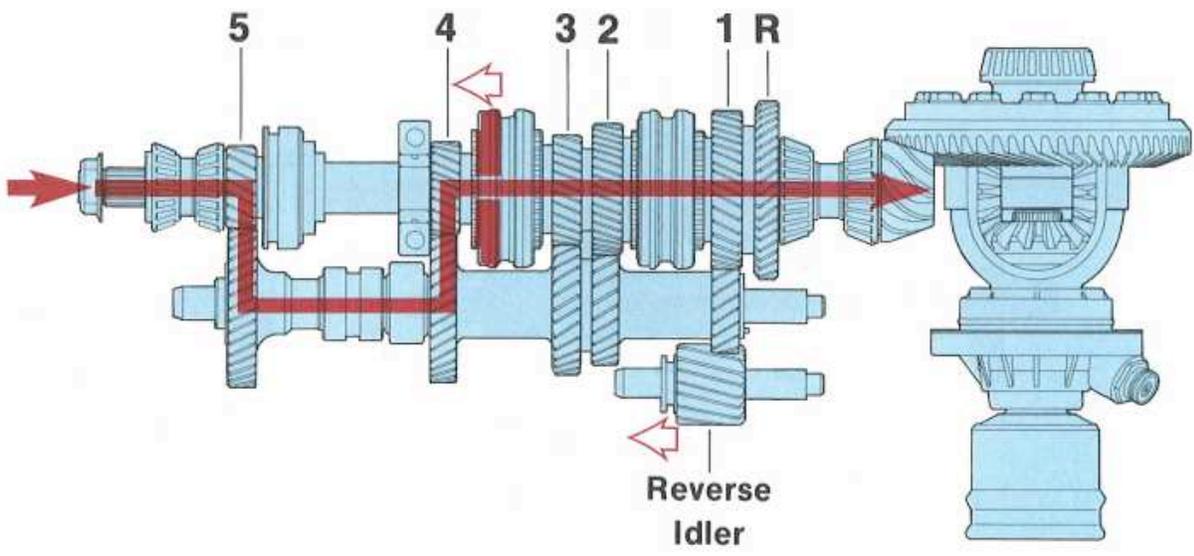
Second Gear

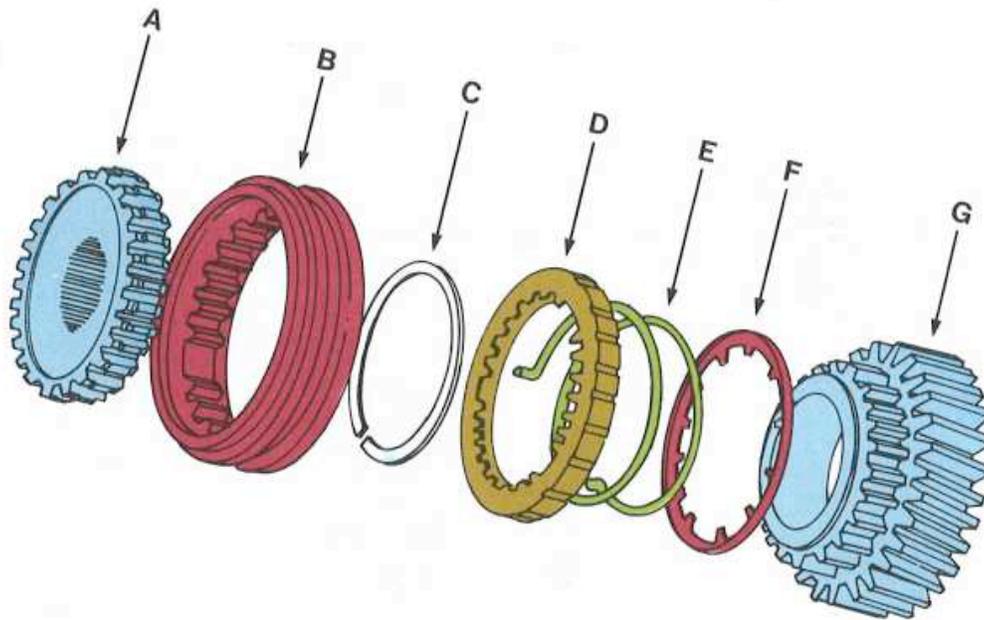


Third Gear



Fourth Gear





The synchronizer assembly has two basic functions; first to match (synchronize) gear speed to pinion speed and, once this has occurred, lock the gear to the pinion shaft.

Like many of the components in the transmission there are several variations of each of the parts shown above, most of which are close enough in appearance to interchange. These differences are covered in detail in the rebuild guide portion of this book. Always check part numbers and identifying marks before installing replacement parts. It can mean the difference between a successful repair and a comeback.

- A Hub-splined pinion
- B Sleeve
- C _____
- D Synchronizer ring
- E Synchronizer spring [Different strengths for each gear]
- F Guide ring
- G _____

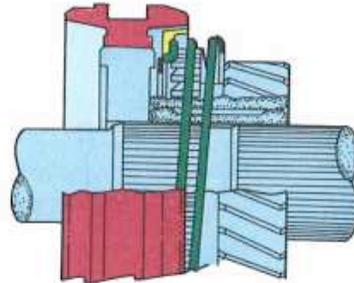
900 5 Speed



Synchronizer Operation

Neutral

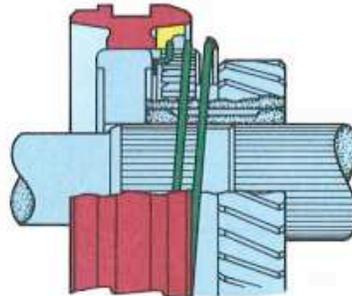
The synchro sleeve is centered on the hub. The synchro ring is in contact with its retaining ring but not with the tapered face of the sleeve.



Neutral

Partially Engaged

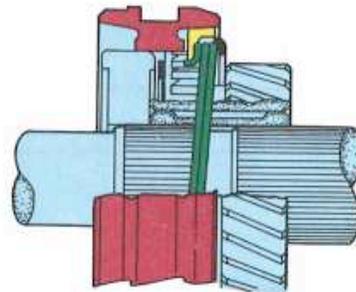
The synchro sleeve has moved slightly to the right towards the gear. The synchro ring is in contact with the sleeve, the friction created between these two components starts to "synchronize" gear and pinion shaft speed. The amount of friction is dependent on spring tension, oil viscosity and temperature, etc.



Partially Engaged

Fully Engaged

After the synchro ring has matched the speed of the gear to that of the pinion shaft the splines on the I.D. of the sleeve bridge the splines on the O.D. of the hub and gear. These splines are what takes the abuse when the synchro is weak or someone "misses" a shift, not the actual gear teeth.



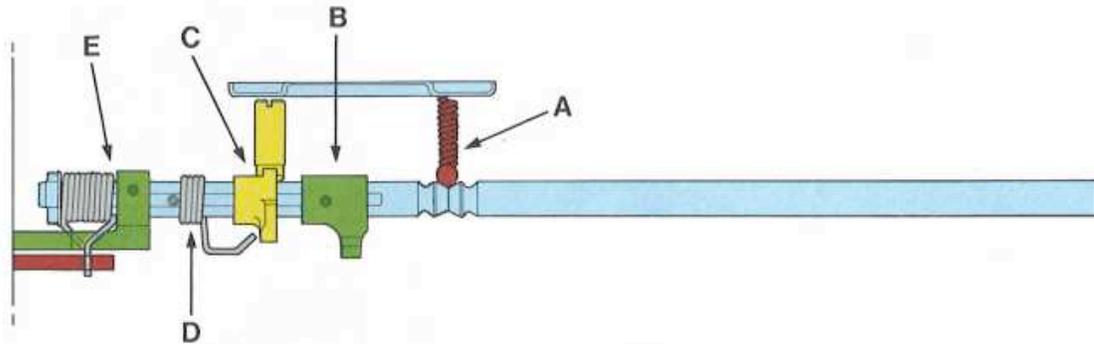
Fully Engaged

900 5 Speed

Selector Mechanism



Must align using internal shims



Name

Function

	Name	Function
A	Ball detent	
B	Engage Finger	
C	Interlock	
D	For reverse "synchron"	
E	Centers into in line 3rd	

The selector mechanism located inside the transmission is responsible for a number of functions. In addition to selecting gear ratios the mechanism blocks the driver from simultaneously engaging two gears, provides a simple synchronizer function for reverse gear, helps lock the transmission into gear and, in later production, centers the shift lever in the selector gate. The selector shaft itself is not adjustable but there are both external adjustments (shift console and selector shaft coupling) and internal tolerances (stack height) which are controllable and can greatly affect shift quality and function.

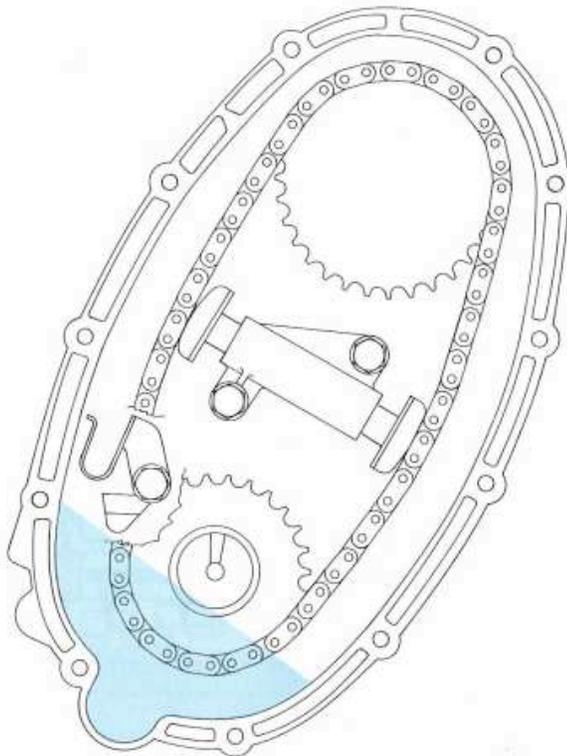
900 5 Speed

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Lubrication

Oil Specification

Only two basic types of oils are specified for this box, engine oil 10W-30 or 10W-40 and 75 weight GL 4 or GL 5 gear oil. **Never** use a heavier oil such as a multi weight gear oil, both shift quality and bearing lubrication will suffer, particularly in cold weather.



