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## Installing a 5 speed gearbox in a Morgan 4/4 Series V 1965

The engine in the car is a Kent 1600 ccm crossflow up rated with 711 block. With rear axle ratio 1 to 4.10, 15 inch wheels and a 5- speed gearbox with 0,82 ratio on the fifth gear, the rpm are lowered with 18 per cent, resulting in rpm 3000 at 106,5 km /hour and 213 km/hour at 6000 rpm.

### ***Sierra 5-speed type N1 for 1,6 or 2.0***

5-speed gearbox type –N1- from a Ford Sierra 1,6 or 2.0 liter can be used. These are identical. If buying a used gearbox, try to listen to the gearbox when the engine is at idle rpm, as there can be some “rumbling” noise from the lay-shaft, when no gears are engaged and the clutch lever is not activated. Repair of the lay-shaft is best done before the gearbox is mounted into the car.

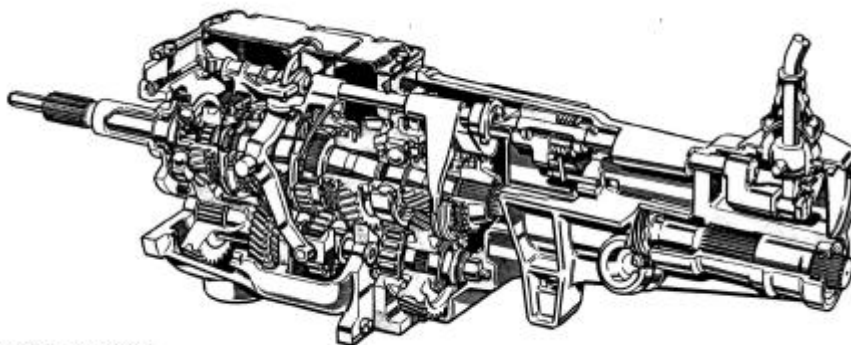


Fig. 111 "N" gearkasse.  
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### ***Use Sierra bell housing***

The bell housing from the Sierra must be used together with the 5-speed gearbox, and the bolt configuration fits straight on the 711-engine block.

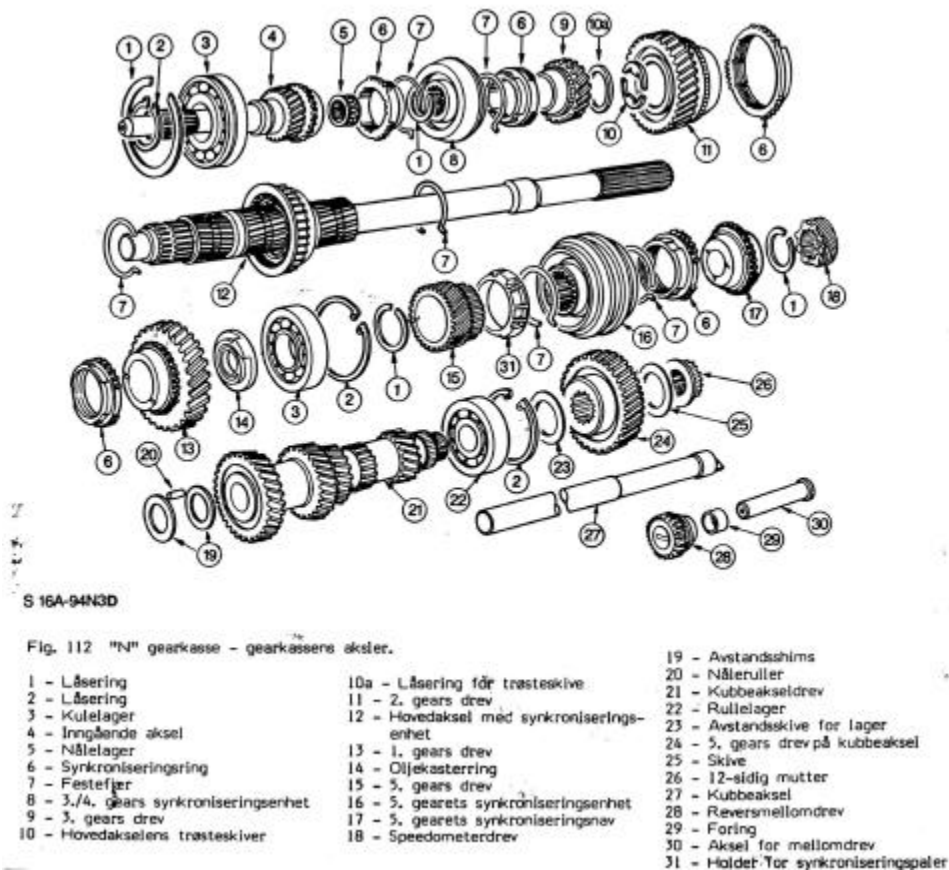
A 4-speed Cortina, or the original gearbox does not have the same bolt configuration between the gearbox and the bell housing as on the 5-speed Sierra gearbox, so the Cortina or original bell housing can not be used together.

