



Technical Information

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AUTOMATIC TRANSMISSION FOR TOWING

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"Automatics? They are dangerous for towing aren't they? No engine braking, and oil overheating problems. And of course too complicated and expensive to buy and repair. No, not for me: anyway they are only for older folk."

There are many old wives tales in caravanning, and this is probably one of the most widely believed. Of course an automatic does have disadvantages as well as advantages, so it is worth setting them down to try and clear away the misconceptions.

Why have a gearbox?

What does a gearbox do? Basically it matches the required speed of the car to the speed of the engine. Car engines do not develop power and torque (turning power) evenly across their speed range. This is why a car engine needs to be revved quite hard to get an outfit moving from rest and why it 'runs out of breath' when rotating at high revs. To get good acceleration from rest up to the required cruising speed it is necessary to keep the engine speed within a range where useful torque is developed. As the engine and road speeds increase the speed ratio between the engine and the driving wheels has to change so that the engine continues to provide suitable torque. A gearbox allows different combinations of gear wheels to be selected to keep the engine operating at close to its optimum speed.

Changing gear requires some method of disconnecting the engine from rest of the 'drive train', so that the engine's speed can then be adjusted to match the new gear ratio. In a manual gearbox you use a foot-operated clutch while you change gear. With a conventional automatic there is no separate clutch. Explaining exactly what goes on inside an automatic gearbox is something of a challenge, and well beyond the scope of this leaflet. For the technically-minded, detailed explanations can be found in automotive reference books or websites.

A key factor, however, is that the role of the mechanical clutch is taken by a fluid coupling. This can be likened to trying to stir a tin of treacle with a spoon – while there is no direct connection between the spoon and the tin, the treacle is sufficiently viscous (i.e. thick) to transfer the torque (or turning action) of the spoon to the tin. If you do not hold the tin tightly, therefore, it will spin around with the spoon. However, there is always going to be a small amount of slippage in such a system, and this provides the necessary decoupling of the engine and gearbox. However, when driving at cruising speed, whether solo or towing, this continuous slippage gives a significant power loss which results in increased fuel consumption and heat build up in the gearbox. This is the main reason why a transmission oil cooler is necessary, and why some vehicles need additional transmission cooling when used for heavier-duty work, such as towing.

Modern designs of automatic gearboxes use a fluid coupling which includes a torque converter. This is one of the main benefits of an automatic over a manual, since the torque converter gives a torque multiplying effect at low engine speeds (in effect ‘extra leverage’), which makes pulling away from standstill and especially hill starts much easier. Most automatics now also have a means of mechanically locking the torque converter at speeds greater than 30-35 mph or so, thus eliminating slippage and hence improving efficiency.

Old automatics had typically 3 and sometimes 4 forward gears. Modern ones tend to have 5 or 6, and occasionally 7 or even 8! The more ratios available, the greater the chance of there being an optimum ratio available to give the best combination of performance, refinement and economy.

All this means that the transmission loss in the gearbox is much reduced and is about the same as a manual gearbox. This in turn means that the fuel consumption and performance of a modern 5 or more speed automatic may be comparable to that of an equivalent manual gearbox in some cases. Check the manufacturer’s fuel consumption data or, better still, independent test figures, to see if this is the case for a specific model. A further benefit is that a smaller heat exchanger is needed and this is often built into the radiator cold header tank as standard and in most applications it does not need supplementing with additional cooling.

Continuously Variable Transmission (CVT), much developed and improved from the DAF/Dutch Volvo type of old, achieves automatic operation via an entirely different principle, and has been available on a few small cars in recent years. While the size and limited engine capacities of these models has restricted their suitability for towing, within their rated limits The Club has found them to perform acceptably.

In recent years, a number of alternative approaches to automatic gear changing have been introduced, including Volkswagen Audi Group’s ‘Direct Shift Gearbox’ (DSG) and similar concepts which combine the best aspects of manual and automatic technology for improved performance and efficiency. Detailed descriptions of all such systems are beyond this leaflet, but by way of an example, in the DSG system, the engine drives a manual gearbox via two separate clutches. One clutch connects to gears 1,3,5 and reverse, the other to gears 2,4 and 6. Hence, 2 gears can be engaged at once, and swapped between extremely quickly by switching clutches. The use of a sophisticated electronic control system enables this mechanism to operate as either a highly effective fully automatic gearbox, or as a manual box with automatic clutch.

