

MORRIS MARINA/ITAL REAR AXLE/DIFFERENTIALS AND SUSPENSION

Steve Green stevejgreen@btopenworld.com

In recent months the subject of Marina differentials has been raised several times. This is an attempt at collating the relevant information as a reference guide; it is a dynamic document and has been edited several times. If you spot any errors or have additional info then please let me know. I will then publish an update.

HISTORY

When the Marina was first designed it was in the early days of the UK motorway network. By comparison to today's A roads many were not dual carriageway, average cruising speeds were consequently much lower and the comparatively low revving engines were geared accordingly.

The Morris Marina/Ital banjo rear axle design is unique to the range, with a leaf sprung, solid axle, though there are many parts that are Triumph derived from the Herald, Spitfire, Dolomite (not Sprint) or TR7 4 speed parts bin.

Marina Vans are a little unusual. The 7cwt used a 4.55 or 4.11 ratio, depending on its age but the 10cwt van used a different style of axle based on an A55/A60 that are now rare and used primarily by Trials prepared cars with a 4.55 ratio generally considered too high for modern road use without a overdrive.

DIFFERENTIAL RATIOS

There are five differential ratios available; generally the smaller engined cars have the higher ratio and automatic cars the lower ratios

The standard Ratios available were

Ratio	Pinion/Crown	Triumph	Marina	Revs@60mph	Used in
4.55	9/41	217082		3954	1.3 Marina 7cwt Van from chassis No 22022
4.11	9/37	UKC1492	217081	3572	1300 Dolomite / 1.3 Marina Saloon and 7cwt van to car No 22021
3.89	9/35	UKC1493		3459	1500 Dolomite / 1.3 Ital
3.63	11/40	TKC2619	21H5549	3154	1850 Dolomite Manual / 4sp TR7 Manual / 1.8 Marina/1.7 Ital Saloon & Estate
3.27	11/36	TKC2768		2842	1850 Dolomite Auto / 4sp TR7 Auto / Ital 2.0 Auto

Revs at 60mph are approx. as it is dependent on tyre size. There are a couple of anomalies in similar listings available on the web, the moral is check before you proceed.

All of the above ratios are housed in the same basic machined centre casting assembly. It is therefore possible to interchange differential centres between each of the models detailed.

Checking the ratio can be done by counting the number of turns of the prop-shaft against the number of turns of the rear wheels. This can be done by rolling the car along a flat road. An alternative is to jack one wheel off the ground and turn a road wheel whilst the other is static, counting the turns of the prop, in this case double the result to counteract the effect of locking one side of the diff. Always check before you proceed. With the age of the cars many modifications/repairs may have taken place with later parts being fitted to original cars.

SPEEDO

The standard Marina/Ital the speedo input is 1000revs of the speedo cable @60mph. If you change your diff ratio or your tyre rolling circumference, it will have an effect on the speedo accuracy. This can be compensated for by selecting a speedo gear combination to suit. There are two choices of internal speedo gear wheels fitted to the gearbox output shaft inside the extension housing. All Marina gearboxes use the same 6 start speedo worm gear 22G1752 and the TR7 and Dolomites, fitted with 3.27 ratio axles, use a 7 start speedo worm gear 22G1753. These combined with the range of pinion gears should account for most circumstances. Some parts are becoming rare and may be difficult to source. Ultimately the only way of getting an accurate speedo is to have it professionally calibrated to suit.

The following are the choices of Pinion gears.

Marina	Triumph	Teeth	Colour	Marina Axle ratio
22G 2019	219006	25	White	4.55
	219005	24	Blue	3.89 Spitfire diff
22G 1785	219004	23	Black	4.11
	219003	22	Red	
	219002	21	Green	
22G 1784	219001	20	Orange	3.63

PARTS

In general all the parts for the overhaul of any Marina/Ital/Dolomite axle, apart from the crown wheel and pinion are the same across the range. Many of the necessary repair/replacement parts are available from Rimmer Brothers, who can also supply an exchange service on complete diff centres. Check before you buy but quote the relevant Triumph part number above. They are likely to say that they cannot confirm that a Dolomite/TR7 will fit a Marina axle, but it has been done with no problems as published on both the Marlin and Fastmarina forum.

Several internal differential parts like the crown wheel and pinion also appear across the Triumph range like the Vitesse, Spitfire and GT6 so supply should be OK for several more years.

I would not be totally surprised if the Dolomite 1300/1500/1850 half-shafts are the same as the Marina/Ital 1.3/1.7/1.8 though I cannot confirm this personally Jigsaw Racing are pretty sure.