### Speedometer gears

The speedometer ratio in the Sierra gearbox have to be clarified before installation. The speedometer gear might be 7 or 8 teeth's. The speedometer pinion gear might be 22, 23 or 24. The color code on the speedometer gear identifies the amount of teeth's (7 or 8), without the need to dismantling of the gearbox. See attached table. Required ratio can be calculated as follows:

The speedometer has a number on its faceplate, here 1020 and the scale is in miles. This means that the wire rotates 1020 times each mile (1609.34 meters). This equals to 633 rotations for each 1000 meter.

The rear wheel is 15" and has a radius of 305 mm, measured with the cars load on the tire. This gives a circumference of 1.915 meters, making the rear wheel rotate 522 times each 1000 meter. Based on above, the total ratio from the rear wheel to the speedometer have to be 633 divided on 522, giving 1.213. The rear axle has a ratio 4.1, and this must be multiplied with the ratio between the different possible combinations of gears for the gearbox. Speedometer gear 7 and pinion with 24 teeth's gives together with the rear axle a total ratio 1.196, witch is very good, giving only 1,5 % error.



### ***Extra oil filler plug***

To make it easy to add or replace oil in the gearbox from the engine compartment, I installed an 1 inch blind plug in a 1 inch thin nut, silver soldered to the front left side of the gearbox 10 hole inspection cover. Then the level can be controlled, and old oil be sucked out.

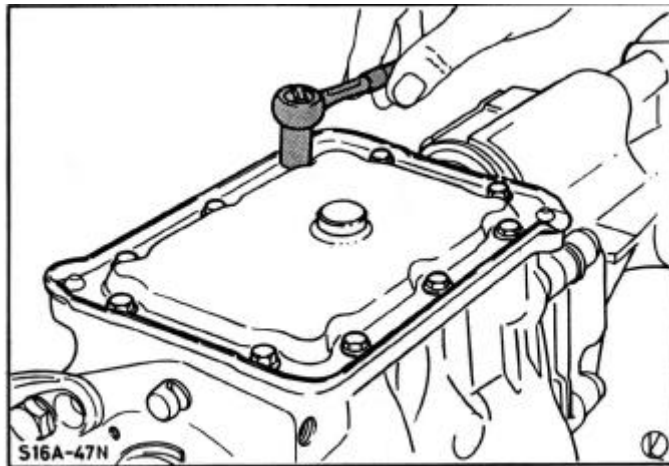


Fig. 114 Demontering av gearkassehusets deksel.

