

THE SELECTION PROCESS

Ford gearboxes were once the standard by which the rest were judged. Interchangeability between different models was a major "plus". Our expert, Jeff Mann, goes through the permutations, explains what fits what

Ford engines find their way into a wide variety of non-Ford manufactured vehicles; Ford gearboxes, because of their reliability, tend to follow on behind. However, such is the progress being made with engine development, particularly in power outputs, that Ford has not been without its problems throughout its predominantly reliable transmission range. There are a whole variety of transmissions available for race competition and fast road use, so we decided to look back through the range to give this comprehensive guide to the cogs, looking at the good and the not-so-good and the way that you can make the best selection.

The five-speed Sierra Type 9 gearbox, for instance, has been plagued with selection difficulties since its introduction in 1982 and an attempt was made to cure this by the use of synthetic oil. The gremlins continued to inhabit the gearbox which led, eventually, to Ford's multi-million pound MT75 development programme. Such is the expectation of this latest transmission unit that even the normally reliable Borg Warner gearbox was scheduled for replacement on the two-wheel drive Sierra Cosworth.

The five-speed Type 9 gearbox has been the only mainstream transmission unit to receive what could be described as above-average criticism. Gripes directed at other types of Ford gearbox are more likely to be connected with mechanical abuse or high mileages. On the whole, Ford has a thoroughly reliable and varied range of stock transmission units, the majority of which have been manufactured and developed 'in house' by the company.

When looking in detail at the Ford gearbox range, there is really no point going back any further than the 105E Anglia. Apart from the lack of synchromesh on first gear, the gearbox fitted to the 1-litre models of 1959 was the ancestor of most subsequent light series units. Many variations have been introduced since those early days with the basic principle proving itself perfectly adequate for all types of club motorsport.

The first gearbox of this type to be fitted to

a production competition vehicle was the close ratio Mk1 Lotus Cortina 'box. The foundation of its construction was the 113E (1200cc Cortina) Type 4 three-rail unit which was considerably modified from the standard offering by Lotus Cars. Unique features included a close-ratio four-speed gear kit giving a very high first and second gear, alloy bell and tailshaft housing, and a single-rail selector assembly enabling a short quick-change gear lever to be located between the seats. You can just imagine Jim Clark's frustration driving a works car away from pole position fearing that the standard 18in cranked gearlever might break off every time a quick change was attempted.

The remote gearlever modification was applied to all Mk1 Cortina GT models, but it did have one rather primitive aspect. Because of the way the aluminium selector rail housing protruded through the transmission tunnel, into the driving area and along the carpet, the internal appearance was one of a bolt-on extra. This was unacceptable by manufacturers' standards, the solution being a neat full-length centre console factory-fitted to all Lotus and GT models.

During the late '60s and early '70s, it was possible to upgrade the standard three-rail Lotus 'box by using roller bearing gear cogs and layshaft thrust washers. The roller thrust washers were a real struggle to slot in between the cluster and gearbox case and were very often discarded because of this. However, CCC mated a roller bearing Lotus 'box to a Phase 4 BRM twin cam in 1973 and used this combination to good effect in a special saloon racing Anglia: 30 races were completed without a hitch.

Another competition gearbox founded on the standard three-rail application was the five-speed Hewland, marketed by C.T. Wooler. It was basically a five-speed gear kit fitted into a four-speed case and although considered 'state-of-the-art' in Broadspeed and Superspeed Anglia days, proved to be unreliable if used with an engine producing more than 120bhp. Spares are now scarce and a replacement gear kit from Jack Knight or R.T. Quaife would set you back £800.

Nevertheless, a surprising number of these unique gearboxes are still being used in club racing circles.

The next three-rail Ford gearbox to be produced at mainstream level, not with the intention of superseding the existing type, but to be partner to it, was the remote-shift "2000 Corsair" unit. Introduced originally for all 2-litre V4 Corsairs produced from 1966, the main differences were a single gear selector shaft enclosed in a new extension tail housing, and different ratios. A unique bellhousing was of course necessary to mate the 'box to the V4 block, but once again the basic gearbox design took its origins from the Anglia and Mk1 Cortina. Of all the early four-speed Ford gearboxes, the 2000E is certainly the best-known and was universally installed by Ford in many performance variations of mainstream models.