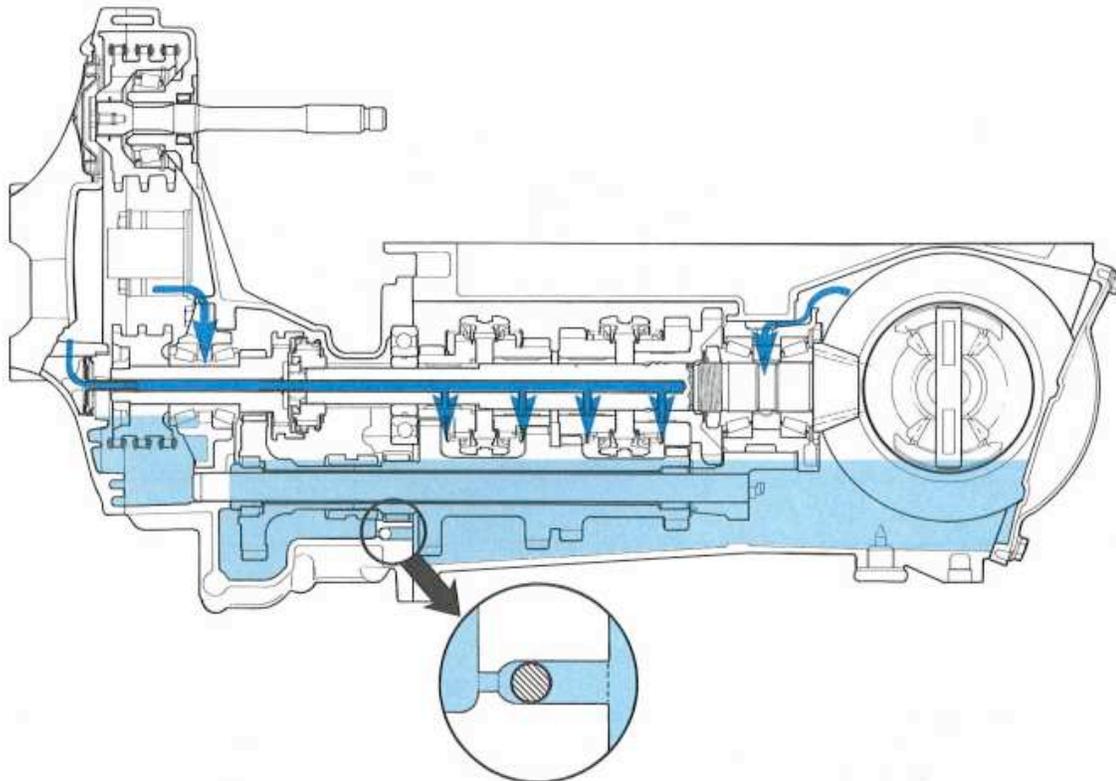
Oil Level

The primary housing has a series of oil collection devices, not the least of which is the chain tensioner. Incidentally, it is possible to install the tensioner upside down with the collecting cup on the bottom which makes trapping oil rather difficult. When installing a rebuilt transmission prefill the primary housing with approximately one pint of oil through the input shaft cover opening to insure good lubrication and tensioner action on start up.

Lubrication

Oil Level

There is a check ball located in the primary case whose function is to prevent gravity from transferring all the oil into the primary housing and starving the final drive when on a steep downgrade. This is a passive device and requires no regular service. A similar function is performed by the single metal shield on the firewall side of the ball bearing supporting the pinion shaft directly above the check ball. Installing a bearing from a jobber without this shield or reversing the bearing would cause oil level or durability problems.



Oil Flow

The bearings, bushings, chains, and gear surfaces are lubricated by a combination of splash feed and gravity flow through a series of collecting troughs and drilled passages. This is an effective, trouble free system. The only common problem has been with technicians failing to clean these passages during a rebuild and recontaminating the gearbox.

900 5 Speed



Production History

Year	Identifying Characteristics	Major Changes, Rebuild Notes
1980	Sand cast maincase, no mounting bosses for the turbo exhaust pipe bracket.	<ul style="list-style-type: none">● Cluster gear and third gear guide ring modified during the model year to prevent loss of third gear synchro spring.
1981	Die cast maincase with two mounting bosses for the turbo exhaust pipe bracket.	<ul style="list-style-type: none">● Snap ring on forward end of pinion shaft must be installed with sharp edges facing forward.
1982	Visually the same as 1981, check the I.D. plate.	<ul style="list-style-type: none">● New ring and pinion, 9:33 (3.67:1) rather than 9:35 (3.89:1).● Larger rear cluster gear bearing, new cluster gear.● Stronger detent spring (recommend retrofitting to older boxes).● Snap ring at front of pinion shaft replaced with a nut (do not over-torque nut).
1983 & 1984	Large dipstick hole for combined oil filler/dipstick (reducer bushing available to install gearbox in older cars).	<ul style="list-style-type: none">● Cast pinion bearing housing replaced die-cast version, all die-cast housings should be scrapped.● Modified synchro cone angle, new synchro sleeves.● Asymmetrical synchro sleeve teeth on 2nd and 3rd gear.● New differential assembly with roll pin locking the cross shaft in position.

900 5 Speed

Production History

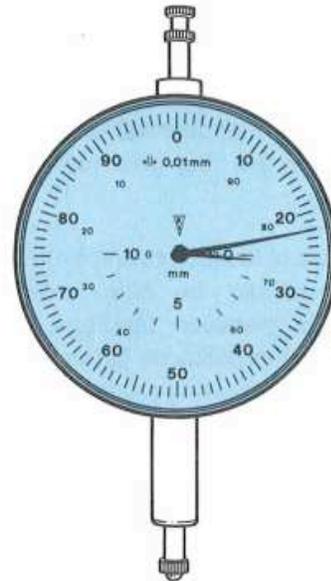


Year	Identifying Characteristics	Major Changes, Rebuild Notes
1985	Turbo models have a heavier inner driver with corresponding changes to axles, boots and trunnion bearings. The inner driver has two rather than three external ribs.	<ul style="list-style-type: none">● Extended input shaft on turbo models with support bearing in the front cover.● Input shafts, bearing housing and spacers modified during the year to reduce chain wear by offsetting the lower sprocket.● Always verify that the transmission has the correct inner drivers before installation.
1986 - 1988	Large inner drivers phased in on non turbo models as running change during 1986. Also changes to the internal selector mechanism identified by a modified rear cover and hole in selector shaft for linkage adjustment tool. Modified front cover for hydraulic front mount on turbo.	<ul style="list-style-type: none">● Gearboxes with new selector mechanism must not be interchanged with the older style. If you mix and match you could have a car with two shift lever centering mechanisms fighting each other, or non at all.
1989	Strengthened, upgraded transmission. No major external differences, check the I.D. plate.	<ul style="list-style-type: none">● All major internal components changed including ring and pinion (9:35 tooth count), larger rear pinion bearing, upgraded cluster shaft bearings, stronger gears, etc.
1990	Rear cover modified to accommodate a transmission oil filter, new "boxy" shape.	<ul style="list-style-type: none">● New selector rod locking tool introduced to fit in the modified rear cover.

The basic measuring tools for the 900 manual transmission are a dial indicator (Saab special tool no. 78 40 622), feeler gauges and a caliper or micrometer. These should all be metric, both to eliminate errors from translating specs back and forth and because of the much greater accuracy inherent in the metric system (the standard unit, 0.01mm, is less than 0.0005 inch, 1/2 of the standard graduation of the English system).

The dial indicator shown has two hands. The larger one records movement in increments of one one hundredth of a millimeter (0.01mm), the shorter one records complete revolution of the larger one (1 graduation = 1mm). Always set the dial indicator up so that the small hand is not near the end of the scale (you may run out of meter movement) and always check both scales (you may set a + 5 pinion at + 1.05mm if you ignore the small scale).

In addition to making the standard backlash and pinion depth checks, the dial indicator may be used as a substitute for a micrometer or caliper by mounting it in the fixture for measuring valve pallet thickness.



900 5 Speed

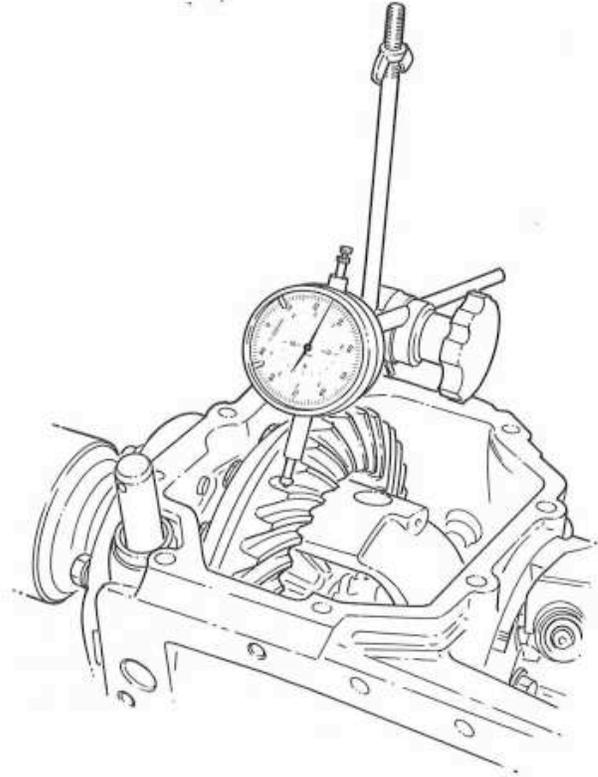


Teardown – Checking Backlash

Anytime a ring and pinion has run more than 6,000 miles, a definite wear pattern has been established. To avoid changing the wear pattern and increasing final drive noise, you must check backlash and pinion depth before stripping the box.

When checking backlash, observe the following steps:

1. Set the dial indicator so that the plunger is at right angles to the ring gear tooth to insure a true reading.
2. Measure at four points and average the readings. There should be little variation (maximum 0.05mm) between readings. If it is greater recheck, there may be dirt on a tooth or you may have rocked the ring gear too hard and moved the pinion.
3. When you remove the differential, tie strap or bolt the shims to the side covers. These shims control both backlash and carrier bearing preload, lose a shim now and you will have to build your shim pack from scratch during reassembly.