As far as The Club is aware, all such systems of this type are suitable for towing, and indeed appear to be very good in that application.

Driving an automatic

Driving an automatic is easy, if sometimes a little disconcerting at first for anyone more used to a manual transmission. The following comments apply to most automatics, but the increasing sophistication of modern vehicles means that this is one area where it is really useful to read the relevant sections of the car's handbook. Specific models may have additional features, modes of operation or recommended patterns of use which are well worth noting if you want to achieve the best performance, fuel economy and safety.

In use the driver has the option either of letting the automatic gearbox be entirely automatic by putting the gear selector in Drive (D), when engine power, engine speed and accelerator pressure will determine the timing of gear changes, *or* of using the lever to select the gear required. This allows changing down for engine braking, so it is totally wrong to claim a driver has no control of his automatic gearbox and no engine braking, although there is less effect than with a manual. *Note:* As a precaution against over-revving the engine, 1st gear hold on some cars can only be engaged from rest, and others only offer a locking facility in second gear. Others have a speed sensitive lock to prevent manual engagement of first over (say) 5 mph. What one cannot do manually is make changes to higher gears if the gearbox's 'brain' says otherwise.

Just how much manual control is offered varies from model to model. The recent trend has been to give the driver more options with this regard, though, and many automatics can in effect be driven as a 'clutchless manual', if you so wish. In the overwhelming majority of situations, though, the sophistication of the control system means that the gearbox is best left to do its own thing. The exceptions to this tend to be situations like driving in snow and ice, where holding a low gear to maximise engine braking is desirable. When towing in hilly terrain, it is also sometimes desirable to hold or select a lower gear, rather than wait for the gearbox to notice it has reached a gradient. Sometimes when planning to overtake, it can be beneficial to select a lower ratio in advance of starting the manoeuvre, rather than waiting for the gearbox to 'kick down' (see below) in response to a press of the throttle.

In addition the Drive (D) mode for forward motion, most automatics will have a number of other gear selection positions, although not all will include all of these:

- Park (P) – the transmission is locked, and the car can be safely left without risk of it rolling away, although it is usually recommended to apply the handbrake as well. The usual position necessary to be selected prior to starting the engine (although Neutral is an alternative). On many models, a safety feature means that it is necessary to be pressing the foot brake before the selector can be moved out of this position.
- Reverse (R) – Engages rearward motion! Again, often interlocked with the foot brake to prevent inadvertent selection when moving forwards.
- Neutral (N) – The transmission is disconnected from the wheels. The engine can also be started in this position.
- 1, 2, 3 etc. Direct selection of an individual ratio, or ratio hold. Exact operation varies from model to model, but usually it is possible to hold lower gears for improved engine braking, or to prevent high ratios being used on slippery surfaces.

Many recent models offer a 'manual' mode, where each available ratio can be selected in turn, although often there are certain safety overrides to prevent really inappropriate ratios for the circumstances to be used.

- Sport (S) or similar – Adjusts the gearbox operating characteristics for maximum performance – eg more willing to select lower ratios, and hold them until higher engine rev are reached.
- Winter (W) or similar - Adjusts the gearbox operating characteristics for optimum slippery surface performance – eg always sets off from standstill in second gear to minimise the risk of wheel spin, and may prevent the selection of the highest gear ratios to maximise engine braking.
- Economy (E) or similar - Adjusts the gearbox operating characteristics for the best fuel economy – eg attempts to use the highest gear ratio at any given time, changing up earlier than normal, with a consequent reduction in acceleration.

Other controls:

- Kick down – A sharp stab on the accelerator will normally result in the gearbox changing down one or more gear ratios to give maximum acceleration. Particularly useful when overtaking.
- Mode selection – In addition to manual selection of modes such as Sport, Winter and Economy as mentioned above, many gearboxes are programmed with a range of different shift characteristics which alter the way the gearbox operates and hence the character of the car. The management system controlling the engine and gearbox monitors the driving style and operating conditions of the car, and will shift between these modes automatically. For instance, enthusiastic driving on a twisty B-road will result in the gearbox becoming more 'sporty', holding lower gears for longer and thus improving acceleration. Often a 'towing' mode is included, which recognised the reduced performance of the towcar due to the presence of a caravan, and adjusts the gearbox accordingly.
- Off road modes – Some 4x4s designed for 'proper' off road use may have additional modes of operation based around different kinds of terrain, and often interlinked with the operation of the four wheel drive system and often the braking system. Such modes are beyond the scope of this leaflet to cover.
- Creep - With the engine running when not in Neutral or Park, to keep the car stationary, it must always be restrained by either the hand or foot brake. This is due to the inbuilt tendency to creep forward (or backward) in gear. See also below.