Probably because of its integral short shift facility, the unit was issued as standard equipment to all Mk2 Cortina 1600GT, 1600E and Lotus models produced from August 1967 to October 1968. After this date, the familiar Type 3 unit with single-rail aluminium tailshaft was used. However, this refugee from the Corsair also found another home during 1968. When the Escort Twin Cam was launched upon an enthusiastic public in January, it too featured the 2000E unit, principally because, at the time, the new car was considered to be a Mk2 Cortina Lotus in different clothes. Instead of being dropped in October 1968 in line with the Cortina transmission change, this gearbox continued and went on to be used as standard equipment on all Mk1 Escort Mexicos and RS1600s. The continued use of this gearbox could have been connected with Ford's reluctance to modify the Escort transmission tunnel in the early days of their AVO facility.

Production policy changed in 1973 when the first RS2000 appeared with the single-rail Cortina Mk3 2-litre gearbox. The transverse tunnel member was altered to gain the necessary extra space. This is one way of spotting an AVO bodysell; all the original Mexicos and RS1600s had this transverse

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◀ member in place and unmodified.

In spite of the standard 2000E ratios having a large gap between second and third gears, Ford was obviously serious about the unit's competitive future because during the early 1970s magnesium castings for the gearbox case and tailshaft were produced, though these were by no means cheap. Unfortunately no close-ratio gear kit was available to complement these now very rare components, except the non-Ford produced Bullit type.

The magnesium gearbox case 9051385 (H69AB7005AA) offered a weight saving over the standard cast iron case of 11lbs and magnesium gearbox extension housing 9051388 (H69AB7A039AA) a weight saving over the standard cast iron housing of 10lbs.

In addition, a magnesium bellhousing was available to mate the lightened gearbox to the Kent engine cylinder block under numbers 9051393 (H69AB7505AA). Again this offered a substantial weight saving over the standard item of some 13lbs.

Moving away from the 30 year-old Anglia/Cortina design range, which nowadays is considered to be rather obsolete, reference should be made to the Type 2 Kent-engined Escort gearbox (RWD of course). This was a unit manufactured only to serve mainstream production cars and was not recommended for any type of serious competition usage. It's main identifying features are the all-in-one cast bellhousing and case and aluminium single-rail extension housing. However, there were two different unit specifications and this is where a logical swap could be made. All GT, Sport and Ghia variants of both Mk1 and 2 models were production-fitted with slightly stronger and closer-ratio gearboxes than the rest. Out-

ward dimensions are the same throughout, so the acquisition of one of these to fit into a modified non-sporting model would be a sensible idea. The only changes required to make with this conversion are to the speedometer driving cogs; everything else fits. To ascertain the correct ratio for your particular Escort, you will have to submit the axle ratio code (located on the bright aluminium chassis plate) and tyre size to a Ford dealer so they can supply a pair of gears with the correct number of teeth. Alternatively, you could take advantage of Ford's reconditioned unit scheme by returning your existing 'box in exchange for the GT/Sport one. Ford operates a method by which certain life-expired assemblies can be returned to various reconditioning plants via an exchange group. Fortunately both types of Escort gearbox fall into the same returns group thus eliminating any surcharge likely to be made by the dealer.

Type 2 GT/Sport gearbox 5004364 - 3.77:1 axle ratio
Type 2 GT/Sport gearbox 5004365 - 3.89:1
4.12:1 axle ratio
4.44:1

On 1100cc Mk1 Escort models, the clutch assembly and flywheel will, of course, have to be changed from the standard 6 $\frac{1}{2}$ in diameter to 7 $\frac{1}{2}$ in.

The next mainstream transmission to benefit from competition activity was that fitted to all 2-litre Cortinas, Granadas, Escorts and the 1975-78 Mexicos. Commonly known as the 'E' Type gearbox it was a four-speed unit based on a similar principle to those described earlier but was more robust in all areas and capable of accepting up to 180bhp without serious modification. It featured a separate bellhousing, aluminium remote tailshaft housing, quick-shift gear lever and evenly spaced ratios. The production origin of this gearbox extended back to August 1970 when the Mk3, 2-litre GT and GXL Cortinas appeared. July 1973 saw this same driveline fitted into the first RS2000 but with the addition of an aluminium bellhousing to combat vibration, and a 'short shift' gear lever. Prior to the introduction of the second RS2000 in 1976, came a competition version of the 'E' 'box officially known as the Rocket gearbox. Original cost price was around £200 but it was also possible to convert an existing standard 'E' 'box to Rocket specification by using a close-ratio gear kit. The use of these Rocket gears was in fact the only difference between the standard and competition unit. All genuine full spec X Series RS2000s would have been fitted with a Rocket 'box as standard, so if you own one of these now classic models, make sure it's there.