Stock Clearance, New Gears
0.17 mm ± 0.05 mm

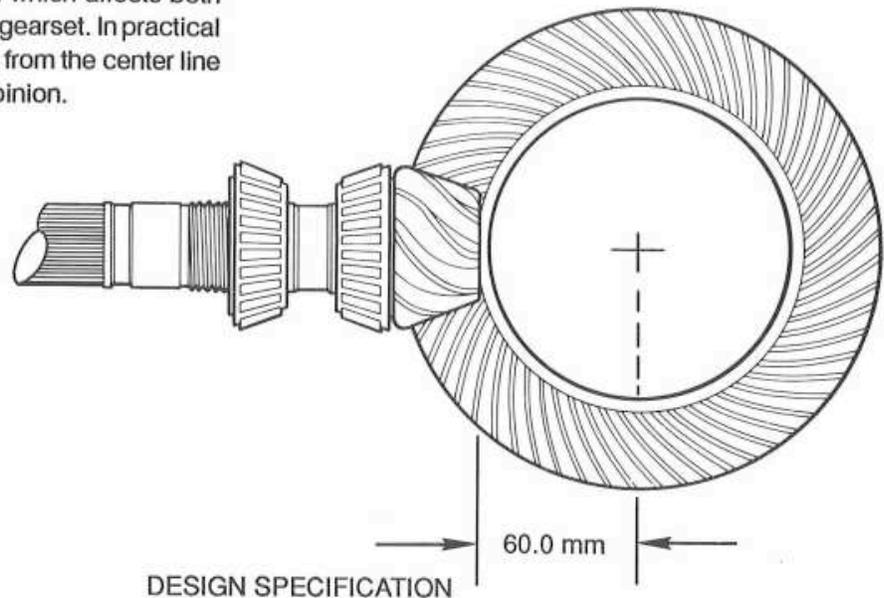
Thickness	Part Number
0.10 mm	83 41 604
0.15 mm	83 41 612
0.30 mm	83 41 620
0.50 mm	83 41 638

900 5 Speed

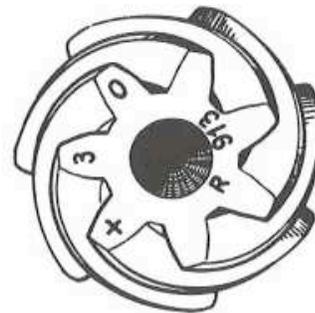
SAAB

Teardown – Checking Pinion Depth

As the name implies pinion depth is an indication of the depth of engagement between the pinion and ring gear. Like backlash, this is a dimension which affects both the noise level and durability of the gearset. In practical terms, pinion depth is the distance from the center line of the ring gear to the face of the pinion.



On a Saab the gearsets are designed to run quietly when this dimension is 60.00 mm. In the real world, due to normal production tolerances, this "ideal" setting varies from set to set. During its production each matched set of gears is tested to find its optimum setting and a number showing that setting is etched on the pinion face along with the I.D. number that matches the ring gear and pinion.



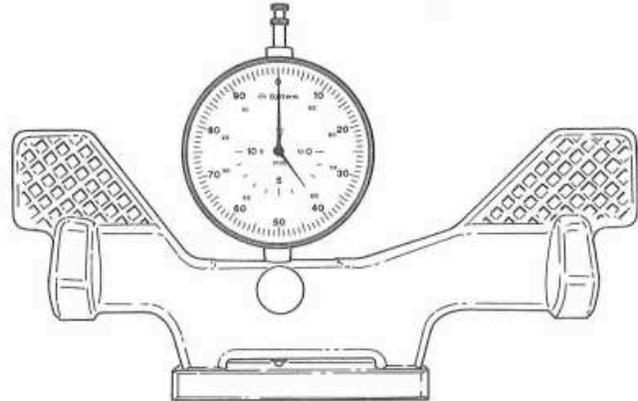
900 5 Speed

SAAB

Teardown – Checking Pinion Depth

Occasionally a gearset will run best at the design setting of 60 mm. That pinion will be marked 0 meaning “no deviation from the standard setting”.

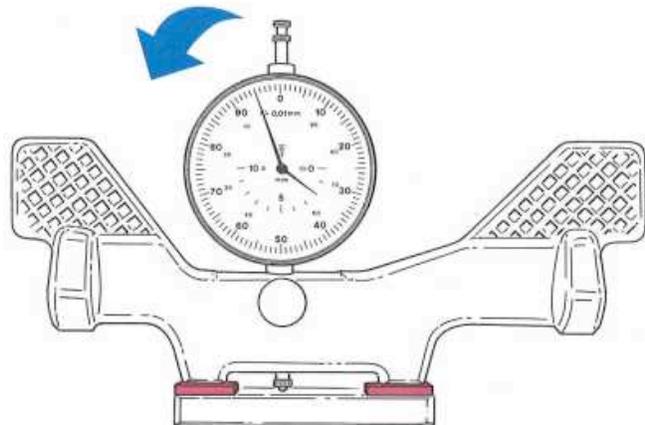
This corresponds to the reading you will see when the dial indicator has been “zeroed” on the pinion depth gauge.



The next ring and pinion produced might run best when the pinion moves **away** from the ring gear center line by 0.05 mm. This means the measured distance has increased to 60.05 mm and the pinion face will be marked +5.

You can simulate this dial indicator reading by slowly lifting the pinion depth gauge off its base plate until the pointer moves 5 graduations from 0. Note that as you increase distance the dial indicator moves counter clockwise.

Plus Pinion Settings Move The Dial Indicator Counter Clockwise



900 5 Speed

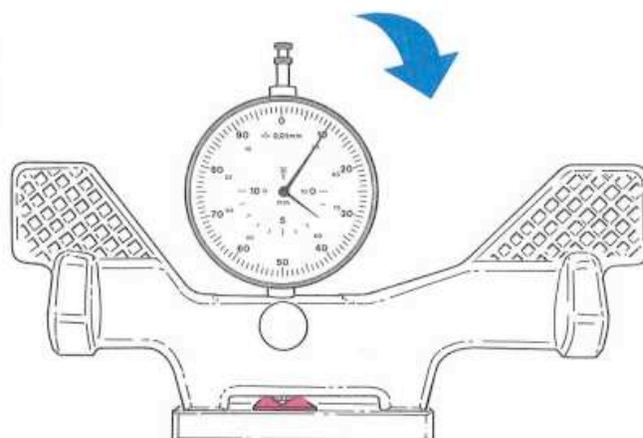


Teardown – Pinion Depth Checks

The third set of gears checked may be happiest when moved **closer together** by 0.10 mm. The measured distance has thus been decreased to 59.90 mm and the pinion face will be marked **-10**.

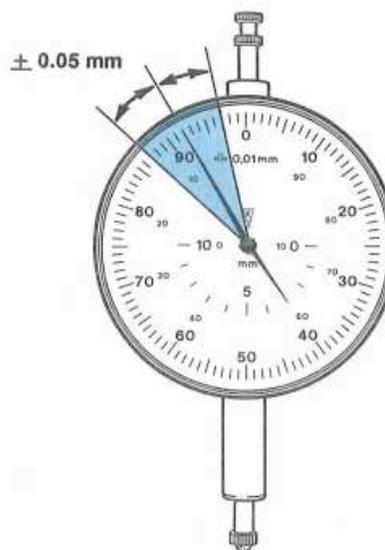
You can simulate this by slipping a 0.10 mm shim between the dial indicator plunger and the base plate of the pinion depth gauge. This will move the dial indicator reading 10 graduations clockwise from 0.

Minus Pinion Settings Move The Dial Indicator Clockwise



Tolerance

All settings have a tolerance of ± 0.05 mm.
For example, a +8 pinion could read anywhere between +13 and +3 and be within specification.



Pinion Shims

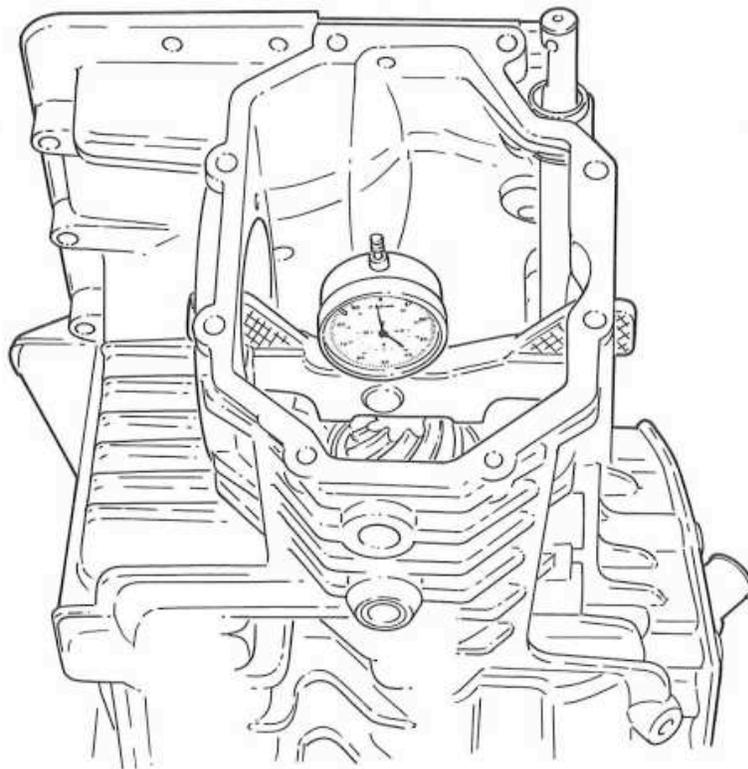
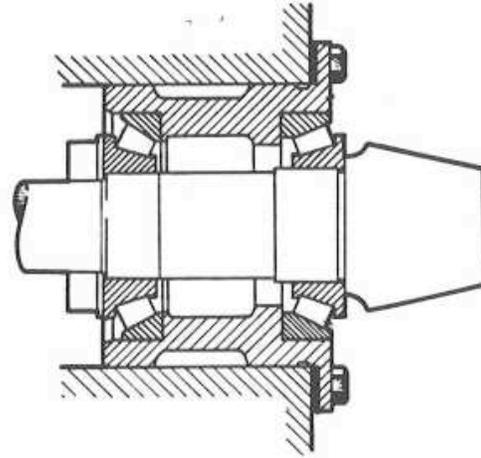
Thickness	-88	89-
0.10 mm	87 24 569	87 26 259
0.15	87 24 577	87 26 267
0.30	87 24 585	87 26 275
0.50	87 24 593	87 26 283

900 5 Speed

SAAB

Teardown - Pinion Depth Checks

Pinion depth is easily adjusted by changing the shims sandwiched between the pinion housing and maincase. There is a one to one relationship between pinion depth and shim thickness, no formulas or calculations are needed.



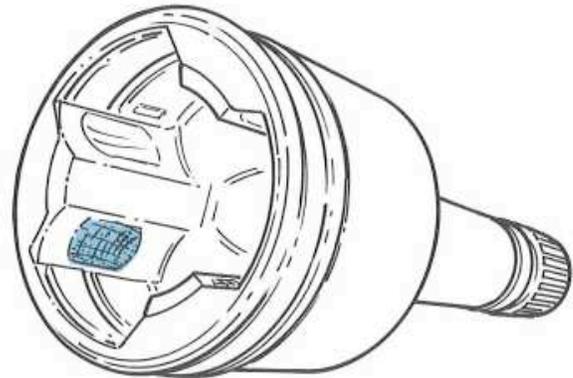
Differential Spider Gear Shafts

Inspect the differential spider gear shaft for wear under the spider gears. This is particularly important if there is evidence of lubrication problems. On earlier models where the shaft was retained by snap rings the shaft **should not** rotate easily in the differential housing. If still usable turn the shaft 90° to provide a fresh seat for the inner driver plungers.

Inner Drivers

Wash and inspect the inner drivers, wear will take place where the axle trunnion bearing contacts the driver. During the rebuild you should swap the drivers from side to side. This will give the axle fresh contact points.