There are many other suppliers of parts, Canley Classics, eBay etc.

VARIATIONS

Whilst the axle bodies are identical across the range, late model Marina and Ital half-shafts and hubs were fitted with 1/4" keys as opposed to 3/16" on pre 1978 Marinas. These are obviously not interchangeable. Hubs with larger 1/4" keyways also have larger bore oil seals. It's worth checking before you buy.

This is a bit academic if you break a halfshaft as the supply of half-shafts is very limited. Only Caterham 7 specialists (they originally used Marina/Ital axles and broke the half-shafts) may have any quantity though they do turn up.

Redline Components currently (2010) have stock of half-shafts and hubs in both sizes.

FAILURE MODES

Once the differential starts whining there is little that can be done to salvage it. Many of the surviving axles will still contain remnants of the original oil as the axles are not fitted with drain plugs. This old oil inevitably contains metal particles after 30+ years of service.

With 1.8TC engines being tuned beyond their design spec and alternative engines being fitted, additional load is placed on the differential. Caterham cars that use the Ital axle generally recon that 135 bhp is the absolute maximum but at these powers, with added torque, the half-shafts are weak especially if kerb hopping. The half-shafts fail around the hub keyway and the wheel parts company from the rest of the car. Rakeway manufacture a replacement half-shaft and hub set. This uses a much larger double roller bearing and a specifically designed hub, retaining the original brakes and PCD. Not for the weak walleter at £750 +vat. This still leaves the crownwheel and pinion power limit.

There is a historical problem of the rear wheel bearings sliding on the half-shaft. If this is allowed to continue it becomes not only dangerous but the half-shaft will need replacing. Caught early enough the solutions advocated by Kilroy on the fastmarinamagazine website can help. Some have tack welded the bearing to the half-shaft, NOT recommended as this introduces another failure point. A method used by the Caterham owners is to fully assemble the bearing and hub on a halfshaft and then carefully measure the gap between the hub and bearing and machining a spacer to fill the gap, thus preventing lateral movement of the bearing. This is quite difficult to do accurately as the hub is fitted on a taper and a little dirt or corrosion can change the position it finally achieves.

I have seen a couple of recent failures where it looks as though a crown wheel fixing bolt has come loose, seized the diff and exploded out of the casing. Something worth checking if you ever have the diff centre out of the axle, they should be torqued 55-60 lbf ft, not detailed in many manuals.

A common mod by the Caterham owners is to reduce the clearance around the oil baffles in the casing. This is intended to keep oil in the diff centre when cornering hard, rather than washing out to the outer limits of the axle where it is not needed. The axles are commonly overfilled for the same reason.

REPAIR / REPLACEMENT

It is possible to buy new gears, crown wheel/pinion and differential pinion/gear as well as bearings for the diff centre. Assembling them correctly is probably beyond the average garage mechanic, needing some special tools, and should be left to the professionals.

Replacing the diff centre assembly is a reasonably easy job. Follow the instructions in a Haynes or similar manual. The half-shafts need pulling out by about 50mm, not complete removal; though this does not save any work it may save space. There is no need to remove the bearings or hubs from the half-shaft but consideration may be given to changing the bearings, seals and brake pads etc. whilst they are exposed. The prop-shaft must be disconnected from the differential flange.

The eight diff centre securing nuts can then be slackened to allow the oil to drain from the diff casing, and then removed. Do not pry the diff centre out as you may damage the gasket face.

Thoroughly clean out the inside of the banjo casing, especially if the old diff centre was noisy as it may well be contaminated with metal particles. In extreme cases it's probably best to remove the axle from the car completely to ensure it is thoroughly clean inside. If you decide to do this consider dismantling the axle on the car. It is a lot easier to manhandle an empty casing, instead of a complete axle!

Reassembly is the reverse of removal with a new gasket Part No 114749, it might be worth replacing the nuts and lock washers, not forgetting to re-grease the bearings with high temp LM grease and refill the casing with 0.71 litres of Hypoy EP90 (see notes below)

HUBS, BEARINGS & SEALS

Removing the hubs and bearings is the nightmare mechanical job on a Marina. 'Kilroy' has made many valuable suggestions on the fastmarinamagazine forum on how to go about the job. The first step is to loosen the hub nut whilst everything is still on the car. Many hubs and bearings will require several tons of pressure to remove them. Ideally a 20 ton hydraulic press will do the job. Avoid using three leg pullers as these can distort the hub and are unlikely to exert enough pressure unless they are hydraulic assisted. Excessive heat is likely to destroy the toughness of the metal and do more damage than good. The Marina hub is similar to many small Triumphs that same the same PCD. Specific pullers are available from TR parts suppliers but can cost as much as £100.00. These only remove the hubs, you will still need to remove the bearings, again best done with a press as you will also need to fit new ones.