During the time the Rocket box was available, it was possible to fit one to a Mk1 Escort RS1600 or Mexico via a special installation kit available from Ford Motorsport parts. The kit consisted of a unique aluminium bellhousing with the hydraulic slave cylinder lug attached, modified and reinforced clutch release arm, special release bearing assembly, larger clutch, modified propshaft and other assorted parts. The unique feature of this bellhousing was in its ability to mate the 'E' type or Rocket gearbox to the Kent engine cylinder block. It

proved to be very popular with all clubmen who ran pushrod-engined Escorts. The parts for this conversion are now obsolete but may well be obtainable from large performance centres such as Malcolm Wilson Motorsport in Carlisle. Part number details are as follows:

Standard 'E' type gearbox	1613118 new
	5006655 reconditioned
Motorsport Rocket gearbox	9052507
Rocket gear kit	9051637
Conversion bellhousing	9051203
Clutch cover plate	9051405
Clutch friction plate	9051404
Clutch release arm	9051928
Clutch release bearing	9054260
Gearbox mounting spacer kit	9052867
Propshaft	9051559
Short shift gearlever kit	9052908
(short shift gearlever also available from R.T. Quaife of Tonbridge, Kent)	
Clutch release pivot pin sleeve	1747305
Clutch release spacer	9052486
Transmission tunnel reinforcement plate	9052502
Bellhousing gasket	1632552
Speedometer cable	6060503
Cap	1425662
Seal	1463342
Bolt - 4 off	1575317
Bolt - 4 off	1715883
Bolt - 4 off	1757038
Washer - 4 off	1613374
Circlip - 4 off	3416354
Bolt	1420737
Speedometer gear - 22 teeth	1473921
Speedometer gear - 23 teeth	6011059
Speedometer gear - 24 teeth	6011058
Speedometer gear - 25 teeth	6011057

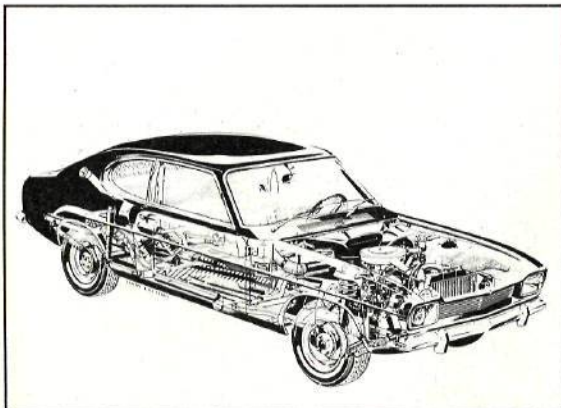
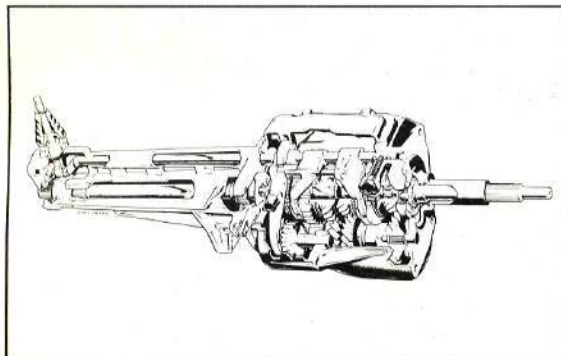
Apart from the heavy series Type 9 gearbox normally found in post-1971 Essex V6 Capris and the oddball side selector Type F 2-litre Capri unit, both of which are unsuitable for inclusion in any conversion plans, that concludes all four-speed rear-wheel drive transmission units.