### ***Mounting and raising***

The 5-speed gearbox is deeper than the 4-speed. The engine must of that reason be raised with metal spacers, typically 5 mm, placed on the two engine rubber mountings. Also make sure there is space enough for raising the engine, between the air filter and the bonnet, preferably before the bonnet is removed. A drill is an easy way to measure the distance, as they comes in different diameters. Also there must be hole large enough in the left inner wing for the raised exhaust pipe. The gearbox bracket in the chassis must also be moved backwards. It is important that gearbox does not lean to much forward, as it might give to large an angle to the prop shaft. The distance from the center of the gearbox outgoing axle to the top of the chassis members, which the gearbox mounting bracket is bolted to, is 152 mm on my Series V 4/4. It is also possible to remove some of the metal from the bottom of the gearbox, where it nearly touches the front cross member. Make sure it is 3-4 mm clearance between the front cross member and the bottom of the gearbox. Gloving some 2 mm thick rubber to the front cross member may avoid noise from the gearbox touching the front cross member.

There might also be necessary to remove a small amount of metal from the left side bottom “lips” of the bulkhead, as it might touch the bell housing.

I had an empty engine block type 711 connected to the 5-speed gearbox, which I used instead of the engine, when I did decide where to mount the gearbox mounting bracket and the thickness of the spacers for the rubber engine mounts.

### ***Crankshaft bearing***

The bronze sleeve bearing in the crankshaft for the input axle from the gearbox must be replaced with the standard Sierra needle roller bearing with 15 mm inside diameter

and 21 mm outside diameter. The original bronze sleeve typically have 17 mm inside diameter. Removing the existing bronze sleeve can easily be removed without special tools; put grease into the sleeve. Enter a bolt with close to 17 mm diameter into the sleeve. By hitting the bolt with an hammer, the grease will force the bronze sleeve out!

### **Clutch plate**

Ingoing axle on the five speed gearbox has 1" diameter and 23 splines, but the original gearbox has 7/8 " diameter and 20 splines. The clutch assembly must of that reason be replaced. The 2.0 liters Sierra clutch has diameter 8,5" and will of that reason not fit. The 1,6 liter Sierra 5- speed has 7,5 " diameter clutch plate, which is the same as on the Cortina-clutch. A complete assembly with clutch plate, throw out bearing and pressure plate for an 5-speed Sierra 1,6 liter must be purchased. This will fit straight onto the three guiding pins on the 711-engines flywheel.

If the flywheel is not the original, for instance aluminum from Tilton racing, the feathers in the center of the clutch plate in an Borg & Becker clutch might touch the 6 bolts holding the flywheel to the crankshaft. Sachs do also offer a clutch kit, where the feathers are flush mounted in the plate, and will of that reason not touch the bolts.

### **Starter**

The starter is mounted to the bell housing, and can preferably be replaced with a Sierra starter, especially if there have been problems with the original Lucas Inertia\ Bendix starter, which is not pre-engaged. The Sierra flywheels ring gear tooth count is 135 and outside diameter is 11.3 " ( 287 mm) and inside diameter is 10,13" (257,3 mm). The flywheel on the 711 engine have a ring gear with outside diameter 11,2" ( 284,5 mm) and 10,03" (254,7 mm ) inside diameter. It is of that reason not possible to mount a Sierra ring gear on the 711 flywheel. If the original 711 flywheel ring gear has 132 teeth's it is OK. The teeth's will function together with the teeth's on an Sierra starter. If the ring gear should happened to have 110 chamfered "sloping" teeth's, and are made to be used with an inertia starter it must be replaced with a 132 teeth's ring gear.

The three holes for the mounting bolts in the starter must be opened up slightly, so the starter can be moved 1,25 mm (1/2-part of 0.1") inwards to get correct entrance to the ring gear. This solves the problem with the smaller diameter on the flywheel.

### **Starter relay**

The original starter relay for the inertia starter can be kept to keep the original appearance. But the voltage supply wire to the starter relay must be moved from the input to the output terminal on the relay, so there are always voltage present on the starter. The wire from the ignition key to the start impulse are moved directly to the starter, instead of the starter relay.