If there is substantial wear the owner will complain of a heavy vibration on acceleration as the axle drops into and climbs out of the wear pockets.



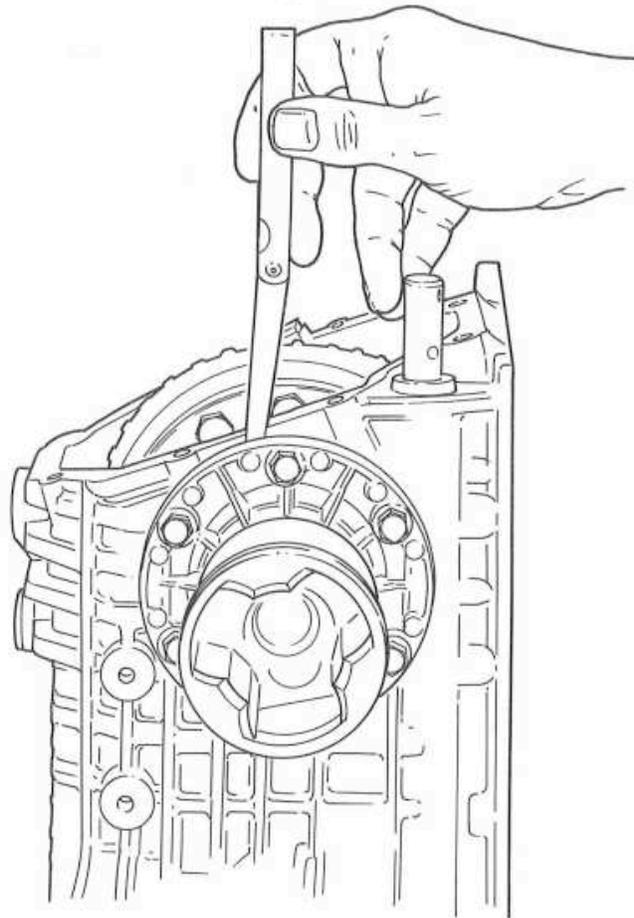
900 5 Speed

SAAB

Reassembly – Differential Bearing Preload

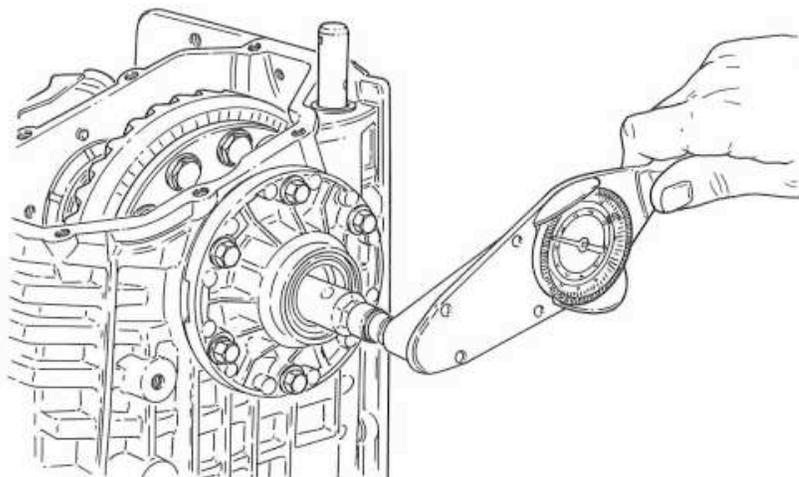
Note: The following procedure need only be followed in its entirety if major components have been replaced or the original shim pack lost. If you have the original shim pack and there have been no major parts changed bypass the first two steps and go directly to checking preload with a torque wrench.

1. Replace inner driver seals, pack between the seal lips with soft grease (Esso Nebula EP2 or equivalent). Lube the differential bearings with engine oil – **do not** use gear additives or snake oil. Install the differential and L.H. (with speedo drive) side cover without the driver or shims, torque the bolts to 14–18 ft lbs.
2. Install the R.H. side cover without the inner driver, shims or O ring. Tighten the bolts in three even stages to 20 inch pounds. Measure the clearance between the maincase and the side cover at three points and average the readings. Add 0.2 mm to this number and build a shim pack equal to this thickness.



Reassembly - Differential Bearing Preload

3. Verify that the total thickness is correct by installing all shims under the R.H. side cover, torque the bolts to 14 ft. lbs. Spin the differential at least 10 revolutions to seat the bearings and then measure preload with a torque wrench and tool 87 90 818. New bearings should show a drag of 16-25 inch pounds, used bearings 7-12 inch pounds. Alter the shim pack as needed to bring the preload within this range.



Once the correct shim pack has been selected remove the differential and tie strap the shims to the R.H. side cover.

Note: Do not change the total shim pack thickness after this point.

Thickness	Part Number
0.10mm	83 41 604
0.15mm	83 41 612
0.30mm	83 41 620
0.50mm	83 41 638

900 5 Speed

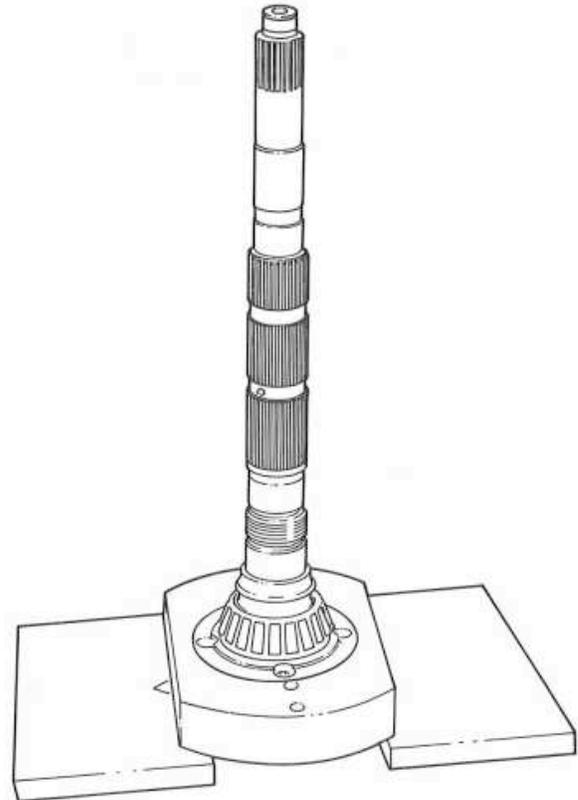
SAAB

Teardown – Pinion Bearings

To prevent damage to the pinion shaft threads drill away the staked flange of the pinion nut. Lock the pinion shaft in tool no. 83 90 064 and remove the nut. Press the forward pinion bearing and housing off the shaft. **Do Not** attempt to press off both bearings at once.

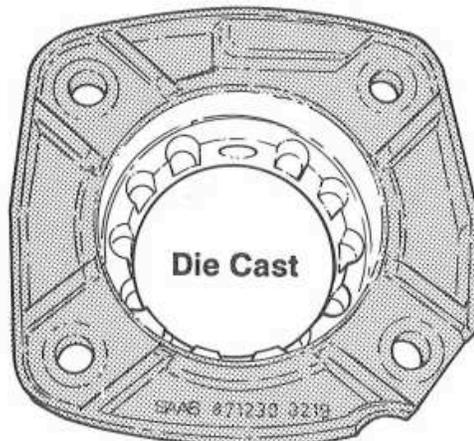
Select the proper pinion adaptor for tool no. 87 90 636, lube the pinion gear and press off the rear pinion bearing.

Note: The pinion will rotate as it passes through the fixture. To avoid binding and possibly chipping the trailing edges of the pinion teeth press the bearing off in stages, ease off on the press and reposition the pinion several times during the removal process.



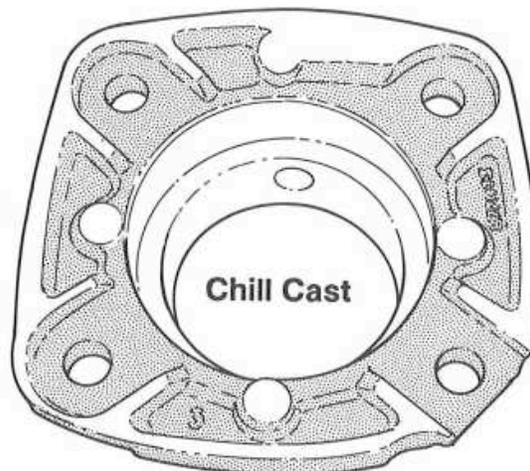
Pinion Bearings

The heart of the transmission is the pinion bearing. Unlike gears and synchros it is false economy to reuse pinion bearings (or any other bearing with more than a few thousand miles of service). If you have gone this far put in new bearings, the latest pinion bearings for 80–88 transmissions are of an improved “profiled” design, Saab P/N 87 24 890. Don’t just pull the universal number off the old bearings and go to a jobber, it will fit but it won’t be right.



Pinion Bearing Housings

Older 5 speeds used a die cast pinion housing characterized by its smooth surface finish requiring relatively little machine work. This style would fail under severe load causing extensive transmission damage, the complaint would usually be hard shifting and being locked in or out of gear. During 1982 production upgraded versions were introduced. The first, a short term solution, was sand cast and characterized by a rough finish and pinkish tint when new. The final solution was a “chill cast” design, Saab P/N 87 20 732.

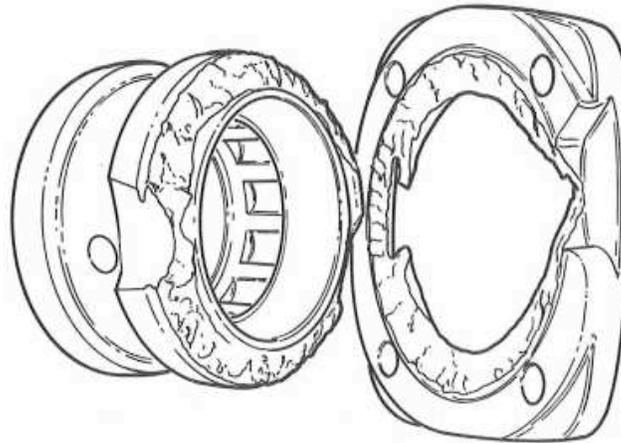


900 5 Speed



Parts Inspection – Pinion Bearings & Housings

Any of the original die cast housings should be scrapped even if they have not failed. An actual failure is easy to spot, the flange over the pinion depth shims separates from the rest of the housing. If this has happened, carefully inspect the main case for cracking in the bore where the pinion housing sits. You can also expect to find damage where the forward end of the pinion shaft and the input shaft come together.



900 5 Speed

SAAB

Reassembly - Pinion Bearings

Press a new rear pinion bearing on the pinion shaft using tool no. 87 90 636 and ring 87 80 925 (-88) or 87 91 972 (89-).