Up until 1982, a fifth gear was reserved for executive car manufacturers and serious motorsport competitors. It was at this time, however, that Ford recovered lost ground from its rivals by commencing five-speed gearbox production. Initially this was an option only to cover selected models within each vehicle range. Prior to this, the only Ford models to benefit from having five forward cogs were pure competition vehicles usually built up from mere bodysells and the gearboxes so fitted took their origins from either specialist manufacturing or the light commercial market.

As mentioned previously, the BTC Group 5 Anglias of the mid-60s used Mk1 Cortina-based units with a five-speed Hewland gear kit. During the 1975-81 Mk2 Escort RS era, all full-Boreham specification cars were equipped with the five-speed ZF; undoubtedly an extremely robust assembly but with many agricultural features. The decision had been taken by Ford Motorsport officials to use the ZF purely because no other transmission unit, at that time, seemed capable of handling the power of a 260bhp BDA. Extensive modifications were required to the transmission tunnel before correct installation could be achieved but once up and running the advantages were obvious.

The 1300 BDA Anglia campaigned by CCC in special saloon car racing during 1975 and '76 used a ZF five-speed with direct top. (Other ZF 'boxes had the less

ORC Capri and its gearbox, circa 1968



desirable overdrive top. Because of a very high first gear, the car was often a swine to drive straight from the grid quickly and smoothly but once away the gearbox was firm and close, albeit rather heavy. On one of the occasions when Terry Samuels carried out a routine inspection of the 'box, I was amazed to discover that the selector forks were of a size resembling riding stirrups. Definitely not classed as delicate precision engineering, although reliable nevertheless.

The Group 4 works rally Escorts continued to use the ZF gearbox from conception until David Sutton terminated his association with this RWD legend in 1981. Throughout these years, many professionally-run private teams equipped their Group 4 cars with the same transmission units so it came as no surprise when Ford issued a comprehensive rally preparation journal. Full details of how to install the ZF 'box was included together with a list of unique motorsport parts that could be purchased through any RS agent. Most of the components used are now unobtainable through the dealer network. If you ever come across any parts and want to check their validity, the part numbers were as follows:

ZF five speed transmission assembly	9053635
Bellhousing ZF/BDA - Kent engine	9052595
Propshaft ZF/Atlas axle	9052598
Multi plate clutch assembly	9052594
Clutch release pivot pin	9053625
Clutch release bearing hub	9053623
Clutch release 'O' ring - 2 off	9053616
Oil seal	9053624
Clutch release fork (reinforced)	1711392
Cap	1745654
Spring (release arm to pivot pin)	1711461
Spring clip (release bearing carrier to fork) - 2 off	1711487
Clutch hydraulic slave cylinder	1432754
Push rod	1730981
Nut	1730982
Spring	1711421
Bearing	1501250
Gaiter	1707553
Plate	1419265
Support - 2 off	1434773
Link	1707552

Significantly, most of the non-905 part numbers listed have been taken from the Mk1 Mexico and the release bearing belonged originally to a V4 Transit van.

In August 1982, production of the Ford Sierra commenced and with it came a new five-speed transmission unit, based loosely on the four-speed Cortina/RS2000 'E' type gearbox. Officially catalogued by Ford as a Type 9, it soon became apparent that because of the similarities, a swap could be made involving all Ford models which used the Pinto engine/'E' gearbox driveline. Some minor bodysheet alterations were of course necessary, particularly in connection with mounting points, but none were beyond the abilities of a competent DIY enthusiast. Because of its motorsport link, the most popular model to be so treated to this conversion was the RS2000. Both Mk1 and Mk2 models were included as was the Mk2 Mexico, all having the same floorpan layout.

The method laid down for the RS2000 five-speed gearbox conversion is documented below. It is an exercise not officially recognised by Ford, so when approaching your friendly local agent make sure you know exactly what parts you require.

The Sierra five-speed gearbox's Achilles

heel has previously been mentioned so before an assembly is obtained, care should be taken to ensure that the unit is in first class condition throughout. Always buy from a reputable dealer. You can, of course, use Ford's exchange unit scheme by procuring an old unserviceable five-speed 'box and exchange it against a reconditioned unit. This would eliminate the £150 surcharge which would be required by the dealer in the event of an old unit not being available. If finances are plentiful then a brand new gearbox would overcome any doubts concerning secondhand parts, but that rather goes without saying!