When using a press, keep the nut on the half-shaft to protect the thread and avoid bits from flying around the workshop and the losing the key.

Reassemble the hub on the half-shaft with a little copper grease. If replacing bearings, fit them dry unless the half-shaft is worn or damaged, in which case use Loctite 641 or 603. This will make the bearings more difficult to remove at a later date. Badly damaged half-shafts should be replaced though they are rare and expensive at around £70 for a used one from parts dealers.

In 1978 the design of the Hub/Halfshaft was changed from a 3/16" keyway and a small oil seal to a 1/4" keyway with a large oil seal.

At the time of writing (2012) Rimmer Bros have two bearing/seal kits for the TR7/Dolomite axle GHK1030 and GHK1007. These kits have the larger (GHS184) post 1978 oil seal. Individual part numbers are:

Axle shaft inner seal GHS181

Hub bearing GHB180

Gasket rear hub GFG117

Outer Oil seal early (small seal) GHS111, Late (large seal) GHS184

A complete Kit from QH is part no (small seal) QWB133C and (large seal) QWB440.

Individual bearings available as SKF6206 or RHP N9661A

LUBRICATION

Both the Triumph and Marina rear axles specify EP90 GL4. The current supply of oil seems to be EP90 GL5. This apparently is an improved lubricant. There is a difference of opinion as to the suitability of GL5 in older transmissions as it has higher levels of additives that may attack the bronze parts of gearboxes and diffs, especially at higher temperatures. The evidence is sketchy and I will leave you to draw your own conclusions but the problem seems to be evident at temperatures not usually experienced in a Marina.

Many of our diffs have probably never been thoroughly cleaned internally since the cars were built and some will contain remnants of the original oil. If the opportunity arises I recommend that the internal parts are thoroughly cleaned, a drain boss welded to the lowest part of the axle case and the axle filled with whatever new oil you decide to use.

Any new high pressure oil will be a good thing rather than to worry about which one to put in.

SPECIALS

Once upon a time Quaife Engineering made a limited slip Marina/Ital differential. These are rarer than hens teeth and command premium prices. The original Quaife units were sold without crown wheel and pinion gears so still need building into a diff centre.

Apart from the Rakeway half shaft mod, James Whiting used to manufacture a modified axle fitted with disc brakes.

OTHER CHOICES

There are no direct like for like replacements for the Marina/Ital axle but it is rarely necessary to replace the whole axle as the casing rarely fails. Triumph Dolomite axles have the same 3.75" PCD but use a different suspension arrangement and require some modification, removing the old suspension mounts and adding new spring pads for the Marina/Ital and new tabs for the brake system etc.

The common upgrade is to fit a Dolomite Sprint tube type axle that can handle more power and has a 3.45 ratio and a 3.75" PCD so is beneficial for lower revs at high speed. Limited slip diffs are also available for these axles. The subject has been covered at length in the forum technical section of Fastmarinamagazine and elsewhere.

It is possible to fit various other axles but these will have different wheel PCD's. Ideally these would have between a 51" & 53" track

Marina Vans were fitted with 4½" PCD hubs, otherwise interchangeable with the saloon hubs, so it may be worth starting with axles with this PCD. The overall width is a critical dimension to avoid tyres extending beyond the bodywork though this can be compensated by fitting wheels with a suitable offset enabling the tyre track to remain the same as the front and to keep the tyres within the bodywork. This obviously adds cost, especially if the front hubs and all four wheels are changed. It is also necessary to ensure that the spring hangers can be relocated to suit the Marina dimensions. Installation would be much the same as that for a Dolomite Sprint axle. It will be necessary to manufacture a new prop-shaft and to rearrange the hydraulic and hand brake system. The overall size and offset of the differential casing may also be the limiting factor especially in a Marlin where it may be necessary to modify the tub.

It's tempting to think that MGB's would be a source. Apart from a change of PCD, the standard tube type (Salisbury) axle ratio is 3.907, not so good for an 1800 Marina as the axle was designed with MGB overdrive in mind. These axles come in wire or bolt on wheel width types.

More choices may be found in Fiat rear wheel drive cars like the 131/132 or Alfas from the same era. I have heard of a RWD Toyota Celica axle being used. Early Ford axles may also be adapted. Nothing is mechanically impossible.