A good choice?

Caravanners are choosing automatics more frequently. In The Club's Membership Survey in 2002, 17% of members owned an automatic - in 2005, the figure had risen to 22%. Hitch a caravan behind a car and the case for an automatic gearbox to protect engine, transmission and body shell from the type of shocks caused by clutch engagement is clear. Solo and (particularly) towing, progress tends to be very much smoother, including when reversing.

The driver of an automatic has the considerable advantage of not needing their left leg to depress a clutch pedal against the resistance of the clutch spring. In town and other heavy traffic such as motorway jams, this can be hundreds of times in a few miles.

The tendency to 'creep' mentioned above has considerable advantages. Having halted briefly on a gentle upward slope, you do not have to apply the handbrake, then release it precisely at the moment the clutch is engaged, with the right amount of engine revs, as with a manual gearbox. Instead the driver of an automatic need only transfer the right foot from the brake back to the accelerator ready for moving off - the creep holds the car or outfit momentarily on the slope. If the hill is steep, experienced automatic drivers use the left foot to hold the outfit on the brake (you could equally well use the handbrake) while depressing the accelerator with the right foot until the engine is producing sufficient torque to be able to pull away, when the footbrake can be eased, giving a smooth, controlled getaway. Most gearboxes also include an 'anti-roll back' feature which mechanically prevents the car rolling backwards on a hill if it is in Drive. The tendency to creep can also be useful during low speed manoeuvring (e.g. hitching up, or backing onto a pitch). Often the car can be controlled using only the brake, with no need to 'pedal with both feet', balancing accelerator and brake and/or clutch. (*Note:* For normal driving on the road, the rule is **always** to use **only** the right foot for braking, keeping the left foot idle. For manoeuvring and at creep speed **only**, the left foot may be used, when experience has been gained.)

You should never use the creep on an incline as a substitute for the brake to hold the car stationary for a significant length of time, as this may overheat the gearbox and cause expensive damage. Similarly the extra weight of a caravan being towed, except where there is an automatic lock-up device included, will cause extra drag in the torque converter, which heats the oil. Add steep hills and hot weather and the oil can get very hot. It then thins, cannot do its job properly and mechanical damage results.

This is why adequate transmission cooling **must** be fitted for towing otherwise you may have an expensive repair bill. Most manufacturers fit a cooler as standard, but some recommend a second cooler for serious towing work. Check carefully that you do what the manufacturer recommends, and this includes not exceeding the trailer towing weight limit or the gross train weight (ie loaded car and loaded caravan). ***Some manufacturers specify a manufacturer's towing limit for automatics which is lower than the manual equivalent. Check carefully before you buy.***

There is significant anecdotal evidence that the clutches on modern manual cars are less robust following the removal of asbestos from the specification of the friction material some years ago. Choosing an automatic eliminates any risk of excessively slipping the clutch during low speed manoeuvring with the caravan, which can cause premature clutch failure on manual towcars.

Another advantage with the automatic is when restarting on slippery surfaces. However gently you let in a manual's clutch you may apply too few revs and stall the engine, or just too many and spin the wheels. With an automatic, power is fed through steadily and progressively and you are less likely to cause wheel spin and it is virtually impossible to stall the engine. Also, when it comes to rocking the car backwards and forwards to extricate it from mud or snow, it is easier and quicker with the automatic's selector lever than with clutch pumping and a manual gear change that sometimes will not slot in easily.

Reference to road tests or the manufacturer's specification will suggest the extent of two possible disadvantages of an automatic gearbox: increased fuel consumption and lesser performance. Historically, automatics used to be perhaps 10% less efficient in terms of fuel economy. This has steadily improved however, and most are comparable, or in some cases

even better than manual equivalents! Unless considering an old generation design (typically 3 or 4 speed models) this should not be a major concern, but always check manufacturer's published data or road test reports to be sure. Again, historically, automatics had reduced acceleration and lower top speed compared to manual equivalents. In both respects, this has also improved to be broadly comparable for recent designs. The situation with judging automatic performance is further complicated, however, as their performance is relatively unaffected by driver skill. Bear in mind when making comparisons that the performance figures quoted tend to be those achieved by professional test drivers. Most of us would struggle to get close to results such as the standing start acceleration performance figures if using a manual gearbox, making the figures somewhat irrelevant. With an automatic, though, the influence of driver skill is reduced, and the performance quoted tends to be more closely achievable.