If serious competition is envisaged, consideration might be given to substituting the standard cogs for a close-ratio Quaife gear kit. This same specification was a popular option available on the HPC Caterham Seven sports car and although rather noisy, certainly kept the BDR engine 'on cam'.

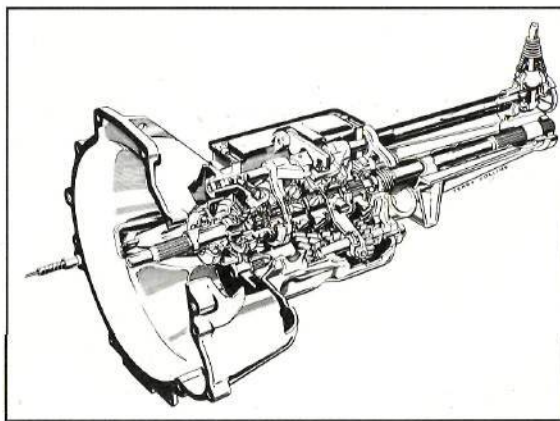
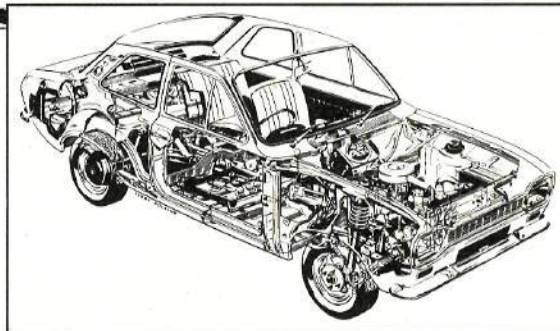
Now on to the Escort RS2000 swap. The most obvious external difference between the four and five-speed gearboxes is that the main housing has an alloy extension which is needed to accommodate the longer gear clusters. This means that the rear gearbox mounting has to be repositioned about 80mm towards the rear of the car. This is the only major modification required in the conversion.

Because of limited clearance, the engine will have to be lowered by at least 5in to enable the four-speed gearbox to be removed from the cylinder block. To achieve this, all that is required is to remove the four dowels and bolts securing the front cross-member to the left and right-hand chassis rails and disconnect the steering rack at its flexible coupling. Use a trolley jack under the subframe to support the engine weight. Do not compromise this method by using long 3/8in UNF bolts because any movement could dislodge the captive nuts which are merely tack-welded to the inside of each chassis rail.

Before completely removing the four-speed gearbox, measure the distance between the top of the transmission tunnel and the centre of the output shaft. For the sake of correct propshaft alignment, it is important to have the rear of the five-speed secured in the same position as its predecessor.

The first non-standard task is to remove the original gearbox mounting brackets, but because new replacements are no longer supplied by Ford, the existing items should be carefully detached from the floor by drilling through the spot welds. Before removing these brackets, their original positions should be marked with a scriber so that resiting can be accurately achieved.

To ascertain the correct position of the resited mounting brackets, it will be necessary to measure the difference between both gearbox crossmember mounting lugs. As referred to earlier, this is approximately 80-85mm. A line should then be scribed rearwards from the first mark to the point where the brackets will be positioned to accept the additional length. By using a pair of prefabricated reinforcing plates, cut and