SUSPENSION

The best thing that can be done for a Marina/Marlin rear suspension is to fit Superflex or other Polyurethane bushes. More comfort can be gained by fitting Spax adjustable Shock absorbers, The original pattern was used only for the Marina and Ital. Replacement Shocks do come up for sale occasionally; avoid NOS items as their seals may be of dubious age. Original parts were

Part No	Setting	Application
GSA379	Low	?
GSA380	Med	?
GSA381	High	Heavy duty pack only.
Spax G632	Adjustable	Any

Superflex leaf Spring Pads are a little oversize and benefit from trimming with a sharp craft knife. The pads for the Vans are different. If you plan to change the pads, there is every likelihood that the U bolts will shear, replacements are available but ensure you buy 3/8" Unf threaded ones, the more commonly available Ford Escort U bolts will require all the suspension plates re-drilling, 24 holes in total.

There are no standard Marina/Ital lowering blocks. The Marina 7 Cwt. van was fitted with a wedge spacer part FAM 1387 the purpose of which is unclear but may be associated with improving the angle of the propshaft to the differential nose. Marlin Roadsters are fitted with larger custom wedge blocks originally supplied by Marlin themselves. It is possible to fit Ford Escort lowering blocks but the centre locating boss and bore need to be modified to positively locate the block, spring and axle.

The two end spring eye bushes can be difficult to press out, try drilling the rubber ring out and then saw carefully through the outer shell through the gap in the spring eye. Take care not to damage the spring. This can all be done on the car.

The springs themselves come in many different rates. With a lightweight Marlin the standard 2 leaf 1300 or 1800 springs should be best. This is always assuming that the springs themselves are in good condition.

Finally on rear suspension issues some MK2 onwards Marinas were fitted with the chassis mountings for a rear anti roll bar, even fewer actually had brackets welded to the axle case and the bar 21H6654 fitted in all probability to HD pack equipped cars.

The following is a list of standard springs, the two leaf are the most common. Often their true identity is hidden through age.

Part no	Rate lb/ins	Free camber	No of leaves	Application
21H6039	130	5.94" (151.0%)	3	
21H6269	130	5.93" (150.6%)	4	
21H6434	113	4.7" (119.3%)	2	Austin Marina – Canada Only
21H6436	165	5.81" (147.6%)	4	
21H6438	225	5.43" (138.2%)	4	
21H6440	130	?	3	Police and Estate
21H6442	130	4.37" (111.1%)	4	1.5 Diesel
21H6714	113	?	2	1800cc Except Estate
21H6707	100	?	2	1300cc Except when Heavy Duty Pack is fitted
FAM2044	130	?	4	1800 Estate and 1.5 Diesel Heavy Duty Pack
FAM1507	165	?	?	7 Cwt Van
FAM1128	225	?	?	10 Cwt van and Pick-up

For new springs or re-tempering the originals try

Midland Motor Springs - <http://www.springs.me.uk/>

Jones Springs - <http://www.jones-springs.co.uk/home.html>

ML (UK) Ltd - <http://www.mluk.co.uk/leaf-spring-manufacture.php>

DRUM BRAKES

The standard drum brakes fitted to the saloons, estates and 7Cwt vans all use the same drums hence the same shoe dimensions though there are various lining materials. There are two prime variations, those with manual handbrake adjusters and those with auto adjusters these have different backplates and obviously some different internal parts, notably the brake cylinders. I have never yet found a fully working reliable auto adjuster.

The following are the available slave cylinder sizes and applications, check before ordering parts as actual cut off dates and types are unclear.

GWC1121	0.625"	Auto	Saloons HD
GWC1110	0.700"	Man	1.3/1.8 Saloon/Estate
GWC1208	0.750"	Man	7Cwt Van
GWC1202	0.625"	Man	1.3/1.8 HD pack

You could always follow my idea of fitting MGF discs and calipers to your Marina/Ital axle but take care that you don't overbrake the rear as the car will become dangerous under heavy braking unless you make other modifications.

SOURCES

Various Marina parts catalogues and workshop manuals

Canley Classics <http://www.canleyclassics.com>

Earlpart Ltd. <http://www.earlpart.co.uk/>

Jigsaw Racing <http://www.jigsawracingservices.co.uk>

Rakeway <http://www.rakeway.co.uk/page37.html>

RevingtonTR <http://www.revingtontr.com>

Crown Differentials <http://www.crowndiffs.co.uk/>

James Whiting <http://www.jameswhiting.com/>

Quiller Triumph <http://www.quillertriumph.co.uk/>

Redline Components <http://www.redlinecomponents.co.uk/>

Rimmer Brothers <http://www.rimmerbros.co.uk>

Various other information gleaned from Chris Weedon, Jez Cox, Kilroy and many others too numerous to mention.