### **Distance plate**

The distance plate between the engine and bell housing from the Sierra can be used. Remember to increase the hole in the plate for the start motor with 1,25 mm on the inner side, making it possible to move the starter inwards.

## ***Clutch release mechanism***

The clutch release function (pedal) must be rebuilt to the Sierra wire type, which pulls the throw out arm, compared to the original hydraulic, who pushes the release arm, making it possible to use the Sierra clutch release arm and throw out bearing. Some of these parts like wire and fasteners can be bought from the Morgan factory, but care must be taken, as there might not be a straight fit. The English 5-speed Morgans has the starter on the left side and the clutch release arm on the right side. On Norwegian Sierra gearboxes it is opposite. Also it must be considered if the car do have left or right hand steering. An alternative is to build something self. I made the clutch pedal pull the wire, by use of a special bracket.

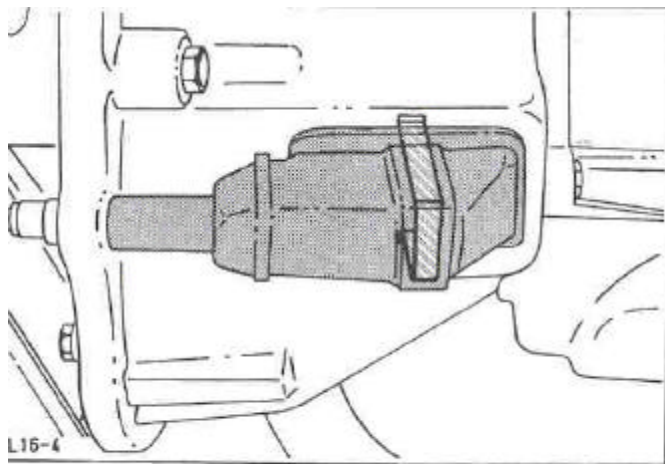


Fig. 165 Belg og fjærholder i stilling.

## ***Prop shaft***

The prop shaft have to be renewed, as the 5-speed gearbox has diameter 35 mm, compared to the original 30 mm. This can be bought from the Morgan factory at a cost of 88 GBP (back in 1998). It is the same as the one used on the model 4/4 5-speed CVH-engine and has part number MRA2020. It fits straight to the rear axle type Salisbury 7HA.

## ***Speedometer wire***

The wire for the speedometer have to be made new. Original it is 145 cm long, but the 5-speed gearbox has the outlet for the wire further back, so length 165-175 cm is recommended. The wire is connected to the Sierra case with a “trumpet”, instead of the angel gear on the original gearbox. The Sierra gearbox pinion gear do also require a thinner wire than the speedometer, so the wire have to be made to fit both sides. After some driving I found that the new wire broke, caused by the limited space underneath the gearbox cover. By use of a small “Dremel” high speed drill, I created a small groove in the gearbox body for a circlip, making it possible to fit the original angle gears, and hold it in place with the circlip. Now it is possible to use a standard speedometer wire, and it has functioned well for some years.

### ***Gearbox cover***

The hole for the gearlever on the 5-speed gearbox and 4-gear Cortina gearbox do have the same distance from the engine blocks rear side, approximately 73 cm. Of that reason it is not necessary to make a new hole, only slightly increase it. The gear level have to be shortened.

The cover over the gearbox have to be lifted about 15 mm in the back to avoid touching the gearbox. Distance pieces can be made in wood or aluminum, and made with zero height in the front, increasing to the 15 mm at the back. Then the original holes in the bulkhead for the gearbox cover can be kept. The hole on the left side of the gearbox cover need to be opened up slightly, to make space for the bulk on the gearbox left side.

The cover over the prop shaft can now be mounted below the gearbox cover, instead of over, making it possible to keep the original mounting holes, without distance pieces.

One dealer who have done many of these conversations is Colin Musgrove, U.K.