Historically, there have been far more petrol-engined automatics around than diesel ones. This perhaps stems from the UK preference to only buy automatics for premium models, which have tended to be petrol in order to have enhanced refinement and performance. Diesel engine technology has improved so far in recent years, though, that there is no reason why a diesel automatic should not be equally as effective as with petrol power, and more models than ever before now offer this option in UK. Indeed, the good torque characteristics of most diesels make them ideal for use in conjunction with an automatic gearbox, and arguably such a combination should make for the best possible towcar.

Note however that a few diesel models have a very low manufacturer's towing limit when fitted with automatic transmission. Check carefully before you buy.

The final issue to consider is that of purchase price. While popularity is steadily increasing, automatics do remain a minority option for many models, and thus tend to command a premium price. For many people, the advantages make this premium worthwhile, but how much extra is worth paying can only ever be a personal decision. If you have not tried an auto before, or have not tried one of the recent models with all their improvements over earlier versions, then it is certainly worth at least taking a test drive, though.

Automatic gearboxes are available on several of the base vehicles commonly used for motor caravan conversions (e.g. Volkswagen T5, Ford Transit, Mercedes Sprinter, and the latest Fiat Ducato since early 2008). These offer similar advantages and disadvantages (whether planning to tow or not), but are far less common, and thus may command a significant premium price.

Finally to summarise the pros and cons of automatic gearboxes:

ADVANTAGES	DISADVANTAGES
Greater reliability	Extra purchase cost
Less wear and tear on driver, especially left leg	Older 3 speed units can use about 10% more fuel. Modern 4 & 5+ speeds and the CVT types are very comparable with manuals
Less wear and tear on car	Some performance lost in the automatic gearbox. Usually top speed is about 5 mph less than a manual. Acceleration usually marginally slower than a manual driven expertly.
Easier mud/snow and hill restarts	May need extra oil cooler for towing. Check with manufacturer
Control of gears (no less than with a manual)	
Easier hitching up	

AUTOMATIC TRANSMISSION TABLE

MAKE AND MODEL	OIL COOLER AS STANDARD FITMENT	NEEDED IF NOT STANDARD	ADDITIONAL REQUIRED
Alfa Romeo 164 Super	Yes	N/A	No
156 2.5 V6 Q-system	Yes	N/A	No
166 2.5 and 3.0 V6	Yes	N/A	No
Sportronic	No	N/A	No
156 2.0 Selespeed	No	N/A	No
147 2.0 Selespeed	No	N/A	No
GT 2.0 Selespeed	No	N/A	No
159/Brera/Spider Qtronic	Yes	N/A	No
Audi	CONSULT YOUR DEALER		
BMW	Yes	N/A	Drivers should always consult their handbooks before towing and if necessary consult an Approved BMW Dealer for further details.
Chevrolet – Kalos/Lacetti/Tacuma/Aveo/Epica/Captiva	Yes	N/A	No
Chrysler - Neon/Voyager/Grand Voyager/PT Cruiser/Jeep Cherokee/Grand Cherokee/.300C Sebring/Avenger/Caliber/Nitro/Patriot/ Compass	Yes	N/A	Refer to owners handbook for specific vehicle information
Citroen	Yes	N/A	No
Daewoo	Yes	N/A	No
Daihatsu	Yes	N/A	No
Fiat Tempra/Punto Speedgear/New Punto Speedgear /Croma 194 Brava/Bravo/Marea/ Croma 154 Stilo 2.4 Selespeed/New Punto Dualogic/New Panda Dualogic/Idea Dualogic/ Ulysse/Grand Punto Dualogic/500 Dualogic/198 Bravo Dualogic	Yes No	N/A N/A	No No
Ford	FOR ALL OTHER MODELS CONSULT YOUR DEALER		Yes for '85' & '92' old shape Granadas & all Sierras under high temps & mountainous conditions
Honda – Accord 2003 Accord 1.8/2.0 1999 – 2002 Prelude 2.0/2.2 1997 – 2000 Legend 2000-2002 2007 onwards Concerto 1990 – 1994 Civic 2001 – 2005 Civic IMA 2002-2005 Civic Hybrid 2006 onwards Jazz 2002 onwards CRV 2002 onwards FRV 2005 onwards	Yes Yes Yes Yes Yes Yes NOT RECOMMENDED NOT RECOMMENDED Yes Yes Yes	N/A N/A N/A N/A N/A N/A FOR TOWING FOR TOWING N/A N/A N/A	No No No No No No No No No No No
Hyundai	Yes	N/A	Consult dealer when anticipating towing under arduous conditions
Isuzu	Yes	N/A	No