Note: Your tool for the 89 and later gearboxes may contact the step on the pinion shaft before the bearing is fully seated. The piston from an old slave cylinder makes a good press tool if this occurs.

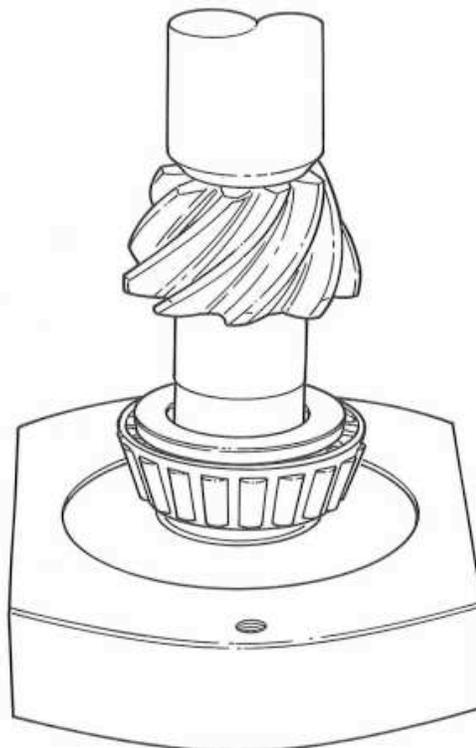
Install a **new** crushable sleeve, loosely assemble the pinion housing, pinion shaft and forward pinion bearing. Lubricate the bearings with engine oil.

Partially collapse the crushable sleeve by pressing against the inner race of the forward pinion bearing and the pinion head. **Stop** as soon as you feel any preload.

Clean and loctite a **new** nut, tighten it until you reach a rolling torque of 18-27 inch pounds (torque wrench) or a pull of 4.7 - 7.0 KG (spring scale). If you go too far strip the assembly, fit a **new** crushable sleeve and start again.

Note: Turn the pinion shaft at least 10 revolutions to seat the bearings before taking the preload reading.

Stake the shoulder of the nut when the proper preload is attained, use a rounded drift to avoid splitting the locking surface.



900 5 Speed

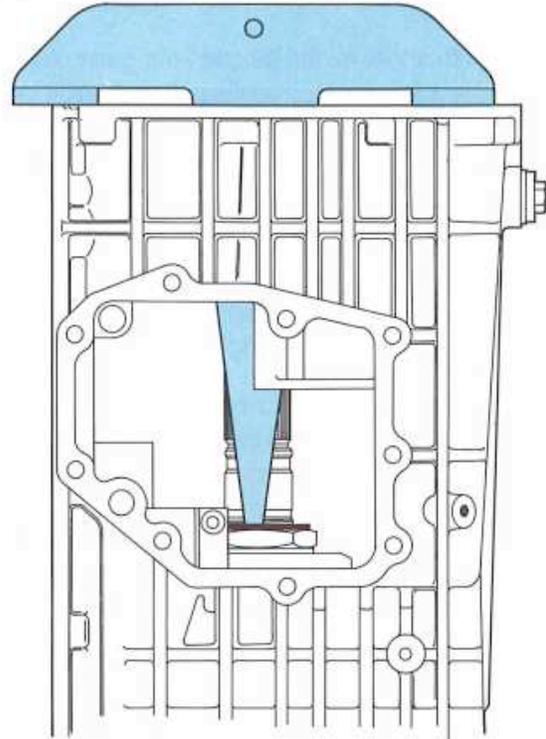
SAAB

Reassembly – Stack Height

The internal shift linkage in the 900 5-speed is not adjustable, its location is fixed by the position of the detent ball in the main case. In order to insure proper alignment between the shift forks and synchro sleeves the gear stack itself is adjusted. This is done by selectively fitting shims between reverse gear and the pinion nut. Failure to properly set this tolerance will result in incomplete synchronizer engagement and a tendency to pop out of gear.

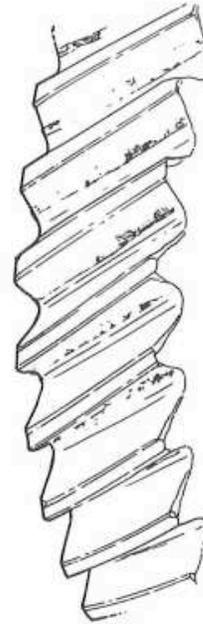
Note: This operation must be done following the final pinion depth adjustment – pinion depth affects stack height.

The sealing surface of the maincase must be clean in order to get an accurate measurement. Adjust the shim pack until there is the smallest possible clearance between the tip of tool no. 87 90 552 and the shim pack without lifting the tool away from the sealing surface of the main case. If using a universal depth gauge the clearance is 195.0 – 195.1 mm. Shims are available in thickness of 0.30, 0.40 and 0.50 mm.



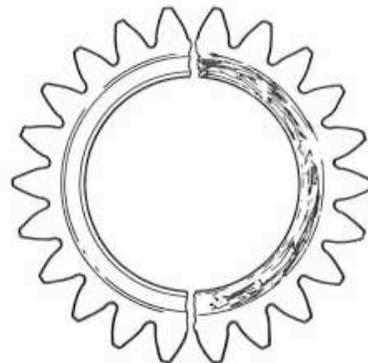
Gear Tooth Deterioration

Always carefully check gear teeth near the root for signs of pitting or spalling and other damage such as that caused by foreign objects or lack of lubrication.



Thrust Surfaces

All gears except reverse ride on bearings or bushings and, in the case of the forward gears, have thrust surfaces to control end float. Check the I.D. of the gear for signs of wear or lack of lubrication and inspect both end faces for signs of damage to the thrust surfaces. This is particularly critical on 4th gear where the stepped bushing will collapse if the 24mm pinion nut is overtorqued.



900 5 Speed

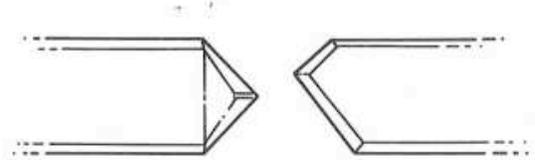


Disassembly Inspection – Synchronmesh Sleeves

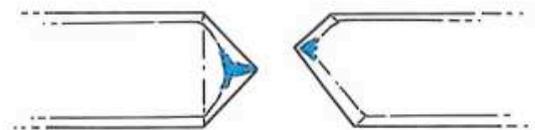
When should a part be replaced? The ability to make this decision marks the difference between a technician and a parts changer. Here are some guidelines:

Synchronmesh Sleeve Friction Surface

At higher mileage the tapered seat for the synchro ring develops a wear pattern. If rough or wavy the sleeve should be replaced. The finish on the surface is critical do not bead blast or otherwise attempt to recondition the sleeve.



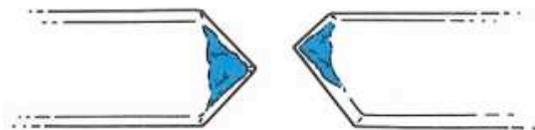
NEW



USABLE

Synchronmesh Engagement Teeth

These are the "gears" that grind when you miss a shift. A certain amount of wear at this point is inevitable, it is a waste of money to replace every gear or sleeve where someone has "kissed" the tip of the teeth.



SCRAP

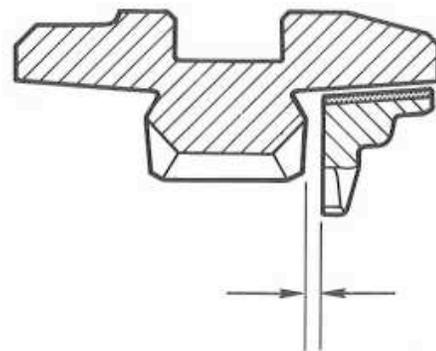
Disassembly Inspection – Synchro Rings

Many technicians automatically install new synchro rings during an overhaul regardless of whether or not the originals show any significant wear.

It is possible to accurately check the condition of the rings as follows:

- Inspect the ring visually for signs of damage to the splines, check the friction surface for damage or contamination from foreign material.
- If the ring passes this test drop it into a good synchro sleeve. Push down gently to seat the ring and measure the clearance as shown at three points. **Bronze rings** must have at least **1.5 mm**, **coated rings** at least **1.0 mm** clearance.

Note: It is good practice to check all synchro rings, new and used, before installing them in the transmission.



900 5 Speed



Parts Identification – Gears

There are three principle factors to be checked when replacing gears during an overhaul or repair, they are:

- Does the tooth count, diameter, etc. match?
- Has the bearing surface changed?
- Are the synchro sleeve engagement teeth the same?

Tooth Count

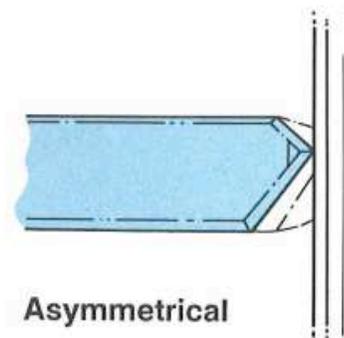
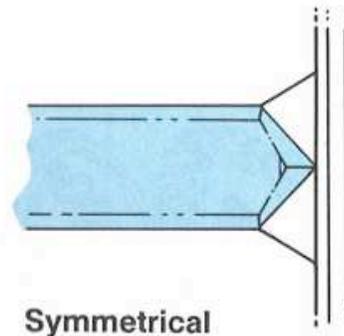
There are currently (spring of 90) three main families of gears that you will encounter during repair work; –1980, 1981–88, 1989–. Many of these gears are similar enough to one another so that is possible to put together a box with the wrong parts. Always check tooth count, outer diameter, root diameter and spacing. Important differences in the first two groups may be found on S.I. 05/82–567 (section 4, page 71 of bound S.I. Supplement No.3).

Synchro Teeth

In November of 1982 the tip angle of the synchro sleeve engagement teeth on 2nd and 3rd gears was changed to improve cold shifting characteristics. The teeth on the later gears are asymmetrical. The earlier style gears are no longer available.