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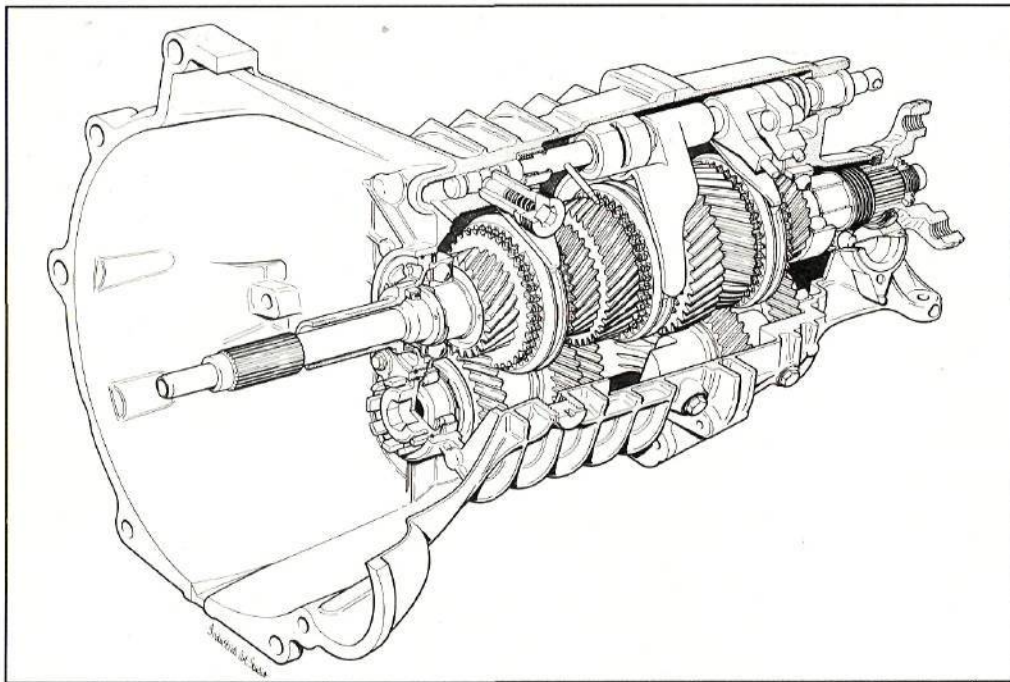
shaped to match the brackets, all four pieces can be bolted to the tunnel sides after first drilling six holes for each bracket.

Before raising the new gearbox to its final position, a couple of components should of course be transferred. These include the bellhousing, using a new gasket, and the reversing light switch. It would also be sensible to inspect the clutch friction plates and flywheel. Due to the fact that the transmission tunnel is narrower at the point where the repositioned brackets are fitted, the gearbox crossmember bolt hole slots will have to be extended inwards by 5mm. In addition, the rectangular spacer blocks will require some extra packing of between 6 and 10mm in order to drop the extension housing enough to allow for correct propshaft alignment. Reference can, at this point, be made to your earlier tunnel-to-output-shaft measurement.

When all the loose ends relating to the above procedure have been tied up, the gearbox can then be securely fixed into position. Assuming that everything has gone according to plan and the need to remove the gearbox again does not arise, your attention should focus on the ancillary items. A longer speedometer cable will be required for Mk2 RS2000 models. The replacement cable carries the Ford part number 6060503

Escort gearbox features integral bellhousing and cable-operated clutch

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Latest Ford in-line gearbox is MT75, designed to counter criticism of "Type 9" gearshift quality

and was fitted as standard to the 2-litre Cortina and Mk1 RS2000.

Secondly, the standard five-speed Sierra gear lever, which fits perfectly through the original tunnel aperture, has been found to be unsuitable if the 'short shift' facility is to be retained. The surplus RS2000 lever can still be used but in conjunction with the Sierra lever's three-bolt base plate. This plate must be stripped clean of all attachments and the teeth removed from the centre hole. Unscrew the metal spacer sleeve from the four-speed gearbox extension housing and position through the centre hole of the Sierra lever base plate. Mig weld these two components together, screw the RS2000 gear lever into the sleeve and the assembly will now be ready for fitting

through the tunnel aperture and on to the five-speed extension housing. The end result will enable you to retain that exclusive short shift movement. Finally, refit the standard propshaft, connect the reversing light switch wire, recheck all the hardware for tightness and choose whatever gear lever knob you feel most comfortable with.

On most of the five-speed gearboxes, the first four cogs are the same as in the original RS unit. Fourth gear gives 18.6mph per 1000rpm on original wheels and tyres. This means that 70mph is attained at 3760rpm and at the peak power figure of 5500rpm, the car will be travelling at 102mph. This clearly shows how 'underdriven' the standard car is. With the fifth gear, 70mph cruising is reduced to 3070rpm and now at a theoretical

5500rpm the car would be travelling at 125mph, confirming the 'overdriven' nature of the new box. Perhaps a good compromise would be to change the rear axle ratio to 3.77:1 or even 3.89:1.