MAKE AND MODEL	OIL COOLER AS STANDARD FITMENT	NEEDED IF NOT	ADDITIONAL REQUIRED
Kia – all models	Yes	N/A	No
Lancia Dedra / Thema	Yes	N/A	No
Jaguar / Daimler six cylinder and V12 engined saloons V8 XJ, S-Type V6 AND V8	CONSULT YOUR DEALER		
Land Rover / Discovery / Range Rover Rover Classic -diesel and petrol	REFER TO HANDBOOK		
Lexus	CONSULT YOUR DEALER		
Mazda	CONSULT YOUR DEALER		
Mercedes	Yes	N/A	E300 TD- additional transmission oil cooler required
Mitsubishi	Yes	N/A	Refer to owner's handbook if towing 1000 metres above sea level.
Nissan	CONSULT YOUR DEALER		
Peugeot 205/206/207 306/307/308/407 405/406/1007 605/607 806/807	Yes Yes Yes Yes Yes	N/A N/A N/A N/A N/A	No No No No No
Proton	CONSULT YOUR DEALER		
Renault - 1990 onward Pre 1990	CONSULT YOUR DEALER		
Rover 827	Yes to 1000 kg or 1500 kg with cooling		No
820/Vitesse	Yes to 1025 kg or 1550 kg with cooling		No
825/75/MGZT-T/ZT4	Yes to 1600 kg		No
623/620	Yes to 1200 kg		No
620 SDi/SLDi/GSDi	Yes to 1400 kg		No
416/216	Yes to 500 kg		No
416 (1995 onwards)	Yes to 800 kg		No
RT400	Yes to 1000 kg		No
25/MGZR	No	No	Yes
45/MGZS	Yes	No	Yes
Metro 1.4	Yes to 800 kg		No
Montego 2.0	Yes to 1220 kg		No
Saab 900 & 9000	Yes	N/A	Yes for 9000 if towing over 1000 kg
9-3 & 9-5	Yes	N/A	No

MAKE AND MODEL	OIL COOLER AS STANDARD FITMENT	NEEDED IF NOT STANDARD	ADDITIONAL REQUIRED
Seat	Yes	N/A	All SEAT vehicles with automatic transmissions have oil coolers as standard and are more than capable in usual operation. However additional cooling maybe required for long distance in mountainous conditions.
Skoda Octavia, Fabia, Superb	Yes	N/A	Consult owners handbook
Ssang Yong	CONSULT YOUR DEALER		
Subaru	Yes	N/A	No
Suzuki – Vitara/Grand Vitara	Yes	N/A	Yes if driving in mountainous conditions
Toyota	CONSULT YOUR DEALER		
Vauxhall	CONSULT YOUR DEALER		
Volkswagen	Yes	N/A	All VW's equipped with 4 & 5 speed automatic transmission have coolers fitted as standard, but extra may be required on long distances in mountainous conditions
Volvo S70/C70 98-05 V70 98-2000	YES	IF SUBJECTED TO HEAVY LOAD, towing for long periods	Volvo accessory option available
S80 98-06 V70 00-07 S60 S90/V90	YES	NO	NO
	YES	IF SUBJECTED TO HEAVY LOAD, towing for long periods	Volvo accessory option available
740/940 NON TURBO	NO	IF SUBJECTED TO HEAVY LOAD, towing for long periods	Volvo accessory option available
740/940 TURBO	YES	IF SUBJECTED TO HEAVY LOAD, towing for long periods	Volvo accessory option available
XC90 D5, 3.2 XC90 V8, 2.5T	YES	NO	NO
	YES	IF SUBJECTED TO HEAVY LOAD, towing for long periods	Volvo accessory option available
S40/V40 NEW S40, V50, C30 NEW C70 NEW S80, NEW V70/V70XC 2008	YES	NO	NO
	YES	NO	NO
XC60	YES	NO	NO. (note) IF BRAND NEW CAR DO NOT TOW FOR FIRST 500 MILES
	YES	NO	NO