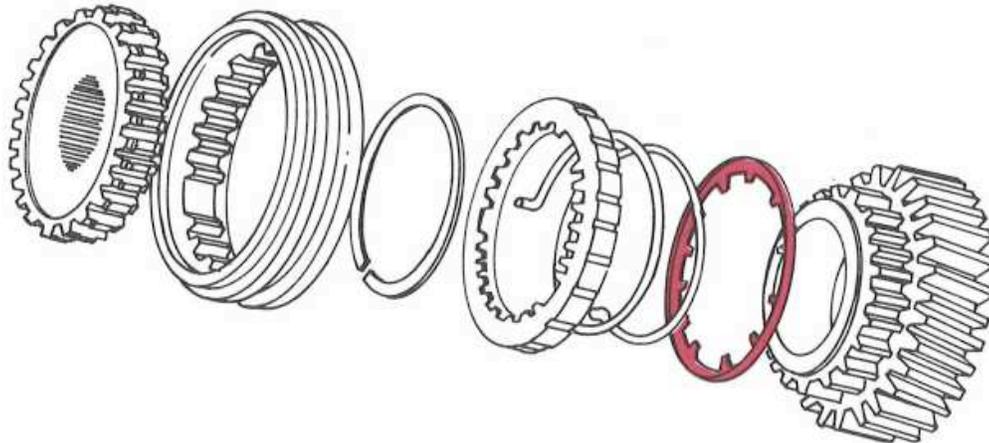
Bearing Design

The support bearings at both ends of the cluster gear were upgraded in 1982 production. In both cases the bore in the gear for the bearing was increased and the bearing altered accordingly. The older gears have been superseded by the newer style and the appropriate bearing. Again these changes are noted on S.I. 05/82-567. In 1989 production both bearings were further upgraded by increasing the roller count at the front to 15 and, in the rear, by installing a combination inner race and thrust washer between the layshaft and the cluster gear.



Guide Rings

Inspect all guide rings, particularly those on 3rd, 4th and 5th gears for wear or distortion. If deformed in any way replace it. The guide rings for 3rd and 4th gears are locked in position by wire lock rings. There have been two styles in use, circular and pear shaped. Pay attention to the fiche and do not mix styles, i.e. don't reuse an early circular ring with a new guide ring designed for a pear shaped lock.



900 5 Speed



Parts Inspection – Synchro Springs

There are four different synchro springs in use on the 900 5 speed, only 3rd and 4th gears share the same spring. Always check the springs for color coding and other characteristics before installing them. As you can see on the chart there is a substantial difference in spring tension and installing the wrong spring will create shift problems, (hard engagement, grinding into gear).

Gear	Color Code	Spring Tension	Part Number
1	BLUE	10 N	87 11 103
2	GREEN	30 N	87 15 120
3 & 4	WHITE	24 N	87 00 429
5	CLEAR	16 N	87 15 005

Inspect the springs for signs of damage or distortion, (1st gear spring is shorter than the others and is manufactured with a short angle or "kink" in the middle of the coil). Replace a spring if its stiffness doesn't seem right when compared to a known good spring or in relation to the other springs.

Note: During reassembly the ends of the springs for gears 1-4 must be visible through two of the "missing" splines of the synchro ring (11 splines apart). The spring ends for 5th gear must be 5 splines apart.

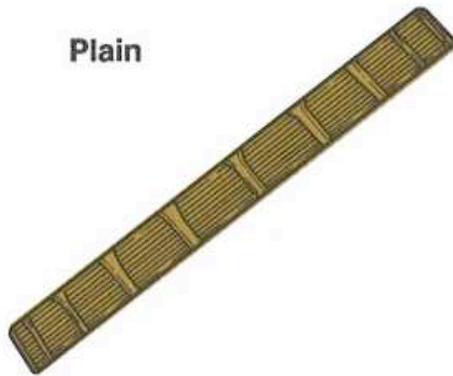


900 5 Speed



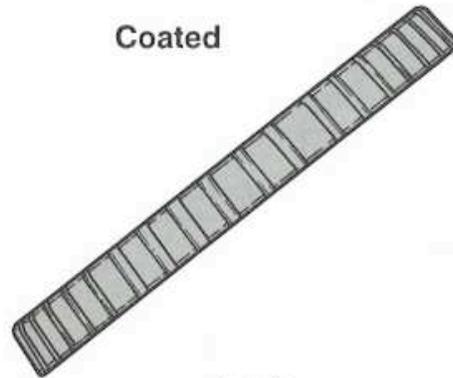
Parts Inspection – Synchro Rings, Hubs

At first glance there appear to be only two types of synchro rings in use on the 900 5-speed. Plain bronze with a sharply ribbed contact face for 1st and 4th gears and bronze with a gray coated contact face for 2nd and 3rd gears.



Plain

1 & 4



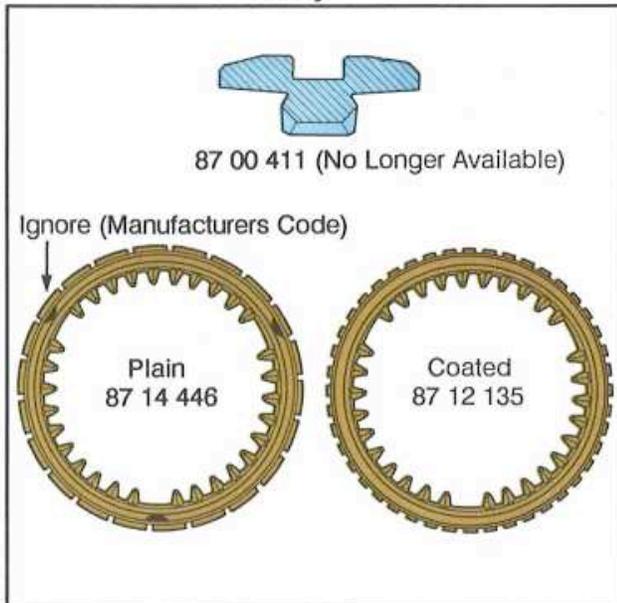
Coated

2 & 3

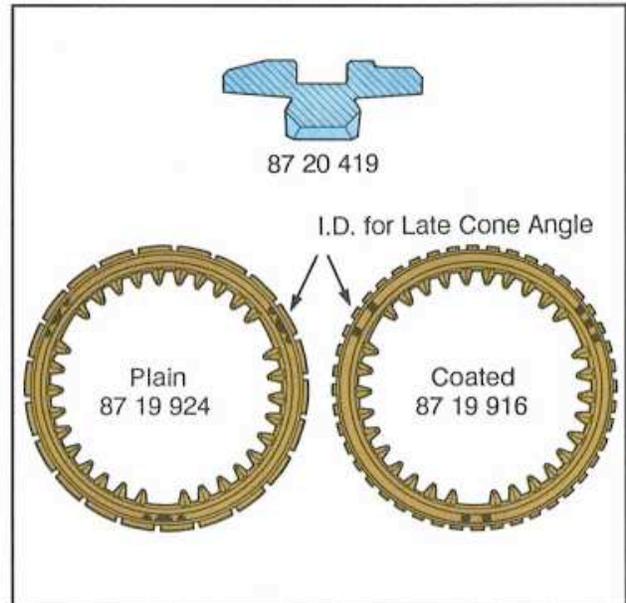
Closer inspection reveals that there are two versions of each type. During 1982 production the taper angle of the contact face was changed and the synchromesh sleeve was modified to match.

It is critical that these parts only be used in sets as shown below.

Early



Late



900 5 Speed

Parts Interchangeability – Gears & Synchro Rings



The early style synchro rings are still available for rebuilding 4 speed and early 5 speed transmissions, the synchro sleeve is **not**. If the synchro sleeve is damaged it must be replaced as a package by the newer style sleeve **and** both newer synchro rings.

The newer gears may be installed in older transmissions in two different configurations.

- New gear with early style synchromesh sleeve and synchro rings (shift quality will be no better than with original parts).
- New gear, late synchromesh sleeve and **both** synchro rings (provides upgraded shift quality).

900 5 Speed

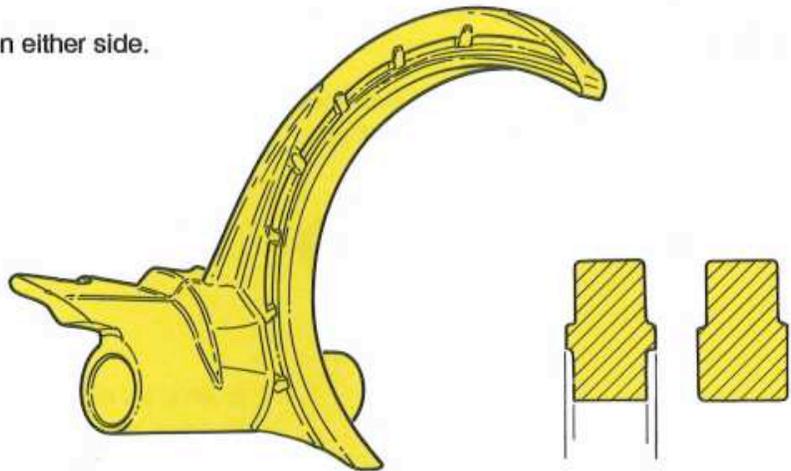


Parts Inspection – Shift Forks

Shift forks must be checked for wear on the faces that come in contact with the synchromesh sleeve as follows:

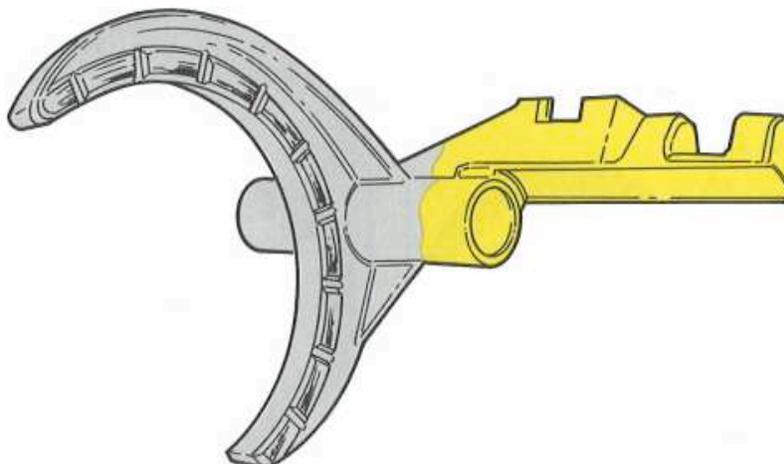
1st, 2nd and 5th GEAR FORKS

Wear must not exceed 0.1mm on either side.



3rd and 4th GEAR FORKS

The silver plating must not be worn through, some surface scratching is allowable.

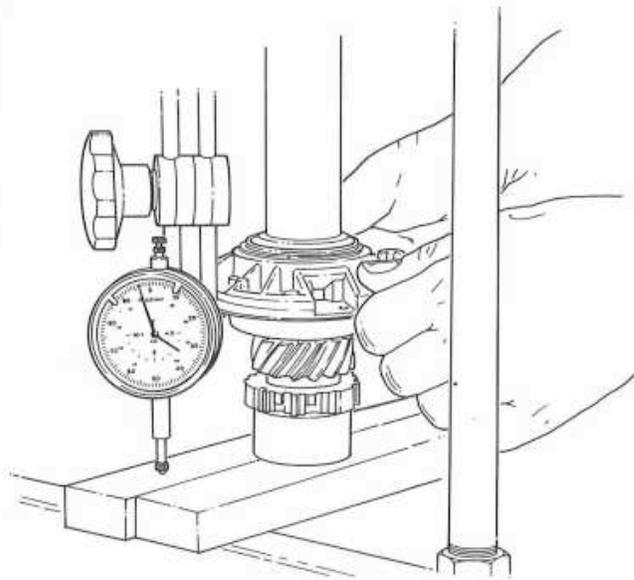


Reassembly – Input Shaft Bearing Preload

The input shaft is carried by a pair of tapered roller bearings much like the pinion shaft. Unlike the pinion bearings there is no preload, the bearings are set up using shims and spacers so that there is zero drag on the bearings. Preloading these bearings would place unacceptable loads on the synchro rings, excessive clearance would cause rapid bearing failure.