Final recommendation to consider with this four to five-speed swap concerns speedometer gearing. The equation for an accurate reading, as stated earlier, is achieved by taking into account the tyre size and rear axle ratio of the vehicle receiving the new 'box'. A selection of driving and driven gears ranging from five to seven teeth on the former and 21 to 25 with the latter are available. The 25 tooth driven gear is the correct choice here and when fitting it, remember to include the little oil seal.

Parts and lubricant required:

1 x gearbox (Type 9 five speed)	5014001 ex 1649015 new
1 x tailshaft seal	1590441
1 x speedometer driven gear (25 tooth)	6011057
1 x speedometer cable	6060903
1 x speedometer gear shaft oil seal	1579860
1 x gear lever (Sierra type to modified)	6149192
3 x bolts for above	6121433
1 x gasket (gearbox case to bellhousing)	1632552
1 x gear knob (suggestion)	1613882
2 x gearbox mounting brackets (now unobtainable part number for reference only)	1434773
1 x clutch pressure plate standard*	6055852
1 x clutch pressure plate Group 1*	9094210
1 x clutch centre plate standard*	6107848
1 x clutch centre plate Group 1*	9094209
1 x clutch release bearing*	6124270
*only if required	
Synthetic gear oil Ford recommend ESDM-2C175A	
1 x litre bottle	5015547

Rather less is known about the versatility of two other five-speed Ford gearboxes, both of which drive through the rear wheels. Ford's latest addition to their comprehensive range of transmission units is the type 'MT75' which will eventually replace the Type 9 gearbox altogether. Currently there are just five passenger car models to benefit from its production fitment which are the Sierra 2-litre Twin Cam, Sapphire Cosworth 4x4, Granada 2 litre Twin Cam, 2.9 V6 and Diesel. Undoubtedly there will come a time when this gearbox finds its way into 'unintended' Ford models, particularly the RS2000 but the newness of the unit means that is unlikely to have occurred yet. However, if anyone has already made the swap, you know our address....

The other five-speed gearbox that has just finished its four year association with the Cosworth turbo engine is the Borg Warner assembly listed by Ford as a Type T5 and used exclusively in all rear-wheel drive Sierra Cosworth models. In spite of this unit being generally available for purchase since its introduction four years ago, less is known about its non-standard useage. Just recently, however, some Cosworth engine and T5 gearbox assemblies have found their way into special build vehicles. We have yet to hear if the T5 transmission can be grafted on to the rear of say, a Kent engine. Perhaps the retail price of £1022.30 is enough to discourage such experiments. However, there are surely by now a fair number of used 'T5' gearboxes on the market to tempt people into the belief that "it may just fit".

Next month we hope to bring you the front wheel drive gearbox story. ■

FORD GEARBOX RATIO CHART

	1st	2nd	3rd	4th	5th
Cortina Mk1 Type 4	3.343	2.396	1.412	1.00	-
Lotus Cortina - Oct 1964	2.500	1.640	1.230	1.00	-
Lotus Cortina from Oct 1964	3.543	2.04	1.412	1.00	-
Corsair 2000E	2.972	2.010	1.397	1.00	-
Bullit competition	2.296	1.697	1.280	1.00	-
Quaife straight cut four speed	2.50	1.64	1.22	1.00	-
Hewland five speed comp	2.84	1.78	1.47	1.21	1.00
Escort Mk1/2 1100, 1300	3.656	2.158	1.425	1.00	-
Escort Mk1/2 GT, Sport	3.337	1.995	1.418	1.00	-
2-litre Type E	3.65	1.97	1.37	1.00	-
Rocket Type E competition	2.54	1.666	1.255	1.00	-
R.T. Quaife Rocket Type E (without synchromesh)	2.04	1.54	1.21	1.00	-
R.T. Quaife Rocket Type E (with synchromesh)	2.39	1.69	1.34	1.00	-
ZF five speed (overdrive)	2.99	1.76	1.305	1.00	0.874
ZF five speed (direct top)	2.30	1.80	1.36	1.14	1.00
Sierra five speed Type 9	3.65	1.97	1.37	1.00	0.82
Sierra five speed Type 9 with straight cut close ratio R.T. Quaife gears	2.39	1.54	1.21	1.00	0.91
Five speed Type MT75	3.89	2.08	1.34	1.00	0.82
Sierra Cosworth Type T5	2.95	1.94	1.34	1.00	0.80