To select the proper shim pack proceed as follows:

1. Wash the bearings to remove the oil film and assemble the input shaft assembly with a few extra shims to insure that you will have freeplay between the bearings and races.
2. Support the synchro hub with tool no. 87 90 867 and simulate lower sprocket nut torque by pressing against the upper bearing using drift no. 78 41 075 with a force of 3 tons.
3. Seat the bearings by rotating the housing 10 times against both the upper and lower bearings.
4. Bolt the dial indicator and backlash fixture to the bearing housing. Zero the indicator against the base plate of the press while pressing downward on the housing. Lift the housing. Subtract the indicated clearance from the shim pack and retest.



Reassembly – Input Shaft Bearing Preload

Reassembly – Input Shaft Bearing Preload

5. You should come as close to zero clearance as possible without putting any drag on the bearings. You may change spacers as well as shims to get the right combination.

Note: Shims always go next to the rear bearing.

Shim Thickness	Part Number
0.20 mm	87 12 994
0.25 mm	87 13 448
0.30 mm	87 13 455

Spacer Thickness (-88)	Part Number
7.28 mm	87 23 272
7.29 mm	87 23 280
7.30 mm	87 23 298
7.31 mm	87 23 306

Spacer Thickness (89-)	Part Number
5.28 mm	87 26 184
5.29 mm	87 26 192
5.30 mm	87 26 200
5.31 mm	87 26 218

900 5 Speed

SAAB

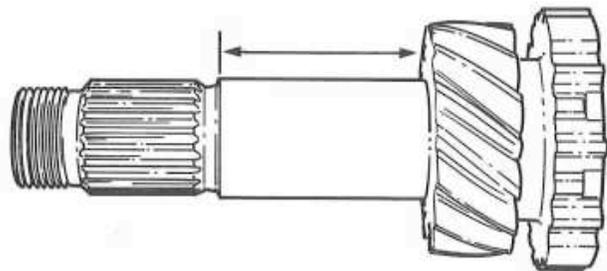
Parts Identification – Input Shafts & Bearing Housings

There are several variations of input shaft and bearing housings in use. Their application varies with model year and engine family. Various combinations of these parts are possible. The major areas of change are:

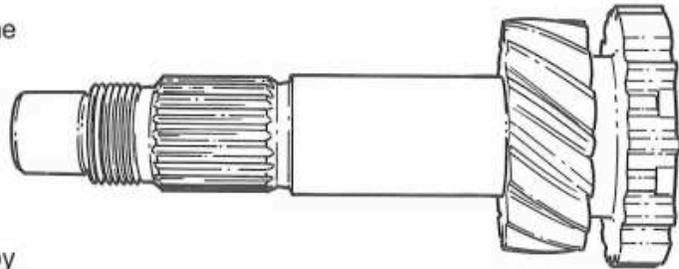
The distance between bearing races on the input shaft bearing support.



Slight variations in the overall length of the portion of the shaft where the bearings ride.



The addition of a forward support bearing on some 16V Turbos.



The only serious mistake you could make by mismatching parts would be to create a condition where the forward nut would bottom out on the threads before proper bearing preload is obtained. This would be caused by combining a narrow housing with a long shaft.

900 5 Speed

SAAB

Reassembly – Ring and Pinion Backlash

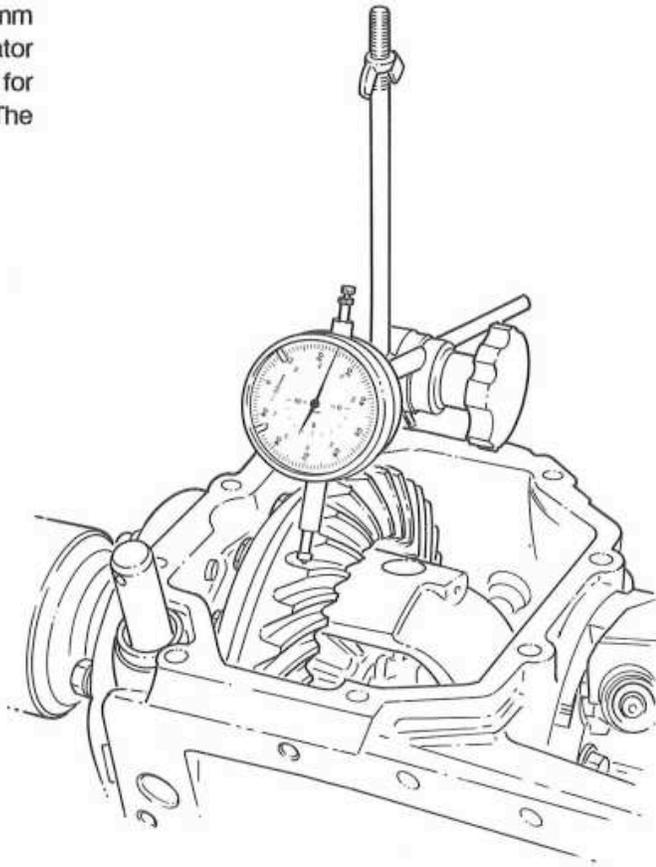
Before assembling the transmission you selected the proper shim pack for carrier bearing preload. In this operation you will redistribute the shims to obtain the correct backlash.

Begin with two thirds of the shims mounted on the right hand side of the transmission. This will prevent you from crowding the ring gear into the pinion when you tighten down the side cover bolts (14–18 ft lbs).

Measure the backlash and compare to the specifications you took during disassembly. Calculate the difference between the two readings and move shims of a corresponding thickness to the left hand side bearing seat. Recheck backlash at four points and make final adjustments if needed.

If the backlash reading varies by more than 0.05 mm remove the ring gear and position the dial indicator against the face of the differential housing, checking for runout much as you would on a brake rotor. The maximum allowable variation is 0.05 mm.

Specification
17 \pm .05 mm



900 5 Speed

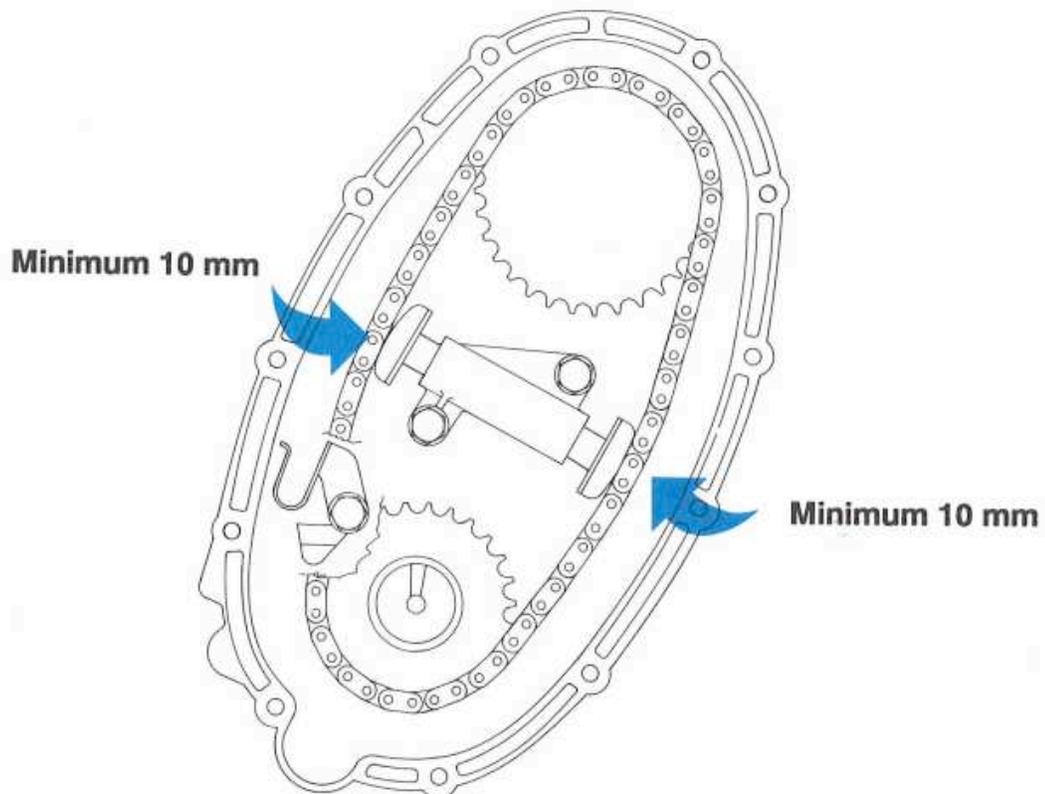
SAAB

Parts Inspection – Primary Chains

Although they rarely fail outright the primary chains do wear and “stretch” during their life. A simple method to determine if the chains have reached their wear limit is to check for clearance between the primary housing and chains at the rubbing block. If you have **less than 10 mm** on both sides the chains should be replaced.

When tearing down the transmission label the chains as to location – outer, middle and inner. They wear at slightly different rates due to shaft movement and should be put back in their original position.

Do not mix chains from different boxes or mix new and used chains.



900 5 Speed

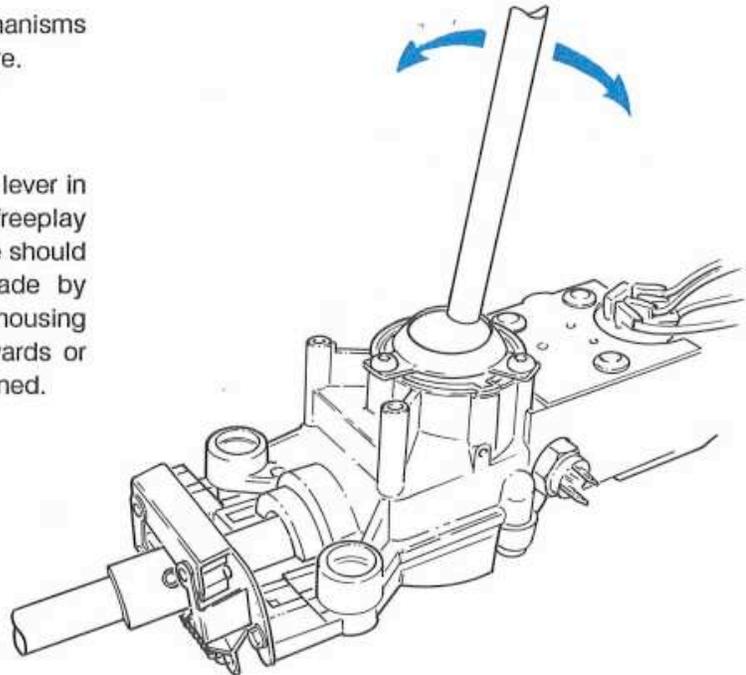
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Shift Linkage Adjustment

There are three principle styles of selector mechanisms in use, each with its own adjustment procedure.

1980 – Mid 1982

Adjustment is carried out by locking the shift lever in reverse with the ignition key and checking for freeplay when rocking the shift lever fore and aft. There should be 3–4 mm movement. Adjustment is made by loosening the three tri-lobed selector housing mounting nuts and moving the housing forwards or backwards until the correct clearance is obtained.

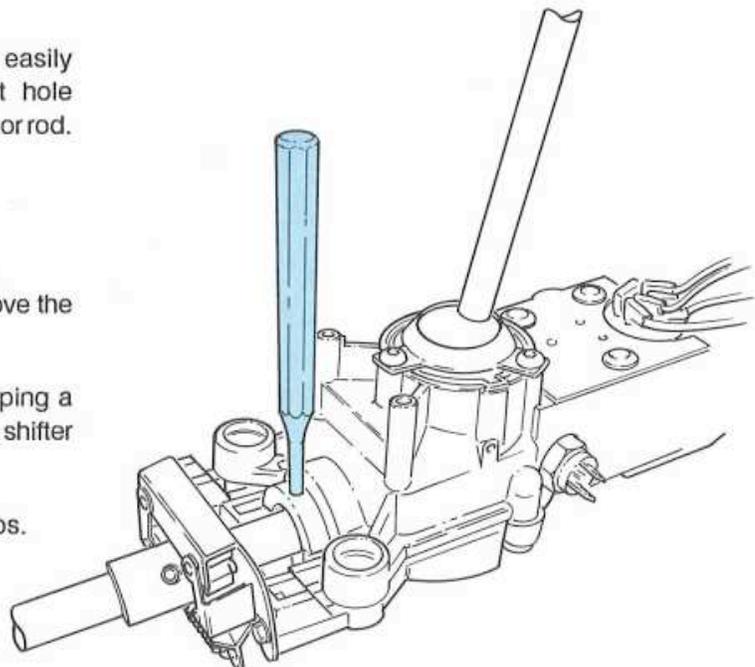


Mid 1982 – Mid 1986

The change over between the two styles is easily spotted, the later version has an alignment hole through the front of the shifter housing and selector rod.

Adjust as follows:

1. Select reverse gear.
2. Loosen the clamp on the selector rod above the steering rack.
3. Lock the selector rod in position by dropping a 6mm pin through the hole at the front of the shifter housing.
4. Torque the bolt on the clamp to 22–26 ft lbs.



900 5 Speed

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Shift Linkage Adjustment

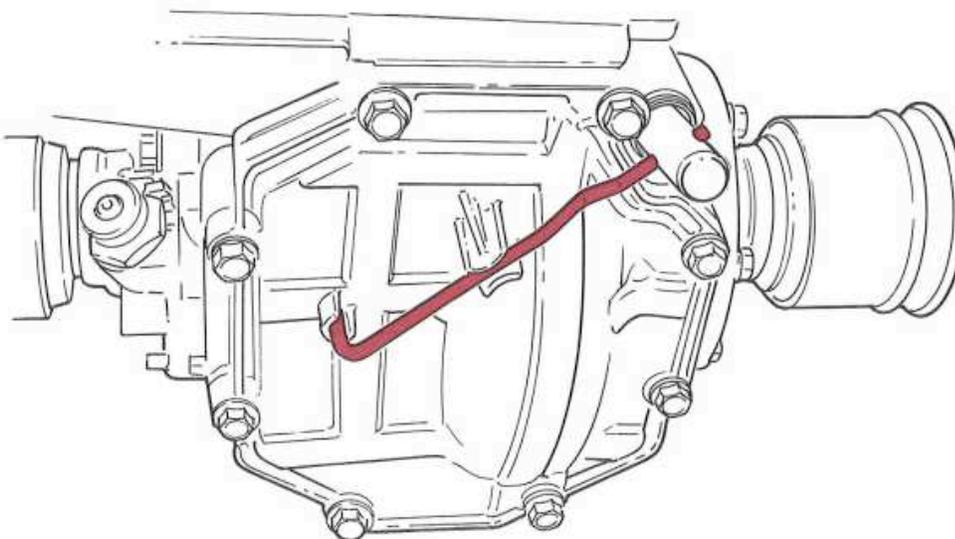
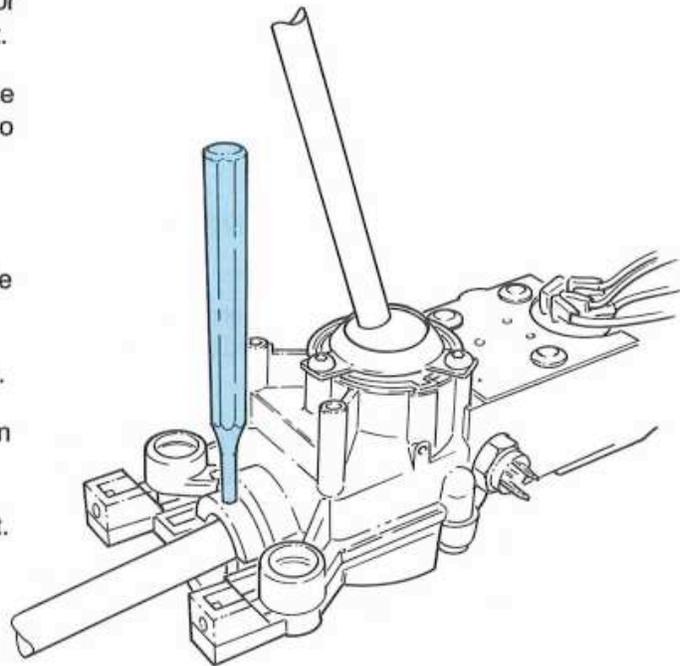
Mid 1986 Onward

At first glance the mechanism appears to be the same but there are three important differences:

1. The 6mm pin holes line up in **3rd gear – not reverse.**
2. The spring loaded selector centering mechanism has disappeared from the front of the selector housing. The function is internal to the gearbox.
3. The gearbox rear cover has a guide slot and the selector rod a new hole to accept a locking tool to insure the linkage is correctly aligned.

Adjust as follows:

1. Select third gear, install the locking tool on the rear cover of the gearbox.
2. Loosen the pinch bolt on the selector rod clamp.
3. Lock the shift lever into third gear with the 6mm pin.
4. Tighten the pinch bolt on the clamp to 22–26 ft. lbs.



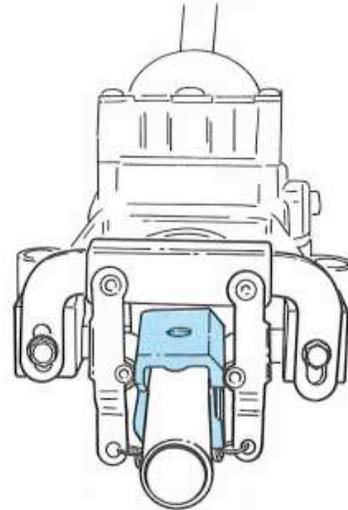
Shift Linkage Adjustment

1980 – Mid 1986 Centering Mechanism

All 5 speed transmissions have a mechanism to automatically center the shift lever in the 3–4th gear slot. Up until mid 1986 this was accomplished by a pair of spring loaded rollers mounted on the front of the selector housing.

Adjust as follows:

1. Remove the console, drivers seat and left sill plate. Fold back the carpet to uncover the tunnel.
2. Engage 3rd gear.
3. Loosen the two retaining screws locking the roller bracket in place.
4. Move the bracket so that the rollers drop into the grooves on the plastic block pinned to the selector rod. Tighten the retaining screws.
5. Move the shift lever into neutral. If the adjustment is done correctly you should be able to push the lever straight forward into third gear without having to “fish” around for the slot.



Mid 1986 Onward Centering Mechanism

No adjustment needed.

900 5 Speed

SAAB

Slave Cylinder – Clutch Wear

The slave cylinder for the Saab 5 speed is a unique co-axial design with a "hollow" piston surrounding the clutch shaft. It is self adjusting, much like a disk brake caliper.

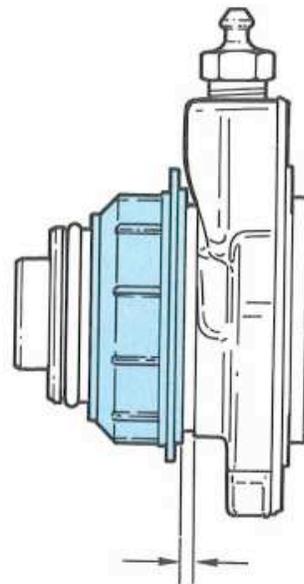
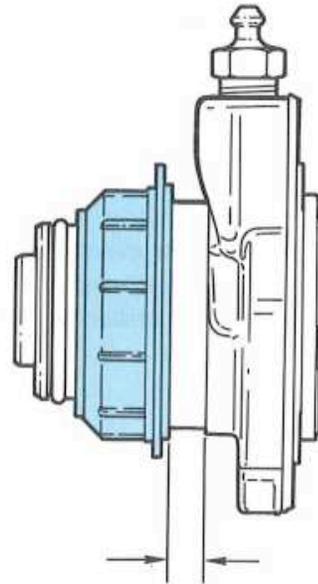
In principle all years function along the same lines but there are some significant changes which affect the following operations.

Checking Clutch Disk Wear

From the service standpoint the single most important part of the slave cylinder is the sliding dust shield. The shield has two functions; one is to protect the exposed portions of the cylinder, the other is to act as a travel stop to prevent the piston from retracting too far when the clutch is released.

The position of the sleeve provides an accurate indication of clutch wear. It is visible through an access hole in the clutch cover. A new clutch will show **9mm** clearance as shown, if there is less than **2mm** the clutch should be replaced.

Note: Early production used a version without the dust shield. The specifications and procedure varies slightly, check the shop manual.



900 5 Speed

SAAB

Slave Cylinder – Basic Setting

Anytime the clutch has been removed the dust shield must be repositioned to prevent the piston from retracting too far. Failure to do this will create a problem very similar to what happens when you back out of your stall after a brake job without first tapping the pedal a few times. Most of the clutch pedal travel will be used getting the throw out bearing into contact with the pressure plate.

Have someone hold the clutch pedal down while pushing the dust shield towards the flywheel. The shield will automatically position itself when the pedal is released.